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Greening Our Existing Homes

National retrofit strategy

A consultative document

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Executive summary

Proposal

This paper sets out the case for the UK Government, working in partnership with industry, finance, and other community based bodies to introduce a national retrofit strategy to make our existing homes greener and more energy and water efficient. Without a long-term plan, the UK cannot meet its targets of achieving net zero carbon emissions by 2050.

The industry is able to deliver this strategy, but there are critical elements that can only be delivered by the Government. While industry can mobilise the majority of the capital that is needed, the Government must also invest to instill confidence in the sector.

What is retrofit?

Retrofit is an integrated approach to transforming the energy and water needs and technical systems in our homes which requires quality in design, installation and customer care.

Why is retrofit needed?

Our homes use 35% of all the energy in the UK and emit 20% of the carbon dioxide emissions. If the UK Government is to deliver its targets of a 68% emissions reduction by 2030, and net zero by 2050, household emissions need to be addressed. The UK has some 28 million homes, the vast majority of which need improving by having retrofit work carried out. A national retrofit strategy will also improve the UK's energy security.

Retrofit should be carried out alongside all other improvements. When typical home improvement works are undertaken, these represent opportunities to trigger measures to help us along the path to net zero.

What are the benefits of retrofit?

Improving the energy performance of our existing homes brings a wide range of benefits:

Economic – the Repair, Maintenance and Improvement (RMI) sector, which this strategy argues would be the main deliverer of retrofit improvements, represents one third of all construction output. Retrofit has the potential to create new and higher skilled jobs in every region and community and boost existing firms (especially SMEs and their supply chains). Economy-wide, retrofit also has the potential to develop and extend a labour force with a full range of high value roles which will sustain the economy at a time when it needs additional support. This speaks directly to the Government's jobs, skills, and 'levelling-up' agendas.

“ Our homes use 35% of all the energy in the UK and emit 20% of the carbon dioxide emissions ”



Executive summary

Social – for individual households, additional disposable income from lower energy bills, the health benefits from improved air quality, a more comfortable home, and improved value of their major asset are all important factors. Of the 31,100 excess winter deaths in 2012/13 - 30 to 50% were due to cold homes.¹ Indeed spending £10 billion on poor quality housing in England alone would save the NHS around £1.4 billion per year.² Heating water for use in the kitchen and bathroom accounts for 10% of energy bills. Retrofit measures will help the Government to meet their progress against statutory fuel poverty targets.

Environmental – reduced carbon emissions from our homes which will help create a low carbon built environment and position the UK as a global leader in the low carbon economy ahead of the United Nations Climate Change Conference (COP26) in November 2021.

How will retrofit be implemented?

Without a plan, the existing workforce cannot deliver the ambitious programme which could transform both our building stock and the construction industry. A systematic scaling up approach is needed to meet the volume of work needed. This has been modelled as a 's-curve' over the programme period from 2021 until 2040 and includes three distinct phases:

- **Phase 1** - underpin capability, including an endorsement by the Government of this strategy.
- **Phase 2** - a slower start focussing on the education of householders and the wider industry through a clear communications campaign as well as an intensive training programme for new entrants to the industry. Piloting and field trials would also be taking place.
- **Phase 3** – a 'quick' middle period based on a mature supply chain eco-system and strong customer protection.
- **Phase 4** - a ramp down of pace towards the end focussing on hard to treat properties, and also a phased redeployment of resources to alternate sectors.

In partnership with industry, the Government is asked to invest and create a long term policy framework which will meet its statutory carbon targets and trigger wider confidence to unlock private investment from property owners and financial institutions.

The industry needs around 500,000 new professionals and trades to tackle this challenge. The Government has supported the development of new training standards for Retrofit Coordinator and Retrofit Installer, which can form the basis of the programme in terms of training and quality assurance. Clarity on standards, process requirements and audit will provide a firm foundation for both training and market transformation.

The strategy has been developed with the private market in mind. However, its principles can and must be extended to the social sector as well. We are aware of significant work being undertaken by local authorities and the housing association sector to improve the energy efficiency of their housing stock.

We hope that 2021, the year when the UK hosts the United Nations Climate Change Conference, will be the ideal moment for all these bodies to unite behind the principle of a national retrofit strategy, and take the bold action needed to reduce carbon emissions before it is too late.



*Nottingham City Homes:
Energiesprong Retrofit, Melius
Homes*

“ The industry needs around **500,000** new professionals and trades to tackle this challenge ”

¹Washan, P., Stenning, J., Goodman, M., 2014. Building the Future: The economic and fiscal impacts of making homes energy efficient

²CCC 2016. Next steps for UK heat policy - Committee on Climate Change - October 2016

Background to the report

The Construction Leadership Council (CLC) provides sector leadership to the construction industry.³ The CLC has twelve workstreams that work collaboratively to address the biggest issues facing the industry, including skills, building safety and the reduction in carbon emissions business models across all sectors of the industry.

The CLC also convenes the industry response to urgent issues such as the COVID-19 pandemic, which led to the development of the Industry Recovery Plan. The Plan addresses the opportunities and challenges for all parts of the industry and sets out collaborative solutions for recovery.

The Domestic Repair, Maintenance and Improvement (RMI) Workstream is chaired by Brian Berry, Chief Executive of the Federation of Master Builders (FMB). The Workstream seeks to support measures that ensure the safe undertaking of work inside people's homes. It also seeks to build confidence among homeowners about conducting building works. The Workstream considers and discusses demand-side stimulus for the purposes of skills retention, job creation, improved industry standards and social benefit.

The Domestic RMI Workstream has developed the national retrofit strategy to achieve these objectives.

The CLC's COVID-19 recovery work is co-chaired by Andy Mitchell, CEO of Tideway and Mark Reynolds, Group CEO of Mace.

“The Construction Leadership Council (CLC) provides leadership to the construction industry”



³ Construction Leadership Council, 2020, <http://www.constructionleadershipcouncil.co.uk/news/construction-roadmap-to-recovery-plan-published/>

Introduction

Our homes use 35% of all the energy in the UK and emit 20% of carbon dioxide emissions. We must tackle this significant area of emissions if we are to be successful at mitigating climate change and meeting our net zero targets. Retrofitting those homes requires more than just one or two insulation measures; it will require an integrated approach to transforming the energy and water needs and technical systems in homes, requiring quality in design, installation and customer care.



The key opportunities for retrofit are in the existing market for repair, maintenance and improvement (RMI), which is worth £25-30 billion per year. Existing RMI represents around one-third of construction sector output but improvements to existing homes are not generally addressing energy efficiency and decarbonised systems in a coherent way. While we must seize every opportunity to green our existing homes, including as part of typical home improvement works, the National Retrofit Strategy redirects and secures employment in the existing sector, and offers the opportunity to grow the sector in a sustainable way through broadening and deepening activity, achieving significant policy goals as a result.

Retrofit brings economic, social and environmental benefits: Improving the performance of a home does not just benefit the climate. It has the potential to create decent jobs in every region and community, and boosts existing firms (especially SMEs and their supply chains) in construction, speaking directly to the Government's 'levelling-up' agenda. Economy-wide, the potential to develop and extend a labour force with a full range of high value skills will sustain the economy at a time when it needs additional support and urgent job creation.⁴ For individual households there are a number of important drivers, including additional disposable income from lower energy bills, the health benefits from improved air quality, a more comfortable home, and improvements to the value of the house. For landlords and asset managers, long term resilience and tenant satisfaction increase asset value. Old and inefficient housing leads to an estimated 11,500 early winter deaths and 4,000 early deaths from overheating per year, and adds around £2 billion to annual NHS costs through negative health impacts.^{5, 6} By 2050 there will be a structural deficit of 8.2 billion litres of water per day, if adaptations aren't made.

The ambition: The UK has some 28 million homes, the vast majority of which need retrofit work and bringing up to a better state of repair. Our goal is to tackle the challenge systematically and pragmatically, establishing firm foundations for scaling up to meet the volume of work needed. For the construction industry, retrofit means improving quality and providing quality assurance. Firms and trade bodies share an ambition to transform the sector to deliver on the multiple policy objectives of retrofit. The sector needs a clear and consistent policy context that supports this ambition. In this way a modern, low carbon industry founded on proud professionalism can be established. In partnership with industry, the Government will need to invest early alongside creating a long term policy framework which meets its statutory carbon targets and delivers on creating quality employment. This action will trigger wider confidence, unlocking private investment from property owners and financial institutions combining to a 20-year programme of circa £525 billion. A comprehensive approach to digitisation, alongside a step-change in trade skills, will also unlock potential for local energy networks, storage and innovation management and tariffs.

The existing industry workforce needs, ultimately, to be more than doubled, with the development of around 500,000 new professionals and tradespeople to tackle this challenge. Government has supported the development of new training standards for Retrofit Coordinator and Retrofit Installer, which can form the basis of the programme in terms of training and quality assurance. Clarity on standards, process requirements and audit will provide a firm foundation for both training and market transformation. We are proposing programme components that have worked well internationally already, in particular a move away from individual products and services, to the home and its occupants as a complete energy-using system.⁷ This work will build on the programmes already underway in the devolved nations^{8, 9}, and across many local authorities in England.

⁴A Green Stimulus For Housing, - The macroeconomic impacts of a UK whole house retrofit programme; New Economics Foundation, Leeds University, Parity Projects, July 2020.

⁵Washan, P., Stenning, J., Goodman, M., 2014. Building the Future: The economic and fiscal impacts of making homes energy efficient

⁶CCC 2016. Next steps for UK heat policy - Committee on Climate Change - October 2016

⁷Gillich, A, Sunikka-Blank, M and Ford, A (2017). Designing an 'optimal' domestic retrofit programme

⁸<https://www.gov.scot/publications/energy-efficient-scotland-route-map>

⁹<https://gov.wales/written-statement-optimised-retrofit-programme-2020-21>

National retrofit strategy

The deliverables:

1. Building renovation plans. Deploying digital techniques to an agreed standard, an assessment based on survey, EPC input data, energy in-use data, and other relevant data such as location, occupancy, ownership etc., can deliver a building renovation plan or 'passport' for each residential unit or group of units, providing an evidence-based pathway to decarbonisation through fabric and water efficiency and zero carbon heating technologies, according to opportunity and budget.

Building renovation plans enable large-scale area-based and locally-managed programmes to be assembled and market opportunities opened up (including, for example, groups of properties suitable for off-site solutions e.g. Energiesprong). Combined with an end-to-end quality assurance system and post-retrofit evaluation of impact and energy outcome, this provides the conditions for low-risk institutional finance and increased consumer confidence. This would need to be founded on a centrally held property database that enables clarity and continuity on plans as ownership changes.

Examples of where this approach is starting to be adopted in the UK through local pilots can be used to inform a new standardised process and opportunities analysis. For example, learning from the BEIS supply chain pilots can be incorporated.¹⁰

2. Skills training modules will be informed by existing qualifications and the recently developed Retrofit Coordinator training standards (PAS 2035/2030). Building renovation planning involves the clustering of trades required for retrofit packages and - except for stand-alone measures such as loft insulation - demands co-ordination, and joint liability for outcomes, as well as adherence to standards for specific measures such as those laid out in PAS 2035. The definition of individual and coordinated packages will be an output for the 2020-2024 period to inform the development of new skills and qualifications.

3. Delivery programmes A series of area-based approaches build capacity in a locally relevant way from the bottom-up. Under a national umbrella of standards and expectations, each delivery programme is accountable for its impacts on employment, skills and carbon reduction. Every programme is made locally relevant by being based on the twin platforms of building plans and 'packages' of skills, which reflect the specifics of local housing stock. Delivery programmes can be initiated by local authorities, combined authorities, retrofit partnerships, local economic partnerships, community development groups, supply chain partners etc., to suit the condition, ownership profiles, financial and skills opportunities in diverse localities.

A retrofit partnership is a place-based franchisee of the powerful central brand consisting of advocates, designers, installers and supply chain firms.

“ The cost of each plan will **reduce** as greater numbers are delivered ”

¹⁰<https://www.gov.uk/government/publications/energy-efficiency-improvement-rates-local-supply-chain-demonstration-projects/local-supply-chain-demonstration-projects-summaries>



The delivery system: Successful delivery of the strategy requires a suite of interdependent modules and if any are left out, the whole ceases to function. Each are dealt with in turn below.

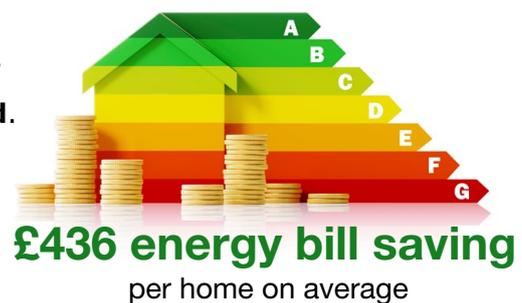
Leadership and Communications	Performance Standards	Ensuring homes perform as promised.
An umbrella to tie diverse local programmes into a coherent whole: A Retrofit Delivery Authority akin to the stature of the Olympics Delivery Authority is needed to oversee and lead strategy delivery, ensuring that all stakeholders, in particular locally-based delivery consortia, are fully enfranchised and that standards are high.	Finance and Grants	Financial support and fiscal incentives in a variety of ways to suit the variety of ownership models.
Supported transition and a research and innovation culture	Training and Accreditation	Building up an army of professionals and trades that can do the work fully and well. This involves developing the skills of the existing workforce and recruiting and training new entrants.
Provide a safe development environment for new entrants and existing organisations so that they grow to meet the new demands as well as extending in capability.	Materials and Equipment	Scaling up the supply of materials and equipment in line with demanding quality standards.
	Creating Customer Demand	A comprehensive approach to giving every homeowner a vision of what their home needs, the belief that it is needed and a route to achieving the change.
	Compliance and Quality regime	Creating an industry culture that ensures all jobs are done to high, enforced standards.

Proposal for the partnership approach to funding the programme: It is proposed that a partnership approach is adopted to funding the national retrofit strategy. The costs are outlined in the table below. Critically, the Government is being asked to invest £5.3 billion over the next four years.

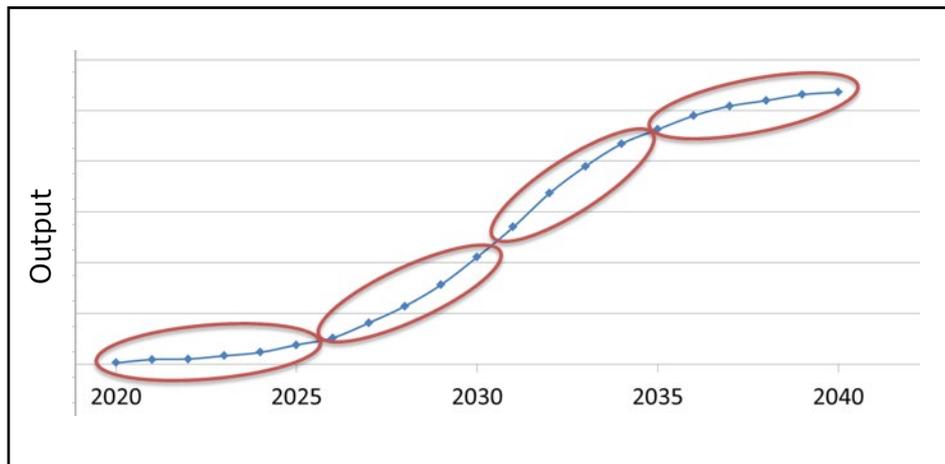
2021 200,000 homes	2022 - 2024 855,000 homes
<p>£3.64bn* programme</p> <p>36,000 direct jobs sustained (27,000 indirect)</p> <p>Government invests £1.16bn</p> <p>Govt revenue £2.69bn</p> <p>Tax benefit per £, £1.36</p> <p>Private capital £2.5bn</p> <p>Health benefits £316m</p> <p>Additional GDP £4.76bn</p>	<p>£16.8bn programme</p> <p>100,000 direct jobs sustained (80,000 indirect)</p> <p>Government invests £5.3bn</p> <p>Govt revenue £12.4bn</p> <p>Tax benefit per £, £1.84</p> <p>Private capital £11.4bn</p> <p>Health benefits £1.4bn</p> <p>Additional GDP £21.9bn</p>
Avoided CO2 emissions: 0.532Mt	Avoided CO2 emissions: 2.53Mt
By 2030 12,300,000 homes	Net Zero homes from 2040 27,300,000 homes
<p>£235.7bn programme</p> <p>500,000 direct jobs sustained (390,000 indirect)</p> <p>Government invests £75.4bn</p> <p>Govt revenue £174.4bn</p> <p>Tax benefit per £, £1.58</p> <p>Private capital £160.2bn</p> <p>Health benefits £22.1bn</p> <p>Additional GDP £308.7bn</p>	<p>£523.7bn programme</p> <p>Jobs sustained down to 70,000 (40,000 indirect)</p> <p>Government invests £167.6bn</p> <p>Govt revenue £387.6bn</p> <p>Tax benefit per £, £1.84</p> <p>Private capital £356.1bn</p> <p>Health benefits £55.9bn</p> <p>Additional GDP £686.1bn</p>
Avoided CO2 emissions: 46.8Mt	Avoided CO2 emissions: 84.9Mt

Other benefits:

- **£436** energy bill saving per home on average per year
- Can be regionally focused targeting the **greatest need**.
- **6,000** avoided deaths p.a.
- **800,000** jobs (retrofit and related)
- Household disposable incomes **2%** higher
- For every **£1** invested - **£2** back in economy



All modelling projections can be seen in Appendix 1 below.



- Phase 1**
Underpin capability
- Phase 2**
Build output
- Phase 3**
Maximum speed
- Phase 4**
Final push

The delivery system (continued):

Leadership and Communications

Any initiative at this scale needs strong, inspirational and clear leadership. A central Retrofit Delivery Agency will be needed to provide oversight, a drive for continual improvement, the opportunity for learning between areas, and to ensure that all stakeholders are fully enfranchised. Feedback and knowledge sharing will be needed to ensure continuous improvement.

A 'Great British Homes' programme or similar should be positioned as aspirational, linked to themes of keeping our families healthy and safe at home, British pride in our homes and neighbourhoods, increasing asset value, and being in control of our own environment and futures. This requires a meticulously planned communications campaign that involves all stakeholders: MPs and policy makers, local authorities and housing associations, community groups, local advocates, green finance and funding experts, industry bodies and regulators, private sector partners, and existing retrofit customers.

The Retrofit Delivery Agency's leadership would enable alignment across client groups such as combined authorities, local authorities, social landlords, energy providers and more. Clarity of leadership would pave the way for locally delivered area-based programmes drawing on the expertise of locally advocacy organisations.



Performance standards

Retrofit needs challenging but realistic 'fabric-first' standards similar to the approach taken by the EnerPhit standard, developed by the Passive House Institute. Such performance standards require verification of attainment, not simply installer self-certification. The standards need to cover technical issues in an integrated way to overcome problems, for example, with the UK's poor experience where heat pumps were installed in higher risk buildings where the necessary fabric improvements had not been made. The technical standards need to be developed in those areas where they are currently absent (eg. insulation measures) and must be linked, through the renovation plan process, with optimal combinations of fabric and systems. Fabric first approach is a 'no regrets' one; reducing the demand for heat, improving the ability to heat the poorest performing homes whilst allowing more time to consider methods available to heat those homes as the decarbonisation of the electricity supply grid continues. This satisfies fuel poverty eradication as well as zero carbon ambitions.

The technical building standards need to be closely aligned with occupational standards for the workforce, building on the welcome introduction the Retrofit Coordinator and Installer standards. These need to tie in with accreditation schemes and a resourced compliance-checking regime at a local level. Support for existing useful policy levers would go together with this approach, such as providing impetus to the Minimum Energy Efficiency Standard (MEES) so that it can drive change in the trickiest area of private rented housing as reinforced by the most recent Private Rented Sector Consultation by BEIS.¹¹

Further digitisation of refurbishment processes would help to address quality issues and improve productivity. Developing techniques to scan, assess and plan, and deliver retrofit with greater speed and accuracy can be fully supported within the innovation element of this overall retrofit programme to empower all sizes of company across the country. This approach also allows industry to create a 'golden thread' of asset knowledge needed in the event of concerns about changing standards or safety. All of these techniques are already being applied in the UK (see 'Case studies'). This would further underpin the overall philosophy of ensuring all work is based on a thorough understanding of the performance of the whole building for the long term, not just immediate push for single measures.

Finance and Grants

Financial support is available in a variety of ways to suit the ownership profile. Some, particularly those in fuel poverty, will at first need grant aid to make changes before innovative financial mechanisms will allow such homes to upgrade without direct government support. 'Pump-priming' the able-to-pay market is needed to help industry to build capacity and to experience economies of scale. Members of UK Finance have indicated that programme-level finance is available, but currently constrained by the risks of policy uncertainty and unenforced technical standards.¹² Institutions need to have confidence in the quality of the delivery mechanism and its ability to systematically attract customers to fully de-risk their investment.

A range of financial incentives will help to build this confidence:

Stamp Duty Rebate - A system of variable Stamp Duty rates would see house buyers receive a discount if a property is above a given energy efficiency standard, and an increased rate for properties that perform less well, designed to be fiscally neutral.

Reduced VAT on 'retrofit-led renovation' - In order to stimulate demand for retrofit, the Government could extend a reduced 5% VAT rate to cover all general home improvement works (with some eligibility criteria), provided a certain EPC rating was achieved. Consequential improvements will reduce disruption to the household.

Government grants for low-income households - A fuel poverty approach (ECO), should be replaced by direct government grants for whole house retrofits, funded by general taxation.

Low interest loans - These loans should be of sufficient scope and scale to fund the full range of measures necessary. Adopt a sliding scale of grant to loan ratios.

Green mortgages - The existing mortgage market should be expanded to incentivise increased lending for retrofit measures as well as reduced rates of interest for highly efficient properties. This will also help incentivise retrofit works at the point of sale, minimising disruption to the household.

Help to Fix - Low cost loans to households, allowing them to improve the general state of repair of the home, but predicated on a requirement for the energy efficiency of the home to be improved.

¹¹Department for Business, Energy and Industrial Strategy, 2020, <https://www.gov.uk/government/consultations/improving-the-energy-performance-of-privately-rented-homes>
¹²Robins, N., Tickell, S., Irwin, W., and Sudmant, A. "Financing climate action with positive social impact: How banking can support a just transition in the UK" LSE Grantham Institute, July 2020

Supply chains and partnerships

The scale of change required means that multiple interests will need to align in different ways, depending on each local partnership.¹³ Each retrofit partnership would be a place-based franchisee of the powerful central brand consisting of advocates, designers, installers and supply chain firms. Supply chain partners are vital. Identifying, manufacturing and supplying the materials and equipment needed to achieve the retrofit potential of every home in the UK is a huge economic challenge. Merchants and wholesalers provide vital routes to connect manufacturing innovation with local delivery programmes.¹⁴ Innovate UK and the Energy Catapult have the potential to support focussed, near market product and process development through refining existing programmes and supporting area-based innovation.¹⁵

Training and Accreditation

An additional 500,000 trade positions, more than double the existing workforce, are needed to meet even a minimum EPC 'C' target by 2030, as well as 50,000 Retrofit Coordinators. The strategy for creating this 'retrofit army' will need to account for the variety of pathways in the construction industry, both skilled and unskilled, and the range of employment opportunities that they could match to. Developing this strategy and recruitment campaign would be a function for the Retrofit Delivery Agency. The Agency would work strategically with Skills Advisory Panels (SAPs). These are local partnerships that work together to establish local skills needs by bringing together employers and skills providers, including training providers, colleges and universities to determine the action needed in local areas to address skills needs. This will be informed by the work of the Government's Green Jobs Taskforce and informed by the CITB's report *Building Skills for Net Zero* (forthcoming).

Additional measures will be needed to help the installation supply chain grow to meet this demand. Offering support for individual trainees to be trained will not be enough.

Long term commitment - a National Retrofit Programme would give employers the confidence to invest, but they also need a 'safe space' in which to innovate.

Apprenticeship subsidy - working with the existing CITB and UK Apprenticeship Levy system, firms must be supported to take on new apprentices. Colleges must be engaged in the local retrofit partnership and be responsive to the skills demands of industry.

Training requirements - the beauty of this sector is that a wide range of skilled people is required, some of which require a longer period at college on apprenticeships. Others have transferable skills that need honing and deploying very quickly. The proposed s-curve deployment of this programme suits entrants of all backgrounds. This includes the arrival of Retrofit Coordinators.

'Route to Work' for trainees - ideally this would be cost-neutral for the recently unemployed. The new apprenticeship standards launched from August 2020 allow us to adapt programmes to suit the prior learning. This can be aligned with incentives for firms to commit to taking on apprentices.

Developing trainers - training to support effective retrofit activity is not a classroom activity, although full involvement of Further Education colleges will be important for local delivering programmes. Training and continuous development to match continuous improvement will need to be integrated into everyday site activities. Place-based networks of site-based learning would drive individual commitment, based on evidence that construction trades like to work 'on the job'.^{16, 17}



¹³Killip G, Owen A, Morgan E, Topouzi M. 2018. A co-evolutionary approach to understanding construction industry innovation in renovation practices for low-carbon outcomes. *International Journal of Entrepreneurship and Innovation*. 19(1), pp. 9-20

¹⁴Killip G, Owen A, Topouzi M. 2020. Exploring the practices and roles of UK construction manufacturers and merchants in relation to housing energy retrofit. *Journal of Cleaner Production*. 251

¹⁵<https://www.ukri.org/innovation/industrial-strategy-challenge-fund/prospering-from-the-energy-revolution/>

¹⁶Simpson K, Janda KB, Owen A. 2020. Preparing 'middle actors' to deliver zero-carbon building transitions. *Buildings and Cities*. 1(1), pp. 610-624

¹⁷Simpson K, Owen A. 2020. Reflections From Engaging a Network of Local Stakeholders in Discussing Training Needs for Sustainable Renovation. *Frontiers in Built Environment*. 6

Creating Customer Demand

It is critical to establish a central campaign vision. Please see communications section.

Informing and educating - the recent Climate Assembly was made-up of 108 members of the public from all walks of life, commissioned by six House of Commons Select Committees, to assist in their scrutiny of the Government. Top of the priority list for assembly members when they voted on the principles that should underpin the UK's path to net zero was 'informing and educating everyone' (the public, industry, individuals and government). This would be a core activity of the Retrofit Delivery Agency, which would increase understanding of retrofit while not diluting the complexity of the works involved.

'A plan for every home' - a clear plan, tailored to the needs of every home, getting the housing stock ready for net zero, would include several possible pathways (e.g. 'all at once' and 'room by room'), reflecting the opportunities and triggers in local markets for RMI. Most of the country can have access to a plan by April 2021 using a digital twin approach supported by in-home surveys when action is instigated. The plan would cover all aspects of retrofit, including energy and water sustainability measures. Households should be provided with independent advice.

Policing fraud and scammers - we propose that a network of well-resourced teams be part of the programme to ensure that fraudsters and scammers are controlled. This could be to bolster Trading Standards or Citizens Advice provision. (See Appendix 3 for more detail).

Ongoing customer research and feedback - the Retrofit Delivery Agency should have a role in generating confidence for a range of ownership models through a retrofit plan process which offers owners different pathways, packages, and finance options as well as accessing the scheme data to understand customer view. It is important that if consumers have declined offers, we must be able to understand why.

Materials and equipment - Appendix 1 estimates the number of energy efficiency measures needed to get the UK to net zero. The analysis does not include the remedial work or other refurbishment work that will be needed alongside such energy efficiency measures. Whilst the UK supply chain appears optimistic about meeting the demand with the supply of products, if we are able to streamline packages and training/accreditations, this optimism can be translated into actual delivery. We propose a stream of the Retrofit Delivery Agency that works with manufacturers and distributors to understand demand, project material needs and guarantee the capacity to scale up once there is a strong policy commitment to the programme.

How much do you agree or disagree that each of the following policy options should be part of how the UK gets to net zero? (%)

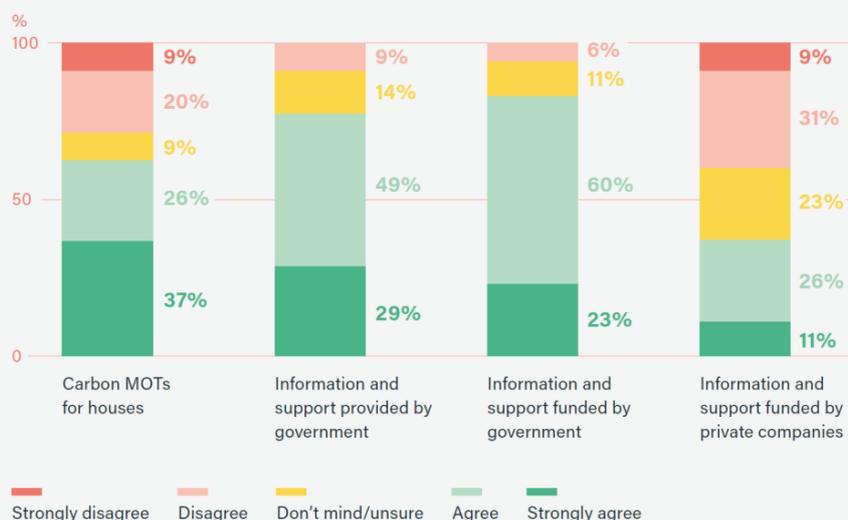


Figure 7, Pg 208, Climate Assembly UK, Final Report, 2020 reference <https://www.climateassembly.uk/report/>

Compliance and Quality Regime

It is critical that we create an industry culture that ensures all jobs are done to the set standards. This requires all industry processes to be integrated with the proposed data services at all stages. This is non-trivial, but essential given the speed and accuracy of the transformation required and aligns with the existing TrustMark regime and its drive for additional requirements for post-occupancy evaluation including energy monitoring. The PAS 2035 standard and the role of Retrofit Coordinators should also embed this. We would urge the development of clear and freely available technical standards for all of the energy efficiency measures to underpin the auditing regimes that are now in place. Continuous improvement from the programme will include links with the newly formed *BSI Technical Committee CB/401 Retrofitting Energy Efficiency Measures* so that learnings are fed back to ensure continuous improvements.

Supported transition; Research and Innovation

The programme should provide a safe development environment for new business models to be developed and streamlined:

- The Retrofit Delivery Agency to develop protocols, coordinate learning, and provide technical support. Innovation is most critically about process development and not just tools or materials.
- Set up 20 trial areas in England, representing a cross-section of different regional economies and local housing markets. Each area would represent enough homes to support a self-sustaining retrofit market once established.
- Establish retrofit partnerships in each trial area, bringing together local construction firms, construction supply chains, local authorities and housing associations, research institutions, property owners, mirroring and working with the Optimised Retrofit Programme in Wales.¹⁸
- Task each retrofit partnership to carry out the first phase. This involves carrying out 10 renovation projects starting in year one (one or more buildings per project), monitor and evaluate results in line with national protocols.
- Coordinate and share learning across all the retrofit partnerships through a national conference and the publication of evaluation reports by the Retrofit Delivery Agency.
- Design phase 2 of the trial, based on the learning from phase 1.
- Task each retrofit partnership to carry out phase 2: carry out 100 renovation projects, monitor and evaluate results in line with national protocols.
- Continue the process of trials, monitoring and evaluation, coordination, and shared learning.
- Scale up the size of each phase as appropriate.

¹⁸ <https://www.cewales.org.uk/latest-news/consortium-wins-welsh-government-funding-retrofit-1300-welsh-homes/>

Risks to be mitigated

The Retrofit Delivery Agency would work with the Government and industry to identify key risks to this programme and seek to build in mitigations from day one. Key areas of concern would be:

Leadership from the Retrofit Delivery Agency	This has to be strong, impartial and covering all aspects of the programme. Alternatives to this proposal should be developed in the event that it might be politically unwelcome.
Mis-selling / Scams / Fraud	Appropriate levels of funding from the overall programme (not necessarily government) to ensure that customers have sufficient confidence and routes to redress to step out of their comfort zone.
Badly designed approaches	Unequivocal support for the PAS2035 whole house approach to retrofit would underpin the long term vision for all homes, whilst also supporting the immediate drive for work volume to support an employment drive. Futureproofing for all work.
Poor quality installations	The application of due process founded on PAS2030, Building Regulations and greater scrutiny brought by Retrofit Coordinators via PAS2035 would address this. The ingredients are in place; they need momentum.
Policy instability leading to private sector finance staying wary (i.e. finance is not de-risked enough)	The cross-sectorial nature of the Retrofit Delivery Agency working closely with the finance sector that is demonstrably keen to make a success of this programme ought to ensure that a long term vision is established and underpinned.



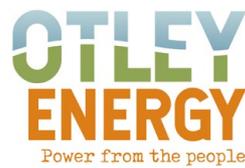
Supporters



Supporters



Glass and Glazing Federation



Contributors

The CLC would like to thank the following contributors:

Parity Projects, Leeds University, Oxford University and the **Green Construction Board**.

Appendices

Appendix 1 – National Retrofit Programme - key modelled outputs

The 's-curve' of output intensity

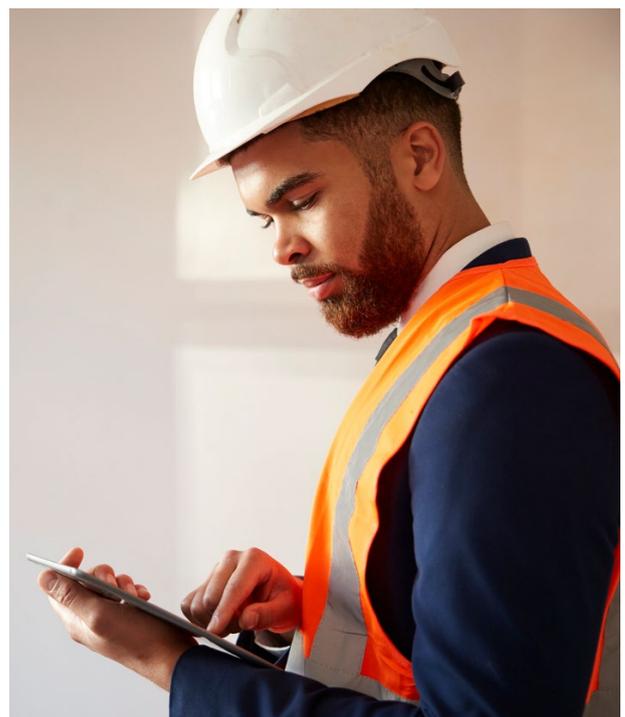
The intensity of the programme's work has been modelled as an s-curve over the programme period.

Key aspects of this are as follows:

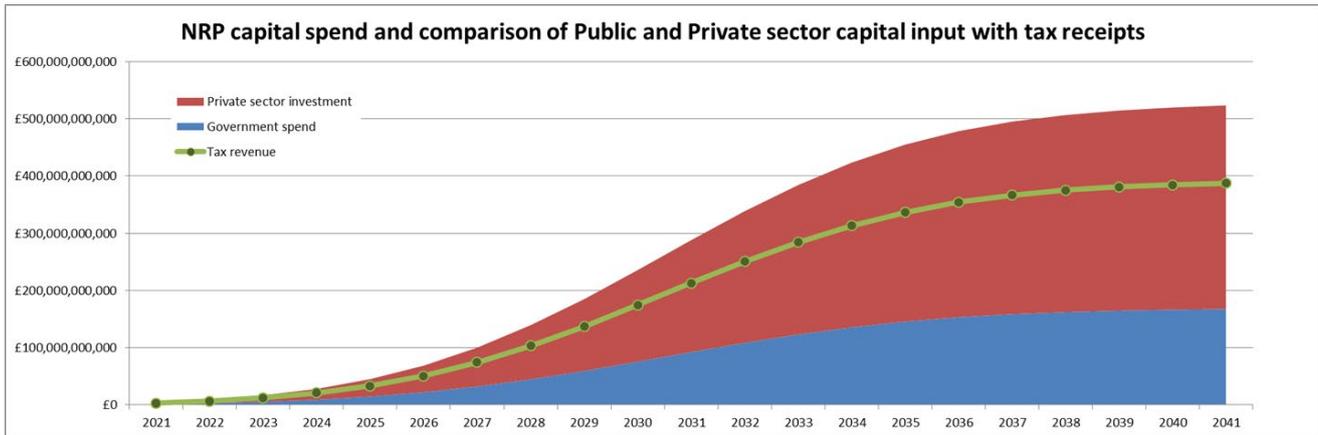
- A.** A slower start helps to focus on:
 - 1. Education of householders and the wider industry through a clear and unambiguous campaign.
 - 2. Intensive training programme for new entrants to the industry to keep up with the gathering pace.
- B.** A 'quick' middle period would be based on a mature supply chain eco-system and strong customer protections.
- C.** A ramp down of pace toward then end:
 - 1. The very-hard-to treat properties may be left to the end; hard to plan, tough to gain permission for and will be the stock that needs work but more care and thus less resource intensity.
 - 2. A signalled ramp down helps the skilled workforce to shift to other sectors without a sudden shock. This also means we must train them with more rounded skills that suit a number of sectors.

Clarifications and assumptions:

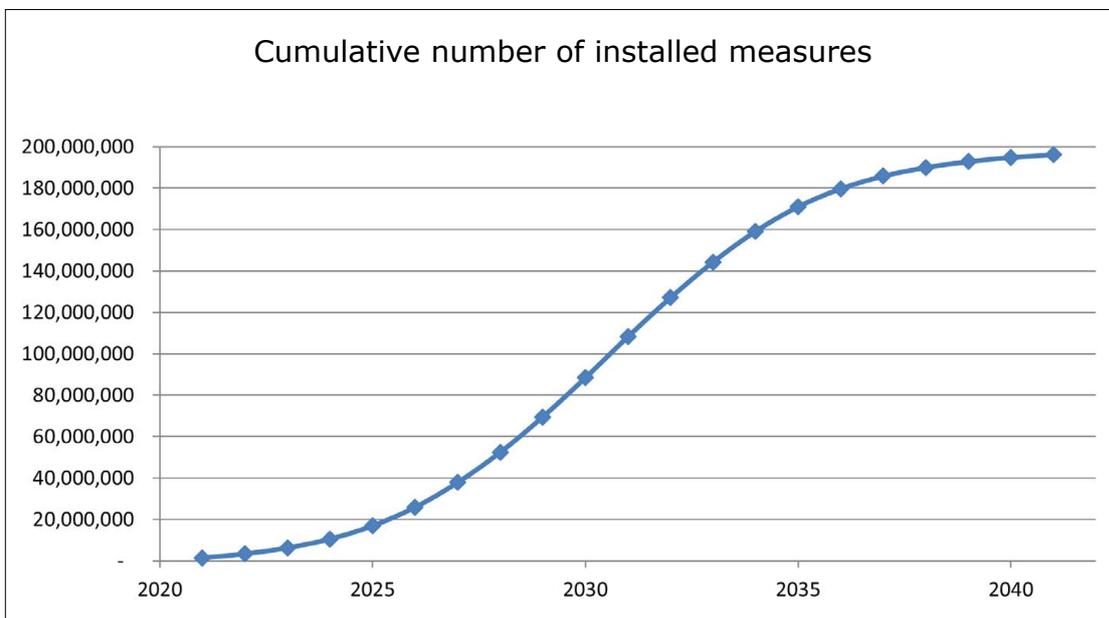
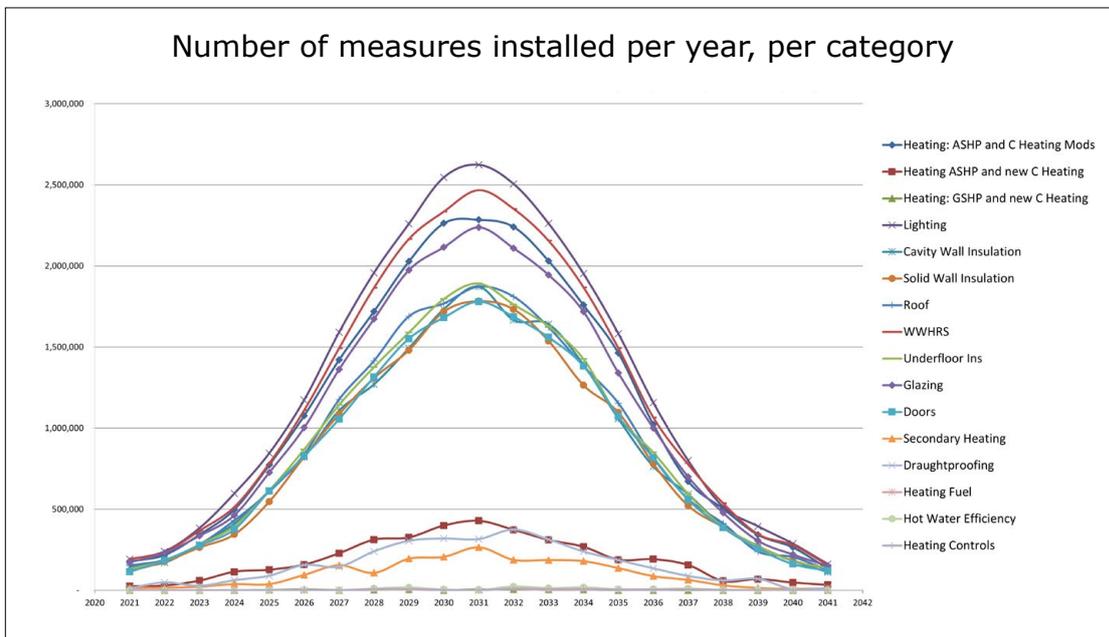
- 1. The analysis is based on the application of over 2,400 individual possible measures to each home in the English Housing Stock Condition Survey to seek the most cost effective measures to reach as close to net zero as possible.
- 2. Any focus on a particular technology or approach for a specific period has not been taken account of at this time. Such considerations will need to be developed alongside industry, for instance, there may be a moratorium on the installation of the new gas boilers from a fixed future date which would change these outputs. The modelling at this time assumes all new heating installations are heat pumps.
- 3. We have not taken account at this time of the process efficiencies and installation technologies that will emerge over time and the subsequent reduction in personnel that may result.
- 4. The Climate Change Committee launched its 6th Carbon Budget on 9 December 2020, setting out trajectories to the achievement of net zero carbon performance of buildings. Their analysis differs mainly on our assumption of greater reliance on fabric first measures. As a consequence the number of personnel and the costs to achieve net zero in the housing stock are higher in our work. In both cases, tackling the fabric requirements is an immediate need, as of course is the industry and finance infrastructure to cope.



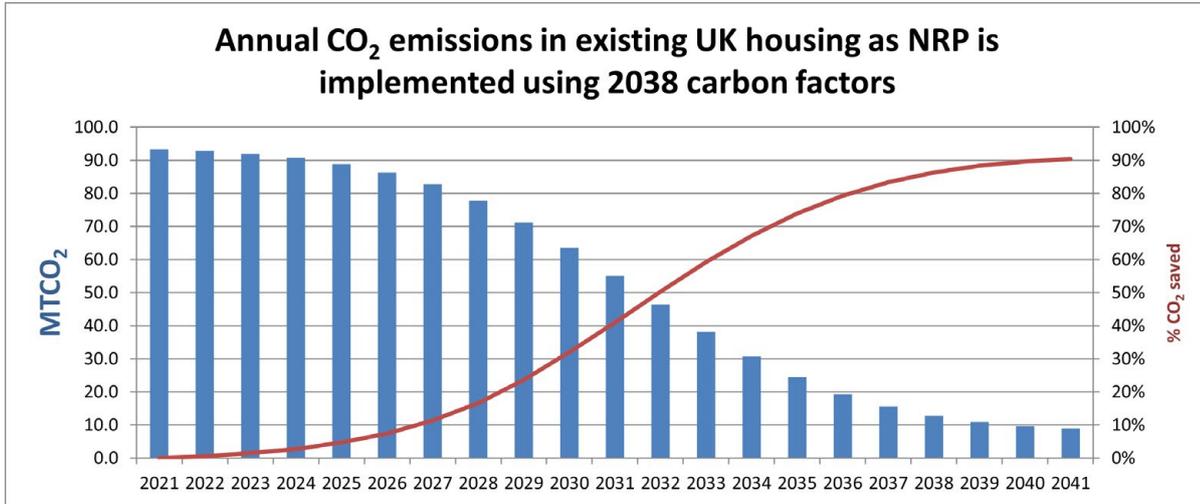
Financials



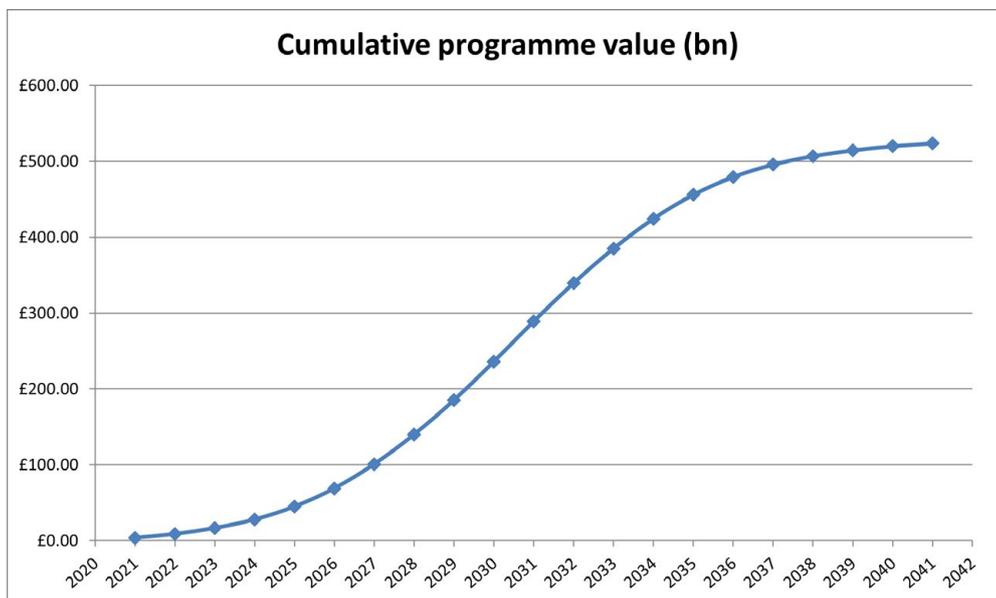
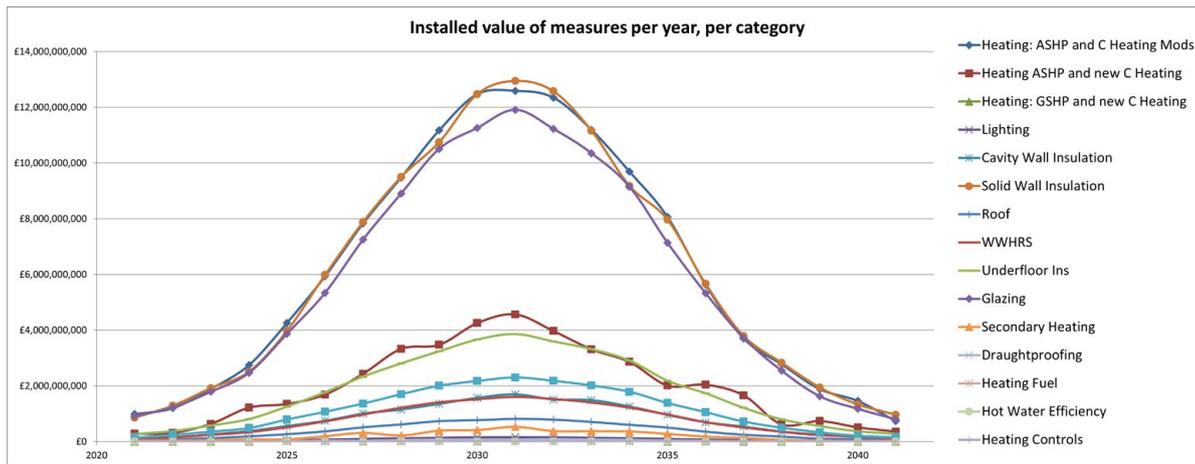
Detail of measures



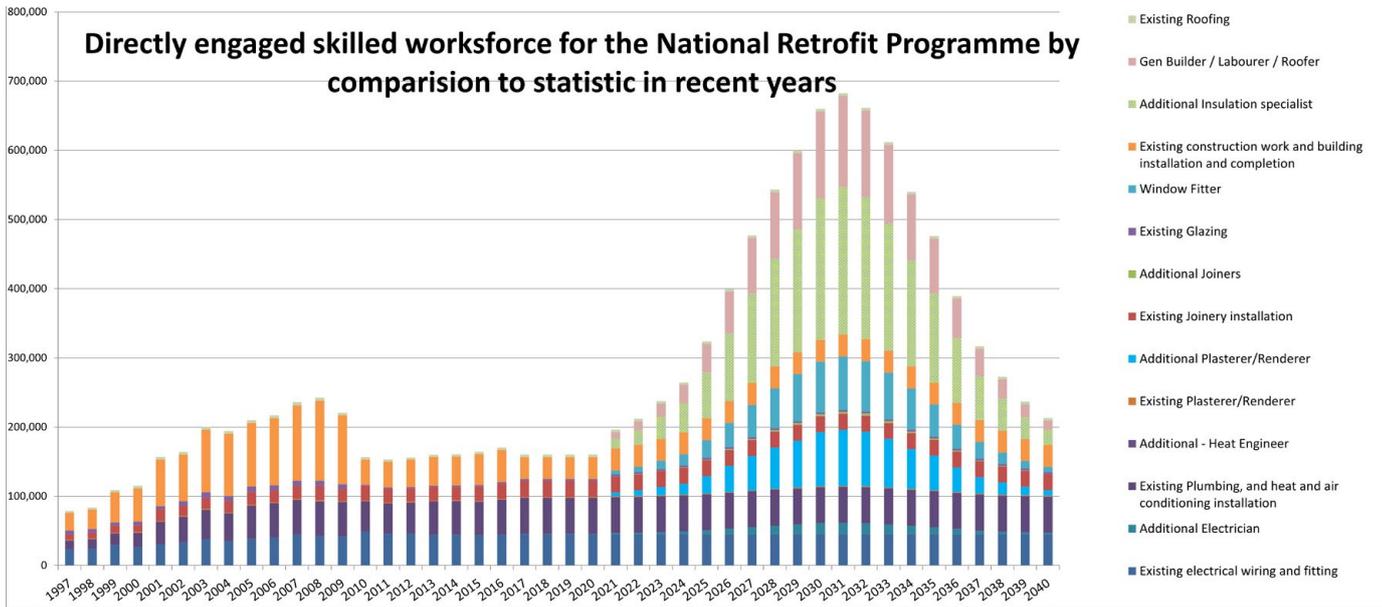
CO₂ trajectory



Programme value



Jobs



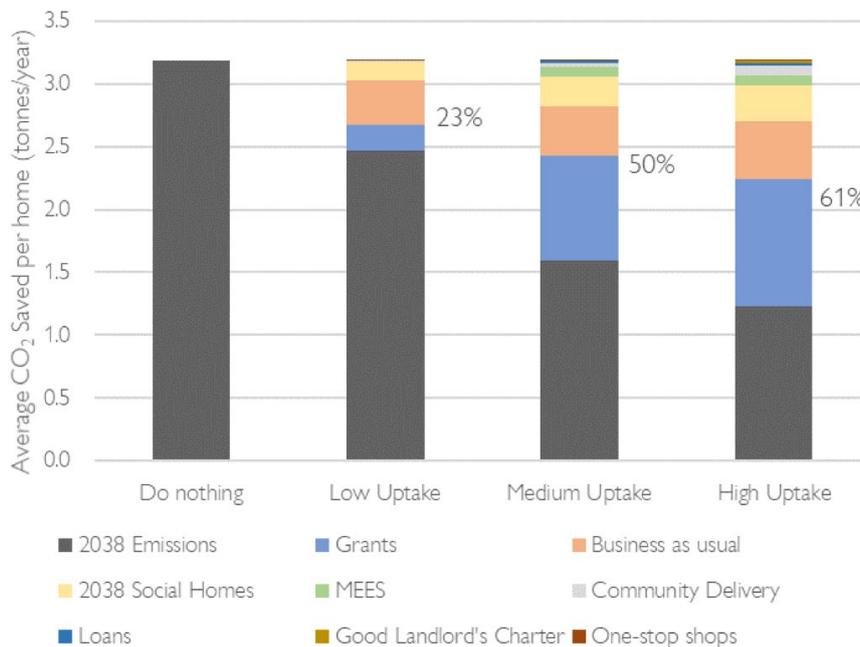
Appendix 2 – Case studies

Case study 1 - Greater Manchester Combined Authority

Parity Projects worked with Greater Manchester Combined Authority to produce pathways to healthy net zero housing by 2038. An energy model was built for every home in Greater Manchester. The analysis had two stages, and reflects what will be needed in all local delivery areas of the UK:

1. Destination scenarios were modelled that described the impact of a wide range of outcomes for the housing stock. The costs of these were considered against the cost of abatement (per kg of CO2 saved. The optimal destination allowed only a subset of cost-effective fabric measures to be installed alongside heat pumps. Defining cost-effective measures needs to take account of the savings in terms of energy generation, network reinforcement costs and the co-benefits for householders.
2. A range of policy interventions were modelled. These ranged from grant schemes, based on the current Green Homes Grant to changes to regulation like higher energy standards for private landlords. Scenarios were modelled under low, medium and high uptake assumptions. This showed that there was a reasonable chance for cutting emissions in half with significant policy intervention from the Combined Authority, but also significant investment to be successful.

Greater Manchester Combined Authority modelled various policy scenarios and their impact on cutting emissions.



Identifying the changes possible at an address level.

Scenario / Pathway Selection

- GMCA Grant H
- GMCA Grant L
- GMCA Grant M
- GMCA Loan H
- GMCA Loan L
- GMCA Loan M
- GMCA Low CO₂ Heat
- GMCA MEES H
- GMCA MEES L
- GMCA MEES M
- GMCA MEES S

£708,820,000
Total Investment

118,871
Number considered

£6,000
Average Investment

118,753
Number affected

118,753
Number missing target

70.04
Average SAP

73.49
Average EI

£779
Average Fuel

5.17
SAP saving

12.48
EI saving

£49
Fuel saving

1,117
Average kgCO₂

4,795
Average kWh

60
Average kWh/m²

2,008
kgCO₂ saving

9,849
kWh saving

117
kWh/m² saving

Apply

Property results				Investment	SAP before	SAP after	Sap saving	Fuel before	Fuel saving	EI before	EI after	kgCO ₂ before	kgCO ₂ after	kWh/m ² before	kWh after
33074411	SP		U	£10,600	51.25	94.12	32.87	£5,380	£2,539	85.78	27.41	3,622	7,183	22	15,543
36244803	FL		Y	£10,600	25.07	75.32	50.25	£4,018	£1,734	78.00	42.49	2,471	5,627	36	10,605
35732319	2F		J	£15,850	21.73	66.55	44.82	£3,409	£2,162	70.10	37.21	3,082	4,762	47	3,228

Appendix 2 – Case studies

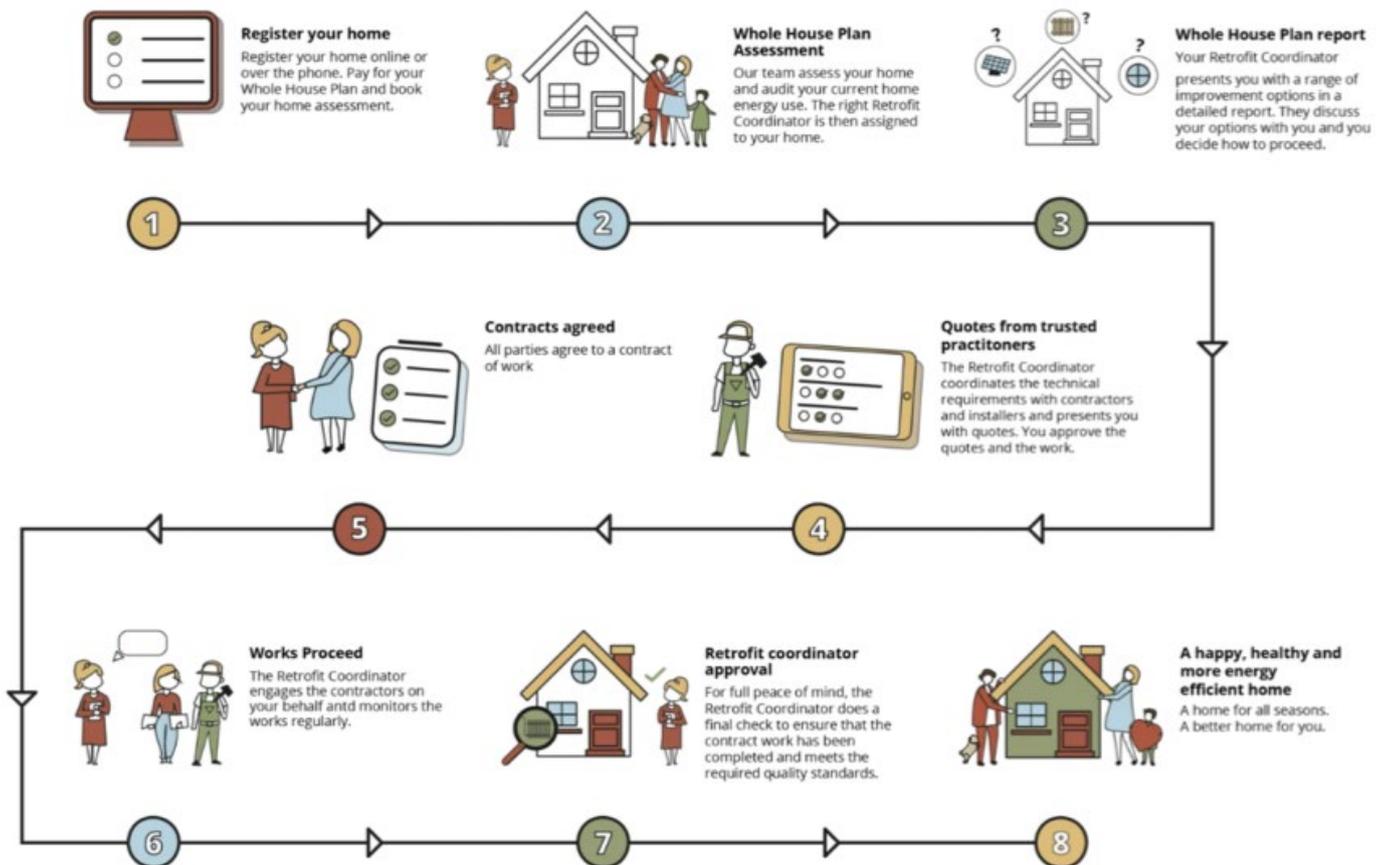
Case study 2 - Cosy Homes Oxfordshire

Cosy Homes Oxfordshire was set up in 2019 to offer householders in the area a one-stop-shop for taking them from advice to strategic design, detailed design and tendering with local companies, to oversight of the installation.

The project has embraced digital technology. To inform marketing, strategic modelling was carried out based on analysis of every dwelling in the county; what homes, what measures, likely cost. This helped to formulate the design of the scheme and how to engage with the local supply chain. 20 community-based organisations coordinated by Low Carbon Hub in Oxford have attracted around 80% of the customers to the scheme. Any interested customer can use a free-to-access, pre-prepared energy model of their home online to help them understand what measures are appropriate, then access the service via a Whole House Plan delivered by an impartial Retrofit Coordinators who stays with them for the duration of the project.

As work is carried out, the building database is updated so that the scheme and the householder can see the envisaged improvement in the building.

This project was supported with funding from BEIS and has generated a significant number of paying customers. The challenge has been in creating a reliable local supply chain.



Cosy Homes Oxfordshire whole house retrofit pathway.

Appendix 2 – Case studies

These case studies are demonstrations of retrofit being carried out alongside other improvements to single properties, to improve the general state of repair of the properties as well as installing measures to help the progress to net zero.

Case study 3 - Eco Tiffin Ltd

Eco Tiffin Ltd is a Hertfordshire-based renovation and improvement company with 320 years' experience in the industry. Director Robert Tiffin specialises in the defect repair and modernisation to old, historic and listed buildings. This often involves improving the energy efficiency performance of buildings and their EPC rating.

Eco Tiffin was contacted by a client who wanted to improve the comfort of their grade II listed home in Hertfordshire. Robert conducted a thorough survey to detect any issues like penetrating rain and damp. A thermal imaging camera was also used, which is a non-invasive way of identifying where the property is losing heat.

All suggested improvements would help the client to have a warmer, draught-free home and lower energy bills.

It was concluded that the house needed a roof renovation, after it was found to be structurally unsound. Improvements to the insulation were also needed and extensive damp-related defects, as well as improved ventilation and repairs to the joinery and brickwork. All these measures would help to improve the overall performance of the home, in accordance with a 'whole house approach' to retrofit.

As the property was a listed building, Robert liaised consistently with the local Conservation Officer to ensure that all the repairs were completed in line with regulations. This required original features, such as the existing timbers, to be preserved.

The renovated roof, and fresh tiling, greatly improved the appearance of the property and made an important contribution to heat retention in the property. This meant that when the client turned the heating on, it kept the house warmer for longer.

A vapour-permeable masonry cream was also applied to the outer brickwork of the property, which is approved by the Energy Saving Trust, and improves the thermal performance of the property by around 27%.

The project took many months to complete, daily supervision and records were essential to ensuring that the project was completed successfully.

The client said: "The house was substantially improved that made it very warm and comfy. Lots of people have commented on how wonderful it looks now."



Case study 4 – Energystore Ltd

Energystore Ltd is a UK-wide company based in County Down, Northern Ireland. They are the longest-established manufacturer of bonded bead cavity wall insulation in Northern Ireland.

Energystore completed a partial fill retrofit in Belfast. The homeowner found their property difficult to heat and were conscious of the environmental impact of their home, so they decided to investigate the insulation solutions available to them.

Following a survey, it was found that there was some existing insulation but it was sparse, so topping up existing measures were recommended to make it more energy-efficient. Energystore carried out a partial fill insulation installation on the property. The result was that the house retained heat much more effectively than it previously did.

The household also reported a 21% reduction in their gas bill, and was brought up to EPC C rating.

The client said: 'We were thrilled to see a reduction in the fuel bill. We limit our carbon footprint so being able to cut down on the fuel we use at home has been great. And it's saved us money.'



Appendix 3 – Consumer protection

Fraud and scamming is a significant problem in the UK and a source of mistrust in the building industry. It must be tackled systematically and robustly if there is to be a move to upscale the retrofit of housing stock significantly over the next 20 years.

- The National Audit Office (NAO) estimated that individuals lose £10 billion a year due to online fraud.¹⁹
- The Crime Survey for England and Wales (CSEW) estimated there were 3.8 million incidents of fraud for the year ending June 2019.²⁰
- Citizens Advice research from 2017 found that:
 - Almost three-quarters (72%) of people have been targeted by scammers in the last two years, either via mail, phone calls, text messages, emails, online, and face-to-face.
 - Over a third (37%) of people have been targeted five times or more.
 - Almost half (45%) of people have taken no action to protect themselves against scams in the last 12 months, and two-thirds (65%) have taken no action to help protect friends or family.²¹
- 7 out of 10 (68%) of people targeted by a scam do not tell anyone about it.
- Most worryingly, the CSEW suggests that only 1 in 7 of incidents of fraud either come to the attention of the police or are reported by the victim to Action Fraud.²²

In addition, during the 2020 Climate Assembly, 92% of assembly members ‘strongly agreed’ or ‘agreed’ that ‘simpler consumer protection measures’ should be part of how the UK gets to net zero with nearly half (46%) strongly agreeing:

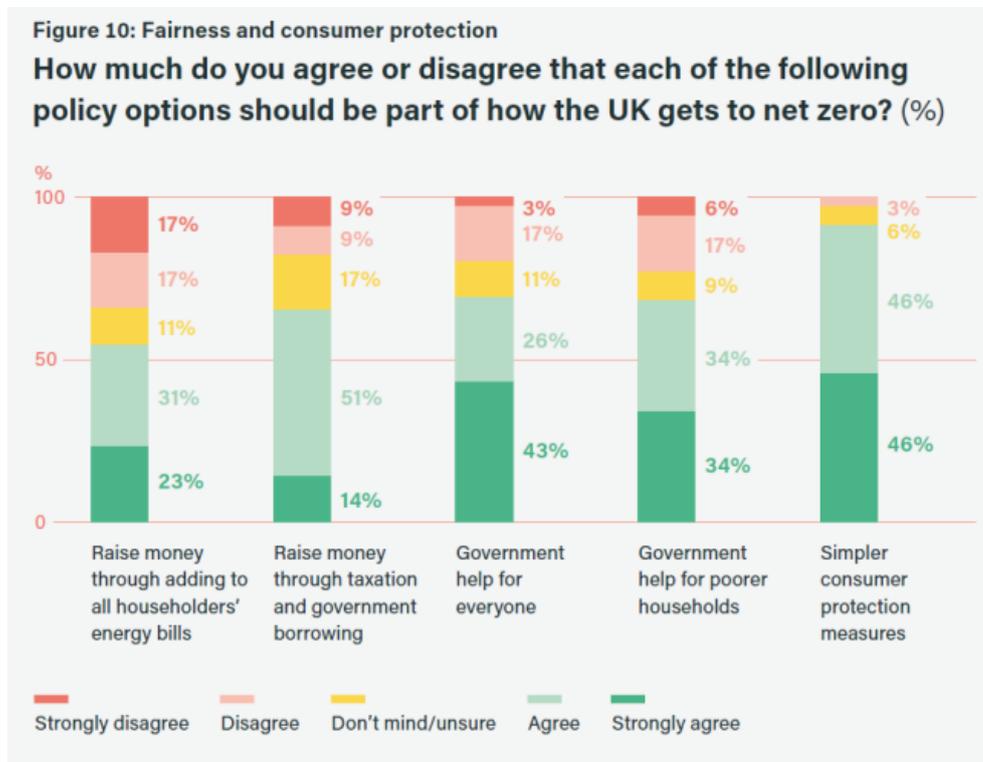


Figure 10, Pg 217, Climate Assembly UK, Final Report, 2020²³

¹⁹<https://www.nao.org.uk/wp-content/uploads/2017/06/Online-Fraud-Summary.pdf>

²⁰<https://www.ons.gov.uk/aboutus/transparencyandgovernance/freedomofinformationfoi/fraud>

²¹[https://www.citizensadvice.org.uk/Global/CitizensAdvice/Consumer publications/Scams report - final.pdf](https://www.citizensadvice.org.uk/Global/CitizensAdvice/Consumer%20publications/Scams%20report%20-%20final.pdf)

²²<https://www.ons.gov.uk/peoplepopulationandcommunity/crimeandjustice/articles/natureoffraudandcomputer misuseinenglandandwales/yearendingmarch2019>

²³<https://www.climateassembly.uk/report/read/>



Construction
Leadership
Council

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