Somerset West and Taunton Council

Report of the Task and Finish Group on Council Housing Zero Carbon Retrofit

Report Contents

About the Task and Finish Group

This cross-party group was established by Scrutiny Committee on 3rd March 2021 to investigate Council housing zero carbon retrofit and to report back to the Scrutiny Committee for Somerset West and Taunton Council (SWT).

The membership of the group was:

Cllr Dave Mansell – Chair

Cllr Norman Cavill – Vice-Chair

Cllr Ian Aldridge

Cllr John Hassall (from August 2021)

Cllr Alan Wedderkopp (to June 2021)

Portfolio Holders invited to attend meetings:

Cllr Dixie Darch – Climate Change

Cllr Fran Smith – Housing

Officers supporting the group:

James Barrah – Director of Housing, SWT

Chris Brown – Assistant Director Development and Regeneration, SWT

Marcus Prouse – Specialist, Governance and Democratic, SWT

Andrew Randell – Democracy and Governance Case Manager, SWT

The group held 8 online meetings from 13 May 2021 to 2 November 2021.

Presentations at group meetings were provided by:

James Barrah – Director of Housing, SWT

Paul Sweeting – Finance Business Partner, SWT

Joanne Stringer – Senior Regional Asset Manager for South West, Sanctuary Housing

Nigel Griffiths – Policy Adviser, Sustainable Traditional Buildings Alliance, and Director, NRS Griffiths Ltd

Ian Hutchcroft – Market Development, Energiesprong UK

Chris Brown – Assistant Director Development and Regeneration, SWT

1) Introduction

1.1 The task and finish group thank all those who gave presentations at our meetings and engaged in helpful discussions.

1.2 As shown by the report contents list, we considered a wide range of issues relevant to the retrofit of insulation and heating systems to the Council's existing housing stock. This included a number of approaches and projects by councils and other social landlords around the UK.

1.3 We are keen to see retrofit projects and a programme that moves towards a zero carbon target for the Council's housing stock. We noted that a whole house approach is now widely recognised as essential to this aim and to effective retrofit work.

1.4 New retrofit proposals were prepared by officers as the group's work progressed and we were pleased to note there was a high degree of alignment with our emerging conclusions and recommendations. It was also helpful that the Government's Heat and Buildings Strategy was finally published just before we concluded.

1.5 Government funding will be important to support the installation of retrofit measures, and correct market price signals too, such as electricity becoming a lower cost heating choice relative to fossil fuel gas.

1.6 Having reviewed the information presented to the group, we have prepared the following recommendations. Some are recommended for adoption by the Council, which we invite Scrutiny Committee and the Executive to consider.

2) Recommendations for Council adoption

2.1 A standard or guide is needed for the net zero retrofit of the Council's housing stock, such as the new LETI Climate Emergency Retrofit Guide. Insulation needs to be an integral part of the approach adopted, with the aim of ensuring high levels of energy efficiency are achieved consistent with a net zero UK.

2.2 A programme for net zero retrofit may be achieved in stages following a planned whole house approach. Each stage should add to work undertaken in previous stages and not replace it. First, the building fabric should be improved through a range of insulation measures, including external wall insulation where possible. Air tightness and ventilation will need to be considered at the same time. In the next stage, gas or oil boilers should be replaced with zero carbon heating systems, such as heat pumps or a shared heating network. Boiler replacement may occur at the end of its life, unless there are reasons for doing so earlier, such as low energy efficiency. With improved insulation, it should be possible to keep homes warm while running boilers on lower settings to reduce energy use and costs.

2.3 A target date be set of 2025 or 2027 by when no new gas boilers will be fitted to the Council's housing stock. Where it can be afforded and be effective,

replacement gas boilers should not be provided before this date and, if possible, an earlier target date be set. This target aims to recognise the pressures of the Council's capital programme and the need to ensure the Housing Revenue Account (HRA) remains financially sound.

2.4 Solar photo-voltaic and thermal panels, batteries and heat storage should be provided where there is a business case for this investment, taking into account the potential income from comfort plan or similar payments and the savings to tenants.

2.5 Especially during the early stages of introducing new insulation and heating systems, support needs to be provided to tenants on their features and use. Where possible, new measures should be provided first to tenants who most welcome their introduction. An effective communication programme on their benefits should be established, together with sufficient on-going support.

2.6 A report be prepared on a retrofit programme, including costs and potential funding, to achieve net zero for the Council's housing stock by 2030, 2035 and 2040, without offsetting. The net zero target should cover heating, use of appliances and lighting, and, as far as possible, should minimise the carbon and environmental impact of measures installed. This report should be presented to Community Scrutiny Committee, Executive and Full Council in 2022/23, with a recommendation on a target date for a full net zero retrofit programme.

2.7 Funding for a retrofit programme should include:

2.7.1 Funding announced by Government, including in their new Heat and Buildings Strategy and Net Zero Strategy: Build Back Greener, October 2021.

2.7.2 The contribution that can be made by the Council's planned and responsive maintenance budgets, where these already include boiler replacement, insulation and other related measures.

2.7.3 Comfort plan or similar contributions from tenants to retrofit investment, but only where each tenant is guaranteed energy bills at least 25% lower than they would otherwise have incurred.

2.7.4 Long term investment possible through the Housing Revenue Account.

2.7.5 Estimates for any funding gap remaining that may need to be sought from Government.

2.8 Further investigations and studies should be undertaken to identify the potential contribution and role for:

2.8.1 Community heating networks with ground source heat pumps, using shared source arrays and either individual or shared heat pumps, which supply blocks of flats, either individually or in small groups.

2.8.2 Larger district or neighbourhood scale heating networks, where opportunities may arise, possibly alongside larger private sector development.

2.8.3 Increasing local renewable energy generation through the Local Plan and planning process, and directly by the council as a landowner, developer and purchaser of power in enabling renewable energy development.

2.9 Retrofit projects should be monitored to check their performance, tenant satisfaction and to learn lessons to improve future work. Monitoring should also identify if further support needs to be provided for tenants with the new measures. Results should be reported to Council Members.

2.10 Progress and adoptable lessons should continue to be reviewed for Energiesprong, the Optimised Retrofit project in Wales and examples of good practice net zero retrofit schemes.

2.11 The Council should seek to work with other social landlords in Somerset to share good practice and joint programmes where benefits, including lower costs, would arise.

2.12 Disposal of properties within the Council housing stock that cannot meet net zero objectives should be avoided and be an option of last resort.

3) Recommendations for Government and other agencies

3.1 Replace or improve Energy Performance Certificates (EPCs) to ensure they are well aligned towards meeting zero carbon objectives, including by incorporating or being used with an energy intensity target.

3.2 Move social and environmental levies from electricity to gas, taking account of the need to make such changes fairly and not to increase fuel poverty.

3.3 Introduce and apply carbon taxation to provide market signals that support net zero retrofit without making lower income households worse off.

3.4 Provide sufficient funding to social landlords to enable net zero retrofit of all their housing stock.

4) 2019 proposal for SWT housing retrofit

4.1 In December 2019, a report was prepared for SWT on providing warm and affordable homes for Council tenants and aiming to achieve net zero emissions in the Council's housing stock by 2050[1]. Compared to a 1990 baseline, this report proposed:

- 65% carbon reduction in our housing stock by 2030.

[1] A Strategic Asset Investment Proposal for Housing in Relation to Achieving Affordable Warmth and Carbon Neutrality – Somerset West and Taunton Council, December 2019

- 85% carbon reduction in our housing stock by 2040.
- Carbon neutrality in our housing stock by 2050.

4.2 For carbon neutrality, it was proposed to achieve 80% carbon emission reductions by 2050 and offsetting the remaining 20% "by investing in local community initiatives, such as local tree plantations, PV (photo-voltaic solar panels) to community-based schemes and other credible, transparent and auditable carbon reduction measures".

4.3 To achieve an 80% carbon reduction, the report states that an average EPC rating of mid-band B would be needed for all SWT properties. It also states that properties that could not achieve a low band C "will need to be considered for disposal or regeneration".

4.4 The 2019 report built on a pilot scheme in Wellington in 2016[2], which installed double glazing, external wall insulation, positive input ventilation and air source heat pumps to 131 homes, increasing the EPC (Energy Performance Certificate) ratings of the council properties from E or F to C.

4.5 The average cost for retrofitting the Council's housing stock to this standard was estimated to be:

- Traditional construction properties - £16,500
- Non-traditional construction properties - £30,000

£11,000 of the cost per property could be covered as it would otherwise have been incurred as part of works necessary for meeting the Decent Homes Standard target.

4.6 The total additional cost impact for the Council's stock of 5,747 properties was estimated at £49.8m over 30 years or £1.66m per annum.

4.7 However, this retrofit proposal for the Council's housing stock was not adopted, as it was deemed unaffordable. This was explained in a report to Full Council on 18 February 2021, as follows:

"The capacity to deliver a zero carbon retrofit (either within 10 years or 30 years) was modelled but both placed significant pressure on the business plan with debt continuing to rise at the end of the period and leaving no headroom for unforeseen circumstances, which is not recommended. The business plan is currently unable to deliver both a development programme and a zero carbon retrofit programme. Unless there is significant government funding we will face future choices between our later years development plans versus retrofit as delivering both is not currently affordable, but this is a decision for a later time as the market and approach to retrofit matures."[3]

[2] Wellington Warmer Homes: Close Out Report and Future Strategy – Low Carbon Expert, November 2018

[3] Para 5.9, SWT report to Special Full Council, 18 February 2021 - HRA Revenue and Capital Budget Setting 2021/22 including 30-Year Business Plan Review.

5) Targeting zero carbon

5.1 Somerset West and Taunton Council declared climate and ecological emergencies in 2019 and 2020. The Council's first corporate objective is to "work towards making our District carbon neutral by 2030"[4].

5.2 The sooner carbon neutrality is achieved the better, as climate change is already having serious and growing impacts, which will get worse as greenhouse gases continue to accumulate in the atmosphere and in the oceans. There are dangers that system tipping points will be breached so further accelerating the impacts and creating risks that parts of the planet become uninhabitable, due to heat, weather extremes or sea level rise.

5.3 Greenhouse gas emissions, such as carbon dioxide and methane, arise from several sources, including the burning of fossil fuels, waste decomposition and some agricultural and industrial practices.

5.4 For buildings and homes, most carbon emissions arise from heating systems and power supplies. These can be reduced by insulation and increasing energy efficiency, installing zero carbon heating systems and using zero carbon electricity.

5.5 Progress is being made to decarbonise power networks, especially electricity. In time, it is expected that the electricity supply will be fully zero carbon. The gas supply may become carbon neutral through conversion to biogas or hydrogen, although there are doubts whether enough can be supplied or if it could be carbon neutral. These alternative gas sources may be limited by the land needed, the high costs and the inefficiency of processes involved[5].

5.6 Heat pumps will be a major new source of heating. They extract heat from external sources, such as the air, ground or water, which is converted to a low-level heat that can efficiently heat well-insulated homes. For each unit of electricity used by a heat pump, 2-4 units of heat energy can be supplied. Good insulation is necessary for the efficient operation of heat pumps, especially in the coldest months, and reduces the amount of energy needed for effective heating.

5.7 The method for assessing Energy Performance Certificates (EPCs) is currently not well-aligned for measuring progress towards net zero carbon or indicating its achievement (see more on this in section 12).

5.8 As temperatures rise with global heating, cooling for homes is becoming increasingly important too. This is best achieved by design measures to prevent over-heating from direct sunlight, including shading and insulation.

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[4] SWT, Corporate Strategy 2020-2024.

[5] Ignore hype over hydrogen heating, government told – BBC, 14 May 2021: www.bbc.co.uk/news/business-57103298

6) Whole house retrofit

6.1 Presentations by Nigel Griffiths and Ian Hutchcroft to the task and finish group highlighted the benefits of a whole house approach for insulation measures to avoid risks from thermal bridges, impermeable layers and insufficient ventilation in creating condensation, damp and mould.

6.2 The Centre for Alternative Technology also highlight the benefits of an integrated whole house approach to retrofit[6]:

"Taking individual measures without proper attention to detail and consideration of the ways different elements interact can make a house worse rather than improving it. Upgraded glazing and draught-proofing can increase damp problems if there isn't suitable ventilation. Leaving 'cold bridges' through a thick insulation layer will concentrate heat loss and may be prone to condensation.

"The 'whole house retrofit' approach is intended to avoid these pitfalls. Instead of piecemeal efficiency measures, this systematic approach looks at all aspects of insulation, draught-proofing, ventilation and heating to create a structured plan. Such a retrofit is a big job, and you can treat it like a new build by engaging a specialist architect or retrofit expert to oversee the project and tailor the plan to your home. Houses in rows or blocks can be looked at together, as this should make accurate detailing easier as well as reducing costs.

"Research has shown that spending more money and time on a deeper level of retrofit actually decreases the payback time when compared to measures added without consideration of how elements will interact."

6.3 Nigel Griffiths suggested the whole building approach to retrofit should be expanded to include human health and wellbeing, local economy (supply of materials and labour) and building communities, as well as to water efficiency, sustainable drainage, the impact of materials, re-greening and local facilities. In Wales, the Government takes a more rounded approach due to the Wellbeing of Future Generations Act.

6.4 To address the performance gap that can arise from retrofit measures that are poorly planned or installed, PAS 2035 is a new standard for effective energy retrofits of existing buildings[7]. PAS 2035 drives a whole house and fabric first approach, and specifies roles and responsibilities for those involved, including for retrofit coordinators and assessors.

6.5 Social housing retrofit projects are now required to comply with the PAS 2035 standard to receive Government funding, which has prompted PAS 2035 training to be provided for SWT officers. Adopting PAS 2035 should ensure risks of thermal bridging and internal condensation are minimised.

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[6] cat.org.uk/energy-saving-retrofits

[7] www.trustmark.org.uk/tradespeople/pas-2035

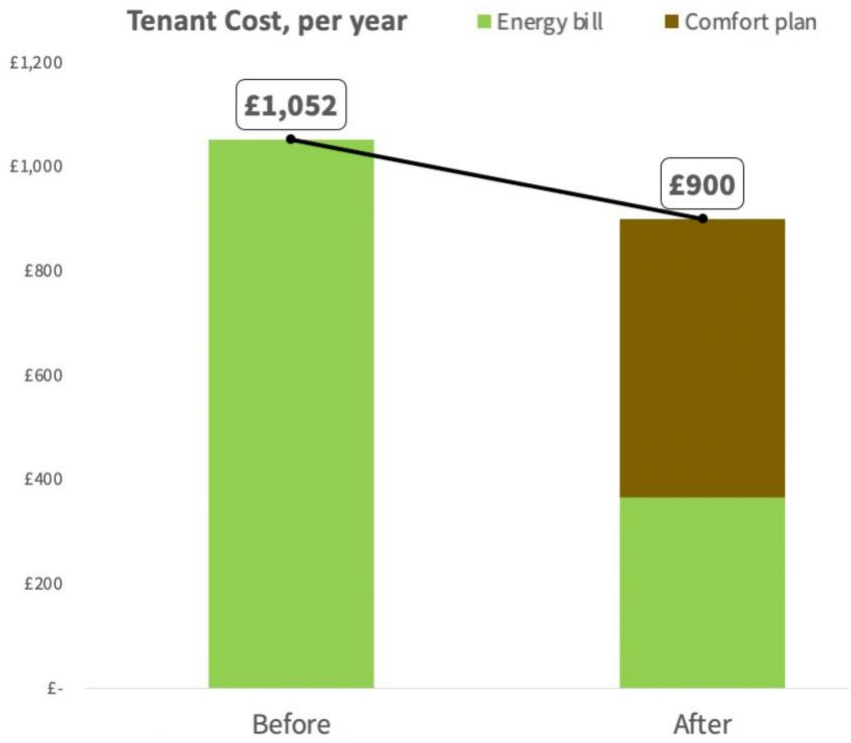
7) Energiesprong approach and case studies

7.1 Energiesprong (energy leap) is an approach to retrofit developed in the Netherlands and widely adopted there, with 5,700 homes installed and thousands more planned.

7.2 Energiesprong covers insulation, heating, cooling and home energy generation and storage. It is implemented through a specification, which requires whole house retrofit and allows competitive procurement. Costs are reduced by manufacturing components in a factory, which are mostly fitted externally. On-site installation can be undertaken quickly and doesn't require tenants to move out, minimising disruption.

7.3 Installers provide a long-term performance guarantee to ensure long-term benefits are delivered and maintained.

7.4 Energiesprong has an investment model, which aims to be self-financing through long term savings achieved and government support programmes for energy efficiency and renewable generation. This requires supply costs to be reduced with economies of scale achieved by sufficiently large-scale adoption. As part of the savings realised, tenants make comfort plan payments for their energy and heating, with lower bills for these services than previously, as shown below. A fuel poverty fund can be used to support those who cannot afford their energy bills.



7.5 Further value can be gained with the Energiesprong approach by extending or adding homes at the same time.

7.6 Energiesprong UK[8] has received funding from the European Union and the Government, and a delivery team able to work with local authorities and social landlords.

7.7 There have been pilot schemes in the UK, including in Nottingham, Essex and Devon, and others in France and Germany.

Nottingham – Energiesprong applied to 7 of 9 properties in a terrace.

Energiesprong project in Maldon, Essex on right (similar house without on left)

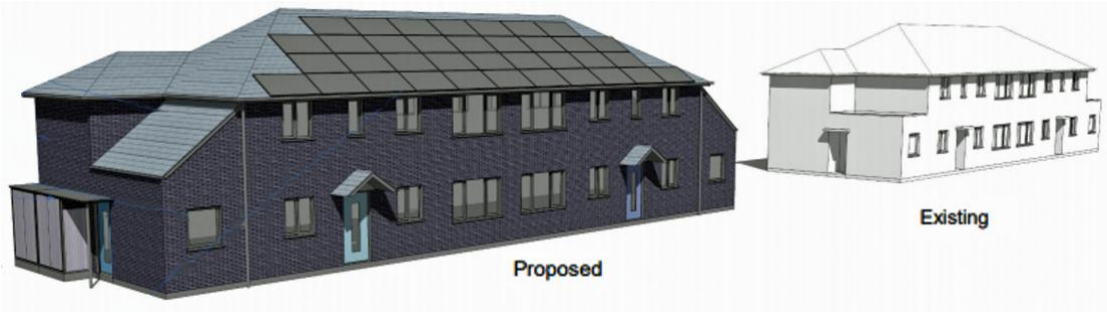
7.8 Sanctuary Housing have undertaken an Energiesprong pilot project in partnership with Devon County Council in Paignton, which has been partly funded by a European Regional Development Fund grant. Key elements of

[8] www.energiesprong.uk/about

the work at two blocks of flats (design shown below), due to be completed this autumn, are:

- Solar panels
- External wall insulation
- Thermally efficient windows and doors (triple glazed)
- Ground source heat pump – communal system for each block
- Floor insulation – between properties and solid ground floors
- Removal of gas appliances and heating systems.

7.9 There have been delays to the project due to Covid, with some supply difficulties and a problem with the initial design of wall insulation panels, which has been addressed. The retrofit work has 10-year performance guarantees to minimise ongoing repairs and maintenance costs.



7.10 Sanctuary is at the design stage for a second pilot project for 13 terraced bungalows in Torquay.

7.11 Sanctuary costs have been about £84,000 per unit. With increased scale and more mature supply chains, costs of £56,000 per unit are expected.

7.12 The cost of the pilot projects has still been cost neutral for Sanctuary over a 10-year investment period, due to grant funding, renewable heat incentive payments, and savings on planned and responsive maintenance costs.

7.13 Government funding for a whole house retrofit competition has been awarded to two Energiesprong projects in Sutton (91 non-traditional construction homes) and Nottingham (172 homes on two sites, including flats and houses). There is a similar project in Cornwall for 83 1950s semi-detached homes. These retrofits are all aiming to deliver an energy performance of at most 30 kWh/m^2/yr.

7.14 In a presentation to the group, Ian Hutchcroft, provided information on a Retrofit Accelerator Homes Innovation Partnership involving ten social landlord projects. This aims to build the scale of delivery necessary for economies to be achieved with the Energiesprong approach. For a grant-funded initial prototype stage, retrofit costs of about £85,000 per home are expected. Costs should fall, as the partnership moves to a pilot stage and

then onto a commercialisation stage, with the volume of homes retrofitted increasing. A final framework stage will be open to other social landlords and is expected to allow Energiesprong retrofit at about £55,000 per property.

7.15 Energiesprong UK now estimate income and savings of about £55,000 per property for a retrofit investment over 30 years. This includes about £15,000 from comfort plan charges to tenants, maintenance savings of £28,000 and renewable energy income of £12,000.

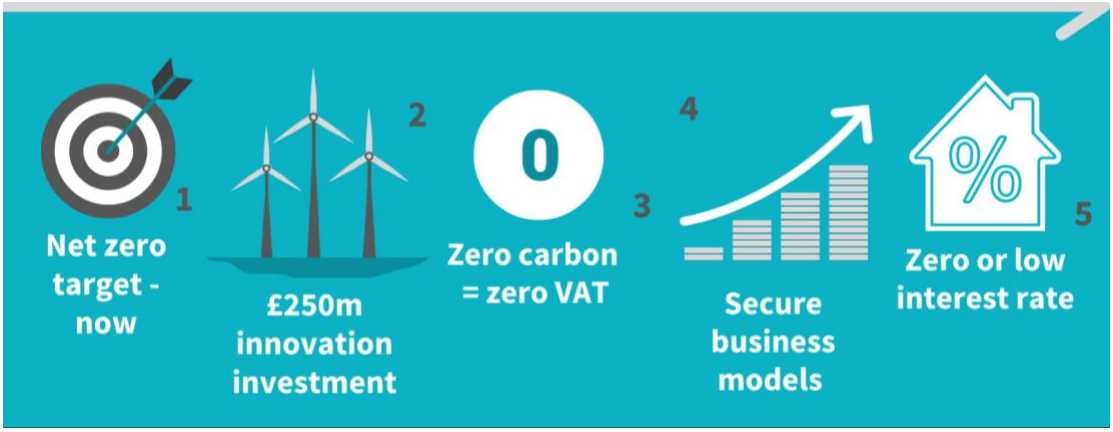
7.16 Previously, Energiesprong costs and savings delivered at scale have been estimated at about £35,000 per property[9].

7.17 The group felt Energiesprong has merit as an approach and includes good features, but the costs currently look too high, even delivered at scale. There was also concern on whether all the income and savings forecast could be realised, including for the comfort plan.

7.18 Currently, the comfort plan cannot be implemented in the UK in the same way as in the Netherlands. Although Energiesprong UK projects have been able to introduce similar charges for tenants. In Nottingham, there is a communal energy standing charge. For future projects, a specific tenant contract has been prepared. However, these approaches are not ideal, as they cannot guarantee the income over the 30-year investment period, so Energiesprong is still seeking Government support to allow comfort plan charges in the UK.

7.19 Energiesprong, with more than 25 industry organisations, have called for 5 policy interventions[10] (as shown in image below) to help allow deep retrofit in the UK. These asks are designed to unlock:

- Zero carbon retrofit at scale
- Paid for by energy and maintenance savings
- Delivered by a new high-tech British industry
- Guaranteed actual performance, comfort and costs long term
- Warm, affordable, desirable homes for life.



[9] Green Alliance, 2019 - Reinventing Retrofit

[10] www.energiesprong.uk/newspage/unlocking-net-zero-retrofit-at-scale-in-the-uk-our-5-asks-of-government

8) Other approaches to retrofit

8.1 In his presentation to the group, Nigel Griffiths mentioned a good programme for retrofit being established in Wales.

8.2 To decarbonise Welsh homes, investment of £14.5bn has been proposed, including £5.5bn for social housing (£24,000 per property) and £4.8bn for homes in fuel poverty (£36,000 per property)[11].

8.3 In November 2020, Wales launched the £20 million Optimised Retrofit Programme[12] to test and trial a whole-building approach to decarbonise social homes. The trial period will also identify capacity, skills and capability gaps in the delivery system.

8.4 A study[13] by the Welsh School of Architecture at Cardiff University has recommended:

- "There should be no distinction between performance standards for retrofit and newbuild. Similarly, there should be no distinction between standards based on tenure or housing type.
- "Some houses have constraints around retrofit, mostly related to character and historic features. However the justification for 'acceptable fails' must be carefully defined so as not to jeopardise decarbonisation targets.
- "All other housing must be retrofitted beyond SAP90, to achieve an EPC A rating."

8.5 Green Square Accord has transformed an apartment block of 22 homes in Darlaston (below). This has been upgraded through the installation of a whole house wrap of timber framed panels, dramatically improving the insulation and reducing electricity bills for the residents[14].

[11] www.futuregenerations.wales/resources_posts/homes-fit-for-the-future-the-retrofit-challenge/

[12] https://gov.wales/written-statement-optimised-retrofit-programme-2020-21 and www.optimised-retrofit.wales

[13] gov.wales/sites/default/files/publications/2019-07/decarbonising-welsh-homes-stage-2-report.pdf

[14] accordgroup.org.uk/news/2021-07-01/retrofit-whole-house-wrap-project-delivers-lower-fuel-bills-for-residents

8.6 In Cornwall, a whole house retrofit pilot project has been launched to install energy efficiency measures to 83 of the council's poorest performing homes[15]. Costs are expected to be about £45,000 per property, with measures chosen to suit the property including:

- loft, external wall and ground floor insulation
- ground source heating
- block and decommission chimney
- single room ventilation with heat recovery to kitchen and bathroom
- double glazing
- solar power.

8.7 A 2018 project in North Camden, retrofitted a block of 15 flats to the EnerPHit standard (equivalent to Passivhaus for new build). This achieved a very low heat demand, but at a cost of £93,000 per flat[16].

9) LETI climate emergency retrofit guide

9.1 LETI (originally the London Energy Transformation Initiative) is a network of over 1,000 built environment professionals that are working together on the path to a zero carbon future.

9.2 On 21 October 2021, LETI published their Climate Emergency Retrofit Guide[17]. This sets out what good retrofit looks like, and advises on how to deliver efficient, resilient and healthy homes. This includes defining energy use requirements, as well as highlighting the potential risks of poor retrofit. The guide was written by a group of over 100 construction industry professionals representing leading architecture and engineering firms, academia and non-governmental organisations.

9.3 LETI's recommendations for a net zero compliant retrofit are:

- Follow a whole building retrofit plan.
- Follow the LETI retrofit hierarchy:
  1) Reduce the space heating demand and energy use intensity as far as is practicable for the building/situation.
  2) Remove fossil fuel heat sources and replace with low carbon alternatives. LETI believes that the main option for this over at least the next decade will be heat pumps.
  3) Generate renewable energy on site wherever feasible – but do not pursue this at the detriment of items 1 or 2 above.
- Meet the LETI Energy Use Intensity targets which will often result in a 60-80% reduction in total energy consumption.

[15] www.cornwallhousing.org.uk/residents-area/repairs-and-maintenance/whole-house-retrofit

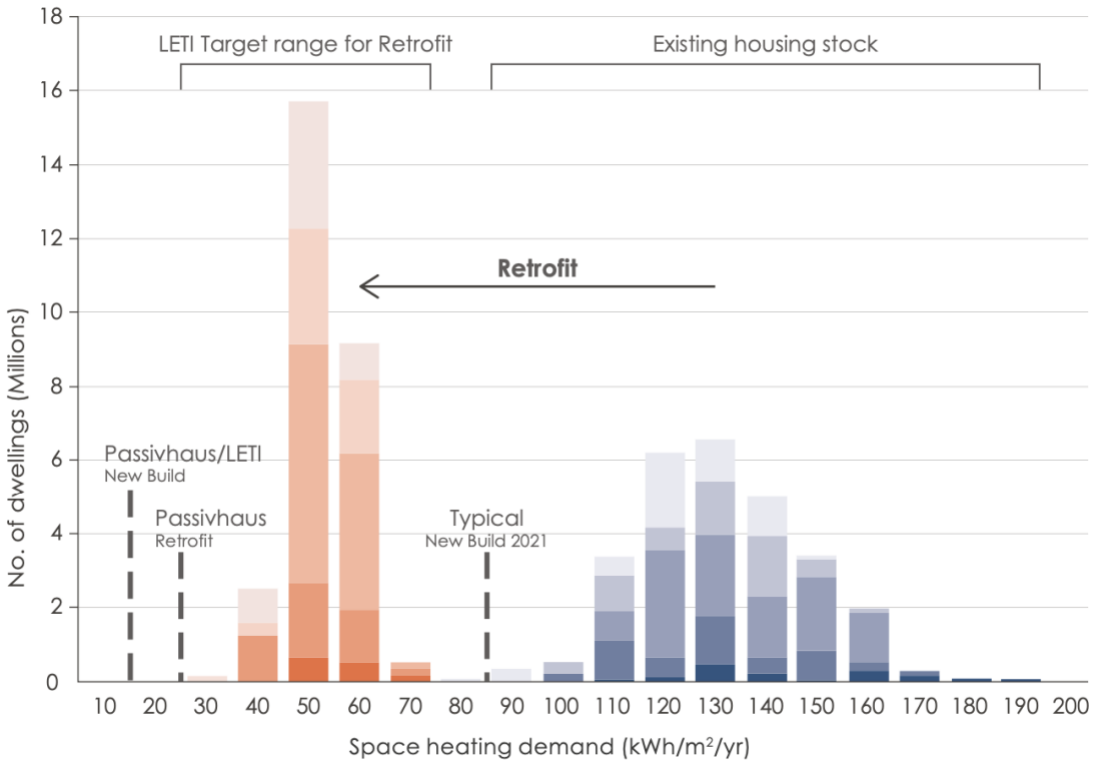
[16] www.passivhaustrust.org.uk/news/detail/?nId=867

[17] www.leti.london/retrofit

9.4 LETI's principles for good retrofit also include:

- Prioritise occupant and building health.
- Measure the performance.
- Think big!
- Consider impact on embodied carbon.

9.5 The energy performance transition required for UK dwellings to achieve the LETI target range is shown in the following chart.



9.6 LETI energy performance targets are:

	LETI best practice retrofit		LETI exemplar retrofit
Fossil fuel free	Fossil fuel free home		Fossil fuel free home
Energy Use Intensity	50 kWh/m²/yr	+10 kWh/m²/yr Additional allowance for constrained retrofit	40 kWh/m²/yr
Space heating demand	50 kWh/m²/yr	+10 kWh/m²/yr Additional allowance for constrained retrofit	25 kWh/m²/yr

9.7 The LETI guidance can be used alongside PAS 2035.

10) Gas and electricity prices

10.1 A comparison from 2019, showed typical electricity prices of 12.5 – 13p per kWh and typical gas prices of about 2.8p per kWh (with similar ranges of standing charges)[18]. Most of a gas bill comes from wholesale, network and operating costs. Electricity bills also include about 23% (3p/kWh) from social and environmental levies, which are only 2% (0.06p/kWh) for gas[19].

10.2 However, gas is a fossil fuel producing greenhouse gases when burnt, whereas electricity is increasingly a cleaner source of power derived from renewable energy, especially wind power (on and off shore).

10.3 The higher levies on electricity send the wrong market signal and the lower levies on gas do not reflect its environmental impact costs.

10.4 To encourage the use of electricity for heating, social and environmental levies should be switched from electricity to gas, so that both better reflect their carbon and environmental costs.

11) Comparing heat pumps and gas boilers (carbon and costs)

11.1 Heat pumps extract heat from an external source (air, ground or water) and are powered by electricity. A heat pump can supply 2-4 units of heat energy for each unit of electricity input.

11.2 Fossil fuel gas boilers are powered by natural gas.

11.3 Current UK carbon emissions[20] for electricity and gas are:

- Electricity - 0.212 kg CO_2 equivalent per unit (kWh)
- Natural gas - 0.204 kg CO_2 equivalent per unit (kWh).

11.4 If a heat pump gives 2.5 units of heat for each unit of electricity used, the carbon emissions from currently using a heat pump are 0.085 kg CO_2e per

[18] www.ukpower.co.uk/home_energy/tariffs-per-unit-kwh

[19] www.ofgem.gov.uk/publications/infographic-bills-prices-and-profits

[20] www.gov.uk/government/publications/greenhouse-gas-reporting-conversion-factors-2021

kWh. There are some efficiency losses when using gas boilers and heat pumps, which are thought to be similar[21]. Therefore, carbon emissions from a heat pump will normally be less than half those from a gas boiler and will be even less where heat pumps are operating more efficiently.

11.5 The electricity grid is continuing to decarbonise so the reductions in emissions from using heat pumps over gas boilers will continue to increase.

11.6 The efficiency of a heat pump will fall in the coldest weather, but it should still supply at least 2 units of heat for every unit of electricity used.

11.7 Sufficient insulation is required for heat pumps to operate efficiently throughout the year, including in the coldest months. Better insulation will increase heat pump efficiency, as well as reducing the energy used for heating and increasing the carbon savings.

11.8 The table below shows fuel costs (2019 as above) for different heating systems, taking account of the efficiency multiplier achieved by heat pumps.

Heating system	Efficiency	Cost per kWh	Cost of useful heat per kWh
Electric heating	100%	13p	13p
Condensing boiler	88%	3p	3.4p
Heat pump	x 2.5	13p	5.2p
Heat pump	x 3.5	13p	3.7p

12) Energy Performance Certificates

12.1 Energy Performance Certificates (EPCs) are used to indicate the energy and carbon performance of new homes and the existing housing stock in the UK. They are used as a guide by residents, the Council and Government.

12.2 Both Nigel Griffiths and Ian Hutchcroft were critical of EPCs, as they are currently based on energy costs and so reflect how costs vary for different energy sources. EPC ratings are not a good indicator for the use of energy or carbon emissions and can also be out-of-date in their assessments.

12.3 EPCs are based on the Standard Assessment Procedure (SAP), which has developed over more than 20 years. SAP is currently being reviewed and the next version needs to be improved[22], so it can be used as a true measure of energy efficiency, which better addresses carbon impact and fuel poverty.

[21] Page 118, Heat Pumps for the Home (2nd Edition) – John Cantor, 2020

[22] Making SAP and RdSAP 11 Fit for Net Zero: Summary, 6 August 2021 - issuu.com/deepgreenengineering/docs/making_sap_and_rdsap_11_fit_for_net_zero-summary

13) Ground source heat pumps

13.1 Ground source heat pumps are more efficient than air source as they extract heat from below ground where the temperature stays around 10°C all year, protected from temperature extremes[23].

13.2 Where sufficient land is available, a horizontal collection loop can be laid with pipes in trenches approximately 1.5m below ground level. If space is tight, a vertical loop can be installed, which generally reaches between 50m and 90m deep[24].

13.3 Ground source heat pumps are more expensive than air source, but also have few moving parts, so should last for many years and require minimal maintenance (see reference 24 in footnote).

14) Community and district heating

14.1 Heat networks are expected to increase as the UK transitions to net zero. Heat is supplied through a network of highly insulated pipes from an energy source to homes, businesses and public buildings in the area. Community heating supplies heat to several buildings in a small area, such as a group of blocks of flats. District heating connects multiple buildings over a large area[25].

14.2 Heating sources could be waste heat from an industrial process, such as energy from waste incinerator, or, for community heating, a large biomass boiler or a ground source heat array.

14.3 There are examples of new heat networks bringing ground source heating to 500 homes in Cornwall[26] and to 364 homes in seven tower blocks in Sunderland[27], and heat from an energy from waste plant to 1,983 homes and many businesses in Leeds[28].

14.4 Changeworks and the Centre for Sustainable Energy have produced a report on increasing interest by social landlords in heat networks[29].

14.5 Government support is available for heat networks[30].

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[23] cat.org.uk/info-resources/free-information-service/energy/heat-pumps

[24] Ultimate Guide to Ground Source Heat Pumps – Nigel Griffiths, July 2019 at www.self-build.co.uk/ground-source-heat-pumps-guide

[25] energysavingtrust.org.uk/what-district-heating

[26] heatthestreets.co.uk/

[27] www.kensacontracting.com/largest-gas-replacement-programme-with-ground-source-heat-pumps-in-tower-blocks-commences-in-sunderland

[28] www.carbontrust.com/our-projects/supporting-leeds-visionary-district-heating-network

[29] www.cse.org.uk/projects/view/1313

[30] www.gov.uk/guidance/heat-networks-overview

15) Survey of registered social landlords and Homes in Sedgemoor

15.1 A survey was circulated to social landlords with housing in Somerset West and Taunton and to Homes in Sedgemoor. Three completed forms, one written response and one telephone response were received.

15.2 The main aims of the survey were to learn about retrofit projects undertaken or planned, their objectives and levels of information and advice.

15.3 Two smaller social landlords had not undertaken projects or had any planned. One lacked information and sources of affordable guidance.

15.4 A larger regional social landlord had reviewed their stock, which identified 9,000 below EPC band C. Funding had been received to upgrade 370 of these, with the primary aims being to achieve band C and reduce high heating costs. They had an installation team that was being trained for PAS 2035 and were keen to work with partners. Cost was a challenge for whole house retrofit and they had a policy not to increase rents based on energy performance.

15.5 Magna provides social housing that includes stock previously transferred from West Somerset Council. Recent retrofit projects have replaced night storage heaters with air source heat pumps, upgraded previous cavity wall insulation from fibre to beads where needed, and topped up loft insulation to 300mm.

15.6 Magna's supply and investment strategy aims to ensure all their homes meet EPC C within 10 years, with an aspiration to achieve net zero carbon backed by investment provision in their business plan. Homes with low EPCs may be progressed beyond C to achieve net zero carbon.

15.7 Magna have a retrofit coordinator and assessor and are adopting PAS 2035 for new retrofit work. Working with AWS and other social landlords, they are preparing a retrofit strategy and plan a pilot for a whole house approach, which may follow LETI guidance. Engaging with tenants is seen as very important, as well as the need to improve local retrofit supply and skills.

15.8 Homes in Sedgemoor have a stock of 3,969 properties. Previously, they had programmes for loft and cavity wall insulation. External wall insulation and air source heat pumps have been installed in some properties and a ground source heat pump to a block of flats. Cavity wall and loft insulation programmes are ongoing and future projects planned under the Social Housing Decarbonisation Fund.

15.9 Primary objectives for Homes in Sedgemoor were to solve damp problems, reduce high heating costs, achieve band C and A or B, to reduce carbon emissions and switch to LED lighting. They have a retrofit coordinator and energy support advisor. They have joined the Net Zero Collective[31] and are undertaking monitoring of 5 properties prior to retrofit to learn more about impacts on costs, energy efficiency and tenants.

[31] netzerocollective.co.uk

16) Government policy and funding

16.1 The Government's Clean Growth Strategy (BEIS[32], 2017) set a target for social housing to achieve Energy Performance Certificate (EPC) band C by 2035, "where practical, affordable and cost effective".

16.2 The Government's new Heat and Buildings Strategy (BEIS, October 2021) describes how the energy performance for buildings, including social housing, will be improved. It states (page 125):

"While we continue to build our evidence base and make strategic decisions, we need to take action in the 2020s to improve the energy performance of our buildings and prepare for and begin the switch to low-carbon sources of heat.

"To balance the certainty and stability needed for market growth, ensure we remain on track for Net Zero, and build-in flexibility and consumer choice, in the 2020s we will:

- introduce and improve energy performance standards.
- develop our policies on smart and flexible technology.
- begin phasing out use of fossil fuel sources of heat.
- build and support low-carbon heat markets.

16.3 Minimum EPC ratings will continue to be used (page 126), with EPCs to be developed through an Action Plan published in 2020 (page 127).

16.4 The press release[33] for the new strategy highlights the following points:

"The government and industry will work together to help meet the aim of heat pumps costing the same to buy and run as fossil fuel boilers by 2030, with big cost reductions of between a quarter and a half by 2025 expected as the market expands and technology develops.

"The Heat and Buildings Strategy sets out how we are taking 'no-regrets' action now, particularly on heat pumps, whilst supporting ongoing trials and other research and innovation on our future heating systems, including on hydrogen. We will make a decision on the potential role for hydrogen in heating buildings by 2026, by learning from our Hydrogen Village pilot. Heat pump technology will play a key role in all scenarios, so for those who want to install them now, we are supporting them to do so.

"To ensure electric heat pumps will be no more expensive to run than gas boilers, ministers want to reduce the price of electricity over the next decade by shifting levies away from electricity to gas. A call for evidence is expected to be published with decisions made in 2022.

"With heat in buildings being one of the largest sources of UK carbon emissions, accounting for 21% of the total, there is an urgent need to deliver a mix of new, low-carbon heating solutions to meet our legally-binding target to

[32] Secretary of State for Business, Energy and Industrial Strategy
[33] www.gov.uk/government/news/plan-to-drive-down-the-cost-of-clean-heat

end the UK's contribution to climate change by 2050.

"… experts are clear there will need to be a mix of new, low-carbon heating solutions into the future for different property types in different parts of the country – such as electric heat pumps, heat networks and potentially hydrogen.

"… the UK currently has 40% of homes receiving a band C energy rating - up from just 9% in 2008 - and the government will continue to drive improvements to poorer performing homes, in line with the government's commitment for as many homes as possible to achieve EPC band C by 2035 where cost-effective, practical and affordable, and to ensure as many fuel poor homes as reasonably practicable achieve a band C rating by the end of 2030.

"… funding support will be targeted to those who need it most through schemes such as the Social Housing Decarbonisation Fund and Home Upgrade Grant, while improvements to public sector buildings will continue to be made through the Public Sector Decarbonisation Scheme."

16.5 On socially rented housing, the new strategy states (page 137):

"… the UK Social Housing Decarbonisation Fund (SHDF) Demonstrator, launched in 2020, … awarded £62 million of funding to social landlords across England and Scotland to test innovative approaches to retrofitting at scale. The Government has announced up to £160 million funding in financial year 21/22, delivering up to January 2023 as the first wave of the SHDF, which is England only. We are investing a further £800 million over financial years 2022/23 to 2024/25.

"We will also consider setting a long-term regulatory standard to improve social housing to EPC band C, with levers required to decarbonise the stock in line with Net Zero. We will consult the sector before setting any regulatory standard."

16.6 The SHDF Demonstrator competition requires retrofit to achieve "an end use energy demand target of at least 50 kWh/m^2" (same as LETI target) and compliance with PAS 2035[34].

16.7 The SHDF Wave 1 funding competition requires retrofit to achieve "at least a minimum energy efficiency rating threshold of EPC band C and are expected to improve properties to a space heating demand target of 90 kWh/m^2/year or better", as well as compliance with PAS 2035[35].

17) SWT challenges and emerging plans

17.1 SWT are developing plans for the Housing Revenue Account (HRA) to economically retrofit the Council's housing to meet carbon saving targets, whilst also ensuring tenants remain in well-managed, maintained and

[34] Social Housing Decarbonisation Fund Demonstrator: guidance notes – BEIS, Sept 2020
[35] Social Housing Decarbonisation Fund: competition guidance notes – BEIS, August 2021

compliant properties in great neighbourhoods.

17.2 A financially sound investment strategy should be achieved by:

- Learning from others and from our own pilots.
- Investment in processes and training (PAS 2035).
- Accurate and up to date data.
- Maximising grant funding where it supports strategic priorities.
- Developing a whole house approach to ensure works are specified and installed 'Right First Time' and avoiding the creation of sick housing.
- Create communities, tenants and a workforce who are advocates for low carbon retrofit.

17.3 Challenges include: affordability, competing HRA business plan pressures and risks, funding criteria, achieving PAS 2035, delivering pilots and new initiatives, targets set for 2030 and 2050, and ensuring no regrets, best practice and taking account of wider matters.

17.4 SWT's stock of 2,700 homes has a high proportion of non-traditional houses, a significant proportion of sheltered housing and pre-1940s stock and a wide range of property architypes. 8% have EPC ratings of A or B, 48% are C, 35% are D, and 8.5% are E or F.

17.5 The HRA's capital programme has on-going commitments, especially to maintenance and disabled adaptations. In addition, the capital programme has a large commitment to new build and housing replacement up to 2026/27.

17.6 Currently, there are Local Authority Delivery Scheme (LADS) projects with Green Homes Grant funding, improving heating for a small number of low-income households, including mobile homes. The Warm Homes Fund currently provides support to install air source heat pumps.

17.7 SWT has joined a consortium of 8 social landlords, including Homes in Sedgemoor, to bid for £4m from Wave 1 of the Social Homes Decarbonisation Fund (SHDF). If successful, SWT's share would be £380k for 24 units. Wave 2 applications are expected to be invited during 2022, when SWT officers anticipate bidding for funding to improve 200-300 units from EPC D to C. Prospects will be improved if the Wave 1 consortium bid and delivery is completed successfully.

17.8 Successful retrofit will need to work well with tenants (customer) and address property fabric (insulation, air tightness and ventilation) and heat and power (electricity, other non-fossil fuels, heat pumps, solar electricity and water heating, batteries). Consideration is being given to adopting the new LETI Retrofit guidance.

17.9 The LETI Climate Emergency Design Guide for new builds, published in January 2020, is being used for SWT's zero carbon affordable homes pilot[36].

[36] Report to Full Council – 7 July 2020: Zero Carbon Affordable Homes Pilot