energy saving trust

Building the evidence base for retrofit in North of Tyne

Final Report – Executive Summary

NORTH
OF TYNE

COMBINED
AUTHORITY

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1. Executive Summary

1.1 Introduction

The North of Tyne has ambitions of becoming a national leader in its pursuit of net zero emissions and the creation of new green jobs. The aim is to achieve a thriving post-pandemic economy that 'levels up' the North East and creates prosperity for all its communities. Regionally, this includes plans to create 100,000 jobs, retrofit 100,000 homes and achieve net zero carbon emissions by 2030[1]. To support this ambition, the North of Tyne area signed a Devolution Deal which is set to add £1.1 bn to the economy, delivering over 10,000 new jobs and leveraging £2.1 bn in private sector investment[2].

In July 2021, Energy Saving Trust (EST) was commissioned by the North of Tyne Combined Authority (NTCA) to develop a robust evidence base to inform the business case for a large scale housing retrofit programme. The first task involved developing a housing stock database for the NTCA from EST's Home Analytics[3] dataset. Extracts of this database were produced for the NTCA and its constituent authorities (Newcastle City Council, Northumberland County Council, North Tyneside Council) and made available via interactive dashboards.

The second task was delivered in partnership with Frontier Economics and Accelar. It involved four main workstreams: (1) profiling the current North of Tyne housing stock, (2) modelling retrofit pathways to achieve net zero, (3) identifying and shortlisting relevant funding options and (4) estimating the potential impact on local employment. This report presents the findings of this analysis to the NTCA Steering Group[4].

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[1] North East Covid-19 Economic Response Group (2020). [Recovery and Renewal Deal for the North East](#)

[2] HM Government. (2017). [North of Tyne Devolution Deal](#)

[3] Home Analytics is an address-level housing stock database covering all homes in Great Britain. It includes over 85 fields of property attribute and energy efficiency details, drawn from EPCs and other relevant sources. Gaps in the underlying data are filled using statistical and geospatial models.

[4] The NTCA Steering Group included representatives from NTCA, Newcastle, Northumberland, North Tyneside and the North East Local Enterprise Partnership (NE-LEP).

1.2   Stock baselining

To assess the current state of the housing stock in the North of Tyne, EST used Home Analytics to benchmark homes in the NTCA against regional and national trends. This profiling included six key dimensions: property attributes, building fabric, heating systems, SAP[5] characteristics, local area conditions and deprivation. The key findings from the benchmarking are summarised below.

<u>Property attributes</u>

- Semi-detached and end-terraced houses account for the largest segment of the NTCA housing stock (36%). Compared to the national average, mid-terraced houses (23%) are more common and detached houses (16%) are less common.

- NTCA has more council housing (15%) than the national average (9%), indicating local councils may have more ability to spearhead retrofit efforts.

- Despite a lower concentration of owner occupied homes relative to the national average (63% vs. 68%), this segment represents the largest portion of the NTCA stock. A lack of energy efficiency standards on existing owner occupied homes poses one the greatest challenges to achieving carbon neutrality in the housing sector.

- Construction age follows the national trend, with slightly more homes built in the 1900–1949 period.

- Three quarters of homes have between three and five habitable rooms, with a skew towards smaller, three-room properties.

<u>Building fabric</u>

- The NTCA stock has 10% more cavity walls than the national average. Due to the lower cost of cavity wall insulation relative to solid wall insulation, this also translates into a higher overall rate of wall insulation (72% vs. 61%).

- 85% of cavity walls are filled, but only 21% of solid walls are insulated. This is indicative of historical retrofit work targeting homes with cavity walls, which are less disruptive and costly to insulate compared to solid wall homes. This

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[5] The Standard Assessment Procedure (SAP) is the methodology used by the UK Government to assess and compare the energy and environmental performance of dwellings. SAP works by assessing how much energy a dwelling will consume, when delivering a defined level of comfort and service provision, based on standardised assumptions for occupancy and behaviour. A home's SAP band/score is synonymous with its EPC score/band.

underscores the financial and logistical barriers to achieving future improvements in wall insulation.

- The rate of loft insulation is 17% higher in the NTCA compared to the national average. Excluding homes with no lofts, two thirds of homes have at least 150mm of insulation.

- The NTCA has 15% more suspended floors and 12% fewer solid floors than average. This is encouraging given that suspended floors are cheaper and easier to insulate.

- Only about 7% of the stock has floor insulation. While this is likely due to logistical and cost barriers, there is some additional uncertainty in this figure as floor insulation is difficult to observe and is more prone to being assumed in EPC assessments.

- While opportunities to upgrade single/partial glazed homes is low (5%), most double glazed windows can benefit from new, high performance glazing upgrades.

Heating system

- Natural gas is the primary heating fuel in the NTCA (84%). This is on par with the national average and represents a significant challenge to decarbonisation. It's worth noting that there is significant variation in the proportion of off-gas homes between North of Tyne councils.

- Boilers are the predominant heating system (89%) while heat pumps account for less than 1% of current heating systems in the NTCA.

SAP characteristics

- NTCA has a higher proportion of SAP C homes and a lower proportion of SAP E homes. 38% of the stock has a SAP band of C or higher, while 17% is below SAP band D.

- Energy consumption is concentrated in the middle of the range (10,000-25,000 kWh/yr) with a higher than average concentration of homes with SAP modelled fuel bills between £500-£1,000 (58%).

- Homes in the NTCA emit an average of 4.2 tCO_2/yr, on par with the national average. Nearly 50% of homes have a carbon footprint between 2 and 4 tCO_2/yr.

Local area conditions

- Overall, the NTCA has an 80:20 urban-rural split. With the Tyneside conurbation, three quarters of urban housing in the NTCA is in major conurbations, compared to just 50% at the regional and national level.

- 8% of homes in the NTCA are in conservation areas and 1% are listed buildings. Depending on the retrofit approach being considered, these homes may require special planning permissions.

Deprivation

- Deprivation in the NTCA is lower than in the North East but still higher than the national level. 27% of homes are in the top 20% most deprived areas based on the Index of Multiple Deprivation (IMD).

- A slightly higher proportion of NTCA homes fall into the top and bottom quartiles in terms of benefit claimant counts.

- Net income (after housing costs) in the NTCA is 4% higher than the North East region but still 9% lower than national levels.

- Approximately 15% of homes in the NTCA are in fuel poverty; slightly higher than the national average (13%).

Spatial patterns within the NTCA were also assessed by comparing council-level statistics to the NTCA average and mapping relevant characteristics at the Lower-layer Super Output Area (LSOA) level. As Table 1 shows, the NTCA is a tale of three councils, each posing unique challenges and opportunities to regional retrofit activity.

Table 1 – Summary of NTCA stock by council

Dimension	Newcastle	North Tyneside	Northumberland
Property attributes	• 40% flats; 7% detached houses • 51% owner occupied; 24% privately rented • 41% of homes built 1900–1949 • Skewed toward homes with less than four habitable rooms	• 25% flats; 11% detached houses • 69% owner occupied; 10% privately rented • 42% of homes built 1950–1966 • Normal distribution between three and five habitable rooms	• 13% flats; 27% detached houses • 69% owner occupied; 11% privately rented • 40% of homes built pre-1900 or 1967–1982 • Skewed toward homes with five or more habitable rooms
Building fabric	• 71% cavity walls; 19% solid brick or stone • Lowest total wall insulation rate (69%) • 30% no loft; 35% <150mm loft insulation (exc. no lofts) • 28% solid floors; 72% suspended or above other premise • 7% single glazing	• 82% cavity walls; 14% solid brick or stone • Highest total wall insulation rate (76%) • 16% no loft; 31% <150mm loft insulation (exc. no lofts) • 34% solid floors; 66% suspended or above other premise • 3% single glazing	• 76% cavity walls; 20% solid brick or stone • Average total wall insulation rate (72%) • 7% no loft; 31% <150mm loft insulation (exc. no lofts) • 48% solid floors; 52% suspended or above other premise • 5% single glazing
Heating system	• 84% gas; 11% electric • 83% boiler; 10% communal heating • <1% heat pump uptake	• 94% gas; 5% electric • 92% boiler • <1% heat pump uptake	• 78% gas; 15% biomass/oil • 91% boiler • <1% heat pump uptake
SAP profile	• Mean SAP rating: 64 • 15% SAP E–G • More homes with low energy demand (<15,000 kWh/yr) and fuel bills (<£750/yr) • 63% <4 tCO_2/yr; 16% >6 tCO_2/yr	• Mean SAP rating: 65 • 12% SAP E–G • More homes with average demand (15–20,000 kWh/yr) and low fuel bills (<£750/yr) • 66% <4 tCO_2/yr; 13% >6 tCO_2/yr	• Mean SAP rating: 62 • 22% SAP E–G • More homes with high energy demand (>25,000 kWh/yr) and fuel bills (>£1,250/yr) • 52% <4 tCO_2/yr; 26% >6 tCO_2/yr
Local area conditions	• 96% urban conurbation • 8% conservation area • <1% listed buildings	• 94% urban conurbation • 6% conservation area • <1% listed buildings	• 52% urban city/town; 48% rural • 9% conservation area • <1% listed buildings
Deprivation	• Most deprived (38% in top IMD quintile) • 56% in output areas with above average benefit claimants • Net income after housing: £24,086 • 16% in fuel poverty • Highest LAD eligibility	• Second most deprived (27% in second IMD quintile) • 52% in output areas with above average benefit claimants • Net income after housing: £26,017 • 13% in fuel poverty	• Least deprived (24% in third IMD quintile) • 44% in output areas with above average benefit claimants • Net income after housing: £26,653 • 15% in fuel poverty

1.3   Retrofit modelling

To determine the types of interventions required for the NTCA to achieve carbon neutrality, each home was classified into one of 67,000 unique archetypes. EST then used its Portfolio Energy Assessment Tool (PEAT) to model an optimal package of retrofit measures for each archetype, based on standard SAP methodology. PEAT also provided key outputs such as the anticipated investment cost, carbon savings and energy efficiency improvements.

In consultation with the Steering Group, EST investigated two main retrofit scenarios. The **Business as Usual (BAU) scenario** assumed a continuation of historical trends in retrofit funding and delivery in the North of Tyne. The **Net Zero scenario** assumed extensive energy efficiency and lower carbon heating system upgrades with the goal of achieving net zero emissions. For each scenario, a different set of parameters and assumptions were used to constrain the PEAT model accordingly.

The retrofit analysis was used to quantify the incremental retrofit activity, costs and savings associated with the net zero commitments in the North of Tyne vis-à-vis the current approach to home retrofits in the area. The scenario outputs were compared over two timeframes (2022-2030, 2022-2050) to provide the NTCA with further context for the timing of net zero commitments. The findings from the scenario modelling indicate:

- Local retrofit rates across the NTCA will need to ramp up quickly. The Net Zero 2030 scenario will require over **80,000 homes to be retrofitted per year by 2027**; more than 10 times the current rate.

- The cost of achieving **the Net Zero scenario will require an estimated £13bn in funding**, beyond BAU funding sources (eg current and forthcoming grant funding).

- Electrifying heat through the **mass deployment of heat pumps will not enable the NTCA to achieve net zero by 2030**, due to residual fossil fuel generation in the grid.

- A net zero retrofit approach can deliver significant energy efficiency gains, **improving the NTCA stock from an average of SAP band D to a high B.**

- Blocks of flats pose unique financial and logistical challenges to the uptake of low carbon heating systems. Further research is required to identify common types of multi-owner mixed use buildings and develop decarbonisation pathways that account for the mixed tenure types prevalent in this segment of the housing stock.

1.4   Funding analysis

The significant gap in funding between the BAU and Net Zero scenarios, will require alternative funding sources, including private finance. To identify existing and forthcoming finance models which could be suitable for funding retrofit activity in the North of Tyne, Accelar conducted a rapid 'meta study' style literature review. From this research, **more than 60 individual funds were identified and classified into 19 overarching funding models**.

To capture the views and experiences associated with key aspects of green funding and finance, Accelar also conducted **semi-structured interviews with 25 targeted stakeholders**, including the Green Finance Institute, Ministry for Housing Communities and Local Government (MHCLG) and Department for Business, Energy and Industrial Strategy (BEIS). This stakeholder engagement identified several common themes, most notably the need for a portfolio of scalable, sustainable and demonstrable funding models that consider the wider benefits of retrofit, beyond energy savings.

Table 2 – Shortlisted green finance funding models

Funding Model	Model Definition
Secured Loans	A secured loan allows homeowners to borrow money whilst using the property as 'security'. Taking out a secured loan may lead to better mortgage terms – both because the house value will increase as energy efficiency is improved, and because borrowers are less likely to default on their loans with lower energy bills.
Demand Aggregation Finance	Demand Aggregation Finance (DAF) is an online service, coupled with new financial products, that establish a 'critical mass' in demand for a retrofit technology (e.g. heat pumps, solar PV) in a local area, bringing down the up-front and financing costs for property owners that register an interest in the scheme.
Green ISAs/ Energy Saving ISA	Green ISAs are a new 'class' of savings account that invests into environmentally positive activities, including the decarbonisation of buildings. Green ISAs offer consumers the confidence that their savings are being invested sustainably.
Pay as you save	A utility company pays for the upfront cost of a distributed energy solution and recovers its cost on the monthly bill with a charge that is less than the estimated savings. The customer sees positive cash flow at the start of the operation, and once the utility is able to recover its costs, the equipment belongs to the customer.
Aggregated Investment Products	An investment product could be structured that allows investors to provide capital for retrofits and receive predictable long-term returns from energy efficient properties. This packaged deal could be used as a product to take to market, in a similar way to Real Estate Investment trusts – that finances income-generating real estate. A new class of a product would be a green ESG investment product that invests into energy efficient buildings/ zero carbon heating systems.

A workshop was convened with the Steering Group to develop a list of criteria that could be used to identify the funding options that were best suited across the North of Tyne. The final prioritisation criteria included investor interest, relevance to the NTCA population and housing stock, scalability and long-term sustainability. Table 2 summarises the five funding models that were shortlisted, based on these criteria.

1.5   Employment effects

To help build a business case for a large scale retrofit programme in the North of Tyne, the consideration of economic benefits, such as local jobs, is important. While a full econometric modelling exercise was beyond the scope of this project, the NTCA expressed interest in obtaining headline estimates of the effect each retrofit scenario may have on local jobs.

To support this workstream, Frontier Economics used the Energy Innovation Needs Assessment (EINA) approach[6] to develop a step-by-step methodology for assessing the potential employment effects of an increased scale of domestic retrofitting activity in the NTCA. The methodology was presented in a separate report[7] which includes recommendations for (a) calculating the direct and indirect jobs supported by the programme, over a business-as-usual scenario; (b) assessing the opportunities to promote diversity and inclusion; and (c) assessing the net employment impacts, taking into account displacement and substitution effects. A guide to interpreting and communicating the employment impact results was also included.

To demonstrate the methodology, Frontier Economics used the outputs of EST's retrofit modelling to provide an indicative calculation of the jobs supported under the Net Zero 2030 and 2050 scenarios, relative to the BAU scenario. The results indicate that **the scale of activity required to reach net zero by 2050 has the potential to support between 1,500 and 3,500 full-time equivalents** (FTEs) in the retrofitting sector from 2022 up to 2030, and between 2,500 and 5,800 FTEs from 2030 to 2050. The scale of activity required to reach net zero by 2030 requires a markedly higher labour input over the 2022-2030 period.

The scale of retrofitting in both Net Zero scenarios, compared to estimates of the current available labour supply, implies a high level of investment required to train additional workers with the necessary skills to carry out the retrofits consistent with

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[6] The EINA approach is a methodology used to estimate the jobs supported from a domestic business opportunity and aligns with Green Book guidance for place-based analysis.

[7] Frontier Economics (2021). Estimating the employment effects of housing retrofit energy efficiency programmes: Methodology for assessing the effects on employment of a retrofit programme in the NTCA

policy targets. Displacement of other economic activity due to labour shortages is also a risk.

The NTCA has the potential to support skills development within the North of Tyne retrofit sector in several ways. For example, through the devolved Adult Education Budget. The North East LEP's Skills team is undertaking a qualitative and quantitative retrofit skills gap assessment, the results of which, should provide a further steer on the specific skill areas where this type of financial support should be directed.

1.6   Conclusion

The evidence base presented in this report highlights several key challenges and barriers to North of Tyne achieving its net zero commitments by 2030. These include the following:

- The scale and pace of retrofit work required to deliver the recommended net zero upgrades is a factor higher than the business as usual case which, based on historical installation data, will be a challenge to sustain itself.
- A significant shortfall in funding between available public sources and the total investment required to achieve net zero.
- Supply chain bottlenecks due to a forecasted shortage of skilled labour in the North of Tyne construction sector (eg retrofit coordinators, installers, assessors).
- Rapidly increasing energy prices which are likely to drive more households into fuel poverty and reduce ability to pay for retrofit work when the next price cap increases take effect in April 2022.
- A significant portion of homes rely on gas to meet their heating demands, so the economic case for heat pumps may be more limited in the short-term.
- The forecasted decarbonisation of the UK electricity grid suggests that electrically heated homes will still produce significant carbon emissions in 2030 (46% of 2021 emission intensity).
- Owner occupied homes account for nearly two thirds of the stock, but are the least efficient, most expensive to upgrade and have no regulatory standard to meet in terms of energy efficiency. Mobilising action in this sector is particularly difficult due to high upfront costs and a lack of public funding targeted at able to pay households.
- Differences in the size, density, built form, energy efficiency and socio-demographics between North of Tyne councils may pose programmatic challenges to a 'one size fits all' regional retrofit programme.

Although the goal of achieving net zero is daunting and will require transformational change over the coming decades, many of the above challenges can also be framed as opportunities. For example, the scale of retrofit activity required has the potential to create a long-term source of good paying jobs in North of Tyne. The funding gap provides an immediate need to explore innovative

models for private green finance, which can help reduce reliance on public schemes that lack long-term sustainability and contribute to the start-stop nature of retrofit work (eg Green Homes Grant voucher scheme).

Based on the available evidence, this report presents the following list of recommendations to help guide NTCA and its constituent councils in the development of a retrofit strategy and formation of a business case for a regional retrofit programme in North of Tyne.

<u>Retrofit planning</u>

- **Adopt a fabric-first approach to retrofits** to help get homes heat pump ready. Homes with a SAP band of E-G should be prioritised as they are more likely to be in fuel poverty, qualify for public funding and require more costly interventions, which may not be undertaken without financial support.
- To account for differences between each local authority's housing stock, **consider a blend of council-led and regional retrofit programmes**. For example, using Home Upgrade Grant (HUG) funding to support decarbonisation in off-grid homes in Northumberland and an area-based, fabric-first approach in Newcastle and North Tyneside to retrofit homes in neighbourhoods with high Local Authority Delivery (LAD) eligibility (eg likely to be fuel poor or on means-tested benefits).
- Undertake additional research to **identify the most common types of multi-owner mixed use buildings** (eg low rise, high rise, flats above shops, Tyneside flats) within North of Tyne and develop a tailored decarbonisation guide for each.
- **Target owner occupied homes**. This segment of the stock accounts for 63% of all homes in North of Tyne, but their large footprints, high space heating demand and lack of energy efficiency regulation, indicates they will be responsible for 70% of the investment required to achieve net zero in the housing stock. This segment presents a good opportunity to test the shortlisted green financing models in North of Tyne.
- Despite the step-change in retrofit activity, funding and labour force development required to approach carbon neutrality, the NTCA and its councils should **continue to take bold, ambitious steps to promote and facilitate decarbonisation** in the region.
- Do not wait for new technologies (eg hydrogen) to act. Given the scale of the decarbonisation challenge, it's crucial to **identify no/low regret options that are available now and use demonstrator projects to start shaping perspectives and stimulating the local supply chain** (eg Electrification of Heat pilot in Newcastle).

<u>Funding and finance</u>

- Maintain momentum from recent launch of the Green New Deal Fund by **confirming and communicating a strategic approach in relation to innovative funding**. This can crowd-in third party funding and capitalise on the anticipated growth in the supply of products and services from the financial community.
- Encourage partners to **explore and test a range of innovative funding models at as large a scale as possible** and support them in capturing appropriate learning and impact data.
- **Create tactical testing and implementation plans** for innovative funding arrangements on an area-by-area basis (rather than by funding model types).

<u>Labour market</u>

- Use devolved funding programmes (eg Adult Education Budget) to **direct additional investment into expanding and upskilling the retrofit supply chain** in North of Tyne.
- Use Frontier Economics' best practice methodology to qualitatively **assess opportunities for improving diversity and inclusion** within the retrofit workforce.
- Refine the headline job supported figures in this report. **Assess the extent of the net labour market impact and limitations** such as localisation, substitution and displacement.
- Consider the scale/type of retrofit activity identified in this research in context with the North East LEP's skills assessment to **direct investment toward the skill areas that are likely to be in greatest demand** in North of Tyne over the next 10 years.

Energy Saving Trust

Energy Saving Trust (EST) is an independent organisation – working to address the climate emergency.

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Accelar

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