A1 Corridor
Local Area Energy Plan

CATAPULT Energy Systems

York & North Yorkshire LOCAL ENTERPRISE PARTNERSHIP

HM Government

LOCAL AREA ENERGY PLAN

Summary

Summary

To reach a net zero energy system by **2040**, the A1 Corridor's local area energy plan requires capital investment of

£5.4 billion

Total (excluding electric vehicles and charging infrastructure)

Including:

£0.9 billion

in dwellings (including building fabric upgrades, heating systems and rooftop solar PV)

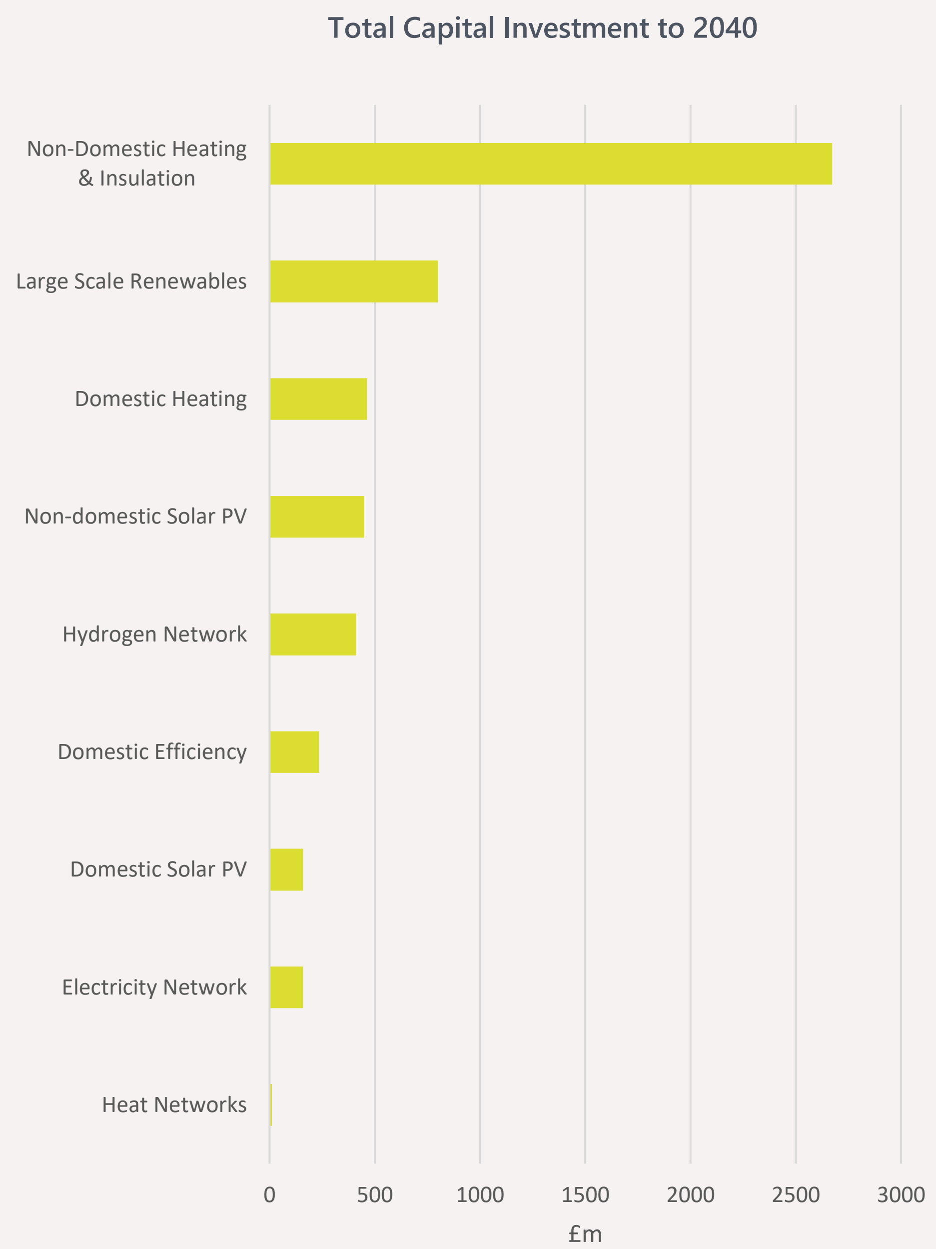
£0.8 billion

in large scale renewable generation

Saving:

1.03 million tonnes CO_2

cumulatively to 2050 against a business-as-usual pathway.



The A1 Corridor energy system will have been transformed, with:

92,000

heat pumps installed in dwellings

61,000

dwellings retrofitted with insulation, glazing and draughtproofing improvements.

107,000

fully electric vehicles

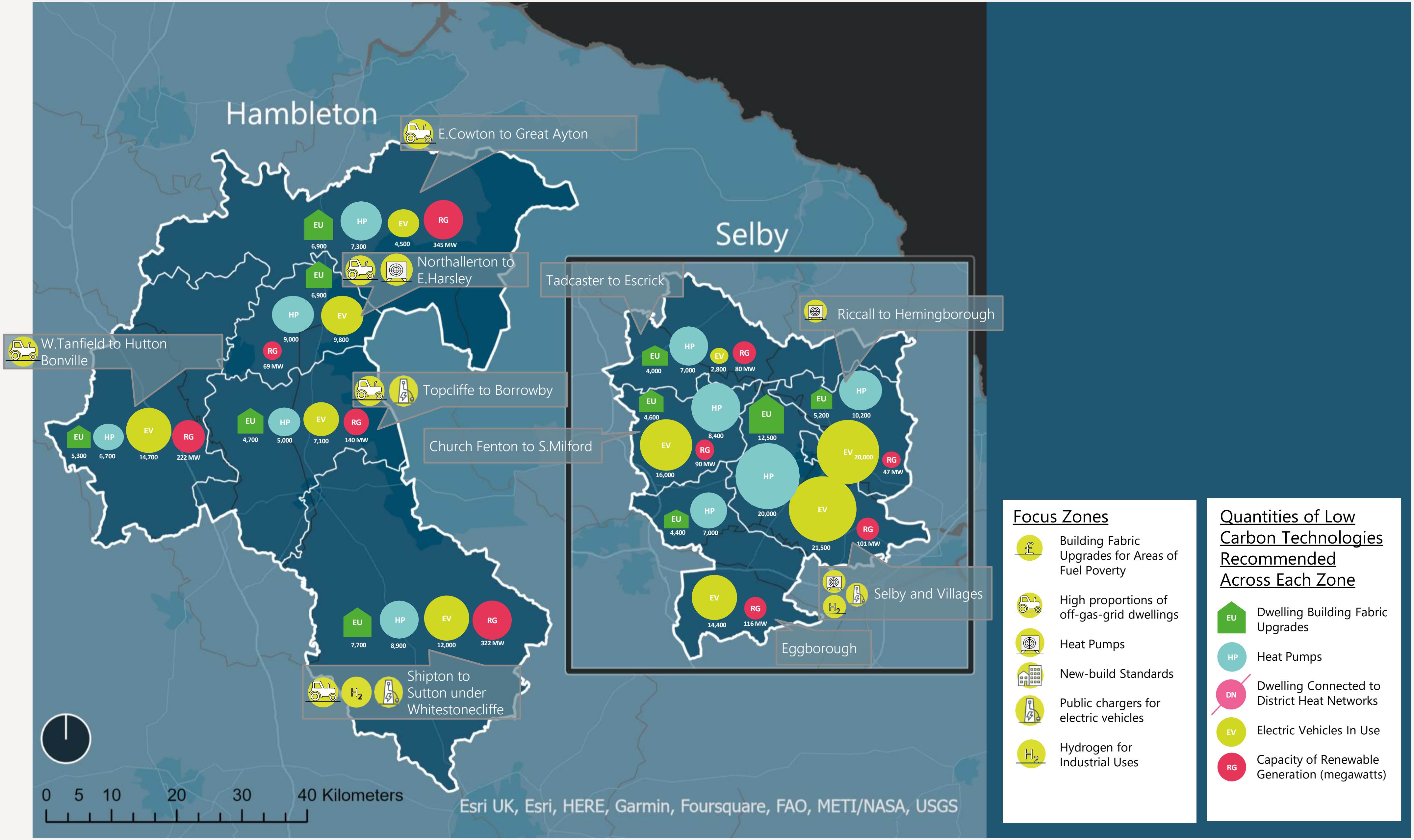
27%

dwellings generating their own electricity with rooftop solar

1,115 MW

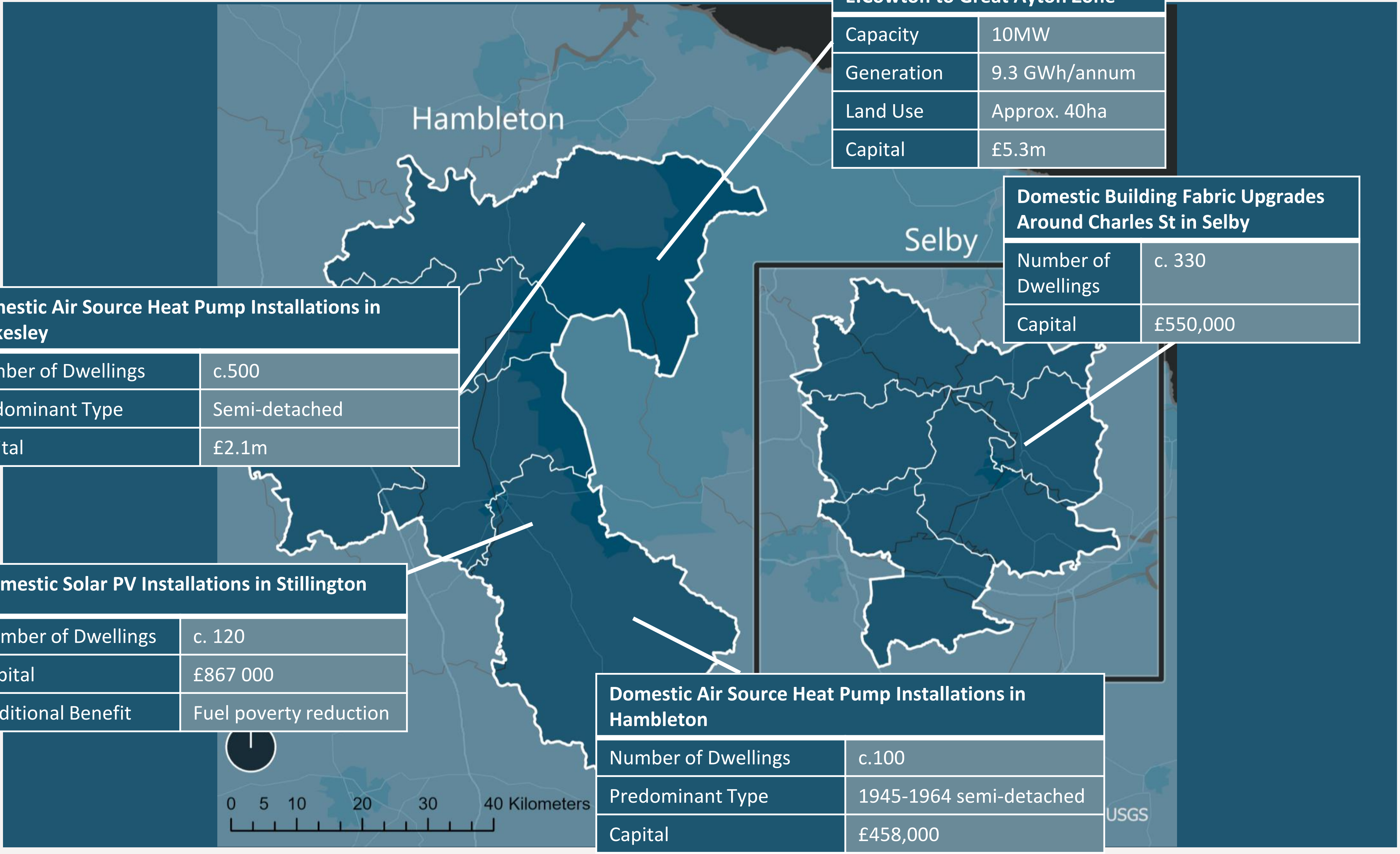
of large scale renewable generation

Plan on a Page



Outline Priority Projects Summary

Demonstrator and low regrets projects for near-term implementation



Ground Mounted Solar in the E.Cowton to Great Ayton Zone	
Capacity	10MW
Generation	9.3 GWh/annum
Land Use	Approx. 40ha
Capital	£5.3m

Domestic Building Fabric Upgrades Around Charles St in Selby	
Number of Dwellings	c. 330
Capital	£550,000

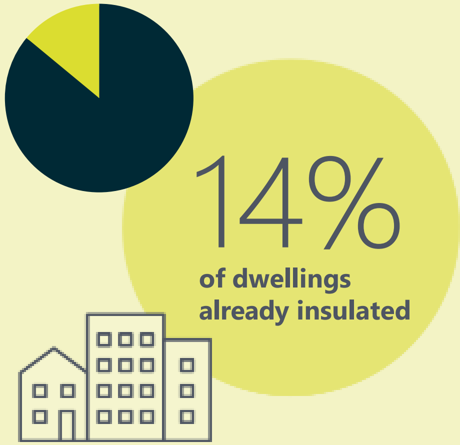
Domestic Air Source Heat Pump Installations in Stokesley	
Number of Dwellings	c.500
Predominant Type	Semi-detached
Capital	£2.1m

Domestic Solar PV Installations in Stillington	
Number of Dwellings	c. 120
Capital	£867 000
Additional Benefit	Fuel poverty reduction

Domestic Air Source Heat Pump Installations in Hambleton	
Number of Dwellings	c.100
Predominant Type	1945-1964 semi-detached
Capital	£458,000

Current State

Setting the Scene: The A1 Corridor Today

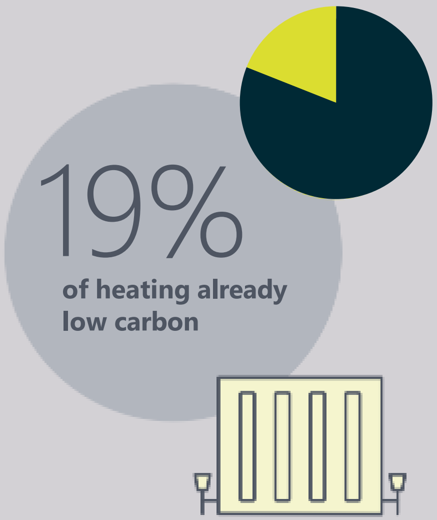


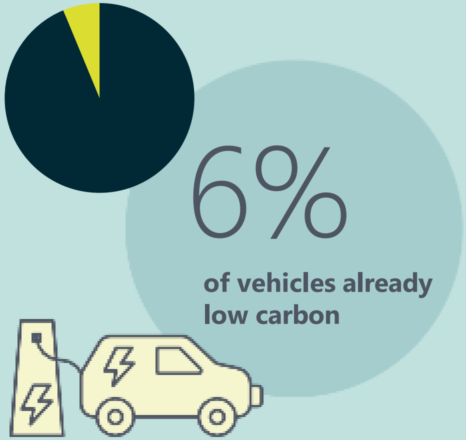
BUILDINGS

Currently 14% of the dwellings in the A1 Corridor are insulated to a good standard, or do not have potential for further insulation.

HEATING

81% of buildings currently use gas, oil or LPG for heating. The remainder already use some form of low carbon heating, such as heat pumps, biomass or electric resistive heating.



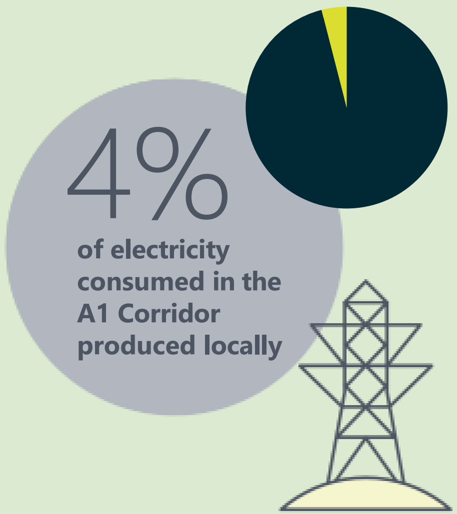


VEHICLES

Around 9,850 cars and vans currently registered in the A1 Corridor are either plug-in hybrid or pure electric, making up 8% of these vehicles. The remainder, and vast majority, are petrol, diesel or hybrid.

ELECTRICITY

96% of electricity consumed comes from the National Grid. Around 5% of dwellings have solar panels, with rooftop solar on non-domestic buildings, and a small biomass and energy-from-waste scheme also contributing.



Destination

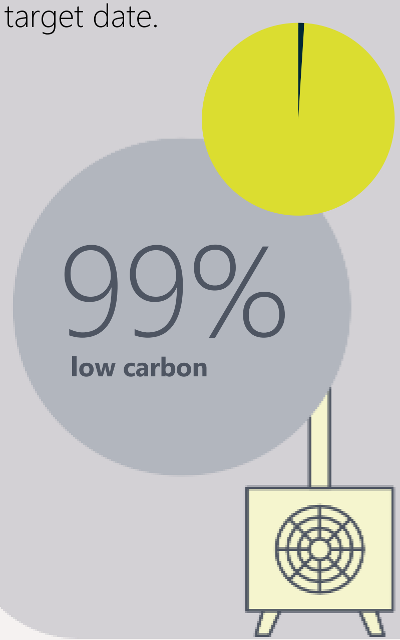
The Destination: The A1 Corridor 2040

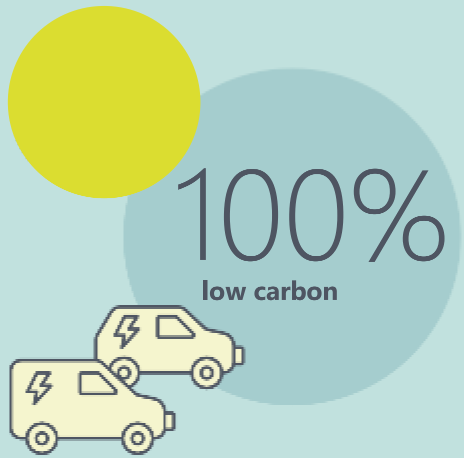
BUILDINGS

Around 76% of the A1 Corridor's buildings will require insulation upgrades, bringing the majority of dwellings up to a high standard of building fabric performance. The supply chain would need to provide upgrades to over 61,000 dwellings by the year 2040.

HEATING

Virtually all fossil fuelled heating systems need to be replaced in order to reach net zero. This can occur as current heating systems reach their natural end-of-life but scrappage (or similar) schemes will need to be considered to ensure that all heating systems are decarbonised before the target date.



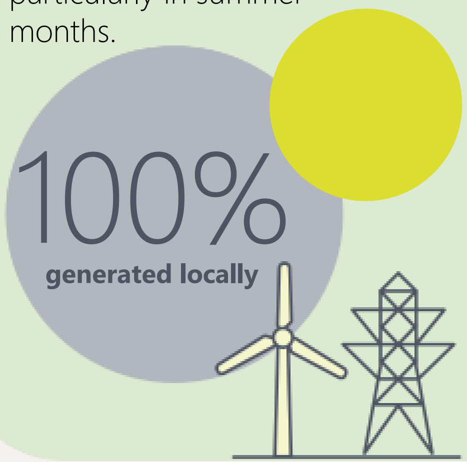


VEHICLES

Electric vehicle use is projected to rise rapidly and would need to reach 100% by 2040 to achieve net zero. Steps will need to be taken to cater for these users with public charge points and assist residents to install domestic chargers. These chargers will place new demands on the electrical distribution system.

ELECTRICITY

There is enough land with technical potential to generate all of the A1 Corridor's electricity requirements (including electrified heating and transport) from local renewables on a net annual basis. In reality, there would likely be issues with generating this amount of electricity as large excesses would be produced, particularly in summer months.



The Pathways

Three pathways to net zero were modelled to understand which of the recommended actions could be affected by different net zero target dates. The three ambition levels are described as
Low: Aligning with the national 2050 net zero target
Medium: A balanced approach, achieving a net zero energy system locally by 2040, ahead of the UK as a whole.
High: An extremely ambitious push for a net zero energy system locally by 2030.

This plan focusses primarily on the medium ambition scenario, with key similarities and differences between the scenarios drawn out where appropriate. Actions that are common across these scenarios are considered to be 'low regrets' and can be undertaken as soon as possible. Actions that are not common and are identified later in the pathway will require decision points and early enabling actions to remove barriers.

The key similarities and differences between these ambition levels are summarised as follows.

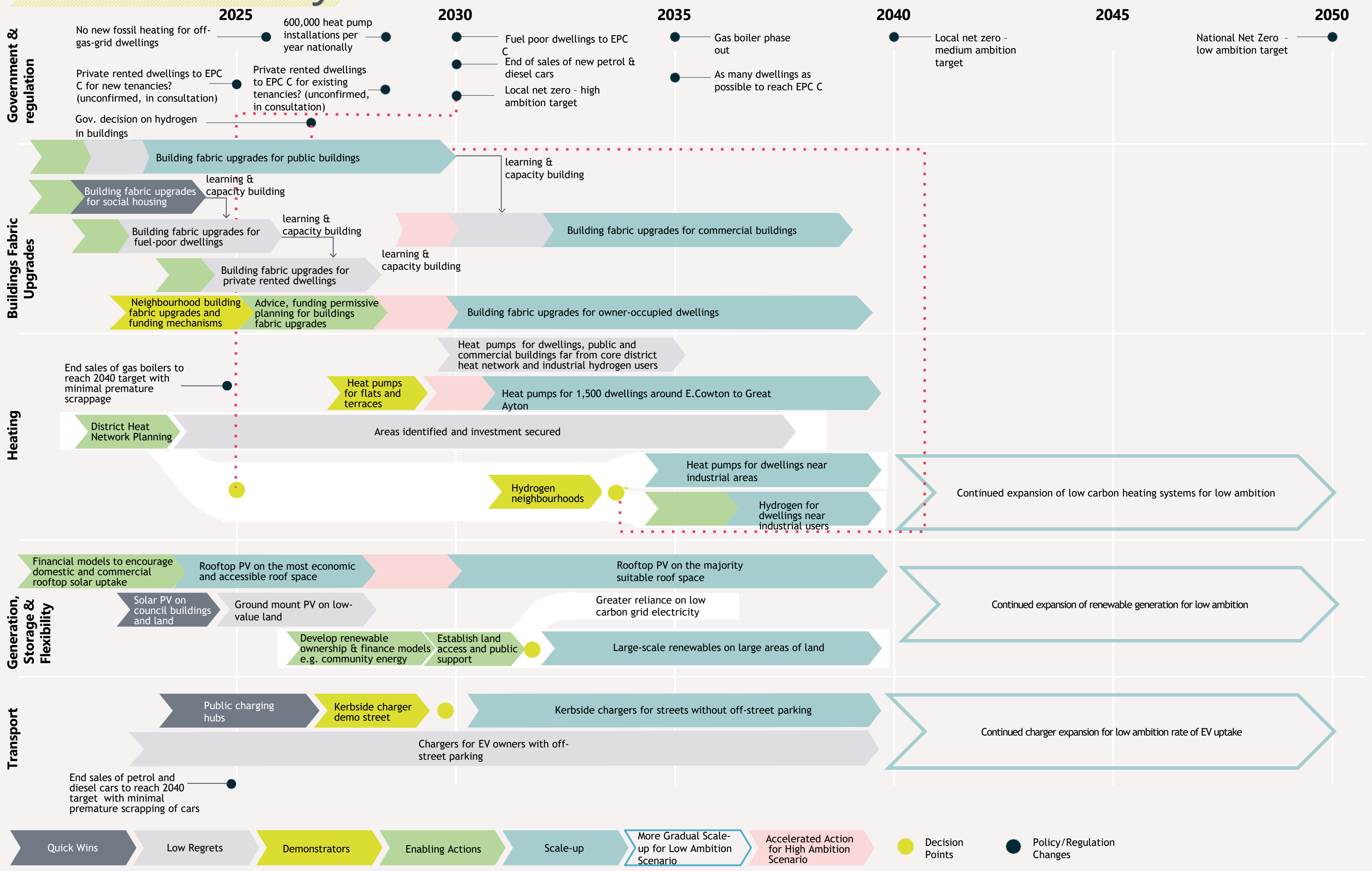
Low regrets

- Basic building fabric upgrades for almost every dwelling which has upgrade opportunities.
- Heat pumps installed in off-gas-grid dwellings, where neither district heat networks or hydrogen are likely to reach.
- Heat pumps installed in on-gas grid dwellings which are far from any likely heat networks or industrial users of hydrogen.
- EV chargers for dwellings with off-street parking and public charging points in key hubs such as retail parks, supermarkets, etc.
- Solar PV on rooftops and on low value areas of land.

Key Decisions

- Deeper building fabric upgrades which will tend to have long payback periods, but can have additional benefits such as fuel poverty alleviation and employment creation
- Hydrogen to heat dwellings close to areas of industrial use instead of heat pumps: once more evidence is available around the viability, cost, emissions and policy around hydrogen for building heating, a decision can be made about dwellings in these areas. Hydrogen may be able to reduce the upfront cost and disruption of low carbon heating system installations.
- Further deployment of ground-mount solar PV and wind turbines to reduce emissions from consumption of grid electricity. In theory, very large areas of land could be used to produce all of The A1 Corridor's energy requirements on an annual basis, though the occupation of this extent of land could be challenging. Visual impact of developments would need to be assessed as part of feasibility studies, as well as alternative land uses. Greater deployment of local renewables can bring economic benefits and accelerate decarbonisation, while greater reliance on decarbonised grid electricity can reduce the difficulties around developing large areas of land.

The Pathway


2025
2030
2035
2040
2045
2050
Government & regulation
No new fossil heating for off-gas-grid dwellings
600,000 heat pump installations per year nationally
Fuel poor dwellings to EPC C
Gas boiler phase out
Local net zero - medium ambition target
National Net Zero - low ambition target
Private rented dwellings to EPC C for new tenancies? (unconfirmed, in consultation)
Private rented dwellings to EPC C for existing tenancies? (unconfirmed, in consultation)
End of sales of new petrol & diesel cars
As many dwellings as possible to reach EPC C
Local net zero - high ambition target
Gov. decision on hydrogen in buildings
Buildings Fabric Upgrades
Building fabric upgrades for public buildings
learning & capacity building
Building fabric upgrades for social housing
learning & capacity building
Building fabric upgrades for fuel-poor dwellings
learning & capacity building
Building fabric upgrades for commercial buildings
Building fabric upgrades for private rented dwellings
learning & capacity building
Neighbourhood building fabric upgrades and funding mechanisms
Advice, funding permissive planning for buildings fabric upgrades
Building fabric upgrades for owner-occupied dwellings
Heating
Heat pumps for dwellings, public and commercial buildings far from core district heat network and industrial hydrogen users
End sales of gas boilers to reach 2040 target with minimal premature scrappage
Heat pumps for flats and terraces
Heat pumps for 1,500 dwellings around E.Cowton to Great Ayton
District Heat Network Planning
Areas identified and investment secured
Heat pumps for dwellings near industrial areas
Hydrogen neighbourhoods
Continued expansion of low carbon heating systems for low ambition
Hydrogen for dwellings near industrial users
Generation, Storage & Flexibility
Financial models to encourage domestic and commercial rooftop solar uptake
Rooftop PV on the most economic and accessible roof space
Rooftop PV on the majority suitable roof space
Continued expansion of renewable generation for low ambition
Solar PV on council buildings and land
Ground mount PV on low-value land
Greater reliance on low carbon grid electricity
Develop renewable ownership & finance models e.g. community energy
Establish land access and public support
Large-scale renewables on large areas of land
Transport
Public charging hubs
Kerbside charger demo street
Kerbside chargers for streets without off-street parking
Continued charger expansion for low ambition rate of EV uptake
Chargers for EV owners with off-street parking
End sales of petrol and diesel cars to reach 2040 target with minimal premature scrapping of cars
Quick Wins
Low Regrets
Demonstrators
Enabling Actions
Scale-up
More Gradual Scale-up for Low Ambition Scenario
Accelerated Action for High Ambition Scenario
Decision Points
Policy/Regulation Changes

Buildings

Overview

In most zones across the A1 Corridor, a substantial portion of dwellings are recommended for building fabric upgrades to reduce their energy use. This is consistent across all ambition levels, with earlier targets requiring more rapid treatment of dwellings. The map shows the geographical distribution of these building fabric upgrades. In total, over 61,000 dwellings will be required to achieve a net zero energy system by 2040 and aid the transition to a net zero York & North Yorkshire region by 2034, and net negative region by 2040.

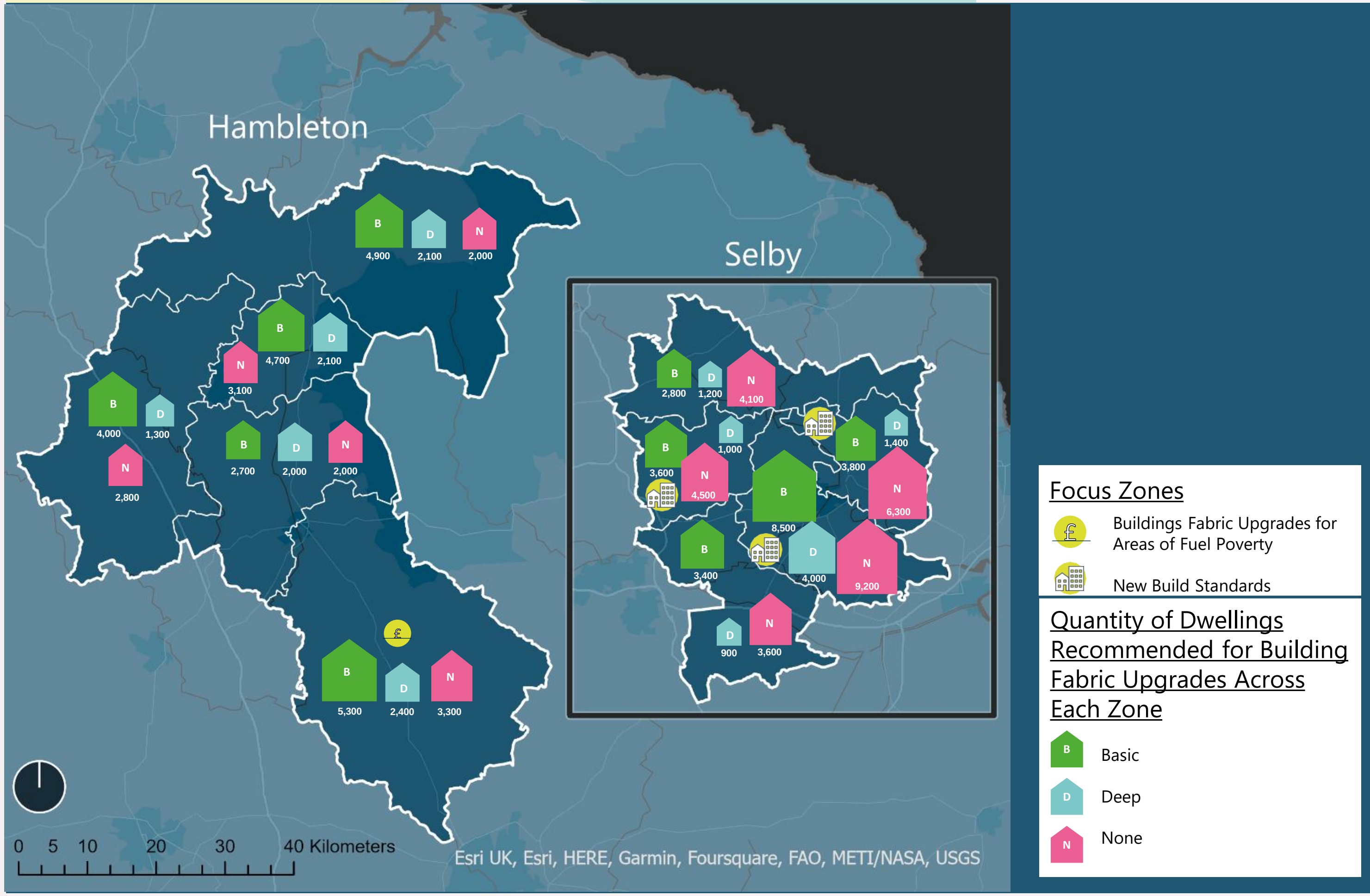
To achieve the greatest level of impact from the decarbonisation of the domestic housing stock, building fabric packages should be prioritised in areas which have existing high levels of fuel poverty. This will reduce bills and increase comfort for residents, while reducing the negative impact on the health from cold housing.

For similar reasons, the roll-out of a building fabric upgrade programme could be started with local authority owned social housing (or that which can be influenced through local housing groups). Given the additional control that the local authorities typically have over these assets, roll-out is likely to be quicker and therefore have an immediate and longer-term effect on decarbonisation.

The able-to-pay sector should not be ignored however, given the increase in fuel prices (at the time of writing, 2022) more homeowners can benefit from the reduced running costs provided by having a suitably insulated dwelling. Areas with large numbers of new build dwellings planned can prioritise building to net zero standards (e.g. Passivhaus), potentially encouraged a local design code or supplementary planning

61,000 **dwellings (60%) recommended for building fabric upgrades**

over £235m **capital investment in domestic building fabric upgrades required**



Building fabric programmes – particularly at the scale which is required – could spur economic growth in the A1 Corridor area by creating a large demand for materials and services from the supply chain. This will require significant training and/or upskilling of the workforce, providing stable well-earning jobs for residents.

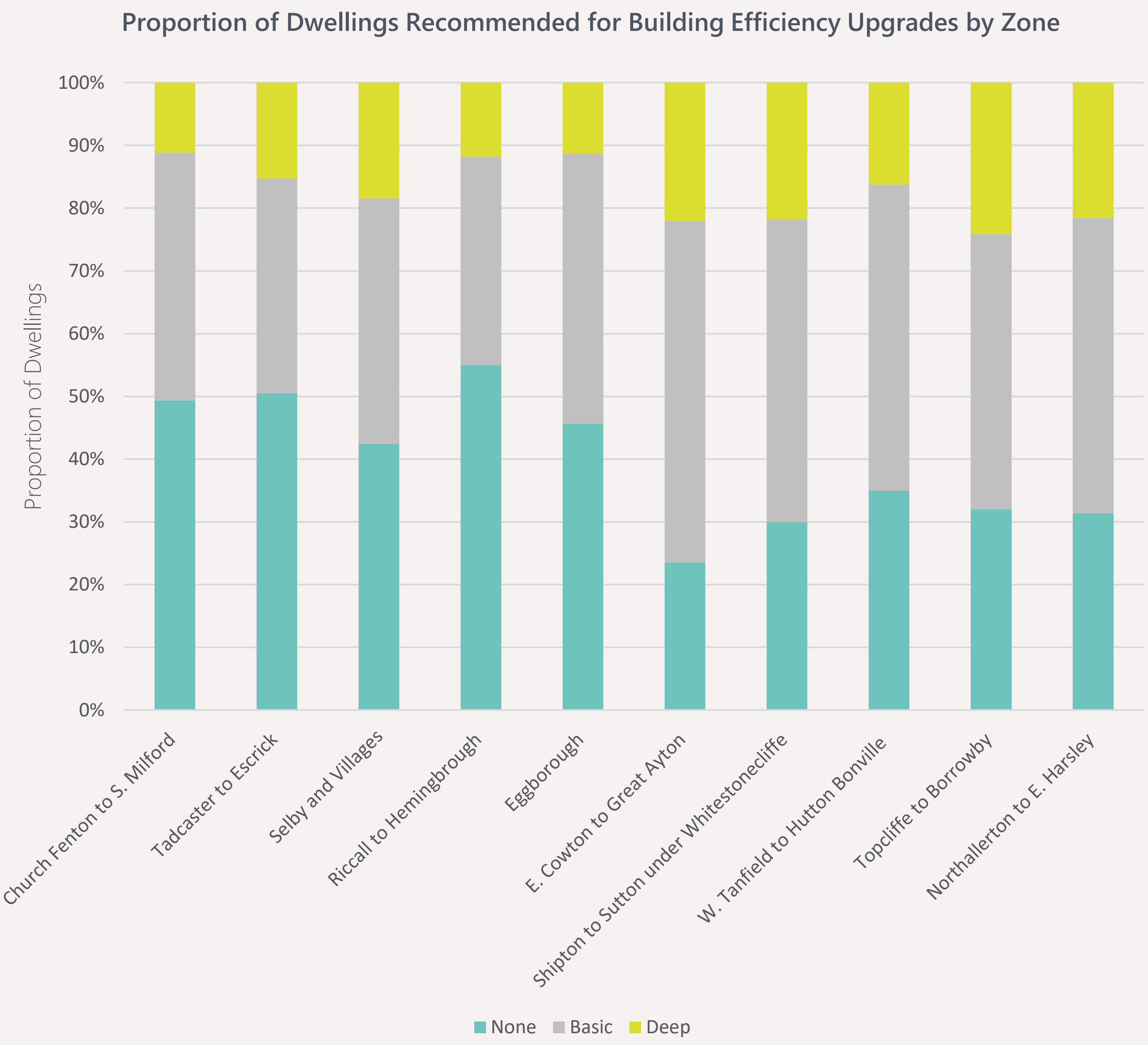
However, it should be noted that these jobs could 'leak' out into other areas if the skills shortage is not met within the area. Local training such as the retrofit courses currently available at Harrogate College will be vital for building the capacity to carry out this work at scale and at high quality.

Zones and Dwelling Types

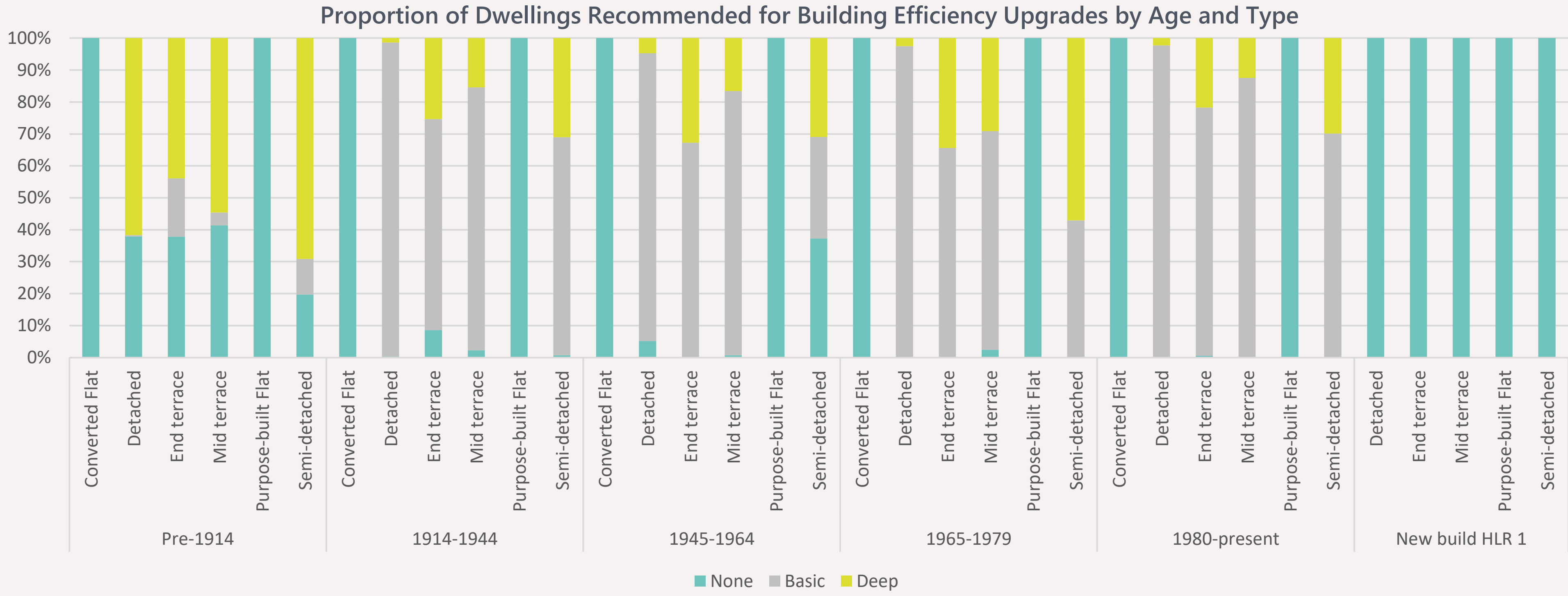
Building fabric upgrades are improvements made to the fabric of domestic and non-domestic buildings to reduce heat loss. Upgrades can include draught proofing, loft and cavity wall insulation (referred to here as "basic" upgrades), double or triple glazing, internal or external wall insulation, floor insulation, and door upgrades ("deep"). These measures can improve comfort and health of occupants, reduce bills, and make it easier to transition to low carbon heating systems, whilst also reducing the need to upgrade the electrical network. Since building fabric upgrades can reduce the size and cost of heating system needed, it makes practical sense to complete them before heating system replacements take place, or at the same time to minimise disruption to occupants.

The graph shows the extent of upgrades recommended across each zone of the A1 Corridor, which is influenced by the types of dwellings in each area. Where there is a high proportion of flats or new builds, fewer upgrades are typically recommended as they are often energy efficient enough to be transitioned onto a low carbon heating system. In the 'E. Cowton to Great Ayton' zone, a large proportion of the dwellings (69%) require a cost-effective fabric upgrade, with the majority of these (71%) being 'basic'.

Dwellings which aren't highlighted for upgrades by cost-optimal modelling are not necessarily ruled out from benefiting from upgrades; other factors such as prevalence of fuel poverty, or a focus on the health and comfort benefits of dwellings which are easier to keep warm, could drive the decision to go beyond the suggested cost-optimum.



Dwelling Type & Age



Across the A1 Corridor area, pre-1914 dwellings are likely to require a deep building fabric upgrade, or no upgrade. This is due to the way that the building fabric packages have been classified, with deep building fabric upgrades including solid wall insulation which is more prevalent within the pre-1914 housing stock. This also means that the building fabric upgrades of this section of the housing stock is more likely to be expensive and require more specialist skills.

Conversely, the 1980-present age band are much more likely to require a basic building fabric package as they typically have cavity walls.

Detached dwellings in the A1 Corridor area have the highest proportion requiring building fabric upgrades regardless of their age. This shows the importance of focussing on the able-to-pay sector which are most likely to be living in detached dwellings. The installation of building fabric measures across the detached housing stock is to ensure that the heat loss of the dwellings is low enough to make them suitable for the installation of a low carbon heating technology.

57% of semi-detached dwellings built between 1965 and 1979 are likely to require deep building fabric upgrades. It is unclear how many of these dwellings form part of the private rental sector market – this could form a follow-on investigation – however, this could be a sensible candidate for policy intervention.

Flats are considered individually and therefore show as requiring no building fabric upgrades, since to do so individually would not be cost-effective. However, flats could be considered for building fabric upgrades together where blocks are insulated collectively making the installation more cost-effective.

Focus Zones

Focus zones highlight areas where particularly large numbers of a certain solution are recommended, directing efforts towards delivery at scale in that zone, often in advance of other parts of the plan. Focus zones can account for factors such as the socio-economic conditions in an area, network capacity, or characteristics of the building stock, which could bring specific advantages, learning opportunities or challenges to delivery in that location.

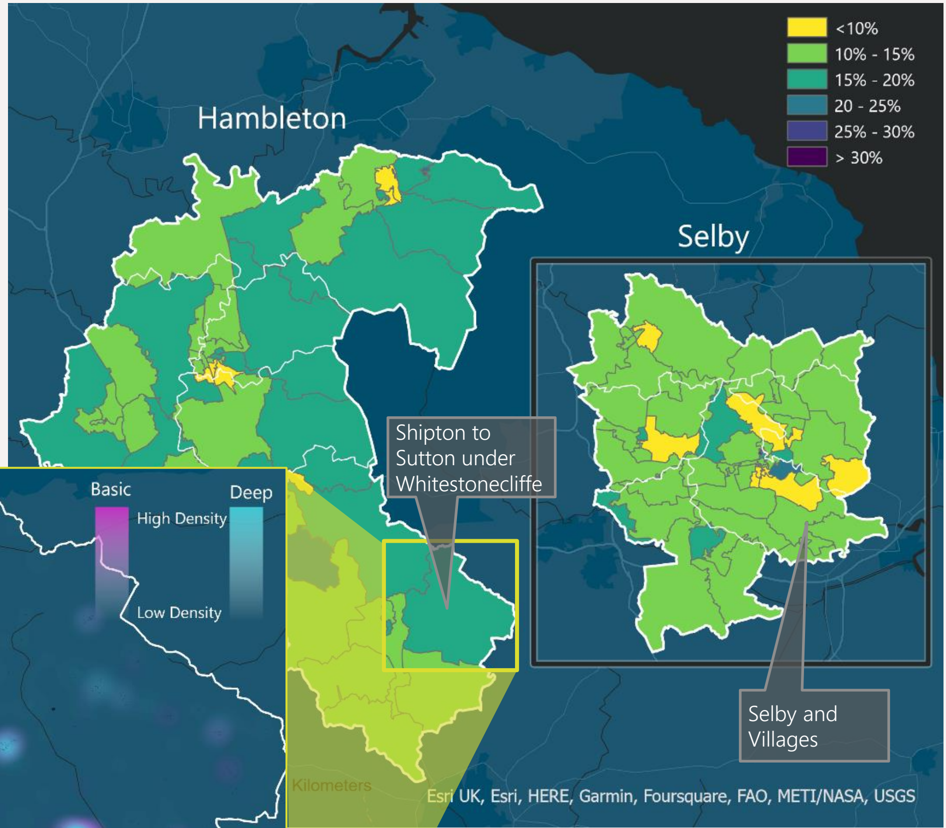
The 'Selby and Villages' Zone

Up to 12,500 dwellings in this zone could benefit from some level of building fabric upgrade. Due to this, and the high levels of fuel poverty it has been designated a focus zone. This zone also contains the town of Selby which has around 2,000 detached dwellings built between 1965 and 1979 which will require basic or deep building fabric upgrades.

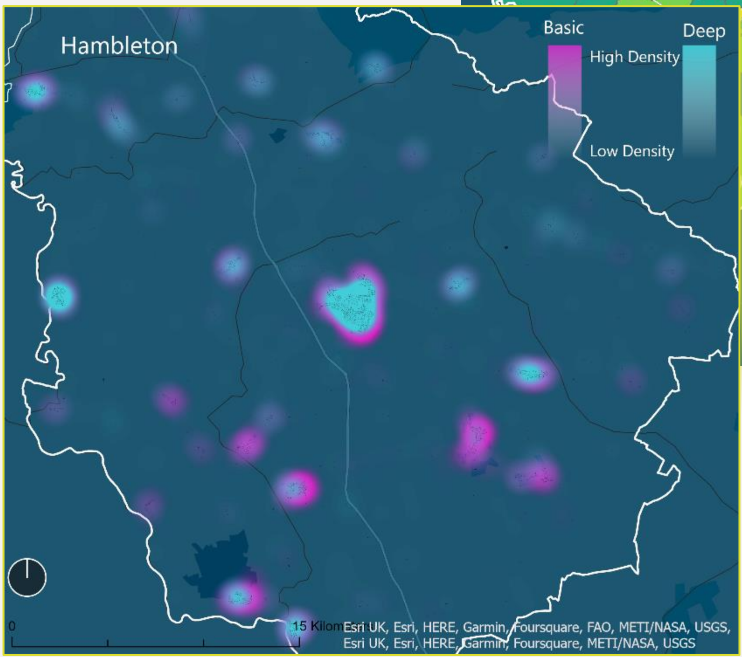
The 'Shipton to Sutton under Whitestonecliffe' Zone

This zone in Hambleton has a range of fuel poverty levels, with north western areas around the Dalton Airbase Industrial cluster and the eastern parts around Stillington, Husthwaite and Crayke being above the regional average.

Many of the semi-detached dwellings built between 1945-1980 (c. 600) could benefit from deep building fabric upgrades, while many detached dwellings built between 1965-1979 (c. 1,500) would benefit from basic building fabric upgrades.



Estimated Proportion of Dwellings in Fuel Poverty



Building Fabric Upgrades Recommended in the Shipton to Sutton under Whitestonecliffe zone

Heating

Overview

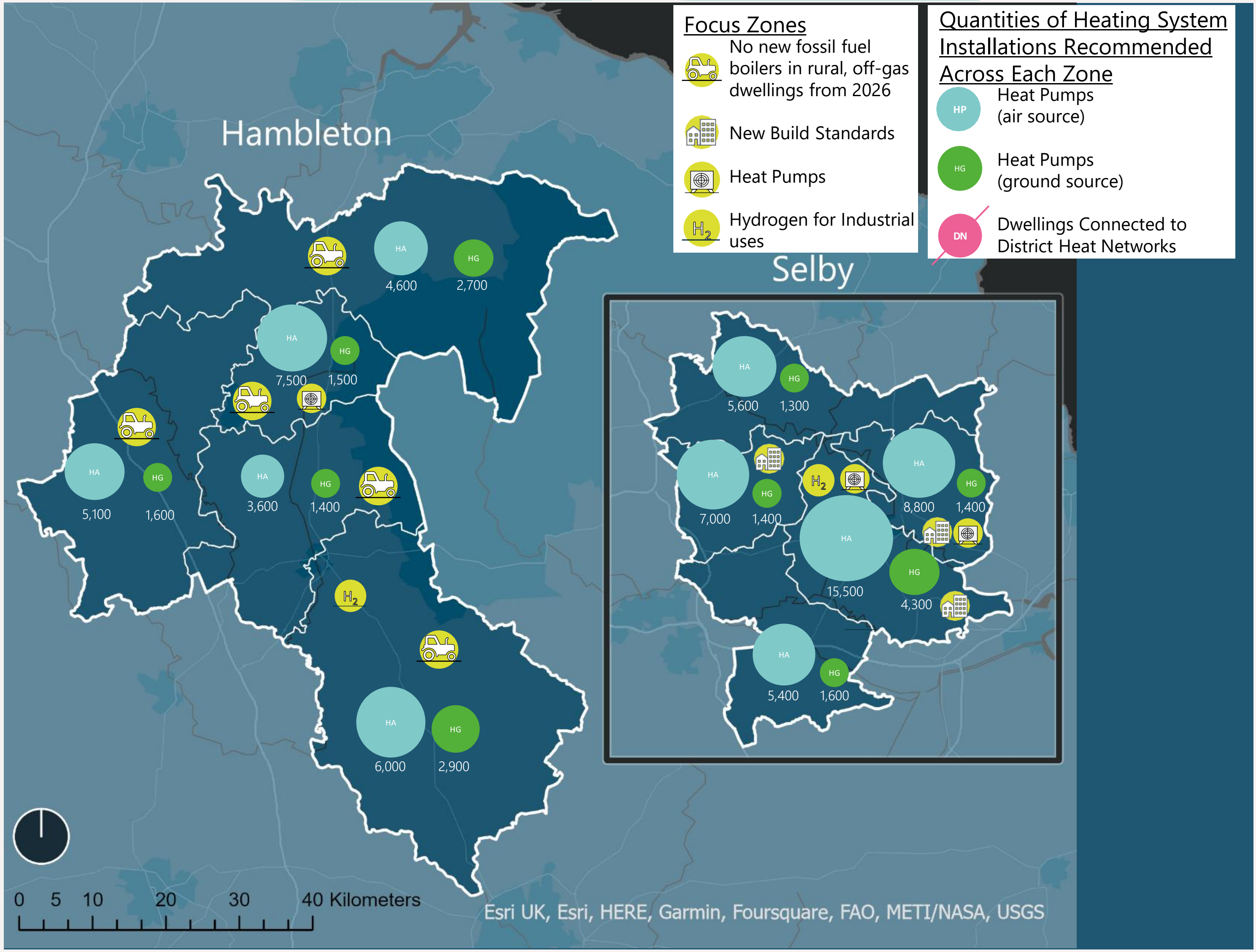
Fossil fuel boilers make up the majority of heating systems in dwellings and non-domestic buildings, with fossil fuel use in buildings (excluding industry) accounting for (18%) of the A1 Corridor's emissions. To reach net zero, these will need to be replaced with low carbon heating systems. Heating systems can be replaced at their natural end-of-life, however early preparations are needed to ensure the low carbon options are available, straightforward and attractive when replacements occur, which can often be during a break-down. The sale of new fossil fuel heating systems would need to end by 2025 to meet a 2040 net zero target, in order to avoid early replacements of working boilers (assuming a 15 year lifespan). This is significantly more ambitious than any cut-off date likely to be imposed by central government, with 2035 currently being considered*.

Heat pumps are the most widely suitable technology for decarbonising heating within the A1 Corridor, with growing evidence** that they can be installed in the full range of dwelling archetypes. Heat networks can serve dense town centre locations (supported by some existing electric resistive heating). Rural zones off the gas grid are low regret for heat pumps, with an end to new fossil heating installations for these dwellings set for 2025. There may be opportunities to use hydrogen for heating dwellings near industrial users of hydrogen.

Learning from the joint project between Ryedale, Scarborough, Richmondshire and Hambleton, using funding from National Grid's Warm Homes Fund to install air sourced heat pumps to eligible dwellings should be leveraged when setting up new schemes for wider roll out.

92,000 dwellings recommended for heat pump installations

c.£465m capital investment in domestic heating systems required

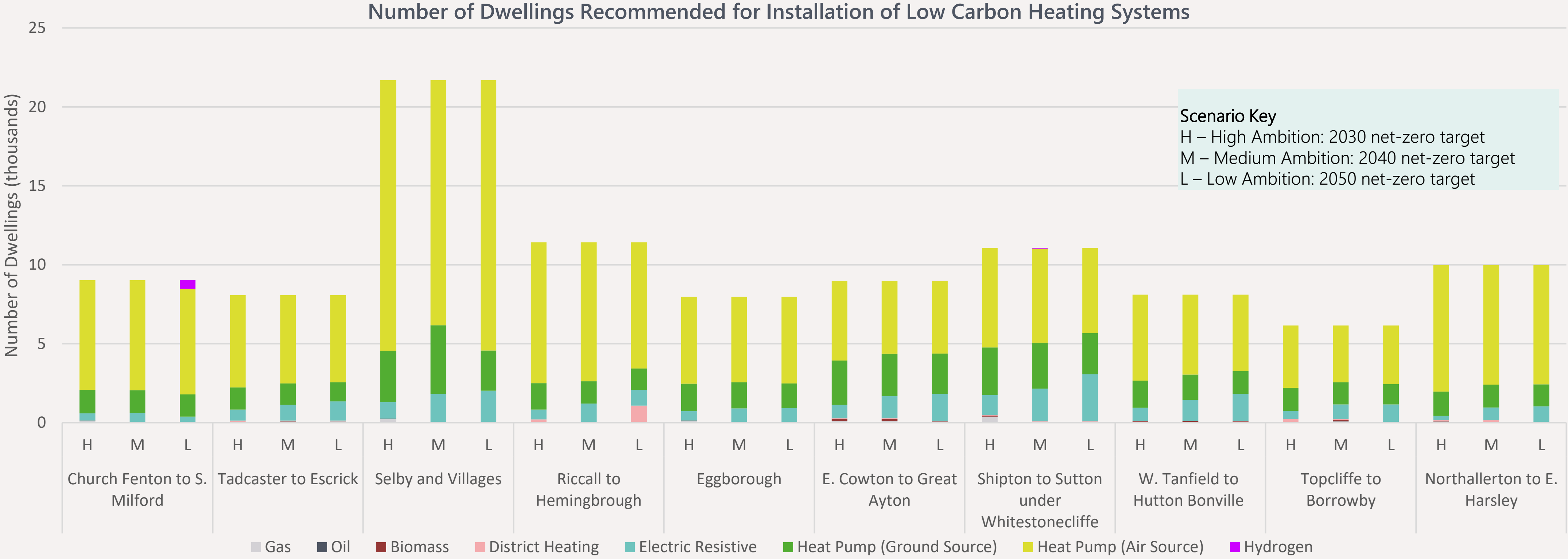


* https://www.gov.uk/government/publications/heat-and-buildings-strategy

** https://es.catapult.org.uk/news/electrification-of-heat-trial-finds-heat-pumps-suitable-for-all-housing-types

Domestic Buildings

The most suitable choices of heating systems for each zone are largely consistent between different levels of ambition for the net zero target date, with only slight variation in places as shown in the chart. This indicates that choices of heating system are mostly low regrets. Where variation is seen, the case for picking one technology over another is more marginal, suggesting that either option would be sound, and local factors and preferences can drive the decision.



Across the three ambitions, heat pumps play a significant role. Over 90% of the A1 Corridor in the medium ambition converts to heat pumps, either air source or ground source. Electric resistive heating is still expected to be utilised in around 8% of heating systems across this region, in dwellings off the gas grid which have a small floor area. In these houses, it would be more cost-effective to keep the existing heating than to upgrade to more efficient heat pumps due to the costs and carbon trade off.

District heat networks (DHNs) are likely to play a very small role in the overall decarbonisation of the heating systems in the A1 Corridor, with pockets of potential, connecting some dwellings. However, consideration should be given to small, localised heat networks e.g. where a shared heating system could be installed which would supply heat to a group of dwellings. This approach would allow a smaller cluster of houses, such as an individual terrace, to make use of the increased efficiency gained by this type of system.

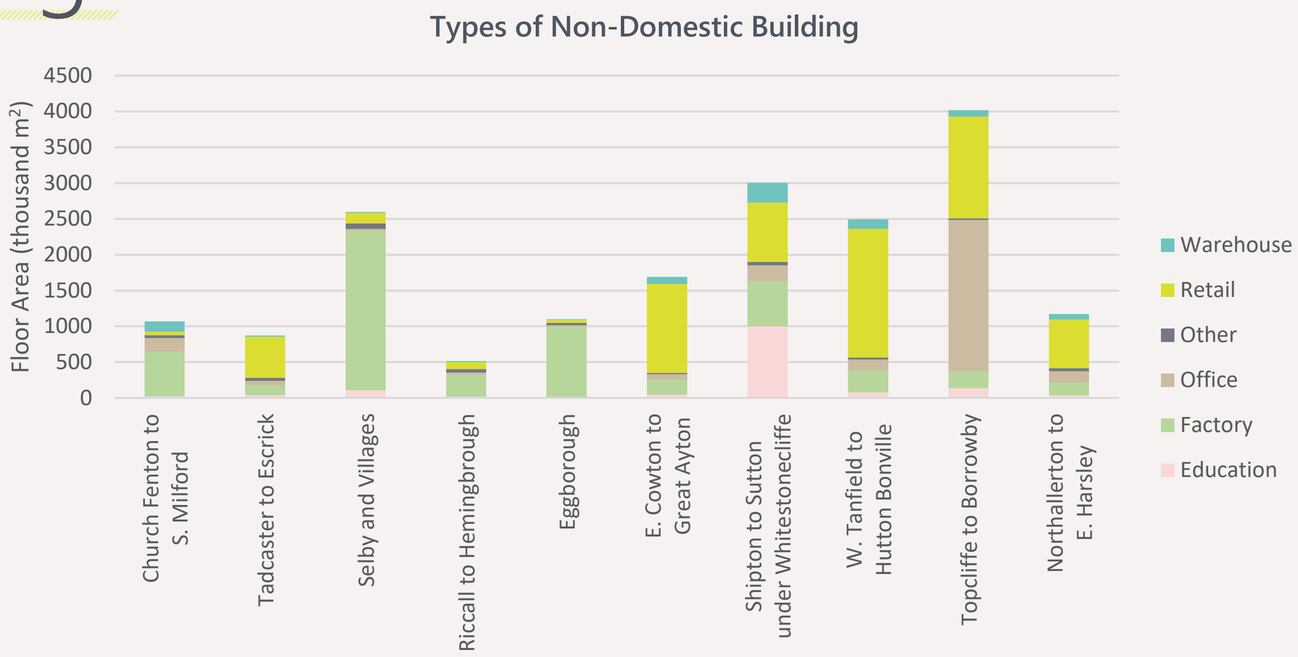
Hydrogen is unlikely to become available in the A1 Corridor areas until the mid-2030's meaning that this is not a possible decarbonisation pathway under the high ambition scenario, which aims to have decarbonised the energy system by 2030.

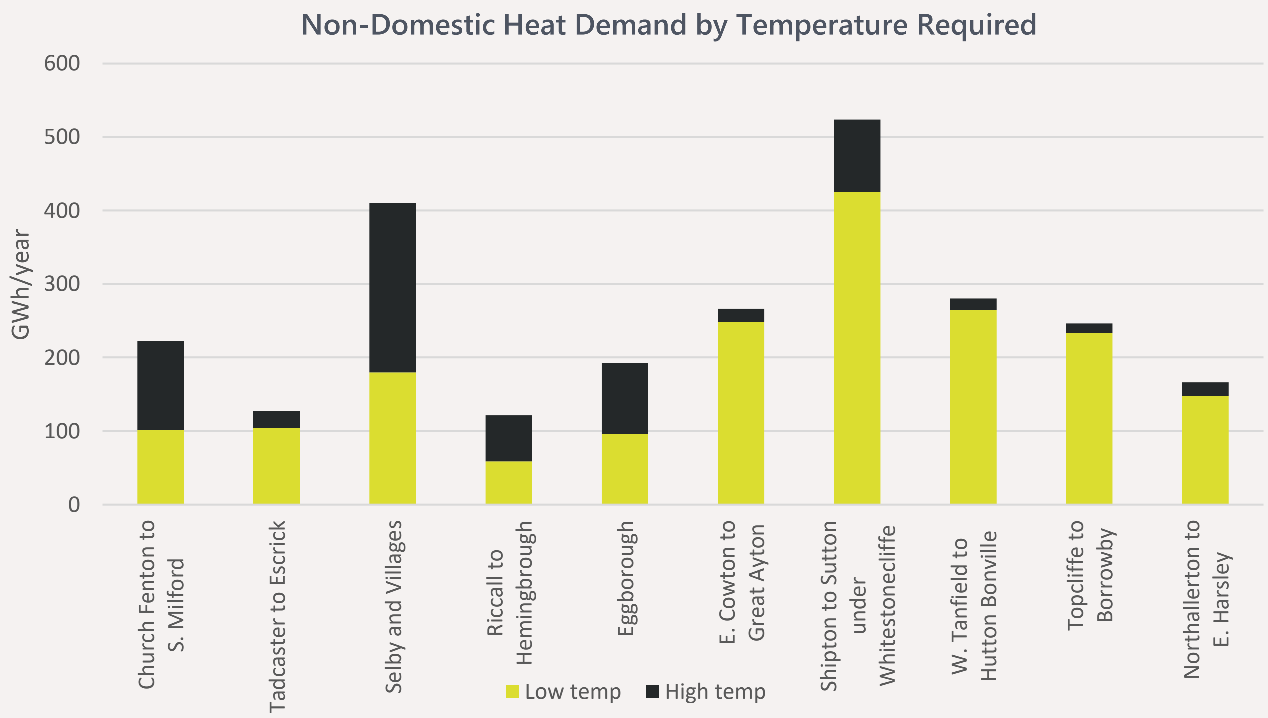
In the medium and low ambition scenarios, hydrogen boilers are not expected to be cost-effective. This is likely, in part, due to a large proportion of the A1 Corridor area being off the gas grid and the electrical network having fully decarbonised by 2035.

Non-Domestic Buildings

Non-domestic buildings are categorised into a range of uses, shown in the chart (top). Most of the heat demand in non-domestic buildings is for space heating and hot water, so only requires low temperature heat. However, a significant proportion of heat demand in some zones may require high temperatures for specialised industrial processes, as shown on the chart (bottom). The 'Selby and Villages' zone has the largest amount of energy usage for high temp processes as it houses large industrial sites such as the Cemex cement factory, which is next to the Drax power station.

High temperature heat is likely to be more difficult to electrify or provide with district heating, making a stronger case for hydrogen to replace fossil fuels for these applications.



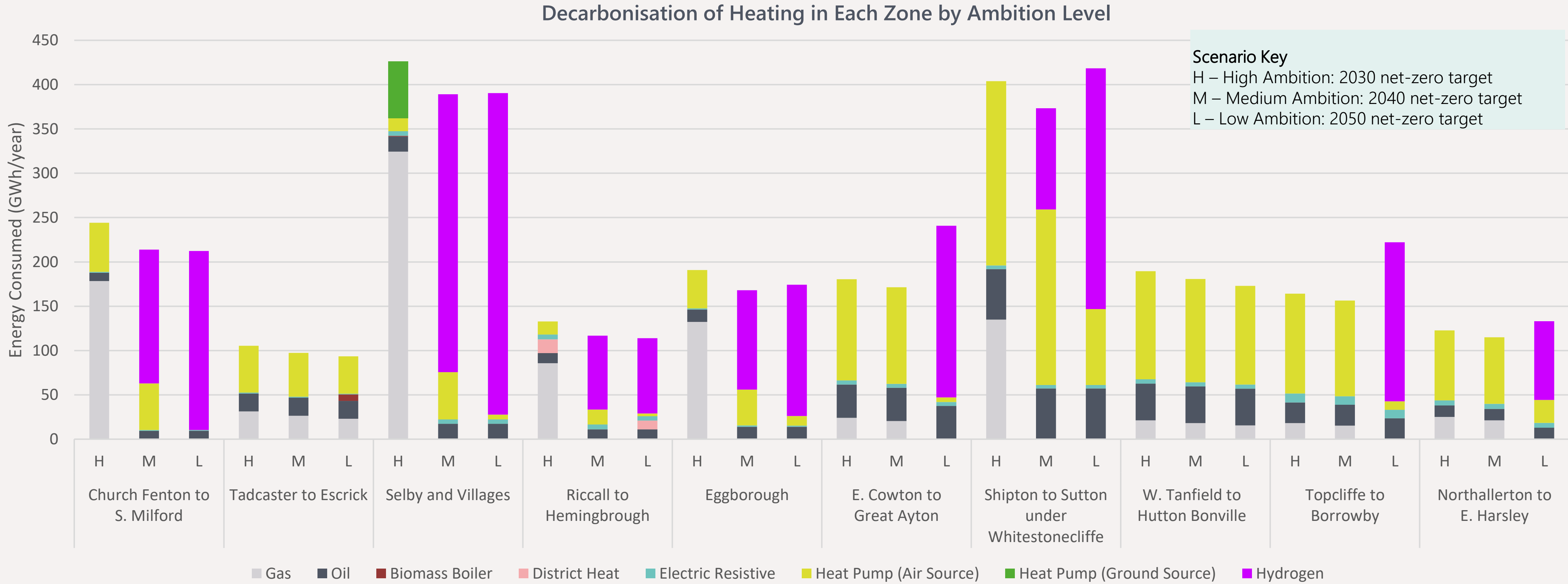


Non-Domestic Buildings

The decarbonisation of low temperature heat, used to provide space heating and hot water in non-domestic buildings, follows a similar pattern to domestic decarbonisation, with much of the fossil fuel systems being replaced with heat pumps. However, non-domestic buildings differ from dwellings, as significant amounts of space heating could be cost-effectively provided by hydrogen in the scenarios where it's available, especially where high-temperature process heat is also required which cannot effectively be decarbonised by a heat pump or DHN. Building fabric upgrades are bundled with the heating system upgrades shown here, and other efficiency measures such as recommissioning and upgrades of building management systems, LED lighting and lighting control can be implemented at the same time, often improving the economics of the project.

In the modelled pathways, hydrogen isn't assumed to be available until the mid-2030s at the earliest, meaning that the high ambition scenario is unable to decarbonise high-temperature processes. Even for the medium ambition scenario, the transition to hydrogen in these non-domestic buildings is likely to happen in the few years prior to 2040, meaning that significant planning and preparation will be needed to enable a rapid deployment once available. However, earlier decarbonisation of these processes could be achieved with local electrolysers to produce hydrogen in the absence of a pipeline supply.

Significant quantities of oil consumption remain in some of the pathways due to assumptions about the practicalities of replacing oil usage on farms. For these uses, alternatives such as biofuels could be explored. Self-production of biofuel could be an option depending upon the economics and availability of a supply chain.



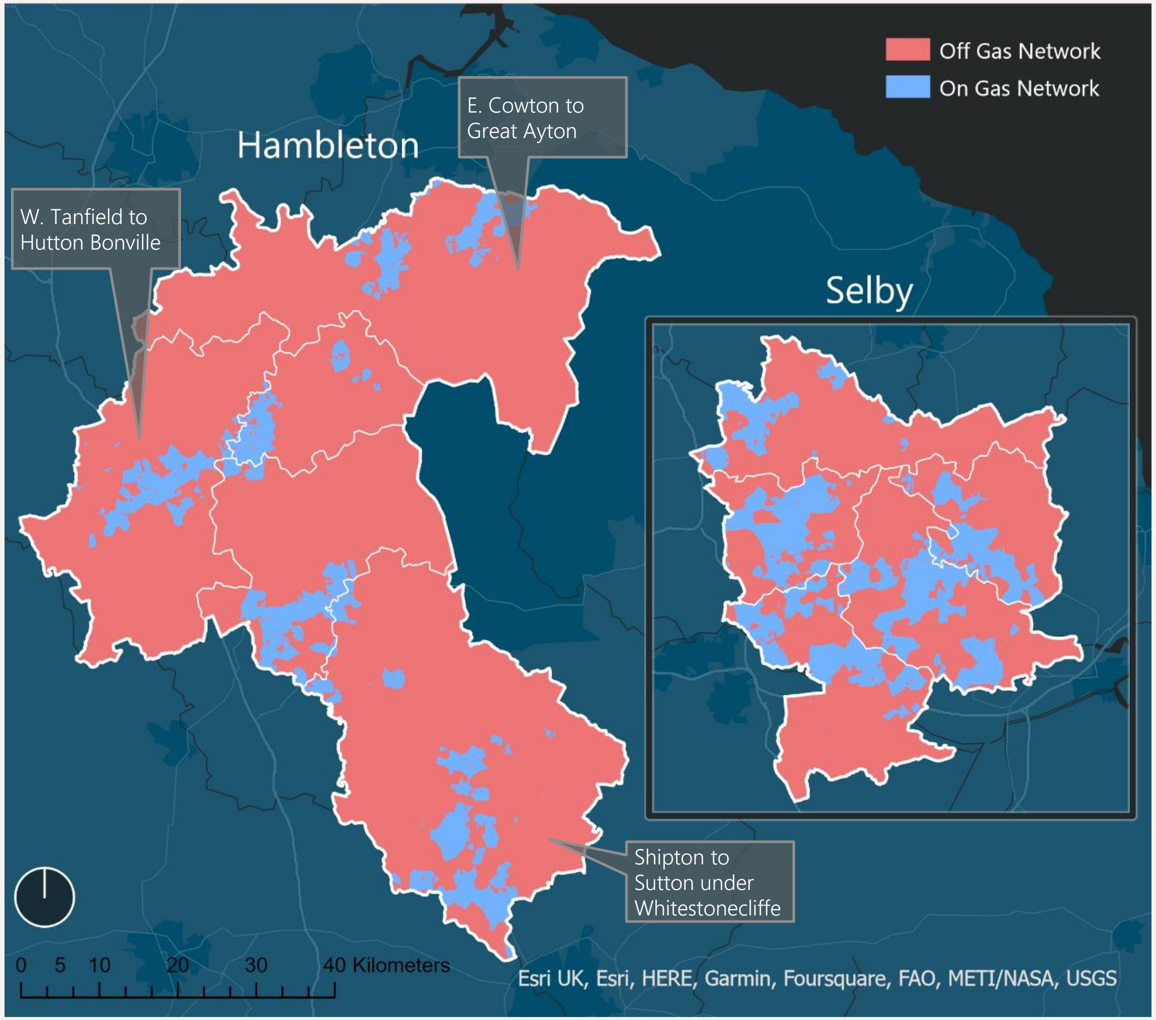
Rural Focus Zones

The 'E. Cowton to Great Ayton', 'Shipton to Sutton under Whitestonecliffe' and 'W. Tanfield to Hutton Bonville' zones have the largest number of dwellings which are not connected to the gas grid (3,636 (40%), 5,337 (48%) and 3,147 (39%) respectively).

The government's 'Heat and Buildings Strategy' proposes to end the installation of fossil-fuelled heating systems in off-gas dwellings from 2025, meaning rural dwellings will decarbonise in an earlier wave than most of the housing stock. Prioritising these zones for the deployment of low carbon heating can enable local supply chains to have a guaranteed supply of work, providing them with the certainty in the market to invest in jobs, skills and materials, as well as providing a solid evidence base for the installation of low carbon technologies in the wider A1 Corridor area.

With no gas network to carry hydrogen, or dense areas of dwellings to make a heat network financially viable in rural zones, it is very likely that heating will be electrified, making them low regrets for heat pump installations. All three of these zones have spare capacity in the electrical distribution network, meaning they should be able to proceed with significant numbers of heat pump installations before encountering capacity constraints.

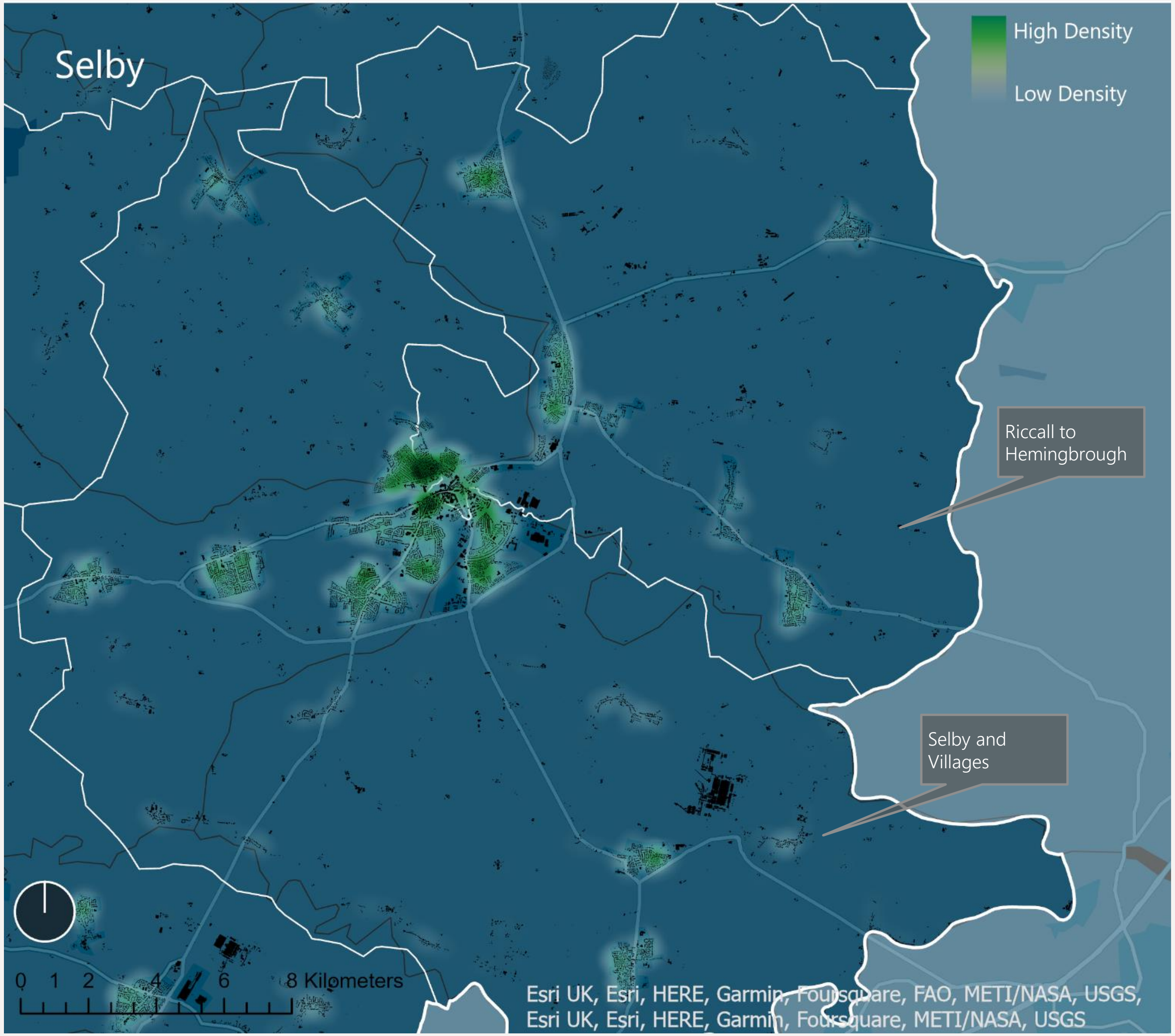
When installing a low carbon heating system, it's advisable to carry out any basic building fabric upgrades at the same time or beforehand to avoid needlessly oversizing the new heating system or incurring high running costs. The current requirement to qualify for the government's 'Boiler Upgrade Scheme' (open till April 2025) is that there is no outstanding recommendation for loft or cavity wall insulation in the building's energy performance certificate*.



Areas with and without coverage from the gas grid

* https://www.gov.uk/guidance/check-if-you-may-be-eligible-for-the-boiler-upgrade-scheme-from-april-2022

Heat Pump Focus Zones



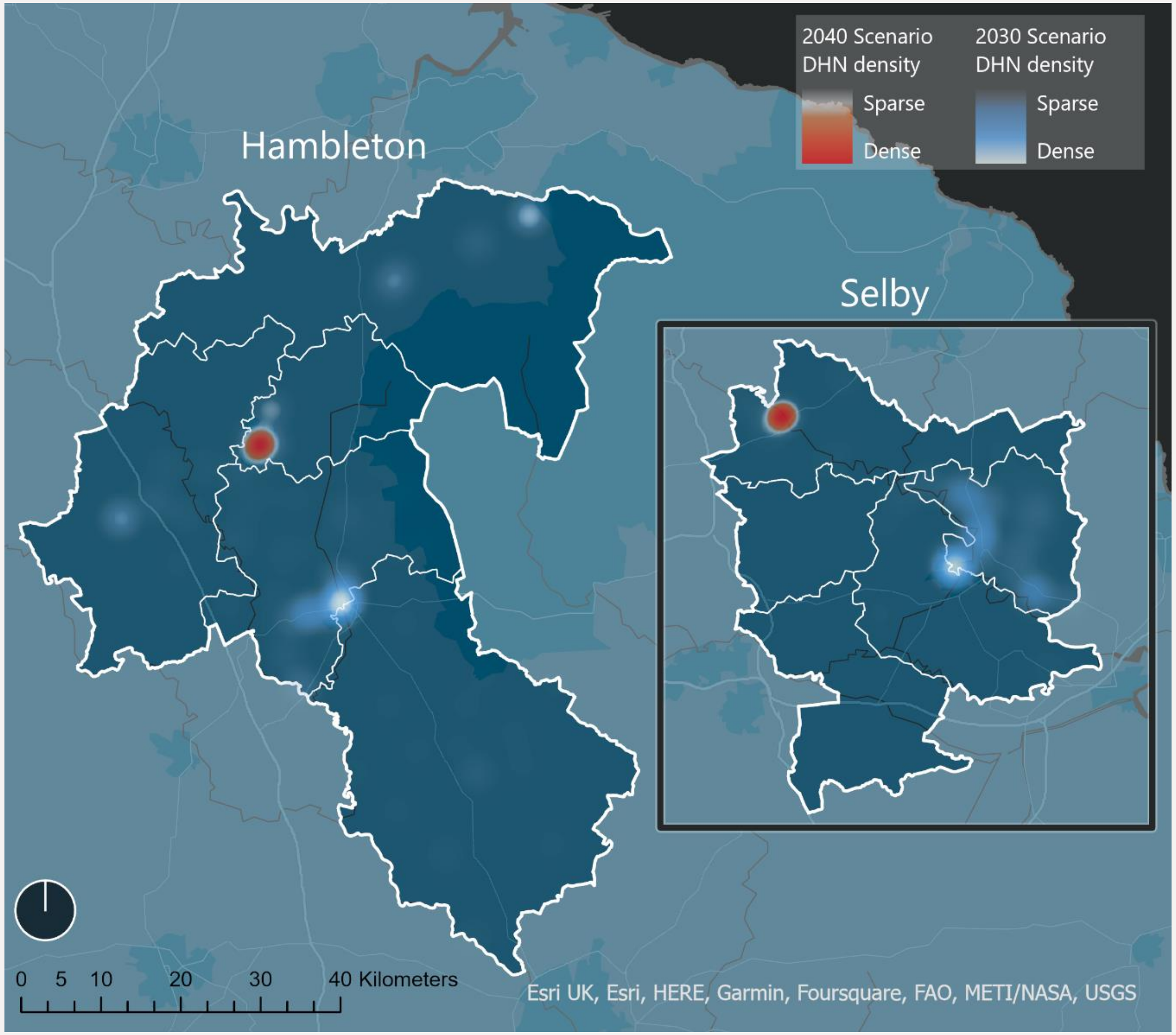
Example area of high potential uptake of air source heat pumps in and around Selby

The 'Selby and Villages' zone, 'Riccall to Hemingbrough' zone and 'Northallerton to E. Harsley' zone (not shown) have a large number of suitable dwellings for the roll-out of air source heat pumps (15,500, 8,800 and 7,500 respectively). A roll-out of this scale will require a significant ramp-up of the local supply chain, citizen awareness and buy-in, and attractive commercial offerings to compete with existing fossil fuel options. These zones benefit from having spare capacity on the electrical network and therefore deployment can begin as soon as the projects are developed and individual dwellings have been surveyed.

Air source heat pumps are typically the most cost-effective heat pump type due to their lower capital costs compared to ground source heat pumps. However, in these zones, around 10% of dwellings could have a cost-effective economic case for the installation of ground source heat pumps. These dwellings will be detached or semi-detached and therefore have the land available to them for the installation of the underground pipework. The higher ground temperatures in winter (compared to the ambient air temperatures) result in higher efficiency and lower running cost compared to air source heat pumps.

A roll-out of heat pumps at this scale will put pressure on supply chains and installation companies which in turn will delay the roll-out. Local and regional authorities should support upskilling and education programmes to increase the pool of installers available.

District Heat Networks (DHN)



Density of buildings recommended for connection to district heat network in medium ambition scenario (red) and high (blue)

Heat supplied through underground pipes from a centralised energy centre, or a network of decentralised energy centres, tends to be the most suitable solution for denser urban zones, particularly where there are large numbers of dwellings that require building fabric upgrades to make them suitable for heat pumps, which is either too expensive or impractical. Heat networks cause less disruption in dwellings during installation compared to some other options, though there are wider considerations such as traffic disruption during pipe laying, and space restrictions in city centres.

Using a whole system approach which optimises based on the costs (capital and operational) and carbon, very few buildings – domestic or non-domestic – were found to be suitable for a cost-effective transition to a district heating in the area and it is unlikely that any DHN schemes will be commercially viable. However, some small schemes may be identified which, when suitable anchor loads are found, open up an alternative to local residents and businesses.

For any identified schemes, including the potential scheme in Northallerton, the Green Heat Network Fund* will have quarterly application rounds from March 2022 until 2025.

* https://www.gov.uk/government/publications/green-heat-network-fund-ghnf

Northallerton Heat Network

One of the smaller DHN opportunities that have been identified is in the centre of Northallerton. In total, approximately 400 buildings (domestic and non-domestic) are located in close proximity giving a high-density of energy demand.

The energy demand includes the Friarage Hospital to the north-east of the map shown (right) which would act as the key anchor load. Domestic and non-domestic buildings nearby would also provide heat demand at different times of the day, which produces a more efficient and cost-effective district heat network.

Further studies would need to be undertaken to assess the feasibility a DHN in this area.

Northallerton sits on a low productivity aquifer** so ground water is unlikely to be a suitable source of low carbon heat meaning that alternatives such as large air source heat pumps will need to be considered.

Potential DHN in Northallerton

	Number of Properties	Domestic Peak Demand (MW)	Non-Domestic Peak Demand (MW)	Total Peak Demand (MW)
Northallerton	c. 400	0.2	1.9	2.0

** http://mapapps2.bgs.ac.uk/geoindex/home.html?layer=BGSHydroMap&_ga=2.227016797.1726030392.1645026282-782257203.1645026282

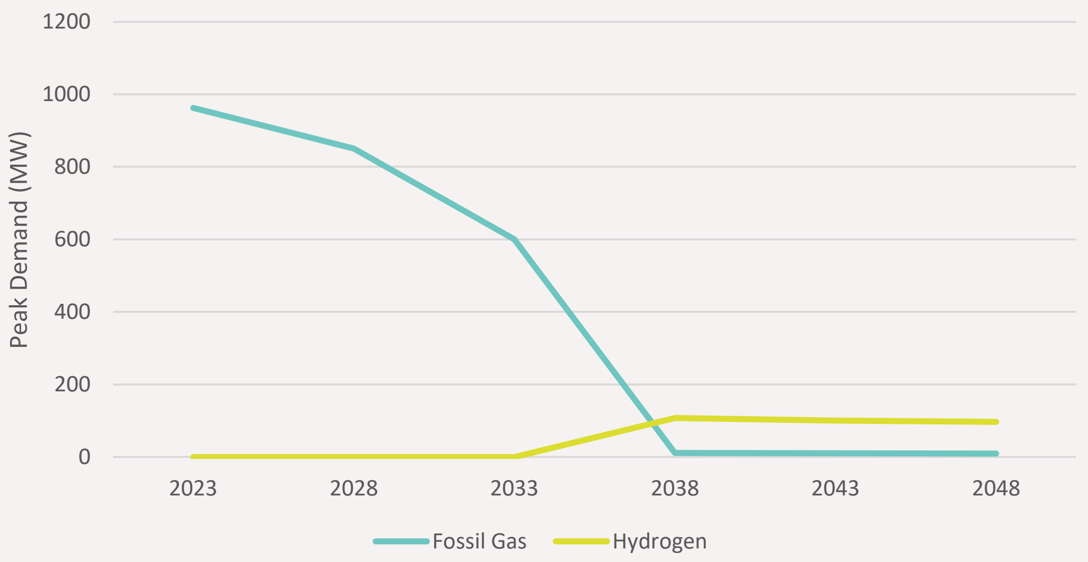
Gas Network

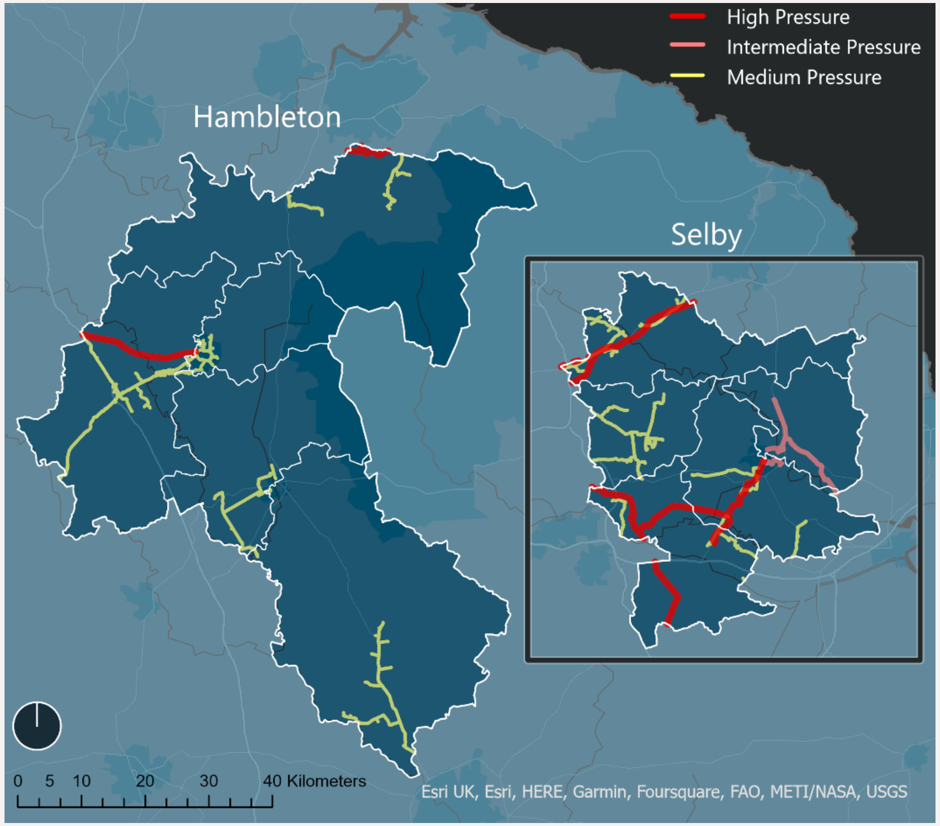
The gas network in the A1 Corridor is operated under license by Northern Gas Networks and currently supplies gas to the majority of dwellings in the A1 Corridor (extents of the high-pressure network are shown in the map). It is used predominantly for domestic heating, hot water and cooking, but also supports a range of non-domestic and industrial local energy demands.

The current total fossil gas consumption across the A1 Corridor is around 2,000 GWh per year. Meeting the net zero goal would mean a steep decline in fossil gas consumed across the A1 Corridor, illustrated in the graph below (based on following the medium ambition pathway). In this pathway, a significant amount of the decarbonisation of heat takes place between 2035 and 2040. The effect of this switch to low carbon heating systems and more insulation measures is a large drop in fossil gas usage between 2033 and 2038.

Meanwhile, parts of the gas network could be repurposed to supply hydrogen around industrial areas – this is detailed on the following page.

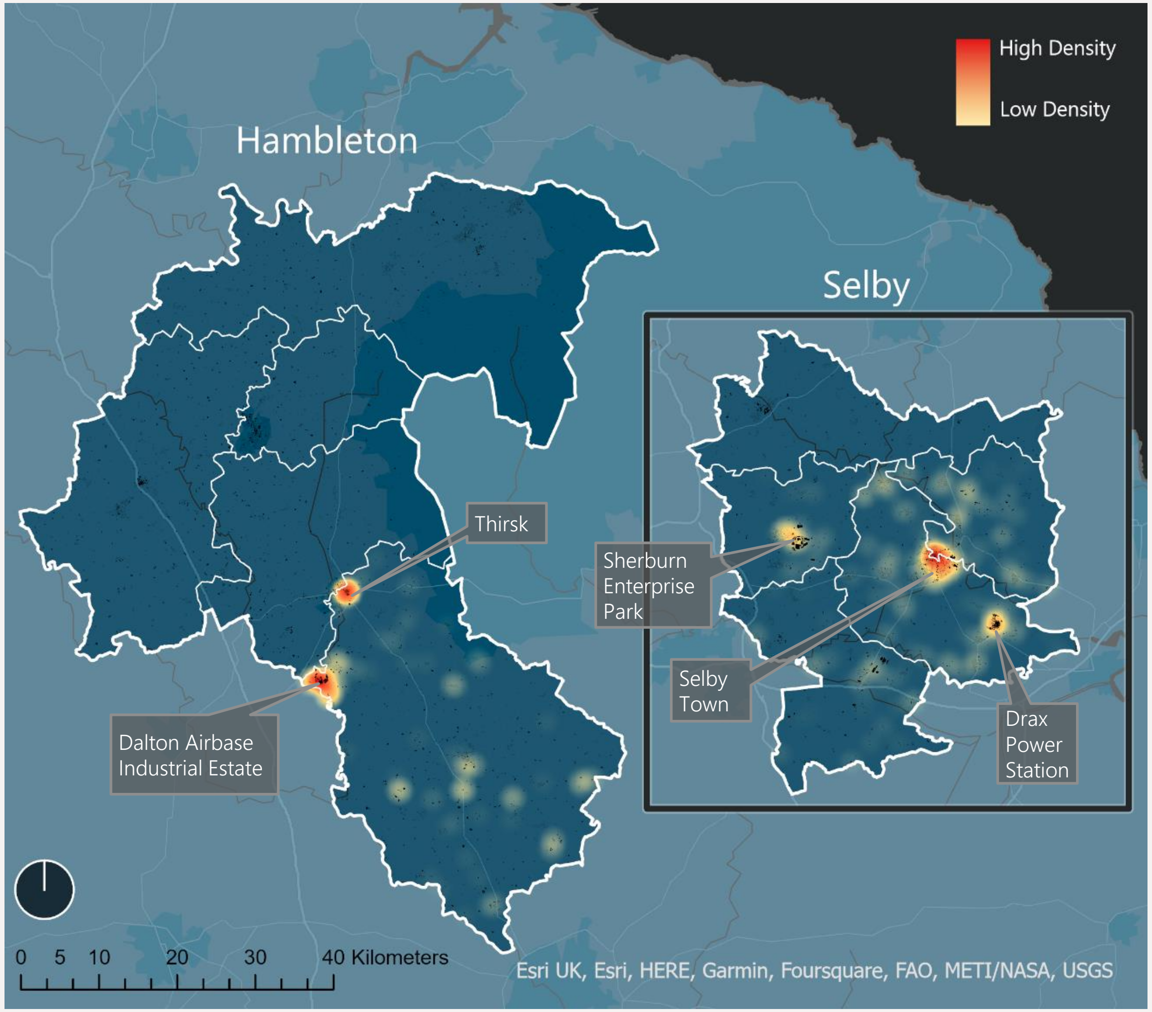
Change in Peak Demand (2020 to 2050)





Map of the high-pressure gas network in the A1 Corridor

Hydrogen



Use of Hydrogen for High Temperature Industrial Processes

It is assumed that hydrogen will become available from a converted gas network in the mid-2030s under the H21 scheme*, and therefore cannot contribute to the high ambition scenario (net zero energy system by 2030). Even under the medium ambition scenario, the use of hydrogen for domestic heating is likely to be minimal, as the cost and carbon intensity of hydrogen** are less favourable than for electrification of heat.

However, there are uses of fossil gas in industry for high temperature processes that would be difficult to electrify, and this is where hydrogen could be usefully deployed. Once these industrial clusters are supplied by hydrogen, it could make sense for nearby buildings, including any dwellings in the area, to also be heated by hydrogen, avoiding the disruption, upfront cost and space requirements of heat pump installation. This could be valuable in dwellings such as terraces where space for heat pump equipment is constrained.

Areas with high-temperature industrial processes which are unlikely to be reached by a hydrogen network could investigate the use of electrolysers to produce hydrogen on-site. Such electrolysers could form central supplies for a small cluster of nearby users of hydrogen, as shown in the map.

The two main areas for potential hydrogen deployment in Hambleton are the Dalton Airbase Industrial Estate in the west of the A1 Corridor area, and Thirsk.

The town of Selby has the largest potential for hydrogen deployment in the Selby local authority area, in addition to the area near Drax Power Station and Sherburn Enterprise Park. In total, around 280GWh of hydrogen could be used for non-domestic buildings in the medium ambition scenario.

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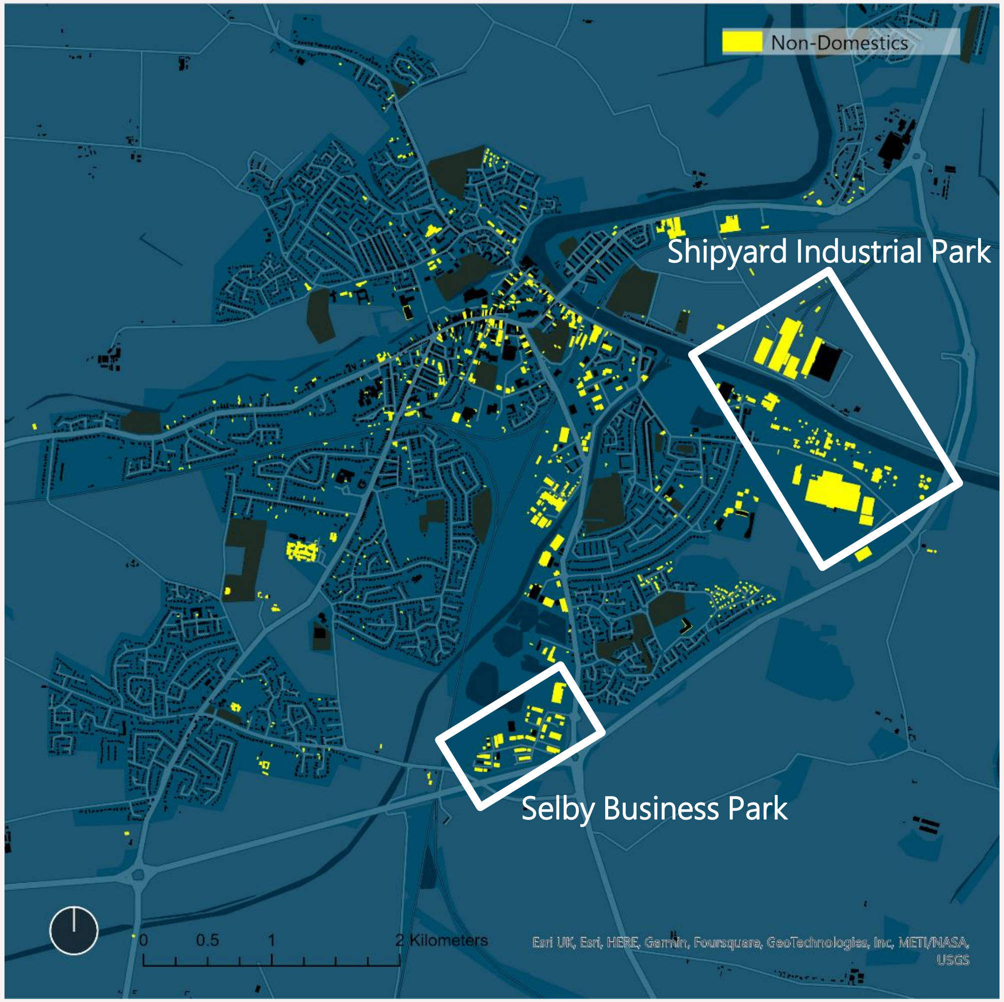
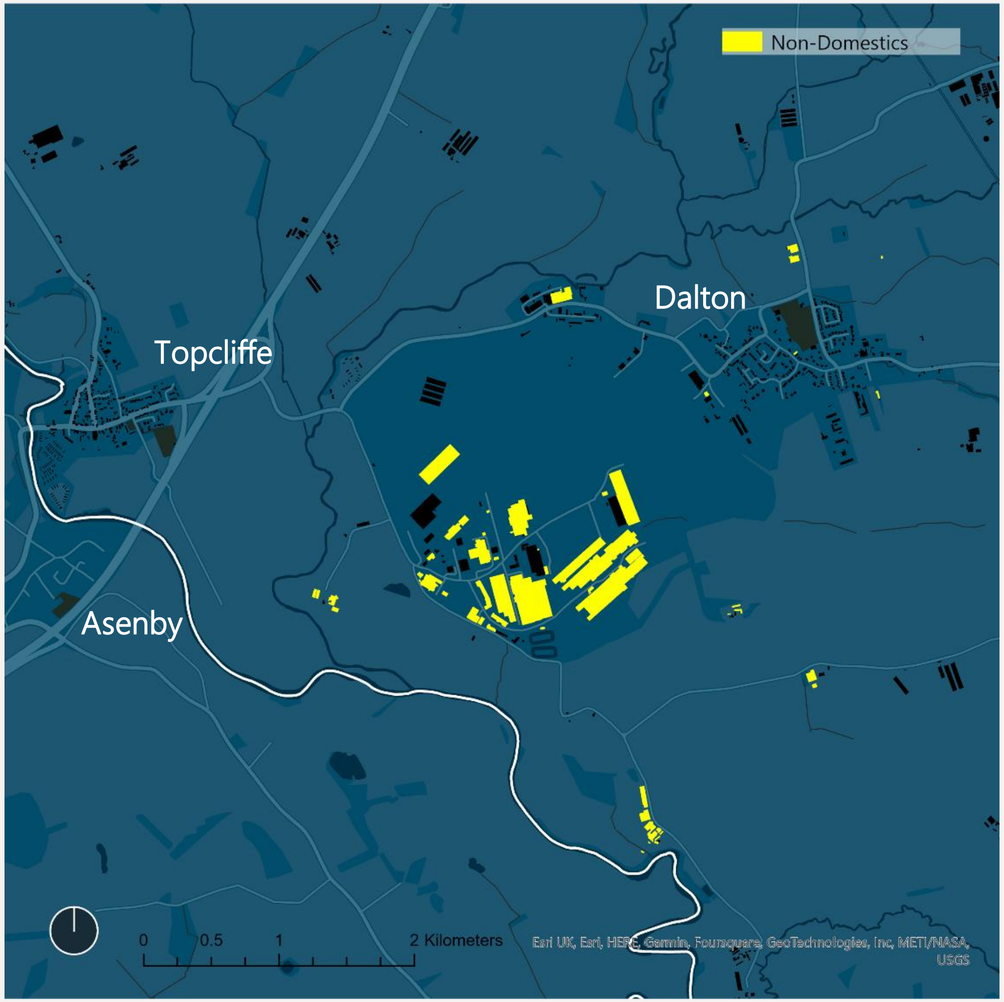
* https://h21.green/about/

** Hydrogen production cost based on BEIS figures
https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1011506/Hydrogen_Production_Costs_2021.pdf

Carbon intensity based on the East Coast Hydrogen Feasibility Report https://www.nationalgrid.com/gas-transmission/document/138181/download

Hydrogen



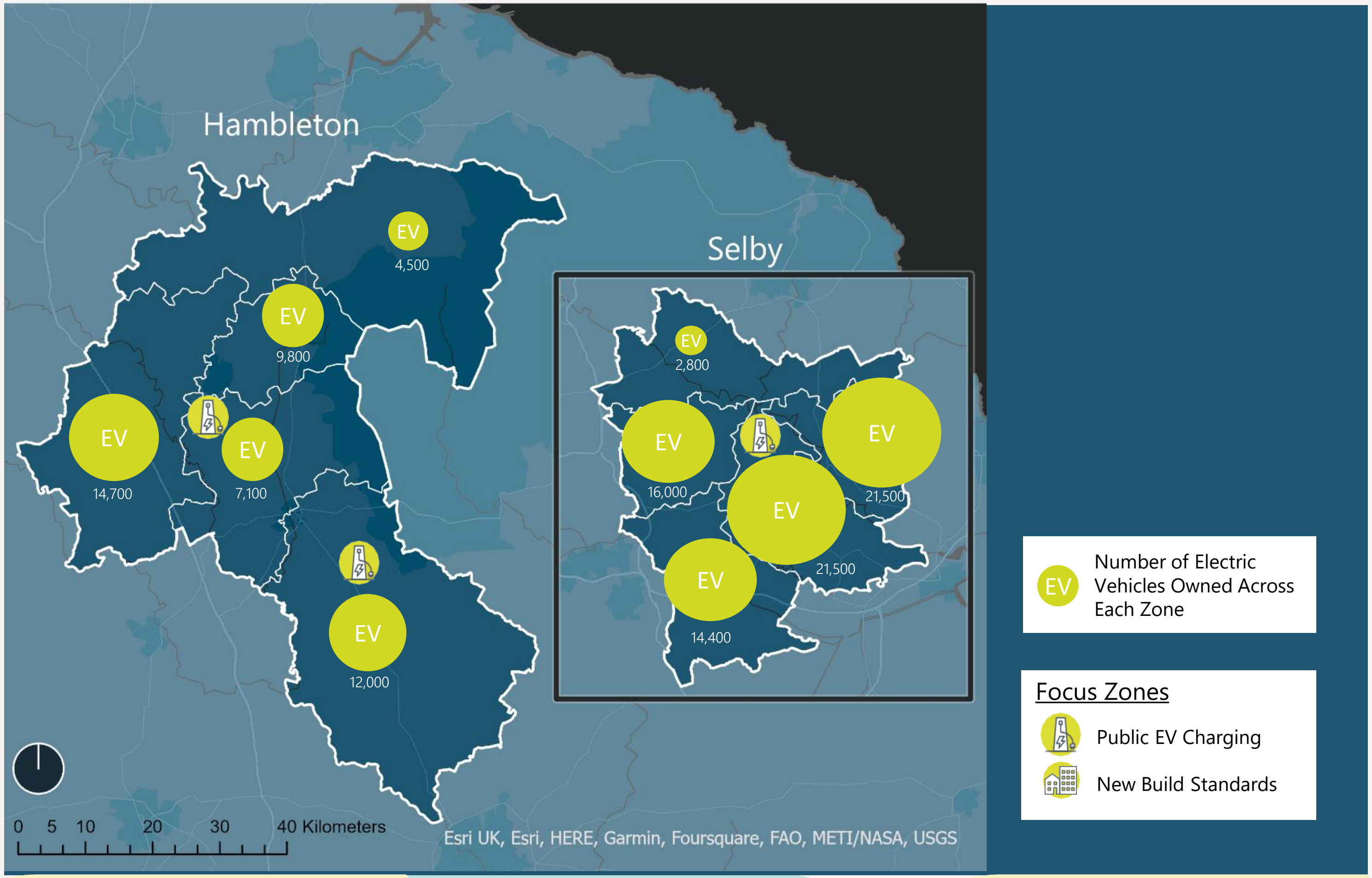


In Selby, possible hydrogen use in non-domestic buildings is spread across the town, with Shipyard Industrial Park to the east, and the Selby Business Park to the south standing out as major energy demand centres. There are, however, a large number of non-domestic buildings between the two sites which could act as a hydrogen supply corridor creating connections to both domestic and non-domestic buildings en-route.

To the west of the Hambleton District, the Dalton Airbase Industrial Park has a total annual demand of 33GWh and is closely situated to some smaller towns and villages (as shown in the map, above). If hydrogen were to be made available to the Industrial Park, connections to the nearby buildings could be investigated.

Transport

EV Overview



Electric vehicles (EVs) are expected to grow significantly in number as a proportion of total vehicle fleet, as purchase costs match or fall below those of petrol and diesel vehicles, local clean air zones favour clean vehicles, and national policy phases out petrol and diesel vehicle sales by 2030 and hybrids by 2035. Reaching net zero ahead of the national target would require strong incentives for residents to shift to electric vehicle purchases earlier which could lead to the scrappage of working vehicles.

Projections of an increasing proportion of private electric vehicles were used to anticipate the electricity demand across the A1 Corridor for charging these vehicles, and the associated infrastructure upgrades that would be required. EV uptake is naturally higher in the more densely populated areas of the A1 Corridor. The far lower density of dwellings in the rural areas results in correspondingly fewer EVs, although the number of vehicles per household will tend to be higher.

122,300

Electric cars (including plug-in hybrids) by 2040

201 GWh/year

Energy consumption for charging when 100% of cars and vans are electric

58%

Households have off-street parking, suitable for home charging

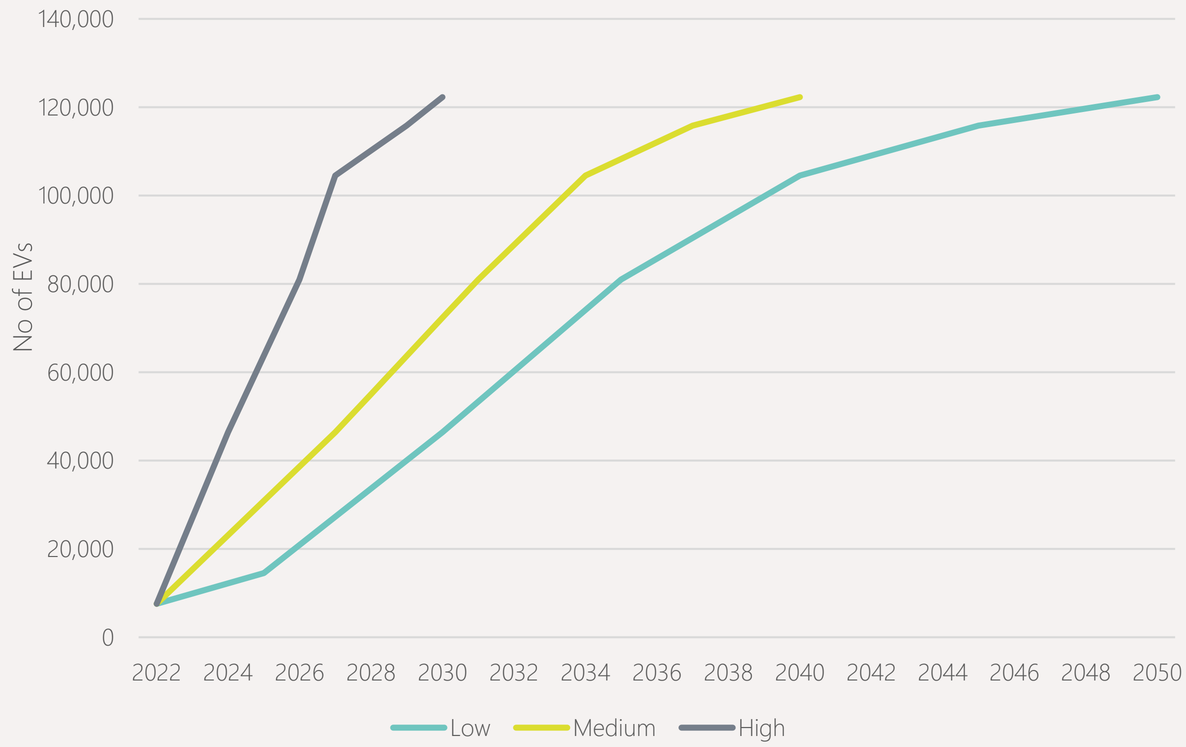
EV Projections

Based on projections by Transport for the North, private electric vehicles are expected to grow from their current level to over 86,000 vehicles (~60% of the total fleet) by 2030 and around 123,000 (100%) by 2040. To reach net zero before the national target, this transition would need to happen even faster, with the sale of new petrol and diesel vehicles having to end by 2025 to reach net zero by 2040 if premature replacement of vehicles is to be minimised (assuming a 15-year vehicle lifespan).

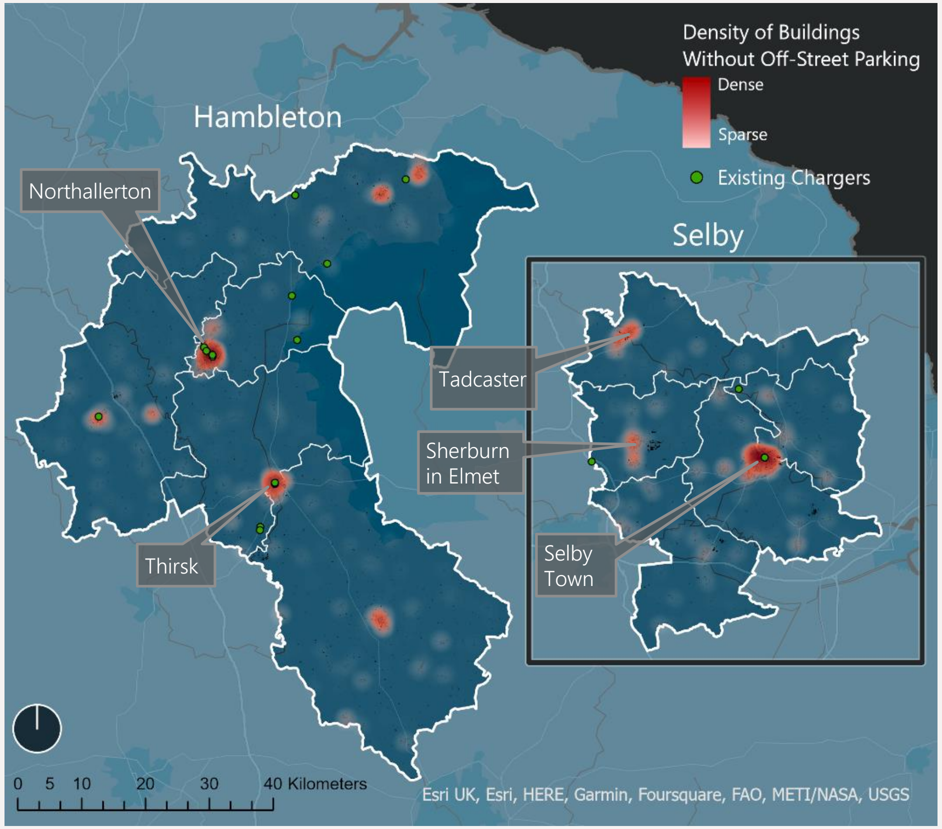
Currently there are few options available to local authorities that give this level of control, however the introduction of low emission zones which charge non-EV owners for entering certain areas can help to drive behaviour. Access to abundant and reliable charging infrastructure will also be important to encourage the transition and keep up with demand. This provides confidence to residents that they can be part of the transition and reduces the 'range anxiety' often cited as a block to EV uptake.

For more information about the Transport for the North data which fed into this plan please visit: https://evcivisualiser.z33.web.core.windows.net

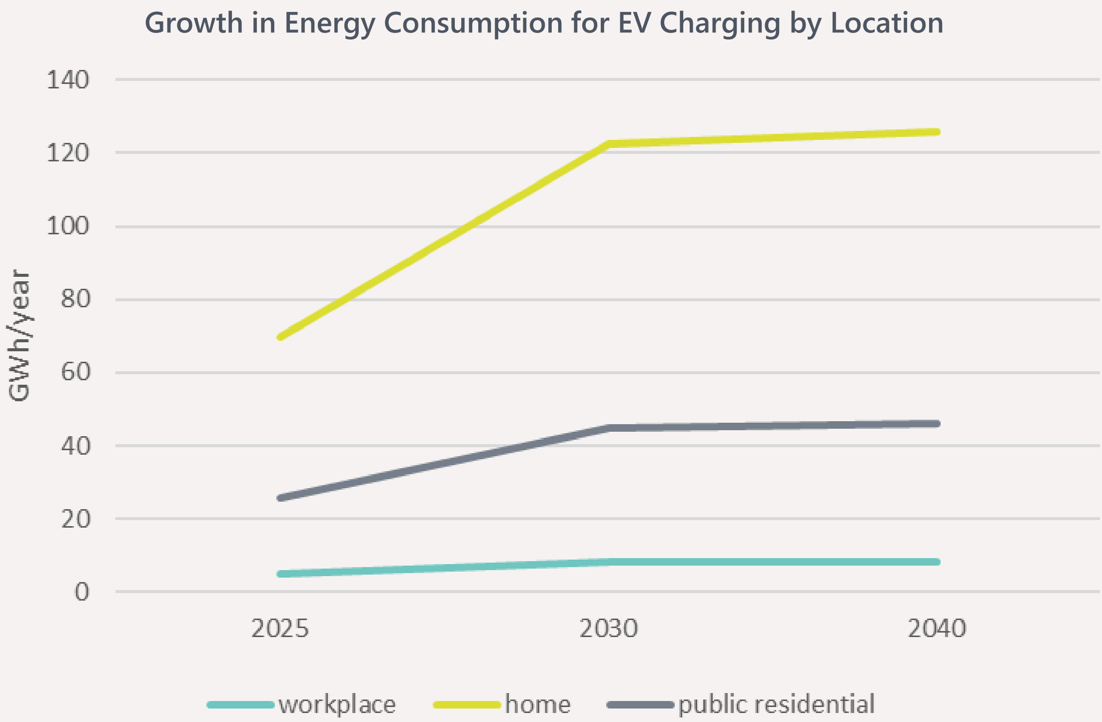
Projected EV Ownership (2022 to 2050)



EV Charging Infrastructure



Density of housing without off-street parking



Given the rural nature of the A1 Corridor, there are small pockets of the area which don't have off-street parking. These are in urban areas, e.g. Northallerton and Thirsk in Hambleton, and the town of Selby, where the density of housing means that driveways are less likely. Areas of high-density housing without off-street parking exist in a several areas, particularly urban areas e.g., Tadcaster and Sherburn in Elmet, where current charging infrastructure is not available and is likely to be limiting the uptake of EVs in these locations.

Those residents without off-street parking will require ready access to charging hubs, i.e. kerb-side charging, destination charging, workplace charging, etc. Funds such as the On-street Residential Charge Point Scheme and the Local EV Infrastructure Fund can be utilised to support the development of this infrastructure.

The electricity requirement to charge electric vehicles in various locations is expected to grow as shown in the graph above. Home charging is expected to remain the most cost-effective way of charging an electric vehicle therefore those who have access to off-street parking are assumed to do this.

EV Focus Zones

The 'Riccall to Hemingbrough' zone has the highest expected roll-out of EVs due to the town of Selby being located within this zone. Selby has many residential buildings with no off-street parking and limited existing charging infrastructure making it an EV focus zone. This zone also has available headroom on the electricity network allowing EV charging infrastructure to be deployed.

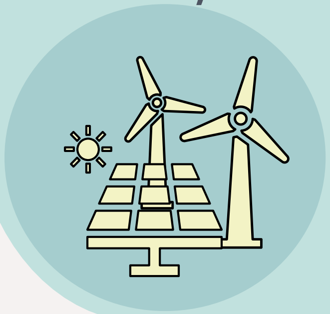
Given the large roll-out of EVs across this zone, there will likely be a requirement for EV users to charge their vehicle in a 'smart' manner i.e. charging outside of peak times to reduce the impact on the low voltage network. This will move some of the 35GWh/annum to times when the network is less constrained and will likely also be more cost-effective for the EV user.

Where no off-street parking is available, predominantly in the north of the town, (the yellow highlighted areas in the map, right), more on-street/kerbside charging or local charging hubs will be required to enable residents to make the transition from fossil fuelled vehicles to EVs.

Map showing off-street parking and domestic building type in Selby

Local Generation

Overview

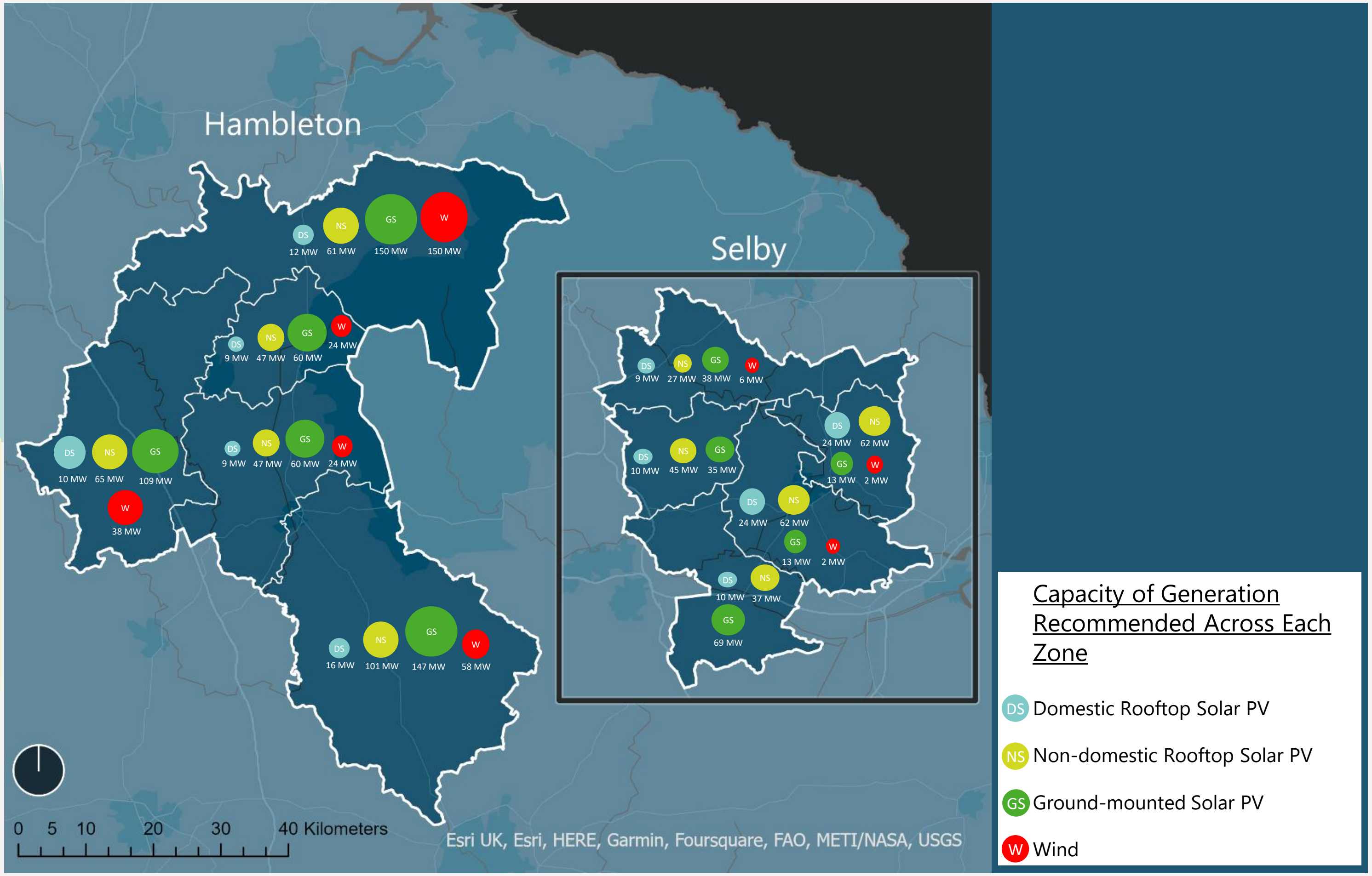


1,735MW

of wind and solar generation capacity could be developed

£1.4b

Investment in local renewable generation



Electrification of heat and transport is essential for decarbonisation, since oil and gas supplies are unlikely to decarbonise, or face major uncertainties doing so. This electrification will increase the A1 Corridor's annual demand for electricity from 1,700GWh to 2,125GWh between 2020 and 2040. The A1 Corridor can participate in producing that electricity from low carbon sources by deploying rooftop and ground-mounted solar as well as onshore wind, which will reduce the area's emissions faster than relying on grid decarbonisation.

However, local generation of electricity is less essential for reaching net zero than eliminating local fossil fuel use in buildings and vehicles. This is because the electricity network is on a credible path to full decarbonisation, with an intention to reach net zero by 2035. Renewable generation built in the A1 Corridor can contribute to national progress as well as accelerating local emissions reductions. The A1 Corridor has more than enough suitable land for large scale renewable projects to produce as much energy as it uses on an annual basis.

An increase in renewables in the A1 Corridor can reduce the amount spent on imported electricity from the grid and keep the flow of money within the area. Generation can be linked directly to assets and virtually through Power Purchase Agreements (PPA)* and other contract types and with novel approaches such as local marketplaces and Peer-to-Peer (P2P) networks.

* For an example of a virtual PPA with large solar developments, see https://www.novartis.com/news/media-releases/novartis-set-achieve-100-renewable-electricity-its-european-operations

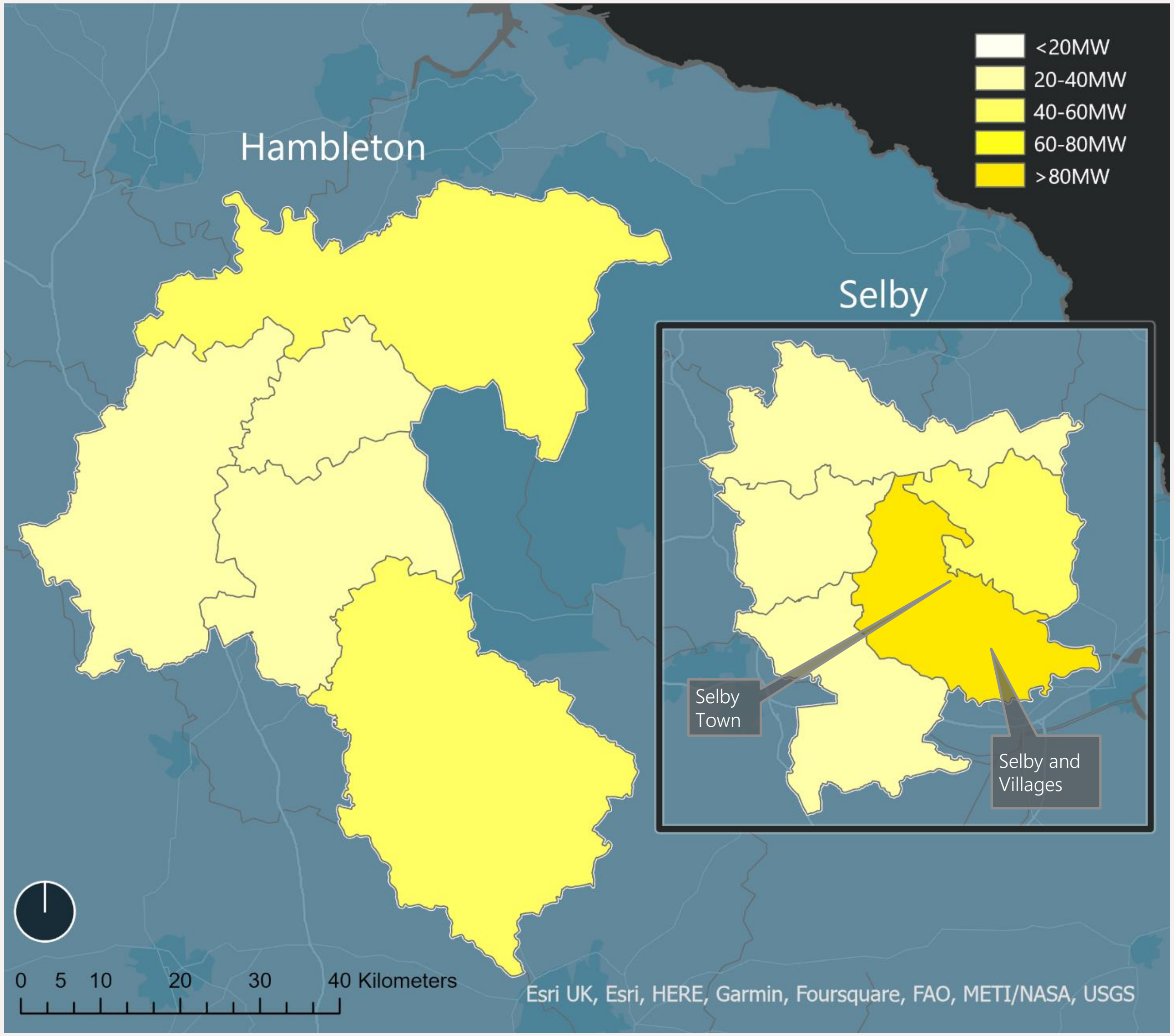
Domestic Solar PV

Although more expensive per unit of energy generated than ground mounted solar, domestic PV makes use of roof space that would otherwise be unused and can provide direct financial benefits to householders. The recent energy crisis has resulted in rising costs of wholesale energy, which further improves the investment case for rooftop solar while energy prices remain high. A large rollout of domestic PV is of value, regardless of the net zero target date chosen and therefore is deemed to be low regret.

Based on roof orientation and pitch, dwellings are identified for solar PV suitability. It is estimated that around 123MW of rooftop solar capacity could be deployed, which would contribute 118 GWh per year of electricity at a total capital cost of £160m, representing a low regret, cost effective and realistic deployment scenario.

The 'Selby and Villages' zone within Selby District stands out on the map as an area of high potential for domestic solar PV deployment. This is due to Selby town which has around 20,000 dwellings providing a high-potential for a roll-out of rooftop solar. A large residential deployment could benefit from group buying programmes, allowing residents to benefit from reduced prices. This would also provide opportunity to local businesses across the supply chain to win business and upskill to meet the demands of delivering net zero.

LA owned assets and social housing could be prioritised for roll-out of domestic PV in the A1 Corridor. This approach could stimulate supply chain and skills in the area preparing them for a larger roll out in private rental and owner-occupied residences. Most of this cost would be funded by residents, given that majority of dwellings are owner occupied. Programs such as group solar buying schemes , which can be initiated by the LA, can be utilised to develop economies of scale and to reduce costs to residents.



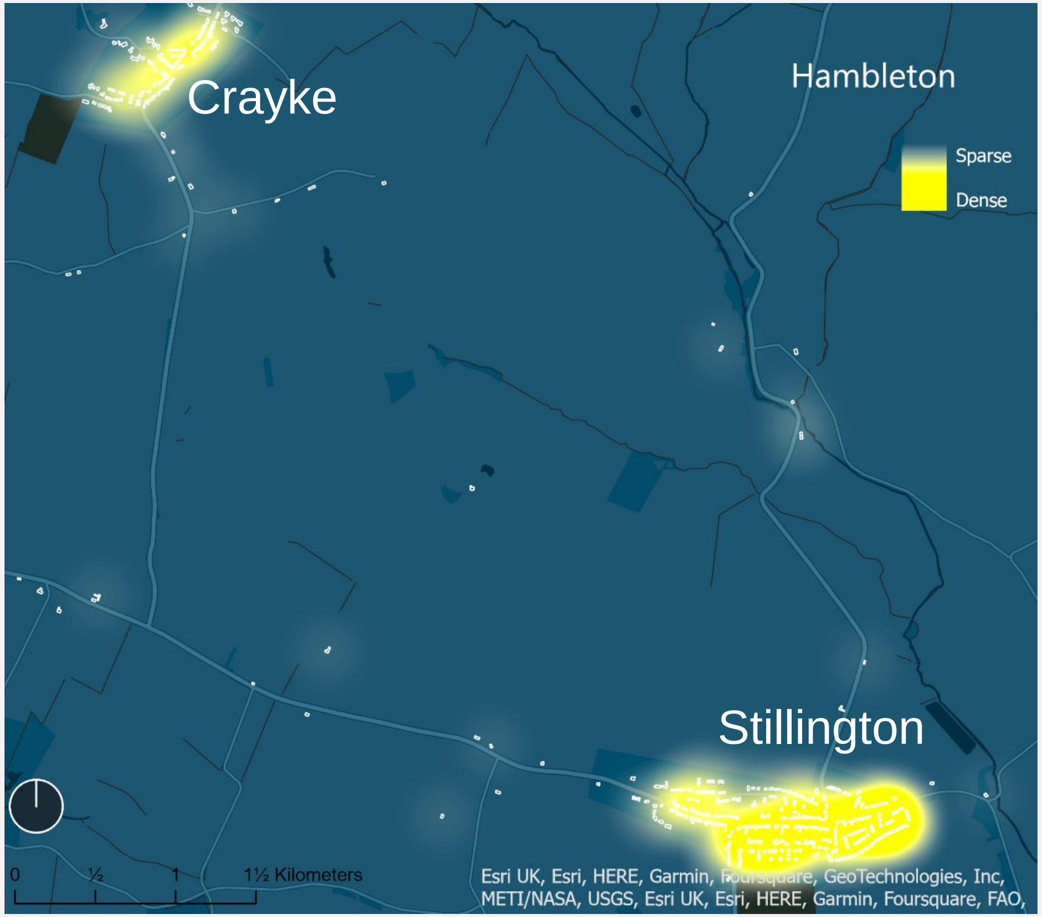
Total potential for domestic rooftop solar deployment in each zone

Domestic Solar Focus Zone

Solar focus zones are areas within the A1 Corridor which could be prioritised for delivery of rooftop solar in addition to the area around Selby town.

The 'Shipton to Sutton under Whitestonecliffe' zone has the highest level of fuel poverty within the A1 Corridor area. Deploying rooftop solar would allow residents to generate electricity on-site and self-consume, reducing the amount of electricity imported from the grid, and reducing their electricity bills. It is estimated that this zone could deploy around 16MW of solar PV.

The roll-out of a scheme could start with social housing by working with key stakeholders, allowing for supply chains to ramp up and then expanding into the private rental and private owned market.



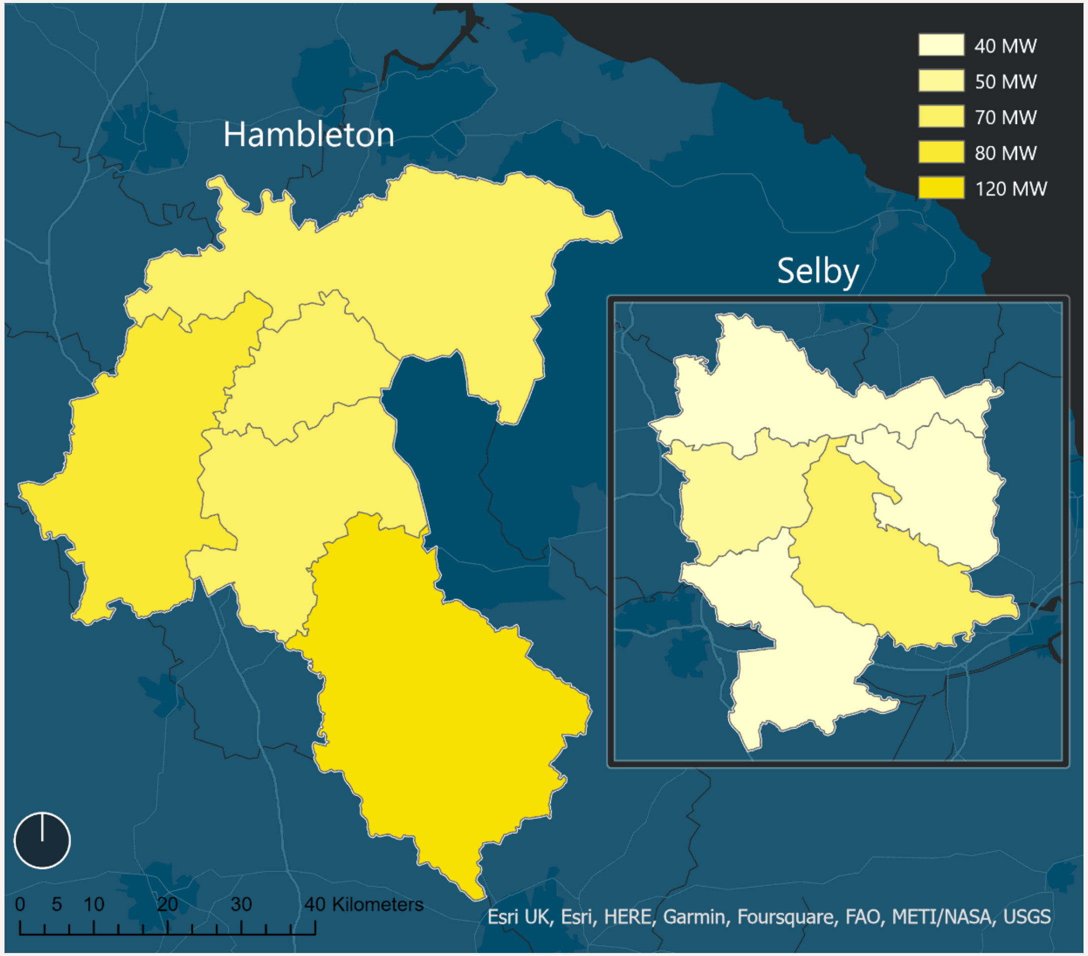
Density of potential rooftop solar uptake in fuel poor parts of the 'Shipton to Sutton under Whitestonecliffe' zone

Non-Domestic Solar

Non-domestic solar installations also contribute to cost-effective decarbonisation plans for the A1 Corridor, regardless of the level of ambition. They have the potential to be more cost-effective than domestic solar, but there are some challenges that arise when the building owner is not the bill payer. These projects would be low regret and should give confidence that they are an appropriate investment. The map shows a potential capacity for non-domestic solar deployment, based on available roof space and assumptions about the extent to which it could be developed.

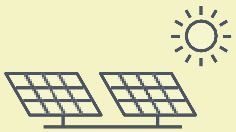
Non-domestic building construction is more variable than domestic, and it is not possible to say if a building is suitable for PV without a site survey of the roof construction, load bearing capacity and the extent to which other building services such as cooling vents are present.

With over 7MW of rooftop solar already deployed on non-domestic sites, a further 500MW of capacity could be installed. This would contribute 489 GWh per year of electricity at a cost of £450m. Non-domestic solar in the A1 Corridor area could generate 65% of their yearly demand of non-domestic buildings on a net basis. Given that many of the non-domestic buildings are also in areas with significant potential for onshore wind or ground mounted solar, there could be further potential to connect to such sites.

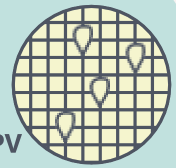


Total potential for rooftop solar PV on non-domestic buildings in each zone

508MW
Non-domestic solar PV potential



The 'Shipton to Sutton under Whitestonecliffe' zone has the highest potential for non-domestic rooftop solar PV

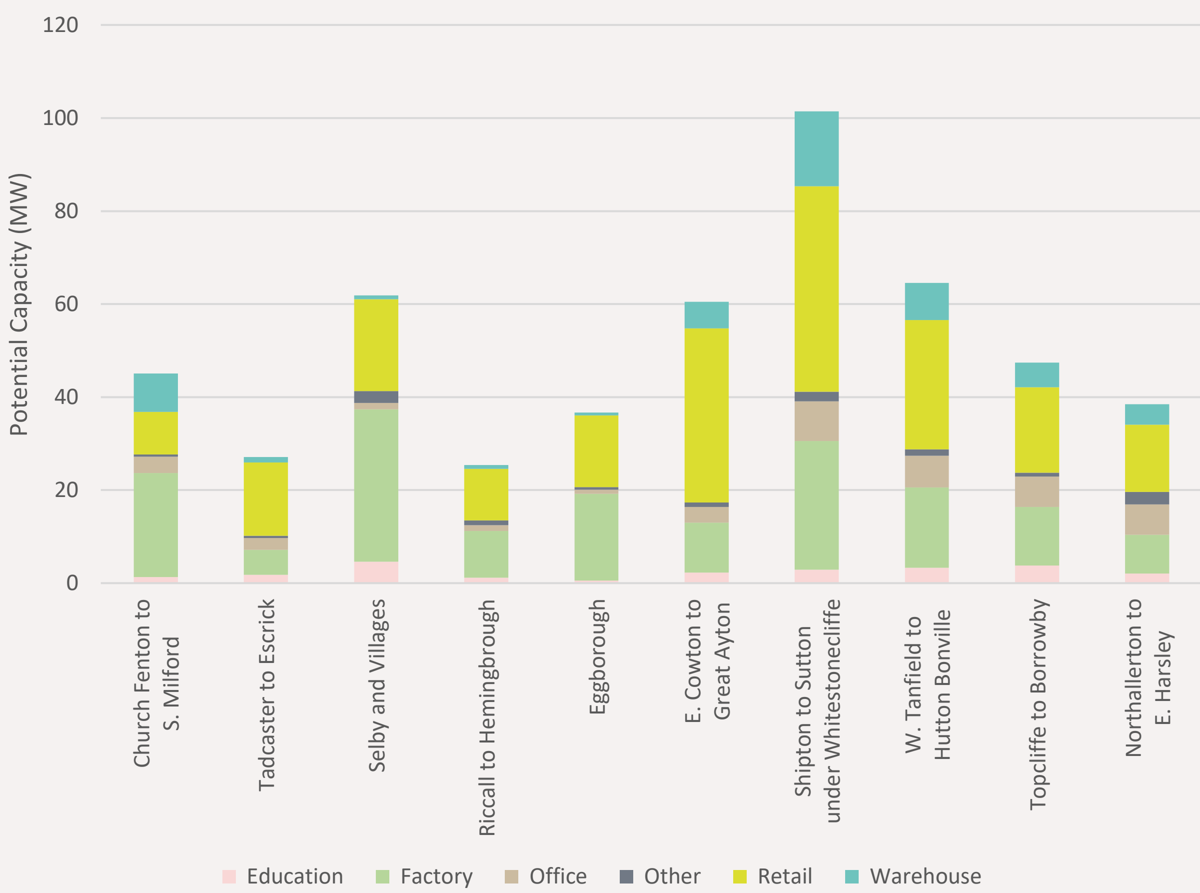


Non-Domestic Solar

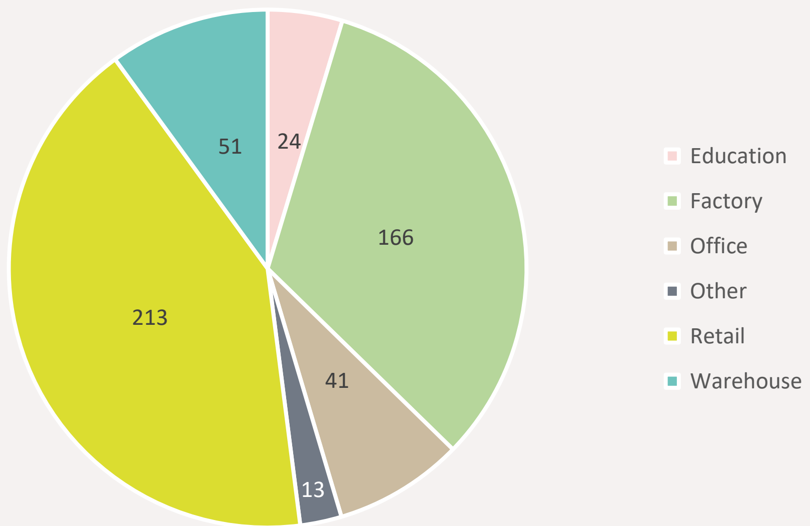
The majority of non-domestic roof space which could be used for solar PV belongs to the retail category. While this is a large amount of rooftop solar identified, each individual site would take on the cost of deploying its own solar (with or without storage) based on its needs. One benefit of businesses generating their own power is that it will typically be generated at a time of higher demand which increases the utilisation rate.

With retail buildings typically being rented, a shift towards landlords taking more ownership of their buildings' carbon and energy cost credentials could help deliver this solar capacity.

Rooftop Solar PV Potential on Non-Domestic Buildings in Each Zone



Total Potential Generation Capacity by Building Type (MW)



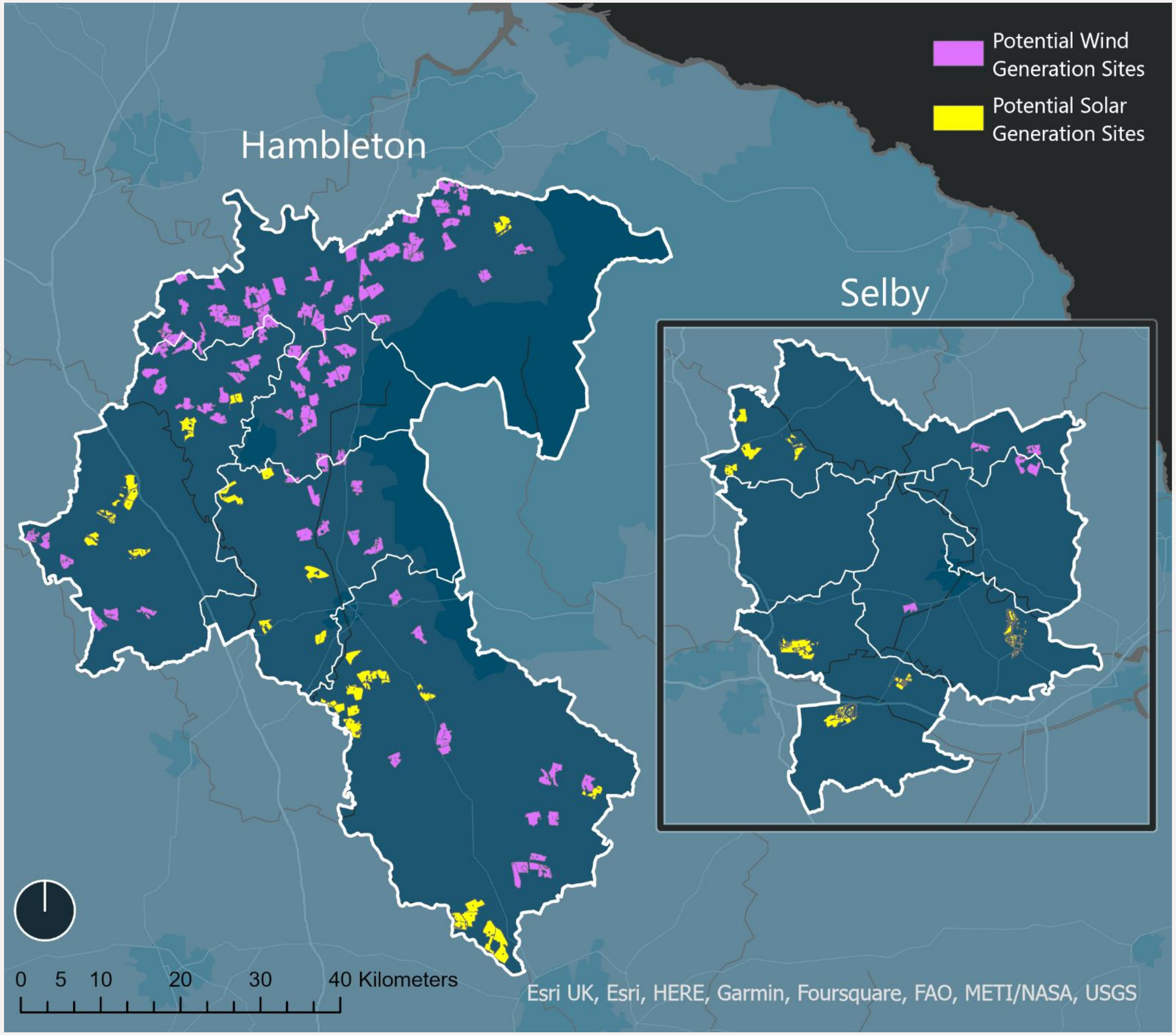
Large-Scale Renewables

Large-scale renewable generation, particularly ground-mounted solar PV and onshore wind, are the most cost-effective way to produce low-carbon electricity. Arrangements such as power purchase agreements (PPAs) and community ownership co-ops can capture this value locally. Many examples of community ownership models can be found in the UK, with residents enjoying income or bill savings from the schemes.

The requirements for land purchase, planning permission, public acceptance and connection to the grid can put limits on their scale and deployment. While obstacles to development could delay the journey to net zero, they will not necessarily make it impossible to reach, since grid electricity is also [expected to reach net zero by 2035](#).

Around 20,000 hectares are suitable to build ground-mounted solar, with a potential capacity of 12,000 MW. A further 8,000 hectares are suitable for onshore wind assets, sufficient to build 318MW of capacity, which would contribute 752 GWh per year of electricity for an investment of £378m*. While wind farms require far more land per megawatt, most of the area remains unused as space between turbine bases, which can continue to be used for other purposes such as agriculture. Potential for hydro to contribute to energy requirements is expected to be very small and has not been studied in detail, though there are likely to be some sites which would be suitable for development.

The remaining annual energy demand after developing rooftop solar and wind to their full potential could be met by developing 7% (795 MW) of the ground mounted solar potential. This would contribute 766 GWh per year of electricity for an investment of £422m.



Map showing land suitability for large scale renewable developments

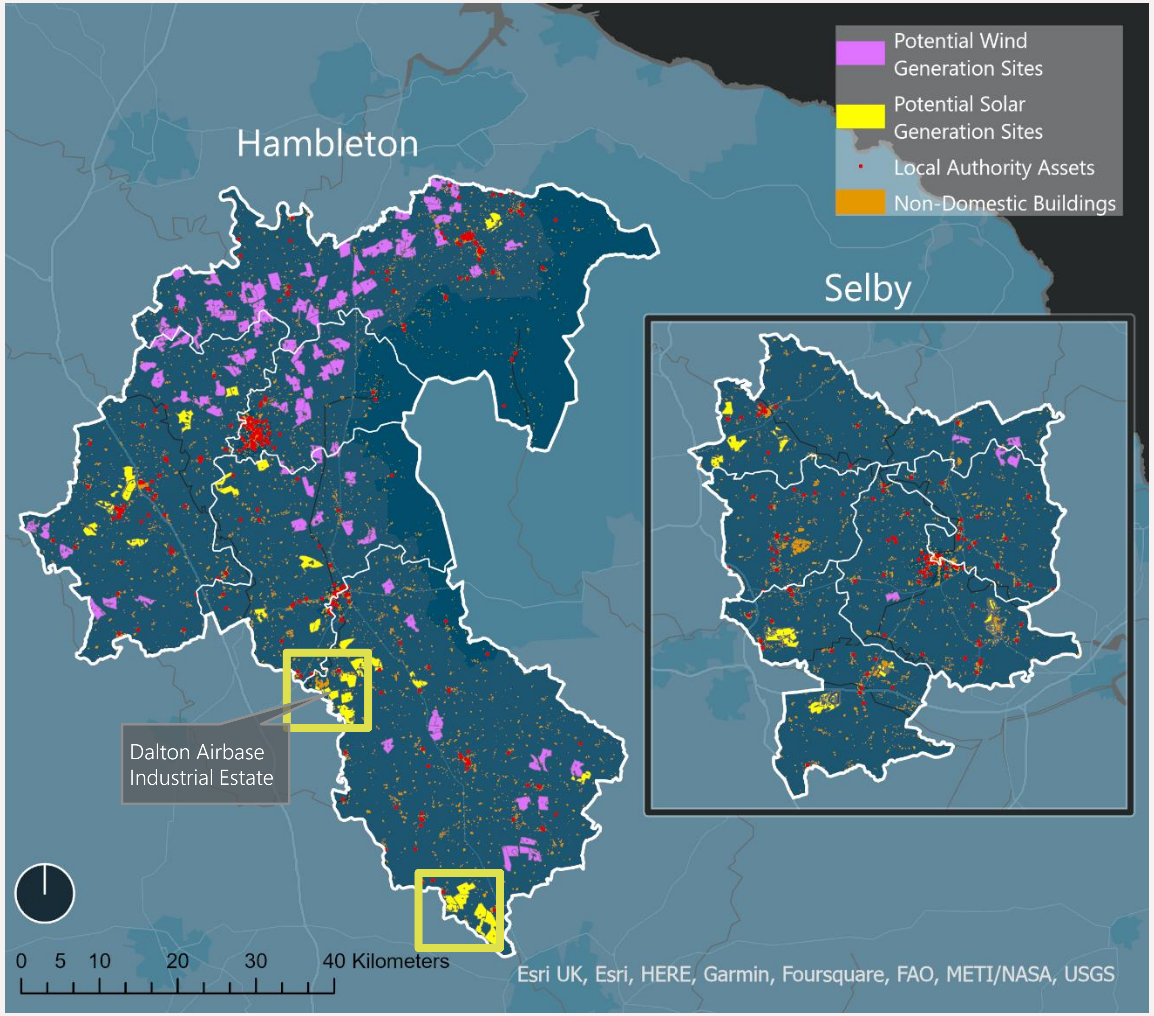
* Costs based on BEIS figures, including pre-construction cost and infrastructure cost scaled to capacity
https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/911818/GC20_Key_Data_and_Assumptions.xlsx

Large-Scale Renewables

It is not expected that ground-mounted solar would be built upon a single piece of land, but over many distributed plots across the A1 Corridor. These could become part of a local energy marketplace if permitted by regulation, where generation assets could be matched with off-takers requiring electricity, allowing local businesses to directly benefit from the production of locally generated low carbon electricity. Sites are selected according to criteria including vicinity of roads, quality of agricultural land, areas of outstanding beauty and other factors. Sites which would accommodate less than 10 MW or more than 50MW of solar capacity are excluded. For wind, less than 2MW and more than 10MW is excluded, to identify projects of suitable scale for investment and deployment.

The map highlights where non-domestic buildings and the Hambleton and Selby District council owned assets are located alongside land which has been deemed suitable for ground-mounted solar and wind.

As an additional benefit, well designed and located ground mounted solar and wind farms can support the A1 Corridor's commitment to biodiversity and protecting local wildlife. Many site specific measures can be taken to improve biodiversity, e.g. restoring peatlands on onshore wind sites.



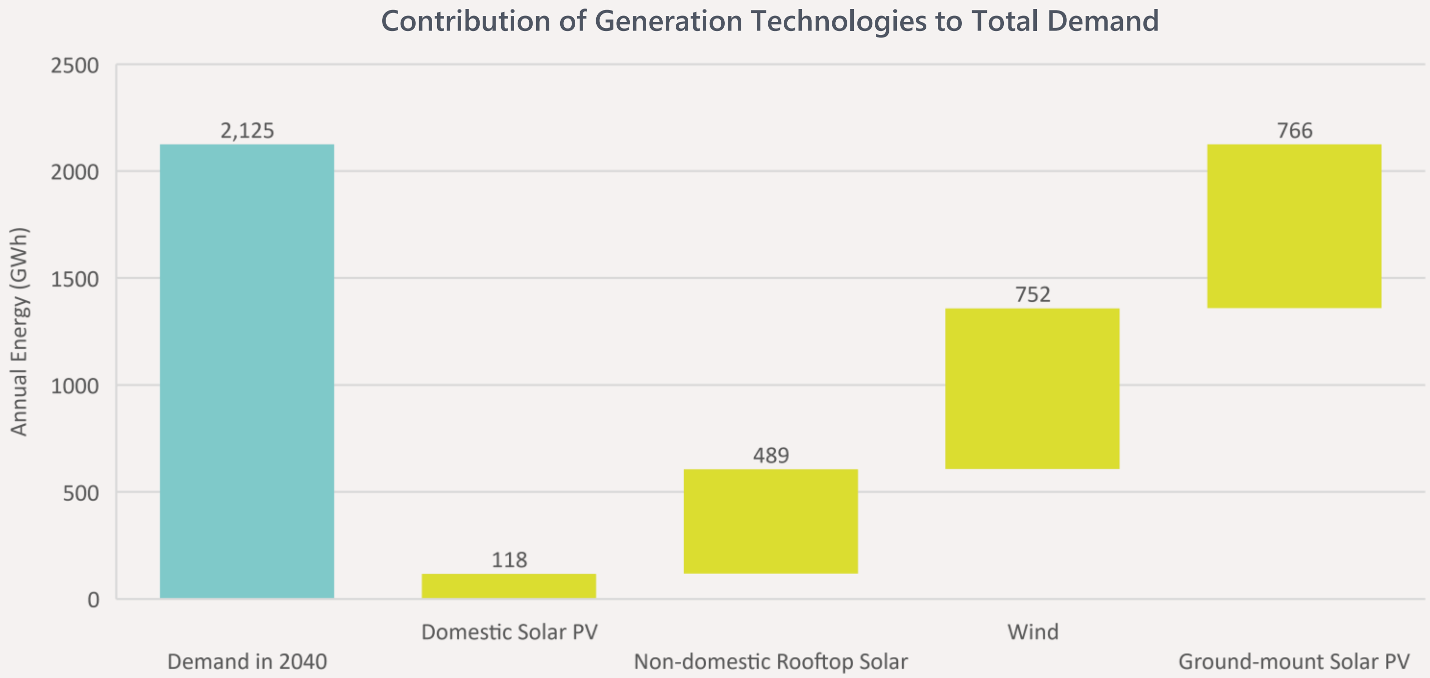
Land suitability for large scale renewable developments overlayed with potential purchasers of energy

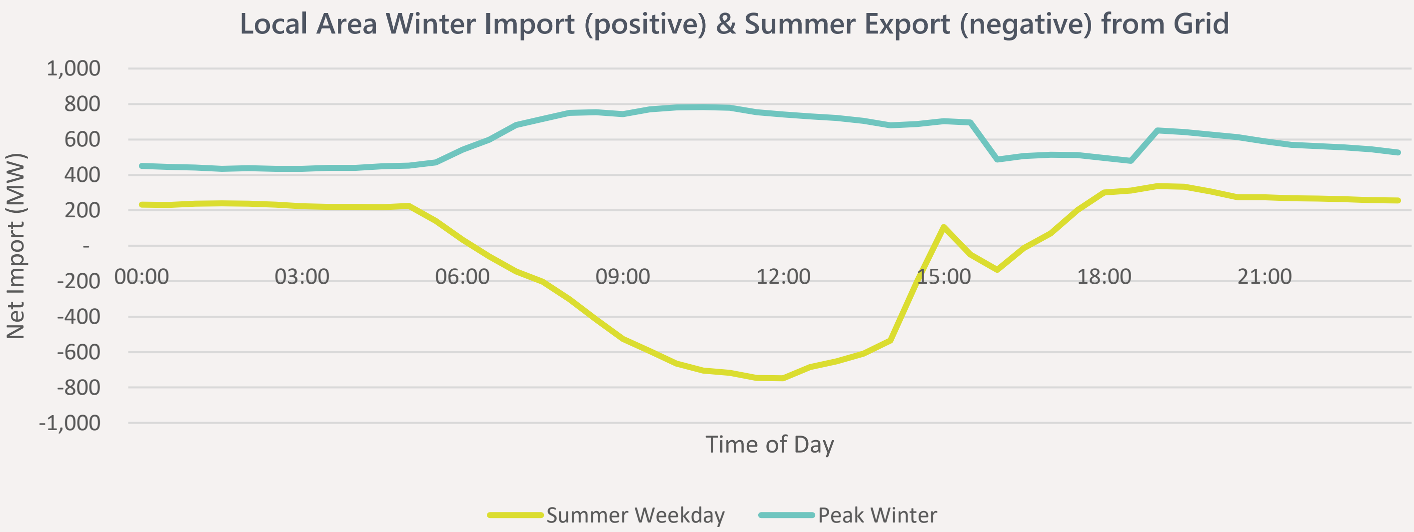
The Dalton Airbase Industrial Estate is surrounded by a number of land parcels which have been identified to be suitable for ground mounted solar. This could be a potential location to install ground mounted solar and supply the industrial estate with energy either through private wires or PPA contracts. Similarly, in the south of Hambleton, there are a number of potential sites for ground mounted solar PV which are in close proximity to the Clifton Moor Retail and Industrial Park in York.

Since solar generation will occur in the daytime and vary between the seasons, the A1 Corridor would still need to import from the electricity grid when supply from local generation does not meet demand.

Batteries and other types of energy storage could be co-located with ground mounted solar and wind. Co-located battery storage can help to smooth generation and enable participation in grid balancing services, increasing revenue streams available.

Large-Scale Renewables





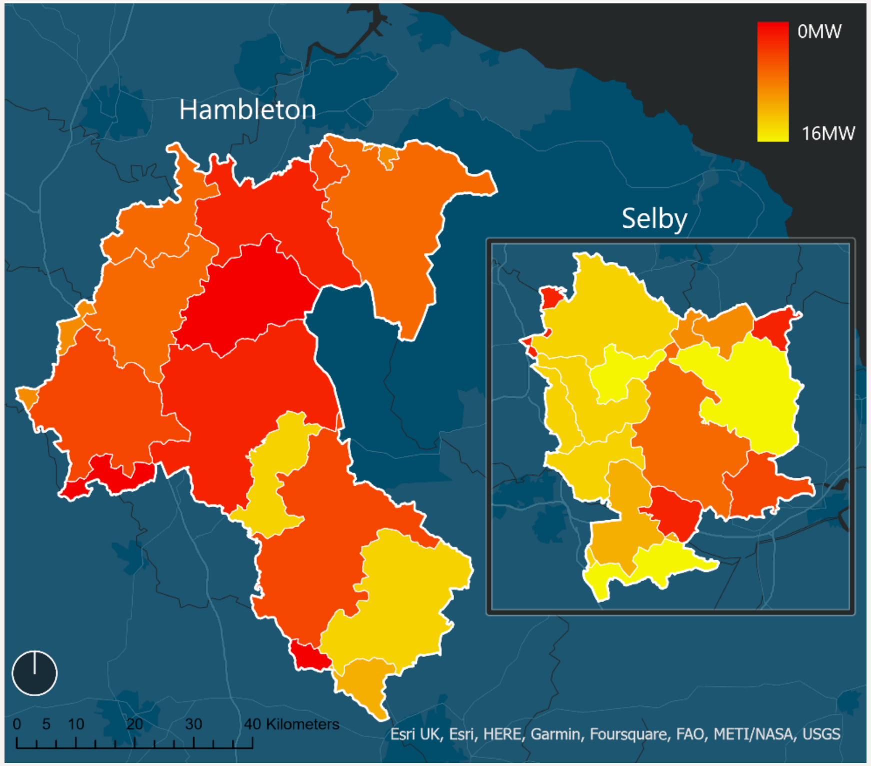
Priority has been given to fully developing domestic and non-domestic rooftop solar, as no land is needed, and residents and owners can make direct use of the generation. Wind has also been prioritised next given that its generation profile matches winter heating demand, and the land around wind turbines remains useable for other purposes. The development of ground mounted solar is then scaled to cover the remaining local requirement for energy, on a net annual basis. The contribution of each type of generation is visualised against the total local demand in the top graph.

Since solar generation will occur in the daytime and vary between the seasons, the A1 Corridor would still need to import from the electricity grid when supply from local generation does not meet demand, and export to the network when there is excess supply. The summer peak export, as can be seen from the lower graph, will be almost 800MW. Alternatively, local hydrogen production may offer a viable option for seasonal storage.

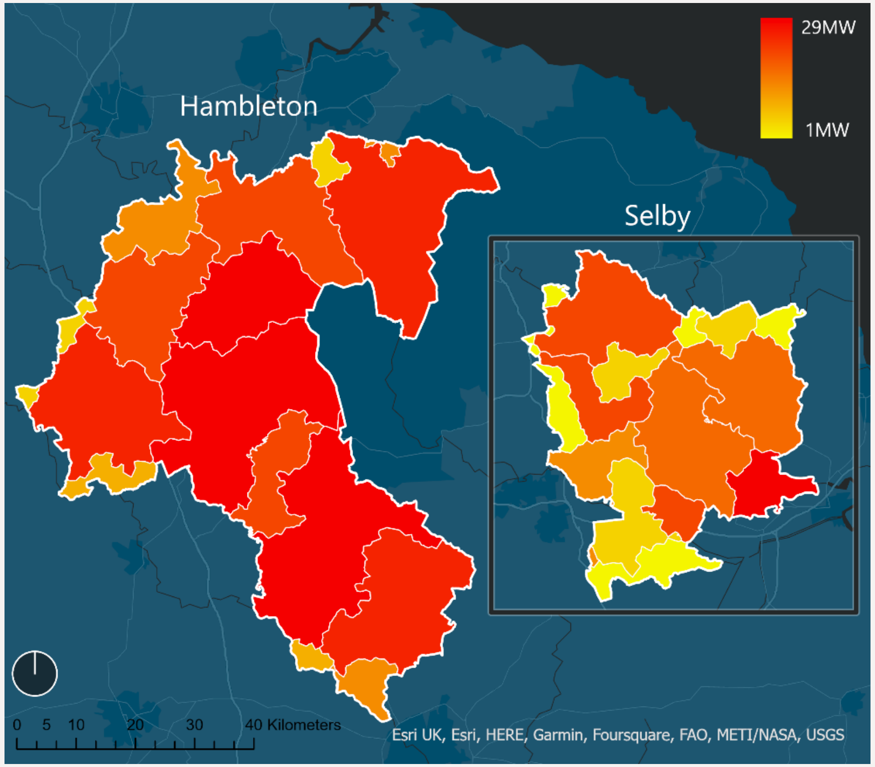
There is limited local capacity for increased generation in the area (see https://www.northernpowergrid.com/generation-availability-map). Any large scale deployments of solar generation will need to be coordinated with Northern Powergrid to ensure that network capacity is available. National Grid's Future Energy Scenarios envisage around 20 gigawatts (GW) of solar and 7 GW of wind in the North of England by 2050. If distributed evenly by household, this would be about 320MW of solar and 150 MW of wind for the A1 Corridor, suggesting that meeting all of the A1 Corridor's demand with local generation could require more grid connection of generation than National Grid are planning for. However, it would seem appropriate for sparsely populated areas like the A1 Corridor to accommodate more of their share of generation to compensate for more urban areas.

Networks, Storage & Flexibility

Upgrading the High Voltage Network



Current headroom on the high-voltage network



Increase in peak demand on the high-voltage network to 2040

A **total gross investment of £326m in capacity upgrades is estimated across the high and low voltage networks** by 2040 to accommodate the changes in this pathway (£160m net investment against a business-as-usual counterfactual). Ofgem's Open Letter on the Green Recovery Scheme "is aimed at accelerating low regrets, shovel ready network investment under the remainder of the RIIO-ED1 period [ends 31 March 2023] to stimulate economic recovery and support faster delivery of decarbonisation benefits for customers, while supporting Government's climate change ambitions."

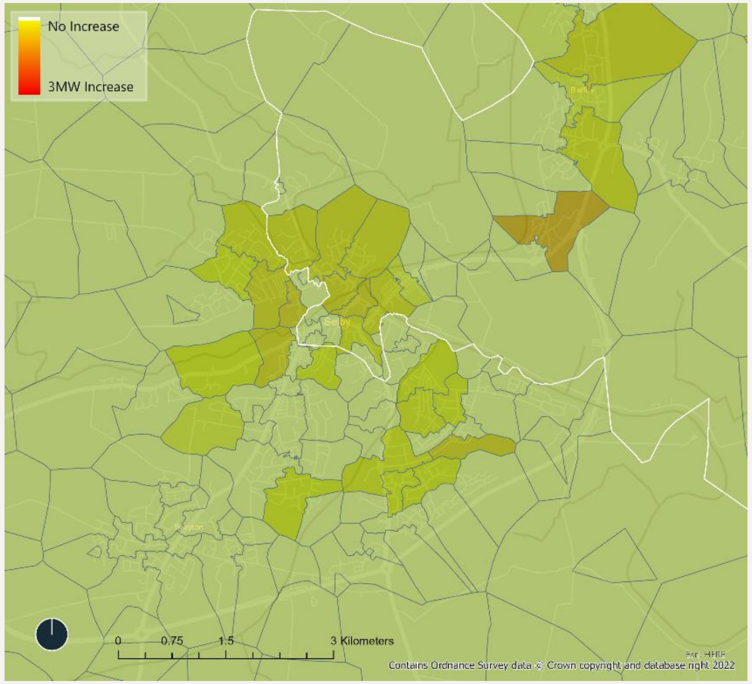
The high voltage network consists of substations on land owned by the distribution network operator, supplying feeders which run to secondary substations, which in turn serve multiple streets. The maps above show the area where high voltage substations serve in the A1 Corridor and the amount of headroom available on the high voltage network.

Currently within the A1 corridor area the amount of headroom available on the high voltage network varies significantly. Several of the areas in Hambleton are quite constrained with little headroom available, while Selby District has much better network availability.

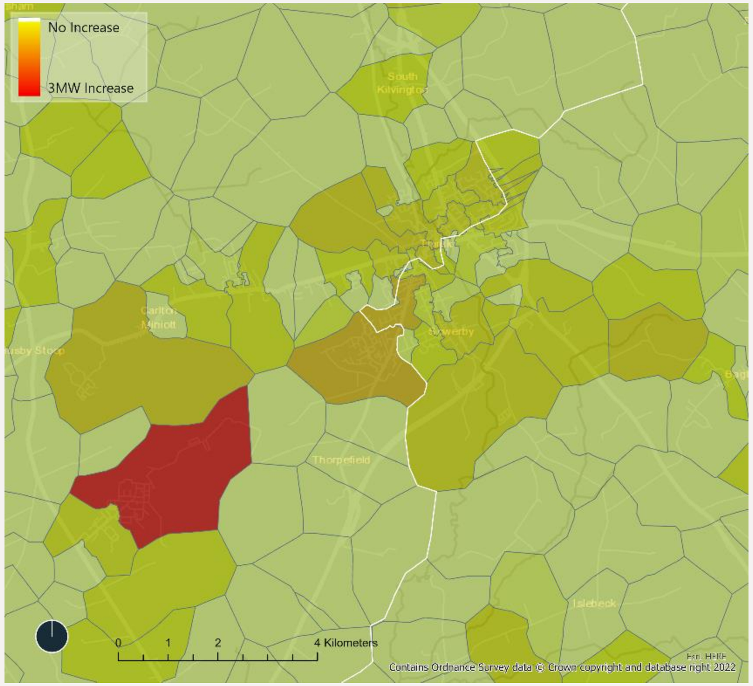
It is likely that given the rural nature of Hambleton, the electricity network will need to be upgraded, but there should be capacity in the short-term to begin deployment of some of the identified projects (whilst taking advice from Northern Powergrid).

From the map on the right, most of the zones will see large increases (>25MW) in demand by 2040. Overall, Hambleton sees a larger overall increase than Selby due to off-gas dwellings moving to electric heating systems and transport.

Upgrading the Low Voltage Network



Demand change on the low voltage network in Selby



Demand change on the low voltage network in Thirsk

The low voltage network consists of smaller neighbourhood substations, supplying feeders which run under pavements or roads to each building or on overhead wires in rural areas. The maps above show the approximate areas covered by LV (low voltage) substations.

In Selby, most LV substations will see an increase in demand of varying amounts, however, the LV network in Thirsk is likely to see a greater demand increase. In particular, the area to the south-west of Thirsk includes factories and other large non-domestic sites which are currently using gas for heating and are then likely to transition to electricity for heating causing a significant increase in demand.

This increase, however, provides an opportunity to take advantage of flexibility. DNOs could turn to flexibility services as a way to delay or reduce upgrades. Further work would be needed to identify solutions, aligning with the DNOs' business planning processes.

Other ways to reduce the effect include demand shifting, where smart charging for EVs, residential power and heat storage could delay the need for network upgrades as demand is moved away from peak times.

In some areas flexibility will not be sufficient to manage increased demands without network reinforcement. Discussing plans well in advance with the DNO will ensure that both provision of flexibility and network reinforcement can be planned so that projects are not delayed longer than absolutely necessary through lack of network capacity.

Outline Priority Projects

Overview

In creating the LAEP, near-term projects have been identified where the proposed North Yorkshire Council and York & North Yorkshire LEP could start the process of implementation. These near-term projects are either:

- Low regrets – common under various scenarios but may require further enabling action before they can be progressed.
- Quick wins – which can be carried out in the near-term without major blockers.
- Focus zones - specific areas within the LAEP boundary that have a cluster of near- term components.

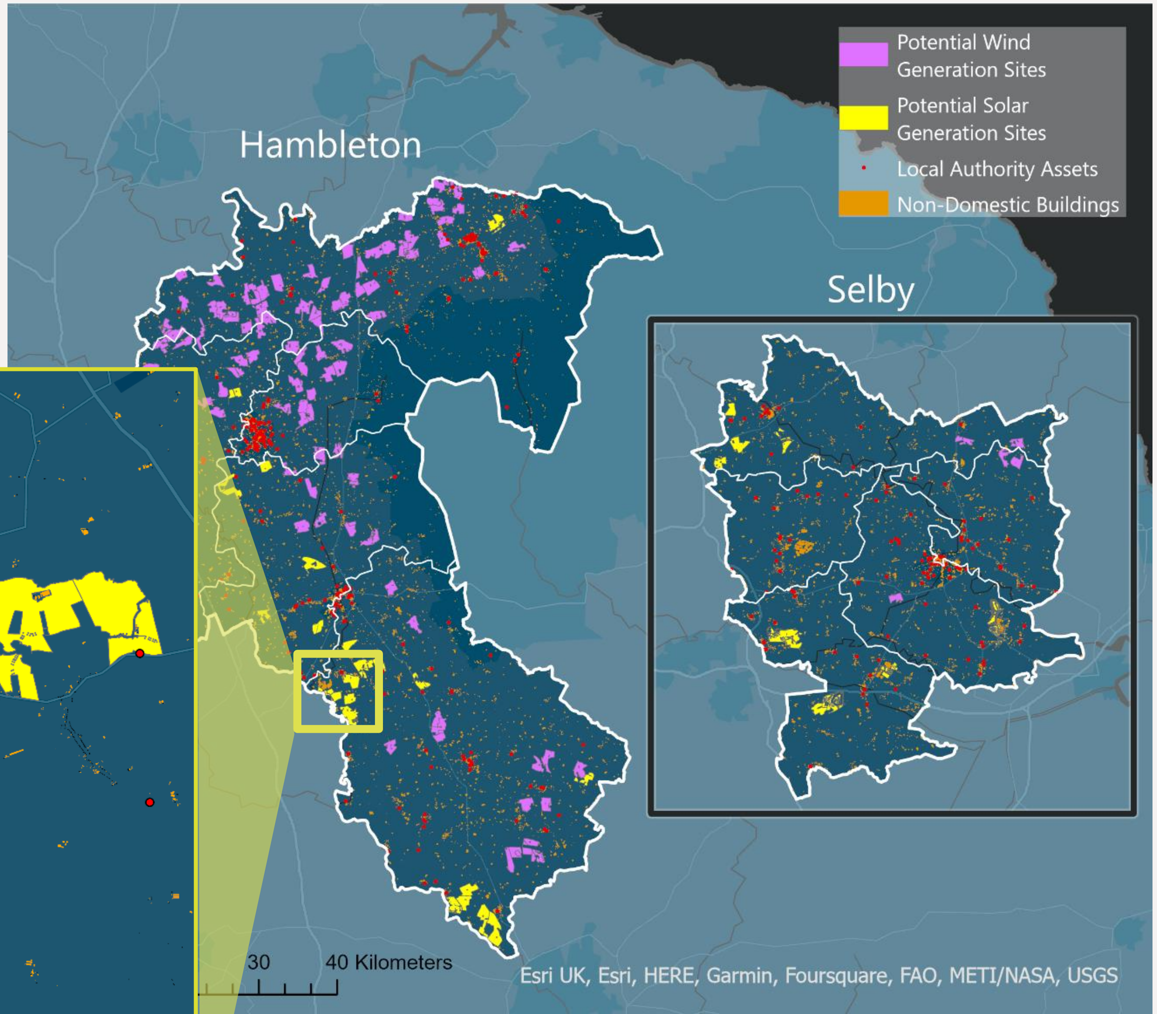
The purpose of identifying specific outline priority projects is to provide stakeholders with projects that can immediately be implemented to make progress towards net zero. The following section specifies details of these near-term projects, including details such as locations and financial information. Energy Systems catapult “Net Zero Go” platform* provides resources to help local authorities design and develop energy projects.

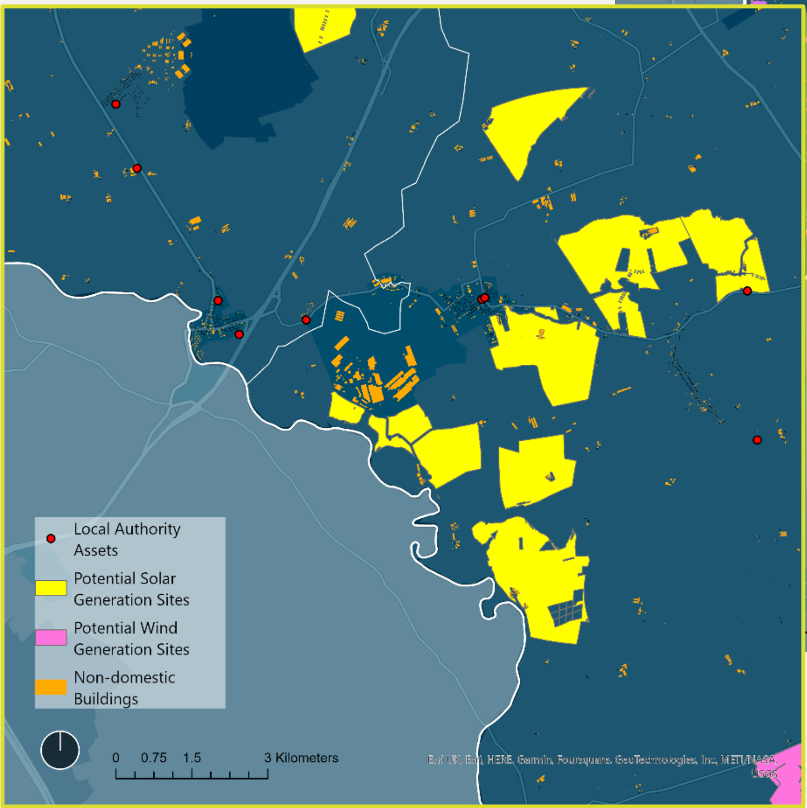
Further details, information and advice for implementing the Outline Priority Projects can be found towards the end of this document, in the sections titled ‘Next Steps’ and ‘Business Model Innovation’.

* https://www.netzerogo.org.uk/s/

Ground Mounted Solar

Within the 'Shipton to Sutton under Whitestonecliffe' zone, the Dalton Airbase Industrial Site has been identified as a potential near-term project to investigate the plots of land in close proximity (<2km) which have been identified as being suitable for ground mounted solar PV generation. The land highlighted in the zoomed-in map below could accommodate a total of 145MW of solar PV.





Land suitability for large-scale ground-mounted solar PV developments overlayed with large electricity users nearby

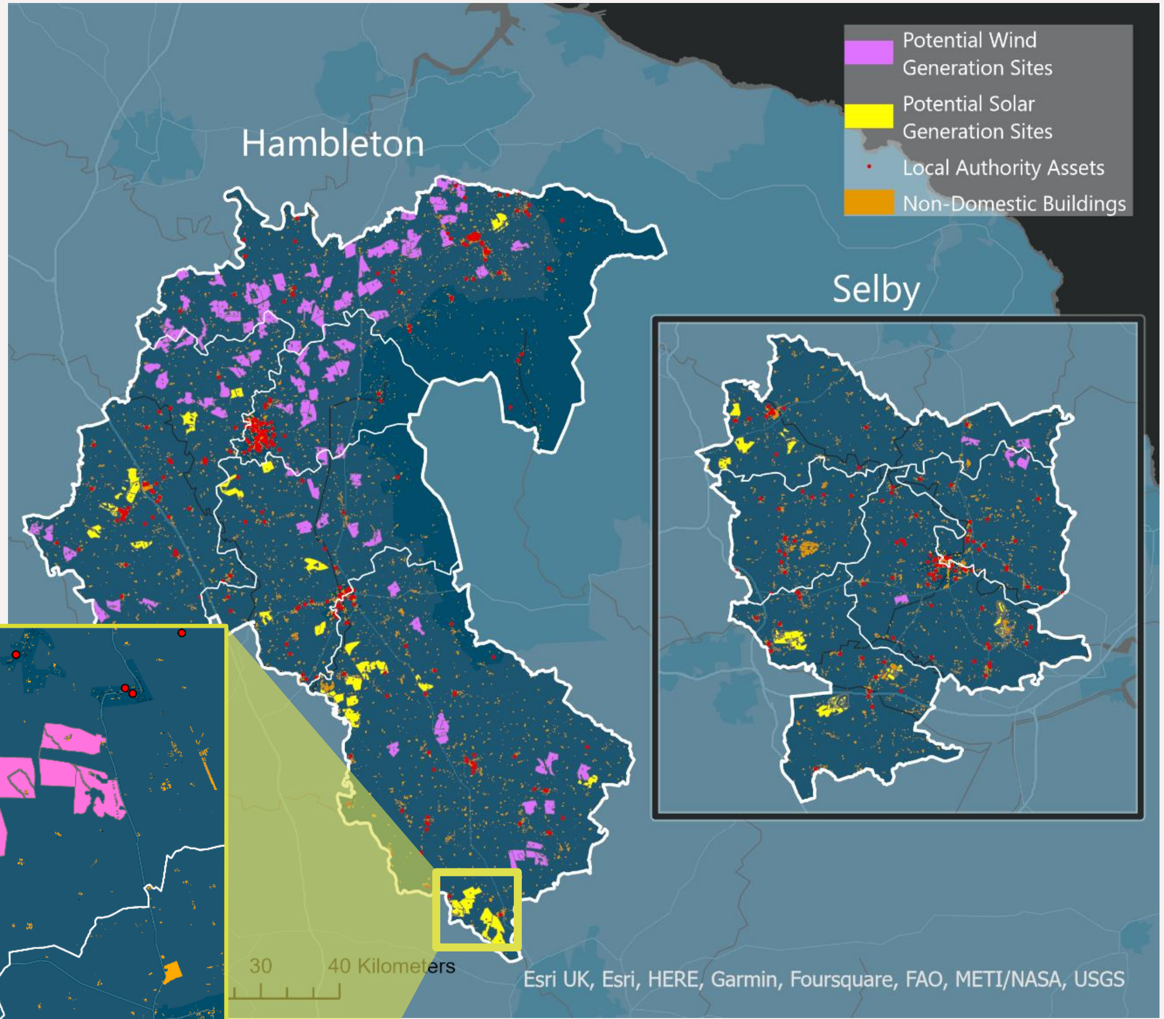
Given the proximity of these land parcels to the industrial park, a private wire could connect the ground mounted solar directly to the sites which could significantly improve the business case of developing the sites. Given the intermittent nature of solar, battery storage could be co-located. Electrolysers supplied by the solar generation could also supply hydrogen to the industrial park, where it has been found that a hydrogen supply could be valuable.

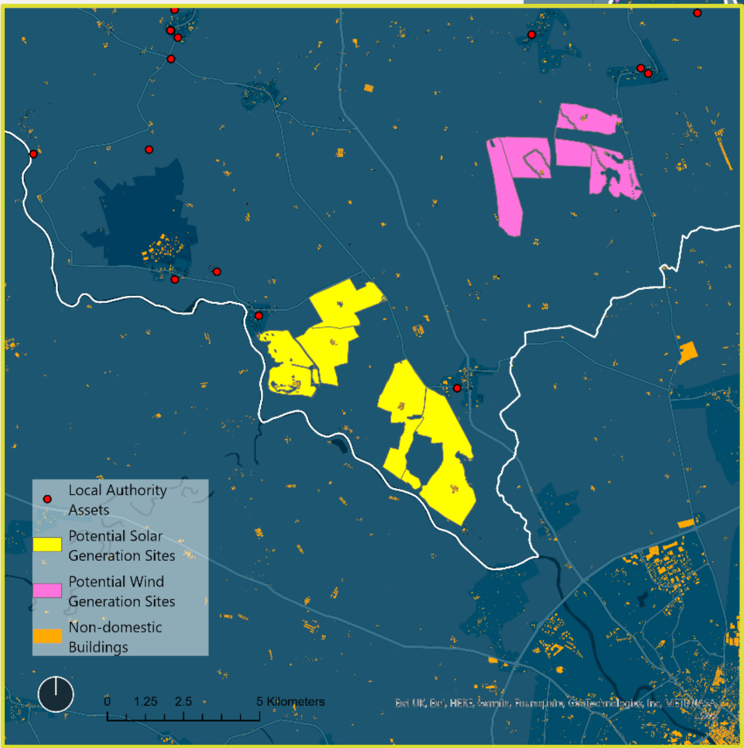
Low Carbon Generation

The southern tip of the 'Shipton to Sutton under Whitestonecliffe' zone has several sites identified as being suitable for ground mounted solar and onshore wind. In the zoomed-in map below, the land highlighted could accommodate a total of 45MW of solar PV and 8MW of wind.

Given their proximity to Clifton Moor Retail and Industrial Park, there is the potential for a project to be developed whereby generation from within Hambleton is utilised within the City of York.

By co-ordinating across the local authority boundaries, the low carbon electricity generated could benefit the decarbonisation efforts of both local authorities and reduce the energy expenditure of a number of local businesses.





Land suitability for large-scale ground-mounted solar PV and onshore wind developments overlayed with large electricity users nearby

Buildings: Focus Zones

Selby and Villages and Shipton to Sutton under Whitestonecliffe are focus zones. Selby and Villages has the highest number of buildings which are appropriate for building fabric upgrades. It also has the town of Selby located within it which has areas which are above average fuel poverty for the region (~10-15%), specifically in the west of the town.

Learning from previous retrofit schemes such as *Warm and Well in North Yorkshire* relating to aspects such funding sources, consumer engagement, buildings surveys and local contractors should be leveraged to aid success of any new fabric upgrade initiatives.

Building Fabric Upgrades	Dwellings	Cost
Basic	c.330	£296,000
Deep	c.170	£1,250,000

Insulation proposed in north parts of Selby, an area of high fuel poverty

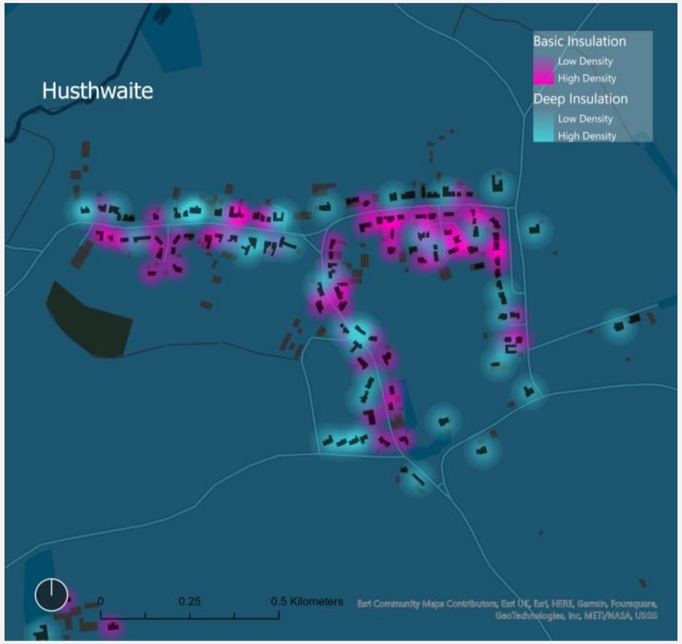
Buildings: Focus Zones

The villages of Stillington, Husthwaite and Crayke provide starting points for rolling out building fabric upgrades in residential buildings, basic and deep.

Proposed insulation in Stillington

	Basic	Deep
Dwellings	c.85	c.15
Type	Detached 1965-1979	Semi-Detached 1965-1979
Cost	£39,000	81,000

Proposed insulation in Husthwaite



	Basic	Deep
Dwellings	c.65	c.45
Type	Detached 1945-1979	Detached 1945-1964
Cost	£57,000	£430,000

Proposed insulation in Crayke

	Basic	Deep
Dwellings	c.40	c.10
Type	Detached 1965-1979	Detached 1945-1964
Cost	£22,000	£96,000

Rural Priority Zone – Heating

In the zone of 'Shipton to Sutton under Whitestonecliffe' in Hambleton, the town of Easingwold has a high density of heat pump uptake, air source and ground source.

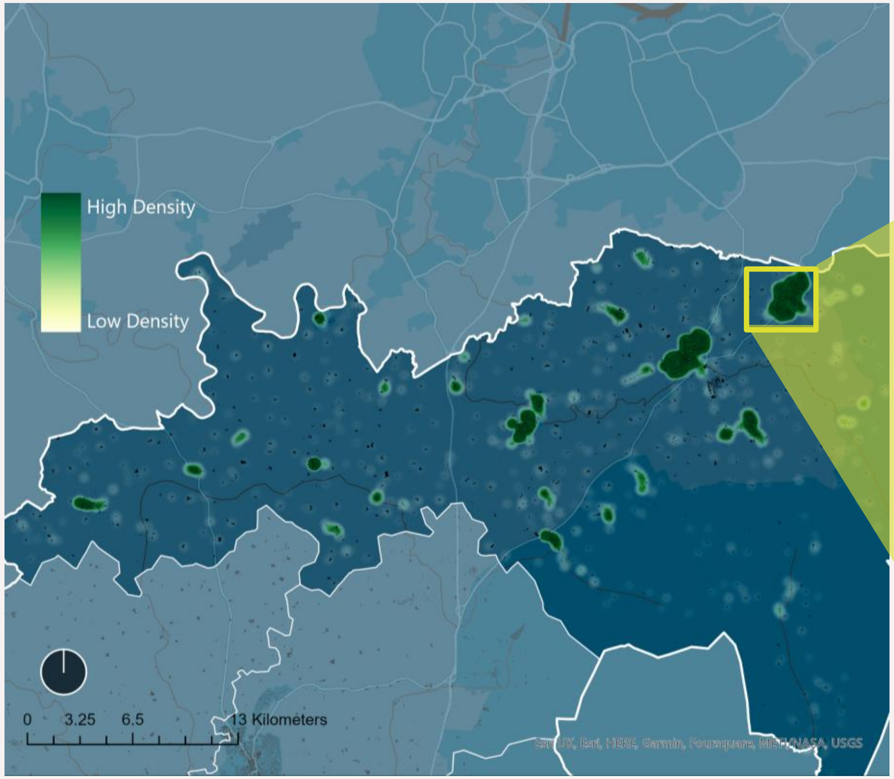
Previous experience using funding from National Grid's Warm Homes Fund to install air source heat pumps should be exploited when designing this scheme.

Due to the size of the heat pump roll out schemes proposed here, early engagement with Northern Powergrid is recommended to ensure that the local electricity network can support the likely increase in demand.

Area	Easingwold
Number of Dwellings	c.2,250
Technology	A mix of air source and ground source heat pumps
Total Cost	£19.6m

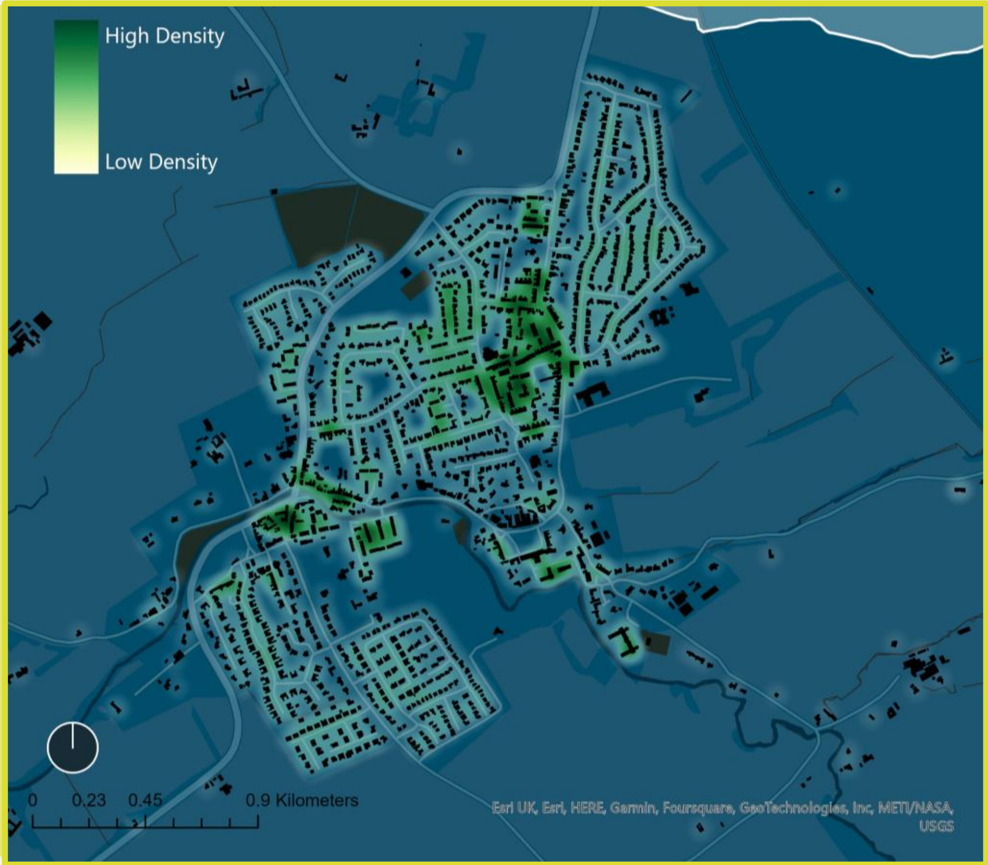
Density of proposed heat pump uptake in Easingwold

Rural Priority Zone – Heating



Density of proposed heat pump uptake in E.Cowton to Great Ayton

Density of proposed heat pump uptake in Great Ayton



Great Ayton in the E.Cowton to Great Ayton area, northern Hambleton, has been identified for a mix of heat pumps to decarbonise the existing off-gas residential dwellings.

Great Ayton could be a starting point to roll out heat pumps given its size. Supply chains could then ramp up to meet the demand in the rest of the zone.

Location	Great Ayton
Number of Dwellings	c.2,000
Technology	A mix of ground source and air source heat pumps
Total Cost	£17.4m.

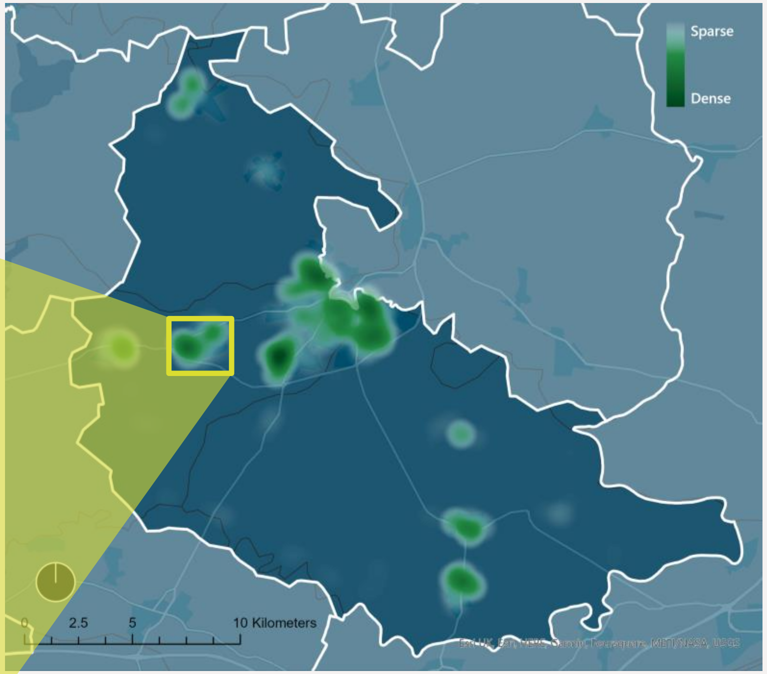
ASHP – Selby and Villages

The area of Selby and Villages is proposed for air source heat pumps (ASHP) for semi detached buildings built between 1945-1964.

Selby and Villages is a heating focus zone. Projects in small villages such as Hambleton and Thorpe Willoughby could be great starting projects to learn how to scale from previous local projects and how to engage owner-occupiers.

Semi-detached 1945-1964 dwellings in Thorpe Willoughby and Hambleton

Location	Hambleton
Number of Dwelllings	c.100
Building Type	Semi-Detached (1945-1964)
Total Cost	£638,000



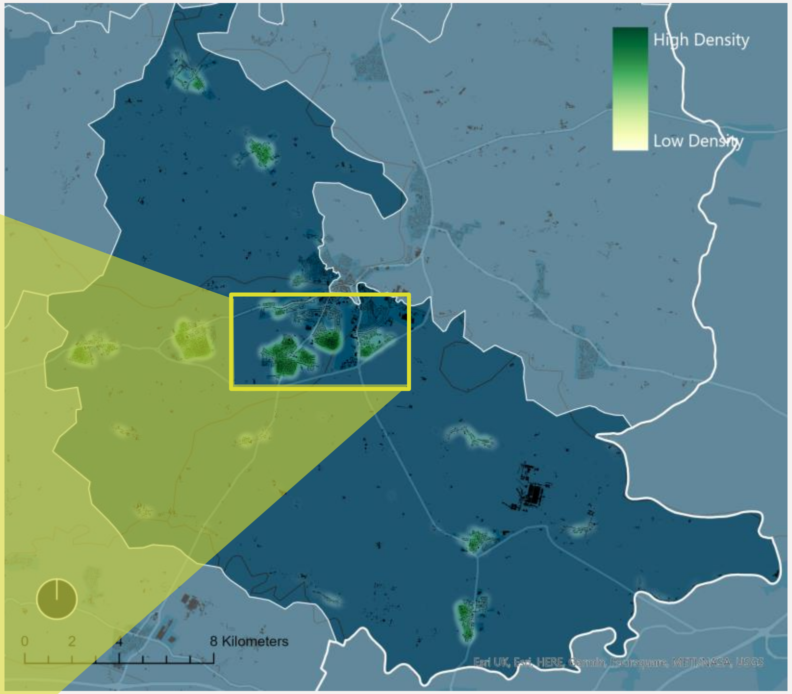
Semi-detached 1945-1964 dwellings in Selby and Villages

Location	Thorpe Willoughby
Number of Dwellings	c.110
Building Type	Semi-Detached (1945-1964)
Total Cost	£711,000

GSHP – Selby and Villages

Southern parts of Selby have been identified as areas which are suitable for ground source heat pumps. Three specific areas are identified on the map to the right.

Density of GSHP in Selby



Density of GSHP in Selby and Villages

Selby Area	1
Number of Dwellings	c.710
Total Cost	£11.8m

Selby Area	2
Number of Dwellings	c.360
Total Cost	£5.9m

Selby Area	3
Number of Dwellings	c.240
Total Cost	£4.1m

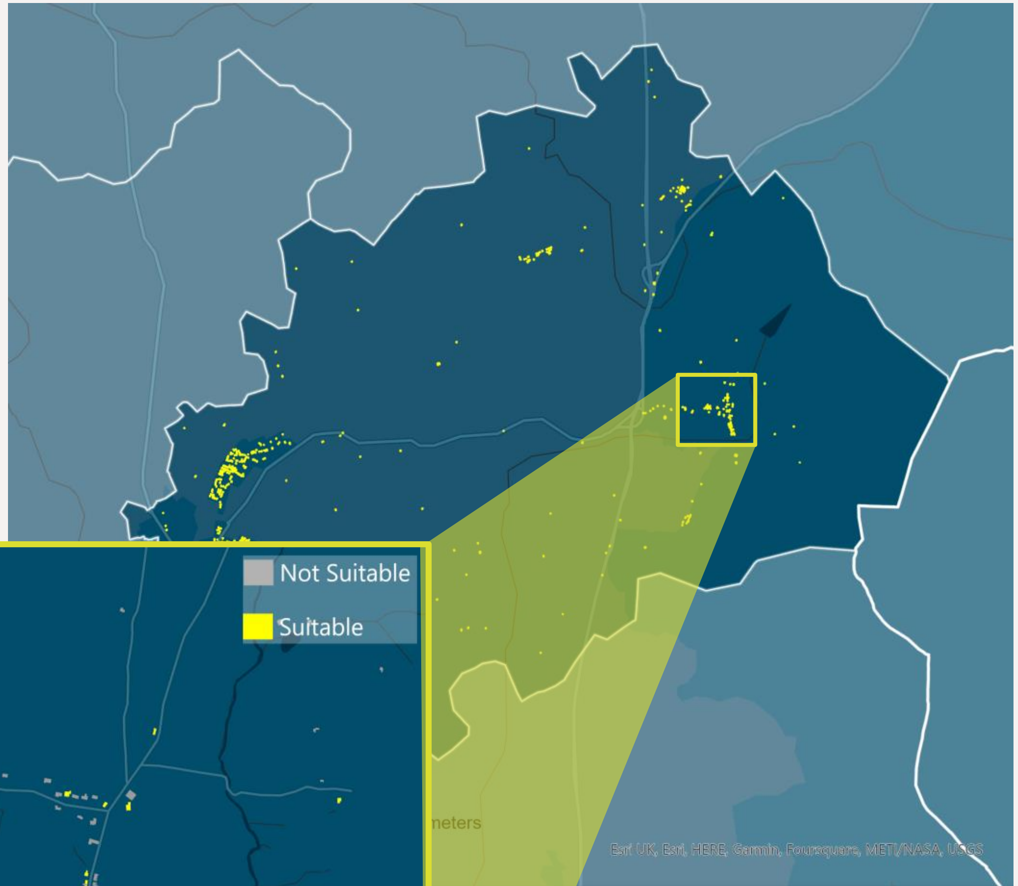
Domestic Solar – E.Cowton to Great Ayton

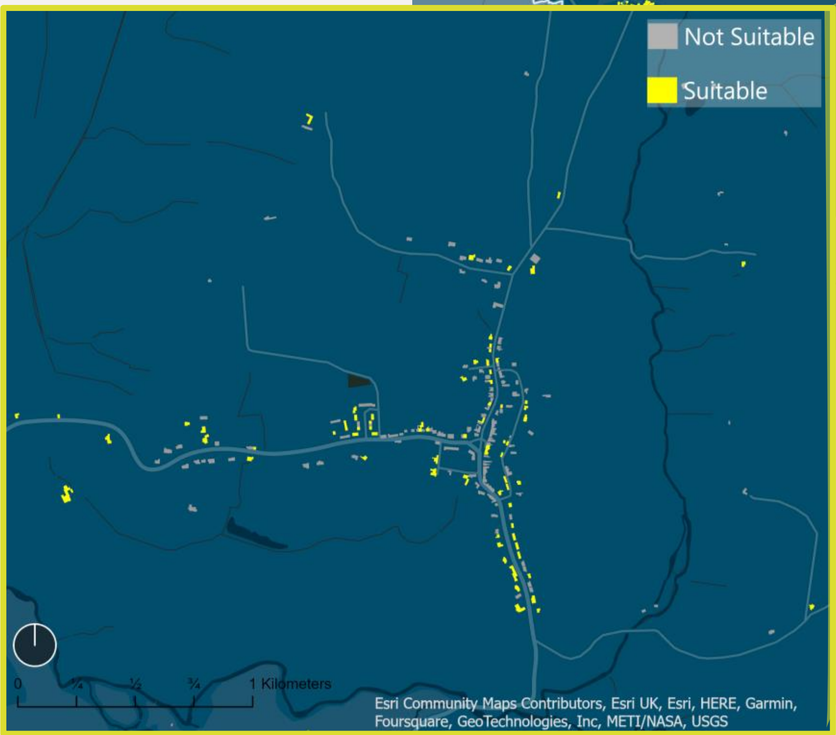
In fuel poor area of E.Cowton to Great Ayton, domestic PV can be installed for residentials to generate and self-consume electricity. Savings to electricity bills will depend on the occupier's times of use in the dwelling.

Within the area, Osmotherley has been identified for a priority project given its size and cost.

As with all areas identified for early use of solar PV, it will be important to engage with Northern Powergrid early to ensure that local electricity networks can support this scale of roll out.

Rooftop solar potential in residential buildings in E.Cowton to Great Ayton





Dwellings proposed for domestic rooftop solar in Osmotherley

Location	Osmotherley
Number of Dwellings	c.80
Total Cost	£610 000
Savings	£165 - £400 depending on demand times and energy tariffs

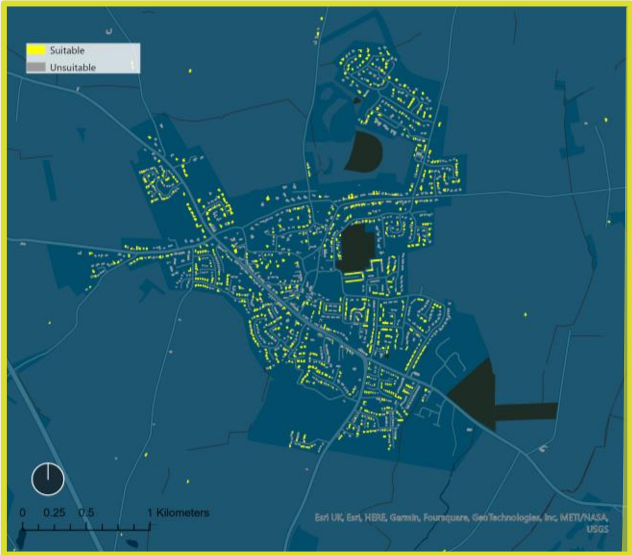
Domestic Solar – Stillington & Easingwold

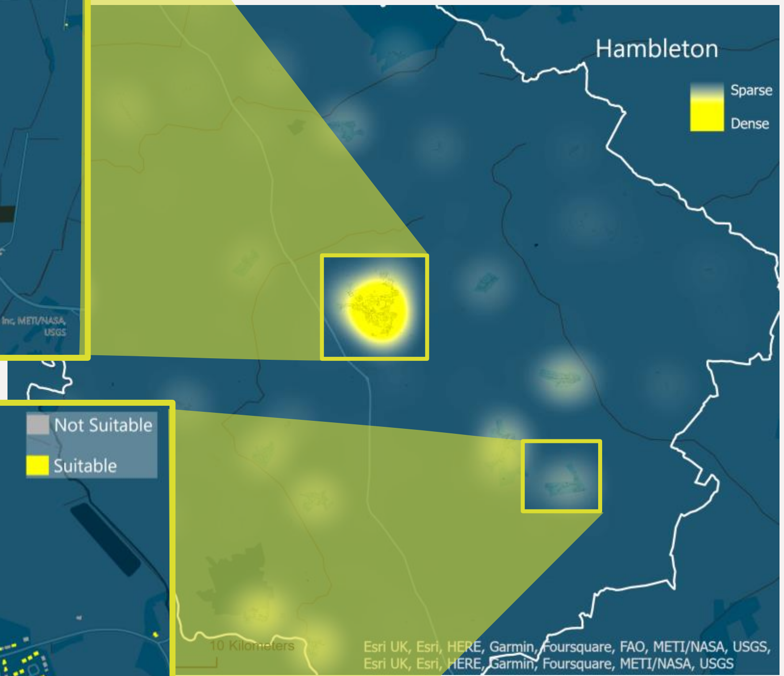
In fuel poor areas of Shipton to Sutton under Whitestonecliffe, domestic PV can be installed for residents to generate and self consume electricity. Savings to electricity bills will depend on the occupier's times of use in the dwelling.

Location	Easingwold
Number of Dwellings	c.850
Total Cost	£6.2m
Savings	£165 - £400 depending on demand times and energy tariffs

Location	Stillington
Number of Dwellings	c.120
Total Cost	£870 000
Savings	£165 - £400 depending on demand times and energy tariffs

Rooftop solar potential in residential buildings in Easingwold





Density of domestic PV in Shipton to Sutton under Whitestonecliffe

Rooftop solar potential in residential buildings in Stillington

District Heat Network

Potential DHN in Northallerton

Network cost	£1.6m
Connection cost	£1.3m
Total DHN cost	£2.9m

In Northallerton connecting the hospital in the north of the High Street to the High Street, will connect over 280 buildings. This DHN, with a peak demand of 2MW is expected to have a capital cost of £2.9m. Further feasibility studies would need to be conducted to assess the feasibility of such a network, but this provides an indicative design set-up.

Northallerton sits on a low productivity aquifer** so ground water is unlikely to be a suitable source of low carbon heat meaning that alternatives such as large air source heat pumps will need to be considered.

** http://mapapps2.bgs.ac.uk/geoindex/home.html?layer=BGSHydroMap&_ga=2.227016797.1726030392.1645026282-782257203.1645026282