The Vale, Moors & Coast

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 Vale, Moors & Coast local area energy plan requires capital investment of

£5.3 billion

Total (excluding electric vehicles and charging infrastructure)

Including:

£0.75 billion

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

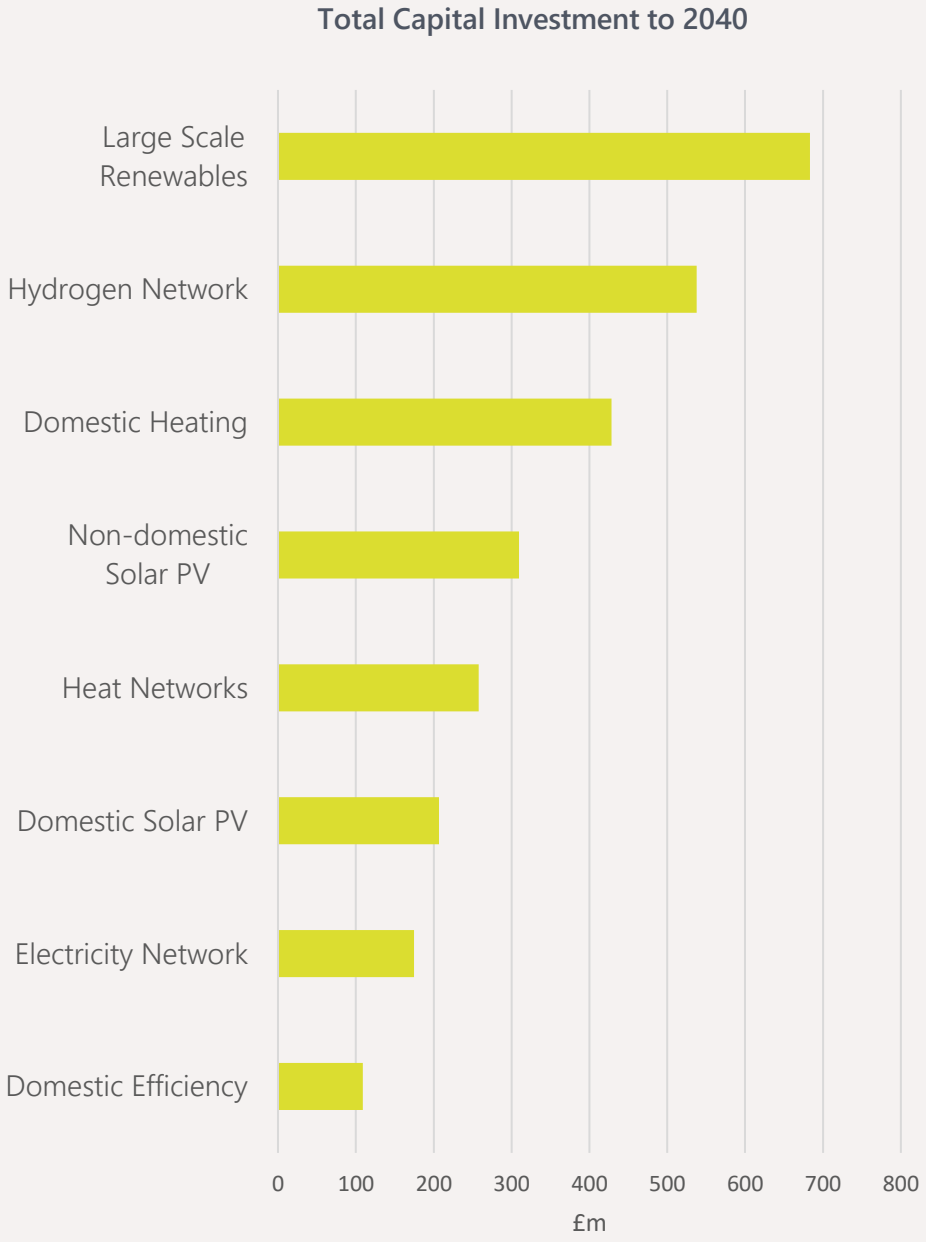
£0.7 billion

In large scale renewable generation

Saving:

1.71 million tonnes CO_2

cumulatively to 2050 against a business-as-usual pathway – equivalent to ten return flights to New York for every household.



The Vale, Moors & Coast's energy system will have been transformed, with:

83,000

heat pumps installed in dwellings

At least 11,000 new connections to a district heat network

39,500

dwellings retrofitted with insulation, glazing and draughtproofing improvements

90,000

fully electric vehicles

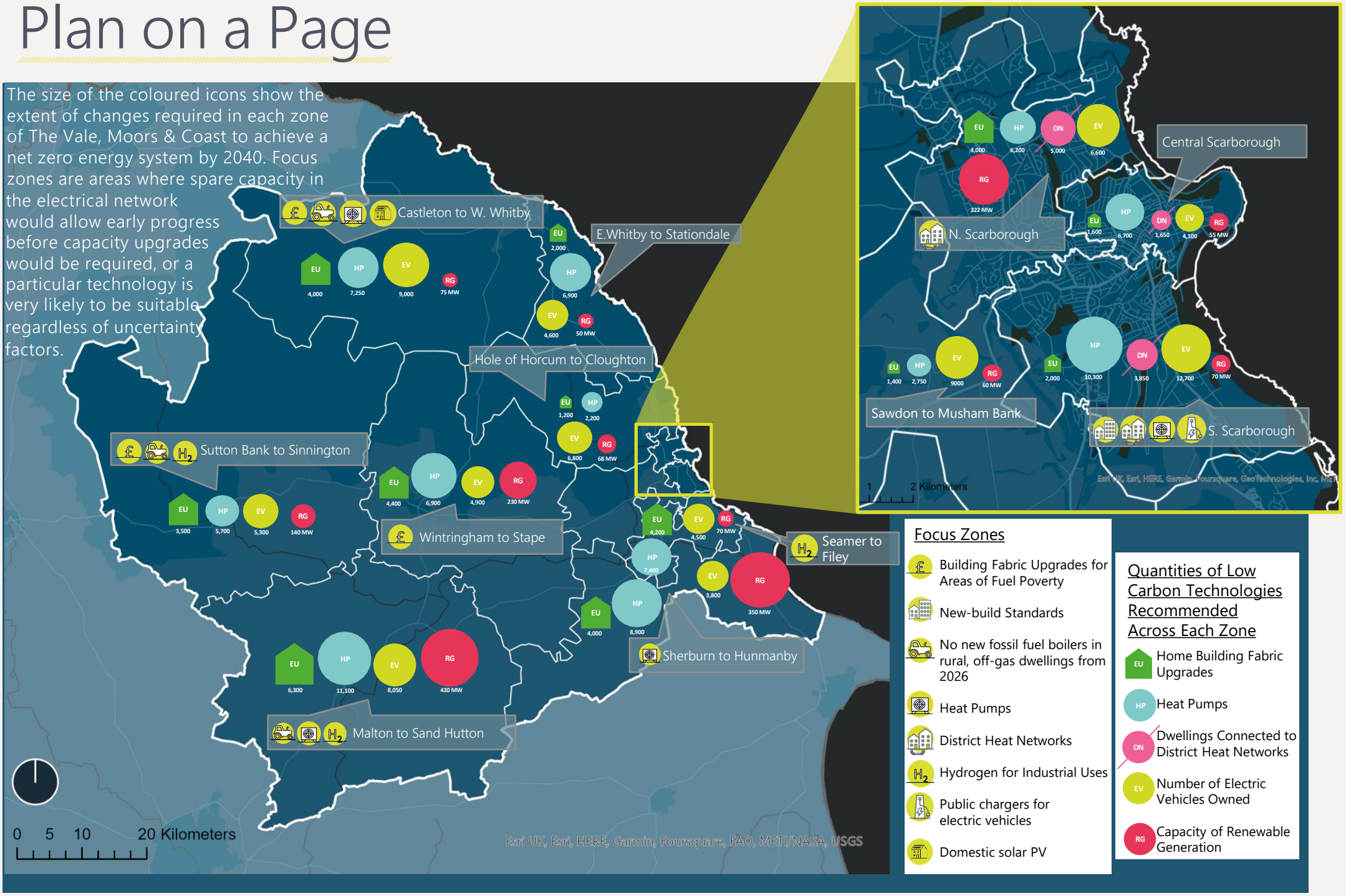
22%

dwellings generating their own electricity with rooftop solar

858 MW

of large scale renewable generation

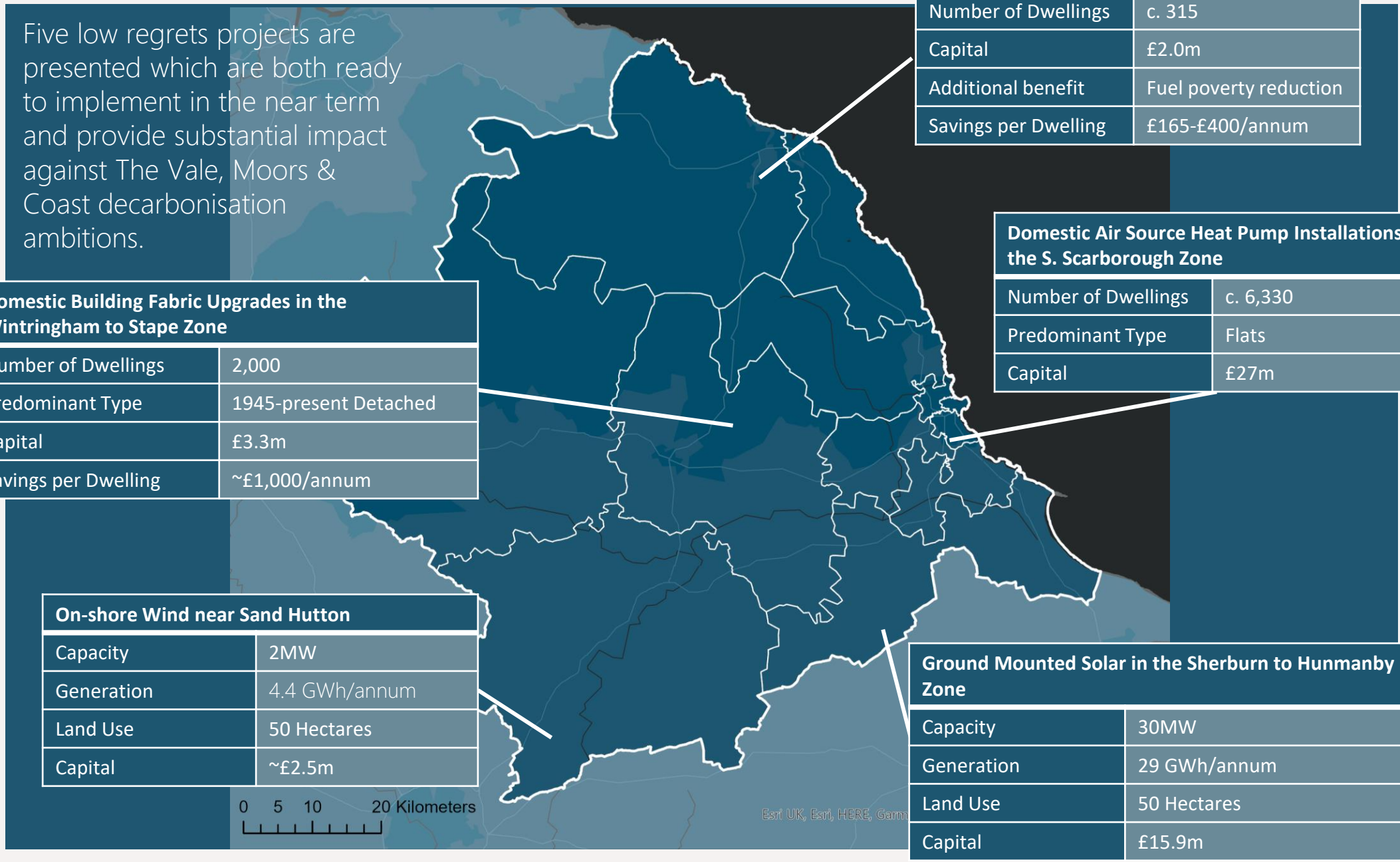
Plan on a Page



Outline Priority Projects Summary

Demonstrator and low regrets projects for near-term implementation

Five low regrets projects are presented which are both ready to implement in the near term and provide substantial impact against The Vale, Moors & Coast decarbonisation ambitions.



Domestic Solar PV Installations in Sleights	
Number of Dwellings	c. 315
Capital	£2.0m
Additional benefit	Fuel poverty reduction
Savings per Dwelling	£165-£400/annum

Domestic Air Source Heat Pump Installations in the S. Scarborough Zone	
Number of Dwellings	c. 6,330
Predominant Type	Flats
Capital	£27m

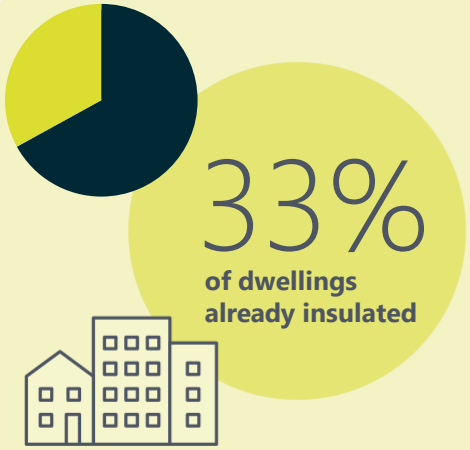
Domestic Building Fabric Upgrades in the Wintringham to Stape Zone	
Number of Dwellings	2,000
Predominant Type	1945-present Detached
Capital	£3.3m
Savings per Dwelling	~£1,000/annum

On-shore Wind near Sand Hutton	
Capacity	2MW
Generation	4.4 GWh/annum
Land Use	50 Hectares
Capital	~£2.5m

Ground Mounted Solar in the Sherburn to Hunmanby Zone	
Capacity	30MW
Generation	29 GWh/annum
Land Use	50 Hectares
Capital	£15.9m

Current State

Setting the Scene: The Vale, Moors & Coast Today

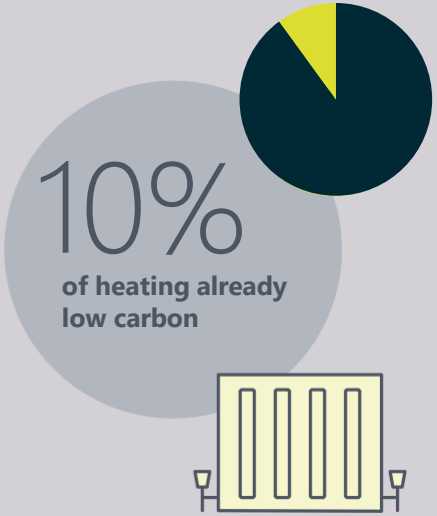


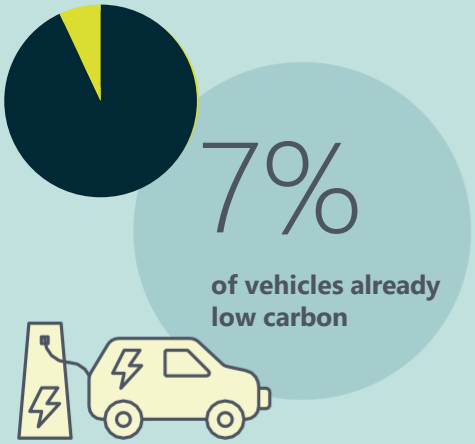
BUILDINGS

Currently 33% of the dwellings in The Vale, Moors & Coast are insulated to a good standard, or do not have potential for further insulation.

HEATING

90% 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.



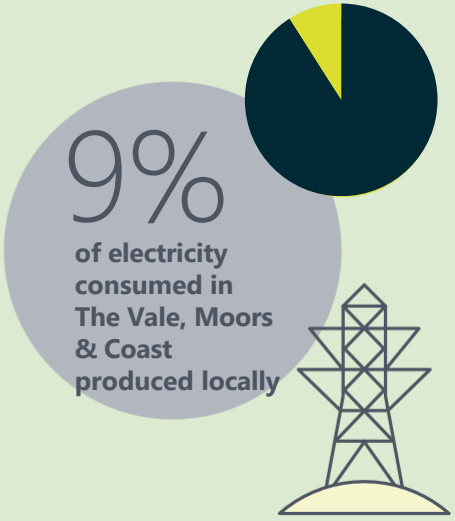


VEHICLES

Around 7,150 cars and vans currently registered in The Vale, Moors & Coast are either plug-in hybrid or pure electric, making up 7% of those vehicles. The remaining 89,350, are petrol, diesel or hybrid.

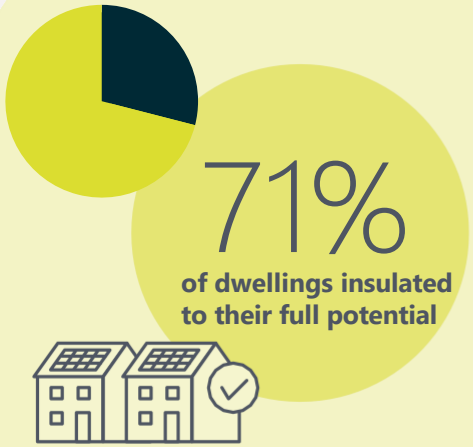
ELECTRICITY

91% of electricity consumed comes from the National Grid. Around 3% of dwellings have solar panels, with rooftop solar on non-domestic buildings, and a small biomass and energy-from-waste scheme also contributing.




Destination
COUNTY OF
NORTH YORKSHIRE

The Destination: The Vale, Moors & Coast 2040

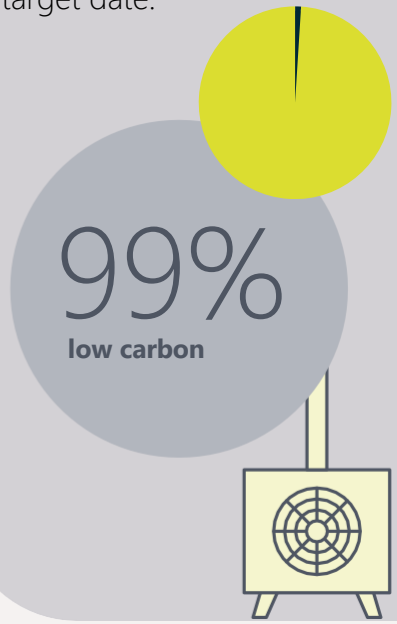


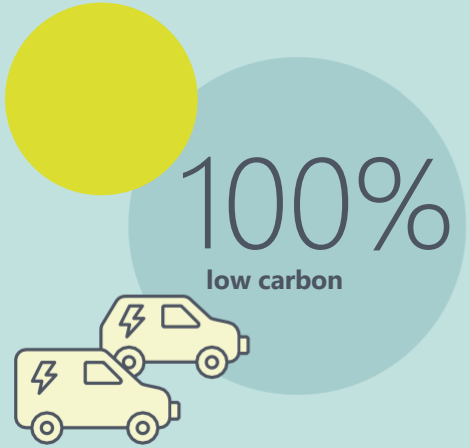
BUILDINGS

Around 38% of The Vale, Moors & Coast's buildings will require insulation upgrades, bringing the majority of dwellings up to a high standard of building fabric performance.

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.



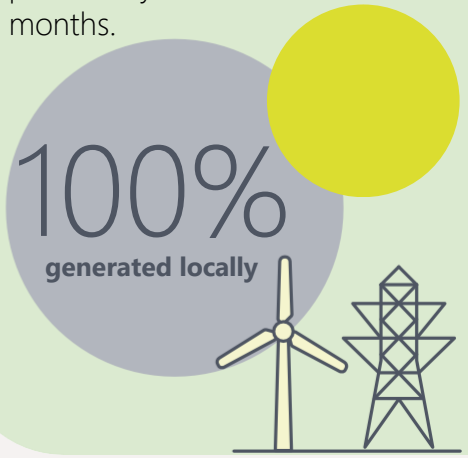


VEHICLES

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 Vale, Moors & Coast'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.

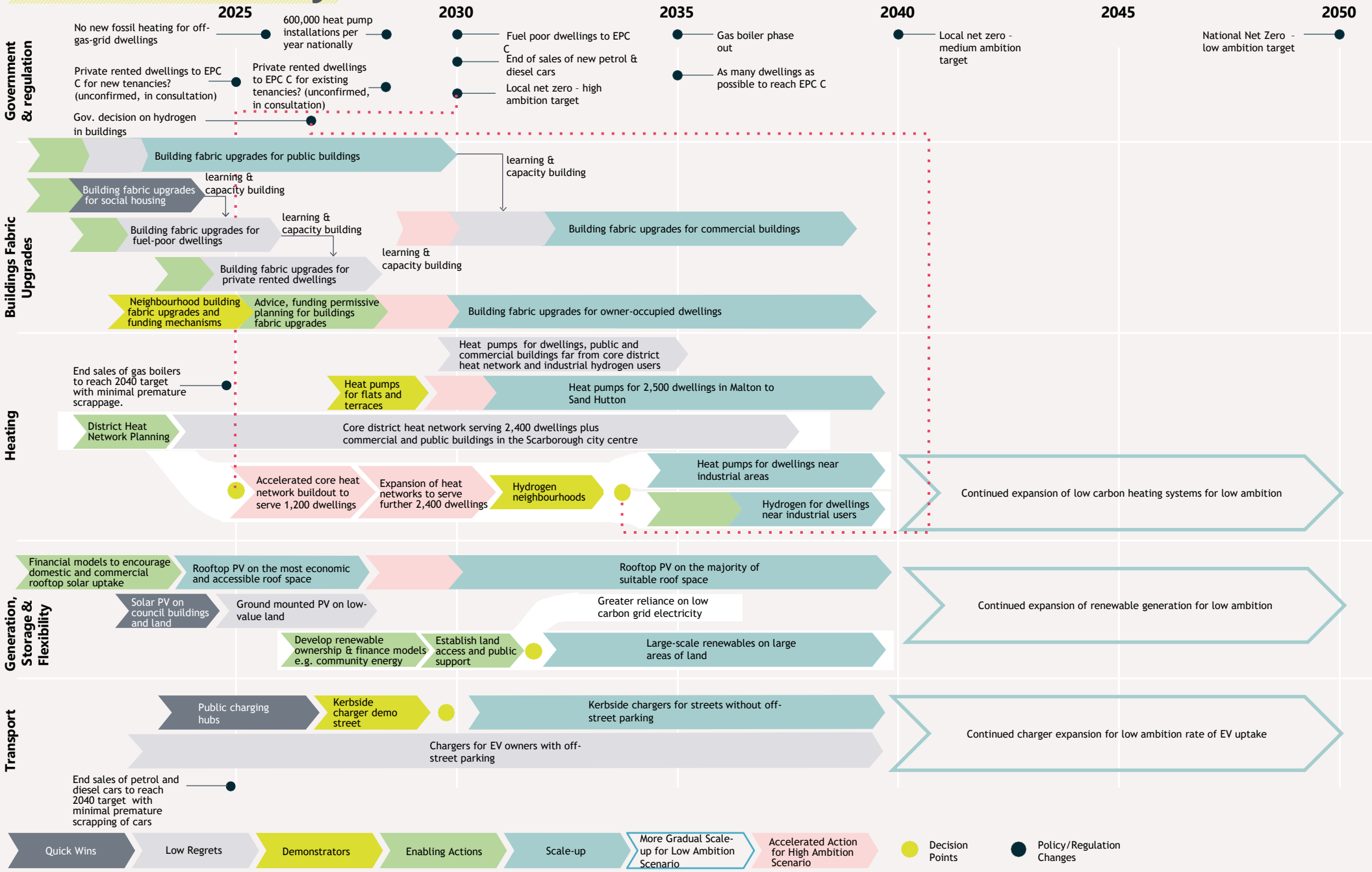
Low regrets

- 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.
- District heat network in Scarborough to serve public, commercial and private buildings in and around the town centre.
- 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 in
  The Vale, Moors & Coast, 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 to reduce emissions from consumption of grid electricity. In theory, very large areas of land could be used to produce The Vale, Moors & Coast'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
End of sales of new petrol & diesel cars
Local net zero - high ambition target
Gas boiler phase out
As many dwellings as possible to reach EPC C
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)
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 2,500 dwellings in Malton to Sand Hutton
District Heat Network Planning
Core district heat network serving 2,400 dwellings plus commercial and public buildings in the Scarborough city centre
Heat pumps for dwellings near industrial areas
Accelerated core heat network buildout to serve 1,200 dwellings
Expansion of heat networks to serve further 2,400 dwellings
Hydrogen neighbourhoods
Hydrogen for dwellings near industrial users
Continued expansion of low carbon heating systems for low ambition
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 of suitable roof space
Solar PV on council buildings and land
Ground mounted PV on low-value land
Greater reliance on low carbon grid electricity
Continued expansion of renewable generation for low ambition
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
Chargers for EV owners with off-street parking
Continued charger expansion for low ambition rate of EV uptake
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

A large proportion of dwellings across The Vale, Moors & Coast are recommended for building fabric upgrades (retrofit) to meet net zero. This is consistent across all ambition levels, with earlier targets requiring more rapid treatment of dwellings. The map shows how these building fabric upgrade measures (insulation, glazing and draughtproofing) are likely to be distributed across the region. In total, 39,500 dwellings across The Vale, Moors & Coast are recommended for upgrades at a cost of £110m. Upgrades are split into "basic" and "deep", explained on the following pages.

Prioritising the delivery of building fabric upgrades in areas with high levels of fuel poverty will maximise the impact of bill savings and the health benefits of warmer dwellings. These priority zones are shown on the map. While this plan outlines the least cost path to a net zero energy system, additional deep building fabric upgrades may be desirable to meet other local priorities, particularly fuel poverty alleviation and job creation.

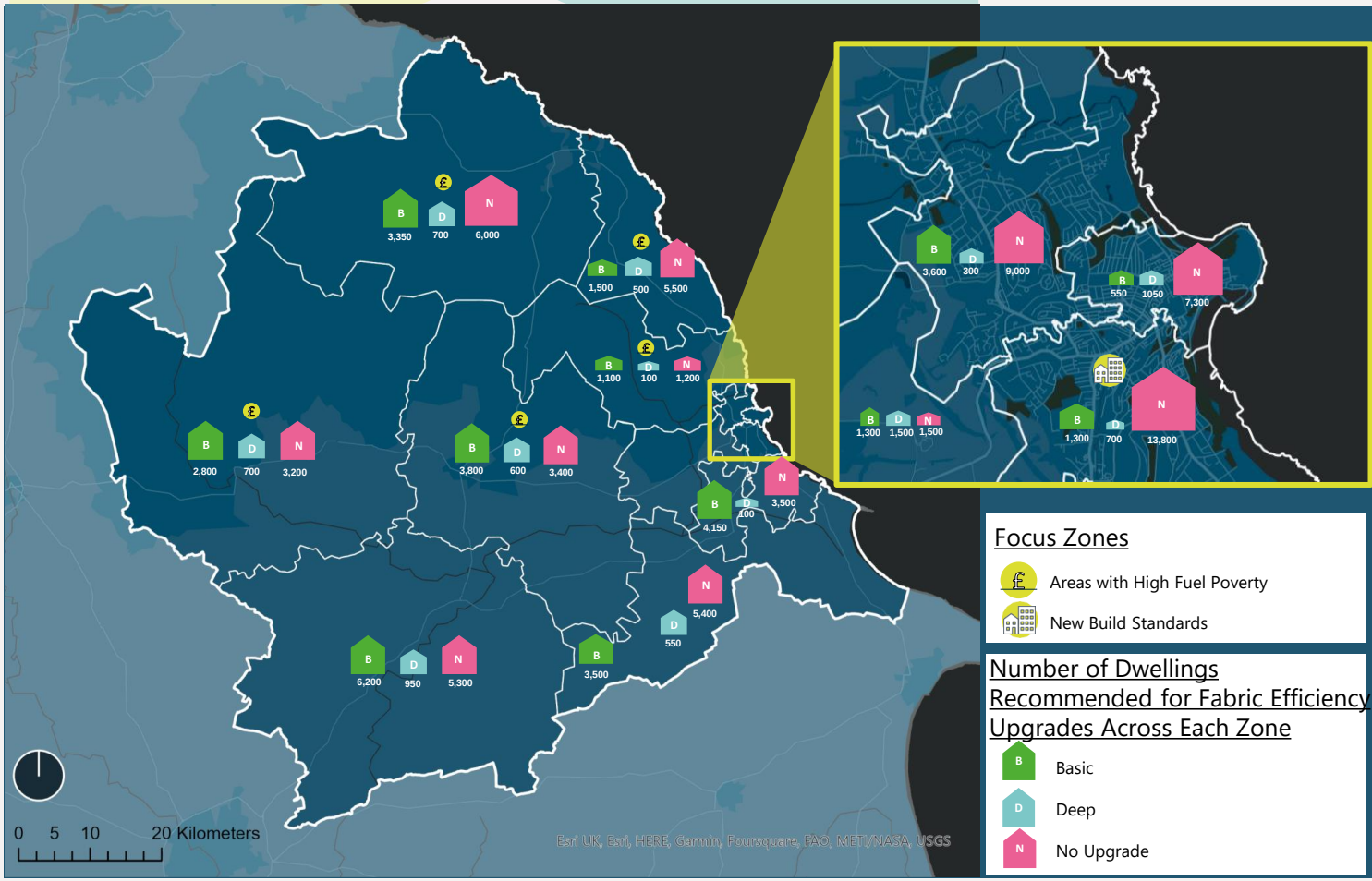
Dwellings which cater to tourism may see seasonal variation in usage. If a dwelling's usage in winter is low, the value of building fabric upgrades could be much lower. Seasonal usage patterns should be understood for these dwellings when making an investment case.

Areas with large numbers of new build dwellings planned can prioritise building to net zero standards (e.g. Passivhaus), potentially encouraged by a local design code or supplementary planning document.

Learning from previous schemes such as the Ryedale Energy Saver Scheme or North Yorks Warm Homes Scheme should be incorporated into planning future schemes.

39,500
dwellings (38%) recommended for building fabric upgrades

over £110m
capital investment in domestic building fabric upgrades required



Zones and Dwelling Types

Building fabric upgrades are improvements 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 Vale, Moors & Coast, which is influenced by the types of dwellings in each area. Where there is a high proportion of flats (such as the E. Whitby to Stationdale zone and the S. Scarborough zone) or new builds (the N. Scarborough zone), fewer upgrades are recommended. In contrast, the Malton to Sand Hutton zone is an area where the largest number of dwellings with cost-effective potential for upgrades can be found.

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.

Focus Zones

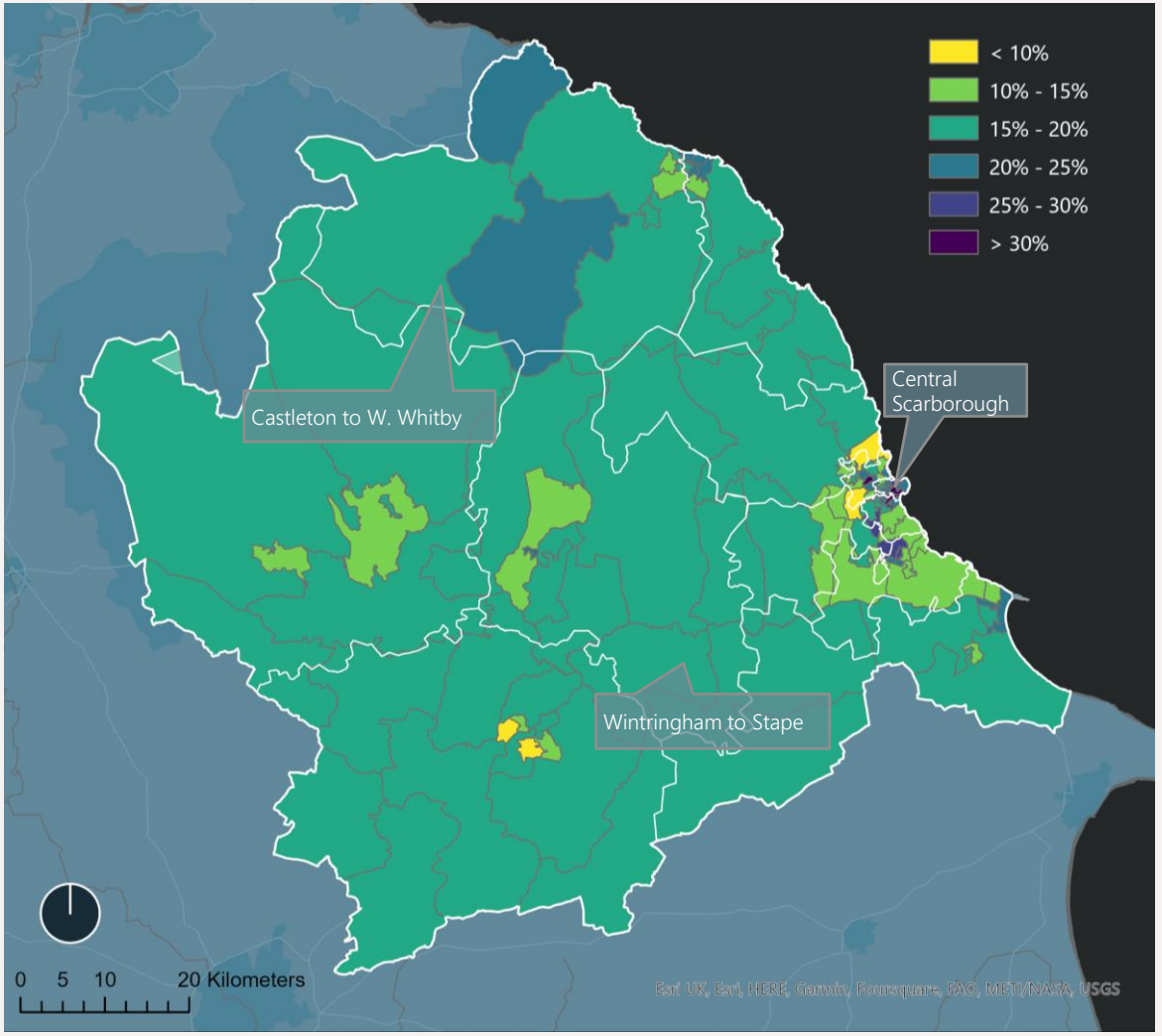
Focus zones highlight areas where particularly large numbers of a certain solution are recommended, directing efforts towards delivery at scale in that zone, often in advance of other parts of the plan. Focus zones can account for factors such as the socio-economic conditions in an area, network capacity,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

The 'Wintringham to Stape' & 'Castleton to W. Whitby' Zones

These zones have been designated focus zones as they have high levels of fuel poverty, coinciding with high potential for cost-effective building fabric upgrade, so prioritising delivery of building fabric projects in this area would unleash the high potential for impact and benefits. Over 3,800 dwellings in The 'Wintringham to Stape' zone and 3,350 in the 'Castleton to W. Whitby' zone would benefit from basic building fabric upgrades, with almost 1,300 dwellings benefiting from deep upgrades across the two zones combined. A prominent housing type to focus on is detached dwellings built after 1944; 2,000 of these can be improved with basic insulation in the 'Wintringham to Stape' zone and 1,400 in the 'Castleton to W. Whitby' zone.

The 'Central Scarborough' Zone

Opportunities in Scarborough are slightly more limited overall, but since fuel poverty is especially prevalent in the 'Central Scarborough' zone, the opportunity for building fabric upgrades on 2,250 terrace dwellings built pre-1914 could be highly beneficial for the town centre and its residents.



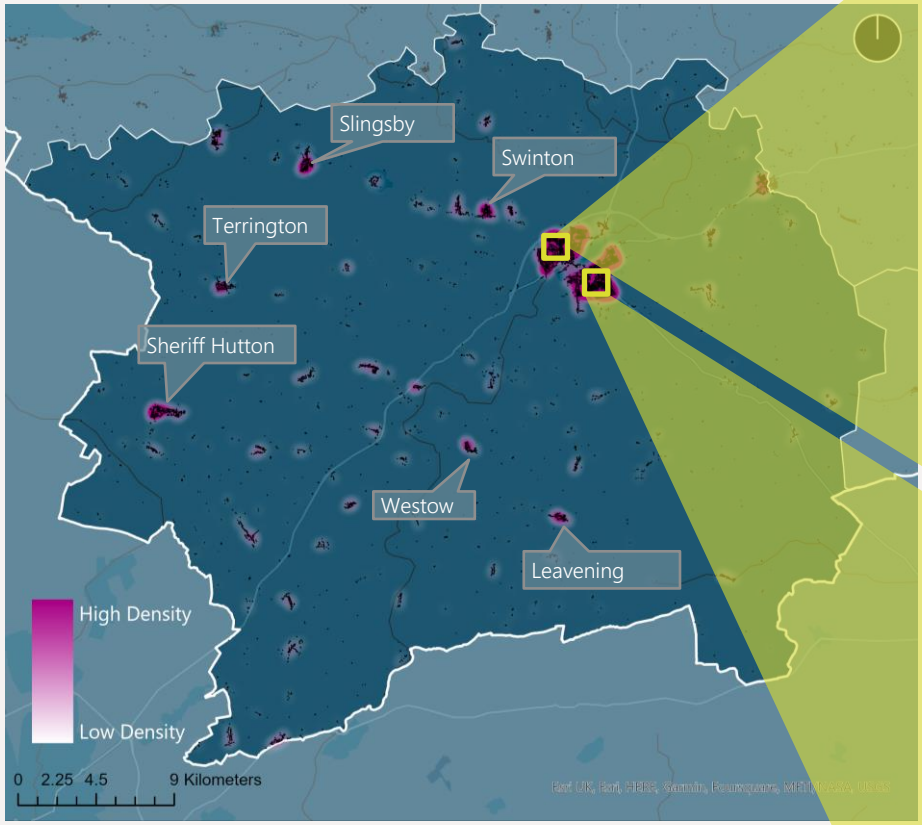
Estimated Proportion of Dwellings in Fuel Poverty

Focus Zones

The 'Malton to Sand Hutton' Zone

This zone has the largest number of dwellings overall which would benefit from basic building fabric upgrades.

Approximately one-third of dwellings in this area are detached dwellings, one-third are semi-detached, and one-third terraces and flats. Over 2,850 detached dwellings built after 1944 could receive basic upgrades.



Roll-out of Basic Building Fabric Upgrades in the 'Malton to Sand Hutton' zone

Fabric Upgrades in Malton

Fabric Upgrades in Norton

The 'Central Scarborough' Zone

This zone is where the most deep building fabric upgrades could take place, having the greatest proportion of pre-1914 dwellings (50% of those in this zone), and a low representation of the age band normally selected for basic upgrades. While there are large numbers of flats* not selected for upgrades, this zone does have 2,250 terraces built pre-1914 which could be considered for deep upgrades.

* Flats are considered individually and therefore are not often suitable for building fabric upgrades. However, they can be considered collectively as blocks to improve their thermal performance.


Heating
COUNTY OF

Overview

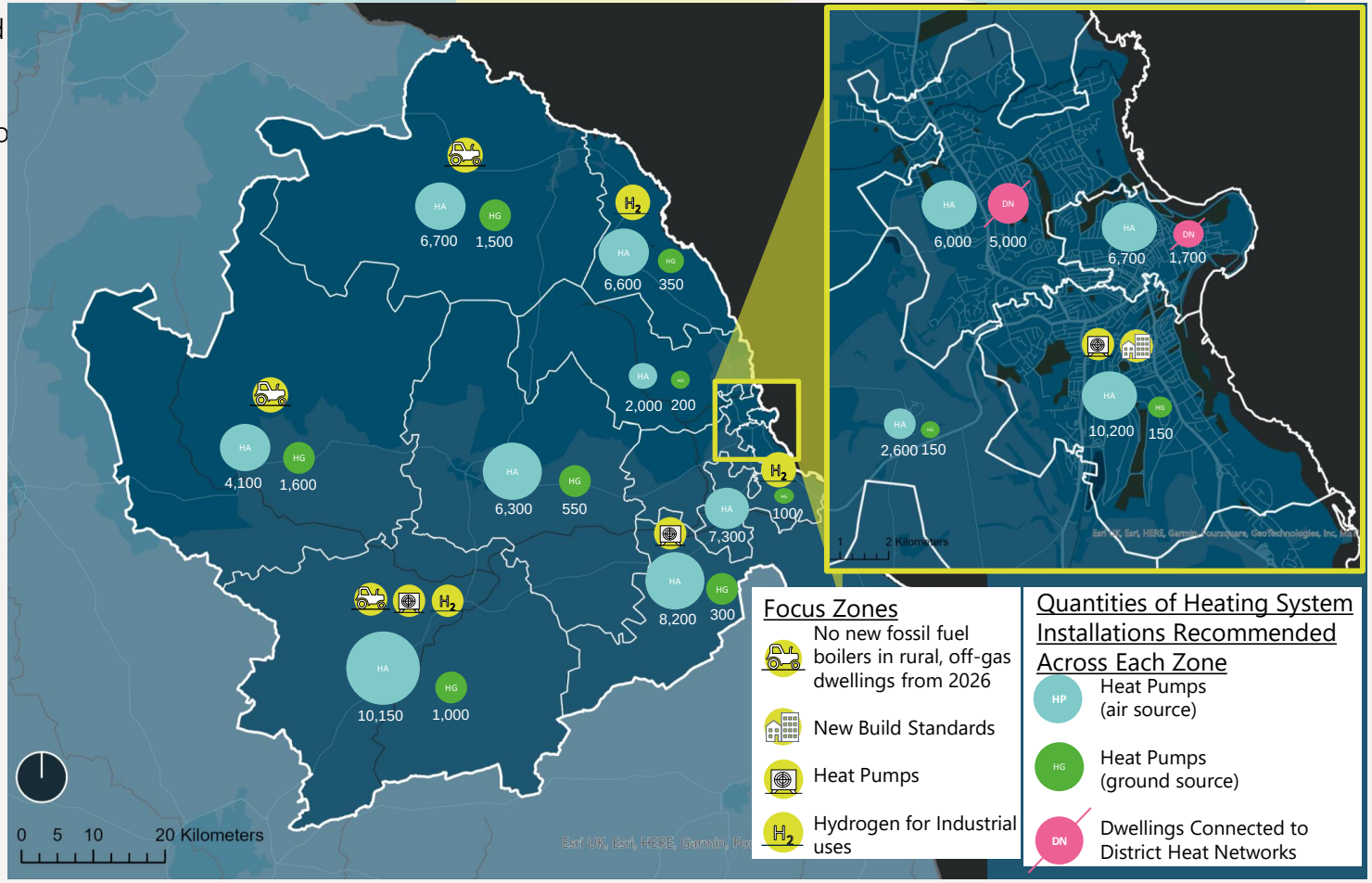
Fossil fuel boilers make up the majority of heating systems in dwellings (90%) and non-domestic buildings, with fossil fuel use in buildings accounting for 28% of emissions in The Vale, Moors & Coast (excluding industry). To achieve a net zero energy system, these will need to be replaced with low carbon heating systems. Heating systems can be replaced at their natural end-of-life, however, supply chain capacity and household awareness will need to be built ahead of time 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 achieve a net zero energy system by 2040 in order to minimise premature replacements of 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 Vale, Moors & Coast, 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). Holiday homes which see low occupancy in winter may be more cost-effectively decarbonised with resistive heating, rather than more expensive technology with lower running costs like heat pumps. 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. Areas with large numbers of new build dwellings planned can prioritise building to net zero standards, avoiding the need for costlier retrofit later.

83,000 dwellings recommended for heat pump installations

11,000 dwellings recommended for connection to district heat networks

c.£430m 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

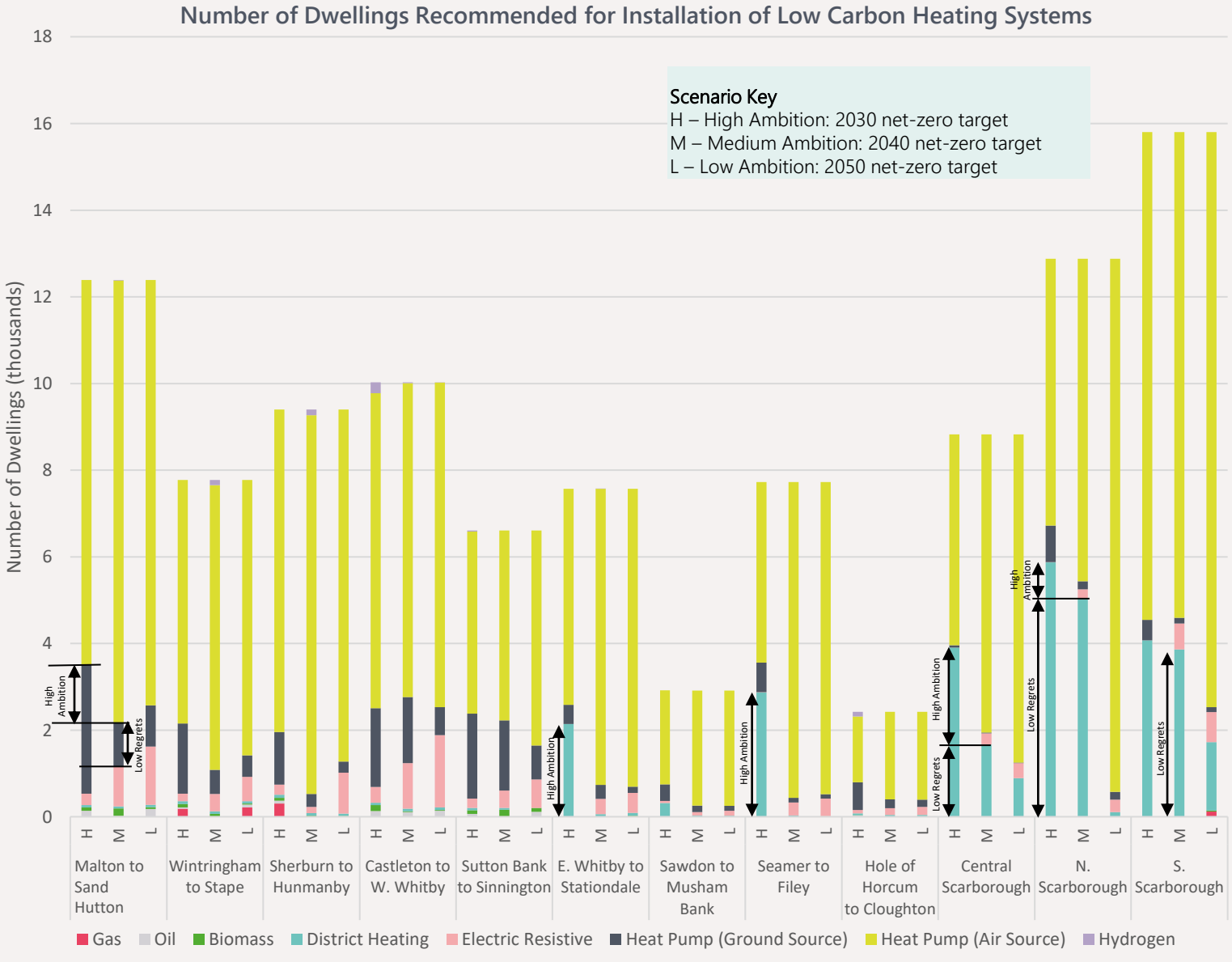
Domestic Buildings

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.

The extent of the heat network in Scarborough in particular depends on the level of ambition of the scenario; earlier net zero targets call for a larger network to make more efficient use of higher carbon grid electricity in the earlier years. Whereas the later targets allow cleaner grid electricity to be used in slightly less efficient individual dwelling heat pumps. An additional heat network in Whitby is also recommended for the high ambition scenario. Examples where the ambition level does or doesn't affect the heat network size are highlighted by the arrows in the chart. District heat networks could also be advantageous for dwellings with limited space for the additional equipment required with a heat pump system (e.g. terraces).

Ground source heat pumps can be more advantageous in rural areas, where larger properties and more garden space can make them a viable option. However, air source heat pumps would also be suitable for many of these properties, reducing installation costs in exchange for slightly higher running costs. Property specific consideration would be needed to determine the preferred solution. In addition, shared ground loop systems may also be an option for clusters of suitable properties

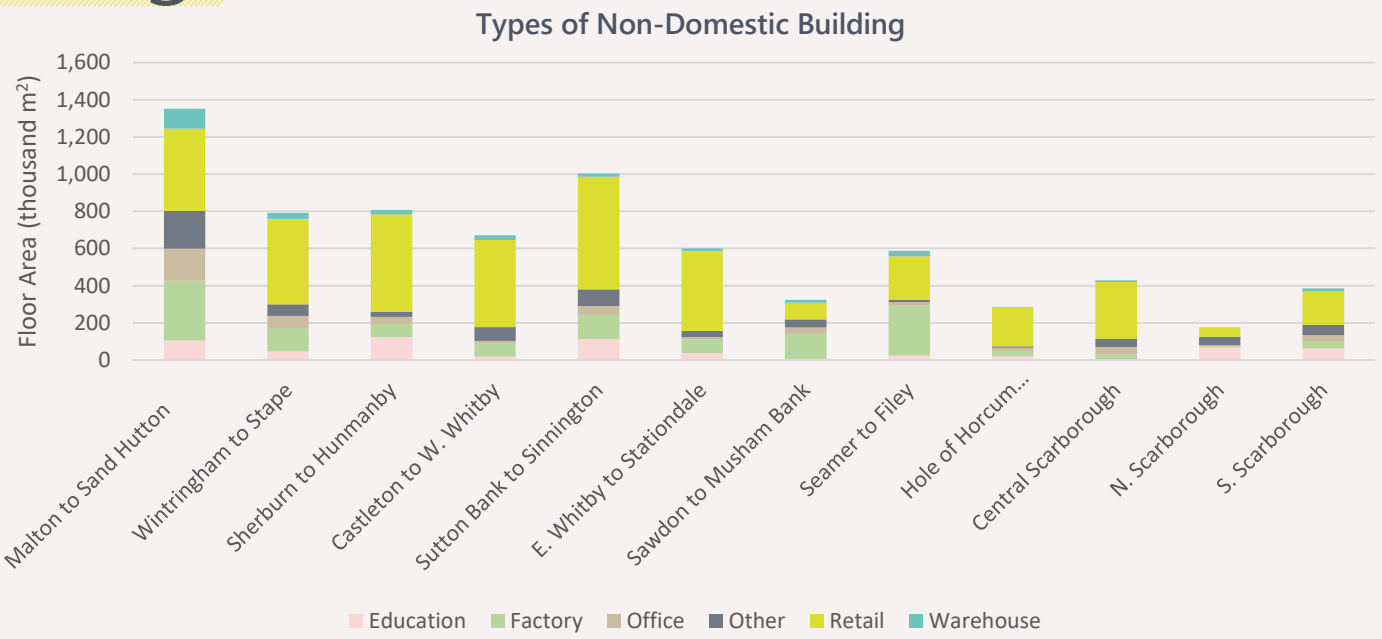
Hydrogen boilers could also provide a low-carbon replacement for fossil gas boilers, but they are dependent on a supply of hydrogen becoming available at acceptable cost and carbon emissions, explored in full on page 28

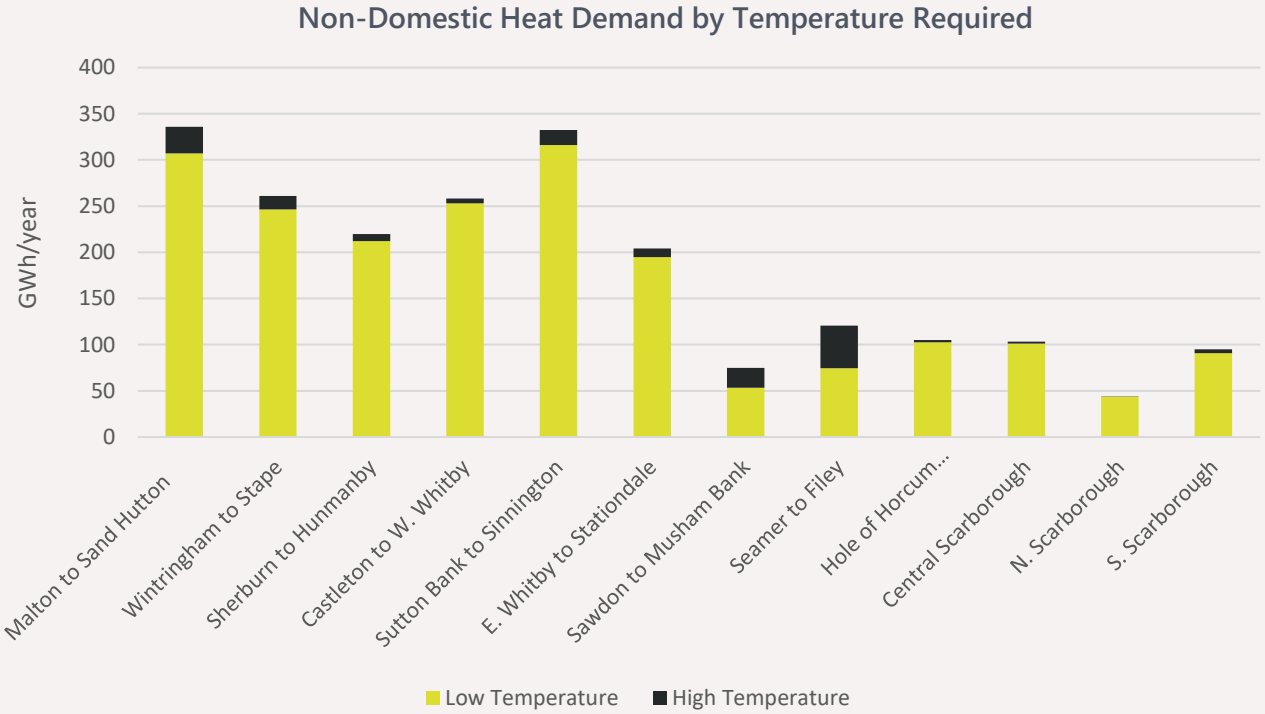


Non-Domestic Buildings

Non-domestic buildings are categorised into a range of uses, shown in the top chart. Most of the heat demand in non-domestic buildings is for space heating and hot water, and can typically be decarbonised using heat pumps, or by connecting to district heat networks in areas of high heat density. However, a small portion of heat is likely to be required at high temperature for specialised industrial processes, as shown on the lower chart.

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. 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, while the medium ambition scenario, which aims to achieve a net zero energy system by 2040, would require significant planning and rapid deployment for hydrogen becoming available shortly before the net zero target date. However, earlier decarbonisation of these processes could be achieved with local electrolysers to produce hydrogen in the absence of a pipeline supply.

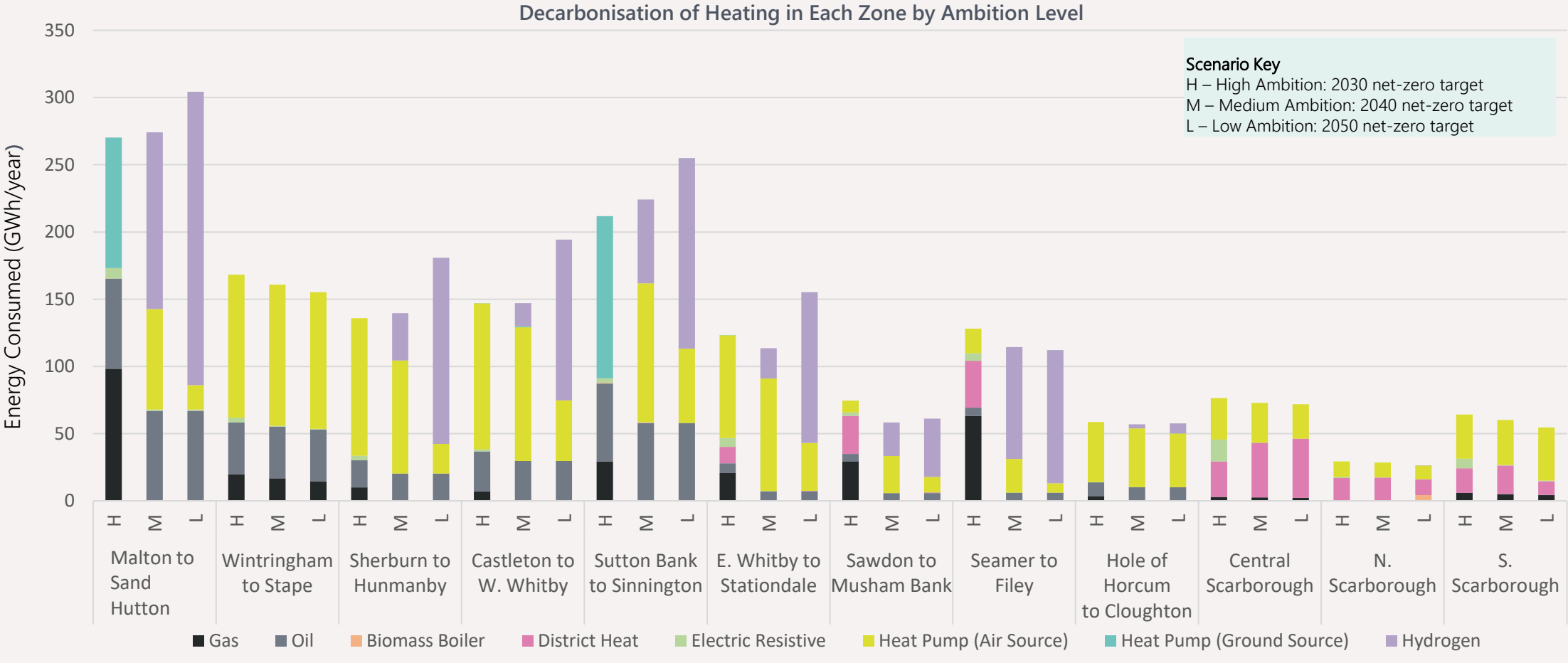




Non-Domestic Buildings

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, or by connecting to district heat networks in town centres as shown in the chart. 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. More hydrogen is used in the lower ambition scenarios, as a later energy system net zero date leaves more time to wait for hydrogen availability before replacing heating systems. 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.

Significant quantities of oil consumption remain in some of the modelled pathways due to assumptions about the practicalities of replacing oil usage on farms. For these uses, alternatives such as biofuels could be explored. It may also be found that these uses can be electrified, similarly to off-gas-grid dwellings.



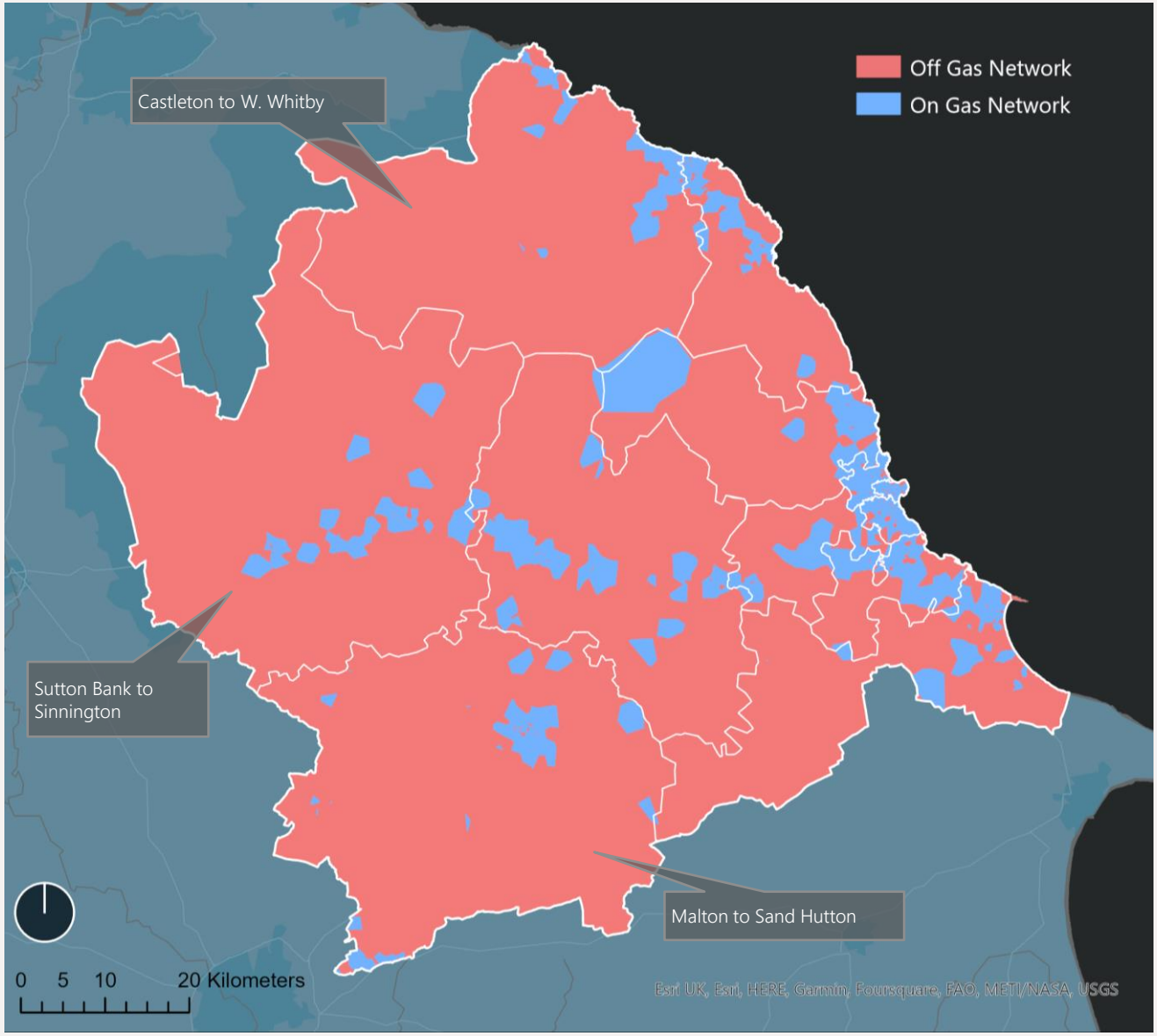
Rural Focus Zones

The 'Malton to Sand Hutton', 'Castleton to W. Whitby' and 'Sutton Bank to Sinnington' zones have the largest number of dwellings which are not connected to the gas grid (5,700 (46%), 4,750 (48%) and 3,450 (53%) respectively).

The government's 'Heat and Buildings Strategy' proposes to end the installation of fossil-fuelled heating systems in off-gas dwellings from 2026, meaning rural dwellings will decarbonise in an earlier wave than most of the housing stock.

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*.



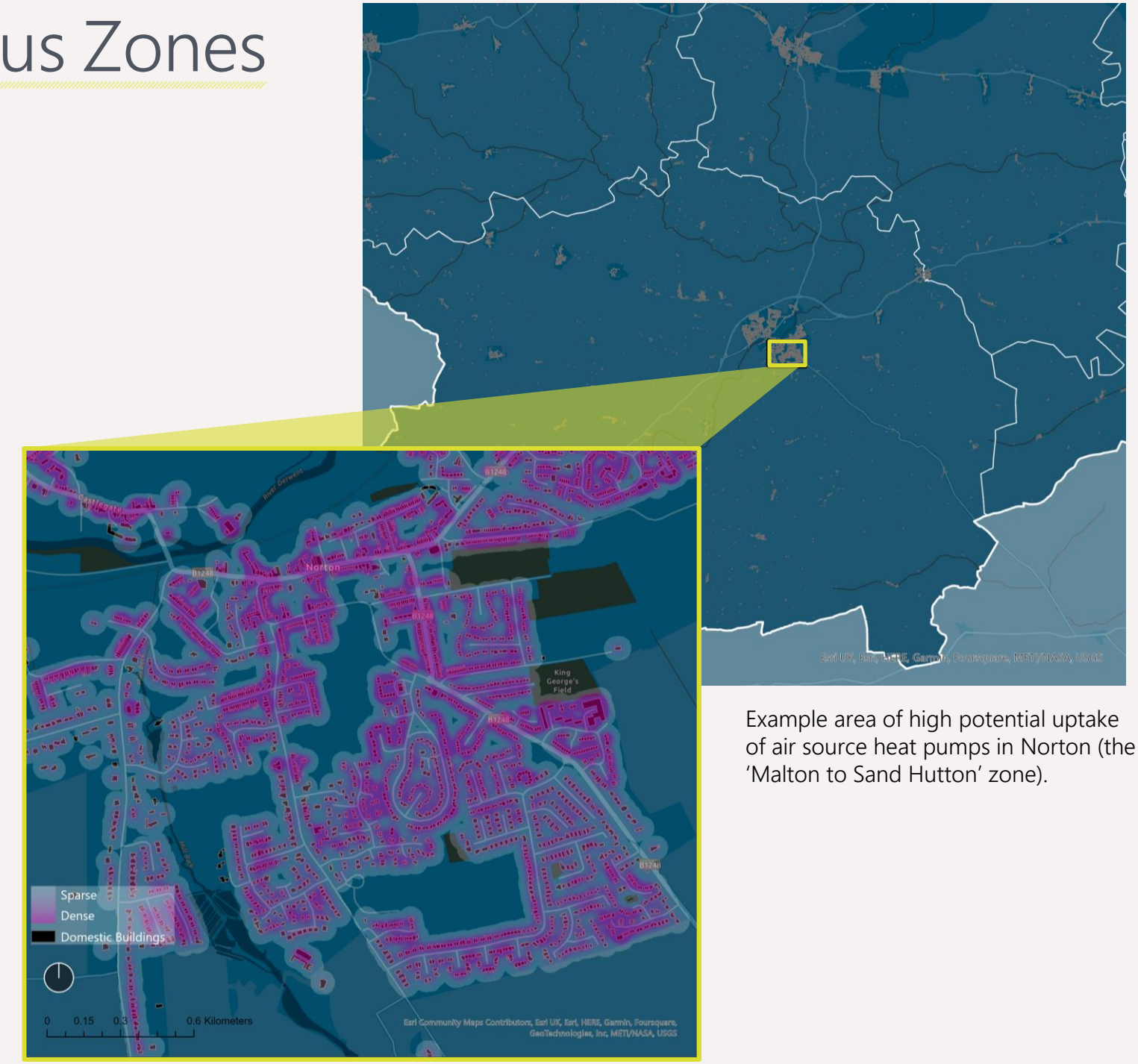
Areas with and without coverage from the gas grid

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

Heat Pump Focus Zones

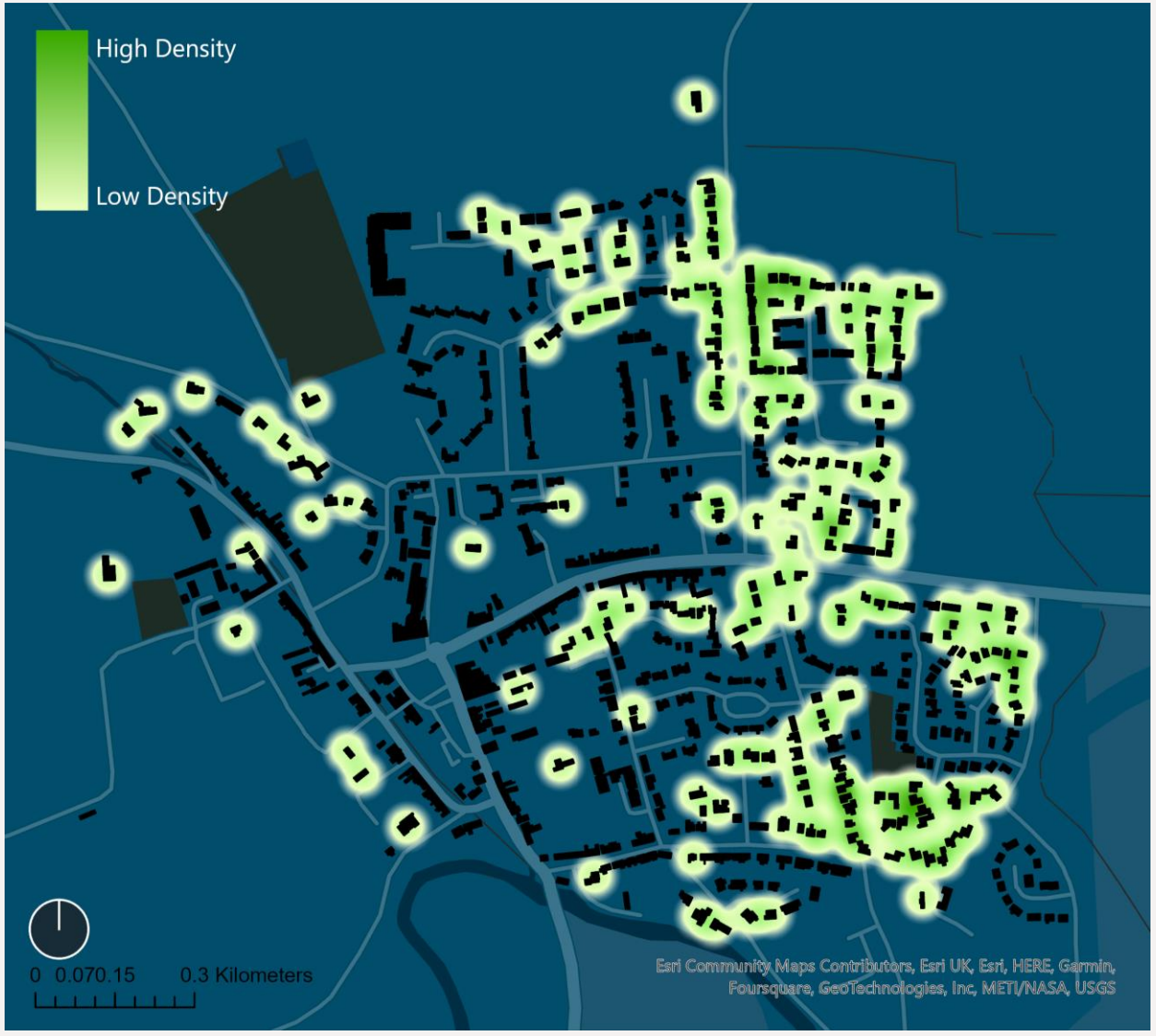
The 'Malton to Sand Hutton', 'Sherburn to Hunmanby' and 'S. Scarborough' zones have greatest potential for air source heat pump installations (10,150, 8,200 and 10,200 respectively) across the full range of ages and types of dwellings, from flats to detached, pre-1914 to new build.

Installations of this scale will require significant supply chain scale-up, citizen awareness and buy-in, and attractive commercial offerings to compete with existing fossil fuel options. These three zones also have some spare capacity in the electrical distribution system, allowing roll out to commence before encountering constraints, particularly the 'Malton to Sand Hutton' zone. The 'Castleton to W. Whitby' zone also has substantial spare capacity, and with 7,750 heat pumps to be installed in total, this area is also a suitable heat pump focus zone.



Example area of high potential uptake of air source heat pumps in Norton (the 'Malton to Sand Hutton' zone).

Heat Pump Focus Zones

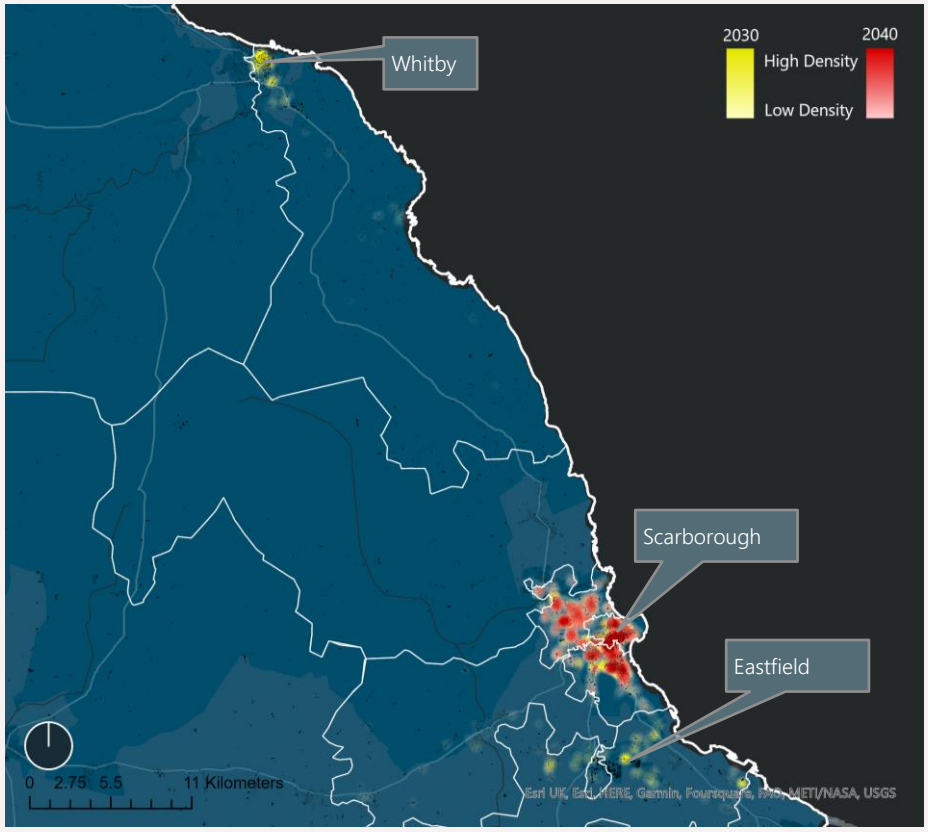


Example area of high potential for ground source heat pumps in Helmsley (in the 'Sutton Bank to Sinnington' zone).

Air source heat pumps are typically the most cost-effective type of heat pump due to their lower capital costs compared to ground source heat pumps. However, in the 'Castleton to W. Whitby' and the 'Sutton Bank to Sinnington' zones, there is an economic case for installing significant numbers of ground source heat pumps in detached dwellings with land available (1,450 and 1,600 respectively). Whilst these dwellings have been identified as having the potential for ground source heat pumps, no site survey has been conducted to ascertain whether there is a suitable amount of land availability or any further practical considerations.

For large properties, the higher heat demand can justify the higher upfront cost of ground source, since it achieves higher efficiencies and lower running costs. Additionally, lower peak demands can reduce network upgrade costs. The map gives an example of a neighbourhood in the 'Sutton Bank to Sinnington' zone where dwellings which seem suitable for ground source heat pumps are clustered and therefore could form a demonstration neighbourhood.

District Heat Networks (DHN)



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

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 urban centres.

The town of Scarborough is likely to be viable for a district heating scheme, serving over 10,550 dwellings (28%) and non-domestic buildings across the three zones, with further potential to develop a network in Whitby and Eastfield (in the 'Seamer to Filey' zone) as well. The red shading in the map shows core district heat coverage, where buildings are connected to the network in both medium and high ambition scenarios, so are low regrets. The yellow shading shows the additional coverage of heat networks in the high ambition scenario, with core networks expanding to serve more buildings and additional networks being built.

The Green Heat Network Fund* will have quarterly application rounds from March 2022 until 2025, and could provide funding for heat networks in Scarborough.

Zone	No. of Dwellings Connected	Domestic Peak Demand (MW)	Non-domestic Peak Demand (MW)	Total Peak Demand (MW)
Central Scarborough	1,670	6.6	11.6	15.2
N. Scarborough	5,022	9.7	7.4	14.7
S. Scarborough	3,861	11	6	14.2

Scarborough sits on a moderately productive aquifer** which has the potential to provide low carbon heat for heat networks. Coastal locations also present opportunities for water source heat pumps.

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

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

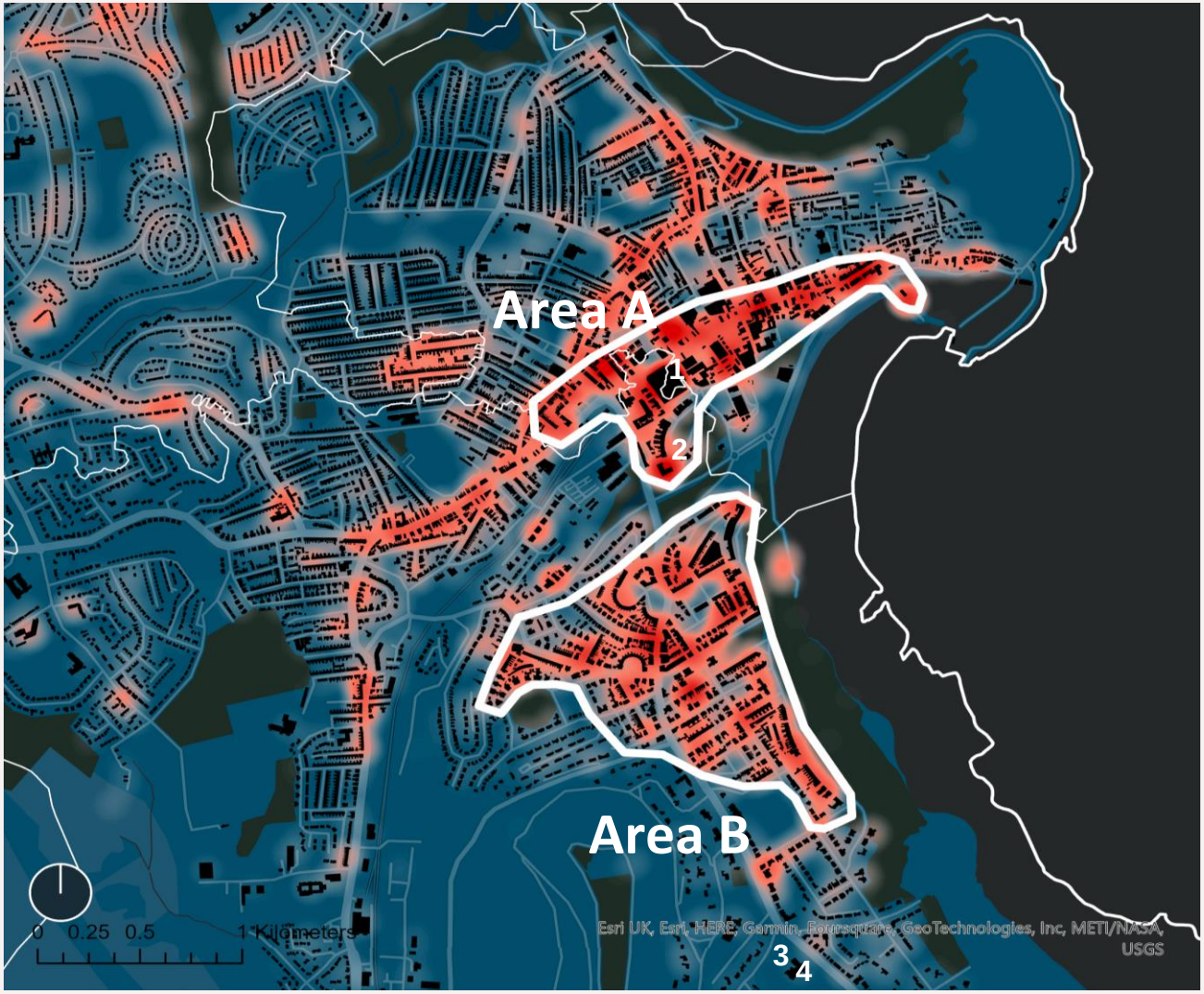
Figures shown are based on the medium ambition scenario. Total peak demands are lower than the sum of domestic and non-domestic peaks, as they will not fully coincide in time

Scarborough Heat Network

Within Scarborough, there are two areas (shown in the map) which stand out as suitable starting points for district heat network deployment, due to the higher heat demand density (a large amount of heat requirement in a small area). From these starting points, networks could expand to serve significant numbers of terraced dwellings – high density housing which can be more difficult to site heat pump equipment in – particularly between areas A & B, as well as other types of dwellings and non-domestic buildings.

A wastewater treatment plant located a short distance to the north of the area shown in the map may be suitable as a waste heat contributor to the networks.

The mixture of domestic and non-domestic buildings allows for more of a balanced load across the network at any given time. Heat network development projects should consider working with the large hotels, Scarborough General Hospital and other large public buildings all of which have large demands for heat and may be both anchor loads and providers of heat for use in networks. Some examples of potential anchor loads are labelled on the map.
The table shows the split of domestic and non-domestic properties and the peak demands. (Note: peaks are not additive as domestic and non-domestic peaks will not occur at the same time.)



1. Brunswick Shopping Centre
2. Scarborough Art Gallery
3. Bramcote Junior School
4. Scarborough College

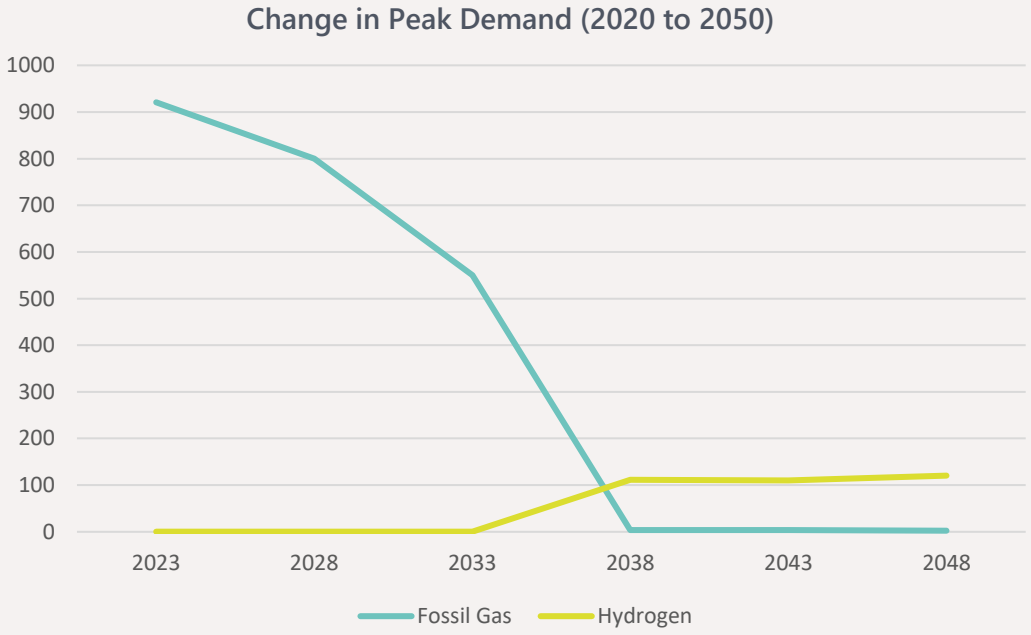
	Number of Domestic Dwellings	Number of Non-Domestic Properties	Domestic Peak Demand (MW)	Non-Domestic Peak Demand (MW)	Total Peak Demand (MW)
Area A	611	1,138	3.15	6.14	7.88
Area B	1,782	180	4.91	1.37	5.68

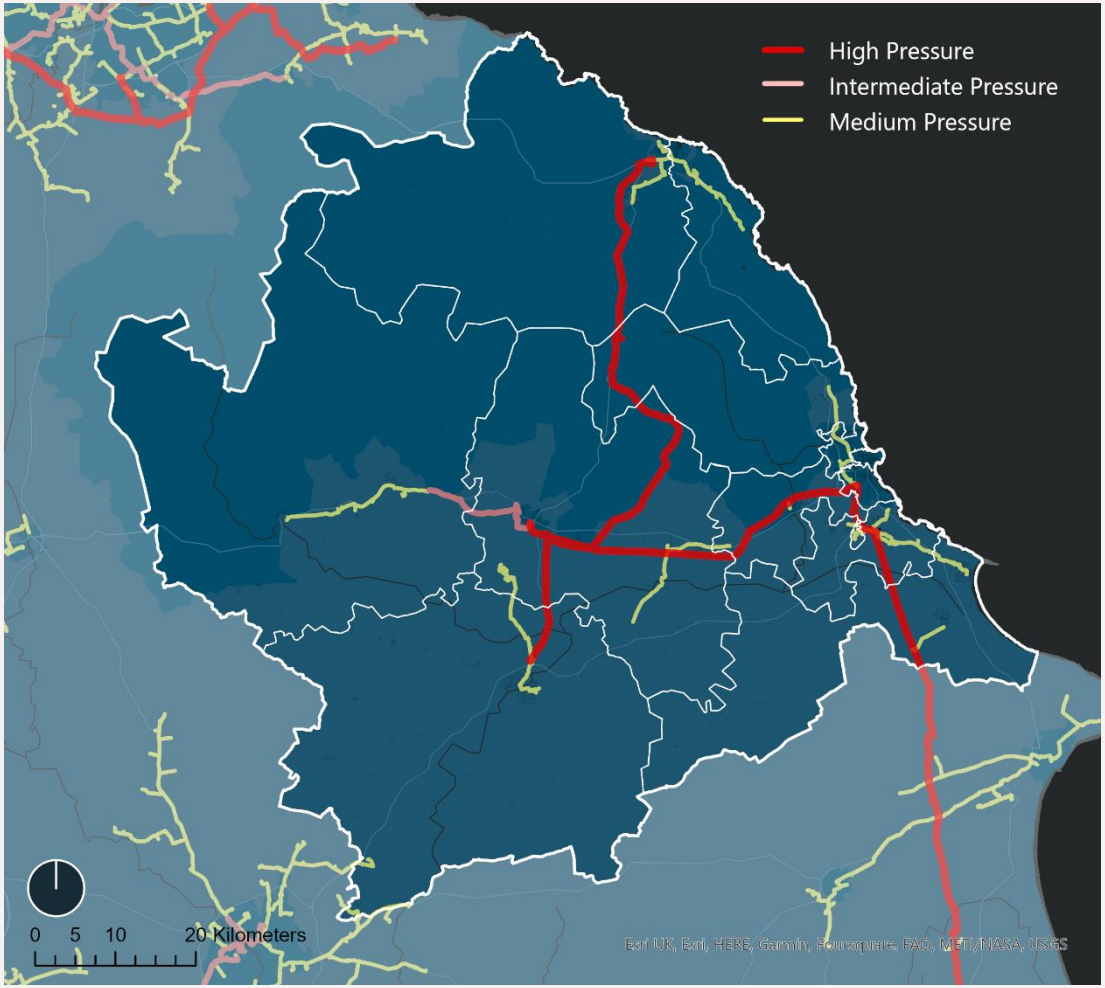
Gas Network

The gas network in The Vale, Moors & Coast is operated under license by Northern Gas Networks and currently supplies fossil gas to the majority of dwellings in the area (extents of the high-pressure network 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 Vale, Moors & Coast is around 2,027 GWh per year. Meeting the net zero goal would mean a steep decline in fossil gas consumed, illustrated in the graph below (based on medium ambition scenario).

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





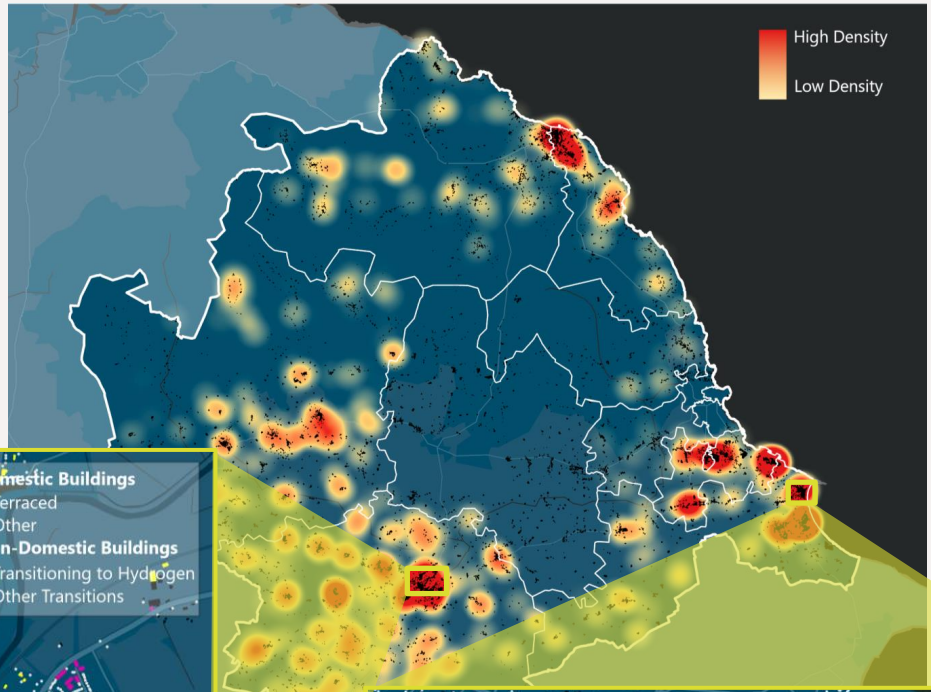
Map of the gas network in The Vale, Moors & Coast

Hydrogen

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 those of the 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 at any time using electrolysers, powered by low carbon electricity, to produce hydrogen.

Once these industrial clusters are supplied by hydrogen, nearby dwellings and non-domestic buildings could also be transitioned to hydrogen heating, avoiding the disruption, upfront cost and space requirements of heat pump installation. This may be particularly valuable in dwellings where space for heat pump equipment is constrained, such as the terraces in Malton and Filey. The maps show example neighbourhoods where potential users of hydrogen for industrial purposes are near to hard-to-decarbonise dwellings.

Use of hydrogen for high-temperature industrial processes.



Example areas (Malton and Norton, above; Filey, right) where hydrogen used on industrial estates could benefit nearby hard-to-electrify dwellings,

- https://h21.green/about/

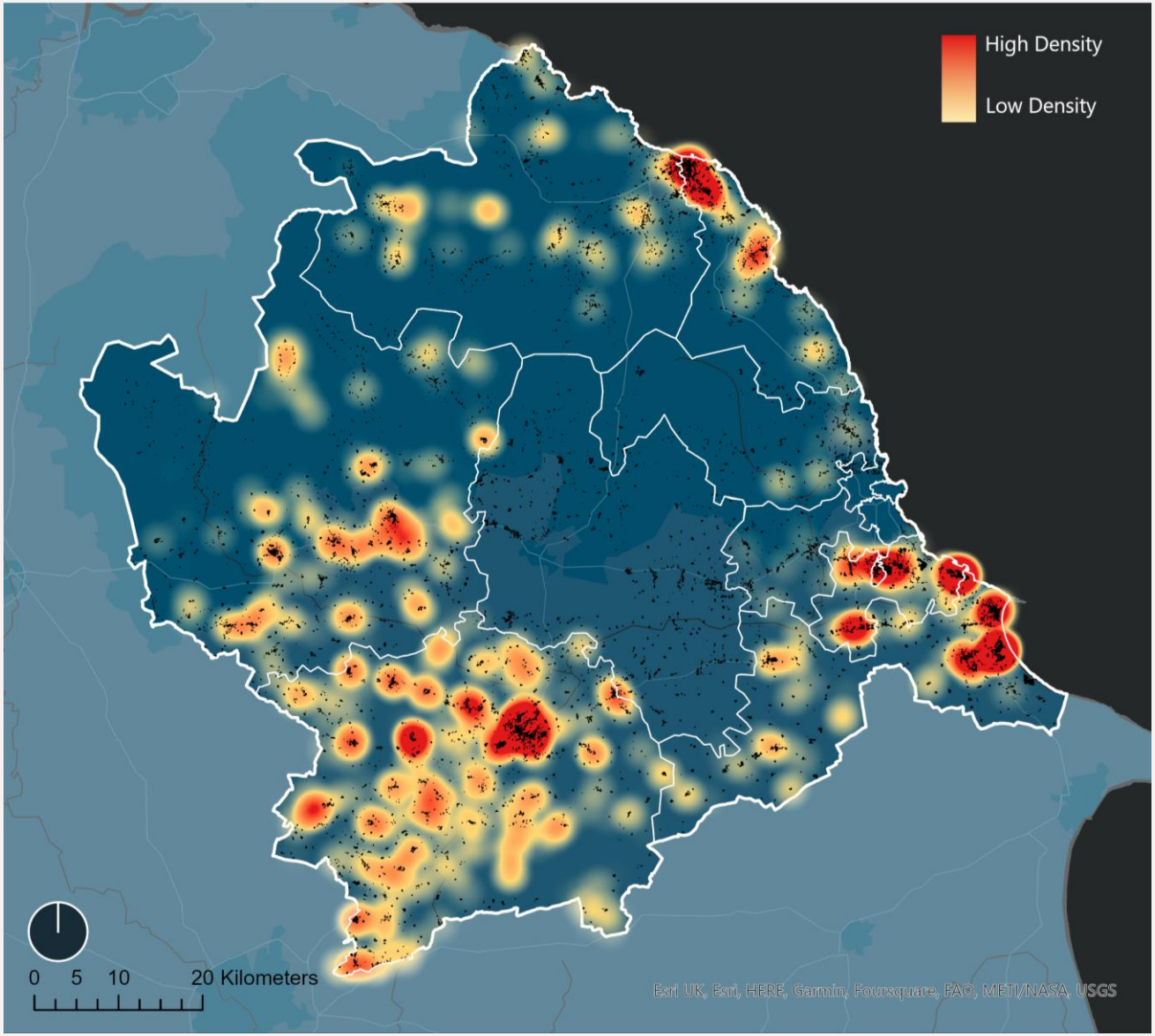
** Hydrogen production cost based on BEIS figures
https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1011506/Hydrogen_Production_Costs_2021.pdf

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

Hydrogen

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.

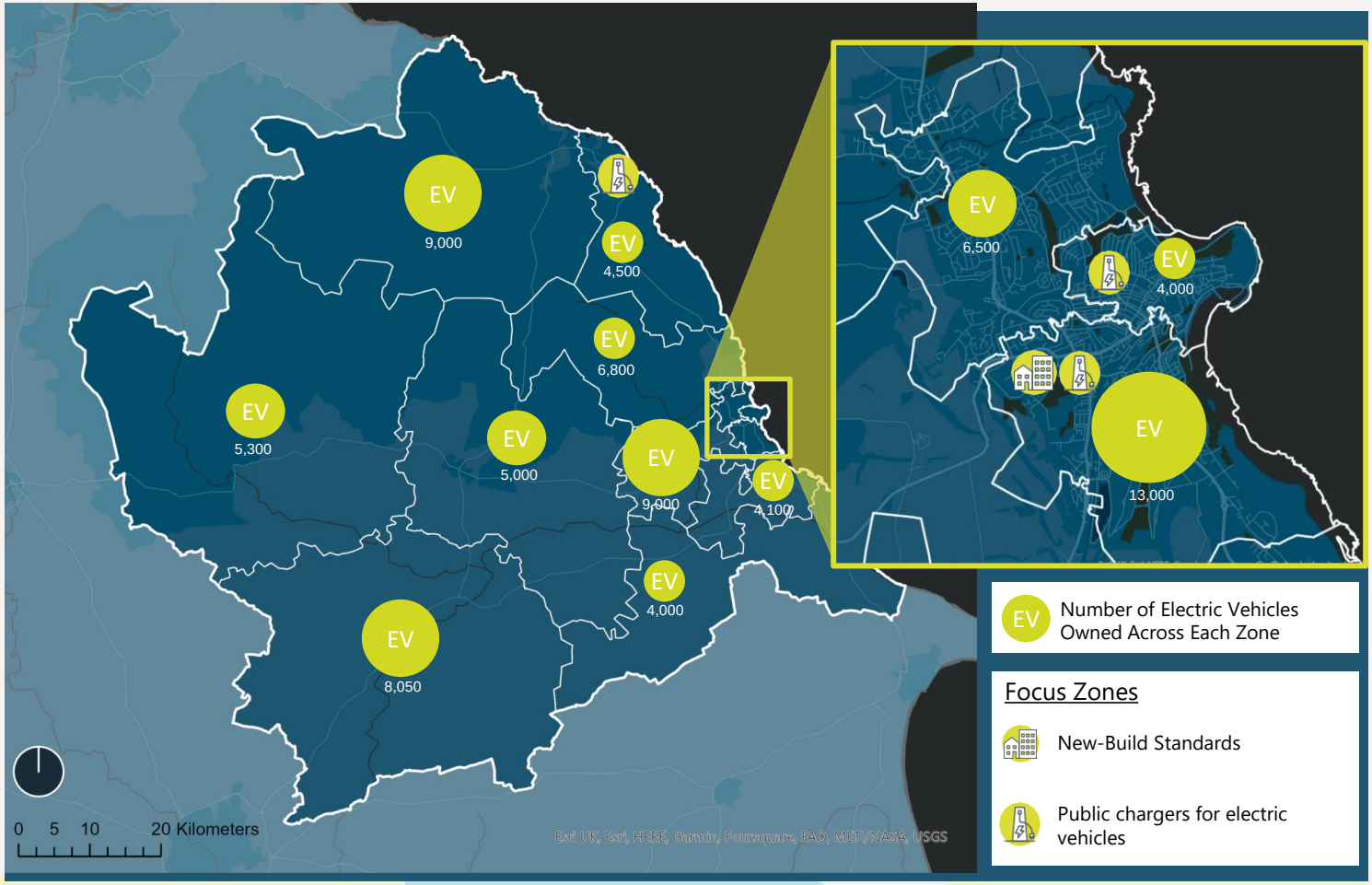
Recognising that there is uncertainty associated with the cost and carbon projections used for hydrogen, near-term focus should be centred on the identified heat pump and district heat network focus zones, keeping options open for areas outside the focus zones. The UK government is expected to clarify its strategy on the use of hydrogen for heating buildings in 2026, which will give a steer on the decisions for these areas.



Use of hydrogen for high-temperature industrial processes

Transport

EV Overview



90,000
Electric cars (including plug-in hybrids) by 2040

180 GWh/year
Energy consumption for charging when 100% of cars and vans are electric

42%
Households have off-street parking, suitable for home charging

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 are used to anticipate the electricity demand across The Vale, Moors & Coast 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 Vale, Moors & Coast. 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.

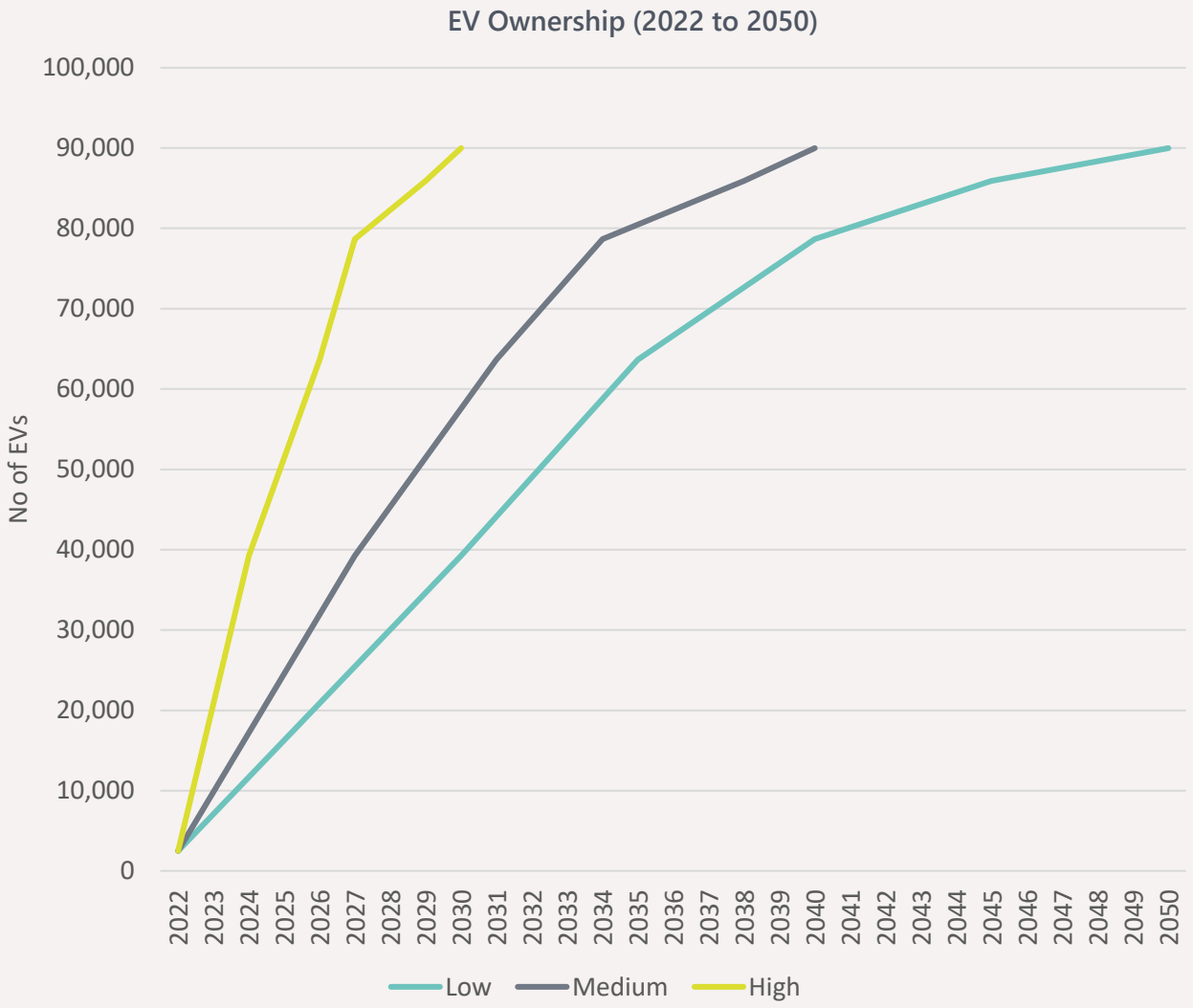
Areas with large numbers of new builds expected can ensure dwellings are built with EV chargers in place, avoiding the need for costlier retrofit at a later date.

EV Projections

Based on projections by Transport for the North, private electric vehicles are expected to grow from their current level of around 2,500 in the year 2022 to over 63,000 vehicles (~70% of the total fleet) by 2030 and around 90,000 (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 to 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 removes the 'range anxiety' often cited as a block to EV uptake.

Given the seasonal nature of the tourist economy of the region, policy will need to address whether infrastructure should be provided for average or peak demand.

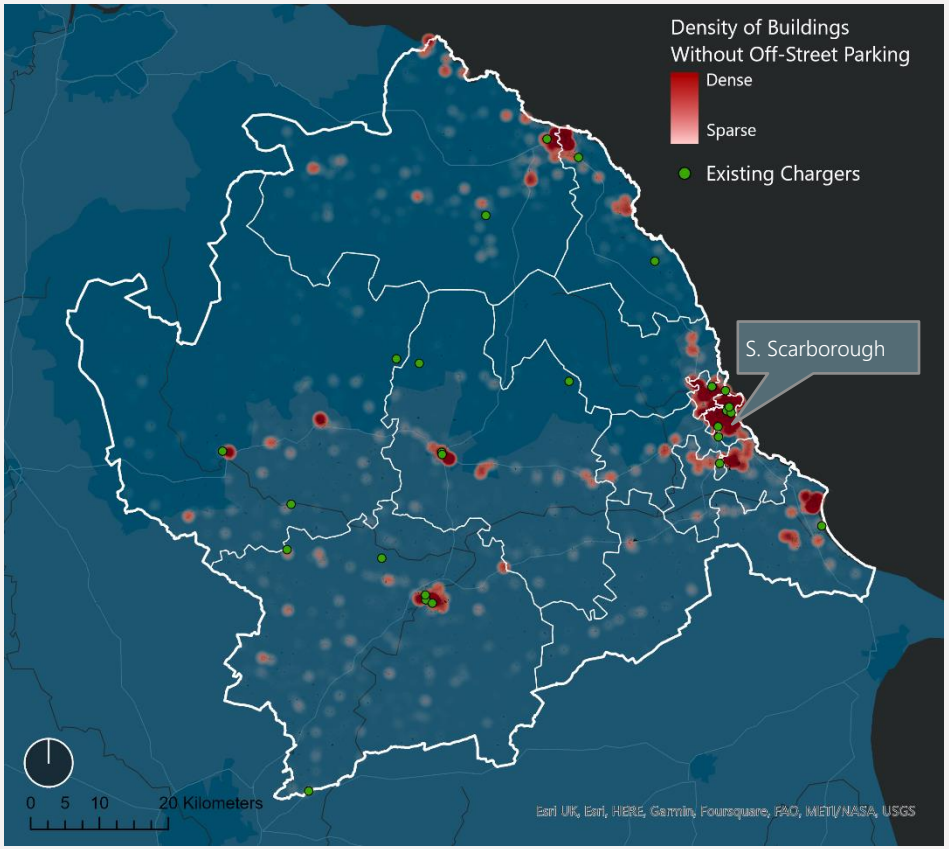
For more information about the Transport for the North data which fed into this plan please visit: https://evcivisualiser.z33.web.core.windows.net



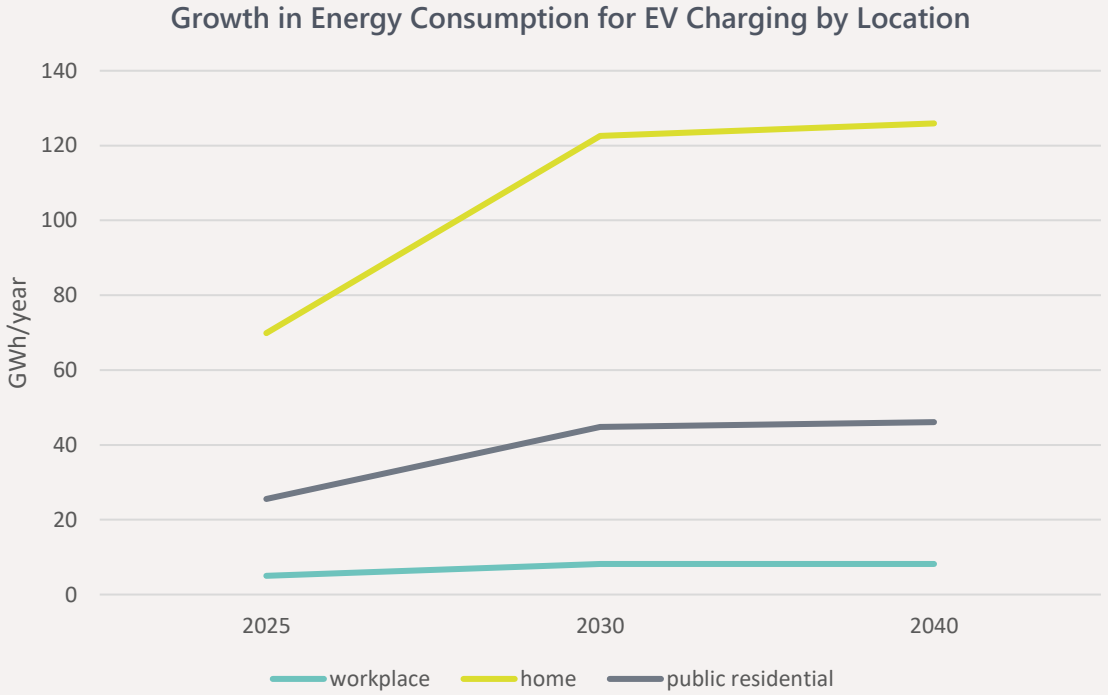
TRANSPORT FOR THE NORTH

EV Charging Infrastructure

Density of housing without off-street parking



Areas of high-density housing without off-street parking exist in several areas, particularly urban. For example, only around 21% of the 'S. Scarborough' zone's residents have off-street parking; this zone would need to be prioritised for public charging infrastructure to ensure an equitable transition to low carbon transport.



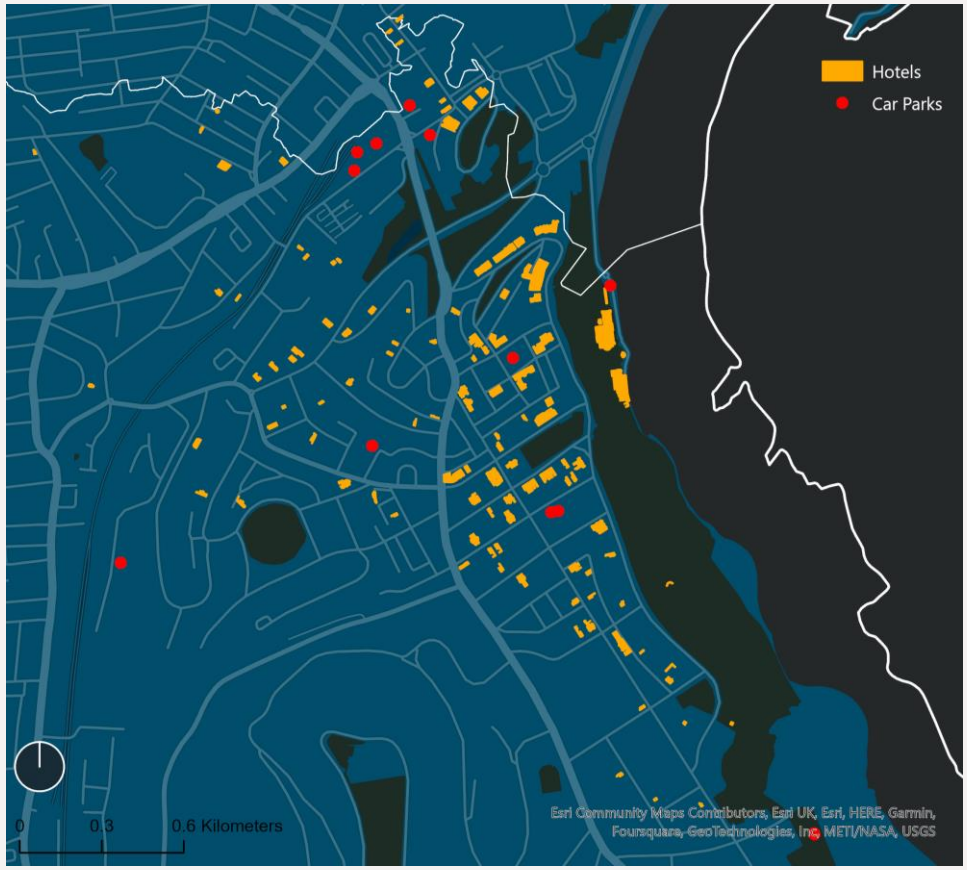
Those residents without off-street parking will require ready access to charging hubs, kerb-side charging, destination charging, workplace charging, etc. Only 41% of dwellings have suitable off-street parking to facilitate home EV charging, therefore some areas will require significant investment in publicly accessible EV charging infrastructure. Funds such as ORCS (On-street residential charge point scheme) and 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. Those residents without off-street parking will require ready access to charging hubs, i.e. kerb-side charging, destination charging, workplace charging, etc.

EV Focus Zones

The 'S. Scarborough' zone has the fastest expected roll-out of EVs, with a projection of over 12,000 EVs in use by 2040 and given there is good capacity on the electrical network, this has been identified as a focus zone for installation of public charging infrastructure.

Given that there are a large number of flats in the area and little off-street parking, it is likely that most of the charging requirement will be met through public charging infrastructure in the form of kerb-side and destination/site charging.



Map showing Hotels and car parks in the South Cliff area of Scarborough

Map showing on-street parking and flats in Scarborough

Within the zone, there are several bed & breakfasts, hotels and guests houses. From the map (left), the density of these non-domestic building types can be seen. Given that the demand in these buildings is likely to be seasonal, it is expected that there will be a larger energy requirement at charge points in this area in the summer periods. It is unlikely that all visitors would have access to EV charging infrastructure at their hotel and therefore policy decisions will need to be made to decide if assets should be made available to manage the peak or average charging requirement.

In areas where demand is likely to be high North Yorkshire Council should work with private providers to increase provision of charge points whilst targeting public sector funding towards providing charging infrastructure in areas where the private sector could struggle to build a business case due to lower charge point utilisation and where problems with network constraints or high connection costs could be additional barriers.


Local Generation
COUNTY OF
NORTH YORKSHIRE

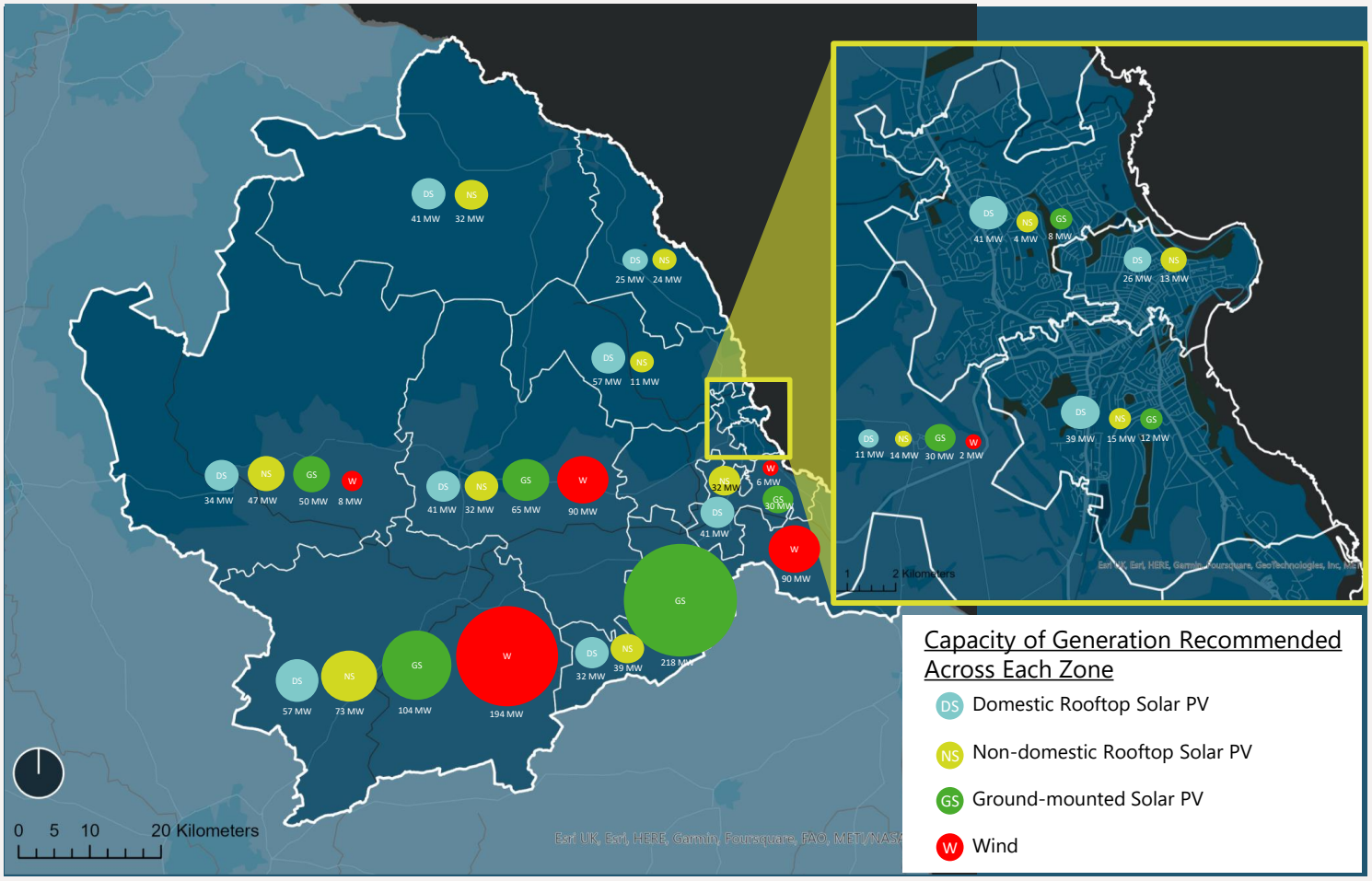
Overview

1,390MW

of wind and solar generation capacity could be developed

£1.2b

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 Vale, Moors & Coast's annual demand for electricity from 1,067 GWh to 1,259 GWh between 2020 and 2040. Electrification of the harbour facilities, not considered for this plan, would increase demand further; this could be studied separately. The Vale, Moors & Coast 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.

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 Vale, Moors & Coast can contribute to national progress as well as accelerating local emissions reductions. The area which is suitable for large scale renewable projects could produce more energy than is used locally, even allowing The Vale, Moors & Coast to become a net exporter if fully developed.

To further reduce the spend on imported electricity from the grid, The Vale, Moors & Coast may wish to explore the use of power purchase agreements (PPAs)* and novel approaches such as local market places and peer-to-peer (P2P) networks. These all aim to maximise the consumption of local production within the area.

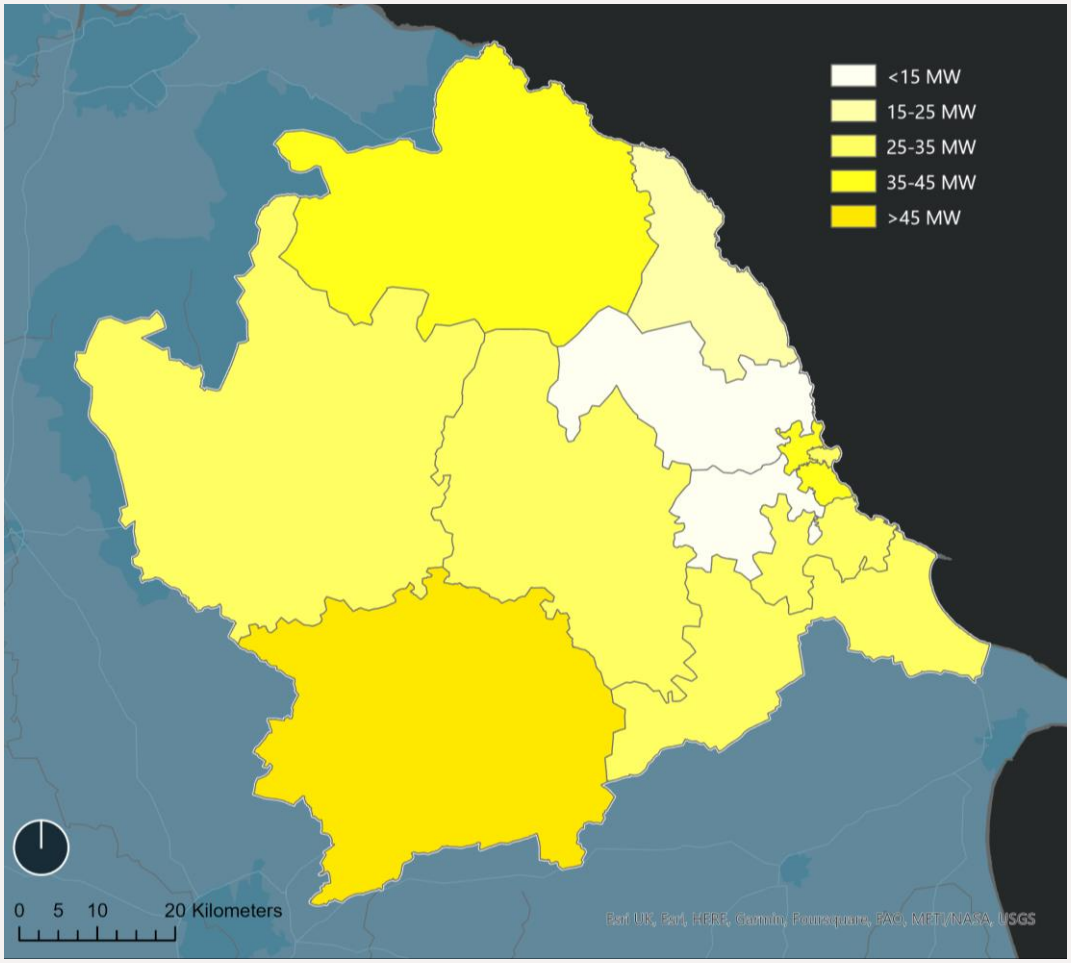
* For an example of a virtual PPA with large solar developments, see https://www.novartis.com/news/media-releases/novartis-set-achieve-100-renewable-electricity-its-european-operations

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. 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. In this plan, we propose 159MW of rooftop solar, which would contribute 153 GWh per year of electricity for a total investment of £207 million, representing a low regret, cost effective and realistic deployment scenario.

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

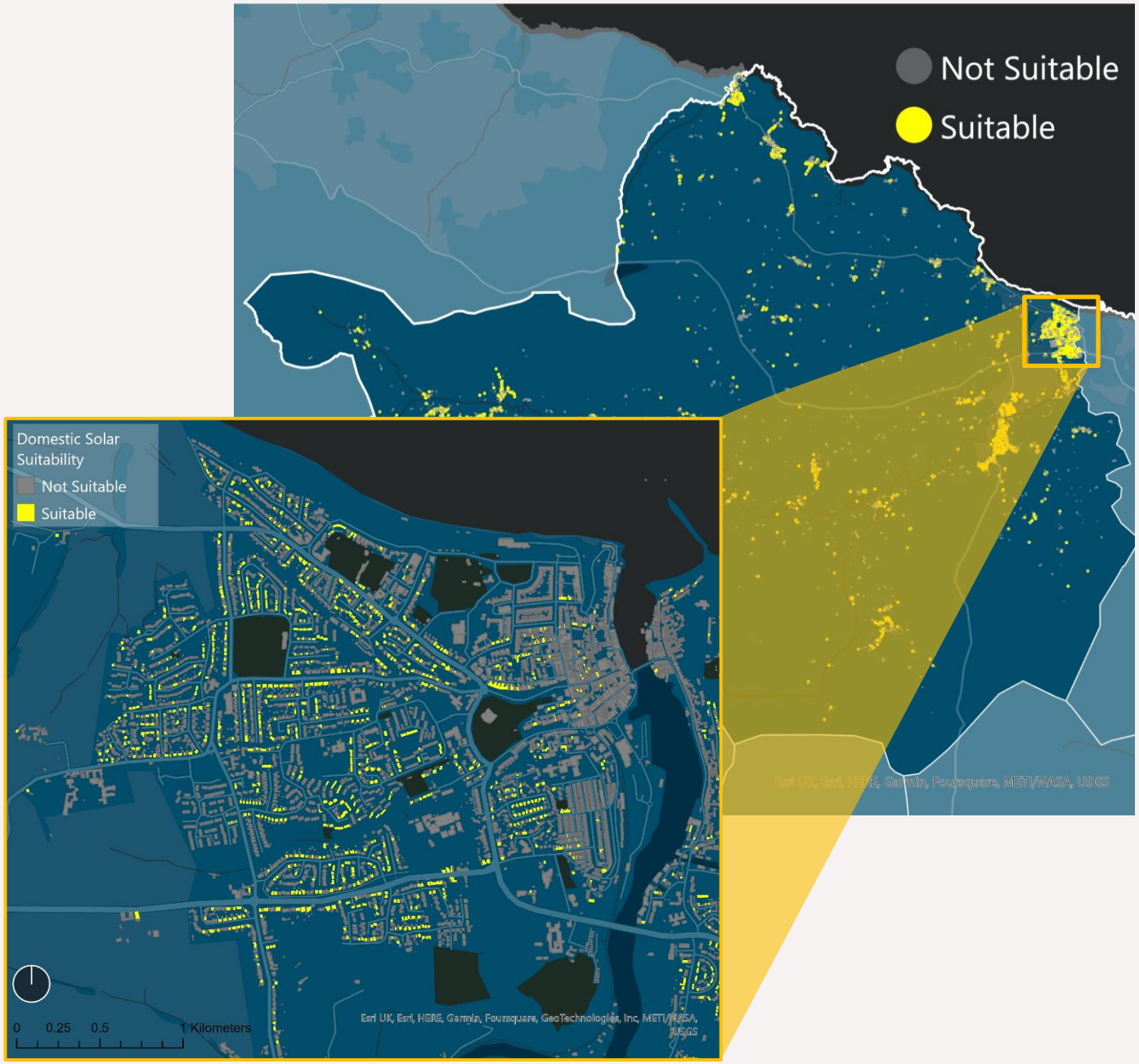


Total potential for domestic rooftop solar deployment in each zone

Domestic Solar Focus Zone

Solar focus zones are areas within The Vale, Moors & Coast which could be prioritised for delivery of rooftop solar. The Castleton to W. Whitby zone has been prioritised because it has a large potential for roll-out of domestic PV (40MW) and the highest level of fuel poverty within The Vale, Moors & Coast and so deploying rooftop solar would mean that consumers could generate electricity on-site and self-consume, reducing the amount of electricity imported from the grid, and thus reducing their bills.

The roll-out of a scheme like this 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.



Suitability of dwellings for rooftop solar PV in the 'Castleton to W. Whitby' zone

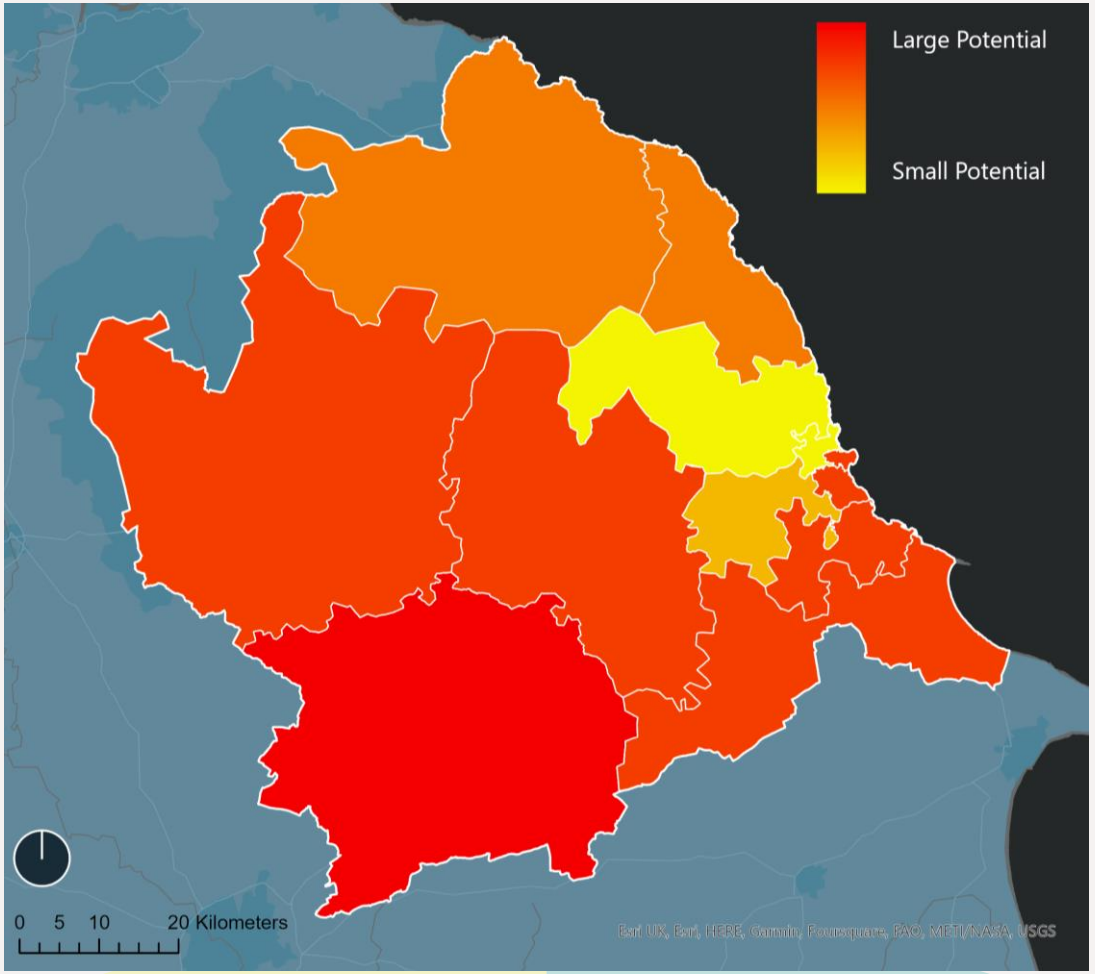
Non-Domestic Solar

Non-domestic solar installations also contribute to cost effective decarbonisation plans for The Vale, Moors & Coast, 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 therefore be low regret and should give confidence that it is 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 40MW of rooftop solar already deployed on non-domestic sites, there is a potential to develop 384MW of capacity for an investment of £310m. Non-domestic solar in The Vale, Moors & Coast could generate 370 GWh/year, 60% of the yearly demand from non-domestic buildings. 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



384MW

Non-domestic solar PV potential

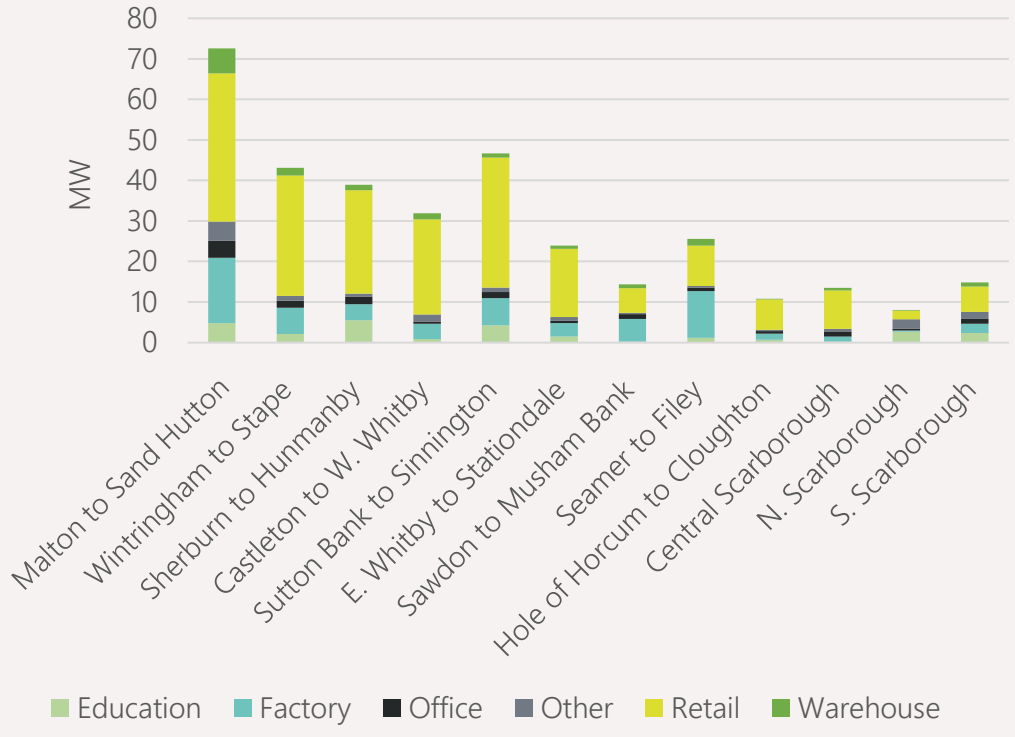
The 'Malton to Sand Hutton' zone has the highest potential for non-domestic rooftop solar PV

Non-Domestic Solar

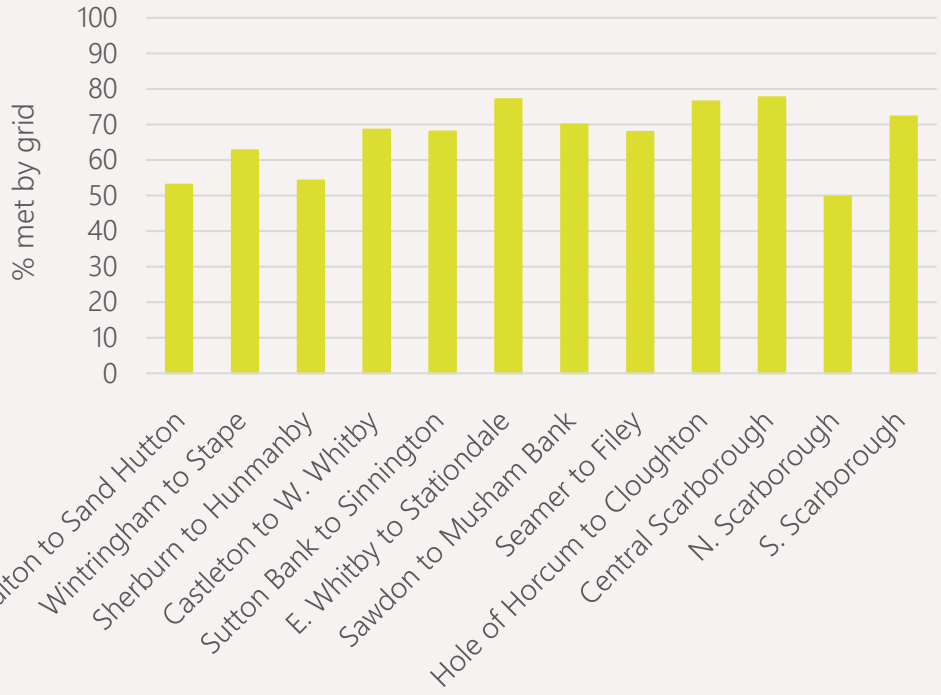
The majority of non-domestic roof space which could be used for solar PV belongs to the retail category. It should be noted that due to the categorisation used, many of the tourist industry buildings – which are quite prevalent within The Vale, Moors & Coast – such as hotels, B&Bs, and guest houses are included within the 'Retail' category.

In the 'N. Scarborough' zone, 50% of the net demand can be met if all potential non-domestic rooftop solar PV is deployed. This would be beneficial to the owners or leaseholders of accommodation sites, as demand for their services would coincide with electricity generation in the summer months. Localised storage systems could also be deployed to utilise as much of the generation on-site as possible.

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



Proportion of Non-Domestic Demand Met from Grid After Full Development of Solar PV



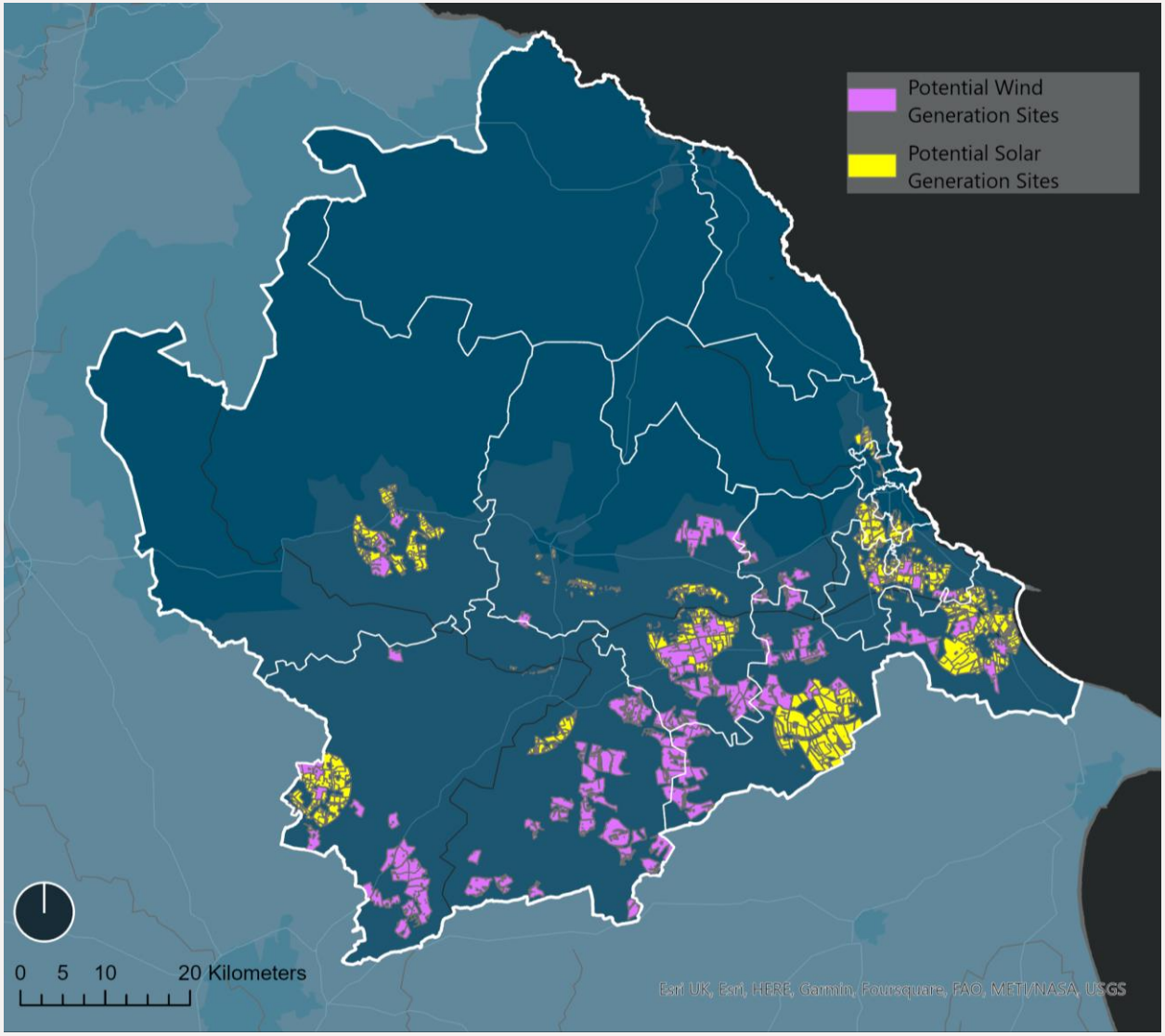
Large-Scale Renewables

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 8,700 hectares is suitable to build ground-mounted solar, sufficient for a capacity of 5,200MW. A further 9,000 hectares is suitable for onshore wind assets, sufficient to build 346MW of capacity, which would contribute 760 GWh of electricity per year for an investment of £411m*. 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.
The remaining annual energy demand after developing rooftop solar and wind to their full potential could be met by developing 10% (512MW) of the ground mounted solar potential. This would come at a cost of £272m*. Yorwaste are seeking to install up to 28 MW of solar PV and 2 MW of wind generation at their Seamer Carr Green Energy Park.

The potential for small tidal and wave power developments on the coast has not been studied for this plan, and could be considered separately. 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.



Map showing land suitability for large scale renewable developments

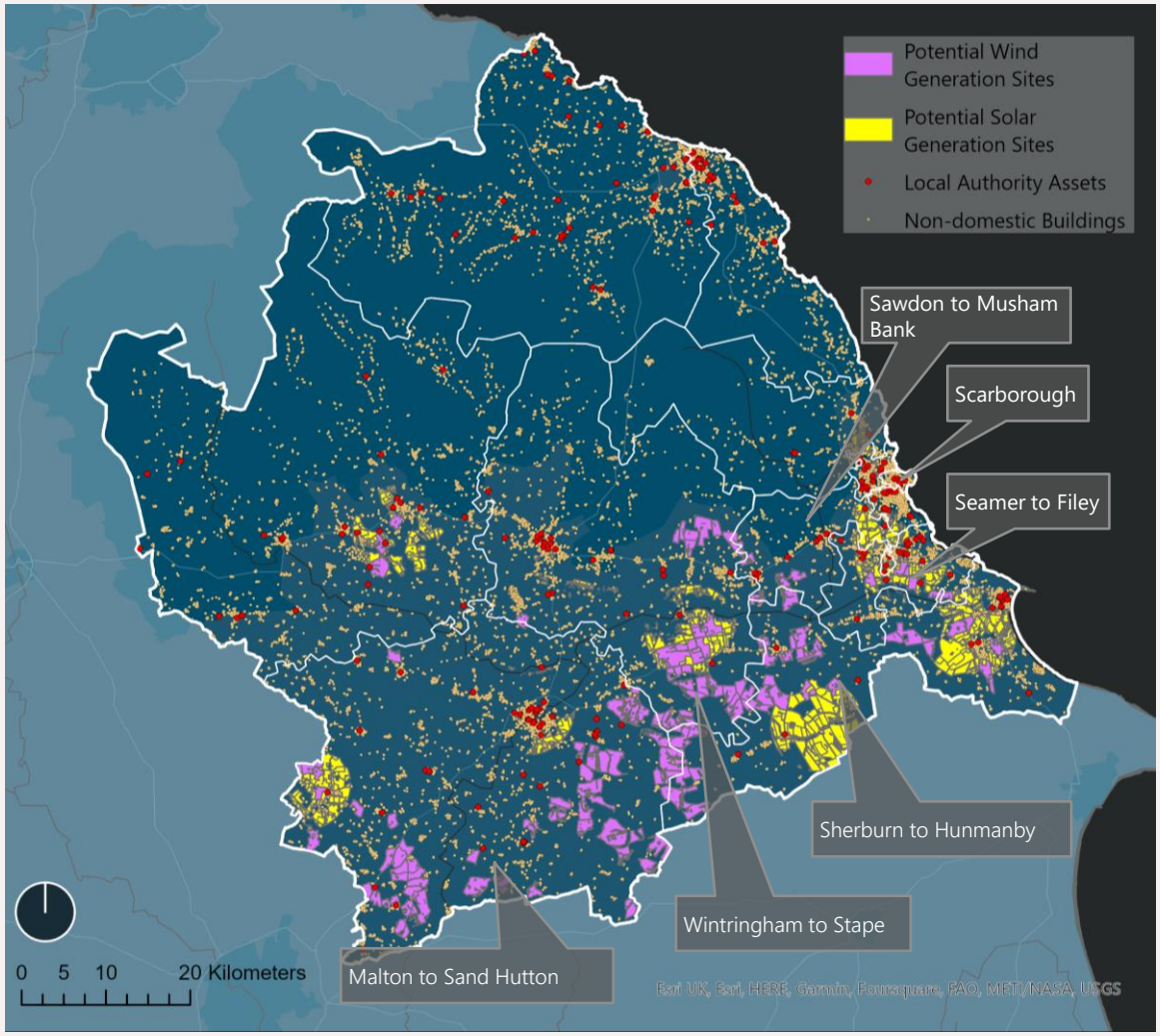
* Costs based on BEIS figures, including pre-construction cost and infrastructure cost scaled to capacity
https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/911818/GC20_Key_Data_and_Assumptions.xlsx

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 Vale, Moors & Coast. 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 Scarborough and Ryedale local authority 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 Vale, Moors & Coast commitment to biodiversity and protecting local wildlife. Many site specific measures can be taken to improve biodiversity, e.g. restoring peatlands on on-shore wind sites.



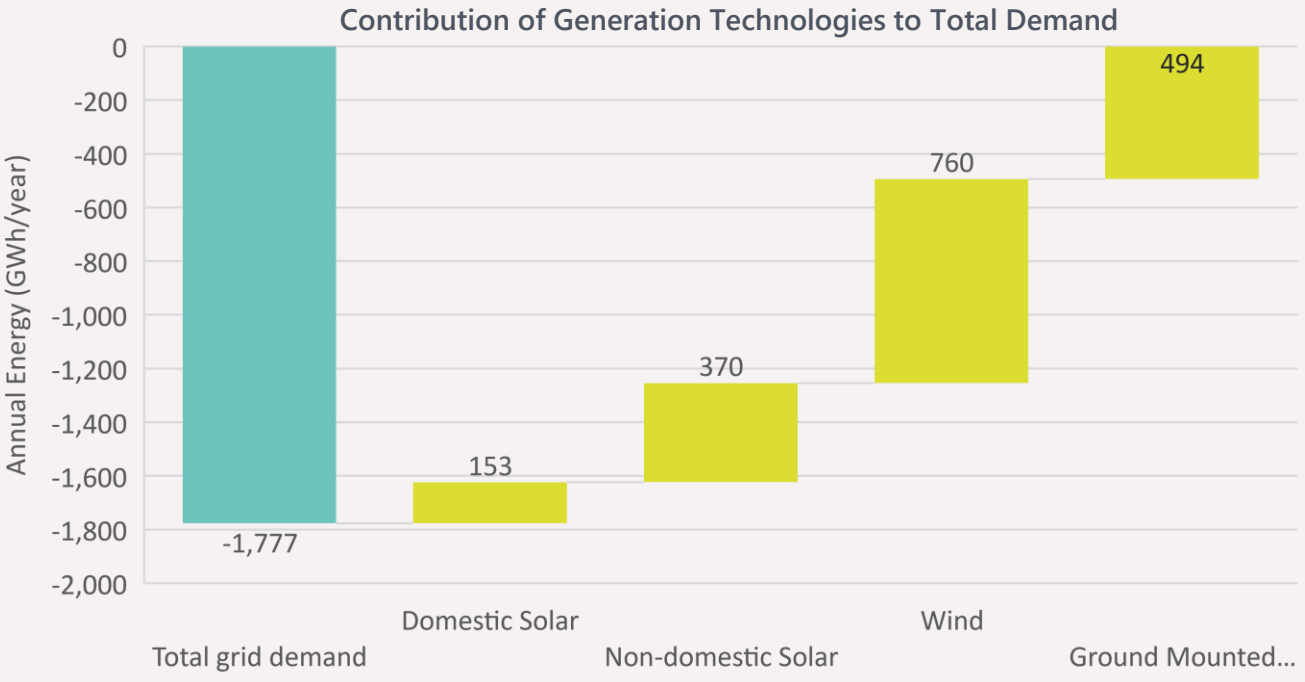
Land suitability for large scale renewable developments overlayed with potential purchases of energy

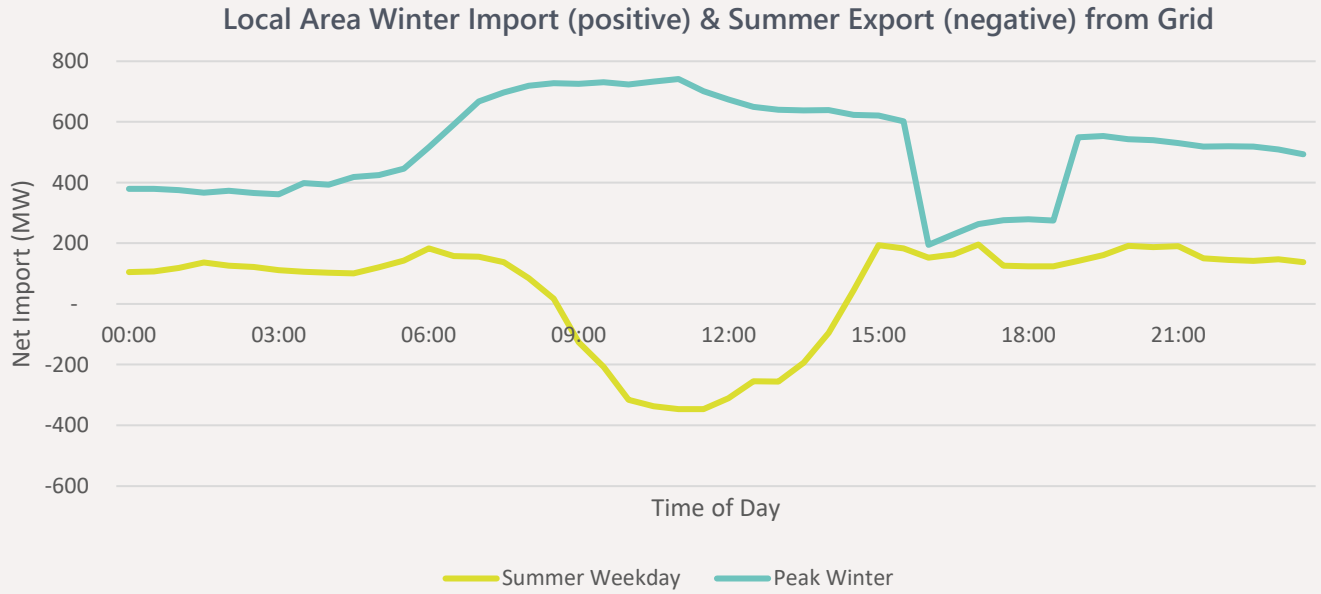
The Malton to Sand Hutton, Wintringham to Stape and Sherburn to Hunmanby zones have large amounts of solar and wind potential, however, LA assets as well as non-domestic sites are scattered and not always close to generating sites, thus making it difficult to benefit from proximity to generation.

At the boundary of Scarborough, Sawdon to Musham Bank and Seamer to Filey, there is potential for on-shore wind and ground mounted solar. Given the proximity to a town, these sites could be developed in such a way that they would directly benefit businesses and residents in Scarborough.

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 solar, as no land is needed, and residents and owners can make direct use of the generation. Wind has then also been prioritised given that it 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.

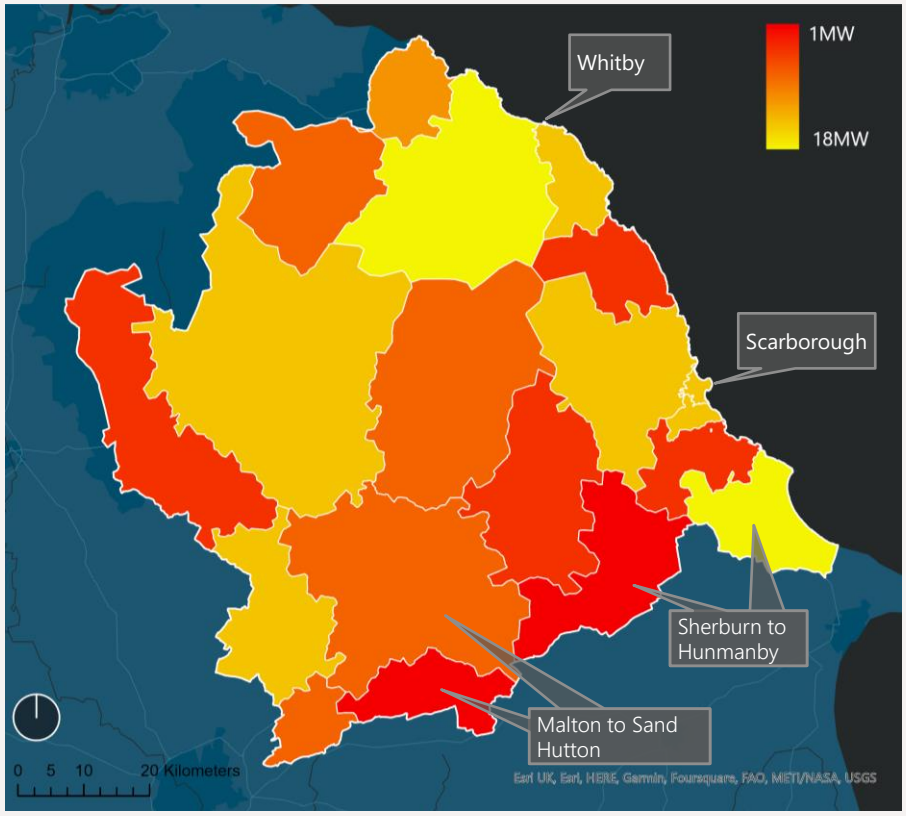
Since solar generation will vary with weather, time of day and season, The Vale, Moors & Coast would still need to import from the electricity grid when supply from local generation does not meet demand, and export to the network when there is excess supply. Wind and solar are somewhat complementary, with wind increasing in winter months and occurring through the night, while still days are often very bright. Battery storage would enable more of the generated electricity to be utilised locally at times of demand, but would not be suitable to store the energy inter-seasonally to use the summer surplus in winter. Local hydrogen production may offer a viable option for seasonal storage.

Without seasonal storage, the large quantity of solar generation would result in a large summer export to grid from the area (shown in lower graph). There is limited local capacity for increased generation in the area (see https://www.northernpowergrid.com/generation-availability-map). Any large scale deployments of generation will need to be coordinated with Northern Powergrid to ensure the network capacity is available.

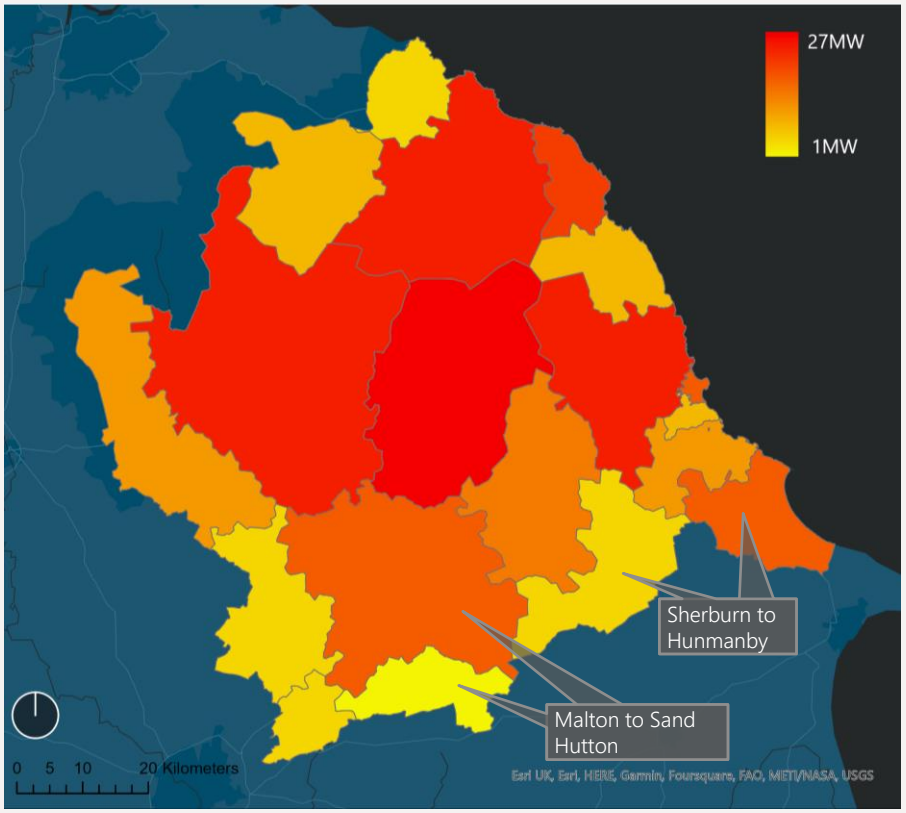
National Grid's Future Energy Scenarios envisage around 20 gigawatts (GW) of solar and 7 GW of wind in the North of England by 2050. If distributed evenly by household, this would be about 327MW of solar and 113 MW of wind for The Vale, Moors & Coast, suggesting that meeting all of The Vale, Moors & Coast'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 Vale, Moors & Coast to accommodate more of their share of generation to compensate for more urban areas. National Grid plan for very large flows of wind power from Scotland towards Southern England. Producing more of this energy south of the border could be beneficial for net energy flows and fit with transmission capacity between the north and south.

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 £175m in capacity upgrades is estimated across the high and low voltage networks** by 2040 to accommodate the changes in this. 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."

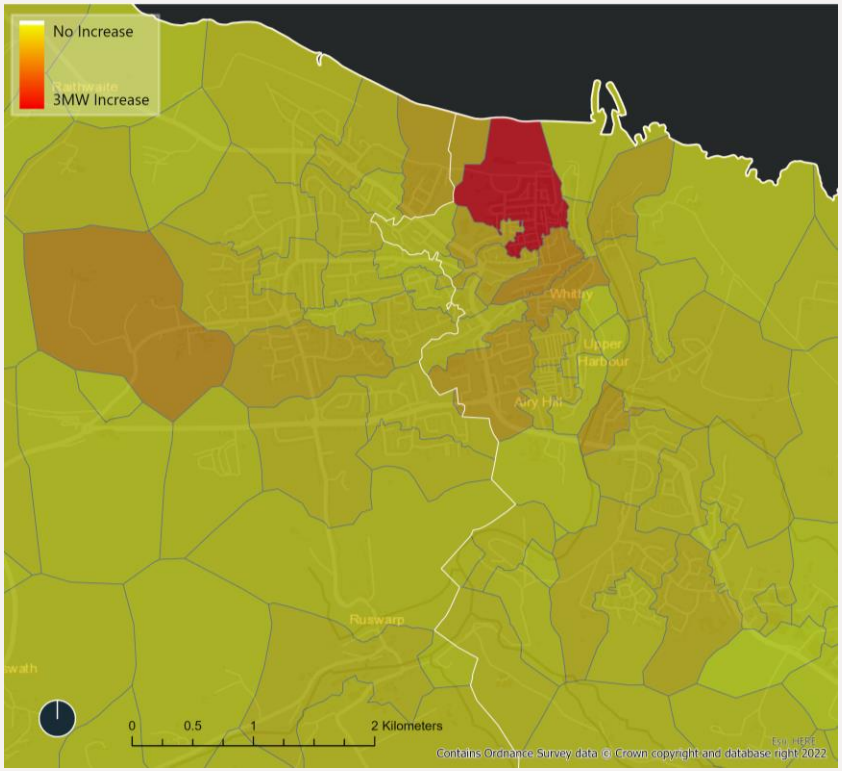
The high voltage network consists of substations on land owned by the distribution network operator, supplying feeders which run to secondary substations, which in turn serve multiple streets. The maps above show the area where high voltage substations serve in The Vale, Moors & Coast and the amount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

Southern parts of Whitby and Scarborough are already limited in their headroom, and so will be expected to require upgrades in the short to medium term.

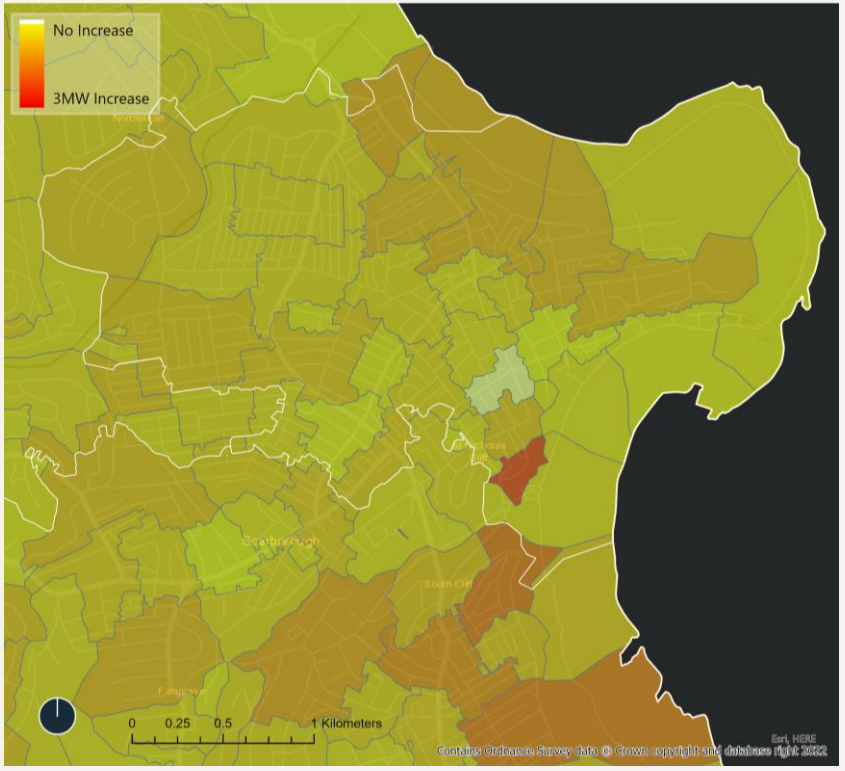
Most of the central part of The Vale, Moors & Coast is rural, given the electrification of heat for off-gas properties there is a large requirement to upgrade the network in 2040.

Interestingly, southern parts of The Vale, Moors & Coast, i.e. 'Malton to Sand Hutton' and 'Sherburn to Hunmanby' currently have little headroom and have limited upgrade requirements in 2040. Solutions at the low voltage level could be explored to assess if upgrades could be deferred through flexibility.

Upgrading the Low Voltage Network



Demand change on the low voltage network in Whitby



Demand change on the low voltage network in Scarborough

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. In Whitby, The area of West Cliff is expected to have the largest increase in demand. Within Scarborough, the area around St Nicholas Cliff is expected to have the highest increase in demand. Both areas house purpose-built flats which will be converted to heat pumps, thus increasing the demand requirements.

Innovations in flexibility have the potential to delay and reduce the scale of electricity network reinforcement by shifting peak demands to periods of lower demand. DNOs would need to tender for local flexibility services, which could be provided by, for example, smart EV charging.

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.

A **total investment of £175m in capacity upgrades is estimated across the high and low voltage networks** by 2040 to accommodate the changes in this pathway.

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's "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/

Buildings – Castleton to W.Whitby

Density of basic building fabric upgrades uptake in semi-detached dwellings in Sleights

Number of Dwellings	190
Type	Basic
House Type	Semi-detached (1945-1964)
Total Cost	£132,000

Given the rural nature of Castleton to W.Whitby, the map above shows density of basic building fabric upgrades. Only in the area of Whitby and a few villages do we see a high density of basic building fabric upgrade roll out.

Density of detached buildings receiving basic building fabric upgrades in Pickering

Number of Dwellings	72
Type	Basic
Type	Detached
Total Cost	£62,000

In the west side of the town of Pickering, there are high levels of fuel poverty. Basic building fabric could be retrofitted to reduce energy consumption and thus reducing consumer bills.

Further investigations would need to be conducted by the LA to assess which houses were experiencing the highest levels of fuel poverty and thus to be targeted.

Heating Demonstrators & Enablers

There are over 2,550 terraced dwellings in the 'Malton to Sand Hutton' zone that are potentially suitable for air source heat pumps making this a good area for the early demonstration of the technology. This will help to develop the approach for air source heat pump installation in this housing type, identifying common barriers and solutions and providing a showcase to build public support.

Terrace dwellings in the Malton to Sand Hutton Zone

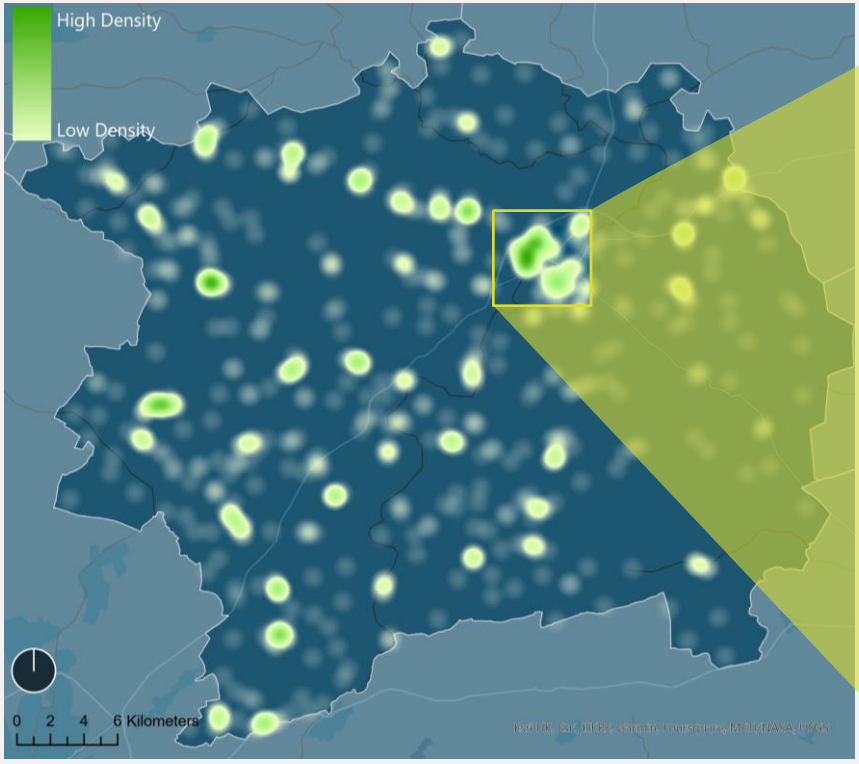
A similar demonstrator could be considered in the 'S. Scarborough' zone where around 6,300 flats were identified as being suitable for air source heat pumps. As with terraces, there are a number of challenges when installing the technology in this housing archetype, but these may be different e.g. finding the space to locate the external unit while considering access and noise. Indoor space in both terraces and flats is at a premium and therefore locating the internal equipment could be difficult and is a challenge that will need to be overcome for the decarbonisation of this part of the housing stock. Innovations such as more compact heat storage/batteries* may be part of the future solution. Whole-building solutions which include a central heating system, and a shared distribution could also be investigated.

The 'S. Scarborough' zone also has a large number of flats that could be connected to a district heat network. Early steps here could include surveying residents to gauge their appetite and knowledge of heat networks, spreading awareness of the technology, and identifying nearby anchor loads which can vastly improve the efficiency and cost-effectiveness of a heat network scheme.

Flats in the S. Scarborough Zone

* https://es.catapult.org.uk/case-study/electrification-of-heat-2000s-flat-heat-pump-installation/

Heating – Malton to Sand Hutton



Proposed GSHP density in Malton to Sand Hutton

Proposed GSHP density in Malton

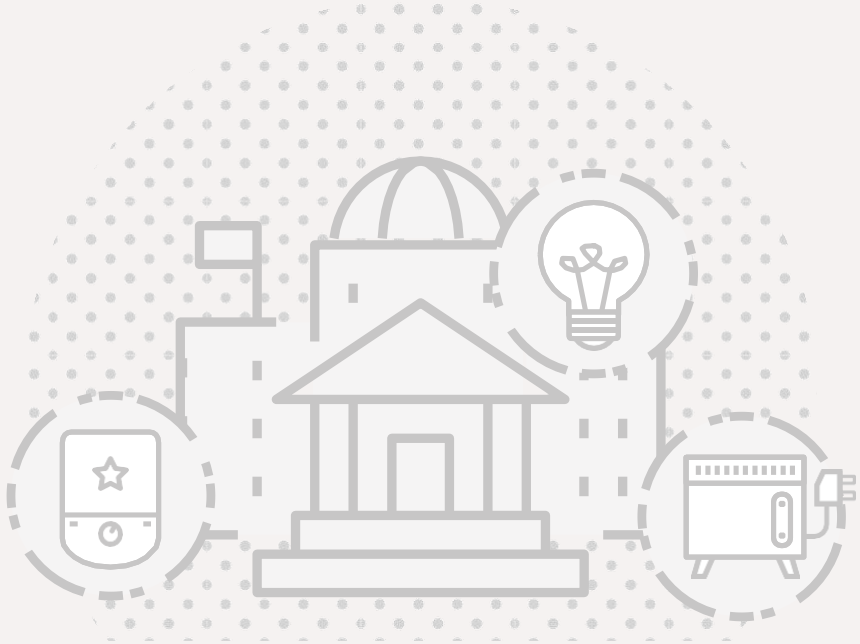
Number of Dwellings	145
House Type	Semi-detached (1945-1964)
Total Cost	£2.4m

Detached properties in The Vale, Moors & Coast can benefit from the extra space and use GSHPs to electrify their heating.
Malton to Sand Hutton is a rural area and thus has pockets of proposed GSHP spread across the cluster.

District Heat Network

Network cost	£2.1m
Connection cost	£2.05m
Total DHN cost	£4.15m

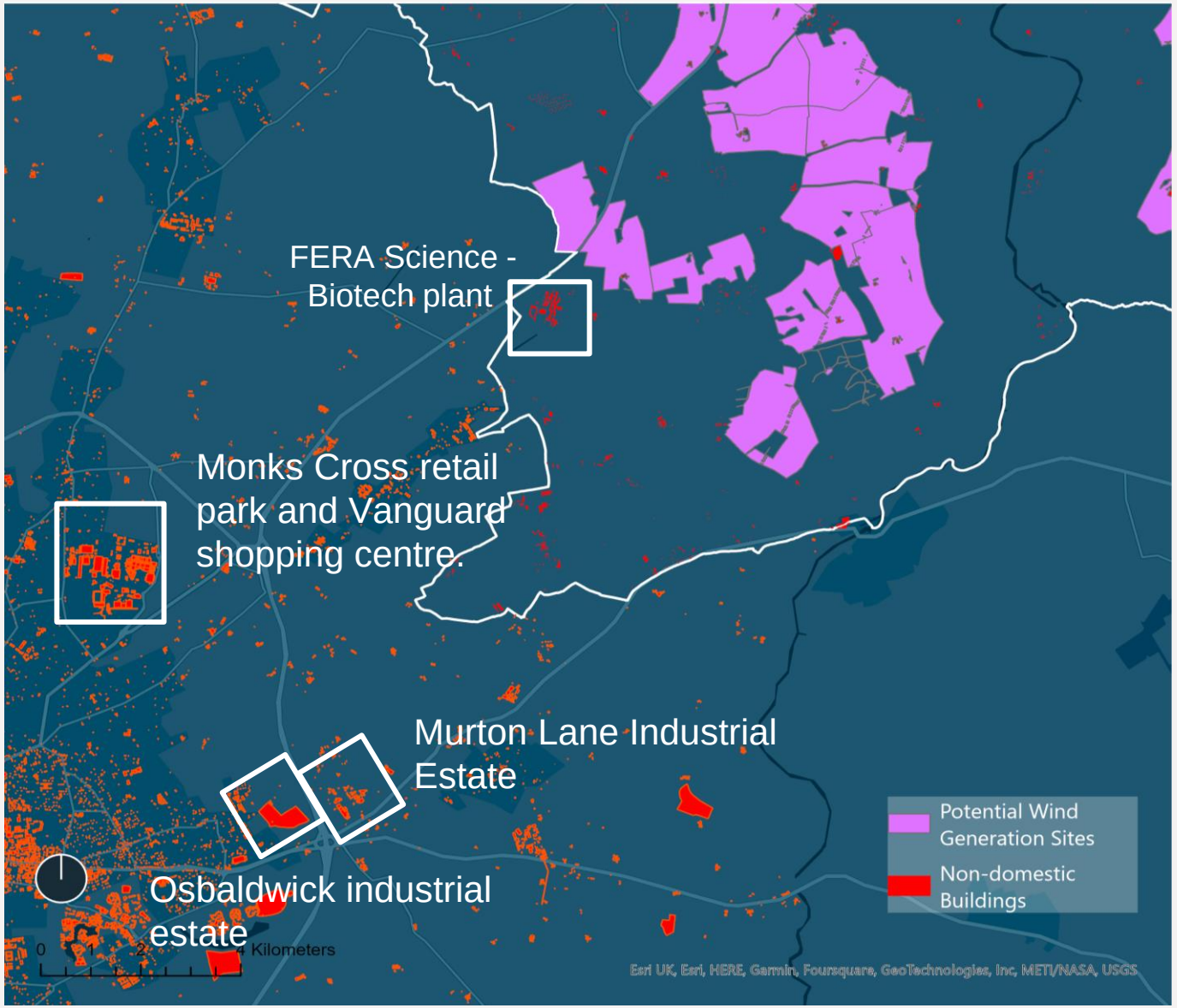
This proposed DHN in Scarborough covers the harbour, a number of hotels and retail shops. Given the number and varying demand profiles of the connected buildings, the business case for a heat network in the area is likely to be compelling.



Onshore Wind

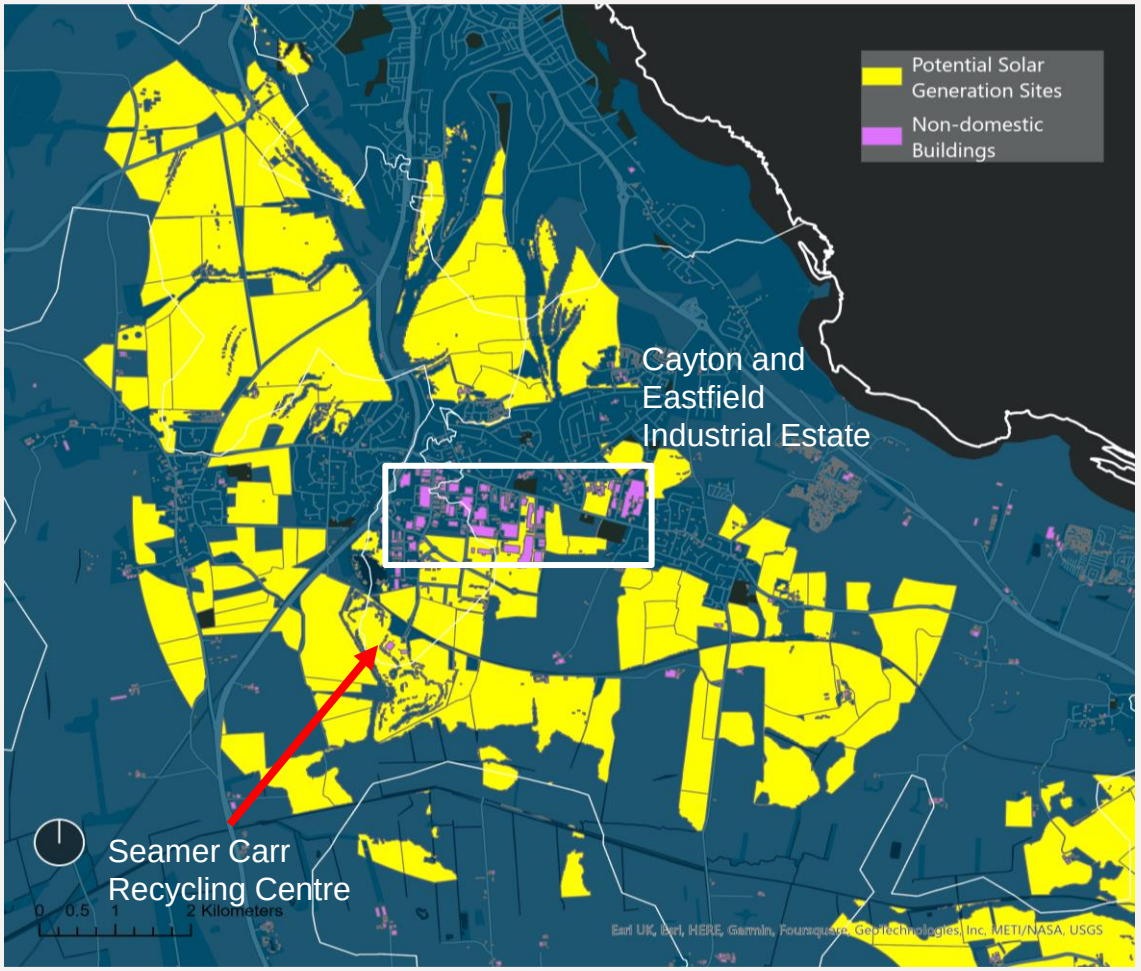
Towards the southernmost tip of The Vale, Moors & Coast, in the 'Malton to Sand Hutton' zone, there are a number of land parcels with the potential to be developed for onshore wind – 36MW of total potential capacity. Although there are no large nearby off-takers within the zone, there are several industrial sites in relative proximity in York. These sites have the potential to consume much of the electricity that could be generated but would require a significant amount of planning to route cabling over long distances which could see it deemed not cost-effective.

Private wire renewable energy developments are, however, often more profitable compared to generation which is sold directly to the grid. Network fees, VAT and others are waived when you don't buy from the grid, making the profitability higher for developers and costs cheaper for off-takers.



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

Ground Mounted Solar



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

South of Scarborough in between the 'Sawdon to Musham Bank' and 'Seamer to Filey' zones, there are a large number of land parcels that have been identified as having potential to have ground-mounted solar PV deployed. All of the sites shown in the map (left) have an estimated potential capacity once built out of between 10MW and 50MW, making them a sensible size for investment. In total, the potential capacity which could be hosted on this land comes to 533MW.

The Cayton and Eastfield Industrial Estate is also shown in the map. The buildings within this area have been highlighted as potential off-takers of the generated electricity showing the private wire potential.

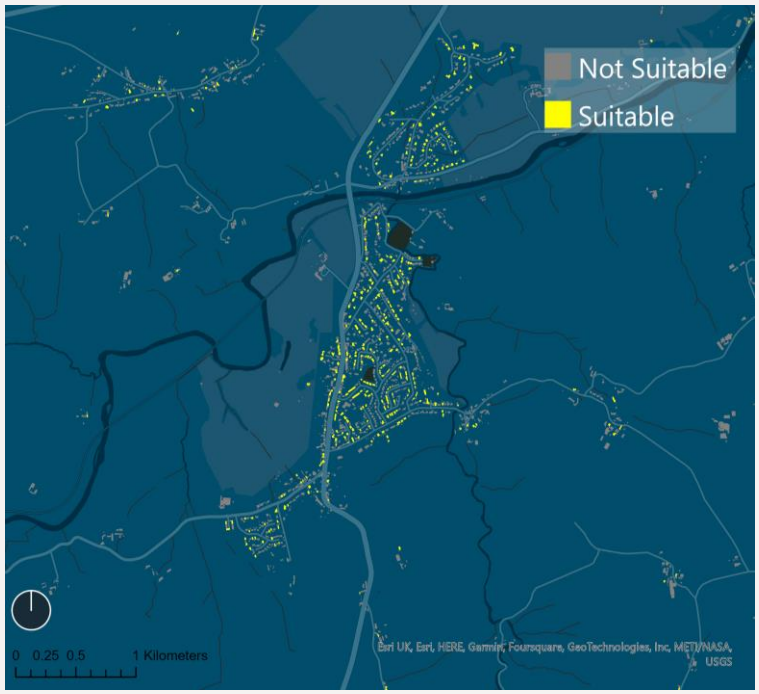
Proposals are underway to install a 28MW solar array and a 4MW wind turbine on the Seamer Carr landfill in this area as part of a green energy park development, which would make a valuable contribution towards the renewable capacity recommended.

Domestic PV

Sleights and Ebberston are areas within The Vale, Moors & Coast with higher levels of fuel poverty compared to the average. Installing domestic rooftop PV allows residents to self-consume the generated electricity, reducing the amount they are required to purchase, and thus lowering fuel bills. This will become increasingly important as the energy system electrifies with the addition of significant numbers of heat pumps and electric vehicles.

To increase the impact of a solar PV roll-out, specific dwellings and areas can be targeted where there is a known increased prevalence of social housing, which can aid social mobility. Further feasibility studies should be undertaken to fully understand options and potential benefits to individual households.

As new innovative business models are entering the market, social housing providers and landlords can also profit from installing rooftop solar, e.g. Social Energy, combining storage and insulation.



Suitable dwellings for rooftop PV in Sleights

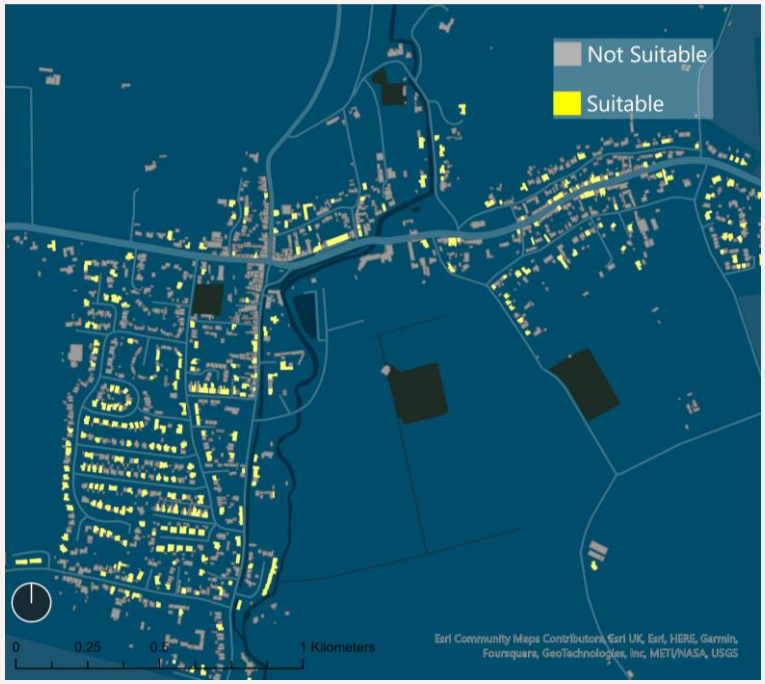
Suitable dwellings for rooftop PV in Ebberston

Zone	Sleights
Number of Dwellings Selected for Solar PV	c. 320
Total Cost	c. £2m

Zone	Ebberston
Number of Dwellings Selected for Solar PV	c. 70
Total Cost	c. £440k

Fuel Poverty	Prioritising fuel poor areas to reduce bills and give residents more autonomy.
Social Housing	Supporting roll-out, particularly, in local authority owned assets to rapidly increase the amount of low carbon electricity generation .
Solar Together	Supporting community buying programmes to reduce capital cost.

Domestic PV



Dwellings suitable for rooftop solar PV in Thornton-le-Dale

Zone	Thornton-le-Dale
Number of Dwellings	c. 400
Total Cost	c. £2.5m

Private homeowners can purchase rooftop solar panels through a variety of mechanisms, directly paying for them or through innovative business models which include no CAPEX options.

Thornton-le-Dale could be used as a demonstrator within The Vale, Moors & Coast for how to reach out to the able-to-pay sector using collective purchasing or other mechanisms.

Dwellings suitable for rooftop solar PV in Whitby

Zone	Whitby
Number of Dwellings	c. 1,800
Total Cost	c. £12m

The west of Whitby has fuel poverty levels of around 15% and very good suitability for rooftop solar PV deployment. Coupling a solar PV roll-out with heat pumps, insulation measures and potentially battery storage would have a large positive effect on the residents by significantly reducing their bills and carbon emissions.