

North Yorkshire & City of York

Local Area Energy Plans

CATAPULT
Energy Systems



Acknowledgements

These plans were prepared by Energy Systems Catapult, on behalf of the York & North Yorkshire Local Enterprise Partnership (Y&NY LEP) and City of York Council.

The North Yorkshire elements of this plan have been funded by the UK Government through the UK Community Renewal Fund. The UK Community Renewal Fund is a UK Government programme for 2021/22. This aims to support people and communities most in need across the UK to pilot programmes and new approaches to prepare for the UK Shared Prosperity Fund. It invests in skills, community and place, local business, and supporting people into employment. For more information, visit <https://www.gov.uk/government/publications/uk-community-renewal-fund-prospectus>.

The City of York elements have been funded directly by City of York Council.

Contributors

The development of the LAEPs has been supported with contributions to the Steering Group by the local authorities, national park authorities, and gas and electricity network operators in the region (see logos). The Steering Group have been instrumental in shaping the LAEPs, supporting data gathering, examining model assumptions and providing local economic and political context, and proofing the draft documents.

Further support was provided by a Technical Advisory panel, made up of local and regional energy experts, and a Peer Challenge Group, made up of people with expertise in adjacent disciplines such as fuel poverty, social inclusion, skills and economic development and biodiversity.



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Executive Summary



Context & Current State

*In 2019, the UK government amended the Climate Change Act (2008), that previously legislated for a reduction in greenhouse gas emissions of 80% by 2050 compared to 1990 levels, to be net zero. The change is significant - no longer can anything be considered 'too difficult' to tackle – every source of emissions must be accounted for and addressed.**

Reaching net zero will be a monumental task requiring significant, far-reaching action across the entire country at every level. The national government will be required to set policy and provide targeted funding to support the transition, and individual householders and businesses will need to make decisions about their heating systems, modes of transport, and behaviours. However, local areas will arguably be the keystone in this transition. Local and regional authorities and other stakeholders will be required to plan their area's transition to net zero accounting for the infrastructure and economic challenges and opportunities that are borne of it.

To meet this need and further the decarbonisation of local areas, Energy Systems Catapult (ESC) pioneered the local area energy planning (LAEP) approach to deliver a comprehensive, data-driven and cost-effective plan for decarbonisation of the energy system. Importantly, the approach requires working closely with stakeholders to build upon progress being made and incorporate existing plans.

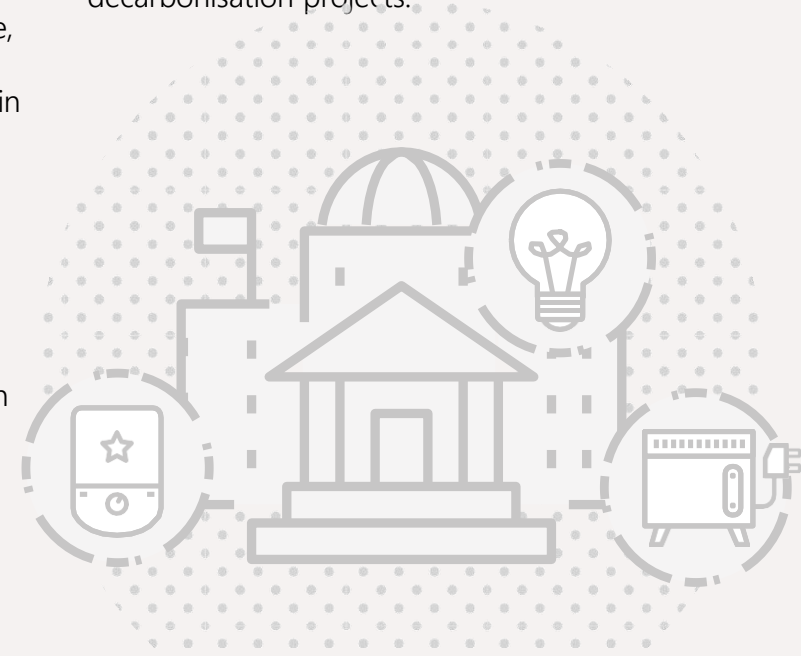
To ensure a strategic and coordinated approach to decarbonisation across the region, Y&NY LEP have led the development of York & North Yorkshire's Routemap to Carbon Negative, which is underpinned by the Carbon Abatement Pathways study. When completed, these gave Y&NY, and their local stakeholders, an understanding of the high-level measures that were required, the policies that needed to be established and adopted by which they could reach net zero by 2034, and carbon negative to 2040. Some of the detail included in these are the number of dwellings that require energy efficiency upgrades, the heating systems that need to be replaced and an indicative amount of renewable energy generation required.

When combined with the local area energy plans (LAEPs) in this report, Y&NY should have a good understanding of 'why' action needs to take place, 'what' needs to be done, and 'when' and 'where' this needs to happen. By including stakeholders in the process of developing these plans and future work on the feasibility of projects, the 'who' and 'how' will become clearer over time.

Decarbonisation of the energy system requires transformation and targeted investment. However, much of the investment to reach net zero is envisaged to come from households when they replace their current systems e.g. switching from a fossil gas boiler to a heat pump, or traditional internal combustion engine vehicle to an electric vehicle (EV). Beyond this, private finance and local/central government will be important to realise the overall goal.

Although local goals and targets for decarbonisation have been adopted by local governments, following a consultation on local government reorganisation, it was proposed that the current county, district and borough councils would be replaced by a new single unitary council for North Yorkshire alongside the City of York unitary council in April 2023. Existing North Yorkshire local authorities have already been working together to make progress towards decarbonisation, and the merger into a single authority cannot stall this progress.

Devolution is also being sought for York & North Yorkshire, creating a new combined authority to cover the two unitary council areas. This will bring more opportunities for local decision making, including on major investments and priority decarbonisation projects.



* <https://es.catapult.org.uk/guide/guidance-on-creating-a-local-area-energy-plan/>

Scenarios & Pathways

Scenarios

To carry out the modelling and analysis required to produce a LAEP, the York and North Yorkshire region was split into 44 geographical areas or 'zones' based on their connection to the electricity network (these do not follow any typical political or geographical boundaries).

Following discussions with key stakeholders, zoning was agreed, and three future scenarios were identified for consideration:

- A high ambition scenario with a 2030 net zero target for the energy system.
- A medium ambition scenario with a 2040 net zero target for the energy system.
- A low ambition scenario with a 2050 net zero target for the energy system, in line with the UK as a whole.

All of the scenarios were created to be complimentary to the Carbon Abatement Pathways from previous work. Aiming for a net zero energy system by 2050 (a 'low' ambition scenario) would result in the 2034 net zero target being missed regardless of the speed of decarbonisation in other areas not considered by the LAEP.

Further to this, a "do nothing" scenario was modelled where no decarbonisation actions take place, providing a counterfactual for cost and carbon impacts of the scenarios to be calculated.

This plan centres on the medium ambition scenario, aiming to reach a net zero energy system by 2040, but draws comparisons to the other scenarios throughout. Eliminating carbon emissions in a local area requires the replacement of heating systems in most private dwellings and businesses, and for every petrol and diesel vehicle to be taken off the road, supported by large investments in infrastructure and the development of large land areas for renewable generation. The investment, skilled trades, supply chain capacity and co-ordination across a wide range of actors required to reach this goal even by 2040 will require a step change across society from today's status quo. The ambition aligns with the Routemap to Carbon Negative and, once the decarbonisation of elements outside of the LAEP's energy system boundaries are taken into account, will still result in a target regional net zero date of 2034. The elements included in the Routemap but not the LAEP are: LULUCF and agriculture; negative emissions; industrial emissions not related to building fabric and heating; transport demand reduction, modal shift and public transport; and circular economy activities. The pathways to net zero bring an abundance of opportunities to stimulate the local economy and create local employment.

Pathways

Pathways have been developed for each of the LAEP areas and identify the key projects and decision points on the route to a net zero energy system. Some key short-term aspects of these pathways are*:

- Begin roll-out of building fabric measures and heat pumps to rural, off-gas grid dwellings.
- Begin to replace gas boilers with heat pumps in dwellings outside of urban areas.
- Begin roll-out basic building energy efficiency upgrades for dwellings, starting with a focus on social housing and fuel poor areas, with a view to scale up to owner-occupied dwellings.
- Develop a scheme to widely deploy rooftop PV.
- Provisions to enable and encourage the installation of electric vehicle chargers at dwellings, public spaces, workplaces and commercial destinations.
- Provide suitable land to be developed for large scale renewable generation projects.
- Decide the scale of proposed district heat networks.

As part of the pathway to net zero, some near-term projects have been identified for further feasibility study or 'low regret' deployment.

* Note: Not all of these are applicable to all areas, these are simply a snapshot of some of the steps of the various pathways.

Buildings

Across the York & North Yorkshire region, there are approximately 386,000 dwellings. To reach a net zero energy system, around 216,000 of them will require energy efficiency upgrades to reduce the amount of energy being used to heat them. This is in addition to commercial and industrial buildings. The 216,000 dwellings requiring energy efficiency upgrades are split across the region with 71,000 dwellings in 'Harrogate & The Dales', 61,000 in the A1 Corridor, 44,000 in City of York, and 40,000 in 'The Vale, Moors & Coast'.

The level of energy efficiency upgrade is not consistent across the LAEP areas with older dwellings with solid walls requiring 'deep' upgrades e.g. solid wall insulation, triple glazing, door upgrades etc. More modern dwellings typically require only 'basic' upgrades e.g. loft insulation, cavity wall insulation, draughtproofing etc.

Flats pose a different challenge to houses in that they often aren't able to install loft insulation, wall insulation, floor insulation as a single dwelling within a block. Therefore, these have been excluded from receiving energy efficiency upgrades as part of this report. Yet, options are available where flats can be considered as blocks and loft insulation added to top-floor dwellings, floor insulation added to ground-floor dwellings, and wall insulation added to the building as a whole. Similarly, heating systems can be considered on a block-level rather than individual to increase the cost-effectiveness and reduce the space requirement for equipment in each flat.

Energy efficiency upgrades were found to be 'low regret' almost universally under all scenarios modelled. There is also no upper limit to the amount of energy efficiency upgrades that should take place – they simply become less cost-effective in some circumstances – yet, they always have benefits to the energy system as a whole by reducing the peak demand, as well as reducing energy bills for the occupants and often improving comfort and health outcomes.

All newly built dwellings are expected to be designed and constructed to a standard where they are not going to require insulation upgrades before the chosen net zero target. There is also an opportunity to bring forward the use of low carbon heating systems for new builds from the current 2025 date, to avoid more expensive retrofitting at a later date.

In total, domestic building fabric upgrades are expected to be a large proportion of the cost of achieving a net zero energy system in York & North Yorkshire. For 'The Vale, Moors & Coast' the cost will be approximately £110m (an average of around £2,760 per dwelling upgraded, although the cost for a specific dwelling will vary significantly depending on its individual requirements). However, this is the lowest of the LAEP areas with City of York, A1 Corridor, and 'Harrogate & The Dales' expected to cost around £185m (£4,200/dwelling), £235m (£3,850/dwelling), and £450m (£6,500/dwelling) respectively.

In total, almost £1bn is required to upgrade the energy efficiency of the housing stock across York & North Yorkshire.



Heating

The decarbonisation of heat is one of the greatest challenges in the transition to net zero. Low carbon heating technologies have improved significantly over recent years with regards to their market penetration, consumer awareness, and cost. Compared to the more 'traditional', higher emission forms of heating, they are still very much on the periphery. This outlook is required to change significantly in order for York & North Yorkshire to achieve a net zero energy system.

Currently, the predominant heating system in each LAEP area is fossil gas boilers. In the City of York, this accounts for over 90% of all heating systems currently installed in dwellings. Across the 'The Vale, Moors & Coast' and 'Harrogate & The Dales' areas, the proportion is lower, yet still very high, at 77% and 76% respectively. The A1 Corridor has the lowest proportion of fossil gas boilers at 55% of dwellings.

Oil boilers are the second most common heating system currently across York & North Yorkshire, with as many as 15% of dwellings getting their heating from this technology in 'Harrogate & The Dales'.

To decarbonise these dwellings, air source heat pumps (ASHPs) are the most likely technology to be installed. ASHPs use the heat from the ambient air to evaporate a refrigerant which is then compressed, increasing its temperature. This heat is then extracted for use in the dwelling, making the refrigerant condense ready to go around the cycle again.

This process makes ASHPs, and ground source heat pumps (GSHPs, which work in the same way but use heat from the ground rather than the air), incredibly efficient, getting 3-4 times the amount of heat out than the electricity put in.

The deployment of heat pumps will be substantial – with around 355,000 needing to be deployed across York & North Yorkshire by 2040. The largest proportion of the installations will take place in the 'Harrogate & The Dales' LAEP area, with 124,000 being required. A further 92,000, 77,000 and 62,000 will be needed in the A1 Corridor, 'The Vale, Moors & Coast', and City of York LAEP areas respectively.

Although lower in population, the rural off-gas areas are 'low regrets' i.e. those that will need to transition to heat pumps regardless of developments in other low carbon heating technologies.

District heat networks (DHNs) are systems of highly-insulated pipes carrying hot/warm fluid. This can then heat hundreds or thousands of buildings in an area in a cost-effective way. DHNs can also be low or zero carbon depending on the way in which the heat is generated e.g. large heat pumps or waste heat from industry. For a DHN to be cost-effective, there needs to be a high number of buildings requiring heat in a small area i.e. a 'high heat density'.

Therefore, DHNs are expected to be deployed in dense urban areas such as York and Scarborough. DHNs in York and Scarborough could heat 20,000 and 11,000 dwellings respectively, in addition to many non-domestic buildings in the vicinity. Smaller DHNs have been considered for more densely packed parts of 'Harrogate & The Dales' and A1 Corridor, for example, in Northallerton.

For non-domestic buildings much of the space heating can be decarbonised using heat pumps, however there is a sizeable proportion of high-temperature and/or process heat required where heat pumps are not going to be suitable. Before the mid-2030s and potentially longer term, this is an issue as hydrogen will not be available at scale, meaning that this part of the economy will continue to rely on fossil gas and produce carbon emissions. If decarbonisation is required before hydrogen is available at scale, on-site generation of hydrogen via electrolysis could be considered although it is likely to be at a higher cost than fossil gas.

After the mid-2030s, hydrogen is expected to become a viable option to decarbonise the remaining non-domestic buildings. Assuming that hydrogen infrastructure is sufficiently developed beyond the mid 2030s, it may also be worth considering extending the hydrogen offering to nearby dwellings.

Transport

Sales of plug-in cars and vans in the UK are growing rapidly, with 1 million plug-in cars on the road in 2022. The number of chargepoints is also growing quickly; at the end of September 2022, there were 34,860 charging points across the UK which is a 36% increase compared to September 2021.

Even though sales of electric cars and vans are growing, to meet the Sixth Carbon Budget commitment, ending the sale of Internal Combustion Engine (ICE) vehicles in 2030 to ultimately meet the net zero emission target by 2050, bold and aggressive rollouts of vehicles and infrastructure are needed. This will need to be even more aggressive locally to meet earlier net zero targets.

Transport for the North scenarios* anticipate all 514,000 cars and vans in Y&NY will be 100% electric by 2050. To achieve net zero earlier than 2050, the transition to 100% electric vehicles would need to be brought forward to be in line with the net zero energy system date significantly increasing the difficulty of meeting the target.

Once fully electric, these vehicles will consume approximately 840 GWh of electricity per year across the whole region.

* <https://transportforthenorth.com/future-travel-scenarios/>

Delivering a chargepoint network that is visible, accessible, connected, secure and interoperable will be vital in giving users confidence in transitioning to electric mobility. Furthermore, public charging infrastructure will need to be built ahead of the mass market transition as it will create the right conditions to enable it. The EV Energy Taskforce made a series of recommendations on how to enable the roll out of charging infrastructure ahead of need; from options for financial support including blended public and private capital and utilisation-linked loans, to anticipatory distribution network investment, underpinned by local area energy plans and support for local authorities in the form of tools and resources.

The charging infrastructure mix is expected to be diverse to be able to meet user needs. It is still expected that where available at home, off-street charging will cover the majority of charging needs. The mechanisms for deploying off-street charging for rental and council owned properties will need to be explored to encourage at home charging.

For users without access to off-street parking a range of solutions might be available. On-street slow chargepoints, slow chargepoints at secure car parks and local rapid hubs are all options that are being explored and deployed across the country. Suitability of each type of near home charging is dependant on a range of factors. Local resident preferences are a critical factor; from private users to fleet or van drivers, their charging needs, and therefore the charging infrastructure they will need vary. Land and network connection cost and parking availability are among factors that could make one area more appealing than the other. This highlights the need for local area assessments that consider local resident needs, network constraints and transport demands.

Other public chargepoint locations such as shopping centres and supermarkets will also support users and will complement home and near home charging. Finally, a network of rapid charging at motorways and major A roads will also be needed to support longer journeys and fleet vehicles.

In all cases the exact number and type of chargepoints will be influenced by user behaviour and preferences. Changes in how users travel will affect the charging infrastructure needed. Moreover, shifting to a mobility as a service model would require a different set of chargepoints to be rollout. Finally, the length of time vehicles are parked at a chargepoint will also affect the number of chargepoints needed.

Local Generation

To decarbonise heat and transport across York & North Yorkshire, a significant number of heat pumps need to be deployed and electric vehicles purchased. Both of these technologies will require large amounts of zero carbon electricity to ensure that they are not producing emissions. However, the scale of deployment and therefore the demand for electricity in the region is expected to occur ahead of the decarbonisation of the national grid in 2035. This means that zero carbon electricity will need to be generated locally in order to meet the demand.

The electricity demand is likely to have increased by between 21% in the 'The Vale, Moors & Coast' region and 68% in the City of York by 2040 when compared to current levels.

In the LAEPs for each area, rooftop and ground-mounted solar have been considered to demonstrate the scale of local renewable capacity which would decarbonise the York & North Yorkshire region ahead of the country as a whole. A high-level assessment was also conducted to give an indication of the maximum contribution of onshore wind to the future energy system.

Domestic rooftop solar could provide a large contribution. It is estimated that around 320 MW of rooftop solar capacity would be cost-optimal (subject to full feasibility and site visits) in the City of York with a further 163 MW in 'Harrogate & The Dales', 159 MW in the 'The Vale, Moors & Coast', and 123 MW in the 'A1 Corridor'. Collectively therefore, there is the potential for around 765 MW of domestic rooftop solar PV capacity across the region. Deploying all of this capacity would cost upwards of £600m. At the time of writing (Autumn 2022) however, the cost of domestic solar PV is being driven by the increased cost of importing panels, their scarcity as people look to reduce their reliance on 'grid bought' electricity, and increased installation costs due to the high demand. There are also obvious social benefits to installing domestic solar PV, especially for residents in fuel poverty who would immediately see a reduction in their electricity bills. By adding in-home battery storage, more of the generated electricity could be consumed by the household, reducing the reliance on the network during peak times and reducing the amount of electricity purchased. The economic case for batteries can be marginal in the 2022 energy market, but is likely to change with the emergence of novel incentives such as time-of-use tariffs, falling battery costs, and additional increases in electricity prices.

Large-scale solar farms are also considered to be a cost-effective way of generating significant amounts of zero carbon electricity. Indeed, due to their scale, they are often the most cost effective. Within York & North Yorkshire, there are many land parcels which – using our high-level method of identification – seem to be worthy of further investigation.

If the land areas identified are deemed to be suitable, 512 MW (10% of maximum potential) of ground-mounted solar could be deployed in 'The Vale, Moors & Coast', 890 MW (88% of maximum potential) within the City of York boundary, 547 MW (5% of maximum potential) in 'Harrogate & The Dales', and 609 MW in the A1 Corridor could be deployed. Together with 346 MW of onshore wind deployment in 'The Vale, Moors & Coast', 666 MW in 'Harrogate & The Dales' and 318 MW in the A1 Corridor, and the rooftop solar deployment, York & North Yorkshire could generate as much electricity as it requires on a net annual basis.

There are concerns though about what this amount of generation would do to the electrical network, since the power would be predominantly generated in mid-summer when heat pumps are not required for heating and therefore demand is low. Currently, seasonal storage for this quantity of electrical power is not deployable.

Networks

Electricity Network & Flexibility

To meet the new demand from electric heating and transport, there will be a need to upgrade the electrical network, since total peak electricity demand could increase to as much as 2.5x current levels. The high and low voltage networks may have sufficient capacity to accommodate most or all of the electrification in this plan in some areas, but many areas are likely to see a need for capacity upgrades.

In these LAEPs, network costs are estimated based on meeting increased demand with capacity upgrades, however it may be possible for flexibility services to reduce the investment required in conventional capacity upgrades.

Smart appliances which can shift the times they use electricity without any loss in performance (particularly EV chargers and heat pumps) can provide this flexibility.

Gas Network & Hydrogen

Although much of the current fossil gas demand for heating is expected to become electrified across the whole York & North Yorkshire region, the gas network still has an important part to play in the future energy system. As highlighted earlier, there are some areas of the non-domestic sector that will be hard to electrify and therefore will remain on fossil gas in the short-to-medium term before considering a transition to hydrogen in the mid-2030s. This provides an opportunity for nearby properties to also connect to a hydrogen network if they are yet to transition to an electrified heating technology.

However, many of the proposals for hydrogen will depend on the Government's policy position which they are expected to lay out in 2026.



Introduction



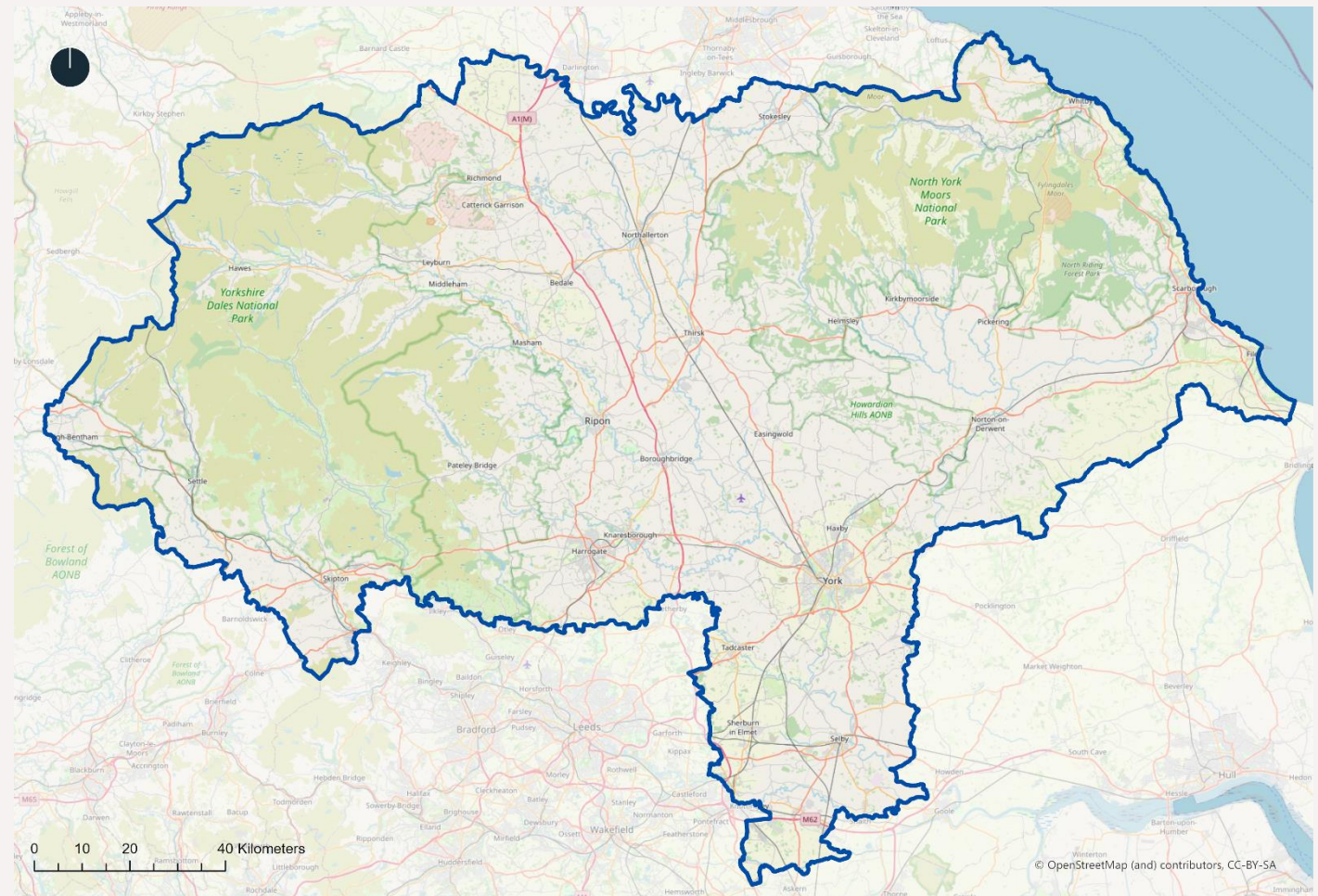
Introduction

Four Local Area Energy Plans (LAEP) have been produced for North Yorkshire and the City of York Council. The purpose of the LAEPs are to support the Y&NY region in meeting its net zero and carbon negative goals, enabling transition to an affordable and decarbonised energy system as well as supporting wider socio-economic goals.

The Y&NY LEP has set an ambitious target of achieving net zero by 2034 across the whole region, and to be England's first 'net negative' region by 2040. These ambitious targets put the Y&NY region well ahead of the national plan to achieve net zero by 2050.

North Yorkshire covers a large and predominantly rural area with two National Parks as well as densely urban areas such as the City of York. It covers a total of 8,325km², and is home to over 800,000 people. The geographic area covered by the LAEPs is shown in the figure (right).

Previous work focussed on the region has helped the Y&NY LEP, City of York Council, and other stakeholders understand the scale of the challenge to reach net zero. Undertaking LAEP builds on the existing strategies and action plans within the region and takes these to a spatial level to identify what changes needed to be made and where.



A further benefit of local area energy planning is the 'whole systems approach' which allows a future energy system to be considered which is most cost-effective as a whole, e.g. deploying different heat decarbonisation technologies to avoid a high-cost upgrade of the electricity network.

By working closely with local stakeholders, incorporating their data, knowledge and future plans, a LAEP is built on a common evidence base. The outputs can then be used reliably by stakeholders from council planners to network operators to community groups, knowing they are working towards a common goal built on strong foundations.

What is a LAEP?

A LAEP sets out the change required to transition an area's energy system to net zero in a given timeframe. This is achieved by exploring potential pathways that consider a range of technologies and scenarios, and when combined with stakeholder engagement leads to the identification of the most cost-effective preferred pathway and sequenced plan of proposed actions to achieving an area's net zero goal.

The scope of the LAEP covers the current energy consumption and associated greenhouse gas emissions, as well as the projected consumption in a defined area to 2050, primarily focussing on the area's built-environment (all categories of domestic, non-domestic, commercial, and industrial buildings) and some aspects of energy used for transportation.

A LAEP provides a level of detail comparable to an urban masterplan. It provides a proposed future plan for an area rather than providing a detailed schematic that sets out how each part of the area would be designed and built. More detailed work would be required to deliver specific elements of a LAEP¹.

¹ As an example, a LAEP identifies a zone that is best suited to a district heat network by assessing the types of buildings in the zone, their characteristics, and density; however, to deliver the district heat network it would require a full feasibility assessment by an appropriately qualified installation / design company, along with assessment of commercial viability and delivery mechanisms.

² <https://es.catapult.org.uk/report/the-future-of-local-area-energy-planning-in-the-uk/> and <https://es.catapult.org.uk/guide/guidance-on-creating-a-local-area-energy-plan/>

Definition of LAEP²:

- LAEP is a data driven and whole energy system, evidence-based approach that is led by local government developed collaboratively with defined stakeholders. It sets out to identify the most effective route for the local area to contribute towards meeting the national net zero target, as well as meeting its local net zero target.
- LAEP results in a fully costed and spatial plan that identifies the change needed to the local energy system and built environment, detailing 'what, where and when and by whom'.
- LAEP provides the level of detail for an area that is equivalent to an outline design or master plan; additional detailed design work is required for identified projects to progress to implementation.

³ A number of emissions sources are not included in the scope of a LAEP, but are included in the Routemap to Carbon Negative, including: land use and agriculture, negative emissions, industrial emissions not related to building fabric and heating; transport demand reduction, modal shift and public transport; and circular economy activities

- LAEP defines a long-term vision for an area but should be updated approximately every 3–5 years (or when significant technological, policy or local changes occur) to ensure the long-term vision remains relevant.
- LAEP identifies near-term actions and projects, providing stakeholders with a basis for taking forward activity and prioritising investments and action.
- LAEP scope addresses electricity, heat, and gas networks, future potential for hydrogen, the built environment (industrial, domestic, and commercial) its fabric and systems, flexibility, energy generation and storage, and providing energy to decarbonised transport e.g., electricity to electric vehicles and charging infrastructure.

Note: Some technologies such as batteries, storage, wave and hydro, and offshore wind have not been included in the LAEP modelling. It is likely that these technologies will play an important part of the future energy mix of both the local area and the UK as a whole.

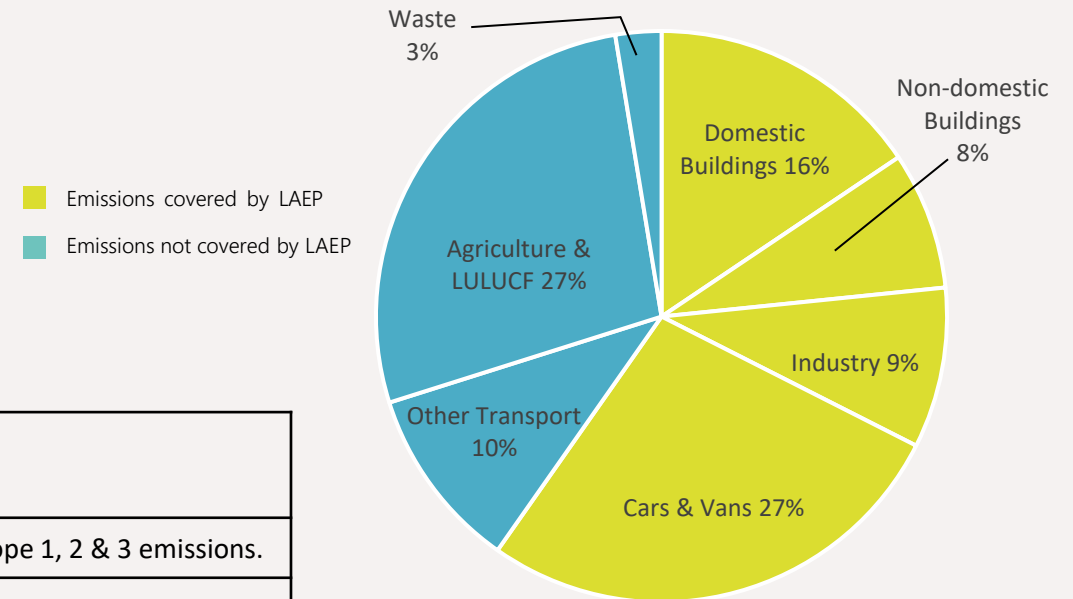
Emissions and Net Zero Targets

In 2020, the Y&NY region's emissions totalled 7.7 MtCO₂e¹. The chart (right) shows Y&NY region's emissions broken down according to their sources, such as buildings and transport. To be a net zero region by 2034, all of these emissions must be eliminated, not just those covered by this LAEP.

The Y&NY region currently comprises several local authorities and other regional bodies that each have their own targets relating to net zero as outlined in the table below. After April 2023, these local authorities will merge as part of local government reorganisation and emissions targets will need to be agreed by the proposed North Yorkshire Council.

Local Authority	Climate Emergency Declared	Targets
Craven District Council	Yes	Carbon neutral by 2030 including scope 1, 2 & 3 emissions.
Hambleton District Council	No	Carbon neutral by 2030.
Harrogate Borough Council	No	Aligned to the West Yorkshire Combined Authority target of net zero by 2038.
Richmondshire District Council	Yes	Net zero carbon Council by 2030, whole district by 2034.
Ryedale District Council	Yes	Net zero carbon emissions by 2050.
Scarborough Borough Council	Yes	Carbon neutral by 2030.
Selby District Council	No	Carbon neutral before 2050, with aspirations of achieving this by 2030.
City of York Council	Yes	Net zero carbon emissions by 2030.
North Yorkshire County Council	Yes	Net zero Council by 2030.
York & North Yorkshire LEP	No	Net zero region by 2034 and net negative by 2040.
Yorkshire Dales National Park Authority	Yes	95% reduction by 2030 (2005 baseline)

Approximate proportion of Y&NY's 2020 CO₂ emissions covered by this LAEP



The delivery of these plans will require all stakeholders in the areas to work towards the collective goal of net zero. The local authorities and other regional bodies are likely to be best placed to convene experts including the network operators, community groups, investors, and delivery partners under a governance structure to take forward the recommendations in these LAEPs through to delivery.

The graph on the next page shows all emissions (i.e., everything in the chart above) as pathways out towards net zero.

¹ CO₂e represents an amount of a greenhouse gas emissions whose atmospheric impact has been standardized to that of one unit mass of carbon dioxide (CO₂), based on the global warming potential (GWP) of the gas. Mt is millions of tonnes.

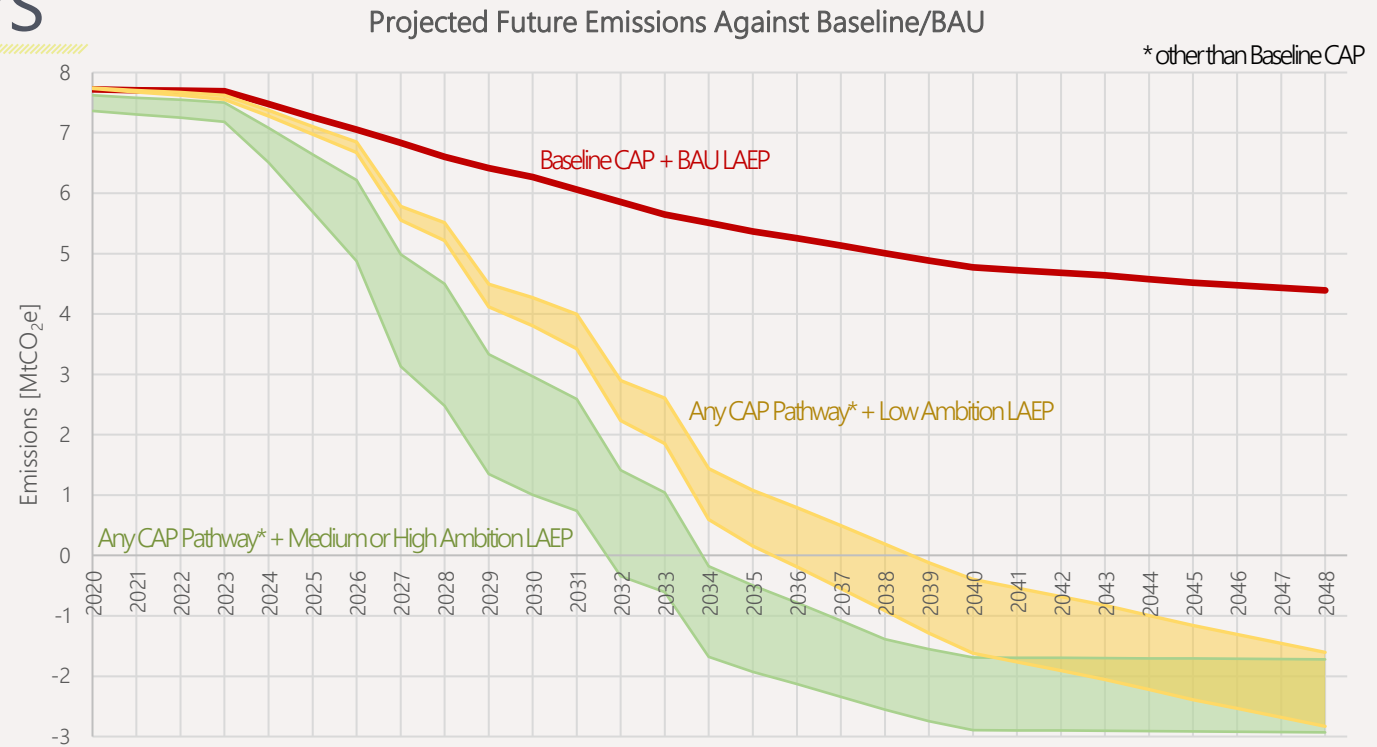
Emissions Pathways

In creating local area energy plans for North Yorkshire and City of York, a number of future scenarios and emissions trajectories have been considered in combination with the Carbon Abatement Pathways (CAP). North Yorkshire and City of York therefore have multiple pathways to follow to reach their goal of net zero by 2034 and to become the first net negative region in England by 2040. The CAP are named 'Max Ambition', 'High H2' 'Balanced', and 'Baseline'; ESC has used 'High', 'Medium' and 'Low' ambition.

The 'Low' ambition scenario progresses slower than the region's ambitions, aiming to achieve a net zero energy system by 2050 – aligned with the national net zero target of 2050. The 'Medium' ambition pathway aims to achieve a net zero energy system by 2040, and 'High' ambition aims to achieve a net zero energy system by 2030.

When these pathways are combined, only the 'Baseline' CAP and the 'Low' ambition LAEP scenarios fail to meet net zero in time to meet the 2034 net zero target. The 'Low' ambition scenarios do however still reach net negative before 2040.

It should be noted that the CAP includes negative emissions from carbon capture and storage at the Drax power station to offset emissions elsewhere. Since ESC considers the Drax power station to be a 'national asset' rather than a local one, the power generated and its associated emissions are considered to be accounted for at a national level. This therefore produces an inconsistency as any negative emissions, in ESC's opinion, would also be accounted for at a national level.



In the graph, above, the green area represents the combinations of CAP and LAEP pathways that would reach net zero by 2034 – in line with the Y&NY target. The yellow area represents areas that reach 'net negative' by 2040, but miss the 2034 net zero target. These are compared against a red line which represents the status quo in both the CAP and LAEP pathways.

<https://www.ynlep.com/Portals/0/adam/Stories/VqQDBytZGUuDihbMTz2ZZQ/Body/North-West-Yorkshire-Emissions-Reduction-Pathways.pdf>

The figures in the Routemap to Carbon Negative fall within the green area of the graph above. This is due to the figures in the majority being from the Max Ambition CAP scenario with some elements of the other pathways.

The LAEPs will therefore focus on a 'Medium' ambition scenario unless otherwise stated, as this, plus a 'Balanced' pathway from the CAP will produce a net zero Y&NY region in 2034.

Each scenario has associated early actions and long-term scale-up activities to reach the target in a cost-effective way, along with key enabling actions and decision points to stay on track and navigate future uncertainty.

In the near-term, the LAEPs illustrate the proposed activities for the region to progress towards net zero by identifying 'easy wins', 'focus zones' and specific 'outline priority projects' which could be taken forward into a feasibility stage.

Creating North Yorkshire & City of York LAEPs

The Y&NY region was broken into four sub-regions to align with the criteria of the Community Renewal Fund (CRF).

These sub-regions are:

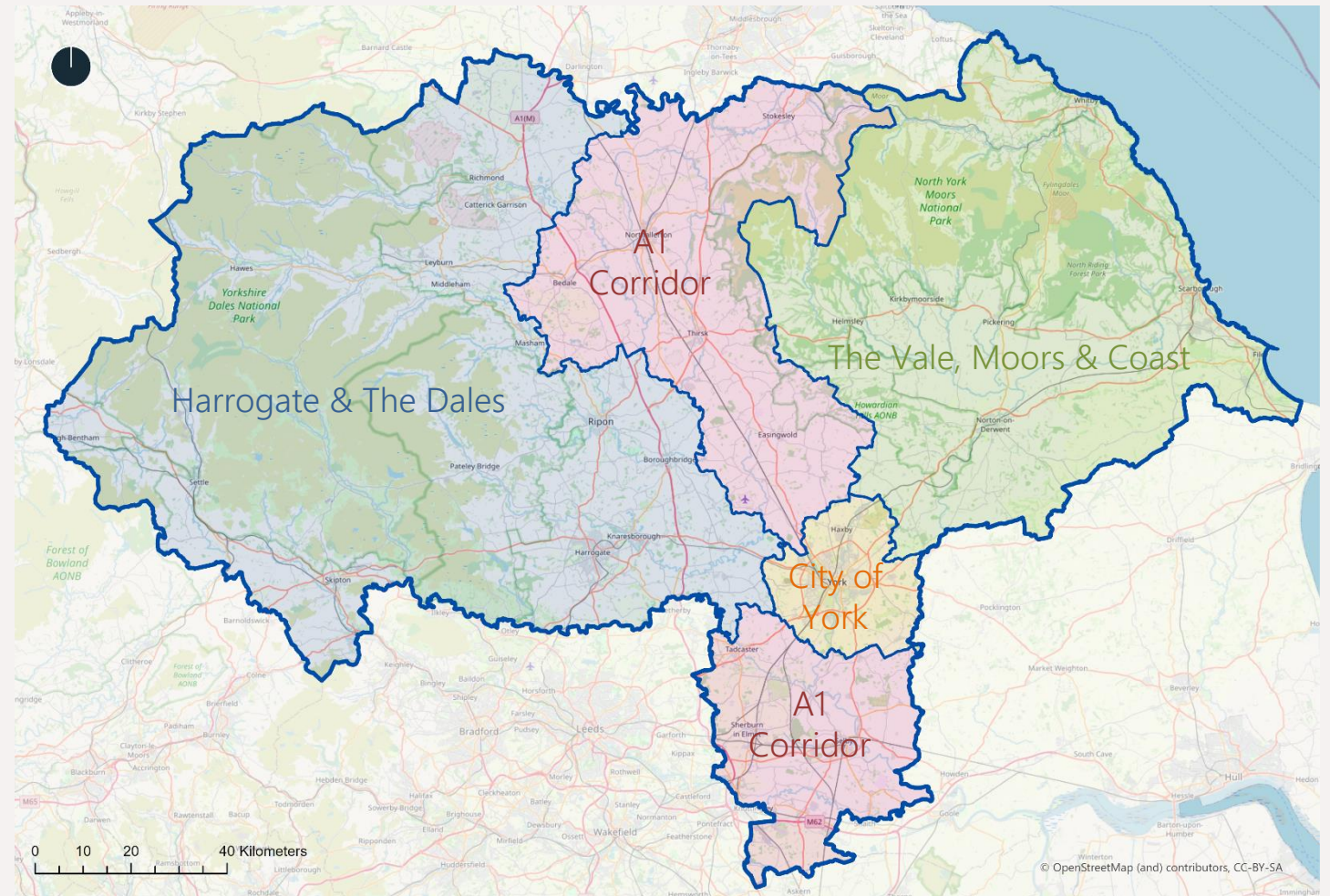
- A1 Corridor (pink)
- The Vale, Moors & Coast (green)
- Harrogate & The Dales (blue)
- City of York (yellow)

These were then sub-divided into several 'zones' to allow for a better understanding and assessment of options for decarbonisation.

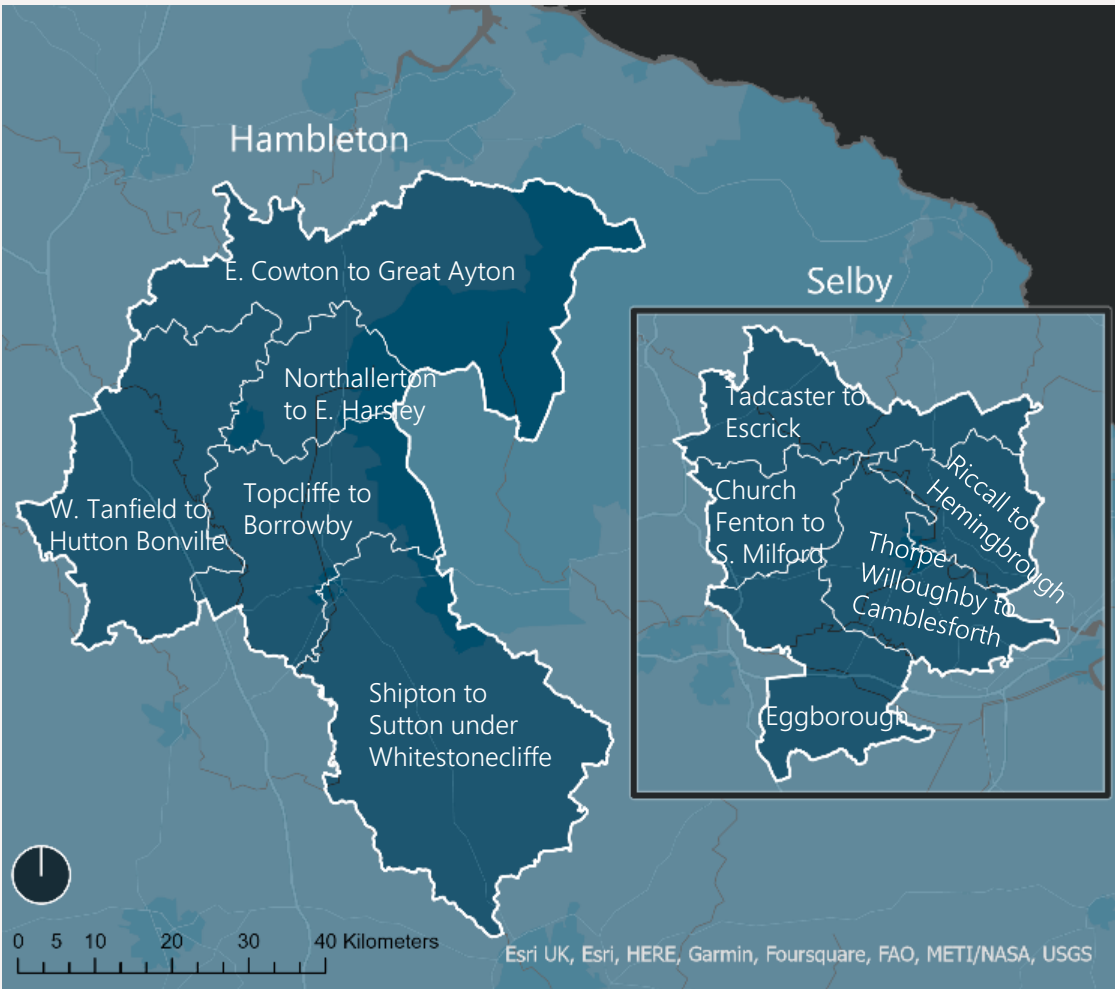
Zones for analysis were identified based on areas served by primary substations, using data provided by the electrical network (Northern Powergrid) that identifies buildings connected to secondary substations that are in-turn connected to each primary substation.

The zones therefore do not follow other standard geographical boundaries such as LSOAs, MSOAs, constituencies, or electoral wards.

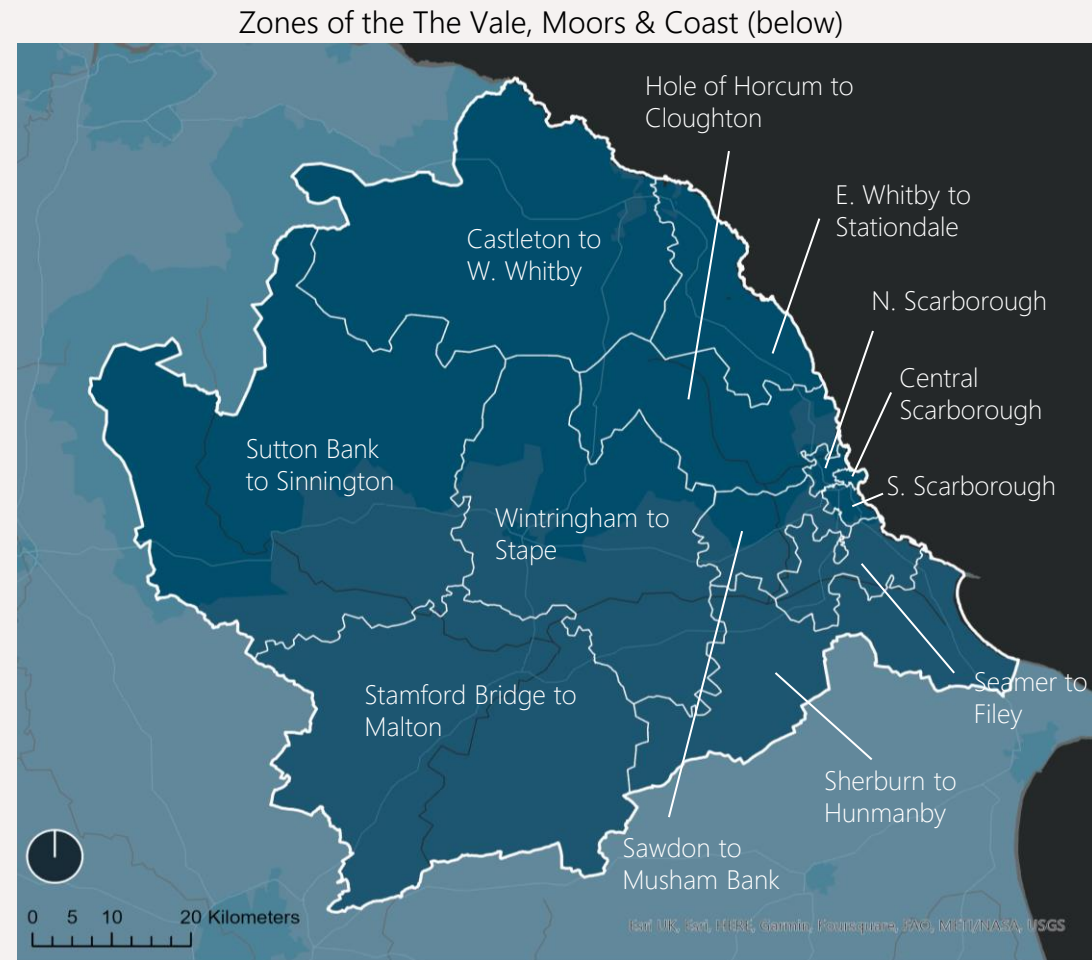
The following four sections of this report provide further detail on the LAEPs for each of the sub-regions.



Zones – A1 Corridor and The Vale, Moors & Coast

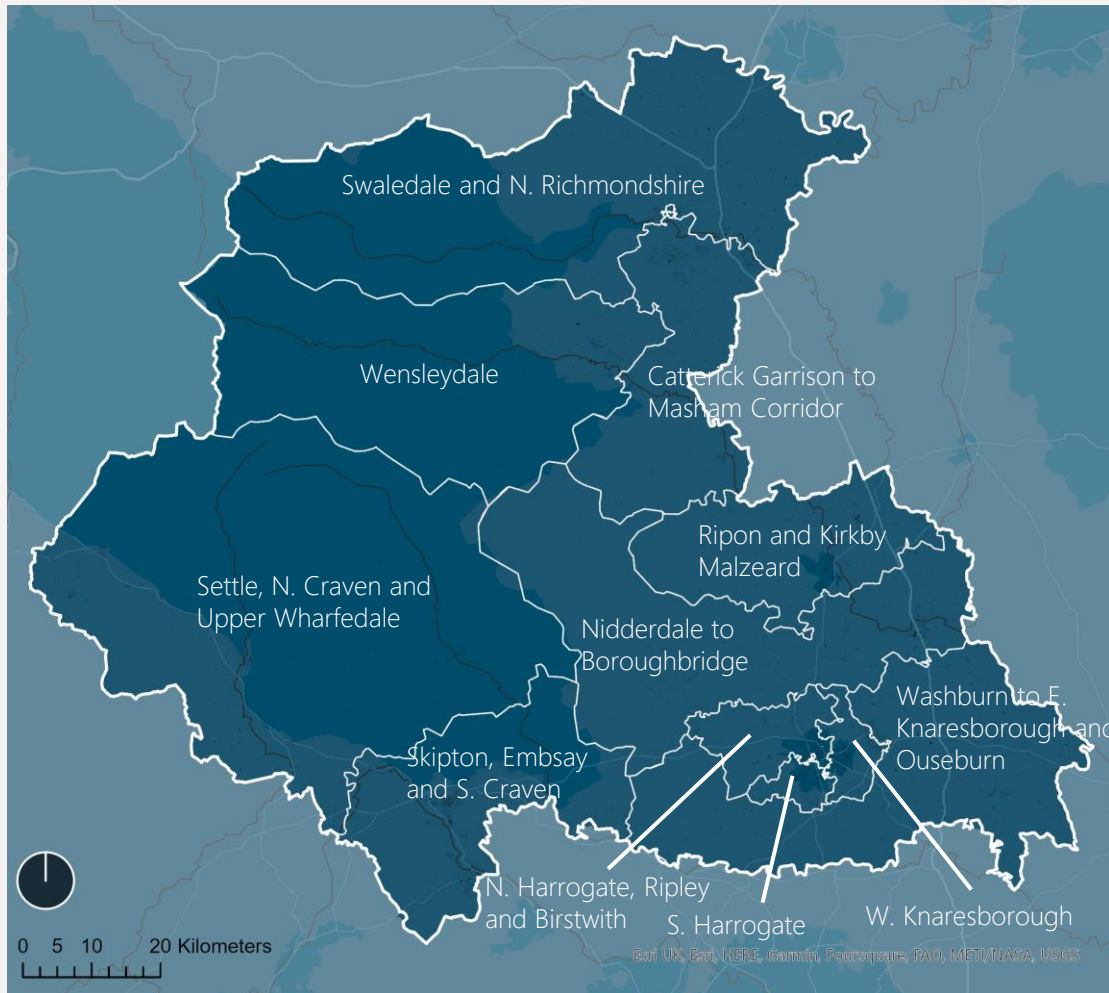


Zones of the A1 Corridor (above)



Zones of the The Vale, Moors & Coast (below)

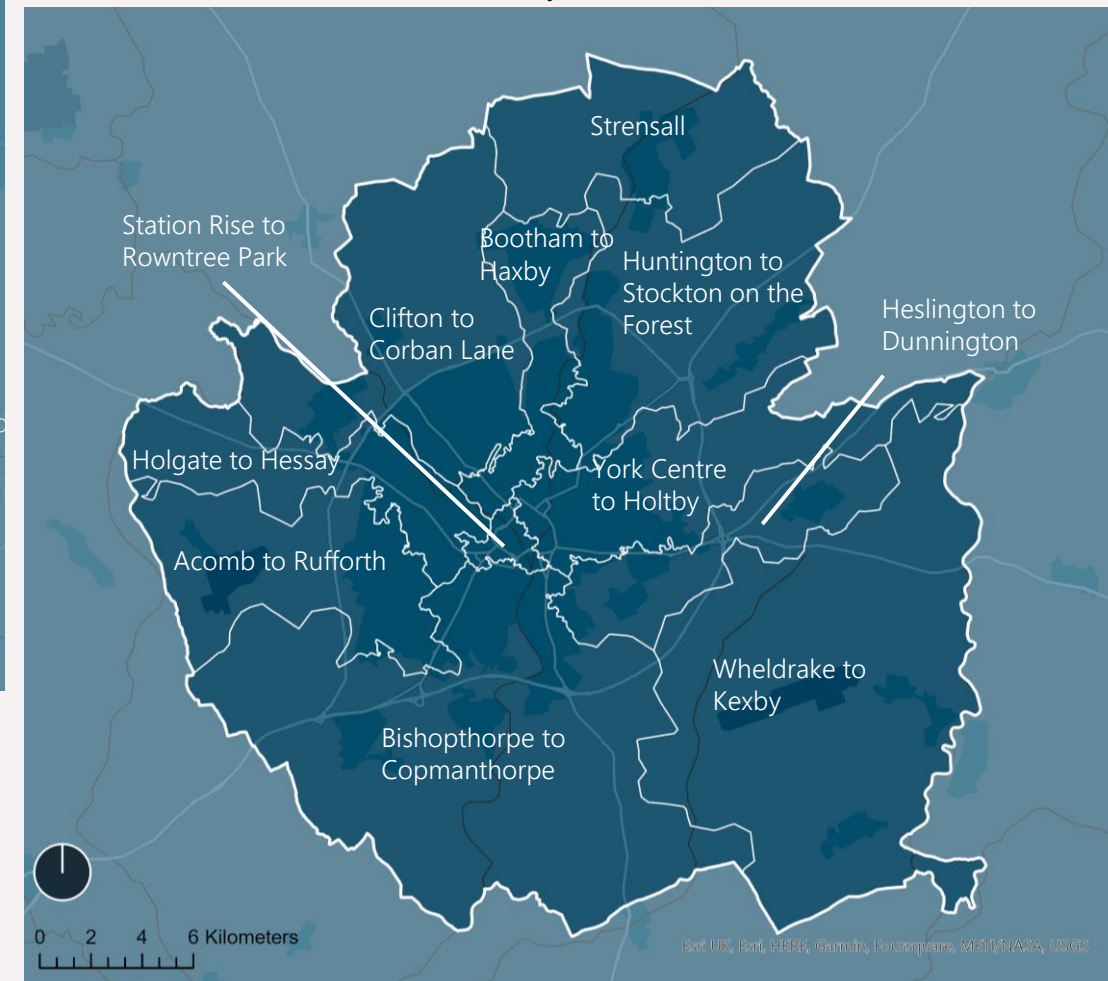
Zones – Harrogate & The Dales and City of York



Zones of the Harrogate & The Dales (above)

"The Dales" refers to the current council areas of Richmondshire and Craven.

Zones of the City of York (below)



A1 Corridor

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The Vale, Moors & Coast

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Harrogate & The Dales

Local Area Energy Plan



City of York

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Implementation

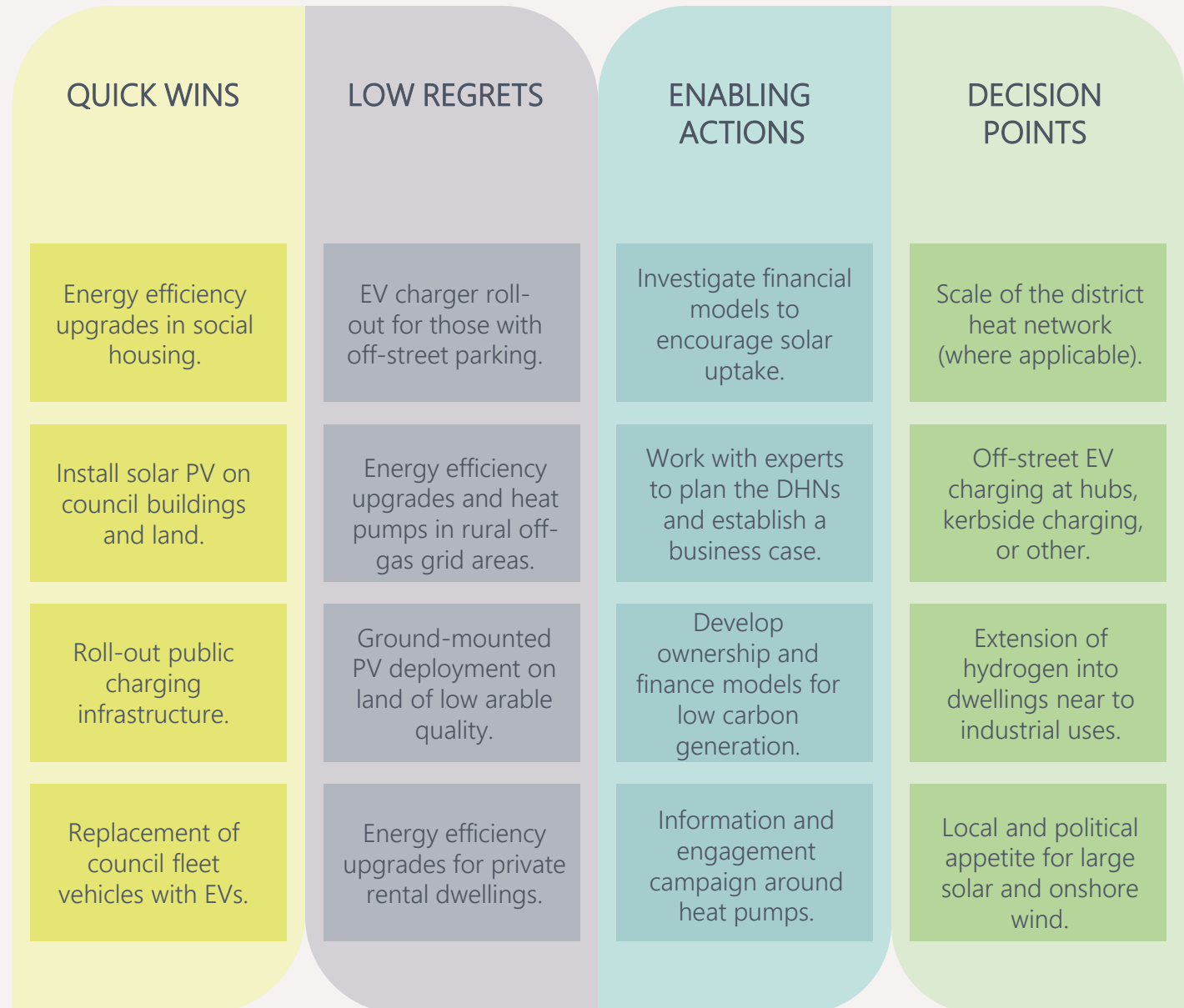


Overview of Implementation

Recognising the scale of the transition needed to support Y&NY region's net zero ambitions, the LAEPs are broken down into:

- Near-term components made up of "Quick Wins" which can be carried out in the near-term without major blockers, and "Low Regrets" projects which are common under various scenarios but may require further enabling action before they can be progressed
- Long-term components made up of "Enabling Actions" which need to be carried out ahead of time to pave the way for later solutions, and "Decision Points" where the most appropriate solution is chosen at some point in the future once more information is known. These decision points may be needed before widespread scale-up and deployment of solutions.

Some of these are summarised opposite, which along with other components feed into The Pathway. The Pathway is followed by a series of Next Steps which highlight the aspects the Y&NY region should consider to progress the LAEPs; working with the Key Stakeholders to determine roles in supporting the implementation of these LAEPs.



Next Steps



Taking LAEP Forward

The local area energy plans (LAEPs) for the Y&NY region have highlighted initial 'low regret' outline priority projects for consideration. In order to take these projects forward and assess the role the local authorities in the proposed combined authority and the LEP wish to play in the future low carbon energy system, ESC has developed an initial approach illustrated on the next page, followed by specific actions.

Prioritise

The first stage recommends stakeholders work to prioritise the projects identified within the LAEPs and commission desktop feasibility studies to assess their viability in meeting the regional aims and objectives. Prioritisation of the LAEP projects should be influenced by areas currently within direct control, for example social housing or land assets and public buildings owned by the councils. Resources are available at Net Zero Go¹ to assist with this.

Projects should then be assessed in line with regional targets to assess impact on fuel poverty, air quality, local economic growth plans, etc.

Prioritisation should also include understanding the role each tier of local and regional government wishes to play as decarbonisation projects are further developed.

For example, they could work with partner organisations to assess their risk profiles, and desired roles in any future energy system before matching outcomes against different types of local energy business models. Prioritised projects should subsequently undergo desktop feasibility studies to assess their viability and to understand the low carbon interventions and renewable technologies required in further detail. This could include sizing commercial renewable technologies, assessing co-located storage options, consideration of network connection requirements and an initial outline business case.

Assess

In the next phase of energy project development, various options can be assessed with the aim of exploring investible delivery mechanisms. Dependent on project type, a partner organisation with experience of innovative business modelling can assess how technologies can be connected and delivered to residents in a way that matches the risk profile of each stakeholder and the role they wish to play. This could include assessing different types of Smart Energy Tariffs that incorporate costs for retrofit for social housing, exploring ways for councils to invest into infrastructure projects while ensuring commercial revenues are secured or assessing business models where the councils are off-takers or customers.

Connect

Further consideration should be given to how technologies and projects can be connected together through Smart Local Energy Systems (SLES), which can aggregate to unlock private investment and create numerous co-benefits. Once a firm Capital Investment Plan has been formed and initial sources of investment and funding have been identified, the design phase needs to firm up assumptions made during desktop feasibility.

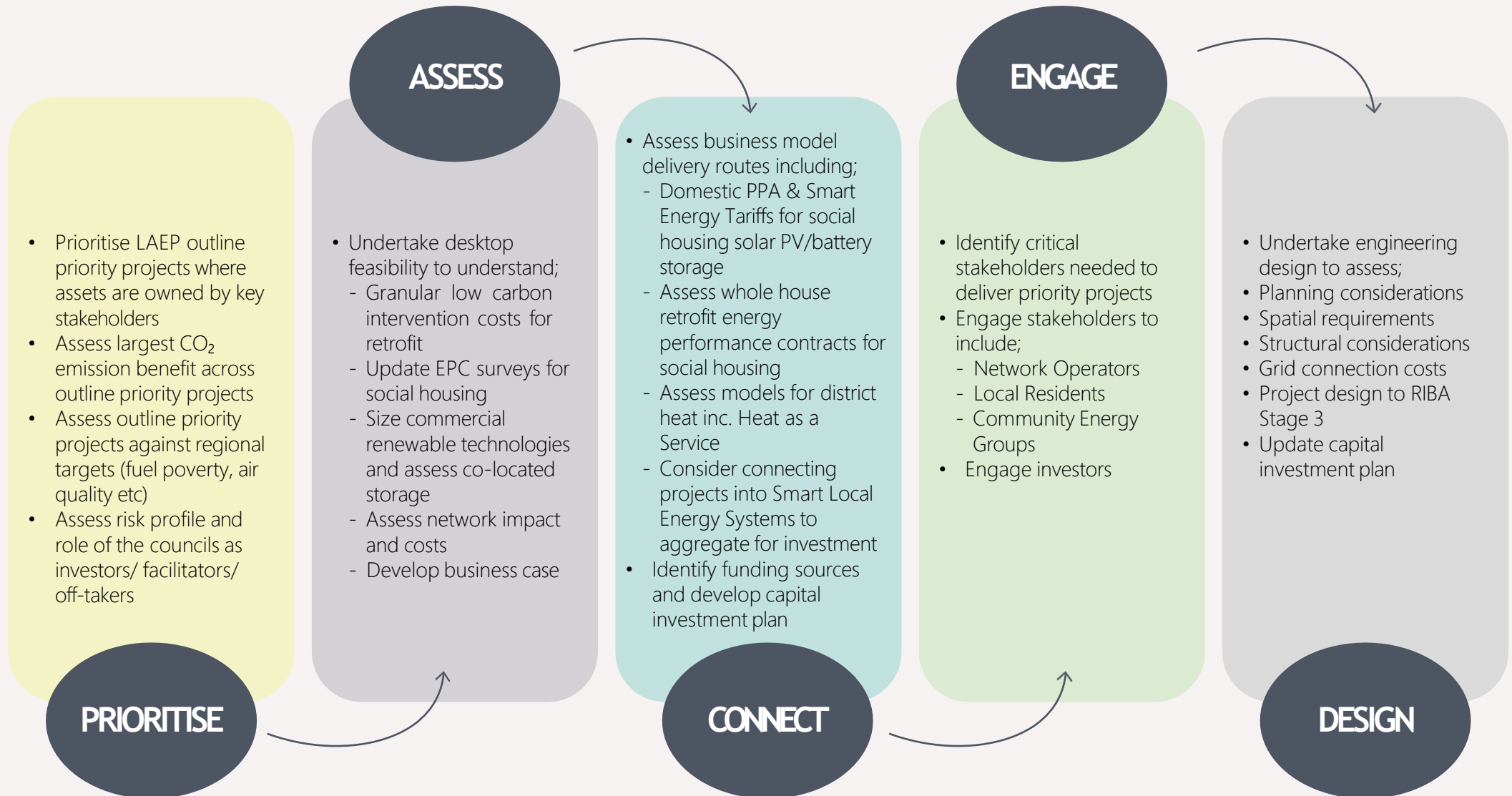
This involves working with partner organisations with engineering expertise to assess spatial, planning and structural considerations. Connection costs should be fully understood and a finalised capital investment plan produced.

Engage

Engagement is another key part of taking outline priority projects identified in the LAEPs forward. Key stakeholders need to be identified and consideration should be given to how residents are consulted and bought into the potential benefits of decarbonising dwellings and estates. A partner organisation with strong digital engagement experience and relationships with network operators can support this process.

¹ <https://www.netzerogo.org.uk>

Unlocking Investment



Energy Systems Catapult is well placed to help York & North Yorkshire LEP, City of York Council, and other stakeholders to move from LAEP towards design and delivery.

Taking LAEP Forward

Devolution for York & North Yorkshire alongside the creation of the new North Yorkshire Council provides an excellent opportunity to take forward projects identified in these LAEPs. The proposed combined authority could provide a coordinated, centralised approach which learns from previous work in the area and leverages the knowledge, data and skills this has created whilst enabling economies of scale and efficient working.

Creation of a LAEP Delivery Group with leadership groups for different sectors can:

- Help to coordinate actions across the York & North Yorkshire region to drive change.
- Ensure that different aspects of the energy transition are considered together to ensure appropriate action is taken. For example, ensuring that if electricity network reinforcement is required for EV charging, consideration is given to any future requirement to support electrification of heat to avoid two phases of works.
- Provide a central contact point for stakeholders such as gas and electricity network operators and other delivery partners helping them to understand priorities, opportunities and constraints across the area and to work effectively in supporting and delivering the proposed combined authority's vision.
- Enable larger scale procurement to reduce costs.
- Help with identification of skills gaps and provision of local training to fill them.
- Provide opportunities to identify approved and trusted suppliers to support private investment that builds upon public investments.
- Provide a central resource to support local residents when making decisions about their dwellings and travel options.
- Ensure that a consistent approach is taken to tracking progress and updating plans.

As part of this work, creation of a Citizens Panel could be considered to ensure that local communities are engaged in the challenge of reaching Net Zero, feel that their voices have been heard and are supportive of the change required.

Domestic Buildings

The proposed creation of the York & North Yorkshire combined authority provides an opportunity to build on existing local schemes such as Warm & Well in North Yorkshire, which are already delivering help to vulnerable people by addressing cold, damp dwellings, and fuel poverty. Opportunities exist to build on existing partnerships and to take learning from these schemes in areas such as working with local residents, identifying appropriate interventions, and building local supply chains to scale delivery of decarbonisation of dwellings to whole local areas.

Areas where existing local projects and knowledge could be leveraged include:

- Accessing funding through the Local Authority Delivery Scheme, Social Housing Decarbonisation Fund, National Energy Action, ECO and the National Grid Warm Homes Fund.
- Using other funding streams such as Boiler Upgrade Scheme.
- Widening the target clients and areas for activities such as York Energy Advice to cover a wider pool of residents and the whole of York & North Yorkshire.

- Using existing resident contacts from energy efficiency, oil buying and collective switching schemes to target communication around retrofit and low carbon heat schemes. Residents who have been involved in these types of schemes are likely to be more engaged with energy issues and may be more receptive to approaches regarding retrofit and low carbon heating opportunities.
- Comparing across all the different schemes that have been run in local areas to identify best practice and opportunities to share data, methods and approaches to applying for funding.
- Use of social housing asset registers and registers of private landlords (such as HMO registers and landlord forums) to understand these market sectors and identify retrofit options.
- Learning from previous schemes such as 'Hitting Hard' run by Scarborough Borough Council and Richmondshire District Council to build similar schemes across the whole of York & North Yorkshire.

In addition, consideration should be given to:

- Designing schemes for social housing so that a package can be offered to owner-occupied in the same area, with the potential to reduce costs for both housing providers and owner-occupiers whilst also increasing coverage.

- Considering where existing and new schemes can be aligned with the wider energy strategy and targeted towards heat pump and retrofit priority zones
- Applying lessons learnt on supply chains and accessing grant funding from existing schemes to help fuel poor and social housing tenants to scale up to include private rented and owner occupied dwellings.
- Improving understanding of local delivery capacity and identifying skills gaps and associated training needs.
- Considering learning from funding initiatives such as the Energy Repayment, Home Appreciation and Empty Property Loans set up under Hambleton's Private Sector Housing Assistance Policy Funding to help develop future options for similar combined authority schemes.
- A survey of existing MCS registered local suppliers to understand the scale of delivery possible with the existing supply chain.
- Working closely with local network operators to ensure timely delivery of the introduction of low carbon heating systems. For example, experience from BEIS' Electrification of Heat programme is that geographically clustered DNO approvals for heat pumps are easier for DNOs to manage and are processed more quickly than dispersed applications.

Non-Domestic Buildings

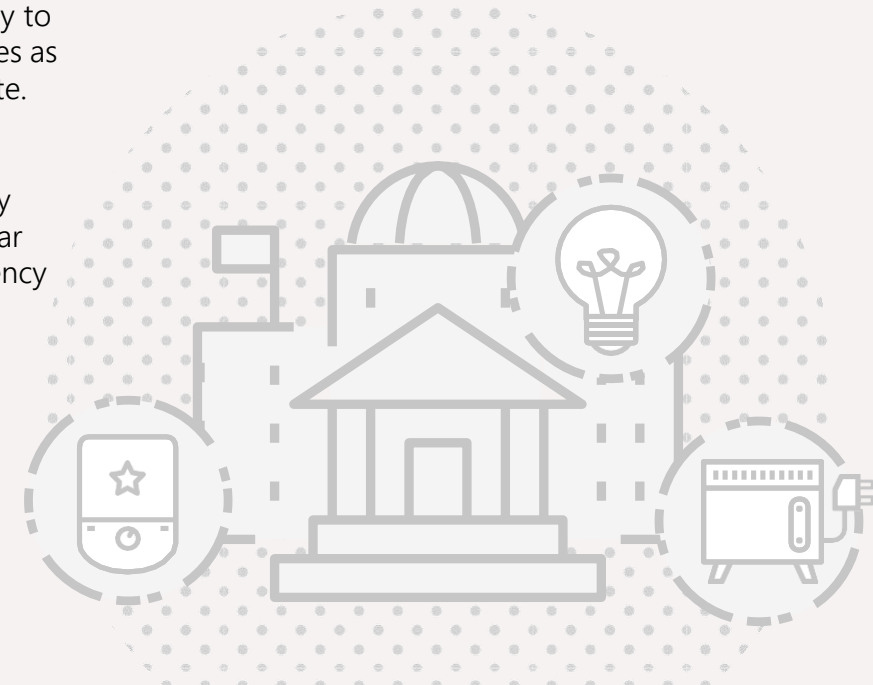
A similar approach to that adopted for domestic buildings can be applied to commercial and public building energy efficiency and decarbonisation, with learning and scaling up from existing projects and programmes to achieve scale. For example:

- Using experience from previous applications to the Public Sector Decarbonisation Scheme (PSDS) to identify approaches that have worked well to improve future applications.
- Developing site decarbonisation strategies in preparation for future PSDS funding rounds.
- Using learning from public sector building energy efficiency and decarbonisation programmes to develop other programmes to support local businesses in their own energy efficiency and decarbonisation.
- Using links with local businesses through the Federation of Small Businesses and West and North Yorkshire Chamber of Commerce to engage them with support programmes to help them decarbonise.

- Considering how local business might be supported to access funding through schemes such as the Renewable Heat Incentive.

In addition, the proposed combined authority should consider a programme to gather better data on commercial and industrial buildings including:

- Construction types
- Current energy use
- Surveying small industry sites to understand the current technologies on all sites and applicability of low carbon options alongside identification of where hydrogen is likely to be required to generate high temperatures as alternative approaches are not appropriate.
- Exploiting Northern Gas Network's* and National Atmospheric Emissions Inventory data on large gas users, to target particular sites for discussions around energy efficiency and decarbonisation.



* Note that there may be data sharing and commercial considerations which restrict how much of this information can be made available such that a partnership arrangement might be the best approach

Transport and Local Generation

Transport

In order to help enable the switch to electric vehicles and build on local studies, several actions should be considered:

- Providing information on low emission vehicles for car owners. For example, the EV Experience Centre in Milton Keynes provided impartial help and advice on electric vehicles to local residents.
- Focusing on charge points in public locations and areas without off road parking to enable and encourage uptake of electric vehicles.
- Targeting public sector activity and funding towards providing charging infrastructure for rural 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.
- Proceeding with electrification of vehicles owned and operated by local councils starting with cars and vans before exploring decarbonisation options for heavy vehicles (which may use alternative approaches such as BioLNG in preference to electrification).
- Using learning from these schemes to provide help and support to local businesses with understanding options and decarbonising their own vehicle fleets.
- Considering if reduced cost charge points could be offered to local businesses by leveraging investments in publicly funded charge points.
- Working with local bus operators as part of the introduction of bus franchising under the devolution deal to encourage introduction of low emission bus services.
- Working closely with Northern Powergrid (NPg) to ensure that network constraints do not hamper widescale introduction of electric vehicles, and that they are aware of which areas are being targeted for the introduction of electric heat solutions so that planning can account for both changes.

Local Generation

Local, low carbon energy generation is likely to be at a variety of scales from individual domestic solar PV installations to large wind farm and ground mounted solar developments. Several actions can be taken to encourage uptake across this spectrum.

- Understanding the number and size of local suppliers and the scale of delivery possible with the existing supply chain.
- Engaging with residents to understand public attitudes to low carbon generation and to garner support for new installations.
- Identifying funding opportunities and developing schemes to encourage uptake.
- Supporting new community energy schemes by working with existing local schemes and providing contacts, learning and coordination. This could be in combination with the North East and Yorkshire Net Zero Hub.
- Exploring opportunities to leverage investments in solar PV for social housing and public buildings to provide support and to reduce costs for private investments
- Coordinating with NPg to ensure that viable schemes are not held back through problems relating to network connection issues.

Networks, Storage and Flexibility

The most important aspect of taking forward the Y&NY region's LAEPs with respect to energy networks will be ensuring regular communication and coordination with and between network operators to ensure that they are aware of what is planned, where it is planned, and when it is planned to happen. This should provide significant benefits in ensuring that any network preparations that are required to enable different projects do not prevent those projects from progressing. There are also specific actions that should be considered for different individual energy networks.

Electricity Networks

A York & North Yorkshire Local Energy Market* may prove valuable in supporting roll out of heat pumps, electric vehicles, solar PV, energy storage and flexibility across York & North Yorkshire. It is proposed that a project to understand and investigate options is undertaken.

Heat Networks

BEIS' Heat Networks Delivery Unit (HNDU) has funding available for heat network feasibility studies. This should be accessed to progress development in heat network focus areas. It is suggested that the knowledge and experience of local staff who have already worked with HDNU is used to support future work in this area.

It will be important to engage with local sites that have been identified as potential anchor loads or heat providers for heat networks, as well as local resident associations when starting to build the case for new district heat networks. This will ensure that sufficient scale can be achieved to make developments commercially viable.

In the absence of individual site energy demand data, the information used to identify heat network focus zones has been based on a series of assumptions around the energy use of different sites and buildings. It will be valuable to start gathering better energy data from target areas based on their actual energy use. This will be particularly important for larger sites that are likely to be integral to building the business case and technical design requirements of future heat networks.

Gas Networks

Opportunities and timelines for use of hydrogen in the Y&NY region will be heavily dependent on the plans of Northern Gas Networks. It is important that the new proposed combined authority maintains an ongoing discussion with them around these plans. This will be linked to the suggestion above to work with local industrial sites to better understand their decarbonisation options and needs.

Since options for future use of hydrogen are also being developed and discussed at a national scale, it is important that the proposed combined authority also monitors central government action in this area and engages with BEIS to ensure that local needs and priorities are sufficiently considered in the national decision making process.

* For example see: <https://gmgreencity.com/projects-and-campaigns/local-energy-market/>

Risks



Risks

There are risks and benefits associated with each of the technologies and options presented in these LAEPs. Due to these, the Y&NY region's actual transition is expected to vary from how it has been presented to reflect challenges and opportunities that have not been accounted for, or those that could arise in coming years. Therefore, before making any widescale and significant commitment to one option or technology over another, evaluation of multiple factors will be needed.

The key risks associated with these LAEPs are summarised below. Consideration of these aspects during implementation must be reflected, as outcomes may necessitate an update to these LAEPs. In addition, there may be additional market, policy and regulatory changes that could also result in a need to reconsider aspects of the pathway and LAEPs. Many of the actions identified in the Next Steps section of this document should also assist in mitigating some of these risks.

Risk	Description	Mitigation
Domestic and non-domestic heat decarbonisation using hydrogen	The LAEPs are based on projected figures for hydrogen availability, carbon content and cost; these have influenced the heat pump and heat network focus in a number of zones and are unlikely to accurately reflect future outcomes.	Concentration of early action in focus zones of least regret identified for heat pumps and district heating; moving forward, consideration of UK heat strategy and gas network plans will be needed before planning wider scale-up.
Domestic heat decarbonisation and resident acceptance	Transitioning away from fossil gas boilers to heat pumps or district heating will require innovative solutions to overcome resident acceptance of solutions that are more expensive to purchase and potentially disruptive.	Focusing implementation in off gas grid areas reduces risk associated with picking a technology type, where heat pumps would be a low regret solution. These areas could be used to test models and approaches that appeal to residents before considering wide scale up. Building on previous local projects such as North Yorkshire's Warm Homes to design new schemes that incorporate previous learning.
Level of district heating	The rationale of transitioning large numbers of dwellings to district heating is based on the ability to cost effectively provide district heating systems in comparison to other options. These LAEPs have only been able to consider the effectiveness of the proposed district heating areas at a high level, more detailed consideration will be needed.	Focussing on areas which have a high-density of buildings increases the likelihood that a district heat network will be cost-effective - more detailed studies are needed to confirm which zones have the highest potential. Heat networks could be lower risk than individual heat pumps for low income residents as the cost is less likely to fluctuate and the emissions, due to the technology choice, can be managed centrally and these aspects should also be taken into consideration in studies.

Risk	Description	Mitigation
Level of local generation (solar PV)	The significant level of solar PV proposed is primarily related to the requirement to cost effectively reduce carbon emissions ahead of the decarbonisation of grid supplied electricity and is most effective at reducing carbon in the earlier years of the plan. However, it presents many challenges related to the scale and speed of roll out required.	Further consideration of the benefits to the Y&NY region, potential operating models, system design (e.g. considering smart local energy systems), land use and whether large volumes of locally generated renewable energy can and should be exported to the grid.
Non-domestic buildings and suitable solutions	The decarbonisation options that have been assessed are based on high level information regarding the buildings, their energy systems and the operation/processes of the site. More detailed information will be required to refine preferred solutions.	Identify an approach to better understand non-domestic building use, construction, heating systems and energy use and preferred decarbonisation solutions, potentially targeting areas where a high proportion of industrial site types have been identified; this could also inform consideration of hydrogen to this area.
Practicality and disruption associated with heat decarbonisation	Both heat networks and heat pumps can work in most of the building types in York and North Yorkshire although heat networks will only be an option in urban areas. However, replacing gas based boilers with these options presents challenges; for example, installation costs and the potential disruptive internal works associated with adapting/changing the heating distribution system.	Focusing initially on off gas grid areas for heat pumps and areas identified as least regret for heat networks; aligning with the associated hydrogen based risk. In addition, consider any wider roll out once UK heat strategy is in place. Building on lessons learnt in previous local schemes such as Scarborough and Ryedale's Heat Pump Programme.
Social and community benefits and impacts	Each heat decarbonisation option results in varying benefits and impacts; for example, heat pumps could result in lower energy bills than a hydrogen or heat network system but the installation cost would likely be notably greater without policy intervention.	Use socio-demographic indicators when considering implementation; alongside targeting where corresponding whole home based solutions, such as providing deeper retrofit and domestic solar PV systems can best support those residents in most need.
Funding and investment	The LAEP has identified some possible funding sources but these will only cover a proportion of the total funding required.	York and North Yorkshire will need to work with regional partners and central government to identify potential additional funding routes as well as learning from previous applications for funding to schemes such as National Grid's Warm Homes Fund and the UK Community Renewal Fund to ensure good quality applications for existing schemes.

Risk	Description	Mitigation
Ability to rapidly scale and implement measures; considering supply chain and impacts of implementation rates	The ability to achieve a net zero target ahead of the UK's 2050 target will require the scale up and deployment of measures far beyond current or historical rates; in addition, the benefit of measures (e.g. solar PV) also depends on the ability to install extremely quickly and at highly ambitious scales.	Consideration of the corresponding projections for implementation will be needed to determine if and how ambition can be met.
Electricity Network Capacity	Significant increases to local electricity demand through increased use of heat pumps and EV charging and increased local renewable electricity generation could both be impacted by local electricity network capacity	<p>Regular discussion and engagement with Northern Powergrid to ensure they have as much time as possible to prepare and implement any network changes required.</p> <p>Ensuring that consideration is given to development of Smart Local Energy Systems and associated local energy markets when developing schemes to reduce the influence of network constraints where possible.</p>
Skills availability	The level of change required across York and North Yorkshire to meet the ambition demonstrated in the LAEPs will require significant local delivery capacity which may not be currently available.	Improving understand of local delivery capacity, identification of skills gaps and provision of local training to fill them
Gas Network affordability and availability	As consumers are switched away from the gas network the costs for remaining users will rise. In addition, maintaining the gas network to supply sites (e.g. industrial) in areas that are expected to be heat pump or district heat prevalent may prove problematic if areas of the network start to be decommissioned.	<p>Care must be taken to ensure that increasing gas network costs do not end up being paid by those least able to pay by ensuring these households are given affordable options to switch alongside more affluent ones.</p> <p>Regular discussion and engagement with Northern Gas Networks to ensure that they have as much time as possible to prepare and implement any network changes required and that their plans for introduction of hydrogen into local networks are understood and accounted for during planning.</p>
Coordination	There are a large number of stakeholders (both inside and outside the local area) that will be involved in, and influenced by the transition of York and North Yorkshire to Net Zero. There is a risk that lack of coordination may result in transition being blocked, assets being stranded or costs increasing significantly.	Identification of key stakeholders with regular discussion and engagement, creation of a LAEP Delivery Group and working with neighbouring areas as well as national government to ensure a common understanding and good coordination.

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If there are any questions about the method or outputs in this LAEP, then please feel free to contact the Energy Systems Catapult team on:

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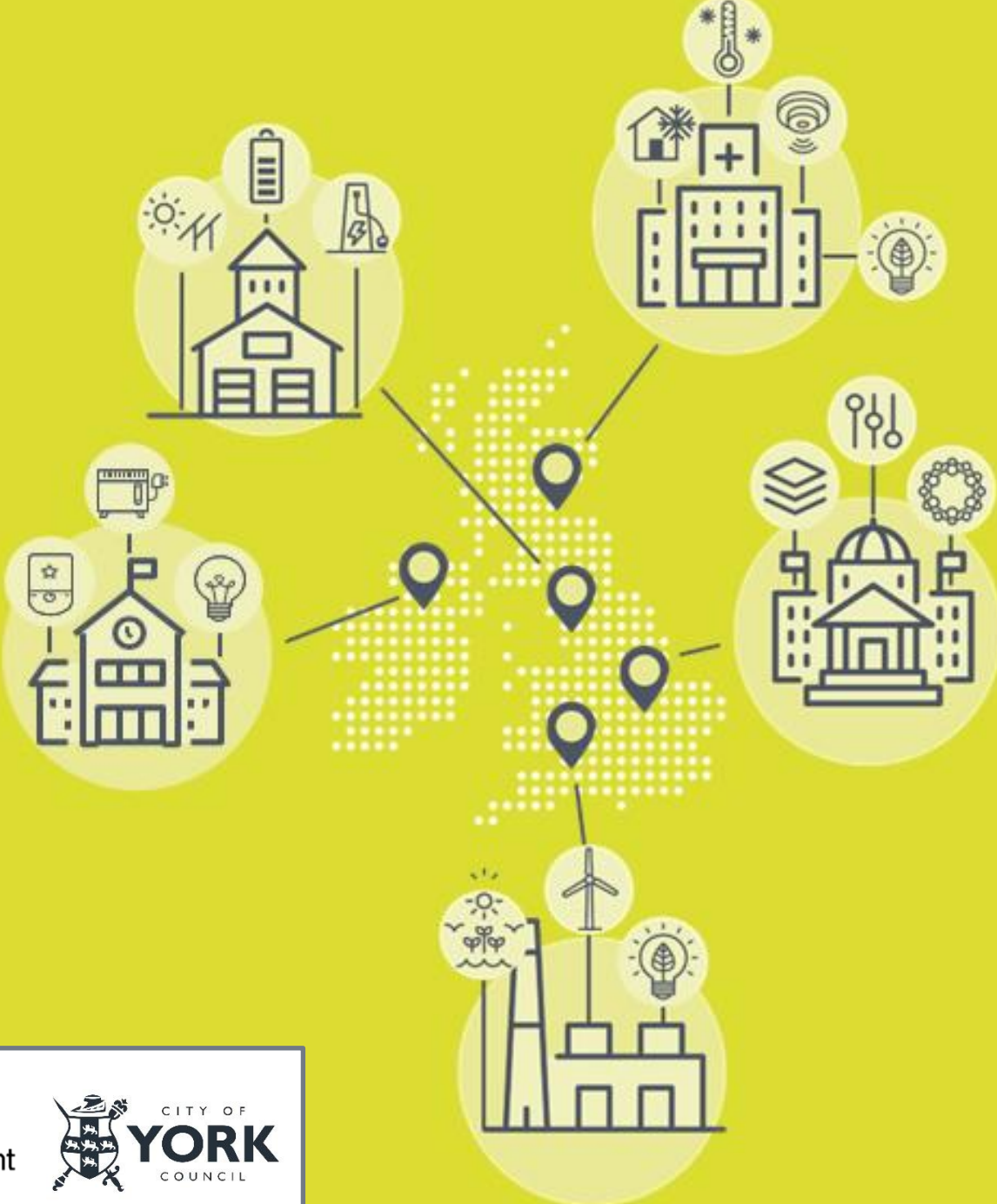
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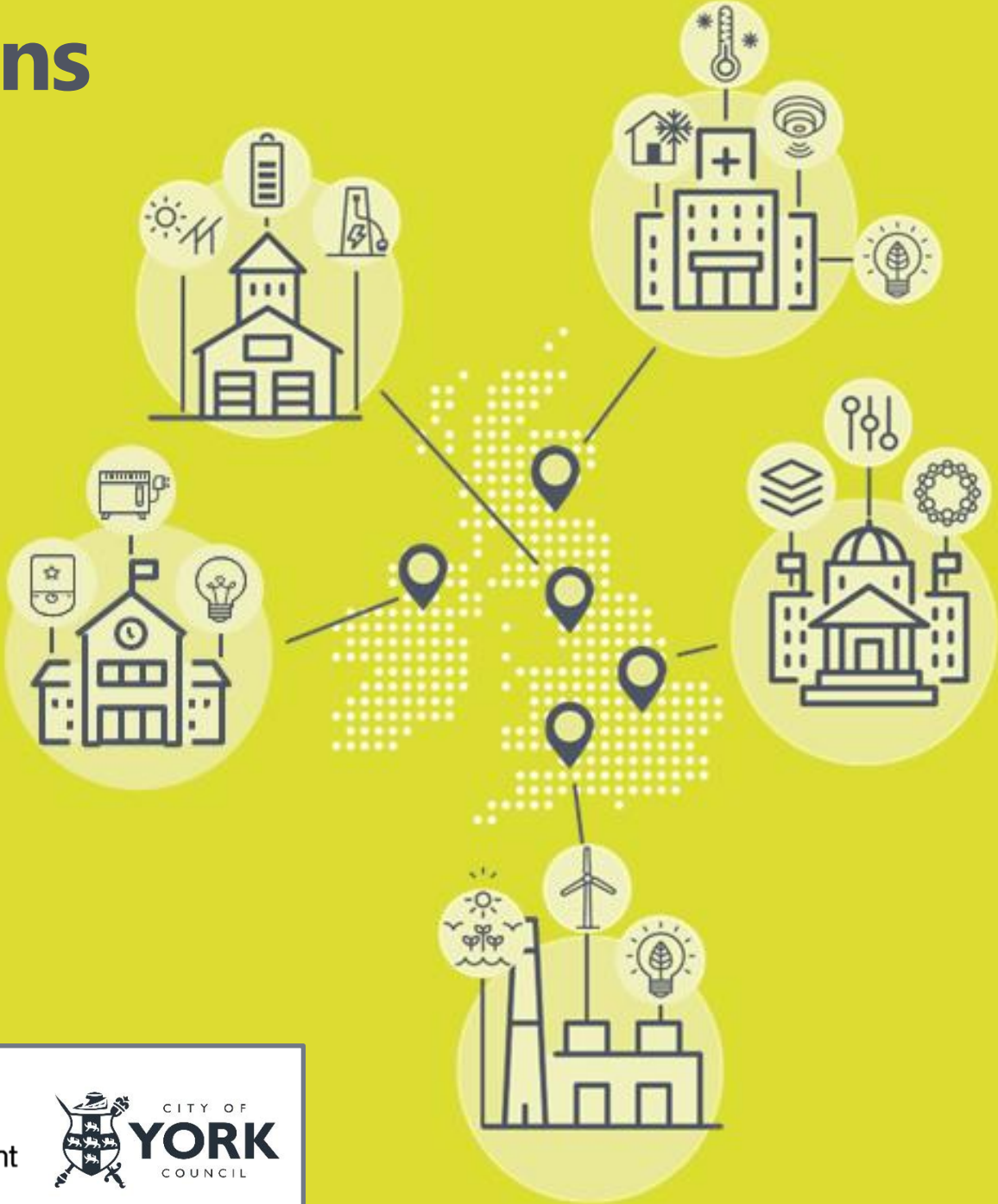
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Annexe A – Stokesley Case Study



Annexe B – Method, Data & Assumptions



Annexe C – 2030 York

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