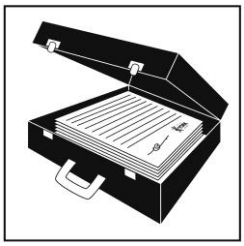


Notice of a public

Decision Session - Executive Member for Environment and Climate Change

To: Councillor Widdowson (Executive Member)

Date: Wednesday, 8 March 2023

Time: 3.00 pm

Venue: The George Hudson Board Room - 1st Floor West Offices (F045)

AGENDA

Notice to Members – Post Decision Calling In:

Members are reminded that, should they wish to call in any item* on this agenda, notice must be given to Democratic Services by **4:00 pm on Friday 10 March 2023.**

*With the exception of matters that have been the subject of a previous call in, require Full Council approval or are urgent, which are not subject to the call-in provisions. Any called in items will be considered by the Customer and Corporate Services Scrutiny Management Committee.

Written representations in respect of items on this agenda should be submitted to Democratic Services by **5.00 pm** on **Monday 6 March 2023.**

1. Declarations of Interest

At this point in the meeting, the Executive Member is asked to declare any disclosable pecuniary interests or other registerable interests she might have in respect of business on this agenda, if they have not already done so in advance on the Register of Interests.

2. Minutes (Pages 1 - 6)

To approve and sign the minutes of the Decision Session held on 14 December 2022.

3. Public Participation

At this point in the meeting members of the public who have registered to speak can do so. Members of the public may speak on agenda items or on matters within the remit of the committee.

Please note that our registration deadlines have changed to 2 working days before the meeting. The deadline for registering at this meeting is at **5.00pm** on **Monday 6 March 2023.**

To register to speak please visit www.york.gov.uk/AttendCouncilMeetings to fill out an online registration form. If you have any questions about the registration form or the meeting please contact the Democracy Officer for the meeting whose details can be found at the foot of the agenda.

Webcasting of Public Meetings

Please note that, subject to available resources, this public meeting will be webcast including any registered public speakers who have given their permission. The public meeting can be viewed on demand at www.york.gov.uk/webcasts.

During coronavirus, we've made some changes to how we're running council meetings. See our coronavirus updates (www.york.gov.uk/COVIDDemocracy) for more information on meetings and decisions.

4. York 5 Year Flood Plan Update (Pages 7 - 20)
This report contains an update on York's 5 Year Flood Plan following new funding being allocated to the Environment Agency to renew existing and provide new flood defences across the City.

5. Local Area Energy Plan (Pages 21 - 200)
This report outlines York's Local Area Energy Plan, which is holistic spatial approach to decarbonising an area's energy system, and provides a pipeline of investable projects to support the energy transition.

6. E-petition – More Bins a Clean City Centre, Surrounding Areas and River's Embankment (Pages 201 - 210)
This report details the e-petition received by the Council regarding cleanliness in the city centre and the provision of more bins, and the changes that have happened over the last 12-15 months in the area.

It has not been possible to give 28 clear days' notice of the intention to make this decision due to an administrative error. It has been included on the agenda under informal urgency provisions.

7. Urgent Business
Any other business which the Executive Member considers urgent under the Local Government Act 1972.

Democracy Officer: Margo Budreviciute
Telephone No: 01904 551088
Email: margo.budreviciute@york.gov.uk

For more information about any of the following please contact the Democratic Services Officer responsible for servicing this meeting:

- Registering to speak
- Business of the meeting
- Any special arrangements
- Copies of reports and
- For receiving reports in other formats

Contact details are set out above.

This information can be provided in your own language.

我們也用您們的語言提供這個信息 **(Cantonese)**

এই তথ্য আপনার নিজের ভাষায় দেয়া যেতে পারে। **(Bengali)**

Ta informacja może być dostarczona w twoim własnym języku. **(Polish)**

Bu bilgiyi kendi dilinizde almanız mümkündür. **(Turkish)**

یہ معلومات آپ کی اپنی زبان (بولی) میں بھی مہیا کی جاسکتی ہیں۔ **(Urdu)**

☎ **(01904) 551550**

City of York Council	Committee Minutes
Meeting	Decision Session - Executive Member for Environment and Climate Change
Date	14 December 2022
Present	Councillors Widdowson
In attendance	Shaun Gibbons, Head of Carbon Reduction Ben Grabham, Head of Environmental Services Dave Meigh, Operations Manager Steve Wragg, Flood Risk Manager Marilyn Sanderson, Environment Agency

5. Declarations of Interest (13:30)

The Executive Member was asked to declare, at this point in the meeting, any personal interests not included on the Register of Interests or any prejudicial or disclosable pecuniary interests she might have in respect of the business on the agenda. None were declared.

6. Minutes (13:30)

Resolved: That the minutes of the Decision Session held on 5 October 2022 be approved and signed by the Executive Member as a correct record.

7. Public Participation (13:30)

It was reported that there had been three registrations to speak at the session under the Council's Public Participation Scheme.

Councillor Waters spoke on agenda item 4 - Annual Carbon Emissions Report 2021/22. He opposed York's net zero ambition and stated that the city's emission contributions are minute before questioning the gains from the expenditures so far. He then spoke on the City's £8 million fleet procurement programme and highlighted the issues of their mileage and range, and the lack of appropriate electric charging facilities in York.

Gwen Swinburn spoke on agenda item 6 - Weed Pilot 2022 and on general matters within the remit of the committee. She praised the positive changes regarding road sweeping and gully cleaning before stating that weeds had

reinvaded the residential areas of the city, namely in the Guildhall ward, where councillors opted out of the third weed treatment without consultation with residents. She then expressed frustration with the Council's fault reporting system and raised questions regarding the £8 million fleet procurement programme, the money spent and its lease costs.

Councillor K Taylor also spoke on agenda item 6 - Weed Pilot 2022 and spoke on the positives of recommendations C and D within the report before highlighting its shortcomings. He argued that the Council has not sufficiently engaged with other agencies, that the commitment to phase out pesticides is ineffective as it has no plan with timescales, and that the analysis of the weed contractor is inconsistent with the experience of residents. He concluded by asking for these problems to be tackled to ensure this carries onto the next administration.

8. Annual Carbon Emissions Report 2021/22 (13:41)

The Executive Member considered a report on York's carbon emissions from corporate activity in 2021/22, which monitored progress towards the City's 2030 net zero goal and identified areas of improvements. The Head of Carbon Reduction outlined the report and reported that:

- Total emissions experienced a small decrease between 2020/21 and 2021/22.
- Corporate emissions accounted for roughly 4% of city-wide greenhouse gas emissions and the Council's fleet and buildings accounted for most of the corporate emissions.
- Emissions associated with the fleet continued to reduce as a result of the electrification programme.
- Emissions from the space heating and hot water of buildings increased but are still lower than they were in 2019.

He also went on to explain that since 2019, the Council have produced decarbonisation plans for buildings, introduced carbon literacy training, adopted a policy to consider low carbon heating solutions, and continue to decarbonise the fleet and promote active travel. The Officer concluded by stating that further progress needs to be made in decarbonising the Car Club fleet, improving understanding of scope 3 emissions, and reviewing waste production in office buildings.

The Executive Member thanked the Officer for the work on this issue and the data within the report.

Resolved:

i. That the City of York Council Corporate Emissions Report is approved and the Council's contribution to city-wide emissions is noted.

Reason: This report fulfils the commitment in the Council Plan to report on City of York Council's corporate emissions, using the standardised and transparent SCATTER methodology.

ii. That the recommended actions listed in the report to reduce emissions is approved.

Reason: Progress towards City of York Council becoming net zero carbon by 2030.

9. York Emissions Inventory Report 2022 (13:44)

The Executive Member considered a report on York's Emissions Inventory for 2019, which will be used to monitor progress towards the City's 2030 net zero goal. The Head of Carbon Reduction outlined the report and reported that emissions in the city decreased by 2.6% from 2018 to 2019 and that emissions from all sectors reduced since 2018, with the exception being industrial based emissions. He also noted that emissions from buildings reduced more than any other sectors.

The Executive Member thanked the Officer for the work on this issue and noted the need for some further clarity on the numerical data. She then welcomed the decrease in emissions.

Resolved: That the York Emissions Inventory Report is approved.

Reason: This report fulfils the commitment in the Council Plan to report on city-wide carbon emissions and monitor progress towards the net zero ambition.

10. Weed Pilot 2022 – Feedback and Options (13:47)

The Executive Member considered a report that provided feedback on the weed pilot undertaken in 2022 before it proposed weed treatment options for 2023 and possible further work. The Head of Environmental Services outlined the report and noted that:

- 8 wards participated in the weed pilot in 2022 and they did not have the third spray in September/October. Some areas within wards were omitted from the trial.
- Spraying around highway obstacles was replaced with strimming.
- Reducing to two sprays did not have a detrimental effect on weed growth.
- Weed contractors have sprayed the highway network but there have been some issues with performance on defined areas. These issues have since been addressed.
- Officers have engaged with other agencies, including Pesticide Action Network, the Environment Agency, and other local authorities.

In response to questions from the Executive Member, Officers agreed to engage with wards in the new year, asking them for feedback and to report back where weed hotspots are so that Officers can then create a plan to deal with these before/during the first spray in 2023.

The Executive Member noted the report and requested for some further communication regarding the performance of contractors with an avenue to provide feedback before stating that councillors should consult with residents on whether to opt out of the second or third weed spray in 2023.

Resolved:

i. That the contents of the report and the recommendations are noted.

ii. That Officers will write to wards outlining the treatment of weeds in 2023, asking them for information on hotspots.

iii. That the approach to the treatment of weeds in 2023 is agreed, including options:

b) To offer wards the opportunity to opt out of a third spray in 2023 (i.e., not receiving spray 3 in September/October).

c) To offer wards the opportunity to opt out of a second spray in 2023 (i.e., not receiving spray 2 in June/July).

d) To cease spraying by Public Realm teams around trees within the highway verge.

Reason: The Executive Member was asked to consider the report and decide on the preferred options set out in the report for weed treatment in 2023.

11. York 5 Year Flood Plan Update (13:57)

The Executive Member considered a report which contained an update on York's 5 Year Flood Plan following new funding being allocated to the Environment Agency to renew existing, and provide new, flood defences across the City. The Flood Risk Manager and Project Director, Environment Agency (EA) were in attendance to present the report and respond to questions.

Key points raised during the presentation of the report included:

- The Council continues to progress with the DEFRA funded Innovation Programme exploring natural flood risk management solutions in the Swale, Ure and Nidd catchment areas and how such solutions can be incentivised and supported. They have also started to work with catchment partners and the recruitment of catchment partner posts have progressed.
- The Council are developing proposals for a grant scheme for natural flood management measures for catchment partners.
- The works at Germany Beck were progressing well, the delivery of the design is almost complete with planning application submission is expected late 2022 and the construction phase for the project is expected to commence in late 2023 if all planning and other permissions are granted.
- Water quality and the performance of Yorkshire Water combined sewer overflows is monitored and the Council have formed close links with a University of York led 4-year long project looking at quality issues across the wider river catchments, which will help illustrate the current and future river quality issues in York.

Key updates from the EA included:

- The EA achieved their target of better protecting over 2000 properties in York.
- The control structure at the Foss Storage Area has been completed.
- The Property Flood Resilience project is progressing with installations in progress over the next two weeks.
- 4000 floodplain meadow plants were planted in Rawcliffe Meadows.
- The EA team is prepared for winter and flood measures have been successful so far.

The Flood Risk Manager concluded by raising the issue of flood forecast in York and its inconsistencies and explained that the Council are working on this with the EA.

The Executive Member commented that she was pleased that further work is going on with the forecasting and the general work completed by the EA. She also thanked the Council for its work and expressed disappointment with Yorkshire Water for not engaging with City of York Council.

Resolved:

i. That the updated report and the evidence presented by the Environment Agency in the session is noted and that feedback is provided.

ii. That the progress of actions from the motion in Annex 2 is considered and endorsed, including the need to continue to work with all partners and use any opportunity to develop further studies and projects to better improve river quality and the usage of our rivers. Further updates will be brought to the Executive Member on this item.

Reason: To support the delivery of flood resilience interventions in York and across the wider River Ouse catchment.

Cllr Widdowson, Executive Member
[The meeting started at 1.30 pm and finished at 2.14 pm].

Executive Member for Environment and Climate Change Decision Session **8 March 2023**

Report of the Director of Economy & Place

York 5 Year Flood Plan Update

Summary

1. The flooding in late December 2015 followed an intense period of rainfall across November and December due to the impacts of Storms Desmond and Eva. Record river levels were observed in many river catchments across the north of England. More than 4,000 homes and 2,000 businesses flooded across Yorkshire with 453 properties and 174 businesses flooded in York.

2. Funding has been allocated to the Environment Agency ("**EA**") following the floods to renew existing and provide new flood defences across the city, £38m has been allocated to the Foss Barrier improvements and a total of £64m to the wider flood defences across the City of York.

3. An update on progress has been supplied by the EA, this can be seen in **Annex 1**.

4. The City of York Council (the "**Council**") are leading on the development of the scheme in Fulford, submission of the planning application was made in January 2023, further approvals will be sought and construction phase detailed design will commence during the determination of the application.

5. The Council's Department for Environment, Food and Rural Affairs ("**DEFRA**") funded Innovative Flood Resilience project is being developed. All financial and governance approvals are in place and final procurement of all project partners has been finalised and key work has begun. Recruitment of all project officers is underway.

6. DEFRA have announced a significant way in which surface water will be managed. Delayed legislation from the Flood and Water Management Act will be enacted in 2024 requiring sustainable drainage solutions (SuDS)

to be delivered in new developments, a SuDS Approving Body (SAB) role will need to be developed by the Council to approve and ultimately adopt all drainage features.

Recommendations

7. It is recommended that the Executive Member for the Environment and Climate Change:

    i. Note the updated report and the evidence presented by the Environment Agency in the session, feedback is sought from the Executive Member on all content

    Reason: To support the delivery of flood resilience interventions in York and across the wider River Ouse catchment.

Background

8. Following the development and publication of the York Five Year Plan (https://www.gov.uk/government/publications/york-5-year-flood-plan), the EA have developed detailed business cases and designs for schemes in 19 flood cells across the city.

9. The EA continue to work closely with the Council on all aspects of the York Five Year Plan, an update has been provided by the EA at **Annex 1**.

10. The initial design and appraisal of flood defences and a pumping station on Germany Beck has been completed and a planning application has been made. The scheme will provide protection to homes and maintain access on Fordlands Road during flooding. The scheme will also aid future flood resilience on the A19.

11. The programme for the development of the planning application submission has been delayed due to heritage and conservation matters. Public meetings have been held regularly with the community.

12. The Council are developing works to increase the flood resilience of Millennium Bridge. Although physically impossible to raise the levels to prevent inundation in all future flood events the works will significantly reduce the likelihood of the east/west link across the bridge being unusable. Design work is ongoing, permissions and the delivery programme will be finalised in the new financial year.

13. The DEFRA funded Flood and Coastal Resilience Innovation Programme catchment scale natural flood risk management project has received all financial and governance approvals and the project has progressed into the delivery phase. Procurement of hydraulic and environmental modelling consultants, catchment advisors and academic partners has been completed. Recruitment of the first catchment partner posts have progressed and the programme coordinator hosted by Yorkshire Dales Rivers Trust has started work. Unfortunately, the CYC project manager has left the project, the process to recruit a new project manager has commenced.

14. The project team has developed proposals for a grant scheme for natural flood management (NFM) measures in the river catchments upstream of York, this process will also be promoted as a future way to prioritise the delivery of NFM in other areas of the country, Defra are working closely with our project to this end. Funding will be available for measures which will help reduce to reduce flood risk to people and property, based on current evidence about the effectiveness of a range of NFM measures. A wide range of partnerships and linkages have been formed by the project team and a number of case study demonstration sites have begun to be considered.

15. The North Yorkshire Flood Risk Partnership (co-chaired by the City of York Council Executive Member for Environment and Climate Change) provide governance over the project and will be asked to approve details about how the grant scheme will operate and the initial proposed tranche of grant recipients at their meeting in February 2023. The project team will also present the progress to date to the Climate Emergency Policy and Scrutiny Committee on the 28th of February to show its importance in climate adaptation planning in the city.

16. The review of the 2007 floods which affected over 55,000 homes and businesses across the UK led to the development of the Flood and Water Management Act 2010 (FWMA) to provide improved legislation for the management of risks associated with flooding and coastal erosion. This gave City of York Council responsibilities as the Lead Local Flood Authority (LLFA) for its area, with a range of local flood risk management duties.

17. Two thirds of all properties flooded in 2007 were affected by surface water flooding and Schedule 3 of the FWMA required the delivery of sustainable drainage systems (SuDS – interventions that mimic natural drainage features in developments to control excess surface water at source – ponds, swales, green roofs, rain gardens etc) in new

developments. The act required the setup of a SuDS Approving Body (SAB) to manage the delivery of SuDS in new developments.

18. This was not enacted but changes were made to planning policy that have helped to deliver limited improvements in surface water management.

19. DEFRA announced in January that Schedule 3 will be enacted in 2024. The detail is still to be confirmed but the likely approach, based on the original proposals, will require the SAB to approve all and adopt all infrastructure to ensure whole life maintenance and performance is managed. Sitting alongside the Local Planning Authority, City of York Council, as a LLFA, will be the SAB for its area.

20. A regulatory impact assessment and a new burdens analysis will be made to ensure SABs can carry out their functions, further consultation will be held throughout 2023, a paper will be brought to the Executive Member at a later date.

Consultation

21. Public consultation on the York Five Year Plan continues through a range of flood cells, this is detailed in the update in Annex 1 along with the programme of future consultation events.

22. Consultation on the Germany Beck Flood Alleviation Scheme continues as the design work commences.

Options

23. The principal options open to the Executive Member for Environment and Climate Change are to comment on and review the work undertaken to date, the future work identified and the representations made by the EA and the Council on all detail provided in this report and its Annexes.

Analysis

24. On-going liaison will continue between the Executive Member for Environment and Climate Change and the Council's Flood Risk Manager. Future briefings to the Executive Member for Environment and Climate Change Decision Session will be made to ensure key outputs and decisions are supported by the Council and to provide formal opportunities for members and the public to consult. Further recommendations will be made for agreement at these sessions.

Council Plan

25. Improved provision of flood defences supports a prosperous city for all through safer communities for residents, businesses and visitors, a wide range of consultation events will ensure this is in line with the needs and expectations of local communities.

Implications

26. **Financial** – Funding is allocated directly to the EA. The additional funding is available to be directed towards key flood risk projects in the city in the short term. The extent of required works may require wider funding and DEFRA funding bids will be developed. There are likely to be contribution requirements as part of this wider work.

27. Although the majority of funding for Council's scheme in Fulford is secured a DEFRA Partnership Funding bid is to be developed to finalise the funding package.

28. All funding for the Innovative Flood Resilience Project is secured. The procurement strategy for the delivery phase of the project has been approved, this was endorsed by Council Executive on the 28th July 2022 https://democracy.york.gov.uk/ieListDocuments.aspx?CId=733&MId=13288

29. **Property** – The Site Investigation programme will include sites under Council ownership and/or control, consultation will be carried out with Estates teams and all relevant agreements will be put in place.

30. **Legal** - The governance and cross border working arrangements needed for the delivery phase of the Innovative Flood Resilience Project were endorsed by Council Executive on the 28th July 2022 https://democracy.york.gov.uk/ieListDocuments.aspx?CId=733&MId=13288

31. **Human Resources (HR)** – No implications.

32. **One Planet Council/Equalities** – No implications.

33. **Crime and Disorder** – No implications.

34. **Information Technology (IT)** – No implications.

Risk Management

35. No known risks are identified at this time, detailed risk management work will be developed as the business case and detailed design works commence.

Contact Details

Author:	**Chief Officer Responsible for the report:**
Steve Wragg Flood Risk Manager Highways Steve.Wragg@york.gov.uk	Neil Ferris Director of Economy & Place

Report Approved ✓ **Date** 24/02/2023

Wards Affected: List wards or tick box to indicate all **All** ✓

For further information please contact the author of the report

Background Papers: None

Annexes:
Annex A - York 5 Year Flood Plan Update Mar23

York Flood Alleviation Scheme

Environment Agency

January 2023

Update for March's Executive Decision Session

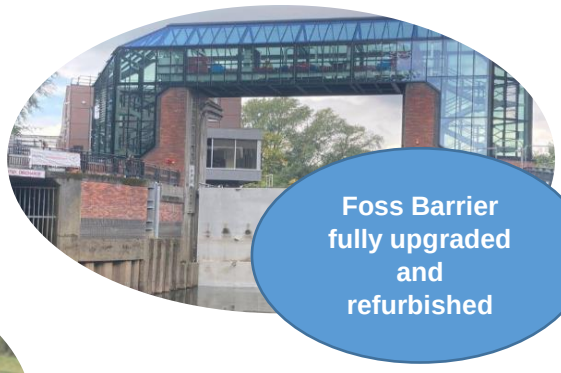
This is a summary of the achievements over the last 7 years on the flood alleviation work in York, as well as providing information on the programme and expected timelines for delivering the remaining work. In this update we have provided:

1. Summary of achievements the Programme
2. Engagement highlights
3. Our response to January Floods
4. Programme information tables
5. Map of the York Five Year Plan flood cell outlines

1. Summary of achievements across the Programme

Following the floods of December 2015, the government allocated additional funding to the Environment Agency to better protect 2,000 properties in York, including upgrading and refurbishing the Foss Barrier and its surrounding infrastructure.

Below are some key figures which highlight our achievements.



Foss Barrier fully upgraded and refurbished

640m of embankment raised and extended

690m of walls raised and extended

Over 2100 Properties better protected

34 Flood Gates

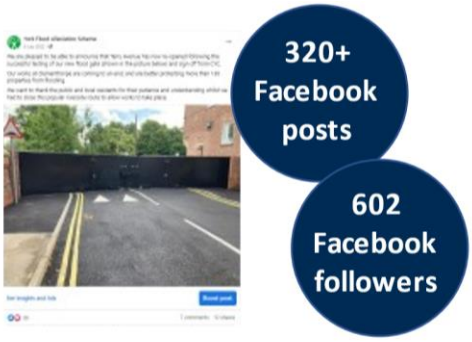
80+ Glass Panels

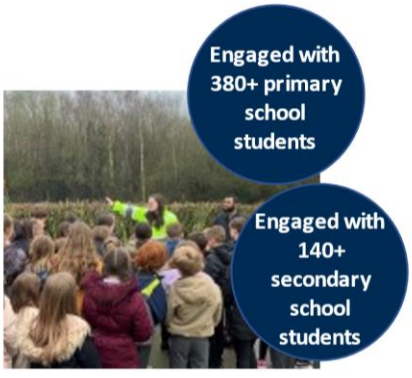
2. Engagement highlights

Throughout the delivery of the York Flood Alleviation Scheme, we made efforts to engage proactively with the public and all other interested stakeholders on the plans and progress of our works. We have adhered to the following engagement principles:

- We will be proactive and transparent and ensure that our information is accessible to the public and other interested stakeholders
- We will use the most appropriate methods and tools of engagement dependent on the audience and key engagement objectives
- We will make time to involve people properly
- We will utilise key dates in the programme as opportunities for targeted engagement
- We will utilise opportunities to engage, influence and build strong relationships
- We will be honest, open and clear about what we can and cannot do to ensure that realistic expectations are set with the public and other stakeholders
- We will act upon information received from, and provide feedback to, our stakeholders
- We will keep internal stakeholders and colleagues informed of our activities

Below are some key figures which highlight our efforts and success with engagement.





3. Our response to January Floods

Following the Met Office's announcement, that 2022 was the hottest year on record for the UK with average annual temperatures reaching over 10°c for the first time, January saw parts of the country in a cold snap with snow seen in places. Freezing temperatures were followed by significant rainfall which caused flooding across parts of the country including here in Yorkshire.

The Ouse in York peaked over the Weekend of 14/15th January, reaching 4.1m at the Viking recorder. It is estimated that our defences, including those newly completed and upgraded, helped protect around 600 properties from flooding.

Here are some images taken from the Skeldergate and Clementhorpe areas in York.



4. Programme Information Table

Capital Schemes being delivered

Flood Cell / Scheme	Estimated total cost (£k)	No. of properties better protected (approx.)	Brief description	Expected completion
B4 - Scarborough Bridge to Ouse Bridge (Right Bank)	2,555	39	A new flood wall along Leeman Rd from Westgate Apartments to a new embankment in the grounds of York City Rowing Club, with demountable flood barriers across the main and second entrance to the Memorial Gardens. A new, larger flood gate under Lendal Bridge. Raised height to existing flood wall along North St with replaced flood gates, including increased width to northernmost gate to improve pedestrian flow.	Completed Feb 2022
B8 - Clementhorpe	7,717	135	A new flood wall in front of Waterfront House. Raised steps between Waterfront House and Dukes Wharf and raised road beside Dukes Wharf. A new flood wall and flood gate at Rowntree Park Caravan Site. Raised height of existing flood wall at Roomzzz Hotel. A new flood wall at the top of the steps between Postern Close and Postern House and raised wall corners at these properties. A new bi-fold floodgate on Clementhorpe Road and a 240m long, up to 6m deep underground seepage cut-off along Terry Avenue.	Completed Sep 2022
B10 - Clifton & Rawcliffe	20,600	140	Increased height of the existing barrier bank and extended at both northern and southern ends. A wider 'footprint' of the bank to reduce the angle of the slope and so reduce the risk of bank slippage in the future. A new pumping station within the barrier bank to control water levels in Blue Beck storage lagoon.	Nov 2023
B11 - Coppins Farm to Scarborough Bridge (Left Bank)	3,665	156	Raised height of the flood embankment in St Peters School fields. A new transition wall between the embankment and the development at the end of Almery Terrace. New floodgates and glass panels to increase the height of the flood defence along Almery Terrace. A new flood gate at the top of the Almery steps and piling within the Network Rail embankment.	Completed May 2022
B12 - Scarborough Bridge to Lendal Bridge (Left Bank)	2,950	57	Increased height of the existing flood wall from Scarborough bridge to Museum gardens. This includes new flood gates and glass panels along Earlsborough Terrace and Esplanade Court, a new flood gate near Scarborough Bridge and new demountable panels for the Marygate flood gate. Increased height of the embankment within Museum Gardens and also extended at southern end. This includes terracing of the embankment adjacent to the Hospitium to preserve the rare True Service tree.	Revised date TBC

C1 - Bishopthorpe	3,390	170	A 180m long flood wall along Chantry Lane with a 6m deep steel barrier underground cut off. A flood gate across the bottom of Chantry Lane. A new manhole chamber with a penstock mechanism.	Completed Apr 2022
F8 /F10/F11- Foss Storage Area	17,526	490	Construction of a new embankment with outfall control structure upstream of York, designed to hold up to 1million m^3 during times of extreme rainfall. Once downstream river levels recede, the stored water will be released at a controlled rate. The creation of two ponds connected to the River Foss, together with improvements to the river channel, will result in new wetland habitats to support wildlife.	Nov 2023
Foss Barrier	38,000	1600	Greatly increased pumping capacity with replacement of all 8 pumps, including new infrastructure and new power supplies. In addition to 2 independently sourced High Voltage electricity supplies the barrier has 5 new back-up generators to maintain operation of all eight pumps at maximum capacity in the event of catastrophic power failure. All vulnerable infrastructure raised to first floor height. A new taller barrier gate, lifting equipment and housing.	Completed Apr 2022

Capital Schemes still in the design phase or being delivered by our partners

Flood Cell / Scheme	**Description**	**Being delivered by**	**Stage**
B9 – Germany Beck	City of York Council (CYC) led project with multiple benefits including increased flood protection to Fordlands Road and the A19 as well as reducing flood risk to local homes and businesses. Initial design has been completed and the planning submission has been made.	CYC	Design
F1 – Tower Street	We are investigating options on how to provide flood protection along Tower Street to prevent exceptionally high flood levels on the River Ouse bypassing the defences within St Georges Car Park and entering the Foss Basin which would pose increased flood risk in the lower Foss. This scheme will initially involve raising of the wall between St George's car park and the Foss Basin tying into Skeldergate Bridge.	Environment Agency	Planning

Property Flood Resilience (PFR)

Flood Cell	B7	B8	B12	B15	B16	C1	C2	C3	F8	Total
1 Participation	12	27	3	27	44	2	9	62	2	188
2 Gertting in touch	12	27	3	27	44	2	9	62	2	188
3 Property Visits	12	27	3	26	44	2	9	61	2	186
4 Viewing Products		27		1	44		3	26		101
5 Choosing products		27			44		2	18		89
6 Costs reviewed		27			44		2	18		89
7 Signing Documents		27			44		2	18		89
8 Ordering Products		27			44			13		84
9 Installing Products		27			44			9		80
10 Training and handover	0	27	0	0	44	0	0	0	0	71

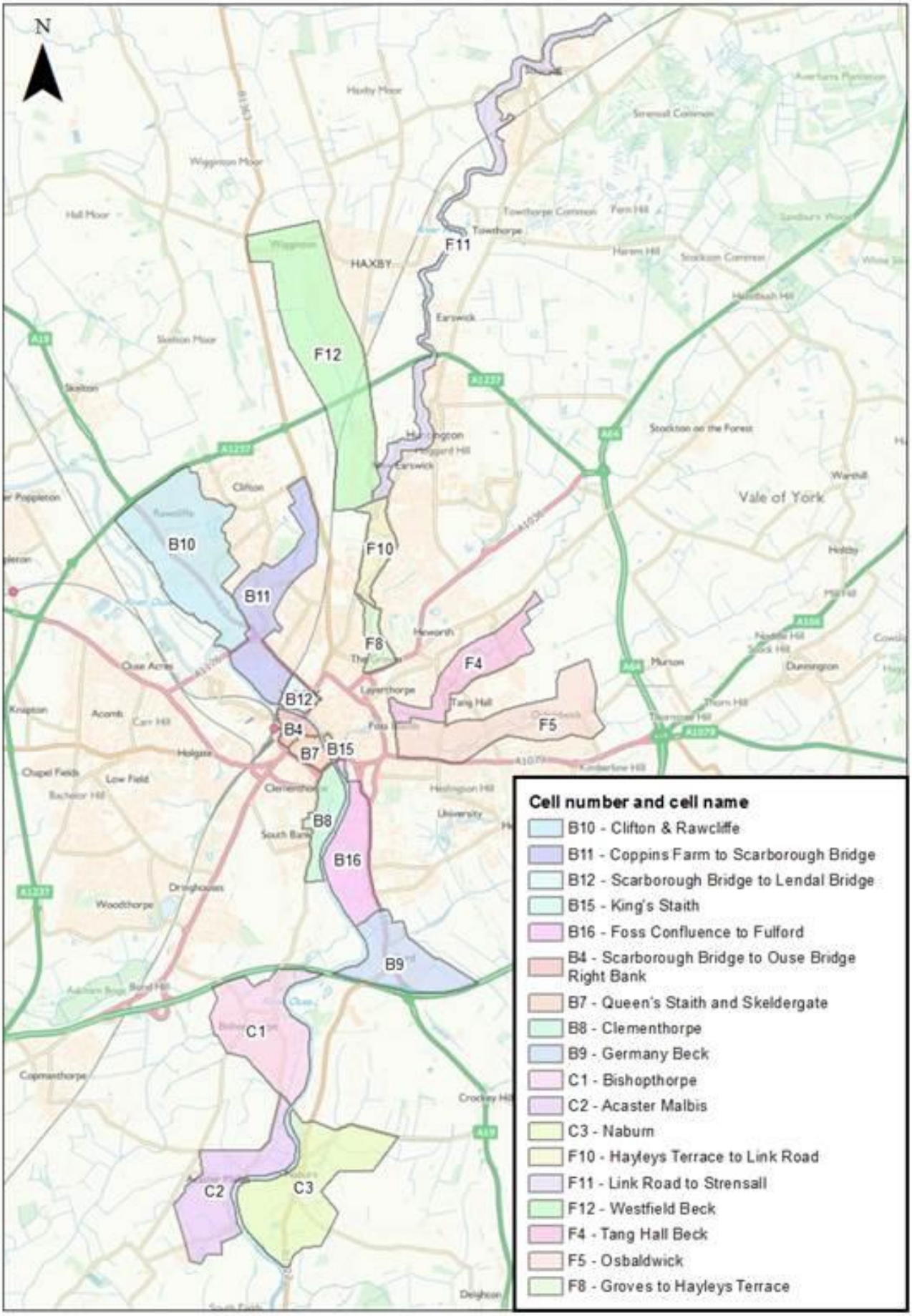
Key

No. Number of properties

Stage complete

Stage initiated/ongoing

5. Map of the York Five Year Plan Flood Cell Outlines



This page is intentionally left blank

Executive Member Decision Session **8 March 2023**

Report of the Head of Carbon Reduction

Portfolio of the Executive Member for Environment and Climate Change

York: Local Area Energy Plan

Summary

1. In March 2022, the Executive Member for Environment and Climate Change approved the allocation of £90,000 from the 2021/22 Carbon Reduction Budget and £20,000 from 2022/23 budget to carry out a Local Area Energy Plan for York.

2. A Local Area Energy Plan (LAEP) is regarded as a critical enabler to decarbonisation, given that spatial planning is one of the biggest opportunities local authorities have to deliver net zero.

3. Over the last 8 months, the council has been working with the Energy Systems Catapult (ESC) and the York & North Yorkshire Local Enterprise Partnership (LEP) to produce a LAEP for York alongside a wider regional North Yorkshire LAEP.

4. A LAEP is a holistic spatial approach to decarbonising an area's energy system that provides decision-makers with the detailed information needed to support informed policy and investment decisions.

5. The LAEP is a report, spatial plan and pipeline of investable projects to support the energy transition, at best value, for the council and the city. It provides an optimised, cost-effective, and evidence-based pathway to achieve our ambition of net zero by 2030, and is a key aspect of delivering the Climate Change Strategy approved by Council in December 2022.

6. To decarbonise the energy system in York, the LAEP identifies the requirement for:

   - 73,000 heat pump installations

- 20,000 new connections to a district heat network
- 44,100 homes retrofitted with insulation, glazing and draughtproofing improvements
- 91,000 fully electric vehicles
- 24% of homes generating their own electricity with rooftop solar
- 920MW of large-scale renewable generation

7. The decarbonisation of York's energy system will require investment of around £3.8billion and save 1.2 million tonnes of CO_2 cumulatively to 2050.

Recommendations

8. The Executive Member is asked to:

   i. Approve the publication of the York Local Area Energy Plan

   Reason: To support the accelerated decarbonisation to achieve the council ambition for York to be net zero by 2030.

Background

9. City of York Council (CYC) announced a climate emergency in March 2019; subsequently setting an ambition for York to be carbon neutral by 2030. The Climate Change Strategy and Action plan were approved by Executive in November 2022, with the Climate Change Strategy subsequently approved by Council in December 2022.

10. In addition, sustainability is a key priority in the 10 year plan which was approved by Council in December 2022. The 10 year plan was co-developed by city partners and sets out the vision, key priorities and ambitions for the city over the decade ahead.

11. Achieving net-zero by 2030 will be extremely challenging. It will require combining a whole system approach with local stakeholder knowledge to deliver a comprehensive, data-driven and cost-effective plan for decarbonisation. This approach is at the heart of a Local Area Energy Plan.

12. In March 2022, the Executive Member for Environment and Climate Change approved the budget and commissioning approach for a Local Area energy Plan for York. York's LAEP was commissioned with the

North Yorkshire LAEP for both economies of scale and to provide a regional response to local energy generation where appropriate, with plans tailored to each council's boundaries.

13. In December 2022, the Climate Emergency Policy and Scrutiny committee reviewed the Local Area Energy Plan, with a request that the Local Area Energy Plan provide clear figures for the project carbon emissions saving that would be delivered in the proposals. This has been incorporated into more detailed planning for the different projects the LAEP recommends.

14. There is no one-size-fits-all approach to achieving Net Zero. Every local area has its own unique characteristics. LAEP considers buildings, transport systems, local industry, energy generation and distribution assets, geographic and spatial constraints, and social factors including fuel poverty to produce a tailored place-based plan for decarbonisation.

15. The LAEP for York was produced in alignment with 3 other LAEPs for North Yorkshire. This approach ensured efficiency savings and will lead to an integrated approach to infrastructure investment and delivery, leading to a more effective use of available funds to realise York's net zero 2030 ambition.

16. Local Area Energy Planning is a 7-step process:

    i) Identify and Engage Stakeholders – The LAEP process and its outputs will need to be owned and led by one organisation but formulating and taking strategies forward will require collaboration with key stakeholders.

    ii) Set Area Vision, Objectives and Targets – Our net zero ambition for York sets the framework for activity towards 2030. Ambitious but achievable interim targets must also be set to drive short-to-medium term change and allow progress to be tracked.

    iii) Create and Understand the Local Area Energy System – Informs what changes are required to make the necessary low carbon transition and providing a baseline from which the future local energy scenarios can be built from.

    iv) Investigate Future Local Energy Scenarios – Creating cost effective and robust scenarios of future local energy system infrastructure to enable decisions to be made on energy network and system choice.

v) Produce a Local Area Energy Strategy – The output from the Local Area Energy Planning process. It consolidates the findings and outputs of the evidence base and represent the output of the collaborative and open dialogue from stakeholders to help plan the delivery of the energy networks and changes to homes and buildings needed to deliver a low carbon future.

vi) Lead and Implement – Implementation will need to be an iterative and collaborative process. A planning horizon over the next decade is likely to involve the need to consider several iterations of technological innovation and research-led development.

vii) Monitor and Review – Setting out the process to manage, monitor and review the strategy over time.

York Local Area Energy Plan

17. York's LAEP was produced through extensive desk-based research, data analysis, modelling and stakeholder engagement. It divides York into '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.

18. The LAEP covers all major sources of emissions within York (over 90% of total emissions):

    a. Buildings - 44,100 homes will require fabric upgrades so that 83% of all homes are insulated to their full potential. This can be achieved at an estimated cost of £185m and will reduce household energy bills and improve living conditions.

       Fabric upgrades can be 'basic' (draught proofing, loft and cavity wall insulation) or 'deep' (double or triple glazing, internal or external wall insulation, floor insulation and door upgrades). Basic upgrades are recommended across much of the housing stock built after 1914, whereas older homes are likely to require deep upgrades.

       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 homes, whilst also reducing the need for expensive upgrades to the electrical network.

b. Heating - 91% of homes in York have a gas boiler heating system. To achieve net zero, all of these will need to be replaced. Due to the timescale of our net zero ambition, it is recommended that heat-pumps are installed in 73,000 homes with a further 20,000 connecting to district heat networks.

   Gas heating systems in the majority of non-domestic buildings will also need to be replaced by a heat-pump or through being connected to a district heat network (with exceptions for when high temperatures are needed).

   High temperature industrial processes can be converted to hydrogen systems; however, these are not thought to be available until the mid-2030s.

c. Transport – The LAEP only considers decarbonisation of the energy system, the impact of reducing overall vehicle use will be considered in separate pieces of work.

   The Electrification of all remaining vehicles will be required to reach net zero. It's estimated that this will be 113,000 electric cars and vans and charging provision will need to increase to service this number of EVs.

   While 48% of households have off-street parking, suitable for home charging – which is thought to be the most cost-effective and convenient way of charging – prioritisation of additional public charging infrastructure will be crucial to ensure an equitable transition to low carbon transport.

d. Local Generation - Due to the necessary electrification of the heating and transport systems, York's annual demand for electricity is projected to increase from 773 GWh to 1,273 GWh. Ground mounted and rooftop solar, alongside onshore wind will be able to meet all of this demand; with the modelled potential for 1,240MW of generation capacity in York for £840m investment.

   If fully developed, 105 MW of domestic solar PV could be installed, contributing 91 GWh/year; available non-domestic roof space could host up to 215 MW of PV capacity if fully developed contributing 207 GWh/year of electricity; and around 3,900 hectares of land could be suitable for ground-mounted solar, which is enough space to host 950 MW of capacity; 800 hectares of suitable land was identified for wind turbines in areas of Hambleton and Ryedale,

immediately adjoining the York area boundary, sufficient to build 28 MW of capacity.

e. Networks, Storage and Flexibility - A total investment of £20m in capacity upgrades is estimated across the high and low voltage networks to accommodate the changes in this pathway.

The amount of headroom currently available on the high-voltage network varies significantly across York. Some zones have very little headroom available whereas other have sufficient capacity for small, near-term projects.

The low voltage network has areas that are likely to see significantly more peak demand increase than others. Innovations in flexibility have the potential to delay and reduce the scale of electricity network reinforcement but network reinforcements will still be needed.

19. To accelerate delivery, the LAEP identifies a number of priority projects. Priority Projects are either:

- Low regret - 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

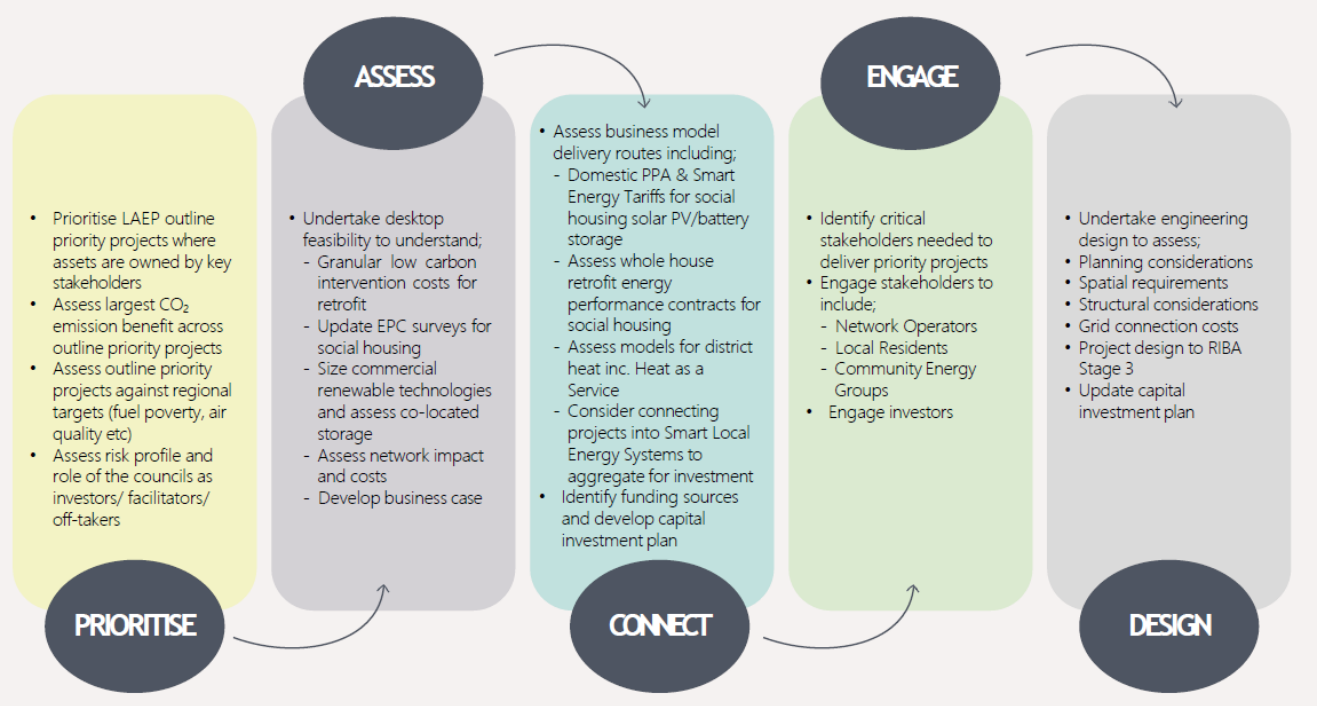
Local Area Energy Plan – York 2030 Annex

20. As York's LAEP was produced alongside the North Yorkshire LAEPs the document is set for net zero 2040. However, due to York's net zero 2030 ambition, additional information has been provided to show the acceleration of action needed to meet this timescale.

21. In most areas of work, the overall target remains the same. The differences are primarily expressed in terms of the delivery rates of various technologies and interventions. Changes/upgrades would need to happen at a significantly faster rate with network upgrades and availability of hydrogen posing significant risks to the 2030 ambition.

Next Steps

22. The LAEP report concludes stage 5 of the full LAEP process. The next stage is to lead and implement; with the report setting out a suggested process for this:



23. Should devolution for York & North Yorkshire take place, it will provide an opportunity to take forward projects identified in the LAEP.

24. 4 Expression of Interest applications have already been submitted to the £7million York and North Yorkshire Net Zero Fund (a fund created from the devolution deal) for 'Priority Projects' suggested in the LAEP.

25. The outputs from the LAEP have also helped secure funding from Innovate UK's 'Net Zero Living: Pioneering Places'. This project will identify 'Acceleration Zones' across York for targeted packages of decarbonisation measures. The approach will demonstrate a practical application of how Local Area Energy Plans can create local partnerships and harness innovation in resident engagement, financial models, capacity building and digitalisation to create a tailored, compelling and achievable net zero proposition for local areas.

26. Continued stakeholder engagement will ensure that local communities are supported in the challenge of reaching Net Zero, feel their voices are heard and they are supported in their actions.

27. To ensure that all residents and stakeholders can view and use the LAEP, the report will be made available online alongside a visualisation tool that will display/match the best suited technologies to specific areas across the city.

28. An event will be held this summer, bringing together multiple stakeholders to collaboratively move forward with the LAEP outputs.

Implications

- **Financial** – Financial implications are noted within the content of the report. All projects will be subject to individual feasibility studies and business cases. None of the projects included have been accurately costed.
- **Human Resources (HR)** – There are no HR implications associated with the report.
- **Equalities** – Consideration needs to be made to the equalities impact of a transition to a decarbonised energy system. All projects would require individual Equalities Impact Assessments.
- **Legal** – There are no legal implications associated with the report.
- **Crime and Disorder** – There are no crime implications associated with this report
- **Information Technology** – There are no IT implications associated with this report
- **Property** – There are no property implications associated with this report

Contact Details

Author:	**Chief Officer Responsible for the report:**
Shaun Gibbons Head of Carbon Reduction Corporate Strategy shaun.gibbons@york.gov.uk	Claire Foale Assistant Director Policy and Strategy

Report Approved	✓	**Date**	27/02/2023

Wards Affected: **All** ✓

For further information please contact the author of the report

Background papers:
March 2022 Executive Member Decision Session
https://modgov.york.gov.uk/documents/s157446/EMDS%20Local%20Area%20Energy%20Plan%20March%202022.pdf

November 2022
Climate Change Strategy and Action Plan Executive item 46
Agenda for Executive on Tuesday, 22 November 2022, 5.30 pm (york.gov.uk)

December 2022
10-Year Plan Council item 36
Agenda for Council on Thursday, 15 December 2022, 6.30 pm (york.gov.uk)

Climate Emergency Policy and Scrutiny item 17
Agenda for Climate Emergency Policy and Scrutiny Committee on Tuesday, 13 December 2022, 5.30 pm (york.gov.uk)

Annexes:
Annex A: Local Area Energy Plan – Overarching Report

Annex B: Local Area Energy Plan – Modelling Approach

Annex C: Local Area Energy Plan – 2030 Ambition

Annex D: Local Area Energy Plan – York Chapter

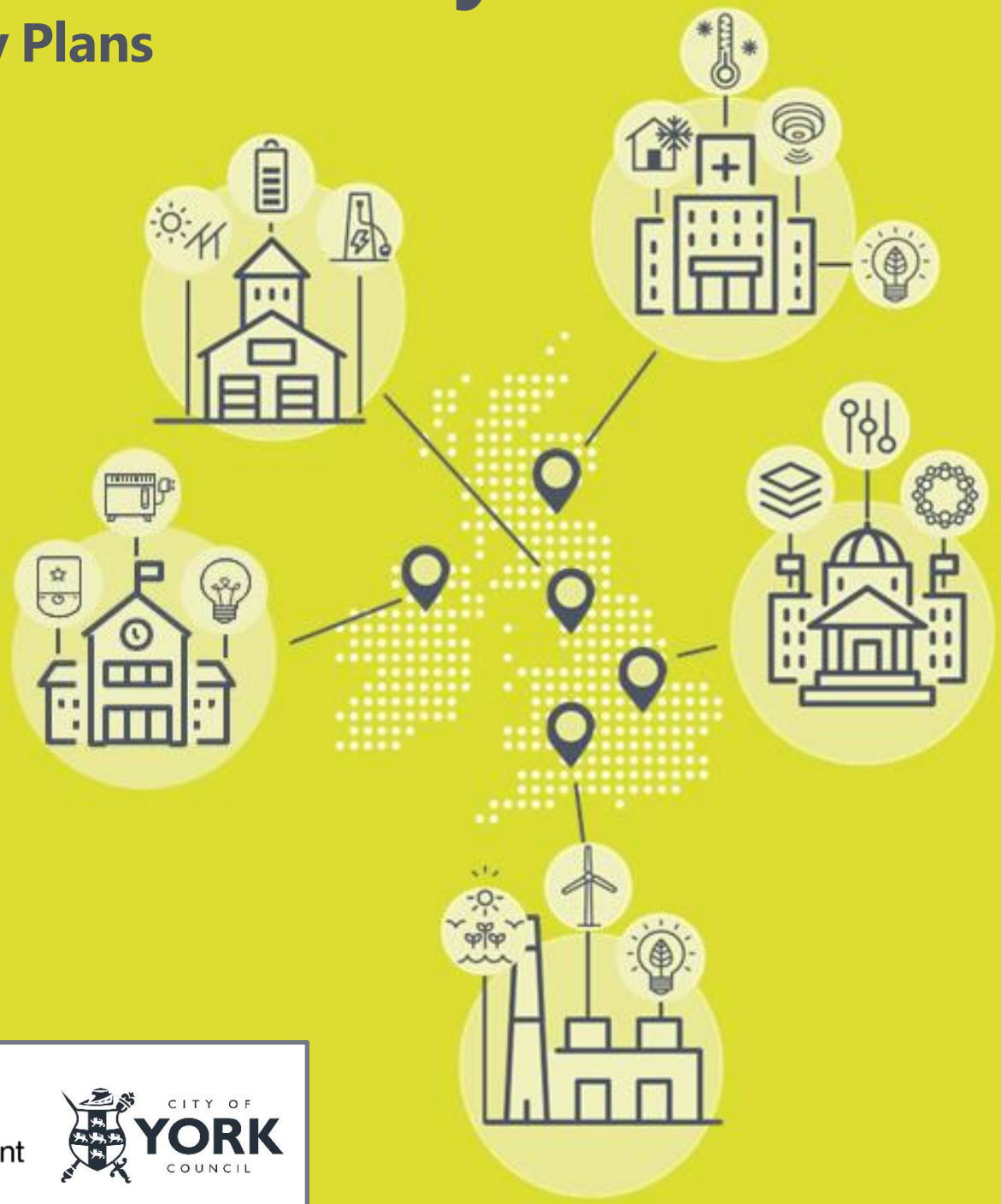
Annex E: Equalities Impact Assessment - LAEP

This page is intentionally left blank

North Yorkshire & City of York

Local Area Energy Plans

CATAPULT Energy Systems



York & North Yorkshire LOCAL ENTERPRISE PARTNERSHIP

HM Government

CITY OF YORK COUNCIL

LOCAL AREA ENERGY PLAN

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.

Contents

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.

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

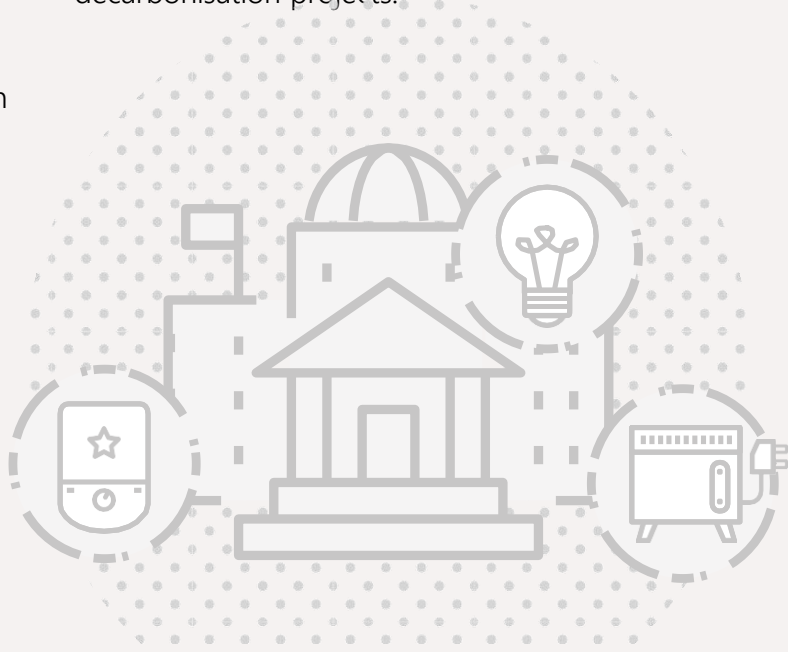
To ensure a strategic and coordinated approach to decarbonisation across the region, Y&NY LEP have led the development of York & North Yorkshire's Routemap to Carbon Negative, which is underpinned by the Carbon Abatement Pathways study. When completed, these gave Y&NY, and their local stakeholders, an 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.



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 efficienc upgrades for dwellings, starting with a focus on social housing and fuel poor areas, with a view to scale up to owner-occupied dwelling
- 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.

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.

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

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

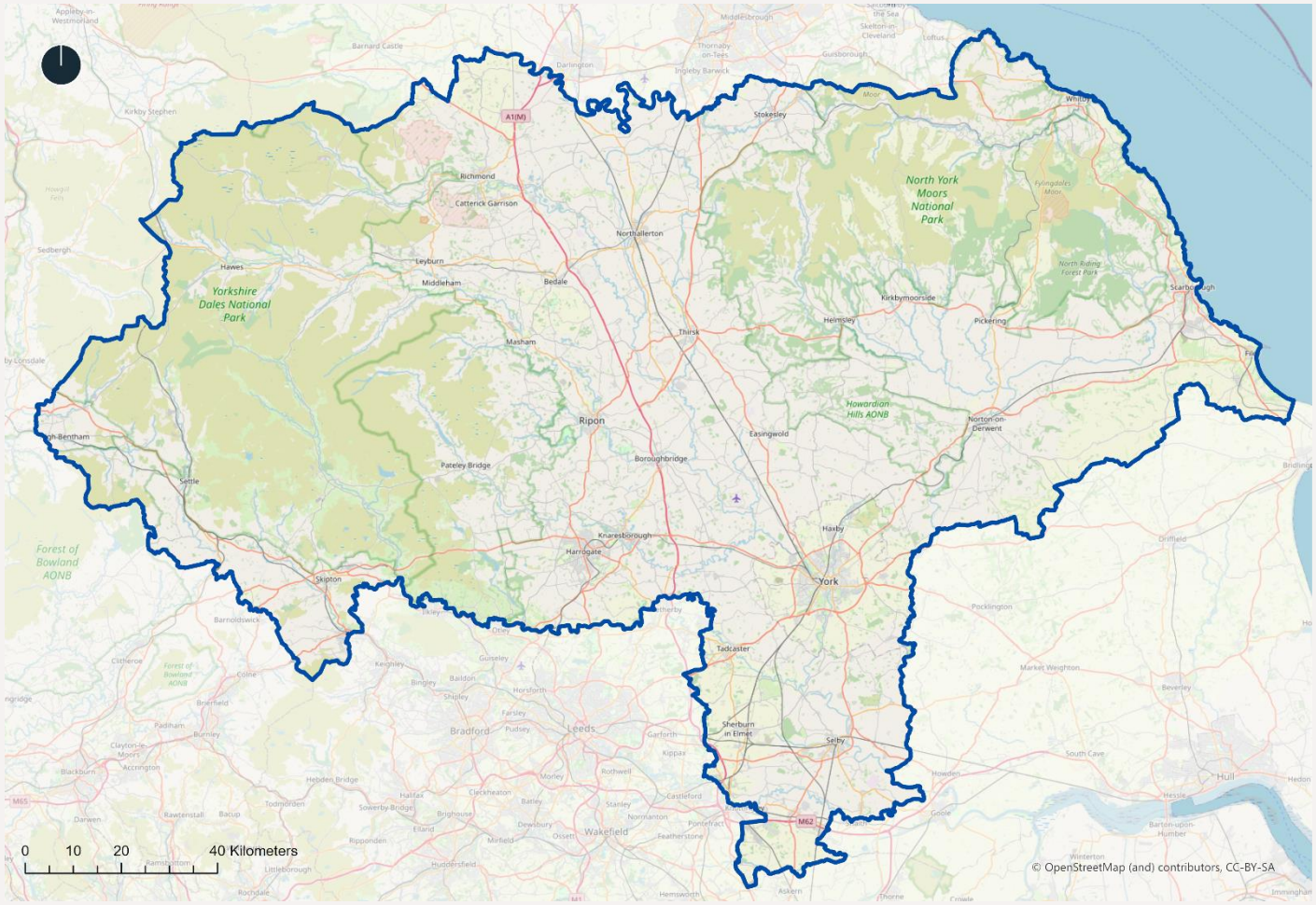
Introduction

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 8,325km^2, 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 LAEP[1].

Definition of LAEP[2]:

- 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.
- 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.

[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/

[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

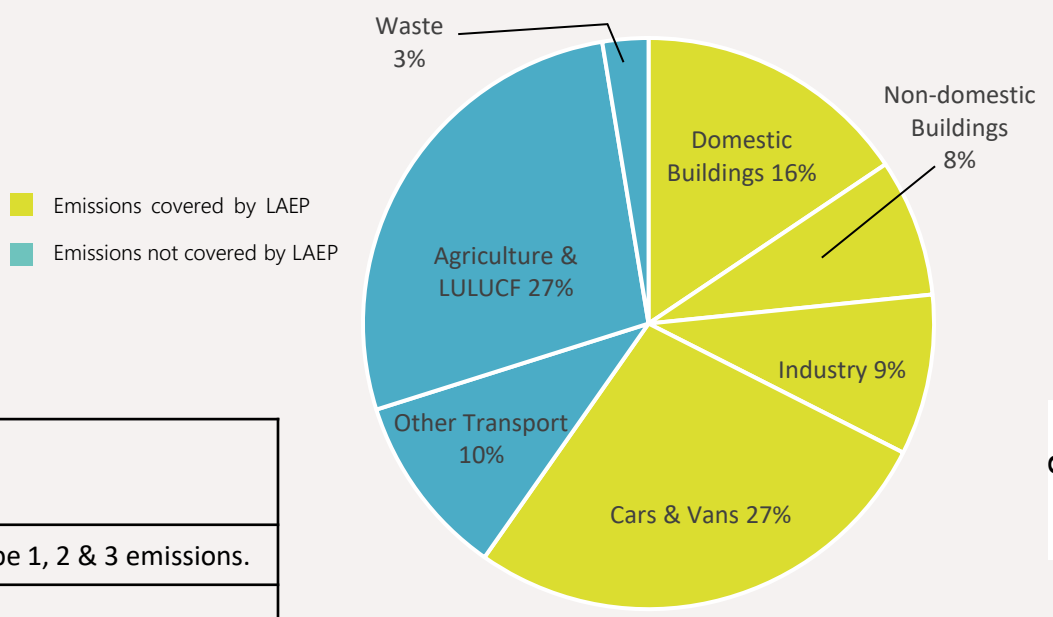
Note: Some technologies such as batteries, storage, wave and hydro, and offshore wind have not been included in the LAEP modelling. It is likely that these technologies will play an important part of the future energy mix of both the local area and the UK as a whole.

Emissions and Net Zero Targets

In 2020, the Y&NY region's emissions totalled 7.7 $MtCO_2e$[1]. 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.

Approximate proportion of Y&NY's 2020 CO_2 emissions covered by this LAEP



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)

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] CO_2e represents an amount of a greenhouse gas emissions whose atmospheric impact has been standardized to that of one unit mass of carbon dioxide (CO_2), based on the global warming potential (GWP) of the gas. Mt is millions of tonnes.

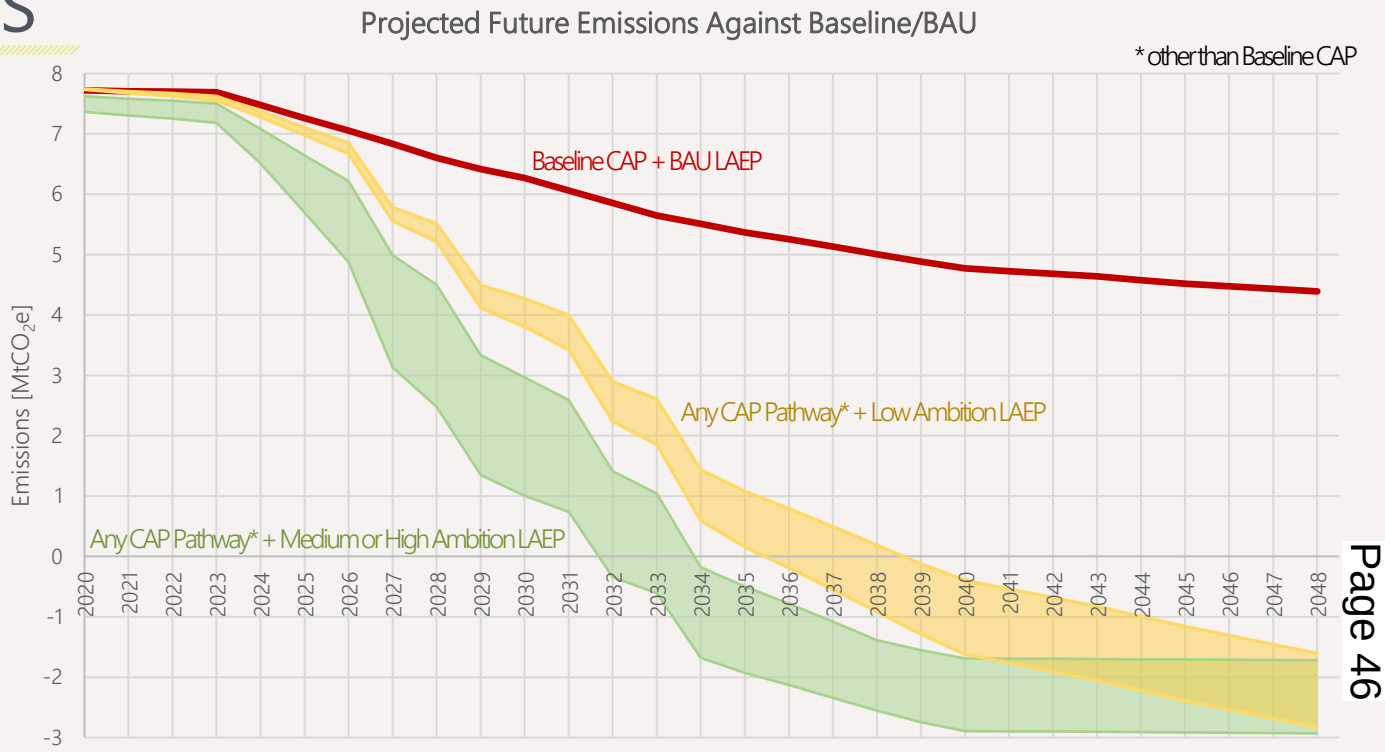
Emissions Pathways

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.ynylep.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:

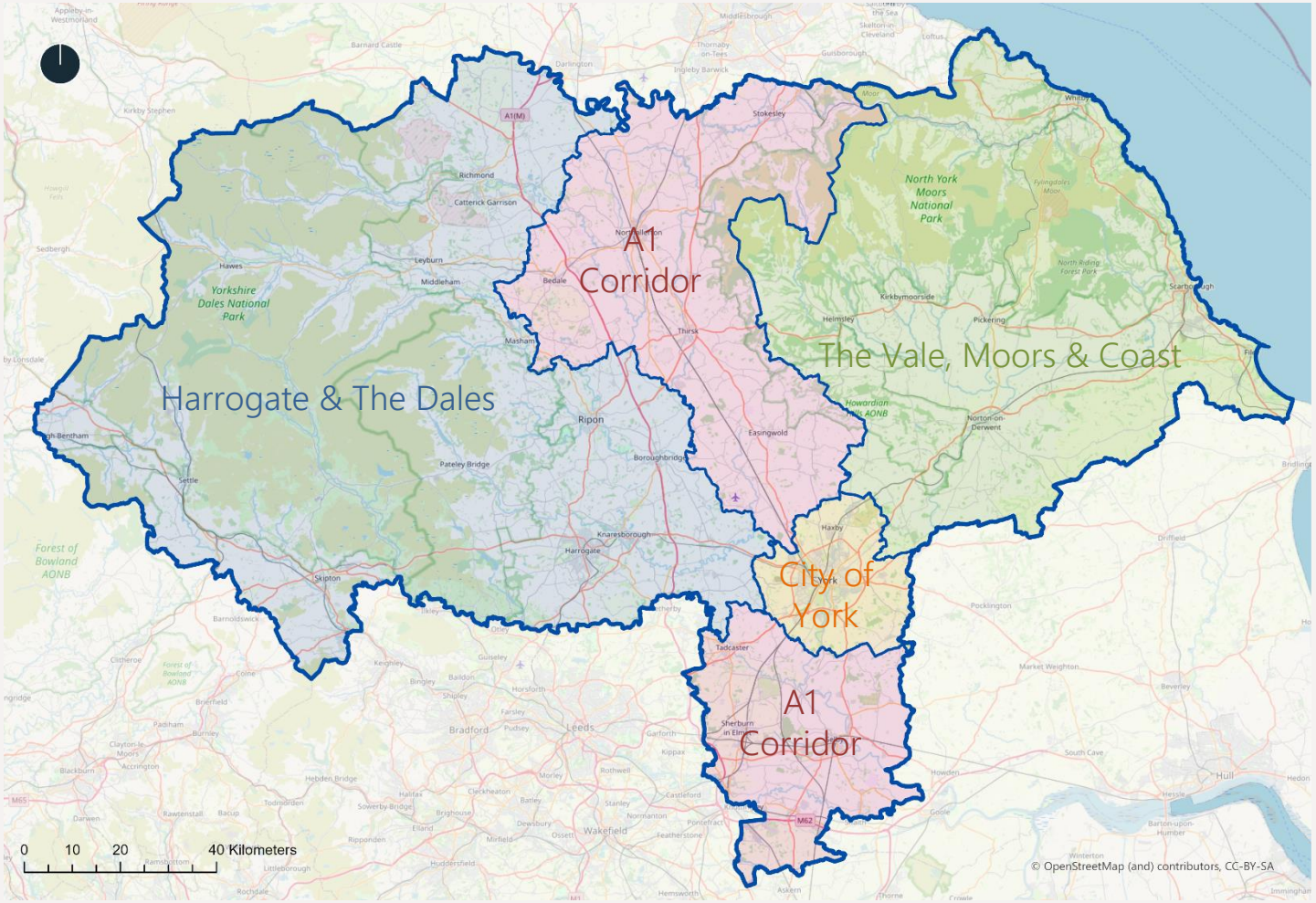
- A1 Corridor (pink)
- The Vale, Moors & Coast (green)
- Harrogate & The Dales (blue)
- City of York (yellow)

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

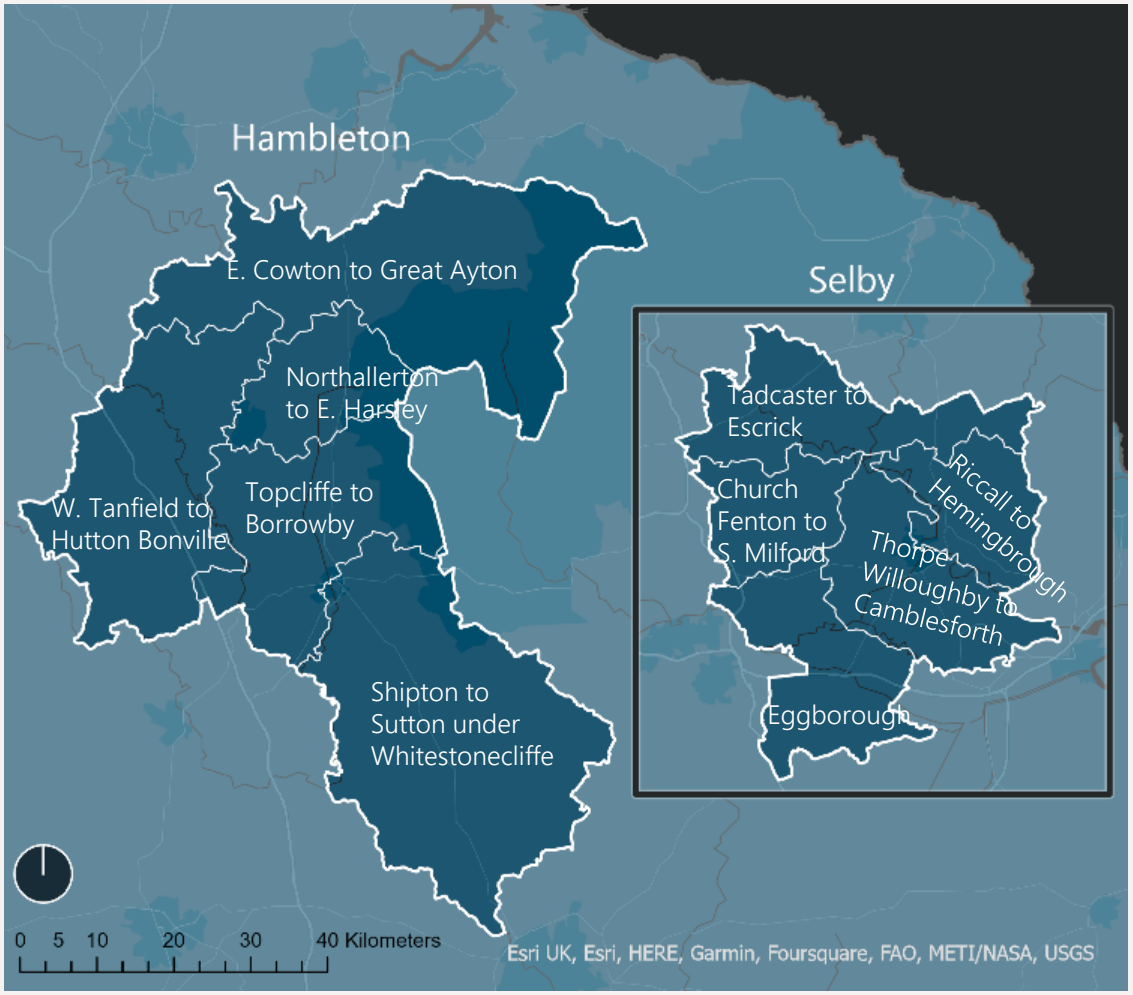
Zones for analysis were identified based on areas served by primary substations, using data provided by the electrical network (Northern Powergrid) that identifies buildings connected to secondary substations that are in-turn connected to each primary substation.

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.

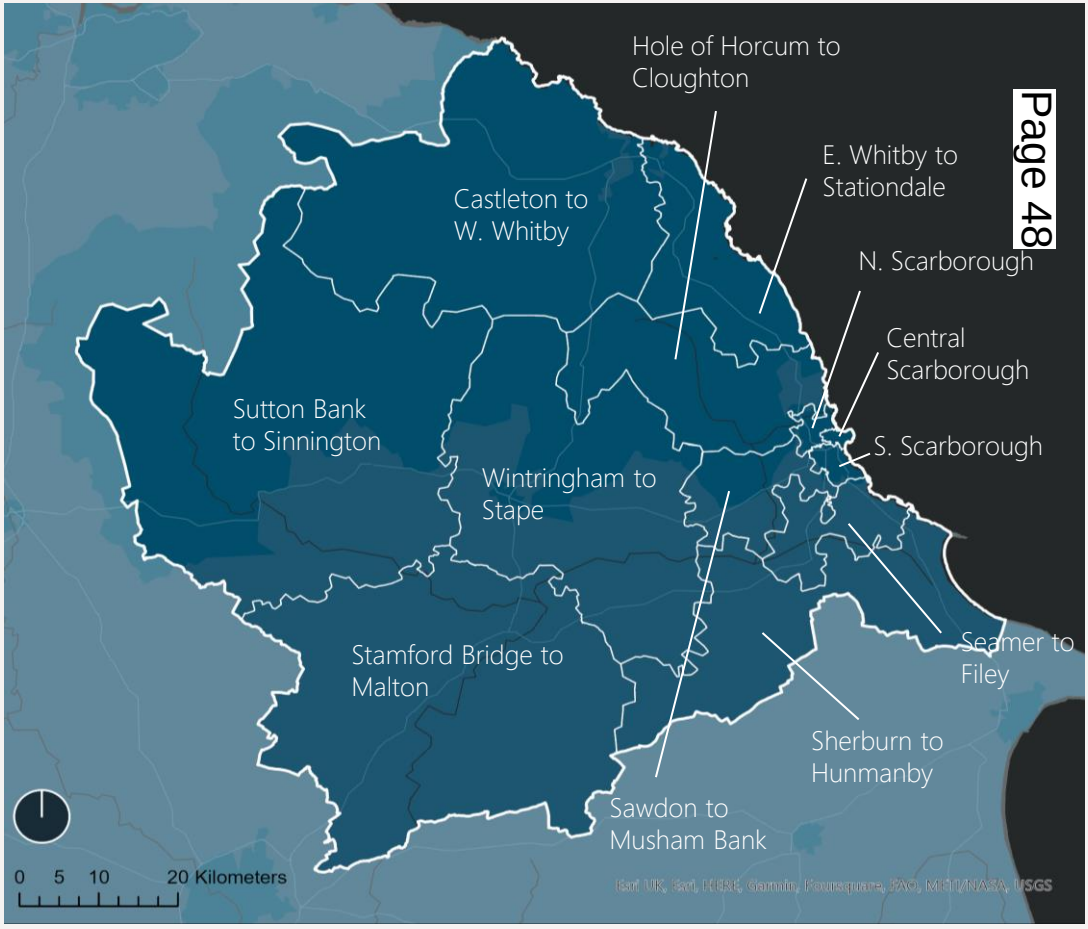


Zones – A1 Corridor and The Vale, Moors & Coast

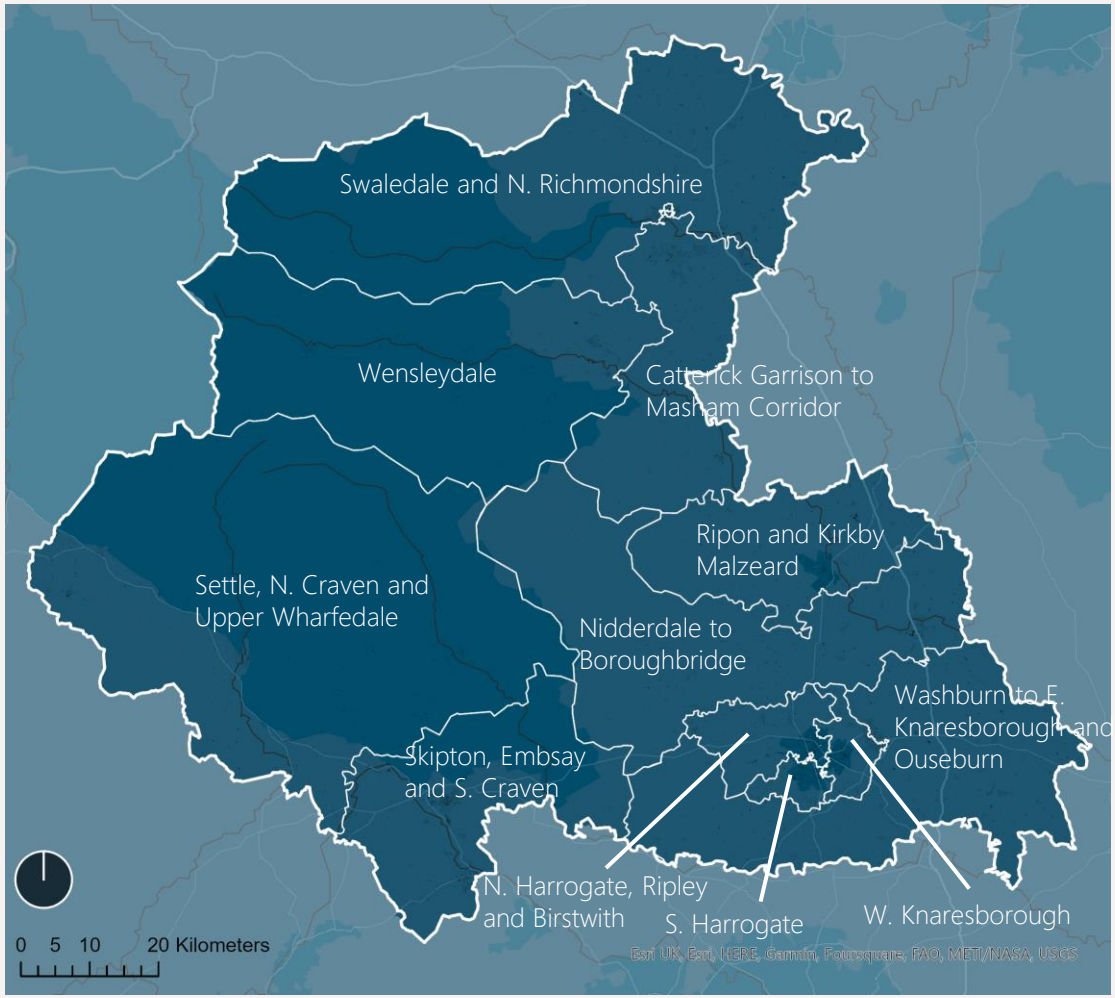


Zones of the A1 Corridor (above)

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



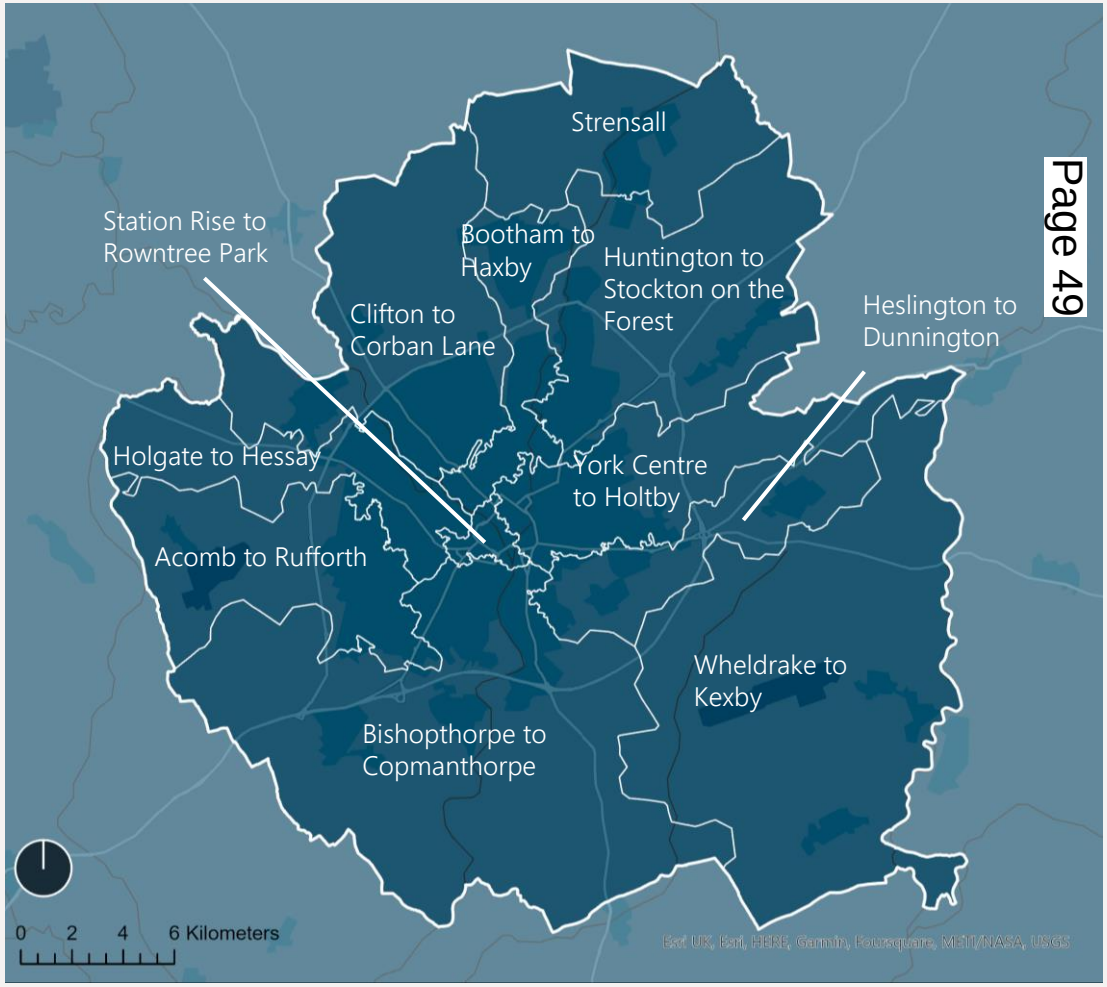
Zones – Harrogate & The Dales and City of York



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

Local Area Energy Plan

CATAPULT Energy Systems

York & North Yorkshire LOCAL ENTERPRISE PARTNERSHIP

HM Government

LOCAL AREA ENERGY PLAN

The Vale, Moors & Coast

Local Area Energy Plan

CATAPULT Energy Systems

York & North Yorkshire LOCAL ENTERPRISE PARTNERSHIP

HM Government

LOCAL AREA ENERGY PLAN

Harrogate & The Dales

Local Area Energy Plan

CATAPULT Energy Systems

York & North Yorkshire LOCAL ENTERPRISE PARTNERSHIP

HM Government

LOCAL AREA ENERGY PLAN

City of York

Local Area Energy Plan

CATAPULT Energy Systems

CITY OF YORK COUNCIL

LOCAL AREA ENERGY PLAN

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.

QUICK WINS	LOW REGRETS	ENABLING ACTIONS	DECISION POINTS
Energy efficiency upgrades in social housing.	EV charger roll-out for those with off-street parking.	Investigate financial models to encourage solar uptake.	Scale of the district heat network (where applicable).
Install solar PV on council buildings and land.	Energy efficiency upgrades and heat pumps in rural off-gas grid areas.	Work with experts to plan the DHNs and establish a business case.	Off-street EV charging at hubs, kerbside charging, or other.
Roll-out public charging infrastructure.	Ground-mounted PV deployment on land of low arable quality.	Develop ownership and finance models for low carbon generation.	Extension of hydrogen into dwellings near to industrial uses.
Replacement of council fleet vehicles with EVs.	Energy efficiency upgrades for private rental dwellings.	Information and engagement campaign around heat pumps.	Local and political appetite for large solar and onshore wind.

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 Go[1] 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.

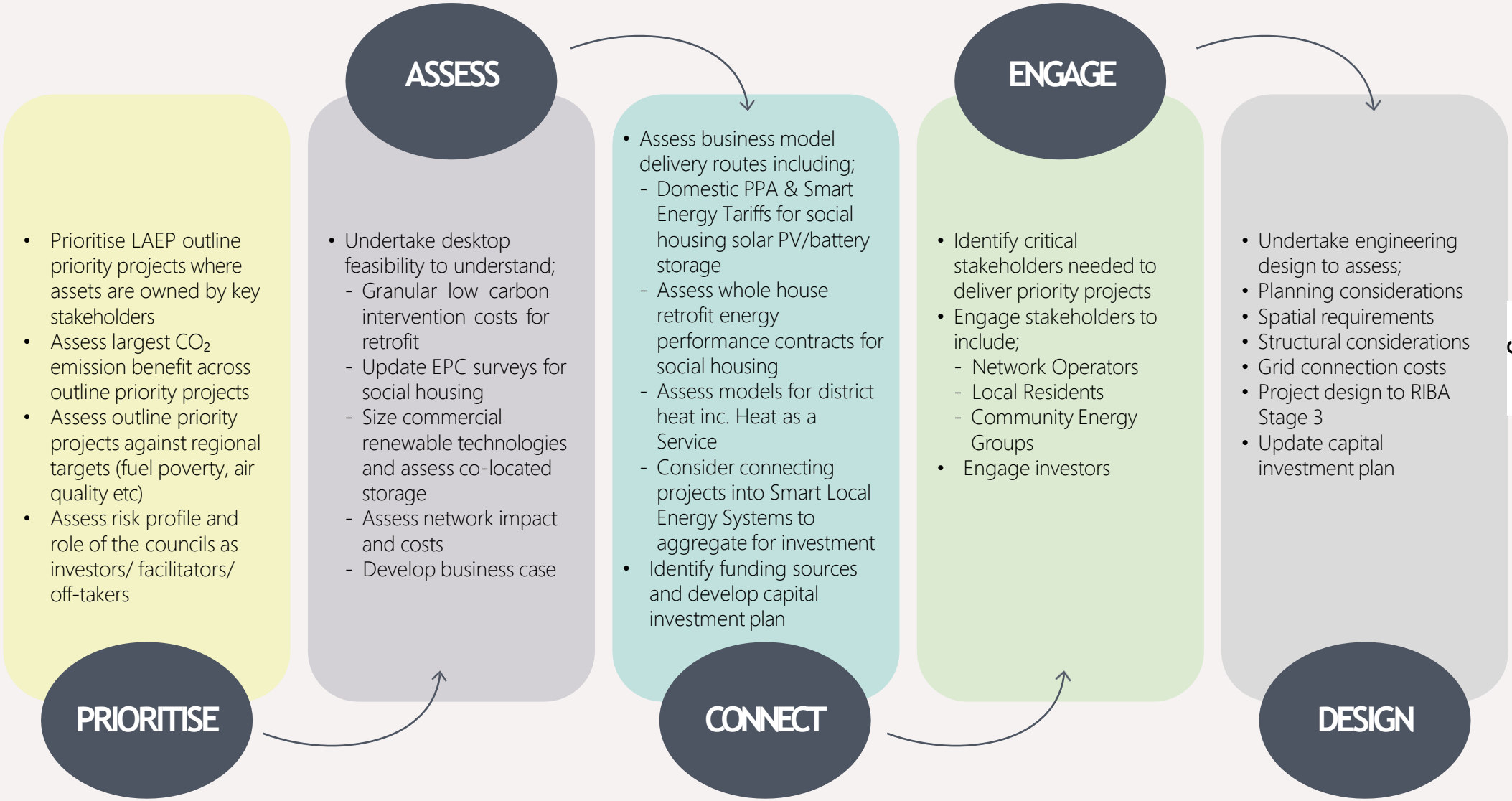
This involves working with partner organisations with engineering expertise to assess spatial, planning and structural considerations. Connection costs should be fully understood and a finalised capital investment plan produced.

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 propsed 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.

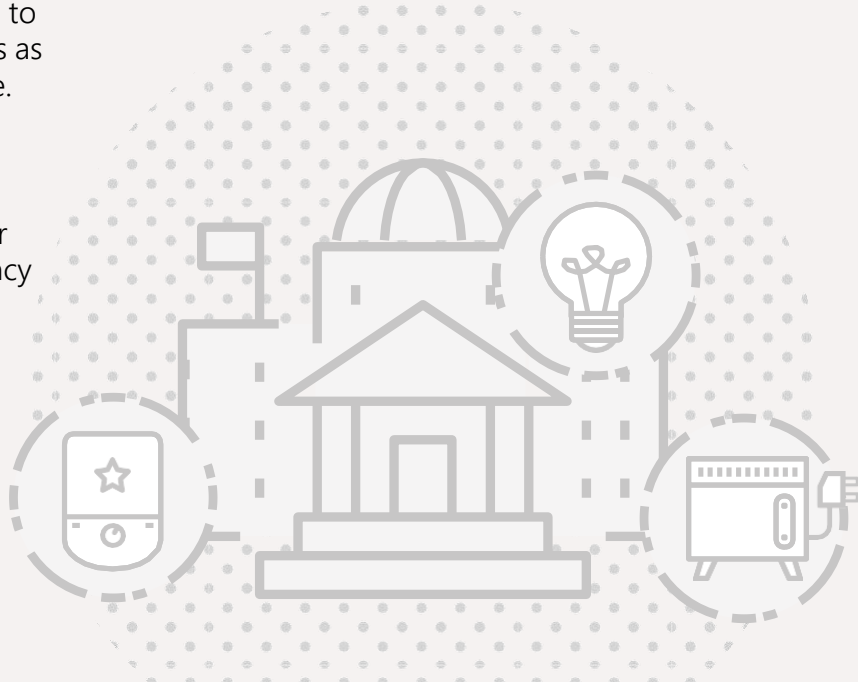
Non-Domestic Buildings

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 is 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/

Business Model Innovation

Business Model Introduction

The implementation of these LAEPs, and the transition towards net zero, is going to require innovative ways to fund the deployment of technologies. This section of the report, provides some examples of business models that could be used within the Y&NY region. These examples will focus on:

- Solar and Storage
- Retrofit

Business models outline how resources can be organised to deliver value to users. The most effective business model for local decarbonisation strategies will be dependent on the characteristics of the local area as well as the low carbon interventions most suited to the place.

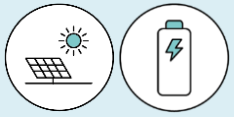
1 PLACE CHARACTERISTICS

- **Local Needs and Priorities** – How is energy used by locals currently and what problems do they face? Can additional value or pain points be solved at the same time as decarbonising the site or region?
- **Spatial** – What space restrictions are there, where can generation be located, how close is it to the demand that is being decarbonised?
- **Resources** - What resources are available to decarbonise (solar, wind, hydro, etc.)?
- **Density** – Are buildings in close proximity, how can generation be shared?
- **Energy Profile** – What does demand look like? i.e., time of day and intensity of energy use
- **Energy System** – What constraints are there for connecting new generation, or what constraints are there on existing demand?
- **Future Development Plans –** What does land and/or building use look like in the future based on development plans?

2 LOW CARBON SOLUTIONS

- Considers what the best technical solution is for decarbonising the site or region based on the place/site characteristics, for example:

SOLAR AND STORAGE



DOMESTIC RETROFIT

3 BUSINESS MODELS

- Business models should be considered in parallel with technical solutions.
- Based on what is best for the site/local area, the right balance needs to be made between what is technically possible (i.e., the technical solution) and how value can be maximised.

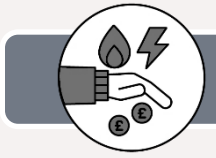
Stakeholder Roles

There are several key stakeholders in the Y&NY region. This slide provides an overview of the various roles that such stakeholders may have in the development and delivery of low-carbon business models.

EXAMPLE STAKEHOLDER ACTIVITIES ASSOCIATED WITH ROLE

INVESTOR

- Investing in and owning a generation, storage or local energy asset in the local area.
- Investing in a service company that acts as the delivery mechanism for the energy services provided to customers.
- Play a central role in the design of local energy markets and local energy platforms, that allows the community to trade different energy services.



CUSTOMER

- A stakeholder who buys energy from the energy system for its own buildings or operations. This includes power, heat and transport.
- Public buildings that benefit from the installation of energy efficiency improvements or low carbon technology.
- Leasing land to 3rd party to develop generation assets.

SUPPORTER

- Support project engagement by providing local community context and identifying key groups/routes to engaging with the community.
- Either provides data to allow others to undertake local area energy planning or undertakes themselves.

Solar & Storage – Business Model Overview

Name	Description	Financial	Co-Benefits	Delivery	Scalability
1. Power Purchasing Agreements and Sleeving	A commercial agreement between an energy generator and an energy user, for the sale of local renewable energy.	Fair	Fair	Good	Good
2. Solar and Storage Licensing	Solar and/or storage is installed at a site at no upfront charge, with power being sold on to the site by the owner of the energy assets.	Fair	Fair	Fair	Very Good
3. Local Energy Market	A software platform, or organization, that allows multiple generators and multiple local users to trade energy with each other.	Very Good	Good	Good	Difficult
4. Local Energy Tariff	A specific tariff that is only available in a local area, usually re-selling locally generated power to the community.	Good	Good	Difficult	Fair
5. Microgrid	A local network for dwellings and buildings that is directly connected to solar and storage. Is managed outside the standard distribution network.	Fair	Very Good	Mid	Difficult

Power Purchase Agreements & 'Sleeving'

A commercial agreement between the owner of a renewable energy asset (the generator) and an organisation with large energy demand (the off-taker). In a virtual PPA the generator will guarantee a price to the off-taker and any difference will be settled once they have been billed. This is viewed more as a financial transaction or hedge but will also include the transfer of Renewable Energy Certificated (REGOs). Alternatively, the generator and off-taker can use an energy supplier to act as a broker for their PPA, helping trade and settle the PPA agreement. Depending on the time and location of both organisations this can be more valuable then a standard virtual PPA.

KEY BENEFITS

Financial and CO_2

- Decrease in energy bills for off-taker, estimated at 20-30% based on 2021 prices,
- Minor uplift in revenue as a generator depending on PPA setup (c. 1-2p per kWh generated),
- Provides long term price security for generator and off-taker,
- Reduces carbon emissions - for off-taker through the purchase of REGOs.

Other Benefits

- Local skills and jobs if using local procurement,
- Easy to setup and well understood,
- Highly scalable if right sites can be found in local area..

RISKS AND CONSIDERATIONS

- Limited commercial viability for smaller scale projects and more complicated sites,
- Business case has some risk and is dependent on future energy price forecasting,
- Existing supply contracts may not include best value terms for sleeving, need to negotiate at the same time supply contract is up for renewal,
- Best pricing will be for projects, or aggregation of projects, above 5MW.

EXAMPLES

CITY OF LONDON

WARRINGTON Borough Council

BRISTOL CITY COUNCIL

Power Purchase Agreements & 'Sleeving'

Warrington Case Study

Overview of Project

- York and Hull solar farms are projects developed by Warrington Borough Council which integrate ground mounted solar PV with battery storage.
- The Public Works Loan Board was used to finance the two sites.
- There are two routes of revenue for Warrington:
  - Sleeved PPA directly with its own local authority demands,
  - Npower optimises operation of battery and provides a route to market,
  - 90% value of wholesale market and ancillary services and 100% of embedded benefits flows through to Warrington Borough Council.

Scale of Deployment

- Investment of £60m across the two sites,
- Hull is a 25.7MW$_p$ solar farm that includes a 21MW battery,
- York is a 35MW solar farm with 27MW battery,
- Expected to return £210m over 30-year project lifetime.

https://www.local.gov.uk/case-studies/warrington-borough-council-commercial-approach-public-sector-clean-energy-investment

https://www.solarpowerportal.co.uk/news/gridserve_completes_game_changing_solar_plus_storage_site

Licensing

Where solar and storage is installed on a building at no up-front cost to the building owner. Often referred to as "solar for free" or "rent a roof" model which was pioneered in early 2010s when renewable subsidies were introduced. This business model is making a return, especially in social housing and community groups, where there is a desire to improve housing standards but issues around affordability.

In this model, the installation of solar and storage is covered under a "licensing arrangement", which means the assets are owned by a 3rd party. Any power used on site from the assets is covered under a PPA and should provide a reduction in energy bills for no upfront cost. The asset owner uses the value they generate to recover costs - any extra is kept as margin. Primarily aimed at cluster of dwellings (e.g., social housing) and can include further upgrades like low carbon heating or retrofit. The model is also applicable for any organisation with multiple sites depending on suitability.

KEY BENEFITS

Financial and CO_2

- Energy bill reduction - estimated 10-20% reduction in energy bills for no up-front investment,
- Fixed price PPA provides greater price certainty over 20-year period,
- Limited ongoing costs or risks compared to other bus model as assets maintained by 3rd party.

Other Benefits

- Helps finance roll out of solar and storage at scale and reduce need for public spending,
- Fair transition – allows low-cost access to net zero transition,
- Reduces complexity and effort of delivery in house by a local authority or community group.

RISKS AND CONSIDERATIONS

- Potential legal issues of roof licensing and 3rd party asset ownership,
- Complexity on energy supply contracts, especially with tenants,
- Only deployed in social housing currently
- LA loses control of future revenue opportunities,
- Cost of finance likely to be higher compared to what a local authority can raise.

EXAMPLES

SMS

Licensing

SMS Case Study

- Solopower is a turn-key solar PV and battery storage solution for social housing
- Assets are installed at no upfront cost to the tenant through a PPA contract between the provider and the landlord. Typical contract length is circa 15-20 years
- Flexigrid technology remotely controls the battery storage asset to optimise when it charges and when it dispatches and exports stored energy into the grid to generate revenue
- Trialled in Orkney as part of Re:Flex Orkney, an IUK demonstration project
- Social Housing Demonstrator in Aberdeen is a £5.2m pilot project which combines this solution with fabric retrofit and low carbon heating, again using controls developed with Flexigrid
- For over 100 social houses and the project aims to improve comfort levels and lower energy costs
- The installation phase of the scheme completed in Feb 2022 and has created 39 local jobs. Energy performance of dwellings currently being assessed.

https://www.sms-plc.com/about-us/case-studies/reflex-orkney/

https://www.sms-plc.com/insights/blogs-news/sms-partners-with-aberdeen-city-council-on-100-home-decarbonisation-retrofit-scheme/

Local Energy Market

The point of a local energy market (LEM) is to link multiple generators with multiple off-takers in a single pool. By aggregating everyone together there is the possibility of increasing the value for both parties. One version of a local energy market is a "Sleeving Pool" where a "Pool Manager" plays the central role in coordinating contracts and finding the best mix of local generation that matches demand. Generators can setup direct PPAs with off-takers or leave supply open to be traded in the pool.

The second version is a Local Energy Exchange which is facilitated by a digital platform. In both cases a central organisation is responsible for local balancing and intraday trades . The differences are in how the price is set for trades -with a local energy exchange being more an open market in theory.

LEMs also have the potential to offer a wider array of services as the market matures like different energy services.

KEY BENEFITS

Financial and CO_2

- Improves on a Sleeved PPA by:
  - creating economies of scale,
  - matching generation and demand,
  - reduced network charges and improved imbalance position,
  - further revenue if flexibility traded,
- Moves community to 100% renewable power that would meet Ofgem green tariff criteria.

Other Benefits

- Creates a stronger business case for local generation,
- Improves system resilience and flexibility,
- Retains value locally.

RISKS AND CONSIDERATIONS

- Value is dependent on market design and local price signals,
- Need enough scale, or liquidity, in the pool / market,
- Only a few trial projects and feasibility studies,
- A partner is required to be the Pool Manager or Local Energy Exchange,
- Risk that the Pool or LEM becomes more regulated and value opportunities are reduced.

EXAMPLES

regen transforming energy

together housing

UrbanChain

Bristol City Council

Local Energy Market

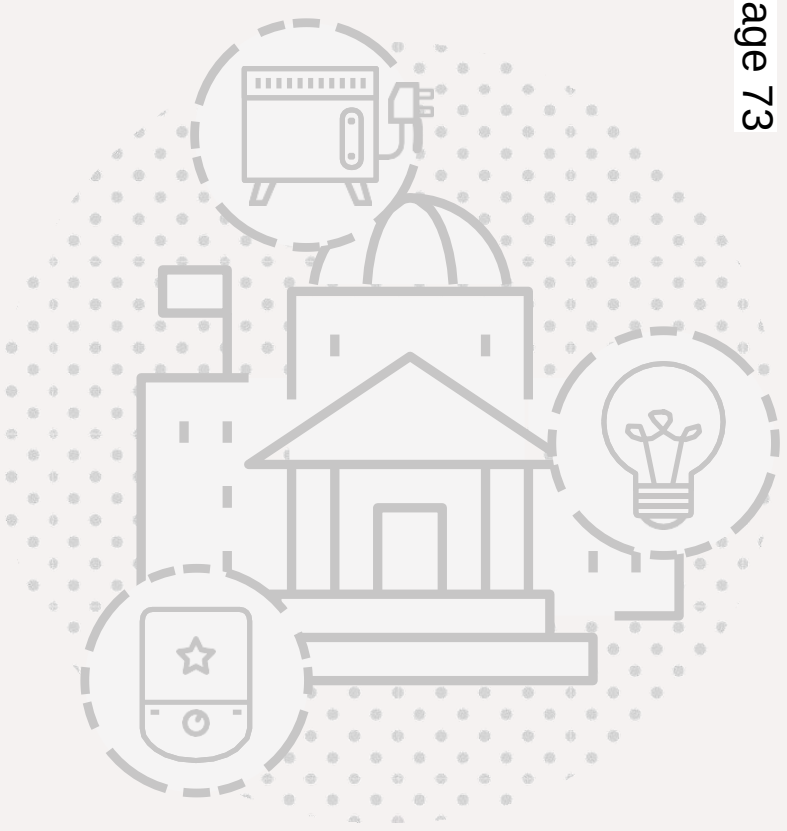
Urban Chain Case Study

Overview of Project

- Urban Chain is a Peer-2-Peer software platform that serves both local generators and local energy users to provide matched renewable power.
- There are different applications of the platform:
  - Local Peer-2-Peer where UrbanChain serves an entire local area with a mix of generators and end users,
  - Private Peer-2-Peer where it is a closed exchange serving only buildings and generation specified by the main investor
- Cost savings are derived from network efficiencies and the licence exempt cost avoidance.

Scale of Deployment

- Working with West Suffolk Council and an industrial park with 50 businesses participating in a local energy exchange and demand side management trial
- Businesses save £40-50 per MWh on bills and get an uplift of £30 per MWh of solar energy exported
- Also working with Together Housing Association
- Partnership will allow 500 houses and bungalows within Lancashire and Yorkshire to buy (and sell) green energy amongst themselves and others.



https://www.current-news.co.uk/blogs/p2p-trading-and-demand-management-at-industrial-parks-a-look-at-west-suffolks-project

https://www.current-news.co.uk/news/urbanchain-onboards-first-housing-association-as-it-continues-to-grow-p2p-market

Local Energy Tariffs

A specific tariff that is only available in a local area, usually re-selling locally generated power to the community. There are a few variations of local energy tariffs that exist today:

1. "Local generation tariff" – customers get a reduction in their bills when there is local generation online and generators get an uplift in their PPA price when they match to local demand (e.g. Octopus Fanclub, Energy Local)

2. "Local Investor tariff" – customers part invest in a generation asset and get a rebate or share in revenue (e.g. Ripple Energy)

Tariffs are currently aimed at domestic consumers and often delivered in partnership with local community energy groups. Feasible that wider community buildings or local authority buildings could be brought into the local tariff.

KEY BENEFITS

Financial and CO_2
- Decrease in energy bills for off-taker, but this is variable depending on local generation matching with local demand,
- Moves community to 100% renewable power that would meet Ofgem green tariff criteria.

Other Benefits
- Creates a stronger business case for local generation,
- Retains value locally,
- Community engaged in local decarbonisation,
- Minor system resilience improvements,
- Local skills and jobs.

RISKS AND CONSIDERATIONS

- Reliant on an energy supplier to do local matching - only one supplier in the market currently,
- Contractually complex to setup,
- Could be scaled over time and encourages diversity in investment in local renewables,
- Flexibility in location - examples (e.g. Ripple) do not require generation and demand to be closely located,
- Not yet tried with local authority.

EXAMPLES

Ripple

octopus energy

Energy Local
making energy work for you

Local Energy Tariffs

Energy Local

Overview of Project

- Energy Local are a Community Interest Company that help communities setup a local energy tariff
- Each community that wants to participate sets up a local co-op called an Energy Local Club
- The idea of the club is to get more value from when local generation is being used by creating a bespoke tariff for local dwellings and businesses
- The generators and households in the club agree a match tariff, which is the value that generators sell directly to the dwellings (in essence a PPA agreement)
- For any additional power demands a time-of-use tariff is available from Octopus Energy / Younity
- Households and businesses need to have a smart meter fitted to monitor when energy is being used and how well it "matches"
- For the club to stack up commercially there has to be sufficient match, otherwise dwellings could potentially pay extra

Scale of Deployment

- First club was setup in 2016 in Bethesda (North Wales) anchored around a 200kW hydro power plant
- Over 20 clubs have been setup or are in the process of being setup
- Membership can range from 20 to 100 dwellings - very dependent on size of generation in the club
- Looking at additional value that can be created, including demand response trials and other ways of trading flexibility

Tariff	Day rate	Peak rate	Night rate
Match tariff rate (p/kwh)	14.5	19.0	12.2
Grid rate (p/kWh)	18.5	28.3	12.3

Example tariff from Bridport Energy Club

Microgrid Models

A microgrid is a series of buildings that are connected to a local renewable energy asset like solar or storage. This network sits behind a grid supply point and would fall outside of the responsibility of a standard local network operator or DNO. Any renewable energy generated is used within the microgrid at a reduced price to standard power that would be imported from the grid. It is rare that the microgrid is totally self sufficient, or islanded, and some additional power will be required from the grid in the winter. It is up to the microgrid operator to balance the needs of those using it, the power being generated and how to source and surplus energy required.

Most common applications are in small scale new build developments, usually with low energy demand and high energy efficiency. There is also a "collective self consumption" model similar to a microgrid which is more common in high density residential developments.

KEY BENEFITS

Financial and CO_2

- Dependent on many factors like the size of generation and power demand of buildings
- Trials suggest c. 10% reduction in bills vs standard market price (2021 prices)
- Moving dwellings to net zero standard, so hugely beneficial if scalability can be improved

Other Benefits

- Creates high-quality, high-energy efficiency dwellings in the community
- Could involve some community ownership or investment in the microgrid or low carbon measures being installed
- Costs are not born by homeowner so makes net zero transition more accessible

RISKS AND CONSIDERATIONS

- Only being done in small scale trials currently (50-100 dwellings) so limited scale
- Complex to setup – will involve multiple partners and unique legal agreements not yet common place in the market

EXAMPLES

Electric Corby – Switched on thinking

Bristol Energy Cooperative

clean energy prospector

SMARTKLUB – Empowering Communities

Microgrid Models

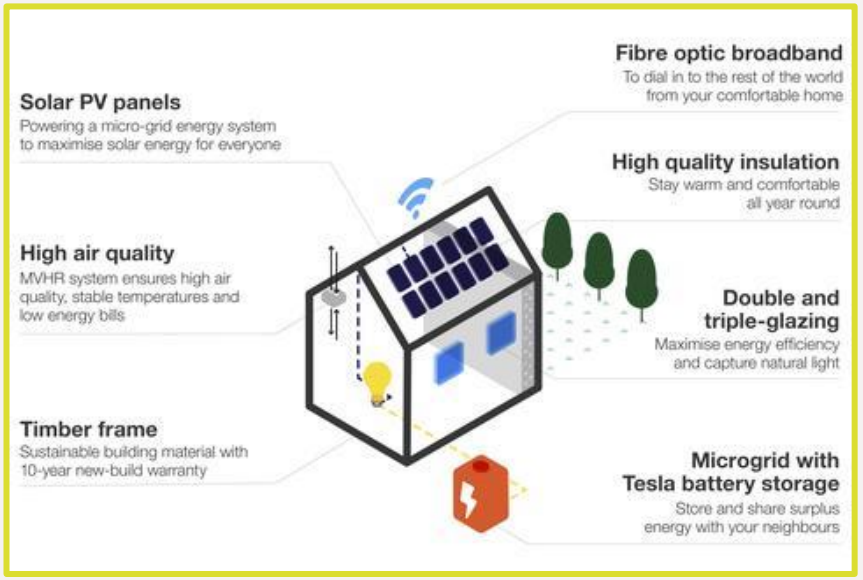
CEPRO and Bristol Energy Co-operative

Overview

- Partnership between Bright Green Futures (developer), Bristol Energy Co-op (energy assets), CEPRO (microgrid design)
- Managed through a community Energy Services Company called the Microgrid Foundry Bristol Energy Co-op is funding the battery and the microgrid infrastructure at the site through £2m community share offer
- Each dwelling fitted to high energy efficiency standard including installation of heat pump and thermal store
- One big power battery on site (Tesla) to manage any export and share at times of low solar generation
- All sat behind a single sub station which is managed by CEPRO to optimise any generation, demand and any additional revenue from trading or flexibility services
- Not a true microgrid, as some import will be required, but has been designed in a way to try and be self sufficient as possible

Scale of Deployment

- Water Lillies is a new build development in Bristol consisting of 33 dwellings
- Size of the microgrid is 115kW$_p$
- The second microgrid is with Bridport Cohousing using the same interconnected methods adopted at Water Lilies.
- BEC is funding the battery, PV and microgrid elements here
- Project is 54 dwellings and microgrid is 210kW$_p$



Other Considerations

Out of Area PPA (For Solar Farms)

Investing in, or purchasing, solar and storage assets throughout the UK on a virtual Power Purchasing Agreement. Where the local authority is buying direct this can be used as a financial hedge against existing energy bills. The model could be adapted to re-sell power to the community as well, akin to a Local Energy Tariff, but would need further investigation and there are regulatory barriers and commercial risks to local supply. Younity example of a national provider which could be explored.

Grid Connected Storage

Investing in stand alone battery storage assets projects around the 20-50MW scale. Examples where local authorities or community energy groups are involved, usually involve JVs or SPVs with other commercial partners who can provide technical expertise. The local area takes on responsibility for providing land, raising finance, navigating planning restrictions and the commercial strategy which seeks opportunities to generate income to future-proof council services to benefit their communities. It also helps the council achieve its commitment to reducing carbon emissions by 2030

Collective Self Consumption (Roof Mounted Solar / High Density Residential)

Model originated in Germany focused on medium and high density buildings (e.g. tower blocks). Involves generation assets supplying a building, usually under a private wire arrangement, and benefits being shared equitably amongst all tenants in the area. Has now been trialled throughout Europe. Emergent Energy's "Solar 4 Flats" most prominent offer in UK.

Retrofit – Business Model Overview

Name	Description	Financial	Co-Benefits	Delivery	Scalability
1. Optimised Retrofit	The goal of this business model is to gradually deliver low carbon improvements over time, with the use of better data and analytics that build a pathway to a net zero dwelling. Savings from cost effective measures are used to fund more expensive ones.	Some risk	Good	Fair	Good
2. Energy Performance Contract	The "Energiesprong" approach. Whole house retrofit is delivered in one go with an energy performance contract that guarantees energy savings and the long-term performance of those improvements.	Some risk	Good	Fair	Fair
3. Neighbourhood Approach	Providing access to funding and low carbon improvements on a neighborhood, or street by street basis. Funded through mix of public and private finance.	Some risk	Very good	Some risk	Some risk
4. Community Homes	Community energy groups leading on the design and operation of low carbon and affordable homes for the community.	Good	Good	Some risk	Difficult

Energy Service Contracting

This approach uses a combination of data, analytics and low carbon technology to help dwellings reach net zero. There are four key components to the approach:

1. Using connected devices in dwellings to build a realistic picture of how energy is being used
2. Analytics to build the cost optimal way of transitioning the dwelling to net zero
3. Creating an energy services plan that will replace the energy contract, and create energy efficiency packages that will be installed and funded through energy savings
4. Maximise the value of energy by utilizing time of use tariffs and trading any excess energy generated

There are numerous providers of steps 1 and 2, especially in the social housing market. Steps 3 and 4 are being developed by smaller scale innovators like Sero and SMS, but they are not being delivered at scale yet.

KEY BENEFITS

Financial and CO_2 reductions

- End users are expected to see some decrease in bills (c. 10% based on 2021 prices)
- Increased house value over time for property owners
- Transition dwellings to net zero / band A so very positive impact in terms of CO_2 reductions

Other Benefits

- Increased health benefits from healthier dwellings
- Local skills and jobs if recruiting local installers
- Improved dwellings can have significant intangible community benefits including better sense of place, stronger sense of community

RISKS AND CONSIDERATIONS

- Significant merchant risk to generate enough revenue through energy trading and flexibility services
- Risk on energy savings, have to be confident savings will be realized to pay for low carbon measures in the future
- Contract lengths have to be long, with a minimum of five years and maximum of twenty
- Shortage of suitably trained workforce could impact delivery

EXAMPLES

sero

SMS

Energy Service Contracting

Sero Optimised Retrofit

Overview of Project

- Sero are a home developer and software company based in Wales
- Their main project is optimised retrofit which is being rolled out across Wales with 26 social housing partners
- The aim is to provide a better quality and more cost-efficient way of improving the energy performance of dwellings
- That's firstly addressed through the Whole Home Survey app, which allows better quality surveys and data to build a detailed picture of the current energy performance of the dwellings
- A second digital tool, Pathways to Zero, will identify a phased approach to reducing the carbon footprint of the property to the lowest possible level
- That optimized plan can then be self funded by the property owner
- Or in the future be funded through Sero Life, that will provide digital controls and an energy service plan that will fund the improvements through energy savings

Scale of Deployment

- The collaboration of 68 partners, including 26 social housing providers, and managed by Sero, will see the decarbonisation of more than 1,750 Pathfinder dwellings
- The project has received £13m funding through the Welsh Government's Optimised Retrofit Programme, part of the Innovative Housing Programme
- Sero Life is being explored as part of an ERDF funded project in Swansea

Energy Performance Contracting

Very similar to the optimised retrofit model, with two key differences:

1. There is a strong focus on ensuring the energy savings or energy performance of any low carbon / energy efficiency measures installed
2. The measures being installed are usually done in one go, classified as the "whole house approach".

The main contractor will provide an energy performance contract with the dwelling at a fixed price per year. Energy savings are in effect guaranteed in this plan, and are used to help pay for the retrofit over a 25-30 year period. If energy savings are not realised then the installer loses out. This plan is separate to the dwelling's energy bill which will still be paid as normal.
The most prominent example of this model is Energiesprong which is covered in the case study. This model also includes a pre fabricated insulation technology that speeds up the whole house retrofit process, but the model could still be adopted without being tied to the technology.

KEY BENEFITS

Financial and CO_2

- Due to cost there are likely to be minimal savings for the dwelling (<10%)
- CO_2 savings per dwelling incredibly high with some trials delivering a net zero standard

Other Benefits

- Better quality, healthier dwellings which can massively reduce impact of cold related illnesses
- Improve house value and land value in the area
- Wider social impacts and costs due to better quality dwellings and better pride of place
- Opportunity for local jobs and upskilling local workforce

RISKS AND CONSIDERATIONS

- Very expensive and low returns for investors – c. £50k per dwelling depending on the final standard targeted
- Supply chain is immature and it can be difficult to source a main contractor to co-ordinate
- Installers are wary of long term guarantees and performance contracting due to risks
- Less reliance on energy suppliers or interfacing with energy markets, which makes it more suitable for local / community projects

EXAMPLES

energiesprong uk

refit

EQUANS

Energy Performance Contracting

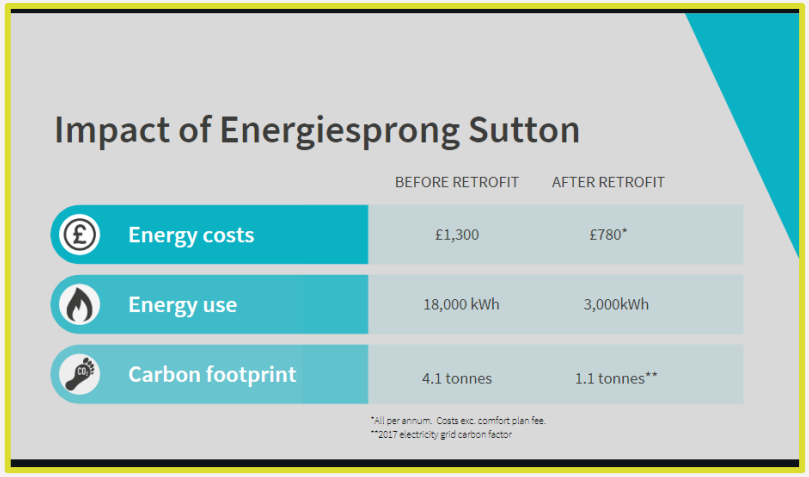
Energiesprong

Overview of Solution

- A whole house retrofit "system" that combines innovation in energy efficiency, innovation in procurement and energy service contracting
- Central to it is a pre-fabricated external cladding system that will provide high energy efficiency walls, windows and doors
- Upgrades will also include upgrades to the roof, solar and low carbon heating
- The whole process is completed in a maximum of 15 days to minimise disruption to the end user
- Total cost is estimated at £65k per property, but they are hoping to reduce this to £50k in the next few years
- Energiesprong System Provider has to guarantee the work for 30 years
- Residents receive guaranteed minimum levels of comfort and continue paying for heat, hot water and light at the rate prior to the work being done
- The difference between this and the reduced cost of energy to run the dwelling pays off the loan for the extra over cost

Scale of Deployment

- Energiesprong UK and Turner & Townsend set up the Innovation Partnership, a SPV to deliver the retrofits
- The Innovation Partnership has eight social landlord partners which include six London boroughs, Nottingham City Homes and Sanctuary Homes in the South-west
- The GLA established the Retrofit Accelerator for Homes which has the objective of achieving 1,500 deep retrofits in London
- Keepmoat / Equans offering Energiesprong type deal across UK



Neighbourhood Approach

Creating an investment vehicle that will help finance, contract and deliver retrofit within a local area. This would be a "planned approach" to retrofit, rather than market led, with a key focus on economies of scale and improving the cost to serve. A few models exist:

- Local grant funding, subsidies or tax breaks which are made accessible to the local area for low carbon projects (e.g. Hackney Borough Council, BHESCo in Brighton)
- Private / public partnership to regenerate an area (e.g. Rugeley and Equans)
- Local authority or city led approach (e.g. West Midlands Combined Authority, Bankers without Boundaries)

In all cases the key benefit is community engagement. By creating a single, community led approach, there should be greater confidence and higher participation from dwellings and businesses.

KEY BENEFITS

Financial and CO_2

- Requires a mix of private and public spending so financial returns are low, steady and long term
- Delivers net zero dwellings, so huge impact and potentially scale if take up is higher than other approaches

Other Benefits

- As per other retrofit projects in terms of improved health, wellbeing and social returns
- Often coupled with wider regeneration aims like improved transport, clean air and green spaces
- Likely to deliver best community engagement in net zero

RISKS AND CONSIDERATIONS

- Finding the funding – in many cases local areas have just repurposed LAD funding for a specific area
- Very early-stage concept – most activity has required innovation or grant funding as a starting point
- Steady but long returns will only suit certain type of investors
- Needs to be done at scale to raise the finance, best suited to densely populated areas

EXAMPLES

West Midlands Combined Authority

EQUANS

BHESCo

Neighbourhood Approach

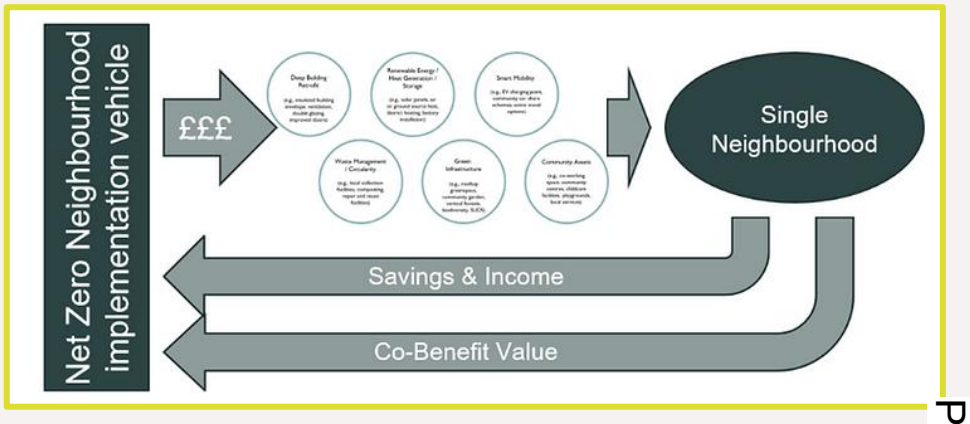
West Midlands Combined Authority (WMCA)

Overview of Project

- A £2m demonstration project launched by WMCA in 2019.
- Aims to demonstrate how retrofit could be designed and delivered on a street-by-street basis.
- While sharing resources on community engagement, delivery and financing across a region.
- As part of the initial trial looking to identify 3-7 neighbourhoods in a district with each neighbourhood designing their own net zero plan.
- WMCA investment will be used to fund retrofit, low carbon heating measures and other low carbon infrastructure.
- Planning to create a replicable financial model to deliver a pipeline of neighbourhoods with increasingly less reliance on grant funding.
- This is being done in collaboration with Energy Capital and Bankers without Boundaries, taking on ideas from "Financing Net Zero Neighborhoods" white paper.

Scale of Deployment

- Part of WMCA's five year plan is to retrofit 300k dwellings by 2026.
- Selection process for net zero neighbourhoods is taking place by the end of 2022, delivery starts 2023.
- The plan is to create a pipeline of projects across 5 Birmingham districts, with new neighbourhoods continuing to submit their net zero plans to aid in discussions with investors.
- WMCA also looking at wider opportunities for local flexibility markets and regional system operation that will allow the area to have greater control over how its climate strategy can be delivered.



Community Homes

Community Homes is where the local community take a greater lead in designing and investing in low carbon dwellings. A new legal entity is created (e.g. a Community Interest Company) that will take full end to end responsibility of house building – from finance to design to build and any ongoing support. The business model is built on the logic that a community is willing to invest in net zero, affordable homes for the area, rather than relying on private investment which will be more focused on making a return on the properties.

Making a return on investment will be difficult without further innovation, as they are trying to keep rent and house prices affordable. Both PEC Homes and Bristol Co-op are developing energy service contracts for the homeowners, so that energy bill savings can be used to repay the extra low carbon improvements.

KEY BENEFITS

Financial and CO_2

- Assumed to be similar to the Microgrid or Performance Contract model, as some form of energy service contract is required to repay finance
- Delivers a net zero dwelling at an affordable price, so hugely beneficial to climate targets if it can be done at scale.

Other Benefits

- Provides greater access to net zero for those who can't afford it
- Will address high cost of living, especially around future energy bills
- Investment and returns retained locally
- Can encourage local jobs and upskilling

RISKS AND CONSIDERATIONS

- Community share offers or community bonds have not exceeded £1m which makes concept difficult to scale
- Long lead times on development are very long term so will take time to mobilise
- Hugely competitive market in terms of land availability and planning
- Requires upskilling community energy groups so that they have sufficient building and energy supply experience

EXAMPLES

PEC HOMES

Hook Norton Low Carbon
Supporting Sustainable Living

Bristol Energy Cooperative

Community Homes

PEC Homes

Overview of Project

- PEC Homes as an independent Community Benefit Society and Community Land Trust setup in 2020
- Have received preliminary planning approval for an affordable, community led, zero carbon development of 70 new dwellings in Plymouth.
- The key goals for the development are:
    1. Up to 100% affordable housing, rather than 55%.
    2. A target of 100% net zero carbon, rather than 55%.
    3. Creating more focal community green spaces, with improved access to surrounding local nature reserves.
    4. Deliver a net gain in biodiversity and provide opportunities for local food growing.
    5. Further promotion of sustainable transport options, including potential for wider community access to electric cars and bikes.
- It will be the first new build development to adopt the Energiesprong approach in terms of technology and contractually, with performance guarantees embedded in contracts.
- Want to retain community ownership, and community share offer to be launched by the end of 2022.

Scale of Deployment

- Building planned in two phases, with first phase due to start in 2023.
- Being developed in partnership with Plymouth Council as part of their £15.4m Plan for Homes, five thousand new dwellings will be built in Plymouth over the next five years.

Heating – Business Models

Shared Ground Source Heat Pumps

A more contained version of a heat network, where a shared ground loop / bore hole can be used to serve multiple dwellings within an estate. By sharing the cost of any external work it should improve the business case for installation. Some initial trials for social housing and new build developments. Increased running costs compared to gas boilers not addressed in business model.

Renewable Powered Heat Networks

A central heat pump in a plant room is used to serve a heat network. That heat network is served by a private wire from nearby solar and storage assets. The logic of the business model is that the energy assets can support demand side response and flexibility services that increase the cost effectiveness of the heat network

Heat as a Service

Moving away from selling kWh and selling customers an outcome based service like a warm dwelling or comfort. This has two benefits: 1) it focuses on delivering a service that customers value and possibly pay more for and 2) if the focus is on outcome the service provider can help manage the transition to low carbon heating

Warmth on Prescription

Similar to heat as a service, but with a specific focus on addressing fuel poverty and vulnerable customers. Involves collaboration with the NHS to identify those suffering from cold related illness symptoms. A service provider, collaborating with NHS, can prescribe a warm dwelling and monitor and subsidise what a comfortable level of heating should be.

Transport – Business Models

Solar Car Ports
Where space is limited, public car parking or public sector sites can have solar mounted on top. Usually connected to nearby site through private wire arrangement. Projects can also combine storage and EV charging to increase accessibility of low carbon transport.

EV Charging Hub
An EV charging hub that is powered by solar and storage. Involves a large concentration of EV charging infrastructure (c. 20 chargers) that can be used by a mix of public sector fleet vehicles or general public use. Solar and storage can be integrated to increase revenue opportunities.

Community Car Club
A community car club is a local, member-based initiative that provides access to self-service, pay as you drive, low-carbon vehicles. Often community car clubs are run by local groups to support their communities. Most interesting opportunities are when this service is combined with energy assets like EV charging infrastructure or storage.

Mobility as a Service Platform
A single platform or application that allows the local community to access a wide range of transport options. Offers an enhanced user experience by simplifying the way to access and pay for different modes of transport. Can also be used to incentivise lower carbon forms of transport.

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 role 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	Regular discussion and engagement with Northern Powergrid to ensure they have as much time as possible to prepare and implement any network changes required. 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.
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.	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. 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.
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.

Licence/Disclaimer

Energy Systems Catapult (ESC) Limited Licence for York & North Yorkshire Local Area Energy Plan

ESC is making this report available under the following conditions. This is intended to make the Information contained in this report available on a similar basis as under the Open Government Licence, but it is not Crown Copyright: it is owned by ESC. Under such licence, ESC is able to make the Information available under the terms of this licence. You are encouraged to Use and re-Use the Information that is available under this ESC licence freely and flexibly, with only a few conditions.

Using information under this ESC licence

Use by You of the Information indicates your acceptance of the terms and conditions below. ESC grants You a licence to Use the Information subject to the conditions below.

You are free to:

- copy, publish, distribute and transmit the Information (with the exception of the Business Model Innovation section which remains the intellectual property of ESC);
- adapt the Information;
- exploit the Information commercially and non-commercially, for example, by combining it with other information, or by including it in your own product or application.

You must, where You do any of the above:

- acknowledge the source of the Information by including the following acknowledgement:
- "Information taken from York & North Yorkshire Local Area Energy Plan, by Energy Systems Catapult";
- provide a copy of or a link to this licence;
- state that the Information contains copyright information licensed under this ESC Licence.
- acquire and maintain all necessary licences from any third party needed to Use the Information.

These are important conditions of this licence and if You fail to comply with them the rights granted to You under this licence, or any similar licence granted by ESC, will end automatically.

Exemptions

This licence only covers the Information and does not cover:

- personal data in the Information;
- trademarks of ESC; and
- any other intellectual property rights, including patents, trademarks, and design rights.

Non-endorsement

This licence does not grant You any right to Use the Information in a way that suggests any official status or that ESC endorses You or your Use of the Information.

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:

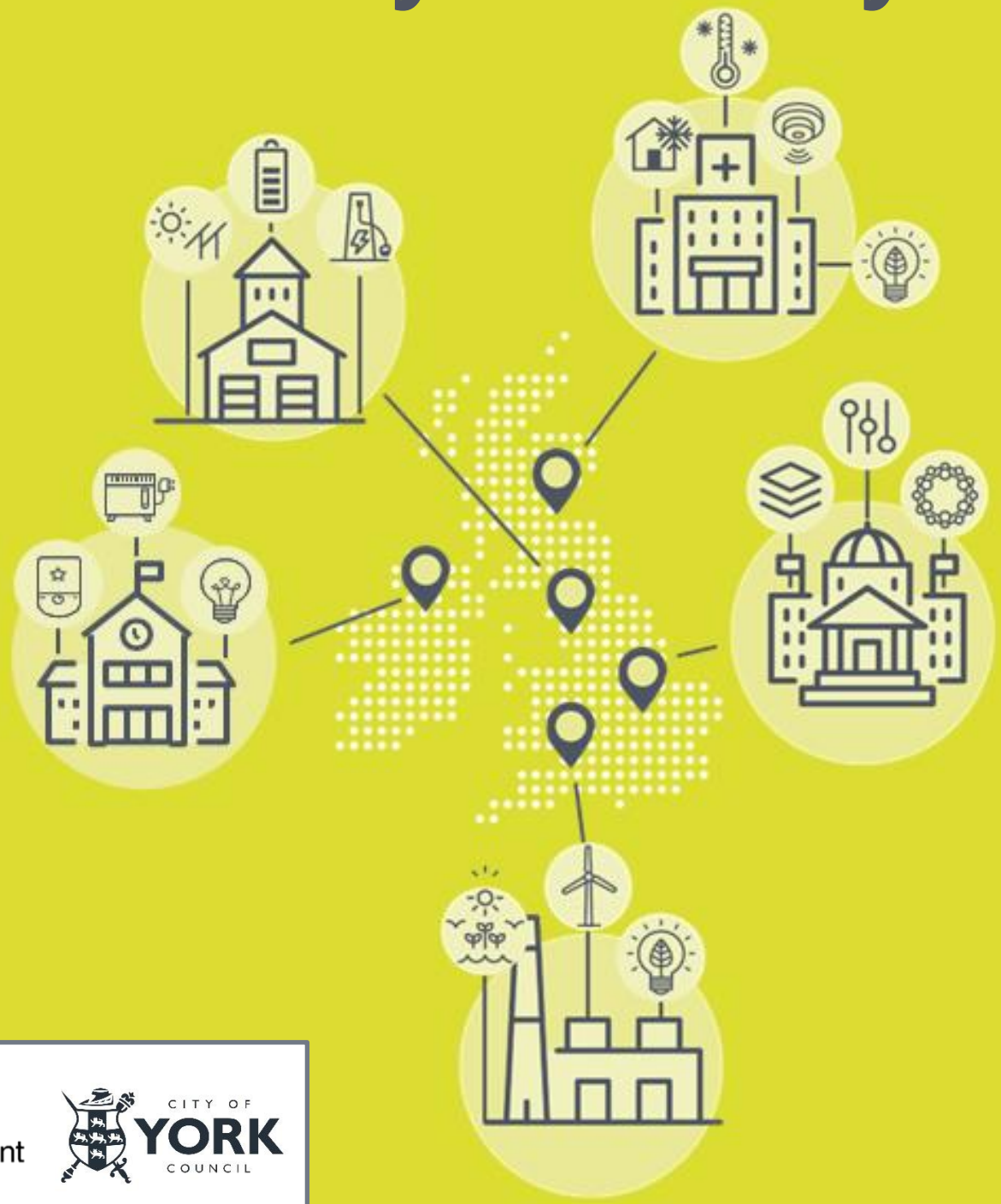
modelling@es.catapult.org.uk
or laep@es.catapult.org.uk

Energy Systems Catapult
7th Floor, Cannon House
18 Priory Queensway
Birmingham B4 6BS

Telephone +44 (0)121 203 3700
Email info@es.catapult.org.uk
es.catapult.org.uk

Annexe A – Stokesley Case Study

CATAPULT Energy Systems



York & North Yorkshire LOCAL ENTERPRISE PARTNERSHIP

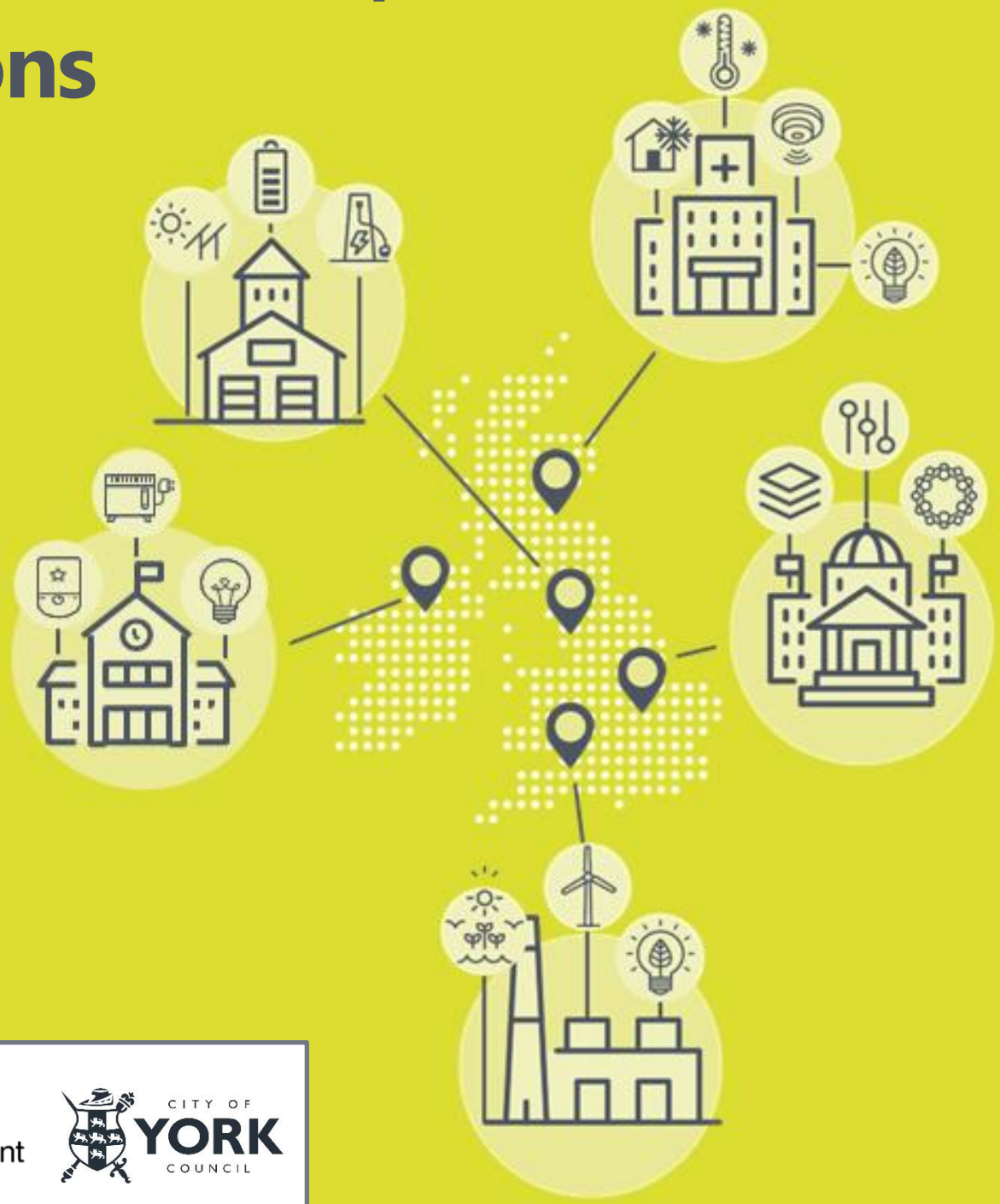
HM Government

CITY OF YORK COUNCIL

LOCAL AREA ENERGY PLAN

Annexe B – Method, Data & Assumptions

CATAPULT Energy Systems



York & North Yorkshire LOCAL ENTERPRISE PARTNERSHIP | HM Government | CITY OF YORK COUNCIL

LOCAL AREA ENERGY PLAN

Annexe C – 2030 York

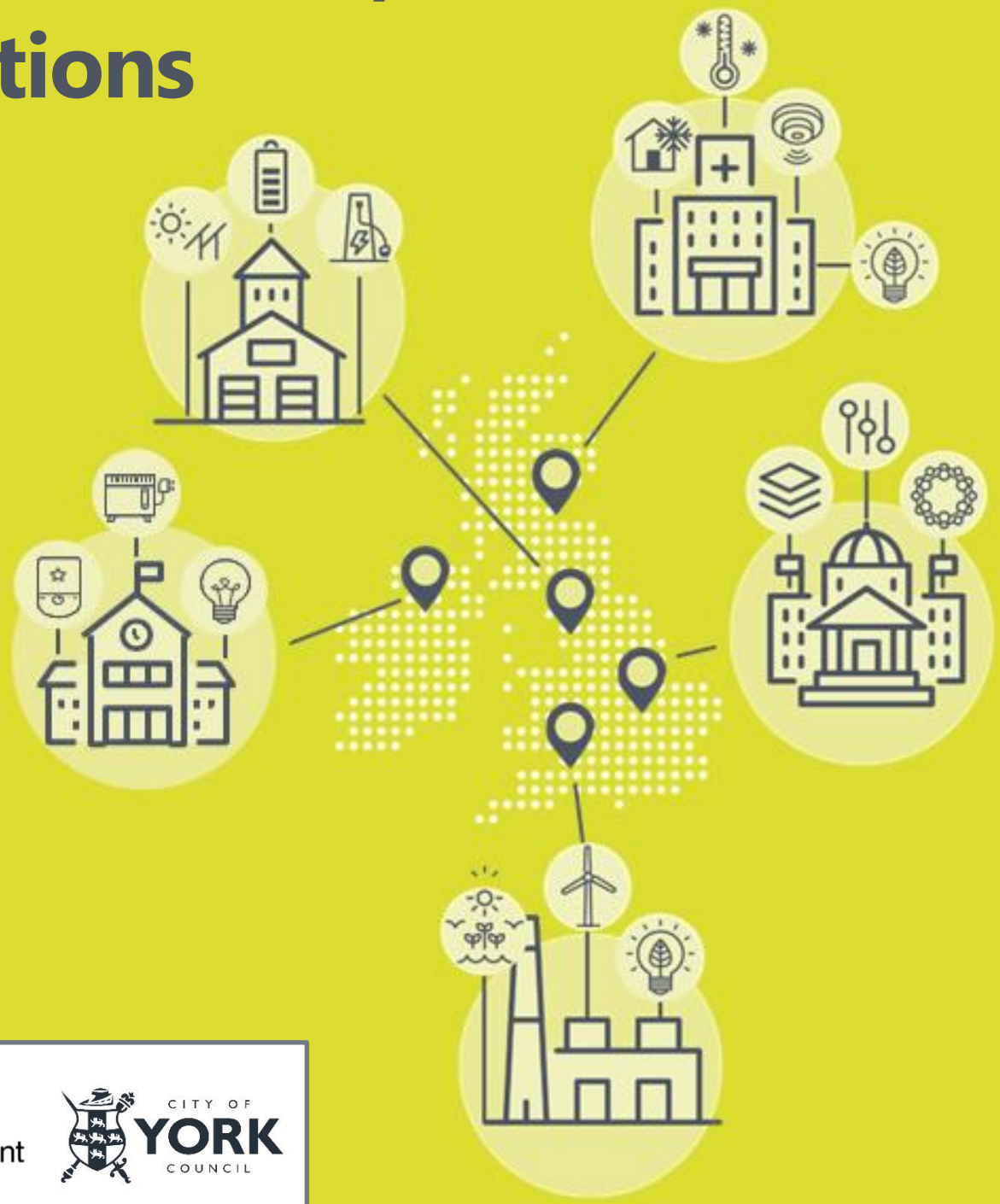
CATAPULT Energy Systems

CITY OF YORK COUNCIL

LOCAL AREA ENERGY PLAN

Annexe B – Method, Data & Assumptions

CATAPULT Energy Systems



York & North Yorkshire LOCAL ENTERPRISE PARTNERSHIP | HM Government | CITY OF YORK COUNCIL

LOCAL AREA ENERGY PLAN

Modelling Approach

We have used the ESC-developed EnergyPath Networks™ tool to produce a series of future local energy scenarios for York & North Yorkshire. This tool seeks to develop a full range of decarbonisation options for the local area and then use an optimisation approach to identify the combination that best meets the carbon ambitions in a cost-effective way across the whole system.

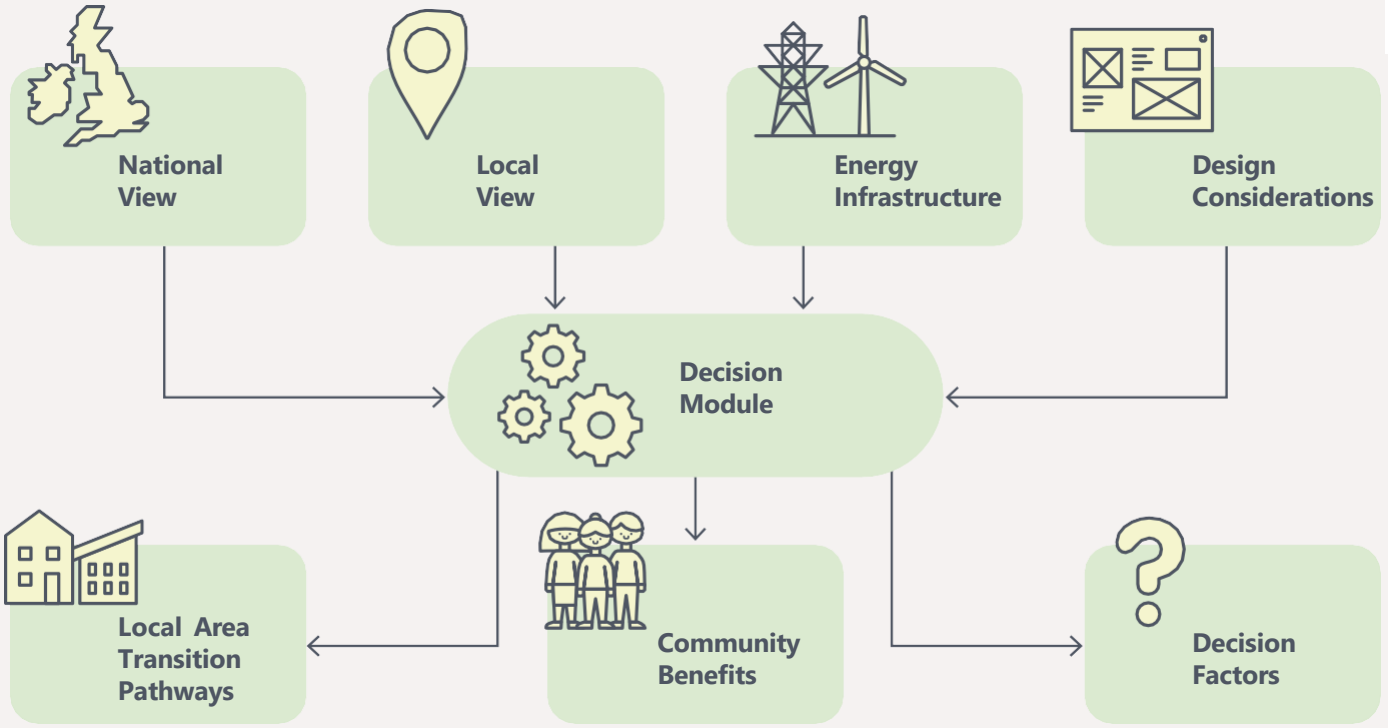
EnergyPath Networks (EPN) is a whole system optimisation analysis framework that aims to find cost effective future pathways for local energy systems to reach a carbon target whilst meeting other local constraints. EPN is spatially detailed, covers the whole energy system and all energy vectors, and projects change over periods of time. The focus is decarbonisation of energy used at a local level.

An overview of EPN is shown in the diagram to the right.

At the core of EPN, a Decision Module compares decarbonisation pathways and selects the combination that meets the CO_2 emissions target set for the local area at the lowest possible total cost to society .

A variety of local energy system pathways are possible to meet emissions targets. Running multiple EnergyPath Networks scenarios and doing detailed sensitivity analyses reveals decarbonisation themes that are prevalent across all scenarios.

EPN uses optimisation techniques in the Decision Module to compare many combinations of options (tens of thousands) rather than relying on comparisons between a limited set of user-defined scenarios (although scenarios of different inputs are still typically used and the Decision Module then runs within each of these scenarios).



Modelling Approach

EnergyPath Networks is unique in combining several aspects of energy system planning in a single tool:

- Integration and trade-off between different methods of meeting heat demand – e.g. gas, solid/liquid fuels, electric power, hydrogen, district heating schemes, etc.
- Integration through the energy supply chain from installing, upgrading or decommissioning assets (production, conversion, distribution and storage) to upgrading building fabric and converting building heating systems.
- Inclusion of existing and new build domestic and commercial buildings.
- The spatial relationships between buildings and the networks that serve them, so that costs and benefits are correctly represented for the area being analysed.
- Spatial granularity down to building level when the input data is of appropriate quality.
- A modelled time frame of 2020 to 2050.

Taken together, the analyses enable informed, evidence-based decision-making and can be used to ensure long-term resilience in near-term decisions, mitigating the risks of stranded assets.

The approach to modelling these aspects of the energy system is described in detail over the following pages.

Modelling Approach

Domestic Buildings

The thermal efficiency of domestic buildings is related to the construction methods used, the level of any additional insulation that has been fitted and any modifications that have been undertaken since construction. The oldest buildings in the UK generally have poor thermal performance compared with modern buildings. In addition to building age, the type and size of a building also have a direct influence on thermal performance. For example large, detached buildings have a higher heat loss rate than purpose-built flats, due to their larger external surface area per m^2 of floorspace.

Buildings are categorised into five age bands in EnergyPath Networks, from pre-1914 to the present, shown in the table on the top right. These are broadly consistent with changes in building construction methods (as defined in building regulations) and so represent different levels of 'as built' thermal efficiency. The thermal efficiency of future new homes represents the minimum efficiency level required by current building regulations. There are ten modelled domestic building types, shown in the table on the bottom right. This allows approximately 60 different age and building type combinations which are used to define the thermal characteristics of existing and planned domestic buildings.

Once the current characteristics of a building have been defined, based on its age and type, the basic construction method can then be categorised. For example, the oldest buildings in the region can be expected to be constructed with solid walls. Buildings constructed between 1914 and 1979 are more likely to have been built with unfilled cavity walls. Buildings constructed from 1980 onwards are likely to have filled cavity walls. Where data (for example, Energy Performance Certificates) shows that they are likely to be present, thermal efficiency improvements that have been carried out since construction (such as filling cavity walls) are also included.

Where available, address level data is utilised in the EnergyPath Networks modelling to provide accurate building attributes. Missing building attributes, for example types of wall or windows are filled using rules based on English Housing Survey data.

Property Age Band
Pre-1914
1914 – 1944
1945 – 1964
1965 – 1979
1980 – Present
New Build

Property Type
Converted Flat: - Mid Floor / End Terrace
Converted flat: - Mid Floor / Mid Terrace
Converted Flat: - Top Floor / End Terrace
Converted Flat: - Top Floor / Mid Terrace
Detached
End Terrace
Mid Terrace
Purpose-Built Flat: - Mid Floor
Purpose-Built Flat: - Top Floor
Semi-detached

Modelling Approach

Domestic Heating Systems

The definition of current (primary) heating systems is handled in a similar way to the definition of the building fabric. Information is used to identify the heating system as follows:

1. Xoserve data is first used to identify which buildings in the local area are not connected to the gas grid.
2. Direct user input is used where the actual heating system in individual buildings is known (e.g. from Energy Performance Certificates).
3. Defining logic rules based on the most likely heating system combinations within each archetype group.

Once the current thermal efficiency of a building has been defined, Ordnance Survey MasterMap and LIDAR data is used to establish its floor area and height. With this knowledge of a building's characteristics there is sufficient information to perform a Standard Assessment Procedure (SAP) calculation. SAP calculations are used to calculate the overall heat loss rate and thermal mass of domestic buildings in the study area.

EnergyPath Networks utilises these SAP results, as well as detailed retrofit and heating system cost data, to group buildings into similar archetypes. EnergyPlus is used to calculate dynamic energy profiles for heat and power demand for each group, for the current and all potential future pathways. These pathways include potential to install varying levels of fabric retrofit and different future heating systems in multiple combinations. Restrictions are applied so that inappropriate combinations are not considered, so for example loft insulation cannot be fitted to a mid-floor flat. EnergyPath Networks also filters out heating systems and storage combinations that cannot be sized to a large enough power within a home to meet a predefined target comfort temperature and hot water requirements based on the EnergyPlus analysis.

Three primary elements are defined in each heating system combination:

1. The main heating system.
2. A secondary heating system which can provide additional heat or hot water.
3. Thermal storage – either not present or a hot water tank.

For each domestic building, the modelling assumes that a high carbon heating system could be replaced at any time. It is assumed low carbon heating systems cannot be replaced until the end of their life (generally around 15-20 years). At each opportunity to change to an alternative heating system there is also the opportunity to perform some level of building fabric retrofit.

Different heating systems reach end of life at different times, but there would need to be some coordination of the change if transitioning to a district heat or community system. Three different levels of retrofit (thermal performance enhancement) are considered, ranging from do-nothing to a full retrofit. In addition, each heating system option can be combined with advanced heating controls and each level of retrofit. Options will be excluded if a new heating system technology is unable to provide sufficient power to meet heat demand in a building with a given level of retrofit. These combinations mean that for each building there can be hundreds of different future pathways which must be considered.

Modelling Approach

Non-Domestic Buildings

Non-domestic (commercial and industrial) building stock is more diverse than domestic stock. There are a wide variety of construction methods and few robust data sets are available defining the design of any particular building, its heating system or thermal performance. Due to these limitations, an energy benchmarking approach is used to establish the energy demand of the non-domestic stock.

Different building types are given an appropriate energy use profile per unit of floor area. The building type represents how the building is used (e.g. industry, retail, offices, school) and is sourced from a variety of datasets including OS Address Base and Energy Performance Certificates.

Benchmarks are defined for electricity (direct electric, ground source heat pump and air source heat pump), gas, hydrogen, oil and heat demand in 30-minute time periods for different characteristic heat days. The characteristic heat days for which energy demand profiles are defined are shown in the table to the right. Benchmarks are defined for current and future use to represent changing energy use over time.

The footprint floor area and height for each building is derived from the OS MasterMap and LIDAR data. The building height is then used to establish the number of storeys, from which the total building floor area is estimated. Using an energy benchmark (derived from CIBSE and CARB2 data) appropriate to the particular use class, the half hour building energy demand for gas, electricity and heat is calculated for each of the characteristic days.

For both domestic and non-domestic pathway options, EnergyPath Networks includes costs of replacing all technologies at their end of life. At these points technologies can be replaced with a lower carbon system or like-for-like. For example, even in a scenario without a local carbon target, costs will be incurred when boilers and windows are replaced with analogous technologies.

Characteristic Heat Day
Autumn Weekday
Autumn Weekend
Peak Winter
Spring Weekday
Spring Weekend
Summer Weekday
Summer Weekend
Winter Weekday
Winter Weekend

Modelling Approach

Electricity Network Infrastructure

In order to assess potential options for future changes to energy systems, knowledge of current electricity, gas and heat network routes and capacities is required. From this the costs of increasing network capacities in different parts of the local area, as well as extending existing networks to serve new areas, can be calculated. The road network is used in EnergyPath Networks as a proxy to calculate energy network lengths. Substation capacities are established using DNO data and steady-state load flow modelling of networks. For example, EnergyPath Networks will find the load at which a Low Voltage (LV) feeder will require reinforcement and the costs associated with doing so. The cost of operating and maintaining the networks varies with network capacity and is modelled using a cost-per-unit length, broken down by network asset and capacity.

The EnergyPath Networks method does not replicate the detailed network planning and analyses performed by network operators. Rather, the energy networks are simplified to a level of complexity sufficient for numerical optimisation and decision-making. The method is used to model the impact of proposed changes to building heat and energy demand on the energy networks that serve them, for example increased or reduced capacity.

The costs of these impacts can then be estimated and the effects of different options on different networks can be compared. Only network reinforcements required inside the study area are explicitly considered as options in EPN.

Northern Powergrid (NPG) and Energy North West (ENW) provided the following data for the current electricity network as both DNOs supply York & North Yorkshire:

1. Locations and nameplate capacities of the HV (33kV to 11kV) and LV (11kV to 400V) substations.
2. HV to LV substation connections.

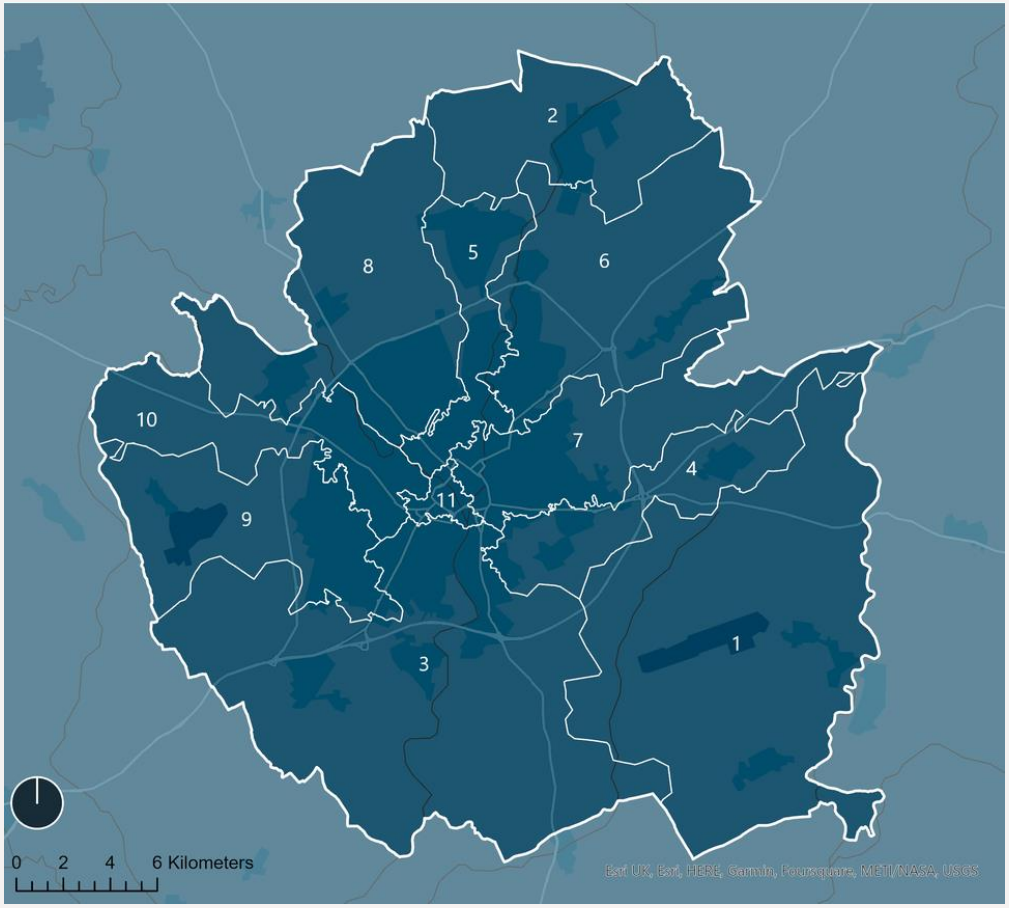
EnergyPath Networks synthesises the routes of the HV to LV substation connections assuming that feeders follow the shortest route allowed by the road network. Customer connections are then derived based on nearest substation and peak load constraints for each feeder. Non-domestic buildings with high demands are assumed to connect directly to the HV network . Network feeder capacities are then calculated based on the current load on each feeder and a headroom allowance. Voltage drop and thermal limits are considered when establishing asset capacity requirements.

EnergyPath Networks performs steady state load flow modelling for electricity and heat networks using the Siemens tool PSS® SINCAL.

Once all the building data has been analysed and the buildings located, it is possible to identify their nearest roads, which shows where the buildings are most likely to be connected to energy networks. In this way the total load and the load profile for each energy network can be calculated at different scales from individual building level, through local networks up to aggregate values for the whole study area. This allows an understanding of different energy load scenarios in different parts of the local area and the energy flows between those locations. In addition, an understanding of network lengths and required capacities can be established.

Modelling Approach

Analysis Areas



Due to the complexity of the number of different options available in EnergyPath Networks (for buildings, networks and generation technologies) the total problem cannot be solved at individual building or network asset level. Each of the four Local Energy Area Plan areas across York & North Yorkshire is further sub-divided into a number of spatial analysis areas. Decisions are made at this level based on aggregating similar buildings and network assets within each area.

The analysis areas are necessary within the EnergyPath Networks model but do not correspond directly to local districts, wards or neighbourhoods.

Within each analysis area, different components of the system are aggregated. Aggregation of buildings is performed based on energy demand and cost of retrofitting insulation and new heating systems. This way, similar buildings within an individual analysis area will all follow the same pathway. Similarly, decisions on network build and reinforcement are made at an aggregated level. If the electricity loads in one analysis area increase, such that the aggregated capacity of the low voltage feeders is exceeded, then reinforcement of all low voltage feeders within that area will be assumed to be required. The same applies for all other aspects of the energy networks such as low voltage substations, high voltage feeders and substations and heat network capacity.

Since the network options are aggregated, it is important that the boundaries between analysis areas do not cut across the electricity network. It would not be realistic to reinforce the 'downstream' end of an electricity feeder without considering the impact of the loads on those components further upstream in that network.

To ensure consistency in the analysis of electricity network options, the study area was divided by considering each high voltage substation within the local area and all of the electricity network downstream of each substation to give the analysis areas discussed above. Some simplifications to create continuous areas were applied.

Once the analysis areas had been defined, energy network links between them were defined. This allows transmission of heat, gas and electricity across the analysis area boundaries.

Modelling Approach

Local Energy System Design Considerations

Options which are not considered technically feasible are excluded from EnergyPath Networks – for example, fitting loft insulation into a mid-floor flat or cavity wall insulation to a building which has solid walls.

There are other options which, whilst they may be possible, are not practical in a real-world environment. For example, the use of ground source heat pumps in areas of dense terraced housing: a lack of space means that cheaper ground loop systems cannot be fitted, whilst there is insufficient access for the equipment required to create vertical boreholes. In addition, the heat demand for a row of terraced houses may cause excessive ground cooling in winter leading to inefficient heat pump operation and a need for additional top-up heat from an alternative source.

Consumer preferences also influence suitability of certain options. The installation of domestic hot water tanks for heat storage is a good example. Many low-carbon heat technologies, such as air source heat pumps, work at a lower output power than conventional gas boilers, and this can require the use of heat storage in order to be able to meet peak demand for heat on cold days. However, many households have removed old hot water tanks and fitted combi-boilers to provide hot water on demand.

This allowed the space previously occupied by the hot water tank to be repurposed for other uses, which householders find valuable, such as additional household storage.

For example, the English Housing Survey shows that 54% of homes had a combi-boiler in 2016 with this figure rising by around 2% a year since 2001. These consumers often place a high value on the space that has been made available by doing this and are unlikely to embrace heat solutions that require large amounts of domestic space to be sacrificed. A proxy for the value that consumers place on space in their homes is property market values normalised by floor area. With median house price costs in England and Wales in 2021 varying from £125,000 (within County Durham) to £1,250,000 (within Kensington and Chelsea)1 it is clear that the options for using space for domestic heat storage are likely to be heavily dependent on local factors.

Assumptions and Inputs

Any technical modelling exercise requires decisions to be made as to the level of complexity and detail that is appropriate. There are several areas where limitations have been applied to limit the complexity of the EnergyPath Networks analysis to keep the scale of the analysis practical, such as grouping buildings into archetypes.

Fixed Input Parameters

Some parameters are considered as fixed inputs within EnergyPath Networks. That is, they are derived externally and presented as inputs to the tool. Any options to vary these parameters are excluded from the decision module. The following energy demands are modelled as inputs:

- Domestic lighting and appliance demands are based on data from DECC's (Department of Energy and Climate Change) household electricity survey which gives these demands for different house types.
- Electric vehicle numbers and charging profiles are based upon assumed take-up rates for electric vehicles from the TfN EV Charging Infrastructure Framework.
- The EV charging profiles reflect a vehicle charging immediately after it returns home and so represent a worst case scenario for peak network loads.
- Non-domestic building demands for current systems and future transition options are calculated based on building use and a set of energy benchmarks.

Building Modelling

Within the domestic building simulation, a standard target temperature profile is taken from SAP and used for all domestic buildings. This is intended to reflect typical building use patterns. It is recognised that real-world building use will deviate from this profile, as shown by the Energy Follow-Up Survey (EFUS). To reflect this, diversity factors are applied within EnergyPath Networks when individual building energy demands are aggregated to calculate total network demands. These diversity factors modify both the magnitudes of the demands and the times at which they occur.

Construction standards are assumed for buildings of different ages. For example, all pre-1914 buildings are assumed to have solid walls. Similarly, for some building ages the thermal conductivity of the walls is assumed to be the same for each level of insulation. For example, all walls in buildings constructed between 1945 and 1964 which now have filled cavities are assumed to have the same thermal performance. Note that these performance assumptions are based on 'traditional' brick construction and assume that insulation is correctly installed and performs to its technical potential. Buildings constructed in other ways may not be correctly represented in terms of their thermal performance.

Assumptions and Inputs

Network Modelling

The network modelling approach assumes that development of future energy systems should be driven by consumer needs. On this basis, the EnergyPath Networks modelling framework works on a traditional network reinforcement model. If load on a network is calculated to exceed capacity, then the network will be reinforced to meet that load.

There is limited capability within the model to consider 'Smart' network control or all aspects of Demand Side Response. For example, if a particular feeder in a street was overloaded, a demand side response could be to raise the price of electricity at peak times to decrease consumer demand on the network. EnergyPath Networks will deploy technologies that minimise electricity use at times of peak costs if it is cost effective to do so, but it is not designed to model the behaviours of the DNO or the consumer in this scenario.

The load-flow modelling is not intended to replace full dynamic network modelling conducted by network operators. EPN uses a steady-state approach which is appropriate for establishing peak loads and the capacity required to meet them, to understand the influence of different options on network costs. It considers both voltage and temperature constraints.

The LAEP modelling approach uses a set of costs for different network technologies. These costs have been sourced from previous DNO data and to maintain consistency have been used across several recent LAEPs. In general, the LAEP approach breaks down the costs in more detail than the Ofgem determinations, and also seeks to model them in a way consistent with how it treats other energy vectors (i.e. heat network costs and gas to hydrogen repurposing) in order to allow a fair and independent comparison between the options in the work.

In conclusion, the transformer rates seem to compare well, with only the largest PMT technologies in the LAEP analysis looking under costed compared to the Ofgem rates.

Technology Cost and Performance

EnergyPath Networks models the future energy system which is considered to have the lowest cost to society whilst meeting defined carbon targets. The selected options are influenced by the costs associated with different technologies. The modelled technology cost should represent the cost in a fully competitive UK market, with significant volumes of the technology being sold. This is currently the case for markets for some technologies such as a gas boiler, but not for others such as heat pumps.

Where the market is not fully developed it is not appropriate to use the current price charged to consumers. Instead, an estimate of the current costs of buying and installing is made using a variety of data sources to ensure that estimated costs are within reasonable bounds.

Optimisation Variables

A variety of technology options have been considered within the EnergyPath Networks analysis. These are described over the following pages.

Primary Heating Systems

Different current and future heating system combinations have been considered within the analysis. The heating systems assessed are as follows:

- **Gas boilers** are the main source of heat for domestic premises in the UK at present.
- **Oil / LPG boilers** are a popular heat source for those buildings which are not connected to the gas network.
- **Biomass boilers** can provide a low-carbon heat source by burning fuel derived from sustainably sourced wood products.
- **Hydrogen boilers** could provide a low-carbon heat source once hydrogen becomes available.
- **Heat pumps** use electrical energy to transfer heat energy from one source to another. They are similar to a domestic refrigerator which transfers heat from a cold space to the surrounding room. This is reversed in a heat pump system so that the internal space is warmed by transferring heat from outside. Heat pumps have an advantage compared to other electrically powered heat sources as they produce more heat energy than the electrical energy required to power them.

Different types of heat pump are considered:

  - **Low Temperature Air Source Heat Pumps (ASHPs)** use the outside air as the source of heat and provide hot water to the heating system at temperatures around 45°C. This temperature is lower than that normally used for domestic heating with a gas boiler and so may require changes to heating distribution systems, such as the provision of larger radiators to allow the building to be heated effectively. These changes are accounted for in the costs of the technology used in the model.
  - **Low Temperature Air Source Heat Pump – Gas Boiler Hybrids** use a combination of a low temperature ASHP to provide a large proportion of the heat demand but can top up this heat using a conventional gas boiler at times when it is not efficient to operate the heat pumps, or the heat pump cannot meet the required demand.
  - **Low Temperature Air Source Heat Pumps** can also have supplementary heat provided by direct electric heating when required.
  - **High Temperature Air Source Heat Pumps** are similar to a low temperature Air Source Heat Pump but provide hot water at a higher temperature (typically 55°C) which may remove the need for other modifications to the heating system. They generally operate at a lower efficiency than low temperature air source heat pumps.
  - **Ground Source Heat Pumps** use heat energy stored in the ground to provide hot water to the heating system. Since ground temperatures are higher than air temperatures in winter they can operate more efficiently and provide higher water temperatures than air source heat pumps. Space is required, however, to install pipework to extract heat from the ground and this adds considerably to the cost of installing these systems.
- **Electric Resistive storage heating** is the most commonly used system for buildings which have electric heating. Room heaters are typically charged overnight (where there can be an option to charge the system at a lower, night rate electricity tariff) and then release this heat over the course of the following day.
- **Electric Resistive heating without storage** provides instant heat through panel, fan or bar heaters.
- **District heating** provides heat to buildings through pipes that carry the heat from a central heat source. In current systems, this is typically a large gas boiler or gas fired Combined Heat and Power (CHP) plant which provides heat to the network and generates electricity which is either consumed locally or exported to the electricity network. Once installed these systems can be converted from using gas to lower carbon alternatives such as a large-scale Ground Source Heat Pump or a biomass boiler. Equally, if there is no gas supply in the first place, then systems can be designed from the outset with such alternatives.

Optimisation Variables

Building Retrofit Options

Domestic buildings in the UK have been constructed to a wide variety of building regulations depending on their age. Many older buildings have low levels of insulation and require much more energy to keep them warm in winter than those built to more recent regulations.

There are many options available to reduce heat loss from older buildings some of which could also be applied to more modern buildings. Loft insulation, wall insulation (cavity or solid depending on existing building fabric) and triple glazing retrofit options are modelled within the EnergyPath Networks model.

In addition, some minor improvements are considered as secondary measures. That is, "quick wins", such as draught proofing, that could be installed at the same time as more substantial building fabric upgrades.

Solar

EnergyPath Networks considers the deployment of solar panels within a local area to generate electricity and hot water. Both systems can produce significant amounts of energy in summer months but may produce close to zero energy on winter days when the sun is low in the sky and days are much shorter. This may coincide with times of greatest heat demand, so alternative energy supply options need to be available at these times.

In the case of electricity generation (solar photovoltaics) the power might be used by the home owner or might be exported to the electricity network if the amount being generated exceeds the demand of the generating building.

Solar hot water systems typically heat water in a hot water tank by circulating a fluid between a heating coil within the tank and the roof mounted panel heated by the sun.

Heat Storage

Heat storage can be considered at two scales:

- Individual domestic storage in hot water tanks.
- Large-scale storage in association with heat networks.

In both cases, it is assumed that more heat could be produced at certain times than is required to meet demand. This provides an option to store that heat and then release it back into the heating system at times when the peak demand is high. It can sometimes be a cost-effective solution as it allows a less powerful heat source to be installed that can be topped up using stored heat at times of peak demand.

Depending on the location in the UK, the value of the floor space lost could outweigh the capital savings associated with installing a heating system with a hot water tank over a more powerful heating system without a hot water tank.

Large-Scale Solar

Suitability for ground mounted solar sites involves screening the entire project area for zones to be excluded. Zones are determined from various datasets that were mapped to identify locations within the area that were not included in modelling. Ill-suited areas are removed leaving behind "empty spaces" that could be sites suggested for PV placement. Multiple sources of data considered during visualisation including: Flood Zones 2 and 3 from the Environment Agency, Protected Areas such as National Parks which were cushioned by 1km, Woodlands, areas used for sport and leisure or airports from CORINE land data, agricultural land classified 1 or 2, areas around rails and road are also buffered as well as potential housing development sites. Finally we also considered the slope of the land under consideration using LiDAR and filtered slope over 8°.

Ideally the land was to be within 2 miles of an HV substation. Consultation of the Land Registry determines the area of the land which can be used for solar based on the areas available with a minimum requirement of 8km is used. Calculation of a potential capacity per cluster was then completed from the resulting dataset.

Onshore Wind

The process for determining regions where wind was deemed suitable factored in analogous datasets and methodology as for large-scale solar. In that only certain areas were left behind from the original shapefile which could correspond to sites for wind technology

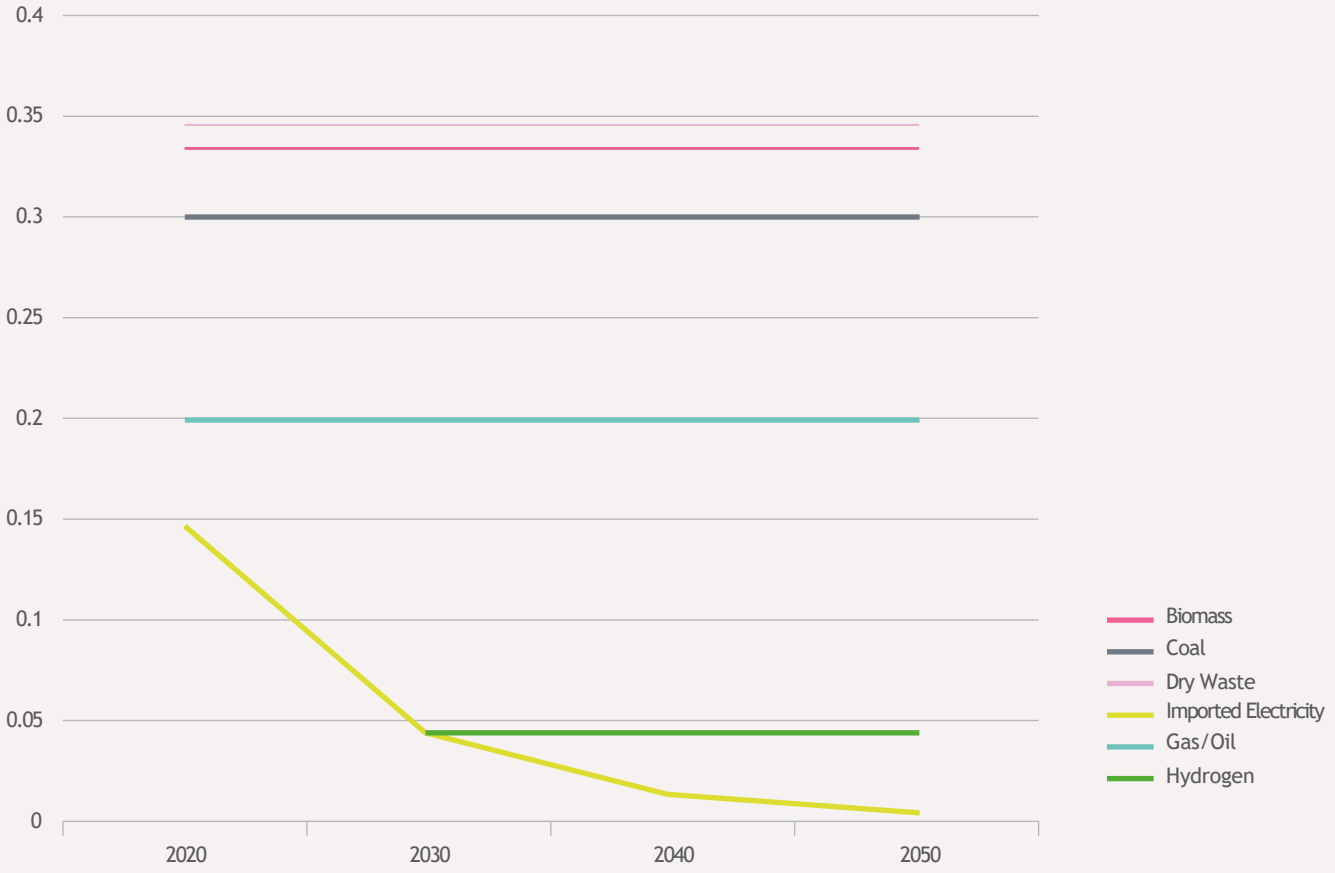
Emission Calculations

EPN optimises to calculate the lowest cost route to meeting a defined carbon target. Domestic, industrial and commercial emissions (i.e. those related to buildings) are in scope for the model. Transport emissions (beyond personal vehicles) and those resulting from land use change are excluded from the analysis.

Some types of non-domestic buildings are projected to have reductions in demand and so emissions over the time period to 2050, even if their heat demand continues to be met using gas or electricity. Emission reductions from these buildings can occur due to:

- Conversion of the national grid to low-carbon electricity which decarbonises the emissions associated with local electricity consumption as shown in graph to the right.
- Reduced gas use in buildings where there is historical evidence to support this trajectory – mainly associated with professionally managed buildings whose managers have a commercial incentive to improve energy efficiency.

CO_2 Emissions Inputs to EnergyPath Networks



Note that it is assumed Hydrogen does not become available until the mid-2030s and therefore there are no emissions for Hydrogen prior to 2030.

Cost Optimisation Approach

EnergyPath Networks has been used to provide evidence to support local area energy planning and the development of local energy system designs able to meet local carbon reduction targets. The importance of other factors such as fuel poverty and health benefits should be recognised in the planning of the future energy system but they are not core parameters in EnergyPath Networks.

Once a set of potential options for the buildings and energy networks in the local area have been identified, the Decision Module compares all valid option combinations and selects the set that meets the local CO_2 emissions target at minimum cost.

The costs considered are the total cost to society for the whole energy system including capital costs, fuel costs and operation and maintenance costs to 2050.

The future costs are discounted. Discounting is a financial process which aims to determine the "present value of future cash flows", or in other words: calculating what monies spent or earned in the future would be worth today. Discounting reflects the "time value of money" – one pound is worth more today than a pound in, say, one year's time as money is subject to inflation and has the ability to earn interest. A discount rate of 3.5% is used, as suggested in the UK Treasury's "Green Book" (used in the financial evaluation of UK Government projects).

Taxes and subsidies are excluded as these are transfer payments with zero net cost to society. Their inclusion in the analysis might result in the selection of sub-optimal solutions. The intention is that, once evidence has been used to define a local area energy strategy and possible future local energy system designs then appropriate delivery methods and associated policies can be developed to enable delivery.

Summary of Data Sources

Buildings and Roads

Category	Data Source	Usage	Owner	Reference and Copyright (if applicable)
Domestic, Non-Domestic and Roads	**Ordnance Survey AddressBase Premium, MasterMap Topography, Highways, Building Heights, Sites, VectorMap District, Open Roads, Terrain 50**	• Shows location, footprint and classification of buildings, plus road layout for network modelling. • Provides status and classification of non-domestic building (e.g. office, retail). • Informs building size and height. • Informs land classification for renewable generation suitability studies. • Latest data obtained September 2021 for buildings and roads.	Ordnance Survey	© Crown copyright and database rights 2021 OS 100057254
Domestic and Non-Domestic	**Lidar Data**	• Used to obtain building heights	Department for Environment, Food & Rural Affairs	Lidar data © Crown 2021 copyright Defra licenced under the Open Government Licence (OGL). https://www.nationalarchives.gov.uk/doc/open-government-licence/version/3/
Domestic and Non-Domestic	**Energy Performance Certificates (EPC)s**	• ESC-built address matching algorithm to match housing attributes from EPCs • Informs building-level attributes – e.g. current heating system, levels of insulation. • Non-domestic Energy Performance Certificates (EPC) and Display Energy Certificates (DEC) to provide further building attributes and demands.	Ministry of Housing, Communities & Local Government	Energy Performance Certificates obtained from https://epc.opendatacommunities.org/ under the Open Government License v3.0 https://www.nationalarchives.gov.uk/doc/open-government-licence/version/3/
Domestic	**English Housing Survey**	• Informs building-level attributes – e.g. current heating system, levels of insulation.	Ministry of Housing, Communities & Local Government	© Crown copyright material is reproduced with the permission of the Controller of HMSO and the Queen's Printer for Scotland Ministry of Housing, Communities and Local Government. (2021). English Housing Survey, 2017: Housing Stock Data: Special Licence Access. [19 March 2019]. 2nd Edition. UK Data Service. SN: 8546, http://doi.org/10.5255/UKDA-SN-8546-2
Domestic	**Off Gas Postcodes from Xoserve**	• Used to determine off-gas buildings	Xoserve	Off Gas Postcodes © Copyright Xoserve Limited 2020
Domestic	**Heritage Data: Listed Buildings**	• Potential constraint on retrofit for listed buildings	Historic England	© Historic England 2021. Contains Ordnance Survey data © Crown copyright and database right 2021. The Historic England GIS Data contained in this material was obtained on 22/09/2021. The most publicly available up to date Historic England GIS Data can be obtained from http://www.HistoricEngland.org.uk
Domestic	**DECC household electricity survey**	• Domestic appliance use profiles	UK Government	© Crown copyright, 2013. Data obtained from https://www.gov.uk/government/publications/household-electricity-survey--2 under the Open Government License v3.0 https://www.nationalarchives.gov.uk/doc/open-government-licence/version/3/
Domestic	**ETI's Optimising Thermal Efficiency of Existing Housing Project**	• Retrofit Costs	ETI	https://www.eti.co.uk/library/optimising-thermal-efficiency-of-existing-housing
Non-Domestic	**Land Registry**	• Informs classification of non-domestic building.	UK Government	© Crown copyright, 2020. Data obtained from https://use-land-property-data.service.gov.uk/datasets/inspire/download under the Open Government License v3.0 https://www.nationalarchives.gov.uk/doc/open-government-licence/version/3/
Non-Domestic	**Energy benchmarks (kWh/m²) developed in conjunction with Arup**	• Non-Domestic building energy profiles	Energy Systems Catapult	
Future Building Stock	**North Yorkshire Housing Allocation Information**	• Identify location and number of buildings with planned construction dates	North Yorkshire County Council	

Summary of Data Sources

Networks, Generation, Emissions and Transport

Category	Data Source	Usage	Owner	Reference and Copyright (if applicable)
Networks	Northern Gas Networks (NGN)	• Mapping of pipes including material, size and pressure.	NGN	
Networks	Northern Powergrid (NPG)	• Substation locations, capacities and headroom (for 11kV-400V upwards)	NPG	
Networks	Electricity North West (ENW)	• Substation locations and capacities (for 11kV-400V upwards)	ENW	
Networks	ETI Infrastructure Calculator	• Electricity, Gas, Heat and Hydrogen Network Costs	ETI	https://www.eti.co.uk/programmes/energy-storage-distribution/infrastructure-cost-calculator
Networks	ETI Macro Distributed Energy project	• Energy Centre costs and technical parameters	ETI	http://www.eti.co.uk/library/macro-distributed-energy-project/
Networks and Generation	Heat Networks Planning Databases	• Used to identify planned heat networks	UK Government	© Crown copyright, 2022. Data obtained from https://www.data.gov.uk/dataset/8a5139b3-e49b-47bd-abba-d0199b624d8a/heat-networks-planning-database under the Open Government License v3.0 https://www.nationalarchives.gov.uk/doc/open-government-licence/version/3/
Networks and Generation	Heat Networks Pipeline	• Used to identify planned heat networks	UK Government	© Crown copyright, 2022. Data obtained from https://www.gov.uk/government/publications/heat-networks-pipelines under the Open Government License v3.0 https://www.nationalarchives.gov.uk/doc/open-government-licence/version/3/
Networks	East Coast Hydrogen Feasibility Report	• Relative proportions of Blue/Green Hydrogen for East Coast Hydrogen • 87 % 'blue', 11 % 'green', 0.044 tCO2e/MWh, £61.20/MWh between 2030-2040 and £54.10 for 2040-2050.	National Grid	https://www.nationalgrid.com/uk/gas-transmission/document/138181/download
Networks	BEIS Hydrogen Production Costs	• Hydrogen Cost and Emissions Calculations	UK Government	© Crown copyright, 2021. Data obtained from https://www.gov.uk/government/publications/hydrogen-production-costs-2021 under the Open Government License v3.0 https://www.nationalarchives.gov.uk/doc/open-government-licence/version/3/
Networks and Emissions	BEIS Green Book	• Electricity Grid Prices and Emissions		© Crown copyright, 2021. Data obtained from https://www.gov.uk/government/publications/valuation-of-energy-use-and-greenhouse-gas-emissions-for-appraisal under the Open Government License v3.0 https://www.nationalarchives.gov.uk/doc/open-government-licence/version/3/
Generation	Renewable Energy Planning Database	• Current planned and operational renewable energy installations (above 150kW)	UK Government	© Crown copyright, 2020. Data obtained from https://www.gov.uk/government/publications/renewable-energy-planning-database-monthly-extract under the Open Government License v3.0 https://www.nationalarchives.gov.uk/doc/open-government-licence/version/3/
Generation	MCS Installations Database	• Data on microgeneration technologies installed in residential and commercial buildings at postcode level.	MCS Data	Some or all of the contents of this document were produced using the information and data from MCS. Data provided through a data-sharing agreement between ESC and Micro Certification Scheme (MCS) in order to perform studies for local authorities (e.g. Local Area Energy Planning studies).
Networks	Northern Gas Networks (NGN)	• Mapping of pipes including material, size and pressure.	NGN	

Summary of Data Sources

Land Classification and Electric Vehicles

Category	Data Source	Usage	Owner	Reference and Copyright (if applicable)
Land	**Flood Risk Maps**	• Identification of areas unsuitable for ground mounted solar PV	UK Government	© Crown copyright, 2021. Data obtained from https://www.gov.uk/government/publications/flood-risk-maps-2019 under the Open Government License v3.0 https://www.nationalarchives.gov.uk/doc/open-government-licence/version/3/
Land	**Natural England: Sites of Special Scientific Interest, Special Areas of Conservation, National Nature Reserves, Areas of Natural Beauty, Ramsar – Wetlands Sites**	• Identification of areas unsuitable for ground mounted solar PV	Natural England	© Natural England copyright, 2021. © Crown copyright and database right. Data obtained from https://naturalengland-defra.opendata.arcgis.com/search?collection=Dataset under the Open Government License v3.0 https://www.nationalarchives.gov.uk/doc/open-government-licence/version/3/
Land	**Heritage Data: National Parks and Woodland**	• Identification of Land use	Historic England	© Historic England 2021. Contains Ordnance Survey data © Crown copyright and database right 2021. The Historic England GIS Data contained in this material was obtained on 22/09/2021. The most publicly available up to date Historic England GIS Data can be obtained from http://www.HistoricEngland.org.uk
Land	**Agricultural Land Classification**	• Identification of areas unsuitable for ground mounted solar PV	UK Government	© Crown copyright, 2021. Data obtained from https://data.gov.uk/dataset/952421ec-da63-4569-817d-4d6399df40a1/provisional-agricultural-land-classification-alc under the Open Government License v3.0 https://www.nationalarchives.gov.uk/doc/open-government-licence/version/3/
Land	**CORINE**	• Identification of areas unsuitable for ground mounted solar PV	Environmental Information Data Centre	Cole, B.; De la Barreda, B.; Hamer, A.; Codd, T.; Payne, M.; Chan, L.; Smith, G.; Balzter, H. (2021). Corine land cover 2018 for the UK, Isle of Man, Jersey and Guernsey. NERC EDS Environmental Information Data Centre. https://doi.org/10.5285/084e0bc6-e67f-4dad-9de6-0c698f60e34d Data obtained from https://catalogue.ceh.ac.uk/documents/084e0bc6-e67f-4dad-9de6-0c698f60e34d Under the Open Government License v3.0 https://www.nationalarchives.gov.uk/doc/open-government-licence/version/3/
Electric Vehicles	**Zap-Map®**	• Location and speed of public chargepoints. • National Chargepoint Registry (NCR) has not been used since its data is included within Zap-Map's national database.	Zap-Map®	https://www.zap-map.com/
Electric Vehicles	**TfN EV Charging Infrastructure Framework**	• Data for EV annual demand forecasts across North Yorkshire by MSOA	TfN	https://.transportforthenorth.com/major-roads-network/Electric-Vehicle-charging-infrastructure/ © TfN 2022. Data obtained from https://evcivisualiser.z33.web.core.windows.net/ under the Open Government License v3.0 https://www.nationalarchives.gov.uk/doc/open-government-licence/version/3/
Electric Vehicles	**National Travel Survey**	• Input for EV charging profiles	UK Government	© Crown copyright, 2021. Data obtained from https://www.gov.uk/government/collections/national-travel-survey-statistics under the Open Government License v3.0 https://www.nationalarchives.gov.uk/doc/open-government-licence/version/3/

Standard Data Inputs and Assumptions for Local Area Energy Planning can be found at: https://es.catapult.org.uk/guide/guidance-on-creating-a-local-area-energy-plan/ (Annexe 2). The document provides links to a number of data sources that can be used when creating a LAEP or carrying out follow-on work, providing a detailed description of the characteristics of the data source, as well as identifying any assumptions that need to be made when using the data. It was not used, however, in the creation of this LAEP and the data sources within this Annexe should be used if considering the source of data and figures.

Licence/Disclaimer

Energy Systems Catapult (ESC) Limited Licence for York & North Yorkshire LAEP – Method, Data & Assumptions

ESC is making this report available under the following conditions. This is intended to make the Information contained in this report available on a similar basis as under the Open Government Licence, but it is not Crown Copyright: it is owned by ESC. Under such licence, ESC is able to make the Information available under the terms of this licence. You are encouraged to Use and re-Use the Information that is available under this ESC licence freely and flexibly, with only a few conditions.

Using information under this ESC licence

Use by You of the Information indicates your acceptance of the terms and conditions below. ESC grants You a licence to Use the Information subject to the conditions below.

You are free to:

- copy, publish, distribute and transmit the Information;
- adapt the Information;
- exploit the Information commercially and non-commercially, for example, by combining it with other information, or by including it in your own product or application.

You must, where You do any of the above:

- acknowledge the source of the Information by including the following acknowledgement:
- "Information taken from York & North Yorkshire LAEP – Method, Data & Assumptions, by Energy Systems Catapult";
- provide a copy of or a link to this licence;
- state that the Information contains copyright information licensed under this ESC Licence.
- acquire and maintain all necessary licences from any third party needed to Use the Information.

These are important conditions of this licence and if You fail to comply with them the rights granted to You under this licence, or any similar licence granted by ESC, will end automatically.

Exemptions

This licence only covers the Information and does not cover:

- personal data in the Information;
- trademarks of ESC; and
- any other intellectual property rights, including patents, trademarks, and design rights.

Non-endorsement

This licence does not grant You any right to Use the Information in a way that suggests any official status or that ESC endorses You or your Use of the Information.

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

modelling@es.catapult.org.uk
or laep@es.catapult.org.uk

Energy Systems Catapult
7th Floor, Cannon House
18 Priory Queensway
Birmingham B4 6BS

Telephone +44 (0)121 203 3700
@Energysyscat
es.catapult.org.uk

Annexe C – 2030 York

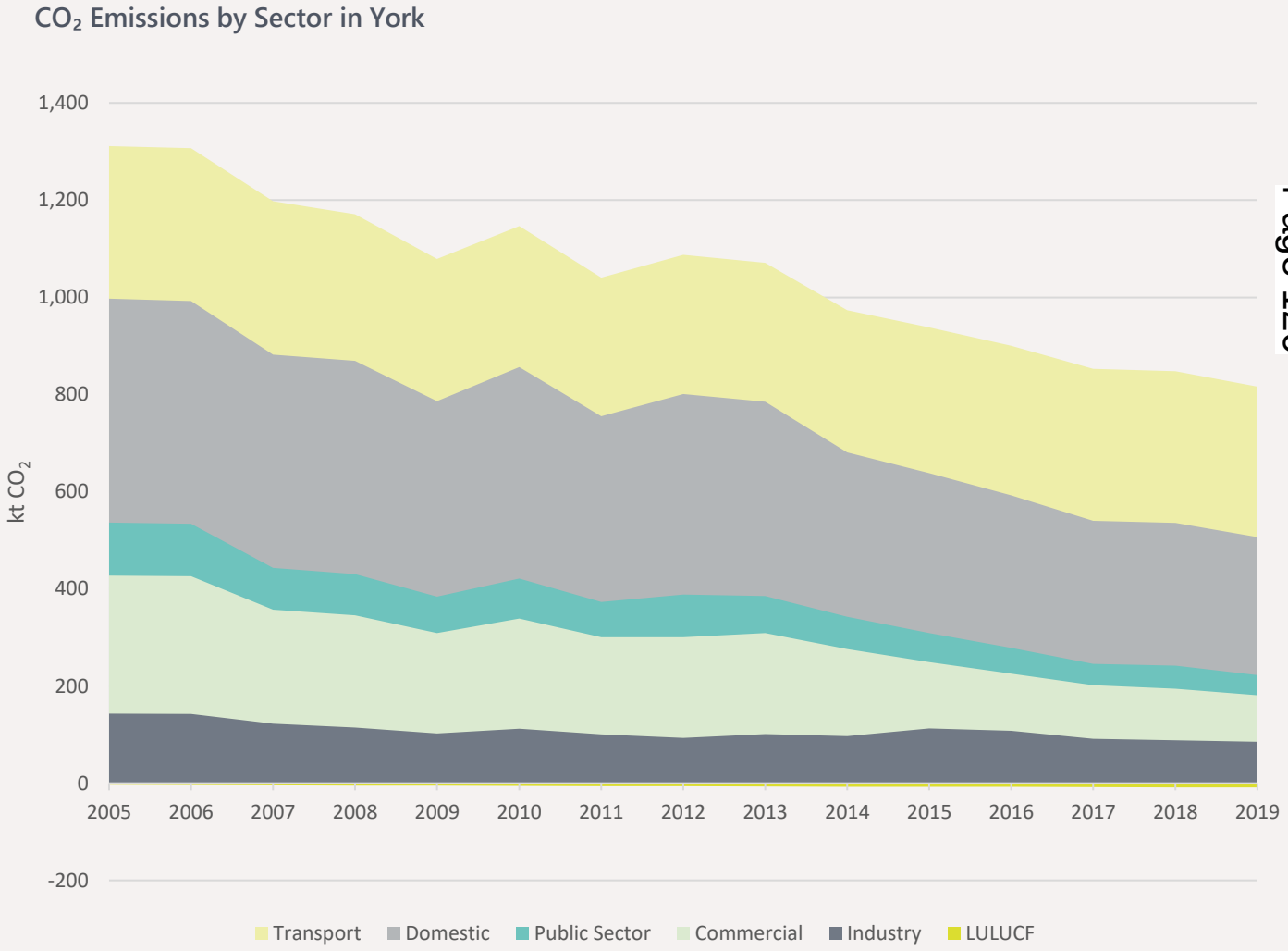
Context & Historical Emissions

This Annexe is complementary to the local area energy plan (LAEP) that has been developed by Energy Systems Catapult on behalf of City of York Council. The main LAEP document has been aligned to the York & North Yorkshire LEP target of reaching net zero by 2034 and becoming England's first net negative region by 2040. To meet these targets, the energy system would need to become net zero before 2040 with all emissions between 2034 and 2040 being offset by negative emissions elsewhere. However, City of York has an ambition to reach net zero by 2030 and therefore some acceleration of the LAEP plan will be required in order to meet that ambition.

In addition to the 2030 net zero ambition, the Council committed to:

- create partnerships among businesses, the public sector, civic organisations and [York's] institutions in higher and further education
- build inclusive, healthy and sustainable communities by promoting the positive social and economic benefits of climate action and by supporting individuals who need it the most.
- create new employment and investment opportunities, strengthening the economy through [the council's] work with local suppliers to build local "green" skills in sectors such as retrofitting and the bio-economy.
- supporting growth in the supply chain, training and upskilling the workforce and positioning York as a place to pioneer and pilot new projects
- attracting national and international investment and accessing new sources of finance to deliver the scale of change required across the city

Whilst the graph below shows that significant progress has been made in decarbonising the York economy over the last 15 years, a lot of this progress is due to the decarbonisation of the electrical network. The electrical network still has a way to go to become zero carbon by 2035, but this alone won't decarbonise the region at the rate that has been committed to.



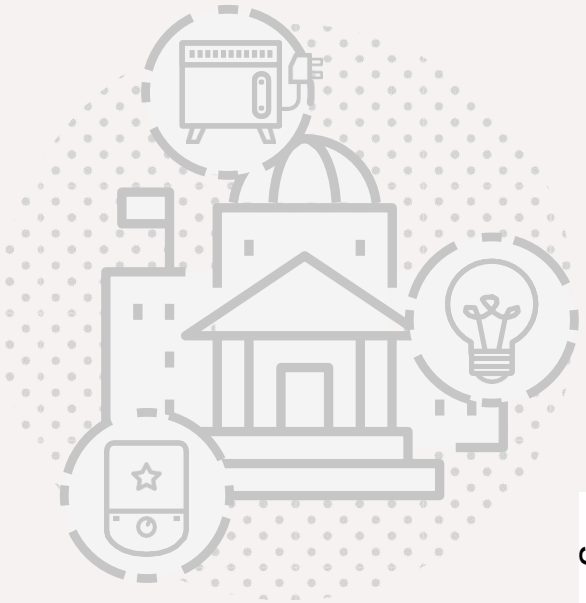
Note: this graph is based on data from BEIS which uses a different accounting method from the data used to estimate emissions in scope in the introduction. This results in lower LULUCF emissions shown in this graph.

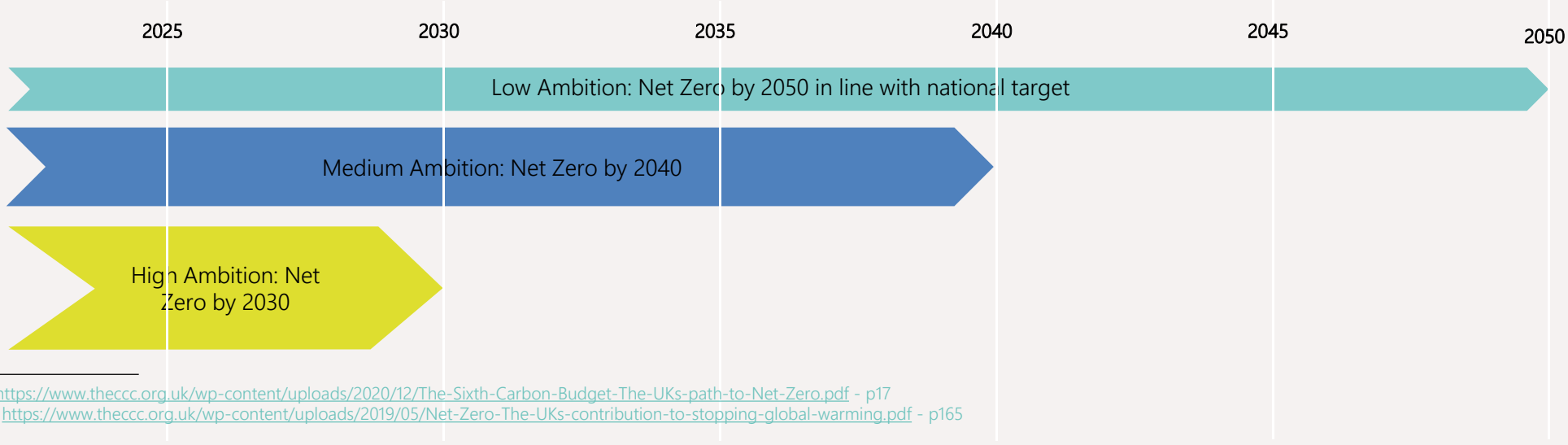
Pathways

The LAEP for the City of York centres on a 2040 net zero target, as a compromise between the national target of 2050 and an admirably ambitious local ambition of 2030, with the aim of allowing time to build the necessary skills and supply chain capacity, public support, funding mechanisms, delivery approaches, novel technologies and supporting infrastructure required to deliver the changes recommended in the plan.

For national context, the Climate Change Committee's "Balanced Pathway" to net zero by 2050 is reflective of what they consider to be "the UK's highest possible ambition", compatible with the 1.5°C Paris climate target*. This pathway recommends that the UK reduce emissions by 78% by 2035 against a 1990 baseline. They also note that "Our assessment is that achieving net-zero GHG emissions domestically prior to 2050 is not credible for the UK as a whole." **

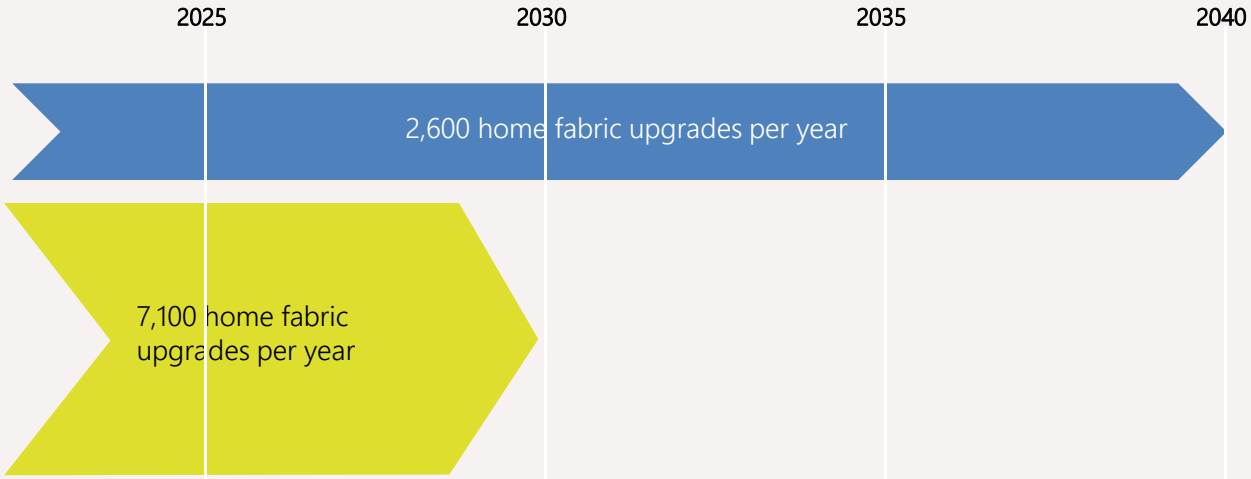
This document draws out some key differences between the pathways to net zero by 2040 and 2030 for the City of York, to support decision making around this ambition level. The differences are primarily expressed in terms of the delivery rates of various technologies and interventions, as average annual figures over the pathways to the net zero target dates. The diagram below shows the format used to visualise these delivery rates, with the delivery rate compressed for earlier target dates.





* https://www.theccc.org.uk/wp-content/uploads/2020/12/The-Sixth-Carbon-Budget-The-UKs-path-to-Net-Zero.pdf - p17
** https://www.theccc.org.uk/wp-content/uploads/2019/05/Net-Zero-The-UKs-contribution-to-stopping-global-warming.pdf - p165

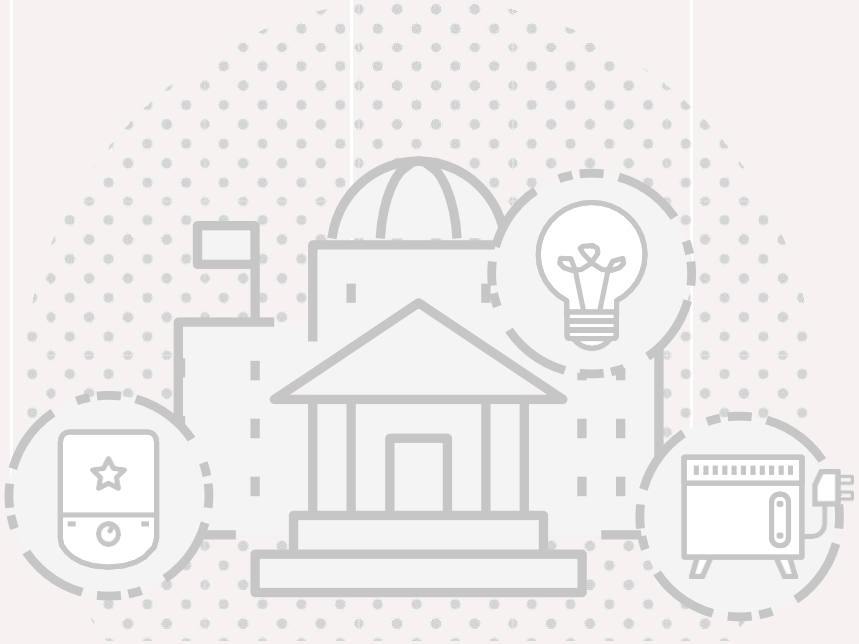
Building Fabric Upgrades



Increasing the ambition to reach net zero by 2030 does not significantly change the overall approach to building fabric upgrades recommended, but it dramatically compresses the rate at which the work would have to be carried out. In modelled pathways, 5,300 additional homes are recommended for fabric upgrades for the 2030 ambition compared to a 2040 target, an increase of 12%.

Upgrading 49,500 homes by 2030 amounts to 7,070 homes each year on average, starting in 2023, compared to the 2,600 per year recommended for the 2040 target.

In 2020, 50,000 wall insulation upgrades were carried out across the UK*. Scaled to York's share of the UK's households, this equates to 156 homes receiving wall insulation per year across York. While not all of the insulation upgrades recommended in the pathways are for wall insulation, this demonstrates at least an order of magnitude increase in delivery rates from today's level is likely to be required.



* https://www.theccc.org.uk/wp-content/uploads/2021/06/Progress-in-reducing-emissions-2021-Report-to-Parliament.pdf - p111

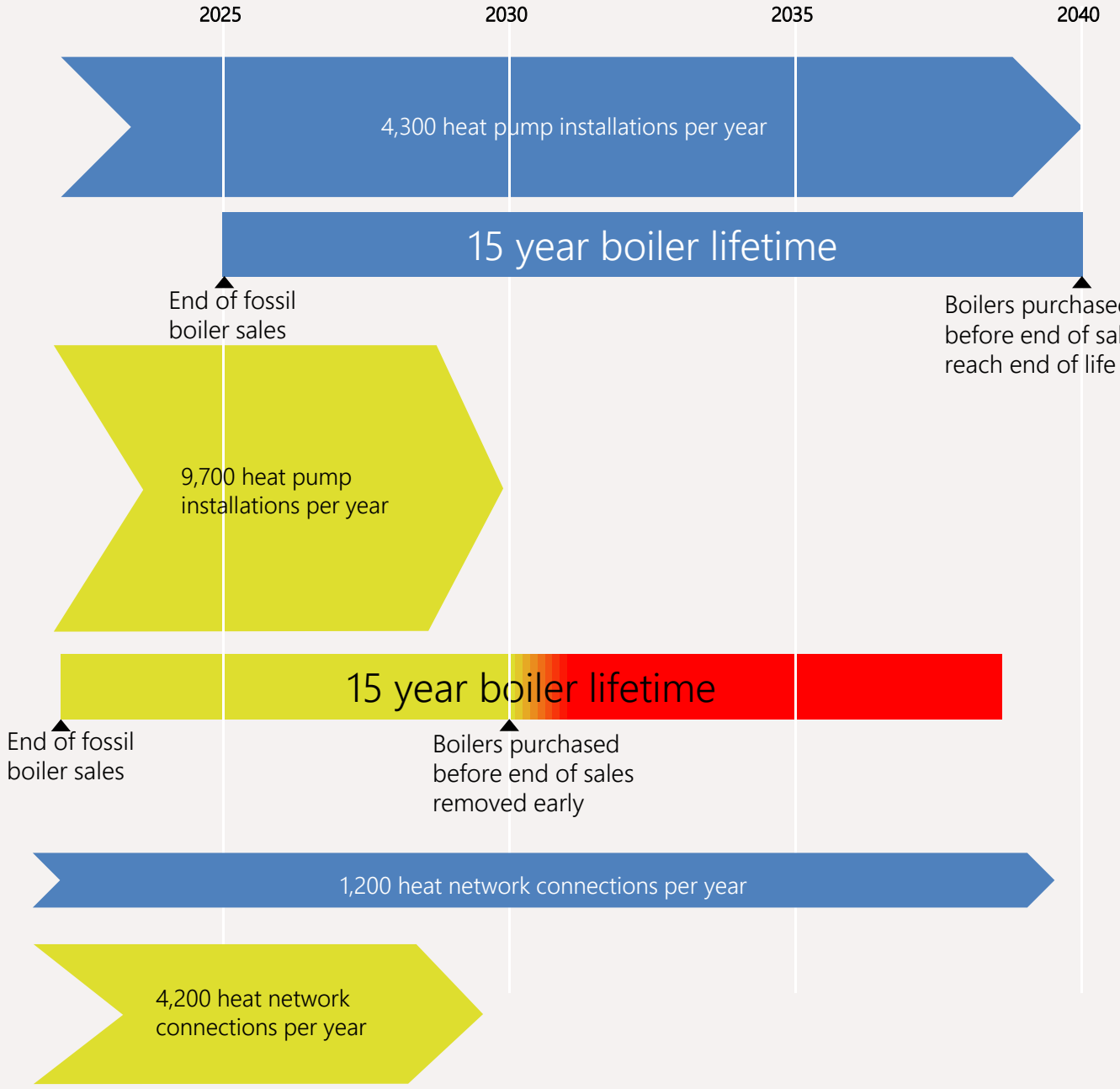
Heating System Replacements

Modelled pathways recommend building a larger heat network, connecting an additional 8,700 homes for the 2030 ambition. This means that for the 2030 ambition, the overall scale of heat network development is increased as well as compressed in timescale.

The total number of heat pump installations recommended for the 2030 ambition is not dramatically different from in the 2040 target, though is reduced slightly by a larger heat network. However, the rate of installation would need to be more than double to meet the compressed delivery timescale.

In 2021, just under 43,000 heat pumps were installed in the UK*. Scaled to York's share of households in the country, this is equivalent to 133 heat pumps per year across York. For the 2030 ambition, the City of York would need to utilise 23% of the current national installer capacity.

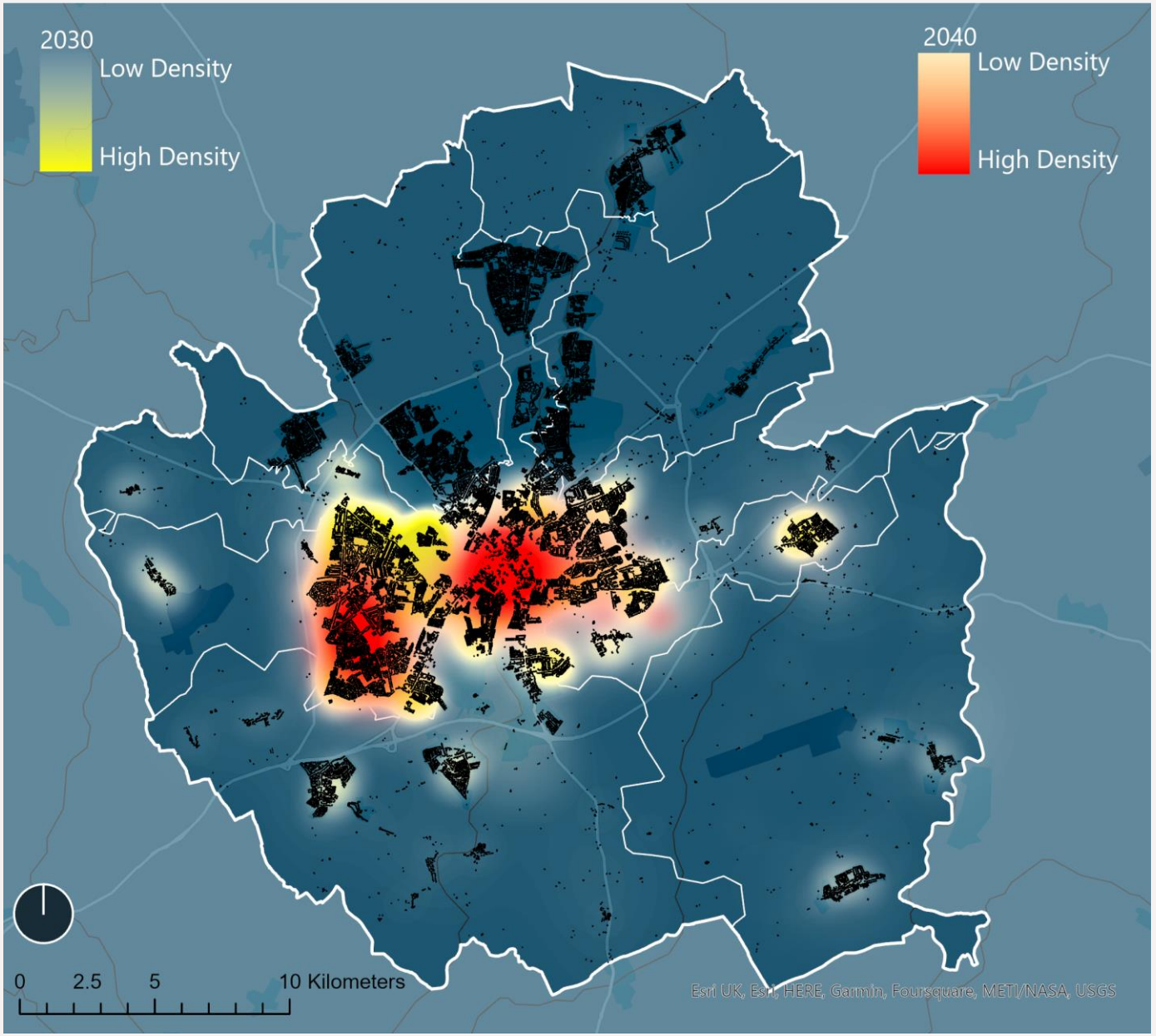
Ideally, the sale of new fossil fuel boilers can be ended in advance of the net zero target date, to minimise the need to remove working boilers before their end of life. Assuming an average boiler lifetime of 15 years, the sale of new fossil fuel boilers would need to end as soon as 2025 to minimise early removal for the 2040 target. For the 2030 ambition it would not be possible to avoid early removal of boilers which have already been installed, even if a ban on new sales was brought into force immediately.



* www.energylivenews.com/2022/07/14/will-the-uk-need-600-years-to-hit-its-2050-heat-pump-target

District Heat Networks

The map shows the slightly greater coverage of heat networks in the 2030 net zero ambition pathway. The density of buildings recommended for connection to district heat networks for the 2040 pathway is shown in shades of red, while the density of additional buildings recommended for connection for the 2030 pathway is shown in shades of yellow.



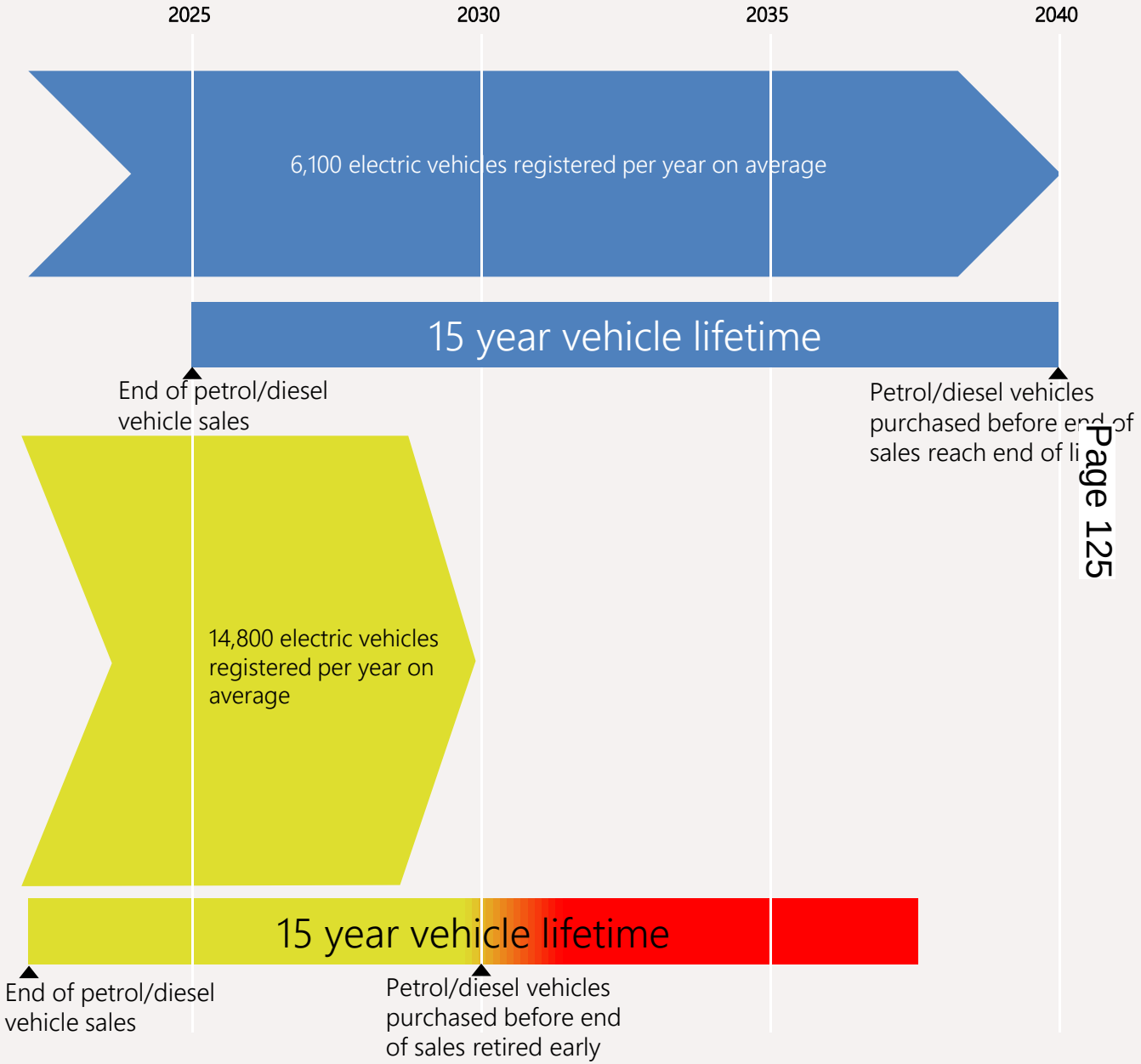
Cars and Vans

In order to reach zero emissions from road vehicles, all petrol and diesel vehicles would have to be retired from use within York – or offset – by the net zero date, with remaining vehicles being battery electric or other zero emissions technologies.

The rates of electric vehicle purchase to replace all petrol and diesel cars and vans by the respective net zero target dates are shown in the diagram.

In the UK in 2021*, 327,000 plug-in vehicles were registered. Scaled to York's share of the UK's cars and vans, this equates to around 825 new plug-in vehicles across York. For the 2030 ambition, York would need to purchase electric vehicles at almost 18 times the national rate, with the corresponding installation of charging infrastructure to support these vehicles. It's worth noting that plug-in hybrids would not be compatible with a zero emissions target unless they were used in pure electric mode within the boundaries of the City of York or their emissions offset. Some vehicles are beginning to use GPS geofencing to detect low emissions zones, and switch to pure electric mode while inside the zone**.

The national phase out of sales of new petrol and diesel cars aims to minimise the need to retire vehicles before their end of life, based on an average vehicle lifetime of 15 years. To adopt the same strategy for York, the sale of new petrol and diesel cars and vans would need to end in 2025 to minimise early retirement of vehicles for the 2040 target. For the 2030 ambition it would not be possible to avoid early retirement of petrol and diesel vehicles which have already been purchased, even if a ban on new sales was brought into force immediately.



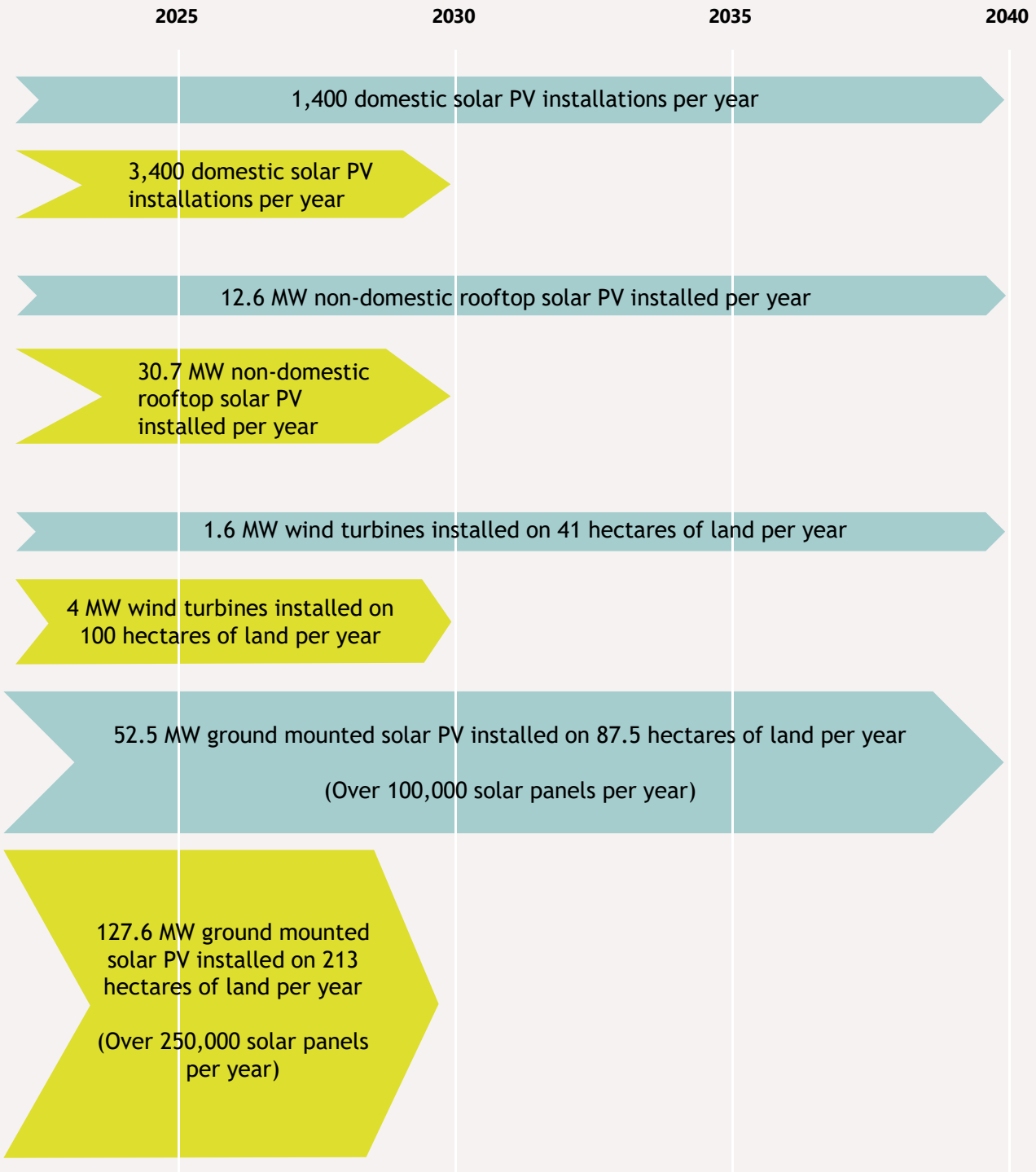
* https://www.gov.uk/government/news/quick-off-the-spark-electric-vehicle-sales-continue-to-soar-in-green-revolution
** https://www.thisismoney.co.uk/money/cars/article-8600251/Hybrid-BMWs-automatically-switch-electric-mode-low-emission-zones.html

Local Generation

With aspirations to decarbonise the national electricity supply by 2035*, there is not a strict requirement to generate all of York's electricity using local renewables for the 2040 target, as the use of grid electricity will no longer contribute to carbon emissions. However, aiming to fully decarbonise earlier than the National Grid would imply a need to source 100% of electricity consumed from renewable generation.

In York's LAEP, the amount of renewable generation required to produce 100% of the electricity consumed in the city on an annual basis is presented to give a sense of scale for a maximum level of ambition. To reach the earlier ambition, the same capacity of generation would need to be installed in a compressed timeframe, illustrated in the diagram.

It is worth noting, that the high-level assessment in the main report showed no land was suitable for onshore wind development within the City of York local authority area. Therefore, harnessing this resource would require engagement with neighbouring local authorities with the generated electricity then being used by dwellings and businesses within York's boundary.



* https://www.gov.uk/government/news/plans-unveiled-to-decarbonise-uk-power-system-by-2035

Networks

A recurrent theme in stakeholder discussions of the LAEPs for York and North Yorkshire has been the risk that the electricity networks may not have the ability to build capacity rapidly enough to support the steep increase in local electricity demand from heating and transport, and generation from renewables. Stakeholder feedback has made mention of Northern Powergrid reinforcement plans across the region which will only come into effect in the early 2030s and anecdotal evidence of connections of low carbon generation to the network being delayed to 2032 at the earliest. Efforts to bring forward and accelerate network capacity upgrades will be needed to reach all net zero targets. An example of this would be a more permissive regulatory environment reducing the barriers to investment. However, it's clear that the risks and challenges posed by network capacity constraints will be exacerbated with a 2030 ambition.

While the availability of hydrogen through a converted gas network from the mid-2030s is uncertain, it is especially unlikely that it will be available in time to support a 2030 net zero ambition. This means that industries which depend on low carbon gas for hard-to-electrify uses will have to use alternative means of decarbonising, such as producing hydrogen on-site using electrolysers.

This page is intentionally left blank

City of York

Local Area Energy Plan

CATAPULT Energy Systems

CITY OF YORK COUNCIL

LOCAL AREA ENERGY PLAN

Summary

Summary

To reach a net zero energy system by **2040**, the York local area energy plan requires a capital investment of

£3.8 billion

Total (excluding electric vehicles and charging infrastructure)

Including:

£0.7 billion

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

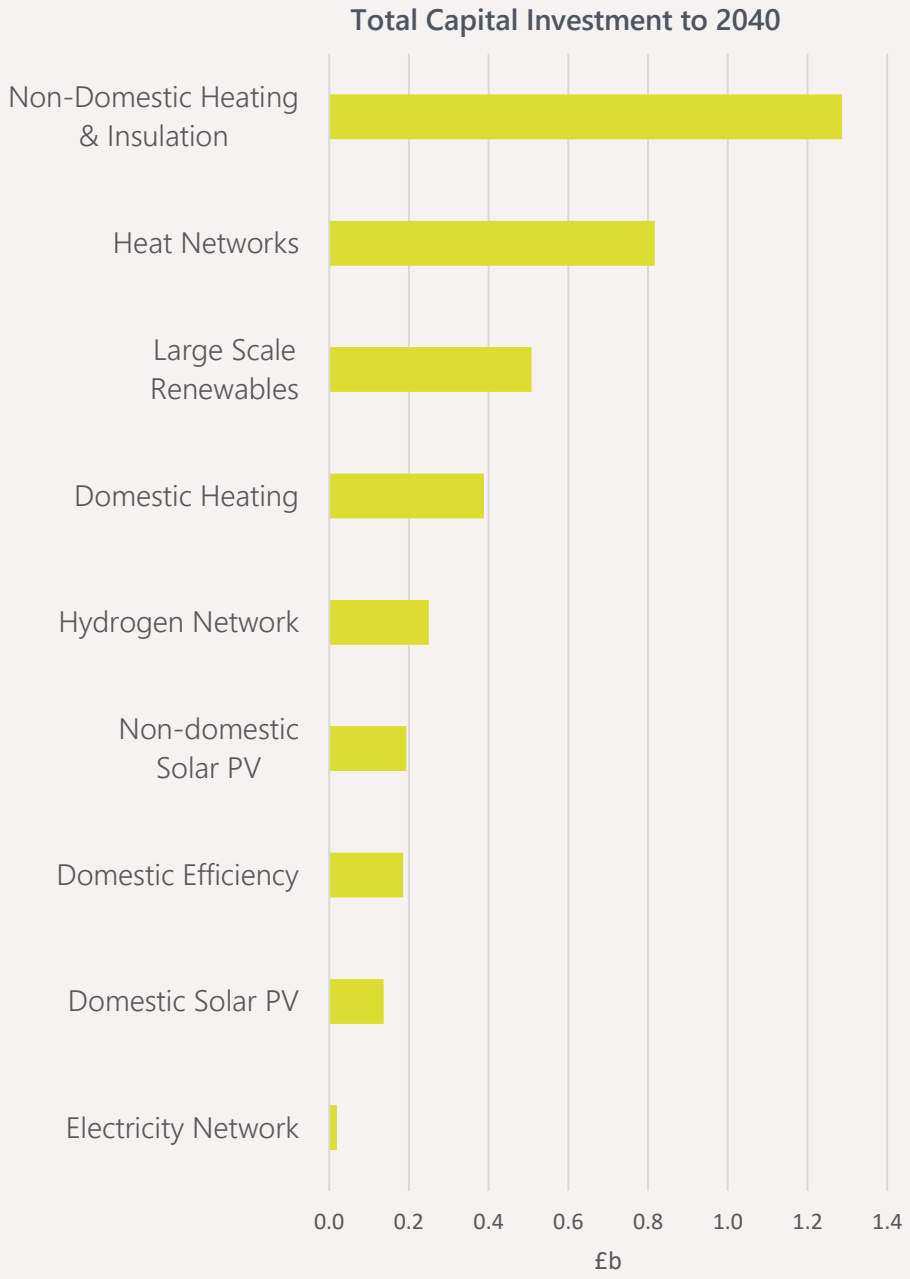
£0.5 billion

In large scale renewable generation

Saving:

1.2 million tonnes CO_2

From buildings cumulatively to 2050 against a business-as-usual pathway – equivalent to more than eight return flights to New York for every household.



York's energy system will have been transformed, with:

73,000

heat pumps installed in dwellings

At least 20,000 new

connections to a district heat network

44,100

dwellings retrofitted with insulation, glazing and draughtproofing improvements

91,000

fully electric vehicles

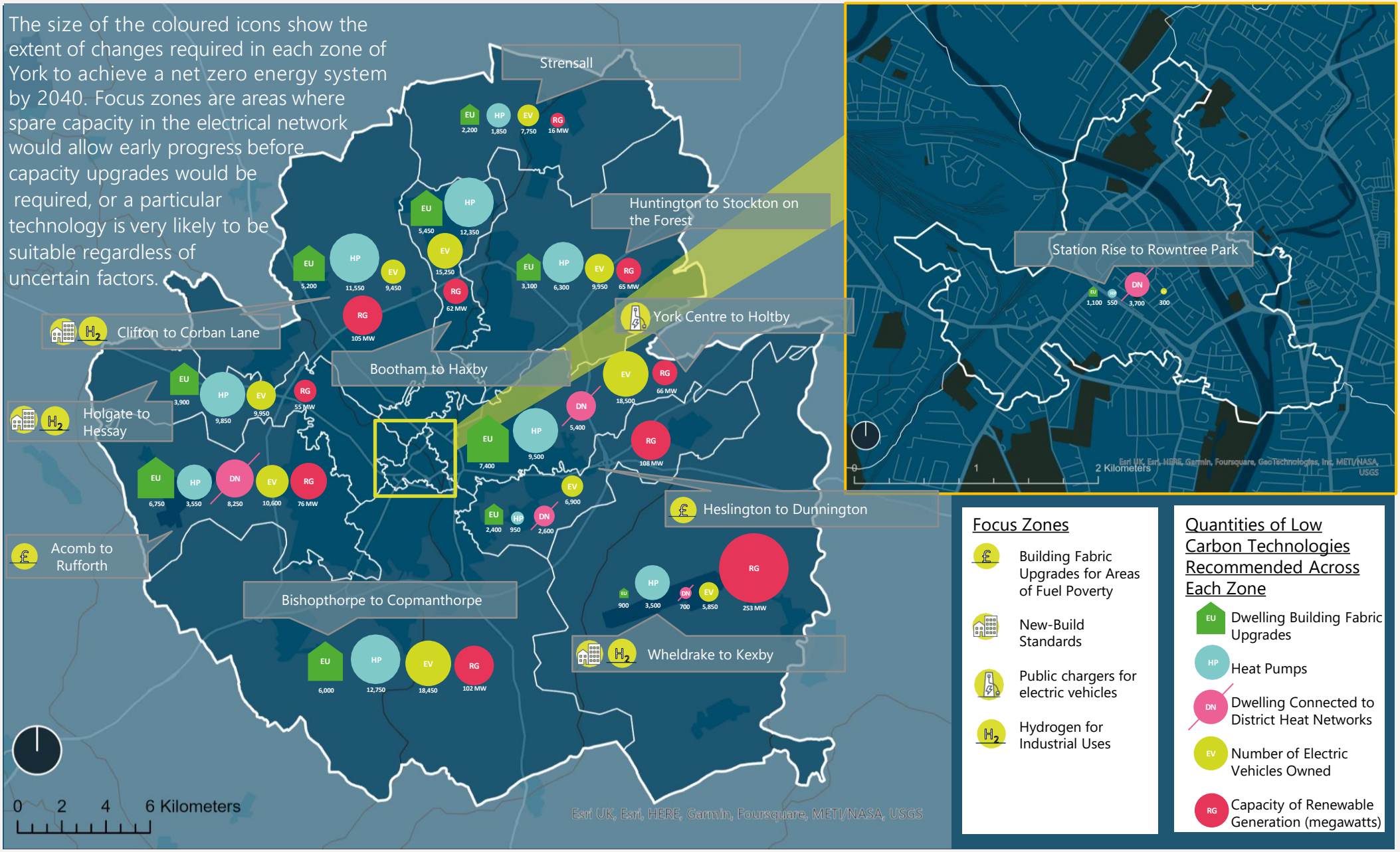
24%

dwellings generating their own electricity with rooftop solar

920 MW

of large scale renewable generation

Plan on a Page



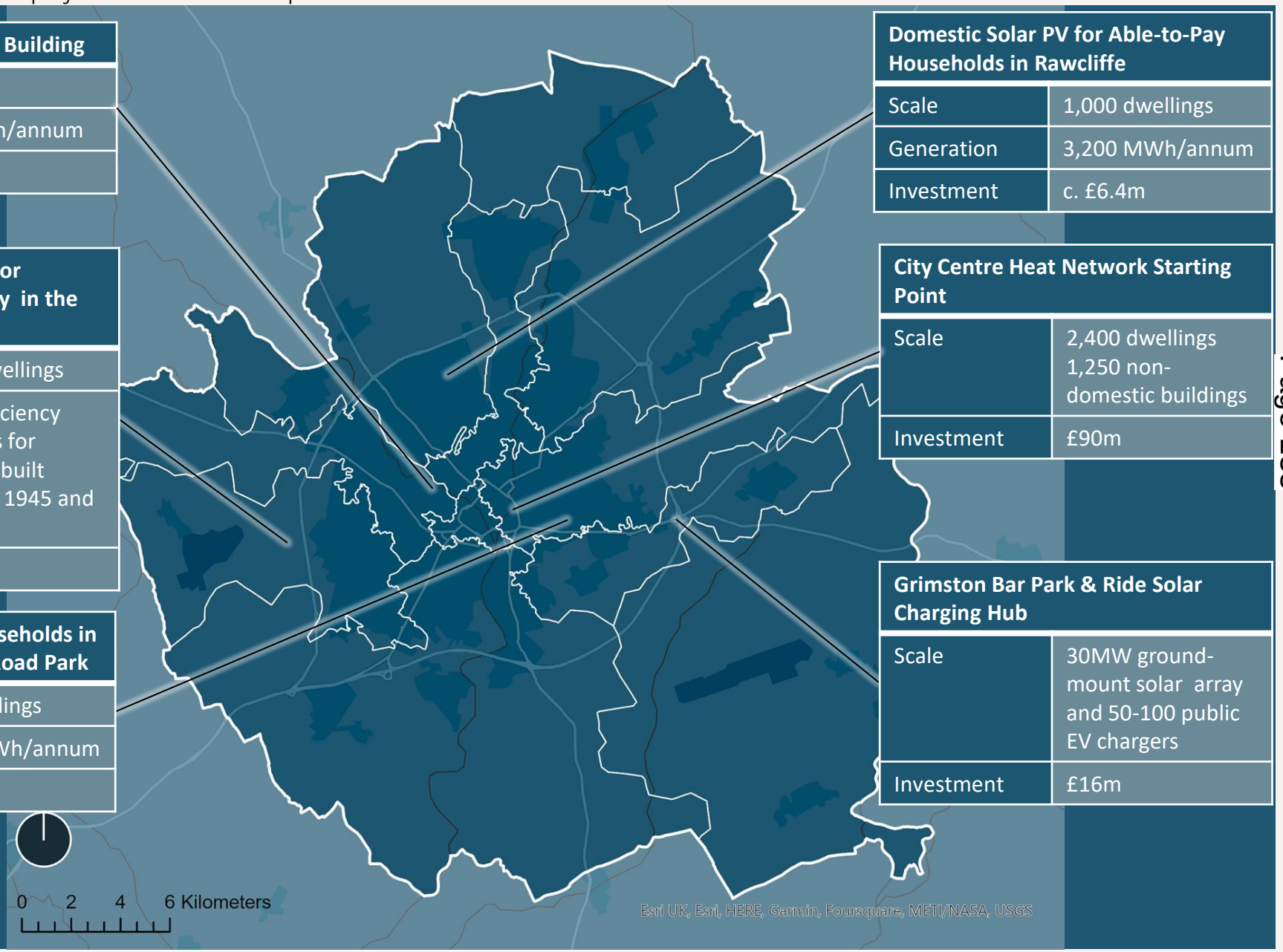
Outline Priority Projects Summary

Demonstrator and low regrets projects for near-term implementation

Rooftop Solar for Heritage Building	
Scale	0.64 MW
Generation	290 MWh/annum
Investment	c. £575k

Building Fabric Upgrades for Households in Fuel Poverty in the Acomb to Rufforth Zone	
Scale	1,000 dwellings
Type	Basic efficiency upgrades for terraced built between 1945 and 1979
Investment	c. £1.1m

Domestic Solar PV for Households in Fuel Poverty around Hull Road Park	
Scale	500 dwellings
Generation	1,575 MWh/annum
Investment	c. £3.2m



Domestic Solar PV for Able-to-Pay Households in Rawcliffe	
Scale	1,000 dwellings
Generation	3,200 MWh/annum
Investment	c. £6.4m

City Centre Heat Network Starting Point	
Scale	2,400 dwellings 1,250 non-domestic buildings
Investment	£90m

Grimston Bar Park & Ride Solar Charging Hub	
Scale	30MW ground-mount solar array and 50-100 public EV chargers
Investment	£16m

Current State

Setting the Scene: York Today

18%

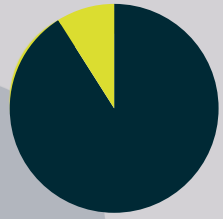
of dwellings already insulated

BUILDINGS

Currently 18% of the dwellings in York are insulated to a good standard, or do not have potential for further insulation.

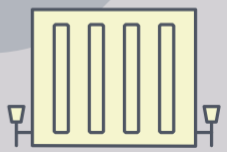
HEATING

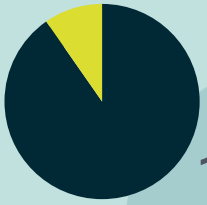
91% of buildings currently use gas for heating, and less than 1% use another form of fossil fuel such as oil. The remainder already use some form of low carbon heating such as heat pumps, biomass or electric resistive heating.



9%

of heating already low carbon





10%

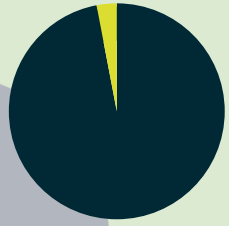
of vehicles already low carbon

VEHICLES

Around 9,150 of the cars and vans currently registered in York are either plug-in hybrid or pure electric, making up 10% of those vehicles. The remaining 85,750 are petrol, diesel or hybrid.

ELECTRICITY

97% of electricity consumed comes from the National Grid. Solar panels on around 3% of dwellings and on some non-domestic buildings make a small contribution to local energy demand, as well as the Harewood Whin landfill gas generator.

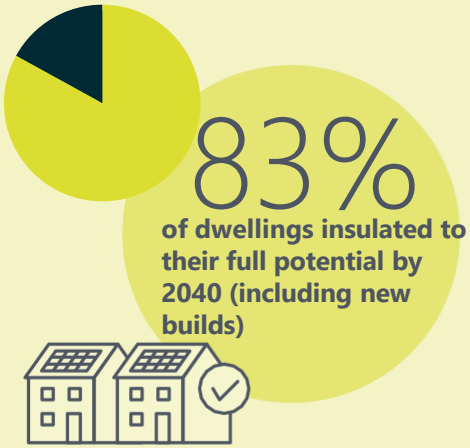


3%

of electricity consumed in York produced locally


Destination

The Destination: York 2040

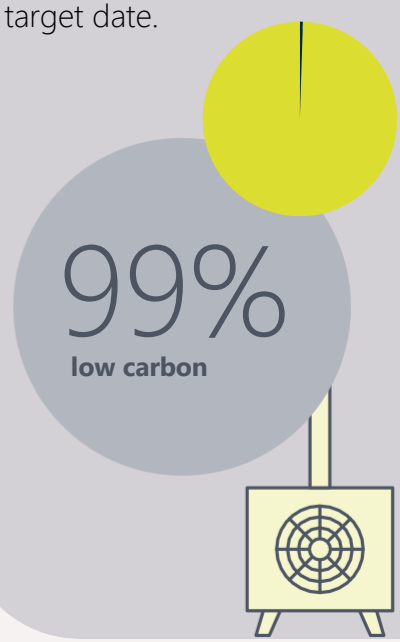


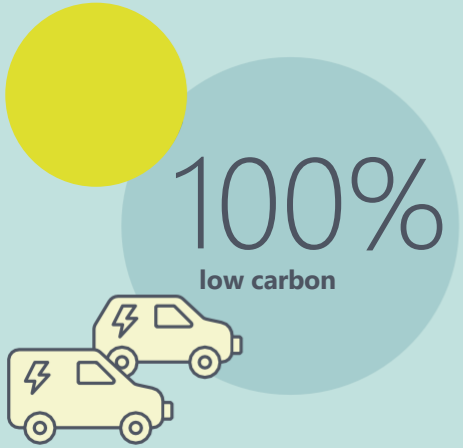
BUILDINGS

Around 63% of York's total current housing stock will require building fabric upgrades, bringing the majority of dwellings up to a high standard of efficiency. The supply chain would need to provide upgrades to over 44,100 dwellings by the year 2040. New builds will also add to the proportion of well-insulated dwellings.

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.



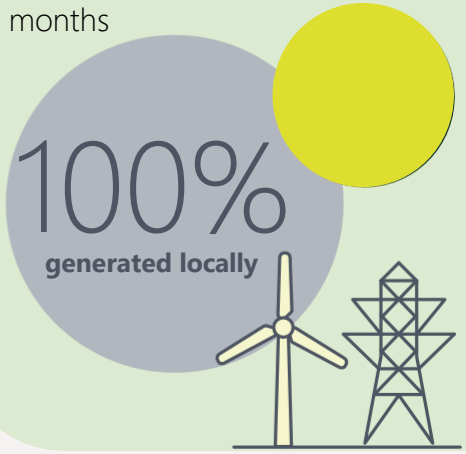


VEHICLES

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

ELECTRICITY

The push to generate low carbon electricity results in a greater proportion of York's energy being produced locally. There is enough land and roof space for solar PV and wind to generate all of the energy needed on an 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.

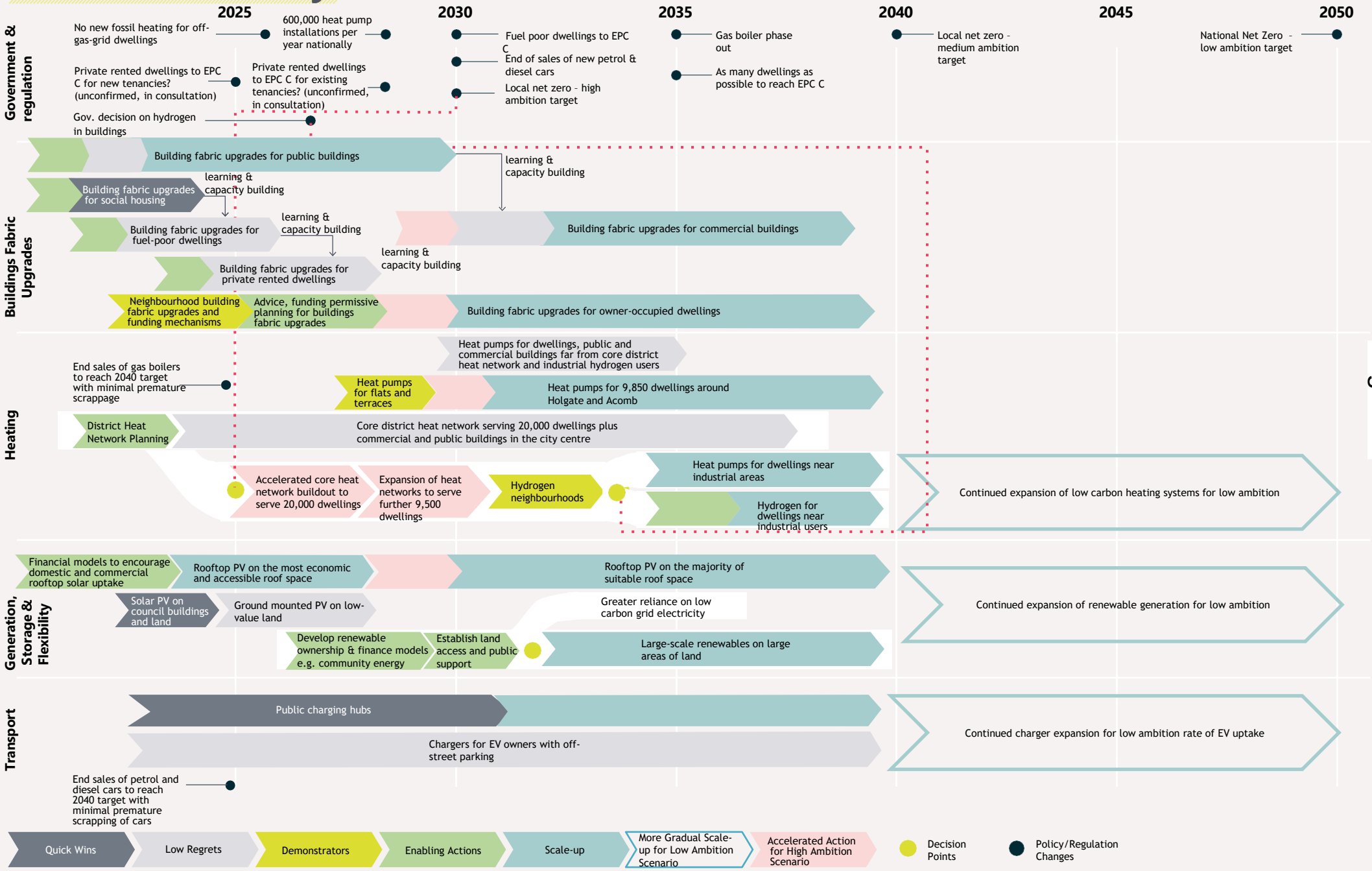
Low regrets

- Basic efficiency upgrades for almost every dwelling which has upgrade opportunities.
- Heat pumps installed in dwellings which are far from any likely heat networks or industrial users of hydrogen
- District heat networks to serve public, commercial and private buildings in the areas of dense heat demand
- Electric vehicle 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 efficiency 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 on the viability, cost, emissions and policy around hydrogen for building heating in York, 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 most of York's energy requirements on an annual basis, though the development 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 9,850 dwellings around Holgate and Acomb
District Heat Network Planning
Core district heat network serving 20,000 dwellings plus commercial and public buildings in the city centre
Heat pumps for dwellings near industrial areas
Accelerated core heat network buildout to serve 20,000 dwellings
Expansion of heat networks to serve further 9,500 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
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

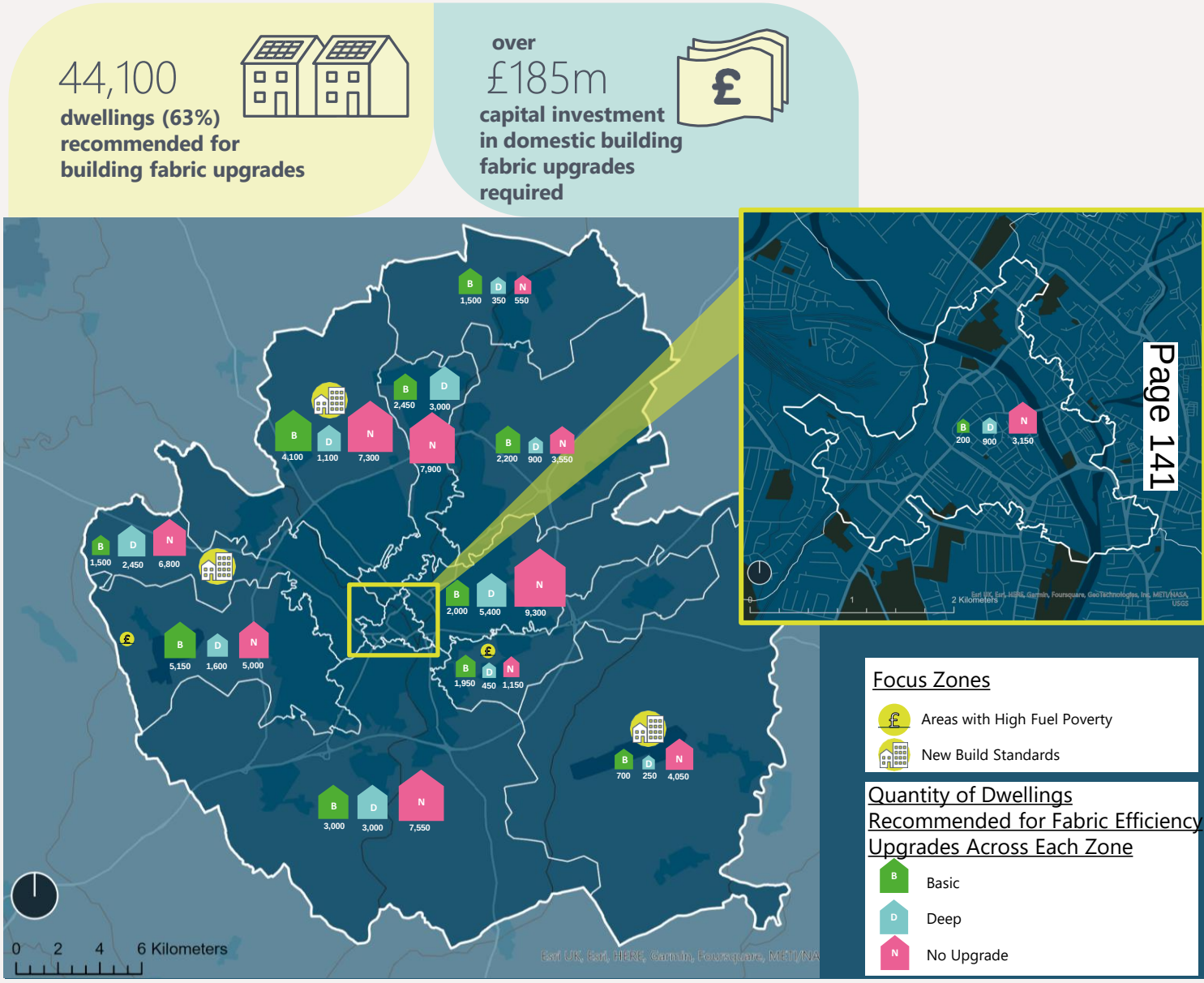
Overview

A large proportion of dwellings across York are recommended for building fabric upgrades (also known as 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 fabric upgrade measures (insulation, glazing and draughtproofing) are likely to be distributed across the region. In total, 44,100 dwellings across York are recommended for upgrades at a cost of £185m. 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 by the '£' symbol. Areas with large numbers of new build dwellings planned can prioritise building to net zero standards (e.g. Passivhaus), potentially encouraged a local design code or supplementary planning document.

While this plan outlines the lowest cost path to a net zero energy system, additional deep retrofits may be desirable to meet other local priorities, particularly fuel poverty alleviation and general energy affordability.

Previous schemes run by York City Council using funding from BEIS dwelling Upgrade Grant and Social Housing Decarbonisation Fund, as well as the development of a Housing Retrofit Action Plan can be learnt from and scaled up to help meet these high levels of roll out.

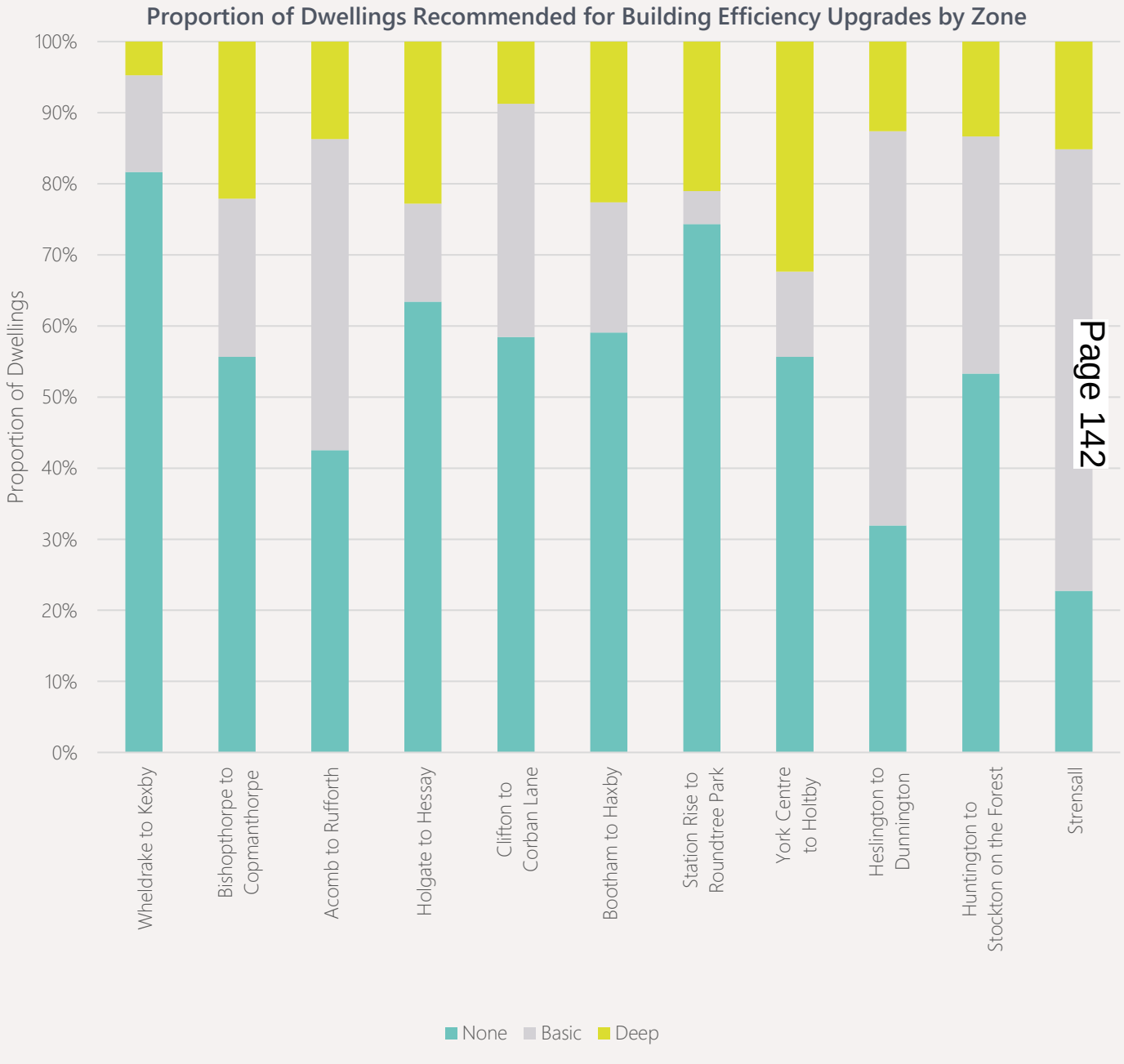


Zones and Dwelling Types

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" upgrades). 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 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 York, which is influenced by the types of dwellings in each area. Where there is a high proportion of flats (such as the Station Rise to Rowntree Park zone) or new builds (such as the Wheldrake to Kexby zone), fewer upgrades are recommended. In contrast, there are areas such as the Strensall zone where the majority of dwellings look suitable for cost-effective fabric upgrades.

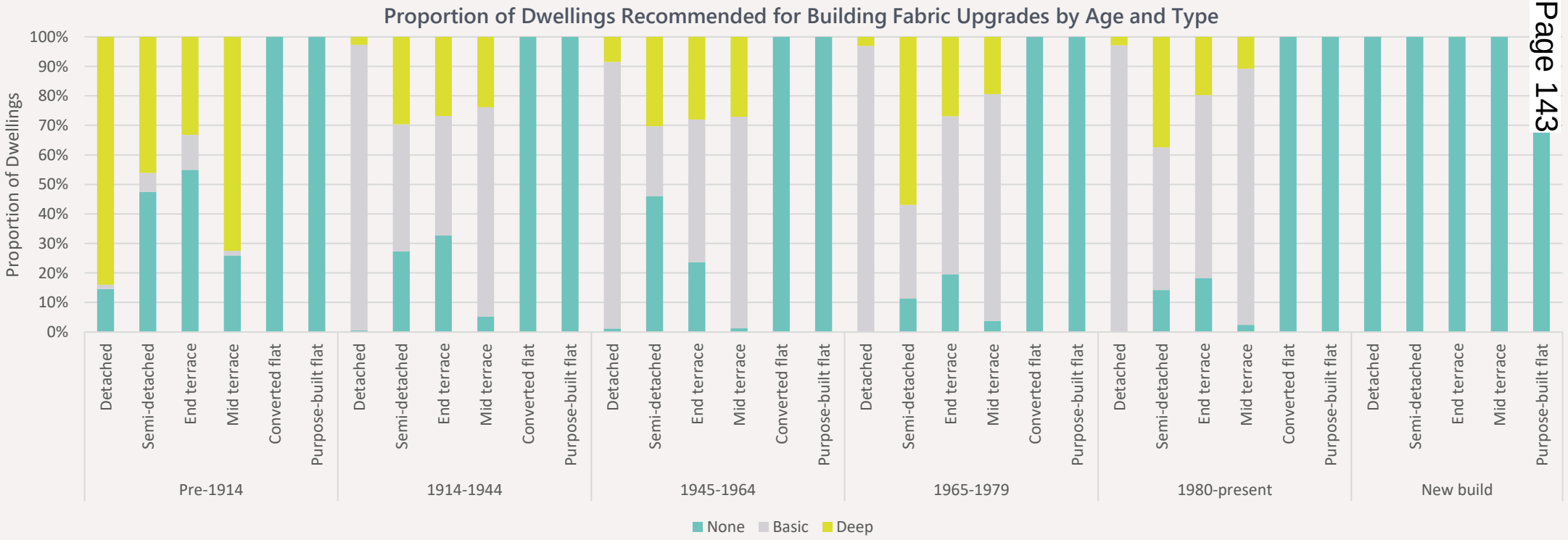
Dwellings which aren't highlighted for upgrades by cost optimal modelling are not necessarily ruled out from benefiting from upgrades. Other factors such as prevalence of fuel poverty, or a focus on the health and comfort benefits of dwellings which are easier to keep warm could drive the decision to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



Zones and Dwelling Types

Building age and construction is a major factor in which types of efficiency upgrades are recommended. As shown in the graph below, basic upgrades are recommended across much of the housing stock built after 1914, whereas older dwellings are likely to require deep upgrades, which can be less cost-effective. This is due to the oldest group of dwellings having been built with solid walls, requiring either internal or external insulation, with cavity walls only becoming the norm from around 1930. Terraces, being the most common building type of the age bracket with solid walls, could make sense to tackle on a street-by-street basis, since attempts to insulate single dwellings within terrace rows are likely to be awkward and limited in their effectiveness. Deployment at this kind of scale could also prove vital for achieving acceptable costs, which is a major hurdle for solid wall insulation.

Modern buildings have little potential for cost-effective upgrades, and opportunities for individual flats are limited. While the modelling approach does not identify upgrade opportunities in any type of flat, some types of converted flats may have similar opportunities to houses, though there may be a need for multi-stakeholder buy-in. Purpose-built flats such as multistorey blocks will tend to require whole-building approaches.



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 Acomb to Rufforth zone & The Heslington to Dunnington zone

are focus zones because they have high levels of fuel poverty, coinciding with high potential for cost-effective fabric upgrades. Prioritising delivery of efficiency projects in this area would unleash the high potential for impact and benefits. Over 4,400 dwellings in the Acomb to Rufforth zone and 2,200 in the Heslington to Dunnington zone would benefit from basic upgrades, with almost 2,000 dwellings benefiting from deep upgrades across the two zones. In these zones, a large number of semi-detached dwellings built between 1914 and 1979 could be insulated (2,000 in the Acomb to Rufforth zone and 1,150 in the Heslington to Dunnington zone). Additionally, almost 1,000 terrace dwellings built between 1945 and 1979 in the Acomb to Rufforth zone are suitable for basic upgrades.

The York Centre to Holtby zone

is where the most deep fabric upgrades could take place. 1,700 terraces built before 1914 could be considered for deep upgrades, along with 1,400 semis built between 1914 and 1979.

An example area of dwellings in the Acomb to Rufforth zone suitable for upgrades

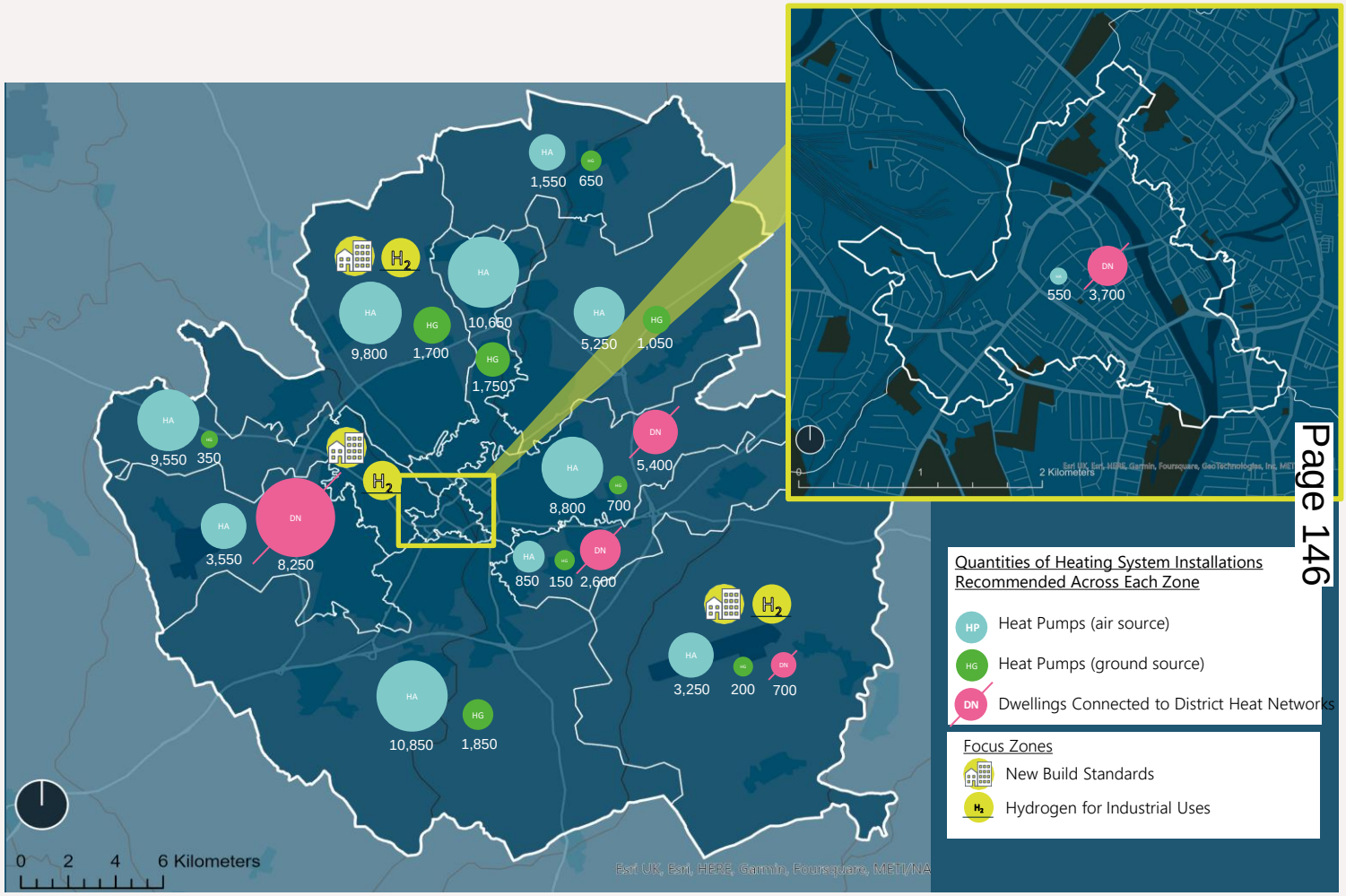
Heating

Overview

Gas boilers make up the majority of heating systems in dwellings (91%) and non-domestic buildings, with fossil fuel use in buildings accounting for 36% of emissions in York (excluding industry). To reach net zero, these will need to be replaced with low carbon heating systems. Heating systems can be replaced at their natural end-of-life, however 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 meet a 2040 net zero target, in order to minimise premature replacements of boilers (based on 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 York, with growing evidence** that they can be installed in the full range of property archetypes. Heat networks can serve dense town centre locations (supported by some existing electric resistive heating).

Off-gas-grid dwellings using fossil fuel heating systems make up a very small minority (less than 1%) of households in York, and so are not considered as a separate stage of the plan. 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.



73,000 dwellings recommended for heat pump installations

20,000 dwellings recommended for connection to district heat networks

c.£390m 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

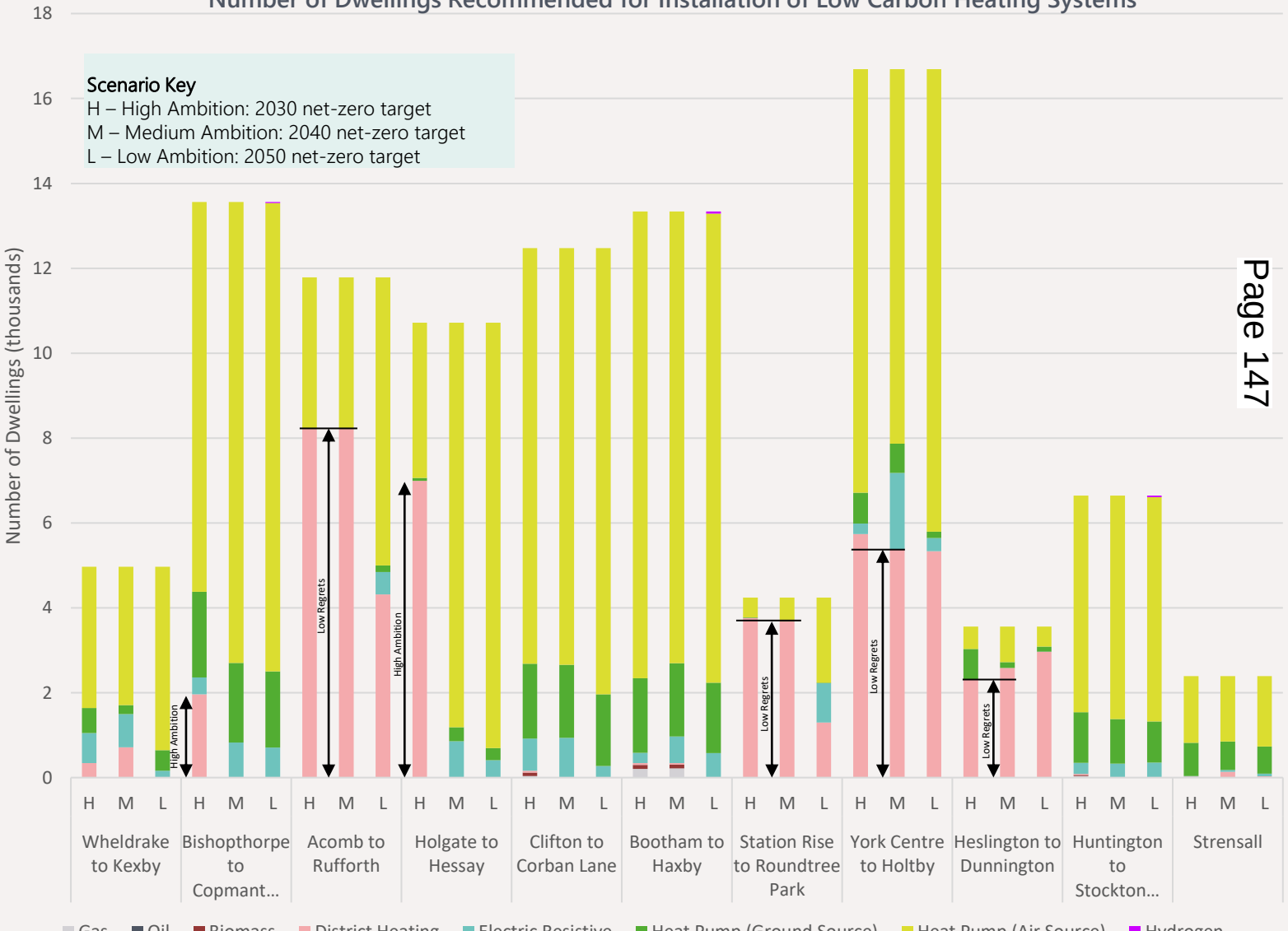
The most suitable choices of heating systems for each zone are largely consistent between different levels of ambition for the net zero target date, with only slight variation in places as shown in the chart. This indicates that choices of heating system are mostly low regrets. Where variation is seen, 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 level of ambition of the scenario affects the type of heating system recommended for some dwellings, as well as the pace of installations, as shown in the chart. In particular, earlier net zero targets call for a larger heat 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. 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 a more advantageous option in rural areas than in urban 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 27.

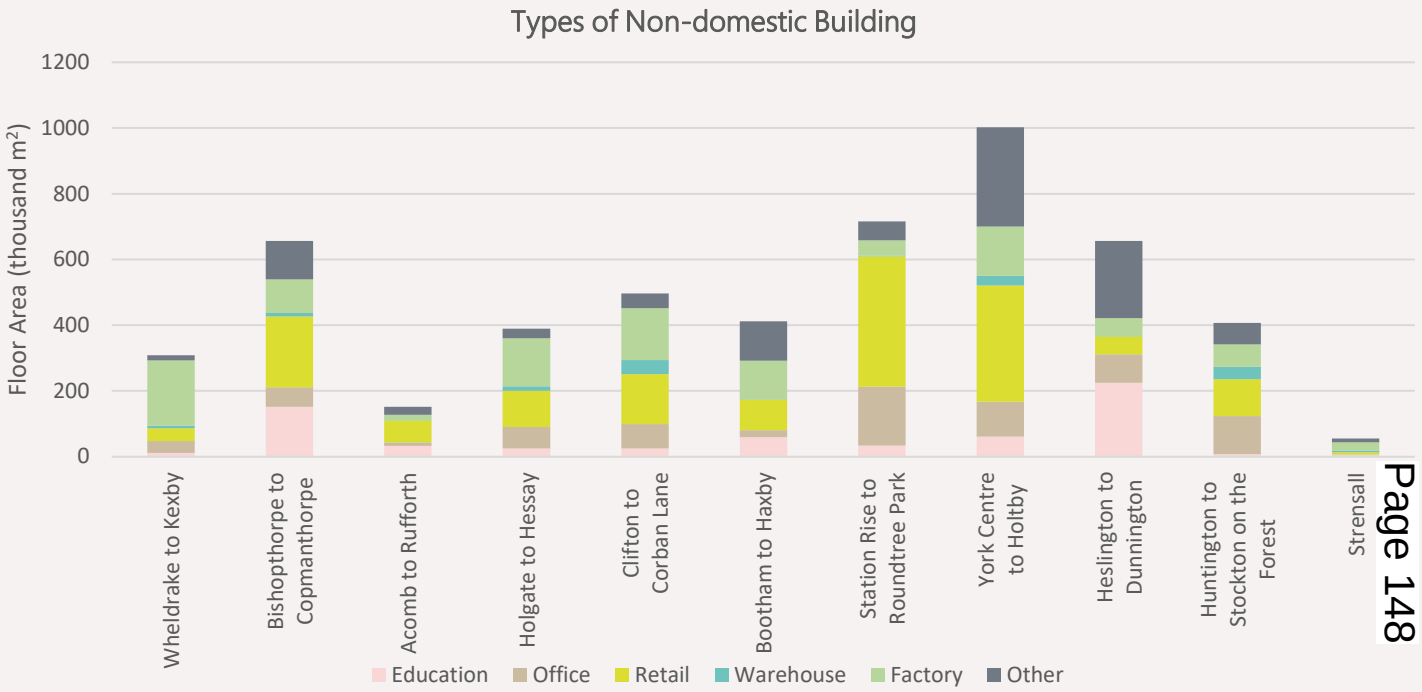
Number of Dwellings Recommended for Installation of Low Carbon Heating Systems

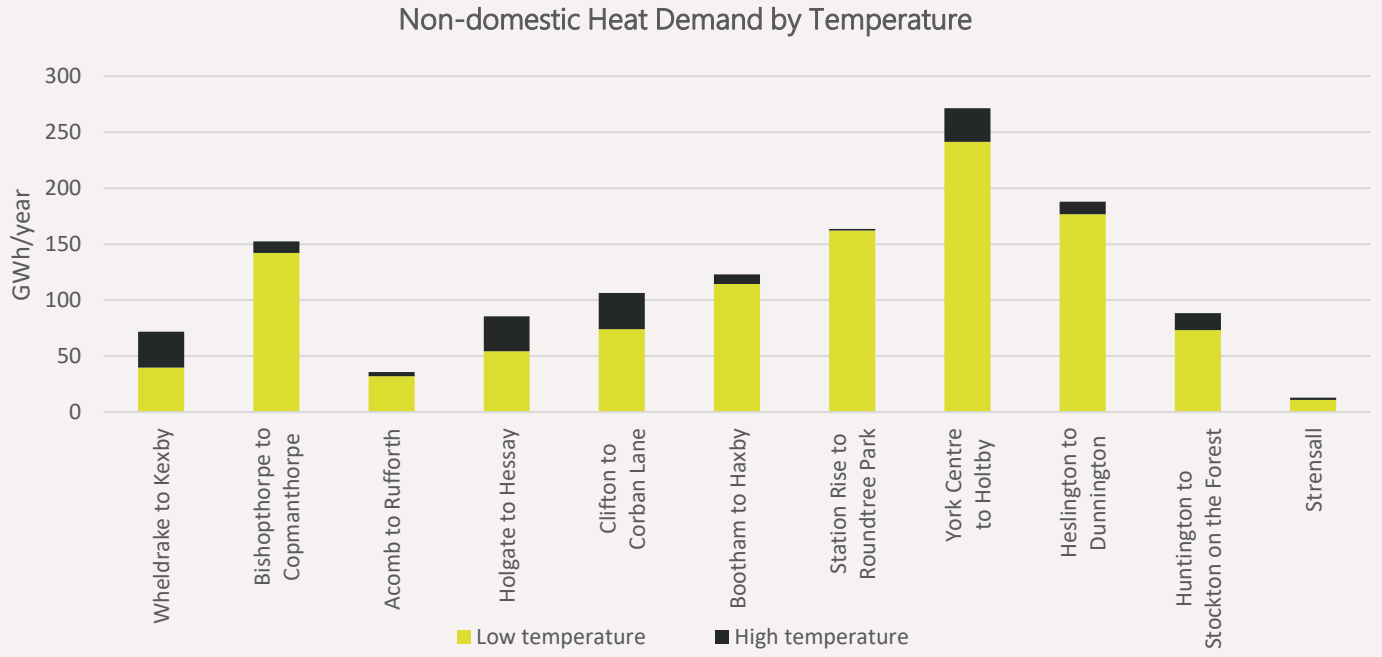


Non-domestic Buildings

Non-domestic buildings are categorised into a range of uses, shown in the chart (right). Much of the demand for heat in non-domestic buildings is low temperature heat for providing space heating and hot water to buildings, with similar decarbonisation options as domestics. However, a small portion of heat is likely to be required at high temperature for specialised industrial processes, as shown on the chart on the right.

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 in time for the target, while the medium ambition scenario 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.

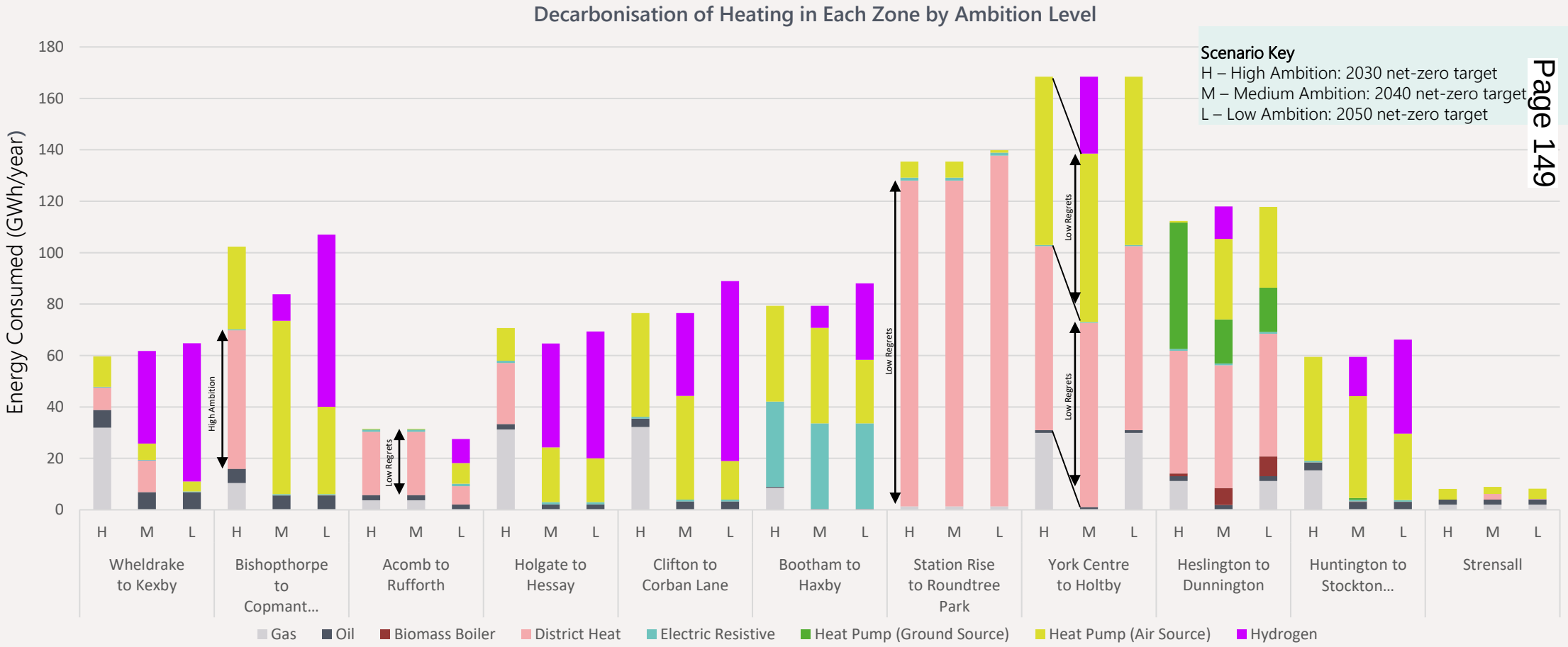




Non-domestic Buildings

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 many of the fossil fuel systems being replaced with heat pumps, or by connecting to district heat networks in dense central areas as shown in the chart. However, non-domestic buildings differ from dwellings, with significant amounts of space heating provided by hydrogen in the scenarios where it's available. More hydrogen is used in the lower ambition scenarios, as the later carbon target 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.

In the high ambition scenario, pipeline hydrogen is not available in time for the 2030 target to replace gas use for high temperature applications, though on-site electrolysers could enable earlier conversion to hydrogen.



Heat Pump Focus Zones

The Bishopthorpe to Copmanthorpe zone, Clifton to Corban Lane zone and Bootham to Haxby zone have the largest roll-out of air source heat pumps (10,850, 9,800 and 10,650 respectively) across the full range of ages and types of dwellings, from flats to detached, and from pre-1914 to new build. This will require significant supply chain scale-up, citizen awareness and buy-in, and attractive commercial offerings to compete with existing fossil fuel options. The map gives a sense of the distribution of air-source installations across York.

Bishopthorpe to Copmanthorpe and Clifton to Corban Lane have some spare capacity in the electrical distribution system, allowing roll-out to commence before encountering constraints (though upgrades are likely to be required to reach full heat electrification, especially when combined with electric vehicle charging requirements). The York Centre to Holtby zone also has substantial spare capacity, and with 9,500 heat pumps to be installed in total, this area would make a good heat pump focus zone from an infrastructure perspective.

Uptake of air source heat pumps across York

Heat Pump Focus Zones

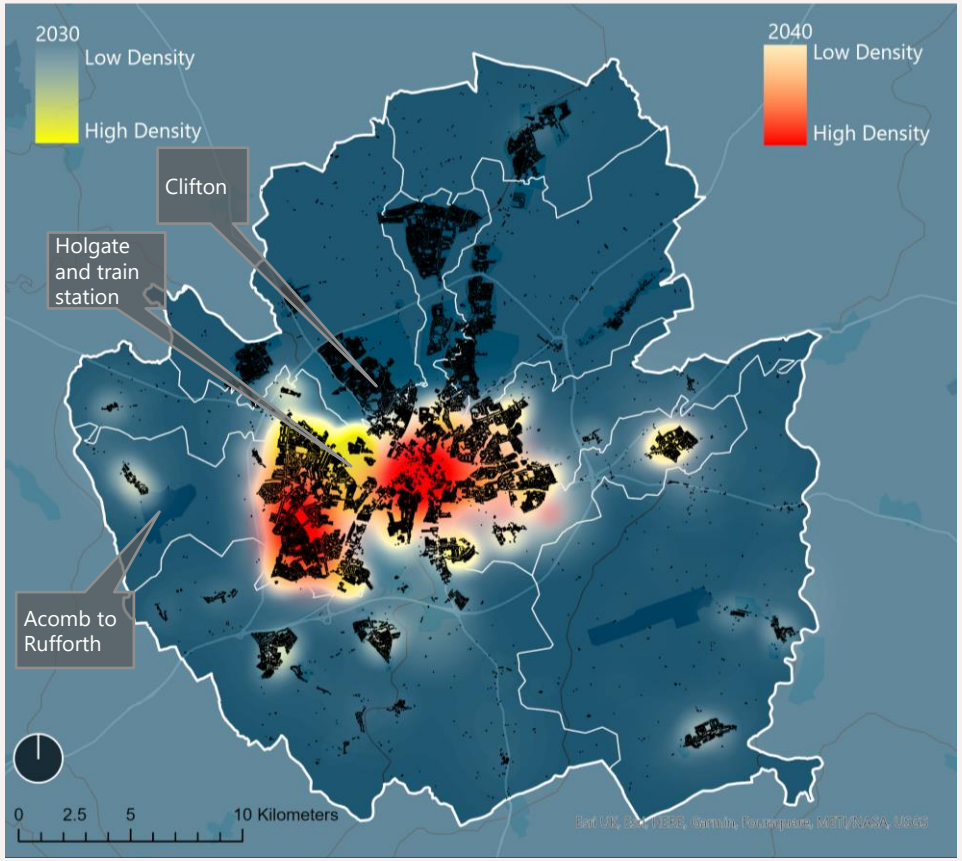
Example neighbourhoods in Wigginton and Haxby with high uptake of ground source heat pumps

Air source heat pumps are typically the most cost-effective heat pump type due to their lower capital costs compared to ground source heat pumps. However, there is an economic case for installing ground source heat pumps in some detached dwellings in the Bishopthorpe to Copmanthorpe zone, the Clifton to Corban Lane zone and the Bootham to Haxby zone (1,850, 1,700 and 1,750 respectively). For these large properties with available land, 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 where dwellings suitable for ground-source cluster together, which could form a demonstration neighbourhood.

When installing a low carbon heating system, it's advisable to carry out any basic building efficiency 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*.

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

District Heat Networks



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 buildings that require retrofit to make them suitable for heat pumps which is either too expensive or impractical (e.g. historic attractions). Heat networks cause less disruption in dwellings during installation compared to some other options, though there are wider considerations such as traffic disruption during pipe laying, and space restrictions in city centres, which are of particular issue in a medieval city like York.

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 extended coverage in the high ambition scenario. From the map it is also apparent that the density of Clifton and its adjacency to the core heat network could make it suitable for expansion of the core heat network, as an alternative to using individual heat pumps in that area.

Areas in and around the city centre, as well as in the Acomb to Rufforth zone have the density which makes heat networks likely to be viable. Energy masterplanning has already been undertaken for the York Central development, a major brownfield redevelopment site. The options studied include connection of the new residential and commercial buildings around the train station, as well as the railway museum, to a new district heat network which could be supplied by a water source heat pump.

This development could form the origin of a larger network, expanded to cover more of the city. The compatibility with net zero targets of investing in new gas-fired assets such as a CHP to serve this network should be carefully considered, as the grid energy displaced by a CHP will be increasingly low carbon in the years ahead*. If a CHP is selected as the heat source, the design of the network should ensure its future compatibility with heat pumps (e.g. pipes sized for low flow temperatures).

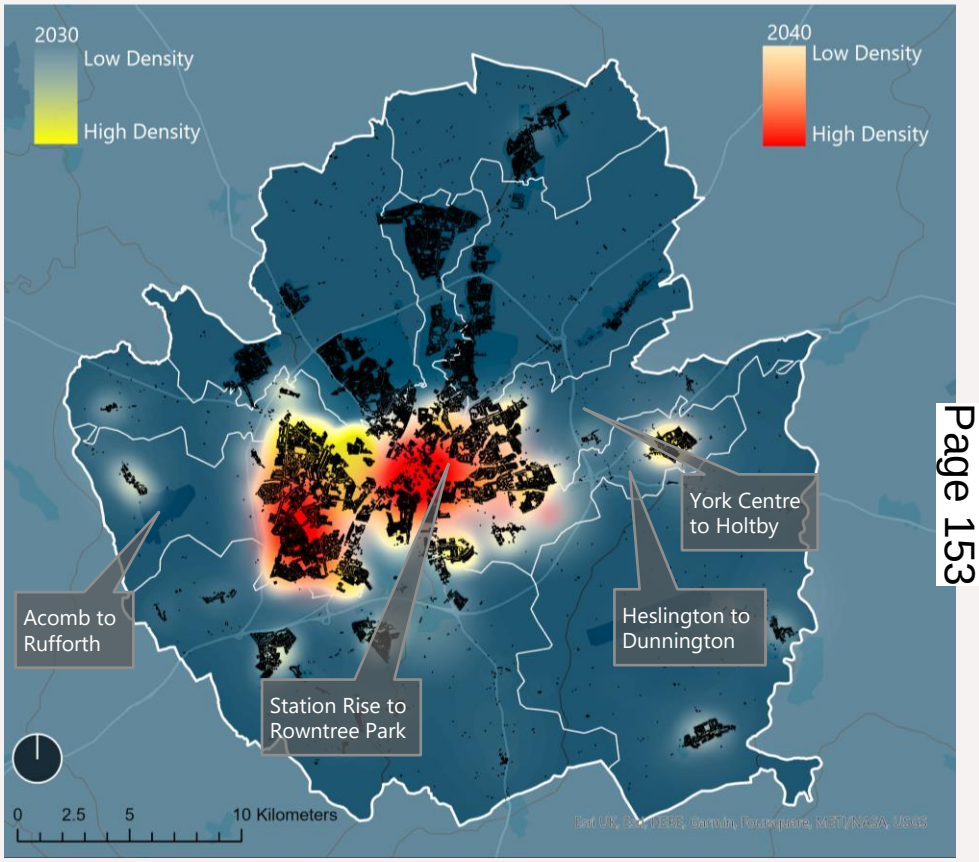
https://www.cibse.org/knowledge-research/knowledge-portal/an-operational-lifetime-assessment-of-the-carbon-performance-of-gas-fired-chp-led-district-heating

District Heat Networks

Heat networks could serve over 20,750 dwellings (55%), concentrated predominantly in the zones listed below. The Green Heat Network Fund* will have quarterly application rounds from March 2022 until 2025 and could provide funding for heat networks in York.

York sits on a productive aquifer** which has the potential to provide significant quantities of low carbon heat for heat networks. Heat network development projects should consider working with York Hospital, the University of York and Nestle all of which have large demands for heat and may be both anchor loads and providers of heat for use in networks.

Zone	No. of Dwellings Connected	Domestic Peak Demand (MW)	Non-domestic Peak Demand (MW)	Total Peak Demand (MW)
Acomb to Rufforth	8,215	16.6	9.8	22.7
Station Rise to Rowntree Park	3,685	8.5	42.1	48
York Centre to Holtby	5,385	11.5	21.9	30.2
Heslington to Dunnington	2,585	5.5	16.1	20.3



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

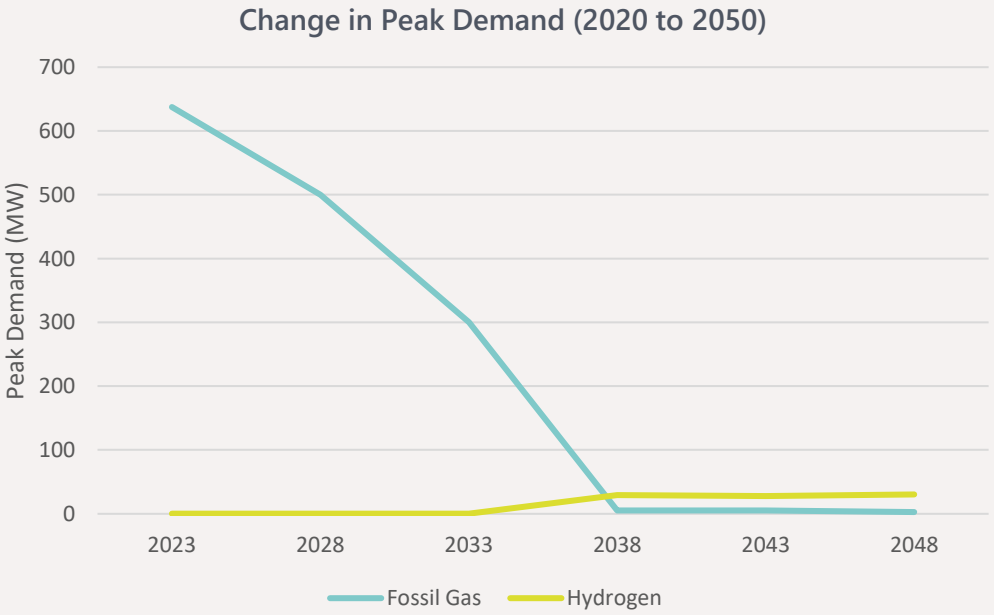
* https://www.gov.uk/government/publications/green-heat-network-fund-ghnf
** http://mapapps2.bgs.ac.uk/geoindex/home.html?layer=BGSHydroMap&_ga=2.227016797.1726030392.1645026282-782257203.1645026282
Figures shown are based on the medium ambition scenario. Total peak demands are lower than the sum of domestic and non-domestic peaks, as they will not fully coincide in time

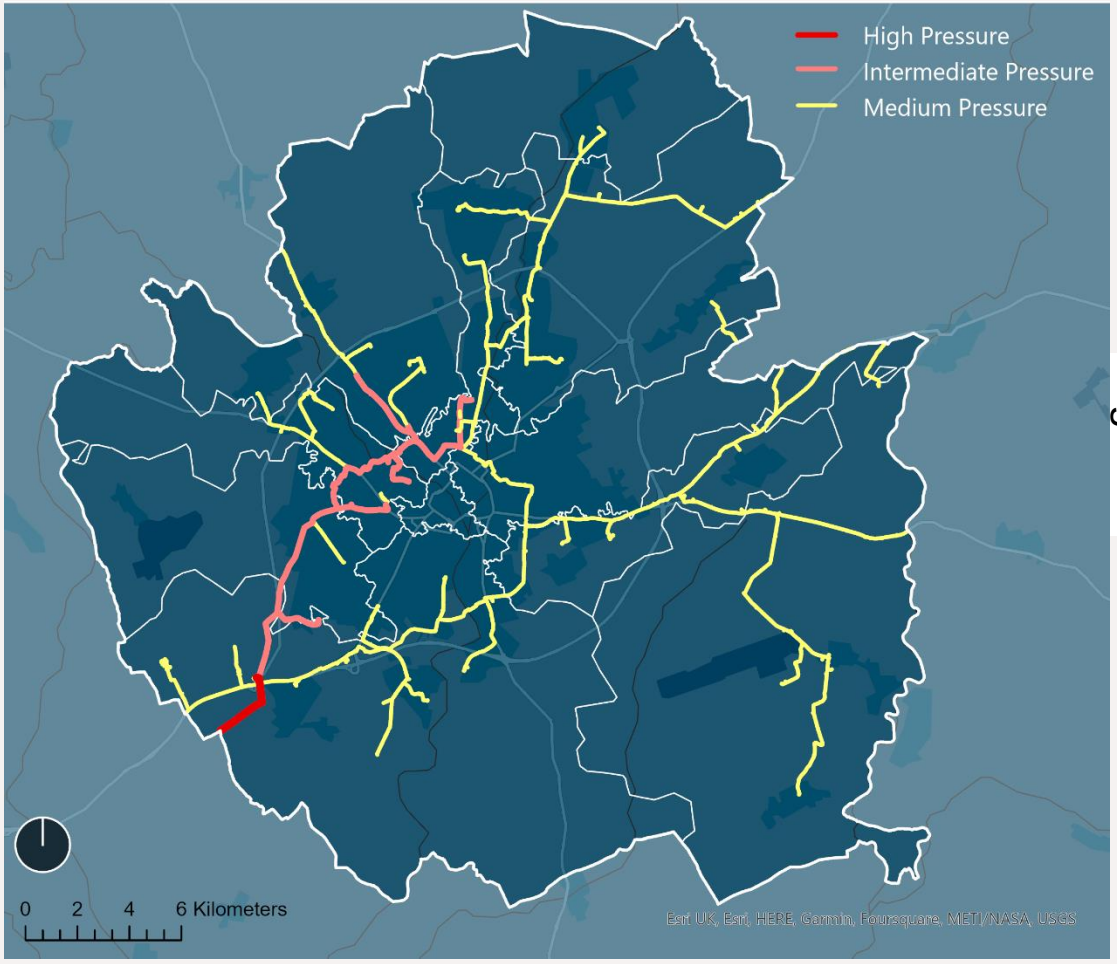
Gas Network

The gas network in York is operated under license by Northern Gas Networks and currently supplies fossil gas to the majority of dwellings (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 York is around 1,625 GWh per year. Meeting the net zero goal would mean a steep decline in fossil gas consumed across York, illustrated in the graph below (based on following the 2040 net zero pathway).

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 existing gas network in York

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 a 2030 net zero target. Even by 2040, the use of hydrogen for dwelling heating is likely to be minimal, as the cost and carbon intensity of hydrogen** are less favourable than for electrification of heat.

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

Use of hydrogen for high-temperature industrial processes.

An example area around the Hazel Court recycling centre where industrial hydrogen use could benefit nearby hard-to-electrify dwellings

- https://h21.green/about/

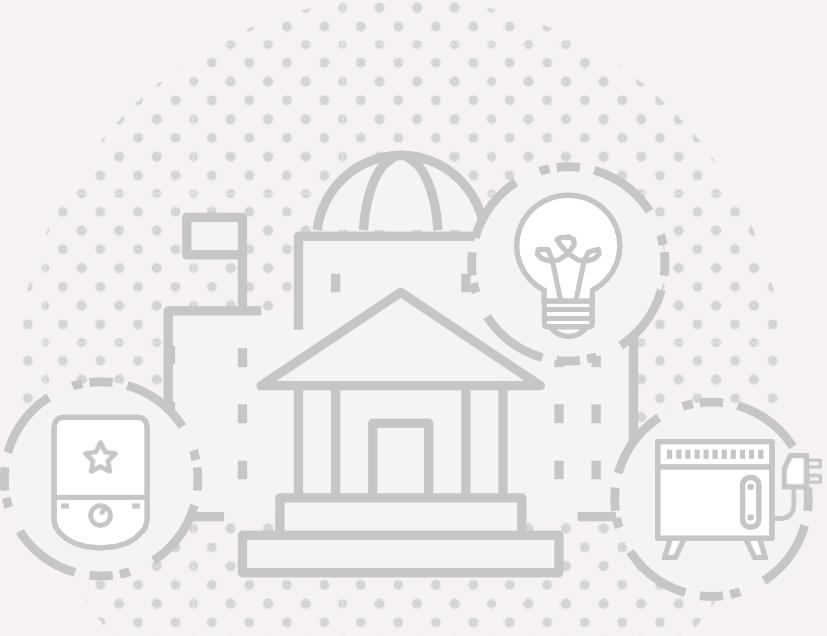
** Hydrogen production cost based on BEIS figures https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1011506/Hydrogen_Production_Costs_2021.pdf

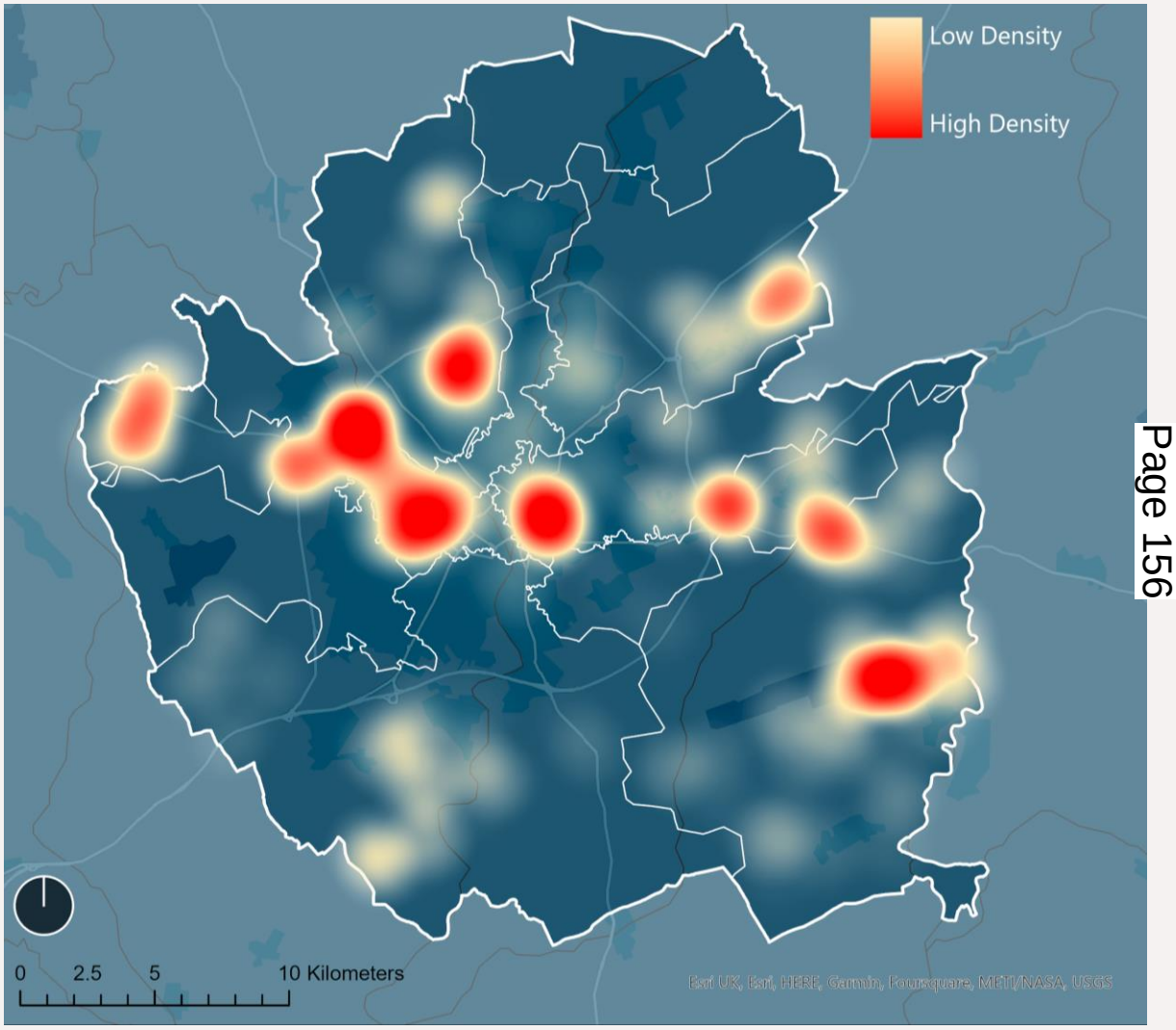
Carbon intensity based on the East Coast Hydrogen Feasibility Report https://www.nationalgrid.com/gas-transmission/document/138181/download

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.

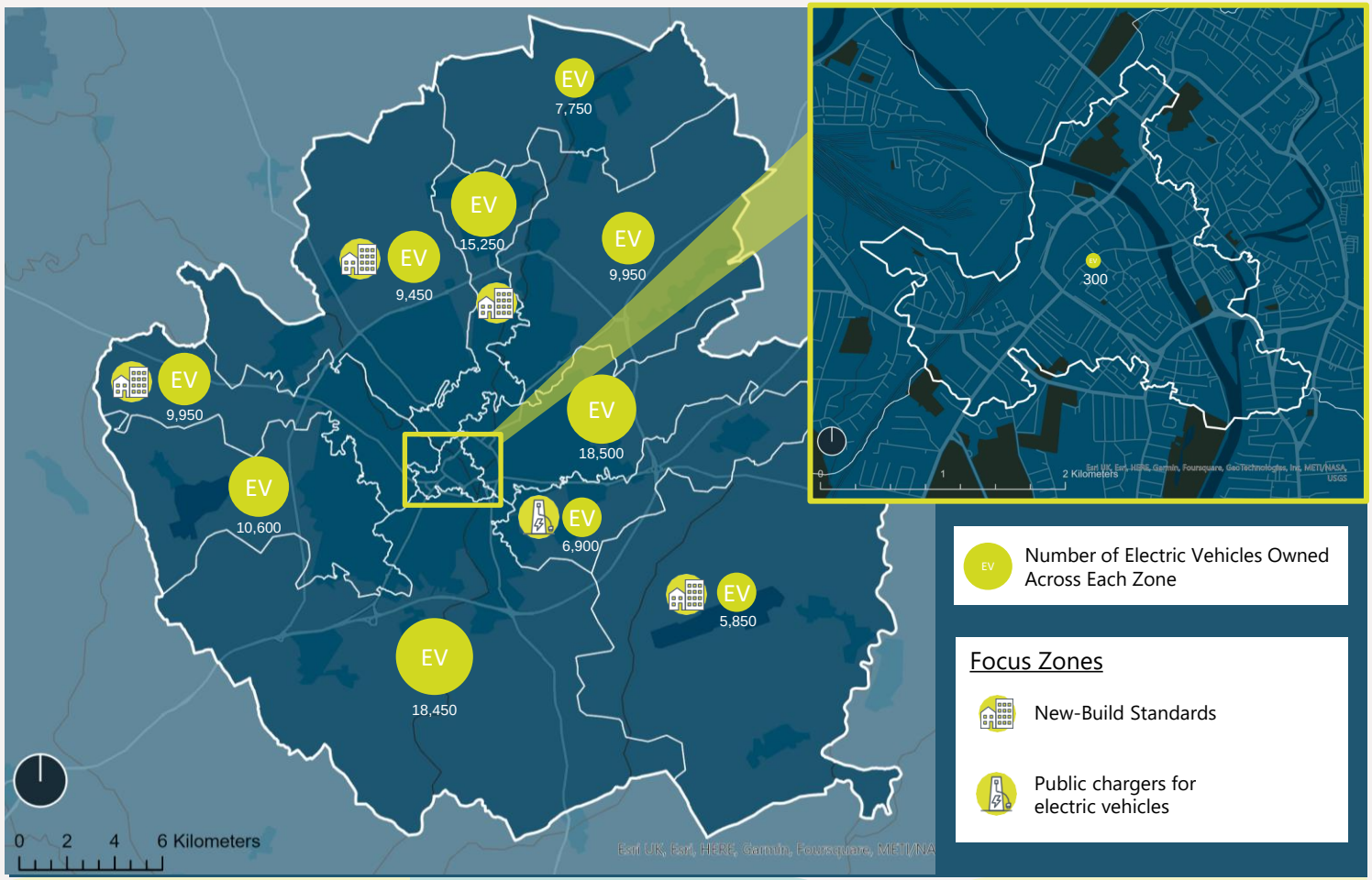




Use of hydrogen for high-temperature industrial processes

Transport

EV Overview



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 vehi

Projections of an increasing proportion of private electric vehicles were used to anticipa the electricity demand across York for chargi these vehicles, and the associated infrastructure upgrades that would be required. EV uptake is higher in the more suburban and rural areas of York, with city dwellers being less likely to own cars.

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.

113,000
Electric cars and vans by 2040

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

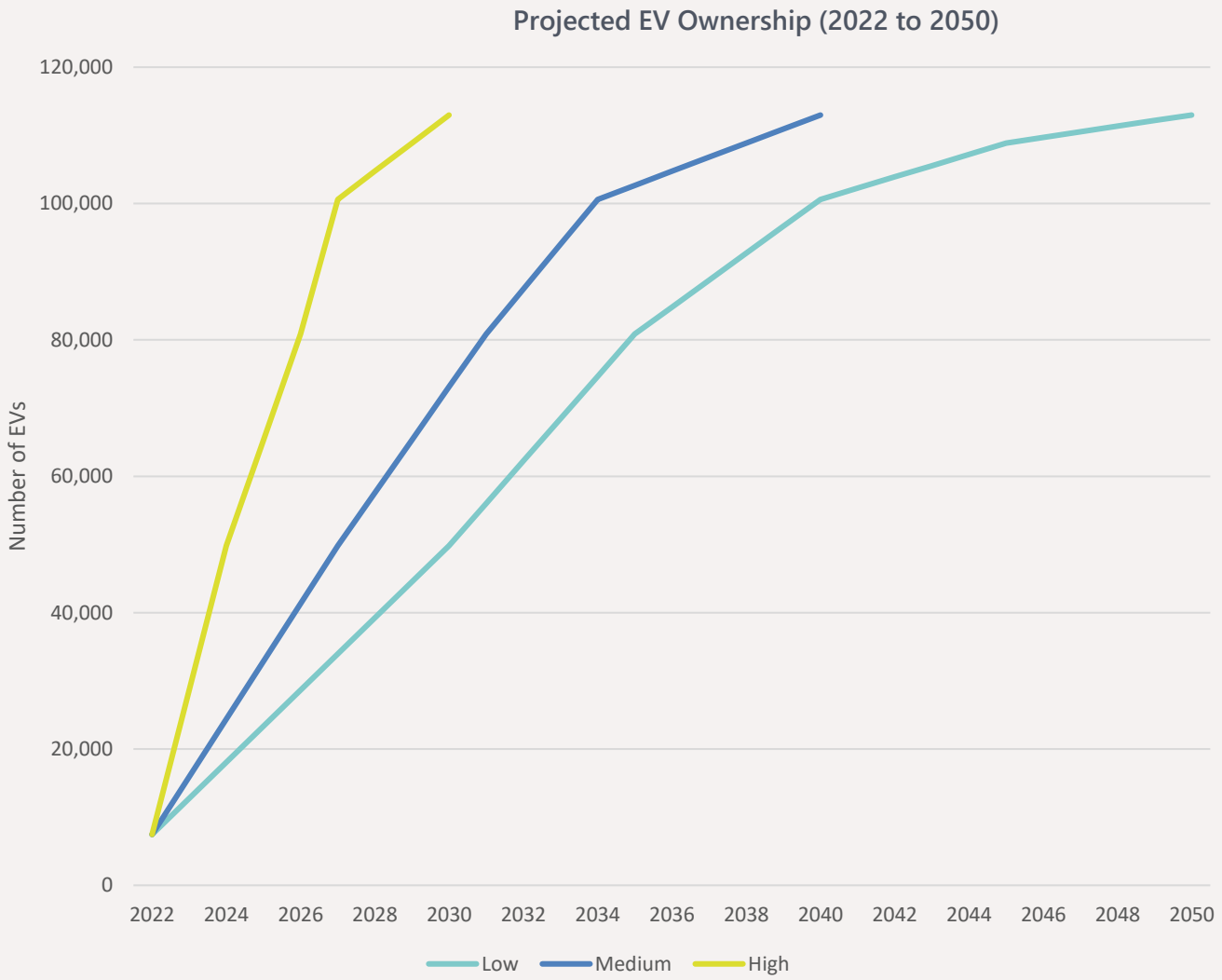
48%
Households have off-street parking, suitable for home charging

EV Projections

Based on projections by Transport for the North, plug-in cars and vans are expected to grow from their current level of around 9,150 in the year 2022 to 49,800 vehicles (~50% of the total fleet) by 2030 and over 113,000 (100%) by 2050. 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 if premature replacement of vehicles is to be minimised (assuming a 15 year vehicle lifespan).

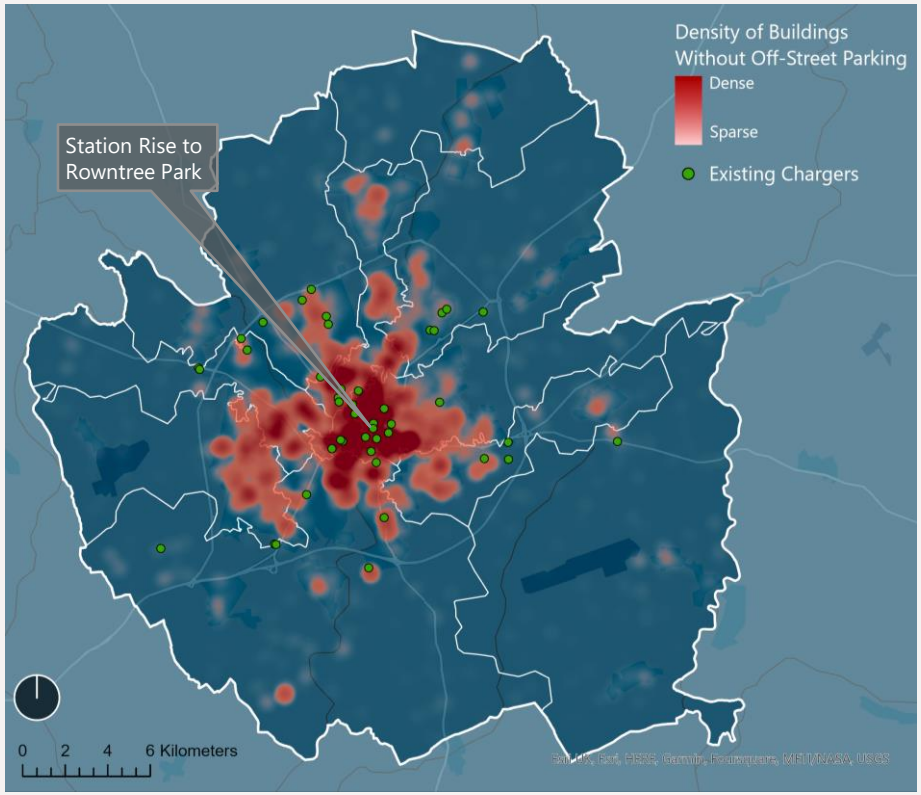
Currently there are few options available to local authorities that give this level of control, however the introduction of low emission zones which charge non-EV owners for entering certain areas can help to drive behaviour. Access to abundant and reliable charging infrastructure will also be important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

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



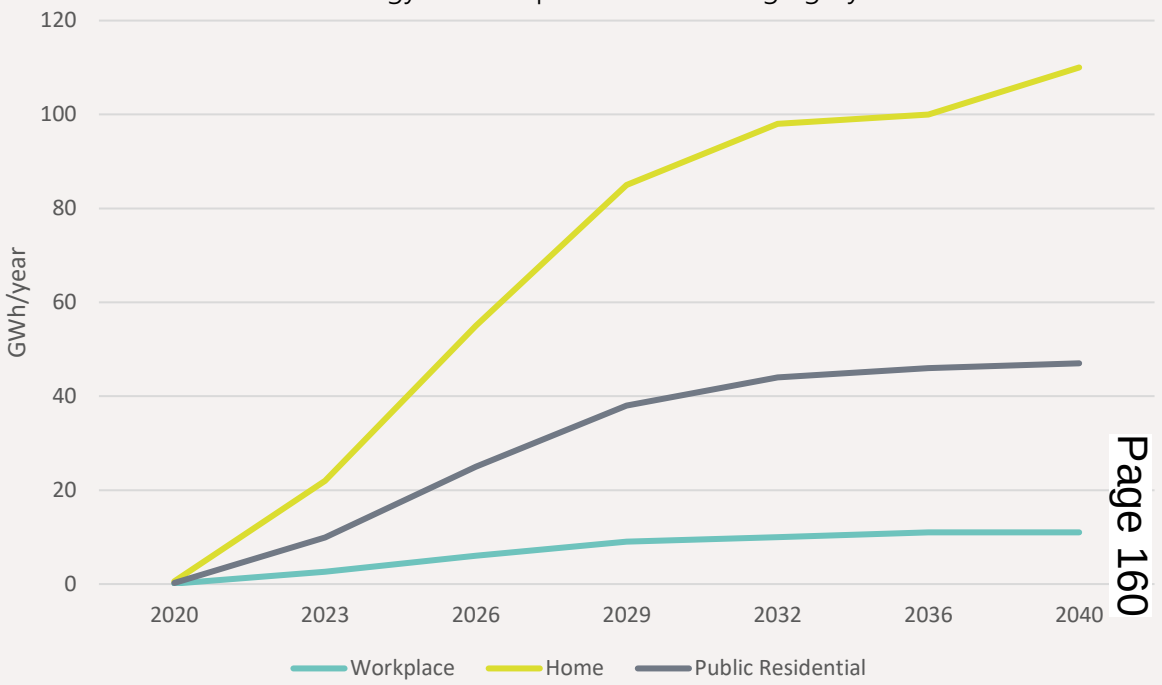
EV Charging Infrastructure

Density of housing without off-street parking & existing charge points



Areas of high-density housing without off-street parking are largely concentrated around York city centre, as seen on the map above. Only 17% residents in the Station Rise to Rowntree Park zone have off-street parking, where prioritisation of public charging infrastructure would be crucial to ensure an equitable transition to low carbon transport.

Growth in Energy Consumption for EV Charging by Location



Those residents without off-street parking will require ready access to charging hubs, kerb-side charging, destination charging, workplace charging, etc. Given that only 48% of the residents of York have access to off-street parking, significant investment needs to be directed towards public EV 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 City of York Council's EV Charging Strategy* sets out plans to further develop York's already extensive public charging network (with around 130 charge points currently available), building HyperHubs to deliver ultra-rapid charging at strategic locations.

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

* https://www.york.gov.uk/downloads/file/6264/city-of-york-public-ev-charging-strategy

EV Focus Zones

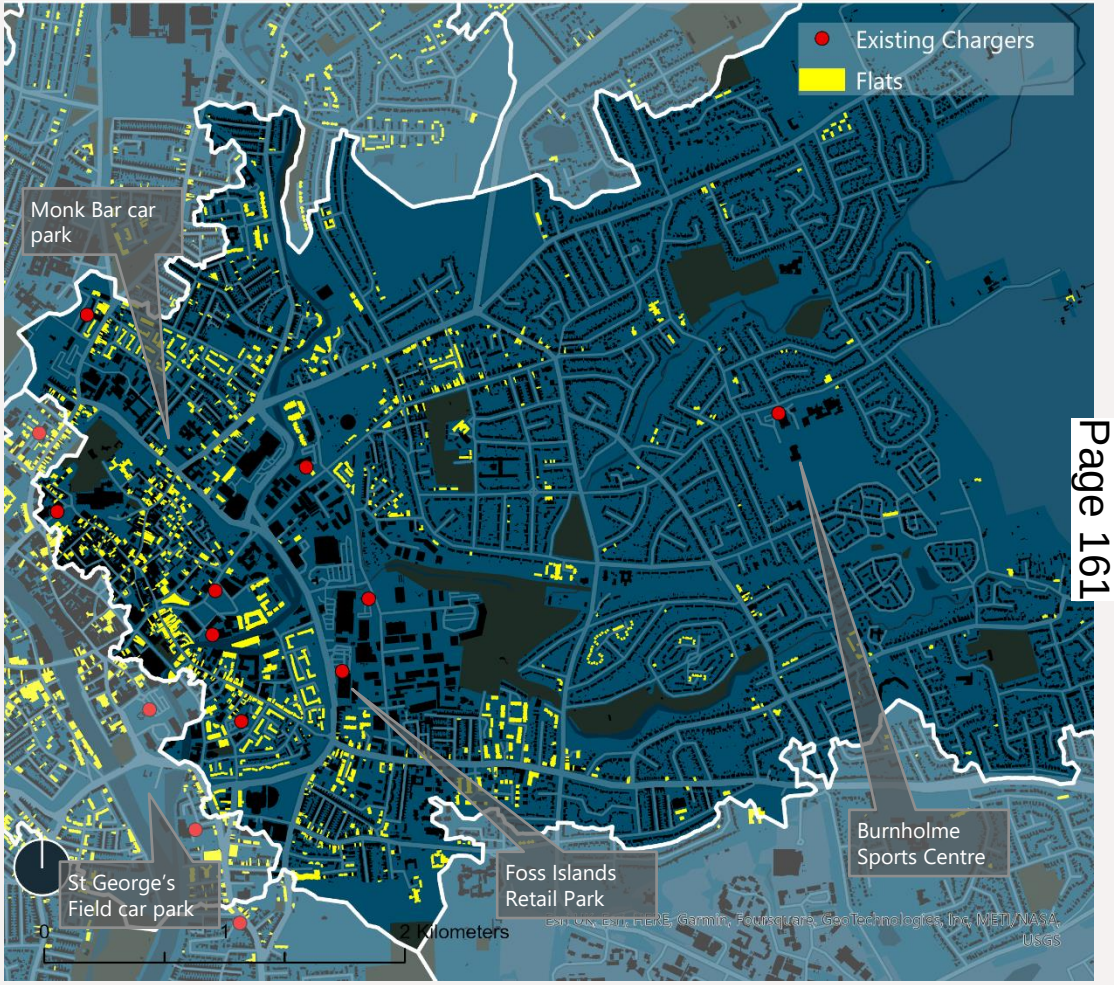
The Bishopthorpe to Copmanthorpe zone and the York Centre to Holtby zone have the largest expected uptake of EVs due to high private vehicle ownership, with around 18,500 expected in each zone by 2040 for the medium ambition pathway. Given there is significant spare capacity on the electrical network in the York Centre to Holtby zone, this has been identified as a focus zone for installation of public charging infrastructure.

Currently, there are around 135 public charge points around the city, but further expansion would be needed to keep up with demand in the near future. Given that there are a large number of flats in the York Centre to Holtby zone and little off-street parking (as shown in the map), it is likely that most charging will need to be provided by public charging infrastructure. This would include a mixture of kerb-side and destination/site charging.

The Foss Islands retail park, with a number of large supermarkets and major outlets, is a clear opportunity for the expansion of public charging provision, where residents and visitors will routinely spend prolonged periods parked. Beyond this, other public facilities such as the Burnholme Sports Centre could host EV chargers.

The Grimston Bar park & ride (off map) will host parked cars for prolonged periods – another opportunity to expand public charging (in addition to the chargers already present). There are a number of car parks in and around the city centre such as St George's Field which could have charging infrastructure installed, in addition to those such as Monk Bar which already have planned roll-out.

In the Wheldrake to Kexby zone, the Holgate to Hessay zone and the Clifton to Corban Lane zone, where substantial numbers of new dwellings are anticipated, EV charging can be fitted during construction, incentivising EV ownership and avoiding the need for costlier retrofit. Strategic transport planning in these areas to provide access to quality public transport and active travel routes could encourage behaviour changes that reduce car dependency, while promoting health.



Map showing flats and existing EV chargers in the York Centre to Holtby zone

In areas where demand is likely to be high, City of York 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. This could be due to lower charge point utilisation or where problems with network constraints or high connection costs could be additional barriers.


Local Generation

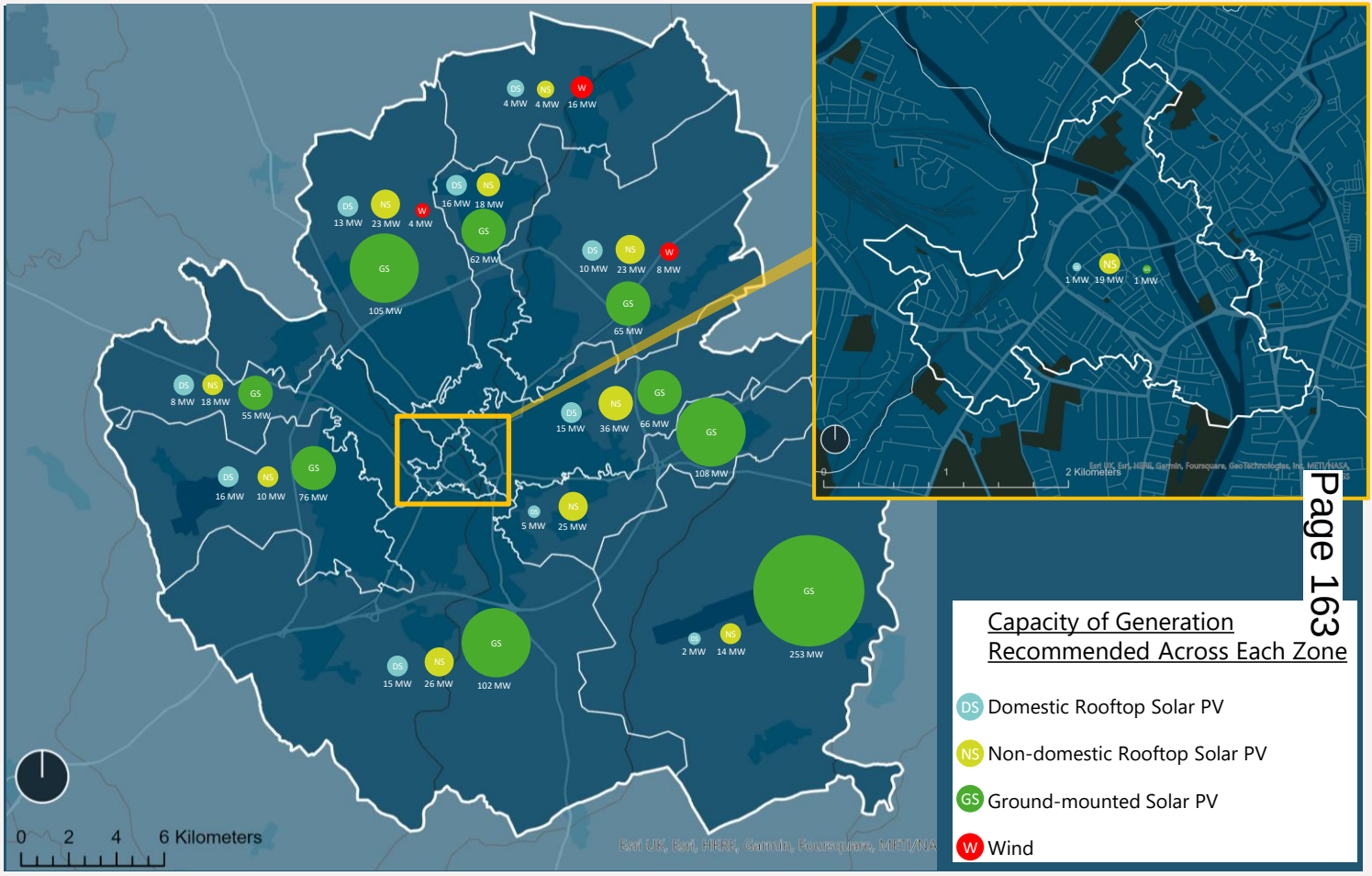
Overview

1,240MW

of wind and solar generation capacity could be developed

£840m

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 York's annual demand for electricity from 773 GWh to 1,273 GWh between 2020 and 2040. York 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 York 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 York to become a net exporter if fully developed.

To further reduce the spend on imported electricity from the grid, York 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.

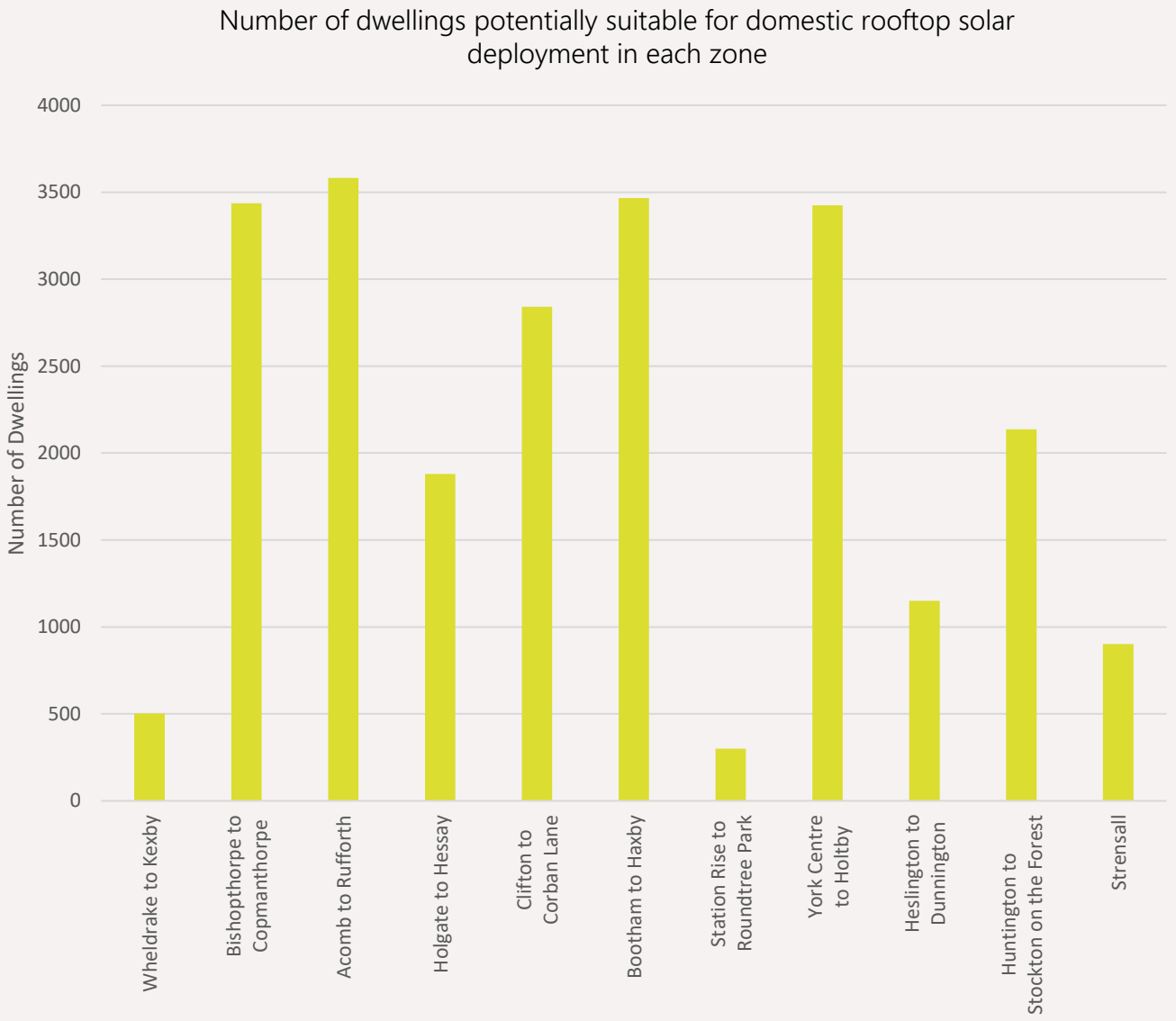
* For an example of a virtual PPA with large solar developments, see https://www.novartis.com/news/media-releases/novartis-set-achieve-100-renewable-electricity-its-european-operations

Domestic Solar PV

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

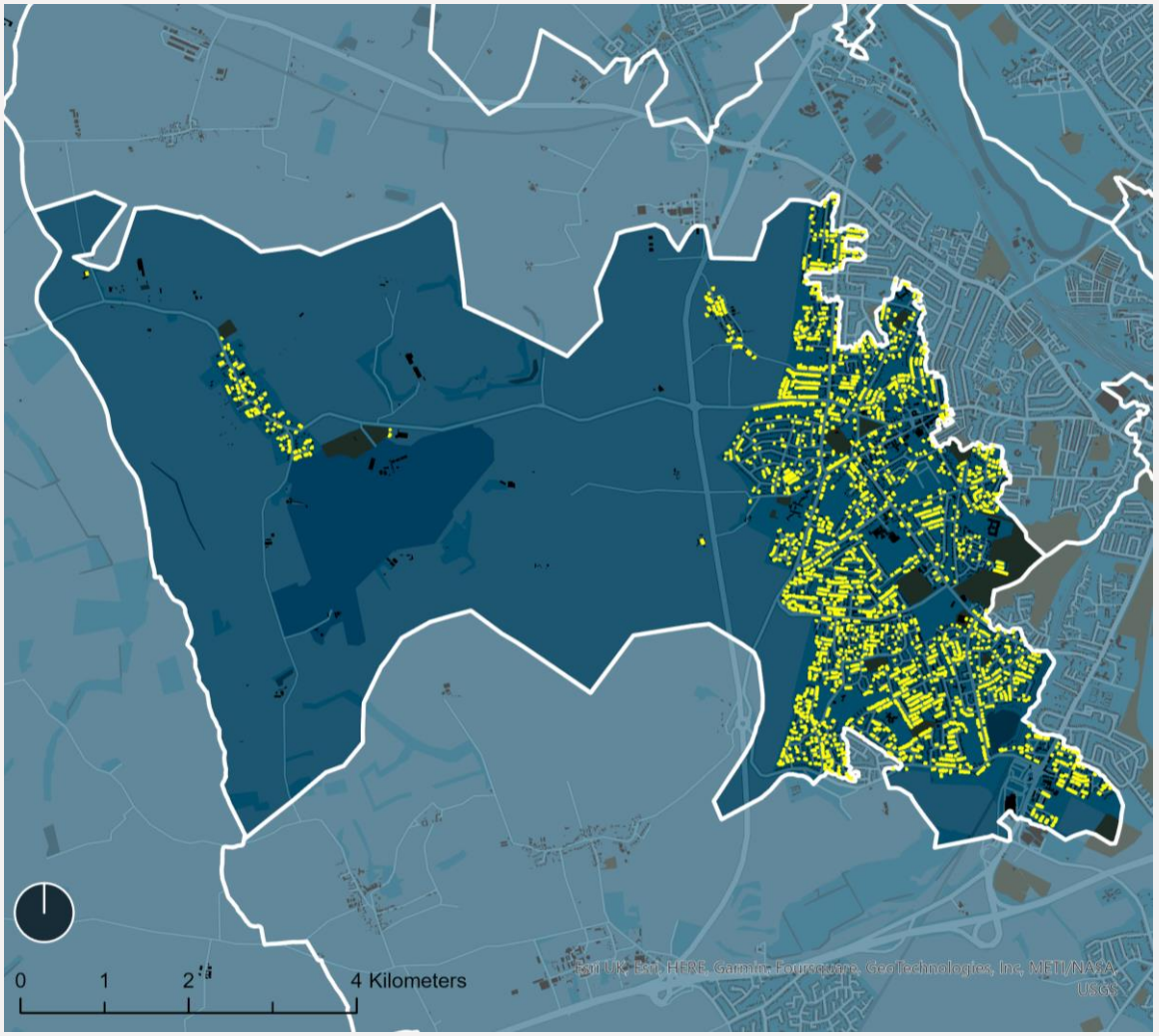
Based on roof orientation and pitch, dwellings are identified for solar PV suitability. If fully developed, a capacity of 105 MW could be installed for a total investment of £137 million. This would contribute 91 GWh per year to York's 1,235 GWh electricity demand in 2040 (with electrified heating and transport).

Local authority owned housing and social housing could be prioritized for roll-out of domestic PV in York. This approach could stimulate supply chain and skills in the area, preparing them for a larger roll out in private rental and owner-occupied residences. To assist owner-occupiers to invest in solar installations, programmes such as group buying schemes, which can be initiated by the LA, can be utilised to develop economies of scale and reduce costs to residents.



Domestic Solar Focus Zone

The Acomb to Rufforth zone has the greatest capacity for new generation in the local network, suggesting a large number of dwellings can install rooftop solar PV before network constraints are encountered. This also coincides with the greatest number of dwellings likely to be suitable for solar PV (over 3,500), making the Acomb to Rufforth zone ideal for an early focus of effort. Whole neighbourhood approaches could be taken to raise the profile of domestic solar to householders and drive down costs with scale and efficiency of installation.



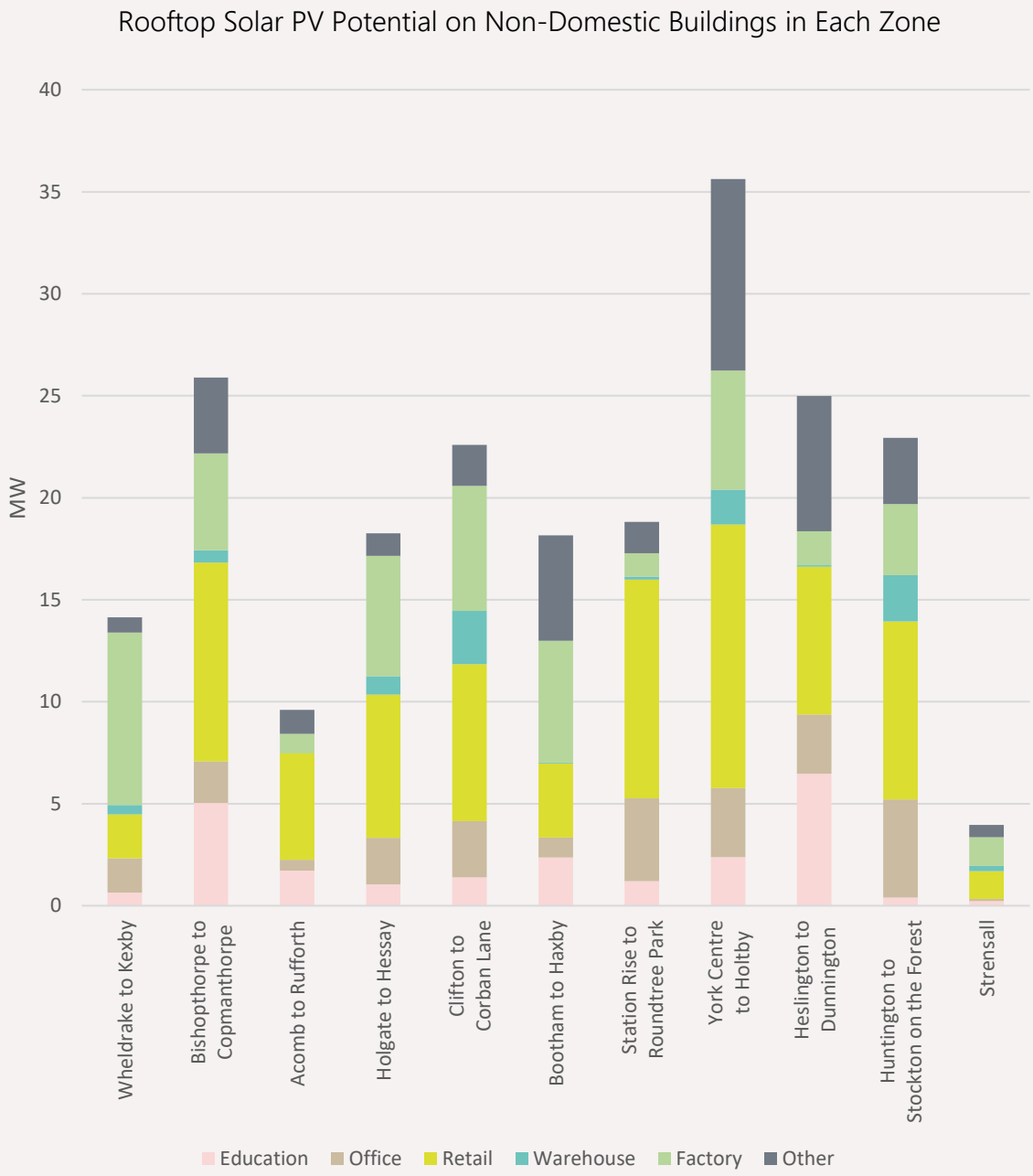
Dwellings with potential for rooftop solar PV in the Acomb to Rufforth zone

Non-Domestic Solar

Non-domestic solar installations also contribute to cost effective decarbonisation plans for York, regardless of the level of ambition. They have the potential to be more cost effective than domestic solar, but there are some challenges that arise when the building owner is not the bill payer. These projects would be low regret and should give confidence that they are an appropriate investment. The chart shows the 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 almost 10MW of rooftop solar already deployed on non-domestic sites, available roof space could host up to 215 MW of PV capacity if fully developed. This would contribute 207 GWh/year of electricity, for an investment of £195m.



Large-Scale Renewables

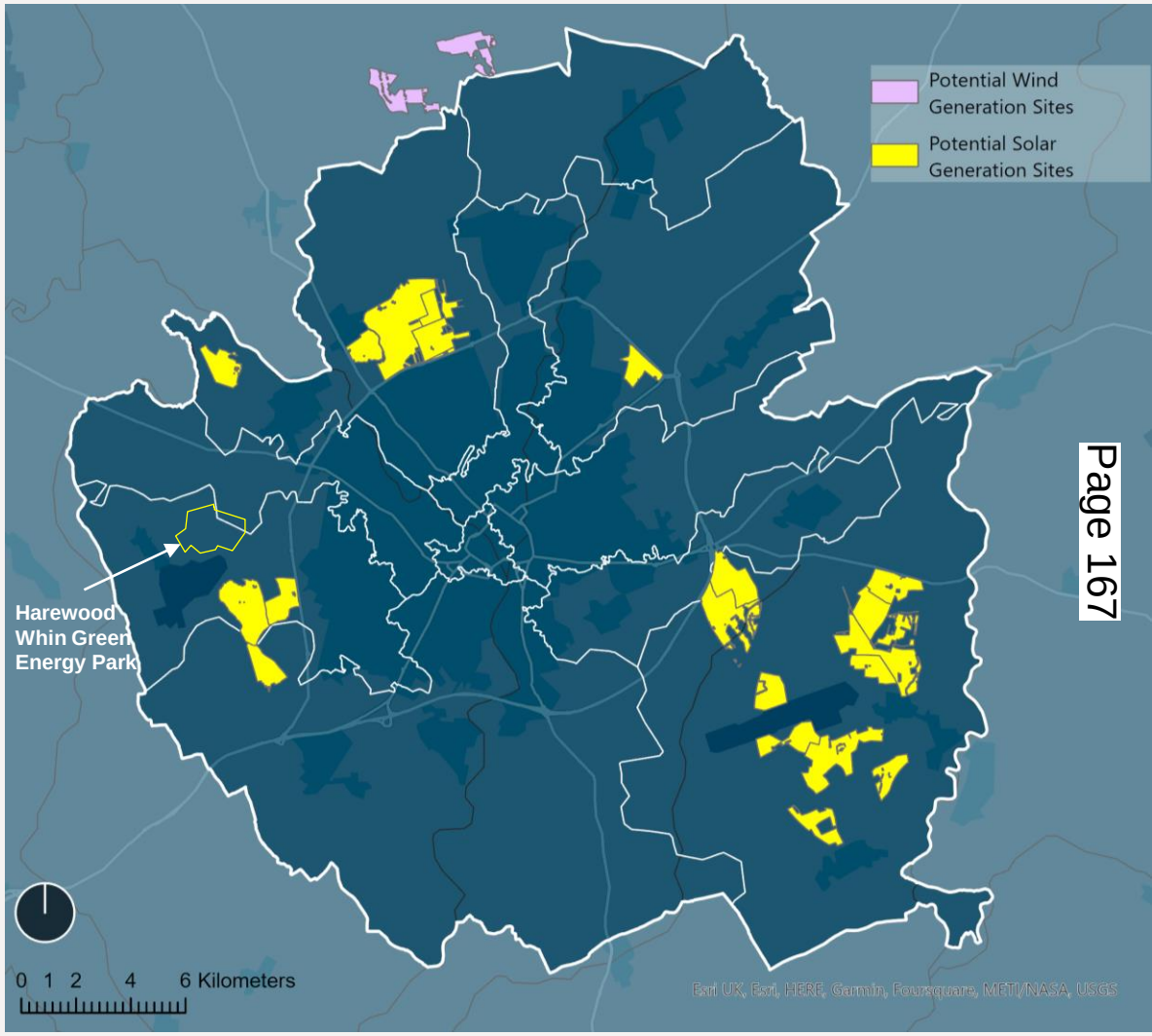
Large-scale renewable generation, particularly ground-mounted solar PV and onshore wind are the most cost-effective way to produce low-carbon electricity, due to economies of scale. Arrangements such as power purchase agreements (PPAs) and community ownership co-ops can capture this value locally. Many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

To give an impression of scale, land in York has been assessed for its suitability for ground-mounted solar and onshore wind. Around 3,900 hectares is suitable to build ground-mounted solar, which is enough space to host 950 MW of solar capacity. This is greater than what was found by the 2014 Renewable Energy Study by AMEC however there were differences in methodology whereby only the top thirteen sites were selected out of a shortlist of fifty-six.

A further 800 hectares of suitable land was found for wind turbines in areas of Hambleton and Ryedale immediately adjoining the York area boundary, sufficient to build 28 MW of capacity for an investment of £33m. No land within York was deemed suitable for onshore wind development using the criteria established. This contradicts the 2014 Renewable Energy Study undertaken by AMEC which found parcels of land with a potential installed capacity of 24 MW. Yorwaste are seeking to install up to 28 MW of solar PV and 2 MW of wind generation at their Harewood Whin Green Energy Park.

The remaining annual energy demand after developing rooftop solar and wind to their full potential could be met by developing 94% (893 MW) of the ground mounted solar potential. This would contribute 858 GWh per year of electricity for an investment of £475m.



Land suitability for large scale renewable developments

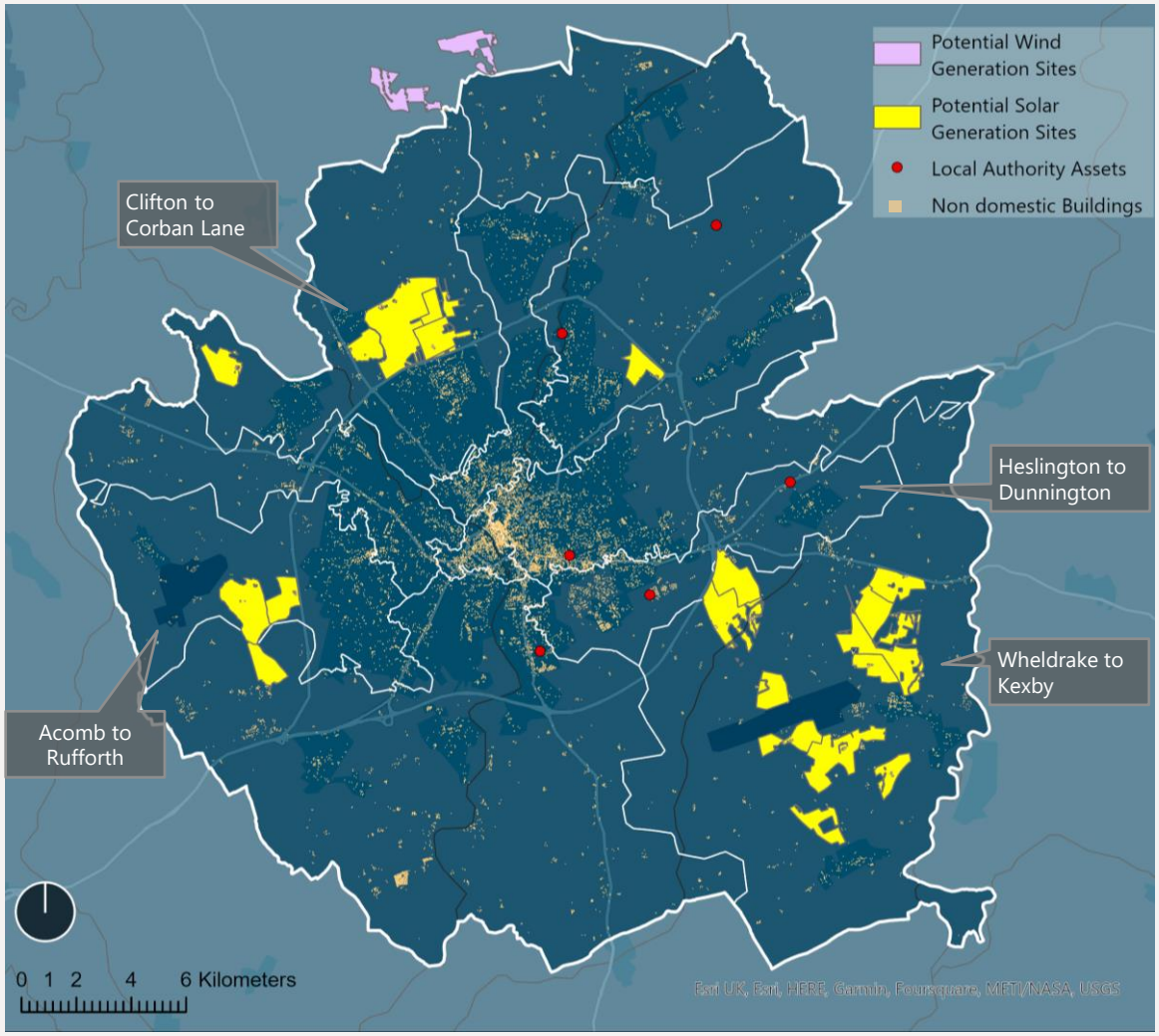
* Costs based on BEIS figures, including pre-construction cost and infrastructure cost scaled to capacity
https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/911818/GC20_Key_Data_and_Assumptions.xlsx

Large-Scale Renewables

It is not expected that ground-mounted solar would be built upon a single piece of land, but over a large number of distributed plots across York. 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 council-owned assets are located alongside land which has been deemed suitable for ground-mounted solar and wind.

As an additional benefit, well designed and located ground mounted solar and wind farms can support York's 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.



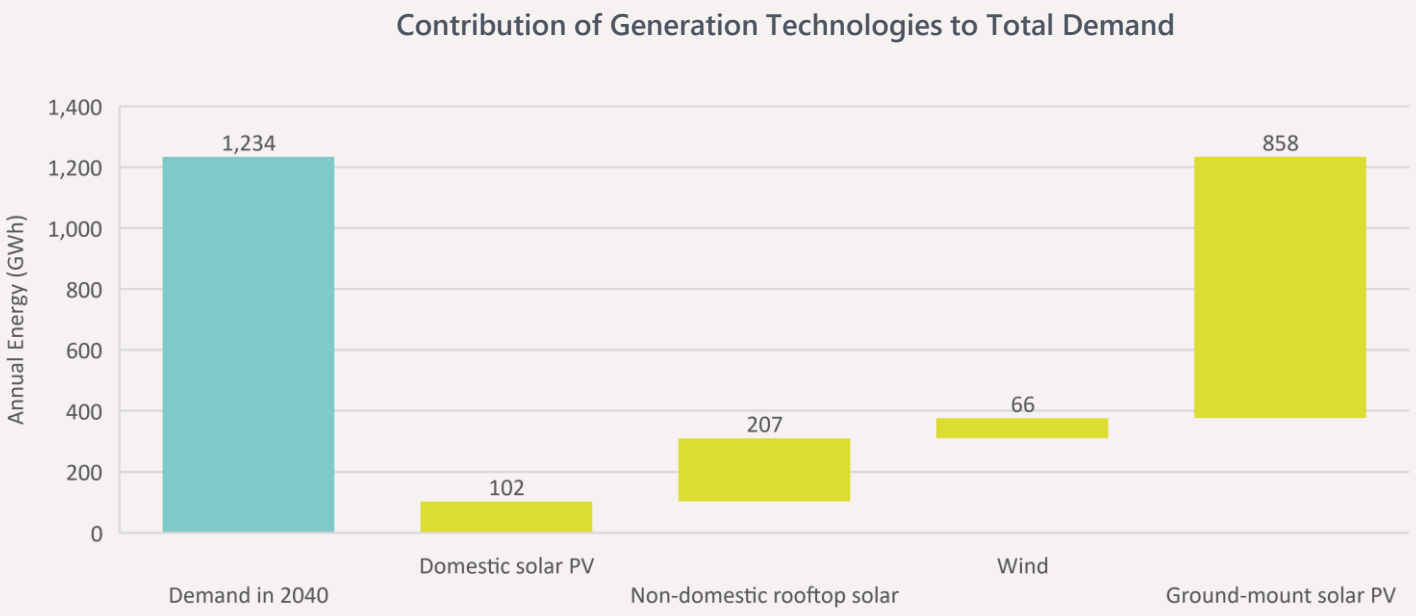
Land suitability for large scale renewable developments overlayed with potential purchases of energy

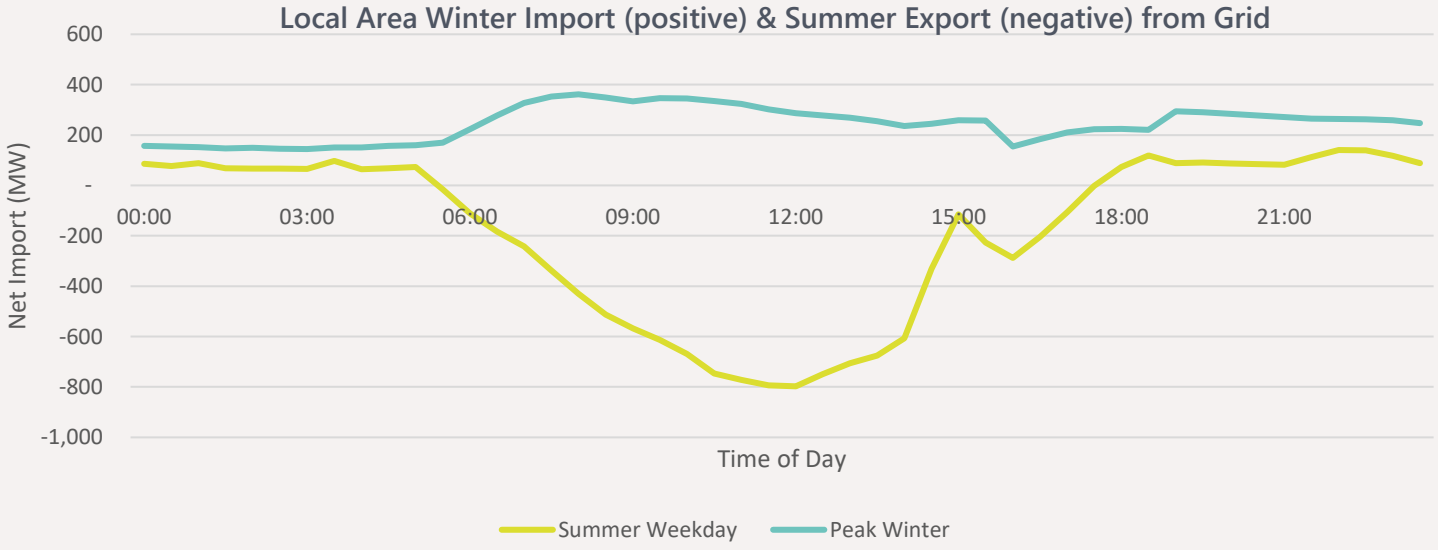
The Wheldrake to Kexby zone, the Acomb to Rufforth zone and the Clifton to Corban Lane zone contain large amounts of solar potential, however, LA assets as well as non-domestic sites are scattered and not always close to generating sites, thus making it difficult to benefit from proximity to generation.

The Heslington to Dunnington zone with its potential for solar in close proximity to a number of LA assets, could be a potential for private wire and PPA contracts, as well as P2P markets.

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

Large-Scale Renewables





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

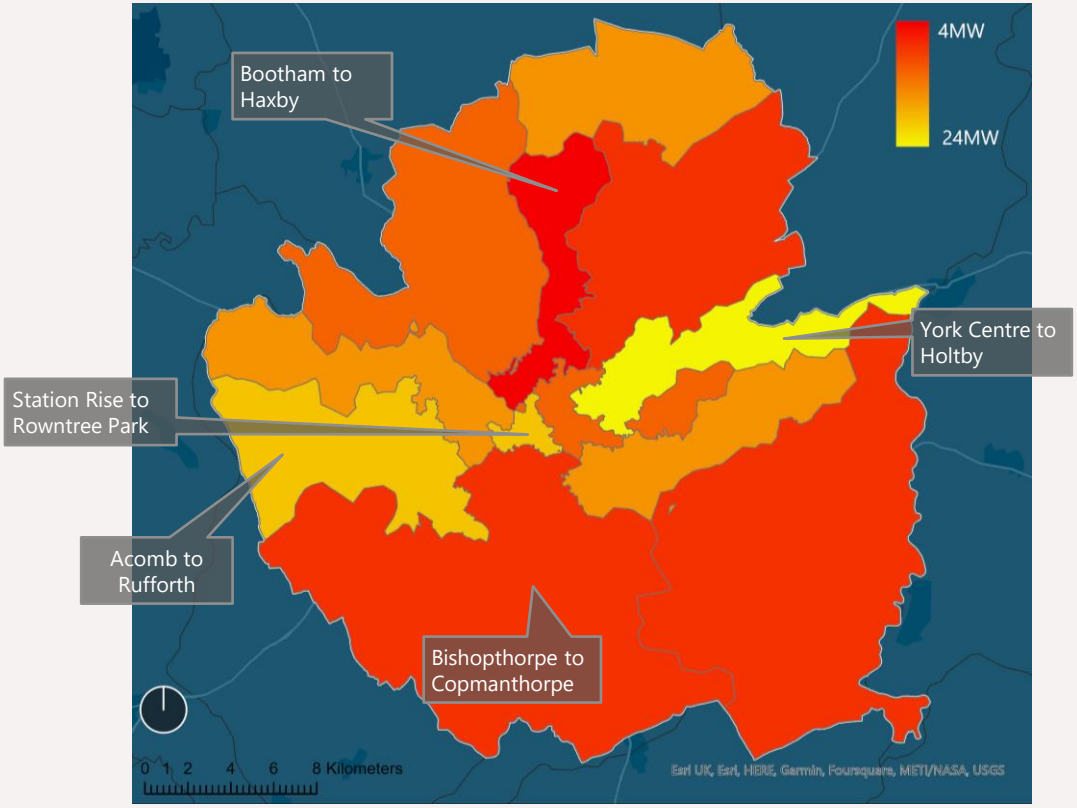
Since renewable generation will vary with weather, time of day and season, York would still need to import from the electricity grid when supply from local generation does not meet demand. Wind and solar are somewhat complementary, with wind increasing in winter months and occurring through the night, while still days are often ver bright. Battery storage would enable more of the genera electricity to be utilised locally at times of demand, but would not be suitable to store the energy inter-seasonall 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). Greater grid capacity would be required to absorb this surplus than the capacity needed to supply the area in winter. Any large scale deployments of solar generation will need to be coordinated with Northern Powergrid to ensure that network capacity is available.

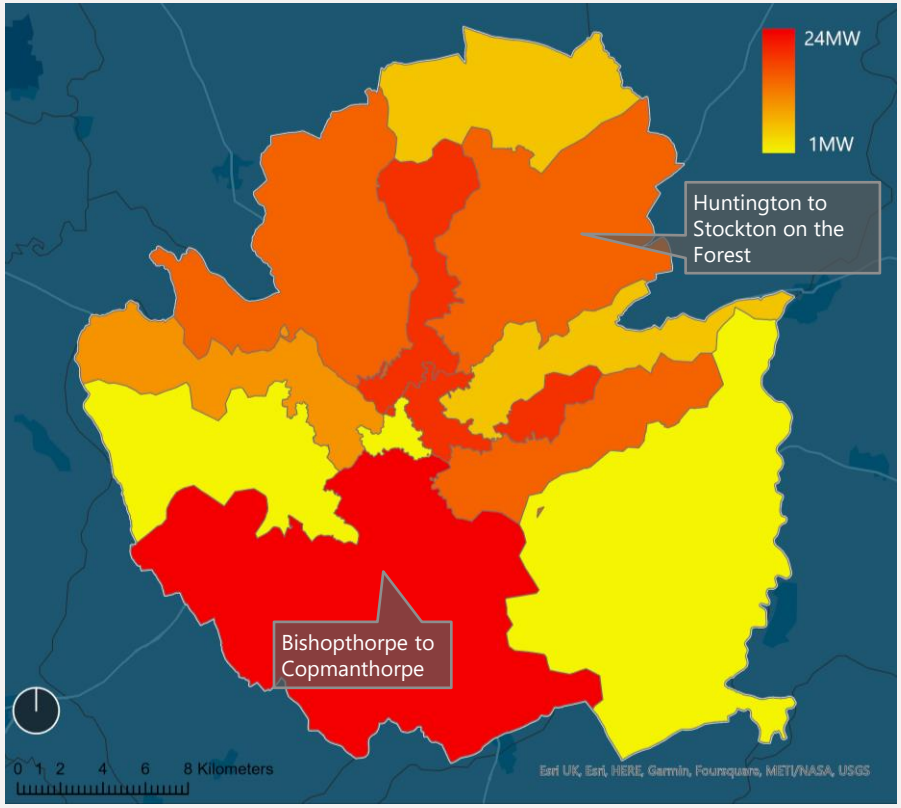
National Grid's Future Energy Scenarios envisage around 20 gigawatts (GW) of solar in the North of England by 2050. If distributed evenly by household, this would be about 315MW for York. This implies that generating all of York's annual demand locally could require more local renewable capacity than the grid is likely to be able to accept.

Networks, Storage & Flexibility

Upgrading the High Voltage Network



Current headroom on the high-voltage network



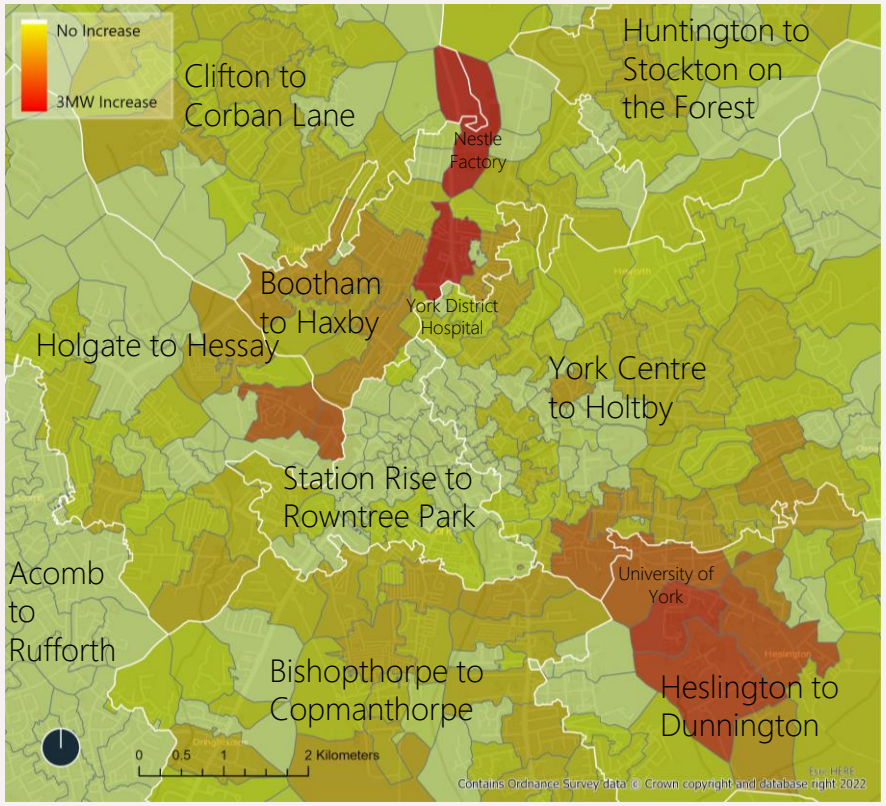
Increase in peak demand on the high-voltage network to 2040

A total gross investment of £20m in capacity upgrades is estimated across the high and low voltage networks by 2040 to accommodate the changes in this pathway. 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."

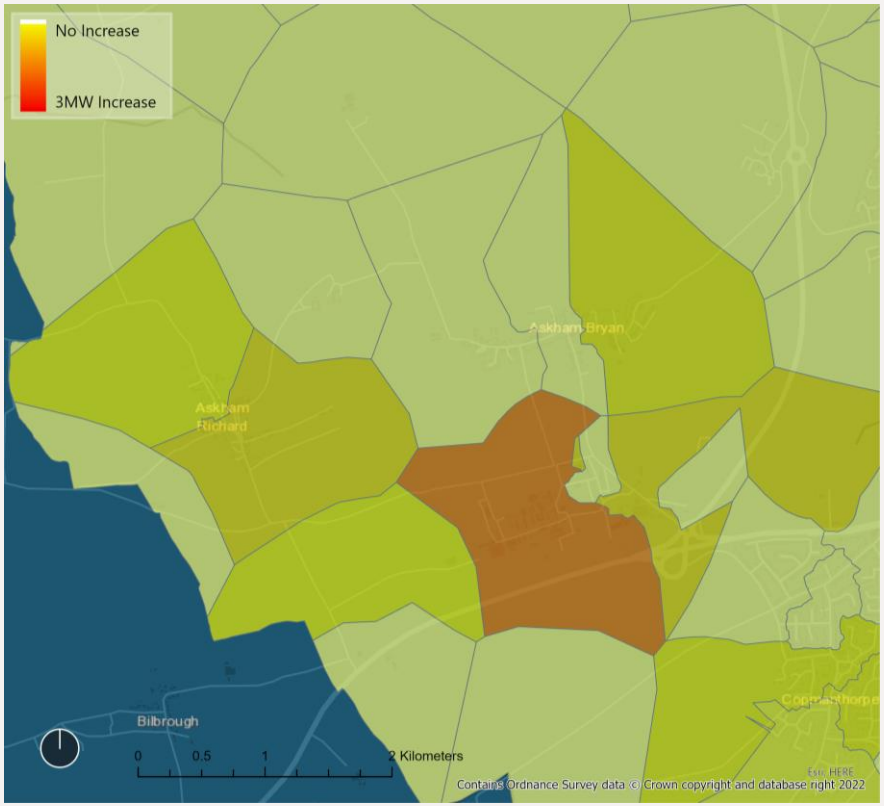
The high voltage network consists of substations on land owned by the distribution network operator, supplying feeders which run to secondary substations, which in turn serve multiple streets. The maps above show the areas of York served by each HV substation.

The amount of headroom currently available on the high-voltage network varies significantly across the area, as shown in the left map. Several zones such as Bishopthorpe to Copmanthorpe and Bootham to Haxby have little headroom available, York Centre to Holtby has a lot more, along with Acomb to Rufforth and Station Rise to Rowntree Park to a lesser degree. Large scale electrification is very likely to trigger the need for capacity upgrades, but several areas have sufficient capacity to get started on small near-term projects. As shown in the map on the right, several areas are likely to require capacity upgrade to accommodate the full extent of electrification needed to reach net zero, such as Bishopthorpe to Copmanthorpe, Bootham to Haxby and Huntington to Stockton on the Forest.

Upgrading the Low Voltage Network



Demand change on the low voltage network around Central York



Increases in peak demand in 2040 in Askham Bryan

The low voltage network consists of smaller neighbourhood substations, supplying feeders which run under pavements or roads to each building or on overhead wires in rural areas. The maps above show for some example areas that parts of the LV network are likely to see significantly more peak demand increase than others, for instance around the York District Hospital and the university campus.

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.

Outline Priority Projects

Overview

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

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

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

Further details, information and advice for implementing the Outline Priority Projects can be found towards the end of this document.

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

Buildings Efficiency Upgrades

Almost 1,000 terrace dwellings built between 1945 and 1979 are likely to be suitable for basic efficiency upgrades across the Acomb to Rufforth zone. As this is an area of high fuel poverty, efficiency upgrades would be especially impactful in their social benefits.

Identification of social housing in this area is likely to be a good starting point. It may then be possible to design a scheme that targets retrofit of all social housing, but with an offer to owner-occupied households and private landlords to join the scheme while contractors are in the area. This has the potential to reduce costs for all homeowners, at the same time as increasing the number of retrofits carried out.

Zone	Acomb to Rufforth
Building Type	Terrace 1945-1979
Number of Dwellings	1,000
Insulation Type	Basic
Cost	c. £1.1m

Dwellings suitable for efficiency upgrades in sample area of Acomb to Rufforth zone (does not show all dwellings identified for project)

Heating Demonstrators & Enablers

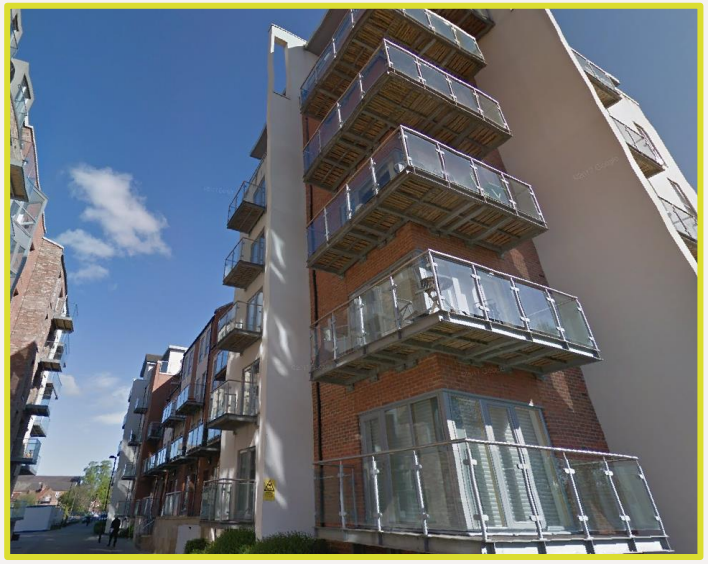
Heat Pump Demonstrators

The Bishopthorpe to Copmanthorpe zone has a significant number of terrace dwellings (just over 4,050) which could be suitable for air source heat pumps making this a good area for early demonstration neighbourhoods. Demonstration neighbourhoods could be valuable for developing the approach for particular housing types, identifying common barriers and finding solutions, such as recommending changes to planning rules.

Terrace dwellings in the Bishopthorpe to Copmanthorpe zone

The York Centre to Holtby zone has many flats (1,650) which could have air source heat pumps installed. 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 supply and a shared distribution could also be investigated.

Zone	Bishopthorpe to Copmanthorpe	York Centre to Holtby
Number of Dwellings	4,050	1,650
Building Type	Terrace	Flats
Heating System	ASHP	ASHP
Total Cost	c. £28m	c. £11m



Flats in the York Centre to Holtby zone

District Heat Network Demonstrators

In addition to the air source heat pumps, the York Centre to Holtby zone also has the greatest number of flats which could connect to a district heat network (2,650). In the Acomb to Rufforth zone, 1,400 terrace dwellings could also connect. Both areas could host demonstrators of heat network connection for these types of dwellings. Early steps 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.

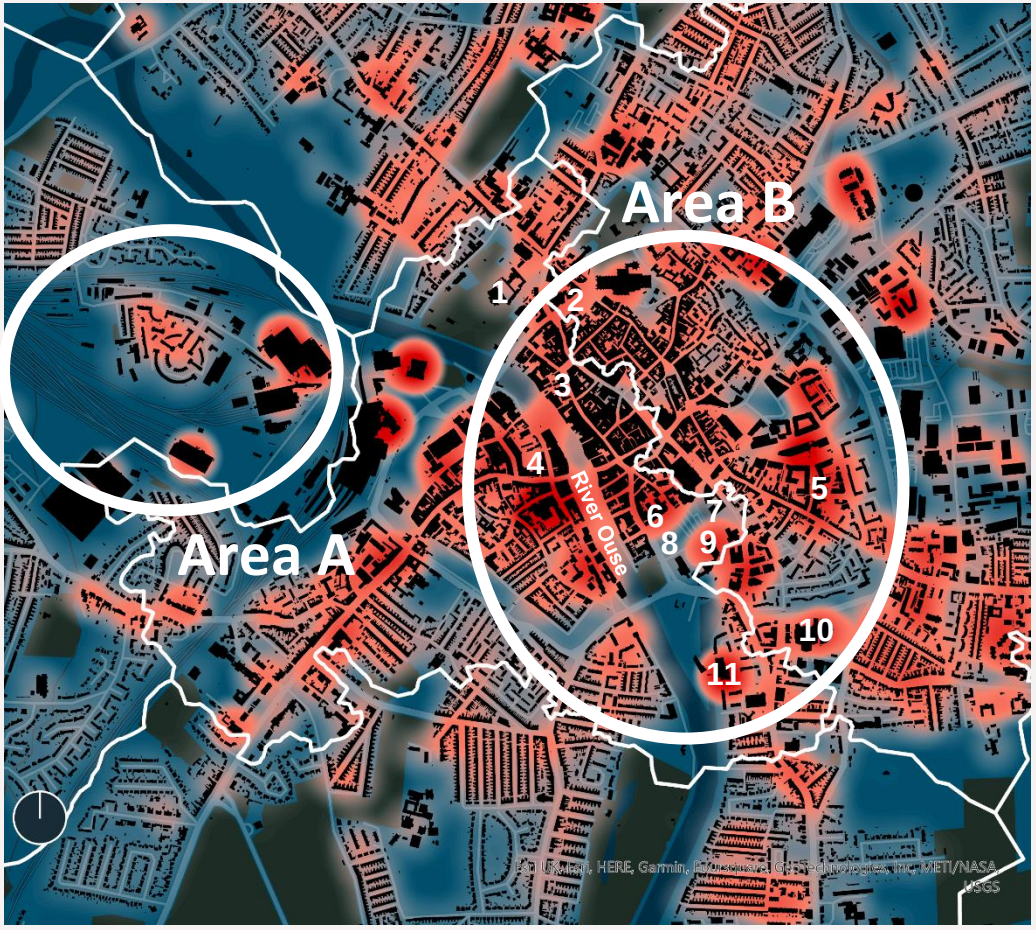
* https://es.catapult.org.uk/case-study/electrification-of-heat-2000s-flat-heat-pump-installation/

Heat Network Starting Point

The heat network proposed for the York Central Energy Masterplan redevelopment (area A) could form a starting point for further expansion into the city. The area either side of the river near Clifford's Tower has a particularly high density of buildings and heat demand (area B). Although many of these buildings are private businesses, which could be more difficult to get on board, large anchor loads such as the York Castle and Yorkshire museums, student accommodation and the hotels in the area could help secure the viability of a heat network. Heat networks could allow historic buildings such as Fairfax House or York Mansion House to decarbonise with minimal disruption. The heat demands in area B are estimated in the table below.

It may be feasible to extract heat from the river using a water-to-water heat pump, as explored in the York Central Energy Masterplan, which can lead to higher efficiency and lower running costs. York also sits on an aquifer which has potential to provide large quantities of heat.

The mixture of domestic and non-domestic buildings allows for more of a balanced load across the network at any given time. Nevertheless, anchor loads (such as large schools, hospitals, leisure centres) with a steady and constant heat requirement should be sought if possible.
The table shows the split of domestic and non-domestic properties and the peak demands within the starting area marked on the map. (Note: peaks are not additive as domestic and non-domestic peaks will not occur at the same time.)



1. Yorkshire Museum
2. Theatre Royale
3. York Mansion House
4. Travelodge
5. Student Accommodation
6. Hilton Hotel
7. Hampton Hotel
8. Clifford's Tower
9. York Castle Museum
10. York Barbican
11. Novotel

Zone	Number of Domestic Dwellings	Number of Non-Domestic Properties	Domestic Peak Demand	Non-Domestic Peak Demand	Combined Network	
					Total Peak Demand	Cost
Station Rise to Rowntree Park	1,456	1,233	3.17 MW	26.19 MW	44 MW	c. £90m
York Centre to Holtby	927	981	2.44 MW	13.91 MW		

Onshore Wind

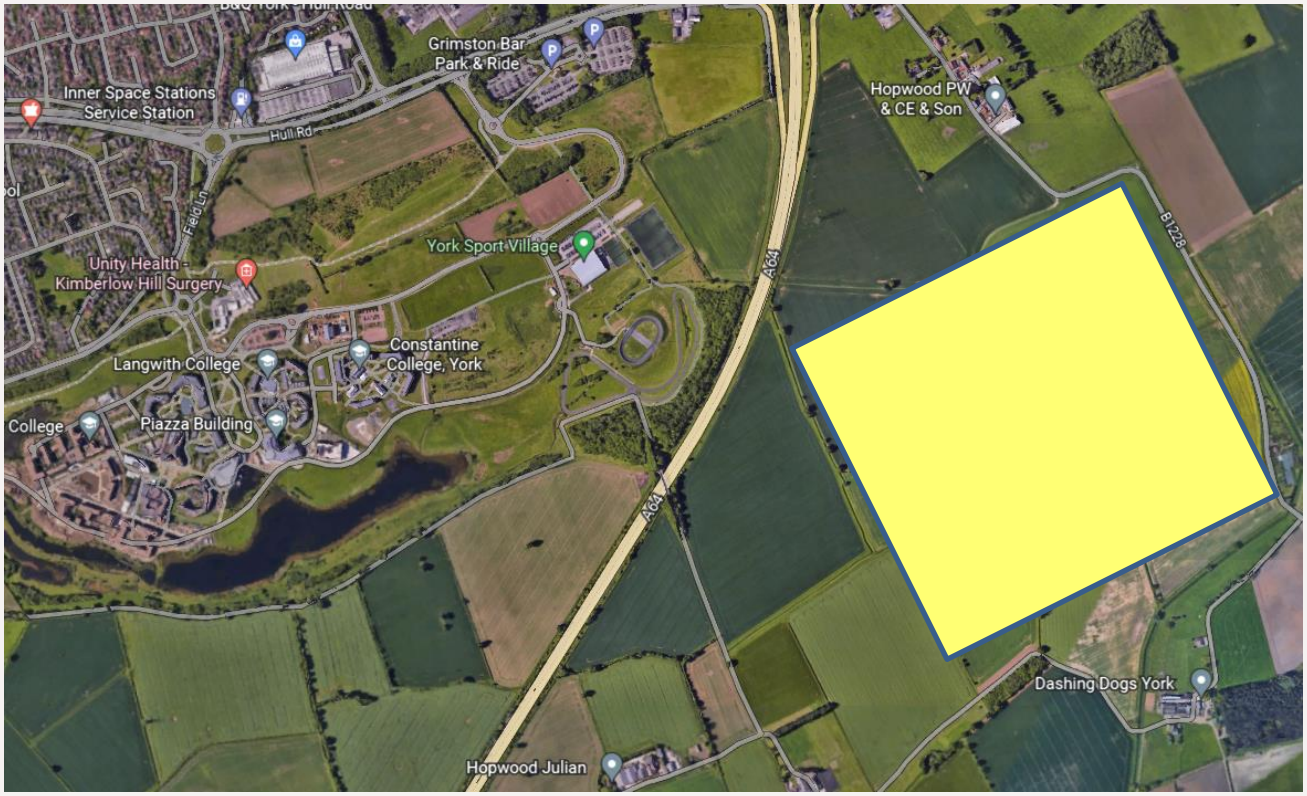
The potential locations for wind turbines north of Wigginton, in the Hambleton area, would be more distant from major consumers, so more likely to feed into the grid. However, a wastewater treatment plant to the north-east of Strensall, Robert Wilkinson Primary Academy to the north and Queen Elizabeth Barracks to the south could be candidates for power purchase agreements.

Zone	North of Wigginton
Size	2 MW
Total Cost	c. £2.4m
IRR	4.5% - 7%
Payback period	15-20 years

Potential Business Models

Ownership	Local authority owns the land and builds a project on it.
	Local authority partners with an organisation and jointly invests.
	Local authority leases the land it owns for others to develop ground mounted PV.
Energy Trading	Via power-purchase-agreements, the LA can secure low-cost electricity with low associated emissions counting towards their footprint.
	Via a power purchase agreement (PPA), a utilities company can be an off taker of all or some of the generation.

Grimston Bar Park-and-Ride Solar Charging Hub



A major area of land suitable for ground solar deployment in the Wheldrake to Kexby zone is near to the Grimston Bar park and ride facility, as well as the east campus of the University of York and the sport village. A 30 MW array (shown as yellow area) would generate power sufficient to supply large numbers of EV chargers and university buildings in favourable conditions. At peak output for example, 30 MW would be sufficient to supply 600 rapid 50 kilowatt (kW) EV chargers or almost 4,300 fast 7 kW chargers.

Zone	Wheldrake to Kexby
Size	30 MW
Total Cost	c. £16m
IRR	7% - 9%
Payback period	15-20 years

Domestic Solar PV

The area around Hull Road Park in the York Centre to Holtby zone has high levels of fuel poverty, coinciding with large numbers of dwellings likely to be suitable for rooftop solar PV. Approximately 500 dwellings in this neighbourhood could be prioritised ahead of the rest of the zone for PV deployment.

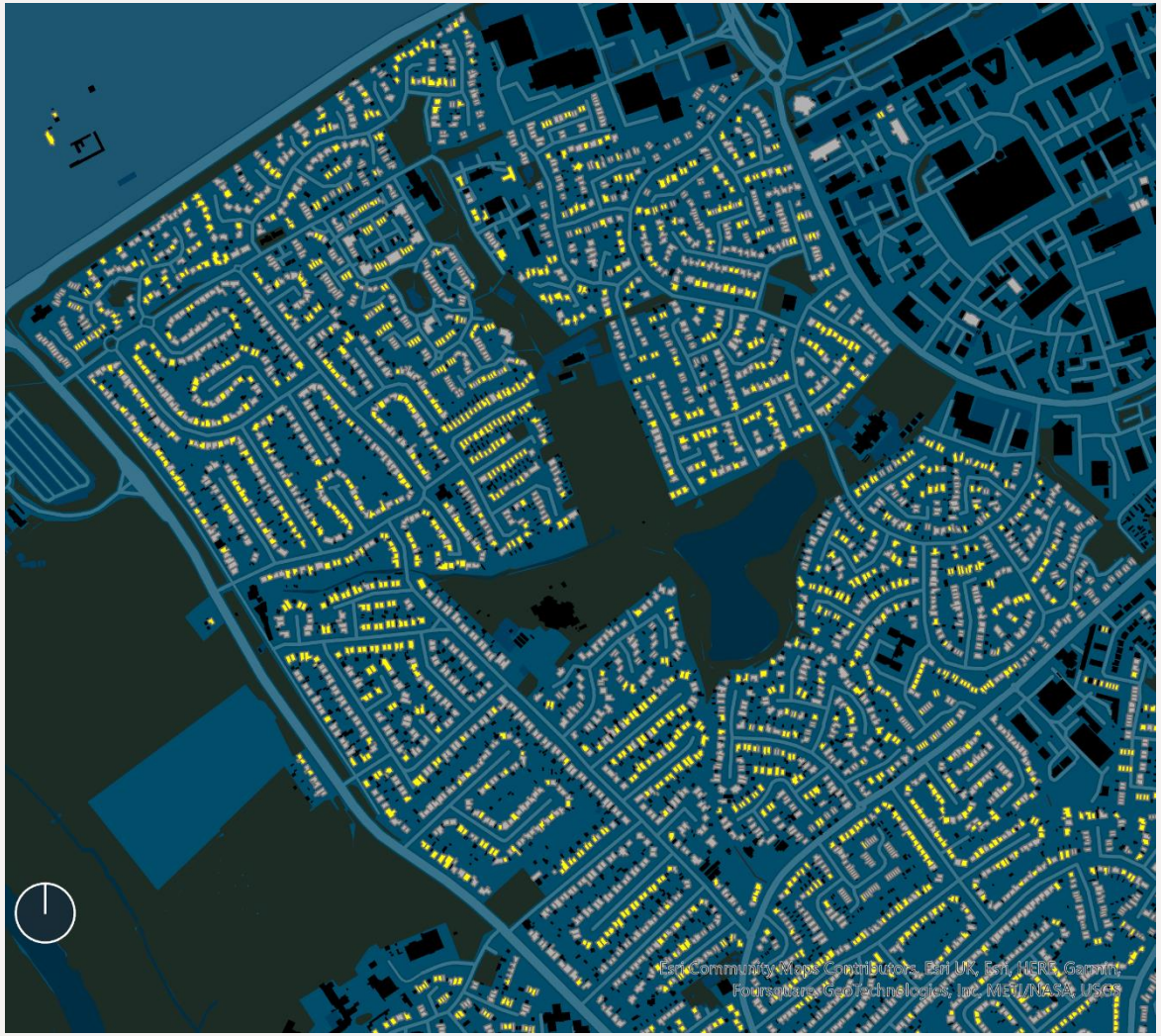
Generating electricity on-site can reduce the requirement to purchase electricity from suppliers which can reduce costs to the household (depending on how the PV installation is paid for). The roll-out of a scheme like this could start with social housing by working with key stakeholders. As with fabric retrofit, it may be possible to offer lower cost installations to private owners by widening such a scheme. Feasibility studies would be required.

Zone	York Centre to Holtby
Number of Dwellings	c. 500
Total Cost	c. £3.2m

Dwellings with potential suitability for rooftop solar PV around Hull Road Park highlighted in yellow

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 Solar PV



Dwellings suitable for rooftop solar PV in Rawcliffe

Zone	Clifton to Corban Lane
Number of Dwellings	c. 1,000
Total Cost	c. £6.4m

The able-to-pay market is the largest market in any area. With the increase in cost of energy, rooftop solar can provide a mechanism to reduce costs of energy for households. The more affluent area of Rawcliffe has around 1,000 dwellings likely to be suitable for rooftop solar PV.

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.

Non-Domestic Solar PV

Large public buildings are well suited for quick win rooftop solar PV projects. Large roof space makes a more cost-effective installation possible. Occupation of the building through the daytime means that a high proportion of the electricity generated can be used on-site, maximising bill savings. Institutions which own their buildings will be best-placed for rapid deployment of projects.

The National Railway Museum's south-facing roof could host 640 kW of solar capacity if completely covered, generating around 617 MWh of energy per year for an investment of around £575k.

The York Leisure Centre has space on its roof for approximately 370 kW of solar PV capacity. For an investment of around £334k, this could generate 292 MWh of electricity per year. More ambitiously, the neighbouring stadium has a roof big enough to accommodate 640 kW on the largest roof, though this would be subject to the structural capabilities of the roof.

The Royal Mail Birch Park depot might be able to host 80 kW of solar panels on its roof, producing 77 MWh of energy per year for an investment of around £72k.

Large roof space of the Monks Cross shopping park

Commercial buildings have some of the largest roof areas, though since many commercial buildings are leased, with bills paid by tenants, installation of solar can be less straightforward. The Monks Cross shopping park hosts multiple businesses under one roof. If most of the south- and south-east-facing roof was used to site solar panels, as much as 1.5 MW capacity could be hosted for an investment of £1.35m.

City of York Council

Equalities Impact Assessment

Who is submitting the proposal?

Directorate:	Corporate Policy and Strategy
Service Area:	Carbon Reduction Team
Name of the proposal :	Local Area Energy Plan
Lead officer:	Shaun Gibbons
Date assessment completed:	

Names of those who contributed to the assessment :			
Name	**Job title**	**Organisation**	**Area of expertise**
Shaun Gibbons	Head of Carbon Reduction	CYC	Carbon Reduction
Issy Burkitt	Carbon Reduction Project Officer	CYC	Carbon Reduction

Step 1 – Aims and intended outcomes

1.1	**What is the purpose of the proposal?** Please explain your proposal in Plain English avoiding acronyms and jargon.
	In 2018, the Intergovernmental Panel on Climate Change (IPCC) published a special report on Global Warming, describing the devastating impact a global temperature rise of 2°C would have on our planet and the importance of limiting warming to 1.5°C. In response, the UK has committed to bring all greenhouse gas emissions to net zero by 2050. In York, the Council declared a Climate Emergency in 2019 and set an ambition for York to be net zero carbon by 2030. York recognises its place as a leader on climate action. Since 2005, we have reduced our emissions by 39%, but there is still more that we can do. Creating a Local Area Energy Plan (LAEP) is regarded as a critical enabler to decarbonisation, given that spatial planning is one of the biggest opportunities local authorities have to deliver net zero. A LAEP is a holistic spatial approach to decarbonising an area's energy system that provides decision-makers with the detailed information needed to support informed policy and investment decisions. The LAEP is a report, spatial plan and pipeline of investable projects to support the energy transition, at best value, for the council and the city. It provides an optimised, cost-effective, and evidence-based pathway to achieving our 2030 ambition.

1.2	**Are there any external considerations?** (Legislation/government directive/codes of practice etc.)
	The UK government is legally bound to achieving net zero by 2050. The 2021 Net Zero Strategy sets an interim target to reduce emissions by 78% by 2035 and sets the trajectory for phasing out the sale of gas boilers and fully decarbonising the power system. The York and North Yorkshire Local Enterprise Partnership aims for the region to be carbon neutral by 2034 and carbon negative by 2040. The Partnership provides support for businesses, assessments of local skillsets and a routemap for York and North Yorkshire becoming England's first carbon negative region. Within CYC, the economic, health and wellbeing and climate change strategies provide a framework for 10 years of activity. The Local Plan also includes climate considerations.

1.3	**Who are the stakeholders and what are their interests?**
	City of York Council The council is taking a leading role in tackling climate change and will reduce corporate emissions to net zero by 2030; however, the council is directly responsible for less than 4% of the total emissions in York. While the council's wider influence can extend beyond this, through purchasing decisions and local policy, every aspect of our society will need to contribute towards achieving our city-wide ambition. **Businesses** With over 7,000 businesses and a Gross Value Added (GVA) of £6.5bn, York is a major driver of growth across the region and beyond. The city is home to a diverse range of enterprising and innovative businesses, many of which are already taking proactive steps to reduce their carbon emissions. Almost 80% of businesses who responded to the Council's Our Big Conversation agree with the ambition for York to be a net zero by 2030, and 20% of firms have considered diversifying into goods and services that are part of the green economy over the next year. Businesses can take actions that not only reduce carbon emissions but also reduce costs and have a positive impact on society. Steps to reduce energy consumption, influence behaviour change (among employees, customers and networks), and engage local supply chains, supports our net zero ambition, ensures businesses are resilient to climate change and provides opportunities for new local jobs. The Local Government Association estimates that 3,090 green jobs will be required in York by 2030 in the low-carbon and renewable energy sector, with the majority of these in bioenergy, low-carbon heat pumps and building insulation. By 2050, this number is expected to be at least 4,902. **Residents** York is home to 210,000 people. We can all make positive changes to how we live and travel around the city, which can help reduce emissions. Making improvements to our homes reduces emissions but also lowers energy bills. Our residents can shape and create neighbourhoods that meet our daily needs close to home and make consumer choices that demonstrates demand for more sustainable products. Encouragingly, 69%

	of respondents to Our Big Conversation have made changes to their purchasing habits and a similar proportion, 65%, have made changes to their personal travel 80% of respondents to Our Big Conversation agree with the ambition for York to be net zero carbon by 2030. Residents have a powerful voice to call for change from their employers, companies, local and national governments. By talking about climate change with others, residents in York can help encourage others to act. York residents equipped with the right skillset have the potential to benefit from new green jobs. In 2021, 14% of residents believed they would have to retrain to continue working in York. Helping residents to develop the knowledge and skills suitable for green jobs can reduce the city's carbon emissions alongside helping residents to recover from the COVID-19 pandemic and support our inclusive growth ambitions. **Visitors** York has been a tourist destination for almost 2,000 years, since being founded by the Romans in 71 AD. These days, York welcomes 8.4 million visitors every year, with the sector contributing £909 million to York's economy. One in five of York's visitors stay overnight in one of over 20,000 bed-spaces and the visitor economy supports 25,000 jobs in the city. We also welcome close to 900,000 conference and event delegates every year. Despite reduced visitor numbers through the pandemic, York remains an attractive visitor destination with a strong regional market. The city's new tourism strategy will take a leap into the future with a bold new plan to rebuild the visitor economy in a more sustainable and integrated way. We want to see York develop as a liveable city, as well as a thriving visitor destination. **Investors** Delivering net zero and adapting to climate change will require significant investment. The city will need to work with the financial sector and attract external investment to help deliver new infrastructure, financial mechanisms and funding for climate projects. Emissions from buildings account for over 60% of our

	emissions, investing in retrofit and renewable energy will strengthen the local economy, create new employment opportunities and help meet our climate ambitions. Our commitment to net zero and climate resilience will make York a more attractive prospect for external investment. Organisations are increasingly incorporating environmental and sustainability considerations into their decision making process. **Academic institutions** York has 63 schools, 2 further education colleges and 2 internationally renowned universities. Around 25,000 school-aged children live in York and a sixth of our population are under 18 years of age. Our academic institutions are crucial for providing new ways of thinking, innovative solutions, research, funding and talent to help develop new ideas and create a more sustainable York. By educating students on the importance of climate change, we can ensure the next generation lead the way in climate action, viewing every job as a green job. **York Climate Commission** City of York Climate Change Commission is a body representing and reflecting public and private sector representatives from across the City of York to deliver action, strategic oversight and accountability for the progression of city's climate change agenda. **Regional ambition and working outside of York** **The Yorkshire & Humber Climate Commission** represents members of local councils, businesses and third sectors. The Commission aims to reduce the carbon emissions of the region as quickly as possible by enabling engagement, providing evidence and promoting best practice. **The York and North Yorkshire Local Enterprise Partnership** **The UK government**

1.4	**What results/outcomes do we want to achieve and for whom?** This section should explain what outcomes you want to achieve for service users, staff and/or the wider community. Demonstrate how the proposal links to the Council Plan (2019- 2023) and other corporate strategies and plans.
	As we move towards 2030, we hope to see rapid decarbonisation through actions of the council, businesses, residents and other city users. Creating a Local Area Energy Plan (LAEP) is regarded as a critical enabler to decarbonisation, given that spatial planning is one of the biggest opportunities local authorities have to deliver net zero. A LAEP is a holistic spatial approach to decarbonising an area's energy system that provides decision-makers with the detailed information needed to support informed policy and investment decisions. The LAEP is a report, spatial plan and pipeline of investable projects to support the energy transition, at best value, for the council and the city. It provides an optimised, cost-effective, and evidence-based pathway to achieving our 2030 ambition. The LAEP directly links with the Climate Change Strategy and action plan by providing projects that align with the 32 objectives in the strategy and provide projects within the action plan to ensure the move towards a greener and cleaner city. The Local Plan was taken into consideration when creating the LAEP to ensure the plan also aligns with current and future planning policies.

Step 2 – Gathering the information and feedback

2.1	**What sources of data, evidence and consultation feedback do we have to help us understand the impact of the proposal on equality rights and human rights?** Please consider a range of sources, including: consultation exercises, surveys, feedback from staff, stakeholders, participants, research reports, the views of equality groups, as well your own experience of working in this area etc.

Source of data/supporting evidence	Reason for using
Stakeholder group: - Energy Systems Catapult - York and North Yorkshire Local Enterprise Partnership - North Yorkshire Local Authority and National Park officers - Northern Powergrid - Norther Gas Network	To ensure all relevant information and local knowledge is captured
Technical Advisory Panel: Harmony Energy Transport for the North Drax Third Energy Daikin Protium Energy Oasis Zero Carbon Yorkshire Wolfland Group	To ensure technical aspects of the plan are sound
Peer Challenge Group: Citizens Advice Northern Regeneration Thirsk Friends of the Earth	To ensure social aspects of the plan are sound
Annex A: Local Area Energy Plan – Modelling Approach	To have the most relevant and up to date information for city wide energy modelling

Local businesses and organisation data	To have the most relevant and up to date information for city wide energy modelling

Step 3 – Gaps in data and knowledge

3.1	What are the main gaps in information and understanding of the impact of your proposal? Please indicate how any gaps will be dealt with.
Gaps in data or knowledge	**Action to deal with this**
Some data is extrapolated from national or regional datasets so may not be 100% accurate for York	Discussions with other organisations to get a bottom-up city-wide energy use data

Step 4 – Analysing the impacts or effects.

4.1	Please consider what the evidence tells you about the likely impact (positive or negative) on people sharing a protected characteristic, i.e. how significant could the impacts be if we did not make any adjustments? Remember the duty is also positive – so please identify where the proposal offers opportunities to promote equality and/or foster good relations.		
Equality Groups and Human Rights.	**Key Findings/Impacts**	**Positive (+) Negative (-) Neutral (0)**	**High (H) Medium (M) Low (L)**
Age	Overall positive impact, working to reduce the impact of climate change for all demographics For this demographic some negative impacts have been identified that we aim to mitigate	**+** **-**	**H** **L**

	Engagement – elderly people without access to internet/a computer and may not be able to access information, public engagement surveys or focus sessions **Buildings** – retrofit may be harder and longer with more disruption for elderly people with special home modifications **Transport** – some elderly people will need a car, even over short distances – the cost of electric vehicles may mean they are not accessible to all people **Energy Supply** – N/A		
Disability	Overall positive impact, working to reduce the impact of climate change for all demographics For this demographic some negative impacts have been identified that we aim to mitigate **Engagement –** may not have access to internet/a computer and may not be able to access information, public engagement surveys or focus sessions **Buildings** - retrofit may be harder and longer with more disruption for people with special home modifications	**+** **-**	**H** **L**

	Transport – some disabled people will need a private vehicle, even over short distances – the cost of electric vehicles may mean they are not accessible to all people **Energy Supply** – N/A		
Gender	Overall positive impact, working to reduce the impact of climate change for all demographics	**+**	**H**
Gender Reassignment	Overall positive impact, working to reduce the impact of climate change for all demographics	**+**	**H**
Marriage and civil partnership	Overall positive impact, working to reduce the impact of climate change for all demographics	**+**	**H**
Pregnancy and maternity	Overall positive impact, working to reduce the impact of climate change for all demographics For this demographic some negative impacts have been identified that we aim to mitigate **Engagement –** N/A **Buildings -** retrofit disruption will not work for pregnant people or people with very young babies/children **Transport** – public charging infrastructure may be difficult to use for pregnant people or people with very young babies/children if home charging is not available	**+** **-**	**H** **L**

	Energy Supply – N/A		
Race	Overall positive impact, working to reduce the impact of climate change for all demographics	**+**	**H**
Religion and belief	Overall positive impact, working to reduce the impact of climate change for all demographics	**+**	**H**
Sexual orientation	Overall positive impact, working to reduce the impact of climate change for all demographics	**+**	**H**
Other Socio-economic groups including :	**Could other socio-economic groups be affected e.g. carers, ex-offenders, low incomes?**		
Carer	Overall positive impact, working to reduce the impact of climate change for all demographics For this demographic some negative impacts have been identified that we aim to mitigate **Engagement** – N/A **Buildings -** retrofit may be harder and longer with more disruption for people with special home modifications **Transport** – some carers will need a car for their job, even over short distances – the cost of electric vehicles may mean they are not accessible to all people	**+** **-**	**H** **L**

	Energy Supply – N/A		
Low income groups	Overall positive impact, working to reduce the impact of climate change for all demographics For this demographic some negative impacts have been identified that we aim to mitigate **Engagement -** may not have access to internet/a computer and may not be able to access information, public engagement surveys or focus sessions **Buildings –** retrofit can be cost a lot of money where funding is not available. Retrofitted houses or those built to a higher energy standard may also increase house prices and/or energy costs can increase in the move away from gas boilers. **Transport** – electric vehicles are often more expensive to buy and install charging infrastructure at home. **Energy Supply** – energy costs may increase dependant on the price of renewable energy (although they will hopefully be less than fossil fuels). It can cost a lot to change energy supply such as purchasing solar panels.	**+** **-**	**H** **L**
Veterans, Armed Forces Community	Overall positive impact, working to reduce the impact of climate change for all demographics	**+**	**H**

Other	For people working in industries that are based on fossil fuels/high carbon there is risk of unemployment as all systems become less carbon intensive	**-**	**M**
Impact on human rights:			
List any human rights impacted.	**None**		

Use the following guidance to inform your responses:

Indicate:

- Where you think that the proposal could have a POSITIVE impact on any of the equality groups like promoting equality and equal opportunities or improving relations within equality groups
- Where you think that the proposal could have a NEGATIVE impact on any of the equality groups, i.e. it could disadvantage them
- Where you think that this proposal has a NEUTRAL effect on any of the equality groups listed below i.e. it has no effect currently on equality groups.

It is important to remember that a proposal may be highly relevant to one aspect of equality and not relevant to another.

High impact (The proposal or process is very equality relevant)	There is significant potential for or evidence of adverse impact The proposal is institution wide or public facing The proposal has consequences for or affects significant numbers of people The proposal has the potential to make a significant contribution to promoting equality and the exercise of human rights.
Medium impact (The proposal or process is somewhat equality relevant)	There is some evidence to suggest potential for or evidence of adverse impact The proposal is institution wide or across services, but mainly internal The proposal has consequences for or affects some people The proposal has the potential to make a contribution to promoting equality and the exercise of human rights
Low impact (The proposal or process might be equality relevant)	There is little evidence to suggest that the proposal could result in adverse impact The proposal operates in a limited way The proposal has consequences for or affects few people The proposal may have the potential to contribute to promoting equality and the exercise of human rights

Step 5 - Mitigating adverse impacts and maximising positive impacts

5.1	**Based on your findings, explain ways you plan to mitigate any unlawful prohibited conduct or unwanted adverse impact. Where positive impacts have been identified, what is been done to optimise opportunities to advance equality or foster good relations?**
Not having unrealistic expectations of actions to reduce emissions. Retain freedom to choose fossil fuels. For some individuals and businesses this may be their only option of fuel. Work to engage with all demographics included those with protected characteristics that may be harder to reach.	

Step 6 – Recommendations and conclusions of the assessment

6.1	**Having considered the potential or actual impacts you should be in a position to make an informed judgement on what should be done. In all cases, document your reasoning that justifies your decision. There are four main options you can take:**

- **No major change to the proposal** – the EIA demonstrates the proposal is robust. There is no potential for unlawful discrimination or adverse impact and you have taken all opportunities to advance equality and foster good relations, subject to continuing monitor and review.

- **Adjust the proposal –** the EIA identifies potential problems or missed opportunities. This involves taking steps to remove any barriers, to better advance quality or to foster good relations.

- **Continue with the proposal** (despite the potential for adverse impact) – you should clearly set out the justifications for doing this and how you believe the decision is compatible with our obligations under the duty

- **Stop and remove the proposal –** if there are adverse effects that are not justified and cannot be mitigated, you should consider stopping the proposal altogether. If a proposal leads to unlawful discrimination it should be removed or changed.

Important: If there are any adverse impacts you cannot mitigate, please provide a compelling reason in the justification column.

Option selected	**Conclusions/justification**
Continue with the proposal	There is an overall positive impact from the Local Area Energy Plan and there are mitigations for any potential negative impacts.

Step 7 – Summary of agreed actions resulting from the assessment

7.1	What action, by whom, will be undertaken as a result of the impact assessment.		
Impact/issue	**Action to be taken**	**Person responsible**	**Timescale**
Engagement	Work to engage with all demographics included those with protected characteristics that may be harder to reach.	Carbon Reduction Team	Ongoing

Step 8 - Monitor, review and improve

8. 1	**How will the impact of your proposal be monitored and improved upon going forward?** Consider how will you identify the impact of activities on protected characteristics and other marginalised groups going forward? How will any learning and enhancements be capitalised on and embedded?
	On-going reporting, monitoring, engagement and consultation

Decision Session – Executive Member for Transport **8 March 2023**

Report of the Director of Environment, Transport & Planning

E-Petition – More bins, a clean city centre, surrounding areas and river's embankments

Summary

1. The Council received an e-petition regarding cleanliness in the city centre and the provision of more bins. The e-petition ran from 15 April 2022 and closed on the 15 June 2022 and was signed by 26 signatories. A full copy of the e-petition is included in Annex 1 (please note that names have been redacted).

2. Public Realm are responsible for the cleanliness of the entire City of York Council area but also have a dedicated city centre cleansing team.

3. This report details service changes that have happened over the last 12-15 months regarding the 'city centre area'.

Recommendations

4. The Executive Member for Environment is recommended to:

   i. Note the e-petition and its contents

   Reason: To ensure that the views of the signatories of the e-petition and the content of the e-petition are considered.

   ii. To note the service changes that have happened over the past 12-15 months regarding the city centre and arrangements to ensure the city centre is kept clean.

   Reason: To reflect on the changes that have taken place and consider if there are further recommendations you wish to make to the service.

Background

City Centre Cleansing

5. The city centre cleansing team are based in Silver Street and they provide a seven day a week service and seek to maintain a clean and welcoming city centre for residents and visitors alike. This is no small undertaking with a vibrant day time and evening economy and therefore, the Council keeps its arrangements under regular review.

6. Over the past 2 years, footfall in the city centre has fluctuated as a result of the covid pandemic and the subsequent recovery in a post pandemic environment. In recent months we have seen a return to more normal levels of footfall across the city centre.

7. A number of operational changes have been made in the city centre over the past 12-15 months and these have been listed below for your information and consideration.

City Centre Bins

8. Over the past 12-15 months the service has made a number of changes to bin provision in the city centre areas in the following locations:-

    - Parliament Street – increased capacity moving from 5 single bins to 5 double bins.
    - Spurriergate - increased capacity moving from 1 single bin to 1 double bin.
    - Coney Street - increased capacity moving from 1 single bin to 1 double bin.
    - St Helens Square – provision of an additional double litter bin.
    - Perky Peacock – provision of one additional single litter bin.
    - Piccadilly – provision of one additional single litter bin.
    - Dame Judy Dench Walk – provision of one additional double litter bin.
    - Clifford Street - increased capacity moving from 1 single bin to 1 double bin.
    - North Street - increased capacity moving from 1 single bin to 1 double bin.
    - Duncombe Place - increased capacity moving from 3 single bins to 3 double bins.

- St Leonard's - increased capacity moving from 2 single bins to 2 double bins.
- Station (Royal York) – provision of one additional double litter bin.
- Six hooped litter bags have been installed along Esplanade and three hooped litter bags have been installed at North Street Gardens.

The bins and bags outlined above are emptied numerous times per day by the city centre cleansing team.

Commercial Waste

9. For the past 12 months, the Council have been undertaking a dedicated collection of bagged commercial waste on a Sunday morning. This has reduced the amount of time commercial waste is left between presentation of waste by businesses and collections undertaken by the Council.

Mechanical Sweeping

10. Mechanical sweeping takes place on a daily basis across the city centre. In addition, a dedicated early morning mechanical and manual sweep is also undertaken every Saturday and Sunday morning between 4 a.m. and 8 a.m.

Additional Resources

11. Additional resources have been deployed on a Saturday and Sunday to ensure that the city centre cleansing and emptying of litter bins is maintained during this busy period.

12. In the summer months, additional temporary resources are deployed in the early evenings across the city centre area to account for the very warm weather and the increased footfall / early evening economy.

Partner activities

13. The Council has supported activities undertaken by parts in the City Centre. For example, York BiD installed a number of picnic areas and seating areas during the covid pandemic and have retained a number of seating areas in select locations. The Council have supported this activity through additional bin provision being made at these sites whilst they have been operational.

14. The online map (on the Council's website) that shows the exact locations of the litter and dog bins across the city (including the city centre) does need to be updated.

    This work is being undertaken over the coming months to ensure that the details on the Council's website are reflective of the current situation and show the increased numbers of bins provided in recent times.

Council Plan

15. The Council Plan has Eight Key Outcomes:

- Well-paid jobs and an inclusive economy.
- A greener and cleaner city.
- Getting around sustainably.
- Good health and wellbeing.
- Safe communities and culture for all.
- Creating homes and world-class infrastructure.
- A better start for children and young people.
- An open and effective council.

The actions detailed within the report contributes to the Council being an open and effective Council, a greener and cleaner city and a creating world-class infrastructure.

Implications

16. This report has the following implications:

Financial – Any further changes that have financial impact will need to be considered within the context of the overall budget.

Equalities – The Council recognises its Public Sector Equality Duty under Section 149 of the Equality Act 2010 (to have due regard to the need to eliminate discrimination, harassment, victimisation and any other prohibited conduct; advance equality of opportunity between persons who share a relevant protected characteristic and persons who do not share it and foster good relations between persons who share a relevant protected characteristic and persons who do not share it in the exercise of a public authority's functions). The impact of the recommendation on protected characteristics has been considered as follows:

- Age – Positive a cleaner city makes it easier to for those walking around the city centre.

- Disability – Positive, a cleaner city removing any obstructions makes it easier to traverse for those with mobility issues.
- Gender – Neutral.
- Gender reassignment – Neutral.
- Marriage and civil partnership– Neutral.
- Pregnancy and maternity – Neutral.
- Race – Neutral.
- Religion and belief – Neutral.
- Sexual orientation – Neutral.

Other socio-economic groups including:

- Carer – Neutral.
- Low income groups – Neutral.
- Veterans, Armed Forces Community– Neutral.

Risk Management – The Public Realm service has undertaken a number of developments in the city centre over the past 12-15 months or so. The task of cleansing the city centre is not an easy one and teams work tirelessly, across seven days, to keep the city as clean as possible. Issues can and do inevitably arise that need to be managed. The Council also works closely with partners (such as the York BiD) to ensure the city is clean.

Contact Details

Author:	**Chief Officer Responsible for the report:**
Ben Grabham Head of Environmental Services Ben.Grabham@york.gov.uk	James Gilchrist Director of Transport, Planning and Environment

Report Approved ✓ **Date** 28/02/2023

Wards Affected: City centre **All** ☐

For further information please contact the author of the report

Annexes:
Annex A – Copy of E-Petition

Annex A

Title: More bins and a clean city centre, surrounding areas and river's embankment

Statement:

We the undersigned petition the council to provide more bins in the city centre and surrounding areas, as well as along the Ouse and Foss rivers' embankments. We also petition the council to clean the bushes and locked vegetation sites surrounding the city centre, e.g. on Foss Island and the railway track beside Marygate Car Park**.**

Justification:

Reducing the number of bins was a deliberate choice of the City Council to save money during collection, but this has become a problem. Now there is an absurd amount of litter in and around the city centre of York. This issue has two factors. On one side, the people who are responsible for leaving cans, bottles and all sorts of packages behind, regardless of whether they are residents or tourists. On the other side, also responsible is the City Council, as the number of bins available is far below what is needed. The bins location map shows large areas without a single bin in the city centre and surrounding areas. Additionally, existing bins described as large are much smaller than in other touristic cities, such as Scarborough. See the map of bins here: https://www.york.gov.uk/ReportDogWasteAndLitterBins

The situation is terrible inside bushes or vegetation in restricted access areas like those behind locked gates. The issue is particularly relevant because the city often gets flooded. When it is constantly raining, it is not difficult to see gutters obstructed by litter on the sides of the roads.

This ePetition ran from 15/04/2022 to 15/06/2022 and has now closed.

26 people signed this ePetition.

ePetition Signatory	Date Signed
REDACTED	19/04/2022
REDACTED	19/04/2022

REDACTED	20/04/2022
REDACTED	20/04/2022
REDACTED	20/04/2022
REDACTED	22/04/2022
REDACTED	22/04/2022
REDACTED	22/04/2022
REDACTED	22/04/2022
REDACTED	22/04/2022
REDACTED	22/04/2022
REDACTED	22/04/2022
REDACTED	22/04/2022
REDACTED	22/04/2022
REDACTED	22/04/2022
REDACTED	22/04/2022
REDACTED	25/04/2022
REDACTED	25/04/2022
REDACTED	27/04/2022
REDACTED	03/05/2022
REDACTED	20/05/2022
REDACTED	20/05/2022
REDACTED	20/05/2022
REDACTED	20/05/2022
REDACTED	20/05/2022
REDACTED	20/05/2022

REDACTED	20/05/2022
REDACTED	23/05/2022

This page is intentionally left blank