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Democratic Services Section
Legal and Civic Services Department
Belfast City Council
City Hall
Belfast
BT1 5GS

Belfast City Council

MEETING OF THE CLIMATE AND CITY RESILIENCE COMMITTEE

Dear Alderman/Councillor,

The above-named Committee will meet in the Lavery Room - City Hall on Thursday, 11th April, 2024 at 5.15 pm, for the transaction of the business noted below.

You are requested to attend.

Yours faithfully,

John Walsh

Chief Executive

AGENDA:

1. Routine Matters

   (a) Apologies

   (b) Minutes (Pages 1 - 4)

   (c) Declarations of Interest

2. Climate and Nature Action: A Vision for the Connswater Community Greenway [Presentation - Jacqueline O'Hagan from EastSide Greenways] (Pages 5 - 18)

3. Belfast Festival of Learning week 22-27 April - theme 'Our Planet' [Kevin Heaney, Head of Inclusive Growth & Anti-Poverty] (Pages 19 - 24)

4. Local Area Energy Plan (LEAP) [Debbie Caldwell, Climate Commissioner] (Pages 25 - 182)

5. Notices of Motion - Quarterly Update [John Tully, Director City & Organisational Strategy / Debbie Caldwell, Climate Commissioner]] (Pages 183 - 188)

Climate and City Resilience Committee

Thursday, 14th March, 2024

MEETING OF THE CLIMATE AND CITY RESILIENCE COMMITTEE

HELD IN THE LAVERY ROOM AND
REMOTELY VIA MICROSOFT TEAMS

Members present: Councillor R-M Donnelly (Chairperson);
Alderman Copeland; and
Councillors Anglin, Bell, Bower, R. Brooks, T. Brooks, Carson, Collins, M. Donnelly, D. Douglas, McAteer, McCabe, McKeown, Smyth and Walsh.

In attendance: Mr. J. Tully, Director of City and Organisational Strategy;
Ms. D. Caldwell, Climate Commissioner; and
Mr. G. Graham, Democratic Services Assistant.

Apologies

Apologies were reported on behalf of the High Sheriff, Councillor S. Douglas and Councillors Doherty, Kelly and Long.

Minutes

The minutes of the meeting of 8th February were taken as read and signed as correct.

Declarations of Interest

No Declarations of Interest were reported.

Restricted Item

The information contained in the reports associated with the following item is restricted in accordance with Part 1 of Schedule 6 of the Local Government Act (Northern Ireland) 2014.

Resolved – That the Committee agrees to exclude the members of the press and public from the meeting during discussion of the following item as, due to the nature of the items, there would be a disclosure of exempt information as described in Section 42(4) and Schedule 6 of the Local Government Act (Northern Ireland) 2014.

The Members were also reminded that the content of 'restricted' reports and any discussion which took place during closed session must be treated as 'confidential information' and that no such information should be disclosed to the public as per Paragraph 4.15 of the Code of Conduct.

Presentation by Living with Water Team

The Committee considered a report and associated presentation from the Living with Water Team in relation to a review process which was currently underway on the Strategic Drainage Infrastructure for Belfast and which was being undertaken due to affordability issues.

After discussion, the Committeenoted the presentation regarding the review of the LWW programme which was currently underway.

Update on Heat Network

The Climate Commissioner provided the Members with an update on the market engagement to date on a potential heat network in Belfast. She referred to work undertaken with institutional investors, heat developers and other councils as part of that process.

The Members were informed that Belfast, with its density of buildings, was ideally suited to the introduction of a heat network which formed a key part of the local energy plan, alongside the retri-fit of buildings, as part of the Council's net-zero carbon ambitions.

The Climate Commissioner reported that a Heat Network Working Group had been established to inform the development of the Council's approach to incentivising the development of a heat network in Belfast, and that the Group would be encouraging public sector bodies, which owned buildings in the city with a high heat demand, to engage in discussions and market engagement as potential heat off-takers.

The Committee was informed that it was proposed to appoint a commercial and legal advisor to support the market engagement process, including the appointment of a technical advisor to support the market engagement and the provision of advice on technical requirements, subject to the approval of the Strategic Policy and Resources Committee.

The Climate Commissioner provided the Members with an overview of the key elements associated with a heat network. She outlined measures to increase the viability of heat networks, including the introduction of waste heat into the heat production process, and the installation of a direct wire to alternative off-grid sources of energy.

The Committee was informed of the importance attached to securing off-taker heat agreements to encourage investment in heat network schemes and provided the Members with a range of delivery models for heat networks, which could be incorporated as part of any future delivery scheme. It was reported that early market engagement with heat developers had suggested that there was strong private sector interest to invest in heat networks with the provision of lands for the development of an energy centre, provision of grant finance and an available source of waste heat energy, as being strong support structures as part of the heat network development process. The Climate Commissioner reported on some of the barriers in place currently to the creation of viable heat networks in Northern Ireland, namely, the fact that there was currently no financial support available for heat-network schemes and no regulatory system in place.

The Climate Commissioner reported that the £150,000 secured from the Innovate UK Project – Belfast Net-Zerro Pathfinder project, was instrumental in securing business funding

analysis, including commerical and legal assistance to develop and secure commercial contracual arrangements in the absence of statutory regulation.

The Committee was informed that it was important to establish the heat demand requirements prior to the establishment of a series of round table discussions, with relevant parties invited to attend, including off-takers, investors and industry representatives.

In response to a request from a Member, the Climate Commissioner agreed to invite represenatives from other authorities who had developed successful heat-network schemes, including off-takers, to present to a future meeting of the Committee. The Committee agreed also that representatives from Bradford City Council be invited to attend a future meeting of the Committtee in order to provide information on the development of their heat-network scheme.

A Member raised concerns in regard to the development of 15 year heat-network contracts and the viability of such contracts should changes occur in terms of occupancy levels and associated heat demand for those public sector buildings. The Member referred also to the problems associated with previous district network schemes which had been developed in certain parts of the city.

In response, the Climate Commissioner reported that contracts were required to be agreed which protected the consumer in terms of price, and that greater priced leverage could be achieved by collaboration with other stakeholders to ensure that customers got the best value on the unit costs of heat and energy.

The Committee noted the information which had been provided and agreed also to receive a presentation from representatives from neighbourhood district heating schemes which had been developed successfully, and which could provide a valuable insight into both, the technical and contractual frameworks to secure the best value for money in terms of the operation of long-term district heating energy contracts.

Innovate UK Project - Belfast Net Zero Pathfinder

The Climate Commissioner welcomed the securing of £150,000 from the Innovate UK Net-Zero Living Pathfinder competition which would help the delivery of two key priority projects, namely, the city's Local Area Energy Plan (LAEP) and the decarbonisation plan for Queens Island (QIDP).

The Committee was informed that the strategic energy masterplans provided a whole energy system approach, including recommendations for decarbonisation pathway planning. The Climate Commissioner explained that the projects built on the outcomes of the Belfast phase 1 pathfinder feasibility study, and would support a whole systems approach to the transition of the city to net-zero.

The Members were informed that the project would focus on overcoming the non-technical barriers in regard to the delivery of the two decarbonisation projects identified in the LAEP and QIDP, and focussed specifically on the heat network and solar pv projects. The Climate Commissioner reported that by accelerating and de-risking the delivery of two decarbonisation projects identified in the LAEP and QIDP, the projects would assist the

Council and its partners to reduce emissions from the City's built environment, which was the largest source of emissions within the city .

The Climate Commissioner agreed to bring an update to a future meeting of the Committee on the progress made on delivery of the projects, which was being undertaken in partnership with Energy Systems Catapult, with a scheduled project commencement date of 1st June 2024.

Noted.

Issue Raised In Advance

Presentation on a vision for the Connswater Community Greenway

At the request from Councillor R. Brooks, the Committee agreed to receive at a future meeting a presentation from Eastside Greenways entitled Climate and Nature Action - A Vision for the Connswater Community Greenway.

Chairperson

Jacqueline O'Hagan – EastSide Greenways Manager

/ConnswaterCommunityGreenway

connswater_greenway

- A 9km linear park for walking and cycling
- 16km of foot and cycle paths
- 26 new or improved bridges and crossings
- Serves 23 schools and colleges
- Up to 5km of rivers cleaned
- 1700 homes protected from flooding
- Hubs for education, interpretation points and tourism and heritage trails
- Wildlife corridor from Belfast Lough to the Castlereagh Hills
- C.S. Lewis Square – a space for events and activities

EastSide Greenways (formerly the Connswater Community Greenway Trust), a registered charity, aims to maximise the potential of the Connswater Community Greenway as a catalyst for the ongoing physical, social and economic regeneration of east Belfast.

/ConnswaterCommunityGreenway

connswater_greenway

@ConnsGreenway

LIVING THE GREEN WAY

Climate and Nature Action: A Vision for the Connswater Community Greenway

GroundsWell Transforming our cities from the ground up | Queen's University Belfast | Connswater Community Greenway | East Side Greenways

the paul hogarth company

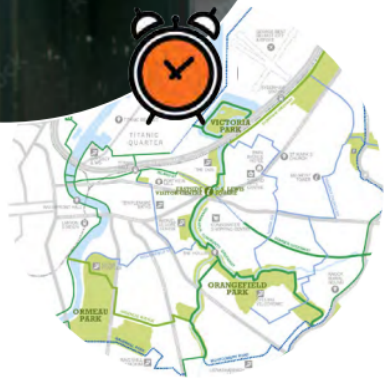
Eliminate Emissions A

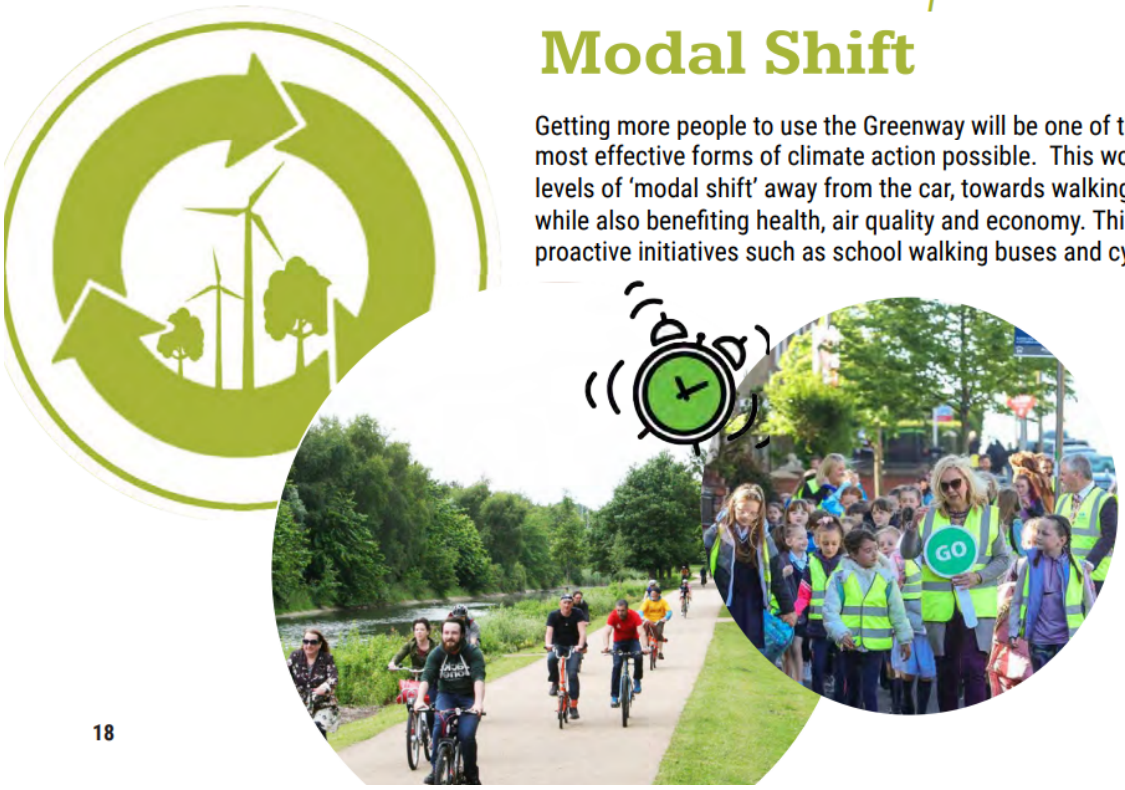
Direct and Indirect Green House Gases (GHGs)

Every effort is urgently required to reduce the emissions of harmful gases into the atmosphere, caused largely by the burning of fossil fuels. The Greenway plays a key role in this regard, offering people an alternative movement route. However, more work must be done to reduce direct and indirect emissions along the Greenway. If all those living and working along the greenway were to work together, their collective impact could be substantial.

Modal Shift 1

Getting more people to use the Greenway will be one of the quickest and most effective forms of climate action possible. This would increase levels of 'modal shift' away from the car, towards walking and cycling, while also benefiting health, air quality and economy. This should include proactive initiatives such as school walking buses and cycle trains.





Network Expansion 2

Growing the Greenway by adding new pathways, spaces and neighbourhood connections would increase its reach and levels of usage. Work is already underway to consider a wider greenways network plan for East Belfast and the city. Where possible in doing so, green spaces should be protected, while grey spaces are transformed. The delivery of this vital work should be accelerated as a means of getting more people moving on greenways by foot and bicycle.

Energy Saving [3]

Another fast way to bring about climate action along the greenway will be energy saving initiatives. This objective was inspired by a member of the public who highlighted that a public building on the Greenway has its lights left on every night. A range of initiatives should be brought forward to reduce energy consumption on and along the Greenway. This would relate to lighting and other draws upon the energy grid, as well as the insulation of buildings to conserve heat.

Eliminate Emissions
Direct and Indirect GHGs

Energy Generation [4]

Imagine the Greenway was one big green power station. This could be made possible through the deployment of on-site energy generators such as wind turbines, solar panels, hydro-electrics and ground source heat pumps. A specialist study is required to determine the most appropriate options. These should not just benefit the greenway, but also surrounding communities and especially those most affected by fuel poverty. ParkPower, the pioneering work in this area by Greenspace Scotland should be consulted.

Capture Carbon[B]

Prioritising Sequestration

There are too many green houses gases in our atmosphere, including carbon dioxide. A priority must be to seek opportunities for its sequestration. This is when carbon dioxide is removed from the air and stored in liquid or solid form. Through its trees and other plant life the Greenway already performs this function - it is now time to make sure it is maximising that very important role.

Wetland Expansion[1]

Wetlands are one of the world's most effective carbon sinks, locking away 'blue carbon' to great effect. The Connswater Community Greenway has some limited areas of wetland, including tidal mudflats at Victoria Park and seasonally flooded meadows at Marsh Wiggleway. Opportunities should now be found to extend and develop wetland areas along the Greenway, helping store more carbon while enhancing wildlife habitats.

Tree Planting [2]

Many people responding to the survey expressed a wish to see more trees planted along the Greenway. Trees provide many ecosystem services, including the storage of carbon throughout their lifetime. A systematic assessment of the greenway should be undertaken to identify areas suitable for the planting of new, locally grown native trees by the community. Consideration should be given to the potential contribution of cetain native trees to a specific area, including blossom for pollinators and fruits for human and non-human consumption.

Capture Carbon
Prioritise Sequestration

Soil Improvement [3]

Another sometimes forgotten carbon sink is the soil. The earth can store high volumes of carbon, especially when it is rich in organic matter. A process of soil testing would therefore inform efforts to improve soil quality along the Greenway (such as mulching and composting), so helping it absorb more carbon dioxide from the atmosphere.

Strengthen Resilience C

Adapt the Greenway and Surrounds

As our climate changes, so too will our landscapes, including the Connswater Community Greenway. It will therefore be important to get 'ahead of the curve' in assessing what adaptations can be made to lessen negative impacts, while realising associated benefits.

Planting Strategy 1

The Greenway is home to many wonderful plants, from trees and woodlands, to shrubs, grasses and semi aquatic species. In the context of the climate and nature crisis, a regular review of plant species should be undertaken to ensure they will be resilient to extreme weather events and continue contributing to ecological objectives. Over time this will inform appropriate new plantings. For example, many hedgerows on the Greenway consist of a single, non native species and potential exists to augment these with complementary native plants, so increasing their ecological value.

Flood Management 2

A key feature of the Connswater Community Greenway is its built-in flood defences. Orangefield Park, for example, has been designed to attenuate flood water, thereby protecting adjacent homes and businesses. The opportunity exists for the greenway to play a further role in local flood defence, by diverting and storing surface and river waters during times of peak rainfall. An added benefit of such interventions is the creation of wetland wildlife habitats.

Strengthen Resilience
Adapt the Greenway and Surrounds

Greenway Neighbourhoods 3

Many thousands of people are lucky to live along the Greenway. By thinking of these areas as 'Greenway Neighbourhoods', much potential exists to extend the value of the Greenway into surrounding streets and spaces. A Greenway Neighbourhood should have more street trees and sustainable urban drainage systems. They may also be good candidates for Low Traffic Neighbourhoods, where walking, cycling and public transport are given greater priority over the needs of the car. Furthermore the continuance of community development in Greenway Neighbourhoods would also help strengthen their social resilience and shared greenway identities.

Build Biodiversity D

Manage Ecologically

The Greenway is a refuge for nature in the city, playing host to various ecosystems of plants and animals. Coming into contact with nature is a great source of joy for many people who use the greenway. In the context of the climate and nature crises, the time has come enhance our understanding of the Greenway's ecology and to use that knowledge to improve management practices. Local people should be involved as much as possible in these processes, further strengthening historic and social ties within the community.

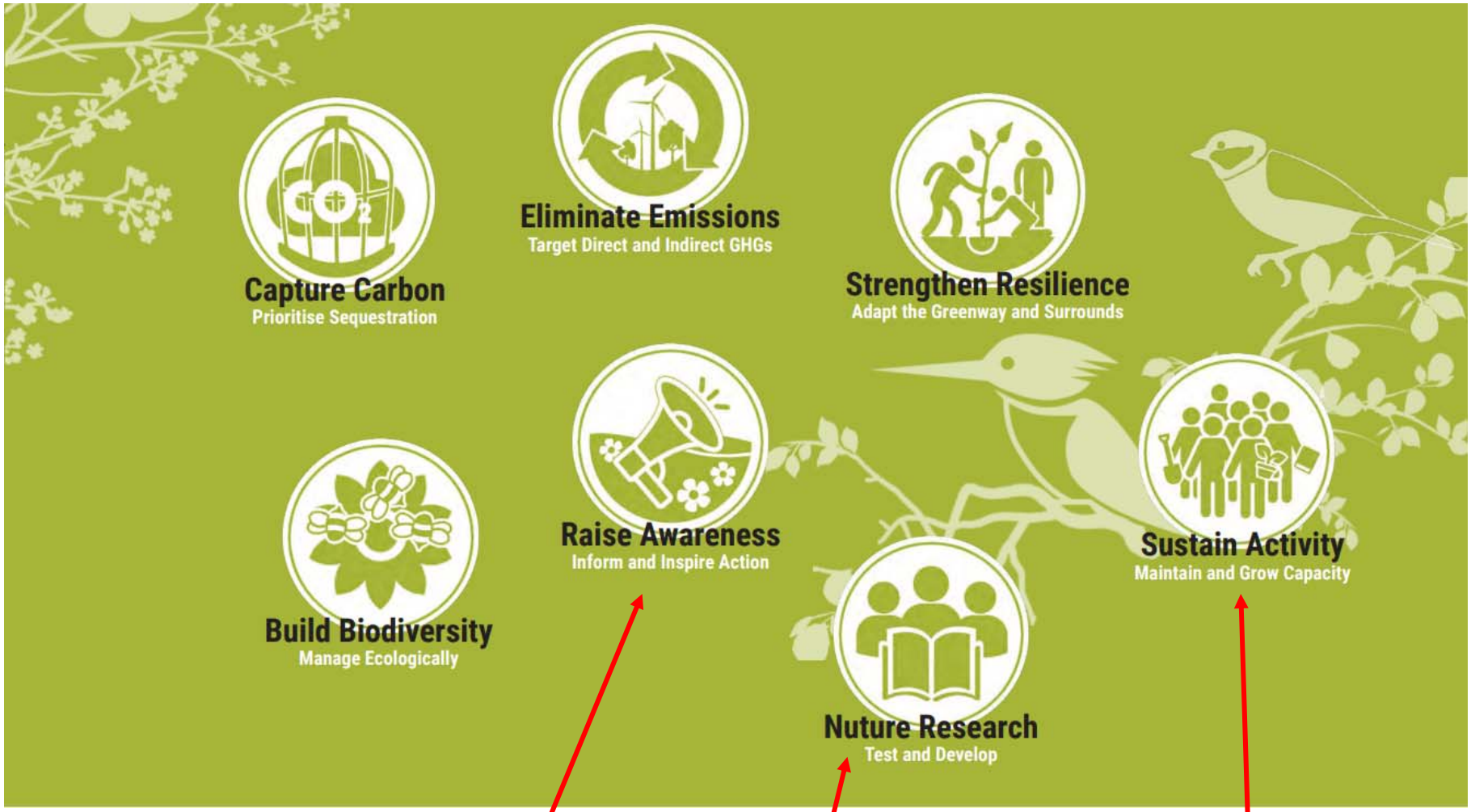
Habitat Surveys 1

Knowing what lives on the Greenway is a critical first step to managing it more ecologically. Various habitat surveys were a requirement of planning consent for the greenway and activities such as birdwatching and river kick-sampling are regular activities today. After a comprehensive review of existing data, habitat surveys are required to systematically map the Greenway and build an accurate ecological baseline. Opportunities for public involvement in this process should be actively sought.

Wetland expansion; tree planting; soil improvement

Modal shift; network expansion; energy saving; energy generation

Flood management



Manage ecologically; habitat surveys

Events; signage; artworks

Test and develop; living lab

Maintain/grow capacity; local skills

Belfast City Council

Subject:	UNESCO Learning Cities - Belfast Festival of Learning 2024
Date:	11 April 2024
Reporting Officer:	John Tully, Director of City and Organisational Strategy Debbie Caldwell, Climate Commissioner
Contact Officers:	Kevin Heaney, Head of Inclusive Growth and Anti-Poverty Patricia Magee, Policy and Performance Analyst,

Restricted Reports

Is this report restricted? **Yes** ☐ **No** **X**

Please indicate the description, as listed in Schedule 6, of the exempt information by virtue of which the council has deemed this report restricted.

Insert number ☐

1. Information relating to any individual.
2. Information likely to reveal the identity of an individual
3. Information relating to the financial or business affairs of any particular person (including the council holding that information)
4. Information in connection with any labour relations matter
5. Information in relation to which a claim to legal professional privilege could be maintained
6. Information showing that the council proposes to (a) to give a notice imposing restrictions on a person; or (b) to make an order or direction
7. Information on any action in relation to the prevention, investigation or prosecution of crime

If Yes, when will the report become unrestricted?

After Committee Decision ☐
After Council Decision ☐
Sometime in the future ☐
Never ☐

Call-in

Is the decision eligible for Call-in? **Yes** X **No** ☐

1.0	**Purpose of Report**
1.1	To update Members on the work underway in support of Belfast's membership of the UNESCO Global Network of Learning Cities and the repositioning of this work in the context of community planning including an update on the planned Belfast's Festival of Learning 2024 which will take place between 22-27 April 2024.
2.0	**Recommendations**
2.1	Members are asked to: i) note the planned Belfast Festival of Learning launch event on Monday 22 April 2024 (recognised worldwide as Earth Day), 11am-1pm in 2 Royal Avenue and consider attendance. ii) help raise awareness of the week-long programme of free events which are available during the Belfast Festival of Learning Week (22 April - 27th April 2024) as attached at Appendix 1 iii) note the focus of this year's Belfast Festival of Learning will be 'Our Planet: Climate Action'.
3.0	**Key Issues**
	Background
3.1	Members may be aware that Belfast joined the UNESCO Global Network of Learning Cities in 2018 in recognition of the City's commitment to promoting and encouraging lifelong learning for people of all ages. Within The Belfast Agenda, we have a vision that our city should be a great place for everyone to live and providing lifelong learning opportunities is a core part of this. Learning has the potential to transform lives for the better- it can build better relationships and help enhance quality of life for everyone in the city.
3.2	Belfast was awarded a UNESCO Learning Cities Award for outstanding learning in 2021. Whilst Belfast continues to play its role as a member of the UNESCO Global Network of Learning Cities as well as a member of an All-Island Network of Learning Cities, it is felt there is a real opportunity to build on Belfast's Learning City status and to bring city stakeholders together to reenergise our focus and maximise the opportunities presented. It is important to recognise that it's not about creating new initiatives but rather connecting and enhancing existing programmes and initiatives as well as aligning policy ambitions across multiple partners. A Learning Cities Leadership Group currently exists and comprises representatives from QUB, UU, BMET, BHSCT, PHA, Education Authority, Libraries NI, community partners and Council.
	Festival Learning Week (22-27 April 2024)
3.3	A key focus of the annual programme of work has bene a 'Festival of Learning' which is a week-long programme of free interactive and engaging events. The festival showcases the range of learning opportunities that already exist in Belfast. Council officers have worked closely with community partners to develop a inclusive programme of citywide learning' events to take place as part of a week-long festival of activity from **22nd April-27th April 2024** (refer to **Appendix 1** for copy of events programme).

3.4	Given the significance of the climate challenges facing the city the theme for this year's Festival of Learning Week is '**Our Planet: Climate Action'** The festival will deliver free events across the city which promote citizen awareness of, and engagement in initiatives focusing on lifelong learning in the context of the local and global climate emergency. This would align with the focus of the UNESCOs 6th Annual Conference on Learning Cities (2024) which is 'Learning Cities at the forefront of climate action'.
3.5	Members are asked to help raise awareness through existing networks and encourage participation in the programme of events.
4.0	**Financial & Resource Implications**
4.1	£10K funding has been secured through the Public Health Agency in support of the delivery of the Belfast Festival of Learning. An additional £10k match funding from Council was agreed through SP&R Committee and funded through available in-year budgets within City and Organisational Strategy.
5.0	**Equality or Good Relations Implications / Rural Needs Assessment**
5.1	There are no Equality, Good Relations or Rural Needs implications contained in this report.
6.0	**Appendices**
	Appendix 1: Belfast Festival of Learning Week Programme

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Belfast Learning Festival

22 to 27 April 2024

120 free events and exhibitions across the city

Belfast Learning City

Belfast City Council

HSC Public Health Agency
Project supported by the PHA

Sew, cycle, draw and dance. Learn by doing, sharing and experimenting.

The 7th Annual Belfast Learning Festival returns to the city for a week-long programme of free events and activities. Promoting lifelong learning for everyone, this year the festival will shine a light on climate action. Find out more at www.belfastcity.gov.uk/BelfastLearningFestival

Get involved when suits you
Activities throughout the week

Make Do and Mend with Small Steps
Lower Oldpark Community Association, 23 Avoca Street

Monday 22 to Friday 26 April, 10am - 12pm

Turn up jeans, replace zips, or re-purpose and customise your clothes. Learn new alteration skills and help save the planet one thread at a time. To book email muriel@small-steps.org or telephone 028 9029 7191.

Small Steps with Duncairn Ulster Scots Society
170 Alexandra Park Avenue

Monday 22 and Wednesday 24 April, 11am - 1pm, Scottish Country Dancing

Tuesday 23 and Thursday 25 April, 11am - 1pm, Line Dancing

To book email Jennifer.crockard@yahoo.com or telephone 07579016936

Reduce, Reuse, Recycle Re-art Exhibition with L'arche
54 Knockbreda Road

Thursday 25 and Friday 26 April, 10am - 4pm

Drop-in to this thought-provoking exhibition sharing important messages about the climate emergency.

Exercise Taster Sessions with Better Gyms
Various locations and dates

From Group Cycle to Circuits and Chair-based Aerobics to Strength, get active in exercise classes across Belfast. Visit the website to find out more.

Rhythm and Rhyme

Introduce children 4 years and under to the wonder of rhymes, songs and stories in the library with these free sessions. To book telephone a library.

Ballyhackamore Library
1-3 Eastleigh Drive
Friday 26 April,
11.30am - 12pm
028 9050 9204

Belfast Central Library
Royal Avenue
Wednesday 24 April,
11am - 11.30am
and 2.30pm-3pm
Friday 26 April,
11am - 11.30am
028 9050 9150

Chichester Library
109 Salisbury Avenue
Tuesday 23 April,
10am - 10.30am
and 11 - 11.30am
028 9050 9210

Cregagh Library
409-413 Cregagh Road
Friday 26 April,
10.30am - 11am
028 9040 1365

Colin Glen Library
Unit 17 The Dairy Farm Centre,
Stewartstown Road
Friday 26 April,
12pm - 12.30pm
028 9043 1266

Falls Road Library
49 Falls Road
Monday 22 April,
10.30am - 11am and
11.15am - 11.45am
028 9050 9212

Finaghy Library
38B Finaghy Road South
Monday 22 April,
2.30pm - 3pm
Tuesday 23 April,
11am - 11.30am
028 9050 9214

Grove Library
Grove Wellbeing Centre
120 York Road
Friday 26 April,
10.30am - 11am
and 11.30am - 12pm
028 9050 9244

Hollywood Arches Library
4 - 12 Holywood Road
Monday 22 April,
10.30am - 11am
Friday 26 April,
10.30am - 11.00am
028 9050 9216

Lisburn Road Library
440 Lisburn Road
Tuesday 23 April,
9.45am - 10.15am and
10.45am - 11.15am
028 9050 9223

Ormeau Road Library
247 Ormeau Road
Wednesday 24 April,
11am - 11.30am
Friday 26 April,
11am - 11.30am
028 9050 9228

Shankill Road Library
298-300 Shankill Road
Monday 22 April,
10.45am - 11.45am. Friday
26 April, 10.45am - 11.45am
028 9050 9232

Suffolk Library
Stewartstown Road
Tuesday 23 April,
10.30am - 11am
028 9050 9235

Tullycarnett Library
Kinross Avenue, Kings Road
Monday 22 April,
11am - 11.30am
028 9048 5079

Whiterock Library
Whiterock Road
Wednesday 24 April,
9.30am - 10am. Friday 26
April, 9.30am - 10am
028 9050 9236

Woodstock Library
358 Woodstock Road
Wednesday 24 April,
10am - 10.30am
028 9050 9239

Get involved together
Activities for community groups and organisations

Adult Beginner Cycle Training with Sustrans
C.S. Lewis Square, Newtownards Road
Friday 26 April, 10am - 4pm
Sunday 28 April, 1pm - 4.30pm
Get into gear with a one-to-one beginner cycling lesson. Employees of Belfast Health and Social Care Trust, Belfast City Council, Department for Infrastructure, Business Service Organisation and Public Health Agency are eligible to take part. Book online.

Free School or Group Visit with W5
Odyssey, 2 Queens Quay
Wednesday 24 to Saturday 27 April, 10am - 3pm
Firing the spirit of discovery with limitless fun for everyone. Learn, play and discover at W5, an interactive exhibition centre that explores science, technology, nature and more. Schools and community groups can book for free during festival week. To book email EducationQueries@w5online.co.uk

Fight Climate Change from Your Kitchen with Belfast City Council
Monday 22 to Friday 26 April, 10am - 3pm
Community groups in Belfast can book this 45 minute session in an outreach centre. Learn how to shop smarter, save money and recycle food you can't eat. To book email environmentaloutreach@belfastcity.gov.uk

How to book and find out more

Open the camera on a smart phone and hold it steadily over this square on the right (QR Code) for 2-3 seconds. Whenever scanning is enabled, this will direct to the website for more information.

Alternatively visit www.belfastcity.gov.uk/BelfastLearningFestival

unesco Global Network of Learning Cities
Frank Gillen Centre
West Belfast Partnership Board
Queen's University Belfast
belfast met
Ulster University
ea Education Authority
Forum for Adult Learning Northern Ireland
HSC Belfast Health and Social Care Trust caring supporting improving together
libraries ni www.librariesni.org.uk

Monday 22 April

Belfast Learning Festival Launch
with Belfast Learning City
2 Royal Avenue, 10.45am - 1pm
Start festival week with this interactive workshop and discover what makes Belfast a UNESCO Learning City. Be moved by powerful learner stories, hear from experts who are tackling the city's climate issues and and help be part of a greener Belfast by making a pledge to reduce your carbon footprint. Book online.

Cookery Class
with Colin Neighbourhood Partnership Healthy Living Centre,
30 Colin Glen Road, 10am - 2pm
Ages 50+. Learn about nutrition and how to cook healthy meals on a budget. To book email matthew@newcolin.com or telephone 028 9062 3813

Bring On Biodiversity
Belfast Central Library, 1pm - 3pm
Learn about urban gardening. Discover how to attract pollinators to your garden or window box. Take part in a plant or seed swap. To book email belfast.central@librariesni.org.uk or telephone 028 9050 9150.

Age Friendly Tea Dance
2 Royal Avenue, 2pm - 4pm.
Ages 50+.
Waltz towards a toe-tapping time with an afternoon of dancing. Learn new steps with friends old and new.

Big Spring Clean
with Live Here Love Here
Belfast City Centre, 5pm - 7pm
Give back to your community in Northern Ireland's largest volunteer clean-up campaign.
Meet at Belfast City Hall.
Book online.

Public Speaking for our Planet
with Belfast Speakers' Circle
Grand Central Hotel, 7.30pm - 9.30pm
Take a tutorial on public speaking on titles around climate change.
To book email william.magee@ntlworld.com

Tuesday 23 April

Crafting a business
with Innovation Factory
385 Springfield Road, 9.30am - 1pm
Join this masterclass on the business opportunities for small to medium enterprises within the environmental sector. Book online.

North Belfast Men's Shed Open Day
239-241 Alexandra Park Avenue, 10.30am - 1pm
Be part of a community where men can create, converse and connect.

Growing Project with De La Salle College and Foodstock
36 Edenmore Drive, 9.30am - 11am
Access fresh, seasonal and local food by growing seeds in the School Greenhouse. To book email paul.doherty@FoodstockCharity.com

Wreath Making with Reachout NI
Duncairn Community Centre,
11am - 1pm
Take some time out with others this spring and learn how to make your own wreath. To book email claire@reachoutni.org

Chess Meet-up with Roaming Knights
Belfast Central Library, 11am - 1pm
Meet other local chess players to talk strategy and play games.
To book email roamingknightsni@gmail.com

Interview Skills Session with ARUP
Bedford House, 2pm - 5pm
Learn how to prepare and practise for different types of interviews. Book online.

Climate Literacy Taster
with NI Environment Link
NI Environment Link, 1.30pm - 4pm
What do terms like 'carbon footprint' and 'net zero' mean? Learn the language of climate change and help play your part. Book online.

Tree Nursery Open Morning
with Belfast Hills Partnership
Social Economy Village,
Hannahstown Hill,
11am - 12.30pm
See around the Tree Nursery where local seeds are planted to grow native trees. #OneMillionTrees

Cookery Class with Colin Neighbourhood Partnership
Healthy Living Centre, 30 Colin Glen Road, 10am - 2pm. Families.
Learn about nutrition and how to cook healthy meals on a budget. To book email matthew@newcolin.com or telephone 028 9062 3813

Digital Art Workshop with Belfast Electronic Arts & Music Academy 31 Henry Place, 1pm - 3pm
Learn how to create animation videos on an environment theme.
Ages 18-30 with additional needs
Book online.

Full of Wonder, Full of Plastic
with Queens University Belfast
Naughton Gallery, Lanyon Building,
7pm - 8.30pm
US-based designer, writer and illustrator, Ingrid Hess explores how art, as much as science, can help fight the environmental crisis. Book online.

Book Club with Pangur Ban
Market Street Community Centre, 6pm - 8pm
Discuss the Ragged Trousered Philanthropist, a classic piece of literature. To book telephone 07934726239.

Set Dancing Class
with 174 Trust Set Dancers
The Duncairn Centre, 7.30pm - 9.30pm

Wednesday 24 April

Lifelong Learning
with Forum for Adult Learning NI
NICVA, 10am - 1pm
Interested in learning more about adult and community education? Meet others from the sector and discover the impacts and benefits of lifelong learning. Book online.

Chess Meet-up
with Roaming Knights
Duncairn Arts Centre, 2pm - 4pm
Meet other local chess players to talk strategy and play games.

The Guild of Library Writers
with Libraries NI
Belfast Central Library, 2pm - 3pm
Are you a budding writer or poet? Be inspired as you meet like-minded people and share ideas.

Creative Writing Group
with Libraries NI
Whiterock Library, 3.30pm - 4.30pm
Ages 8-13. Young minds can unleash their imagination as they discover the joy of writing. To book telephone 028 9050 9236

Writing Group
with Belfast Writers Group
2 Royal Avenue, 4.30pm - 6pm
Unleash your creative flair as you set aside time to discover the joy of writing. To book email writersgroupbelfast@gmail.com

Fun Day with Forthspring Inter-Community Group
373-375 Springfield Road,
3pm - 5.30pm.
To book email mumo@forthspring.com

Elevate Taster with Oh Yeah Belfast
Oh Yeah Music Centre, 5pm - 7pm
Ages 14+. Join this weekly songwriting and guitar programme, designed to help young musicians pursue their passion for music. To book email caoimhe@ohyeahbelfast.com

Climate Fresk with Decarboneaser
Online, 6pm - 9.15pm
This fun workshop will teach you the fundamental science behind climate change and empower you to take action. Book online.

Solo Irish Traditional Dance Step
with Step with Annette
Maddens Bar, 74 Berry Street,
7pm - 8.30pm. Ages 18+.
To book email stepwithannette@yahoo.com or telephone 07788730429

Music Journalism with Oh Yeah Belfast
Oh Yeah Music Centre,
6pm - 9pm Ages 14+.
Learn what it takes to become a music journalist in Belfast.
To book email caoimhe@ohyeahbelfast.com

Thursday 25 April

Leaning and Skills Showcase
with Gems NI
2 Royal Avenue, 9.30am - 12pm
Find out about the current skill building opportunities that are available across the city.

Start a Pollinator Garden with The Conservation Volunteers
Grey to Green, Kent Street,
10am - 3pm
Learn some top tips to attract bees and butterflies to your garden. To book email sian.doherty@tcv.org.uk

Healthy Places, Healthy Children
with Belfast Healthy Cities
Clifton House, 2 Clifton Street,
3.30pm - 4.30pm
Are you a Key Stage 2 teacher or a World Around Us Co-ordinator? Find out more about this teaching resource which introduces children to the links between the built environment and health and well-being. To book email maeve@belfasthealthycities.com

Celebration of Learning with Footprints Women Centre
84a Colinmill, Poleglass, 11am - 1pm
To book email charlene@footprintswomenscentre.com or telephone 028 9092 3444

Take 5 Take Care with Aganza Project Chinese Welfare Association,
1pm - 2pm
To book email Khanyisamafumo@gmail.com

Disabled People – Speak Out
with Action Ability
2 Royal Avenue, 1.30pm - 3.30pm
Be inspired at this peer learning event to explore capacity and consent.
To book telephone 028 9023 6677 (option 8).

Eco Engineers with Belfast South Community Resources
127 Creative Space, 127-145 Sandy Row, 3.30pm. Ages 9-12
Learn about looking after the environment and how to make a difference locally. Book online.

Warmer Homes
with Belfast City Council
St Comgall's Community Hub,
6pm - 8pm
Learn how to make your home more energy efficient and how to budget. Book online.

Music Photography
with Oh Yeah Belfast
Oh Yeah Music Centre, 6pm - 9pm
Ages 14+
Learn from photographer Carrie Davenport who regularly captures photography at live events for Belsonic. To book email caoimhe@ohyeahbelfast.com

Friday 26 April

Greening your Garden
with Groundwork NI
Connswater Meanwhile Garden,
10am - 12pm and 1pm - 3pm
From choosing native plants to attracting pollinators, discover ways to work with nature in your garden.
Book online.

Library Tour with Libraries NI
Belfast Central Library, 10.30am

Learn about Friar's Bush Graveyard Tour with History Hub Ulster
Friar's Bush Graveyard,
11am, 1pm and 3pm.
Watch actors share the story of this historic graveyard.
Book online.

Cregagh Glen Guided Walk
with National Trust
Cregagh Glen, Time 11am - 1pm
Wander alongside the waterfall in this wooded glen with the team who help care for this special place. To book email craig.somerville@nationaltrust.org.uk

Job and Training Opportunities Meet-up with GLL Better Gyms
Templemore Baths, 10am - 12pm

Every Little Thing
with Spectrum Centre Trust
Spectrum Centre, 11am - 1pm.
Ages 18+. Make fun and funky pieces of art with items that might otherwise be thrown in the bin. To book email sally.young@spectrumcentre.com

Shared Reading Group
with Libraries NI
Belfast Central Library,
2.30pm - 3.30pm
Discover the joy of reading in a group setting.

Climate Change Event with Market Development Association
Market Community Centre,
6pm - 8pm
Learn how climate change will impact Belfast City Centre, your community and your family. To book telephone 07934726239

Saturday 27 April

DNA in a Day with W5
Odyssey, 2 Queens Quay,
10am - 4pm. Ages 18+.
Whether you're a science enthusiast or curious about the life, join us to delve into Genes and DNA.
To book email educationqueries@w5online.co.uk

Let's get growing
with Belfast City Council
Lower Botanic Gardens, 10am - 2pm
Roll up your sleeves in Good to Grow Week and get involved with a new eco-community garden.

Waste Wins Wars with NI War Memorial
21 Talbot Street, 12pm - 4pm
Visit the museum to learn about rationing and recycling during the Second World War.

Digital Animation Workshop
with Belfast Electronic Arts & Music Academy
Girdwood Community Hub, 12pm - 2pm
Ages 7-12. Book online.

Tour of the Night Sky with W5
Odyssey, 2 Queens Quay, 11am, 12.30pm, 2pm and 3.30pm
Step into a 6-metre inflatable planetarium and explore the mysteries of constellations and asterisms. To book email educationqueries@w5online.co.uk

Alley Safari with 9ft in Common and Wild Belfast
Ormeau Park, 11am - 12:30pm
A walking tour of spaces behind our backgates. Learn what we can do to encourage more biodiversity.
Meet at Front Gate off Ormeau Road.

Make Some Noise with Rich Music NI
Fitzroy Presbyterian Church Hall
10.30am - 11.15am and
11.45am - 12.30pm
Interactive music workshop for people with additional needs. To book email bethany@richmusicni.co.uk

Sir Samuel Kelly Lifeboat and The Stormy Sea
with Donaghadee Heritage
St. Joseph's Church, 9 Princes Dock,
2pm - 4pm
Learn about the lifeboat crew who saved 33 people from the wreck of the Princess Victoria car ferry.
To book email liz@deeheritage.co.uk

SpringFest
with Belfast City Council
Malone House, Barnett Demesne
Saturday 27 and Sunday 28 April,
1.30pm - 5.30pm
Stroll through hundreds of blooms for a weekend of family fun. With flower displays, craft activities and live music, soak up the sights of spring in this great green space.

CLIMATE & CITY RESILIENCE COMMITTEE

Belfast City Council

Subject:	Local Energy Action Plan
Date:	11th April 2024
Reporting Officer:	John Tully, Director of City and Organisational Strategy
Contact Officer:	Debbie Caldwell, Climate Commissioner

Restricted Reports

Is this report restricted? **Yes** [ ] **No** [x]

Please indicate the description, as listed in Schedule 6, of the exempt information by virtue of which the council has deemed this report restricted.

Insert number [ ]

1. Information relating to any individual
2. Information likely to reveal the identity of an individual
3. Information relating to the financial or business affairs of any particular person (including the council holding that information)
4. Information in connection with any labour relations matter
5. Information in relation to which a claim to legal professional privilege could be maintained
6. Information showing that the council proposes to (a) to give a notice imposing restrictions on a person; or (b) to make an order or direction
7. Information on any action in relation to the prevention, investigation or prosecution of crime

If Yes, when will the report become unrestricted?

After Committee Decision	[ ]
After Council Decision	[ ]
Sometime in the future	[ ]
Never	[ ]

Call-in

Is the decision eligible for Call-in? **Yes** [x] **No** [ ]

1.0	**Purpose of Report/Summary of Main Issues**

1.1	I. To present the draft Local Energy Action Plan (LAEP) and Queen's Island Decarbonisation Plan to elected members. II. Note the contents of the reports and the proposed outline priority decarbonisation projects (domestic retrofit, heat network, solar PV on public buildings, solar car port with EV charging and oil boiler to heat pump transition) and near-term actions to progress the LAEP and the two modelled scenarios for Queen's Island (a Heat network and Solar Photovoltaic Carports. III. Note that the 'Belfast Net Zero pathfinder' project provides the funding to enable BCC to immediately progress the LAEP and the Queen's Island Decarbonisation Plan by developing two of the priority projects identified in these plans: 1) heat network, and 2) a solar PV project. IV. Note that the Climate Team are currently working with Climate NI to develop a proposal to secure up to €120k from a new funding programme Pathways2Resilience which has become available through Horizon Europe to support the development of climate adaptation and resilience for the city. V. An update will be brought back to elected members in due course.
2.0	**Recommendation**
2.1	Give approval to: I. establish a LAEP delivery group to support the delivery of decarbonisation projects across the city; II. establish a community of practice to ensure that the data generated by the modelling is fully utilised by key stakeholders across the City (eg QUB and UU).
3.0	**Main Report**
3.1	**Background** A place-specific approach to delivery is critical to achieving a timely and cost-effective Net Zero as each place has its own unique geographical, socio-economic features and challenges. For example, Belfast's dependence on imported fossil fuels - gas and oil to heat buildings and on petrol and diesel for virtually all its transport needs means that we spend over £300m on energy across the city every year – set to rise to c.£466 million per year or more in 2050. Belfast also has unique geographical features including access to the sea and 10km of waterfront as well as being located over a porous aquifer with Sherwood Sandstone which has above ambient temperatures which could be used to support low carbon infrastructure.
3.2	A Local Energy Action Plan (LAEP) assesses the unique characteristics of Belfast as part of the net zero transition and uses place-based data and network system modelling to identify the most cost effective and impactful pathway to achieving net zero for the city.
3.3	The Energy Systems Catapult (ESC) were appointed in February 2023 to develop a LAEP for the Belfast area while also providing an Energy Decarbonisation Plan specifically for the Innovation District of Queens Island. This is a foundational piece of work for Belfast to help attract external funding and investment into the city and will feed into the wider business case for potential LAEP roll out across Northern Ireland.
3.4	The LAEP approach was developed by ESC to provide decision-makers with the detailed information needed to support informed investment decisions that enable a cost-effective transition to Net Zero.
3.5	The approach uses whole system modelling with local stakeholder knowledge to deliver a comprehensive, data-driven and cost-effective plan for decarbonisation based on the unique characteristics of Belfast's buildings, transport systems, local industry, energy generation

	and distribution assets, geographic and spatial constraints, and social factors including fuel poverty.
3.6	The process brings together the public and politicians, businesses and regulators, energy networks and local authorities, to help towns and cities decarbonise their energy systems on the path to Net Zero.
3.7	**Objective** The overall objective was to develop a Local Area Energy Plan (LAEP) for the city of Belfast and a Decarbonisation plan for part of the Innovation District, Queens Island with two intended outcomes: • A facilitated, collaborative and coordinated transition towards becoming carbon neutral by 2050 with the plans and actions of stakeholders contributing towards a collective goal; and • an optimised, cost-effective, transparent and evidence-based pathway to achieving the target.
3.8	**Key outputs** The draft LAEP (attached at Appendix 1) incudes the following key outputs: 1. **The Pathway** sequencing all of the interventions within the LAEP that set out the area's proposed route to net zero including near-term and long-term components; 2. A **'plan on a page'** illustrating focus zones, priority actions, and areas of energy network change; 3. **Visual focus zones** for all the prioritised activity associated with the main components of the proposed energy system; 4. **Five outline priority projects** to take forward; 5. **Breakdown of investment** to decarbonise the local area aligned to the main energy system components; and 6. **Next steps** - near-term activities and actions needed to progress the LAEP.
3.9	The outputs will determine network system choices, the level of investment required to transition to a net zero energy system, high level project identification and required policy changes.
3.10	The decarbonisation plan is a whole energy system approach to considering how Queens Island can achieve Net Zero over time eliminating the use of fossil fuels on site and replacing with a decarbonised alternative, while also considering the knock-on impacts on the other systems in place. The draft LAEP and the Decarbonisation Plan for Queens Island (Appendix 2) have been presented to the local energy consortium highlighting the most effective pathways to achieve decarbonisation in the city, accounting for the local development and growth plans.
3.11	**Local energy consortium** The work took place over one year and involved a diverse group of stakeholders in the city's energy system with oversight from a Steering group comprising: BCC, NIE, SONI, Phoenix Energy, NIHE, NIGS, the Federation of Master Builders, NI Water, Consumer Council, DFE and DAERA.
3.12	**LAEP outline priority projects** Through a combination of modelling and wider factor analysis with local stakeholders, five outline priority projects were identified for near term implementation. These projects were proposed on the basis of delivering a significant impact against Belfast decarbonisation ambitions. These include:

	• a High Temperature District Heat Network in City Centre which aims to connect multiple anchor loads from public buildings during phase 1, then connecting to domestic buildings in phase 2; • a Domestic Retrofit pilot that targets a mixed tenure, low-income area with EPC ratings D-G; • a Solar PV on Public Buildings project providing a total of no less than 1MWp of renewable electricity for local consumption; • Solar Car Port with EV Charging; • an Oil to Low Carbon Heating Transition project that seeks to replace existing oil heating in domestic and non-domestic buildings with low carbon heating technologies such as heat pumps.
3.13	**Modelled Scenarios for Queen's Island Decarbonisation Plan** • Heat network (Belfast Met, Citi Gateway, Titanic Belfast, PRONI, Titanic Hotel) • Solar Photovoltaic Carports (Odyssey and Catalyst)
3.14	**Next steps** The 'Belfast Net Zero pathfinder' project will develop two of the priority projects identified in these plans: 1) heat network, and 2) a solar PV project. The project is funded by Innovate UK and will run for one year from 1st June. See Appendix 3 for more information. The Climate Team will also establish: • a LAEP Delivery group to maintain momentum, commitment and collaboration around delivering the LAEP; and • a community of practice to ensure that the data generated by the modelling is fully utilised by key stakeholders across the City (eg QUB and UU).
3.15	A report will be brought back to update elected members in due course.
3.16	**Funding Opportunity** A new funding programme has become available through Horizon Europe that will help support the development of climate adaptation and resilience for the city. The Pathways2Resilience project is run by Horizon Europe and aims to increase the resilience of European regions and communities.
3.17	The programme seeks to empower regions and communities through systems innovation and capacity building towards climate resilience and can provide up to €120k to each participating region to co-design a vision of a climate resilience future and innovation to ensure long term impact.
3.18	This current call which closes on 6th May aims to support 40 regions across Europe throughout 2024 and 2025. Applying for this call will provide access to networks, learning and capacity to help progress climate adaptation planning for the city, which is in line with the Northern Ireland Climate Adaptation Plan which is entering its third cycle.
3.19	The Climate Team is currently engaging with Climate NI and DAERA on the role of local councils and Pathways2Resilience will provide more support to build more resources and capacity for this work if successful in securing funding. The Climate Team are currently working with Climate NI to develop a proposal to the fund. A further update will be brought back to elected members in due course.
	<u>Financial and Resource Implications</u> The funding (£150K) secured from Innovate UK will be used to progress two of the outline priority projects.

	<u>Equality or Good Relations Implications/Rural Needs Assessment</u>
4.0	**Appendices - Documents Attached**
	1. Belfast Local Area Energy Plan 2. Queen's Island Decarbonisation Plan

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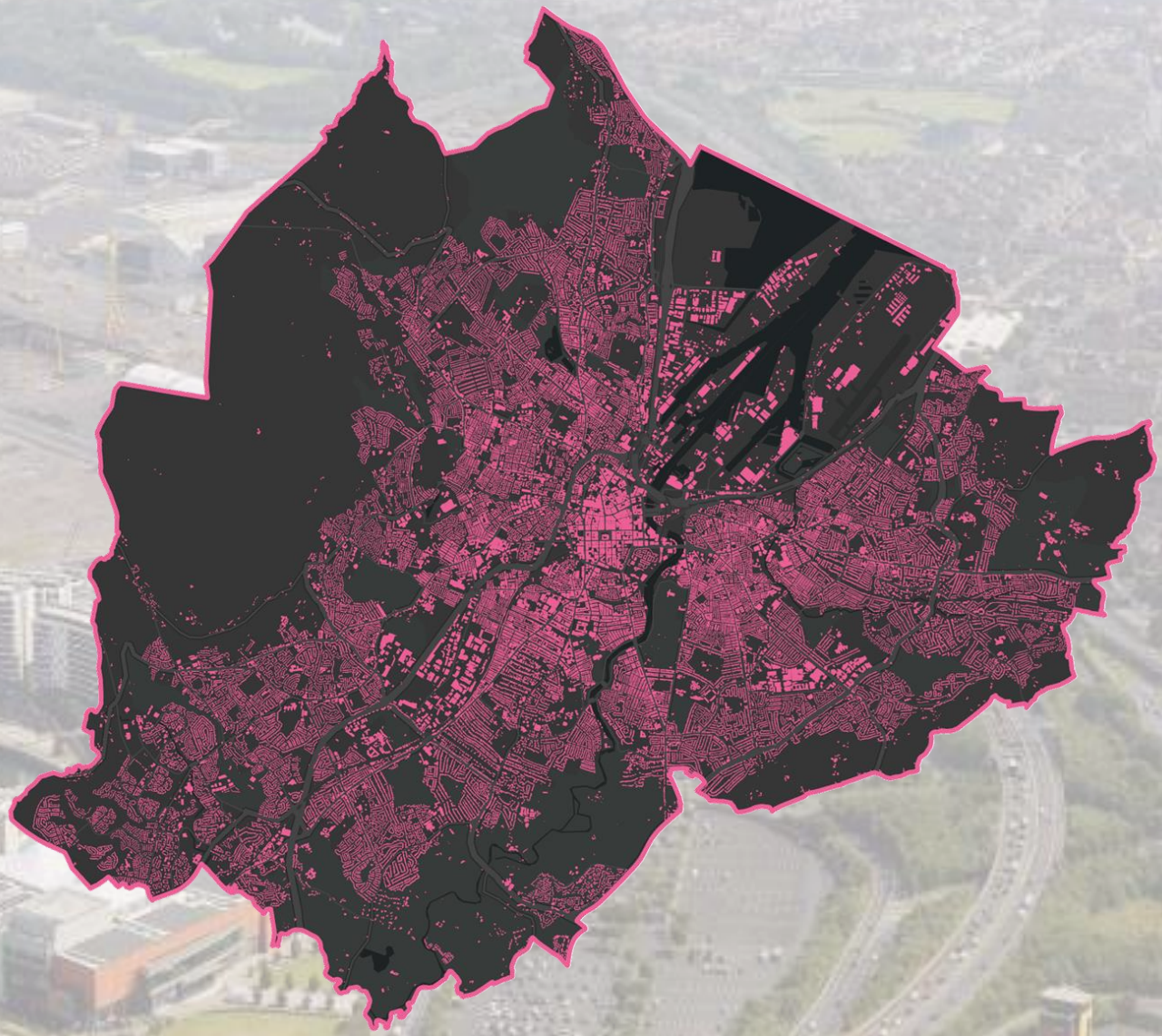
Belfast

LOCAL AREA ENERGY PLAN

Belfast City Council

CATAPULT Energy Systems



March 2024

Acknowledgements

This plan was prepared by Energy Systems Catapult, on behalf of Belfast City Council (BCC).

This plan is funded by BCC.

Contributors

The development of this LAEP has been supported by a Steering Group consisting of BCC, as the lead Government Organisation, plus utility operators in the region, trade associations, and Government Owned Companies (GoCo) under the Department for Infrastructure (DfI), Department for Communities (DfC), and Department for Economy (DfE). The Steering Group have been instrumental in shaping the LAEP by being accountable for decision making, supporting data gathering, providing local context and characteristics, defining the modelling Scenarios, examining model assumptions, and reviewing and commissioning the LAEP.

Further support was provided by local stakeholders who also contributed to the decision-making process, the data gathering, and the understanding of local context and characteristics.

LAEP Steering Group

Definition of Terms and Abbreviations

Term / Abbreviation	Definition	Term / Abbreviation	Definition
ASHP	Air Source Heat Pump	**Low Regrets**	A key component of the LAEP pathway. These are actions/projects which are common under various Scenarios but may require further Enabling Action before they can be progressed. These could occur in the near-term but may require longer-term resolution of uncertainties or market conditions to evolve naturally.
BCC	Belfast City Council	LT	Low Temperature
Data Zone	A statistical output geography, introduced in Northern Ireland by NISRA and OSNI after the 2021 Census	LV	Low Voltage
DfC	Department for Communities	NIHE	Northern Ireland Housing Executive
DfE	Department for Economy	NISRA	Northern Ireland Statistics and Research Agency
DfI	Department for Infrastructure	NDB	Non-Domestic Buildings
DHN	District Heat Network	NI	Northern Ireland
Enabling Actions	A key component of the LAEP pathway. Enabling Actions mostly occur in the near-term to develop market conditions which enable scale up activities in the long-term. Often these are not under Local Government control.	OPPs	Outline Priority Projects
EPC	Energy Performance Certificate	**Opportunity Areas**	An area of Belfast where an intervention is recommended in high numbers but may have uncertainties or barriers associated with delivery.
ETP	Eastern Transport Plan	OSNI	Ordnance Survey of Northern Ireland
EV	Electric Vehicle	**Outline Priority Projects**	Near-term components on the Pathway that provide the local area with projects that can immediately be implemented to make progress towards net zero
Focus Zones	An area of Belfast where an intervention is recommended in high numbers and with high certainty (low-regrets) and enablers for near-term delivery.	**Pathway**	The most cost-effective and co-beneficial way for Belfast to achieve a Net Zero energy system.
GB	Great Britain		
Green Gas or Renewable Gas	Biomethane or Hydrogen	**Primary Stakeholders**	Stakeholders who are responsible for creating the LAEP (typically lead government organisation and network operators)
GoCo	Government Owned Companies	PoP	Plan on a Page
GSHP	Ground Source Heat Pump	PV	Photovoltaics
HP	Heat Pump	**Quick Wins**	A key component of the LAEP pathway. Quick Wins are near-term actions/projects of short duration and with high confidence that the intervention is the correct choice. A Quick Win requires fertile market conditions and has relatively few barriers to implementation.
HT	High Temperature	ROI	Republic of Ireland
HV	High Voltage	**Scale-up**	A key component of the LAEP pathway. These are long duration major decarbonisation activities not expected to happen naturally in today's market conditions. Typically preceded by a Key Decision Point in situations of low certainty or an Enabling Action in situations of high certainty.
Innovation and Demonstrator Projects	A key component of the LAEP pathway. These projects help navigate aspects of uncertainty or bring longer-term solutions into the near-term. Often these feed into Key Decision Points on the Pathway.	Scenario	Scenarios provide a vision of the future energy system and are a common modelling approach to establish the optimal Pathway for the local area.
Interventions	The types of measures that can be taken to enact decarbonisation upon the local energy system.	**Secondary Stakeholders**	Stakeholders who are responsible for supporting the creation of the LAEP by contributing to the decision-making process (may include local citizens, other local government organisations and departments, industrial and commercial energy users, community energy groups etc)
Key Decision Points	A key component of the LAEP pathway. Key Decision Points are a milestone that indicate a fork in the pathway between decarbonisation options. These are typically preceded by Enabling Actions or Innovation & Demonstrator Projects and typically feed into Scale Up activities	**Small Area**	A statistical output geography, used in Northern Ireland prior to the 2021 Census
LAEP	Local Area Energy Plan	**TBC**	To Be Confirmed
LCT	Low Carbon Technology	**UK**	United Kingdom
LIDAR	Light Detection and Ranging		

Contents & Structure

Annex A: Belfast's Energy System Today

Annex B: Modelling Approach & Data Sources

Annex C: Evidence Base Report

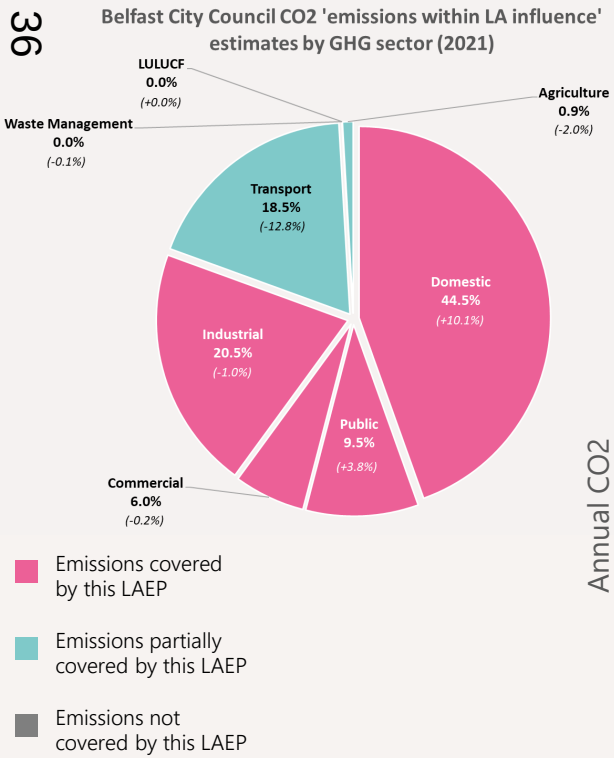
Annex D: Belfast Pathway

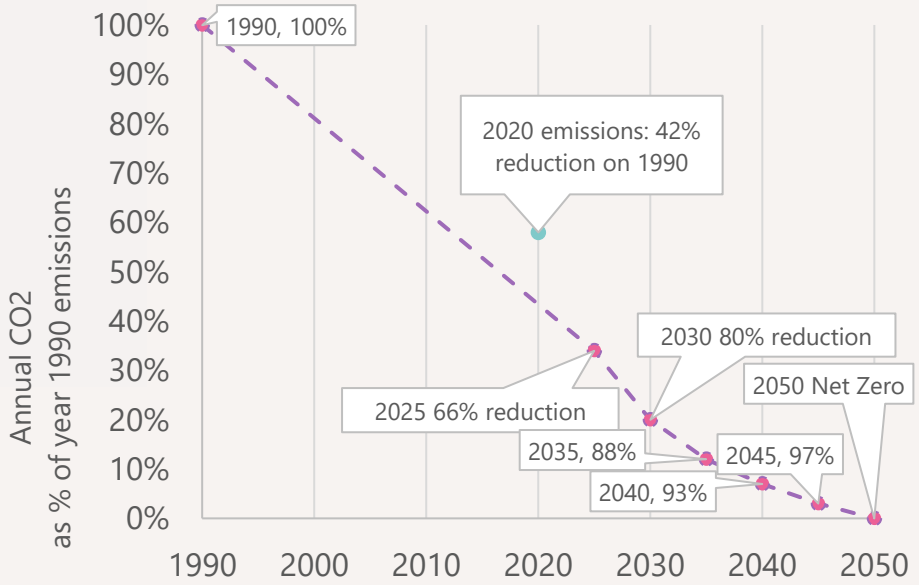
Annex E: Implementation Risk Register

Executive Summary

LAEP Context

This LAEP builds a strategic case for local energy system decarbonisation in Belfast. The evidence base is guided by existing ambitions, plans, and strategies for Belfast stakeholders and the wider Northern Ireland context (see examples above). Analysis uses Belfast's existing emissions (below left) and reduction targets (below centre) applied to the Local Government area boundary (below right).





Summary of Numbers

To reach a Net Zero energy system by **2050**, Belfast requires capital investment of:

£16.6 - £17.9 bn*

In total
This is a 6.2% - 14.5% increase over the BaU investment of £15.6bn

Including up to:

£2.5 - £2.6 bn*

in domestic properties (including building fabric upgrades and heating systems)

~£500 m*

of domestic and non-domestic **rooftop solar PV**

Bringing **potential local co-benefits** of:

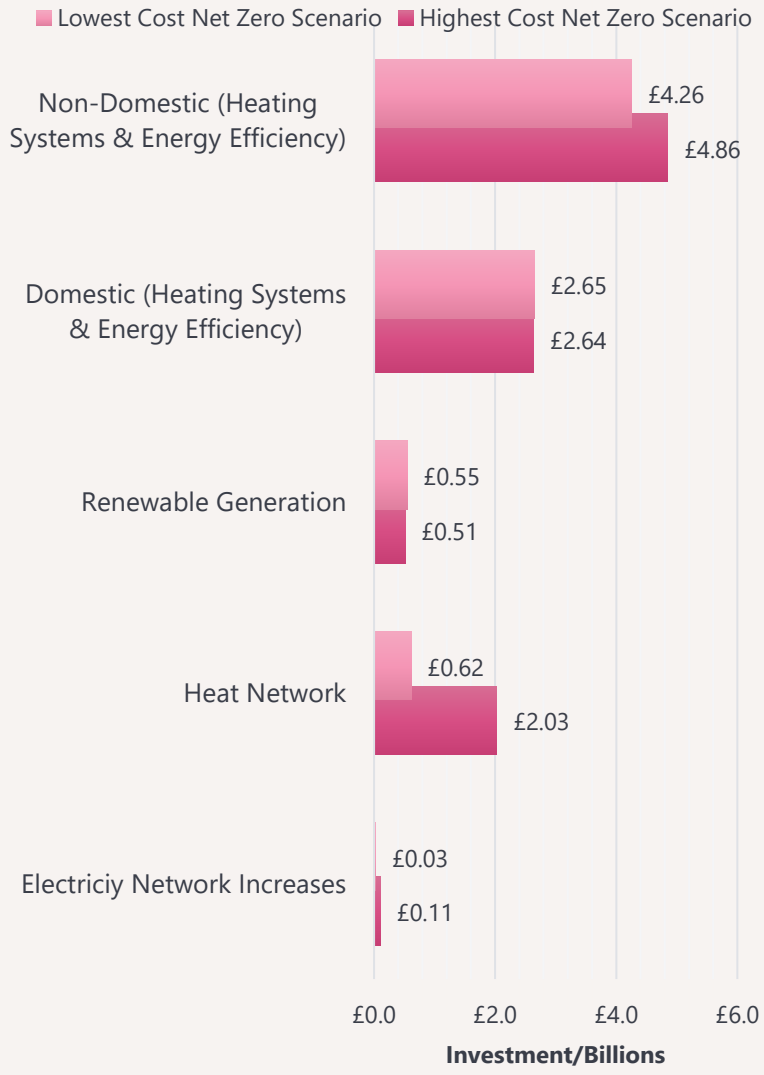
> 500 jobs*

Additional Full-Time Equivalents (FTE) supported (to 2050) relative to BAU

Up to £130 m*

of **monetisable health benefits**

Investment Breakdown to 2050*



By 2050 Belfast's energy system will have been **transformed**, with:

66,000 – 86,000*
heat pumps installed in dwellings

0.4 – 1.1 TWh/year
total demand from District Heat Networks including

23,000 – 110,000* new
domestic connections to **District Heat Networks**

~108,000 domestic properties
retrofitted with measures to improve **building fabric and energy efficiency** (insulation and glazing)

4,400
public electric vehicle charge points installed

1.1 GW
of renewable electricity generation from domestic and non-domestic **rooftop solar PV**

10.5 Mt CO2 saved
cumulatively to 2050 relative to BAU. This is equivalent to 16 return flights from Belfast to New York for every person in Belfast**.

**Numbers quoted are Scenario dependent. Explanation of Scenarios and comparison of results across Scenarios are detailed throughout this document. Costs shown exclude fuel costs which are provided in this document and supporting annexes.*

***https://co2.myclimate.org/en/flight_calculators/.*

Summary of Intervention Areas

This LAEP provides a Pathway, co-developed with the support of local stakeholders, for Belfast to achieve a Net Zero energy system by 2050. The Pathway is based on techno-economic modelling from multiple Scenarios, which describe possible futures for Belfast, with analysis of local co-benefits and impacts of energy system change. The Pathway highlights changes which are considered low regrets, and some which remain uncertain requiring future decisions to be made. The LAEP signposts opportunities for investment, which could bring significant local benefits, such as employment creation, air quality improvements, bill savings and healthier homes. Key risks to the successful implementation of the projects, actions, and recommendations of this LAEP are also identified. Key features by intervention area are summarised as follows:

Fabric Upgrades

Fabric and energy efficiency upgrades (insulation and/or glazing replacement) is identified as a low regrets measure for many homes in Belfast. 38% of homes could benefit from loft insulation, with 26% benefitting from wall insulation, and 4% requiring single glazing window replacement. It could be beneficial to steer the natural end-of-life replacement of windows towards high thermal performance options, such as triple glazing. Belfast's Retrofit Delivery Hub, will be crucial to galvanise the supply chain and provide support to homeowners, landlords, and businesses to deliver retrofit at the required scale and pace.

Low Carbon Heating

Most homes are currently heated by fossil fuel systems (66% on gas boilers and 29% on oil boilers). Belfast's most cost-effective Net Zero energy future is dominated by District Heat Networks (DHN) and Heat Pumps (HPs) but there is space to consider the emergence of biomethane at scale which remains an uncertainty. Belfast has natural resources such as geothermal aquifers and the river Lagan which may prove valuable in supporting the deployment of renewable heating technologies. The solutions for non-domestic buildings are similar to homes, with DHN and HPs being the most likely path to Net Zero depending on the availability of biomethane in the local gas grid.

Electric Vehicle Infrastructure

Transport modal shift through reduced dependence on private cars and a 15-minute city centre are the preferred features of Belfast's Net Zero future. A switch from petrol and diesel vehicles to Electric Vehicles (EVs) will also be required at scale to reach Net Zero by 2050. Public transport and active travel options become an enabler for this modal shift. The deployment of electric vehicle infrastructure aims to support these ambitions whilst recognising the need to make public EV charging an inclusive resource across Belfast with nearly 4,500 public charge points made available by 2050. Up to 43% of homes are fitted with an EV charge point particularly in the outer areas away from the city centre.

Local Renewable Generation

The potential to generate renewable energy locally, is dominated by rooftop solar photovoltaics (PV) due to the vast urban area. As much as 1.1 GW from both domestic and non-domestic buildings may be deployed if the electricity network can accommodate. Future engagement and decisions will be required to determine ownership and business models for this scale of renewable electricity deployment.

Energy Networks

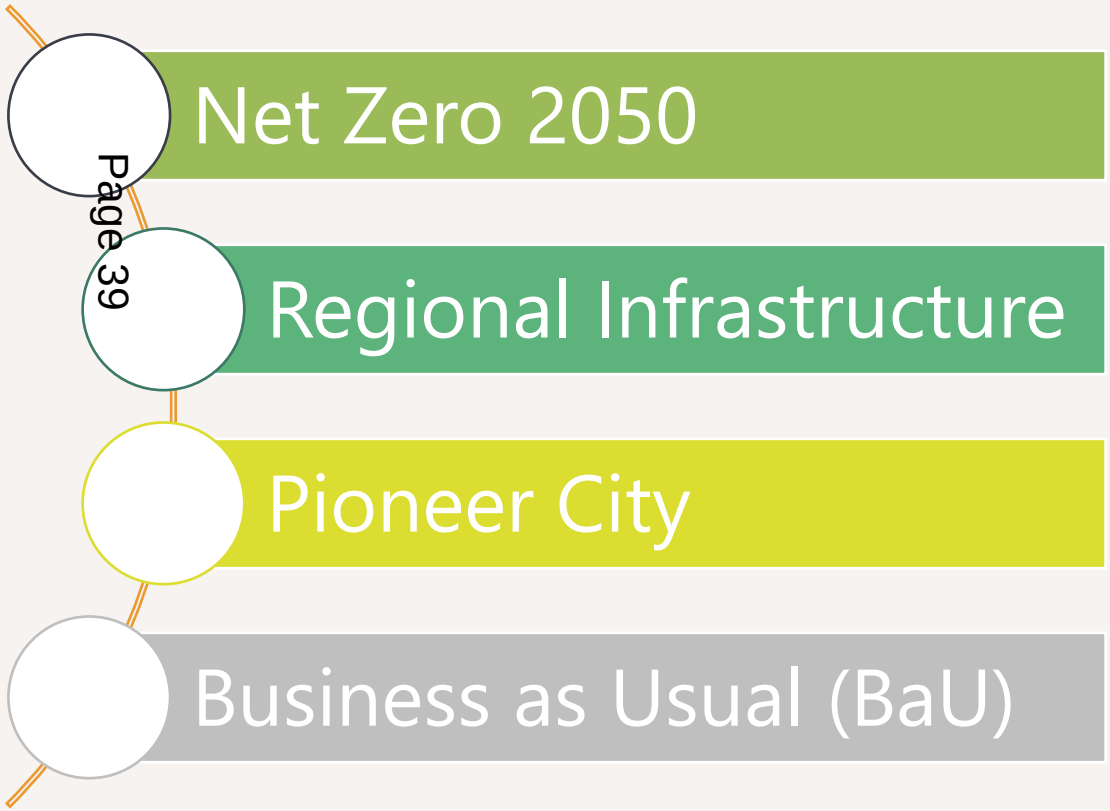
This LAEP illustrates the importance of investment in the electricity network to ensure sufficient capacity is available to support other Interventions such as electrification of heat and transport and the roll out of decentralised solar PV generation throughout the city. Co-ordination with the local electricity distribution network operator will be key to identify where network upgrades could occur in the near-term to enable the rapid growth of local carbon technologies. Flexibility from technologies such as smart energy meters and batteries can help reduce or delay network upgrades, or expediate the installation of low carbon technologies in network constrained areas. The demand from increased EV charging and the significant switch to the electrification of heat are accounted for in the electricity network assessment of this LAEP.

An important and somewhat unique consideration (in a UK context) for Northern Ireland will be the decarbonisation strategy for the agricultural and land use sectors which may lead to the emergence of biomethane production at scale. This LAEP assesses the impact of that emergence and suggests how Belfast should respond. This will be an important consideration in terms of the future purpose and operation of Belfast's gas network which is already well placed to distribute hydrogen through its predominantly plastic pipework. The cost-effective pathway in the LAEP modelling shows a potential role for hydrogen (both heating and industrial processes), but this emerges in the 2040s and remains uncertain, especially if biomethane and hydrogen compete for dominance. Hydrogen related decisions may be aligned to regional and national policies, but this should not impact near-term actions for other Interventions in Belfast.

Scenarios for Belfast

Scenario Overview

Scenarios provide a vision of the future energy system and are a common modelling approach to establish the optimal Pathway for the local area. Scenarios should be based upon aspirations, desires, hopes for the future energy system. Scenarios should focus on areas of specific interest or uncertainty (including stakeholder views that are polarising). Scenarios are modelled through fixing and varying of parameters and assumptions.



Note: Some technologies such as thermal storage, wave, 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 with local, regional, and national contexts.

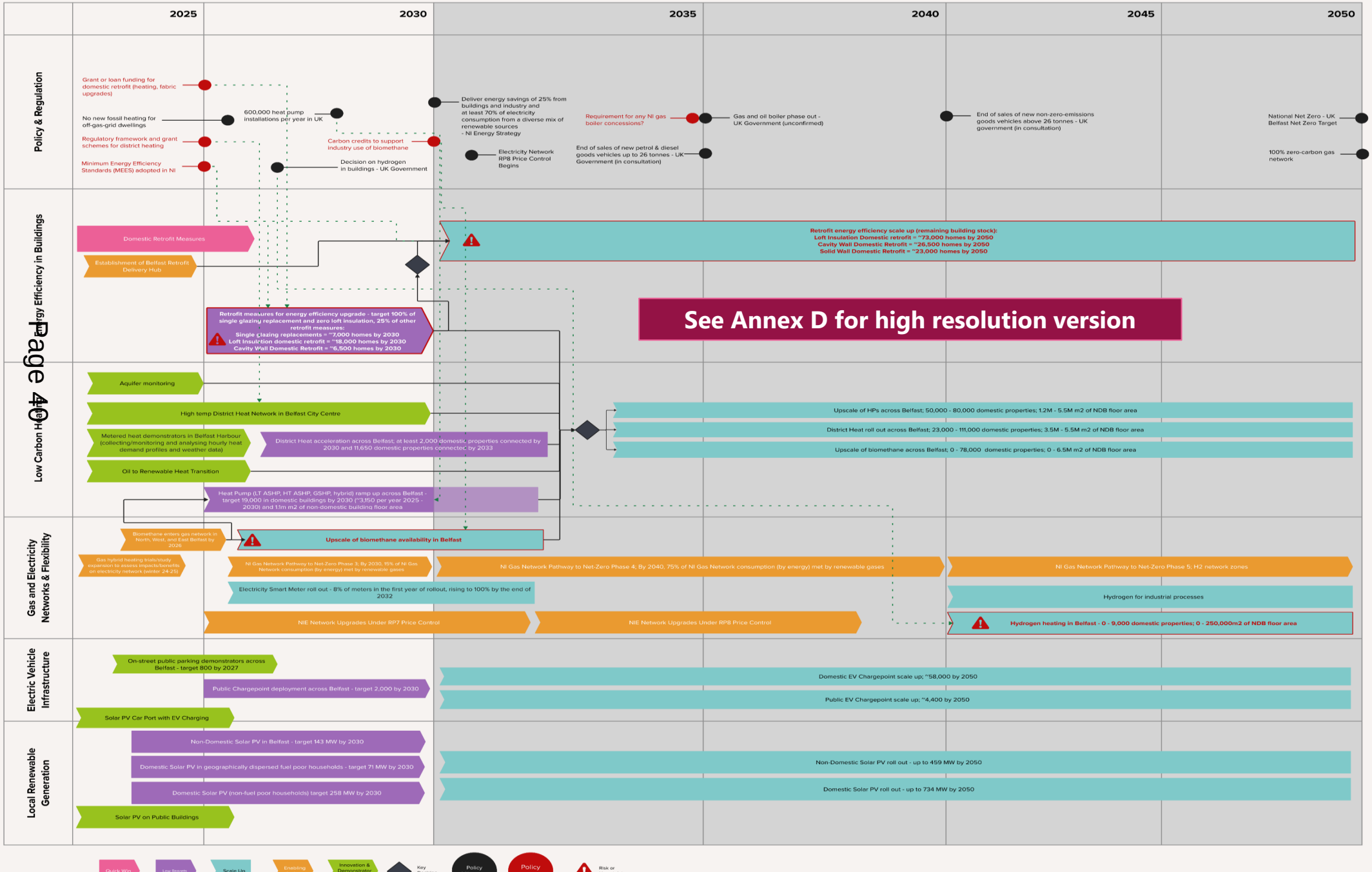
Net Zero 2050 Scenario aims to find the cost optimal path in line with the carbon targets set by the Northern Ireland Assembly; 56% reduction by 2025, 78% reduction by 2030, Net Zero by 2050 (against 1990 baseline). **This Scenario does not impose any constraints that would prioritise or accelerate any Belfast or Northern Ireland specific technologies.**

Regional Infrastructure Scenario aims to meet the same carbon targets, with the **assumption that there is significant regional investment in low carbon infrastructure to unlock the potential of large-scale technologies related to hydrogen and biomethane.** The hydrogen narrative is supported by regional developments such as Ballylumford power-to-X where a high regional capacity of wind generation leads to curtailment and enables the production of hydrogen in parallel with 24/7 operation of wind turbines in a co-benefit solution. Biomethane is made available from agricultural waste and feedstocks through anaerobic digestors located across rural Northern Ireland. Salt caverns in Larne Lough provide the opportunity for storage of both clean gases in large volumes.

Pioneer City Scenario also aims to meet the same carbon targets, with the assumption that Belfast looks inward to take control of its journey to Net Zero irrespective of wider regional developments. Priority is given to local measures which maximise unique opportunities and accelerate decarbonisation. **This Scenario allows for investment in an aquifer-based ambient loop district heat system, accelerated smart meter roll out, higher uptake of solar PV and a higher transport modal shift resulting in fewer EVs.** The hydrogen narrative is supported by local developments such as Belfast power-to-X and small quantities of biomethane are also made available.

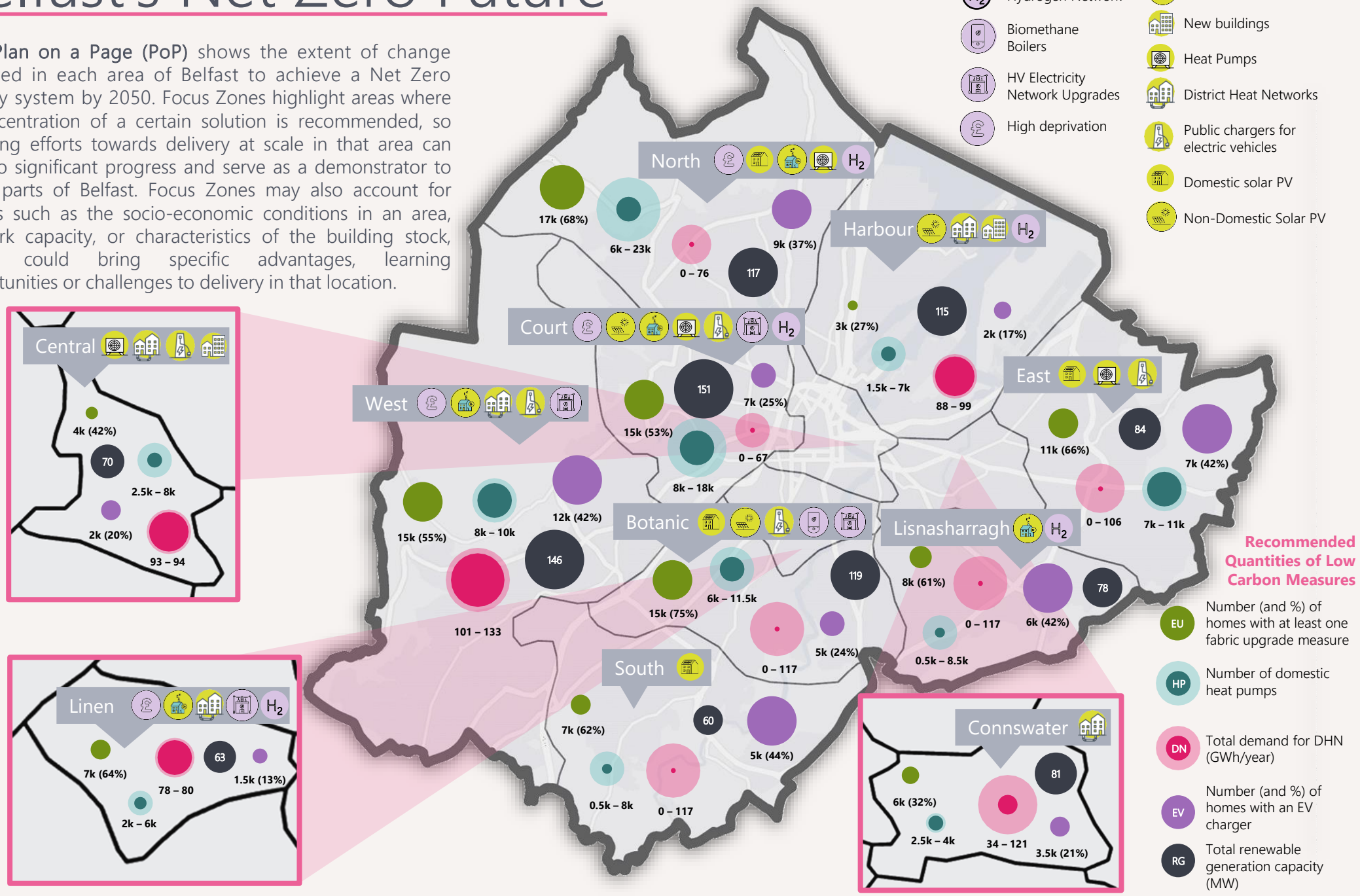
A '**Business-as-usual**' ('do nothing') **Scenario** is also modelled where no decarbonisation actions take place beyond already committed investments and peripheral decarbonisation progress (e.g. electricity grid). **This Scenario provides a counterfactual for cost and carbon impacts and other comparison purposes.** This is not required to meet the same local carbon targets and is not a Net Zero Scenario.

Belfast's Pathway to Net Zero



Belfast's Net Zero Future

This **Plan on a Page (PoP)** shows the extent of change required in each area of Belfast to achieve a Net Zero energy system by 2050. Focus Zones highlight areas where a concentration of a certain solution is recommended, so directing efforts towards delivery at scale in that area can lead to significant progress and serve as a demonstrator to other parts of Belfast. Focus Zones may also 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.

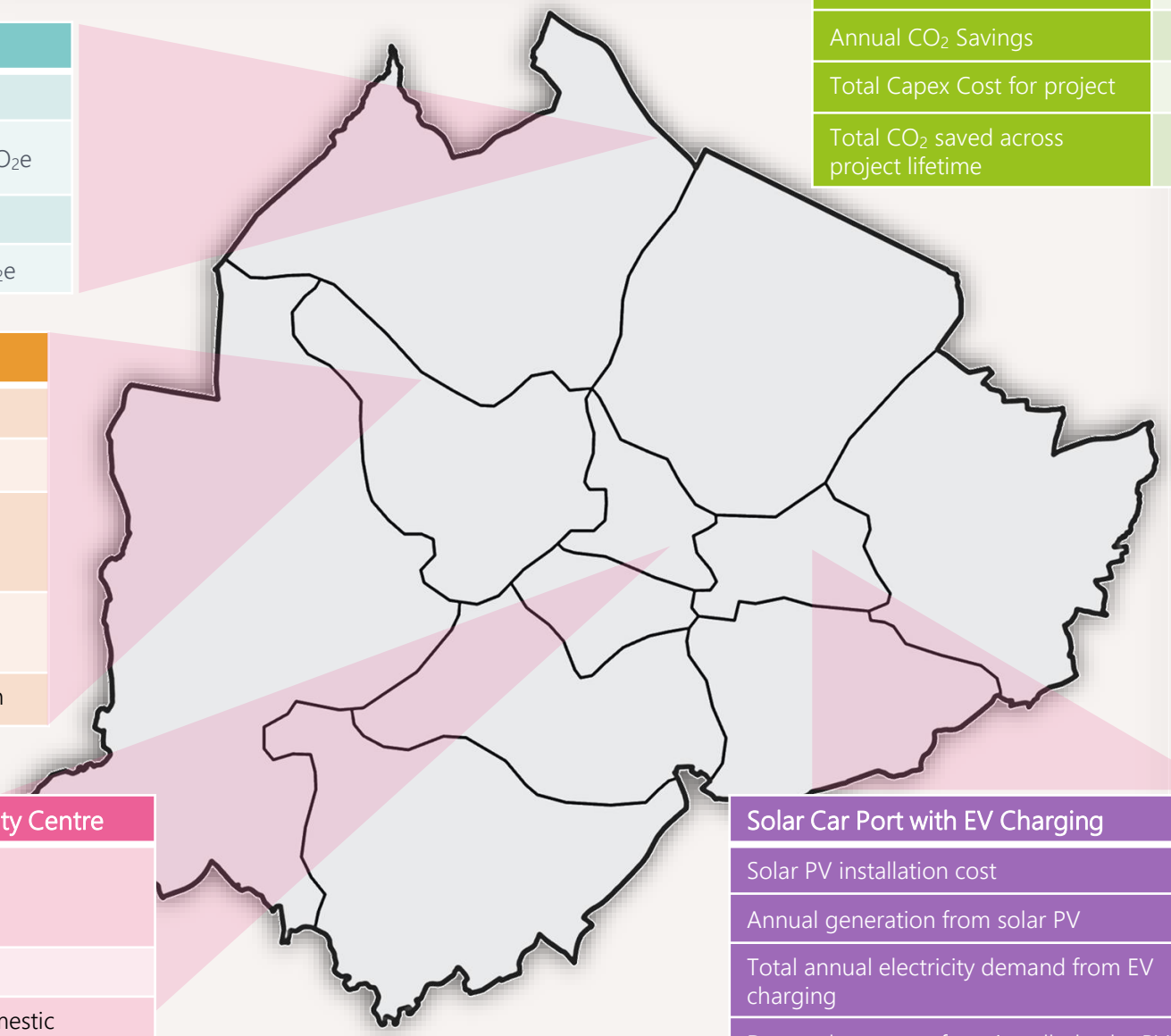


Outline Priority Projects

Oil to Low Carbon Heating Transition	
Number of homes transitioning	500
Annual CO2 Savings (per household)	4,400 $kgCO_2e$
Total Capex Cost for project	£7.0m
Total CO2 saved from project	2.2 $ktCO_2e$

Solar PV on Public Buildings	
Number of buildings	20
Annual energy generated	903 MWh
Annual CO_2 Savings	40 tCO2e
Total Capex Cost for project	£1.0m
Total CO_2 saved across project lifetime	606 tCO_2e

Domestic Retrofit Measures	
Number of Dwellings	Up to 2,000
Capital Investment	£2.7m – £5.6m
Annual bill savings per dwelling	£123 – £520
Annual carbon savings per dwelling	420 – 1,500 $kgCO_2e$
Additional benefit	Fuel poverty reduction



High Temperature District Heat Network in City Centre	
Potential annual energy demand (phase 1: Non-Domestic Buildings only)	2.8 GWh
Capital Investment	£4.2m
Additional benefit	Expansion to domestic properties in phase 2

Solar Car Port with EV Charging	
Solar PV installation cost	£21,100
Annual generation from solar PV	47,800 kWh
Total annual electricity demand from EV charging	3,432 MWh
Demand coverage from installed solar PV	1.4%
Annual CO_2 Savings	2,140 $kgCO_2e$

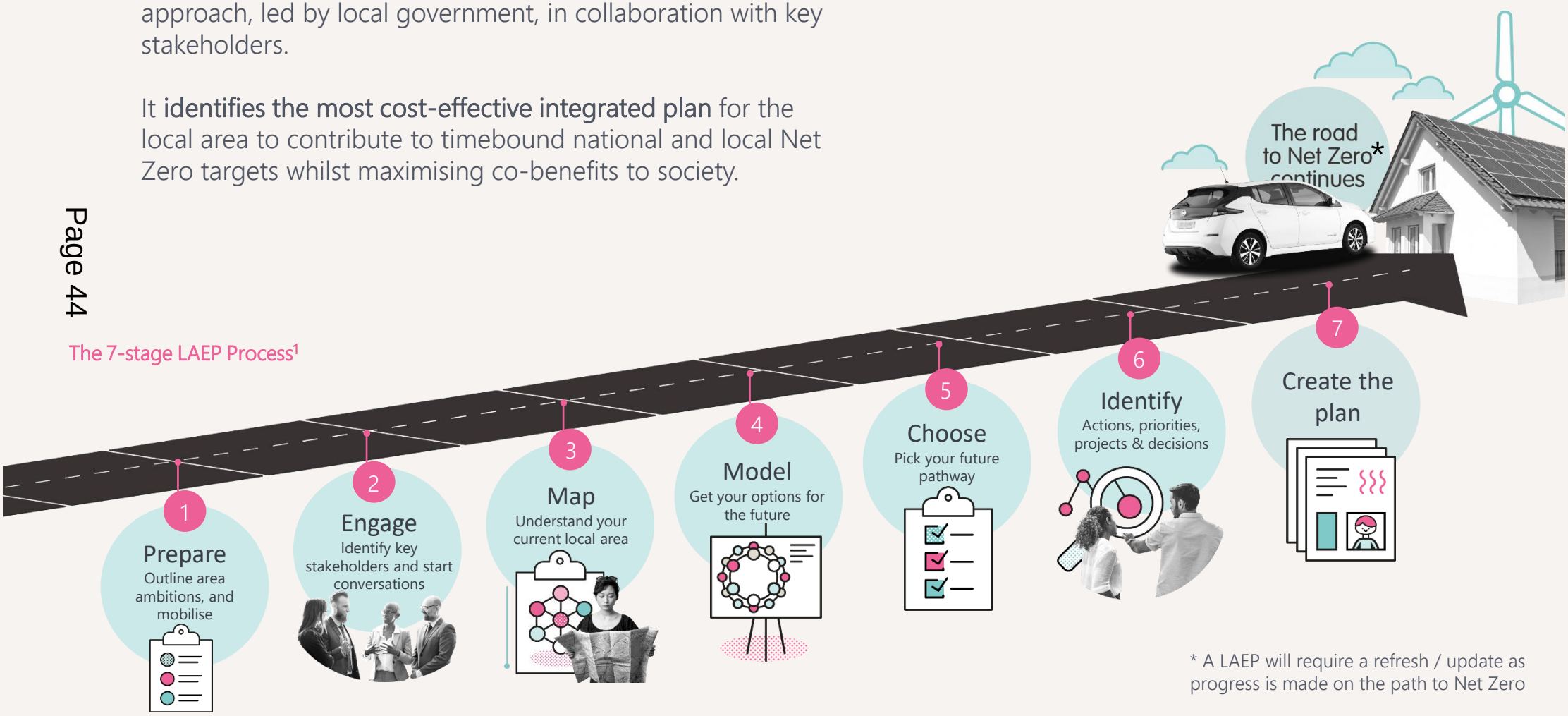
Introduction

What is a LAEP?

A Local Area Energy Plan (LAEP) is a **whole energy system** approach, led by local government, in collaboration with key stakeholders.

It **identifies the most cost-effective integrated plan** for the local area to contribute to timebound national and local Net Zero targets whilst maximising co-benefits to society.

The 7-stage LAEP Process[1]



* A LAEP will require a refresh / update as progress is made on the path to Net Zero

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

What is in a LAEP?

A Local Area Energy Plan (LAEP)[1] sets out the change required to transition an area's energy system to Net Zero against a specified timeframe. The LAEP approach uses continuous stakeholder engagement to drive an evidence-base that is led by data and built on common goals. It aims to identify the most effective route for the local area to meet both its decarbonisation goals and national Net Zero targets. This is achieved by exploring a range of technologies and Scenarios through whole energy system modelling and wider system analysis to identify the most cost-effective pathway to Net Zero whilst realising co-benefits for the local area. A LAEP is led by local government but developed collaboratively with key stakeholders from the local area incorporating their data, knowledge and future plans.

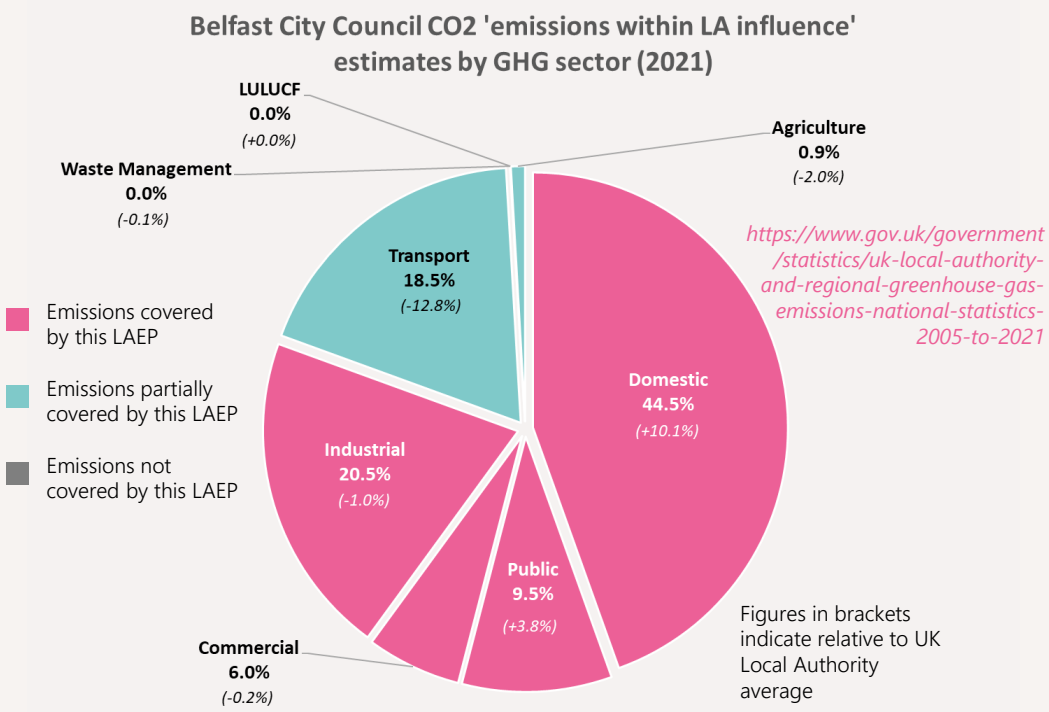
The LAEP provides a fully costed and spatial plan that identifies near-term actions and projects wrapped up in a long-term vision. The LAEP provides stakeholders from council planners to network operators to community groups with a basis for taking action and prioritising investments by detailing the 'what, where, when and by whom'. The level of detail is equivalent to an outline design or master plan for a local area. Additional detailed analysis is generally required to deliver the priority projects and specific recommended actions made by the LAEP[2]. Thus, it provides a high-level vision for the area rather than defining how the area should be designed and built.

A LAEP 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.

Scope of the LAEP

The UK Government's 2021 Net Zero Strategy estimates that **82% of the UK's emissions are "within the scope of influence of local authorities"**

The scope of the LAEP covers the present day and future (projected out to 2050) energy generation, distribution, and demand, plus associated emissions, in a defined local area. The LAEP considers electricity, heat, and gas networks, Green Gas potential (such as biomethane or hydrogen), the built environment (domestic, public, commercial, and industrial buildings – including agricultural buildings) its fabric and supporting systems such as heating, electricity storage and renewable energy generation, and decarbonised transport e.g., Electric Vehicle (EV) charging infrastructure.



[1] 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/

[2] 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.

[3] 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.

Purpose of this LAEP

The purpose of this LAEP is to support the city of Belfast in meeting its carbon targets, enabling transition to an affordable and decarbonised energy system as well as supporting wider socio-economic goals.

This LAEP provides a vision of how the local energy system could look in a Net Zero Greenhouse Gas (GHG) emissions future, and the pathways and steps which can be taken to get there, starting from the present day. It is intended to be used for several purposes by different stakeholders including as:

A primer

- The LAEP provides a high-level overview of the future Net Zero whole energy system, the investment required to achieve this, and priority projects to deliver immediate progress and decarbonisation impact.

A communication aid

- Visualisations of the changes involved can be a powerful engagement tool to give stakeholders clarity and consensus around the energy transition.

A detailed description

- Accelerating the planning process by providing the what, where, when, and how much for a range of decarbonisation Interventions deployed across the local area. The LAEP may help to provide clarity and key insights to drive critical decision-making processes.

A catalyst for investment

- An evidence base containing investment figures, key enablers, supporting infrastructure requirements can help build the strategic case to attract the capital needed for the energy transition. For example, the evidence base may help to inform investment in energy network upgrades or investment in impactful community energy schemes.

BCC aims to use this LAEP to support the strategic case for investment and prioritisation of projects. With the support of local stakeholders, the city aims to become a place-based decarbonisation leader.

Local Context

LAEP Stakeholders

The delivery of this LAEP will require all stakeholders in the local area to take forward the recommendations and work together in the context of wider collective Net Zero goals. To support the LAEP decision making, BCC has selected a community of stakeholders who have the power to influence the LAEP and are best placed to advise on the local interests through the governance structure offered by the LAEP process.

Primary Stakeholders help shape the LAEP by making key decisions as part of the steering group. This group also supports data gathering, provides local context and characteristics, defines the modelling Scenarios, examines model assumptions, and reviews and commissions the LAEP.

Secondary Stakeholders are relevant organisations, groups, or individuals from the local area who can support the LAEP process through data gathering and helping the understanding of local context and characteristics. Secondary Stakeholders need to be kept informed of the LAEP process, but they are not key decision makers.

Belfast Local Government District is home to a population of approximately 348,000 people [1]. Belfast is a city ambitious about Net Zero and building resilience towards climate change. In October 2019, Belfast elected members declared a climate emergency. In 2020, Belfast Climate Commission developed a Net-Zero Carbon Roadmap [2] which identifies a range of cost-effective measures that can be taken to reduce emissions. Subsequently they proposed the following emissions targets which were formally adopted in 2022 [3]:

- 66% by 2025 [reduction in scope one and two CO_2 emissions compared to 1990 levels].
- 80% by 2030 [1990 levels].
- 100% by 2050 [1990 levels].

Commitment to these ambitions is recognised in the most recent Carbon Disclosure Project scores (November 2023) when Belfast received an 'A' score for the second year in a row [4]. More than 900 cities around the world have been scored with only 119 (13%) receiving the sought after A. Belfast has also ranked the highest in Northern Ireland in the 2023 Council Climate Action Scorecards, scoring 43% with the region's average 21%. The assessment covers all UK councils and consists of 91 questions based around topics that include buildings, heating, transport, planning and land use, and governance and finance. Belfast City Council (BCC) is working with partners to reduce emissions from all sectors of the economy. Belfast is currently a member of the Global Resilient Cities Network, Core Cities Network, Eurocities Network, the ICLEI Network, and the PCAN Network. Belfast recognises the contribution that the local energy system will play in achieving those ambitions and has identified several key enablers to reduce carbon emissions in the energy related sectors including:

- Investing in renewable energy, such as solar and wind power.
- Promoting energy efficiency in buildings and low-carbon heat.
- Developing a low-carbon transport system.
- Supporting the development of a green economy and the circular economy.

The Electricity Distribution Network Operator (DNO) for NI is Northern Ireland Electricity (NIE) Networks. NIE supplies electricity to every home, farm, community and business in Northern Ireland via its distribution network. NIE are committed to investing c.£3bn in network performance and upgrades by the early 2030s. This is realised through a one-year extension to RP6 (price control mechanism for NI 2017 – 2024) and their proposed Business Plan for the subsequent RP7 price control period (2025 – 2031) subject to draft determinations expected in late 2023 [5]. NIE work closely with System Operator Northern Ireland (SONI). SONI plans the future of the electricity transmission system and are responsible for day-to-day operation. This includes interconnecting to neighbouring grids and running the wholesale electricity market as well as balancing generation and demand via NIE Networks distribution system. SONI have plans for transmission expansion to cover 10 years' worth of load growth much of which may provide significant capacity headroom for widespread electrification of Belfast. SONI's System Needs Assessment document, 'Tomorrow's Energy Scenarios 2020 [6] has informed NI energy policy and aspects of the Scenarios in this LAEP.

[1] https://www.nisra.gov.uk/publications/2022-mid-year-population-estimates-northern-ireland

[2] https://www.belfastcity.gov.uk/netzero

[3] https://www.belfastcity.gov.uk/Business-and-investment/Resilient-Belfast/Climate-change

[4] https://www.cdp.net/en/cities/cities-scores

[5] rp7-business-plan-full-report-april-2023.aspx (nienetworks.co.uk)

[6] https://www.soni.ltd.uk/media/documents/TESNI-SNA-2020.pdf

The upscaling of Electric Vehicles and associated infrastructure brings the transport system and electricity system together in an emerging sector. Reports from the CCC and NIE Networks forecast between 250,000 and 350,000 EVs would be required by 2050. NIE Networks proposed Business Plan for RP7 assumes that 80% of EVs have access to off-street charging and 25% of EV owning households are on the dual rate economy 7 tariff which provides lower rate electricity overnight. In Belfast, only 40% of households have access to off-street parking. The regional transport operator, Translink, is taking a leading role in the transition from fossil fuelled transport to renewably produced electricity and green hydrogen. Translink have already made significant decarbonisation steps in Belfast with 80 Electric buses and 20 Hydrogen buses already operational across the city by early 2023. Translink have their own decarbonisation objectives which includes 70% reduction in GHGs by 2030 and Net Zero by 2040. Translink are also developing electrolysis capabilities for local production of green hydrogen in collaboration with NI Water. The increased modal shift towards public transport is further justified by the lack of socialising of charges for electricity network upgrades which has proven a barrier to development of EV infrastructure in NI relative to other parts of the UK. There is – in late 2023 – an ongoing consultation regarding the socialisation of these charges. Translink and Belfast more generally, see a vision for a wider use of public transport, supporting ambitions to be a thriving "15-minute" city centre reaping the co-benefits of clean air and affordable mobility for everyone in support of a Just Transition. In the wider picture, an all-island rail review shows the level of investment and commitment in the region to transport modal shift with 30 recommendations being implemented over an estimated 25 years at an estimated cost of £29.2bn [1]. BCC are also supportive of The Eastern Transport Plan (ETP) 2035, being developed by the Department for Infrastructure [2] (DfI) which will set the framework for making transport policy and investment decisions up until 2035.

With its modern plastic pipes suitable for re-purposing to renewable gases, Northern Ireland's £1 billion gas network is a strategically important asset that could support the decarbonisation of multiple sectors by replacing the natural gas currently flowing through the gas grid with Biomethane and Hydrogen; two technologies that this LAEP aims to provide a sound evidence-base to support future decision making. There are significant opportunities in both forms of low carbon gas in the wider regional areas of NI. On this scale, there is relatively high biomethane potential of approximately 4 - 7 TWh per year [3] and a recognised market opportunity for e-fuels and "export" to GB, Republic of Ireland (RoI), and Europe. Phoenix Energy, who operate the gas network in Belfast, have a future strategy for deployment of biomethane targeting 80% penetration of the market with 25% energy efficiency with biomethane expected to enter the Belfast gas supply in West Belfast, East Belfast and North Belfast in 2025. This is anticipated to be realised through the deployment of domestic hybrid heating systems which are currently being trialed. Hydrogen activities are abundant around NI with significant innovation projects such as the Islandmagee project [4], which aims to develop salt caverns 1500m underneath Larne Lough offering long duration storage of clean gas to provide energy flexibility and support seasonal peaks in electricity demand. An "all-island" approach with the RoI presents links to Europe and notably the market opportunity arising from initiatives such as the German-Irish Hydrogen Council [5]. Belfast's gas network , with its plastic pipes, is already well on its way to becoming hydrogen-ready with the remaining cost of upgrade expected to be less than many other local areas across the UK and RoI.

[1] https://www.bbc.co.uk/news/uk-northern-ireland-66297150

[2] https://www.infrastructure-ni.gov.uk/articles/eastern-transport-plan-etp-2035

[3] Utilising Northern Irelands' Agriculture Sector to Decarbonise Heat

[4] https://www.harland-wolff.com/investors/projects/islandmagee-gas-storage-project/

[5] https://www.german-irish.ie/en/hydrogen-council

Agriculture forms an important part of the economy of Northern Ireland, as the country's biggest industry and the biggest sector contributor to GHG emissions [1]. 75% of Northern Irish land is used for agriculture – an average of 5.4km^2 of agricultural land per 1,000 people which is 3 times higher than the UK's average (1.8km^2) [2]. The Northern Irish agriculture industry is dominated by livestock holdings, and this brings with it many environmental challenges ranging from methane production, attributed to livestock, to elevated levels of ammonia and eutrophication resultant from high levels of run-off of manure and other wastes into fresh water supplies. The latter is an ongoing concern in Northern Ireland [3] and a current topic reaching the mainstream media [4]. Despite only accounting for 6% of the UK's land mass, Northern Ireland is responsible for 12% of ammonia emissions with 97% of these coming from agricultural sources, largely cattle farming, and a smaller proportion from poultry, pigs, and fertiliser. Manure management is the key driver of this, accounting for 80% of agricultural ammonia emissions [5]. Excess ammonia can lead to soil and water acidification and a build-up of nitrogen in the environment. Critical levels of ammonia are already exceeded in 90% of protected habitats in Northern Ireland [6]. Improving the handling of agricultural waste is key to reducing this and will also help to reduce the volumes of methane produced by the sector.

Biomethane can be produced from agricultural waste, such as manure, underused silage, or dedicated feedstocks. Biomethane may be used in the existing gas network as a direct replacement for natural gas. This has the potential to provide better control over the production of agricultural nutrient emissions, in addition to reducing the carbon intensity of the gas network without requiring changes to gas boilers already installed in buildings. There is potential for biomethane to stimulate a negative emissions value chain [7]. However, there are challenges in that value chain to ensure methane leakage is minimised at the production plant and in distribution or transportation. It is likely that livestock farming will need to decrease in intensity to meet carbon targets,[8] which may affect the volume of biomethane available in future; and might be more difficult to achieve that decrease if producing biomethane for the supply to the energy system becomes financially attractive. Additionally, the availability of silage for production of biomethane is sensitive to year-on-year variations in environmental conditions. For example, a drought in summer may mean that there is no surplus silage available for contribution to [9].

As it stands, Northern Ireland is exporting agricultural waste – largely to RoI – to help combat pollution issues in the area. For example, a quarter of poultry wastes are being exported [10]. Regardless of the uncertain long-term sustainability of Biomethane, it could be – and already is – used in the short term as a better solution to this issue. Biomethane is currently being injected at small volumes into the gas grid, and there is ambition to quickly increase this [11]. Despite this, there remains uncertainty over the environmental impacts, costs, and feasibility of a Northern Ireland wide gas network based on biomethane. A goal of this LAEP will be to assess the impact that differing quantities of biomethane will have on other aspects of the future local energy system.

[1] https://www.gov.uk/government/statistics/uk-local-authority-and-regional-greenhouse-gas-emissions-national-statistics-2005-to-2021

[2] https://friendsoftheearth.uk/latest/food-and-farming-northern-Ireland (75% NI vs 50% UK agriculture. Scaling applied to 2021 Census population to determine 5.4km^2 vs 1.8km^2

[3] https://www.daera-ni.gov.uk/articles/review-sensitive-areas

[4] https://www.belfasttelegraph.co.uk/news/environment/explainer-what-is-causing-lough-neagh-to-turn-green/a1382464686.html

[5] https://www.daera-ni.gov.uk/articles/ammonia-emissions-northern-Ireland

[6] https://ejni.net/wp-content/uploads/2021/01/EJNI-Briefing-4-Ammonia.pdf

[7] Mehta, N., Anderson, A., Johnston, C. R., & Rooney, D. W. (2022). Evaluating the opportunity for utilising anaerobic digestion and pyrolysis of livestock manure and grass silage to decarbonise gas infrastructure: A Northern Ireland case study. *Renewable Energy*, *196*, 343-357. https://doi.org/10.1016/j.renene.2022.06.115

[8] https://www.theguardian.com/environment/2022/apr/22/northern-ireland-faces-loss-of-1-million-sheep-and-cattle-to-meet-climate-targets

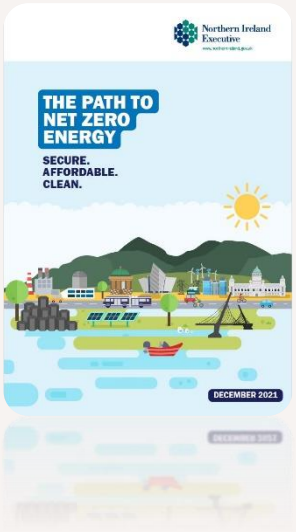
[9]. https://www.sciencedirect.com/science/article/pii/S095965262101057X#bib15

[10] https://www.theguardian.com/environment/2021/jun/23/poo-overload-northern-ireland-could-be-forced-to-export-a-third-of-its-animal-waste

[11] https://www.bbc.co.uk/news/uk-northern-ireland-67469656

Energy Related Policy & Strategy

This LAEP considers a range of local, regional, and national policies and strategies relevant to the local energy system and any wider ambitions for decarbonisation and socio-economic, environmental, or political prosperity and justice. Some of those key documents are highlighted and sumnmarised over the next 4 pages.



Energy Efficiency:
- Deliver energy savings of 25% from buildings and industry by 2030;

Renewables:
- Meet at least 70% of electricity consumption from a diverse mix of renewable sources by 2030.

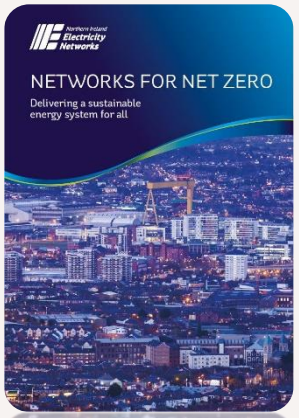
Green Economy:
- Double the size of low carbon and renewable energy economy to a turnover of more than £2 billion by 2030.

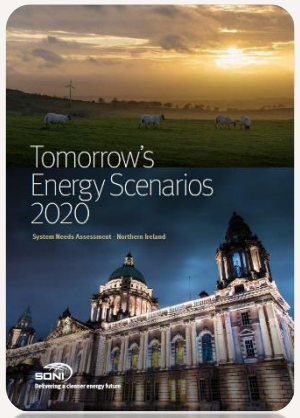
Balanced Pathway:
- 83% reduction in NI emissions by 2050 (compared to levels in 1990)

Stretched Ambition:
- 93% reduction in NI emissions by 2050 (compared to levels in 1990). Requires engineered removal based on carbon capture and storage (CCS) from both solid biomass grown in NI and anaerobic digestion of wastes to produce biomethane

Current State:
Belfast has 14m tonnes of carbon budget to maintain global warming at 1.5°C. Belfast is currently emitting 1.5m tonnes of carbon a year. At this rate, the budget will be used up by 2030.

Cost Effective Options:
- Improved deep retrofitting of heating, lighting and insulation in houses
- Improved cooling and insulation in offices, shops and restaurants
- Modal shift to non-motorised transport and the wider up-take of electric vehicles.





Aims of the Plan (RP7):

- Additional network capacity with a more flexible and digitally enabled operating approach.
- Maintain a safe, reliable and resilient network with minimal customer outages.
- Develop new and more digitalised methods for customers to interact with the network.
- Addressing the challenges of environmentally sustainable operations, greater digitalisation and workforce resilience.

Investment & Innovation:

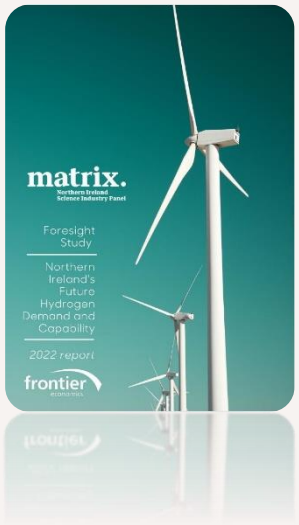
Network investment aims to facilitate 300,000 electric vehicles, 120,000 heat pumps and 3,900 MW of renewable generation in NI by 2030.

Highlights of the Study:

- With the right policy decisions, NI can achieve its Net Zero commitments as outlined in the CCC's 6th Carbon Budget.
- The electrification of demand and moving away from fossil fuels in generation, heating and transport could reduce the demand on primary energy sources by as much as 48% by 2050 compared to today. It could also increase overall electricity consumption by between 50% and 70% by 2050.

Key Messages:

- Bulk supply points - substations which take electricity from the transmission network and supply it to the distribution network to meet demand – are not expected to experience many issues related to growth in demand from electric vehicles and electric heating until beyond 2030.
- By 2040, however, many bulk supply points may require the delivery of additional capacity to accommodate the growth in demand from electric heat and transport. This risk could be brought forward if government pursues ambitious requirements for these technologies.
- High levels of growth in large scale solar PV generation, may ultimately require a clustering policy, similar to that which was used for onshore wind in Northern Ireland.



Near-Term Action Plan for Green Hydrogen:

- Whole-system Planning: to decide the most efficient balance of energy across all vectors, optimise infrastructure, and minimise the costs of decarbonisation.
- Public Funding: made available for the sector to bridge the cost gap between green hydrogen and incumbent fossil fuels.
- Regulatory Adjustment: to enable blending, network adaptation/roll-out, and certification.
- Hydrogen Governance Body: Implemented to align responsibilities and capabilities of relevant government bodies in driving and implementing the sector's development.
- Hydrogen Catapult: Established as identified in the Energy Strategy to ensure NI keeps up pace with global efforts and demand for further progressing hydrogen technologies

Net Zero and Climate Resilience:

Belfast ranked eighth in the Global Destination Sustainability Index (2022).
Achieved an A score in its 2022 submission to the Carbon Disclosure Project global reporting framework.

Key Projects Underway

- Established the Belfast Retrofit Hub and the Belfast Electric Vehicle Infrastructure (EVI) Strategy.
- Belfast One Million Trees.
- UPSURGE: reusing council owned vacant land to test nature-based solutions co-designed with local communities (Funded by Horizon 2020).
- UP2030: designing Net Zero neighbourhoods (funded by Horizon Europe)

In Summary, the LDP will:

- Provide a 15-year plan framework to support economic and social needs in the city, in line with regional strategies and policies, while providing the delivery of sustainable development;
- Facilitate growth by coordinating public and private investment to encourage development where it can be of most benefit to the wellbeing of the community;
- Allocate sufficient land to meet the needs of the city;
- Provide more certainty for where development in Belfast should take place.

Commitments Relevant to Energy for Next 4 Years:

Actions:

- Develop a pipeline of investable local energy projects arising from the LAEP
- Accelerate project development, including concept development, feasibility studies and business cases
- Identify and respond to emerging funding opportunities and secure funding for projects
- Develop appropriate governance and delivery structures for projects as they emerge
- Engage with investors and financial institutions to explore new financial models
- Develop and adopt the Belfast EV Strategy and its targets for the period to 2027 and beyond
- Establish a Belfast EV group which oversees implementation of the EV Strategy
- Accelerate the retrofit of buildings including commercial and public buildings, and domestic housing through the Belfast Retrofit Hub
- Start delivering the Belfast Retrofit Programme
- Undertake preliminary work for a Heat Network for Belfast City Centre
- Provide energy sector expertise to community-based organisations which are developing local energy projects.
- Scope, benchmark, aggregate and upscale feasible local energy projects as part of a project pipeline across the City.

Stretch Goals:

- Develop a pipeline of Net Zero projects up to the value of £1.6bn
- At least 2 projects arising from Belfast Local Area Energy Plan in implementation phase
- Adopt new financial models to scale decarbonisation investments
- Develop a Phase 2 bid to the Shared Island Fund to scale solar PV across the city in partnership with Cork City Council
- Deliver the Belfast EV Strategy and implementation plan in 2023
- Support the installation of at least 800 electric vehicle charging devices for public use by 2027
- Secure funding for public EV charging infrastructure
- Develop and implement the Belfast Retrofit Programme including neighbourhood pathfinder projects through the Belfast Retrofit Delivery Hub
- Deliver energy savings of at least 15% from participating buildings
- Develop a full business case for a Heat Network for Belfast City Centre
- Develop at least two local energy projects (compliant with all current and future energy and carbon regulatory obligations and aligned with international best practice)

[1] https://yoursay.belfastcity.gov.uk/25730/widgets/75246/documents/45372

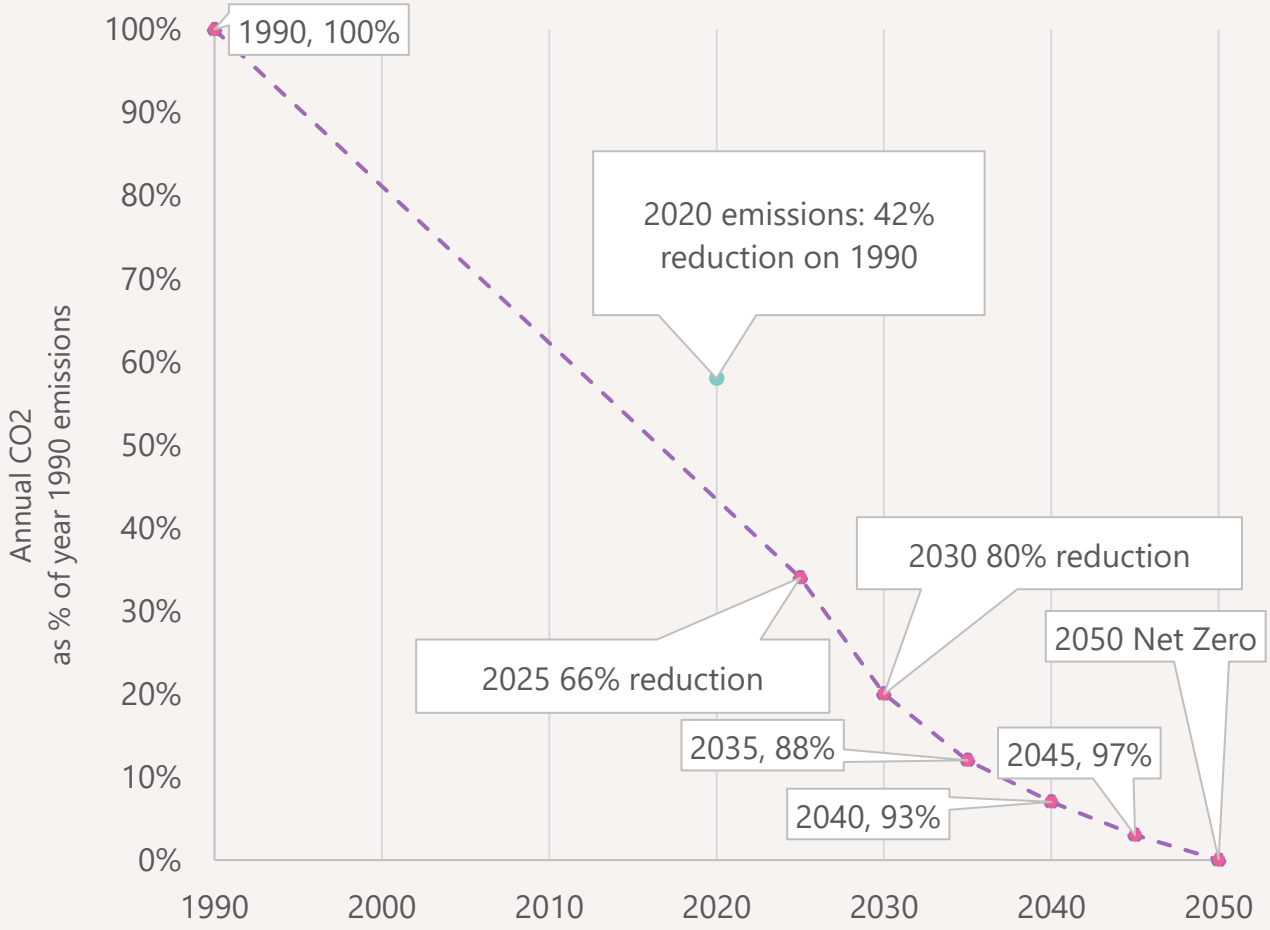
[2] https://yoursay.belfastcity.gov.uk/25730/widgets/75246/documents/45371

Emissions and Net Zero Targets

To help form a strategy to deliver Belfast's ambitious emission targets work has been done to divide the IPCC global carbon budget by the population in Belfast [1]. This gives Belfast a **total carbon budget of 48.4 MTCo2e from 2023**. Belfast **currently emits c.8.9 MTCo2e per year for scope 1 and 2 emissions within its boundaries**. So, on current trajectory, it would use up its carbon budget by the end of 2028[1]. A modified trajectory is shown below to account for the carbon targets and overall budget whilst achieving Net Zero by 2050. These figures help tailor the configuration of the LAEP modelling towards the local area carbon budget and targets.

Belfast's adopted emissions targets [reduction in scope one and two CO2 emissions compared to 1990 levels]:

- *66% by 2025.*
- *80% by 2030.*
- *100% by 2050.*



[1] An Analysis of Net-Zero Carbon Options for the Belfast Region, By Prof. Andy Gouldson, Andrew Sudmant and Ruaidhri Higgins-Lavery

Geographic Scope

The geographic area applicable to the Belfast LAEP is shown in the figure on the right. The area was broken into 11 ‘zones’ to allow for a better understanding and assessment of options for decarbonisation. Zones help to highlight where hotspots of decarbonisation activity might occur and where investment opportunity lies. Zones also make the changes more tangible for local communities and break the pathway into more manageable pieces.

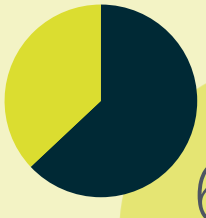
Zones were identified using the High Voltage (HV) electricity network. Low Voltage (LV) substations fed by same HV substation should be within the same zone.

These zones are used to aggregate results shown on visual maps, and to identify similar results related to certain building types within each zone.

Belfast's Energy System Today

See Annex A for detail

Setting the Scene: Belfast Today



63%

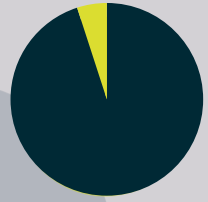
of dwellings EPC rated D – G

BUILDINGS

Currently 35% of of Belfast's existing domestic buildings are EPC rated D with 18% rated E, 8% rated F, and 2% rated G. These require energy efficiency improvements. Belfast must also ensure that 12 million square metres of public, commercial, and industrial floorspace is decarbonised by 2050.

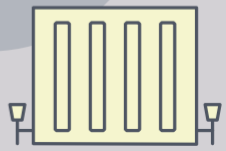
HEATING

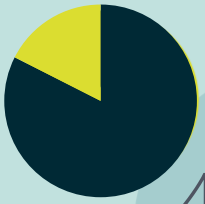
66% of buildings currently use gas for heating with 29% using oil. There are small quantities (<5%) of buildings electric heating, solid fuel or biomass heating.



95%

of heating is fossil fuel based





4.5 MW

Capacity from existing public EV charging points

VEHICLES

Belfast currently has 170 Electric Vehicle charging points around the city delivering a total charging capacity of nearly 4.5 MW. Belfast's ambition is to deliver 800 charging points by 2027.

ENERGY

Belfast's metered energy consumption is 63% from gas and 37% from electricity. There are currently 1,311 domestic solar PV installations across Belfast contributing a total of 8.6 MW of renewable electricity to the local supply.

63%

of energy consumed in Belfast is from gas

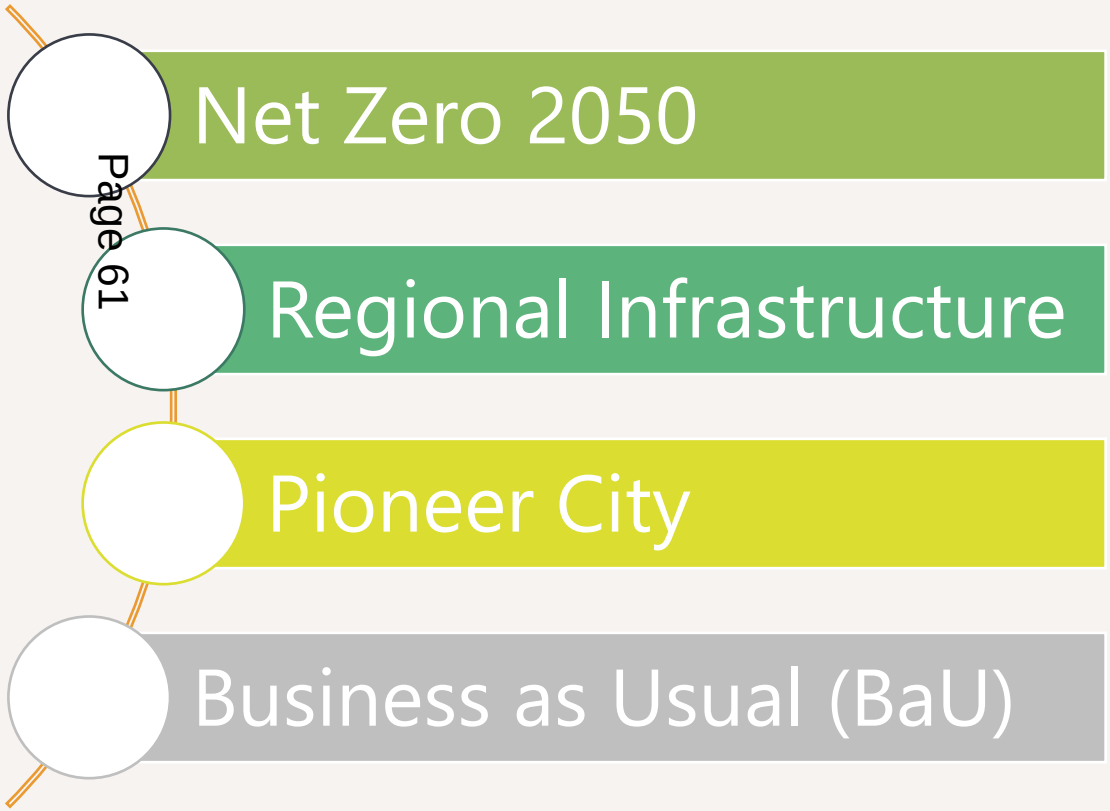
Assessing Options for the Future

See Annex B & C for detail

Scenarios for Belfast

Scenario Overview

Scenarios provide a vision of the future energy system and are a common modelling approach to establish the optimal Pathway for the local area. Scenarios should be based upon aspirations, desires, hopes for the future Net Zero energy system. Scenarios should focus on areas of specific interest or uncertainty (including stakeholder views that are polarising) and are modelled through fixing and varying of parameters and assumptions.



Note: Some technologies such as thermal storage, wave, 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 with local, regional, and national contexts.

Net Zero 2050 Scenario aims to find the cost optimal path in line with the carbon targets set by the Northern Ireland Assembly; 56% reduction by 2025, 78% reduction by 2030, Net Zero by 2050 (against 1990 baseline). **This Scenario does not impose any constraints that would prioritise or accelerate any Belfast or Northern Ireland specific technologies.**

Regional Infrastructure Scenario aims to meet the same carbon targets, with the **assumption that there is significant regional investment in low carbon infrastructure to unlock the potential of large-scale technologies related to hydrogen and biomethane.** The hydrogen narrative is supported by regional developments such as Ballylumford power-to-X where a high regional capacity of wind generation leads to curtailment and enables the production of hydrogen in parallel with 24/7 operation of wind turbines in a co-benefit solution. Biomethane is made available from agricultural waste and feedstocks through anaerobic digestors located across rural Northern Ireland. Salt caverns in Larne Lough provide the opportunity for storage of both clean gases in large volumes.

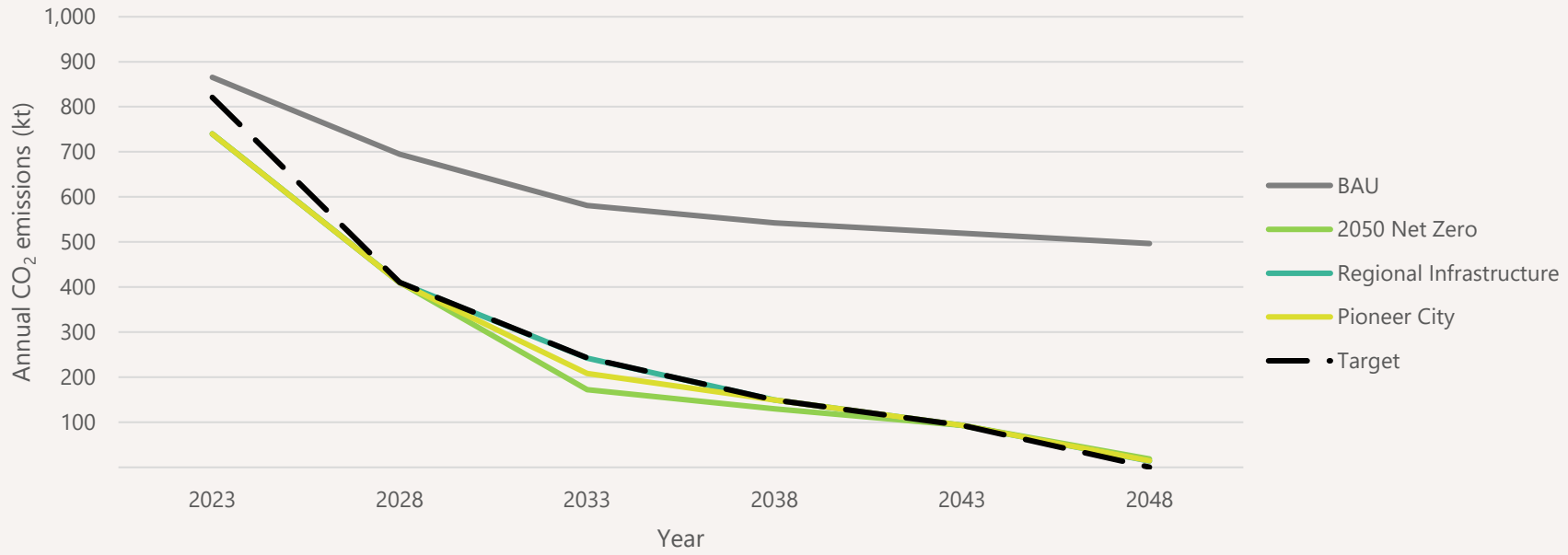
Pioneer City Scenario also aims to meet the same carbon targets, with the assumption that Belfast looks inward to take control of its journey to Net Zero irrespective of wider regional developments. Priority is given to local measures which maximise unique opportunities and accelerate decarbonisation. **This Scenario allows for investment in an aquifer-based ambient loop district heat system, accelerated smart meter roll out, higher uptake of solar PV and a higher transport modal shift resulting in fewer EVs.** The hydrogen narrative is supported by local developments such as Belfast power-to-X and small quantities of biomethane are also made available.

A '**Business-as-usual**' ('do nothing') **Scenario** is also modelled where no decarbonisation actions take place beyond already committed investments and peripheral decarbonisation progress (e.g. electricity grid). **This Scenario provides a counterfactual for cost and carbon impacts and other comparison purposes.** This is not required to meet the same local carbon targets and is not a Net Zero Scenario.

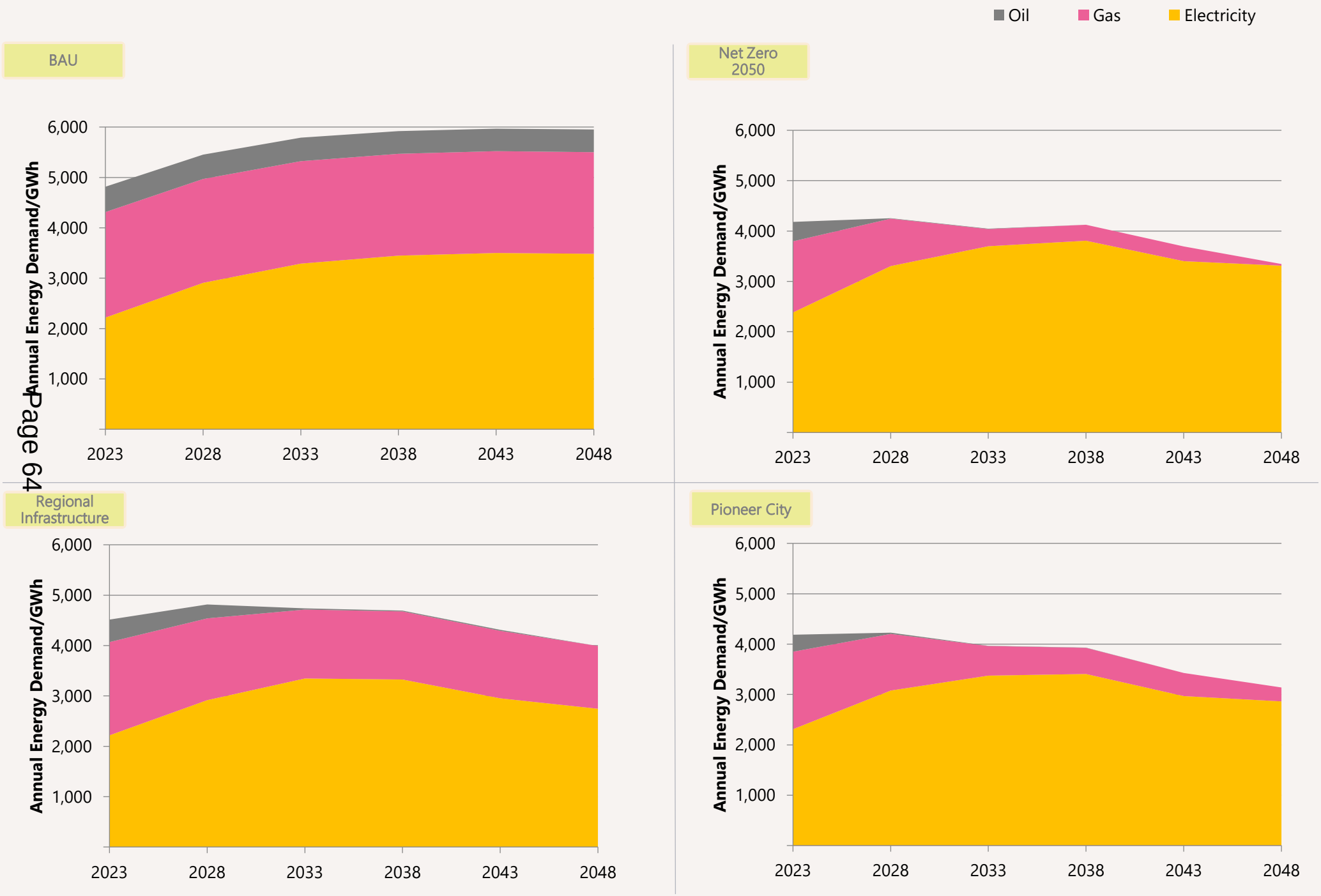
Scenarios: High-Level Overview

	BAU	Net Zero 2050	Regional Infrastructure	Pioneer City
Carbon Reduction Target	None Specified	56% reduction by 2025, 78% reduction by 2030 (against 1990 baseline), Net Zero by 2050		
Smart Meter Roll-Out	Not modelled	Decreased domestic demand over rollout (2.5% reduction per install) but assumed to not include gas or oil meters based on national stance that this is not cost effective.		Decreased domestic demand over rollout (2.5% reduction per install), assumed to include oil and gas meters. Implementation may rely upon local action.
Availability of Green Hydrogen	Not available	Not available (Hydrogen is available with carbon content as advised in Green Book)	Available from Ballylumford Power-to-X (100GWh/year by 2050) - for injection into gas grid up to 20% by volume or repurposing of grid	Available from Belfast Power-to-X (50 GWh/year by 2050) for injection into gas grid up to 20% by volume. Project also makes waste heat available to city centre areas
Transport Modal Shift	Not modelled		25% reduction reduction in demand from domestic EV chargers	50% reduction reduction in demand from domestic EV chargers
Availability of biomethane	Not available		Available – 2511 GWh/year by 2033 (equivalent to current day Belfast gas demand)	Available – 238 GWh/year by 2033 (From sources local to Belfast)
Aquifer ambient loop	Not available			Available (see Technical Annex for details such as cost)
Solar PV	Only current installations (based on MCS data)	Domestic deployment capped at 12.7 MW per year (averaged between 2025 and 2035)		Domestic deployment capped at 34.1 MW per year (averaged between 2025 and 2035)
Heating system Change	Limited	Fully optimised		

Emissions Reduction



All scenarios see a decrease in emissions, with the BAU reduction reflecting the predicted decrease in carbon intensity of grid electricity. The three non-BAU Scenarios see a significant decrease on these BAU emissions, converging negligible residual emissions by 2050. The path that each non-BAU Scenario takes to get to Net Zero is influenced by the timing of installation of low carbon technologies. In practice the rate of deployment may be limited by supply chain capacity which cannot be accurately predicted in the techno-economic modelling. A key difference between the Scenarios is the availability of Green Gas (predominantly biomethane). This non-local resource is made available to the Belfast area with market costs and emissions embedded in the unit cost of energy (i.e. it is treated as an energy "import" to the local area; just as natural gas and electricity are). Regional Infrastructure has the highest availability of Green Gas, with Pioneer City having a smaller amount, and Net Zero 2050 having none. The volume of Green Gas purchased can be adjusted by the model (scaled up or down) to meet carbon targets whilst minimising overall energy system costs. Conversely, when no Green Gas is available, there are fewer decarbonisation options available so larger initial investments are required to meet carbon targets. For example, the Net Zero 2050 Scenario invests early and heavily in new heating systems for buildings to meet the interim carbon reduction targets, and as a result it needs to remove less carbon in the following years since emissions are lower than the target in the mid-2030s. This apparent "overshoot" on the interim emissions target is largely due to roll out of large-scale measures, such as district heating, rather than measures that would result in smaller incremental reductions in emissions over time. Delay of such large-scale measures would prohibit meeting those interim carbon targets and deployment of other solutions would not be cost optimal. The Pioneer City emissions also show some of this overshoot of targeted emissions, but to a lesser extent since it has more decarbonisation options available including a relatively small quantity of Green Gas. The key conclusion is that all Scenarios significantly reduce emissions by 2050 approximately in-line with the carbon targets set. This outcome is expected since Belfast has set challenging interim carbon targets, and all Scenarios (except BAU) are given those same targets including the year of achieving Net Zero. The true 'optimal' pathway to Net Zero relies upon many factors which cannot all be captured in a purely cost optimal model. These aspects are discussed more fully throughout this report. Although emissions from the energy system are reduced over time, energy demand does not significantly decrease until the 2040s despite improvements to energy efficiency such as building fabric and low carbon heating systems. This is largely due to electric vehicles causing an increased demand on the energy system which previously would have been allocated to the transport system when fossil fuelled vehicles were dominant.



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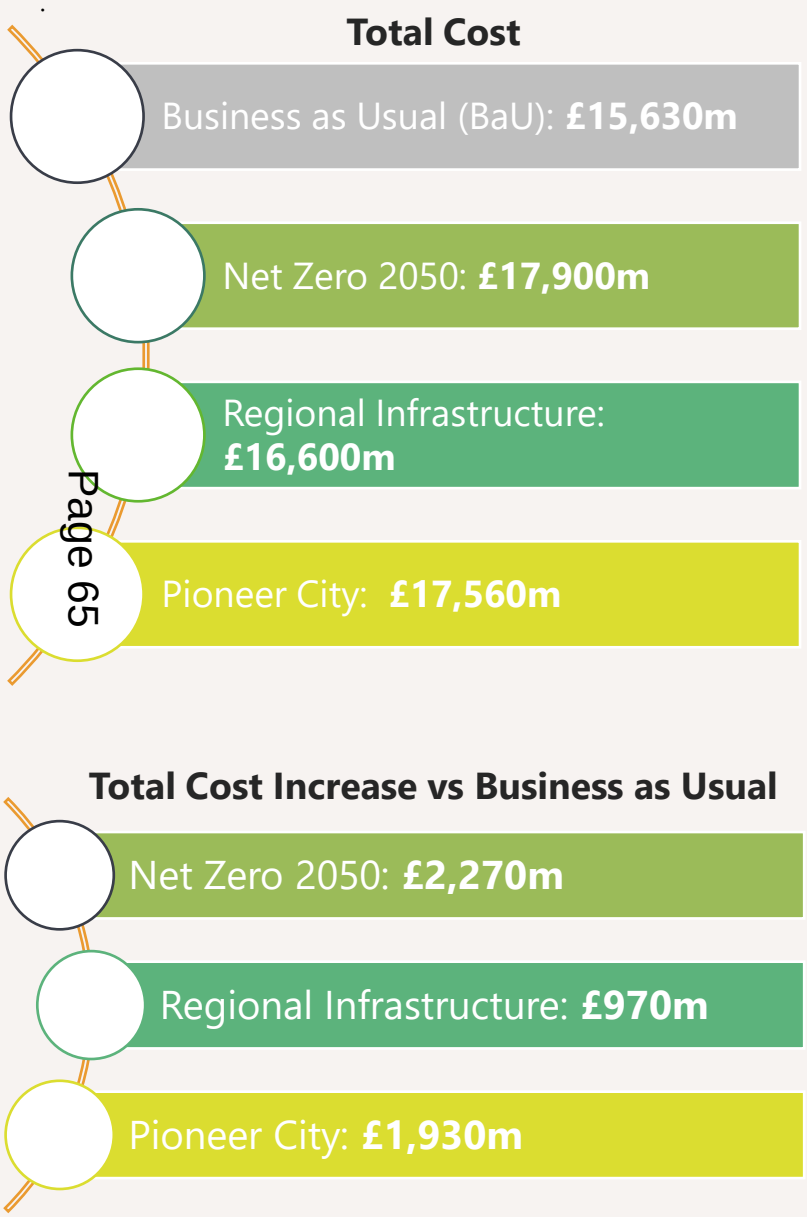
Note: 'Gas' contains biomethane and hydrogen, as well as existing methane natural gas. For a detailed breakdown of these, please refer to Annex C.

Scenario Costs



Business-as-usual

- Costs reflect the considerable spend on maintaining the local energy system; this Scenario puts cost increases of decarbonisation into context.
- Costs include replacing assets at end-of-life with like-for-like replacements (e.g. gas boilers, oil boilers, and other existing heating systems), upkeep of networks for existing demands, the emergence of EVs, and the cost of the fuels supplied to assets.

Net Zero 2050

- Costs – relative to BAU – primarily reflect the shift away from gas and towards electrification of heating.
- Relative to the other decarbonisation Scenarios, the cost of electricity import is higher, with money saved on not importing any Green Gas.

Regional Infrastructure

- Lowest cost Net Zero Scenario.
- Major cost is the import of biomethane. High biomethane availability enables continuation of gas boilers or introduction of hybrid heating which avoid the magnitude of costs associated with electrification of heat prominent in Pioneer City and Net Zero 2050. This also enables more savings on electricity import.

Pioneer city

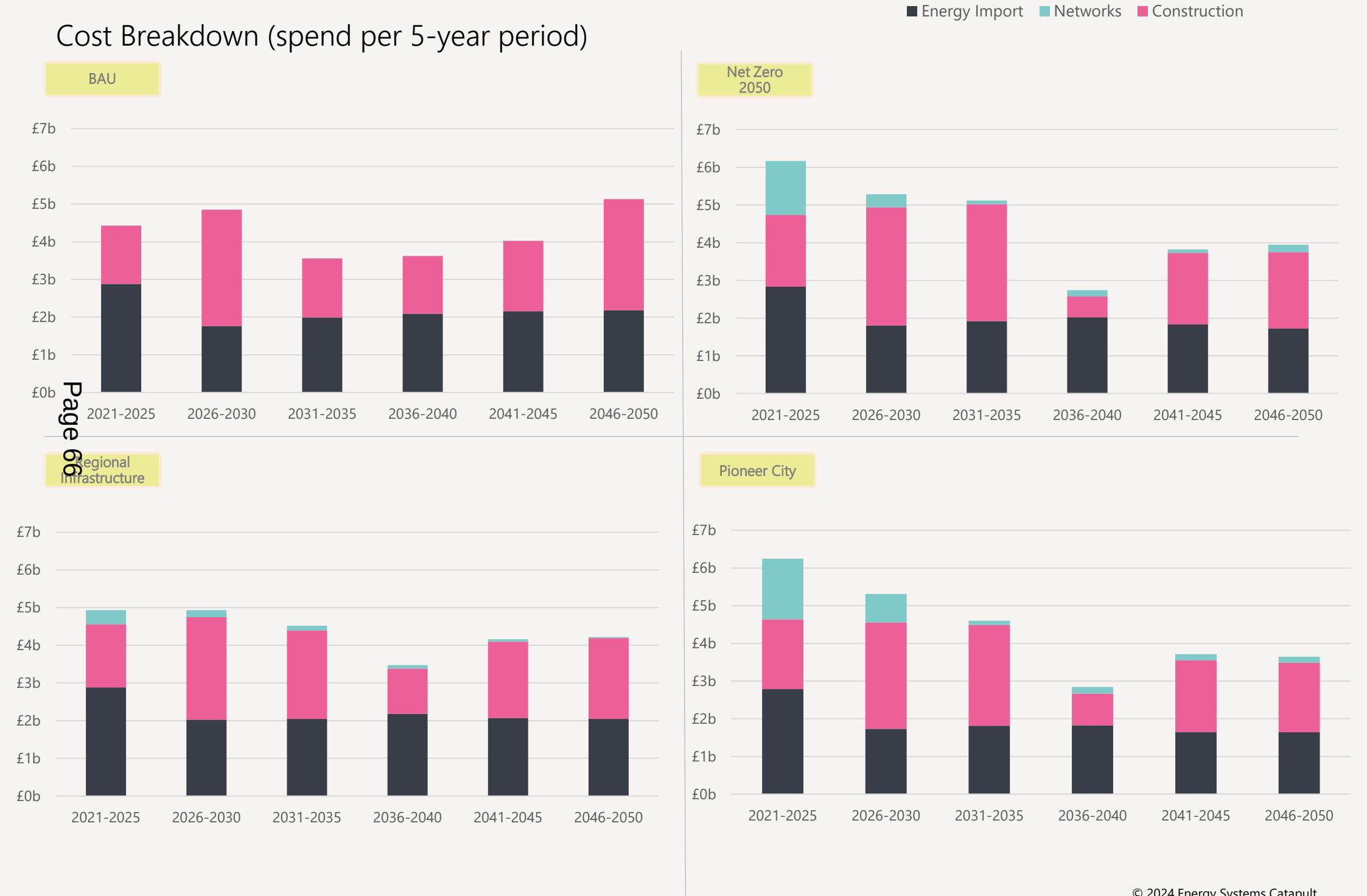
- Lower cost than Net Zero 2050 primarily by using biomethane.
- Ambient loop district heating made available, however not chosen on a cost-optimal basis.

These costs include Capital Expenditure (CapEx) and Operational Expenditure (OpEx) related to the establishment and operation of a Net Zero energy system in Belfast – except for BAU which does not achieve Net Zero. CapEx and OpEx include: fuel costs, network upgrades, heating system installations, insulation, and renewable energy generation.

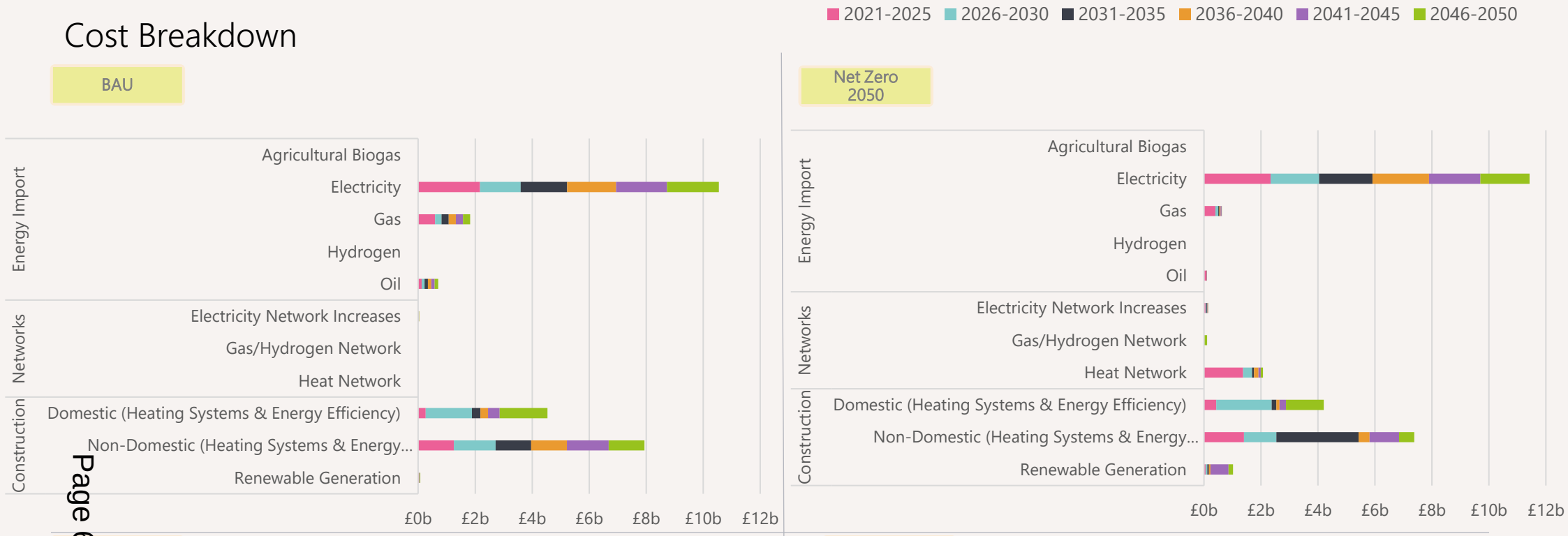
In accordance with HM Treasury Green Book [1] costing, these costs are discounted by a rate of 3.5% per year between now and 2050. Discounting is a financial process which aims to determine the "present value of future cash flows", or in other words: calculating what monies spent or earned in the future would be worth today. Discounting reflects the "time value of money" i.e. 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 is applied to financial inflows or outflows – this generally reflects what it costs a company to borrow money or is a defined rate such as the 3.5% discount rate suggested in the UK Treasury's "Green Book" (used in the financial evaluation of UK Government projects).

[1] https://www.gov.uk/government/publications/the-green-book-appraisal-and-evaluation-in-central-government/the-green-book-2020

Cost Breakdown (spend per 5-year period)

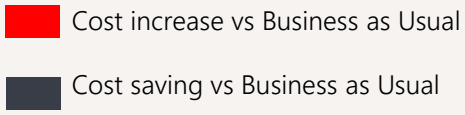


Cost Breakdown

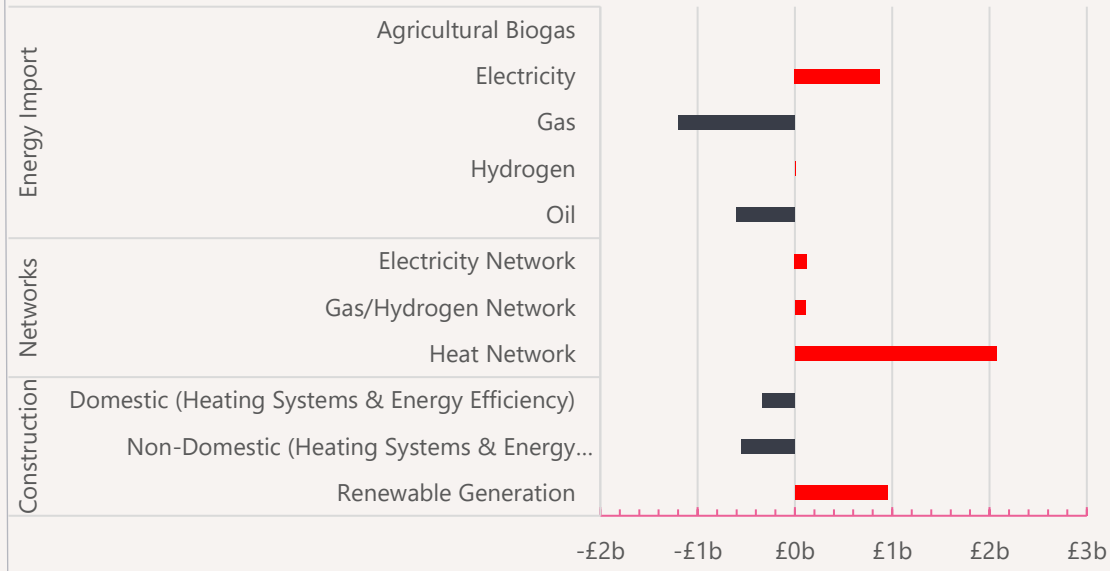


Cost Breakdown (vs Business as Usual)

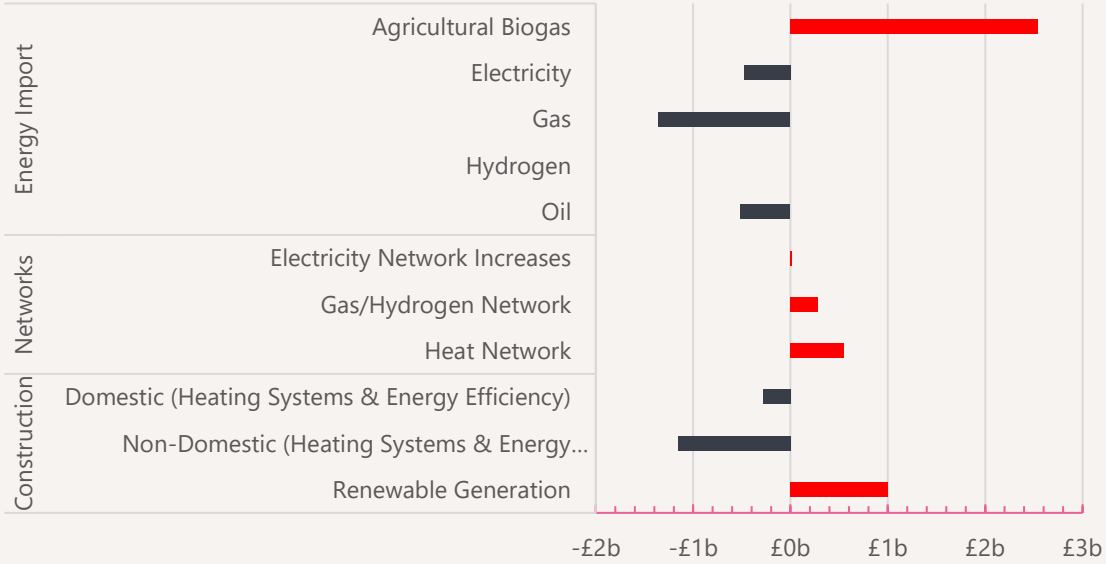
These charts show the cost of each category as additional spending or saving vs the Business-as-Usual Scenario.



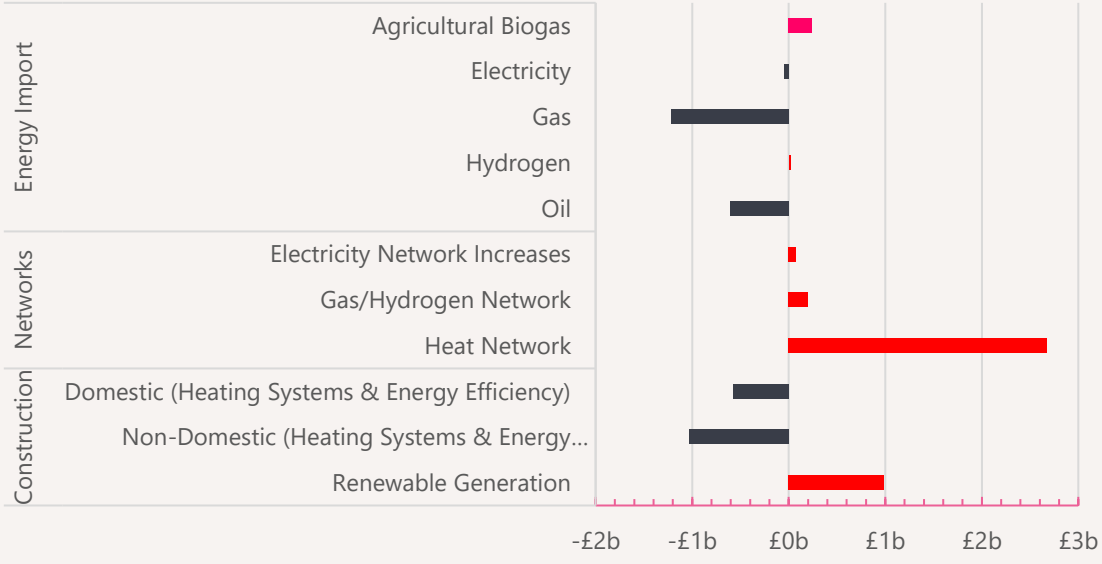
Net Zero 2050



Regional Infrastructure

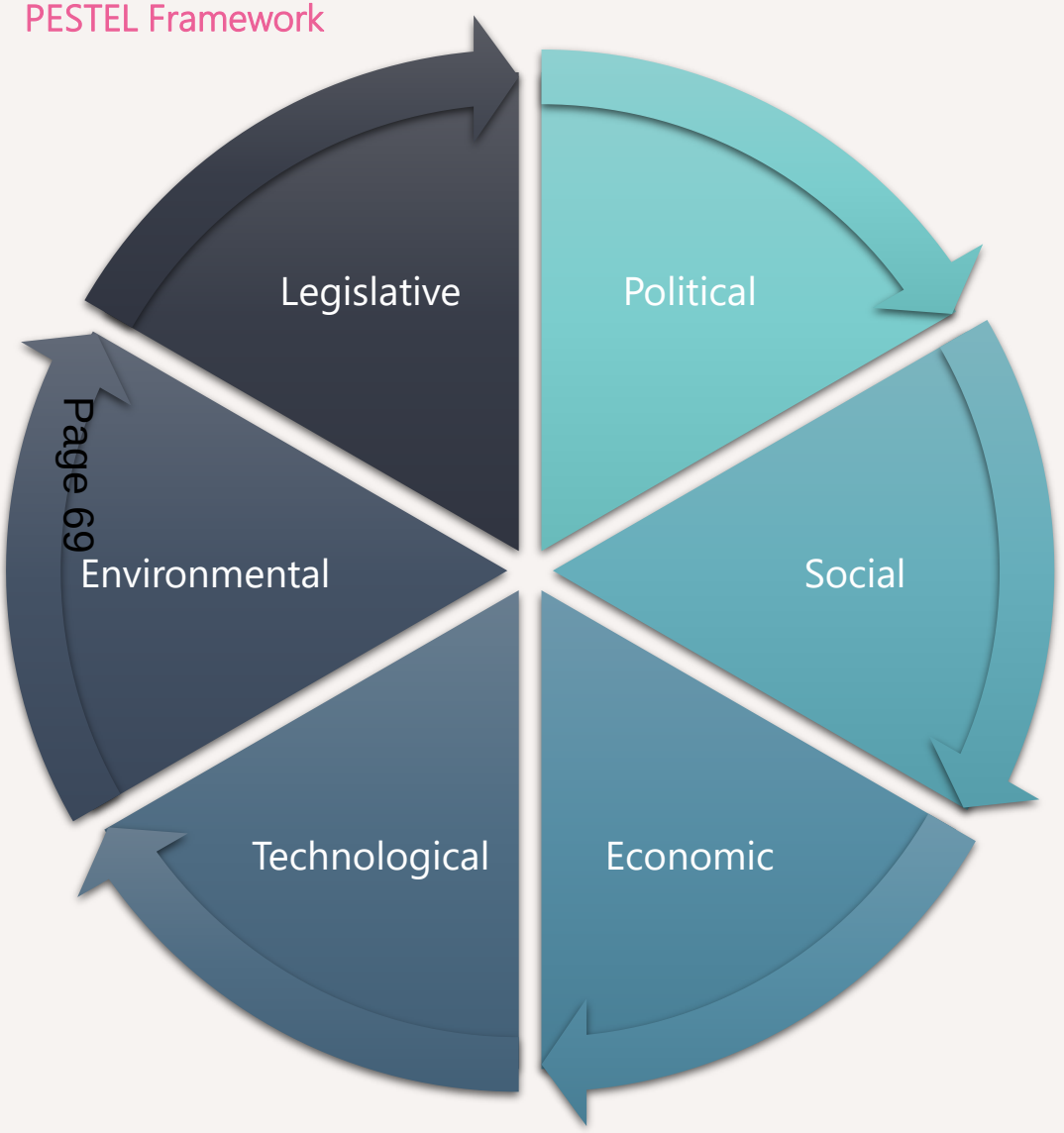


Pioneer City



Wider Factors Evaluation

PESTEL Framework



Evaluation factors are derived from the PESTEL framework to ensure factors cover a sufficient and holistic range of viewpoints. Examples of a typical wider factors analysis included in the LAEP process are:

- Energy and Carbon Savings
- Distribution of Costs & Benefits
- Impact on Bills
- Investment per Household
- Employment
- Health
- Comfort Taking
- Disruption
- Resilience of Supply
- Strategic Influences and Compatibility
- Public Attitudes and Preferences
- Deliverability

Factors may be qualitative or quantitative and some quantitative factors may include monetisation. Qualitative factors are generally analysed with the support of stakeholders who have a better understanding of local context.

A summary of wider factors analysis in Belfast is presented in the table opposite. The factors included here are those that produce **quantitative** results only. **Qualitative** factors, such as deliverability, public attitudes and preferences, and Strategic Influences and Compatibility are not rated. However, these are discussed in **annex C** where more detail can be found including methodology and interpretation of results.

Indicative ratings of wider factors evaluation per Scenario (quantitative measures only)

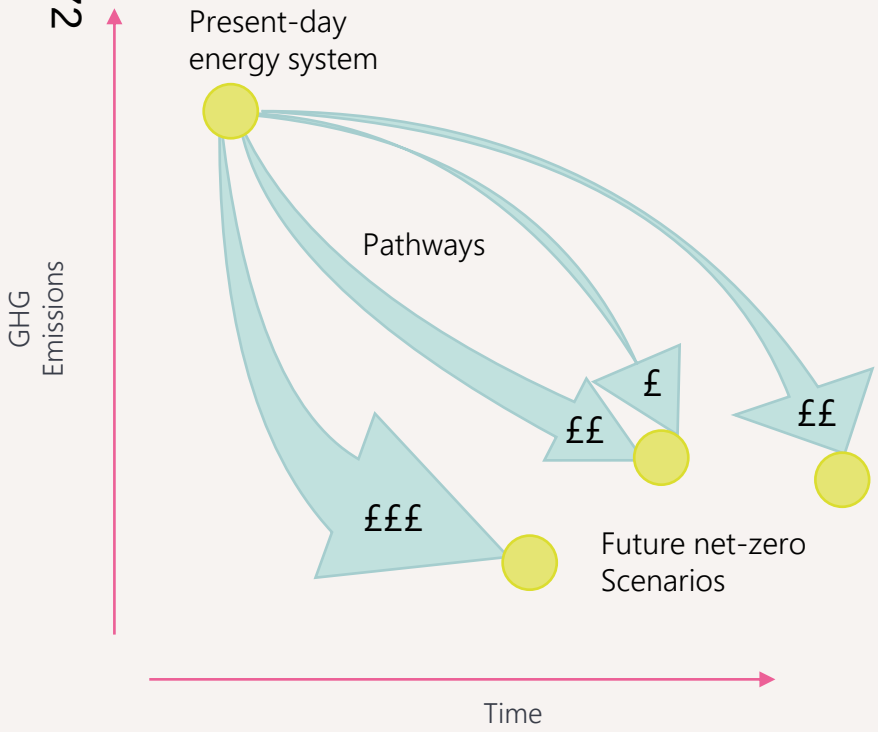
	BAU	Net Zero 2050	Pioneer City	Regional Infrastructure
Carbon Savings Valuation	🔴	🟠	🟠	🟢
Changes to Household Expenditure	🟠	🟢	🟢	🔴
Local Jobs	🟠	🟢	🟢	🔴
Health	🔴	🟢	🟢	🟠

Belfast's Pathway to Net Zero

LAEP Pathways

It is essential for long-terms plans to make allowances for uncertainty about the future, as no projection can ever be completely certain. There is uncertainty about how the world will change over the period covered in this LAEP, and there are different choices which can be made within the local area; hence there is no single "right answer" to the question of what the transition should look like. The LAEP Pathway represents the most cost-effective and co-beneficial way for the area to achieve a Net Zero energy system.

By modelling multiple plausible Scenarios for how Belfast and the wider world will look by 2050, the Pathway can remain flexible to changes and unknowns (hence, the term Pathways may be used instead of Pathway). The various Pathways to progress from the present day to 2050 allow freedom for local decision makers to make choices which best fit their circumstances, concerns and ambitions whist allowing new developments, priorities and information to emerge.



Pathway Components

A pathway has near-term and long-term components to enable and scale up energy system decarbonisation in a cost-effective way, along with Key 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 'Quick Wins', and specific 'Outline Priority Projects' which could be taken forward into a feasibility stage.

Quick Wins — Near-term actions/projects of short duration and with high confidence that the intervention is the correct choice. A Quick Win requires fertile market conditions and has relatively few barriers to implementation.

Low Regrets — Actions/projects which are common under various Scenarios but may require further Enabling Action before they can be progressed. These could occur in the near-term but may require longer-term resolution of uncertainties or market conditions to evolve naturally.

Scale Up — Long duration major decarbonisation activities not expected to happen naturally in today's market conditions. Typically preceded by a Key Decision Point in situations of low certainty or an Enabling Action in situations of high certainty.

Enabling Actions — Mostly occur in the near-term to develop market conditions which enable scale up activities in the long-term. Often these are not under Local Government control.

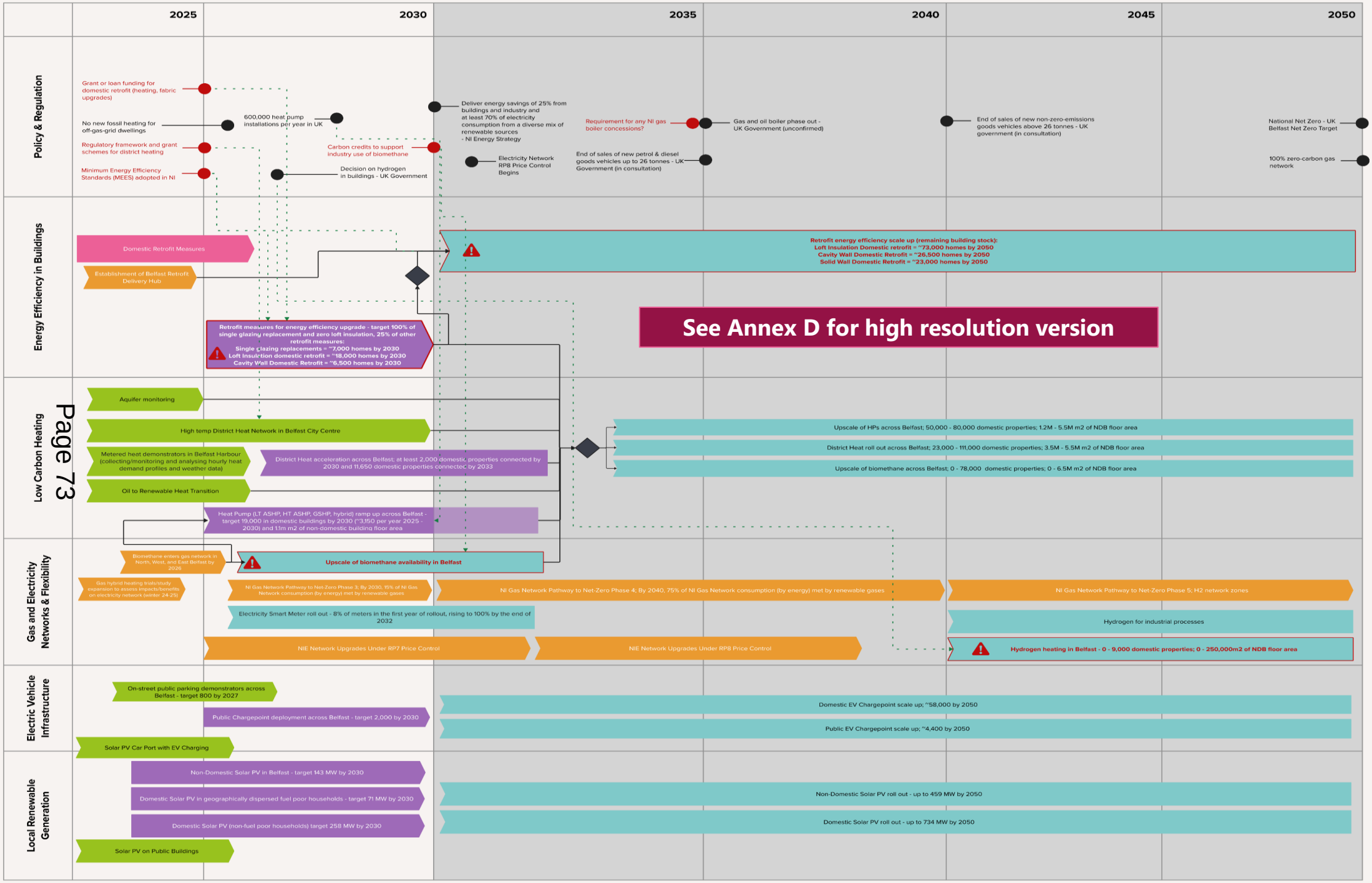
Innovation & Demonstrator Projects — These projects help navigate aspects of uncertainty or bring longer-term solutions into the near-term. Often these feed into Key Decision Points on the Pathway.

Key Decision Points — A milestone marker that indicate a fork in the pathway between decarbonisation options. These are typically preceded by Enabling Actions or Innovation & Demonstrator Projects and typically feed into Scale Up activities.

Policy Milestone

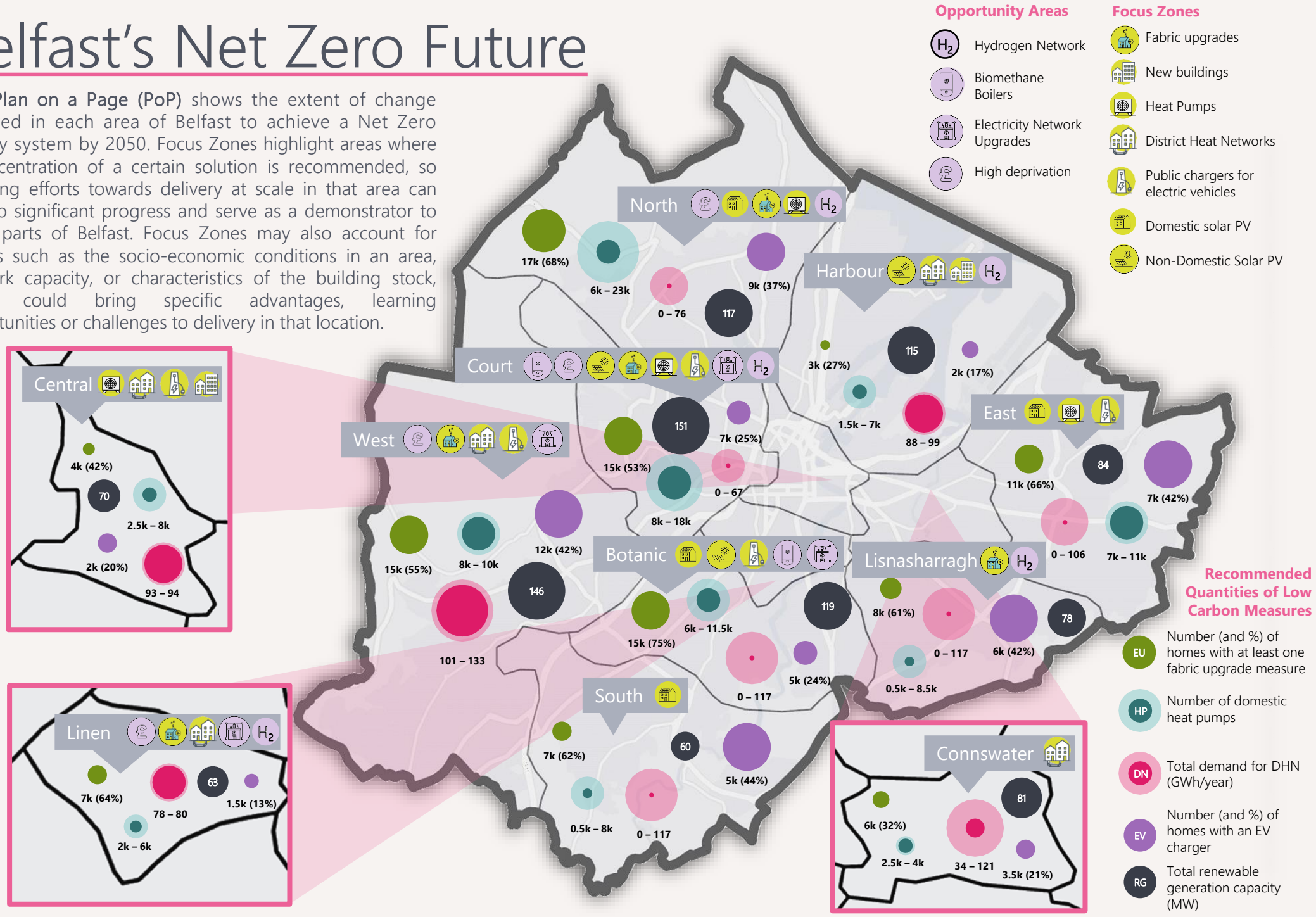
Policy Need

Risk or Uncertainty


2025
2030
2035
2040
2045
2050
Policy & Regulation
Grant or loan funding for domestic retrofit (heating, fabric upgrades)
No new fossil heating for off-gas-grid dwellings
Regulatory framework and grant schemes for district heating
Minimum Energy Efficiency Standards (MEES) adopted in NI
600,000 heat pump installations per year in UK
Decision on hydrogen in buildings - UK Government
Carbon credits to support industry use of biomethane
Deliver energy savings of 25% from buildings and industry and at least 70% of electricity consumption from a diverse mix of renewable sources - NI Energy Strategy
Electricity Network RP8 Price Control Begins
Requirement for any NI gas boiler concessions?
Gas and oil boiler phase out - UK Government (unconfirmed)
End of sales of new petrol & diesel goods vehicles up to 26 tonnes - UK Government (in consultation)
End of sales of new non-zero-emissions goods vehicles above 26 tonnes - UK government (in consultation)
National Net Zero - UK Belfast Net Zero Target
100% zero-carbon gas network
Energy Efficiency in Buildings
Domestic Retrofit Measures
Establishment of Belfast Retrofit Delivery Hub
Retrofit energy efficiency scale up (remaining building stock):
Loft Insulation Domestic retrofit = ~73,000 homes by 2050
Cavity Wall Domestic Retrofit = ~26,500 homes by 2050
Solid Wall Domestic Retrofit = ~23,000 homes by 2050
Retrofit measures for energy efficiency upgrade - target 100% of single glazing replacement and zero loft insulation, 25% of other retrofit measures:
Single glazing replacements = ~7,000 homes by 2030
Loft Insulation domestic retrofit = ~18,000 homes by 2030
Cavity Wall Domestic Retrofit = ~6,500 homes by 2030
See Annex D for high resolution version
Low Carbon Heating
Aquifer monitoring
High temp District Heat Network in Belfast City Centre
Metered heat demonstrators in Belfast Harbour (collecting/monitoring and analysing hourly heat demand profiles and weather data)
District Heat acceleration across Belfast; at least 2,000 domestic properties connected by 2030 and 11,650 domestic properties connected by 2033
Oil to Renewable Heat Transition
Heat Pump (LT ASHP, HT ASHP, GSHP, hybrid) ramp up across Belfast - target 19,000 in domestic buildings by 2030 (~3,150 per year 2025 - 2030) and 1.1m m2 of non-domestic building floor area
Upscale of HPs across Belfast; 50,000 - 80,000 domestic properties; 1.2M - 5.5M m2 of NDB floor area
District Heat roll out across Belfast; 23,000 - 111,000 domestic properties; 3.5M - 5.5M m2 of NDB floor area
Upscale of biomethane across Belfast; 0 - 78,000 domestic properties; 0 - 6.5M m2 of NDB floor area
Gas and Electricity Networks & Flexibility
Biomethane enters gas network in North, West, and East Belfast by 2026
Upscale of biomethane availability in Belfast
Gas hybrid heating trials/study expansion to assess impacts/benefits on electricity network (winter 24-25)
NI Gas Network Pathway to Net-Zero Phase 3; By 2030, 15% of NI Gas Network consumption (by energy) met by renewable gases
NI Gas Network Pathway to Net-Zero Phase 4; By 2040, 75% of NI Gas Network consumption (by energy) met by renewable gases
NI Gas Network Pathway to Net-Zero Phase 5; H2 network zones
Electricity Smart Meter roll out - 8% of meters in the first year of rollout, rising to 100% by the end of 2032
Hydrogen for industrial processes
NIE Network Upgrades Under RP7 Price Control
NIE Network Upgrades Under RP8 Price Control
Hydrogen heating in Belfast - 0 - 9,000 domestic properties; 0 - 250,000m2 of NDB floor area
Electric Vehicle Infrastructure
On-street public parking demonstrators across Belfast - target 800 by 2027
Public Chargepoint deployment across Belfast - target 2,000 by 2030
Solar PV Car Port with EV Charging
Domestic EV Chargepoint scale up; ~58,000 by 2050
Public EV Chargepoint scale up; ~4,400 by 2050
Local Renewable Generation
Non-Domestic Solar PV in Belfast - target 143 MW by 2030
Domestic Solar PV in geographically dispersed fuel poor households - target 71 MW by 2030
Domestic Solar PV (non-fuel poor households) target 258 MW by 2030
Solar PV on Public Buildings
Non-Domestic Solar PV roll out - up to 459 MW by 2050
Domestic Solar PV roll out - up to 734 MW by 2050
Quick Win
Low Regrets
Scale Up
Enabling Actions
Innovation & Demonstrator Projects
Key Decision Point
Policy Milestone
Policy Need
Risk or Uncertainty

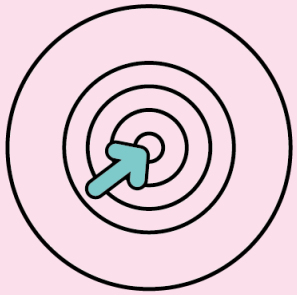
Belfast's Net Zero Future

This **Plan on a Page (PoP)** shows the extent of change required in each area of Belfast to achieve a Net Zero energy system by 2050. Focus Zones highlight areas where a concentration of a certain solution is recommended, so directing efforts towards delivery at scale in that area can lead to significant progress and serve as a demonstrator to other parts of Belfast. Focus Zones may also 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.



Opportunity Areas & Focus Zones

Opportunity Areas & Focus Zones



An **Opportunity Area** describes an area of Belfast where an intervention is recommended in high numbers but **may have uncertainties or barriers associated with delivery.** Opportunity Areas help Belfast City Council and stakeholders see the bigger picture in terms of **medium to long-term delivery**.

A **Focus Zone** describes an area of Belfast where an intervention is recommended in high numbers and with **high certainty (low-regrets) and enablers for near-term delivery**. Focus Zones help to identify key locations which Belfast City Council and stakeholders may use to **prioritise and specify a pipeline of projects for implementation**.

This section of the LAEP uses Opportunity Areas and Focus Zones to summarise the key details for each intervention area within the scope of the LAEP. These help to highlight areas for priority action and are intended to support the post-LAEP implementation to build a pipeline of energy decarbonisation projects and recommended actions for the local area.

The identified Opportunity Areas and Focus Zones have emerged from the techno-economic Scenarios modelled in this LAEP. Depending on the intervention, a 'minimum' number may be specified indicating a low-regrets approach. Or, if it is not possible to declare a low-regrets approach then the key aspects of Scenario variation is explained. The aim is to identify the right priorities for stakeholders to progress their decarbonisation actions whilst simultaneously having a view to where future opportunities may emerge.

Domestic Fabric Upgrades

Fabric upgrades help to improve the thermal performance and energy efficiency of buildings. The measures proposed in this LAEP apply to the existing building stock and are therefore considered to be "retrofit measures". The primary incentive of retrofit measures is energy demand reduction which induces several co-benefits such as:

- Lowering energy bills
- Reducing carbon emissions (if energy demand is not yet from a carbon neutral supply chain)
- Reduced loading on the electricity grid and/or avoiding the need for network reinforcement
- Improving comfort level (warmth of home) which drives improved health and well-being.

63%

Of Belfast's existing domestic buildings are EPC rated D – G

108,000

Properties out of 193,000 require at least one retrofit measure by 2050

This LAEP contains four main retrofit measures each with different potential to reduce carbon and return on investment periods:

- Single glazing window replacement
- Loft insulation
- Cavity wall insulation
- Solid wall insulation

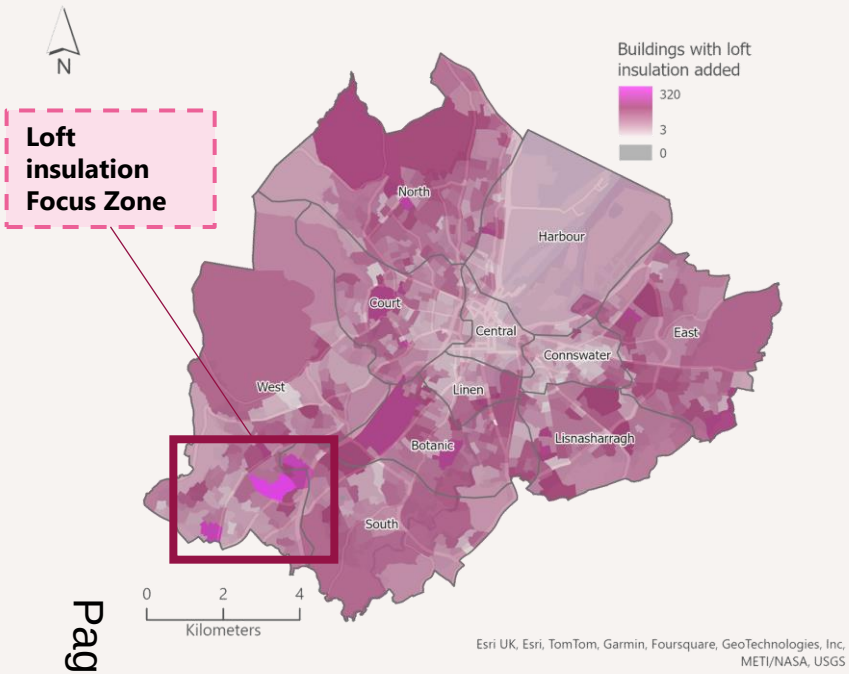
Cavity wall and loft insulation are considered the preferrable options as levels of disruption and up-front investment are relatively low. However, single glazing window replacement can bring co-benefits such as reduction in condensation and damp – which drives health benefits – reduced external noise and draughts which help improve comfort.

Indicative ratings of LAEP retrofit measures

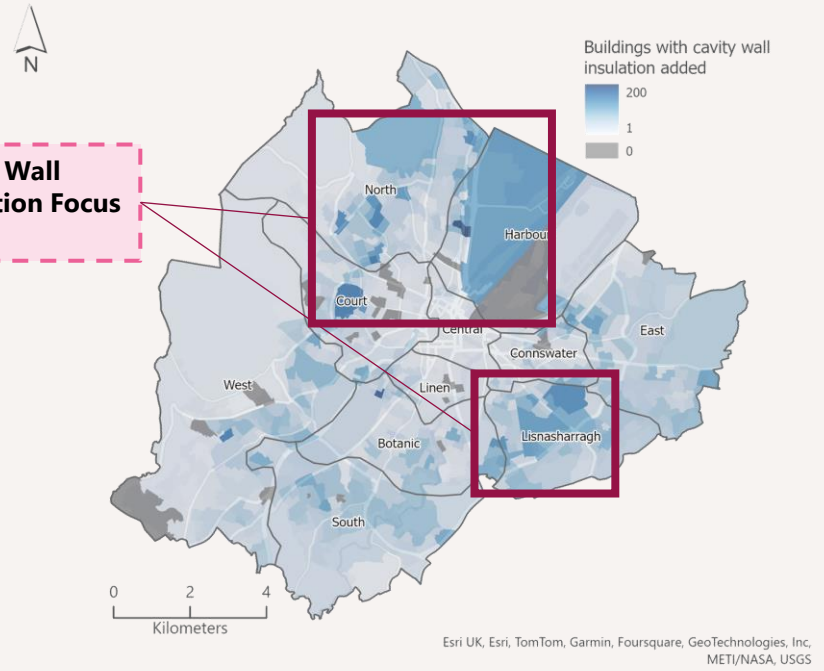
Qualitative indicators taken from Energy Savings Trust [1]	Up front investment	Return on investment	Carbon Savings	Co-benefits (damp reduction, draughts, external noise, comfort level, fuel bills)
Loft Insulation	🟢	🟢	🟠	🟢
Cavity Wall Insulation	🟢	🟢	🟠	🟠
Single Glazing Window Replacement	🔴	🟠	🟠	🟢
Solid Wall Insulation	🔴	🟠	🟢	🟠

Enablers	Barriers	Actions
• Technologies and supply chains are well established. • Funding mechanisms have been provided in the past and may be re-opened. • Fabric first approach is widely recognized as a low-regrets decarbonisation action. • Likely to receive policy backing as a near-term enabler to achieving reduction in energy demand.	• Lack of 'off-the shelf' funding mechanisms for domestic fabric upgrades in Northern Ireland. • Desire to avoid pushing responsibilities for decarbonisation measures onto local citizens and businesses. • Skills and capacity in the supply chain may be inadequate to cope with the same and pace of action recommended by the LAEP.	• Explore opportunities, costs, and benefits for high temperature heating solutions (e.g. HT HPs, gas hybrid HPs, or HT DHN) that may avoid the need for widespread domestic retrofit. • Plug any skills gap or capacity requirements in the supply chain. • Build the case for grant or loan funding for domestic retrofit (heating, fabric upgrades) to be adopted in NI • Ensure citizens and businesses are provided with support services in their decarbonisation journey.

[4] https://energysavingtrust.org.uk/energy-at-home/reducing-home-heat-loss/

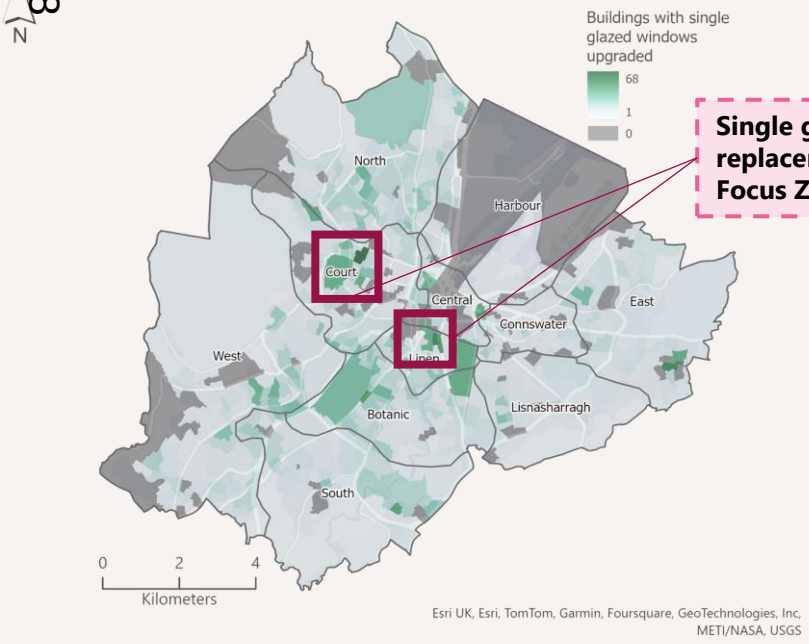


Loft insulation Focus Zone

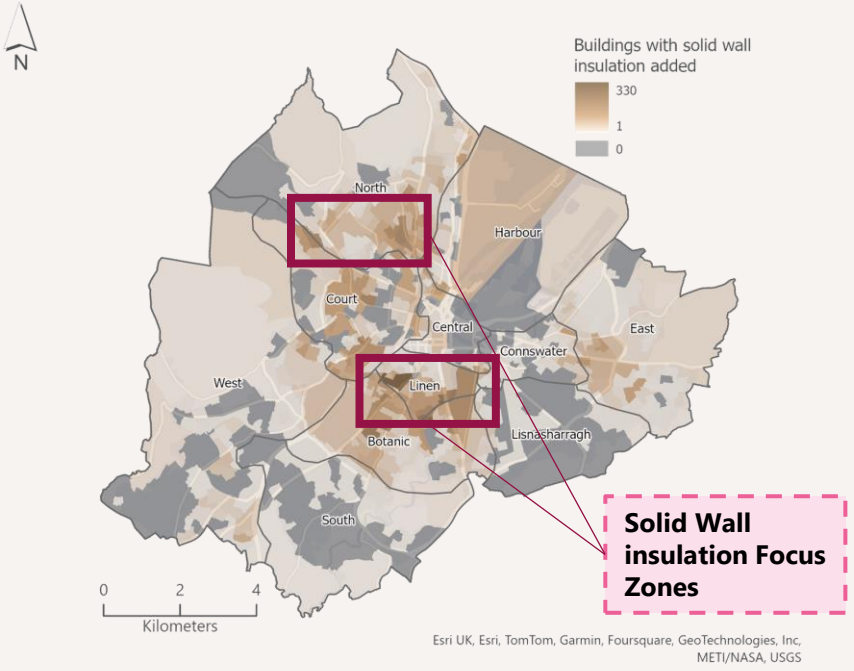


Cavity Wall insulation Focus Zones

Retrofit deployment by 2050 across Belfast is shown in these maps at Data Zone level for each of the 4 retrofit measures modelled in this LAEP. Fabric upgrades are a low regrets measure (minimal Scenario variation), but the images here show data from the Net Zero 2050 Scenario.

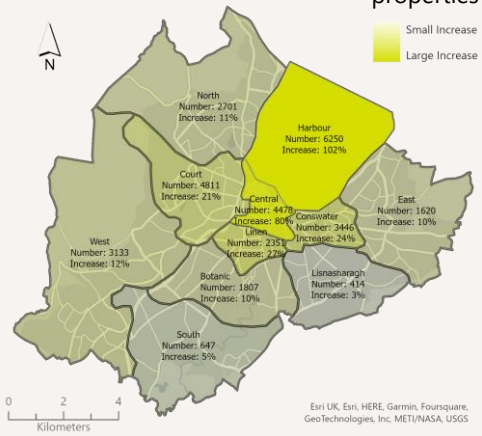


Single glazing replacement Focus Zones

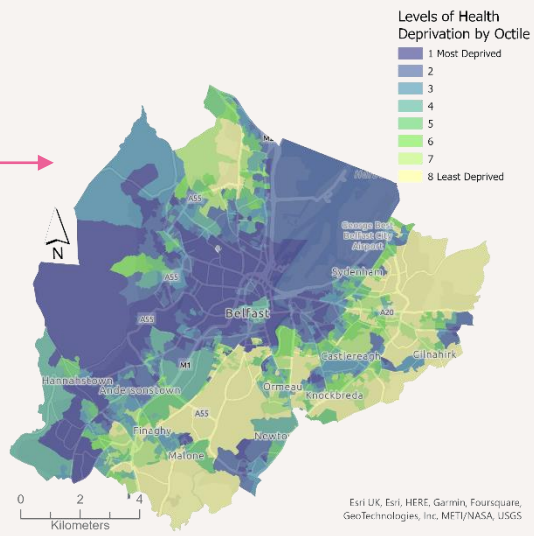


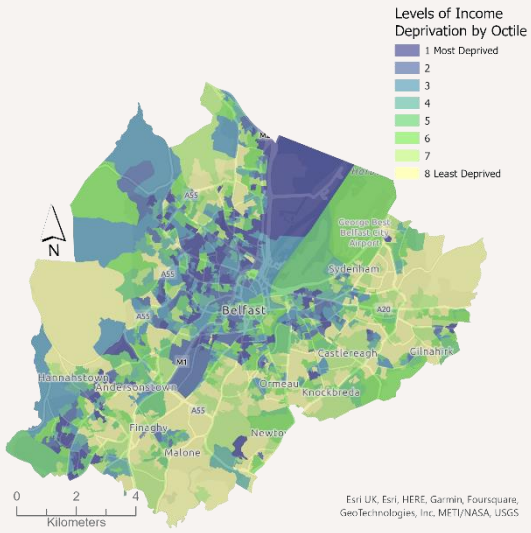
Solid Wall insulation Focus Zones

Planned new build domestic properties



Biasing retrofit towards areas of deprivation can have significant socio-economic benefits such as reduction in consumer energy bills, alleviation of fuel poverty, and warmer homes.



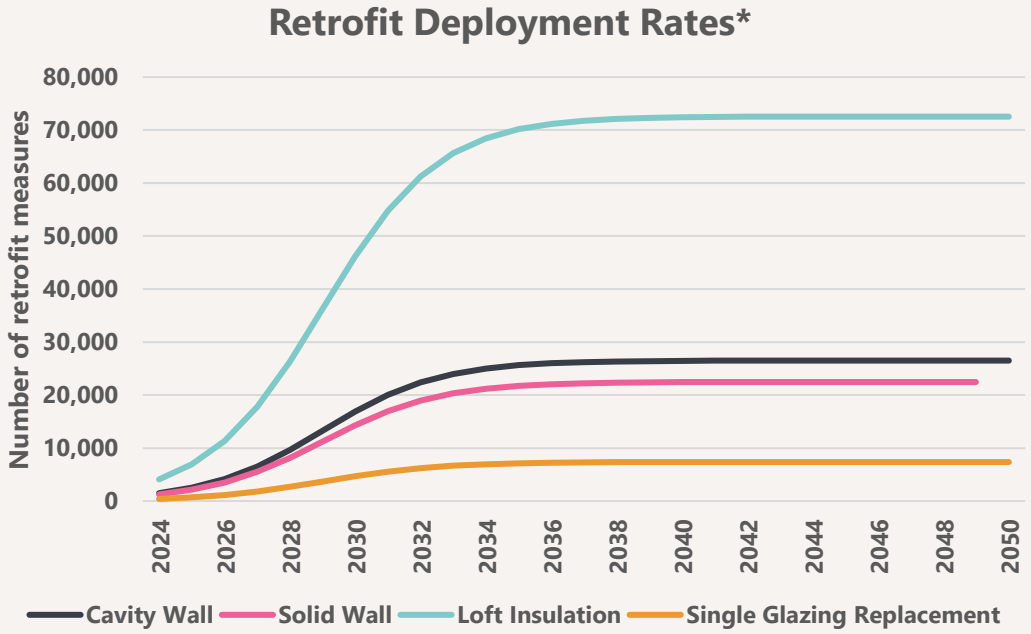


Fabric upgrades may be less prevalent in areas where new build properties due to improvements in energy efficiency enforced through building standards

Belfast's domestic retrofit pathway in numbers:

	2030 (total properties)	2050 (total properties)
Loft Insulation	47,000	73,000
Cavity Wall Insulation	17,000	26,500
Single Glazing Window Replacement	5,000	7,500
Solid Wall Insulation	15,000	23,000

Moving towards high temperature heating solutions will reduce the scale of fabric upgrades required and/or relieve the pressure to progress all fabric upgrades imminently. Increasing domestic connections to DHN by 20% and doubling the number of high temperature HPs will potentially eliminate the need for retrofit although this approach is not as cost-effective from a system perspective.



*Numbers obtained from Net Zero 2050 Scenario

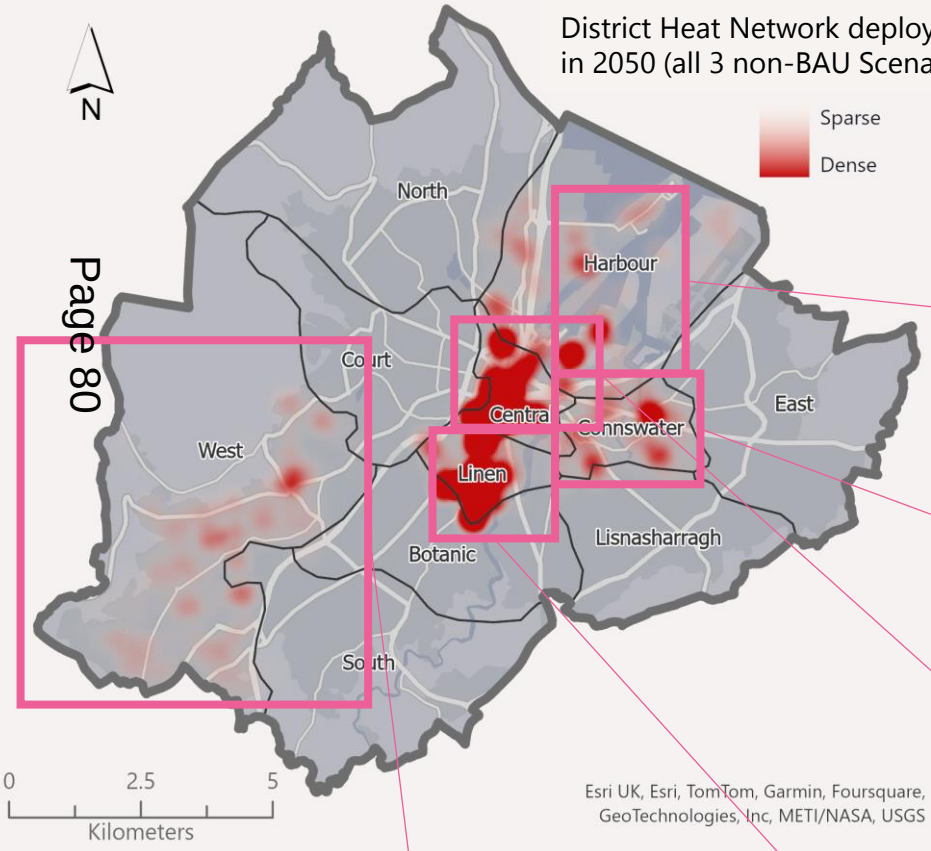
District Heat Networks

At least 30%

of Belfast's non-domestic heat demand is from District Heat Networks by 2050

Up to 58%

of Belfast's domestic buildings could be connected to District Heat Networks by 2050



The 'heat map' opposite shows Opportunity Areas across Belfast for DHN. The map contains data for both domestic and non-domestic buildings from all 3 non-BAU Scenarios modelled in this LAEP. This visual therefore represents a low regrets viewpoint. Specific Focus Zones are highlighted where DHN should be prioritised for near-term action. More detailed feasibility studies will be required in these areas to verify the scale and potential. This should include consideration for deployment of a fully electrified heat network or a biomethane hybrid heat network; the latter preserves compatibility with the medium to long-term emergence of biomethane which remains an uncertainty. Harbour, Central, Connswater, and Linen represent Focus Zones for non-domestic buildings primarily but may offer opportunities to expand the network towards nearby domestic buildings. West represents a Focus Zone driven mainly by domestic connections. Phasing of this deployment will be crucial since typically a heat network requires anchor loads from public, commercial, or industrial buildings to establish viability before connecting domestic properties in subsequent phases.

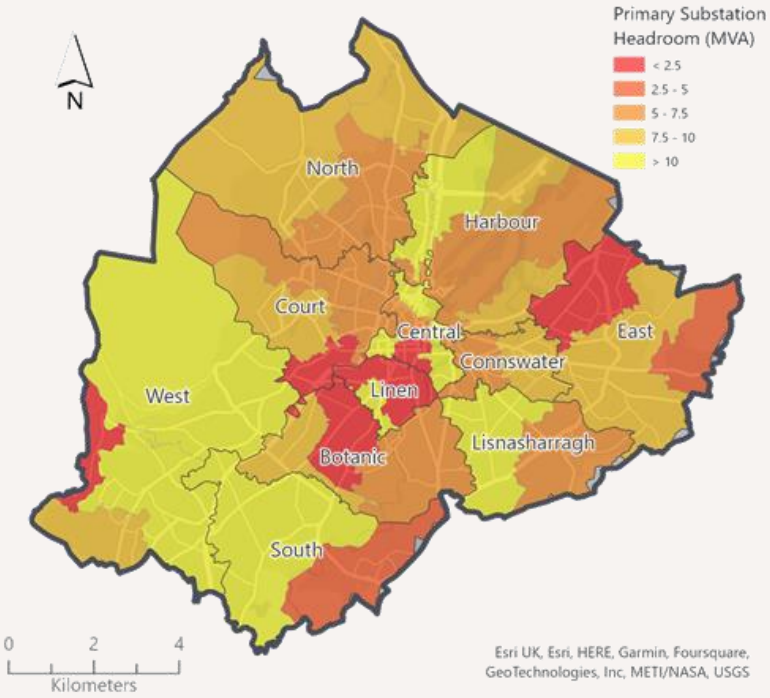
DHN In Harbour Area
- 12,346 homes in Harbour area in total
  - At least 1,100 connected to district heating (8.9%)
  - Potential to connect to the 6,250 emerging new build properties
- 1.95 million m^2 of non-domestic building floor area
  - At least 730,000 m^2 connected to district heating (37.4%)

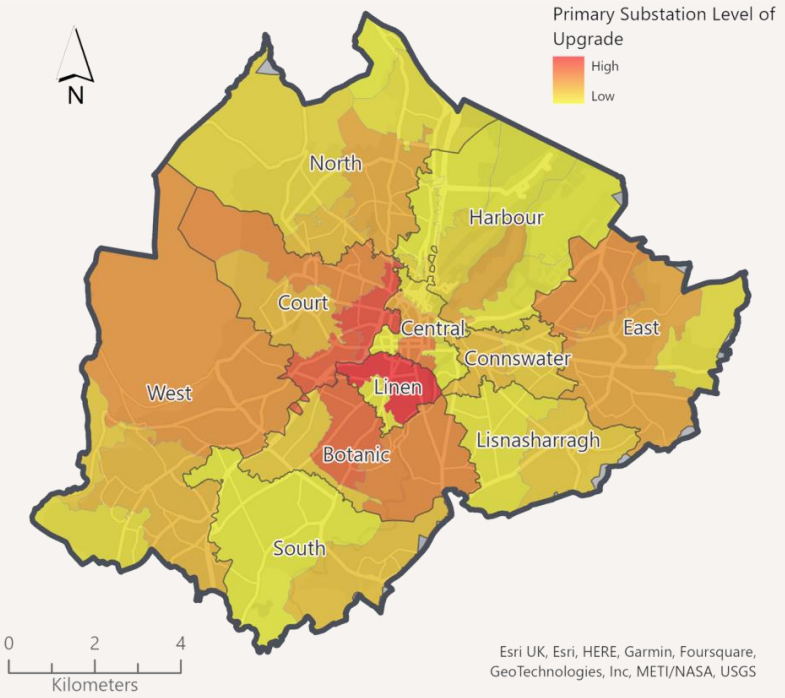
DHN In Connswater
- 17,652 homes in Connswater in total
  - At least 4,900 connected to district heating (27.8%)
- 456,000 m^2 of non-domestic building floor area
  - At least 184,000 m^2 connected to district heating (40.4%)

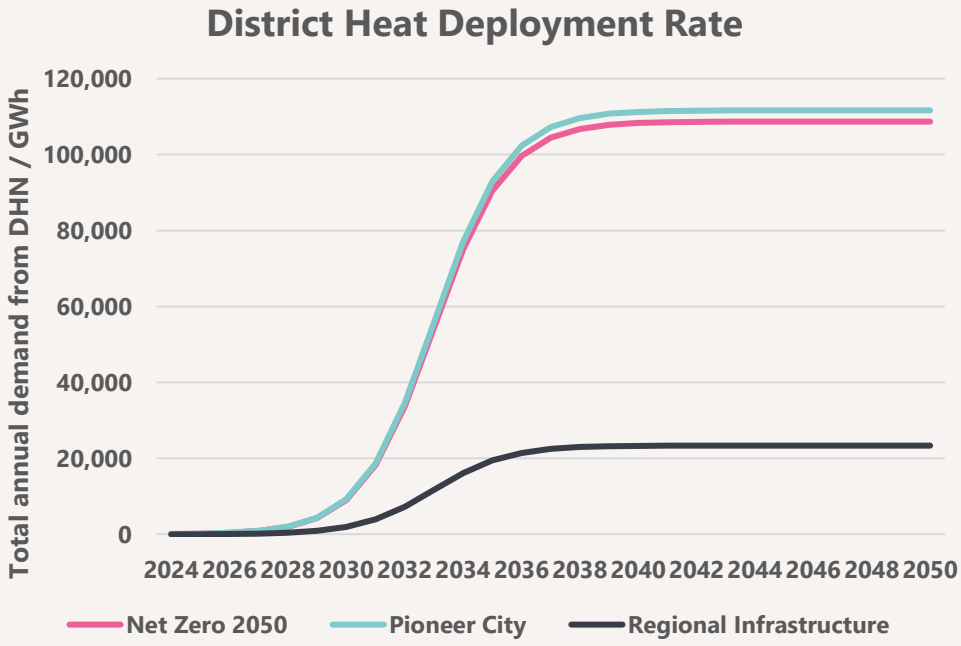
DHN In Central
- 10,047 homes in Central Belfast in total
  - At least 1,700 connected to district heating (16.9%)
- 2.56 million m^2 of non-domestic building floor area
  - At least 1.61 million m^2 connected to district heating (62.9%)

DHN in West
- 28,000 homes in West Belfast in total
  - At least 16,000 connected to district heating (57.1%)
- 870,000 m^2 of non-domestic building floor area
  - At least 334,00 m^2 connected to district heating (38.4%)
- What does the HV network look like? Is upgrade required?

DHN In Linen
- 10,959 homes in Linen in total
  - At least 4,100 connected to district heating (37.4%)
- 1.28 million m^2 of non-domestic building floor area
  - At least 640,000 m^2 connected to district heating (50.0%)







Existing HV network capacity and levels of upgrade required by 2050 are shown top-left and top-right respectively for the Net Zero 2050 Scenario. High temperature DHN on the scale recommended by this LAEP are anticipated to connect to the HV rather than LV network hence these are shown in context here. The deployment rate of district heat networks at the time of writing this LAEP is shown on the left. The relative shape of the curves are identical for all modelled Scenarios but the magnitude of deployment results in different gradients. Steeper gradients indicate more expectations and ramp up on the local supply chain.

Enablers	Barriers	Actions
• Policies and incentives are likely to drive continued HP uptake in the market. • DHN developers are appearing on the market providing end-to-end services from feasibility to commissioning and operation.	• Lack of regulatory framework. • Small profit margin prevents developer investment. • Disruption to roads and buildings. • Co-ordination of consumer switch over from existing heating systems	• Engage the market to offer heat supply agreements to potential off-takers and attract investment from heat network developers. • Build the case for a regulatory framework and grant schemes for district heating to be adopted in NI • Consult citizens to ascertain views on switch to DHN.

Heat Pumps

66k – 86k

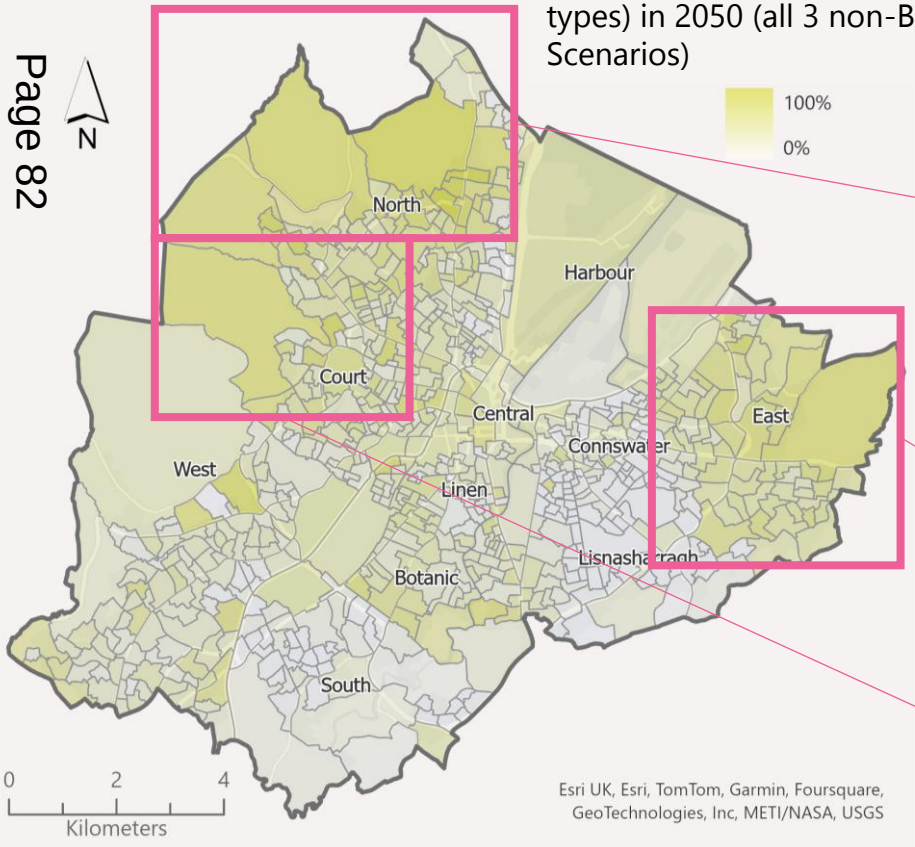
Heat Pumps Deployed across Belfast by 2050

Hybrid HPs or HT HPs may avoid the need for retrofit measures and therefore act as an enabler for low carbon heating uptake

Heat pumps are widely deployed in Belfast's Net Zero future, but their deployment across Belfast is relatively sensitive to Scenario variation and/or domestic-to-non-domestic buildings. However, North, Court, and East are areas with relatively high and stable quantities of heat pump deployment for both domestic and non-domestic buildings making them ideal Focus Zones for near-term action.

The specific form of heat pump technology deployed will depend upon many interdependent factors that require more detailed evaluation during the LAEP implementation phase (see subsequent 'Implementation – Critical Decision-Making Factors' section for example). Heat pump deployment for domestic buildings are shown on the left for all types (LT ASHP, HT ASHP, gas hybrid HP) and presented for all 3 non-BAU Scenarios indicating the scale of low regrets approach to deployment.

% Heat Pump deployment (all types) in 2050 (all 3 non-BAU Scenarios)



Heat Pumps In North Belfast

- 25,325 homes in North Belfast in total
  - At least 6,000 supplied by heat pumps in 2050 (42.9%)
- 500,000 m^2 of non-domestic building floor area
  - Potentially no supply of heat pumps to non-domestic buildings if biomethane is widely available. Otherwise at least 206,000 m^2 supplied by heat pumps in 2050 (41.2%)

Heat Pumps In East Belfast

- 17,034 homes in East Belfast in total
  - At least 7,300 supplied by heat pumps in 2050 (42.9%)
- 560,000 m^2 of non-domestic building floor area
  - At least 49,000 m^2 supplied by heat pumps in 2050 (8.7%)

Heat Pumps In Court

- 27,549 homes in Court in total
  - At least 8,000 supplied by heat pumps in 2050 (29.0%)
- 1.5 million m^2 of non-domestic building floor area
  - At least 370,000 m^2 supplied by heat pumps in 2050 (24.7%)

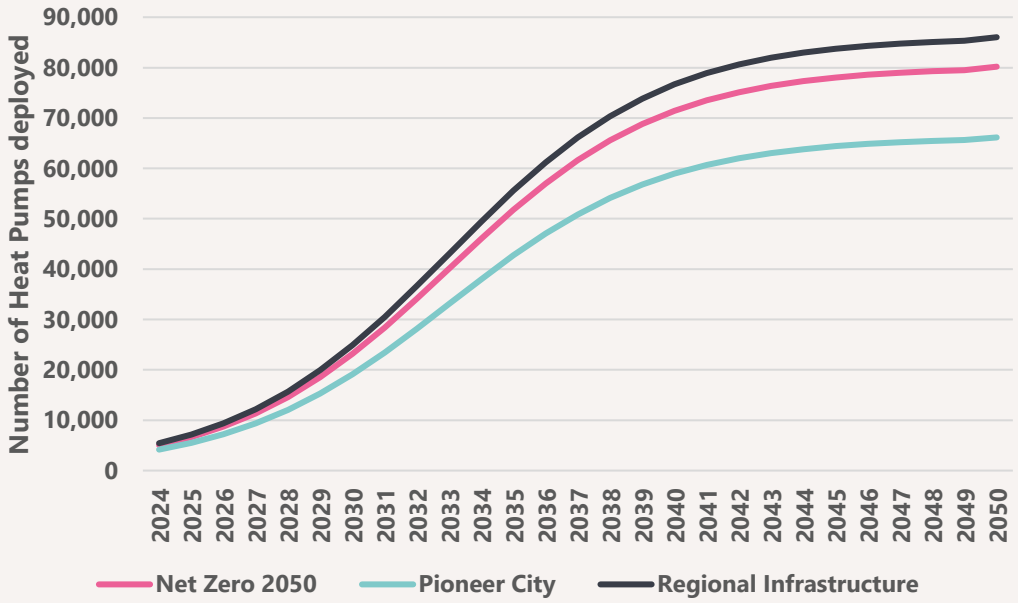
The Scenario variation for heat pump deployment and variation between domestic and non-domestic buildings can be visualised in the 3 maps opposite. Heat Pumps account for between 10% and 47% of total heat demand from Non-Domestic Buildings in 2050. Current estimates of heat pump deployment are shown in the chart below. Using Regional Infrastructure Scenario as the example, HP deployment rate will average at just over 3,000 per year between 2028 and 2030. By comparison, the UK government is committed to 600,000 HP installations annually by 2028. If this commitment is allocated pro-rata to population, then Belfast's rate of deployment over this 3-year period is aligned within 1%.

Enablers	Barriers	Actions
• Technologies and supply chains are becoming increasingly mature. • Policies and incentives are likely to drive continued HP uptake in the market.	• There are no dedicated funding schemes for heat pumps in NI. • Some installations may require concurrent or prior building fabric upgrades. • Desire to avoid pushing responsibilities for decarbonisation measures onto local citizens and businesses. • Skills and capacity in the supply chain may be inadequate to cope with the same and pace of action recommended by the LAEP.	• Explore opportunities, costs, and benefits for high temperature heating solutions (e.g. HT HPs, gas hybrid HPs, or HT DHN) that may avoid the need for widespread domestic retrofit. • Plug any skills gap or capacity requirements in the supply chain. • Build the case for grant or loan funding for domestic retrofit (heating, fabric upgrades) to be adopted in NI • Ensure citizens and businesses are provided with support services in their decarbonisation journey.

1.2 – 5.5 million m^2

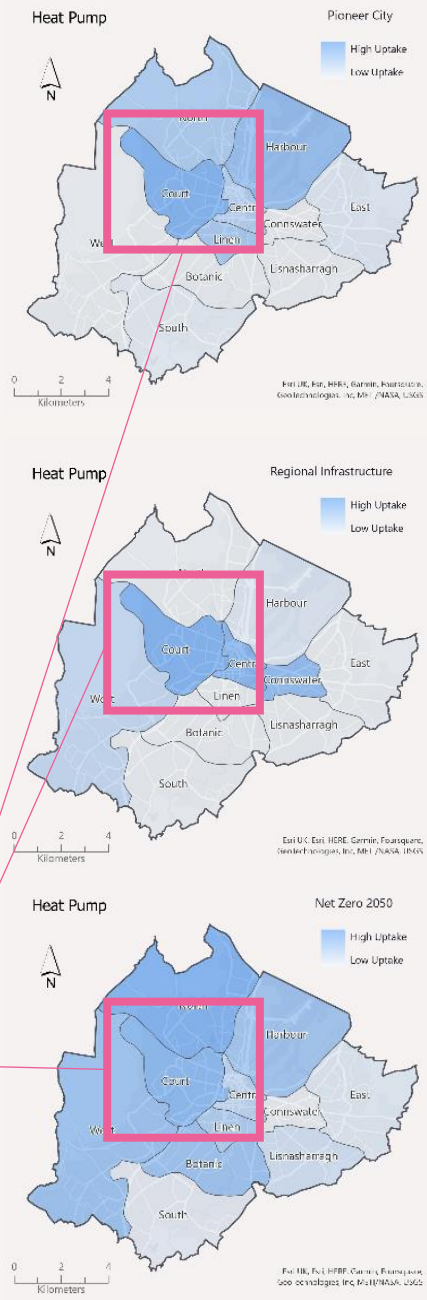
of Non-Domestic Building floor area (public, commercial, or industrial buildings) across Belfast will be heated by Heat Pumps by 2050

Heat Pump Deployment Rates



Court and Central represent the primary Focus Zones for Heat Pumps in Non-Domestic Buildings with 960,000 m^2 – 2.1 million m^2 of floor area heated by Heat Pumps in 2050. The upper estimate accounts for up to 35% of Central's and 75.0% of Court's total non-Domestic floor area heat demand and up to 17.5% of Belfast's total non-Domestic floor area heat demand.

Non-Domestic Heat Pump deployment in 2050 for all 3 non-BAU scenarios

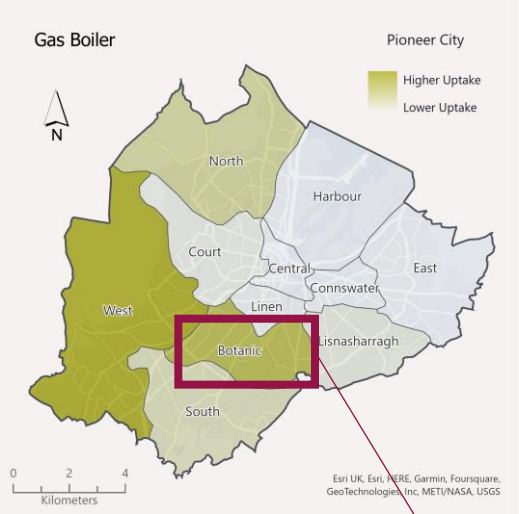


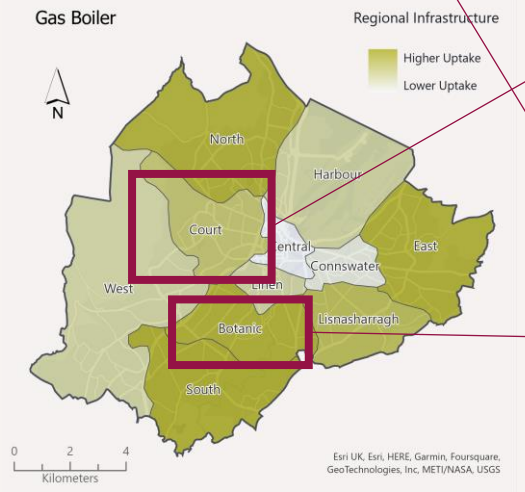
Biomethane Boilers

Enablers	Barriers	Actions
• Gas network already established – level of upgrades not anticipated to differ from BAU.	• Lack of carbon credits to support industry use of biomethane. • Uncertainty on biomethane production – much wider than an energy system consideration • Boiler concessions will be required in the medium to long term assuming UK ban on gas boilers is enforced mid-2030s.	• Build the case for introducing carbon credits to support industry use of biomethane. • Explore the need for NI gas boiler concessions in anticipation of biomethane availability supporting extended use of gas boilers.

Uptake of biomethane boilers is highly Scenario dependent and relatively disparate across areas of Belfast and when comparing domestic and non-domestic buildings. This is not conducive to near-term action through biomethane Focus Zones. However, Botanic and Court stand out as future Opportunity Areas for uptake of biomethane boilers in both domestic and non-domestic buildings. This may correlate with building type and age for domestic uptake and the operational nature of non-domestic (public, commercial, or industrial) buildings. For example, a large quantity of Belfast's listed buildings and oldest housing stock can be found in the Botanic area which may present a barrier to lower temperature electrified heating.

Non-Domestic Buildings





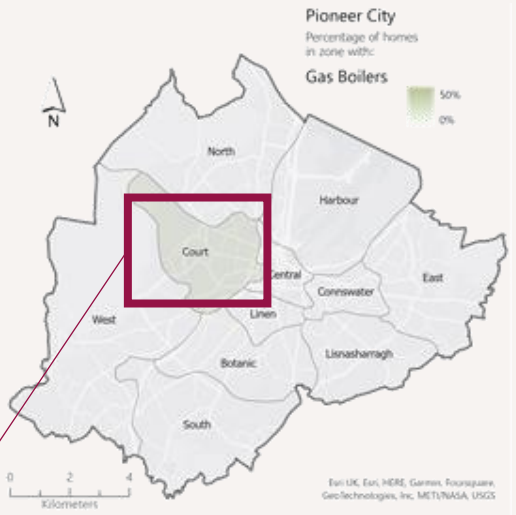
Uptake of Biomethane Boilers in Court

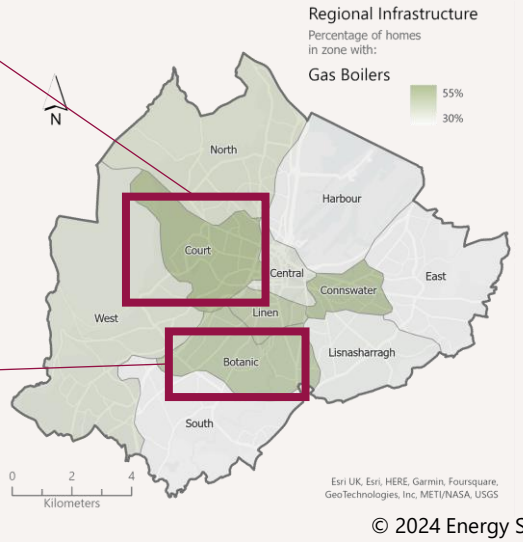
- 27,549 homes in Botanic area in total
  - A maximum uptake of 14,132 biomethane boilers (51.3%)
- 1.54 million m^2 of non-domestic building floor area
  - A maximum uptake of 1.09 million m^2 floor area heated by biomethane boilers (71.1%)

Uptake of Biomethane Boilers in Botanic

- 19,675 homes in Botanic area in total
  - A maximum uptake of 9,000 biomethane boilers (46.0%)
- 1.23 million m^2 of non-domestic building floor area
  - A maximum uptake of 1.18 million m^2 floor area heated by biomethane boilers (95.9%)

Domestic Buildings



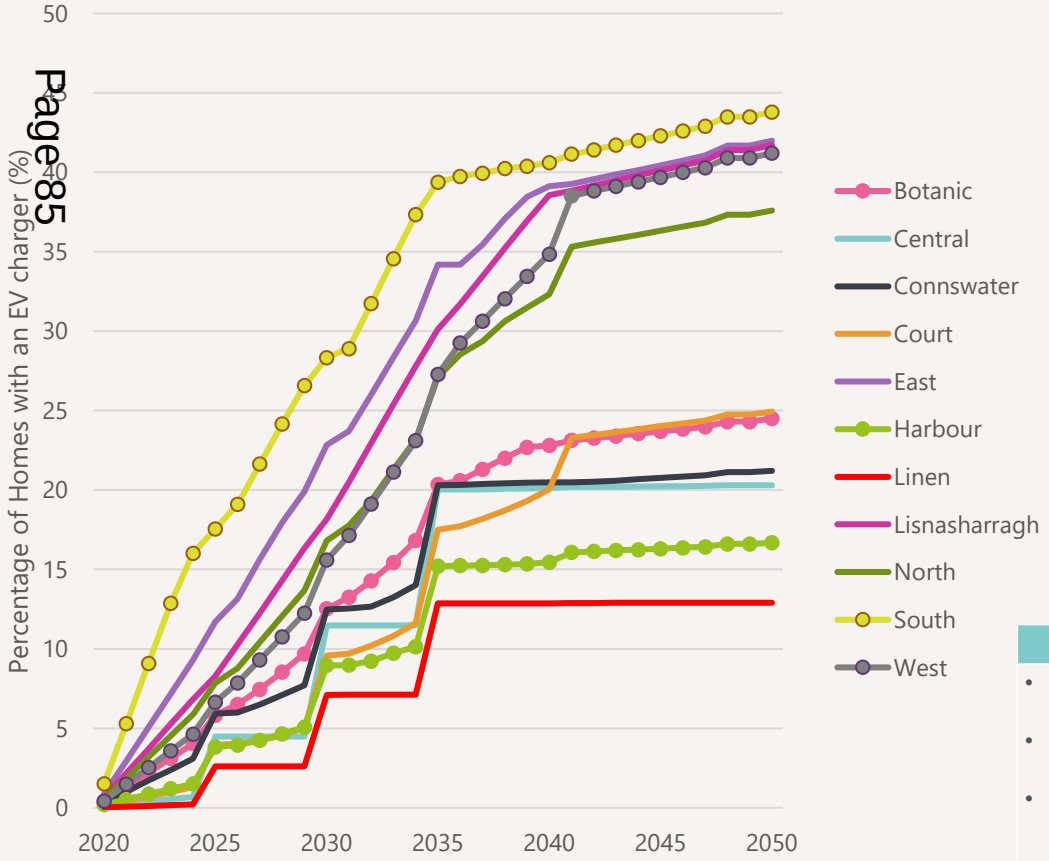


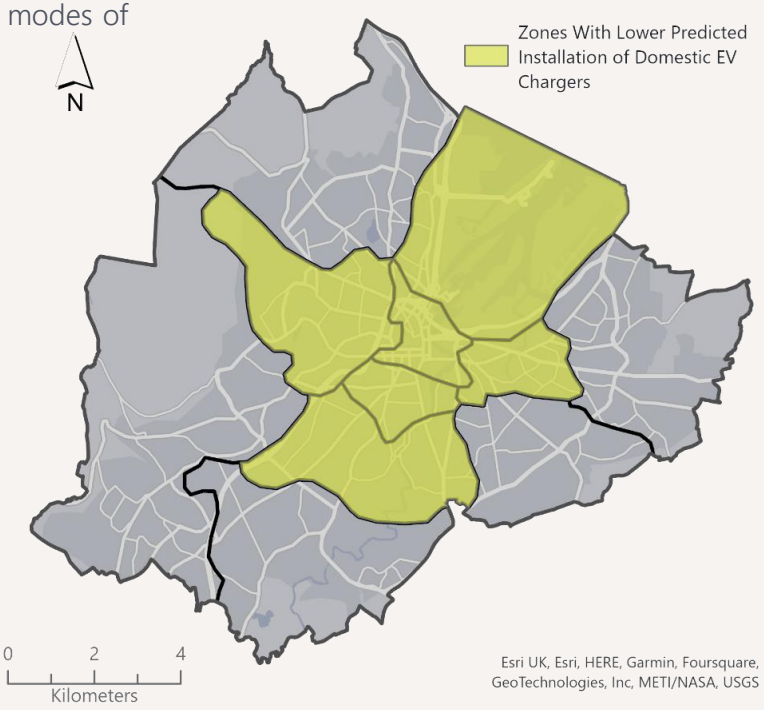
EV Infrastructure

The modelling approach in this LAEP aligns with Belfast's draft EV Strategy which estimates 158,000 electric vehicles (cars and vans) and 59,000 domestic EV charge points will be operational in Belfast by 2050. Spatial deployment of domestic charge points is determined by the potential for off-street parking – including an estimate of available space at each home – plus the allocation of the charge point to the HV electricity network. The resultant distribution of domestic EV charge points across Belfast is shown below as a % of total homes in the area. New build properties are assumed to be more likely to have a charge point installed than existing buildings which accounts for the sharp increase in domestic chargers in some areas – particularly central areas of Belfast – in the mid-2030s. Despite this, these central areas of Belfast fall significantly behind the outer areas of the city where properties typically have more space for off-street EV charging. This also highlights the importance of providing innovative and alternative EV charging provisions and other modes of transport if everyone is to be brought along on the transition to low carbon transport.

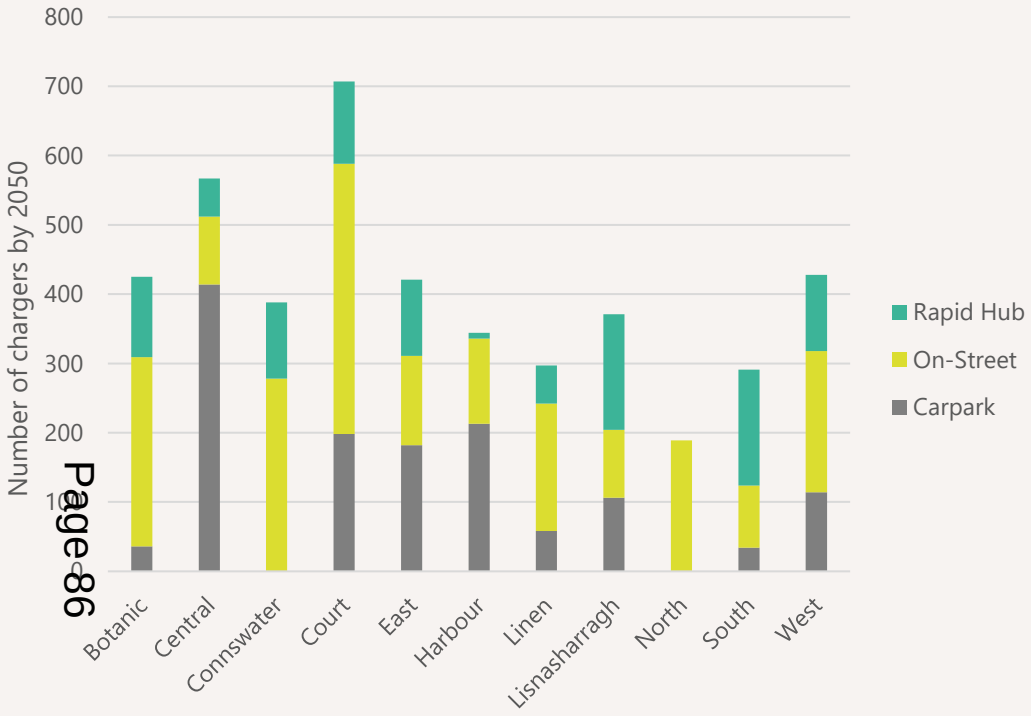
30%

of domestic properties (on average across Belfast) will have an EV charge point by 2050





Enablers	Barriers	Actions
• Technologies are well established. • Market conditions well understood. • Demand almost certain to increase over time.	• The scale and pace of network upgrades could limit deployment in some areas. • Consumer cost to install charge points. • Limitations in ability to deploy domestic and public charge points (e.g. space, competing infrastructure or social perspectives).	• Explore demonstrator projects that might help accelerate public EV charge point deployment.

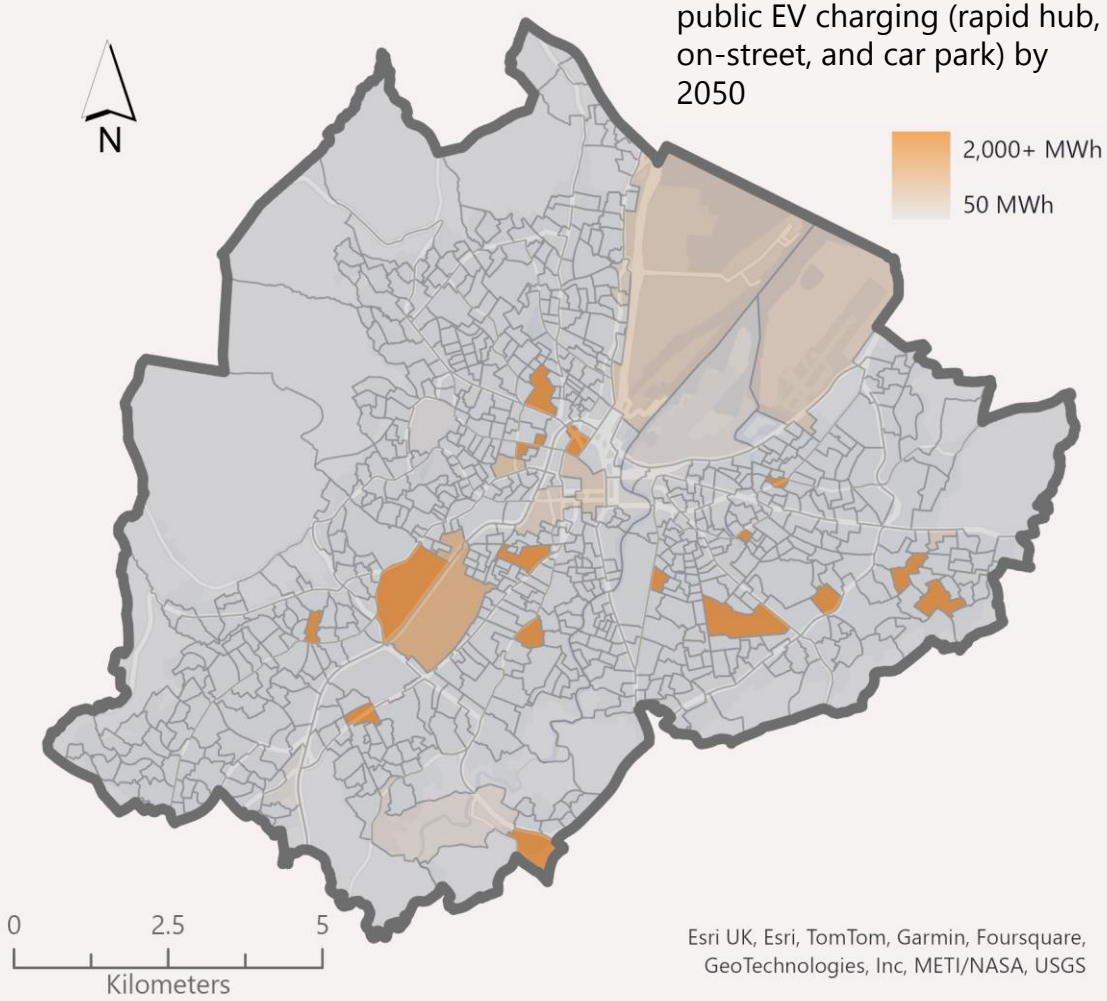


The spatial deployment of public EV infrastructure by 2050 is shown opposite at Data Zone level. The coloured areas highlight annual energy demand from all charge points (types and power outputs) in these areas so each acts as an Opportunity Area for deployment. This deployment is not Scenario sensitive so building towards this is a low regrets option for Belfast. Note the distribution of demand away from Belfast city centre where modal shift towards public transport and active travel are the preferred ambitions for Belfast to help build the status as a "15-minute city centre". Thus, demand from EV charging is lower in these areas. The modelling approach to this deployment varies by type (rapid hub, on-street or carpark). On-street chargers were assumed to be required near homes without sufficient space for off-street home charging. Rapid hubs were placed at the location of petrol stations in the area, and in existing car parks.

4,400
Public Electric Vehicle chargers by 2050

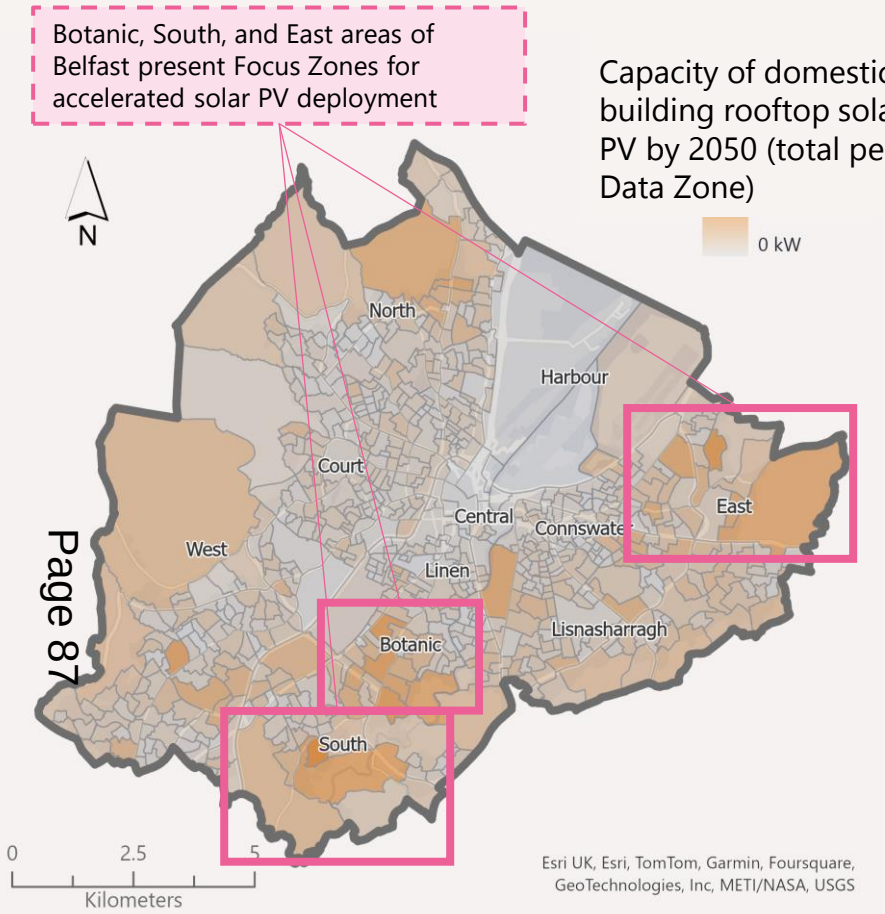
Belfast has ambitions to preserve city centre areas for public transport and active travel meaning reduced demand for EV charging

Annual energy demand from public EV charging (rapid hub, on-street, and car park) by 2050

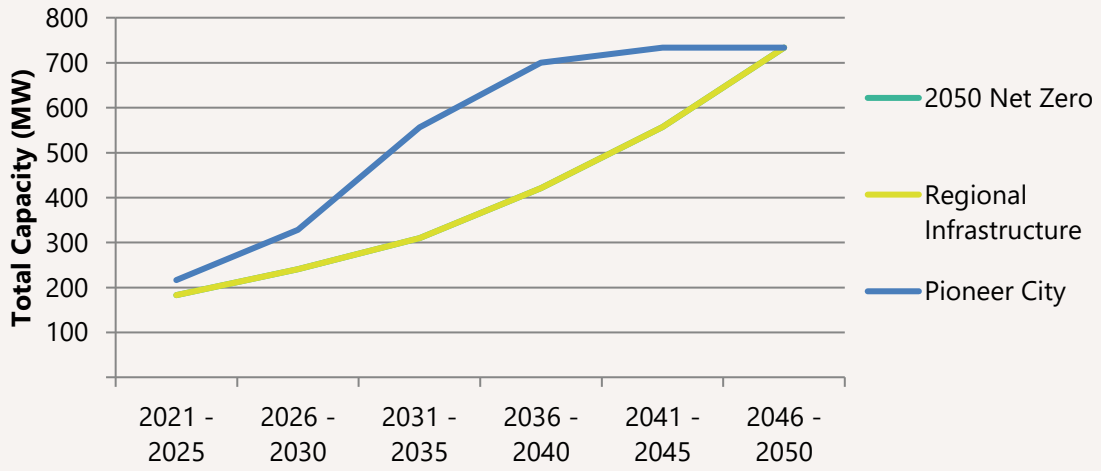


Solar PV

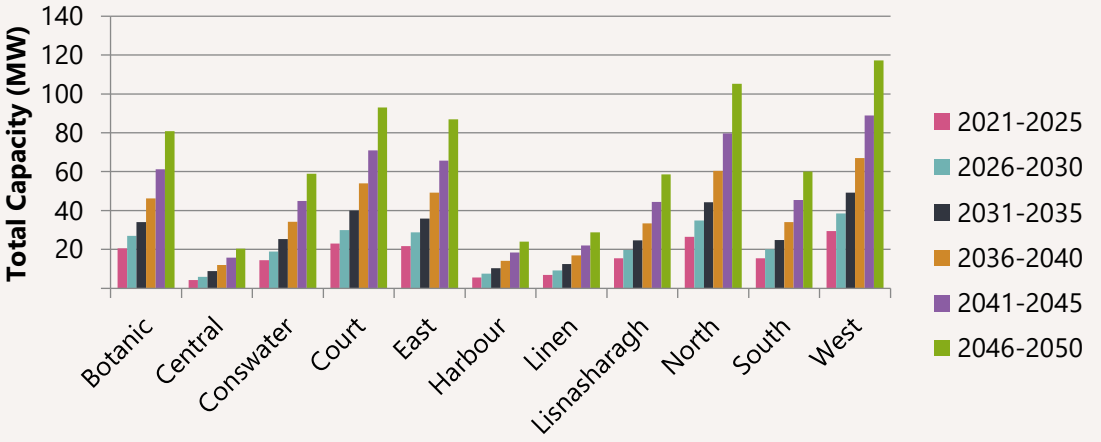
Botanic, South, and East areas of Belfast present Focus Zones for accelerated solar PV deployment



Cap on area of solar PV panels on domestic homes by Scenario



Maximum potential capacity for Solar PV on Domestic Buildings



The criteria for determining rooftop solar PV suitability in the LAEP modelling includes building categorisation, orientation, slope, and area of roof. From this, domestic Solar PV is widely deployed in the LAEP modelling with a total of 734 MW deployed in Belfast's Net Zero future of 2050. This total deployment is not sensitive to Scenario variation although the rate of deployment is modelled differently in the Scenarios of this LAEP (see chart top right). Data from the Microgeneration Certification Scheme (MCS) suggests that there is currently approximately 8.5 MW of domestic Solar PV generation from over 1,300 homes in Belfast therefore the recommended deployment in this LAEP represent an 8,600% increase in domestic solar PV capacity between now and 2050. The spatial distribution of deployment suggests that Belfast has several Opportunity Areas but three predominant Focus Zones of South, Botanic, and East are identified for potential accelerated roll out across relatively geographically dispersed areas (see map above) – which helps mitigate the risk that weather conditions may adversely impact the electricity grid if multiple PV arrays are simultaneously affected.

734 MW

Domestic Rooftop Solar PV potential by 2050

The determination for rooftop solar PV suitability uses similar datasets and methods as for domestic buildings but the pitch and orientation of NDB roofs are determined by Light Detection and Ranging (LIDAR) data. The outcomes are similar to domestic buildings too, with many NDBs subject to a relatively large deployment of solar PV resulting in 459 MW of NDB Rooftop Solar PV potential by 2050.

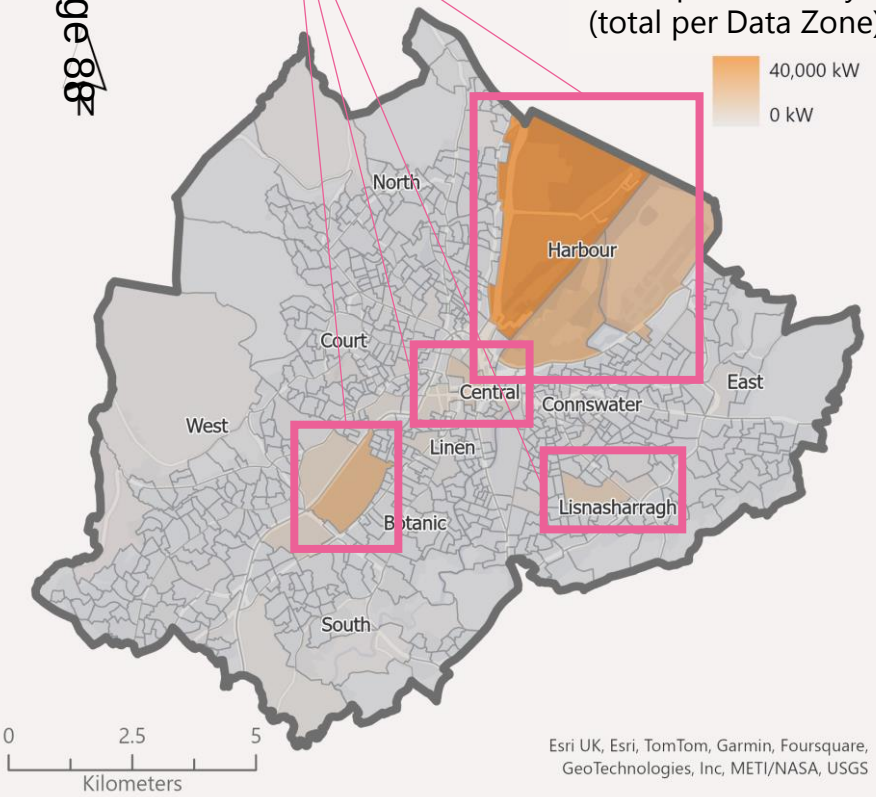
The Harbour offers the biggest opportunity for non-domestic solar PV deployment in Belfast

459 MW
Total Non-Domestic Building Rooftop Solar PV potential by 2050

solar PV may contribute up to 107 GWh of renewable energy in 2030 which is 5% of Belfast's total energy demand in 2030 (2.13 TWh)

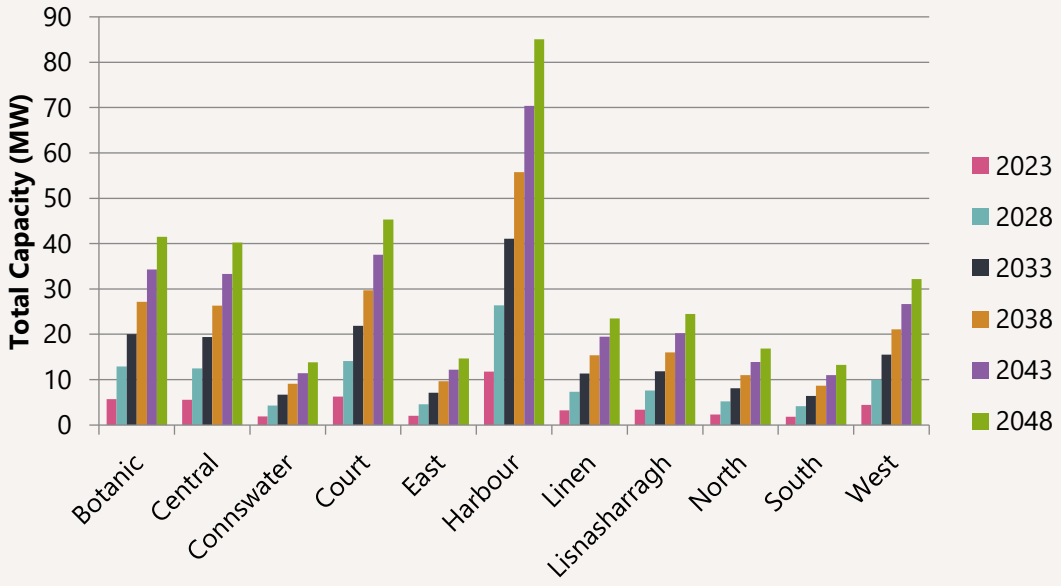
Harbour presents the primary Focus Zone for accelerated NDB solar PV deployment but large public, commercial or industrial areas in Botanic, Central, or Lisnasharragh may provide excellent opportunities for coordinated roll out.

Capacity of Non-Domestic building rooftop solar PV by 2050 (total per Data Zone)



Enablers	Barriers	Actions
• Technologies and supply chains are well established. • Funding mechanisms have been provided in the past and may be re-opened. • Likely to receive policy backing as an enabler to achieving near-term carbon reduction ahead of grid decarbonisation.	• Scale of solar PV recommended by LAEP may impose negative impacts on electricity network (e.g. intermittent weather effects).	• Explore solar PV deployment on council owned buildings. • Support community energy organisations to develop rooftop solar PV installations.

Maximum potential capacity for Solar PV on Non-Domestic Buildings



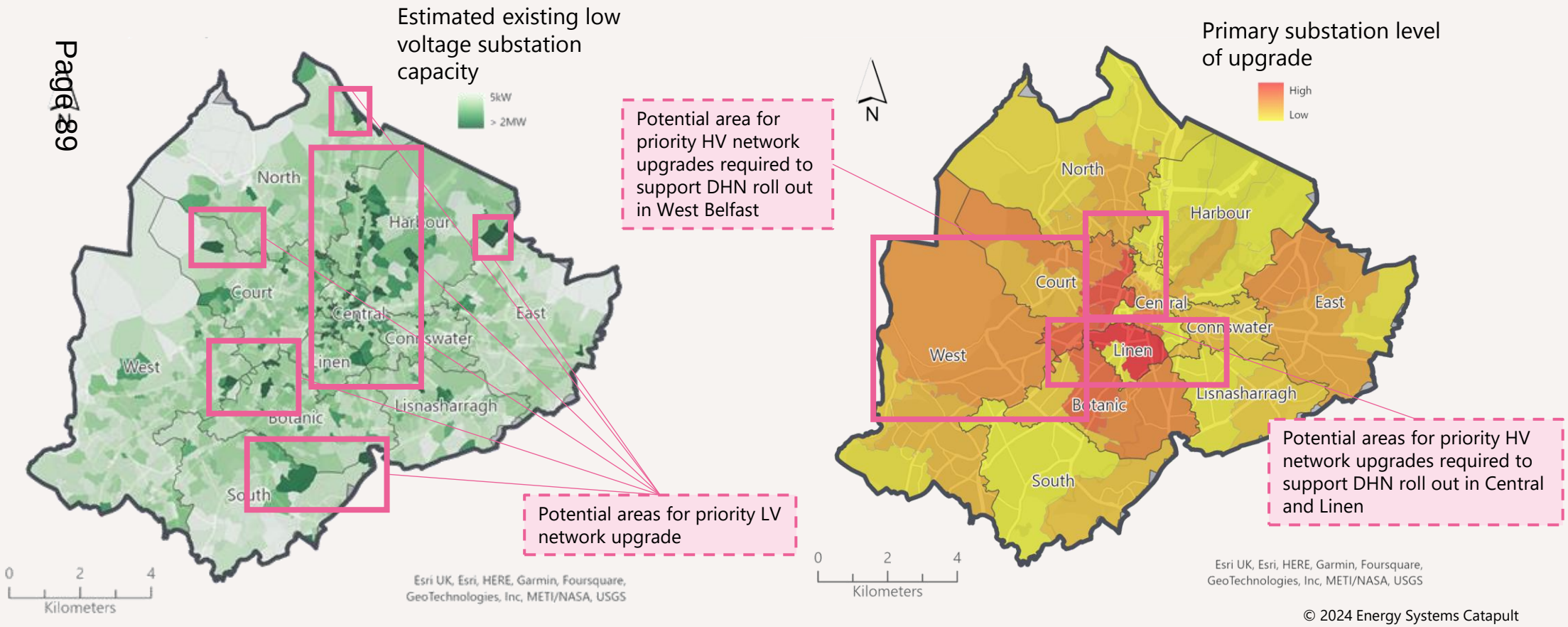
Electricity Networks

Electricity Networks across Northern Ireland are already subject to £3bn of investment by 2031 through the RP7 price control mechanism. The LAEP helps to highlight areas where network upgrades in Belfast could be prioritised to support key Interventions. In areas requiring lower levels of network upgrade, or if Belfast's future tends towards Scenarios with lower electricity demand (Pioneer City or Regional Infrastructure), then flexibility solutions could play a significant role in deferring or avoiding the level of upgrades required.

£117m
Potential cost to upgrade electricity distribution network around Belfast

57% - 166%
increase in peak electricity demand at night (due mainly to EV charging)

Enablers	Barriers	Actions
• Investment already planned for upgrades. • Network operator engaged and aligned with local authority over decarbonisation action. • Emerging flexibility markets may provide near-term low-cost mechanism to reduce or avoid level of required network upgrades	• Uncertainty over gas network re-purposing for biomethane may constrain near-term network upgrades. • Flexibility options not fully modelled in LAEP; uncertain impact and compatibility.	



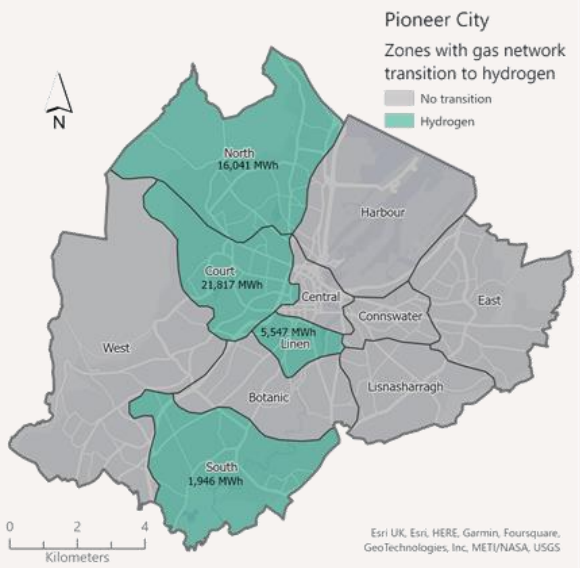
Hydrogen

Two modelled Scenarios – Pioneer City and Net Zero 2050 – provide a methane to green hydrogen conversion of the gas grid in the late 2040s (there is no hydrogen conversion in the 3rd non-BAU Scenario of Regional Infrastructure where biomethane dominates).

The maps below identify the Opportunity Areas where hydrogen may be used in 2050 and the annual demand for hydrogen in MWh/year for each zone and each Scenario respectively. Hydrogen demand is driven by industrial buildings requiring high-temperature processes although some domestic, commercial, or public buildings were forced to switch to hydrogen boilers or hydrogen hybrid heat pumps for heating.

Areas shown in grey for Pioneer City indicate where biomethane is the dominant renewable gas; whereas in Net Zero 2050, areas in grey indicate a decommissioning of the gas network.

Enablers	Barriers	Actions
• Gas network is already composed of plastic pipework and considered "hydrogen ready". • Hydrogen is widely accepted as the preferred decarbonisation option for industrial high temperature processes found in parts of Belfast.	• The level of uncertainty regarding the use-cases, costs, and availability of hydrogen prevents any immediate action recommended by this LAEP. • Modelling proves that both biomethane and hydrogen may coexist in Belfast's Net Zero future, but they are likely to compete for dominance.	• None identified for short term action.



	Pioneer City	Net Zero 2050
Annual demand for green hydrogen by 2050 (GWh/year)	45.4	29.6
As a proportion of the cap applied to the LAEP modelling	98.8%	64.5%

Implementation

Project Implementation Framework

A conceptual framework, consisting of 4 main steps, describes how projects can be taken forward from the LAEP pathway. This framework operates on the assumption that projects are led by Belfast City Council. Delivery of Net Zero will require progression of hundreds and possibly thousands of projects and therefore other frameworks may be necessary to consider in parallel. As part of this framework, Belfast City Council will need to determine their organisational role in Net Zero delivery, and how to work with partners and other stakeholders to deliver effective outcomes. The framework is shown alongside the key stages of Innovate UK's 'Financing Local Net Zero Projects: A Guide for Local Authorities' [1]. Crucially, the steps are not taken in a linear sequence and may require an iterative approach especially when considering the phasing of stakeholder engagement.

Prioritise

The first stage recommends stakeholders work to prioritise the projects identified within the LAEP – seeking Quick Wins or Low Regrets – and commission desktop feasibility studies to understand the low carbon Interventions and renewable technologies required in further detail. Feasibility assessment could include sizing commercial renewable technologies, assessing co-located storage options, consideration of network connection requirements and an initial outline business case. Prioritisation of the LAEP projects should be influenced by areas currently within stakeholders' direct control, for example social housing or land assets and public buildings owned by the council. Projects should be assessed in line with both local and regional targets which may include carbon reduction, cost breakdown, energy reduction, and impact on aspects such as fuel poverty, air quality, and economic growth plans. These activities may be supported by resources such as Net Zero Go [2]. 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. Projects may be arranged and managed using a portfolio approach if desired.

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

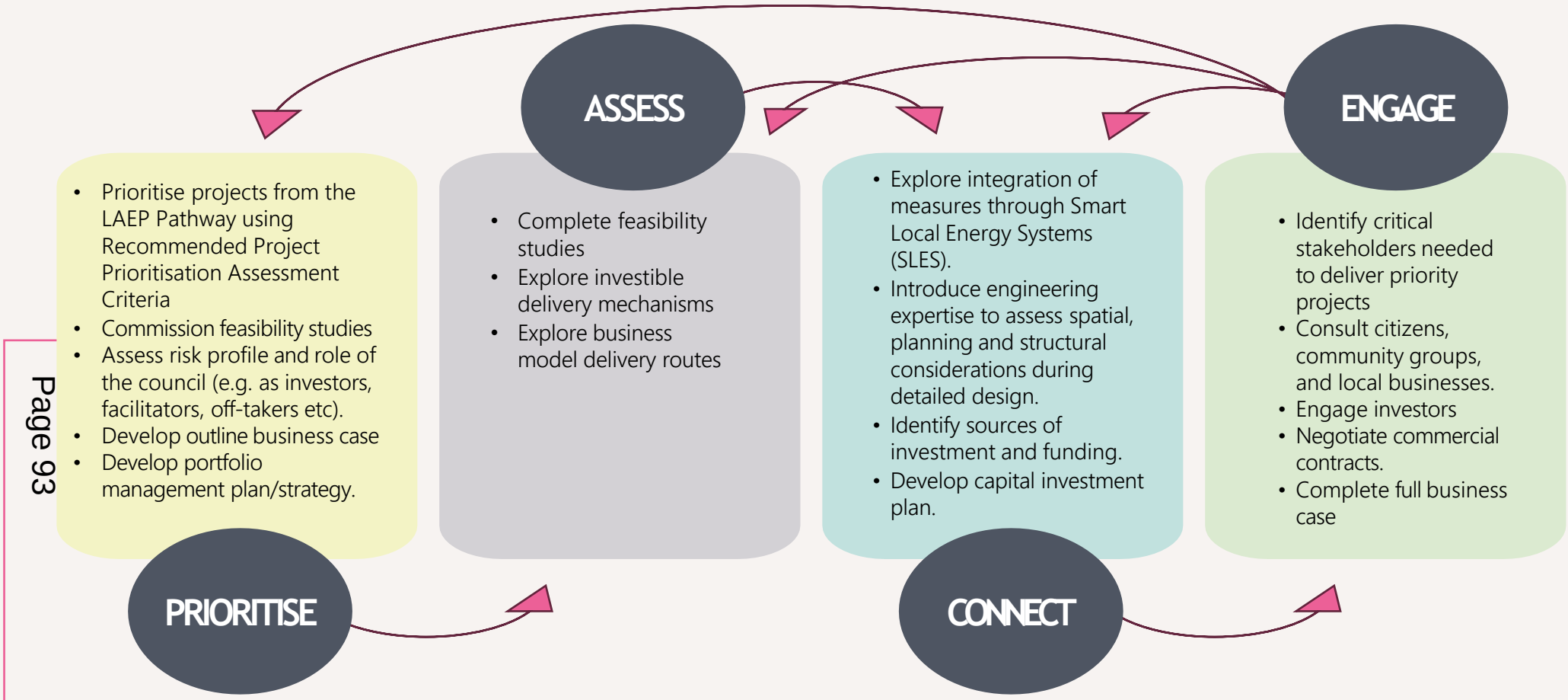
Further consideration should be given to how technologies and other measures – such as market arrangements – can be integrated through Smart Local Energy Systems (SLES), which can aggregate to unlock private investment and create numerous co-benefits. When an initial capital investment plan has been formed and initial sources of investment and funding have been identified, the detailed 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 to the electricity and gas networks should be fully understood, and a finalised capital investment plan produced.

Engage

Key stakeholders need to be identified and consideration should be given to how residents and businesses are consulted and bought into the potential benefits of decarbonising the built environment. A partner organisation with strong digital engagement experience and relationships with key stakeholders such as network operators or community energy groups can support this process. During this phase the local authority should seek to negotiate commercial contracts with other stakeholders.

[1] https://iuk.ktn-uk.org/wp-content/uploads/2023/12/Financing-Local-Net-Zero-Projects-A-Guide-for-Local-Authorities.pdf
[2] https://www.netzerogo.org.uk/

Project Pipeline Development [1] → Commercialisation [1] → Build... [1]



PRIORITISE

- Prioritise projects from the LAEP Pathway using Recommended Project Prioritisation Assessment Criteria
- Commission feasibility studies
- Assess risk profile and role of the council (e.g. as investors, facilitators, off-takers etc).
- Develop outline business case
- Develop portfolio management plan/strategy.

ASSESS

- Complete feasibility studies
- Explore investible delivery mechanisms
- Explore business model delivery routes

CONNECT

- Explore integration of measures through Smart Local Energy Systems (SLES).
- Introduce engineering expertise to assess spatial, planning and structural considerations during detailed design.
- Identify sources of investment and funding.
- Develop capital investment plan.

ENGAGE

- Identify critical stakeholders needed to deliver priority projects
- Consult citizens, community groups, and local businesses.
- Engage investors
- Negotiate commercial contracts.
- Complete full business case

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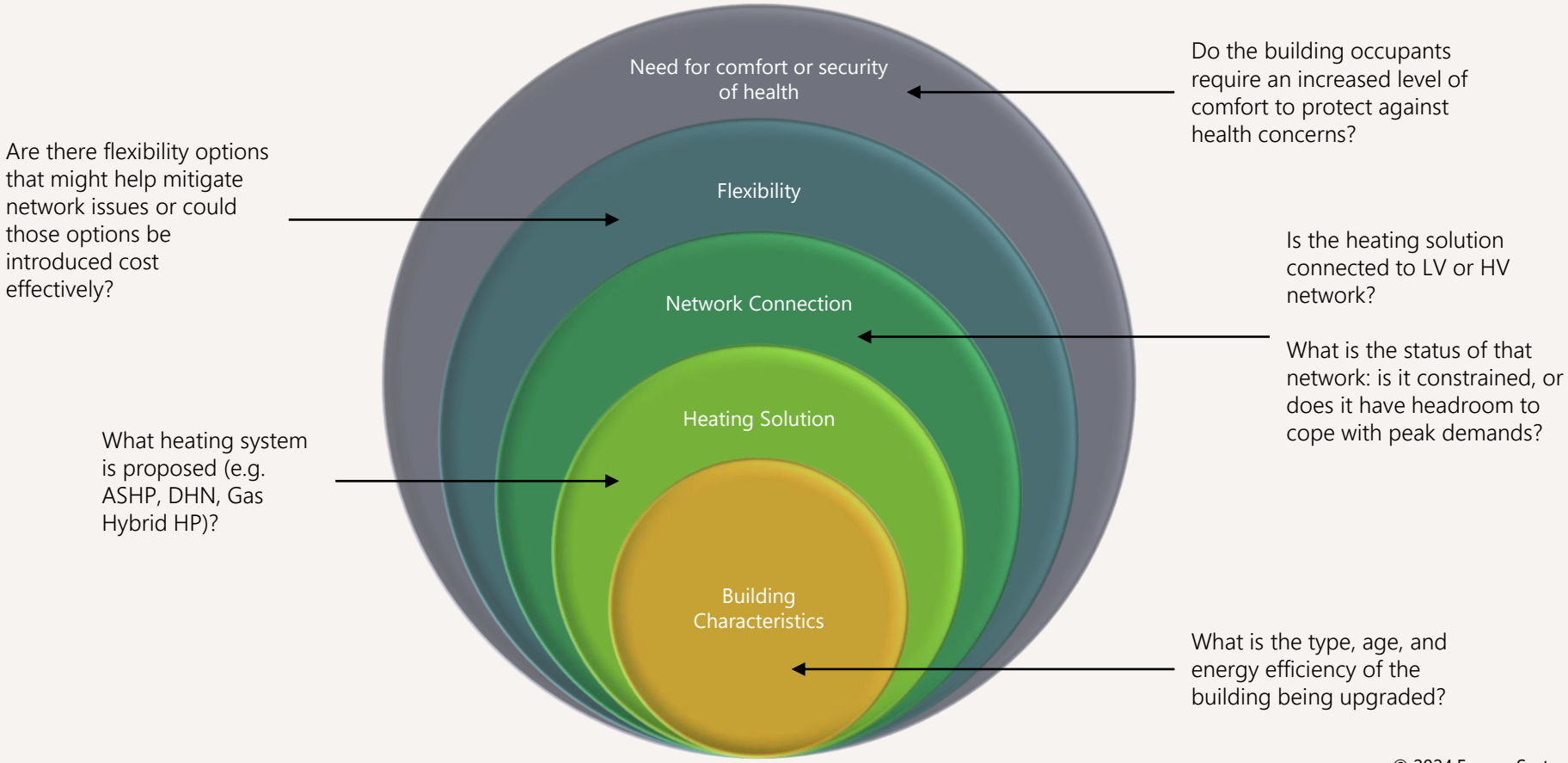
Recommended Project Prioritisation Assessment Criteria

- Level of stakeholders' direct control (e.g. targeting projects related to social housing or land assets and public buildings owned by the council) [1].
- GHG emissions reduction
- Alignment with regional targets (e.g. assess impact on fuel poverty, air quality, local economic growth plans etc).
- Market Conditions including:
  - Technology Readiness Level (TRL),
  - Strength of economic rationale,
  - Maturity/readiness of supply chain,
  - Anticipated access to funding/investment.

[1] https://iuk.ktn-uk.org/wp-content/uploads/2023/12/Financing-Local-Net-Zero-Projects-A-Guide-for-Local-Authorities.pdf

Critical Decision-Making Factors

Many of the implementation decisions about technology deployment involve a range of interdependent factors. For example, a recommendation from this LAEP is to pursue building energy efficiency improvements (mainly through fabric retrofit measures) as a low-regrets decarbonisation action. Such recommendations require a level of detail for implementation beyond the scope of the LAEP (i.e. the need to assess deployment at a building-by-building level or sub-local area level if building characteristics are similar). The factors to consider when making retrofit decisions at this level are shown below. For example, the installation of heat pumps on properties with solid uninsulated walls would increase peak demand on the electricity network. If the network is constrained or would be unable to cope with the additional peak load, then it is often cheaper – at a system level – to deploy measures that would avoid the cost of network upgrade. These may include fabric retrofit measures, such as solid wall insulation, to improve energy efficiency or flexibility measures to balance peak loads on the network. There are other retrofit options such as installation of bigger radiators within the property to achieve a desired level of comfort or to for those who require warmer homes to protect against health concerns, but this type of action would not avoid the higher overall energy system cost for network upgrades. The right incentives in the right places at the right times for the right people need to be considered to ensure the balance is addressed across these factors.



Complexity & Risk

There are risks and benefits associated with each of the technologies and options presented in this LAEP with each option bringing its own range of complexity considerations. Due to these factors, Belfast's actual energy transition will reflect some 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.

Risks

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

Complexity Considerations

Aspects of the LAEP for which there are technological, economic, spatial, or temporal limitations in scope, may present unforeseen issues which could impact delivery with respect to time, budget, or unintended consequences. For example, as the proportion of renewable electricity on the system increases, consumers are likely to see bigger variations in effective electricity prices (generation plus supply costs plus flexibility incentives), making heat storage, batteries, heat networks, and hybrid ASHPs potentially more economically viable and desirable. Variations in CO_2 emissions in time would also affect the viability of different technical combinations. Modelling of these future variations is recommended during post-LAEP implementation to ensure appropriate energy system choices are deployed.

For more details on Risk, see Annex E – Risk Register

Pathway Metrics

Through stakeholder engagement, a range of potential 'Pathway Metrics', were proposed. These act as a system of measurements to track status of delivery and progress of Belfast's Pathway to Net Zero. These represent thematic areas of importance to the Pathway and of interest to stakeholders. Proposed metrics are shown opposite.

Units of measure (where applicable), frequency of reporting, and scale of reporting are not specified to allow the necessary level of post-LAEP definition in the governance and assurance processes required to execute data gathering, monitoring, and reporting. For example, the metric on 'cumulative energy loss' may be an annual report on the average energy efficiency rating obtained from EPCs over the whole of Belfast. Or it may be desirable to report more frequently or using a different indicator or be broken down by areas of the city.

The Next 5 Years:
Outline Priority Projects

Outline Priority Projects

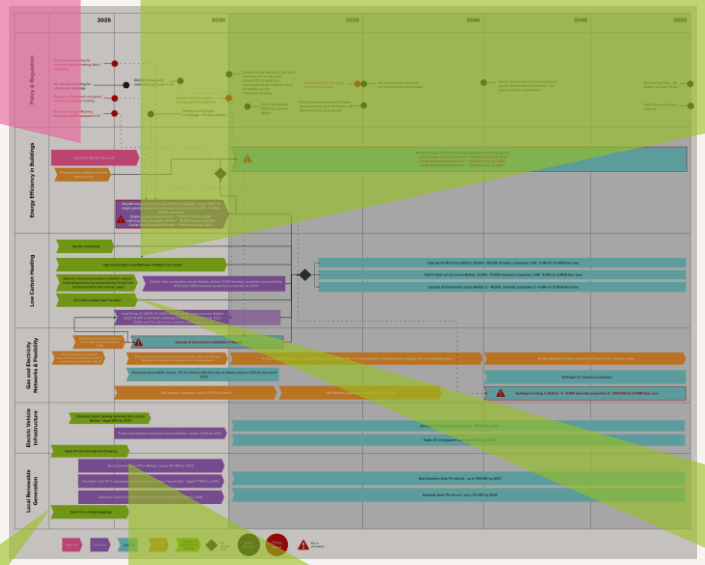
Using the Project Implementation Framework supported by the Project Prioritisation Assessment Criteria (see section Implementation), five projects, which are identified for near term implementation and provide substantial impact against Belfast decarbonisation ambitions, are selected from the LAEP Pathway and declared as Outline Priority Projects (OPPs). The graphic below provides a temporal view of the chosen OPPs and how they relate to the LAEP Pathway. The following page provide a spatial view of where the project may be implemented. Not all OPPs have a spatial allocation at this point and each that is allocated may be subject to change as implementation is progressed.

Domestic Retrofit Measures

High Temperature District Heat Network in City Centre

Each of these 5 OPPs will be described as a high-level concept in terms of:

- What the project looks like
- Rationale for choosing the project
- Estimated costs (where possible)
- Estimated carbon savings (where possible)
- Desired outcomes



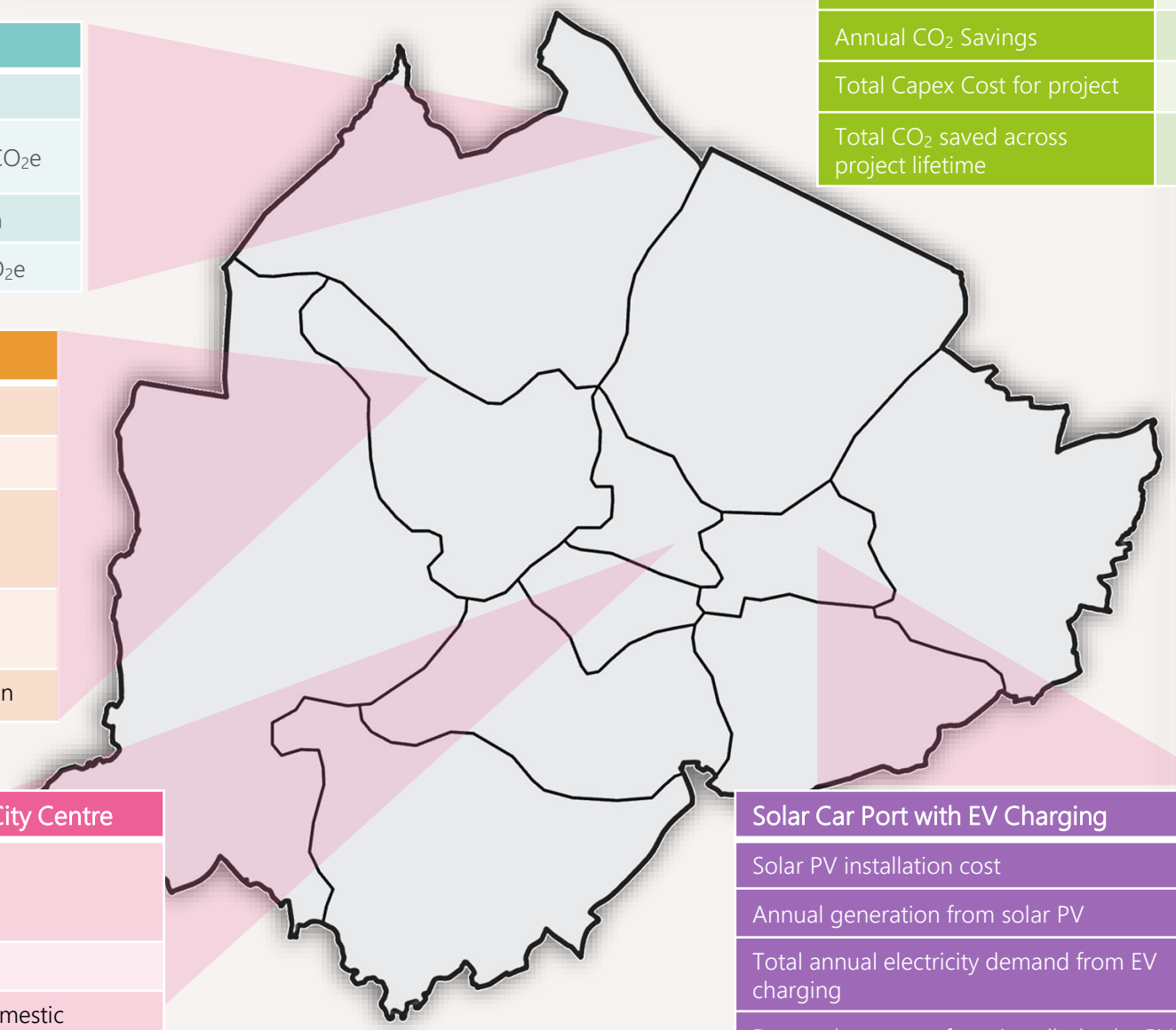
Oil to Low Carbon Heating Transition

Solar Car Port with EV Charging

Solar PV on Public Buildings

Solar PV on Public Buildings	
Number of buildings	20
Annual energy generated	903 MWh
Annual CO_2 Savings	40 tCO2e
Total Capex Cost for project	£1.0m
Total CO_2 saved across project lifetime	606 tCO_2e

Oil to Low Carbon Heating Transition	
Number of homes transitioning	500
Annual CO2 Savings (per household)	4,400 $kgCO_2e$
Total Capex Cost for project	£7.0m
Total CO2 saved from project	2.2 $ktCO_2e$



Domestic Retrofit Measures	
Number of Dwellings	Up to 2,000
Capital Investment	£2.7m – £5.6m
Annual bill savings per dwelling	£123 – £520
Annual carbon savings per dwelling	420 – 1,500 $kgCO_2e$
Additional benefit	Fuel poverty reduction

High Temperature District Heat Network in City Centre	
Potential annual energy demand (phase 1: Non-Domestic Buildings only)	2.8 GWh
Capital Investment	£4.2m
Additional benefit	Expansion to domestic properties in phase 2

Solar Car Port with EV Charging	
Solar PV installation cost	£21,100
Annual generation from solar PV	47,800 kWh
Total annual electricity demand from EV charging	3,432 MWh
Demand coverage from installed solar PV	1.4%
Annual CO_2 Savings	2,140 $kgCO_2e$

Domestic Retrofit Measures

This "quick win" pilot project is expected to target mixed tenure properties in lower income areas with EPC ratings D-G. Funding is anticipated to be provisioned for 500 properties for replacement of single glazing windows, 1,000 properties for loft insulation, and 500 properties for cavity wall insulation. Funding is proposed to be acquired through existing streams such as Northern Ireland's Housing Executive (NIHE) 'Affordable Warmth Scheme [1] or the Northern Ireland Sustainable Energy Programme (NISEP) [2]. Measures may be carried out together as a retrofit package or separately on individual properties. This project should act as a pathfinder which builds on learnings from existing pilot projects of a similar nature (circa 20 homes) helping to inform a city-wide approach to retrofit in Belfast. Ultimately, the goal is to accelerate the supply chain capability to deploy retrofit measures to help contribute to the achievement of 2030 carbon targets.

This project is expected to include:

- Developing a methodology for identifying and prioritising potential areas, properties, measures, project development, management, and delivery.
- Developing the business case to apply for adequate funding.
- Targeted support with applications for households that may be unaware of the scheme or having difficulty with the application process.
- Marketing of the scheme to relevant households.

Estimated required funding for **pilot project** (number of households x cost of retrofit):

Windows:
500 * (£3,300-£6,500) [3] = £1.65m – £3.25m
Loft insulation
1,000 * (£740-£1,700) [4] = £740k – £1.7m
Cavity wall:
500 * (£530-£1,300) [4] = £265k - £650k

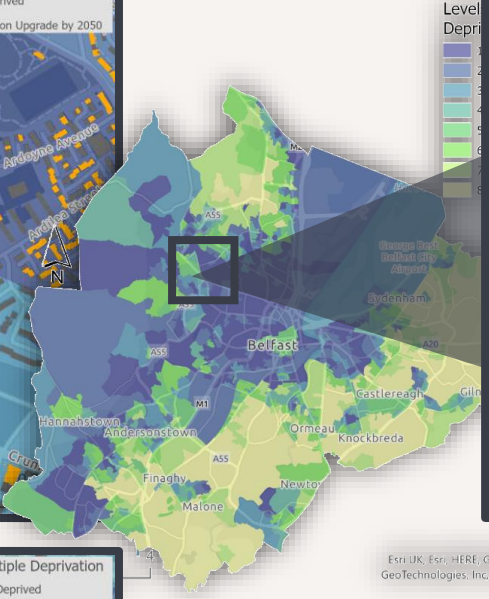
Belfast has approximately **19,000 properties** with inadequate **loft insulation**, approximately **7,000 properties** with **inadequate cavity wall insulation**, and approximately **7,500** with **single glazing windows**.

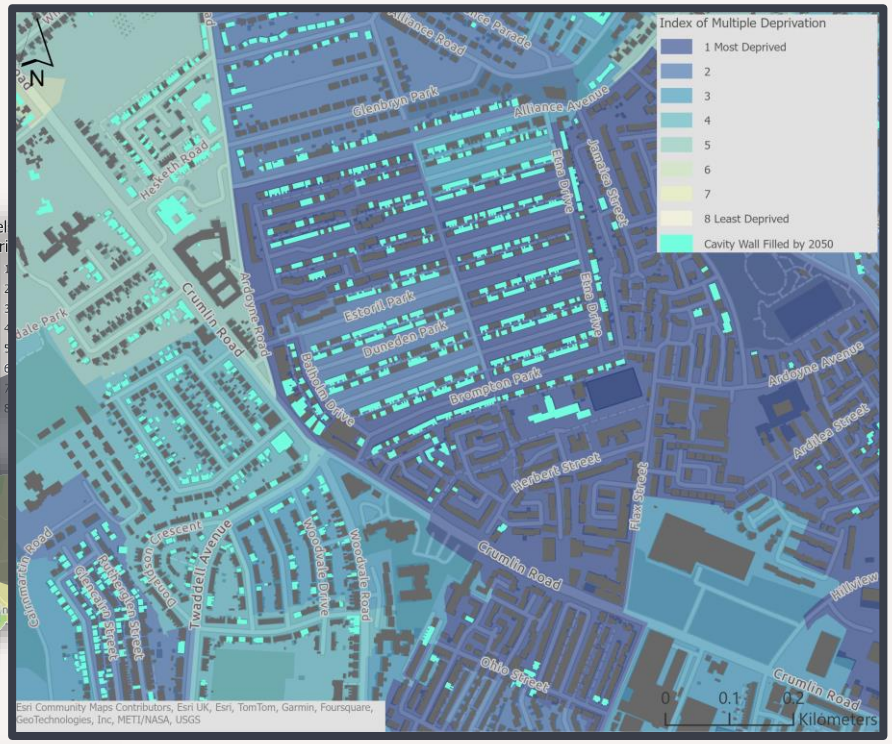
Breakdown of potential benefits from fabric upgrade measures

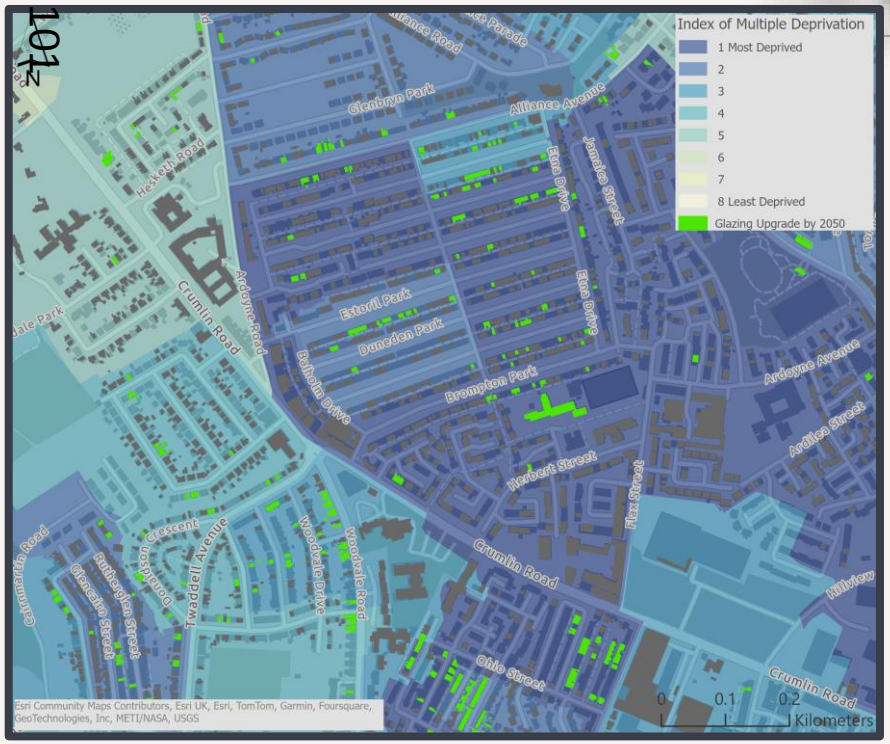
Retrofit Measure	Assumed details on building and fabric [5]	Nominal U-value pre measure [5]	Nominal u-value post measure [5]	Annual energy bills savings	Annual carbon savings ($kgCO_2e$)
Replacement of Single Glazing Windows	Metal single glazing *Changed to:* Wood/PVC low-e double glazing	5.70	2.30	£123 [3]	Not available
Loft insulation	Pitched roof – slates or tiles, ventilated air space, 9.5 mm plasterboard, **no insulation** *Changed to:* Pitched roof – slates or tiles, sarking felt, ventilated air space, 9.5 mm plasterboard, **300 mm** insulation between joists	3.13	0.12	£255 - £475 [4] *figures provided for 270 mm insulation not 300 mm	760 – 1,400 [4] *figures provided for 270 mm insulation not 300 mm
Cavity wall insulation	19 mm render, 102 mm brick, **open cavity**, standard aerated block (100 mm inner leaf), 13 mm plaster *Changed to:* 19 mm render, 102 mm brick, **mineral wool slab in cavity 50 mm**, standard aerated block (100 mm inner leaf), 13 mm plaster	0.82	0.44	£140 - £520 [4]	420 – 1,500 [4]

[1] https://www.nihe.gov.uk/housing-help/affordable-warmth-boiler-replacement/affordable-warmth-scheme
[2] https://energysavingtrust.org.uk/programme/nisep/
[3] https://www.gov.uk/guidance/domestic-private-rented-property-minimum-energy-efficiency-standard-landlord-guidance
[4] https://energysavingtrust.org.uk/energy-at-home/reducing-home-heat-loss/

[5] Energy Systems Catapult Analysis of Microgeneration Installation Standard: MIS 3005 ('The Heat Pump Standard')







These maps show an area of Belfast where a high proportion of fabric upgrades for improved energy efficiency (requiring retrofit action) are spread across areas with differing levels of deprivation (using Index of Multiple Deprivation as the measure). This suggests action may be required across a variety of social circumstances, property types, and property tenures.

Number of retrofit measures applied to properties in the area shown

	Loft Insulation	Cavity Wall Insulation	Single Glazing Window Replacement
Number of homes in area shown (% of all homes in Belfast)	6,615 (3.4%)		
Number of homes in area requiring retrofit measure	2,517	1,419	456
As a % of required measures across Belfast	3.4%	5.4%	6.1%

High-Temperature DHN in City Centre

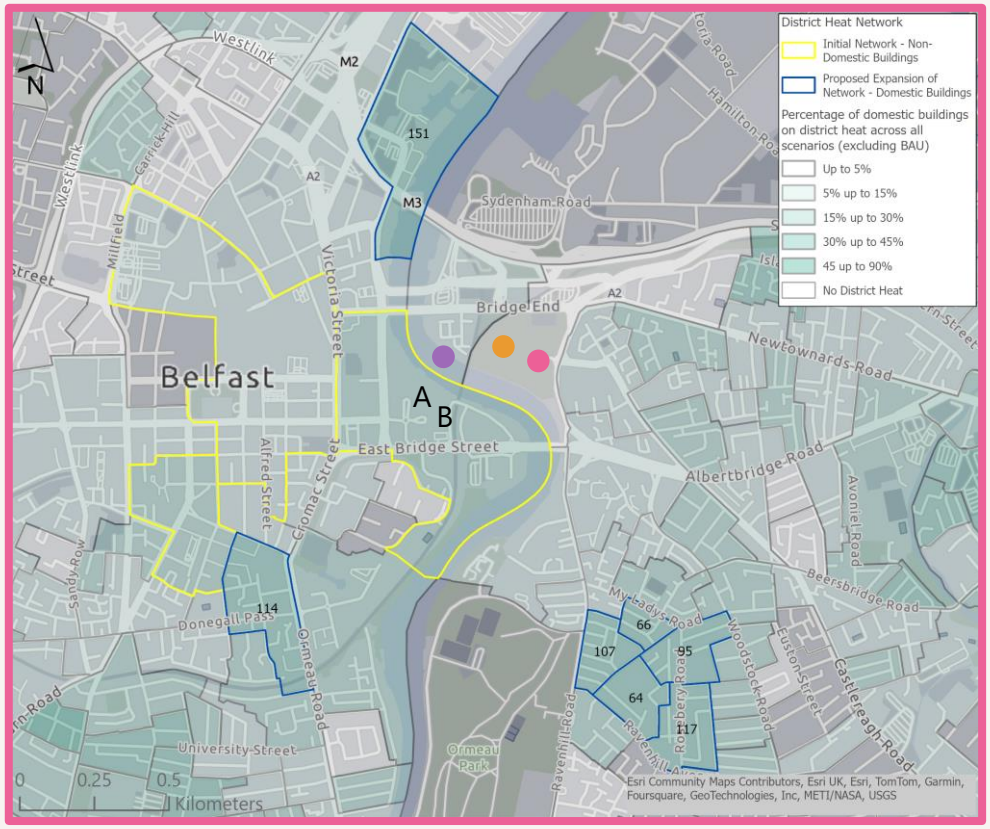
This project seeks to deploy a high temperature heat network in Belfast city centre where there is high heat density (a large amount of heat required in a small area).

Phase 1 (Pilot Phase)

The first phase of the project aims to connect multiple anchor loads from non-domestic buildings – ideally public buildings – each with a minimum annual heat demand of 100 MWh (examples of potential anchor loads are shown on the map). This first phase seeks to establish a viable heat network and create an attractive value proposition to the market in order to attract strong bidders and create competition.

Phase 2

With a viable heat network established it should become convenient and cost-effective for nearby homes to connect in a second phase thus, avoiding the upfront costs and disruption of installing dedicated low carbon heating systems on a per property basis. These connections are anticipated from areas with a high density of domestic buildings, such as terraced dwellings and low-rise flats, where district heat has been selected as a cost-effective low regrets approach in the LAEP modelling (i.e. where a high percentage of domestic buildings are connected in all 3 non-BAU Scenarios). This additional phase and any further phases would seek to extend the heat network to supply hundreds of domestic buildings (as shown by the numbers in the Data Zones outlined in blue). The mixture of domestic and non-domestic buildings allows for a more balanced load across the network at any given time. Although the anchor loads are in Central Belfast, the LAEP modelling suggests that the dominant opportunity for expansion of the heat network lies to the east penetrating into the Connswater zone (with two main exceptions highlighted in blue to the north and south of the phase 1 heat network boundary).



A. Waterfront Hall (annual heat demand 8 GWh)

B. Hilton Hotel, 4 Lanyon Place (annual heat demand 9 GWh)

- Potential river-sourced energy centre
- Potential land-based energy centre
- Potential geothermal boreholes for thermal underground storage

Split of domestic and non-domestic properties connected and annual energy demand. (Note: peak power demands on the network are not considered here)

	Minimum number of domestic dwellings connected (selected by LAEP modelling)	Potential domestic energy demand (GWh/year)	Potential non-domestic energy demand in area (GWh/year)	Assumed % of non-domestic demand connected	Potential total energy demand on network (GWh/year)
Phase 1	-	-	142	2%	2.8
Phase 2_South Connection	114	0.6	142	5%	7.7
Phase 2_North Connection	151	0.7	142	5%	7.8
Phase 2_East Connection	449	2.5	142	5%	9.6

Energy Centre

The potential areas for the energy centre are shown on the image on the previous page. Provision of land required for the energy centre would be a necessary and currently uncertain step in the process but if successful this may serve to attract early investment from heat network developers. With the river Lagan nearby, a water-source heat pump could be considered as an energy centre contributor which may be evaluated as part of the necessary heat network feasibility study following this LAEP. The project aims to allow the opportunity for energy from waste heat to be added to the heat network therefore large commercial or industrial waste heat sources in proximity should also be identified in the feasibility study.

The district heat network will connect to the electricity distribution network in order to draw power for the energy centre. This area of Belfast shows relatively high levels of high voltage and low voltage substation capacity which may allow this project to progress without the network capacity as a barrier.

The project and its associated feasibility study should include provision for thermal underground storage by ensuring:

1. The heat network area sits on top of the geothermal aquifer "high probability" zone.
2. The energy centre is in a suitable open space where it may be feasible to deploy geothermal boreholes.

Estimated CAPEX costs for High-Temperature DHN in City Centre Phase 1

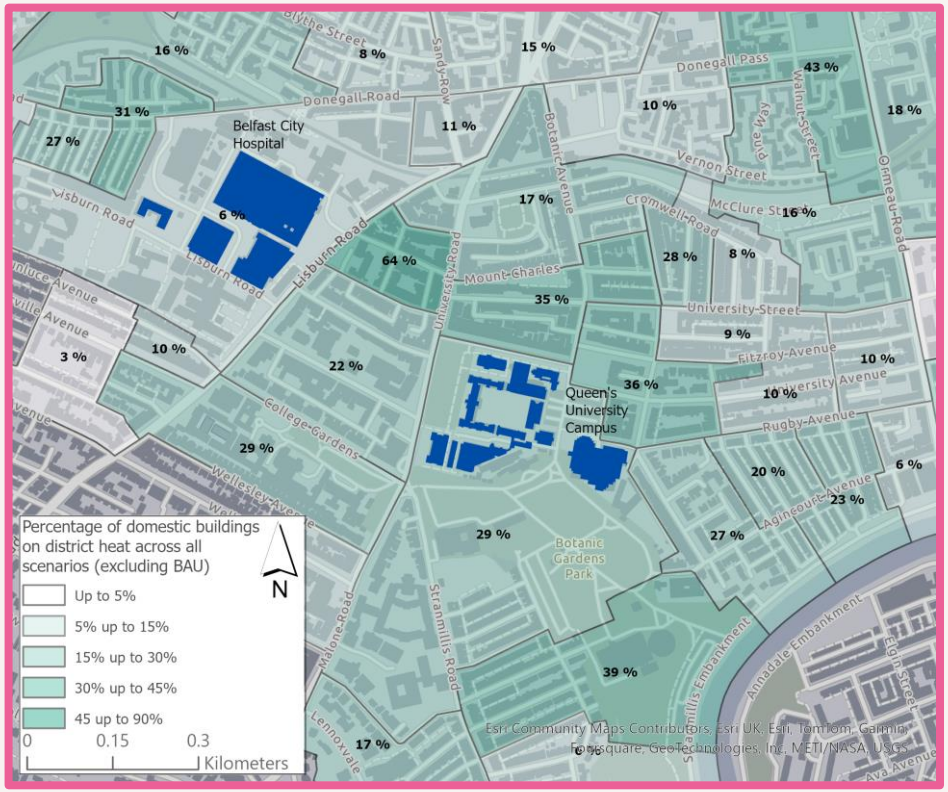
Section of DHN	Parameter	Value
Spine	Length (m)	1,600
	CAPEX rate (£/m)*	1,500
	CAPEX (£)	2.4m
Branch**	Length (m)	500
	CAPEX rate (£/m)*	1,500
	CAPEX (£)	0.75m
Energy Centre (ASHP on land)	Gross internal floor area (m^2)	400
	CAPEX rate (£/m^2)*	2,650
	CAPEX (£)	1.06m
Thermal Underground Storage		Not Costed
Total CAPEX		£4.2m

*CAPEX rates aligned with Queens Island Decarbonisation Plan produced by Energy Systems Catapult

The initial indicators are that both criteria are satisfied in the scoping of this project although this requires verification during the feasibility study.

Other Heat Network Opportunities

Further Opportunity Areas for deployment of a heat network exist in the city centre of Belfast (see below). In this area, key anchor loads from Queens University Belfast (QUB) and Belfast City Hospital are shown in blue. The nearby botanic gardens or indeed grounds within QUB or Belfast City Hospital may also present opportunities for geothermal boreholes and underground thermal storage. Should a heat network be made viable in this area with public, commercial or industrial anchor loads then the potential for expansion into non-domestic buildings is substantial. The numbers shown in % for each Data Zone are taken as the minimum number of domestic connections across all 3 non-BAU Scenarios in this LAEP. This suggests a low regrets approach to domestic district heat deployment in this area.



**Assumes 10 off-takers each at a distance of 50m from main spine

Oil to Low Carbon Heating Transition

This project seeks to replace existing oil heating in domestic and non-domestic buildings with low carbon heating technologies such as heat pumps. The following page shows an area of North Belfast which may act as a suitable and high impact area for this pilot project. At present, this area is predominantly domestic buildings on oil heating (>50%) with the presence of some public and commercial buildings which may also be oil heated. The 5 Data Zones highlighted are in the 67th – 92nd percentile of deprivation across Northern Ireland (using multiple index of deprivation data calculated at Small Area level and cross-referenced to Data Zone level) making this area the most prominent in Belfast for the combination of oil heating prevalence and deprivation. The wider surrounding area of North Belfast scores much higher in the multiple index of deprivation data suggesting relatively isolated deprivation in the 5 Data Zones highlighted.

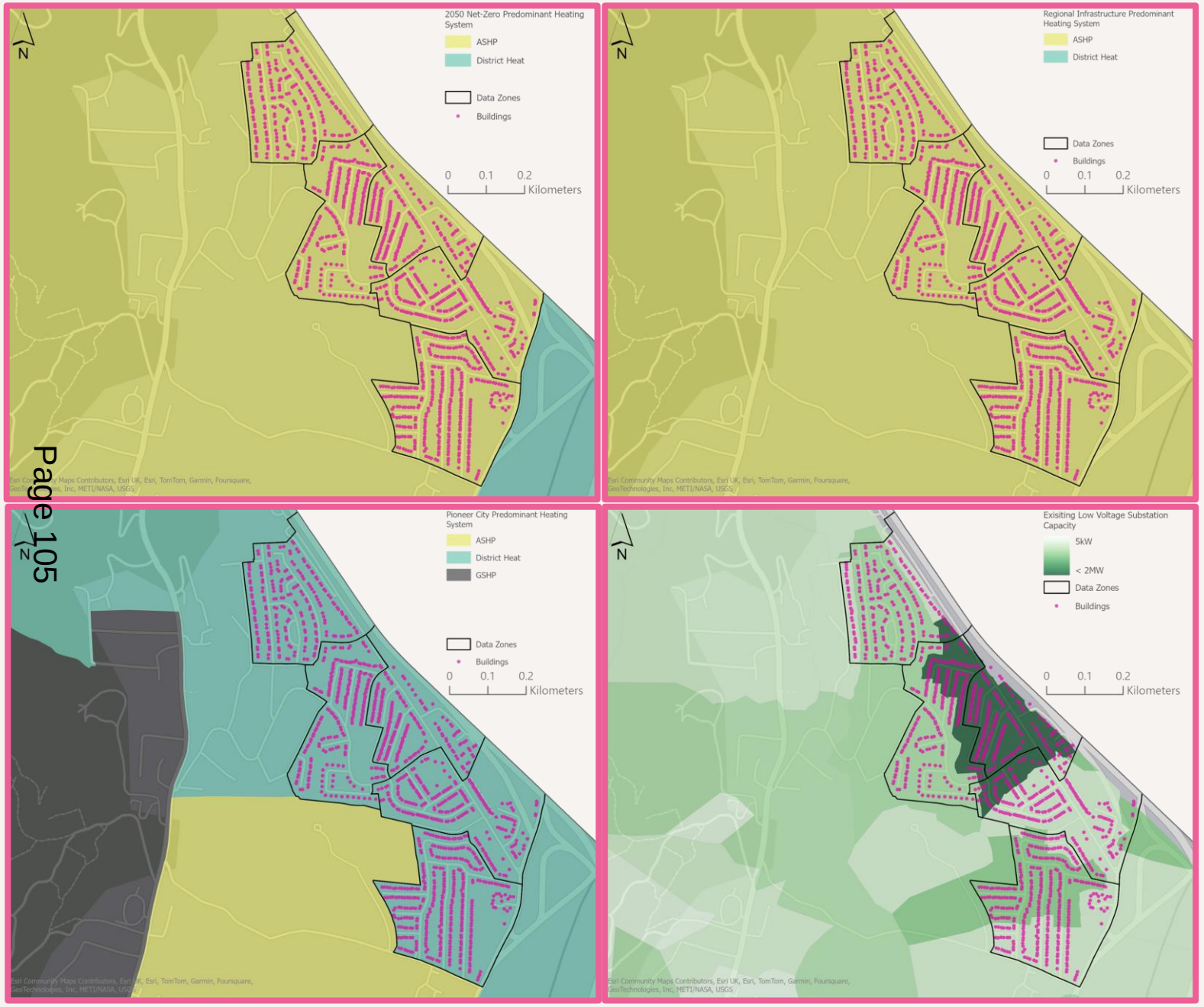
The 4 images on the next page represent the estimated existing low voltage substation capacity and the selected future heating solution from the 3 non-BAU Scenarios of the LAEP techno-economic modelling. The future heating solution is Scenario dependent but comparison between the Regional Infrastructure and Net Zero 2050 Scenarios suggest that the most cost-effective choice of heating is not sensitive to the presence of biomethane. The Pioneer City Scenario suggests that district heating may be a cost-effective option in this area, but this pilot project assumes that decarbonisation of oil heating will be tackled on a property-by-property level in this area and therefore heat pumps present a better demonstrator option. Both the Regional Infrastructure and Net Zero 2050 Scenarios opt for ASHPs but with 10% to 20% of these properties on the gas grid, a transition to hybrid heat pumps may be possible in these areas. The addition of the estimated existing low voltage substation capacity highlights specific areas where network constraints may act as a barrier to the electrification of heat using property level heat pumps. Note the imperfect alignment between substation boundaries and Data Zones and the uncertainty over which properties would connect to which substation areas. Nonetheless, this may support the rationale for prioritisation of network upgrades in support of this pilot project.

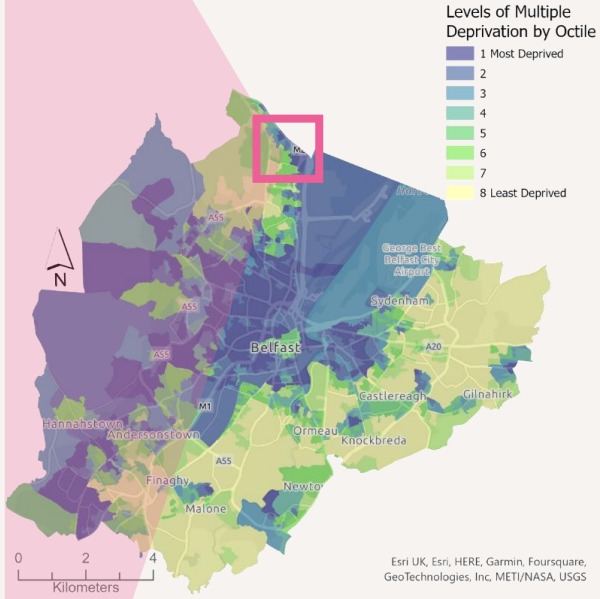
Costs in the table below suggest that annual fuel bills may increase by an average of £45 per year under this type of heating system transition. More detailed assessment at a building-by-building level will be required to verify or amend the assumptions built into this estimate. However, the premise is that this project is driven by the relatively high quantities of CO_2 reduction in the short-term and removal of a reliance on fossil fuel heating systems (and potential prices variations) in the medium to long term.

Estimated figures for Oil to Low Carbon Heating Transition Pilot Project

Parameter	Value	Notes
Number of homes transitioning	500	Assumption on number of properties being transitioned
HP installation cost per home [1]	£14,000	Assumes transition to low temperature ASHP (air-to-water)
Annual fuel bill savings (per household) [1]	-£45	Potential annual savings of installing a standard air source heat pump in an average three-bedroom semi-detached home, with radiator upgrades as required. Assumes transition from old (G rated) oil boiler
Annual CO_2 Savings [1] (per household)	4,400 $kgCO_2e$	
Total Capex Cost for project	£7.0m	
Total CO_2 saved from project	2.2 $ktCO_2e$	

[1] https://energysavingtrust.org.uk/advice/air-source-heat-pumps/





Top-left = Net Zero 2050 Scenario future heating system
Top-right = Regional Infrastructure Scenario future heating system
Bottom-left = Pioneer City Scenario future heating system
Bottom-right = Estimated existing low voltage substation capacity

Data Zones (2021 code) highlighted: N20000790, N20000792, N20000793, N20000794, N20000795

Solar PV on Public Buildings

This project targets public owned buildings providing a total of no less than 1MWp of renewable electricity for local consumption which may be either direct demand to the host buildings or to other buildings via Belfast's electricity distribution network.

Areas where the network has limited capacity may act as a barrier to electrification of heat or transport. This may be exacerbated in areas where the substation, or other network assets, serve a limited number of buildings meaning the upgrade cost per building is relatively high. Solar PV may prove useful in these areas to alleviate network constraints and provide a local source of renewable electricity which may contribute to increased demand from electrification of heat or transport if combined with localised short duration electricity storage.

Solar PV may also enable a cluster of buildings – which may be a mix of public buildings, commercial buildings and industry – to form a commercial arrangement for shared generation and consumption of renewable electricity.

Solar PV may also act as an enabler for the viability of a District Heat Network by providing a direct wire which reduces the electricity costs of heating the water through the energy centre.

Fig Estimated figures for Solar PV on Public Buildings Pilot Project

Parameter	Value	Notes
Number of buildings	20	Assumption to achieve target of 1MWp for this project
Peak power per building (averaged across all buildings)	50kWp	
Solar PV install cost per building [1]	£50,000	Uses the medium estimated construction cost for solar PV of 10-50kW at 2025 prices of 1000 £/kW. The install cost does not include costs for any storage assets or ancillary equipment that may be required as part of this project.
Annual energy savings (for all buildings across project) [2]	903 MWh	Total annual energy generated by all buildings installed with solar PV on this project is assumed to be a saving on energy previously consumed from the electricity grid. Calculation uses specific photovoltaic power output of 903 kWh/kWp (accurate for Donegall Square North, Belfast).
Annual CO_2 Savings [3] (for all buildings across project)	40,400 $kgCO_2e$	The energy generated as a saving from grid is converted to a carbon saving using the HM treasury Green Book grid average for commercial/public sector consumption-based data. This is averaged for 15 years between 2025 and 2039, inclusive, representing an assumed project lifetime of 15 years. The average figure over the 15-year project lifetime is 0.045 kgCO2e/kWh.
Total Capex Cost for project	£1 million	Installation cost per building multiplied by number of buildings
Total CO_2 saved across project lifetime	606,000 $kgCO_2e$	Assuming 15-year project lifetime as above

1 UK Government Department for Energy and Net Zero - Electricity Generation Costs (2023)
2 https://globalsolaratlas.info/map?c=54.597183,-5.930829,11&s=54.597183,-5.930829&m=site
3 HM Treasury Green Book Table 1: Electricity emissions factors to 2100, kgCO2e/kWh

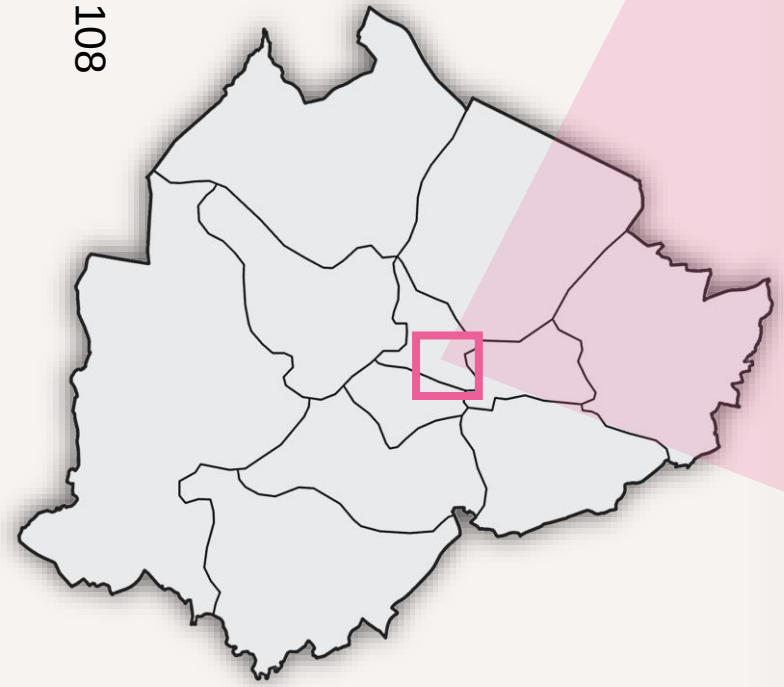
Data Zone (2021 code): **N20000842** Solar PV capacity in area shown = 670 kW

Data Zone (2021 code): **N20000825** Solar PV capacity in area shown = 40 MW

Data Zone (2021 code): N20001421 Solar PV capacity in area shown = 2 MW

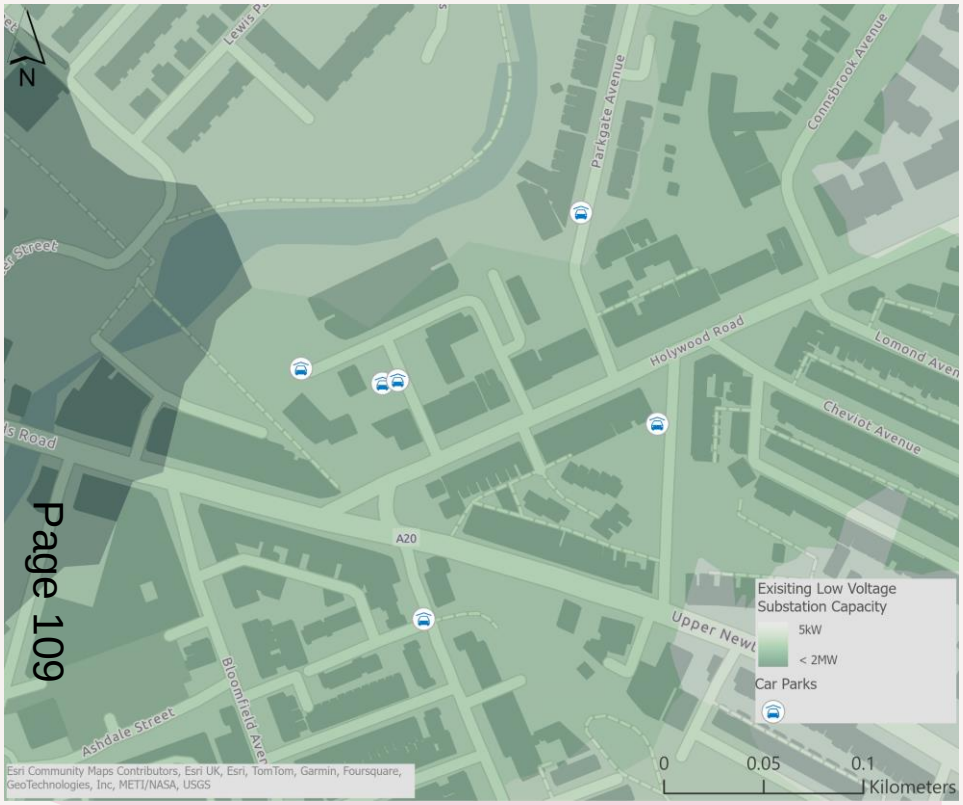
Data Zone (2021 code): **N20001121** Solar PV capacity in area shown = 774 kW

Solar PV may also prove to be a crucial enabler in establishing the viability of a district heat network since it presents the opportunity to provide a direct wire for supply of renewable electricity at minimal operational expenditure. The image below shows some of the non-domestic buildings within the proposed area for the 'High Temperature District Heat Network in Belfast City Centre' OPP. In yellow are the Non-Domestic Buildings with the potential for installation of rooftop solar PV. The buildings highlighted in red have both solar PV potential and are known public buildings which could be attractive as anchor loads for establishment of the heat network. Note that buildings unsuitable for non-domestic solar PV *may* include domestic buildings and, in those cases, will appear black in this image.



Solar PV potential on Non-Domestic Buildings in central Belfast potential DHN area

Solar Car Port with EV Charging



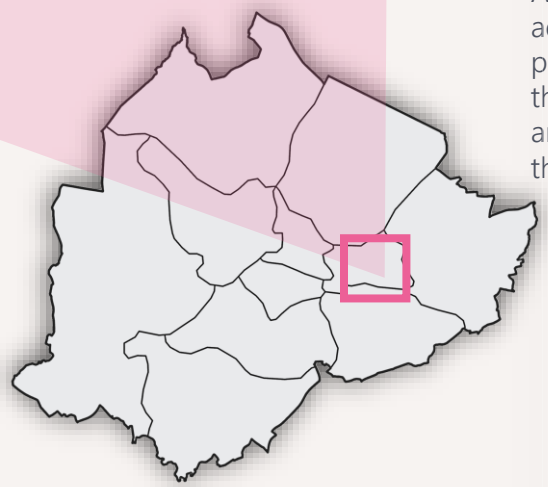
The area in the image opposite (centred on Data Zone N20000891 within the Connswater area of Belfast) shows a collection of BCC owned car parks that currently do not offer EV charging. The colours of the base map indicate the estimated existing low voltage substation capacity.

This area is outside of Belfast city centre but on one of the main arterial roads into the centre from east to west. These roads are relatively congested with traffic, especially on weekdays [1]. Car parks in this area may therefore serve as attractive park and ride facilities when used in conjunction with public transport. This may inspire some innovative commercial and market incentives collaboratively between the energy and transport domains in the public sector. For example, the potential to offer a public transport incentive for users of EV charging facilities in the nearby car parks during times of peak traffic. An increase in the usage of these car parks, future improvements in public transport, and innovative business models available to the citizens of Belfast, would potentially enable both a reduction in road traffic congestion and the desire to reduce overall city centre traffic leaving Belfast one-step closer to being a 15-minute city with widespread modal shift towards public transport.

There is a need for public EV charge point deployment in this area although notable that this is generally in the form of on-street charging to serve residential areas without a driveway or where installation of a charge point is compromised.

Additional capacity required from the local electricity substation to service the additional demand from EV charging may not be a major barrier to making progress depending on the point of connection. The combination of solar PV with the EV charging infrastructure helps mitigate any risks in this area although it is anticipated that short-duration electrical storage would be required to support the functionality expected of this system architecture.

Car parks shown and respective capacities:
Westminster (north, east, and west) = 87
Parkgate = 36
Grampian Ave = 41
Ravenscroft = 53
Ashdale St (paid) = 85



[1] Google Maps. (n.d.). Retrieved February 15th, 2024, from https://www.google.com/maps/place/Belfast/

Estimated figures for Solar Car Port with EV Charging

Parameter	Value	Notes
Solar PV peak power (across all car parks)	52.7 kW	Assumes that 80% of the car park area for Westminster (north, east, and west), Parkgate, Grampian Avenue, Ravenscroft, and Ashdale St car parks can be converted to an overhead solar PV array. Car park area is calculated by multiplying the number of spaces across all car parks by the area of one space which is assumed to be 2.4m by 4.8m
Solar PV installation cost [1]	£21,100	Uses the medium estimated construction cost for Large-scale solar at 2025 prices of 400 £/kW. The install cost does not include costs for super structure to support solar panels.
Annual generation from solar PV [2]	47,800 kWh	Total annual energy generated by all car parks installed with solar PV on this project. Calculation uses specific photovoltaic power output of 907 kWh/kWp (accurate for Ashdale Street, Belfast).
Number of parking spaces with EV charging	75	Assume that 25% of the available spaces in the Westminster (north, east, and west), Parkgate, Grampian Avenue, Ravenscroft, and Ashdale St car parks are converted to EV charging stations
Power rating per EV charge point	22kW	Assumes that all stations are 22kW fast chargers
Total annual electricity demand from EV charging	3,432 MWh	Assumes that chargers are in use for an average of 8 hours per day and an average of 5 days per week
Demand coverage from installed solar	1.4%	
Annual CO_2 Savings [3]	2,140 $kgCO_2e$	The energy generated from solar PV is converted to a carbon saving using the HM treasury Green Book grid average for commercial/public sector consumption-based data. This is averaged for 15 years between 2025 and 2039, inclusive, representing an assumed project lifetime of 15 years. The average figure over the 15-year project lifetime is 0.045 kgCO2e/kWh.

Cost estimates for this project are shown in the table above. The range of variables for this project requires a much deeper feasibility study and business model exploration to better understand the following aspects not fully covered in this conceptual project definition:

- The potential and cost to install solar PV in one or more of the identified car parks.
- The potential and cost to add EV charging to these car parks and to connect these to the electricity distribution network.
- Any other technologies or infrastructure that may be required to support the project such as electrical battery storage or superstructures for supporting the EV installation.
- The business models and commercial arrangements that would make the project viable.
- The cost-benefit analysis including carbon savings which should look to verify the underpinning assumptions around road traffic and public transport integration.

Indeed, it is possible that other car parks owned by BCC would serve as more appropriate and relevant assets for deployment of a solar car port with EV charging. The estimates provided here may, however, serve to deliver the strategic case for pursuing those feasibility studies and future commercial offerings.

1 UK Government Department for Energy and Net Zero - Electricity Generation Costs (2023)
2 https://globalsolaratlas.info/map?c=54.596769,-5.889619,11&s=54.596769,-5.889619&m=site
3 HM Treasury Green Book Table 1: Electricity emissions factors to 2100, kgCO2e/kWh

The Next 5 Years:

Next Steps

Pathway Actions & Responsibilities

Delivering the scale of change demanded by Belfast's Pathway to Net Zero will take coordinated action from a variety of stakeholders, driven primarily – at least in the early stages after delivery of this LAEP – by Belfast City Council.

The following pages describe the **what, when and who** for a breakdown of actions relating to the LAEP Pathway and/or mitigation of risks associated with the forthcoming implementation phase.

Area	What		When	Who	
	Action	Rationale		Responsible	Supporting
Collaboration and Capacity Building	Form a LAEP delivery group across council departments, local businesses and other local stakeholders, appointing points of contact for each party, and arranging regular forums	To maintain momentum and collaboration post-LAEP delivery	Short-term	BCC	All LAEP stakeholders
	Inform electricity networks of any plans for low carbon technologies to be connected to the distribution network.	Ensure that decarbonisation measures – which are likely to tend towards high electrification of aspects such as heat and transport – are not planned without network buy-in.	Ongoing	BCC	NIE SONI
	Collaborate, with housing providers and registered social landlords, to develop the retrofit plan for low-income households in relation to the Domestic Retrofit Measures OPP	Success of the OPPs relies upon consensus amongst the delivery stakeholders	Short-term	BCC NIHE	TBC
	Engage, monitor data, and asses the impact of emerging solar PV deployment across Belfast	Risk raised during stakeholder workshop about scale of solar PV recommended deployment	Ongoing	NIE SONI	BCC

Area	What		When	Who	
	Action	Rationale		Responsible	Supporting
Planning and Preparation	Advance the Belfast Retrofit Delivery Hub by creating a one-stop shop to provide guidance and support to citizens and businesses on the transition to Net Zero	Helps to build a more mature supply chain and connect citizens or businesses to that supply chain	Ongoing	NIHE	BCC
	Develop a procurement framework for street-by-street retrofit	This will help facilitate the delivery of the Domestic Retrofit Measures OPP and serve as a demonstrator to other areas of Belfast.	Implementation framework – Assess Phase	BCC	TBC
	Engage the market to offer heat supply agreements to potential off-takers and attract investment from heat network developers	This is the preferred strategy for Belfast City Council to progress DHN potential in the local area. Market intelligence suggests that DHN developers prefer to commission their own feasibility studies (e.g. as part of an end-to-end design, commission and operate service).	Implementation framework - Engage Phase	BCC	-
	Commission a feasibility study for the 'Solar PV Car Port with EV Charging' OPP	This is identified as an Outline Priority Project (OPP) for the Belfast LAEP	Implementation framework - Prioritise Phase	BCC	-
	Commission a feasibility study for the 'Solar PV on Public Buildings' OPP	This is identified as an Outline Priority Project (OPP) for the Belfast LAEP	Implementation framework - Prioritise Phase	BCC	-
	Commission a feasibility study for the 'Oil to Low Carbon Heating Transition' OPP	This is identified as an Outline Priority Project (OPP) for the Belfast LAEP	Implementation framework - Prioritise Phase	BCC	-
	Develop the outline business case for each of the 5 OPPs	This is identified as a critical step in the LAEP implementation process	Implementation framework - Prioritise Phase	BCC	TBC
	Commission a study into Belfast's heat pump incentivisation strategy aligned to LAEP identified heat pump deployment areas and building types.	This LAEP recommends where heat pumps are the most cost-effective option on the pathway to Net Zero, but the type of heat pumps deployed (LT ASHP, HT ASHP, GSHP, Hybrid) are reserved for post-LAEP decision making.	Implementation framework - Prioritise Phase	BCC	TBC
	Commission a study on how gas hybrid heat pumps impact or benefit the electricity network	This is identified as an Enabling Action on the LAEP Pathway	Winter 2024-2025	Phoenix Energy and NIE	BCC
	Commission a study for on-street public parking in Belfast and establish a pipeline of demonstrators.	This acts as an enabler to maintain the ambition of having 800 new public charge points by 2027 across Belfast	Implementation framework - Prioritise Phase	BCC	TBC
	Form a delivery plan for Belfast's near-term roll out of solar PV.	The scale of solar PV deployment and its necessity to be a near-term action to contribute most effectively to decarbonisation means that solar PV requires special attention across domestic and non-domestic buildings	Implementation framework - Prioritise Phase	BCC	TBC

Area	What		When	Who	
	Action	**Rationale**		**Responsible**	**Supporting**
Skills	Seek to resolve any skills gaps in the supply chain for delivering the actions and projects recommended by the LAEP.	Near-term actions	Medium-term	NIHE	BCC
	Find a sponsor to communicate the career opportunities of the energy transition to young people		Short-term	BCC	TBC
Decisions	Validate the rate of technology deployments proposed in the LAEP with the local supply chain.	Incorrect assumptions on technology deployment rates could have significant effects on post-LAEP implementation	Short-term	BCC	TBC
	Re-assess whether the 2030 carbon target can be met given the scale of measures and deployment required by the LAEP Pathway. If not, consider whether decarbonisation in other areas could compensate, offsets could be used as a temporary stop-gap, or the target should be reviewed.	Stakeholders expressed concern over the lack of funding and other barriers required to realise the scale of measures recommended by the LAEP	Short-term	BCC	TBC
Policy	Build the case for grant or loan funding for domestic retrofit (heating, fabric upgrades) to be adopted in NI	Identified as a Policy Need on the LAEP Pathway	Short-term	BCC	TBC
	Build the case for a regulatory framework and grant schemes for district heating to be adopted in NI	Identified as a Policy Need on the LAEP Pathway	Short-term	BCC	TBC
	Build the case for Minimum Energy Efficiency Standards (MEES) to be adopted in NI	Identified as a Policy Need on the LAEP Pathway	Short-term	BCC	TBC
	Build the case for introducing carbon credits to support industry use of biomethane	Identified as a Policy Need on the LAEP Pathway	Short-term	BCC	TBC
	Explore the need for NI gas boiler concessions in anticipation of biomethane availability supporting extended use of gas boilers	Identified as a Policy Need on the LAEP Pathway to mitigate the UK Government planned gas and oil boiler phase out in 2035 (unconfirmed)	Short-term	BCC	TBC

Area	What		When	Who	
	Action	Rationale		Responsible	Supporting
Engagement	Seek citizen and local business views on key aspects of the LAEP such as DHN, retrofit, and renewable generation	It is more value-adding to gauge citizen and local business views from the recommendations in the LAEP where the types of measures as well as where and when they are deployed can be discussed in greater detail	Implementation framework - Engage Phase	BCC	TBC
Funding	Approach private financial providers or create a decarbonisation fund for homeowners who are not eligible for existing schemes	Stakeholders expressed concern over the lack of funding and other barriers required to realise the scale of measures recommended by the LAEP	Implementation framework - Engage Phase	BCC	TBC
	Identify and communicate funding opportunities available for businesses, and highlight funding gaps	Stakeholders expressed concern over the lack of funding and other barriers required to realise the scale of measures recommended by the LAEP	Implementation framework - Connect Phase	BCC	TBC
	Identify and communicate funding opportunities available for homeowners or landlords, and highlight funding gaps	Stakeholders expressed concern over the lack of funding and other barriers required to realise the scale of measures recommended by the LAEP	Implementation framework - Connect Phase	BCC NIHE (Retrofit Delivery Hub)	TBC
	Complete a cost-benefit analysis for electricity network funding of retrofit measures	It may be cheaper to fund retrofit measures than invest in the required additional network capacity if no retrofit measures are in place (see Annex C – Wider Factors Analysis – Public Attitudes and Preferences).	Short-term	BCC NIE SONI	TBC
Business Models	Support community energy organisations which can develop shared ownership of large rooftop solar installations on public and commercial buildings	This is identified as a critical step in the LAEP implementation process relevant to the identified OPPs	During implementation framework - Assess Phase	BCC	TBC
	Explore Heat Supply Agreements as the primary mechanism for establishing viability of Belfast's near-term District Heat Networks	This is identified as a critical step in the LAEP implementation process relevant to the identified OPPs	During implementation framework - Assess Phase	BCC	TBC
	Explore commercial arrangements for solar PV deployment on council owned buildings.	This is identified as a critical step in the LAEP implementation process relevant to the identified OPPs	During implementation framework - Assess Phase	BCC	TBC

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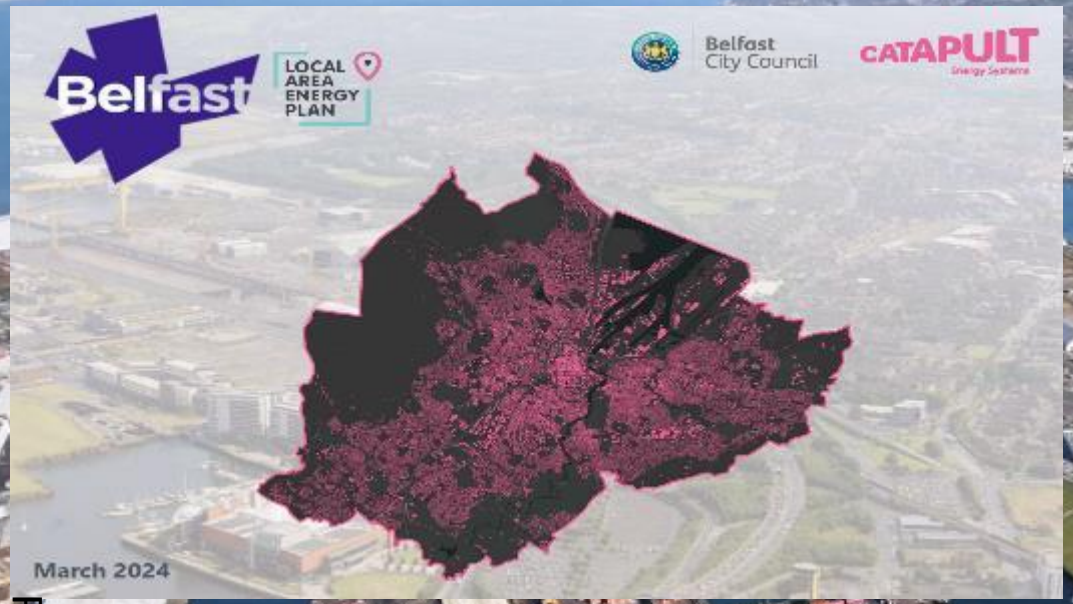

Belfast
LOCAL AREA ENERGY PLAN
Belfast City Council
CATAPULT
March 2024


Belfast
Queen's Island Decarbonisation Plan
CATAPULT
Belfast City Council
Belfast

City wide programme of work 2024-28 Belfast Agenda – Our Planet

Re-naturing the city and increasing resilience to climate change

1. Increase the number of trees across the city.
2. Protect and enhance our local environment and natural eco-systems.
3. Promote the uptake of nature-based solutions across the city to support climate resilience.

- One Million Trees
- UPSURGE
- Mainstreaming
- Green/Blue Regeneration Plan

Creating a sustainable circular economy

1. Promote sustainable circular economy approaches.
2. Promote a Just Transition to Net Zero in Belfast.
3. Increase the use of Electric Vehicles in Belfast and improve access to charge points.
4. Reduce energy consumption (and bills) of housing and public /commercial buildings.
5. Decarbonise the heat supply to buildings in the city.
6. Embed sustainable food practices and partnership working in Belfast.

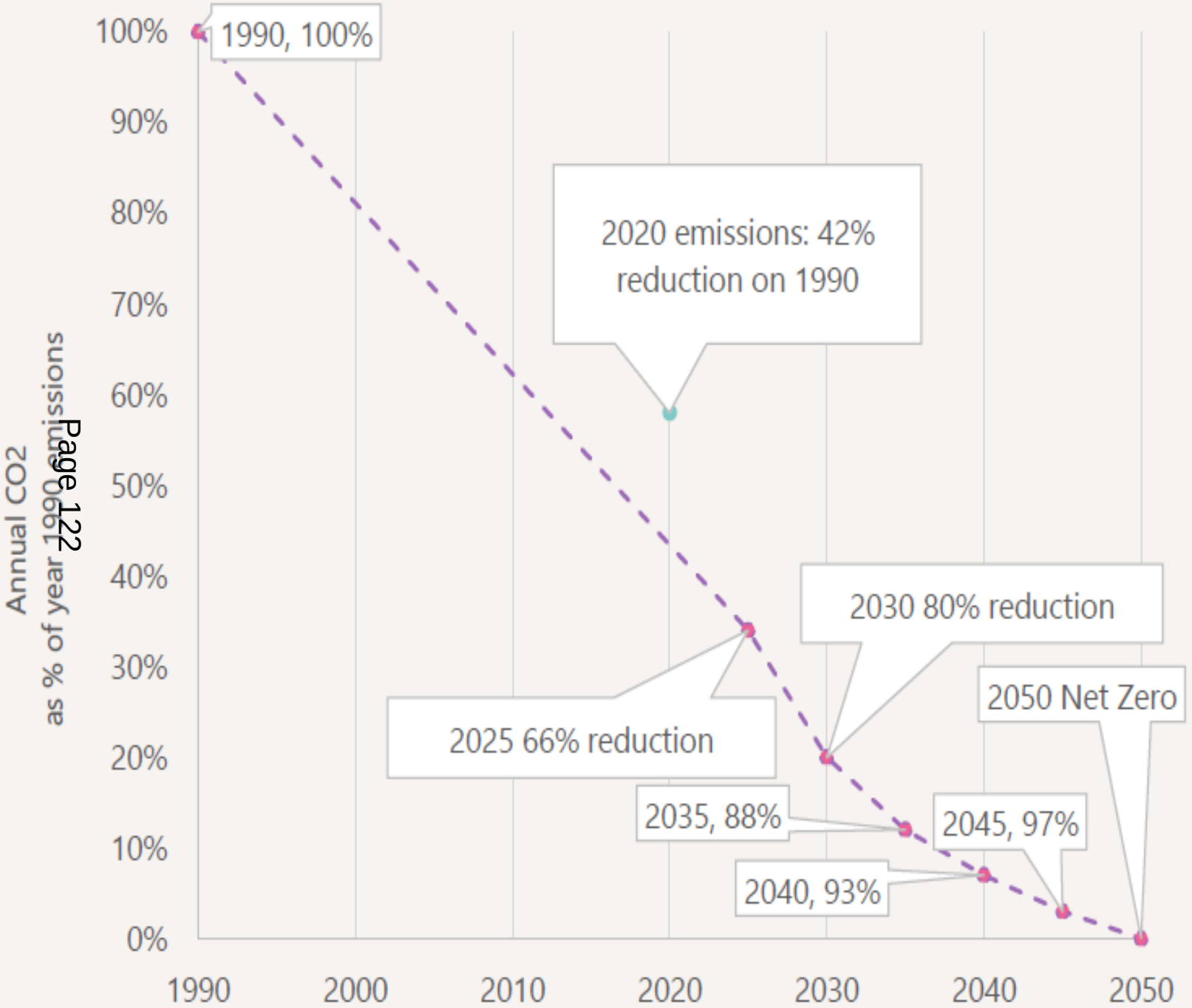
- Net Zero neighbourhood pilot
- Circular economy hubs
- Sustainable Waste
- Reduce emissions from municipal Waste
- Tourism carbon footprint
- EV Strategy
- Retrofit programme
- Heat network
- Community Energy projects
- Food Strategy + accreditation

Innovating to Net Zero

1. Enable the city to decarbonise at scale.
2. Create an exemplar Net Zero Tech Park in the Harbour Estate to develop, test and commercialise green technologies.
3. Develop a stable supply of green energy to the Net Zero Park and surrounding lands to support the industrial cluster.
4. Accelerate the transition to low carbon manufacturing.
5. Support Green Multi-Modal Mobility.

- 2 Decarbonisation projects developed
- Delivery of LAEP
- Net Zero Tech Park
- Green energy project
- Green shipping corridor study

Belfast Local Area Energy Plan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Annual CO2
as % of year 1990 emissions
1990, 100%
2020 emissions: 42% reduction on 1990
2030 80% reduction
2025 66% reduction
2050 Net Zero
2035, 88%
2045, 97%
2040, 93%


A NET-ZERO CARBON ROADMAP FOR BELFAST
Andy Couldson, Andrew Sudmant, Jessica Boyd, Robert Fraser Williamson, John Barry & Amanda Slevin
PCAN
BELFAST CLIMATE COMMISSION
CO2

Belfast's Energy System Today

63%

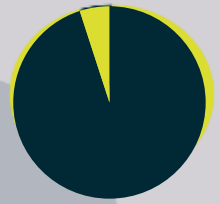
of dwellings EPC rated D – G

BUILDINGS

Currently 35% of of Belfast's existing domestic buildings are EPC rated D with 18% rated E, 8% rated F, and 2% rated G. These require energy efficiency improvements. Belfast must also ensure that 12 million square metres of public, commercial, and industrial floorspace is decarbonised by 2050.

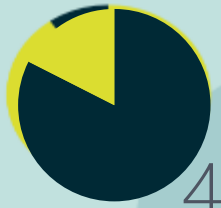
HEATING

66% of buildings currently use gas for heating with 29% using oil. There are small quantities (<5%) of buildings electric heating, solid fuel or biomass heating.



95%

of heating is fossil fuel based



4.5 MW

Capacity from existing public EV charging points

VEHICLES

Belfast currently has 170 Electric Vehicle charging points around the city delivering a total charging capacity of nearly 4.5 MW. Belfast's ambition is to deliver 800 charging points by 2027.

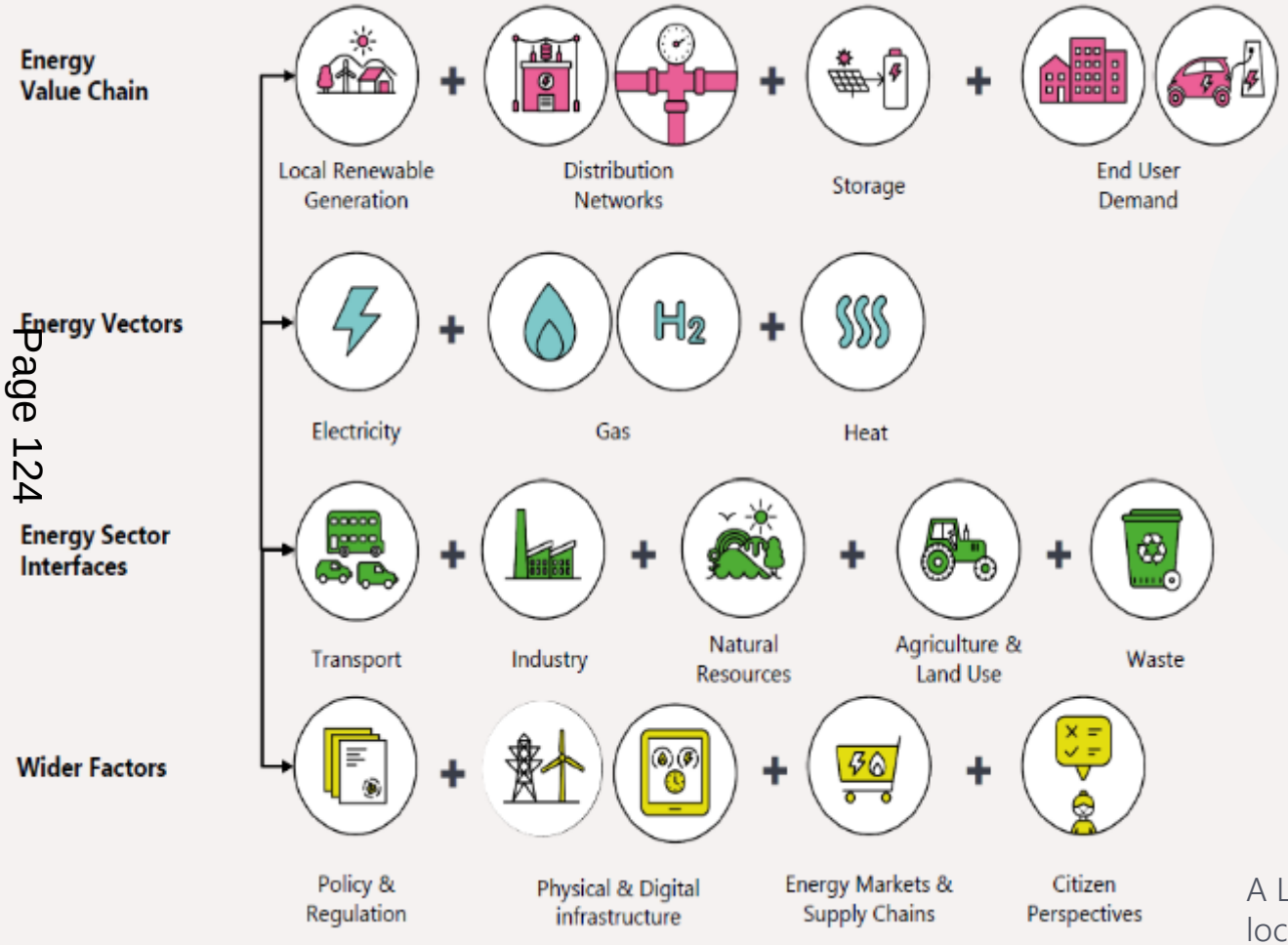
ENERGY

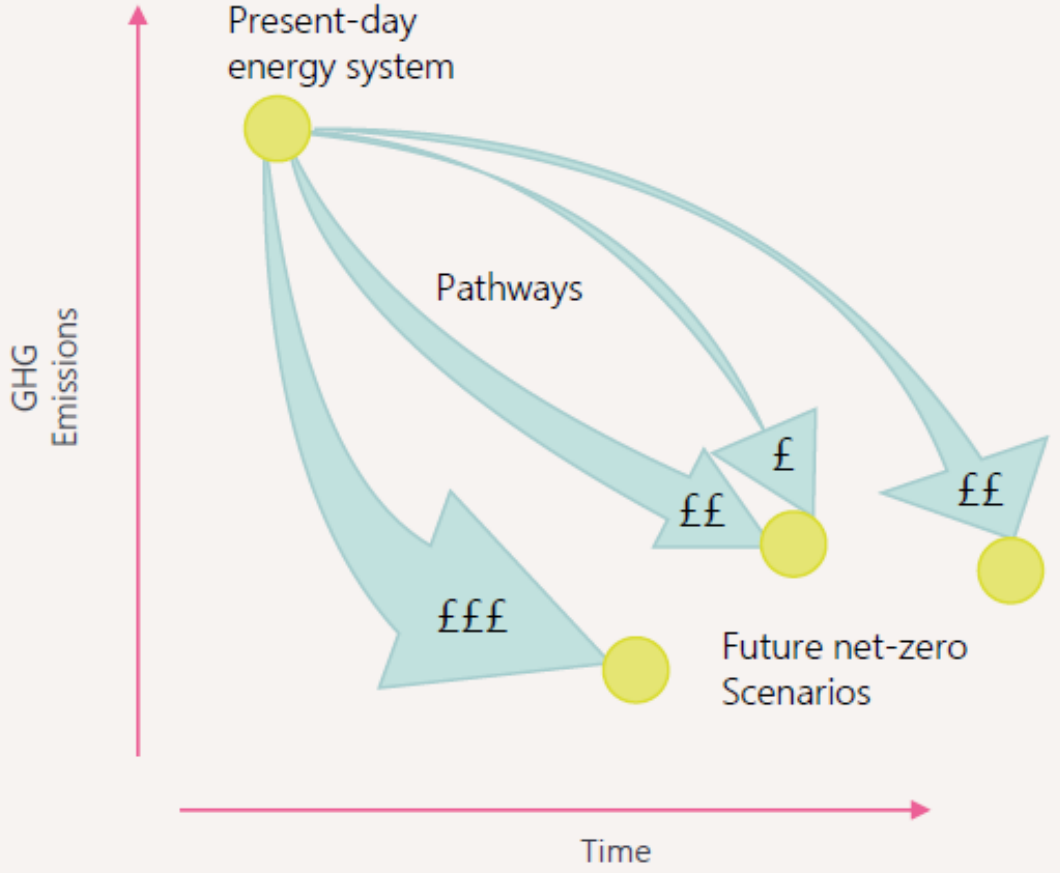
Belfast's metered energy consumption is 63% from gas and 37% from electricity. There are currently 1,311 domestic solar PV installations across Belfast contributing a total of 8.6 MW of renewable electricity to the local supply.

63%

of energy consumed in Belfast is from gas

Belfast Local Area Energy Plan



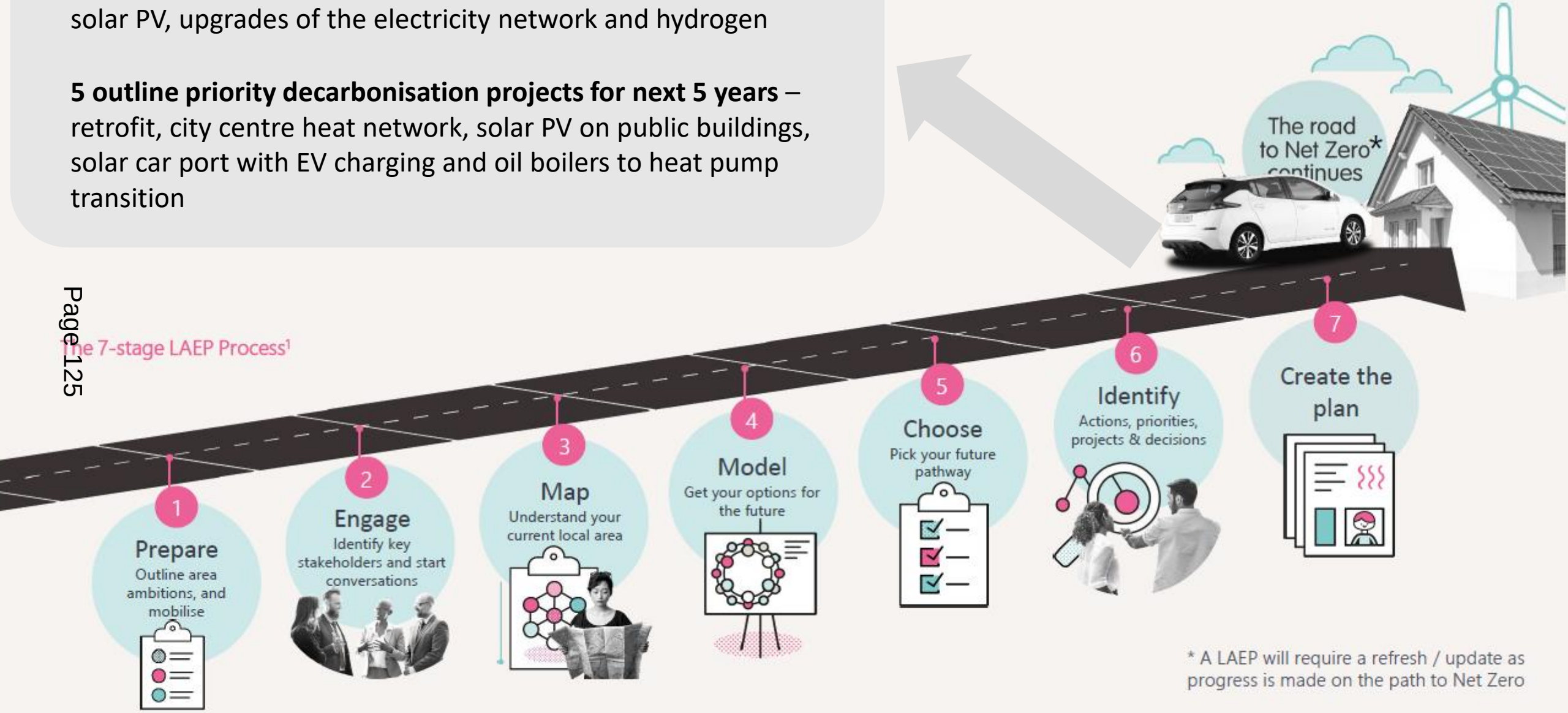


A Local Area Energy Plan (LAEP) is a **whole energy system** approach, led by local government, in collaboration with key stakeholders.

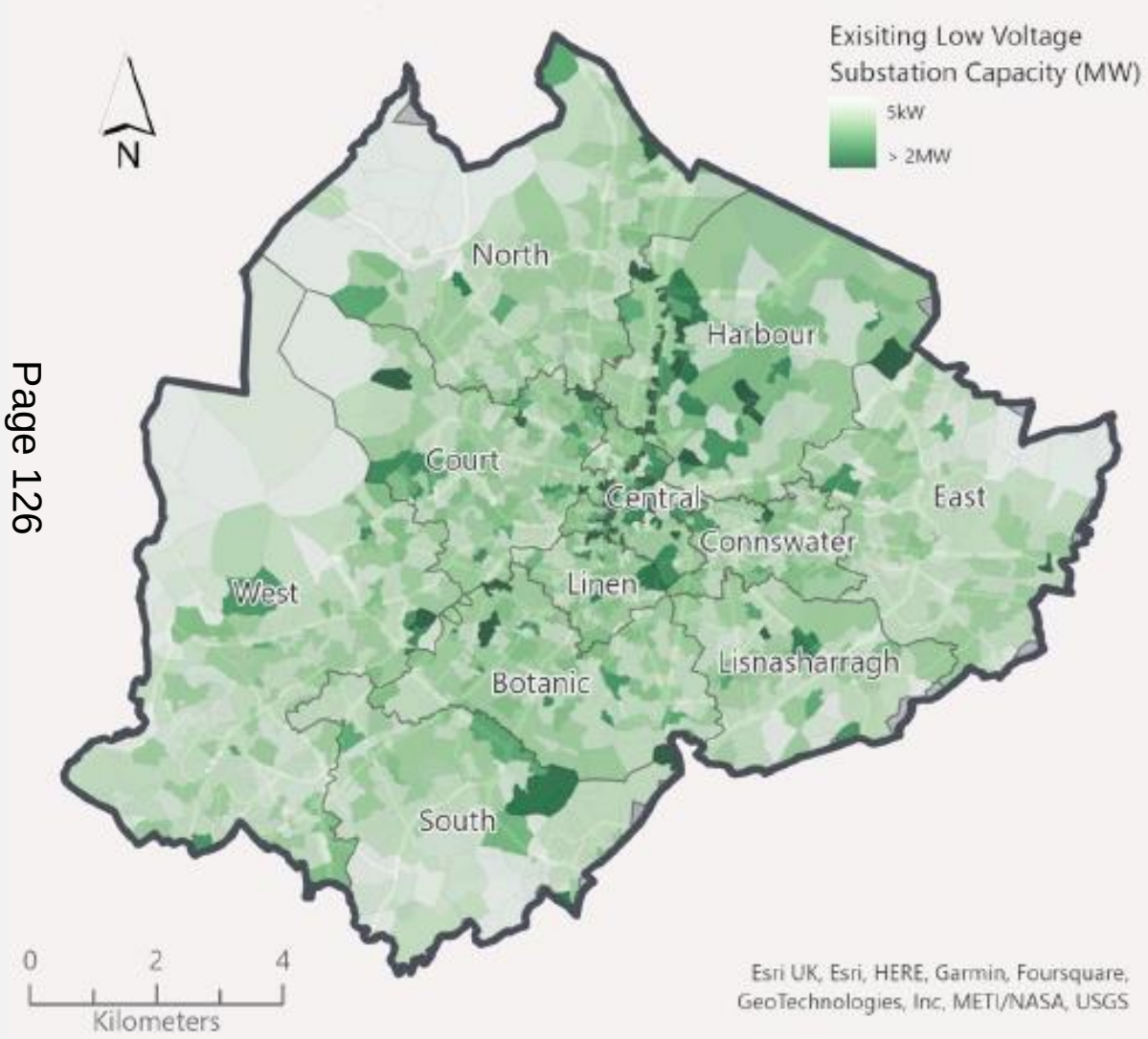
It **identifies the most cost-effective integrated plan** for the local area to contribute to timebound national and local Net Zero targets whilst maximising co-benefits to society.

Opportunity areas and focus zones – fabric upgrades, heat networks, heat pumps, biomethane boilers, EV infrastructure, solar PV, upgrades of the electricity network and hydrogen

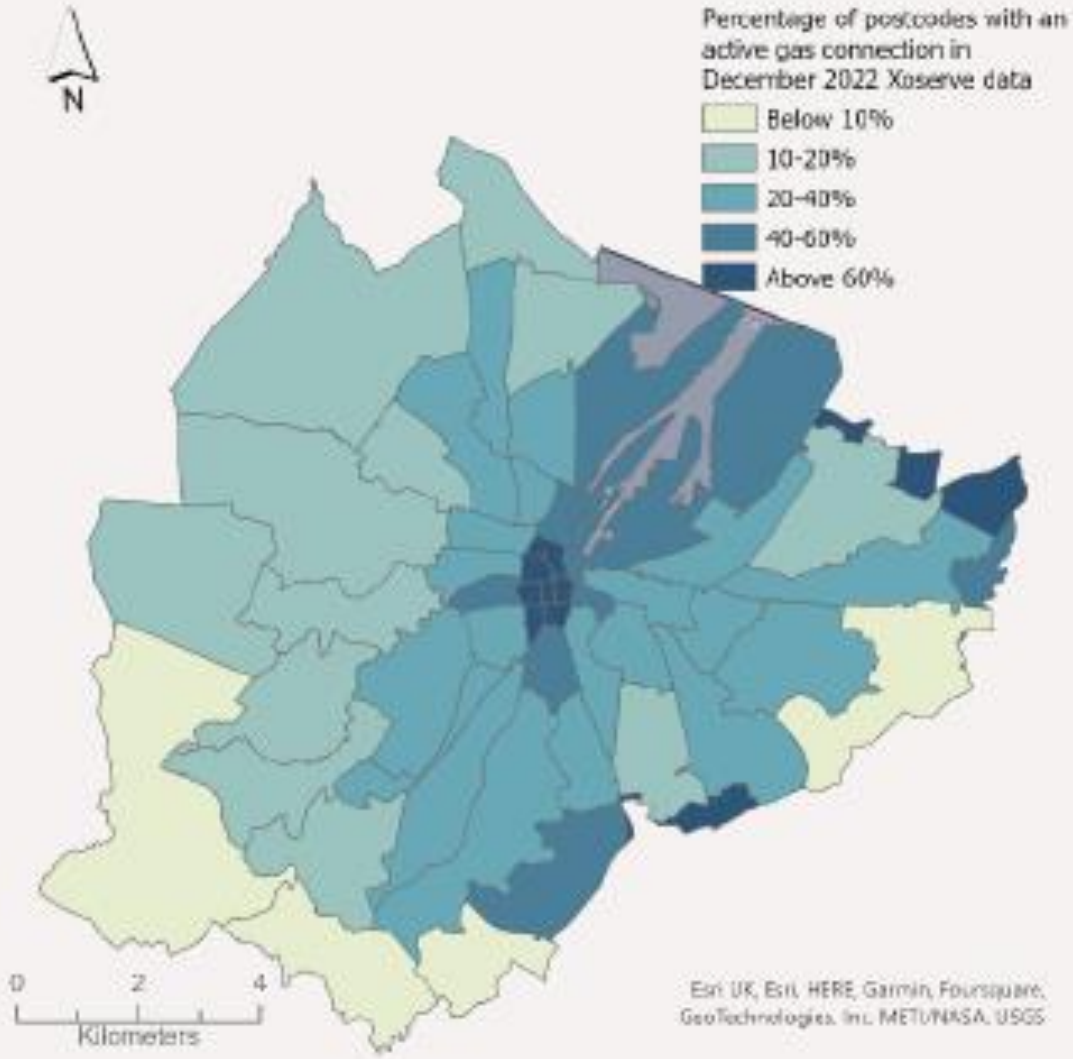
5 outline priority decarbonisation projects for next 5 years – retrofit, city centre heat network, solar PV on public buildings, solar car port with EV charging and oil boilers to heat pump transition



Low voltage sub-station capacity



Gas connection

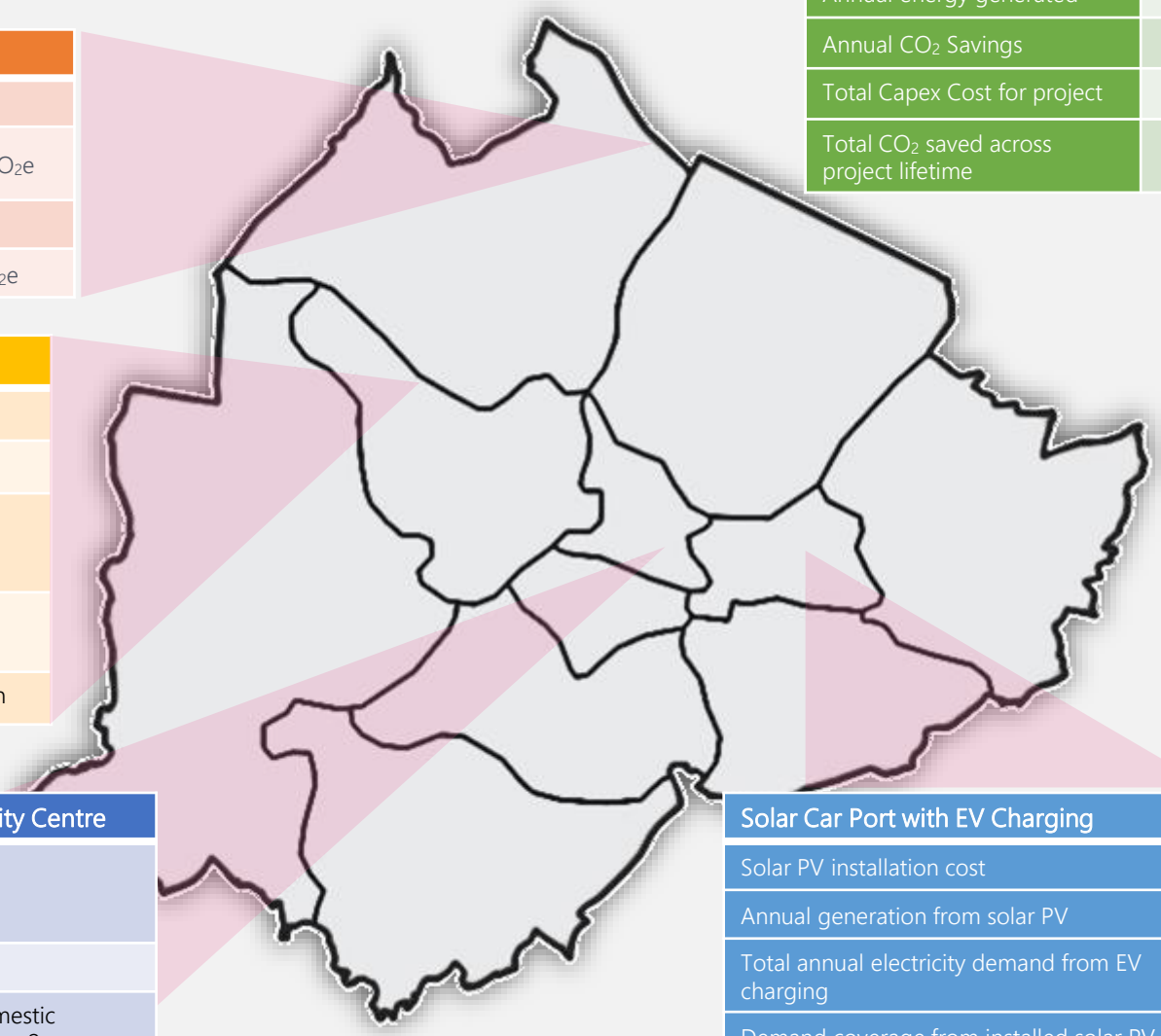


Outline Priority Projects

Oil to Low Carbon Heating Transition	
Number of homes transitioning	500
Annual CO2 Savings (per household)	4,400 $kgCO_2e$
Total Capex Cost for project	£7.0m
Total CO2 saved from project	2.2 $ktCO_2e$

Solar PV on Public Buildings	
Number of buildings	20
Annual energy generated	903 MWh
Annual CO_2 Savings	40 tCO2e
Total Capex Cost for project	£1.0m
Total CO_2 saved across project lifetime	606 tCO_2e

Domestic Retrofit Measures	
Number of Dwellings	Up to 2,000
Capital Investment	£2.7m – £5.6m
Annual bill savings per dwelling	£123 – £520
Annual carbon savings per dwelling	420 – 1,500 $kgCO_2e$
Additional benefit	Fuel poverty reduction



High Temperature District Heat Network in City Centre	
Potential annual energy demand (phase 1: Non-Domestic Buildings only)	2.8 GWh
Capital Investment	£4.2m
Additional benefit	Expansion to domestic properties in phase 2

Solar Car Port with EV Charging	
Solar PV installation cost	£21,100
Annual generation from solar PV	47,800 kWh
Total annual electricity demand from EV charging	3,432 MWh
Demand coverage from installed solar PV	1.4%
Annual CO_2 Savings	2,140 $kgCO_2e$

District Heat Networks

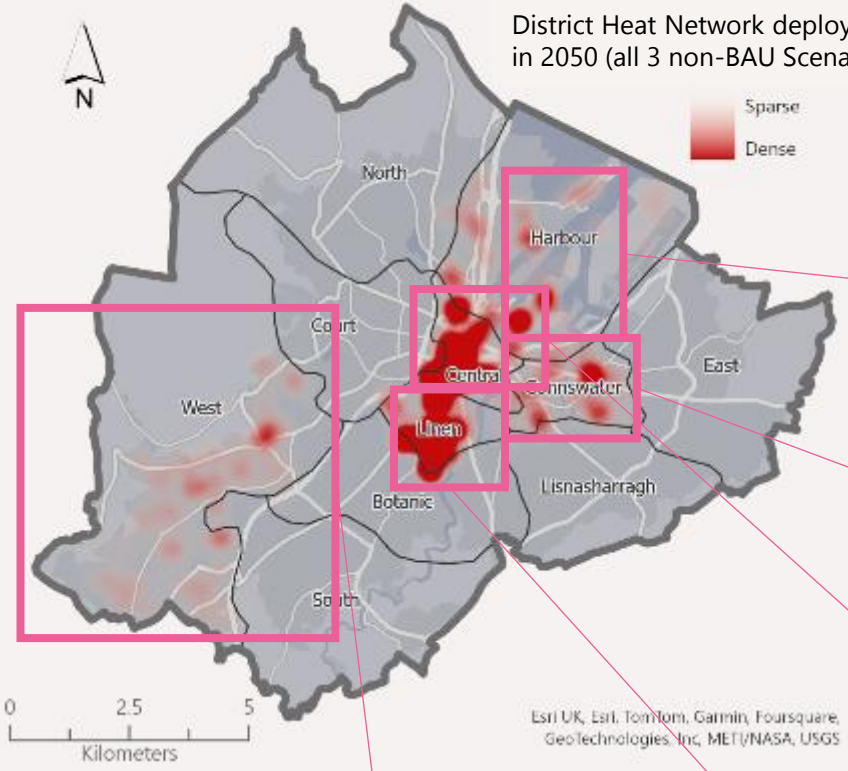
At least 30%

of Belfast's non-domestic heat demand is from District Heat Networks by 2050

Up to 58%

of Belfast's domestic buildings could be connected to District Heat Networks by 2050

District Heat Network deployment in 2050 (all 3 non-BAU Scenarios)



DHN In Harbour Area
- 12,346 homes in Harbour area in total
  - At least 1,100 connected to district heating (8.9%)
  - Potential to connect to the 6,250 emerging new build properties
- 1.95 million m^2 of non-domestic building floor area
  - At least 730,000 m^2 connected to district heating (37.4%)

DHN In Connswater
- 17,652 homes in Connswater in total
  - At least 4,900 connected to district heating (27.8%)
- 456,000 m^2 of non-domestic building floor area
  - At least 184,000 m^2 connected to district heating (40.4%)

DHN In Central
- 10,047 homes in Central Belfast in total
  - At least 1,700 connected to district heating (16.9%)
- 2.56 million m^2 of non-domestic building floor area
  - At least 1.61 million m^2 connected to district heating (62.9%)

DHN in West
- 28,000 homes in West Belfast in total
  - At least 16,000 connected to district heating (57.1%)
- 870,000 m^2 of non-domestic building floor area
  - At least 334,00 m^2 connected to district heating (38.4%)
- What does the HV network look like? Is upgrade required?

DHN In Linen
- 10,959 homes in Linen in total
  - At least 4,100 connected to district heating (37.4%)
- 1.28 million m^2 of non-domestic building floor area
  - At least 640,000 m^2 connected to district heating (50.0%)

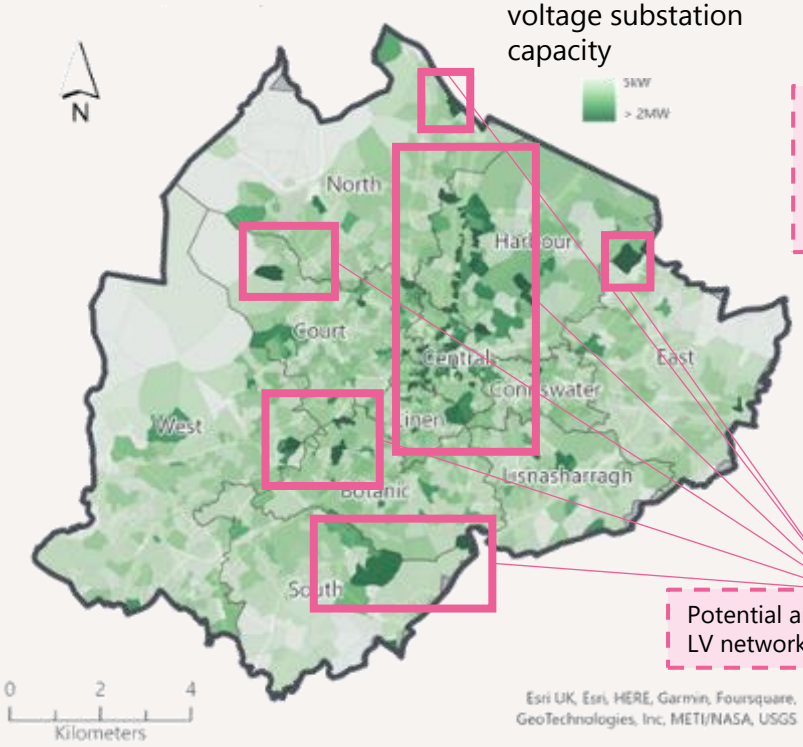
Electricity Networks

£117m
Potential cost to upgrade electricity distribution network around Belfast

57% - 166%
increase in peak electricity demand at night (due mainly to EV charging)

Enablers	Barriers	Actions
• Investment already planned for upgrades. • Network operator engaged and aligned with local authority over decarbonisation action. • Emerging flexibility markets may provide near-term low-cost mechanism to reduce or avoid level of required network upgrades	• Uncertainty over gas network re-purposing for biomethane may constrain near-term network upgrades. • Flexibility options not fully modelled in LAEP; uncertain impact and compatibility.	

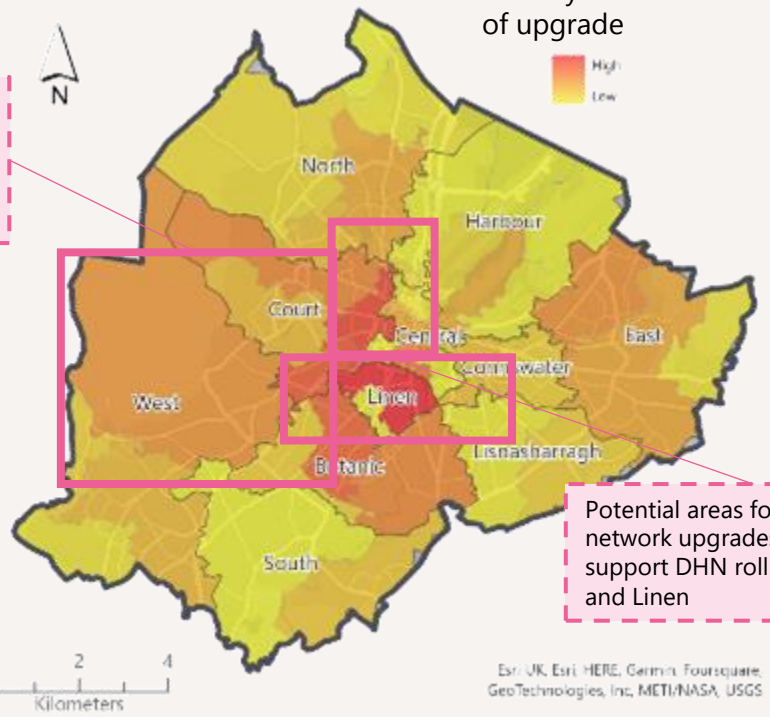
Estimated existing low voltage substation capacity



Potential area for priority HV network upgrades required to support DHN roll out in West Belfast

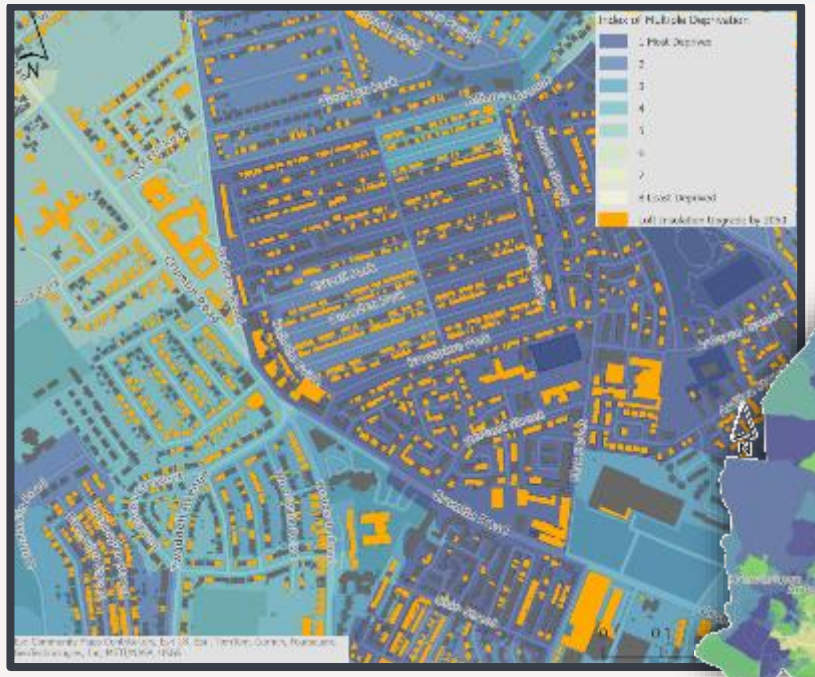
Potential areas for priority LV network upgrade

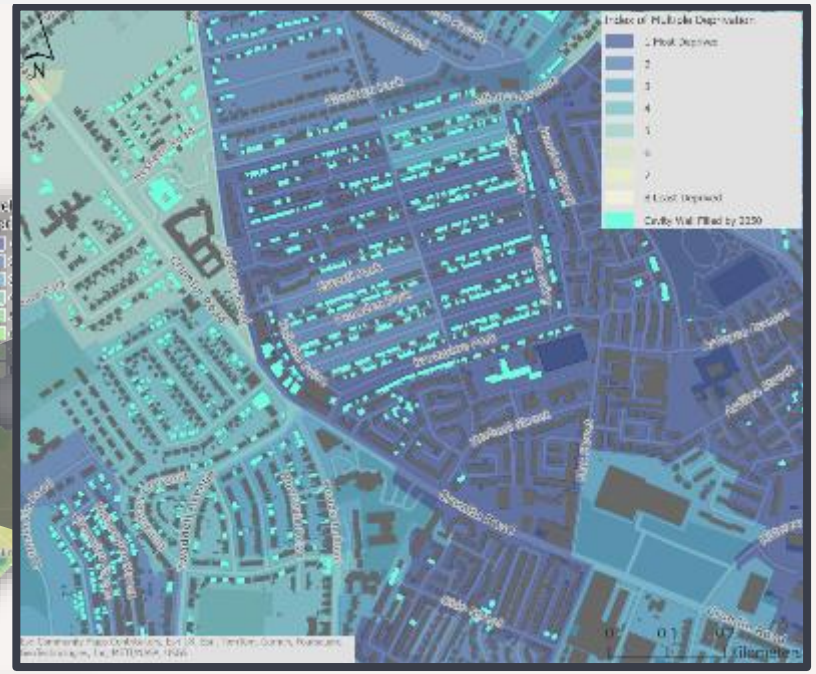
Primary substation level of upgrade



Potential areas for priority HV network upgrades required to support DHN roll out in Central and Linen

Loft insulation





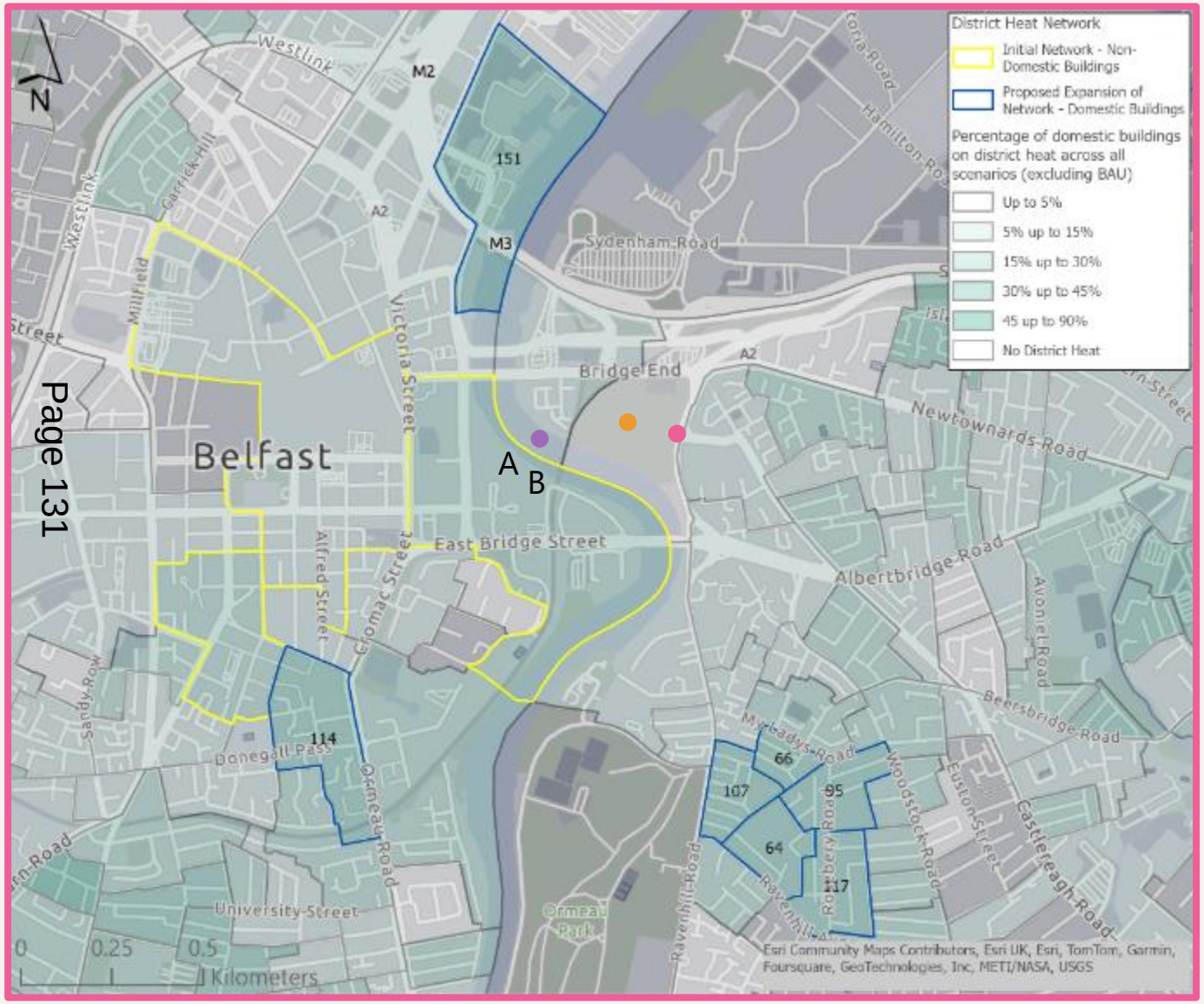
Cavity wall insulation

Glazing

Number of retrofit measures applied to properties in the area shown

	Loft Insulation	Cavity Wall Insulation	Single Glazing Window Replacement
Number of homes in area shown (% of all homes in Belfast)	6,615 (3.4%)		
Number of homes in area requiring retrofit measure	2,517	1,419	456
As a % of required measures across Belfast	3.4%	5.4%	6.1%

High-Temperature DHN in City Centre

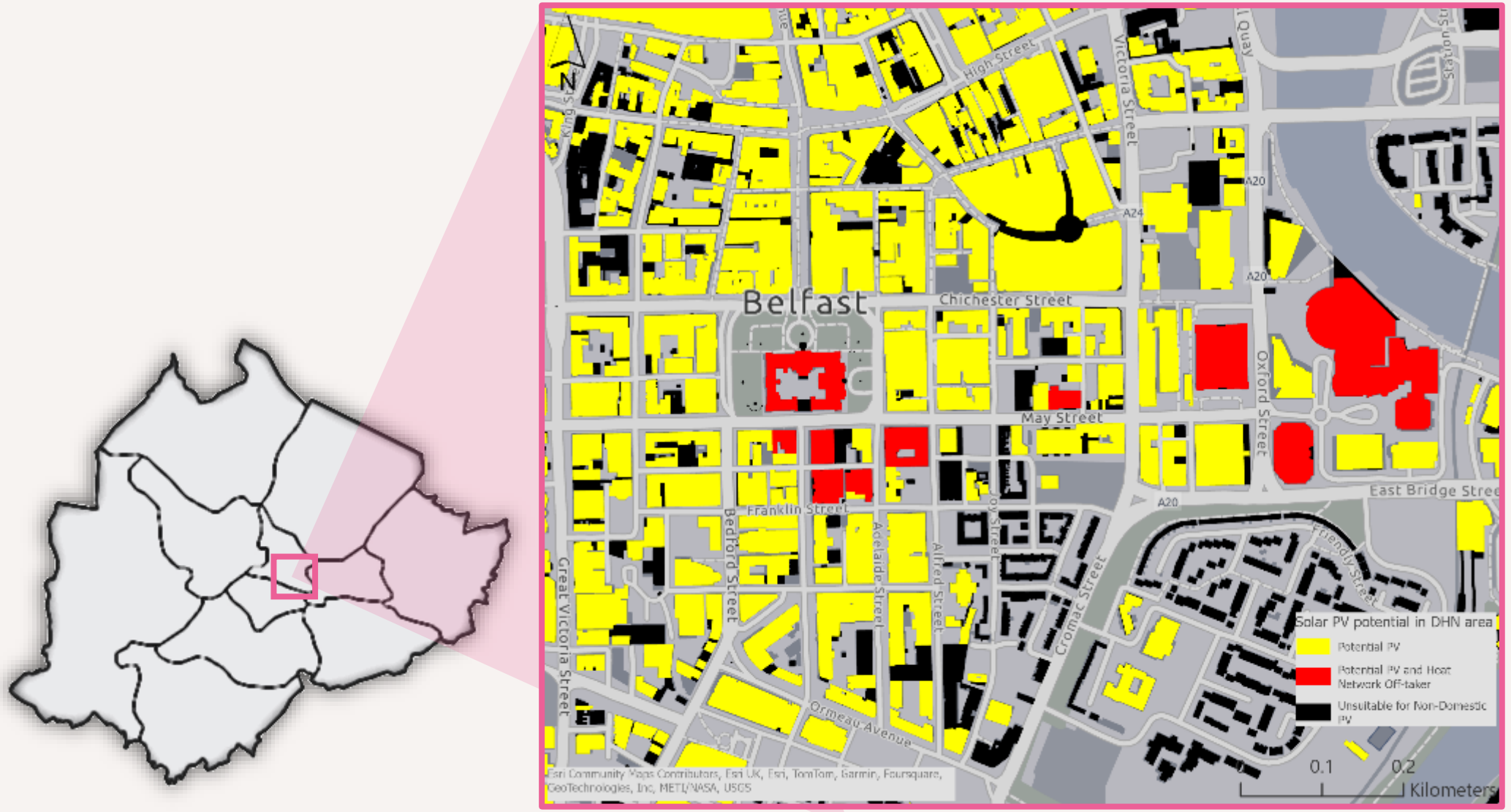


A. Waterfront Hall (annual heat demand 8 GWh)

B. Hilton Hotel, 4 Lanyon Place (annual heat demand 9 GWh)

- Potential river-sourced energy centre
- Potential land-based energy centre
- Potential geothermal boreholes for thermal underground storage

Solar PV potential on Non-Domestic Buildings in central Belfast potential DHN area



Belfast

Queen's Island Decarbonisation Plan

CATAPULT Energy Systems

Belfast City Council

Belfast

01 Citi Gateway Offices
05 Public Record Office of Northern Ireland
06 Belfast Metropolitan College
08 Titanic Belfast
15 Titanic Hotel Belfast

£15 million

Total net CapEx

Providing:

£2.5 million

Cumulative cost savings to 2050

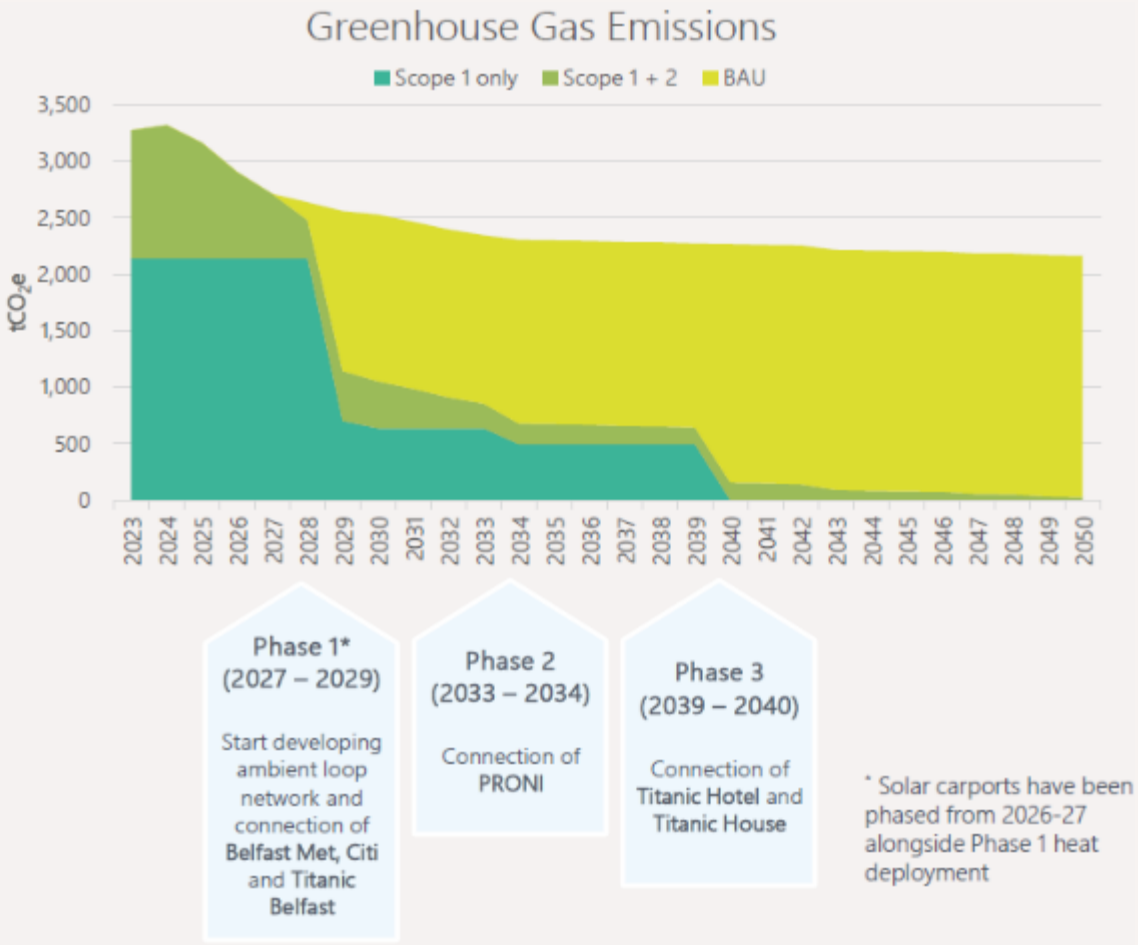
Saving:

2,136 tCO_2e

in 2050 against a business-as-usual pathway

7.3 GWh

energy in 2050 against a business-as-usual pathway



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Solar car port Odyssey

Heat network

Solar car port Catalyst

Option to extend network to future potential waste heat source (Global Innovation Institute)

Option to extend/replicate ambient loop for existing Catalyst buildings

Option to supply domestic hot water, heating or cooling to future site developments

Support development of Net Zero Technology Park

Next steps

Belfast Net Zero Pathfinder project

Form LAEP delivery group

Use the LAEP to build a pipeline of net-zero aligned investments

Develop investible business models

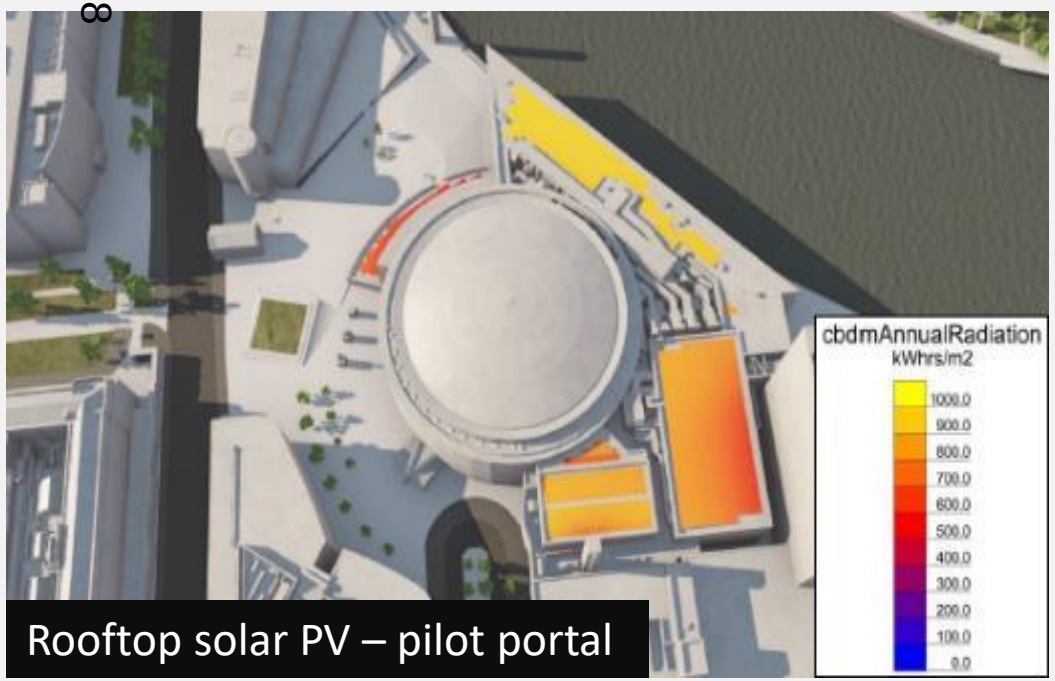
Engage citizens

Measure the decarbonisation and social co-benefits

Priority projects – work underway

Retrofit hub

District heat network



Rooftop solar PV – pilot portal

kWh

solar PV may contribute up to 107 GWh of renewable energy in 2030 which is 5% of Belfast's total energy demand in 2030 (2.13 TWh)

734 MW

Domestic Rooftop Solar PV potential by 2050

459 MW

Total Non-Domestic Building Rooftop Solar PV potential by 2050

Thankyou

Contact: Caldwelld@belfastcity.gov.uk

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Belfast

Queen's Island Decarbonisation Plan

Context

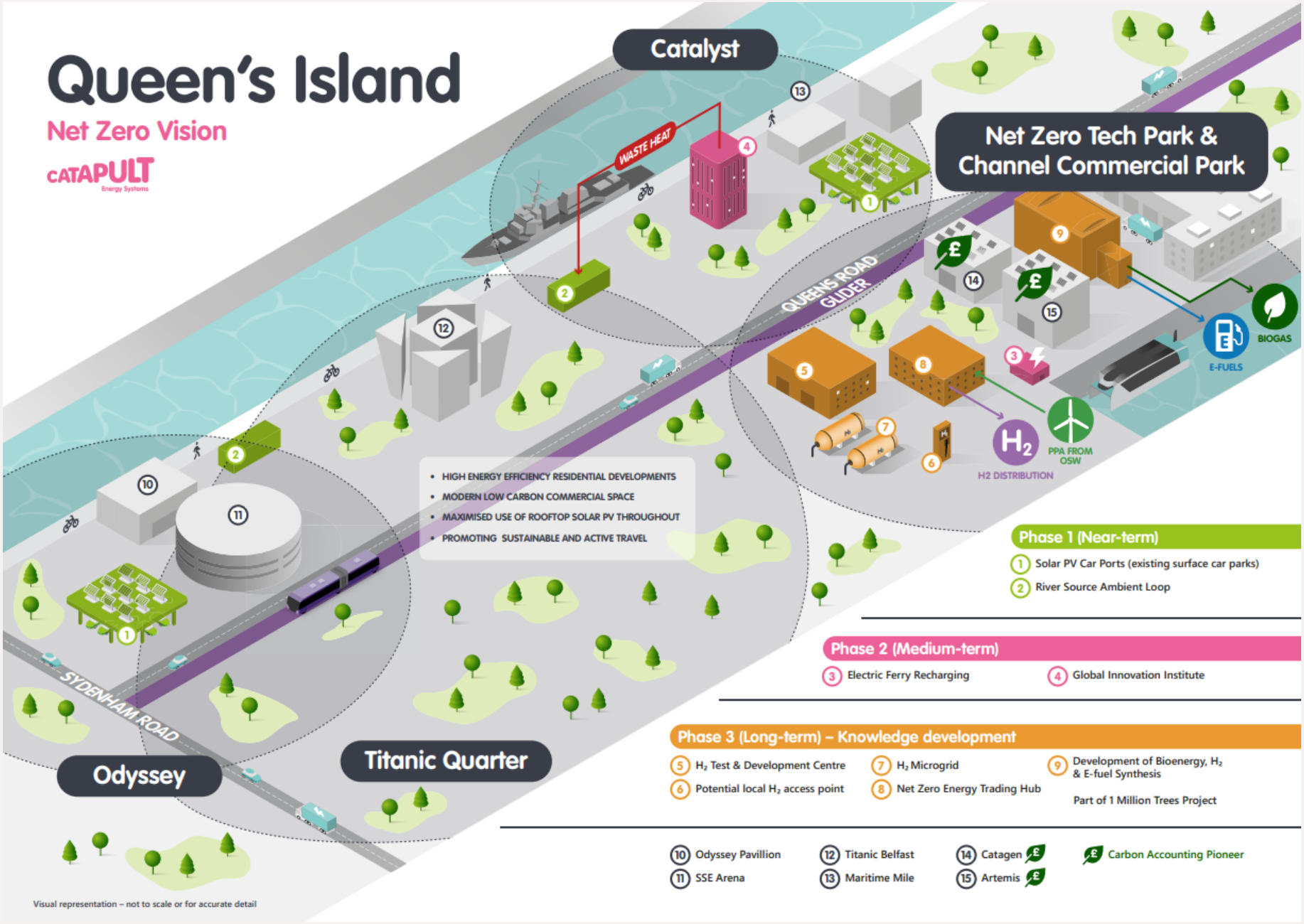
This document provides the output from the Queen's Island decarbonisation plan activity. This has been the product of a desk-based survey of the existing buildings and energy use within the area. It is intended to provide a high-level carbon reduction pathway and view of the site's decarbonisation potential for both electricity and heat over time, broken down into a series of phased activities. The plan also proposes the key components for future decarbonisation and Net Zero developments on Queen's Island. The emergence of a Net Zero Technology Park is a key enabler for innovation in this area and this will help drive decarbonisation at scale for Queen's Island, Belfast, Northern Ireland and beyond.

Based on the scope of works agreed, two initiatives have been chosen which have been modelled to provide an initial assessment as to size, scale, cost and techno-economic decarbonisation impacts to site. The heating activity is centered around an ambient loop network, which is where ambient temperature water is delivered around a building, or group of buildings, to deliver heating and cooling via decentralised heat pumps. We have provided a solution which could supply heat to a number of existing buildings centered around the Belfast Metropolitan College. This solution is designed to be scalable, although in this first stage it has been suggested that it can connect over time to the Citi building, PRONI, Titanic Belfast and Titanic Hotel (designated as southern cluster). Alongside this development, there is an assessment on the potential for additional renewable electricity generation in the area. This study suggests two solar carports: one at Odyssey and another at Catalyst. This would help support the transition to electrification of the area.

The pack is enhanced with key metrics, data and modelling outputs to enable future discussions and feasibility studies. The projects include a first staging for an ambient loop network and two potential solar carport developments.

Note that this work has been done in parallel with a Local Area Energy Plan (LAEP) for Belfast. There are a number of key differences between the two programmes which may lead to some differences in outcomes. The first is the scale and granularity of the scope, where the LAEP considers the whole of the Belfast area and the decarbonisation plan focusses in on Queen's Island. This in itself highlights differences in suitable solutions due to the granularity of data available for use at the focused level. Additionally, while the LAEP considers the baseline or current view of the energy demands, the decarbonisation plan includes a view on the future potential through specific developments which can lead to different recommendations.

Net Zero Vision



Contents

Executive Summary

Summary

A pathway has been outlined to support the decarbonisation aims of Queen's Island. This consists of an ambient loop network supplying zero-carbon heating and hot water to a cluster of buildings surrounding the Belfast Met, supported by renewable generation from solar carports. This pathway would require capital investment of:

£15 million
Total net CapEx

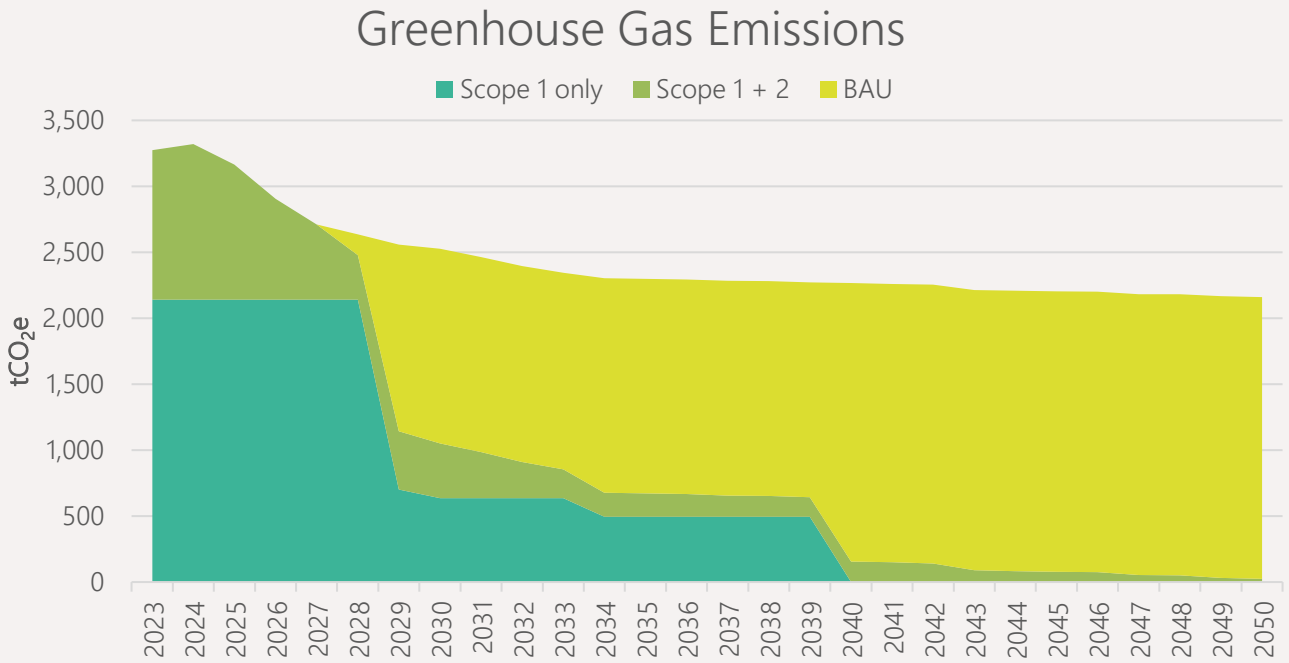
Providing:

£2.5 million
Cumulative cost savings to 2050

Saving:

2,136 tCO_2e
in 2050 against a business-as-usual pathway

7.3 GWh
energy in 2050 against a business-as-usual pathway



Phase 1* (2027 – 2029)
Start developing ambient loop network and connection of **Belfast Met, Citi** and **Titanic Belfast**

Phase 2 (2033 – 2034)
Connection of **PRONI**

Phase 3 (2039 – 2040)
Connection of **Titanic Hotel** and **Titanic House**

* Solar carports have been phased from 2026-27 alongside Phase 1 heat deployment

Decarbonisation Pathway

Focus on modelled solution:

The focus has been only on a part of the site, selected as it contains existing buildings that need to be decarbonised; relatively high emissions (lots of natural gas consumption); engaged stakeholders; plant reaching end-of-life expected over next 5-10 years; reasonably high density; and with waterfront access (for seawater source heat pump).

Also, could work well as an initial cluster from which to expand to both new and existing development, with the opportunity to recover waste heat from industrial processes/data centre.

Ambient Loop network connecting existing buildings, supplied by seawater source heat pump (SSHP)– install phased over time

- Belfast Met
- Citi Gateway
- Titanic Belfast
- PRONI
- Titanic House / Hotel

Solar carport A – Odyssey (2.2 MW_p)

Solar carport B – Catalyst (0.7 MW_p)

Decarbonisation Pathway

Growing the potential / future expansion:

Additional benefits:

- Unlock potential for waste heat to be used on existing network
- Connect up the whole area to benefit from future changes (tie-in with Vision):
  - Possibility for micro-grid / energy as service for area
  - Increased flexibility / resilience

Additional benefits (cont.):

- Fixed price energy costs
- Innovation led
- Plug-and-play / cost effective heat supply
- Future-proof area
- Free up roof real estate

Option to extend network to future potential waste heat source (Global Innovation Institute)

Option to extend/replicate ambient loop for existing Catalyst buildings

Option to supply domestic hot water, heating or cooling to future site developments

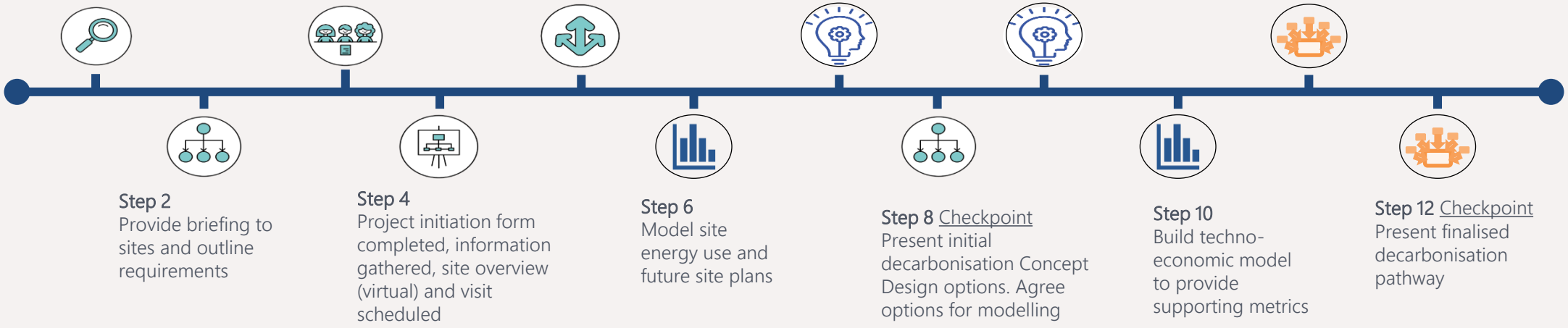
Support development of Net Zero Technology Park

Introduction

What is a Decarbonisation Plan?

A decarbonisation plan is a **whole energy system** approach to considering how a site can achieve Net Zero over time. The key objective is to eliminate the use of fossil fuels on site and replace with a decarbonised alternative, while also considering the knock-on impacts on the other systems in place.

An effective plan **identifies a cost-effective pathway** for the site, considering a timeline for carrying out a set number of interventions in order to achieve the Net Zero goals.



Approach

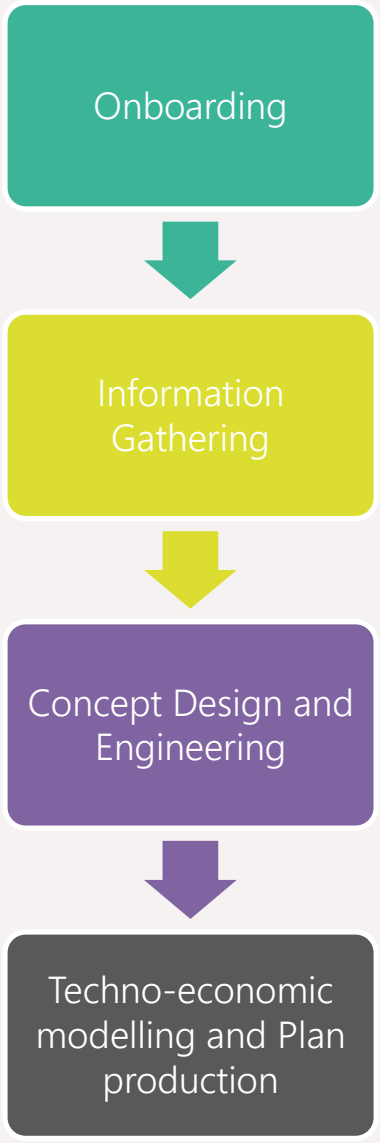
Utilising a consistent whole site energy system approach that considers aspects such as:

- Existing site buildings and uses, where necessary accounting for potential changes e.g., building demolition / repurposing
- A joined-up approach considering the influence of heat decarbonisation on building fabric and site power strategies alongside the changes needed to energy systems and infrastructure
- Achieving a cost-effective transition, evaluated using the Green Book methodology and forward carbon emission projections alongside techno-economic appraisals to assess opportunity costs
- Stakeholder engagement approach
- Asset replacement over time
- Wider energy system integration and constraints

The decarbonisation plan has been based on the production of both forward projected business-as-usual (BAU) and post intervention carbon emissions (tCO_2e) based on the proposed decarbonisation pathway, utilising a consistent methodology. This provides a projection of emissions reduction from implementing the pathway (and the options considered); considering total emission reduction and non-traded or direct emissions.

Process

- Site/stakeholder relationships
- Current situation, forward plans and baseline



Project Scope

The geographic scope of this project is the Queen's Island area of the Belfast docks. Specifically, the task is to consider two decarbonisation solutions for the area.

01 Citi Gateway Offices
05 Public Record Office of Northern Ireland
06 Belfast Metropolitan College
08 Titanic Belfast
15 Titanic Hotel Belfast

Data was gathered as far as possible from all buildings with the Queen's Island area (included in Appendix). However, our design solution was narrowed down to several key buildings.

This project is a high-level feasibility study and any outputs are indicative only. There are a few assumptions and restrictions as a result:

- Annual or monthly energy consumption data
- Energy benchmarks used where not available
- Baseline year used was 2022 (which had a high number of public holidays)
- Space heating demand profiled according to heating degree days
- Costs are indicative only (based on benchmark costs and do not include allowances for building alterations, ground contamination issues, local variance, etc.)
- Electrical grid upgrade haven't been included at this stage, though initial investigation suggests that impact is reduced

Setting the Scene: Queen's Island

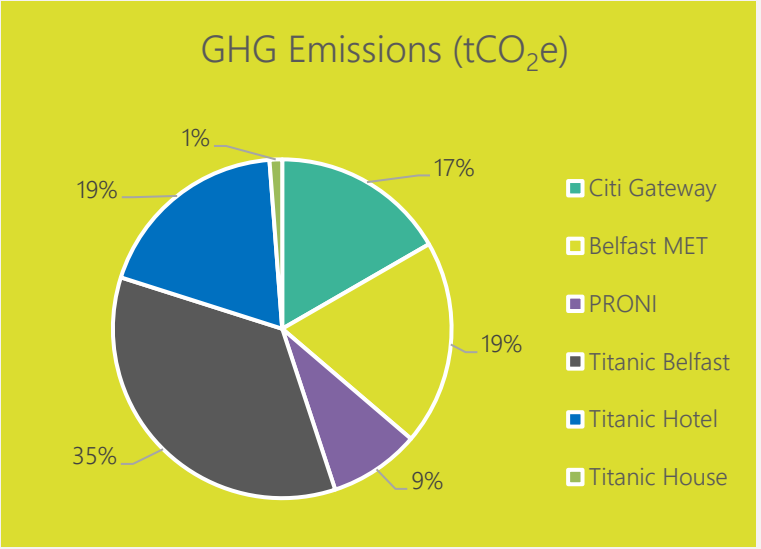
Current Emissions

Metered Energy Consumption and Emissions

Energy consumption data was collected for the financial year 2022/23 for the majority of the buildings in scope, with the exception of Titanic Hotel*. This is summarised in the table below.

Carbon emissions associated with this consumption has been calculated using DESNZ Commercial/Public Sector carbon emission factors for 2023.

Building	GIA (m^2)	Electricity (kWh)	Natural Gas (kWh)	GHG Emissions (tCO_2e)
Citi Gateway	12,375	3,136,582	363,171	515
Belfast Met*	22,000	1,800,000	1,900,000	604
PRONI	9,825	895,586	767,079	268
Titanic Belfast	11,000	1,212,203	4,964,838	1,080
Titanic Hotel**	8,624	776,160	2,587,200	583
Titanic House	1,112	99,142	126,181	37
	64,936	**7,919,673**	**10,708,469**	**3,088**



* Average consumption assumed

** Consumption estimated using CIBSE Type 1 (Good Practice) benchmark

Emissions and Net Zero Targets

" The Climate Change Act 2022 targets are a reduction of greenhouse gas emissions [reduction in scope one and two CO_2 emissions compared to 1990 levels] of:

- *48% by 2030.*
- *100% by 2050. "*

" Belfast Met has committed to reducing by 2030:

- *50% carbon emissions.*
- *30% energy consumption.*

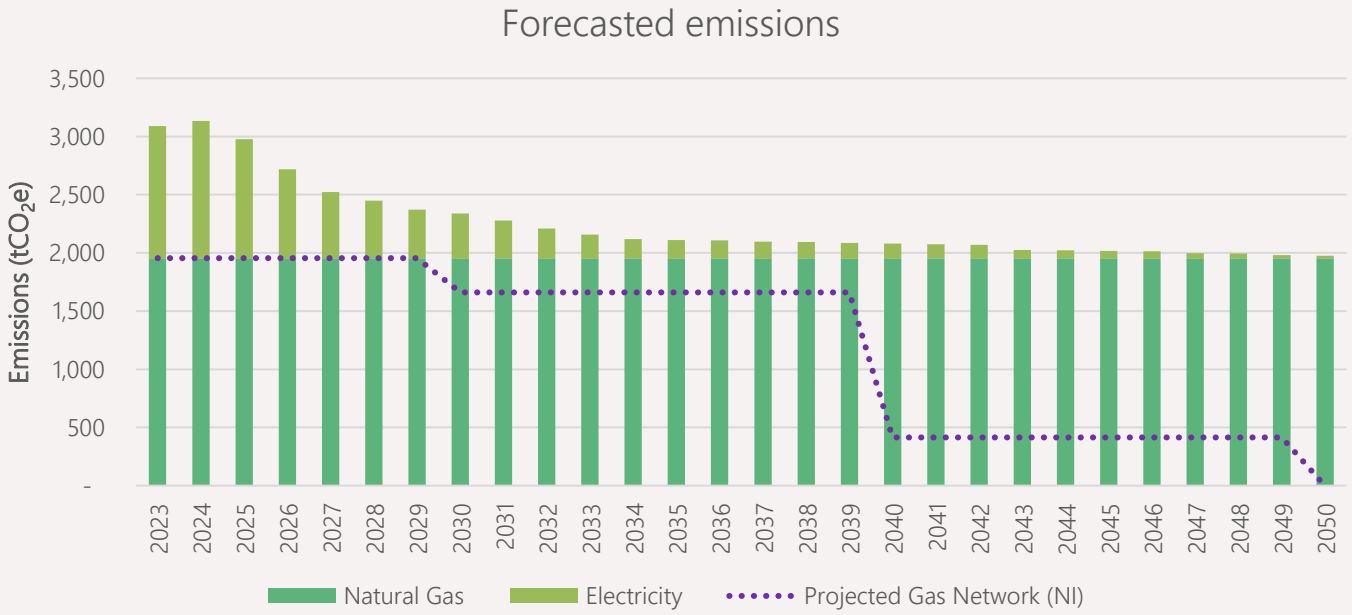
[against a 2016-17 baseline] "

To help form a decarbonisation pathway for Queen's Island we have forecasted the emissions of the current building stock within scope (energy consumption) to 2050 to understand the business-as-usual (BAU) situation. This uses UK Government Green Book projections for emission factors, which indicate that the electricity consumed is on a Net Zero trajectory whereas the natural gas emissions will remain unchanged over time.

Baseline emissions for the selected buildings are 3,088 tCO_2e and, on current trajectory, emissions for the buildings in scope in 2050 would be 1,975 tCO_2e (a 36% reduction). This is based on no decarbonisation of the natural gas grid.

It is noted that there are projections for the Northern Ireland gas network to undergo decarbonisation over this timeline due to the increase in biomethane injection. Projections suggest that emissions could reduce by 15% in 2030, 75% in 2040 and 100% by 2050*.

While this could substantially change the outlook, it is suggested that this pathway would require a reduction in gas consumption meaning that electrification of heat is still a key target.



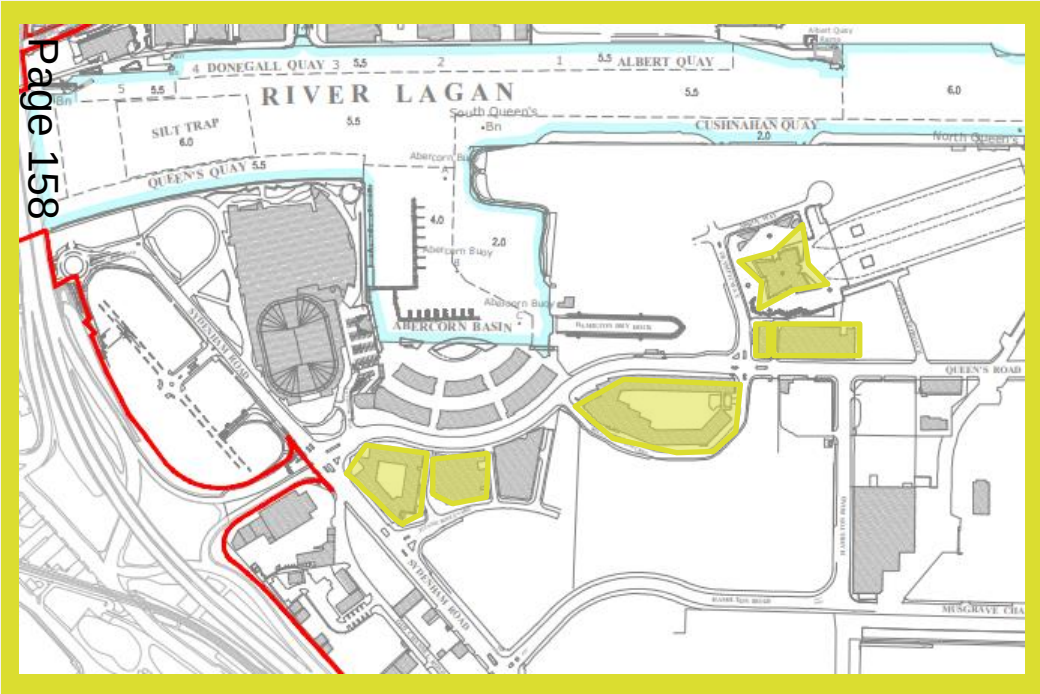
* NI Gas Network Pathway to Net Zero report

Heating

Existing Heating and Hot Water

A survey was conducted of the buildings within scope to find out type and age of existing heating provision. This found a mix of natural gas use for both heating and hot water provision as well as instances of electric provision.

An element of complexity was found in the case of the Titanic Belfast building as this is supplied via a gas-fired CHP installation. This has been accommodated within the modelling as there are additional impacts from the electricity generated. It is also understood that cooling is provided from this system.



Building	Heating provision	Hot water provision	Year of installation
Citi Gateway	Electric	Gas	2012
Belfast Met	Gas	Gas	2011
PRONI	Gas	Gas	2011
Titanic Belfast	Gas (CHP + boiler)	Gas (CHP + boiler)	2011
Titanic Hotel	Gas	Gas	2017
Titanic House	Gas	Electric	2017

Local Generation

Existing Generation

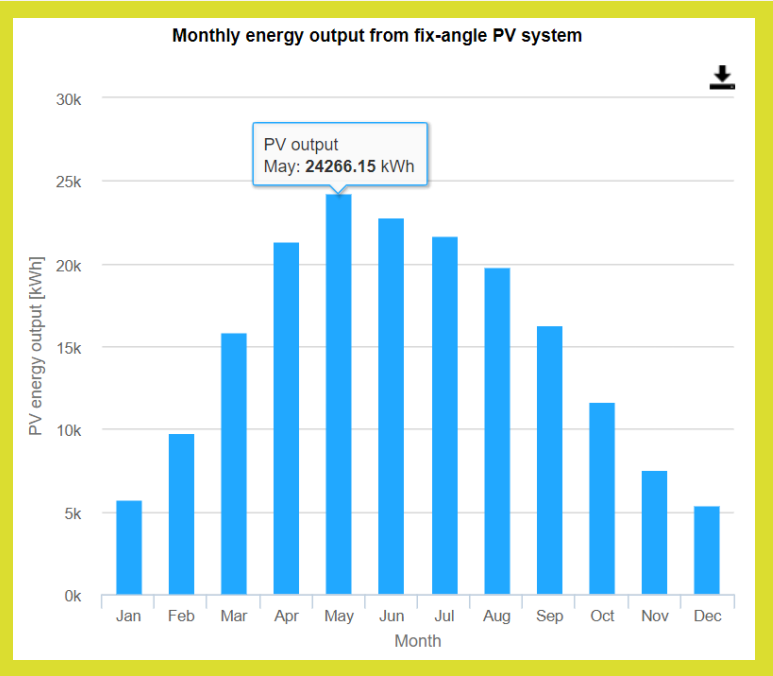
From data made available and desktop research it is understood that the only generation on site is the existing CHP installation at Titanic Belfast. It is noted that there is a substantial rooftop PV installation at the Odyssey, however this has been excluded from the baseline analysis.

There is also a planned rooftop PV installation for the Belfast Met, which we have estimated an annual generation output from.

Building	Generation type	Assumed annual generation (kWh)	Year of installation
Belfast Met	Solar PV	161,411	TBC
Titanic Belfast	CHP	1,022,130	2011

Beyond this, it is understood that the future development of the site will aim to achieve self-sufficiency and therefore is likely to include additional installation of rooftop solar PV. This has been excluded on the basis that it will have a positive impact on the site electricity demand.

An initial assessment was made as to the existing roof space and suitability for further deployment of rooftop PV. However, it was found that there would be substantial challenges with the available space to warrant further investigation. Additionally, initial screening has been conducted on the viability of wind generation within the boundary of Queen's Island. Whilst the resource would be suitable, the significant constraints on the location mean that this has also been excluded from further consideration.



Source: PVGIS

Assessing Options for the Future

Long List Options

Outcome of Concept Design

Intervention type	Long-list option	Include / exclude	Rationale
Heating	Ambient loop system with seawater source heat pump (SSHP)	Modelled	Ambient Loop (Shared-loop) heat networks consist of a communal distribution system moving low-grade heat between the source and the individual heat pumps contained within each property. This differs from the traditional centralised heat network (HN), as each property is fitted with its own heat pump unit, rather than relying solely on centralised energy centre. Shared-loop networks can offer reduced capital expenditure for infrastructure by utilising plastic pipes with minimal thermal insulation. However, overall capital cost including the building-level heat pumps can be higher than for conventional heat networks and, in this case, the seawater heat exchanger introduces some complexity, for example with respect to corrosion and licensing.
Renewable Generation	Ground-mounted / Solar Car Park Canopy PV	Modelled	There are parking spaces on the areas that are suitable for solar PV carports installations. This solution can work to offset the running cost of the proposed heat networks and provide some form of resilience in the local electrical network.
Heating	*Conventional low temperature hot water (LTHW) heat network with seawater source heat pump (SSHP)*	*Not modelled*	*A conventional heat network operating at up to 70^{0}C flow and 40^{0}C return, with a seawater-source heat pump as the primary heat generator. Technical, environmental and economic performance can be optimised with thermal storage and secondary heat generators for 'peak lopping'*
Heating	*Localised low-temperature hot water (LTHW) air source heat pump (ASHP)*	*Not modelled*	*ASHP can readily be used to replace existing wet heating systems on site and considered for areas that are heated by direct gas systems. System type (HT or LT) would vary depending on upgrades of the LTHW systems feeding radiators and AHU's such as in the Met to be practical examples. Other consideration would be heat recovery and combining heat pumps and Chillers, or any buildings with UF heating would form higher priorities as will buildings where boilers are approaching end of life.*
Heating	*Localised domestic hot water (DHW) high-temperature ASHP*	*Not modelled*	*DHW demands could be provided by an independent DHW high-temperature ASHP that can more efficiently supply the demand. A modular system would be best suited where demand varies considerably, e.g. in the SSE arena*
Heating	*Ground source heat pump (GSHP)*	*Not modelled*	*There are several variants of GSHP systems. In Belfast, the most promising option is the use of groundwater abstraction/reinjection with ambient loop heat networks, which is the subject of ongoing research. While this type of solution may in due course prove to be the best option, there are significant risks/uncertainties at this stage, e.g. source temperature, historic ground contamination from industry.*
Heating	*Localised bivalent systems*	*Not modelled*	*This solution has been excluded because, while it offers short-term flexibility in meeting heat demand, it could require significant on-site infrastructure for either storing or generating hydrogen/biogas for decarbonisation. Alternatives have been explored to investigate potential for off-site generation of biogas (biomethane) which could be transported to site via existing infrastructure. However, it was deemed that this type of fuel is more likely to be used in higher value systems.*
Energy Storage	*Battery Storage*	*Not modelled*	*On a high-level assessment approach, it is deemed a battery storage solution for individual buildings or network to be excluded due to low ratio of solar PV potential when compared to the current energy consumption and increased electricity demand if any sort of heat pump solutions are installed. However, PV system design should consider future retrofitting of Battery Storage as should any potential larger scale renewable energy generation schemes.*

Pros and Cons for Long List

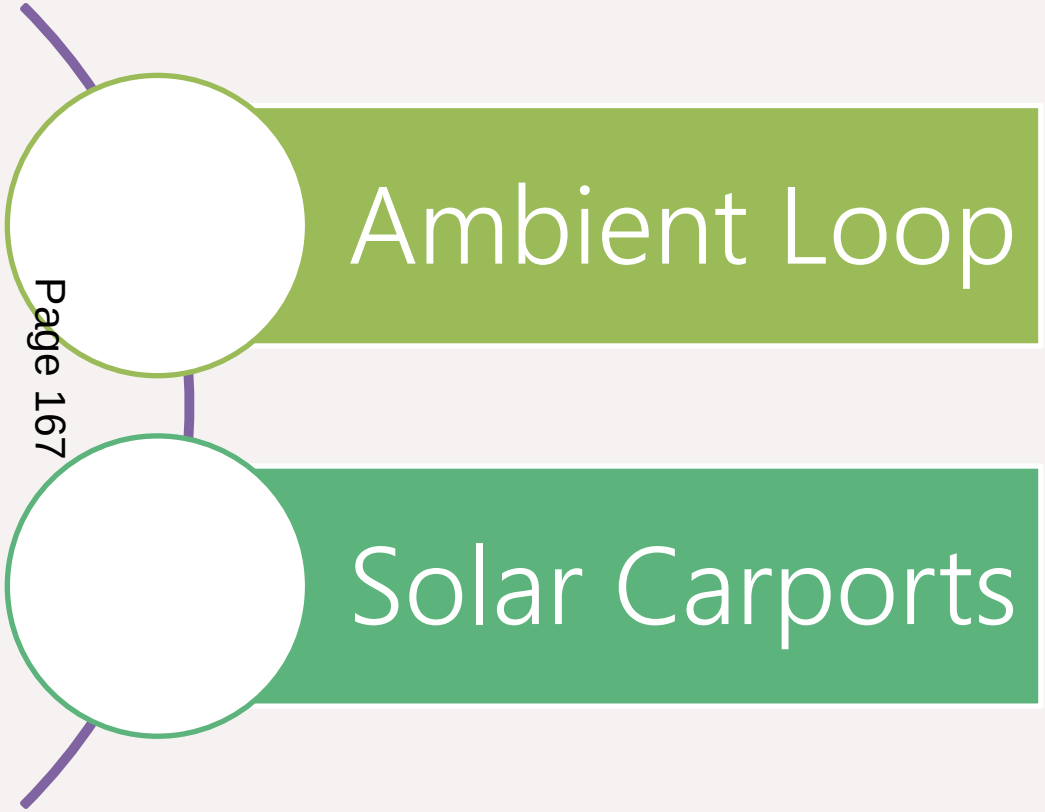
Long-list option	Pros	Cons
Ambient loop system	• Shared ambient-loop networks can result in lower infrastructure costs compared to high-temperature HN systems, as they can often use cost-effective plastic pipes • Provides capability for both heating and cooling in buildings • The shared components for an ambient loop system are significantly less complex and less capital intensive than a high temperature network where a high-capacity central heat pump would be required • The small temperature gradient between the network and ambient conditions leads to minimal system losses • Each property/building is equipped with its own heat pump unit, offering residents individual control and responsibility for their heating needs, similar to having individual boilers • Integration of multiple buildings on different flow/return temperatures can be more easily managed to obtain optimum system efficiency • System flexibility is high, as new additions to the network can be relatively easily connected in phases • Local water source heat pumps connected to an ambient loop are likely to be less capital intensive and require smaller installation space when compared with local air source heat pumps • Renewable Energy Sources: Shared ambient-loop systems can utilize various renewable energy sources, such as ground heat, surface water, or sewage treatment, promoting sustainable and green energy practices. Seawater is available as an abundant heat source for the development in question • Seawater temperature likely to result in higher heat pump performance than air source heat pumps during the coldest periods with less effect on heat pump capacity than local air source heat pumps • Flexibility to accommodate any future waste heat for use in buildings, particularly given the potential temperature available	• The overall capital cost, including building-level plant and equipment, is likely to be higher than for a conventional heat network, though this depends on network length and how any cooling demand is met • The lower temperature difference across the ambient loop typically results in larger pipe diameters than for modern, conventional networks, though this is mitigated by the fact that less heat is distributed across the network. Furthermore, once the minimal thermal insulation requirements are considered, the capital cost of distribution pipework is likely to be lower than for conventional networks • Every building installed on the ambient loop network would require its own heat pump. This is more capital intensive at the point of connection than a conventional high temperature heat network with traditional heat interface units • High temperature backup heat sources may still be required at a local level (e.g. gas boiler or redundant air source heat pumps), for buildings requiring very high levels of resilience • Building-level thermal storage may be required for customers requiring additional resilience and/or intending to benefit from time-of-use electricity tariffs • Planning consent is likely to be required for installation of any shared loop system and a noise test is likely to be required and potential planning conditions. Planning approval including inlet and outlet discharge consent and DNO requirements also need to be considered • Local building controls will likely require replacement or modification to integrate with a new heat source • Low Return On Investment and potential short term utility cost increase • Central high temperature heat buffering is not possible, resulting in a need for an overall higher heat pump capacity than traditional high temperature shared heat loops • Electrical reinforcements may be required to multiple buildings on the ambient loop in order to support local heat pumps. This is likely to be more complex than a traditional centralised system where reinforcements may only be required to a single energy centre • Maintenance cost associated with sea water filtration systems

Pros and Cons for Long List

Long-list option	Pros	Cons
Ground Mounted PV (Solar Carport)	• Available carparks that could be used to install solar carports. • The solar carport will provide protection from the elements to the cars and people using the spaces • It also allows for integrations such as EV charging station being directly power by the PV system (not modelled in scenario) • Offsetting increased running cost of any heat electrification to be implemented • Good visual impact on the site as it will show the green goals being implemented on the site • Good payback periods	• The sizing of the system depends directly on the layout of the car parks. It may require a redesign to maximize the usage of space and electricity generation • DNO consent will be required via submission of a G99 application • Significant capital cost of electrical infrastructure, including connection to distribution network due to private wire underground runs and carport civil works • Planning consent is required
WSHP Heat Network	• *Substantial carbon savings would be achieved by switching from fossil-fuelled boilers (in most cases) to heat pumps* • *Potential to upgrade/replacement of air handling units (AHU) as part of project* • *Combine with improved Chiller efficiency (reuse of heat)* • *Opportunity to increase control efficiencies* • *Design to reduce system size by retaining existing gas boiler capacity and large buffer (thermal store) capacities*	• *Approval issues from with privately owned buildings and stake holders.* • *High investment Capex for the heat pumps, pipe work network and distribution* • *Additional work to upgrade heating distribution system (Radiators, AHU, and others) if building not capable of operating at lower temperatures (e.g. 60^{o}C)* • *Maintenance cost associated with Sea water filtration systems* • *Larger area required to be used for an energy centre than for comparable ambient loop system (high civil costs)* • *Sizing and location of the buffer vessel to reduce maximum capacity of the heat pump capacity* • *Expected low Return On Investment and potential short term utility cost increase* • *Electrical connection capacity available to be confirmed* • *Planning approval and DNO requirements* • *Disruption to buildings during retrofits*
Localised ASHP for independent buildings	• *Substantial carbon savings would be achieved by switching from fossil-fuelled boilers (in most cases) to heat pumps* • *Potential to upgrade/replace AHU (optimisation) as part of installation* • *Flexibility of integration with the current system* • *Opportunity to increase control efficiencies*	• *Available roof space may be required close to the plant rooms for installation of heat pumps. This could prove challenging with other building services required* • *Planning consent may be required for the installation of the ASHP units, and a noise test is likely to be required and potential planning conditions* • *It is normal for heat pump-based systems to provide lower-level heat almost continually during the heating season which keeps the internal temperature more constant and therefore avoids periods when higher peak demands are required.* • *The BMS will need to be optimised for the system running regime (which could lead to improved overall SCOP efficiencies), however this comes at an additional cost* • *Expected low Return On Investment and potential short term utility cost increase.* • *Requires an investigate to ensure that there is sufficient electrical connection capacity available.* • *Planning approval and DNO requirements.* • *Disruption to buildings during retrofits*

Scenarios

Modelled Scenarios for Queen's Island



Ambient Loop aims to provide a decarbonisation pathway for the heating of the existing buildings within the site, this being the major target for meeting the areas Net Zero ambitions. This solution has been put forward on the basis of some key buildings, however it is of note that this is a flexible solution that could accommodate further buildings or areas in future if found to be feasible.

Solar Carports aims to quantify the potential for additional onsite renewable generation. In this instance, it was found the there is limited potential for additional roof-mounted PV and therefore an assessment is carried out for installation of solar carports on the large car parks on site.

Ambient Loop Heating

In its simplest form an ambient temperature heat network moves water around a building, or group of buildings, to deliver heating and cooling via decentralised heat pumps. The ambient loop acts as the water source/sink for water source heat pumps that can provide both heating and cooling. As heat pumps can efficiently deliver both heating and cooling at source/sink water temperatures close to ambient, the insulation requirements for such networks can be eliminated, or at least significantly reduced compared with their higher temperature equivalents. A deficit or excess of heat in the network is most commonly addressed by introducing an element of ground source to the ambient loop. This can be via closed loops of pipe buried or drilled into the ground, or via open loop systems.

In this instance, the source of heat proposed is seawater from Belfast Lough, but the principle remains the same. At this stage, it is assumed centralised heat pump(s) in a dedicated energy centre will be required to upgrade heat from seawater (at 7-15^{0}C) to optimum ambient loop temperatures (15-25^{0}C). Each individual building would then have their own heat pump to raise it to the desired operational temperature.

Using the dataset provided we have outlined a design encompassing the buildings identified in scope. The design is shown to be led by heating (though it is noted that this will be seasonal in nature).

Over time, it is expected that circa 3.5MW$_{th}$ capacity will be required to serve the demands.

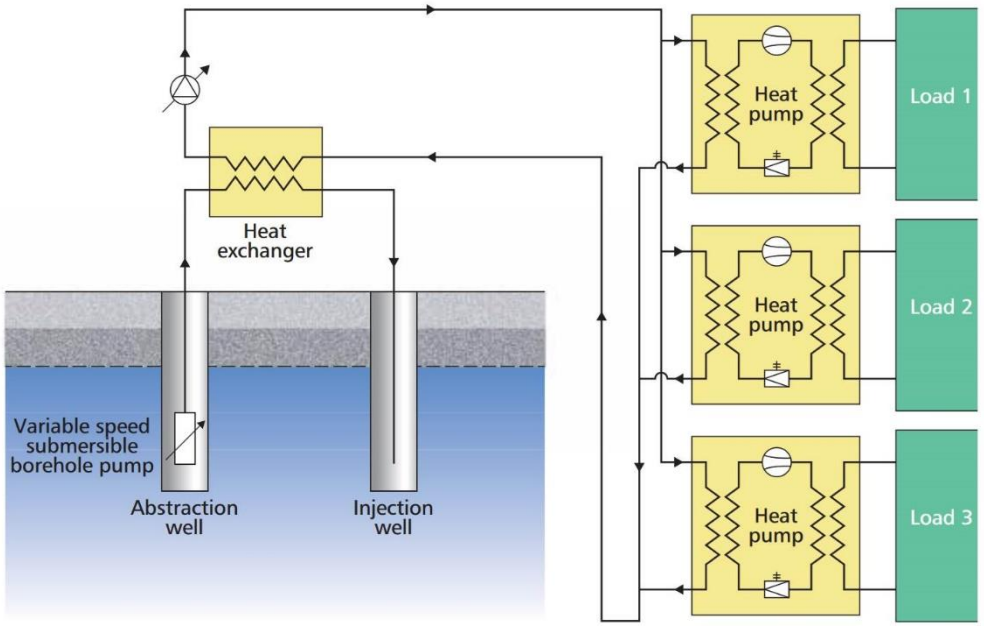
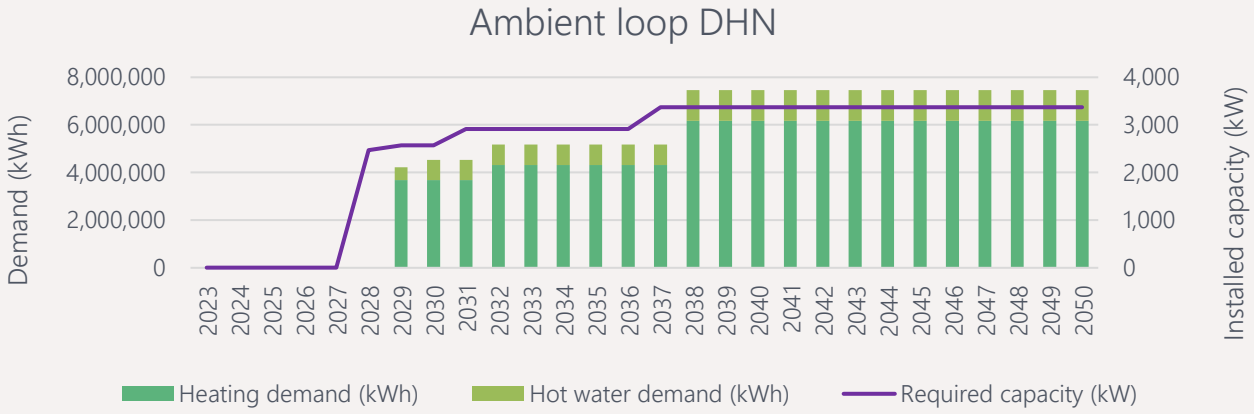


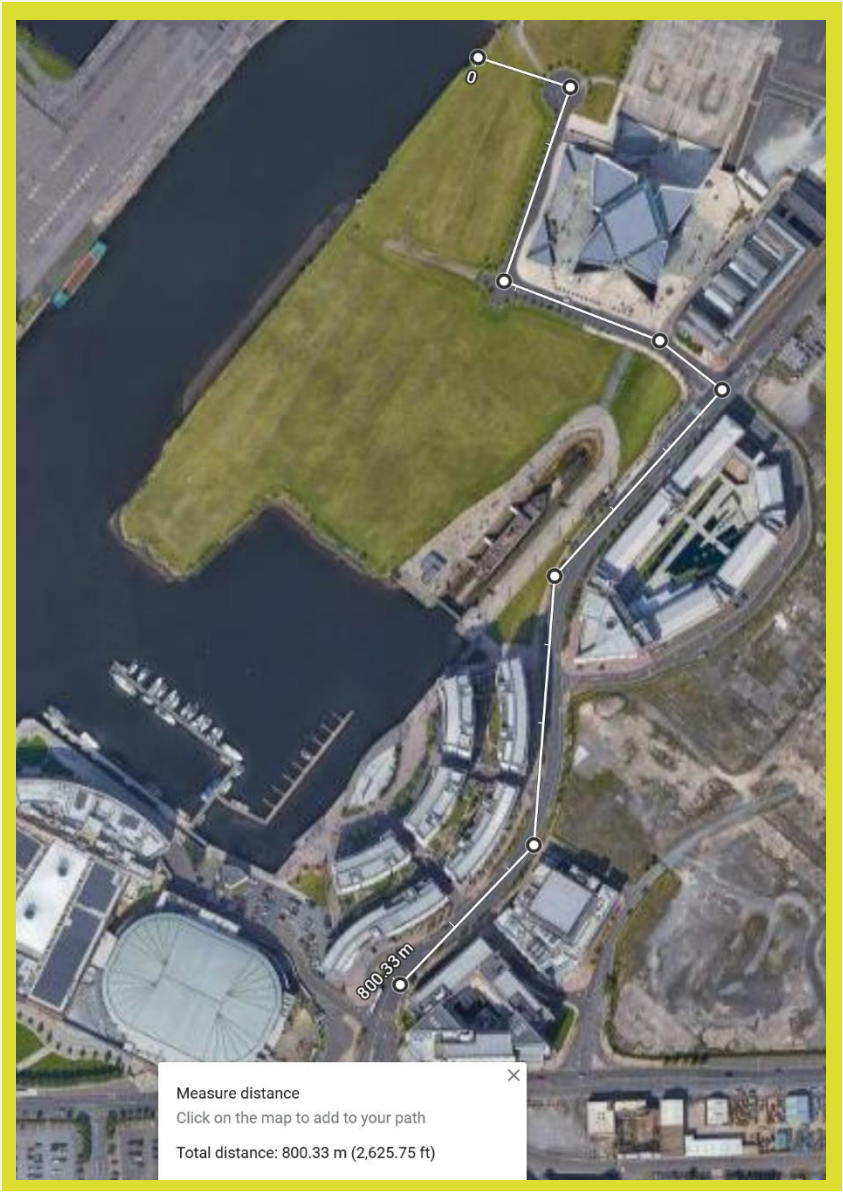
Figure 55 Example of an open-loop ambient temperature network (from CIBSE/GSHPA CP3: CIBSE, 2019a)



Ambient Loop Heating

Key characteristics/metrics of proposed network:

Spine	
Length (m)	800
CAPEX rate (£/m)	1,500
CAPEX (£)	1,200,000
Estimated pipe size (mm DN)	200
Flow temperature (°C)	25
Return temperature (°C)	15
Temperature difference (K)	10
Branch (typical)	
Length (m)	25
CAPEX rate (£/m)	1,500
CAPEX (£)	37,500
Energy centre	
Gross internal floor area (m^2)	250
CAPEX rate (£/m^2)	2,650
CAPEX (£)	662,500
Heat generators (energy centre)	
WSHP capacity (kW)	3,436
SCOP	6.85
CAPEX rate (£/kW)	1,350
OPEX to CAPEX ratio	3.0%
Heat generators (buildings)	
WSHP capacity (kW)	varies
SCOP (heating)	3.15*
SCOP (hot water)	3.15*
CAPEX rate (£/m^2)	450
OPEX to CAPEX ratio	3.0%



* These are conservative values being based on high temperature demand. These could increase to 4-8 for modern, energy-efficient buildings

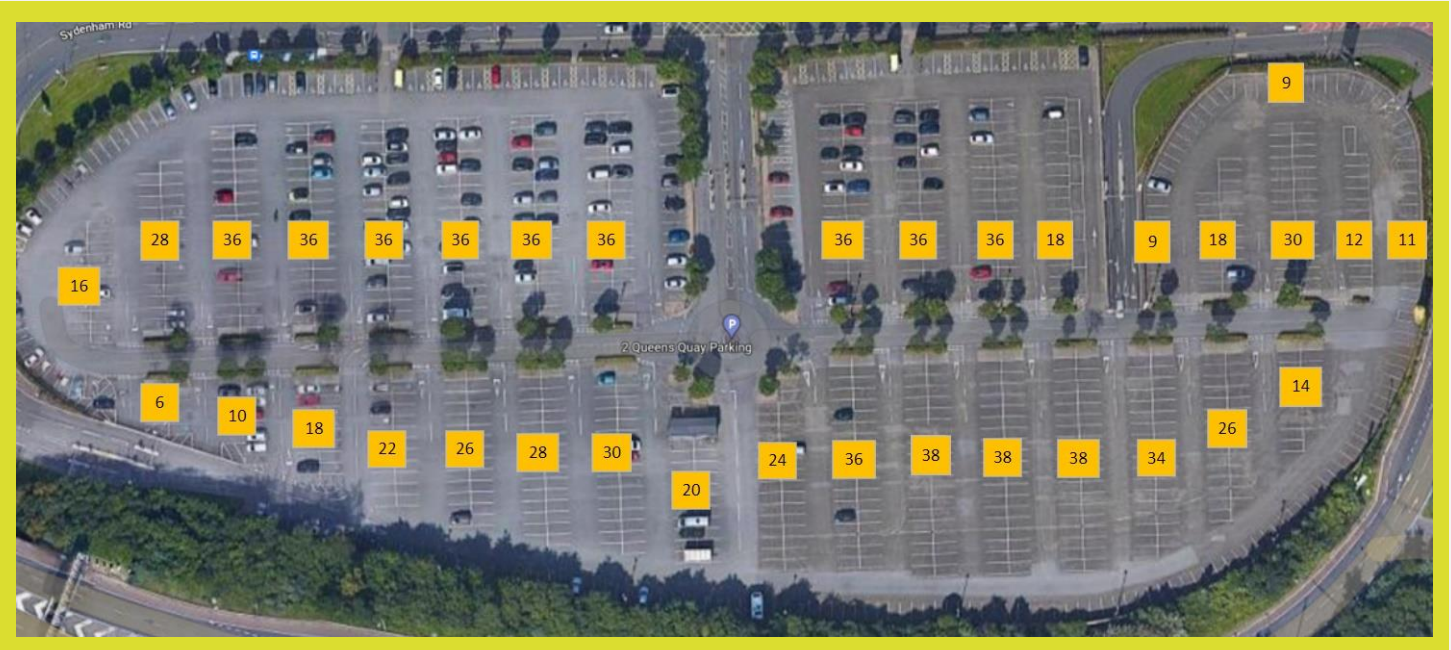
Solar Photovoltaic

Solar Carport A

The study considered the potential to instal solar carports encompassing the car park at Odyssey.

Allowances have been made for accessibility and overshadowing potential. Also included is additional electrical infrastructure to be able to connect this installation to the local network.

In total, it was assessed that there are 883 spaces available for solar carport within the area identified.



Carport A	Metrics
Installation capacity	2,238 kW_p
Annual electricity generation	1,863 MWh
Solar carport cost	£3,003k
Additional electrical infrastructure cost	£305k
Total install cost	£2,767k
Annual operation cost	£49k per year
Simple payback	11 years
Cost per car parking space	£3,401 per space

Assumptions

- Proposed installation over 2026/27
- Full operation/generation not achieved until 2028
- Benefits assessed up to 2050, using Green Book methodology and forecast electricity prices
  - Electricity rate of 69p/kWh in 2023 dropping to 14p/kWh in 2034 until 2050
- Degradation factor (reduction in generation) of 0.5% per year included in modelling
- No export revenue modelled

Solar Photovoltaic

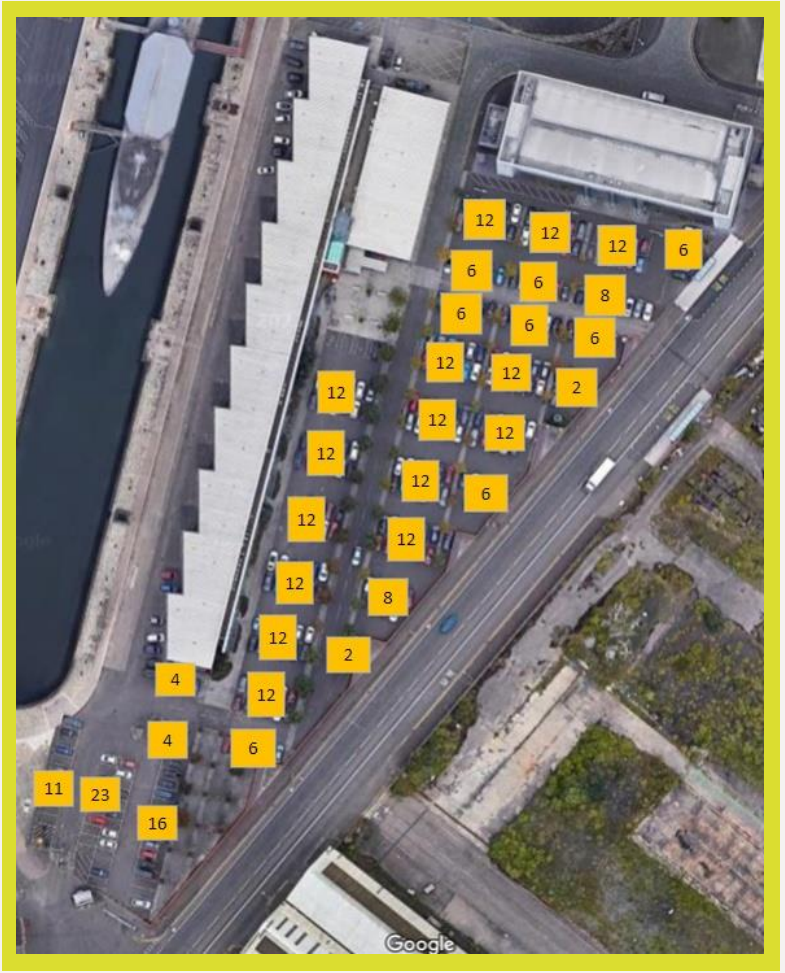
Solar Carport B

The study also considered the potential to instal solar carports encompassing a car park at Catalyst.

Allowances have been made for accessibility and overshadowing potential. Also included is additional electrical infrastructure to be able to connect this installation to the local network.

In total, it was assessed that there are 306 spaces available for solar carport within the area identified.

Same assumptions applied as for option A.



Carport B	Metrics
Installation capacity	776 kW_p
Annual electricity generation	646 MWh
Solar carport cost	£1,036k
Additional electrical infrastructure cost	£102k
Total install cost	£955k
Annual operation cost	£17k per year
Simple payback	11 years
Cost per car parking space	£3,386 per space

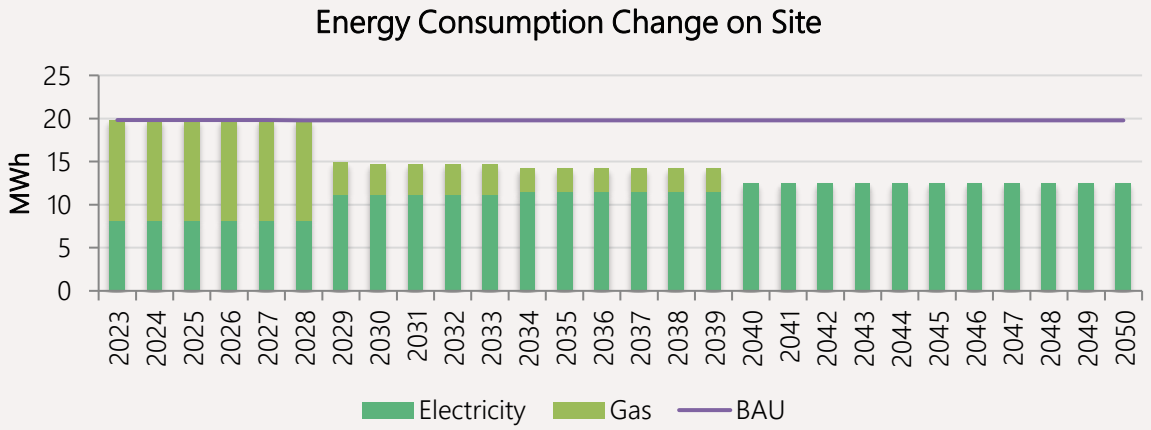
Scenario Summary

- As discussed, the ambient loop heat network has a high upfront cost. However, it is effective at removing the carbon from fossil fuel use in the existing buildings. This results in a good abatement cost, the cost it would take to remove carbon that would otherwise be emitted.
    - There are also additional benefits that have not been modelled such as additional flexibility, integration of waste heat and provision of cooling during the summer

- The purpose of combining onsite electricity generation with the ambient loop heat network is to help offset some of the running costs for heating. It also provides additional resilience to the local network as well as, in the short term, helping to reduce carbon.

- Overall, the plan would help reduce carbon emissions and along with it reduce the total energy consumed (through efficiency gains).

Intervention	Capital expenditure (£k)	Average carbon reduction per annum (tCO_2e)	Internal Rate of Return	Abatement Cost (£/tCO_2e)	Payback
Ambient Loop	9,810	1,795	None	230	None
Solar Carport A	3,003	37	2%	688	11
Solar Carport B	1,036	13	2%	678	11
Feasibility studies*	1,349	-	-	-	-



* 10% allowance for heat and renewable feasibility studies

Evaluation of Wider Benefits

Growing Future Benefits of Ambient Loop (not modelled)

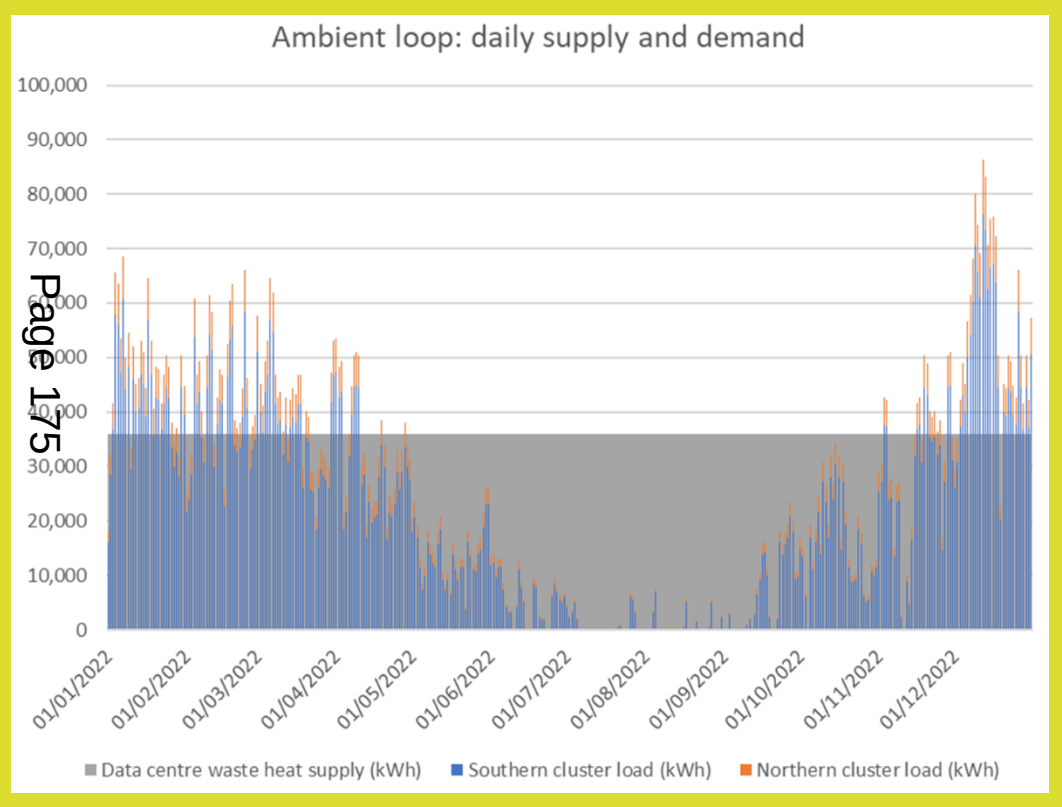
Connect buildings on existing network (potential for Olympic House at end of life, and Thomas Andrews House). This would further benefit the decarbonisation pathway for the whole area.

Connecting to the **Global Innovation Institute** will enable potential waste heat to be utilised within the ambient loop network. Based on the expected waste heat potential, this could be a substantial benefit in terms of operating efficiency and justify the additional capex for the infrastructure.

Extend to Catalyst and therefore maximising the benefit to the wider Queen's Island area. Based on preliminary information the demand would be suitable for an ambient loop solution, which coupled with waste heat from the Global Innovation Institute, would further futureproof the site.

To be assessed as a **design consideration** for any future site development, particularly given the potential from the waste heat, to be included on the network for provision of hot water. Having an existing ambient loop network is also likely to positively impact on the development of the proposed Net Zero Technology Park.

Initial Analysis on Waste Heat



- Preliminary analysis of the heat demands (including Catalyst buildings) suggests that the southern cluster (centred around the Belfast Met) is circa 8 times higher than the northern cluster (Catalyst).
- Possibility to provide a substantial proportion of the heat demand of the whole Queen's Island. This is on the assumption that the Global Innovation Institute would be rejecting around 1.5 MW_{th} of heat between 35-45^{0}C.
- This will substantially increase the efficiency of any heat pumps on the network.
- To further benefit this option, it would be beneficial to consider an aquifer thermal energy storage (ATES) solution. This can be used to store the excess waste heat generated during the summer months where heat is not as high a demand and utilise it better during the colder months (on the basis that hot water demand will be lower than heating demand)
- This approach would also benefit from any additional sources of waste heat from buildings on the site (site cooling plant, etc.)

Conclusions and Recommendations

Conclusions

Emissions Reduction

- This plan has effectively shown a practical approach to achieving Net Zero for the target buildings.
- The timeline to delivering these is challenging but highlights the need to act to achieve targets.

Local Generation

- While there is limited scope for renewable generation on existing buildings, the study provides options for solar carports providing a substantial generation capacity for the area.
- There is also expected to be further rooftop PV capacity installed as part of future development on site.

Costs

- The projected costs and benefits are high, as expected. However, the positives of a good abatement cost (which could help leverage funding) and future stability in annual heating costs for the businesses in the area will undoubtedly further support future development.

Growing Benefits

- The plan highlights some of the potential benefits when incorporating future energy users and waste heat into the network.
- This approach also provides additional flexibility and resilience in the area which will attract future growth.

**Conclusions enable recommended actions and projects in Belfast's Net Zero Pathways*

Appendix

Summary of Queen's Island baseline assessment

Building or plot	Annual fossil fuel import - baseline (kWh)	Annual electricity import - baseline (kWh)	Annual total fuel import - baseline (kWh)	Proportion of total	Heat system capacity - recorded (kW)*	Fossil fuel baseline source	Electricity baseline source	Suitability for heat network connection
Titanic Belfast	4,964,838	1,212,203	6,177,041	15%	1,320	Recorded	Recorded	High
Titanic Hotel	3,451,000	1,518,440	4,969,440	12%	150	Recorded	Recorded	High
SSE Arena	1,132,725	3,651,685	4,784,410	11%	5,100	Recorded	Recorded	High
MET (Belfast Metropolitan College)	1,900,000	1,800,000	3,700,000	9%	1,860	Recorded	Recorded	High
Citi Gateway	363,171	3,136,582	3,499,753	8%	-	Recorded	Recorded	High
Premier Inn	2,018,400	765,600	2,784,000	7%	-	Benchmark	Benchmark	High
W5	419,561	1,352,584	1,772,146	4%	2,500	Recorded	Recorded	High
Olympic House	0	1,745,024	1,745,024	4%	-	Benchmark	Benchmark	High
PRONI	767,079	895,586	1,662,665	4%	500	Recorded	Recorded	High
ARC 2 Bed Apartments	658,224	952,896	1,611,120	4%	-	Benchmark	Benchmark	Medium
Painthall, Media Campus	29,851	834,923	864,774	2%	-	Recorded	Recorded	Low
Oakbank CCP Units	289,907	330,697	620,604	1%	-	Recorded	Recorded	Medium
Concourse 1	263,533	344,246	607,779	1%	585	Recorded	Recorded	High
Concourse 2	263,533	344,246	607,779	1%	600	Recorded	Recorded	High
Concourse 3	263,533	344,246	607,779	1%	600	Recorded	Recorded	High
Pinebank CCP Units	249,858	285,013	534,871	1%	-	Recorded	Recorded	Medium
White Star House	210,826	275,397	486,223	1%	500	Recorded	Recorded	High
ARC 1 Bed Apartments	191,982	277,928	469,910	1%	-	Benchmark	Benchmark	Medium
Innovation Centre	184,473	240,973	425,446	1%	924	Recorded	Recorded	High
CSIT/ECIT Building	184,473	240,973	425,446	1%	400	Recorded	Recorded	High
ARC 3 Bed Apartments	202,000	194,880	396,880	1%	-	Benchmark	Benchmark	Medium
Amazon Warehouse	0	394,320	394,320	1%	-	Benchmark	Benchmark	Medium
Legacy Building	131,766	172,123	303,890	1%	140	Recorded	Recorded	High
Ashbank CCP Units	134,493	153,416	287,909	1%	-	Recorded	Recorded	Medium
Thomas Andrews House	104,954	163,500	268,454	1%	40	Benchmark	Recorded	High
Life @W5	60,714	195,730	256,444	1%	400	Recorded	Recorded	High
ARC Apartments Block A&B	0	252,133	252,133	1%	-	Benchmark	Recorded	Not applicable
Elmbank CCP Units	113,572	129,551	243,123	1%	-	Recorded	Recorded	Medium
Titanic House	126,181	99,142	225,323	1%	-	Recorded	Recorded	High
ARC Apartments Block E&F	0	174,424	174,424	0%	-	Benchmark	Recorded	Not applicable
ARC Apartments Block C&D	0	163,096	163,096	0%	-	Benchmark	Recorded	Not applicable
Titanics Dock & Pumphouse	52,707	68,849	121,556	0%	50	Recorded	Recorded	High
Dock Café	0	37,000	37,000	0%	-	Benchmark	Recorded	High
Total	**18,733,355**	**23,141,728**	**41,875,083**	**100%**	**15,669**			

* Not all data was available for existing capacity

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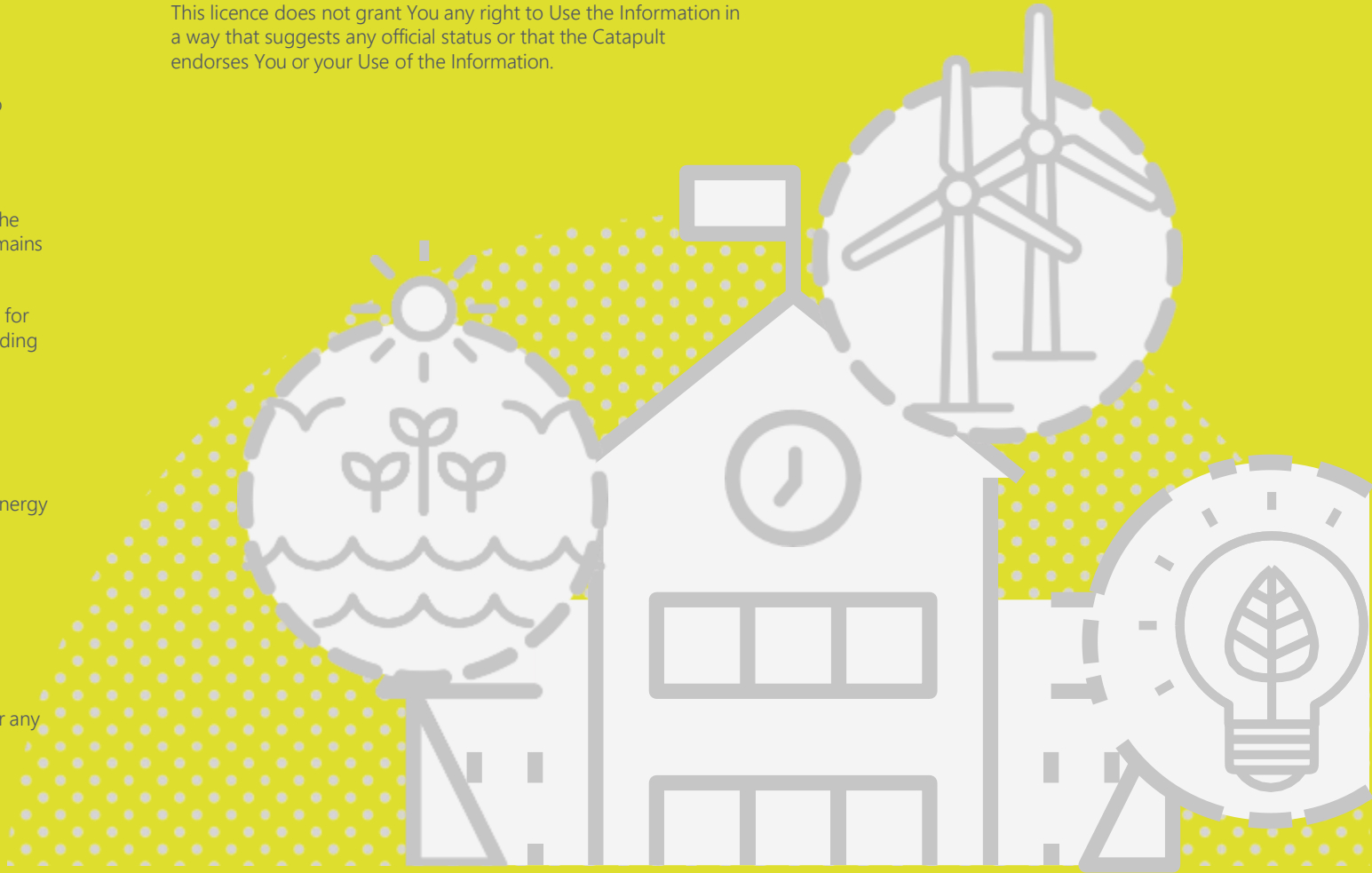

If there are any questions about the method or outputs in this Decarbonisation Plan, then please feel free to contact the Energy Systems Catapult team on:

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Belfast City Council

CLIMATE AND CITY RESILIENCE COMMITTEE

Subject:	Notices of Motion – Quarterly Update
Date:	11th April 2024
Reporting Officer:	John Tully, Director of City and Organisational Strategy Debbie Caldwell, Climate Commissioner
Contact Officer:	Clare Hutchinson, Strategic Planning and Policy Officer

Restricted Reports

Is this report restricted? **Yes** ☐ **No** ☒ x

Please indicate the description, as listed in Schedule 6, of the exempt information by virtue of which the council has deemed this report restricted.

Insert number ☐

1. Information relating to any individual
2. Information likely to reveal the identity of an individual
3. Information relating to the financial or business affairs of any particular person (including the council holding that information)
4. Information in connection with any labour relations matter
5. Information in relation to which a claim to legal professional privilege could be maintained
6. Information showing that the council proposes to (a) to give a notice imposing restrictions on a person; or (b) to make an order or direction
7. Information on any action in relation to the prevention, investigation or prosecution of crime

If Yes, when will the report become unrestricted?

After Committee Decision ☐
After Council Decision ☐
Sometime in the future ☐
Never ☐

Call-in				
Is the decision eligible for Call-in?		**Yes**		**No**	X

1.0	**Purpose of Report or Summary of main Issues**
1.1	The purpose of this report is to update Committee on the progress of all Notices of Motion and Issues Raised in Advance for which the Climate and City Resilience Committee is responsible for.
2.0	**Recommendations**
2.1	It is recommended that the Climate and City Resilience Committee: • Note the updates to all Notices of Motions and Issues Raised in Advance that this Committee is responsible for and • Agree to the closure of Issues' Raised in Advance 277, 278, 316 and 324 as referenced in Appendix 1 and paragraph 3.4 below.
3.0	**Main report**
3.1	<u>Background</u> At SP&R Committee on 25th October 2019, the following Notice of Motion was agreed: "That this Council notes that other Councils produce a monthly status report in relation to Notices of Motion; and agrees Belfast City Council adopts a similar practice and produces a monthly Notice of Motion Update which will be brought to each full Council Meeting, detailing the following: 1. Date received 2. Notice of motion title 3. Submitted by which Councillor 4. Council meeting date 5. Committee motion is referred to 6. Outcome of committee where Notice of Motion will be debated 7. Month it will be reported back to committee 8. Other action to be taken."
3.2	Following a review exercise, a new database containing all Notices of Motion and Issues Raised in Advance at Committee was created and quarterly reporting to Committee commenced in March 2021. Appendix 1 is the latest quarterly update showing all active Notices of Motions and Issues Raised in Advance which the Climate and City Resilience Committee is responsible for.
3.3	**Closure of Notices of Motion and Issues Raised in Advance** At SP&R Committee on 20th November 2020, it was agreed that Notices of Motion could be closed for one of two reasons: • Notices of Motion which contained an action(s) that has been completed; and • Notices of Motion have become Council policy.
3.4	The Climate and City Resilience Committee are asked to agree that the Issues' Raised in Advance as outlined below are now closed:

	Category 1 Recommended Closures: • **New Ireland Forum and Citizens' Assemblies (Ref 278) -** This Issue Raised in Advance called on the Council to write again to the Taoiseach's office regarding the establishment of a New Ireland Forum for the 21st Century, alongside a series of comprehensive Citizens' Assemblies, to examine the practical, social and economic aspects of a New Ireland. The Council wrote again to the Taioseach Office on 23 January 2023 and as of yet no reply has been received. Therefore it is recommended that this Issue Raised in Advance is now closed. • **Felling of trees in Orangefield Park (Ref 316) –** This Issue Raised in Advance relates to the felling of approximately one hundred and seventy trees in Orangefield Park by contractors, acting on behalf of N.I.E. The Member requested to be furnished with information on the circumstances surrounding the decision to fell the trees, the agreement which was in place between the Council and N.I.E., the cost of the tree restoration programme and what legal redress the Council might have in the matter. At the Dec 23 Committee an update was provided by the Neighbourhood Services Manager on learning from the incident and changes to working practices associated with the tree cutting undertaken by contractors, working on behalf of NIE. Therefore it is recommended that this Issue Raised in Advance is now closed. • **Proposed agenda items for future meetings (Ref 324) –** This Issue Raised in Advance requested that consideration be given to the inclusion of four agenda items for discussion at suitable future dates. Two of the four themed presentations requested (Passivhouse and Embedded Carbon) were included in the Dec 23 Climate and City Resilience Committee. The other two items requested relate to active travel which is covered by the City Growth & Regeneration Committee. Therefore it is recommended that this Issue Raised in Advance is now closed. Category 2 Recommended Closures: • **Energy Efficiency Education Programme for Citizens (Ref 277)** – This Issue Raised in Advance made a recommendation that Belfast City Council should develop an energy efficiency campaign to educate and inform citizens around how to conserve energy use and attempt to reduce the financial pressures households will face, working alongside relevant partners in both government and the community sector. In 2022 an Energy Efficiency Campaign was run through the Community Planning team, producing advice materials, delivered in a targeted manner through community services, advice centres and outreach teams. A similar approach was taken during the 23/24 winter period, including energy efficiency guidance and tips being included in the 2023/2024 'Cost-of-Living Support Guide'. This work will be reviewed with the aim of developing resources that can be delivered on an ongoing basis and in a targeted manner. Therefore it is now recommended that this Issue Raise in Advance is now closed.
3.5	<u>Financial & Resource Implications</u> There are no additional financial implications associated with this report
3.6	<u>Equality or Good Relations Implications/Rural Needs Assessment</u> There are no equality, good relations or rural needs implications contained in this report.
4.0	**Appendices**
	Appendix 1: Notices of Motion Live Database – Climate and City Resilience Committee

Belfast City Council Notice of Motion Database

Ref	Type	Meeting Date	Duration	Motion Title	Proposed by	Committee	Reporting Officer	Lead Department	Status	Status Update
277	Issue Raised in Advanc	13/10/2022	1y 5m	Energy Efficiency Education Programme for citizens	Cllr Brian Smyth	Climate and City Resilience	John Tully	City & Organisational Strategy	Recommend Close	In 2022 an Energy Efficiency Campaign was run through the Community Planning team, producing advice materials, delivered in a targeted manner through community services, advice centres and outreach teams. A similar approach will be taken to raise awareness during the incoming 23/24 winter period, including energy efficiency guidance and tips being included in the 2023/2024 'Cost-of-Living Support Guide' which has been disseminated widely across the city including being available in 100 public and community buildings as well as via the Council website This will be reviewed with the aim of developing resources that can be delivered on an ongoing basis and in a targeted manner.
278	Issue Raised in Advanc	13/10/2022	1y 5m	New Ireland Forum and citizens Assemblies	Cllr Seamas de Faoite	Climate and City Resilience	Nora Largey	Legal & Civic Services	Recommend Close	Council did write again to the Taioseach Office on 23 January 2023. No reply has been received.
316	Issue Raised in Advanc	15/06/2023	0y 9m	Felling of Trees in Orangefield Park	Cllr Brian Smyth	Climate and City Resilience	John Tully	Legal & Civic Services	Recommend Close	The Dec 23 Committee noted an update provided by Mr. Stephen Leonard, Neighbourhood Services Manager on the next steps and learning from the incident and changes to working practices associated with the tree cutting undertaken by contractors, working on behalf of NIE, at Orangefield Park
317	Issue Raised in Advanc	15/06/2023	0y 9m	Climate and City Resilience Dashboard	Cllr Tara Brooks	Climate and City Resilience	John Tully	City & Organisational Strategy	Ongoing	Work with AWS is complete and the Climate Team will be working with our own internal digital services to build the solution. Work on this will begin June 2024
324	Issue Raised in Advanc	10/08/2023	0y 7m	Proposed agenda items for future meetings	Cllr Tara Brooks	Climate and City Resilience	John Tully	City & Organisational Strategy	Recommend Close	Two of the four themed presentations requested (Passivhouse and Embedded Carbon) were included in the Dec C&CR Committee. The other two items requested relate to active travel which is covered by the CG&R committee.

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