

Energy Transition Region

ETR Strategic Outline Case
Greater Manchester Combined Authority

4 October 2019

Contains *sensitive* information



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Introduction

Introduction text

Executive summary

This Document

This document provides the Strategic Outline Case (SOC) for the establishment of an Energy Transition Region (ETR) for Greater Manchester. In line with Treasury Green Book Guidance the SOC is intended to make the case for change and explore the preferred way forward. The planning phase and any subsequent procurement should be recorded in an Outline Business Case (OBC) and Full Business Case (FBC) respectively; both of which follow the SOC.

The SOC is structured as follows:

1. Introduction: Overview of the energy sector in Greater Manchester, and the national and local policy context
2. Strategic Case: Strategic context, rationale and objectives for Greater Manchester
3. Economic Case: Identification and appraisal of options for the proposed ETR
4. Commercial Case: Discussion of potential commercial arrangements upon which the ETR could be established
5. Financial Case: Discussion of potential means of funding for the establishment and ongoing delivery of the ETR
6. Management Case: Outline of the arrangements to be put in place to deliver, monitor and evaluate the implementation of the ETR

1. Introduction

This section provides an overview of the energy sector in Greater Manchester and the national and local policy context. It sets out the broader ambitions before considering, in the Strategic Case that follows, the more specific strategic objectives for Greater Manchester and the challenges faced in achieving its goals.

1.1. Overview of energy in the Great Manchester Area

Greater Manchester Combined Authority (GMCA) has the target of being carbon neutral by 2038. The Greater Manchester (GM) region is at the forefront of tackling the challenge of climate change through the reduction of carbon emissions. The carbon neutral target will be supported through the transition to a smarter and cleaner energy system. Greater Manchester aims to become a “carbon neutral city region”, with a transformed energy system which is based on being fit for the future, low carbon, smart and sustainable, both economically and environmentally.

1.2. Local policy Overview

1.2.1. Greater Manchester

5-Year Environment Plan – Greater Manchester has the vision to become a clean, carbon-neutral, climate resilient region, with the mitigation of climate change the most significant environmental challenge. There is an urgent need to reduce emissions produced by energy through shifting away from fossil fuels towards renewable energy sources. Three key priorities for the energy sector include:

1. Increasing local renewable electricity generation;
2. Decarbonising the heating of buildings; and
3. Increasing the diversity and flexibility of energy supply.

Greater Manchester Strategy – Our People, Our Place – The energy sector is a key component of one of the 10 priorities for GM. Priority 7, “a green city for all”, will be realised through the generation of local low carbon energy to tackle climate change. In order for the region to reduce carbon emissions, the methods for supplying, managing and consuming energy need to be transformed, including the development of new, renewable energy sources and improvement of the whole energy system.

Greater Manchester Spatial Strategy – This strategy highlights the importance of improving energy efficiency, including low carbon generation and storage of energy for decarbonising the Greater Manchester economy. The GMCA is committed to being carbon neutral by 2038. This goal will be supported by numerous measures:

- Promotion of low carbon energy schemes and networks;
- Introduction of a balanced and smart electricity grid;
- Minimisation of energy demand;
- Maximisation of energy efficiency; and
- Utilisation of low carbon, renewable energy sources.

Climate Change and Low Emissions Implementation Plan – This plan sets out the strategic actions Greater Manchester intends to deliver from 2016 to 2020 in order to fulfil its Climate Change Strategy (2012) and Low Emissions Strategy (2015). The plan aims to deliver the following five outcomes:

1. Make a rapid transition to a sustainable low carbon economy;
2. Reduce collective carbon emissions by 48%;
3. Be prepared for and actively adapt to a rapidly changing climate;
4. Embed low emission behaviours into the culture of our organisations and lifestyles; and
5. Meet all the EU thresholds for key air pollutants at the earliest date.

1.2.2. Wider Policy

Northern Energy Strategy – The strategy aims to transform the north into a leading low carbon energy region by 2050. The region hopes to create an energy economy worth £15bn per annum, providing 100,000 green jobs for the region and supplying clean, affordable energy to customers. The strategy aims to achieve this by building on existing strengths in renewable energy, including hydrogen, tidal and marine energy and new forms of energy storage, along with energy innovation.

Science and Innovation Audit (Greater Manchester and Cheshire East) – The SIA recognises energy as an area with fast-growth potential, with a wide range of key assets across the sector that need to be fully utilised. The region has leading positions in nuclear research, low carbon generation, transmission and storage, these areas must be capitalised on to maximise the benefits to Greater Manchester and Cheshire East.

Realising the Opportunities of Decarbonisation in the North of England – There are big opportunities for the north of England to be the centre point for low-carbon energy economies, with the possibility of creating 46,000 jobs by 2030 in the power sector. This report emphasises the importance of effective management during the transition to a low carbon industry. This will ensure the region capitalises on local strengths and delivers a “high-skill, high-wage, low-carbon economy of the future”. The three main challenges identified are:

1. Lack of policy certainty and ambitions;
2. Failure to put a just transition at the heart of decarbonation policy; and
3. An ill-equipped skills system.

The report made several recommendations with regards to the long-term certainty and devolved powers, a Just Transition Commission and Just Transition Funds for the North and skills standards and funding.

There are major national, regional and local challenges, and Greater Manchester is particularly ambitious in its carbon neutral objectives. The policies that have been established within Greater Manchester and the wider region to tackle the energy challenges show a clear commitment to supporting and promoting the carbon neutral aspiration.

The Strategic Case in the section that follows sets out the specific opportunities, challenges and barriers to the innovation required in the energy sector to meet the goals of Greater Manchester.

2. Strategic Case

The Strategic Case sets out in the specific challenges that Greater Manchester faces in achieving its 2038 carbon neutral target. The barriers and opportunities to closing the 'innovation gap' are described and how the concept of an Energy Transition Region for Greater Manchester can help to overcome this gap.

2.1. The Strategic Challenges

Emissions Reduction:

In 2015/16 the Greater Manchester region emitted 12.5 MtCO₂, through 51.6 TWh of energy usage.¹ In order to be compliant with the 2015 United Nations Climate Change Conference Paris agreement, emissions will need to be reduced by 15% per annum over the next 5 years. The vision of GMCA to be carbon neutral by 2038 has further increased the requirement to reduce emissions relating to energy generation and usage.

Population Growth:

The region is expected to experience strong population growth through to 2035, which is estimated to lead to a 3% increase each year in energy demand, this will correspond to an additional 2,400 GWh of additional energy usage per year.

Energy Generation and Supply:

- Currently only 2.5% of electricity used in Greater Manchester is generated using renewable energy sources within the region.² This is almost half the national average by household. Uptake rates are poor, and it is estimated that only a quarter of the renewable energy potential of the city region is utilised.
- Gas is the main source of heating across the region with 95% of homes connected to the gas grid. There are a small number of microscale heat networks, along with an estimated 1,000 electric heat pumps functioning across the region. There are opportunities to introduce hydrogen into the gas grid to reduce carbon, however due to technical and cost implications, this is currently not viable.
- In terms of diversity and flexibility of energy supply, at present the major energy infrastructure in the Greater Manchester region is configured to supply homes and other buildings with electricity from power stations. Currently the region has 750kW of storage, including 500kW used for research purposes.³

CO₂ emissions have however declined significantly over the last three decades; 39% from 1990 to 2015, predominantly due to changes in energy production at a national level, through a shift from coal to gas and offshore wind.

The Innovation Gap:

The graph below shows the challenge that GMCA will face reducing emissions to become carbon neutral by 2038. The Tyndall budget is the recommended pathway for cuts in emissions for Greater Manchester from the Tyndall Centre for Climate Research. The other pathways use the SCATTER model, which is based on implementing over 40 different interventions to different extents. The SCATTER Level 4 line shows the reduction in carbon emissions pathway when all interventions are pulled through to the maximum extent, while the SCATTER GM line is based on a pathway of what is currently planned in GM and what might be achievable in the future.

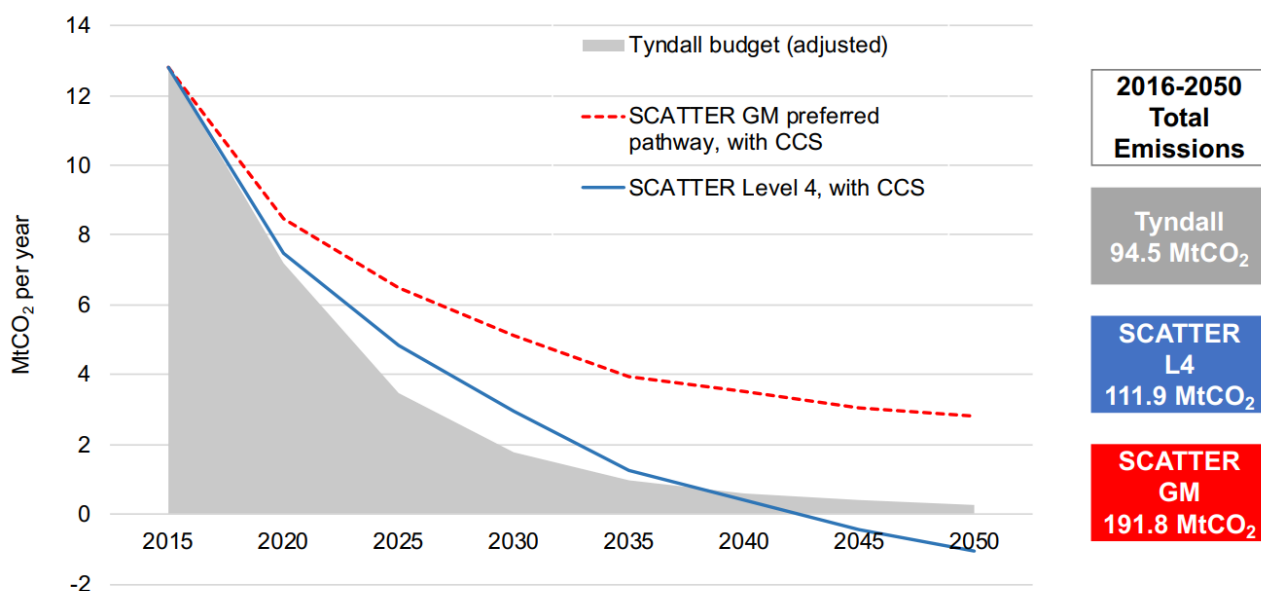
¹ GM Smart Energy Plan

² 5-year Environment Plan for Greater Manchester 2019-2024

³ 5-year Environment Plan for Greater Manchester 2019-2024

The pathways predict a substantial gap between expectations and the current trajectory, and even when the SCATTER Level 4 pathway implemented, total emissions produced from 2016-2050 are almost 20% higher than what should be produced in the Tyndall Centre's recommended pathway. Innovation in the energy sector is crucial to closing this gap and shifting Greater Manchester onto a pathway which reflects the Tyndall Centre's recommendation for carbon emissions.

Figure 1 - Potential Carbon Reduction Pathways for GM



Source: 5-Year Environment Plan for Greater Manchester

With both emissions needing to be reduced and energy usage expected to increase, it is clear that if Greater Manchester continues on its current path, it will not meet its aspiration of being carbon neutral by 2038. There therefore needs to be a transformative shift in the energy sector to enable innovation in new low carbon technology.

2.2. Barriers to Innovation in Greater Manchester

There are three key barriers which we have identified using information from GMCA, workshops and interviews with key contacts in the energy sector in Greater Manchester and our extensive industry knowledge:

1. **Engagement and collaboration between key stakeholders:** There are excellent examples of collaboration across Greater Manchester's energy sector with a number of networks already established (examples); however, the scope of these are limited with no formal overall focal point and joined up approach to innovation and the carbon neutral agenda.
2. **Difficulty securing funding/finance:** Sources of funding are available to support innovation in energy; however, innovators are often not clear on what funding they may be eligible for or how to secure it and in many cases, don't have the resources or necessary skills to successfully apply.
3. **Regulatory and policy:** Regulation and policy is seen as a potential barrier to innovation and this can in different cases be a real or perceived barrier. Regulation and policies need to be forward looking and future-proof, allowing individuals and organisations flexibility and opportunities to innovate. The energy sector needs to promote innovation by creating policies which improves the risk vs. reward trade-off related to innovation within the energy sector, allowing innovators to make returns on successful new products. Closing the innovation gap will require effective engagement with the regulator and policy makers.

Numerous other issues have been identified and discussed in stakeholder workshops and interviews. Many of these relate to the difficulties in the overall 'process of innovation'; stimulating sufficient ideas that address the right problems and opportunities in Greater Manchester, prioritising the innovations that will deliver the greatest benefit to achieving the net zero carbon target, and ultimately commercialising them to achieve the best outcomes. Inherent to this is a real or perceived gap in procurement routes available to support innovation and concerns around a growing skills gap.

2.3. Strengths and Opportunities in Greater Manchester

In contrast to the barriers to innovation in the energy sector, there are also a number of strengths and opportunities to build on in overcoming these barriers and closing the innovation gap. These include:

1. **Ambition:**

The strategies and plans described in the Introduction (section 1) clearly show the level of aspiration for Greater Manchester. The carbon neutral 2038 target is an ambitious statement of intent.

2. **Stakeholder Commitment:**

The engagement with stakeholders in developing the Strategic Outline Case demonstrated a very strong agreement with the need to explore different approaches to achieving the energy goals for Greater Manchester. This included local government, academia, utility companies and private sector stakeholders.

3. **Current Innovation Landscape:**

Greater Manchester has an established track record of innovation in energy and is playing a leading role in the development of, for example, hydrogen fuel and graphene applications.

2.4. Energy Transition Region

The concept of an Energy Transition Region (ETR) is proposed as a means of overcoming the barriers and leveraging the strengths and opportunities to close the innovation gap in Greater Manchester.

The ETR will promote energy innovation in Greater Manchester by bringing together key stakeholders in the industry; including universities, SMEs, large commercial businesses, utilities and public organisations. This connects important local energy assets, ensuring they are fully utilised and work together to create low carbon energy solutions. It aims to create a future proof energy system, which is underpinned by innovative technology and smart networks.

Along with accelerating innovation, the ETR will focus on upscaling deployment through smart technology and services, integration and optimisation. It will bring together the whole range of regional and national stakeholders to share knowledge, agree priorities, develop processes, services and technologies and deploy innovations onto the grid.

It is envisioned that the ETR will speed up the pace of delivery of innovative, carbon-neutral ideas and products within the energy sector. This will be crucial for GM, as urgent action is needed if the carbon-neutral target is to be reached by 2038. If Greater Manchester continues down its current path for the foreseeable future, then the target will become unachievable.

The proposed ETR intends to provide energy security to households, communities and businesses, as well as optimising economic opportunities and minimising costs to taxpayers. These changes will be brought about as the region becomes a leader in smart energy innovation and delivering a decarbonised energy system. Innovative business models, governance and funding solutions will be key enablers to realising this vision and it is crucial that the ETR focuses on a fully integrated, whole system approach.

The aim of the ETR would be to accelerate creation, deployment and uptake of new innovative carbon neutral products and systems for the energy sector. The purpose of the proposed ETR will be to:

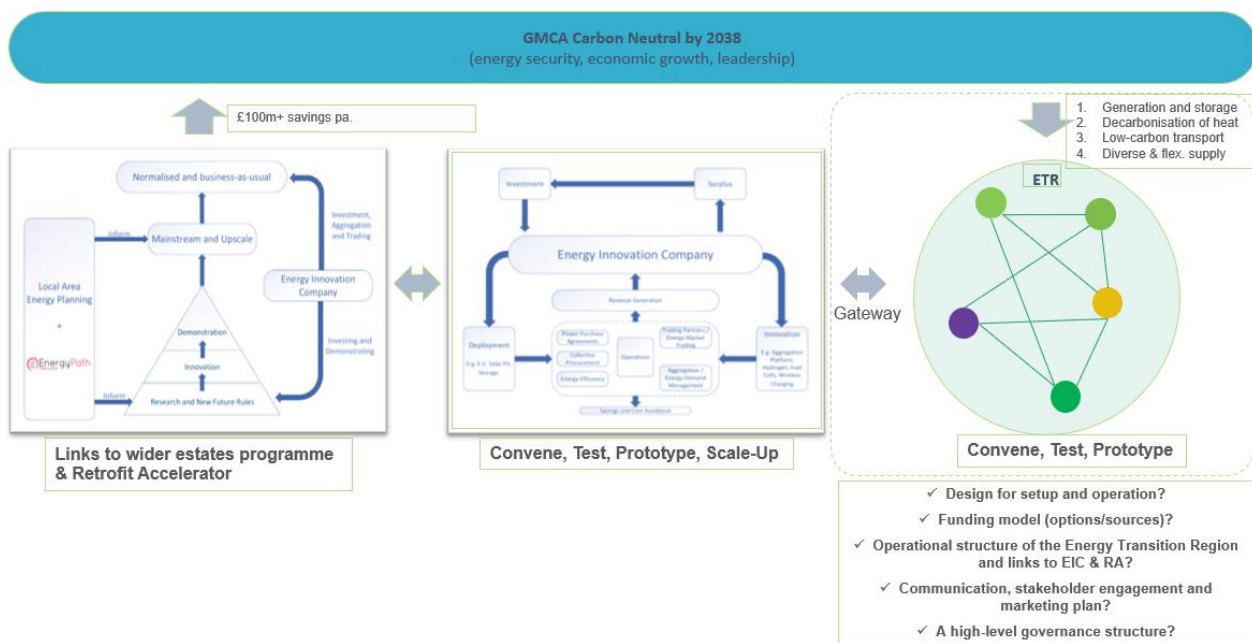
1. Facilitate the provision of innovative and digitally enabled smart energy systems and energy services;
2. Monitor the 'innovation gap', identifying specific opportunities for innovation and proactively encouraging the sector to develop solutions;

3. Facilitate and support access to sources of funding for energy innovations in Greater Manchester;
4. Optimise local assets to open ancillary markets;
5. Improve the connection between local generation and smart networks and consumers in Greater Manchester;
6. Facilitate derogation on a case-by-case basis through accelerated, agreed processes and procedures with Ofgem; and
7. Support and integrate the longer-term proposals for a Greater Manchester Energy Innovation Company and Retrofit Accelerator.

Ultimately it is envisaged that an Energy Innovation Company (EIC) will be established through evolution of the ETR and will seek to accelerate delivery, upscale and mainstream innovations from the ETR using public sector assets. The EIC will promote innovative financing and delivery mechanisms, bringing together public, commercial, industry and citizens.

The Retrofit Accelerator will act as an intermediary between current operators in the retrofit market in the construction sector and potential customers.

Figure 2 - How the ETR will support the Carbon Neutral Target



The appropriate governance and processes will need to be in place to enable an innovation-accelerating atmosphere, while ensuring the grid is secure and consumers are protected.

The ETR will promote the development of projects from any point on the Technology Readiness Levels, testing these projects in real world environments, including consumer homes or businesses, with appropriate consumer protection. GMCA has a number of existing demonstrators which will inform the ETR and shape processes going forward.

The ETR will take a systemic approach to transforming the system to achieve its zero carbon ambitions, with multiple complementary, innovative projects being carried out in parallel.

The ETR will enable exploration of multi-vector solutions and their interaction with the whole energy system. In order to create an innovative environment, various local stakeholders will be required to collaborate, including utilising living demonstrators, simulators and test lab capabilities. This will provide end-to-end integration opportunities of how technologies can connect to the energy system, with feedback from customers on how service models are received.

It will be important to ensure that the ETR does not operate in isolation, but works with and utilises other key organisation within the energy space in GM. This will enable the ETR to maximise the beneficial impact it has

on support GM's goal of being carbon-neutral by 2038. Two key organisations within the GM region which are currently promoting low carbon energy are:

1. Greater Manchester Low Carbon Hub – The GM Low Carbon Hub is responsible for developing and carrying out the delivery of the Greater Manchester Climate Change Strategy and other key environmental plans and priorities. The hub promotes environmental sustainability across the region, with a diverse group of members, including key individuals and organisations in GM.
2. GM Green Switch – This is a partnership between Big Clean Switch and GMCA, which is trying to promote households and businesses to switch to a low carbon energy supply. The partnership provides a service which eases the switch to a green energy supplier through providing information on different options and the cost of each option, along with enabling the switching process by contacting your existing and future energy supplier.

The experience and knowledge acquired by the ETR will help inform and shape the future of energy regulation and local and national policy. Through the ETR, the GMCA aspires to become a leader in the UK energy market, transforming the Greater Manchester into a greener, more climate resilient region.

3. Economic Case

The Economic Case identifies a number of options that Greater Manchester could pursue in establishing the concept of an Energy Transition Region to address the innovation gap as described in the Strategic Case. The options have been developed with the support of discussions with key stakeholders in one-to-one meetings and workshops. Each option is appraised in terms of their estimated costs and the expected advantages and disadvantages of each approach.

The scope of this business case is to establish the model by which an ETR could accelerate innovation in Greater Manchester. Its purpose is not to assess current and likely future innovations, specific gaps or solutions to addressing the carbon neutral challenges. The options proposed are to provide the vehicle which will be responsible.

Options are not mutually exclusive and the ETR is expected to evolve over time. The purpose of this appraisal has been to identify a preferred option for the initial launch of the ETR in Greater Manchester:

1. The **Do-Nothing** option maintains the status quo with Greater Manchester continuing on its current trajectory with respect to reducing emissions.
2. The **ETR Support** option brings key stakeholders together to set and steer the strategy and direction for Greater Manchester and provides minimal support to the GM energy sector via a 'light touch' innovation hub on a case-by-case basis.
3. The **ETR Lead** option provides an established ETR Board and Steering Group with an innovation hub co-ordinating support and administration for innovation in the GM energy sector. Specific subject matter experts within the ETR will proactively enable innovators to overcome barriers to innovation.
4. The **ETR Drive** option builds on the ETR Lead option to directly provide a wider range of subject matter expertise and support to innovation in the energy sector.

The diagram below shows the key elements of the proposed ETR; highlighting which elements are included in each option.

Figure 3 – Key elements in each ETR Option

	Do Nothing	ETR Support	ETR Lead	ETR Drive
ETR Board	No	Yes	Yes	Yes
ETR Steering Group	No	Yes	Yes	Yes
Innovation Director	No	Part-Time	Full-Time	Full-Time
Policy/ Regulatory Lead	No	No	Part-Time	Full-Time
Commercial/ Financial Lead	No	No	Part-Time	Full-Time
Engagement Lead	No	No	Part-Time	Full-Time
Procurement Lead	No	No	No	Full-Time
Skills Development Lead	No	No	No	Full-Time

The roles and responsibilities of the ETR functions are described in Appendix A.

The table below provides an initial appraisal of the four options; considering an estimation of costs to implement and deliver the ETR and the key advantages and disadvantages of each approach.

The costs are at this stage approximate estimations of implementation (including outline/full business case development where relevant) and ongoing annual costs of running the ETR. All costings should be revisited in more detail during the subsequent planning (Outline Business Case) stage.

3.1. Options Appraisal

Table 1 - Options Appraisal

Option	Description	Key Advantages	Key Disadvantages	Indicative Costs	
1	Do Nothing	Maintain the status quo and GM continues on current trajectory	<ul style="list-style-type: none"> Incurs no additional cost or effort 	<ul style="list-style-type: none"> Very high risk of GM meeting its carbon neutral 2038 target Risks to stakeholder commitment and joined up approach to carbon neutral agenda 	<p>Implementation costs: £0</p> <p>Ongoing costs: £0 per annum</p> <p>Total costs (Years 1 – 5): £0</p>
2	ETR Support	Provide minimal structure, direction and support to the GM energy sector on a case-by-case basis.	<ul style="list-style-type: none"> Provides the means for stakeholders to agree strategy and direction for the carbon neutral agenda Establishes a ‘front door’ for support to energy innovation Low level of complexity for implementation and management Achievable relatively quickly within existing stakeholder organisations 	<ul style="list-style-type: none"> ETR likely to act passively due to resource constraints and therefore fail to make the necessary impact to close the innovation gap Risk of losing stakeholder commitment if benefits of ETR are not easily recognised Does not provide targeted support to overcoming barriers to innovation 	<p>Implementation costs: £100k</p> <p>Ongoing costs: £175k per annum</p> <p>Total costs (Years 1 – 5): £917k</p> <p>Based on 4-month implementation period</p>
3	ETR Lead	Provides structure, direction and support to the GM energy sector plus subject matter expertise to support overcoming priority barriers to innovation.	<ul style="list-style-type: none"> Provides a firm focus on a joined-up strategic approach to the carbon neutral agenda Provides the resources for a more proactive approach to accelerating innovation Offers subject matter expertise to help overcome the most significant barriers to innovation 	<ul style="list-style-type: none"> No provision for subject matter expertise to help overcome the Likely to require some organisational changes to be most effective 	<p>Implementation costs: £200k</p> <p>Ongoing costs: £360k per annum</p> <p>Total costs (Years 1 – 5): £1.73m</p> <p>Based on 9-month implementation period</p>
4	ETR Drive	Provides structure, direction and support to the GM energy sector plus subject matter expertise to support overcoming a wide range of barriers to innovation.	<ul style="list-style-type: none"> Provides the advantages of the ETR lead option plus a wider range of subject matter expertise to overcome barriers to innovation. 	<ul style="list-style-type: none"> Will require organisational changes and potentially the need to establish a special purpose vehicle Implementation timescales and effort required likely to be significant 	<p>Implementation costs: £750k</p> <p>Ongoing costs: £680k per annum</p> <p>Total costs (Years 1 – 5): £3.47m</p> <p>Based on 12-month implementation period</p>

3.1.1. Cost Assumptions

Implementation costs for each option include development of the Outline and Full Business Case plus the project management and specialist input (legal, HR, procurement, etc.). They are approximate estimates based on similar instances where third-parties have been commissioned.

The implementation costs are expected to be reduced if delivered in-house by GMCA and/or other stakeholders. No market testing or implementation planning/resourcing has been conducted at this stage. This should be carried out in the subsequent Outline Business Case stage.

Ongoing costs of operating the ETR are based on employee costs only as per the table below.

Table 2 - Summary of Costs

	ETR Board	ETR Steering group	Innovation Director	Innovation Hub	Enabler Leads	Total Cost (per annum)
Assumed average employee cost	£100k	£80k	£60k	£40k	£50k	
Do nothing (FTE)	0	0	0	0	0	£0
ETR Support (FTE)	0.25	1	0.5	1	0	£175k
ETR Lead (FTE)	0.25	1.5	1	2	1.5	£360k
ETR Drive (FTE)	0.5	2	1	4	5	£680k

3.1.2. Benefits of an Energy Transition Region

The proposed Energy Transition Region for Greater Manchester intends to provide focus, strategic direction and to accelerate innovation to achieve the carbon neutral ambition by 2038.

The costs and benefits of innovation proposals will be assessed, selected and supported through their lifecycle by the ETR once it is established.

The negative effects of climate change caused by carbon emissions are many, ranging from extreme weather events such as flooding, heatwaves and storms, to increased spread of disease and reduced security for water and food supplies. These effects can cause severe financial impacts to businesses and families through rising healthcare costs, increased food prices and destruction of property. The intensity and frequency of climate related weather events are only likely to increase. To cover some recent relevant examples, the estimated cost of the 2016 Manchester Boxing Day floods was £6.5m. Manchester and Stockport also experienced a flood event in August this year.

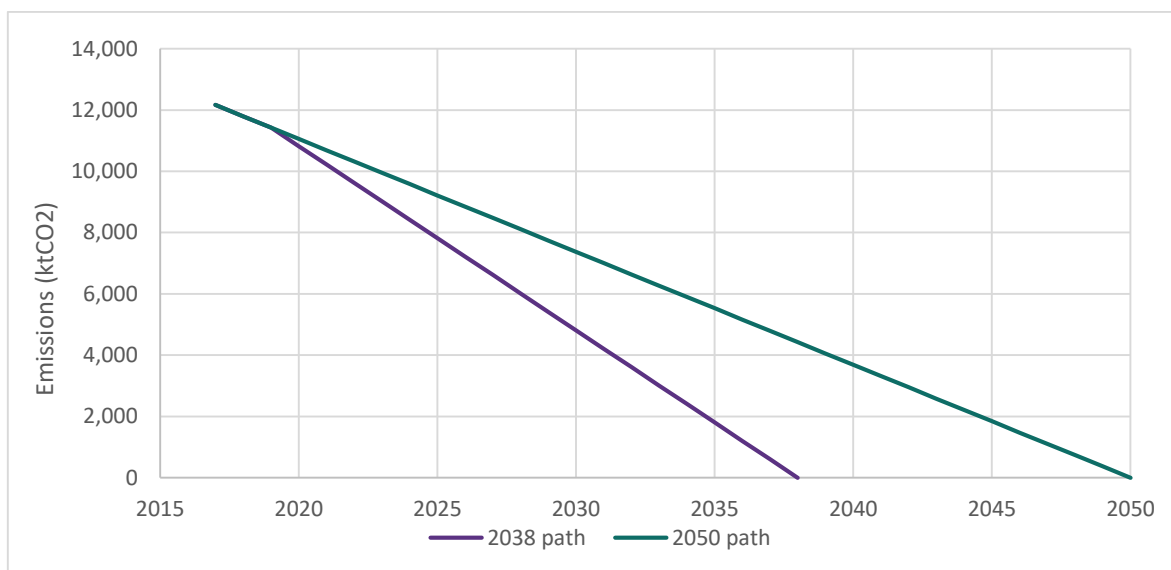
The social cost of carbon is a measure of the economic harm of those impacts, expressed as the sterling value of the total damages of emitting one tonne of CO₂ into the atmosphere. Consensus estimates for the social cost of carbon ranges between £30 and £41 per tonne of CO₂.

By choosing to become net zero carbon by 2038 instead of the government target of 2050, GMCA will avoid significant expenditure on climate related impacts. Official UK government statistics show that carbon emissions for the 10 GMCA regions in 2017 was 12,164ktCO₂. These figures cover industrial, commercial, residential and transport sectors.

To determine the avoided emissions the earlier decarbonisation path would deliver, and hence the avoided costs, emissions under each path need to be calculated. Three assumptions have been made. The first is that the national decarbonisation trajectory follows a straight path from the 2017 baseline year to 2050. The second is that the GMCA region aligns with the national decarbonisation trajectory until 2020, after which GMCA region emissions decline faster to meet their 2038 target, and the third is that from 2020 the GMCA

region decarbonisation path follows a straight line path to zero emissions. The outcome of this calculation is indicated in the figure below.

Figure 4 – Decarbonisation paths for 2038 and 2050



The cumulative emissions under the 2050 scenario is approximately 206,800ktCO₂. whereas if the ETR is successful in accelerating innovation and achieving zero net carbon for Greater Manchester by 2038 the cumulative emissions will be approximately 138,250ktCO₂, a reduction of 68,550ktCO₂. Using the low and high social cost figures, potential savings between now and 2050 would be between £2.093bn and £2.828bn.

Each ETR option in the appraisal is expected to progressively increase the likelihood of achieving this target in the ascending order 'Do Nothing', 'ETR Support', 'ETR Lead' and 'ETR Drive'.

3.2. Preferred Option

The 'ETR Lead' option is recommended as the preferred option. This recommendation is made on the rationale that:

- The 'do nothing' option is discounted as the pathways analysis shows that the current trajectory will not achieve the net zero carbon ambition for Greater Manchester
- The 'ETR Support' option does not provide sufficient support to overcoming the barriers to innovation is therefore also unlikely to achieve the net zero carbon ambition for Greater Manchester
- The 'ETR Drive' option whilst vastly increasing the likelihood of success, will require significant investment, effort and timescale to implement and likely require establishing a special purpose vehicle to be effective. This option may be considered as a longer-term development of an Energy Innovation Company; a natural evolution of the ETR.

In the preferred option the ETR will act as a lead for the energy sector in Greater Manchester, bringing businesses, public organisations, universities and SMEs together, promoting collaboration and engagement and providing a channel for the whole sector to communicate regulators and policy makers with one salient voice. The ETR will also provide support for innovators, through identification and facilitation of engagement with the people and organisations who can provide opportunities to get innovative products to market, through finance or provision of resources and workshop space. The group will also be able to advise on regulation and commercial matters, along with support on preventing key blockers from affecting new, innovation solutions' ability to get access to market.

4. Commercial Case

The Commercial Case discusses the potential commercial arrangements that may be required to deliver the preferred option for an Energy Transition Region in Greater Manchester. The planning and implementation of the ETR model is considered first, followed by the ongoing operation of the ETR and potential future evolution.

4.1. Planning and Implementation of ETR

Establishing and delivering the ETR will incorporate, planning and development of the Outline Business Case (OBC), resourcing the implementation project team (which may require support from third-parties), and designing, implementing and handing-over the solution.

The implementation project team may be resourced entirely with GMCA and/or key stakeholder resources if the capacity and capability is available; however, with third-party support required to develop the Strategic Outline Case it should be expected that this is likely to be required.

No market testing has been conducted at this stage; however, there are existing Government Frameworks (such as Crown Commercial Services Management Consultancy Framework Two) that are accessible to GMCA, and provide the right capabilities, value for money and terms and conditions for this requirement.

4.2. Ongoing Operation of ETR

The ETR, once implemented will require resources for its ongoing delivery. The preferred option aims to strike a good balance between providing sufficient focus and support to accelerate innovation in the Greater Manchester energy sector whilst keeping the organisation and resources required simple enough to facilitate a relatively rapid implementation.

There are several options for establishing the ETR.

- Resources provided by an existing entity in Greater Manchester (GMCA, for example): This creates a clear lead and focus but places the administrative and financial burden on a single stakeholder. Governance (Board and Steering Group) would still require input from other stakeholders to be effective and financial contributions from other stakeholders may be sought. Additional recruitment or secondments may be required to fill any capacity/capability gaps.
- Sharing of resource contributions between key stakeholders: Agreement on contributions from stakeholders via a memorandum of understanding without the need for
- Creating a special purpose vehicle for ETR: The simple nature of the preferred option and the limited financial risk it holds means the benefits of an SPV are unlikely to warrant this model in the early phases of operation. However, as the ETR evolves it may move towards the creation of an Energy Innovation Company, at which point an SPV may be more appropriate.
- Outsourcing to a third-party: Transferring the ETR to a third-party creates the risk of diluting the control and influence of key stakeholders on the strategic direction for Greater Manchester. At the very least the Board and Steering Group should have local stakeholder leadership and influence.

A model in which resource contributions are shared between stakeholders provides a starting point in which the ETR can be established relatively quickly and evolve over time.

As with planning and implementation, potential capacity and capability constraints may require third-party support. The planning and Outline Business Case stage should explore this further; firstly, assessing capacity and capabilities in stakeholder organisations and planning to address any gaps with recruitment, secondments and/or third-party contract(s). A delivery partner model may be an appropriate through planning, implementation and ongoing operation of the ETR.

5. Financial Case

The Financial Case considers the affordability and potential sources of funding for the implementation and ongoing operation of the Energy Transition Region for Greater Manchester. These will need to be explored further in the planning and Outline Business Case phase.

5.1. Current Funding Opportunities

UK Research and Innovation Strength in Places Fund

The Strength in Places Fund (SIPF) was established by UK Research and Innovation and supports significant local economic growth. The SIPF is a competitive funding scheme for research and innovation through a place-based approach. The objectives of the fund are to support innovation-led regional growth by identifying and supporting areas of R&D strength, and enhance local collaboration between universities, research institutes, other R&D facilities and businesses at the forefront of innovation. The deadline for initial expression of interest (EOI) for the first stage of the fund is the 9th of October, which will provide funding to develop a full proposal.

BEIS Clean Growth Fund

This fund was set up by the UK government as a new clean technology early stage investment fund. The Clean Growth Fund has £20 million available, with aims to speed up the deployment of innovative clean technology. Investments will be made in organisations which support the commercialisation of technologies that reduce emissions from greenhouse gases. The application closing date is the 15th October 2019.

Innovate UK Smart Grants

Innovate UK are investing up to £25 million in the commercialisation of innovative or disruptive ideas. Proposals for funding must demonstrate a strong business plan which addresses market needs, a clear evidence-based plan to deliver significant economic impact and good value for money. Innovate UK welcome projects which promote the grand challenges, one of which is clean growth, which would be promoted through innovate, carbon-neutral products and technology. The application for grants closes on 16th October.

5.2. Other Future Funding Opportunities

Industrial Strategy Challenge Fund

The Industrial Strategy Challenge Fund is part of the Government's Industrial Strategy, with the aim to increase funding in research and development to strengthen UK science and business. The fund will invest in world-leading research base and highly-innovative companies in order to tackle the biggest challenges in society and industry, with industrial decarbonisation a shortlisted challenge area for future support. EOIs for wave 3 of funding is closed, with a 4th wave not currently established.

BEIS Energy Innovation Programme

The Government has increased investment in low carbon innovation between 2015-2021. The Energy Investment Programme is run by the UK's Department for Business, Energy & Industrial Strategy, with funding of up to £505 million to accelerate the commercialisation of innovative clean energy technologies and processes.

Low Carbon Networks Fund

The Low Carbon Networks (LCN) Fund has up to £500 million to support new technology, operating and commercial arrangement. The fund will be available to projects sponsored by the Distribution Network Operators (DNOs) and will aim to help DNOs provide security of supply at value for money for low carbon initiatives.

Shared Prosperity Fund

The Shared Prosperity Fund is expected to replace the EU structural funding, which comprises of the European Regional Development Fund, the European Agricultural Fund for Rural Development and the European Social Fund. Around 20% (£364M) of the investments for the European Regional Development Fund went towards supporting the shift to low carbon economies. The Shared Prosperity Fund will be aiming to reduce inequalities between communities across the UK.

European Regional Development Fund

The European Regional Development Fund (ERDF) is allocated by the European Union, with £60 million of funding made available for the Greater Manchester region. The fund focuses on 4 key areas: innovation and research; the digital agenda; support for SMEs; and the low-carbon economy. In more developed regions, such as Greater Manchester, at least 20% of resources must be channelled specifically towards low-carbon economies. This funding will not be available post-Brexit.

Horizon 2020

Horizon 2020 is the EU's funding programme for research and development, with over €80 billion available from 2014-2020. Funding for the energy industry must support the EU's commitment to reduce greenhouse gas emission by 20% by 2020 and a further reduction of up to 80-95% by 2050. Funding for non-nuclear research between 2014-2020 has a budget of almost €6 billion.

Greater Manchester Low Carbon Fund – The fund has been set up by the GMCA and aims to promote the generation and distribution of energy from renewable, low carbon sources. £15million has been made available to fund projects that require a flexible approach to finance due to the implementation of new technology or projects the would benefit from the fund's expertise.

5.3. Funding for ETR Projects

A key role of the ETR will be to facilitate access to funding for innovation in the Greater Manchester energy sector. The initial expectation of the ETR will be that it will support innovators by signposting them to available sources of funding and helping them to secure what they need.

As the ETR evolves and potentially transitions into an Energy Innovation Company, it may change its focus to secure funding on behalf of Greater Manchester and allocate it to priority innovation projects.

6. Management Case

The management case outlines the arrangements to be put in place to deliver, monitor and evaluate the implementation of the ETR.

6.1. Implementation Project Management Arrangements

The preferred option has been selected to balance achieving a sufficient impact on energy innovation in Greater Manchester with simplicity and ease of implementation. The project management arrangements required to implement the ETR are accordingly intended to be simple in nature, whilst also providing appropriate governance and control of delivery.

The key features of the project management approach are as follows:

- **Sponsorship:** A project sponsor should be appointed to own the delivery of the ETR. This may be but is not necessarily the same as the sponsor for the ETR into ongoing operation. The sponsor should have a strong vested interest in the successful delivery of the ETR and
- **Project Board:** Involvement of key stakeholders in decision-making will be critical to successful delivery and operation. A Project Board should be established for the implementation period, supporting the sponsor in scrutinising and approving key project deliverables.
- **Project Management:** A Project Manager will be responsible for planning and delivering the implementation of ETR, any third-party procurement activity, risk, issues and benefits management. A Project Support Officer may be required to support the project manager with administrative tasks.
- **Delivery Resource:** A small team should be established that will be responsible for developing the Outline Business Case (and Full Business Case if required), key processes, terms of reference, and roles and responsibilities for approval by the Project Board.
- **Business Change:** Careful attention to the people aspects of change is critical to the successful delivery of ETR. This could be the responsibility of the project manager, delivery team or require an additional resource to support the implementation. In any case the lead for Business Change will be responsible for readiness assessments, stakeholder engagement and communications and any training required.
- **Subject Matter Expertise:** The implementation project team will need to draw on specialist capabilities to support delivery of the ETR

6.2. Project Plan

The implementation project plan, to include timescales and key milestones, should be evolved in the planning and Outline Business Case phase. At this stage the key activities are considered to be:

1. Project Initiation and Planning: To establish the detailed scope and plans for the implementation of the ETR.
2. Outline Business Case development: To progress the Strategic Outline Case and reflect the outcomes of the initiation and planning activities.
3. Third-party Procurement: If required, a procurement exercise will need to be undertaken to address any capability or capacity gaps in stakeholder organisations.
4. Full Business Case development: The Outline Business Case should be revisited to reflect any procurement outcomes.
5. Detailed Design: Develop the key processes, terms of reference, and roles and responsibilities for approval by the Project Board.
6. Implementation: Delivery of the ETR and transition to ongoing operation.

Appendix A. ETR Roles & Responsibilities

A brief description of each role is outlined below:

ETR Board:

- Defines objectives of the ETR and secures top level commitment from key stakeholders;
- Decides upon strategic direction and corporate governance;
- Chaired by sponsor.

Steering group:

- Appointed by ETR board;
- Implement strategic direction, including filtering projects;
- Identify gaps in sector and focus innovation;
- Members proactively engaging with sector.

Innovation Director

- Lead and organise of steering group;
- Manages the overall ETR programme of innovation and the process;
- Develops and updates milestone plan;
- Budgetary responsibility;
- Manages interdependencies within the ETR;
- Ensures benefit realisation;
- Provides stakeholder management.

Innovation Hub

- Responsible for the day-to-day management and administration of the processes, controls and methodologies that underpin project and programme delivery for the ETR; including reporting, governance, assurance, change control, planning, risks and issues management, resource management, benefits management and financial management.

Enabler leads

- Provides specialist support to accelerate and enable progress and overcome barriers to innovation;
- Make recommendation to steering group and board;
- Enabler leads will specialise in policy/regulation, commercial/finance and engagement in the preferred option (skills and procurement leads can be introduced in the future).

The overall structure of the ETR can be seen below.

- The **ETR Board** will be made up of key stakeholders in the region and will be required to manage the overall direction of the ETR, with the sponsor being the chairperson of this group. The board is expected to meet up a couple of times a month to review the ETR and discuss any changes or improvements that should be implemented in the future. The board will also be responsible for lobbying with regulators and policy makers. If any discussions or challenges within the rest of the organisation aren't able to be resolved within that arm of the organisation, it will be the board's responsibility to resolve the matter with a satisfactory solution.
- The **ETR Steering Group** will communicate and meet with businesses, SMEs and innovators to identify which projects require and will benefit from support from the ETR. It is probable that the ETR will be unable to support all projects presented to them, therefore it is the steering group's role to select to support the projects which will have a highest chance of successful deployment and will bring the greatest benefit to the energy sector in the Greater Manchester region. It is important that the steering group is made up of key stakeholders, who are experts in the energy market, with in depth knowledge of the industry and the ability to recognise viable projects.
- The **ETR Innovation Director** will be responsible for delivering the ETR programme and ensuring that all the different parts of the organisation are working together effectively and collaboratively. The programme manager will provide project milestone plans and oversee the overall programme, guaranteeing project benefits are realised. The programme manager will organise support from enabler leads, based on discussions with the steering group. It will be important for the programme manager to be well-embedded in the local region and to have the public's best interest at the forefront of decision making, therefore we recommend GMCA appoint an internal candidate for this role.
- The **Innovation Hub** will run the day to day management and administrative responsibilities of the programme, working closely with the programme manager to ensure the smooth running of the ETR. The PMO will maintain high standards for the processes in the ETR and will carry out the reporting, governance, documentation and assurance responsibilities.
- The **Enabler Leads** will work closely with business, SMEs and innovators on a project-by-project basis, providing high-quality, expert support to help push innovative products onto the market and promote deployment across the network. These leads will be experts in their individual areas of specialism and will be able to identify key actions to boost the success rate of innovative projects.

Appendix B. 1-2-1 Interview Notes

Name: Simon Brooke

Company: ENWL

Time/date: 9:30 8/8/19

Introduction: Capacity Strategy Manager for ENWL, involved in forecasting, reinforcement and role as a market facilitator. ENWL has a good relationship with LEPs, including understanding their visions. Houses need to be un-looped to enable low carbon technology. The business tries to make it easier for customers to switch to low carbon.

Notes:

- The ENWL are governed by statutes and licenses.
- Regulation needs to change ahead of the curve
- The ENWL wants to invest ahead of the curve, however it is hard to predict the future
- Forecasting helps to predict which investment will be required
- There is the need to implement now for delivery in the future
- The company needs to react to change, regulations/policy change is more in advance, customer behaviour change is more reactive
- There is a clustering of low carbon tech in local areas
- There is uncertainty with regards to where the future will be, depends on the uptake of tech
- Invest needs to be done to ensure the grid is ready for the uptake of low carbon tech to ensure stability in supply
- Uncertain where certain infrastructure or low carbon tech will need to be located (home or public spaces)
- Learning about government plans and regulation changes in advance, gives the grid/network time to prepare
- The move to decarbonisation will cause people to be more flexible in terms of source of energy and less dependent on energy from the grid
- If the infrastructure of the future can be planned and built today, then this will minimise long run costs

Name: Jane Lindsay-Green & Yujia Du

Company: Shell

Time/date: 10:30 8/8/19

Introduction: Works in renewable sustainable energy and the energy transition programme, taking products to create an integrated solution for clients. Shell have a good relationship with GM, with a long history of establishment on the GM region and want to support GM using their expertise to decarbonise public services. Areas shell would be interested in exploring with GM include: district heating network, transport and mobility and energy efficiency. Could set up something similar to a Clean Air Zone to reduce carbon from transport. Ventures part of business invests in innovations, including equity stakes. How does the ETR fit in with GMs mission-based approach?

Notes:

- The involvement of OFGEM is key, more regulatory framework support and engagement is needed, especially in the district heating network industry
- In terms of transport, customers' needs are and will continue to change, rapid charge points and use of hydrogen are key for the future
- There is a need for more generation of renewable energy at a local scale, including speeding up the ability of new innovations to compete in the industry
- New technology needs an integrated and commercial approach
- The timescale to get regulatory changes in currently too long leading to new projects being financially not viable
- Getting regulatory bodies engaged early in projects increases success rates, shows the key stakeholders are on board, encourages private investment
- There is a need for an aligned industry position to lobby for regulatory change
- It's not necessarily all about Central government leading the sector forward, local authorities need to play a key role in developing their own space and shaping the industry.
- Local authorities need to be the driving force is shaping the future of the sector, leading engagement with Ofgem
- In order to be successful, innovations need to be commercial opportunities

Name: Jonathan Collins

Company: Cadent Gas

Time/date: 11:30 8/8/19

Introduction: Cadent Gas is aiming to redesign network delivery to a more regional process. Cadent are working with the electricity network to deliver a decarbonisation plan. Hydrogen should be introduced into the network, especially for transportation. N8 partnership between universities for collaboration in innovation.

Notes:

- The energy network is a strategic national asset, which should be utilised better and future-proofed to promote low carbon tech
- Electronification will not be able supply all the energy needs of the local area, gas still plays an important role
- The use of hydrogen will be key for the future of the gas network
- A change in the mindset of key stakeholders is needed
- Regulators are not promoting innovation and decarbonisation, framework needs to change

- Change needs to be driven from top down and bottom up
- The benefits of greater collaboration need to be demonstrated to regulators, a collective approach increases the change of regulatory change
- The future of the energy sector could use existing assets/network, using more efficient and low carbon practices and increasing reliability
- Government/regulators need to move quickly to promote innovation and industry change, otherwise the UK will lose out to other European countries, just following their lead. GM is well placed to be a leader
- The energy sector drives the future economy. There is a need to develop skills in future energy technology and services, collaborate with universities to promote training
- It is important engagement with regulators is made through a sectoral group rather than in isolation
- The ETR will provide collective insight into industry problems and promote a collective case for change

Name: Ivan Hewlett, Ian Lloyd & Robin Phillips

Company: Siemens

Time/date: 13:00 8/8/19

Introduction: Robin: Siemens Consulting, site development manager for Manchester office; Ivan: Innovative energy management; Ian: head of strategic growth in innovation. Interviewees very well contacted, on board of the growth hub, vice president of the chamber of commerce, on board of UoM. Triangulum-Oxford road project: increasing energy efficiency through smart innovations in centralised control, grid independency, energy storage and optimisation. Siemens have good experience, contacts and arrangements with key stakeholders and operate in multiple areas. The company also have a venture capital arm and are keen to finance innovative projects.

Notes:

- The energy grid is not ready for complete independence
- Issues over how to scale up innovative tech
- Need to optimise and maximise network and create system resilience
- Smart technologies should be used to help GM reach its vision
- The ETR should collate experience and collaborative in terms of contracts and arrangements
- Regulation varies across projects causing delays, constraints and barriers
- Derogation will enable projects
- Getting regulators onboard as key stakeholders of a project will benefit several elements of a project
- Local authorities have poor regulatory frameworks to test tech or new systems
- The boundaries of digitalisation need to be pushed and data from tech should be utilised

- People are protectionist with data, which causes a barrier. GM would benefit pooling all data and working out how best to achieve their vision – data might need to be cleaned
- There are not enough commercially viable projects to invest in
- With Brexit some funding branches might become unavailable, need for other sources of funding
- The sector is constantly evolving and shifting

Name: Kevin Toye

Company: TFGM

Time/date: 14:00 8/8/19

Introduction: Works in the innovation team for TfGM, helping to secure funding for projects. Helping to deliver the strategy for electricity vehicle charging innovation. GM has been shortlisted as a Future Mobility Zone. Creation of a future mobility zone marketplace for innovator to get funding and set up of an intelligent mobility accelerator.

Notes:

- Future proof the industry by utilising the latest technology and smart infrastructure
- There is a need to control and balance electricity (solar and wind are not always readily available, more energy needed in winter)
- Standardisation is needed across the industry to make innovative products more attractive to customers
- Smart energy management using real-time data will help balance surges
- The network needs to be developed to ensure capacity
- Questions over who should pay for and bear the risk of innovation
- TfGM do not have dedicated capital or consistent revenue for individuals with innovative ideas, they do provide advice and letters of support
- Legislation should be made for new innovation, there is a need to move fast
- A process should be introduced to set rules of enforcement – innovation permit?
- All data collected should be shared in one central source
- Smart infrastructure – connecting all energy usage into an integrated payment system
- Often innovative SMEs are prevented from big contracted programmes due to stringent procurement rules – support should be made available to submit more polished bids

Name: Arjun Sikand

Company: HIM

Time/date: 9:30 9/8/19

Introduction: Partner of Health Innovation Manchester (HIM). Similar concept to ETR, solving barriers to health sector and bringing together all stakeholders in the sector in GM. Created as a virtual organisation with no resources, however joined up with an academic research centre. Initially funded by NHS England, however various other organisations now contribute. Now the organisation is based in the City Lab.

Notes:

- Difficulty working together with clinical and academic sides, lots of bureaucracy
- Academics are encouraged to get involved as it provides an opportunity to prove the real impact of their work
- A big culture change is needed to improve the uptake of new technology
- HIM acts as a bridge to maximise the impact of the innovation of SMEs, through their understanding of barriers and processes
- People who spend the money don't always feel the benefits – solution: pool funding
- Simple solutions can have big impacts, if barriers are removed
- A key factor is a common resource team and the availability of academic resources
- There needs to be plans and data for each phase in the process, including which policy changes are needed
- Once a project has been selected it is essential to set milestones for quality checks and evaluation

Name: David Hilton

Company: MIDAS

Time/date: 10:30 9/8/19

Introduction: MIDAS is a Greater Manchester inward investment agency, promoting GM as a business location. Aim to help start-ups by linking them with key stakeholders and aligning the businesses with the vision of the local region. Potential for investment with Japan Bank of International Corporation, however they want a packaged-up pipeline of opportunities. MIDAS could provide the ETR with opportunities to attract overseas investors. Strength In Places fund could provide funding for a proper business proposal for the ETR.

Notes:

- There is genuine inward investment potential in GM
- Reasons to set up businesses in GM include that there are many other companies and supply chain linkages

- A key barrier is the availability of funding, especially for SMEs
- There is a need to ensure projects benefit GM once investors/funding stops sponsoring the project
- ETR should aim to replicate the consolidation hub, a place for new businesses
- Provide incentives for each project stage, including for consumers
- There is currently much uncertainty
- Investment is promoted through commercial viability, good access to skills, connectivity, tax incentives, business enabling environment, financial incentives
- Changing customer spending habits is difficult
- Innovative projects often have a large upfront capital cost and do not make good returns in the short run
- Office/lab space can be hard to find, especially for larger projects

Name: William Swan

Company: Salford University

Time/date: 10:30 9/8/19

Notes:

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Name: Karolis Petruskevicius

Company: Homely Energy

Time/date: 11:30 9/8/19

Introduction: Synthesis of data relating to efficient use of energy mapping at home. Octopus energy, through Homely energy shows the price/cost of heating a home for 24 hours, allows each home to effectively become an energy trader. Customers buy energy at the start of the day, with the possibility to sell any unused energy at the end of the day. An app has been created to help monitor heat pumps at home and have introduced technology to monitor heating needs of houses.

Notes:

- In the future there will be a greater need for heat pumps. With the gas ban there will be a greater need for non-gas heating by 2025
- An increase in the take up of renewable energy will reduce stress on the grid

- Difficult to obtain funding with lack of project management skills cited
- Innovative ideas need sufficient access to test beds to provide evidence to investors of the future potential and viability
- If innovators are not protected, larger companies can easily replicate ideas, which prevents investment and discourages innovation

Name: Amer Gaffar & John Willis

Company: Manchester Metropolitan University

Time/date: 13:00 9/8/19

Introduction: Amer Gaffar: Works on innovative research and projects on hydrogen fuel cells at Manchester Met. Plans to establish an energy centre in the Jon Dolton Centre. Hydrogen fuel cell train from Germany will be tested on one of the lines in GM.

John Willis: SME programme manager at Manchester Met. The Centre for Aviation, Transport and Environment and the Fuel Cell Centre help researcher with equipment and winning funding. There is a good amount of academics who put time aside for business engagement.

Notes:

- There is not currently an established supply chain in GM for hydrogen fuel cell
- Questions over whether there are skills available in GM for growing the hydrogen fuel cell sector
- Manchester met provide access to centre for SMEs to get into the market
- Property owners do not prioritise innovation-based projects
- Businesses will only use innovative products if it will make them money or it is low risk
- It is key to look at the real impact of innovative products on the GM economy, and its potential to survive past the incentives phase
- Whole life costing is an important consideration
- Public perception needs changing, marketing could be a potential solution
- There are various test bed centres and a good supply of knowledge and experience from university academics
- Innovative projects need to be centred around a core funding scheme, programmes have to fit around available funding options
- There a lack of collaboration between innovative SMEs and the public sector
- GMCA in a leadership role will help bring the private sector on board, including multinationals
- Creative and flexible funding avenues are available

Name: Graham Oakes

Company: G Oakes Cons

Time/date: 14:00 9/8/19

Introduction: Technical background, now involved in software engineering. GM has a project to set up a public-private SPV to redesign the local energy system. TELCO have done similar programmes to ETR but not in energy.

Notes:

- Regulation is a big barrier for innovation, it restricts flexibility within the energy sector
- Skills development and procurement need more support
- Tech is available but needs to be refined
- Getting real data will drive idea generation
- Customers are confident and reliant on old technology, they don't have the confidence and trust on new innovations
- Questions over how the market will adopt new tech
- Uncertainty over the path to scale up investment and giving investors the confidence to scale up investment
- Data driven governance gives people agility
- Ensuring data is available and managed to provide clarity on business risks
- It is difficult for innovation to come through public sector channels
- At a local level the sector is more agile

Name: Nic Gowland

Company: Graphene Inst

Time/date: 15:00 9/8/19

Introduction: Workers for Graphene Institution (GI), including the graphene innovation centre. Advises and helps select/direct projects with potential. GI aims to enhance existing projects and bring new products to market. The graphene centre has one of the best energy labs in the UK, funded EU and a private Abu Dhabi company. The company receives royalties on IP, which is how it makes money.

Notes:

- A strategic agreement across universities would benefit the sector
- The ETR should test new ideas and products in housing and building
- There are a number of ideas, but not the resources/bodies to get the ideas to market
- There is a need for test beds in GM to allow opportunities to prove products are applicable to the real world, maybe in a university campus
- Funding is needed for test areas

- Individual research projects are funded by a number of organisations, including EPSRC, the European commission and the royal society

Company: The Growth Company GC Angels

Time/Date: 15:00 23/8/19

Introduction: From the finance arm of the Growth Company, focusing on green energy and smart power. Aiming to reduce reliance on non-renewable materials and has a multi-sector relationship with GMCA.

Notes:

- There are some great innovative projects being realised in the energy sector
- Funding remains a significant barrier for innovators
- Many innovators are not commercially minded and would massively benefit for commercial support
- There is lots of technical expertise within Greater Manchester across different organisations
- Collaboration will benefit the region by allowing individual experts to team up to provide solutions and innovations
- Many innovative projects established by universities are not commercially minded, and do not have any commercial support

Name: Richard Halsey & Lisa Evans

Company: Energy Systems Catapult

Time/Date: 27/8/19 15:00

Introduction: Energy Systems Catapult is aiming to decarbonise the domestic energy market through a smart system and heating programme, with a focus on a whole system view. The company is mainly funded by the public sector, however has some private funding too.

Notes:

- The main people facing barrier is a lack of consumer appeal for innovation
- Policy and regulation need to drive whole system change through incentives, rather than just incentivising certain technology
- Regulation is often very complex and scares of potential innovators
- The risk-reward for innovation in the energy sector prevents innovation as companies are penalised for making large returns. Businesses should be financially rewarded for innovation

- An environment needs to be created within the energy sector, where innovation encourages suppliers and excites consumers
- Sometimes it is the combination of innovations that might provide market solutions
- Before money is spent creating, testing and deploying new tech, the market should be tested to uncover what consumers want and help shape the product
- The main funding gap for innovation is not the piloting stage but the scaling up due to time and money costs. A solution to this could be the creation of a living lab.
- A whole view approach should be encouraged. Often innovation will have trade-off, benefitting one part of the system but negatively impacting another part
- The energy industry is not seen as a value generating industry, more of a necessary evil. Customers are only concerned with cost and reliability
- There is a strong appetite, but it is constrained by barriers
- Innovation would be encouraged through easing the access to data
- Different LEPs have different approaches to strategic plans, forecasting demand, procurement and implementation, creating a standardised approach across GM will encourage innovators
- Creating innovation momentum will promote more innovation
- Barriers should be addressed at the early stages of innovation
- Innovative products/projects need to be commercial with a solid rationale

Appendix C. Case Studies

C.1. Copenhagen

Copenhagen is aiming to become the first zero net carbon capital by 2025, including having a 100% renewable energy target by 2025. The city has already reduced carbon emission by 42%. The city's Climate Plan is based on 4 key pillars: energy consumption, energy production, mobility and city administration initiatives, with energy production accounting for 80% of the needed carbon reduction.

EnergyLab Nordhavn is a smart energy programme which is aiming to integrate all available energy sources in Copenhagen. The programme is concentrated in the Nordhavn neighbourhood, with the district's heating and smart-grid creating a fully integrated, intelligent, optimised energy system. The city's traditional heating infrastructure is the biggest contributor to reducing carbon, with the potential to remove 80,000 tons on CO₂ from the atmosphere. The programme is promoting a transition to cost-effective future smart energy system, with integration across electricity, thermal and transportation energy infrastructure.

<http://www.energylabnordhavn.com/about.html>

<https://europeansting.com/2019/05/22/this-is-how-copenhagen-plans-to-go-carbon-neutral-by-2025/>

<https://carbonneutralcities.org/cities/copenhagen/>

C.2. Norwegian Energy Solutions

Norwegian Energy Solutions is an energy cluster made up of companies, operators, suppliers, start-ups, investors, academia and authorities. The company aims to lead the transition to low emission energy solutions by promoting the development of renewable and sustainable energy solutions and improving existing solutions. The organisation focuses on generating zero-emission value chains, promoting local innovation, reducing emissions from hydrocarbon production, developing new value chains, connecting with other clusters working on renewables, exporting innovative technologies and services and putting Norway on the map for development of renewable energy.

C.3. Melbourne

The City of Melbourne is aiming to reduce emissions by 4.5% per year in order to contribute to the 2015 Paris Climate Change Agreement's target to limit global temperature growth to 1.5oC above pre-industrial levels. The City government's operations were certified as carbon neutral in 2012. Melbourne has met its target set in 2010-11, reducing emissions by 10% by 2018 and has also reducing greenhouse gas emissions by 31% since 2013-14, despite strong population growth. Melbourne has a renewable energy target of 25% by 2018. The priority area to assist the plan to reduce emissions include: developing a low carbon culture, zero carbon for buildings, carbon neutral goods and services and reduce emissions from waste. The City are working closely with the regional, national and local governments, the public, and businesses to achieve this target. Melbourne government has introduced several programmes including the innovative 1200 Buildings, Smart Blocks, City Switch and Solar programmes, which promote innovative solutions.

<https://carbonneutralcities.org/cities/melbourne/>

<https://www.melbourne.vic.gov.au/about-council/vision-goals/eco-city/Pages/carbon-neutral-operations.aspx>

<https://www.melbourne.vic.gov.au/sitecollectiondocuments/climate-change-adaptation-strategy-refresh-2017.pdf>

C.4. Health Innovation Manchester

Health Innovation Manchester (HIM) was formed in 2017 to address the problems in the healthcare across the region. The poor health of the population in Greater Manchester (GM) was impairing productivity and economy growth and there was an unacceptable level of variation in health across GM. HIM was set up to support the creation and adoption of innovation, bringing together the existing assets of the Manchester Academic Health Science Network and Centre, with academic and commercial assets in the region. The board of the organisation is made up of leaders from health and social care, academia, research and industry. HIM is currently delivering over 50 projects in the GM region, along with making significant steps to create key infrastructure, governance and decision mechanisms.

Appendix D. Technical Note Example Accelerators

1.0 Overview and Purpose

The Energy Transition Region (ETR) will be an innovation zone across Greater Manchester. The zone will bring together: GM assets and its public estate; with academia and its research facilities; other expert in devolved energy systems; and partners willing to invest in those innovations. The innovation zone will convene, test, prototype and scale-up those innovations to a point where they can be deployed safely on the networks. It will bring together this whole range of regional and national stakeholders to share knowledge, agree priorities, develop processes, services and technologies and deploy these innovations to the grid.

Atkins commission will assess the governance and structures required to enable partnerships that will facilitate multiple individual projects within the ETR being conducted at any one time, to cohesively tackle different energy system challenges.

This Technical Note (TN) has been produced to provide an overview of research to assess existing accelerator/ innovation initiative models that are analogous to the proposed ETR concept. This includes the energy sector specifically, but also wider sectors where parallels can be drawn. The list is not intended to be exhaustive, but rather to provide a flavour of similar models to help provide inspiration/ learning for developing the ETR concept.

2.0 Review

Table 1 below summarises projects and initiatives, and where appropriate their relevance to ETR.

We note that GMCA are not attempting to recreate initiatives such as the Cornwall Energy scheme, however these examples have been included below, as there will be elements of learning from such models.

Table 1 - Project Examples

Project	Sector	Partners	Project Description	Relevance to ETR	Notes
Brooklyn Microgrid	Energy	LO3 Energy	Started in 2016, this project has enabled local peer-to-peer (P2P) energy trading between consumers. It utilises blockchain and other controls to enable the P2P element and also microgrid/'smart grid' control. The platform also enables the distribution system operator to negotiate with the microgrid to acquire load balancing and demand response.	P2P and grid energy trading, balancing and flexibility platform. The project was initiated by consumers and operated with LO3 Energy, utilising their 'Exergy' platform. Network operator able to interact with available resources through platform.	Potential accelerator in terms of software platform. Greater interaction with DSO, and also P2P trading. One of the more valuable project lessons will be the experience of utilising blockchain technology for energy transactions.
Cornwall Local Energy Market Trial	Energy	LO3 Energy; Centrica	Centrica and LO3 Energy have partnered to trial a local energy market in Cornwall. The trial will utilise the Exergy platform by LO3 Energy, which is also used in the Brooklyn Microgrid project	This project will explore how blockchain technology can unlock potential savings for 200 homes and businesses.	Similar to the Brooklyn microgrid project, the key accelerators will be the use of software and automation, in the context of local energy markets.
ReFLEX Orkney	Energy	Herriot-Watt University; European Marine Energy Centre; Solo Energy; Aquatera; Community Energy Scotland; Orkney Islands	This project aims to create a Virtual Energy System (VES) by digitally linking distributed resources to flexible demand and storage. The project takes a whole-system approach (i.e. electricity, transport, and heat networks), to create "one	Innovative technology applications, aiming to provide cheaper energy with reduced CO2 emissions. Flexible 'virtual' energy system to enable flexibility.	

Project	Sector	Partners	Project Description	Relevance to ETR	Notes
		Council; Doosan Babcock;	controllable, overarching system...which will reduce and eventually eliminate the need for fossil fuels”	Project scale. Potential insight into large scale roll out of innovative technology and how stakeholders are considered during the project.	
Project LEO (Local Energy Oxfordshire)	Energy	EDF Energy R&D; SSE; Oxfordshire County and Oxford City Council’s; Piclo; Origami; Nuvve; Oxford Brookes University; University of Oxford;	This local energy project will utilise experience from previous Low Carbon Hub projects. The various partners will all contribute to achieving ambitious local low carbon energy targets, by utilising local energy markets, renewable energy, flexibility, and demand optimisation.	Local energy markets, for heat, transport, and electricity systems. Applied research and innovation-based activities (e.g. demand optimisation). Low carbon emission objectives. Scale of project (270,000 homes, 35,000 businesses, and 5 science parks).	
Oxford Energy Superhub	Energy	Pivot Power; Oxford City Council; Habitat Energy; Kensa Contracting; RedT Energy Storage; University of Oxford.	The energy superhub in Oxford will apply renewable energy sources, smart grid technology, flow battery storage,	Innovation to achieve low carbon targets. Scale of project (300 homes “expected to half carbon footprint”). Councils working with innovative energy companies, research institutes, and local communities.	

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Eden Campus Energy Centre (University of St. Andrews)	Energy	St. Andrews	This project aims to implement the Guardbridge Guarantee ¹ and make St. Andrews the first energy carbon neutral university in the UK, through leveraging local renewable energy, and energy efficiency measures.	Local energy measures through engagement, provision of business and job opportunities. University engagement with local community. Low carbon targets.	
The Burntisland Community Energy Masterplan	Energy	Local Energy Scotland; Fife Council	The masterplan pilot project mapped out options for a whole energy system for the community in Fife and how to achieve a 80% carbon footprint reduction, through e.g.energy efficiency, and renewable energy.	Local community whole system energy masterplan. Carbon reduction targets. Applicable knowledge/lessons on how councils and communities can work together to deliver local energy systems.	
FlexLondon	Energy	London Council; UKPN; The Carbon Trust; Open Energi; Various businesses within London; Islington and Merton councils; South Western Railway; Premier Inn; Liberty	This project aims to unlock flexibility within London's power networks. The project is aiming to help local businesses to fully utilise flexibility opportunities by removing barriers and complexity in current arrangements.	Body that sits between end users and UKPN/London Councils. End user engagement. Removal of barriers to enable full utilisation of energy flexibility opportunities. New business models.	Use of air quality data from across London

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		Global; Go Ahead London; Centrica.		Energy-as-a-service.	
Simris Microgrid²	Energy	E.On	This project is building a business model for microgrids based on 100% renewables, and aims to provide flexibility to the grid via demand response from customers.	Community engagement "To help determine the right mix of industrial and domestic participation from a technical and commercial perspective."	
InterFlex	Energy	H2020	This EU research project is investigating local energy optimisation within various countries in the EU.	Results being published this year will share lessons learnt from various projects across Europe.	
ChArGED Project	Energy	EU H2020 European Dynamics Belgium	This project addresses the energy consumption in public buildings by use of a framework/app-based gamification, with the aim to reduce energy wastage. Social interaction and competition aim to achieve long term savings and energy efficiency targets.	Engagement approach for participants involved in ETR.	
Centre of Nuclear Excellence (CoNE)	Nuclear	- Britain's Energy Coast (BEC) - The nuclear organisations, BAE,	CoNE is a partnership of the nuclear sector and communities in Cumbria working together as a sector	Local initiative bringing together public and private sector.	

Project	Sector	Partners	Project Description	Relevance to ETR	Notes
		<p>LLWR, NDA, NNL, Nugen, Sellafield Ltd</p> <ul style="list-style-type: none"> - The regional supply chain through BECBC and the chamber of commerce - Local councils and the Cumbria LEP - The regional education and training sector 	cluster focussed on growth of the Cumbrian and UK sector	<p>Research based activities.</p> <p>Innovative model.</p>	
Data Science Accelerator	Data Science	UK Govt.	<p>“The Data Science Accelerator is a capability-building programme which gives analysts from across the public sector the opportunity to develop their data science skills.”</p> <p>Analysts and aspiring data scientists work on a self-proposed project over three months. This accelerator aims to boost data science skills within the UK, by providing a mentor and equipment.</p>	<p>Example of accelerator programme for individuals, potential for ETR in development of individuals in Manchester who could be involved in the ETR (local engagement, ambassador, energy managers, etc)</p>	
MedTech Super Connector (MTSC) Accelerator	Medical	<p>Imperial College London</p> <p>Research England Connecting Capability Fund</p>	<p>This body aims to enable research to become new diagnostic tools, medical devices, and digital healthcare solutions. This</p>	<p>Example of accelerator programme for individuals, potential for ETR in development of individuals in</p>	<p>Modelled on MIT's Venture Mentoring Service)</p>

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			aims to position the UK as a leader in 'MedTech' development and create a standard for the acceleration of medical technologies to market. The MTSC provides participants with funding, training, mentorship and access to industry partners and patients etc to enable fast delivery of new medical technologies.	Manchester who could be involved in the ETR (local engagement, ambassador, energy managers, etc)	
Airbus³ Bizlab	Aerospace	Airbus	This is a global aerospace accelerator but is not limited to the aerospace domain ⁴ . This "...offers early-stage projects wide-ranging support in the form of a 6-month acceleration programme. Startups have access to a large number of Airbus coaches, experts in various domains, and support staff, free hosting, and a Demo Day with Airbus decision makers, venture capitalists, Airbus customers and partners."	Potential knowledge exchange. Accelerator programme framework (multiple start-ups that use various technologies).	

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Astropreneurs Accelerator	Aerospace	EU H2020 Various	“Astropreneurs Accelerator is a three-month acceleration program that includes business and technical mentorship, support to fund your business idea and access to our “SPACE Economy “Astropreneurs” network”. Through Astropreneurs Accelerator, you can use this mentorship and the “space economy network” of investors, industry and supporting agencies to scale your business and better capitalize target markets and global opportunities. Start-ups will also have access to Astropreneurs workshops and initiatives aimed at a wider audience.”	Potential knowledge exchange. Accelerator/mentorship programme framework.	
ABB Industrial AI Accelerator⁵	Artificial Intelligence	ABB Various	“The ABB Industrial AI Accelerator supports startups working on deploying novel technologies around Artificial Intelligence (AI) to address most relevant challenges in industrial environments”	Potential knowledge exchange. Accelerator programme framework. Energy system optimisation/automation through AI techniques.	

Project	Sector	Partners	Project Description	Relevance to ETR	Notes
Greenlytics⁶	Data Analytics / Energy	KTH Various	This Swedish start up is listed as a team under the ABB Industrial AI Accelerator, which “provides AI-based energy forecasting for wind, solar, and consumption as well as decision support tools for power trading and asset optimisation.”	Relevant industry experience to ETR, and lessons learnt from start up via the ABB accelerator.	
Bellrock Technology⁷	Data Analytics / Energy		Data analytics start-up which provides predictive analytics.	Sits between the plant owner/source of data, provides analytics, and a toolbox of apps for the client. Experience of company start up in energy sector.	
Y Combinator Accelerator	Tech/IT ⁸		Y Combinator is the start-up accelerator space that has been involved with Airbnb, Dropbox, Stripe, Reddit, Twitch, Coinbase, and Weekly.	Accelerator that has helped various successful companies to market.	
MassChallenge	Start Up Biotech Fintech		Accelerator programme which focuses on biotech and fintech in the UK, Israel, Mexico, and Switzerland.	Potential for experience in other sectors.	

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MIT Enterprise Forum ⁹	Various	MIT	This hub helps inform, connect, and coach technology entrepreneurs via a global network.	Various chapters globally ¹⁰ provide support to technology-related entrepreneurs. Potential valuable experience in training individuals and examples of stakeholder engagement (events, knowledge exchange, etc.).	

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