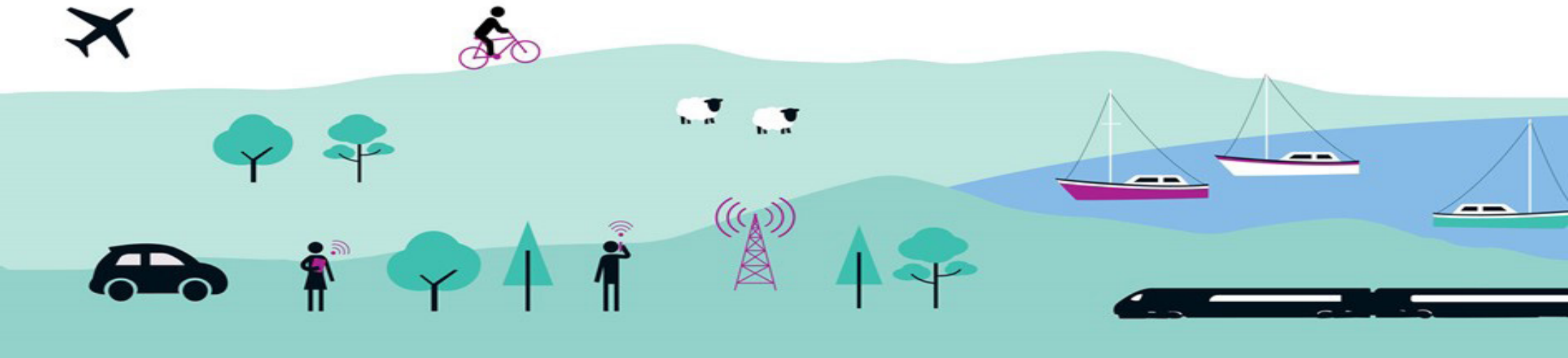
BURO HAPPOLD

Borderlands Inclusive Growth Deal

BORDERLANDS STRATEGIC LOW CARBON ENERGY MASTERPLAN

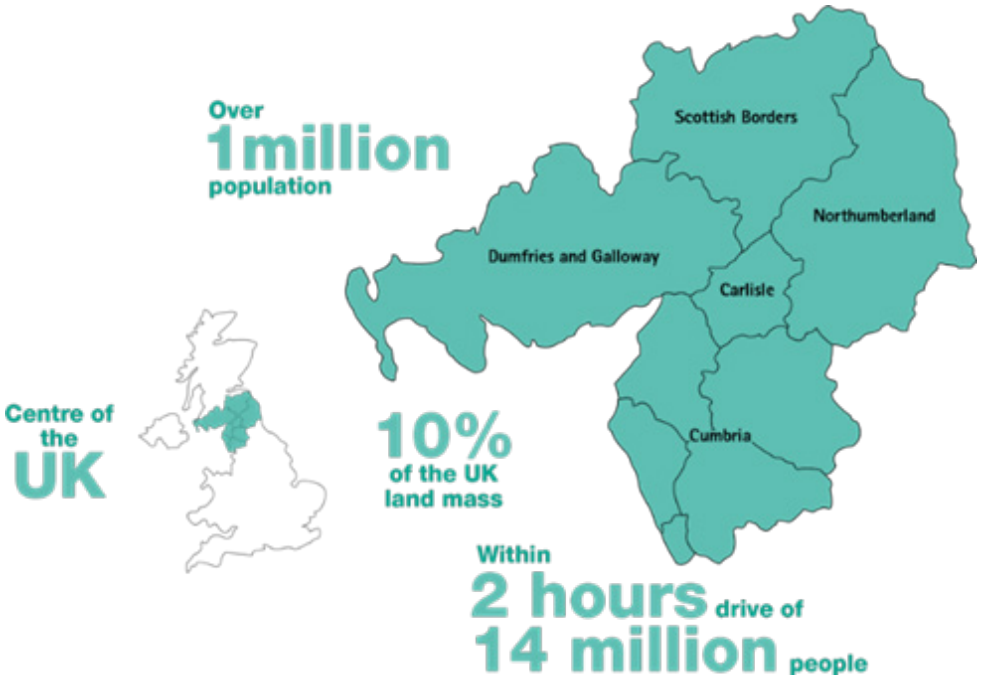
EXTENDED EXECUTIVE SUMMARY



Why do we need an Energy Masterplan for Borderlands Region?

The Borderlands Strategic Low Carbon Energy Masterplan (BSLCEM) is a progressive and inclusive initiative which is a key component of the Borderlands Inclusive Growth Deal which was formally signed on the 18th March 2021.

The overall growth deal provides an injection of up to £452 to support a range of activities, including those targeting the low carbon energy transition. The growth deal covers the largest ever area covered by a growth deal and is unique in that covers both Scottish and English Local Authorities.



The energy masterplan has a number of key objectives themes to support the aims of the growth deal, these are summarised as follows:

- Aiming towards a **Net Zero Carbon Region** with a whole systems approach
- Through investment **stimulate economic development and inclusive growth** from the energy transition.
- Enabling **inward investment into the area** and retaining the **economic benefits** of the transition through implementation and management
- A focus on **stakeholder engagement** to motivate and include all groups in the discussion and consequent transition

This document is an extended executive summary to the main report.

How was the Energy Masterplan Developed?

Developing an energy masterplan for such a vast area has required input from a wide range of experts and stakeholder consultation and represents the first major step for the region to develop an inclusive approach which aims to benefit different public and private sector stakeholders.

The energy masterplan constituted 4 main steps including initial data reconciliation, stakeholder engagement, socio-economic analysis and development of comprehensive energy masterplan document.

The full report and supporting appendices and database provides a in depth review of the supporting data, analysis and engagement, and provides direction on the next stages of the process.

Figure 1.1: The Energy Masterplan Process

The Policy Context

Now more than ever there is a need to develop a coordinated net zero carbon strategy for the region which is focussed on energy. Manmade climate change is a well understood concept and the Borderlands region has many common attributes which make it compelling for not only an inclusive growth deal but an overarching energy masterplan. Policy development will be a dynamic necessity to ensure guidance and transitional targets are developed for stakeholders to respond to in both the public and private sector.

Both UK and Scottish Government have set net zero carbon emissions targets at 2050 and 2045 respectively. The UK was the first major economy to pass net zero carbon emissions law.

BEIS is responsible for the overarching energy policy in the UK, although Scottish Government has a separate energy policy which was enabled through the Scotland Act 1998.

The key aims of current policy is to end contributions to global warming, keeping warming to 1.5°C – below the 2°C limit as set out in the Paris Agreement, signed in 2015.

There are a number of key documents which provide direction to industry and more localised policy makers which include

- 6th Carbon Budget ; proposing a 78% reduction in UK by 2035
- UK Government Ten Point Plan
- UK Government White Paper Powering our net zero future
- UK Government energy security strategy
- Scotland Energy Strategy Position Statement

The national level policy provides a strong backdrop to the Borderlands energy masterplan but necessarily there will be a need to adopt a regionalised approach which reflects the geography and unique context of the 5 local authorities.

What does the Current Borderlands Energy System Look Like?

The current physical energy network system for the Borderlands region can be characterised with the following summary elements:

1. Electricity – generation and networks
2. Gas - networks
3. Liquid and solid fuels – e.g., heating and transport

The high-level representation of the current energy system in the Borderlands region shown in Figure 1.2 underlines the complexity of not only the technical system architecture but also the influence of different stakeholders to impact on the energy transition for the region.

The energy masterplan focusses on energy generation, distribution and demand with the Borderlands region.

Whilst recognising the synergies of offshore generation the masterplan concentrates on "onshore" systems and interfaces between supply and demand.

Further work is to be completed to assess the offshore potential and how this has the potential to interface with the EM.

The masterplan also outlines the current energy vector sub elements, and respective complex ownership and policy for electricity, gas, solid fuel and oil, transport, buildings and renewable energy generation.

Recognising the ownership of different elements will be critical to develop the necessary funding and policy mechanisms to make the transition happen.

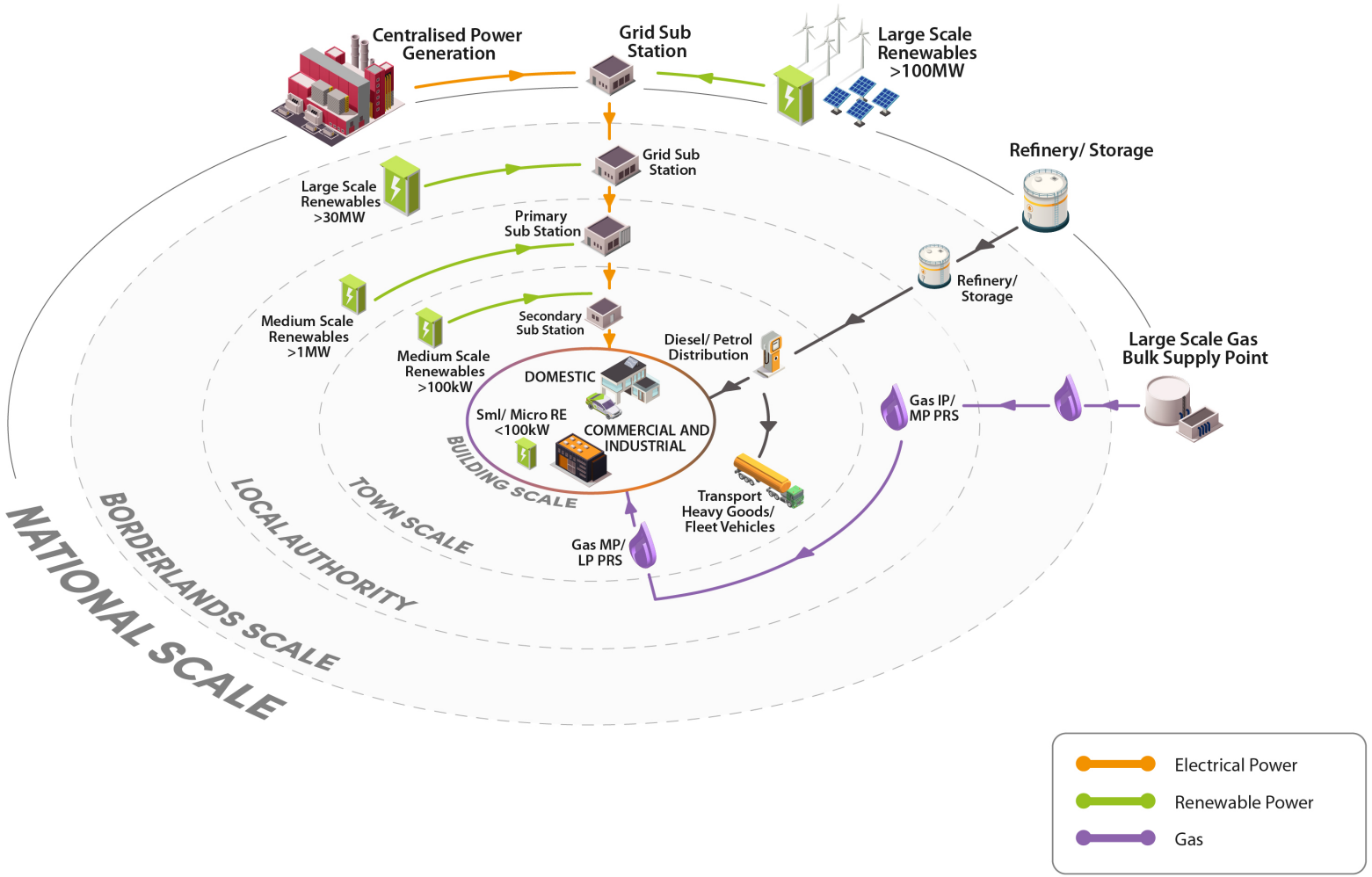


Figure 1.2: The Current Energy System

Energy Analysis Summary

The data analysis completed is based on the Future Energy Scenarios (FES) completed by National Grid and translated to the Borderlands region.

The resulting reconciliation from the FES details the current energy use, and the projections based on balanced and hydrogen scenarios.

- Balanced scenario description
- Hydrogen scenario description

The analysis included a breakdown according to sector with summary data graphs for different technologies and fuel transition from 2020 to 2050.

Key findings from the balanced scenario

- Significant increase in electric heat (mostly heat pumps – ground, air and shared ground heat networks
- Retention of some gas for commercial and industrial
- Huge increase in energy efficiency including both insulation and controls
- Electric transport
- Huge increase in hydro, onshore wind, solar PV and nuclear power (England)
- Introduction of flexibility market to enable the energy system to be more dynamic between traditional consumers, utility distribution and generation

Example transition graphs for domestic heat and generation for the balanced scenario are shown in Figure 1.3 and Figure 1.4.

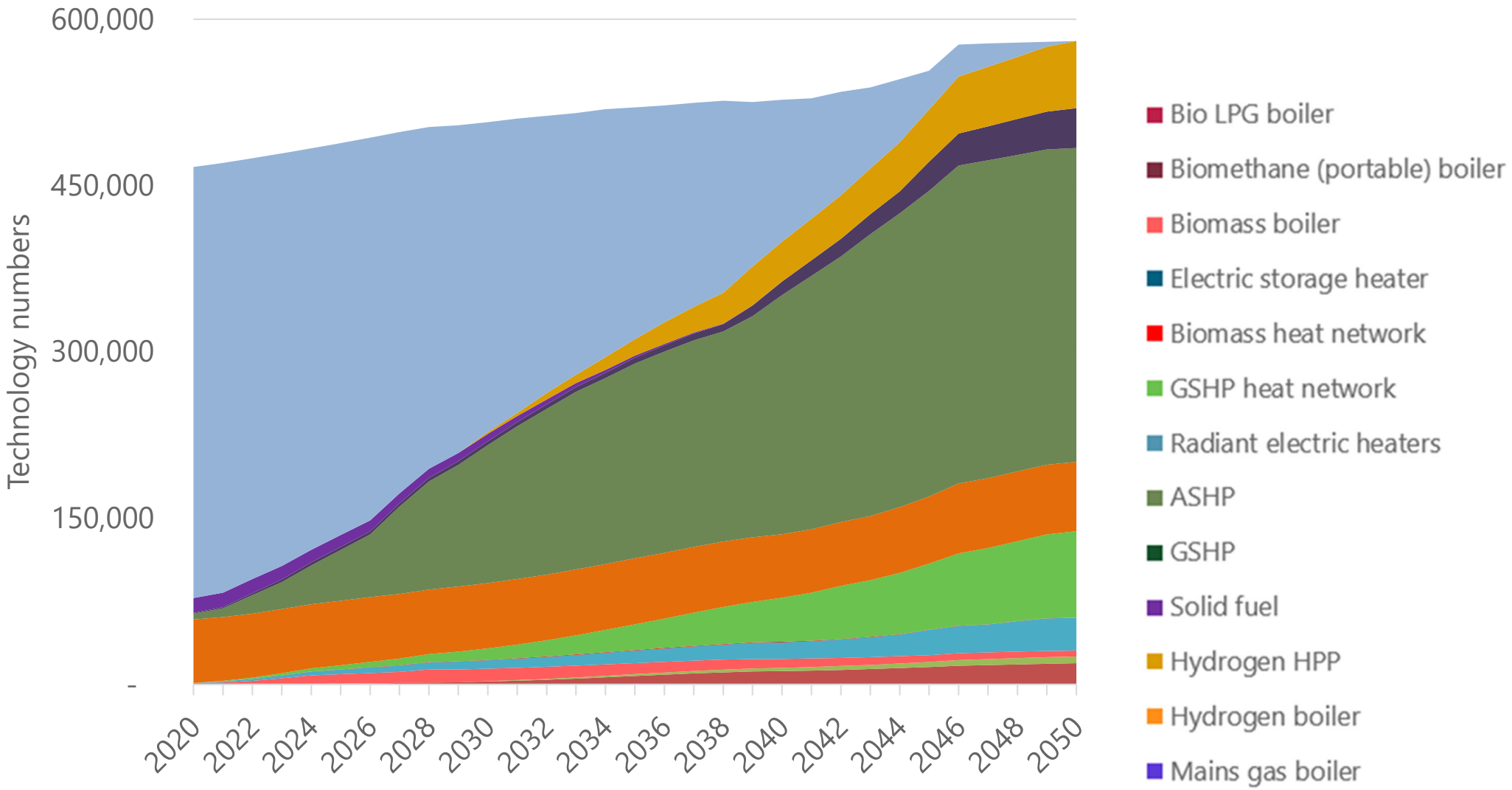


Figure 1.3: Domestic Heat: Technology Transition for Homes in the Borderlands Region

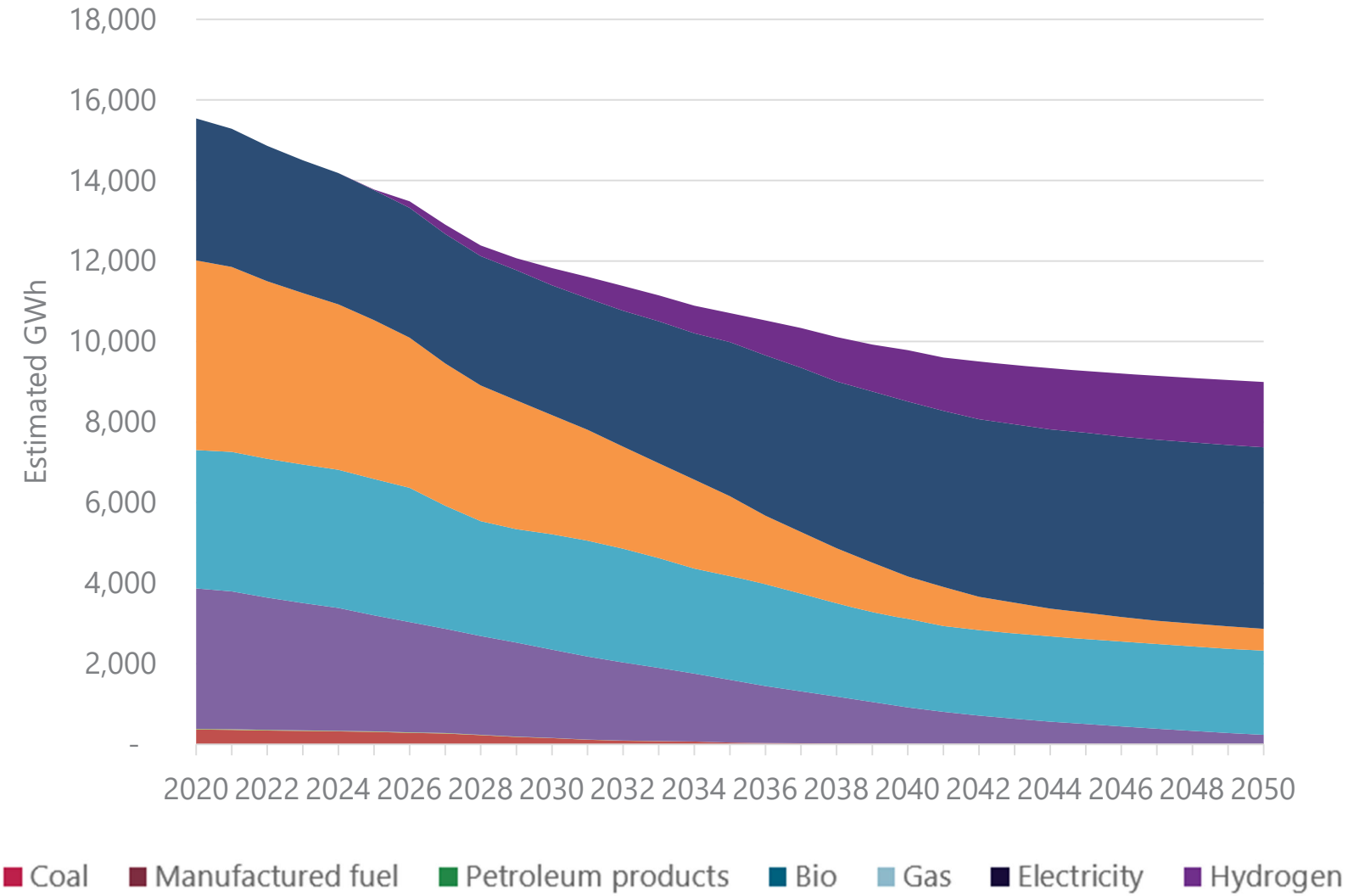


Figure 1.4: Energy Demands for Different Commercial and Industrial Sectors in the Borderlands

Long Listing the Options

The identification of interventions was initially led by the FES scenarios in Step 1 and then short listed using a ranking according to impact and penetration. The interventions were grouped according to national, borderlands, local authority, town and building scale.

A total of 41 interventions are identified in the long listing and are split into six investment areas.

- Commercial and industrial
- Domestic Heat
- Energy Efficiency
- Transport
- Electricity Generation
- Flexibility and Networks

The analysis showed that the majority of interventions sit at a building level. However, this does not mean the responsibilities for implementation of these measures only sit with the building owner. Rather, any larger geographic scale can influence interventions at geographics below. For example, national policy can to a greater or lesser extent influence the uptake of interventions at any level.

However, there is a balance to be struck as the geographies become larger the effectiveness at targeting the interventions becomes wider and less appropriate to specific contexts. The proposed phase 2 LAEIPs will provide the basis to ensure the local context is understood and interventions are more accurately reflected versus the existing building stock, infrastructure and stakeholders.

Further work is also being commissioned to examine investment opportunities in the Borderlands which fall within the national remit/strategy rather than the Borderland's sphere of influence.

There are four key areas identified:

- Nuclear power (focus on the NW Nuclear Arc)
- Tidal lagoon
- Offshore wind
- Hydrogen

Creating the Short List of Investment Areas

The shortlisting prioritisation process was based on the relative contribution to decarbonisation, economic activity and projected volume penetration of different technologies within the Borderlands.

The number of technology units, installed capacity and carbon/ energy savings were the primary consideration of selecting the shortlisted technologies. A technology also had to represent a transition, for example a high level of bio-energy is present in the non-domestic sector in 2050; this is due to retention of existing bio-energy (particularly in the manufacturing sector) and is therefore not a considered a transitional technology.

In the cases of some interventions (energy efficiency measures and various SMART technologies being key examples) are bundled which helps reduce the long list. This can also be more representative of how certain technologies could be deployed together

This process resulted in 14 interventions being taken forward to the shortlist.

These interventions were divided into six investment areas as shown in Table 1.1.

Table 1.1: Shortlisted Investment Areas and Interventions

Investment Ref	Intervention	Scale
Commercial and Industrialisation		
1.2	Non-domestic heat electrification	Building
1.3	Non-domestic hybrid/ hydrogen boilers	Building
Domestic		
2.2	Domestic heat electrification	Building
2.7	Domestic hybrid/ hydrogen boilers	Building
Energy Efficiency		
3.1 to 3.5	Domestic retrofit (bundled)	Building
3.1 to 3.5	Non-domestic energy efficiency	Building
Transport		
4.1	Hydrogen buses and coaches and HGVs	Non Domestic, regional and national

Investment Ref	Intervention	Scale
4.2	Electrification of LGVs, buses and coaches and cars	All Scales
Electricity Generation		
5.5	Wind (onshore)	Regional, Local Authority and Town Scale
5.7 and 5.8	Solar PV	LA, town, building
Flexibility and Networks		
6.1	Utility battery storage	Local authority, Town
6.1	Domestic/ non-domestic battery storage	Building
6.3, 6.5, 6.6	Non-domestic smart technology	Building
6.3, 6.5, 6.6	Domestic smart technology	Building
6.4	Hydrogen (from constrained renewables)	National, regional

Stakeholder Contributions

74 different stakeholder organisations were engaged in the process, this included interviews, surveys and participation in thematic workshops. There were five of these thematic workshops, based around five key stakeholder groups:

1. Renewable energy generation / flexibility and networks
2. Domestic
3. Surface transport
4. Commercial and industrial
5. Over-arching strategic

Participants covered a wide variety of organisations, including the DNOs, social landlords, freight and haulage operators, enterprise partnerships and the tourism industry. A detailed catalogue of key issues, constraints and opportunities identified by different stakeholders were made. This engagement process included one to one interviews, group sessions and five stakeholder workshops.

The stakeholder workshops were also informed by a multi-criteria analysis (MCA) modelling approach that was uniform across the workshops.

The MCA outcomes indicated that onshore wind to be the rank 1 priority investment area, with it being the highest ranked intervention for technology, innovation and economics. Solar power also performed well, performing better than onshore wind for social and environmental factors. The economic viability will be particularly key for private investment which has historically been the main procurement route for renewable generation.

Domestic retrofit for improved energy efficiency is the third highest ranking intervention, the highest excluding generation technology, scoring well in all areas. It is a particular focus for social and environmental benefits. The high number of installations needed makes it one of the most challenging interventions but also the most rewarding.

Despite not having a social and environmental score utility scale battery storage is a high-ranking technology. This is related to the nature of the Borderlands with a high wind potential and capacity (coupled with large grid constraint), making it better suited to utility batteries than is usual in the UK energy network.

What are the Socio-Economic Implications?

After the shortlisting of the 14 interventions, the socio-economic benefits were assessed for the region.

This was completed using the Input-Output approach and UK and Scotland government data to assess regional impact due to policy changes and developments based on the expected capital investment requirement.

In addition to using the capital investments to estimate the expected jobs and economic growth, the economic benefits that will result from the ongoing operation of the investment area assets were also considered. The estimated annual operational expenditure was based on technical knowledge of the proposed systems which were then translated into additional economic benefits. Assumptions over leakage, displacement and substitution effects were applied to arrive at the net benefits for the area.

Overall, it was estimated the capital investment for all investment areas will be £6.9 billion (2021£).

By investing in the 14 interventions, the Borderlands region can expect the following economic benefits between 2021 and 2050:

- £ 2.69 billion total gross value added (GVA) income to the Borderlands region, in NPV (2021£)
- Approximately 2,600 average annual FTEs, plus as many as 1,300 ongoing jobs for O&M activities beyond 2050.
- £ 109 million of tax revenue (NPV, 2021£) for the Treasury.

A benefit distribution analysis was conducted, with each of the Borderlands local authorities capturing a significant portion of the expected benefits, see Figure 1.5.

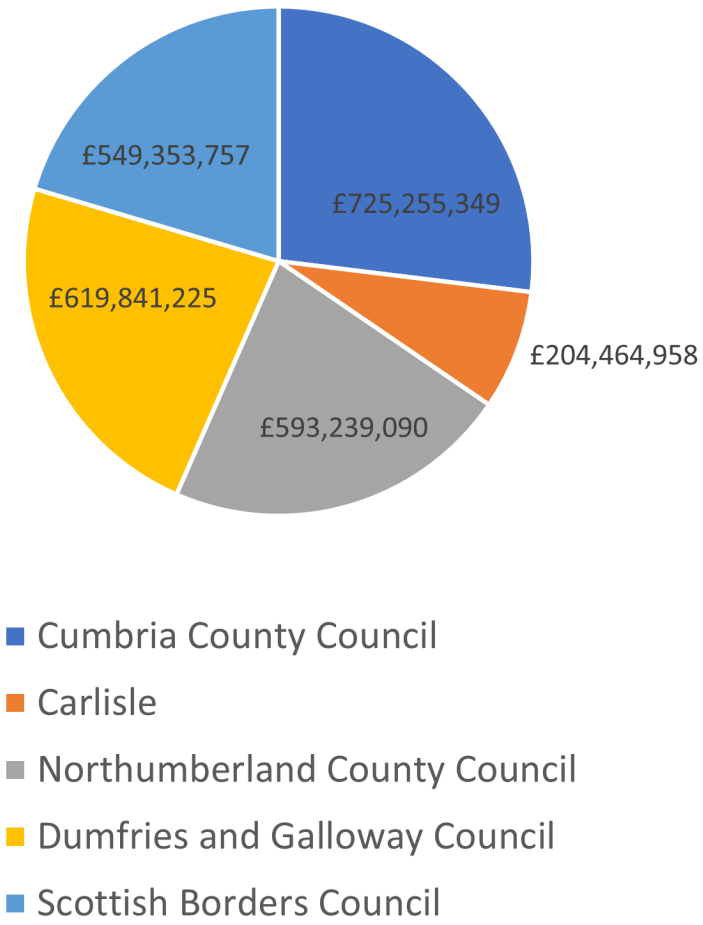


Figure 1.5: Benefit Distribution Analysis for the Region (GVA Distribution by Local Authority – NPV 2021£)

In addition to the above quantifiable economic benefits, the interventions are also expected to deliver social benefits such as alleviation to fuel poverty, improved health and wellbeing, and increased job opportunities and security.

What Will the Future Energy System Look Like?

Transitioning to a new energy system will not happen overnight and will require coordinated action amongst many stakeholders.

Taking into account the projected future energy scenarios and identified energy scenarios a new simplified representation of the future Borderlands region energy system was created, see Figure 1.6.

Different networks can be isolated from the diagram but it is critical to retain an understanding of the integration required throughout the Borderlands region to achieve the ambition to meet inclusive economic, social and net zero carbon ambitions.

To further the energy transition beyond a conceptual proposal will require the growth deal to support action in a range of areas, for example:

1. Further technical analysis at a greater level of resolution, e.g. through the procurement and facilitation of LAEIPs
2. Coordinated stakeholder engagement
3. Adjusted and new policy mechanisms
4. Potential capital and operation support
5. Recognised procurement and delivery functions for each intervention

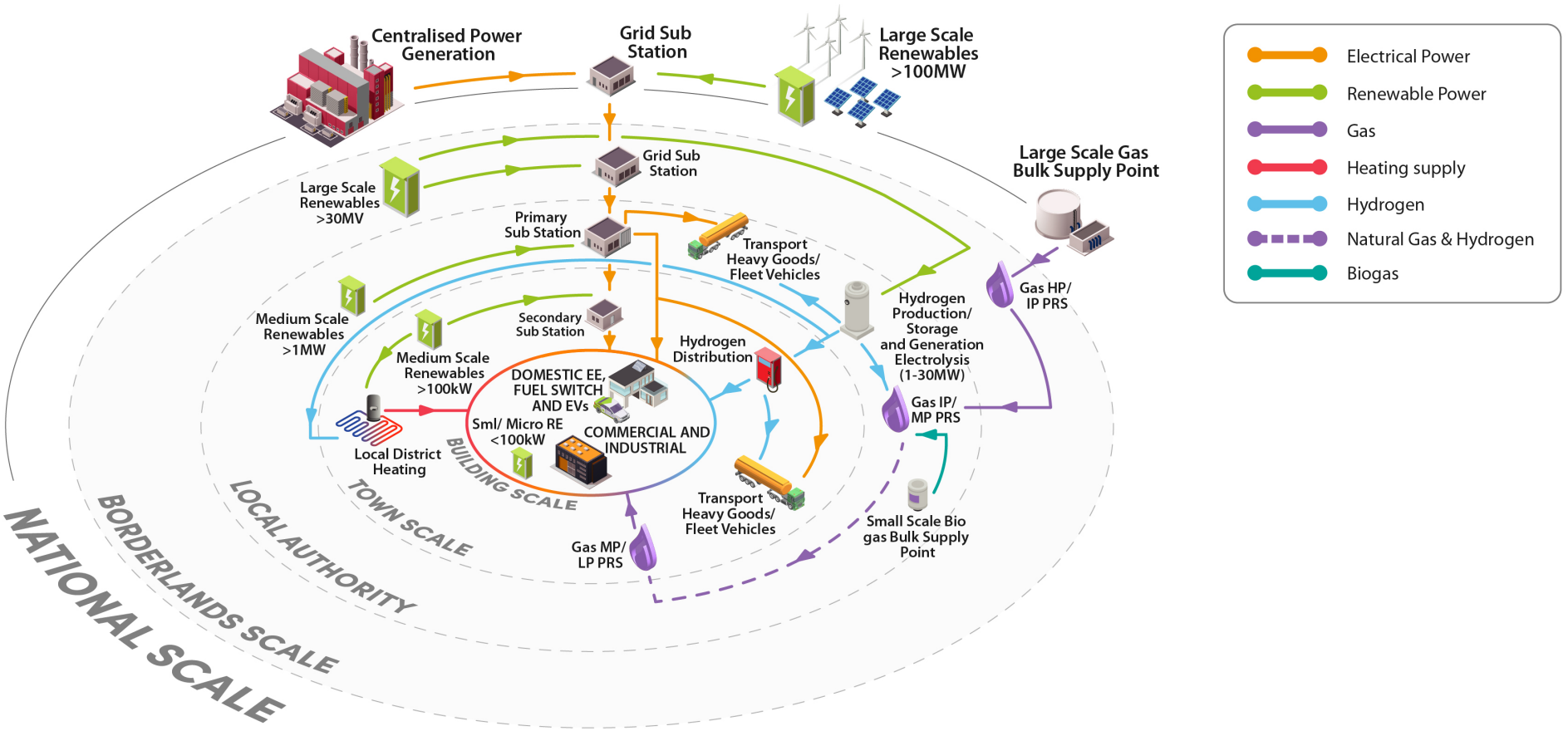


Figure 1.6: The Future Energy System

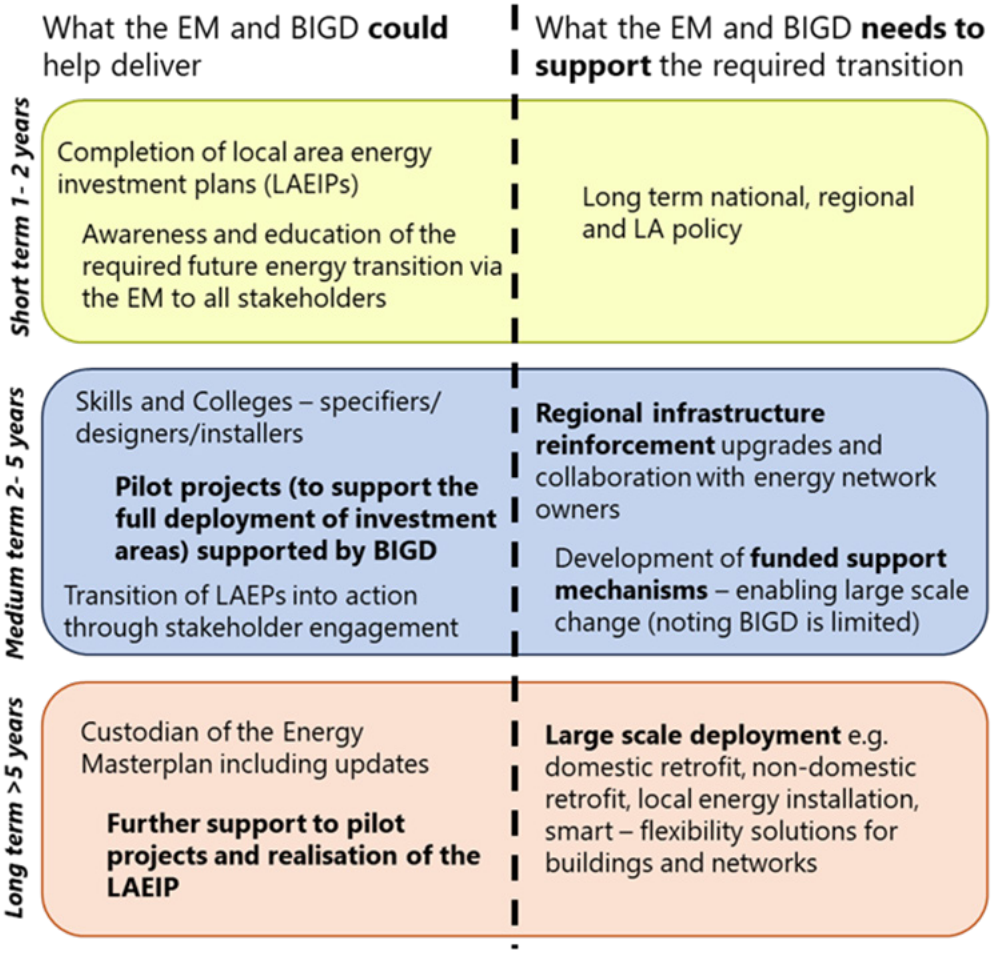
How to Make it Happen?

To progress the energy masterplan an investment area implementation framework has been created. The intent of the framework is to begin to level expectations between what the growth deal can achieve and help deliver directly, versus what requires further support to realise the full transition.

Short term (1-2 years): In the short term, the growth deal has already indicated that it wishes to progress with a series of pilot local area energy investment plans (LAEIPs) and further the awareness and education of the required future energy transition to a wider set of stakeholders.

Medium term (2-5years): In the medium term the growth deal has the potential to instigate a number of key enabling initiatives including a ramp up in skills development in local education institutions, a number of pilot projects and deep stakeholder engagement and action with the outcomes of the LAEIPs.

Long term (>5years): Looking forward into the long term, i.e. beyond 5 years, the BIGD will need to maintain momentum and be active in being a custodian for the Energy Masterplan.



Summary and Next Steps

This innovative energy masterplanning approach is based on the translation of the national Future Energy Scenarios created by National Grid.

It represents a fantastic platform for the growth deal and region to use in accelerating the transition to net zero carbon in the region. Unique to the masterplan is the deep stakeholder engagement, socio-economic analysis and recognition of the integrated and diverse energy system including technology typology and function, but also ownership.

The next steps will require significant coordination and political leadership to maintain momentum and create a dynamic strategy which develops expertise and knowledge across the region. This will ensure the economic and socio-economic benefits are realised to support the wider objectives of the growth deal.

The transition to net zero requires alignment across many sectors and stakeholders and a long-term plan. The energy masterplan is the first step in the process and will need to be updated and managed to ensure its success.

The key next steps for the energy masterplan include:

1. The first is to undertake analysis of how wider national level projects could contribute to the Borderlands. The Borderlands has the potential to be a major powerhouse for renewable generation and the wider electrification of the UK as a whole, allowing the Future Energy Scenarios to be realised at a national level.
2. For translation of this energy masterplan into a focused set of local outputs Local Area Energy Investment Plans will be commissioned. This masterplan will help focus on key themes and geographies to explore. The MCA results showed there is a strong prioritisation of domestic interventions. Additional analysis to better characterise the domestic building stock would aid the targeting of these LAEIPs, to ensure representative building typologies and areas are analysed within the LAEIPs
3. Further communication and consultation on the proposed energy masterplan; enabling stakeholders to begin to align strategies to support the approach. To include; development of a prospectus, webinars and socialising data through web portal (e.g. using Power BI)

4. Engagement with policy makers at local, regional and national levels to review existing and required new policy mechanisms to help drive the transition over the coming years
5. Deep skills and training review through engagement with regional contractors and education experts and providers
6. Consideration of potential pilot projects to be supported by the capital funding from the growth deal

References (ESS only)

https://www.theccc.org.uk/publication/sixth-carbon-budget/

https://www.gov.uk/government/publications/the-ten-point-plan-for-a-green-industrial-revolution/title

https://www.gov.uk/government/publications/energy-white-paper-powering-our-net-zero-future

https://www.gov.uk/government/publications/british-energy-security-strategy

https://www.gov.scot/publications/scotlands-energy-strategy-position-statement/

https://www.nationalgrideso.com/future-energy/future-energy-scenarios