

# Project EPIC

## Work Package 1, Deliverable 1: Area Selection Document

# EPIC

Energy Planning Integrated with Councils



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This report was produced for Project EPIC

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# 1. Project Scope

## 1.1. Background to the EPIC Project

The EPIC (Energy Planning Integrated with Councils) project seeks to test the hypothesis that developing an integrated local energy plan which considers the impacts on both the electricity and gas networks, and reflects the strategic ambitions of the local authority, will enable better investment outcomes for both the networks and regional stakeholders.

As part of the current process to create Distribution Future Energy Scenarios (DFES), gas and electricity utilities reflect local and regional factors as well as information from local authority development and decarbonisation plans. Although local authorities are consulted and input into the DFES process, it is based on national scenarios and does not wholly adopt or incorporate local authorities' longer term strategic plans for specific areas. This can lead to different expectations of future energy requirements between local authorities and the utilities.

EPIC will develop a process for electricity and gas distribution networks to work with local authorities to create local energy plans that can be incorporated into the DFES analysis. These plans will then be used by the DNOs to assess their networks and enable investment decisions to be made that supports the ambitions of the local authorities for strategic areas. The process and supporting tool set will be trialled in three selected trial areas within the West of England Combined Authority (WECA) area.

This type of plan may result in lower overall cost to the consumer, improved risk management and also enabling local partners to realise their own strategic outcomes including net zero decarbonisation, economic growth, industrial strategy and wider societal benefits.

## 1.2. Document purpose and associated project deliverable

The EPIC project is made up of several work packages. The first work package is the trial strategic area selection and the objective of this work package is to document the area selection process and also to define how strategic planning areas will be mapped onto the electricity and gas networks in order to produce an integrated energy plan.

This report is the area selection document which is deliverable 1 for work package 1. It describes the process and key considerations that were used to select the three trial areas as well as summarising the approach for area network mapping and the data requirements. It also contains an interim learning review of the lessons, opportunities and challenges of the selection process which is intended to capture and provide input to the final Learning Report produced in work package 7.

## 2. Area selection process

### 2.1. Geographic scope and selection criteria

Working with the West of England Combined Authority (WECA), the EPIC project focussed on specific areas of strategic development within the region where local growth strategies could have significant impact on energy demand, energy generation and the required energy infrastructure. Further considerations for area selection included:

- Diversity of specific geography and land use, for example, industrial, domestic, urban and rural settings
- A range of energy requirements including those for new developments
- Planned energy efficiency measures
- Opportunities for energy generation and green gas
- Opportunities for heat networks
- Current and future transport infrastructure and requirements
- Opportunities for flexibility and energy storage

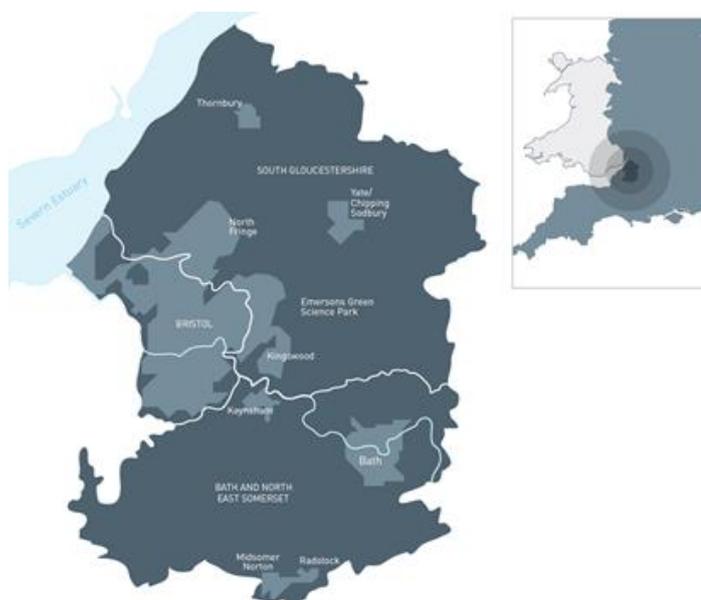


Figure 1 The WECA regions

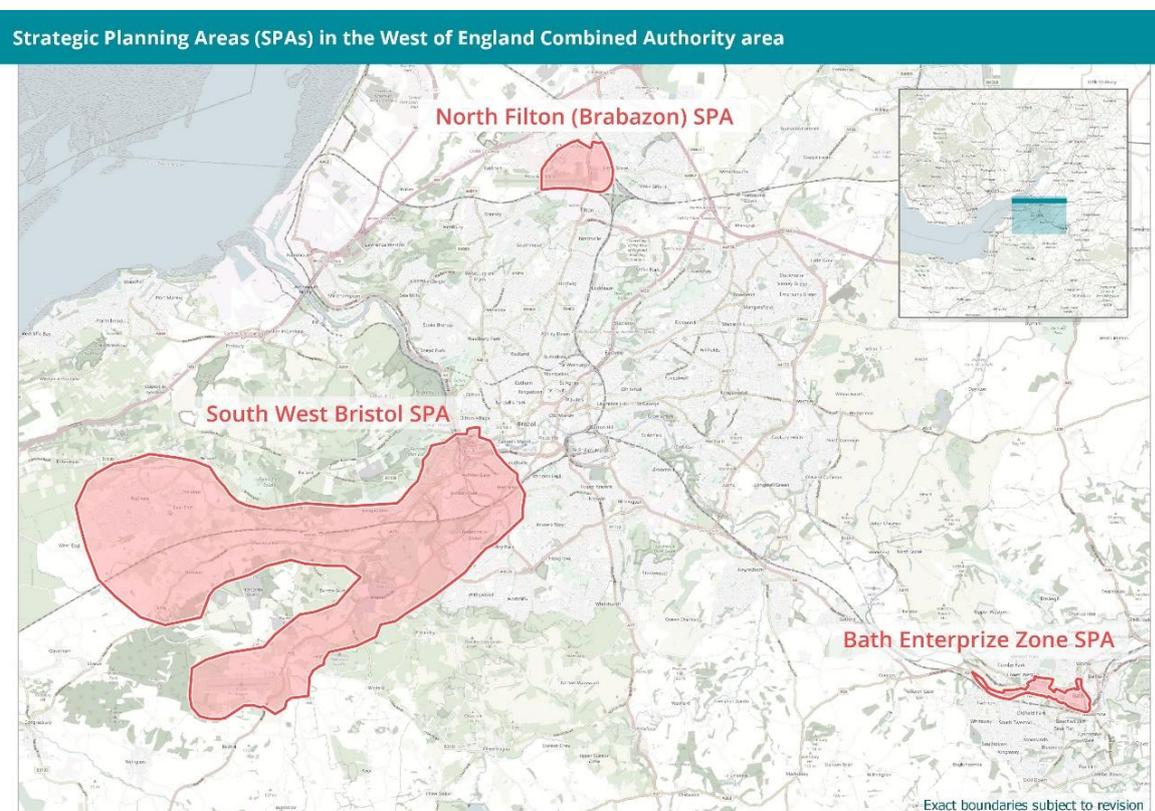
### 2.2. Strategic Planning Area (SPA) selection

Initial discussions with WECA and the four unitary authorities identified several potential strategic areas which were prioritised using the considerations summarised above:

Priority	Shortlisted Strategic Planning Area
1	<b>South West Bristol</b> A mixed urban, commuter and rural area to the south of Bristol that includes Bristol airport. This is a priority area for WECA's Strategic Infrastructure Master Plan.
2	<b>Bristol North Fringe</b> An area to the north of Bristol which includes key commercial and industrial sites in and around Filton. These include both aerospace and advanced manufacturing industries, innovation centres and some of the University of the West of England campus. This is a priority area for WECA's Strategic Infrastructure Master Plan.
3	<b>The Bath Enterprise Zone</b> An area along the Bath riverside which has already been established for development. It has a number of active new developments as well as the potential for significant retrofit and energy efficiency measures. More details on the Bath Enterprise Zone can be found <a href="#">here</a> .
The following three areas were also considered but were less well defined:	
4	<b>An area around Weston-super-Mare</b>

	Specific geography to be determined.
5	<b>The HIF corridor</b> Growth corridor from Bristol Temple Meads to Keynsham earmarked for further housing and commercial developments, as well as significant transport infrastructure.
6	<b>Yate, South Gloucestershire</b> A smaller scale but a good example of a local area development plan.

The initial intention was to conduct a joint review of the strategic areas together with WECA, the Unitary Authorities, Western Power Distribution (WPD) and Wales and West Utilities (WWU). However, owing to the delayed start of the EPIC project, this review was essentially completed before the project start date and was driven by the areas selected by WECA for infrastructure master planning (Bristol North Fringe and South West Bristol) and the area already designated as an enterprise zone (Bath Enterprise Zone). A map of these areas can be seen in Figure 2.



*Figure 2 A map of the three Strategic Planning Areas chosen for the EPIC project*

However, subsequent to the EPIC project start these areas have now been confirmed with WECA and with the relevant Unitary Authorities.

Ideally, the selection and definition of SPAs would have been developed in partnership between the networks and councils which could have enabled the tailoring of the SPAs to map onto the network supply areas. However, it is realistic to assume that any future EPIC process will have to deal with local energy planning boundaries that do not match with network infrastructure. In many cases, SPA areas will already have been defined due to the designation of a particular area as an Enterprise Zone, regional and local development area, Energy Innovation Zone, Free Port area or master planning area. One of the additional benefits of selecting an SPA is that these areas often come with established

structures which already involve many of the key stakeholders and areas that are not SPAs will need to establish these engagement methods.

It is therefore a good test of the underlying planning process and a good challenge to be able to create a planning data model that can be aggregated and disaggregated to meet the requirements of councils as well as electricity and gas network planners.

### 2.3. South West Bristol SPA

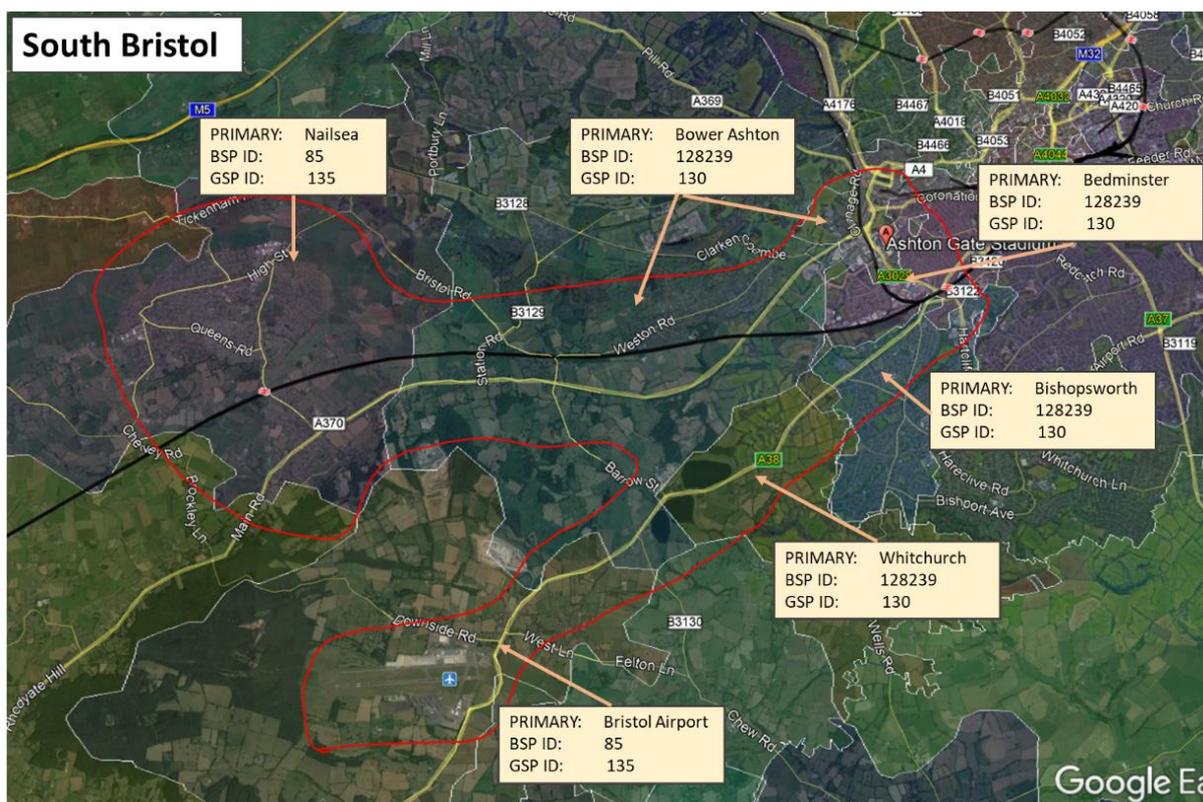


Figure 3 SW Bristol Strategic Planning Area

The SW Bristol SPA includes urban areas within the boundary of Bristol City Council, together with some rural and commuter belt areas in North Somerset. Significantly, it includes the main transport routes into SW Bristol and is therefore likely to feature as a hub for new transport infrastructure including EV charging stations and hydrogen stations, potentially with electrolysis. There is also potential for heat networks within the Bristol City Council (BCC) area and also within North Somerset, potentially utilising waste heat (from Avonmouth) and/or heat from old mine workings.

This SPA includes Bristol International Airport and the large area of commercial development around the airport site. (However, the scope of the EPIC project does not include energy demand within the airport for aviation purposes.)

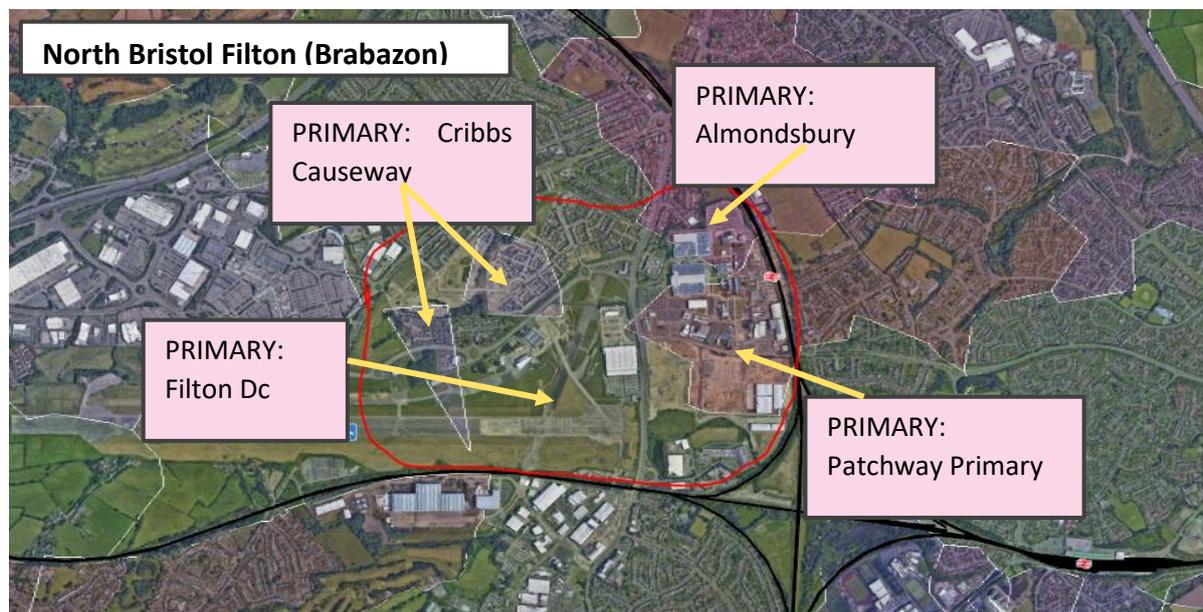
WECA has already started infrastructure master planning of this area working with AECOM. The EPIC project has now met with the AECOM team and agreed to share and coordinate data gathering.

Main rationale for inclusion as an EPIC trial area:

- A good mix of rural, commuter and urban areas with a variety of housing stock
- Significant transport infrastructure including main arterial roads into Bristol

- Already pre-selected as an Infrastructure Master planning area by WECA

## 2.4. Bristol North Fringe SPA



*Figure 4 Bristol North Fringe Strategic Planning Area*

The Bristol North Fringe SPA includes areas of industrial and commercial development as well as new housing. It includes major developments around Cribbs Causeway shopping centre and also brownfield sites on and around the site of the old Filton airfield.

The commercial and industrial cluster around the SPA includes major aerospace companies, composites and manufacturing. The area sits within the South Gloucestershire Unitary Authority, but is also of importance to Bristol City Council and is a major commute to work destination with transport links including the nearby M4.

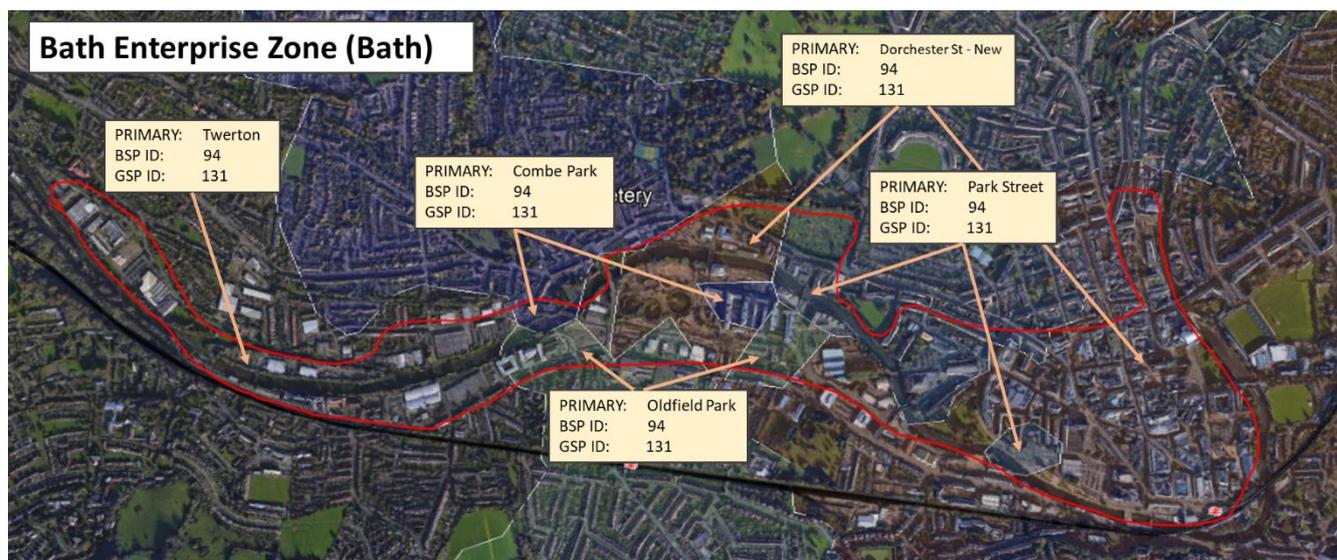
It is therefore likely to feature as a hub for further future commercial and industrial development and the potential for the use of hydrogen and hydrogen manufacturing.

WECA is about to start infrastructure master planning of this area, and is due to be working with the consultant Atkins. The EPIC project has not yet met with the Atkins team, but the intention is to agree to share and coordinate data gathering.

Main rationale for inclusion as an EPIC trial area:

- A good mix of commercial and industrial and housing developments with a variety of housing stock
- Significant transport infrastructure including main arterial roads into Bristol
- Already pre-selected as an Infrastructure Master planning area by WECA

## 2.5. Bath Enterprise Zone SPA



*Figure 5 Bath Enterprise Zone Strategic Planning Area*

The Bath Enterprise Zone SPA is the most clearly defined of the three trial areas, having already been designated as an Enterprise Zone with a relatively well defined development plan.

The zone sits within Bath and North East Somerset UA and includes proposals to redevelop a number of council-owned and private sector sites for both housing and commercial purposes. Bath also has ambitions to redesign its transport infrastructure to support more active mobility and EV charging. There is a proposal to implement an emission reduction area within the city but this has been delayed due to Covid-19.

The development plans have already been shared with WPD and there has been a high level of engagement between the council and WPD distribution managers and network planners. The primary substations which serve the Enterprise Zone are lower voltage 6.6 kV primaries. This has already been identified as a potential constraint and an option to build a new sub-station is under consideration.

This SPA therefore represents an area which already has relatively advanced plans which could come to fruition in the short term, and an area which has already seen a high degree of network engagement

Main rationale for inclusion as an EPIC trial area:

- A good mix of commercial and industrial and housing developments with a variety of housing stock
- Already relatively advanced plans and engagement with networks
- Significant ambition around transport, heating and energy efficiency
- Already pre-selected as a defined Enterprise Zone

In conclusion, the three areas include sufficient variety in the types of customers served, the mix of property types, commercial uses and the future developments that are planned that the learning from the project is expected to be broad enough such that the process could be applied to the majority of local authority areas. Including both urban and rural areas results in the inclusion of overhead and underground electricity networks and gas supply networks designed for different levels of energy density. The three trial areas will allow insights into how different local authorities plan for strategic

future developments and what data they have available so that the process and supporting tools are not unduly tailored to a particular authority which may not be representative of the UK.

### 3. Defining the boundaries of the SPAs

The data outputs from the EPIC project will need to use a common language that is meaningful for the electricity and gas networks as well as the local authorities. The SPAs were defined by local authority needs and do not align with existing gas or electricity network assets. A key challenge of this work package was to define the boundaries of the three SPAs in a common language that was meaningful for WECA, WPD and WWU, and which could then be developed within the SPA data model.

Existing network areas are described below for both electricity and gas networks. Data on the existing baseline of network connected assets and changes on that baseline going forward are necessary for both gas and electricity network analysis, and the area to which they are reported is also defined below.

#### 3.1. Defining electricity network areas

The electricity distribution network is hierarchical in construction, ranging in defined ‘steps’ from low voltage at household level to the highest voltages at 132kV for the connection to the national grid transmission system. Typically, all electrical network assets connect to the next voltage ‘step’ up via a single point. This means that all connections ‘below’ that point can be aggregated and analysed at that point. The WPD DFES 2020 took this point as the primary substation level and all analysis and data reporting is done to that level. These electricity network defined shapes are called ‘Electricity Supply Areas’ (ESAs). Any network connection physically located within an ESA is assumed to connect to the single unique primary substation for that ESA. Therefore, all connections in that ESA affect the same upstream network infrastructure. However, the ESA boundaries do not align with local authority or strategic planning area boundaries.

#### 3.2. Interaction between SPAs and ESAs

Multiple ESAs overlap each of the SPAs and therefore data collection and analysis will need to include areas wider than the SPAs, while including the option to separate out the SPAs for local authority uses. The overlap between ESAs and SPAs is shown in Figure 6. For WPD network analysis the areas will therefore need to include all customers or connections for all ESAs that intersect with the SPAs. An example of the extent of these ESAs are shown in Figure 7.

Showing the intersection between North Filton (Brabazon) strategic area and primary-level ESAs (from WPD DFES 2020)

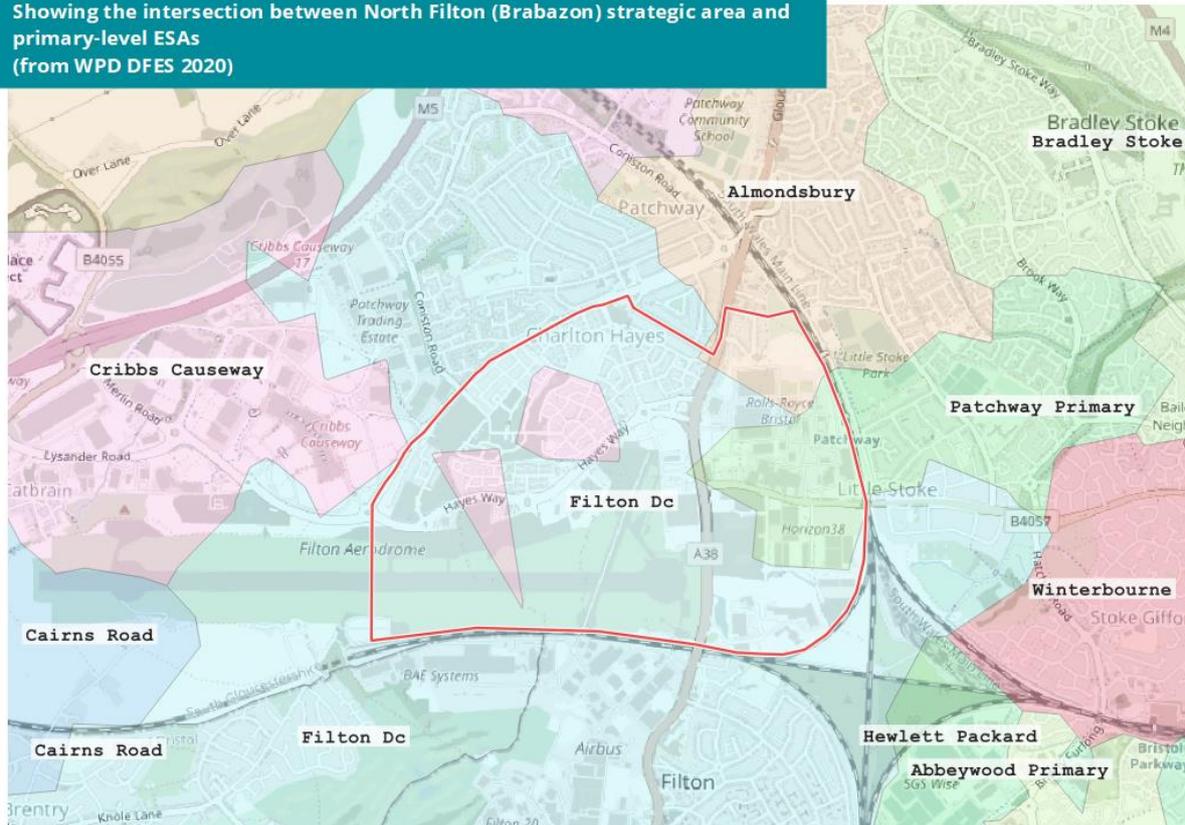


Figure 6 Intersection of the Bristol North Fringe SPA and the primary-level ESAs

South Bristol Strategic Planning Area with ESAs

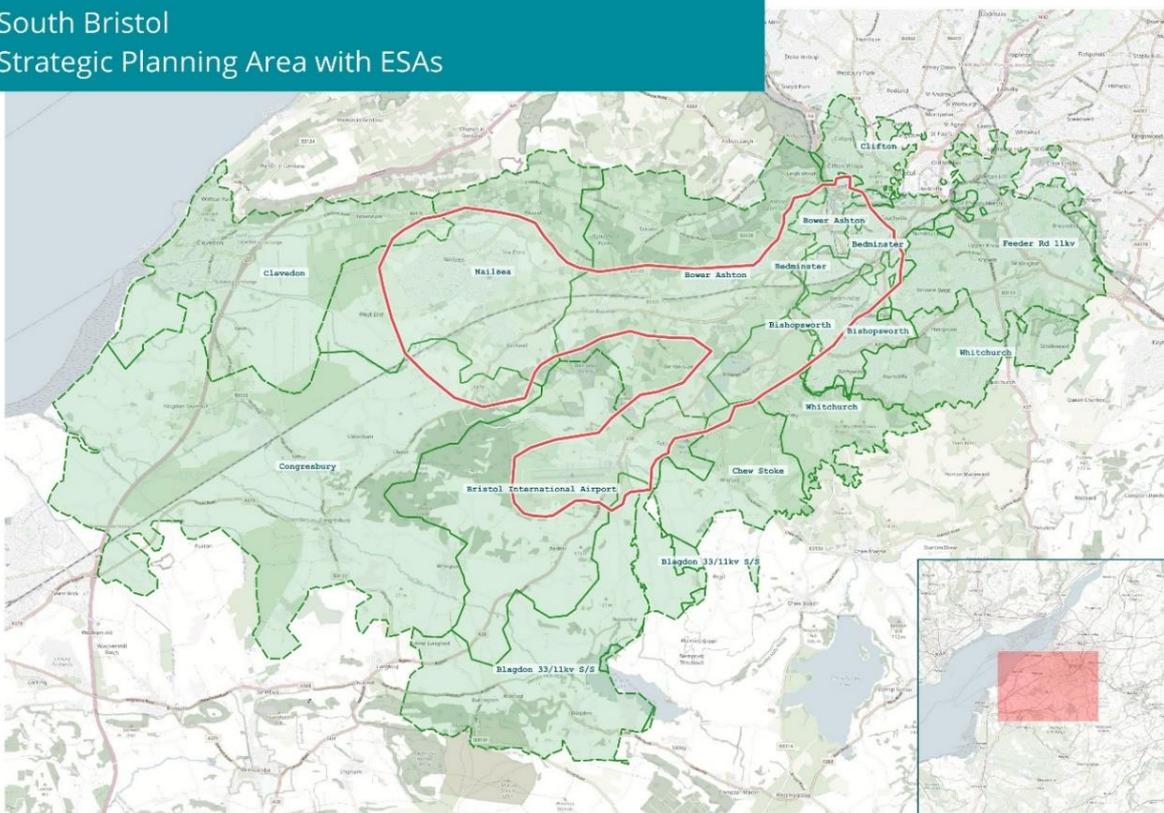
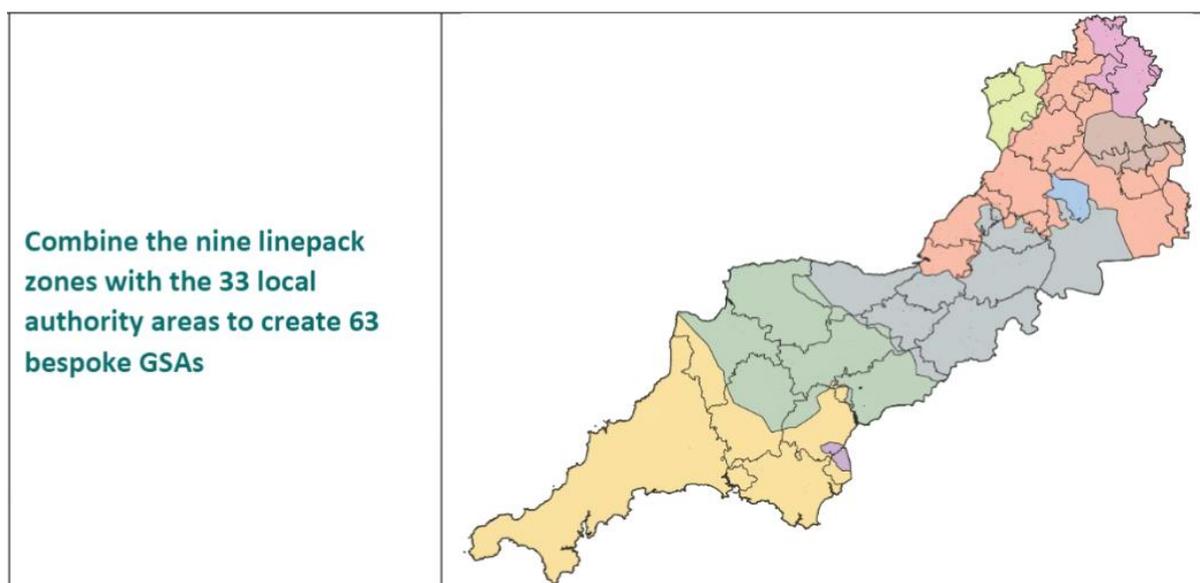


Figure 7 Intersection of the South West Bristol SPA and the primary-level ESAs

### 3.3. Defining gas supply areas

In a previous innovation project, [Net Zero South Wales](#), Gas Supply Areas (GSAs) were defined with WWU for the WWU network areas, as the intersection between linepack zones and local authority area boundaries. The GSAs defined in previous work between WWU and Regen are shown below, however the SPAs in Project EPIC are far smaller than the GSAs, and data reporting at SPA level is insufficient. To work around this, low-pressure connections may be summarised at full postcode level for just those postcodes within an SPA, in a similar manner to postcode reporting at distribution substation / postcode level for the electricity network. As with the postcode-distribution substation reporting for the electricity network, not all data is available down to postcode level and this process will scale the best available data down to the number of customers at each postcode.

The projected network connections data (out to 2050) will be reported as changes on the baseline for each postcode within the SPAs – as this most closely aligns with current gas network analysis methods. Whilst some technologies may be reported by numbers of connections, energy content is more likely to be useful – since fossil gas and hydrogen have different energy content for the same volumetric content.



*Figure 8 Map of the WWU linepack zones*

## 4. Proposed SPA data mapping methodology

### 4.1. Description of proposed solution

To be able to match the various borders of the local authority strategic areas and network-levels, the proposed data solution is to use high-granularity representative areas and aggregate the data up to report for different users.

The lowest level of these representative areas are an intersection of full postcode and electricity network distribution substation customers. These areas are also identifiable at SPA, ESA and local authority areas. To ensure full coverage of the larger zones, the area of focus is wider than just the SPAs, expanding to include all WPD ESAs which intersect the SPAs.

It is likely that much of the customer data, demographic data, or local authority plans do not give detail down to postcode level. The postcode level data is therefore a representation of larger area factors scaled down for the number of customers (domestic or non-domestic) connected at the postcode level.

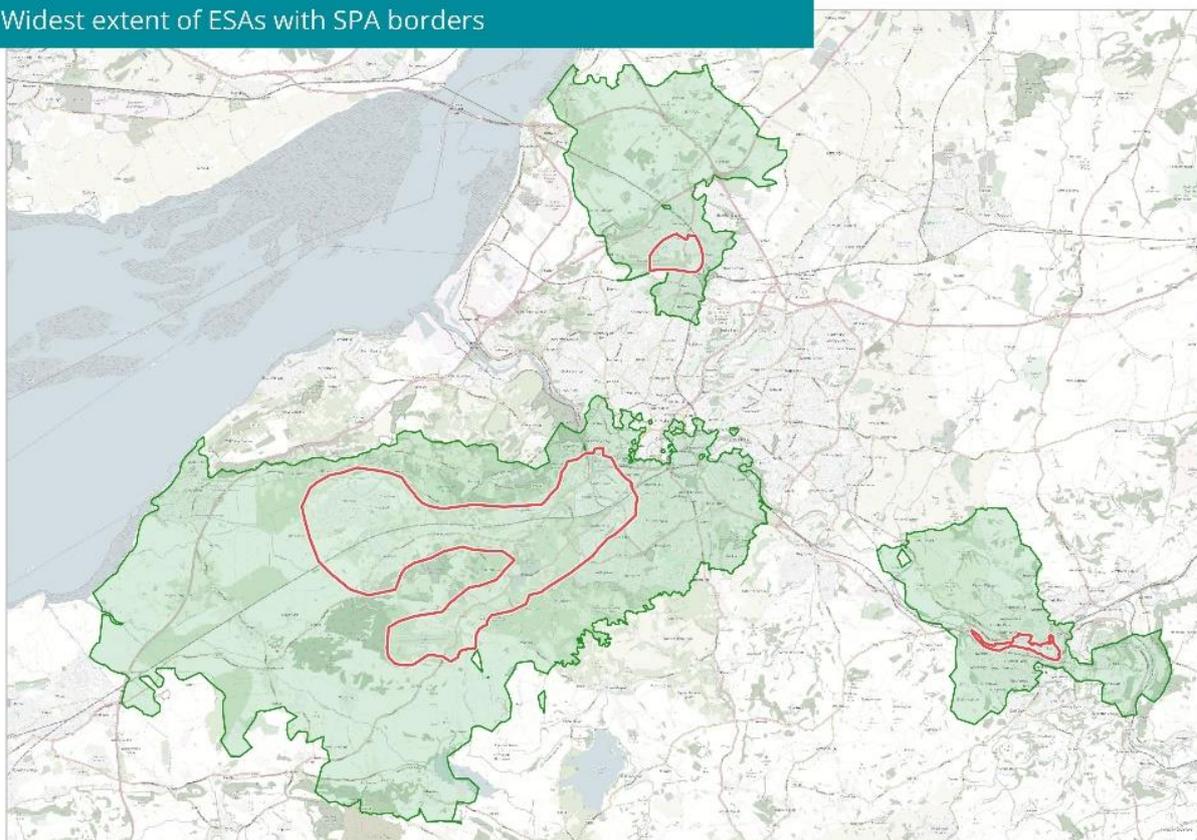
The level of aggregation is technology-specific. Building scale technologies connected at the low voltage or low pressure level will be analysed at the lowest level (postcode / distribution substation), whereas for the electricity network, generation technologies which interact with the network at higher voltage levels will be analysed at either ESA level or, where practical, HV feeder level.

For replicability and ease of use, standardised technology types will be used to report the data, in line with the “building blocks” as developed by the ENA Open Networks project. Further technology types not yet captured in the Building Block technology list will be added, learning from the specifications of the Net Zero South Wales project. For example, this includes gas boilers and various uses of hydrogen. These building blocks are consistent with the WPD DFES 2021 data publication.

### 4.2. Proposed boundaries of local energy analysis

The boundaries of the SPAs are already defined by WECA. The full geographic extent covered in this analysis is larger, incorporating the full boundaries of the ESAs that overlap the SPAs, shown in Figure 9. The widest boundaries includes all primary ESAs that intersect with the SPAs, plus boundaries of postcodes that intersect with the SPAs. Where necessary, the WPD best view scenario from the 2020 DFES will be used to inform the dataset for areas outside of the SPAs. However, for connections inside the SPAs, postcodes will be used.

### Widest extent of ESAs with SPA borders



*Figure 9 Widest extent of the ESAs and SPA boundaries*

## 4.3. Learnings from the Net Zero South Wales innovation project

Some of the key recommendations which arose from the [Net Zero South Wales](#) network innovation project involving WWU, WPD and Regen included:

- Producing an integrated DFES supporting local energy planning
- Increasing the granularity of DFES analysis
- Continue to develop shared definitions in the DFES

These learnings are being taken forward in the proposed data approach reporting to small areas within the SPAs as part of Project EPIC. Postcode level analysis is much higher granularity than previous DFES or FES work, and the building block technology types are being used to increase replicability between regional future energy scenarios and Project EPIC.

## 4.4. Structure of database

The structure of the database will be that of a baseline level of network-connected building blocks at postcode level, with aggregation options for distribution substations, primary ESAs, and SPAs. The projections data is out to 2050, however the greatest level of detail from local authority plans is likely to be in the near term, and the projections will focus on data useful for the next price control periods for the energy networks out to 2035.

## 5. Interim learning from the EPIC area selection process

- a) The SPA selection process for the EPIC project was relatively straightforward in that key strategic areas had already been identified across the region from WECA's Spatial Development Strategy and Strategic Infrastructure Master Plan. This may not be the case in other regions and a more structured selection process may be required that incorporates a weighting to each of the selection criteria.
- b) Effective stakeholder engagement has been critical to the project, particularly with the unitary authorities, and will continue to be. This will be the case for other regions and a stakeholder engagement plan may be beneficial.
- c) Ideally, the area selection process would have been developed in partnership between councils and the networks and would have started with engagement from electricity and gas network distribution and area managers. However, it is realistic to assume that SPA selection and definition will originate from a variety of methods, including areas that have already been defined as part of another process; e.g. an enterprise zone, regional development area, free port or master planning exercise. Connection requests and DFES data will also have a part to play in the area selection process.
- d) It is therefore a good challenge for the EPIC trial and processes to be forced to work with geographic areas that do not easily fit onto the electricity and gas networks.
- e) There is a risk, however, that the areas selected do not produce the variety of investment options and strategies that would fully trial the proposition that by taking a whole systems approach, and thinking strategically, networks are able to make better investment decisions. This is especially true of the gas networks, since the early discussions with UAs suggest that none of the areas feature a strong strategy to implement green gas for domestic and commercial heating. This will be explored further as part of the local energy (requirements) planning.
- f) A critical part of this work package was defining the boundaries of the areas in a way that was useful and meaningful to all stakeholders. The methodology described here for achieving this is intended to be replicable for other regions and networks.
- g) A consequence of the area mapping methodology, and the need to provide plan data for full primary sub-station ESAs, is that the total area which must be analysed is in fact much larger than the SPA. This will complicate the trial process.