CHICKERELL GRID SUPPLY POINT: STRATEGIC DEVELOPMENT PLAN

Our network serving communities across Dorset

Draft for consultation

October 2025

Scottish & Southern Electricity Networks

CONTENTS

1. EXECUTIVE SUMMARY

SSEN is taking a strategic approach in the development of its distribution networks. This will help to enable the net zero transition at a local level to the homes, businesses, and communities we serve. Our Strategic Development Plans (SDPs) take the feedback we have received from stakeholders on their future energy needs from today out to 2050 and translate these requirements into strategic spatial plans of distribution network needs. This helps us transparently present our future conceptual plans and facilitate discussion with local authorities and other stakeholders. The overall methodology and how it fits into our wider strategic planning process is presented in the [Strategic Development Plan methodology](). The focus area of this SDP is the area that is supplied by Chickerell Grid Supply Point (GSP), shown below in Figure 1.

This report documents the stakeholder led plans that are driving net zero and growth in the local area, the resulting electricity demands, and the network needs arising from this. Plans across Dorset have been considered in preparation for this plan.

This SDP utilises the Distribution Future Energy Scenarios (DFES) to understand the pathways to a 2050 network that can support net zero and growth in the local economy. Recommendations from this report outline the initial steps that we believe should be taken on that pathway to develop the network in an efficient and stakeholder-led way.

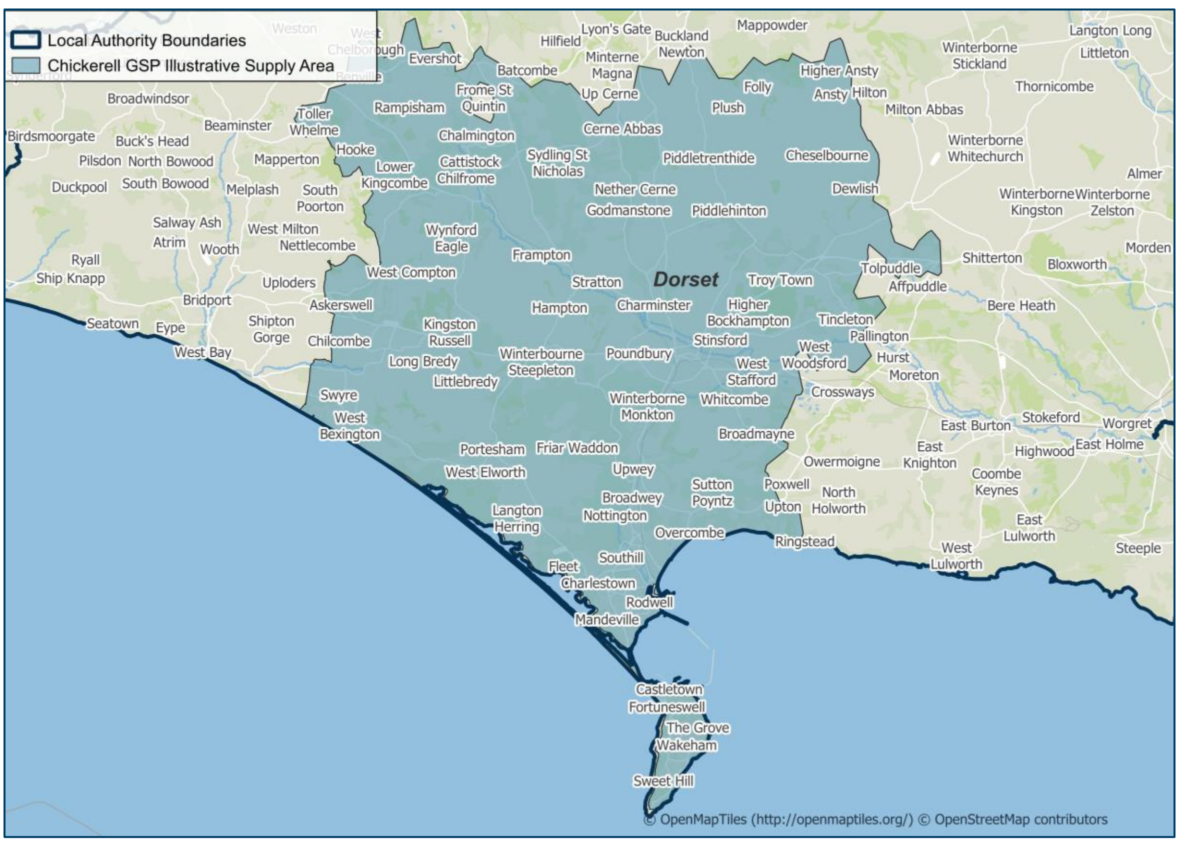

Figure 1 Study area for this SDP

2. INTRODUCTION

The aim of this report is to demonstrate how local, regional, and national targets align with stakeholder ambitions in the area to provide a robust evidence base for load growth out to 2050 across the area served by Chickerell Grid Supply Point (GSP). A GSP is an interface point with the national transmission system where SSEN Distribution then takes power to local homes and businesses within a geographic area. Context for the area this represents is shown above in Figure 1.

To identify the future requirements of the electricity network, SSEN commissions Regen to produce the annual Distribution Future Energy Scenarios (DFES). The DFES analysis is based on the National Energy System Operator (NESO) Future Energy Scenarios (FES), while incorporating more granular stakeholder insights from agencies such as local authorities and new demand and generation connection applications. The DFES provides a forward-looking view of how demand and generation may evolve under different scenarios as we move towards the national 2050 net zero target. These scenarios are summarised in Figure 2. SSEN uses Holistic Transition as the central case scenario, reviewing this position annually. Any more recent unforeseen demand changes, for example customer connection requests, are also considered in our forecasts to ensure that the projected load more accurately reflects what we expect to see in the future.

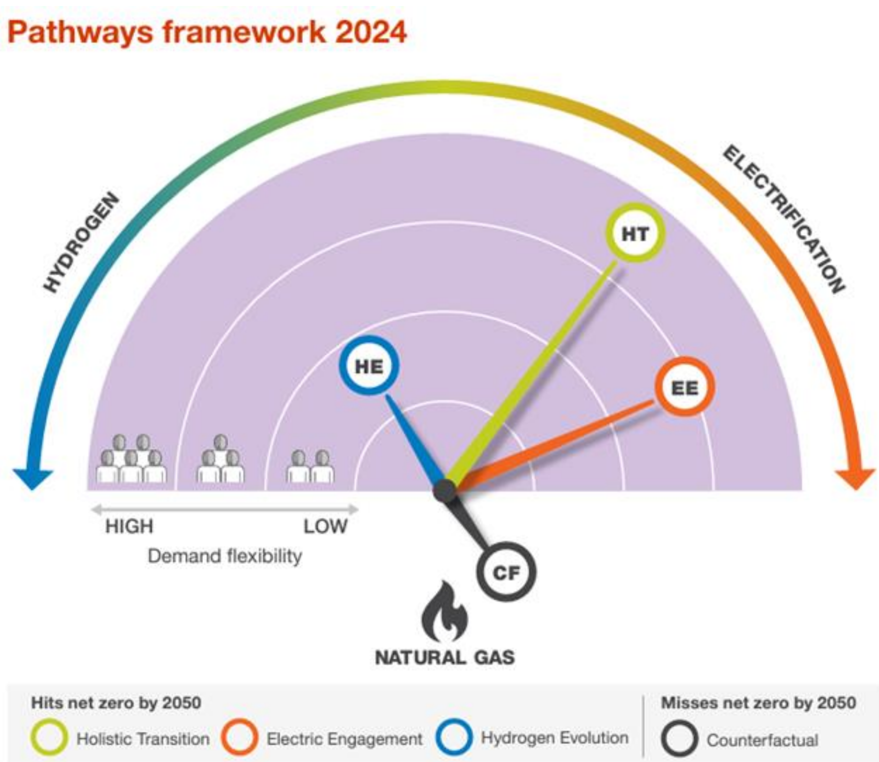

Figure 2 The FES Scenario framework (source: NESO)

Using the DFES, power system analysis has been carried out to identify the future system needs of the electricity network. These needs are summarised by highlighting the year the need is identified under each of the scenarios, and the projected 2050 load. System needs are identified through power system analysis. We also model across the other scenarios to understand when these needs arise and what network capacity should be planned for in the event each scenario is realised.

The DNOA process provides more detailed optioneering for each of these system needs, improving stakeholder visibility of the strategic planning process. Opportunities for the procurement of flexibility are also highlighted in the DNOA to cultivate the flexibility markets.

Further information on the FES framework can be found in the DFES 2024 introductory report.

3. STAKEHOLDER ENGAGEMENT AND WHOLE SYSTEM CONSIDERATIONS

3.1. Local Authorities and Local Area Energy Planning

The local authorities that are supplied by Chickerell GSP include Dorset as shown in Figure 3. The development plans for these local authorities will have a significant impact on the potential future electricity load growth on SSEN's distribution network. As such, it is vital for SSEN to engage with these plans when carrying out strategic network investment.

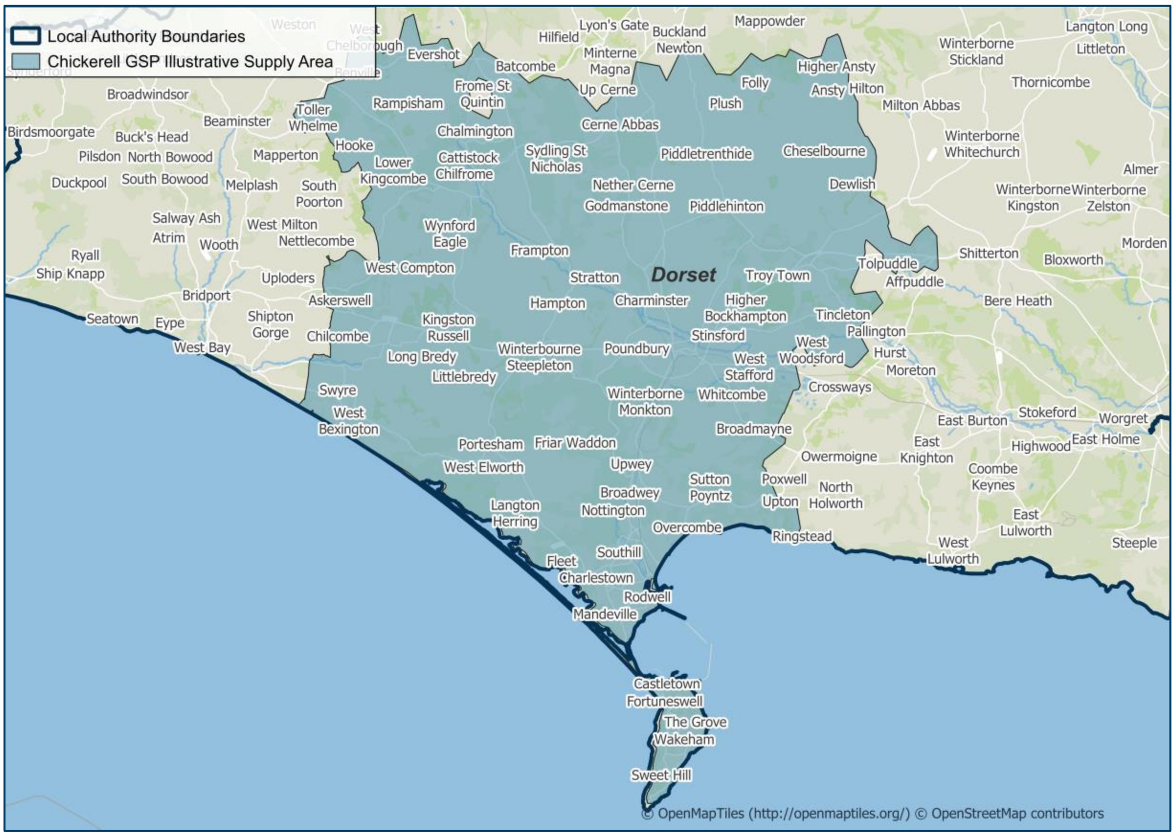

Figure 3 Chickerell GSP Supply Area and Local Authority Boundaries.

3.1.1. Dorset Council

Dorset Council issued a climate declaration in 2019 and adopted their first Climate and Ecological Emergency Strategy in 2021. Their 2021 strategy laid the foundation for Dorset Council's response to the climate and ecological emergency, setting out a long-term vision and initial actions. Although, the initial strategy noted fundamental uncertainty on national policy, greater clarity has since emerged thanks to the introduction of:

- the UK Net Zero Strategy,
- the Environment Act,
- the new Environment Improvement Plan, and
- the Climate Change Risk Assessment.

Building on this emergence, the Dorset Council's Natural Environment, Climate and Ecology strategy (2023–2025 Refresh) was developed in 2023, incorporating clearer national direction with updated scientific evidence, and more comprehensive local data to accelerate and strengthen action. The new strategy set a clearer direction with realistic and achievable ambitions to become a carbon neutral council by 2040 and a carbon neutral county by 2050, frontloaded by interim targets.

Dorset Council has implemented a dual programme approach since 2021 to tackle emissions more effectively: an operational programme targeting emissions within its direct control, and a facilitation programme aimed at influencing those beyond its immediate reach. These programmes are structured around the strategy's three core pillars of climate change mitigation, biodiversity recovery, and climate adaptation. These efforts are supported by a £10 million capital programme to fund delivery, and the progress is now reported biannually.

As a result, the council has achieved more than 25% reduction in emissions compared to its 2019 baseline, putting it on track to meet its targets. However, newly available and more comprehensive data for the wider county reveals that while Dorset's overall emissions dropped by over 10% between 2018 and 2020, county-wide action must accelerate to stay aligned with long-term goals. These developments have set out a series of key national milestones, including the widespread adoption of heat pumps, the phase-out of fossil-fuel vehicles, and the decarbonisation of the electricity grid by 2035.

3.2. Whole System Considerations

As shown in Figure 3, a significant length of coastline is currently supplied by Chickerell GSP, including Portland port. An important consideration is the future electrification of the maritime industry. Due to the significant distance from related network infrastructure, the cost of providing significant additional capacity at this site is potentially high. SSEN should continue to engage with Portland Port to understand the confidence in the demand projections and NGET to understand how capacity can be released to enable it.

3.2.1. Transmission interactions

The distribution interconnection to Yeovil BSP via the 33kV network that is introduced in section 6 will increase security in the area in the event of a Second Circuit Outage (SCO) event either at Chickerell BSP or the transmission network. The NGET T3 plan currently has no detail on further reinforcement of Chickerell GSP.

3.3. Flexibility Considerations

SSEN procures Flexibility Services from owners, operators, or aggregators of Distributed Energy Resources (DERs) or Consumer Energy Resources (CERs), which can be generators, storage, or demand assets. These services are needed in areas of the network which have capacity constraints at particular times or under certain circumstances. SSEN purchases Flexibility Services from all types of providers (e.g. domestic or commercial). Information on the process for procurement and how to participate are published on the Flexibility Services website and information on real time decision making on which providers are dispatched can be found in the Operational Decision-Making document.[1,2]

SSEN regularly recruits new Flexibility Services providers and increases the procured Flexibility Services with the latest bidding round for long term requirements held in May 2025 and recruitment through the Mini-Competition process most recently opening in mid-July 2025.[2]

Areas across Chickerell GSP where flexibility has been procured is shown below in Figure 4. This map shows all Flexibility Services procured, which covers requirements beyond those identified for managing the deferral of reinforcement.

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1 SSEN, Flexibility Services Procurement (Flexibility Services Procurement - SSEN)

2 SSEN, 02/2024, Operational Decision Making (ODM), SSEN Operational Decision Making ODM

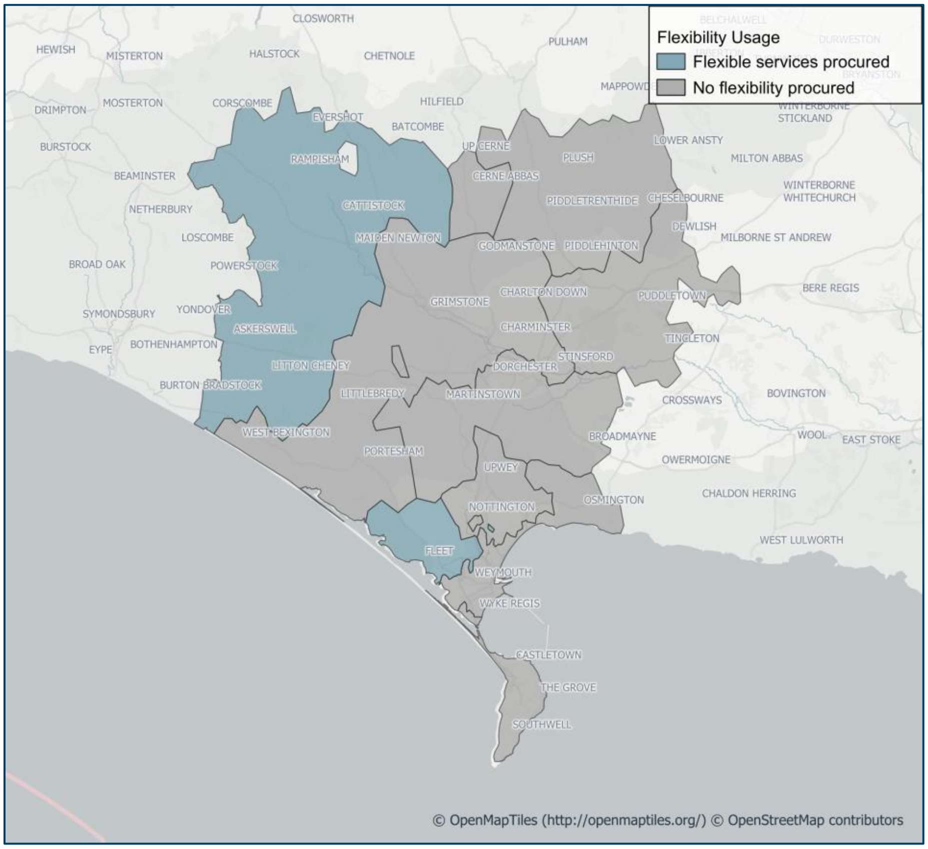

Figure 4 Flexibility procurement across Chickerell GSP

4. EXISTING NETWORK INFRASTRUCTURE

4.1. Chickerell Grid Supply Point Context

The Chickerell GSP network is made up of 132kV, 33kV, 11kV, and LV circuits. It supplies a predominantly rural area across Dorset as well as the towns of Weymouth and Dorchester. In total, the GSP serves approximately 63,000 customers. Table 1 shows the values for the GSP, and the primary substations supplied by the GSP (noting that some sites for single customers are not shown here). The peak maximum demand refers to the peak at each individual substation which may not be at a coincident time as the others (meaning we would not expect the values for all primary substations to sum to that at the GSP).

Substation Name	Site Type	Number of Customers Served (approximate)	2024/25 Substation Maximum demand in MVA (Season)
Chickerell	Grid Supply Point/Bulk Supply Point	63,200	74.03 (Winter)
Cerne Abbas	Primary Substation	500	1.34 (Winter)
Charminster	Primary Substation	5,100	8.02 (Winter)
Chickerell	Primary Substation	4,000	8.06 (Winter)
Dorchester Town	Primary Substation	12,600	16.59 (Winter)
Maiden Newton	Primary Substation	2,800	6.60 (Winter)
Piddletrenthide	Primary Substation	1,200	4.81 (Winter)
Portland	Primary Substation	8,100	9.31 (Winter)
Puddletown	Primary Substation	1,400	2.33 (Winter)
Redlands	Primary Substation	8,000	8.49 (Winter)
Weymouth	Primary Substation	19,400	21.69 (Winter)

Table 1 Customer number breakdown and substation peak demand readings (2024-25) for Chickerell GSP.

4.2. Current Network Topology

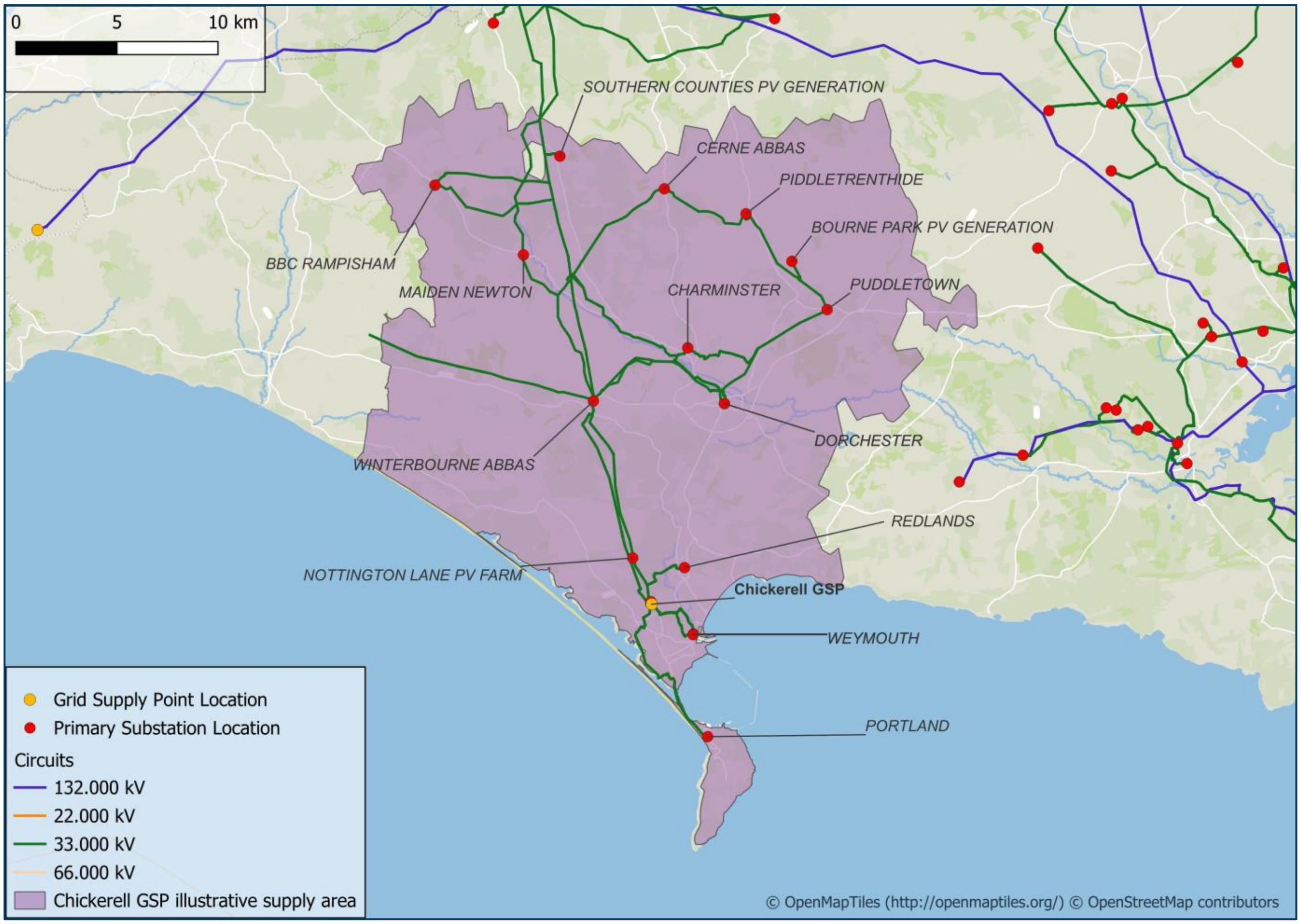

Figure 5 Current network topology of Chickerell GSP.

4.3. Current Network Schematic

The existing 132kV and 33kV networks at Chickerell GSP is shown below in Figure 6.

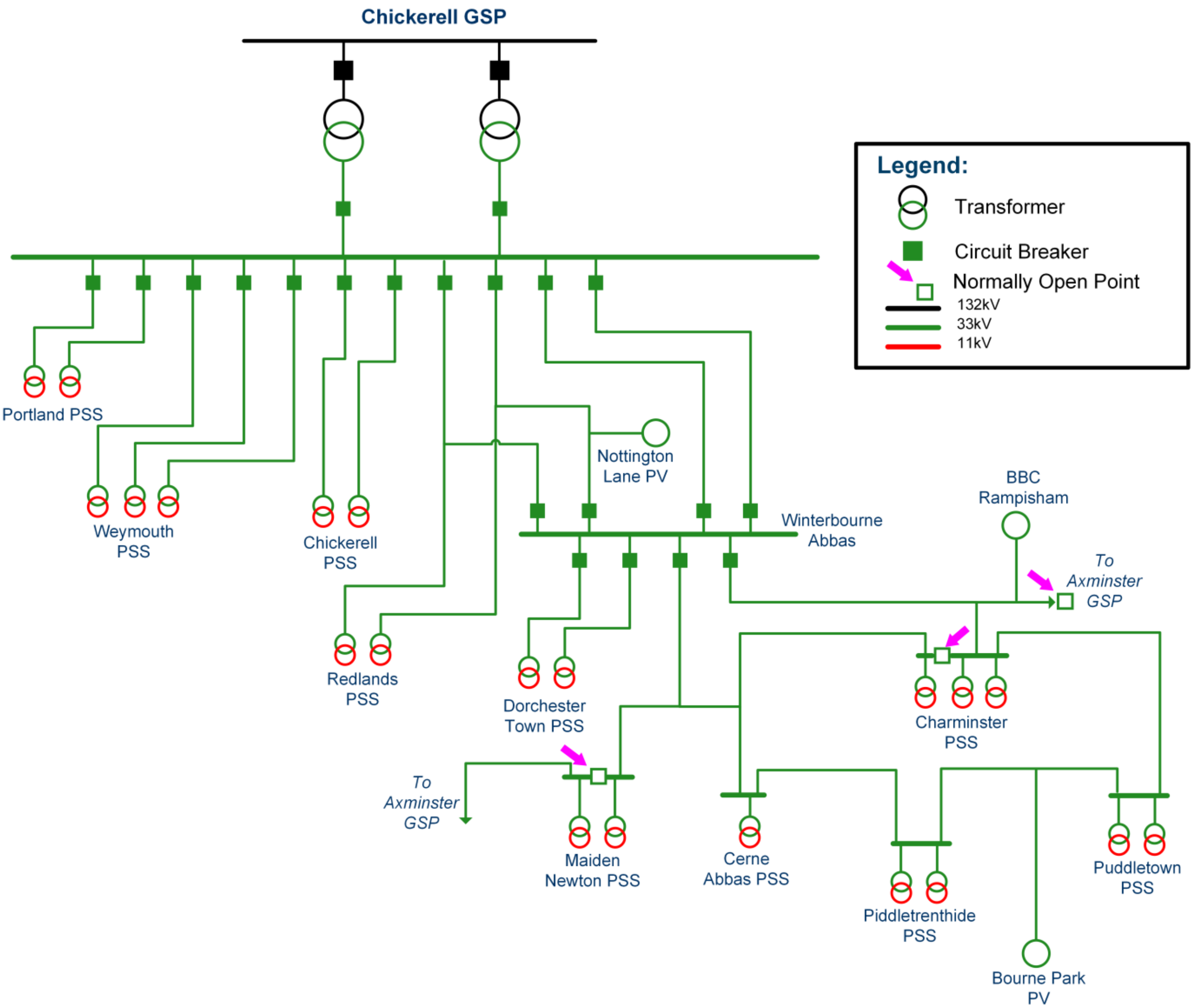

Figure 6 Existing network supplied by Chickerell GSP

5. FUTURE ELECTRICITY LOAD AT CHICKERELL GSP

The following section details load growth across the technologies projected in the Distribution Future Energy Scenarios. There are important notes on the values presented here:

- This SDP and the analysis conducted has been completed ahead of any changes arising from Clean Power 2030.
- These projections relate to the GSP supply area highlighted in Figure 1 and are not directly aligned to a particular local authority.
- Where MW values are presented in this section, they represent total installed capacity. When conducting network studies these values are appropriately diversified to represent the coincident maximum demand of the entire system rather than the total sum of all demands.
- For projections specific to individual primary substations or local authorities, please refer to our online dashboard.[3]

3 SSEN DFES Technology Projections - Microsoft Power BI

5.1. Generation and Storage

DFES Scenario	Generation capacity				Electricity storage capacity			
	Baseline	**2030**	**2040**	**2050**	**Baseline**	**2030**	**2040**	**2050**
Holistic Transition	84MW	113MW	190MW	245MW	0MW	18MW	40MW	52MW
Electric Engagement		98MW	163MW	219MW		15MW	36MW	44MW
Hydrogen Evolution		88MW	140MW	185MW		14MW	26MW	32MW
Counterfactual		78MW	110MW	139MW		12MW	15MW	18MW

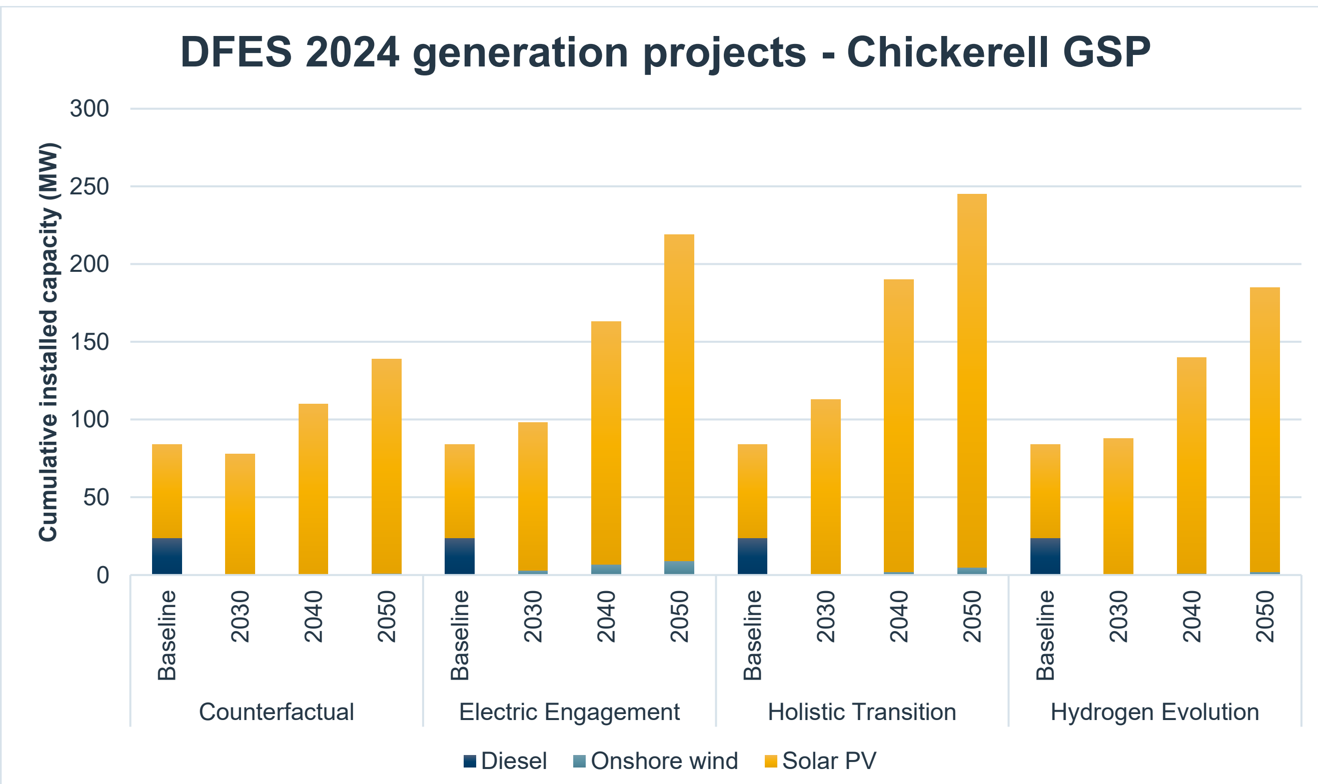

Figure 7 - Projected cumulative distributed generation capacity Chickerell GSP (MW). *Source: SSEN DFES 2024*

5.2. Transport Electrification

DFES Scenario	Domestic EV chargers – off-street (number of units)				Non-domestic EV chargers & domestic on-street EV chargers (MW)			
	Baseline	2030	2040	2050	Baseline	2030	2040	2050
Holistic Transition	1,773	11,650	37,470	39,351	2MW	12MW	52MW	62MW
Electric Engagement		19,664	37,283	38,910		20MW	57MW	60MW
Hydrogen Evolution		11,581	37,149	38,782		14MW	61MW	69MW
Counterfactual		9,222	35,445	38,457		8MW	41MW	67MW

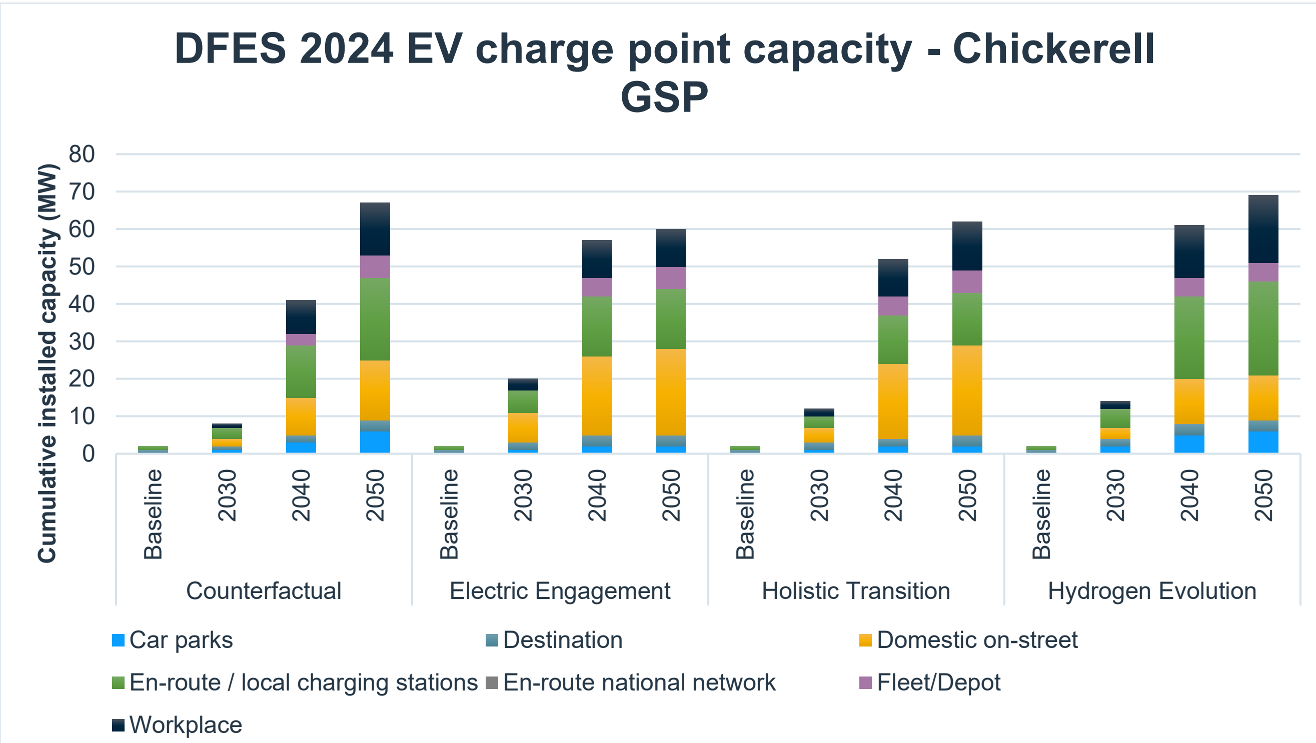

Figure 8 - Projected EV charge point capacity across Chickerell GSP. *Source: SSEN DFES 2024*

5.3. Electrification of Heat

DFES Scenario	Non-domestic heat pumps and resistive electric heating (m^2 of floorspace)				Domestic heat pumps (number of units)			
	Baseline	2030	2040	2050	Baseline	2030	2040	2050
Holistic Transition	123,917m^2	388,689m^2	936,973m^2	1,229,893m^2	726	9,574	38,900	54,069
Electric Engagement		331,832m^2	947,511m^2	1,250,969m^2		9,279	38,265	52,908
Hydrogen Evolution		368,467m^2	729,680m^2	934,303m^2		9,277	35,239	48,657
Counterfactual		264,038m^2	460,700m^2	607,898m^2		5,338	16,973	39,557

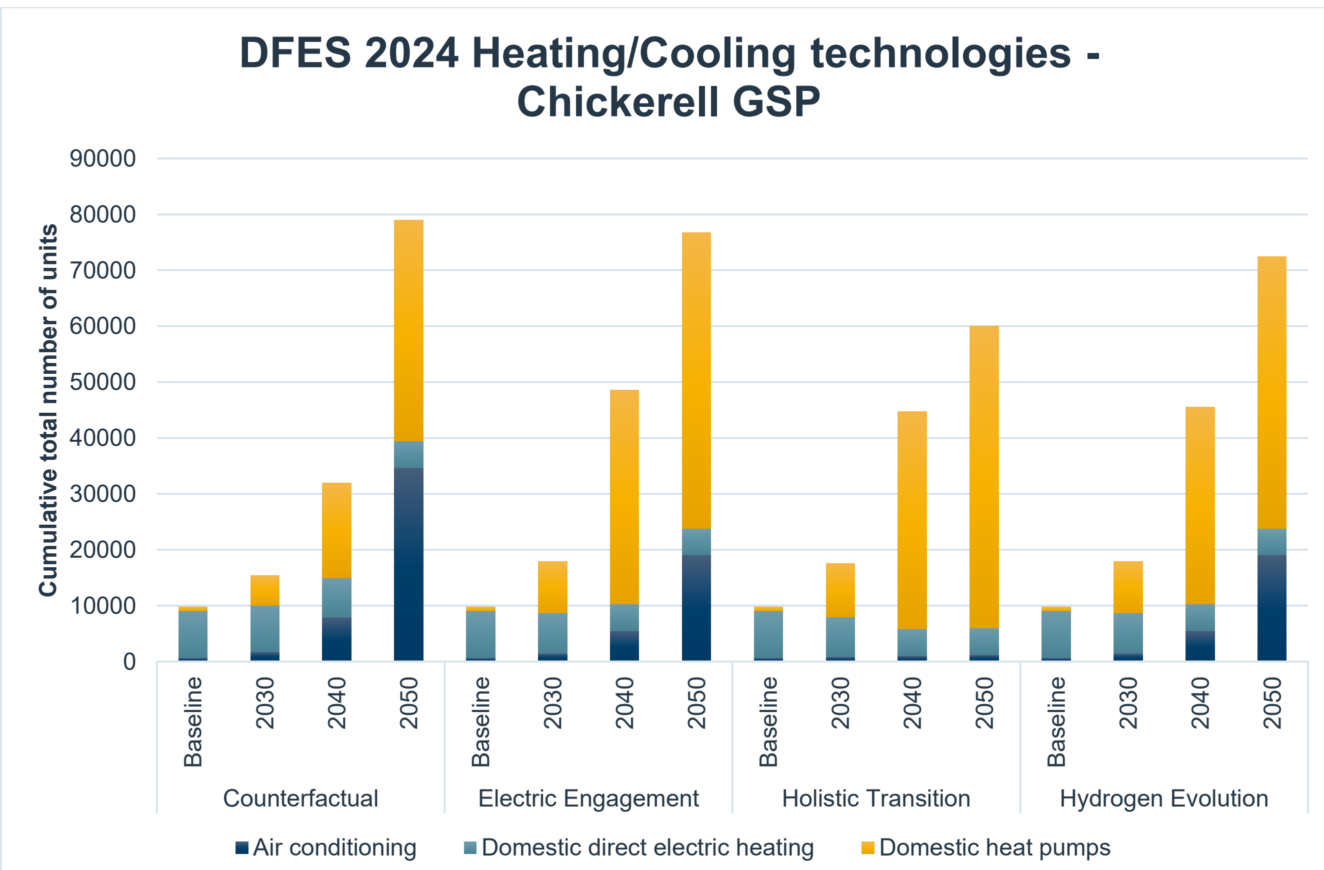

Figure 9 - Projected number of heating/cooling technologies across Chickerell GSP. *Source: SSEN DFES 2024*

5.4. New Building Developments

Through engagement with local authorities, we have developed an understanding of new development across our licence areas. This has allowed us to gauge an insight into future electricity demand for new developments ahead of a formal connection application. Below we investigate the new developments across the study area for this SDP.

DFES Scenario	New domestic development (number of homes)			New non-domestic development (m^2)		
	2030	2040	2050	2030	2040	2050
Holistic Transition	3,788	7,311	11,151	51,204m^2	89,537m^2	104,537m^2
Electric Engagement	3,788	7,253	10,702	51,204m^2	89,537m^2	104,537m^2
Hydrogen Evolution	3,788	7,253	10,702	51,204m^2	89,537m^2	104,537m^2
Counterfactual	3,788	7,245	10,404	57,037m^2	80,685m^2	104,537m^2

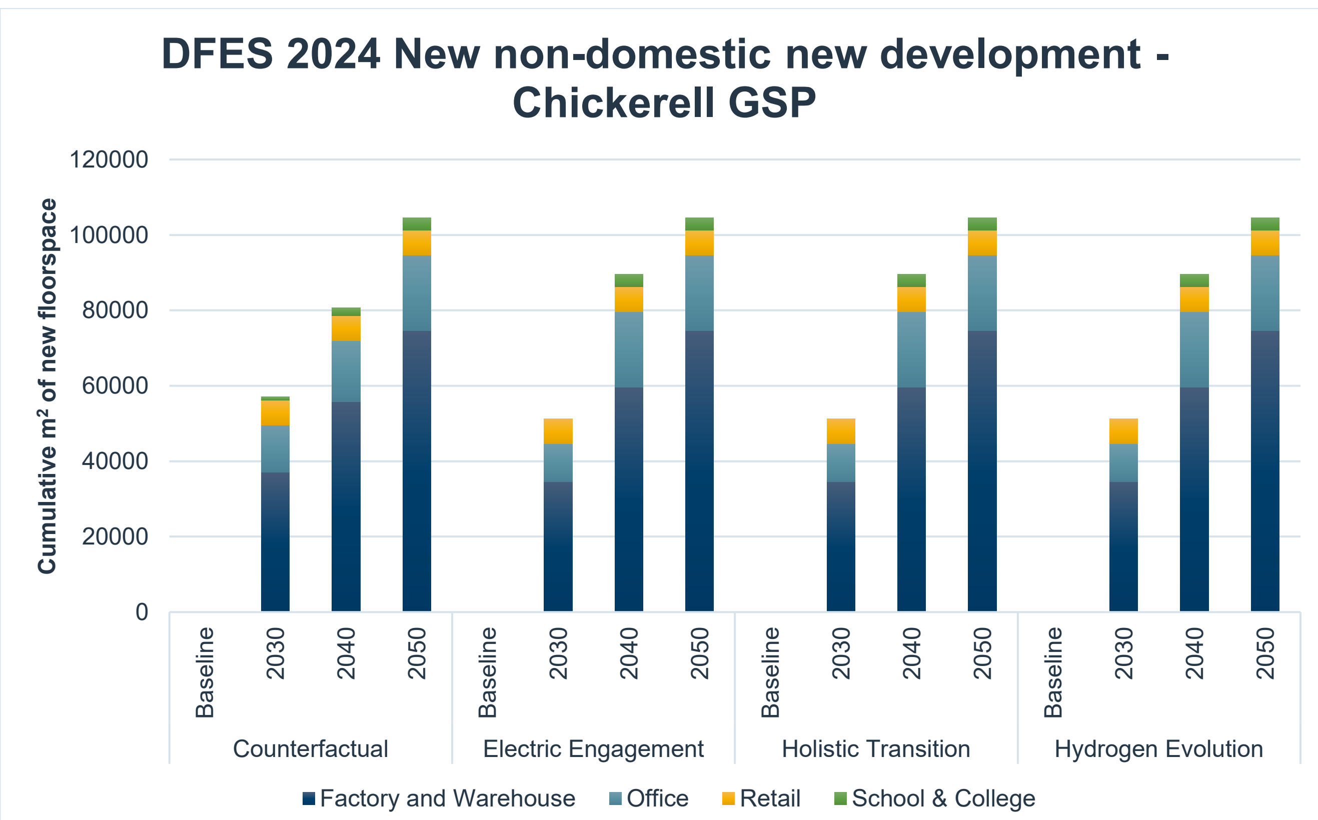

Figure 10 - non-domestic new development under Chickerell GSP. *Source: SSEN DFES 2024*

5.5. Commercial and Industrial Electrification

Engagement with stakeholders across the area studied in this SDP has provided some insights into potential demand growth further to that introduced in the previous sections. For example, there is projected to be a significant requirement for additional capacity driven by the maritime industry. Due to the scale of the demands that will arise from this, there is potentially justification for installation of a second Bulk Supply Point under Chickerell GSP, however due to uncertainty on the confidence that this development will progress, it is not explored in detail here.

In addition to the above, decarbonisation of the agricultural is an important consideration in this geographic area. SSEN leads the innovation project 'Future Agricultural Resilience Mapping' (FARM) which aims to understand the future energy requirements and means of decarbonising the domestic farming industry. This sector is currently still largely dependent on fossil fuels, and the project will support its investigations into the impact of food production on the electricity distribution system, to work out where reinforcement is needed. A data-driven tool to inform network planning will be devised and through this work, FARM will address the gap between the energy demands for food production and future network planning.

6. WORK IN PROGRESS

Network interventions can be caused by a variety of different drivers. Examples of common drivers are load-related growth, specific customer connections, and asset health. Across Chickerell GSP these drivers have already triggered network interventions that have now progressed to detailed design and delivery. For this report, these works are assumed to be complete, with any resulting increase in capacity considered to be released. The drivers listed in the below table are predominantly where a customer connection application has driven the work or where investment proposals developed through our DNOA process are driving the reinforcement work. The work included here is all work that has passed through the ID2 gate of our Distribution Governance and Investment Framework (DGIF), further information on this process is available in the DSO service statement 2025.[4] The network considered for long-term modelling is shown in 11. Summary of existing works shown below in Table 2.

ID	Substation	Description	Driver	Forecast completion	Resolves future strategic needs to 2050?
1	Chickerell BSP	Installation of a third 132/33kV transformer.	Customer connection	2032	
2	Winterbourne Abbas to Yeovil BSP	Installation of a 30km 33kV circuit from Yeovil BSP to Winterbourne Abbas 33kV busbar. Provides interconnection between Chickerell and Axminster GSPs and security of supply under SCO conditions.	Customer connection	2028	
3	Redlands PSS	Network reconfiguration of Redlands PSS to be directly supplied by 33kV circuits to Chickerell BSP	Customer connection	2028	
4	Winterbourne Abbas to Dorchester Town PSS	Reinforcement of 33kV circuit sections between Winterbourne Abbas and Dorchester Town PSS	Primary Reinforcement	2025	
5	Cerne Abbas	Replacement of the existing 33/11kV primary transformer at the site with a 4MVA rated unit.	Asset Replacement	2028	

Table 2 - Works already triggered through customer connections, DNOA process, or asset replacement.

Where the above works are marked as not providing sufficient capacity for 2050 peak demands, it is important to note that this relates to the individual primary substation's firm capacity. When considering the further works

4 DSO Service Statement 2025

identified in this report, the holistic plans aim to provide capacity across the GSP for 2050 based on current projections.

Alongside these asset solutions being deployed, flexibility solutions are also being used to release additional capacity.

6.1. Network Schematic (following completion of above works)

The network schematic below in Figure 11 shows the 132kV network with changes highlighted and referenced to Table 2.

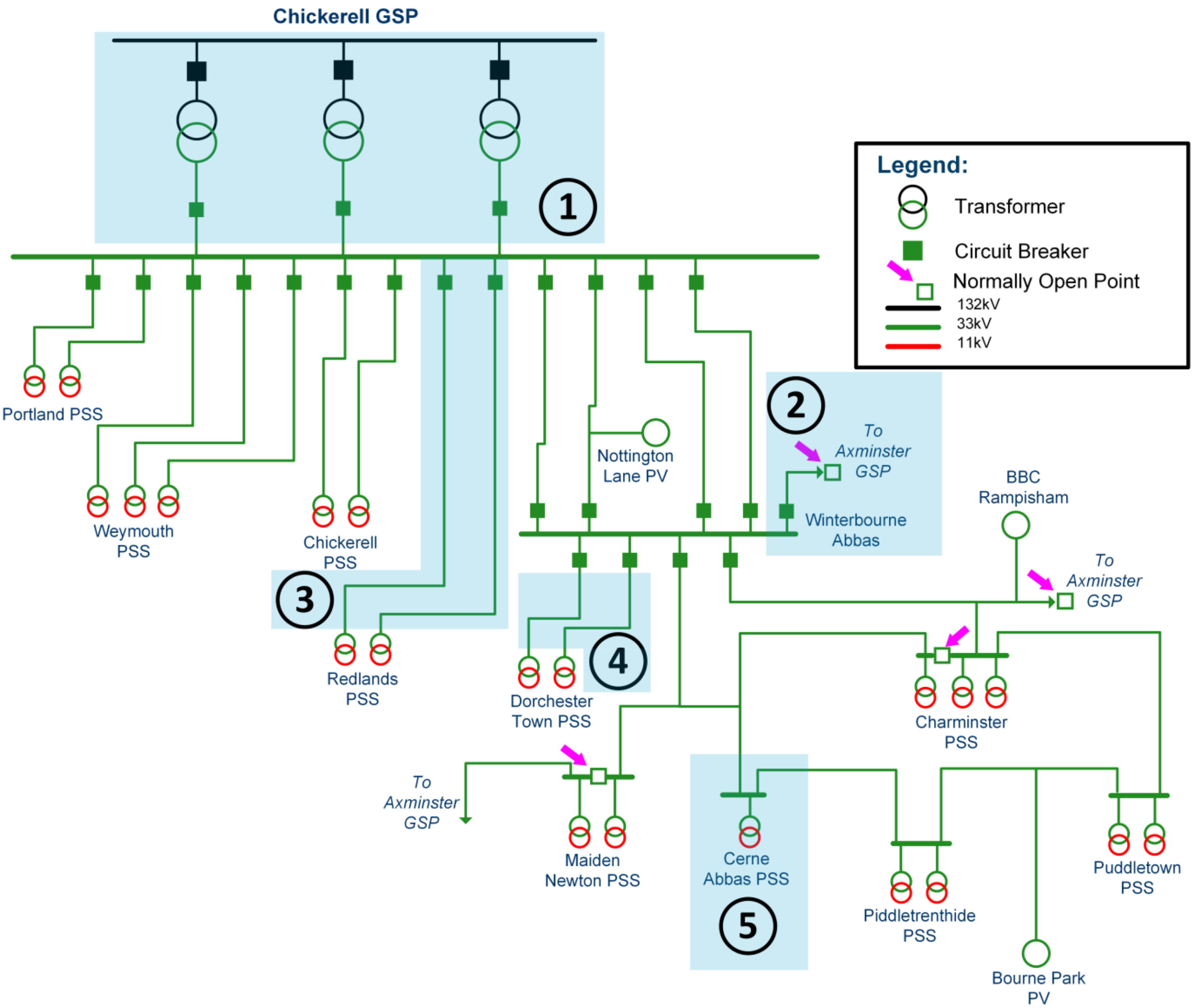

Figure 11 Chickerell Network schematic following completion of triggered works.

7. SPATIAL PLAN OF FUTURE NEEDS

7.1. Extra High Voltage / High Voltage Spatial Plans

The EHV/HV spatial plan shown below in Figure 12 shows the projected headroom or capacity shortfall due to demand increases at primary substations across the Chickerell SDP study area. Darker shades indicate that there is a projected capacity shortfall whereas lighter shades indicate that there is headroom capacity based on current projections. EHV/HV spatial plans for the other DFES scenarios are presented in appendix B. It should be noted that the Network Scenario Headroom Report (NSHR) is produced annually and was last published in May 2025, where work has been triggered between this date and the time of publication of this report, future capacity may not be reflected.

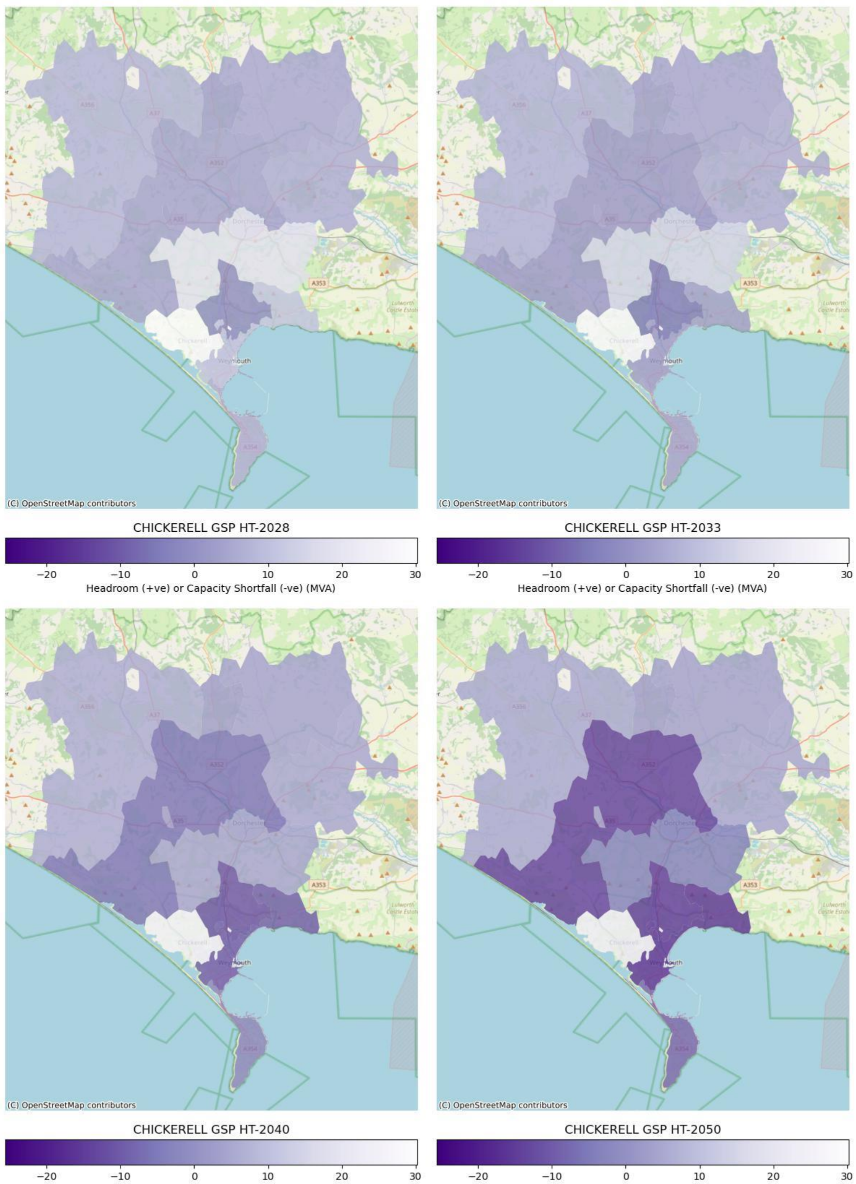

Figure 12 Chickerell GSP - EHV/HV Spatial Plans – Holistic Transition

7.2. HV/LV Spatial Plans

The HV/LV spatial plans shown below in Figure 13 show the point locations of secondary transformers supplied by Chickerell GSP. The points are colourised based on the projected percentage loading with red meaning higher percentage loading and green being lower percentage loading. The HV/LV spatial plans for the other DFES 2024 scenarios are available in Appendix C.

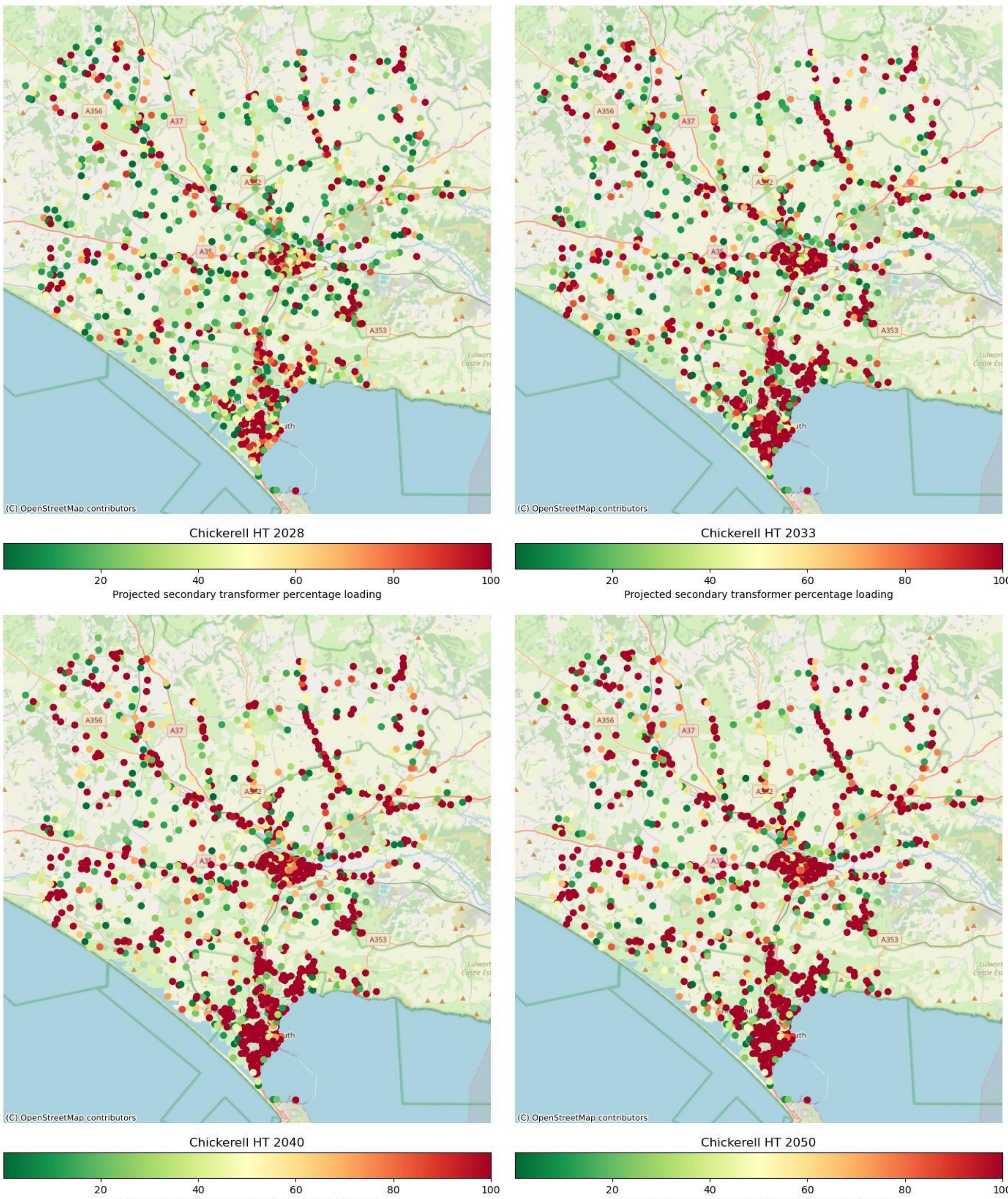

Figure 13 Chickerell GSP - HV/LV Spatial Plans – Holistic Transition

8. SPECIFIC SYSTEM NEEDS AND OPTIONS TO RESOLVE

In this section we summarise the specific needs arising from our future spatial plans. The outputs of the power system analysis in this section show where we may observe the need for further intervention on the distribution network. This could be through asset solutions or flexibility services including access products which may be used to enable connection of projects ahead of reinforcement delivery. We also propose some initial options to resolve the needs forecasted. If required during the next ten years, these will be further developed through the DNOA process.

The section consists of three sets of results:

- Future EHV system needs to 2035 – these needs are more certain and therefore we have more clearly defined options to meet the requirements, and we recommend that these are progressed through the DNOA process. In all cases, we are proposing solutions that meet the projected requirements for 2050 and where appropriate, system needs arising beyond this period-are considered to ensure a holistic solution. We also provide a summary of more strategic elements that also need to be considered in these timeframes.
- Future EHV system needs to 2050 – there is a greater degree of uncertainty of outcomes in this time frame. This also provides more opportunities to work with stakeholders to develop strategic plans, and our outlined solutions reflect this initial phase of the work as we look to engage with interested parties.
- Future HV/LV system needs to 2050 – the future needs of the HV and LV networks are locationally specific but can be considered as an aggregated volume. In this section we provide information on our future forecasts for local HV and LV network needs.

8.1. Overall Dependencies, Risks, and Mitigations

There are several overarching risks to the delivery of our strategic plan. Below we list these alongside proposed mitigating actions. We will work with stakeholders to develop these mitigating actions further.

Dependency: Requirement for extension of the 132kV busbar at Chickerell GSP
Risks: Uncertainty whether this is possible within the existing site – may also require works on NGET’s network.
Mitigation: Early identification and scoping of the system need will stimulate initial discussions so that any plans for the next regulatory price control period do not act as blockers in the future.

Dependency: Growth of generation in the area may begin to cause reverse power flow on the network. It should be ensured that the assets currently on the network are able to handle the projected levels of reverse power flow and increased fault level.
Risks: Further reinforcement than identified here is required to enable connection of generation. Increasing fault levels leads to damaged distribution network assets.
Mitigation: We should further assess the near-term generation requirements to ensure that we are in a position to facilitate the Clean Power 2030 targets set by the Department for Energy Security and Net Zero (DESNZ). Consideration of future fault level to prevent the risk of damaged assets should be considered when designing future schemes.

8.2. Future EHV System Needs

The following tables details the distribution network system needs that have been identified through power system analysis. While asset solutions are described in the table below it is important to note that the use of flexibility will be evaluated for all schemes to ensure the best possible solution is progressed.
For the projects shown in Table 3 we recommend that these are progressed through the DNOA process so that there is sufficient time for solutions to be designed and delivered. The interactions between possible options have been considered to identify potential synergies and efficiencies. As such, related constraints have been grouped to be considered alongside each other and any additional interactions between constraints referenced.

8.2.1. System needs to 2035

ID	Location of proposed intervention	HT Year	EE Year	HE Year	CF Year	Network State	Comments and potential options to resolve the system need
33kV Network							
1	Winterbourne Abbas to Charminster PSS 33kV circuits.	Ahead of 2030	Ahead of 2030	Ahead of 2030	Ahead of 2030	N-1: Loss of 33kV circuit from Winterbourne Abbas – Maiden Newton – Charminster – Cerne Abbas.	• Development of a new primary substation at an existing reserve site to the north of Dorchester. Requires the installation of 2 new 33kV AIS circuit breakers (CBs) at Winterbourne Abbas; new dual circuits to the new site; and 2 new 20/40MVA 33/11kV transformers at the site. • Transfer of load from Charminster to this new primary substation will mitigate the requirement for reinforcement of the Winterbourne Abbas to Charminster PSS 33kV circuits in the near-term.
2	Weymouth PSS 33/11kV transformers	Ahead of 2030	Ahead of 2030	Ahead of 2030	Ahead of 2030	N-1: Loss of any one of the three 33/11kV transformers at Weymouth PSS.	• Reinforcement of the three existing 33/11kV transformers to 30MVA rated units will provide sufficient firm capacity for projected 2050 loads based on the current forecast. • A shorter-term solution would be to transfer load through the HV network to Chickerell PSS, although reinforcement of 33/11kV transformers at both sites is currently projected to be required ahead of 2050.
3	Winterbourne Abbas to Dorchester Town PSS 33kV circuits	2034	2029	2032	2037	N-1: Loss of either 33kV circuit from Winterbourne Abbas to Dorchester Town PSS.	• The cable sections are currently being reinforced as detailed in section 6. Later we see the overhead line sections projected to be overloaded. Potential for reinforcement with higher rated conductors to match the rating of the cables currently being installed (37MVA winter rating) • Investigation on the health levels and type of existing poles will inform the decision for installation of new pole structures or whether installing higher rated conductors on the existing poles is possible.
4	Charminster PSS 33/11kV transformers	2032	2031	2033	2034	N-1: Loss of either 33/11kV transformer at Charminster PSS.	• Reinforcement of the two existing 33/11kV transformers to 30MVA rated units will provide sufficient firm capacity until the late 2040s. Alternatively, 20/40MVA units could be installed

ID	Location of proposed intervention	HT Year	EE Year	HE Year	CF Year	Network State	Comments and potential options to resolve the system need
							which would provide sufficient capacity until beyond 2050. An alternative option would be: • Development of a new primary substation, as introduced in ID1, coupled with load transfers through the HV network will defer the requirement for near-term reinforcement at this site.
5	Piddletrenthide PSS 33/11kV transformers	2032	2030	2032	2034	N-1: Loss of 33/11kV transformer (C2MT) at Piddletrenthide PSS.	• Existing 33/11kV transformers are rated at 5MVA, to resolve this issue installation of higher rated transformers is suggested. • Potential voltage issues on this part of the 33kV network could be resolved through splitting the 33kV ring, potential for further expansion of the Winterbourne Abbas to allow for new CBs alongside the work proposed in **ID1**
6	Dorchester Town PSS 33/11kV transformers	2034	2032	2033	2037	N-1: Loss of either 33/11kV transformer at Dorchester Town PSS.	• Reinforcement of the two existing transformers to 20/40MVA units would only provide an increase in firm capacity of approximately 10MVA, this would not be sufficient based on projected 2050 demands. • As an alternative, it may be possible to install a third 15/30MVA transformer at the site. This would require the installation of a 33kV busbar at the site and potentially expansion of the existing site.
7	Redlands PSS 33/11kV transformers	2031	2031	2031	2034	N-1: Loss of either 33/11kV transformer at Redlands PSS.	• Reinforcement of the existing 33/11kV transformers to 30MVA units provides sufficient capacity for projected demand to 2050 and beyond.

Table 3 Summary of system needs identified in this strategy through to 2035 along with indicative solutions.

8.2.2. System needs to 2050

ID	Location of proposed intervention	HT Year	EE Year	HE Year	CF Year	Network State	Comments and potential options to resolve the system need
33kV Network							
9	Chickerell BSP to Portland PSS 33kV circuits	2037	2036	2037	2042	N-1: Loss of either 33kV circuit from Chickerell BSP to Portland PSS.	• Overlay of sections of the existing circuit would provide capacity until the late 2040s, approximately 7.4km of circuit would require overlay. The other sections of the circuit are rated significantly higher so this would allow time to observe whether load growth is realised and whether additional reinforcement is required without replacing assets twice.

ID	Location of proposed intervention	HT Year	EE Year	HE Year	CF Year	Network State	Comments and potential options to resolve the system need
10	Chickerell BSP to Winterbourne Abbas 33kV circuits	2038	2037	2037	2042	N-1: Loss of any one 33kV circuit from Chickerell BSP to Winterbourne Abbas (following the network reconfiguration with Redlands PSS directly fed from Chickerell BSP detailed in section 6).	• The existing circuits use towers rather than pole structures, as such it is considered that higher rated conductors could be installed onto the existing towers without requiring new structures. • This reinforcement could be phased as some of the assets are projected to overload ahead of others. However, it is anticipated that each of the four circuits will require at least some sections to be reinforced between 2038 (under the HT scenario) and 2050.
11	Portland PSS 33/11kV transformers	2041	2041	2044	2048	N-1: Loss of either 33/11kV transformer at Portland PSS.	• Reinforcement of the two existing 33/11kV transformers to 30MVA would provide sufficient capacity out to 2050 under three of the four DFES scenarios. • Due to the long-time horizon that this constraint is projected on, we can monitor load growth at this site to size the capacity of assets for delivery appropriately.
12	Chickerell BSP to Weymouth PSS 33kV circuits	2041	2040	2042	2046	N-1: Loss of any one of the three 33kV circuits from Chickerell BSP to Weymouth PSS.	• One of the three circuits from Chickerell BSP to Weymouth is projected to be overloaded in 2041 with the other two not projected to overload until a number of years later. • Monitor load growth – potentially only a requirement to overlay one of the three circuits ahead of 2050.
13	Chickerell PSS 33/11kV transformers	2042	2043	2045	2049	N-1: Loss of either 33/11kV transformer at Chickerell PSS.	• Reinforcement of the two existing 33/11kV transformers would resolve this constraint until beyond 2050. • The projected 2050 exceedance of capacity is small with a wide range of exceedance dates across the scenarios – as such there is uncertainty whether this constraint will arise.
14	Puddletown PSS 33/11kV transformers	2043	2047	-	-	N-1: Loss of either 33/11kV transformer at Puddletown PSS.	• Existing 33/11kV transformers are only rated at 6.3MVA and are projected to require reinforcement to higher rated units, subject to asset health and further study it may be appropriate to use the transformers from sites mentioned above (for example those from Chickerell PSS in **ID 13**) to reduce procurement costs.
15	Chickerell BSP to Redlands PSS 33kV circuit	-	-	-	2050	N-1: Loss of either 33kV circuit from Chickerell BSP to Redlands PSS (note that this is following the network reconfiguration with Redlands PSS directly fed from Chickerell BSP detailed in section 6)	• High uncertainty, as this requirement is only projected to arise under one of the four scenarios. • As capacity shortfall is only expected to be small ahead of 2050, it's possible that this overload could be mitigated through 11kV load transfers to Chickerell PSS or Weymouth PSS. This would prevent additional reinforcement of the 33kV network.

Table 4 Summary of system needs identified in this strategy through to 2050 along with indicative solutions.

8.3. Future Requirements of the High Voltage and Low Voltage Networks

Our HV/LV spatial plans have shown that there is no clear pattern to future demands on these lower voltage networks. We are therefore planning on a forecast volume basis, and this section provides further context on this work for both the Chickerell GSP high voltage and low voltage network needs to 2050.

8.3.1. High Voltage Networks

As well as the EHV system needs identified in the previous section, increased penetration of low carbon technologies (LCTs) connecting to the distribution network will result in system needs on the High Voltage (HV) and Low Voltage (LV) networks. To provide a view on the impact of these technologies on the distribution network here we have used the load model that is produced by SSEN's Data and Analytics team.[5]

The load model is a machine learning product which estimates a half-hourly annual demand profile for each household based on a series of demographic, geographic and heating type factors. This enables us to estimate capacity on the electricity network while protecting individual customers data privacy by using modelled data. These views are then aggregated up the network hierarchy based on the combinations of customers associated with each asset. This view is supplemented with the DFES to highlight the projected impact of LCTs on the network.

For the 10 primary substations supplied by Chickerell GSP, the percentage of secondary substations where projected peak loading exceeds the nameplate rating of the secondary transformer was taken from the load model data. Figure 14 demonstrates how this percentage changes under each DFES scenario from now to 2050 where it is projected that without intervention, 47% of secondary transformers will be overloaded under the HT scenario.

To satisfy these requirements a variety of solutions will need to be investigated. It is likely that a combination of flexibility and asset replacement will be employed to resolve the projected HV system needs. It is important to note that for HV needs, flexibility is likely to be provided through Distributed Energy Resources (DER), Consumer Energy Resources (CER), and domestic/commercial Demand Side Response (DSR). One of the challenges associated with procuring flexibility to High Voltage and Low Voltage system needs is that only a small number of customers can provide a flexible service due to the requirement to be supplied by a specific secondary transformer. As the role of aggregators develops, we may see a shift in the potential for flexibility in an area. Where the magnitude of an overload is too large for flexibility to be feasible, addition of new assets or asset replacement will be necessary.

5 SSEN Open Data Portal, 2023, SSEN Secondary Transformer – Asset Capacity and Low Carbon Technology Growth.

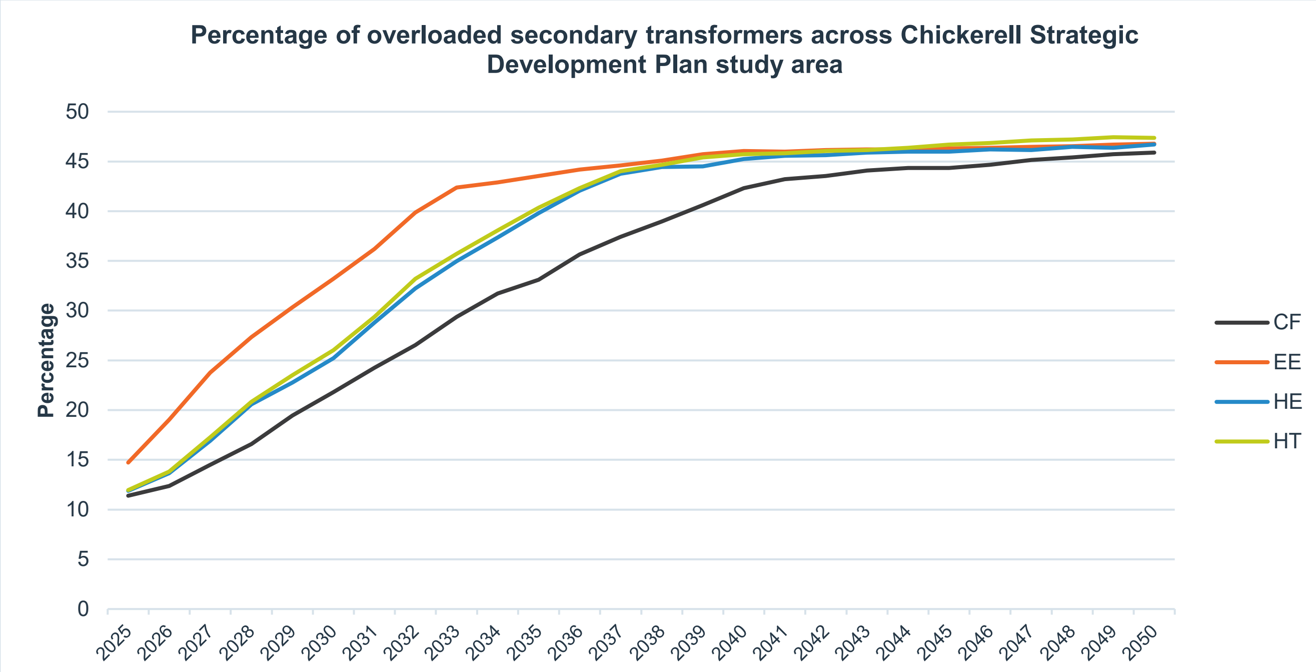

Figure 14 - Chickerell GSP Projected secondary transformer loading. *Source: SSEN Load Model*

Considering the Just Transition in HV development

SSEN are building on the findings from the Vulnerability Future Energy Scenarios (VFES). This innovation project investigated how the use of new foresighting techniques, along with data analytics and expert validation could be used to identify and forecast consumers in vulnerable situations as we move toward net zero. Use of the outputs from the VFES enable SSEN to develop the network in a way that truly accounts for the levels of vulnerability their customers in different locations face. Inclusion of the use of the VFES also acts as an example of how this data can be used more broadly by SSEN as well as other organisations for spatial planning. For example, it can help us identify areas where energy efficiency mechanisms could help reduce the need for network investment.

One of the outputs from this innovation project was the report produced by the Smith Institute.[6] This work groups LSOAs[7] that share similar drivers of vulnerability. The groupings were informed by mathematical analysis of demographic data and of SSEN's priority service register, using machine learning to model the complex relationships that exist between the two. The resulting group numbers and descriptions are shown in Table 5.

Group Number & Level of Vulnerability	Description of Group
1 – Very high	Driven up by higher levels of poor health and disability/mental health benefit claimants, reduced by smaller household sizes.
2 – High	Driven up by larger household sizes, reduced by lower elderly population levels.
3 – High	Driven up by larger elderly population levels, reduced by lower levels of disability and mental health benefit claimants.

6 VFES Machine Learning Discovery of Vulnerability Signatures Report, Smith Institute, 08/11/2022, (NIA SSEN 0063: VFES – Vulnerability Future Energy Scenarios | SSEN Innovation)

7 Lower layer Super Output Areas (LSOAs) (Statistical geographies - Office for National Statistics)

4 – Slightly higher than average	Driven up by larger elder population levels and moderately higher provision of care, reduced by smaller household sizes.
5 – Slightly lower than average	Driven down by lower elderly population levels and larger levels of ethnic diversity, increased by higher household sizes and greater provision of care.
6 – Low	Driven down by lower level of bad health and disability/mental health benefit claimants, increased by moderate elderly population levels and household sizes.
7 – Very low	Driven down by substantially lower elderly population levels, less provision of care and a higher level of households in private rented dwellings.

Table 5 - VFES Groupings

As shown in Figure 15, there are several Lower-layer Super Output Areas (LSOAs) that are class 1, meaning they have been identified as very high vulnerability. From using the load model, we can identify secondary transformers that are projected to be over 100% loaded by 2028. Some of these are also identified as being located within the areas classed as highly vulnerable. Across Chickerell GSP, this appears to most commonly be the case in more urban areas for example Dorchester and Weymouth town centres.
These secondary transformers should be prioritised for load related reinforcement as it will reduce the likelihood of asset failure for load reasons and increase network resilience in these areas.

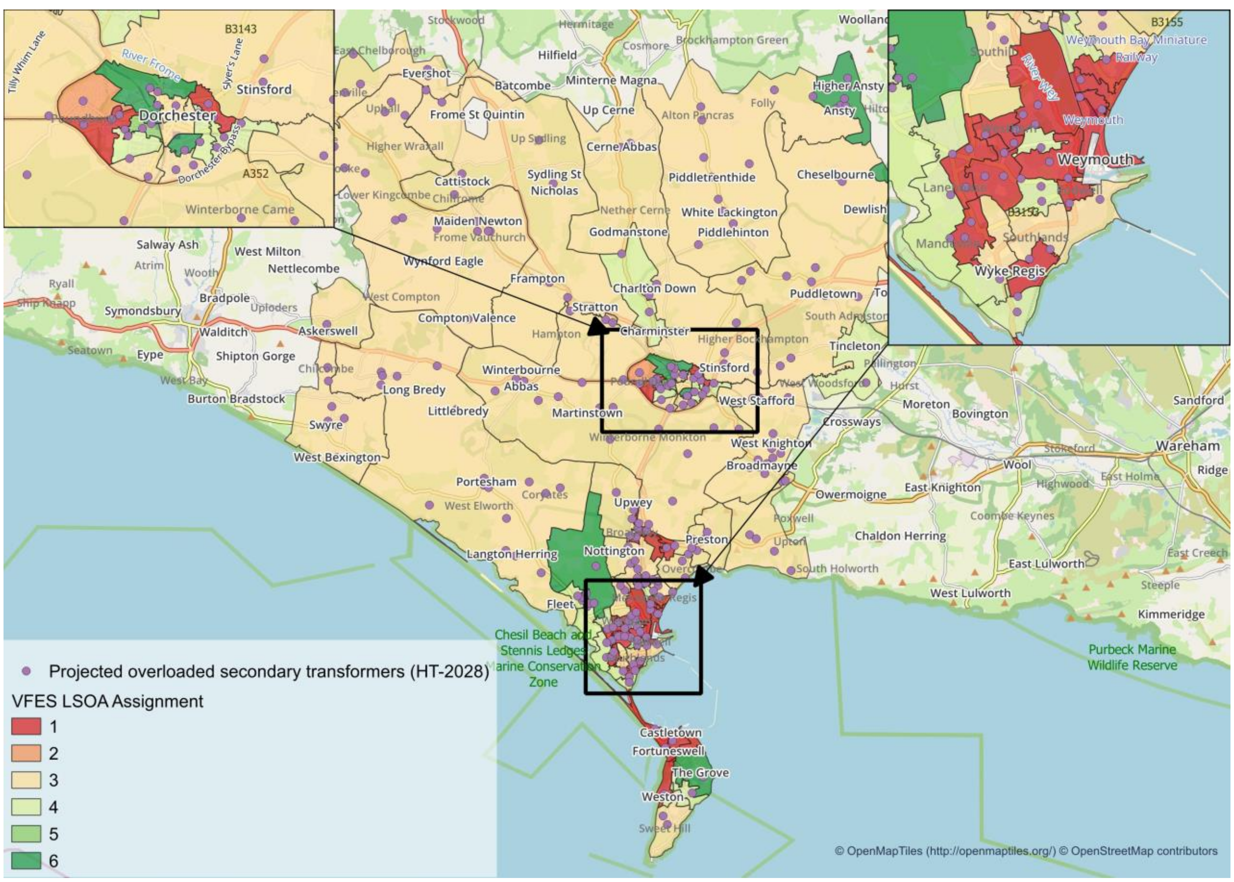

Figure 15 - Chickerell GSP VFES heat map with overloaded secondary transformers.

8.3.2. Low Voltage Networks

Drivers for interventions in low voltage networks may be either capacity related or be driven by voltage requirements. We are progressing options to resolve both drivers. From a network perspective the solution typically involves upgrading the number of LV feeders to split/ balance the load and improve voltage or to install another substation at the remote end of the LV network to balance load and improve voltage. In both instances, flexibility at a local level, especially voltage management products linked to battery export and embedded generation such as solar is likely to be required alongside traditional reinforcement.

We are leveraging recent innovation work through Project LEO (Local Energy Oxfordshire) and My Electric Avenue to inform this strategy. Enhanced network visibility through Smart meter data analytics and low-cost substation feeder monitoring is also necessary to enable appropriate dispatch of services and network reconfiguration.

Capacity driven needs – Thermal constraints tend to materialise in the sections of cable leading to the substation (transformer) where multiple customer loads join together. We are modelling requirements out to 2050 leveraging low voltage monitoring and metering equipment combined with analytical techniques. This will demonstrate how the magnitude of the system need of the LV network across Chickerell changes across scenarios and years out to 2050.

Voltage driven needs – Generally, connection of Low Carbon Technology and large loads such as heat pumps is limited by voltage constraints before thermal constraints when located more than around 150m from the local secondary transformer. Increased loading on our low voltage networks can reduce the voltages to consumer premises. This is a non-linear relationship and as such requires more complex analysis. We are currently undertaking analysis to better understand the extent of this future need.

Initial analysis indicates that across Chickerell GSP 31% of low voltage feeders may need intervention by 2035 and 41% by 2050 under the HT scenario as shown in Figure 16. The need is unlikely to be triggered until 2028 onwards. However, due to the timeline to grow workforce, with jointing skills taking typically 4 years to be fully competent, it is necessary to start recruitment and initiate programmes ahead of need to be able to deliver the required volumes from 2028 onwards.

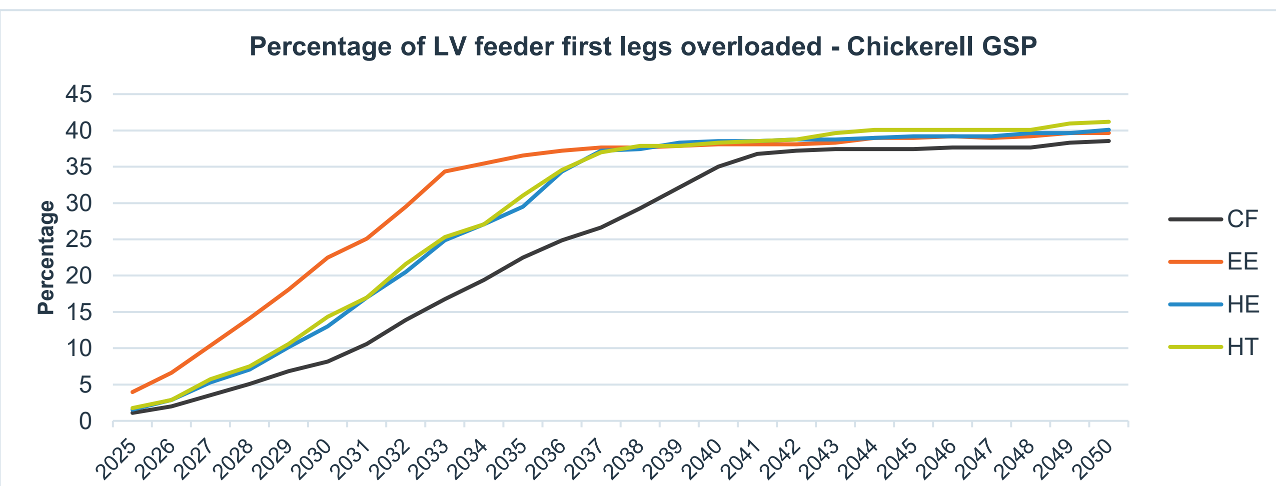

Figure 16 - Percentage of LV feeders projected to be overloaded under Chickerell GSP

9. RECOMMENDATIONS

The review of stakeholder engagement and the SSEN 2024 DFES analysis provides a robust evidence base for load growth across Chickerell GSP group in both the near and longer term. Drivers for load growth across Chickerell GSP arise from multiple sectors and technologies. These drivers impact not only the EHV network but will drive system needs across all voltage levels.

The findings from this report have provided evidence for 3 key recommendations:

1. Where we have identified work that is required in the next 10 years, this should be progressed through the DNOA process. Through detailed study we will understand the network requirements in more detail and progress these where appropriate. This includes the following system needs which are forecasted to arise ahead of 2035 (tabulated in Section 8.2.1):
    a. Winterbourne Abbas to Charminster PSS 33kV circuits.
    b. Weymouth PSS 33/11kV transformers
    c. Winterbourne Abbas to Dorchester Town PSS 33kV circuits
    d. Charminster PSS 33/11kV transformers
    e. Piddletrenthide PSS 33/11kV transformers
    f. Dorchester Town PSS 33/11kV transformers
    g. Redlands PSS 33/11kV transformers

    It is possible that some of the above constraints may not have a near term system need based on actual load growth and therefore will not initially result in a DNOA outcome. Annual reassessment will enable us to confirm whether these system needs are likely to arise. When carrying out this annual reassessment the delivery timelines of the work should be considered alongside the potential for flexibility services to manage network capacity.

2. Continued collaboration with NGET to understand their development plans on the network supplying Chickerell GSP to ensure solutions deployed by SSEN and NGET are complimentary and enable the required capacity in the area.

3. Engage further with large energy users and the maritime industry to understand the confidence in projects requiring additional electricity capacity progressing. The scale of these projects will allow us to plan our network accordingly. For example, by proactively investing in the network to enable capacity for large demands connecting at 33kV or 132kV voltage levels. As the 33kV busbar at Chickerell will be gas insulated and indoor, there is potential for expansion of this to accommodate new connections. However, additional work on the 132kV network to enable this capacity maybe required, it is possible this could be created using interconnection to neighbouring network areas.

Actioning these recommendations will allow SSEN to develop a network that supports local net zero ambitions and enables growth in the local economy. By doing so, this will ultimately contribute to net zero targets at a national level.

EHV/HV spatial plans for other DFES scenarios

Appendix

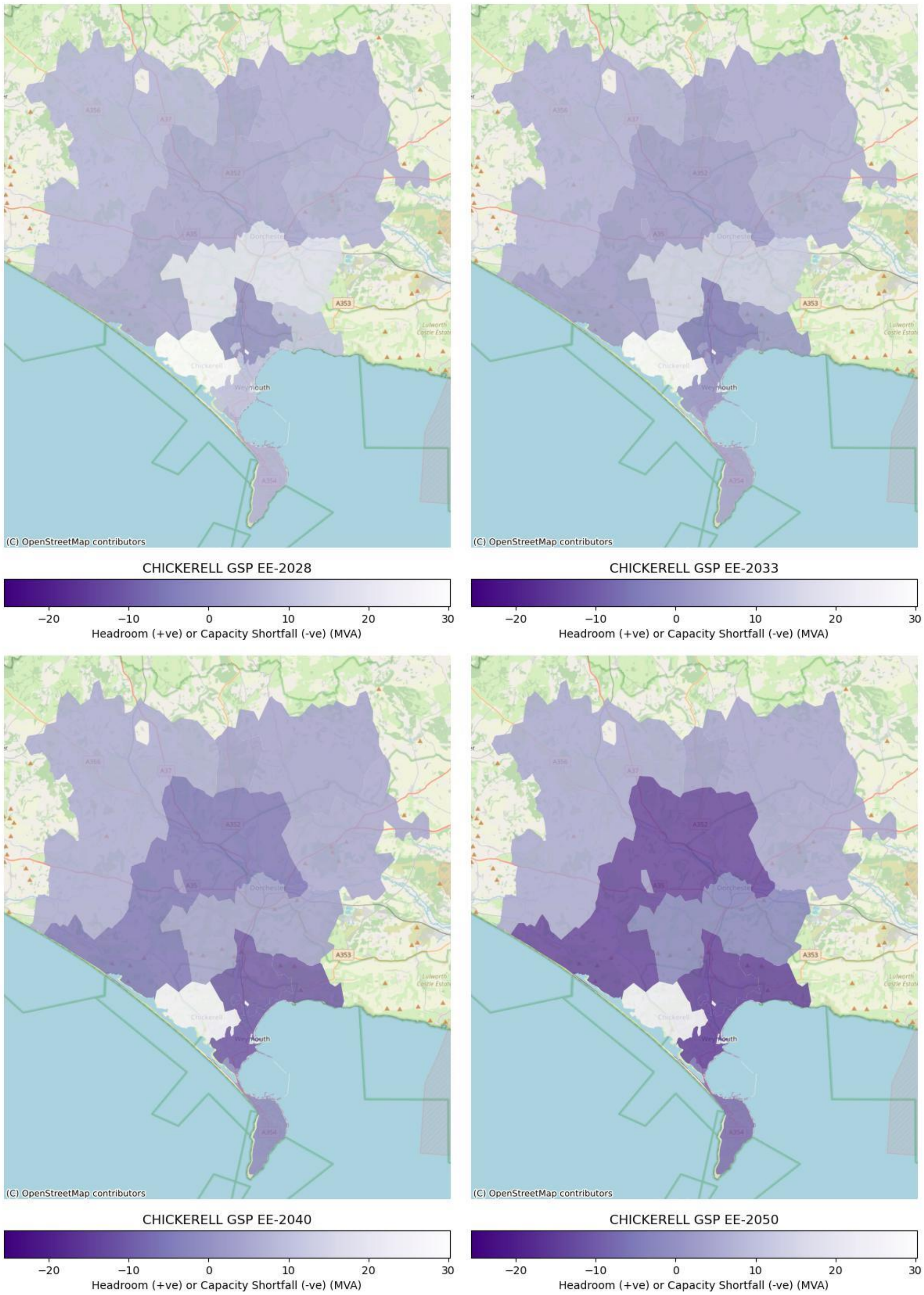

Figure 17 Chickerell GSP - EHV/HV Spatial Plan - Electric Engagement

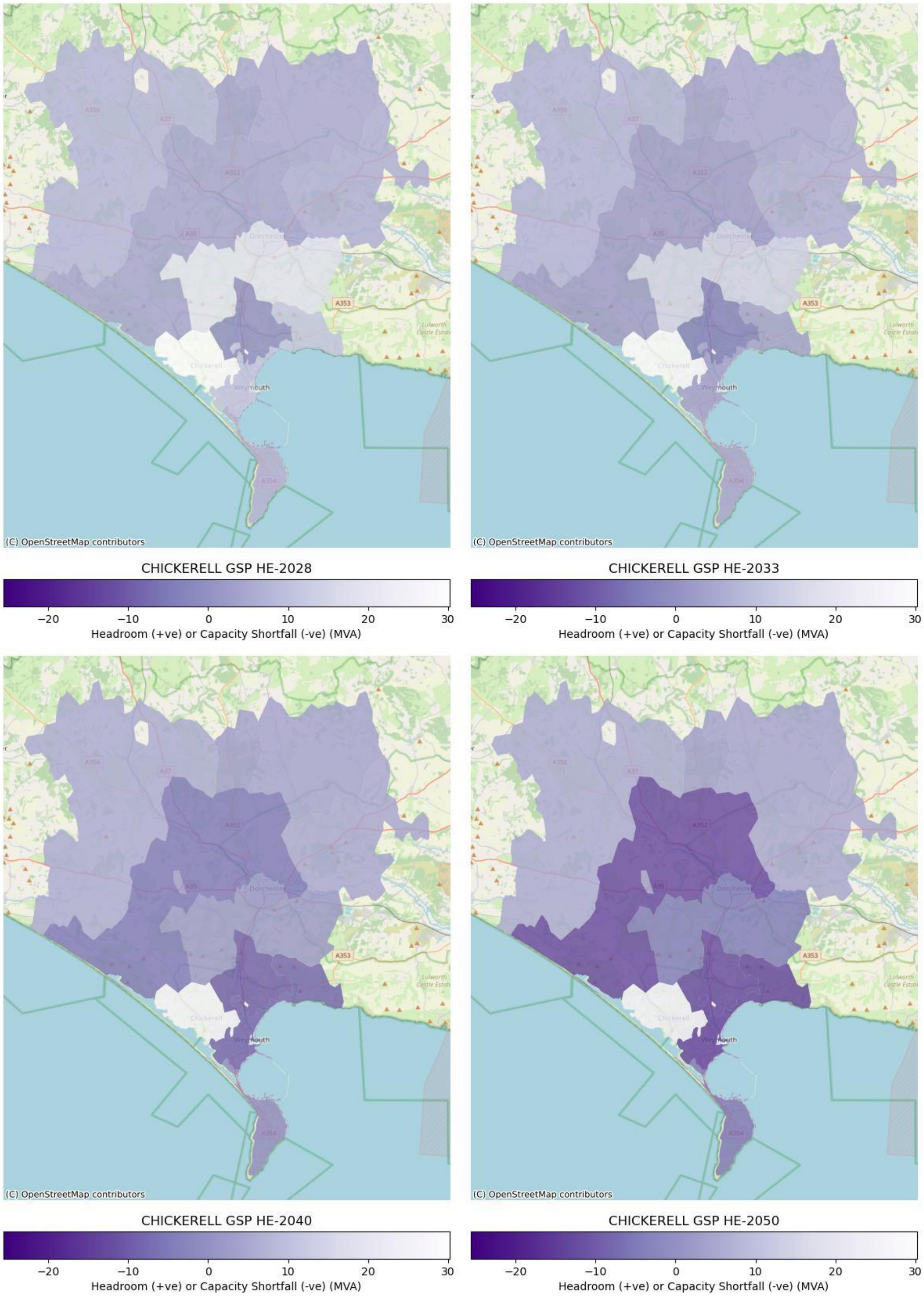

Figure 18 Chickerell GSP - EHV/HV Spatial Plan – Hydrogen Evolution

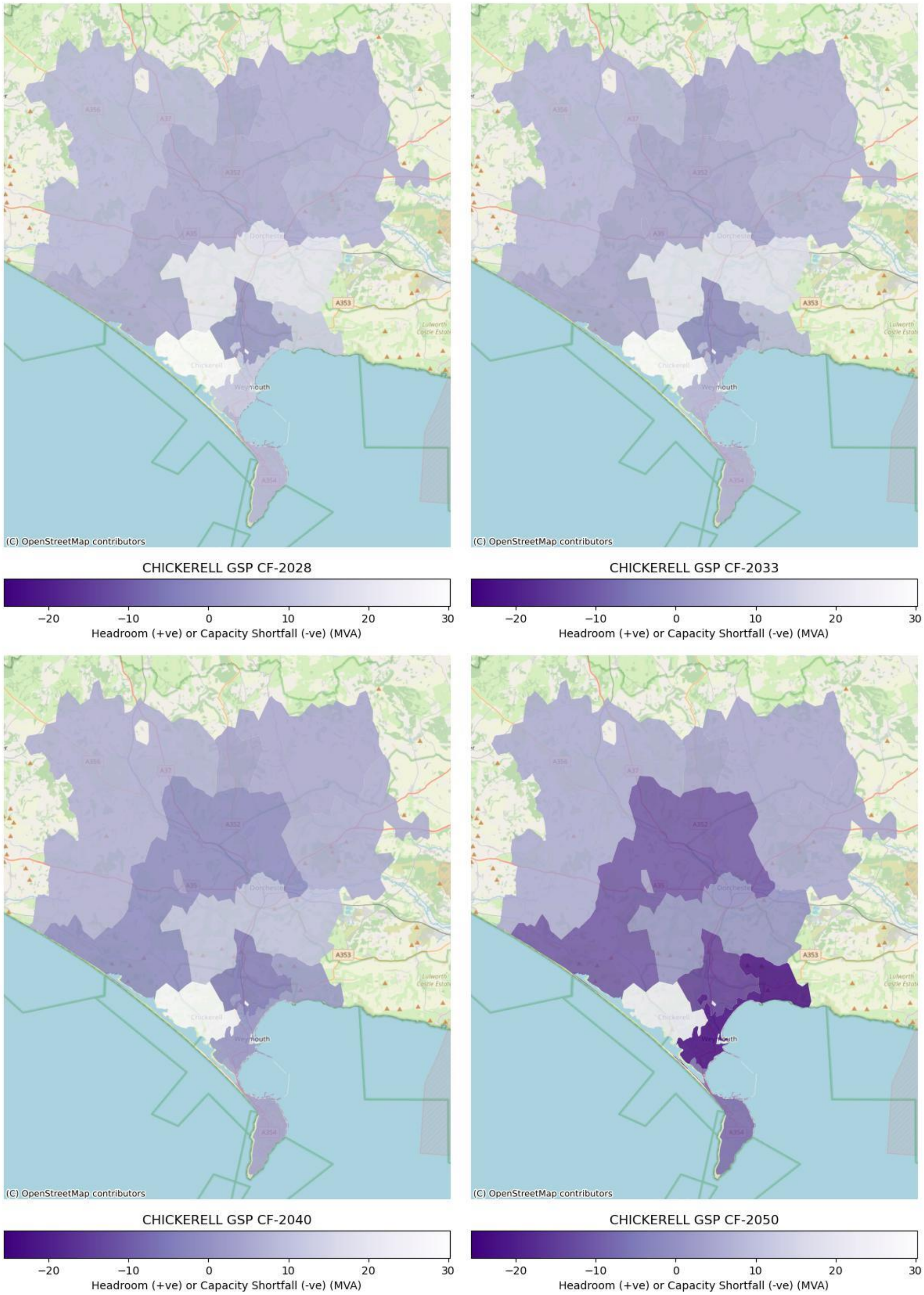

Figure 19 Chickerell GSP - EHV/HV Spatial Plan – Counterfactual

HV/LV spatial plans for other DFES scenarios

Appe

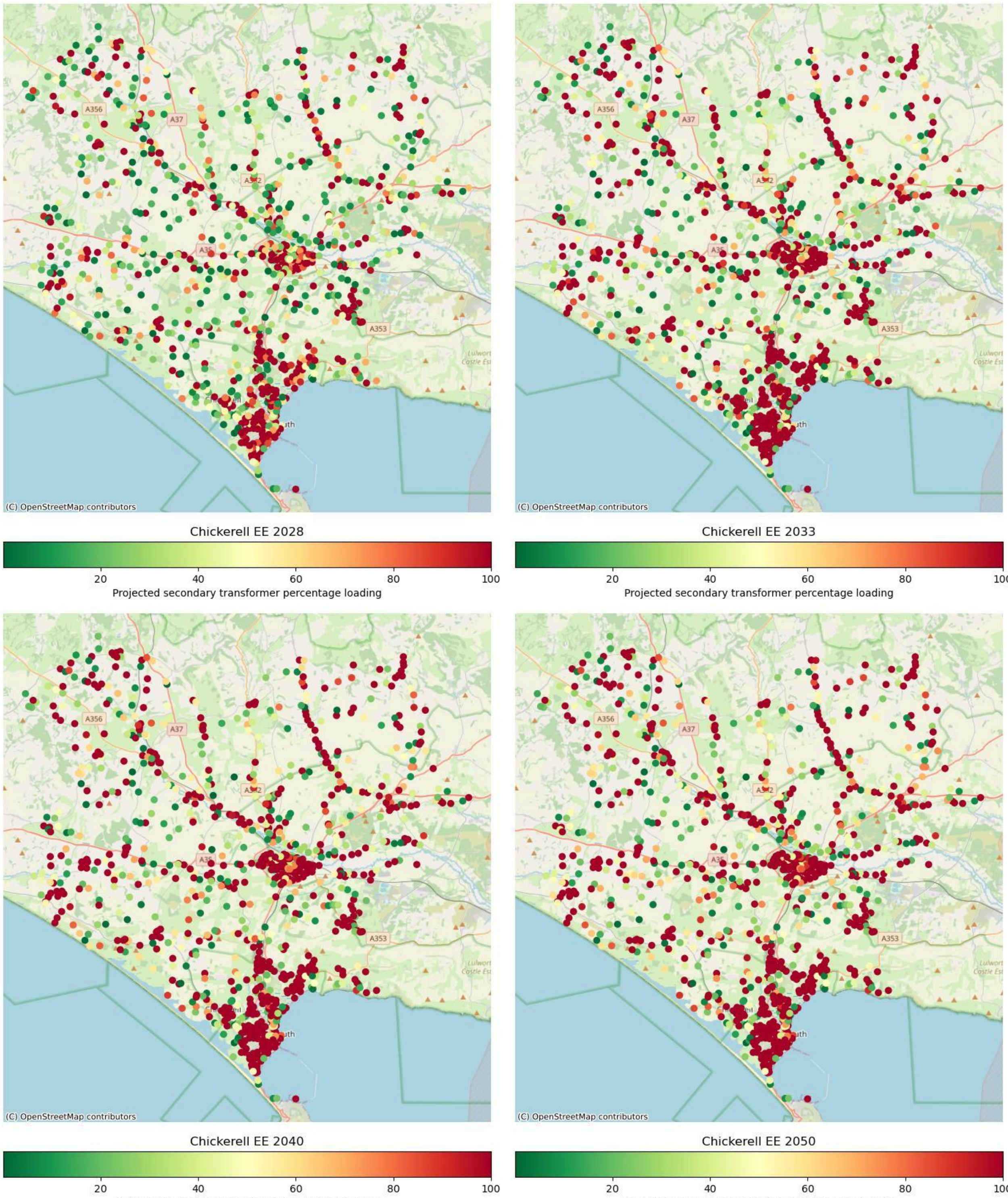

Figure 20 Chickerell GSP - HV/LV Spatial Plan – Electric Engagement

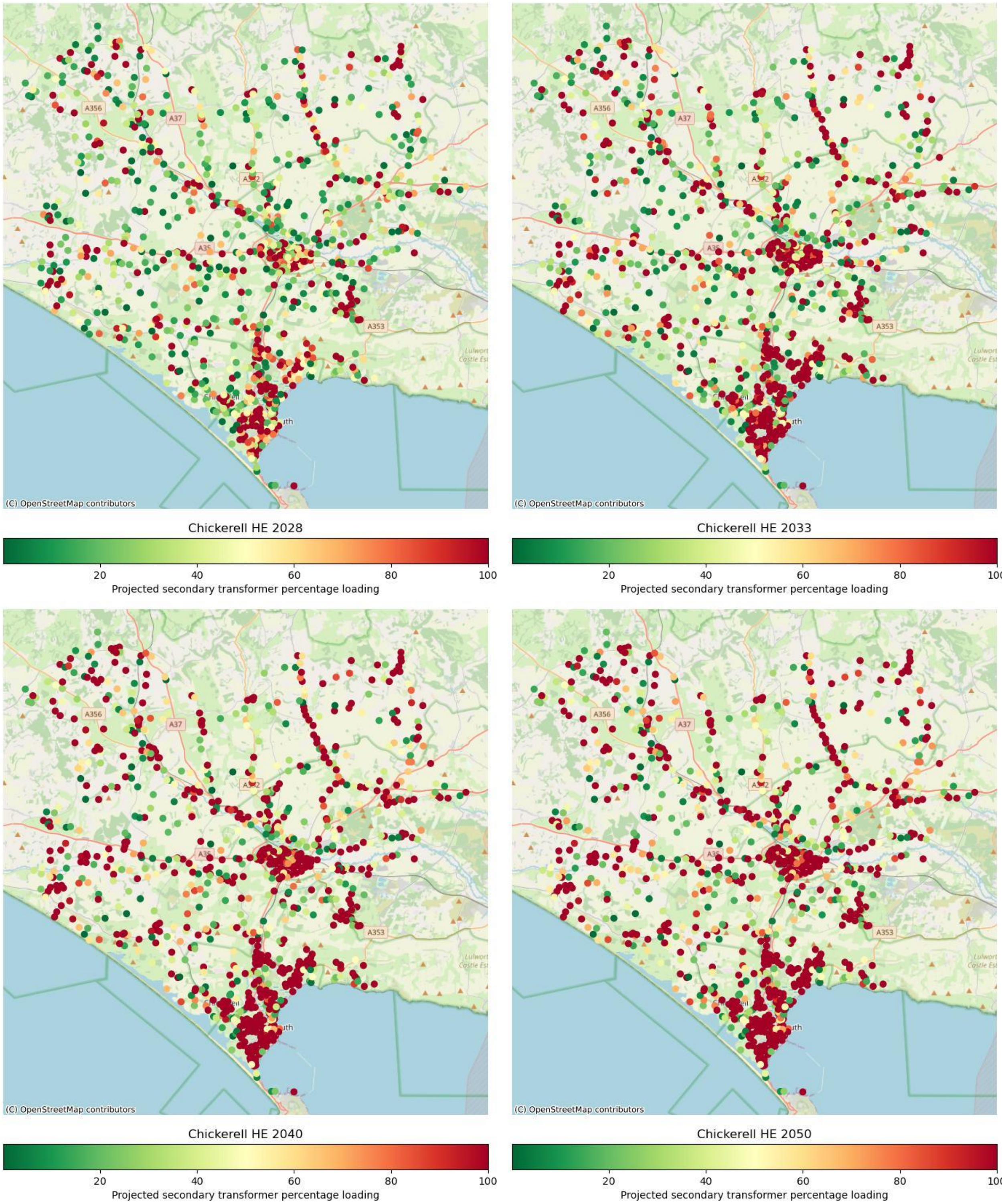

Figure 21 Chickerell GSP - HV/LV Spatial Plan – Hydrogen Evolution

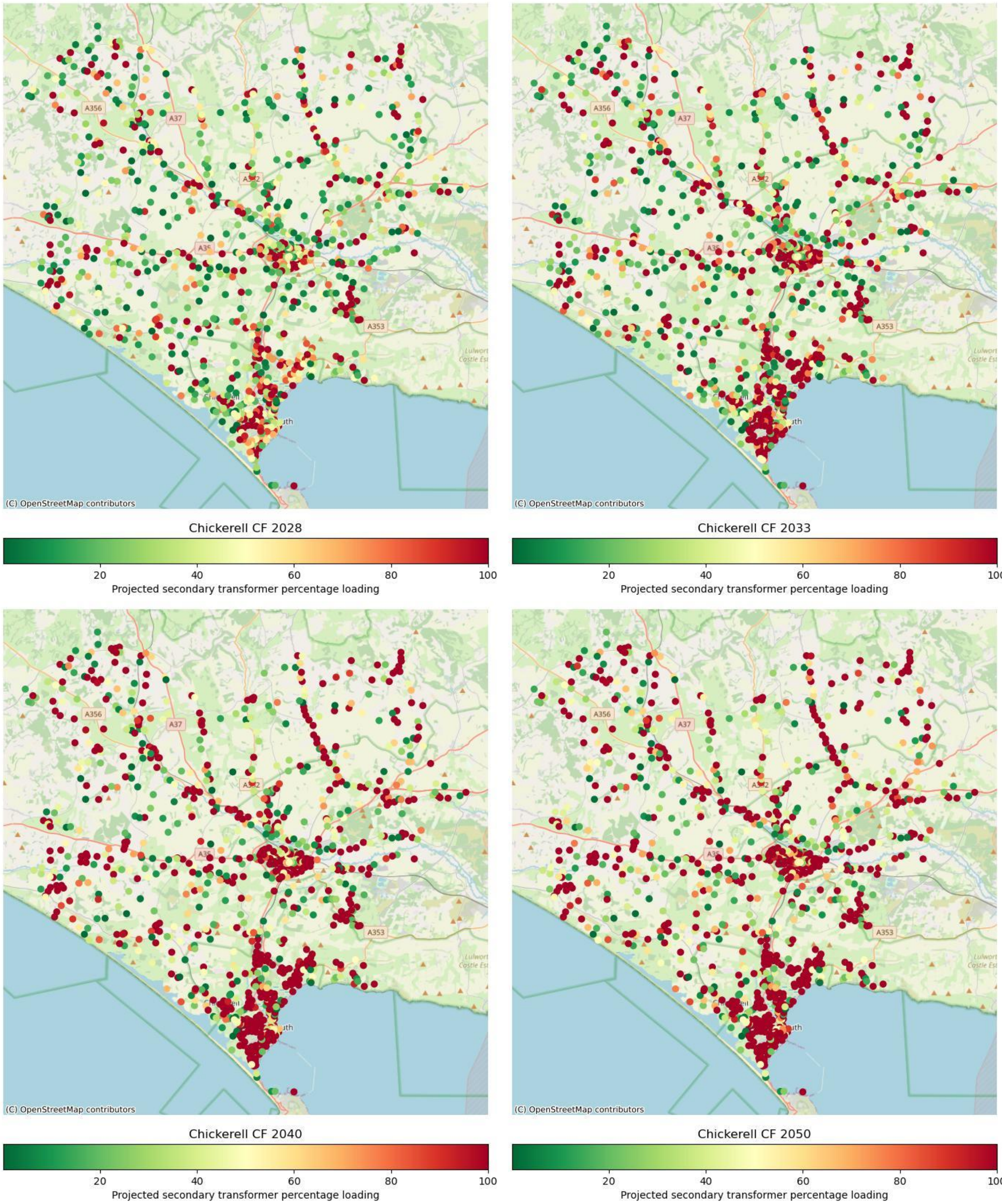

Figure 22 Chickerell GSP - HV/LV Spatial Plan - Counterfactual

Glossary

Appendix C

Acronym	Definition
AIS	Air Insulated Switchgear
ANM	Active Network Management
BAU	Business as Usual
BSP	Bulk Supply Point
CB	Circuit Breaker
CBA	Cost Benefit Analysis
CER	Consumer Energy Resources
CF	Counterfactual
CMZ	Constraint Managed Zone
CT	Consumer Transformation
DER	Distributed Energy Resources
DESNZ	Department for Energy Security and Net Zero
DFES	Distribution Future Energy Scenarios
DNO	Distribution Network Operator
DNOA	Distribution Network Options Assessment
DSO	Distribution System Operation
DSR	Demand Side Response
EE	Electric Engagement
EHV	Extra High Voltage
EJP	Engineering Justification Paper
ER P2	Engineering Recommendation P2
NESO	National Energy System Operator
NGET	National Grid Electricity Transmission
ENA	Electricity Networks Association
EV	Electric Vehicle
FES	Future Energy Scenarios

FS	Falling Short
GIS	Gas Insulated Switchgear
GSPs	Grid Supply Point
HE	Hydrogen Evolution
HT	Holistic Transition
HV	High Voltage
kV	Kilovolt
LAEP	Local Area Energy Planning
LCT	Low Carbon Technology
LENZA	Local Energy Net Zero Accelerator
LV	Low Voltage
LW	Leading the Way
OHL	Overhead Line
PSS	Primary Substation
PV	Photovoltaic
NSHR	Network Scenario Headroom Report (part of the Network Development Plan)
MW	Megawatt
MVA	Mega Volt Ampere
ODM	Operational Decision Making
RESOP	Regional Energy System Operation Planning
RIIO-ED1/2	Revenue = Incentives + Innovation + Outputs, Electricity Distribution 1 / 2 (regulatory price control periods)
SDP	Strategic Development Plan
SEPD	Southern Electric Power Distribution
SLC	Standard Licence Condition
SSEN	Scottish and Southern Electricity Networks
ST	System Transformation
UM	Uncertainty mechanism
VFES	Vulnerability Future Energy Scenarios

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