

IVER 66kV GRID SUPPLY POINT: STRATEGIC DEVELOPMENT PLAN

Our network serving communities across West London
Final Publication

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Scottish & Southern
Electricity Networks



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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 to 2050 and translate these requirements into strategic spatial plans of the future 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 that supplied by Iver 66kV Grid Supply Point (GSP) in West London, shown below.

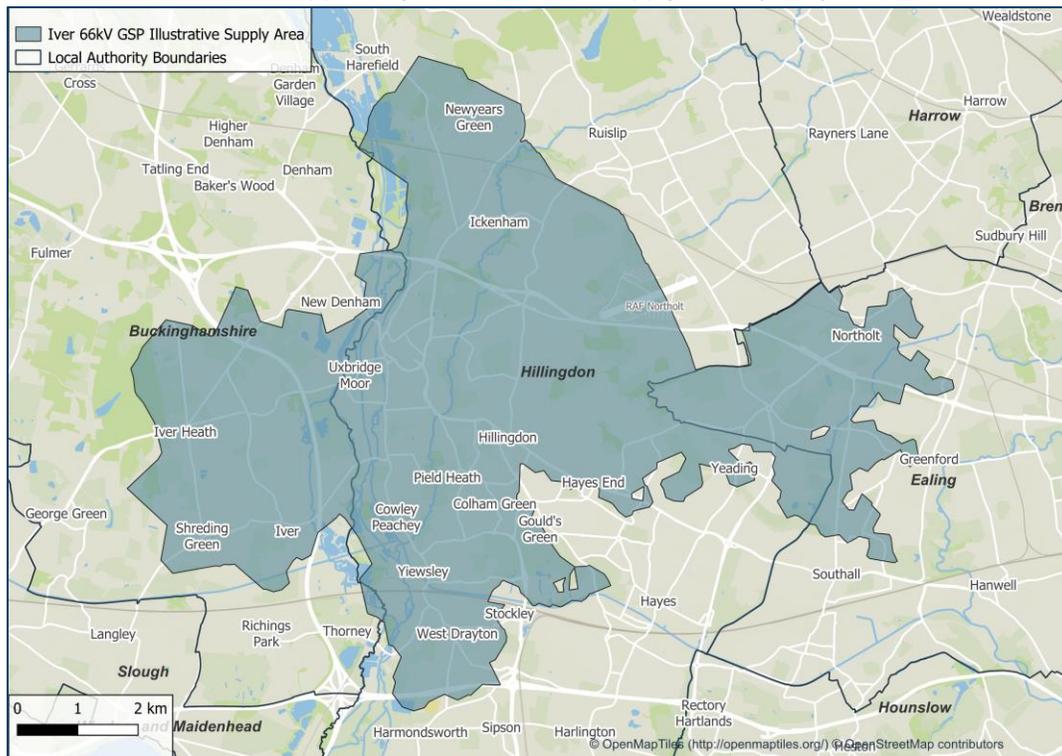


Figure 1 Area of focus for this SDP.

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 Buckinghamshire, Ealing and Hillingdon have been considered in preparation of this plan. Some reinforcement work has been triggered in this area through the Distribution Network Options Assessment (DNOA) process. This SDP utilises the Distribution Future Energy Scenarios (DFES) to understand the pathway 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.



2. INTRODUCTION

The aim of this report is to demonstrate how local, regional, and national targets link with other stakeholder views in the area to provide a robust evidence base for load growth out to 2050 across the Iver 66kV Grid Supply Point (GSP) area. A GSP is an interface point with the national transmission system where SSEN then take power to local homes and businesses within a geographic area. Context for the area this represents is shown above in Figure 1. This report was produced in alignment with SSEN’s Strategic Development Plan methodology.¹ The methodology report outlines the process that we follow in the rollout of our Strategic Development Plans and should be referred to alongside this report.

To identify the future requirements of the electricity network, SSEN commission 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 accounting for 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 four different scenarios as we move towards the national 2050 net zero target, these scenarios are shown below in Figure 2.

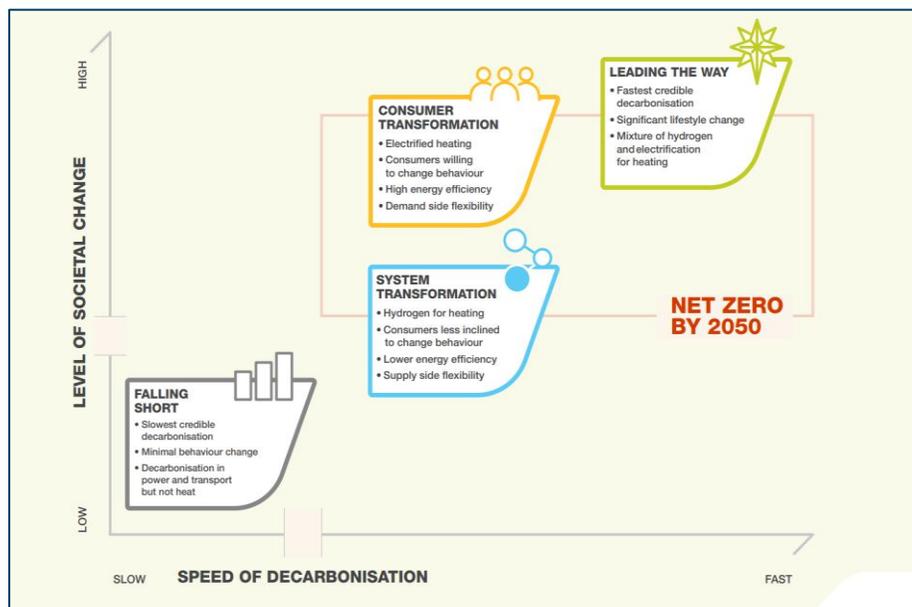


Figure 2 DFES 2023 Scenarios

Using the DFES, power system analysis has been carried out to identify the future system needs of the electricity network. These needs are summarized by highlighting the year the need is identified under each of the four scenarios, and the projected 2050 load. Here, system needs are identified through power system analysis using the DFES 2023 Consumer Transformation scenario in alignment with evidence gathered in preparation of the SSEN ED2 business plan. We also model across the other three scenarios to understand when these needs arise and what demand projections should be planned for in the event each of these scenarios is realised. The DNOA process will provide more detailed optioneering for each of these reinforcements, improving stakeholder visibility of the strategic planning process. Opportunities for procurement of flexibility will also be highlighted in the DNOA, to cultivate the flexibility markets, and to align with SSEN’s flexibility strategy.

¹ [Strategic Development Plan Methodology - January 2025](#)
Iver 66kV Grid Supply Point: Strategic Development Plan



3. STAKEHOLDER ENGAGEMENT AND WHOLE SYSTEM CONSIDERATIONS

3.1. Local Authorities and Local Area Energy Planning

The main local authorities that are supplied by Iver 66kV GSP are Buckinghamshire, Ealing, and Hillingdon 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.

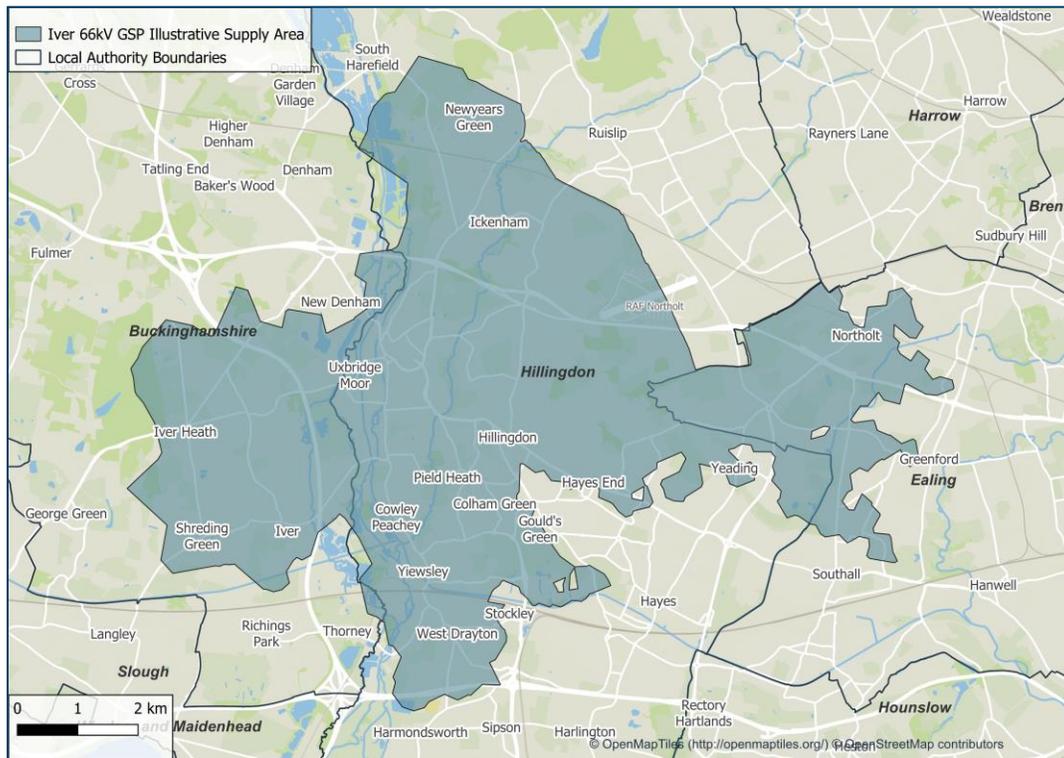


Figure 3 Area of focus for this SDP.

3.1.1. Buckinghamshire

Buckinghamshire Council has seen population growth of 9.5% from around 505,300 in 2011 to around 553,100 in 2021². The Council was formed in 2020, combining the four local councils of Aylesbury Vale, Chiltern, South Bucks, and Wycombe. It is currently developing its first Local Plan and has produced the Council's Climate Change and Air Quality Strategy, which aims to reduce 75% of council emissions by 2030 and meet the national net zero target by 2050 as a minimum with ambitions to reach this target earlier³. In March 2024, the council was successful in securing £1.9 million of government Local Electric Vehicle Infrastructure (LEVI) funding to install

² Census 2021, January 2023, How life has changed in Buckinghamshire: Census 2021.

³ [Climate Change and Air Quality Strategy | Buckinghamshire Council](#)
Iver 66kV Grid Supply Point: Strategic Development Plan



hundreds of publicly accessible EV chargers⁴, supporting its target of 1000 EV chargers by 2027. The council has also started a new home energy efficiency grant scheme for grants up to £30,000 to be used for energy efficiency improvements in homes across the county⁵, making these houses more suitable for the installation of heat pumps. Furthermore, in April 2024, the council released their Housing Strategy for 2024 to 2029⁶, where energy efficiency is placed front and centre.

3.1.2. Ealing

Over the past decade (2011 to 2021) the population of Ealing increased by 8.5% to approximately 367,1004.⁷ The borough is strategically placed with Heathrow Airport to the West and the new High Speed 2 (HS2) terminus at Old Oak Common opening in 2030 to the North-East of the borough. Five new Elizabeth Line stations opened across the borough in 2022 in addition to the existing underground and mainline stations.

Ealing Council have published multiple action plans and strategies highlighting their net zero ambitions, including their target to become carbon neutral by 2030.⁸

3.1.3. Hillingdon

Hillingdon's population increased by 11.7% to approximately 305,900 residents within the 10 years to 2021.⁹ The borough has metropolitan and district centres at Uxbridge, West Drayton, and Hayes. Heathrow Airport comprises substantial land area in the southern region of the borough, and there are ongoing plans under discussion to expand airport capacity through addition of a third runway to the northwest of the current footprint, along with other works such as enhanced public transport links and an additional terminal.¹⁰ The Council has also committed to its own operations reaching carbon neutrality by 2030.¹¹

3.2. Whole System Considerations

3.2.1. Specific whole system considerations

Through the DFES process, SSEN have been made aware of significant development at Pinewood studios to the West of the Iver 66kV supply area. Due to the economic significance of this project, a deeper understanding of the project and its electricity needs should be investigated further to ensure that SSEN do not become a blocker to this development.

3.2.2. Transmission interactions

NGET is proceeding with upgrades at Iver but none directly affecting Iver 66kV GSP. However, we are working with NGET on their longer-term West London strategy. The strategy is in very early stages of development and is centred around a review of NGET's existing 275kV network which may result in potential upgrades to and/or reconfiguration of connected substations including Iver 66kV.

4 [Decision - Electric Vehicle commercial arrangements \(Decision to be taken\) - Modern Council](#)

5 [Domestic Building Envelope Energy Efficiency Grant \(DBEEE\) | Buckinghamshire Council](#)

6 [Housing strategy and policy | Buckinghamshire Council](#)

7 Census 2021, January 2023, How life has changed in Ealing: Census 2021.

8 Ealing Council, January 2021, Climate and Ecological Emergency Strategy

9 Hillingdon Council, January 2021, How life has changed in Hillingdon: Census 2021.

10 [Expansion | Heathrow](#)

11 Hillingdon Council, April 2025, Strategic Climate Action Plan 2025-2028.



3.3. Flexibility Considerations

Flexibility services

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.^{12,13}

SSEN regularly recruits new Flexibility Services Providers and increases the procured Flexibility Services with the latest bidding round for long term requirements held in August 2024 and recruitment through the Mini-Competition process in October 2024.¹²

Areas across Iver 66kV 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.

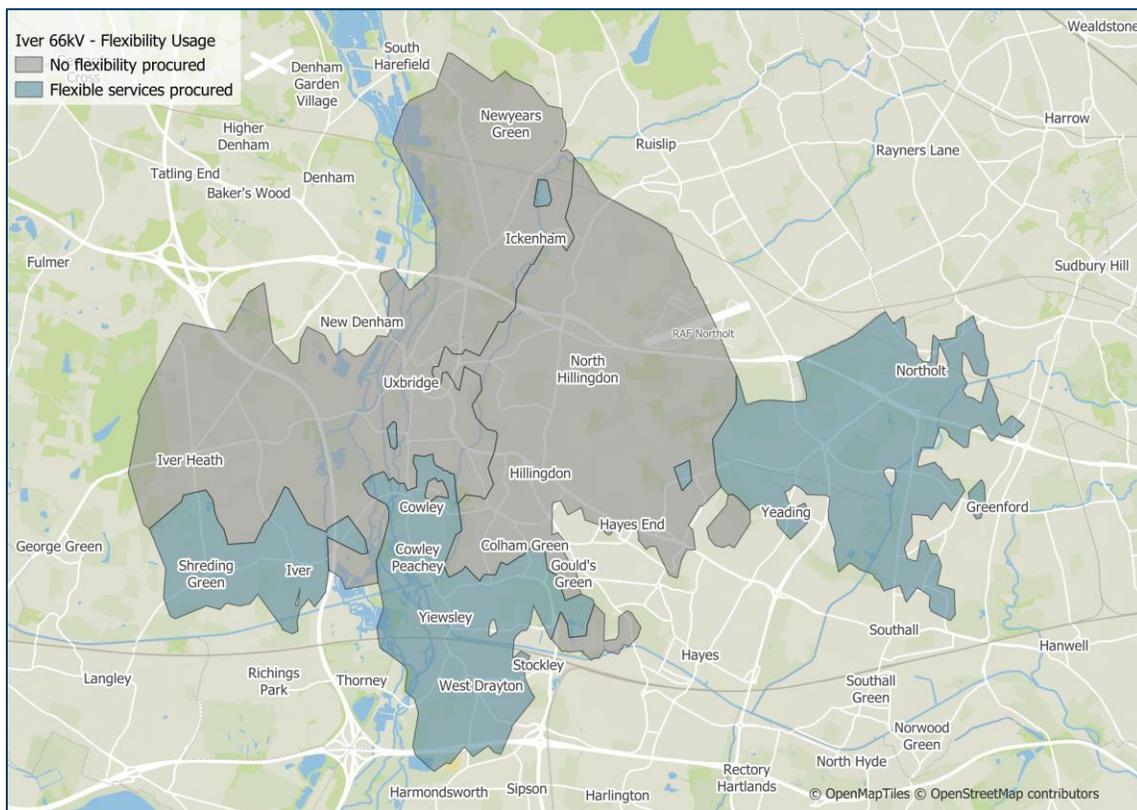


Figure 4 Flexibility procurement across Iver 66kV GSP

12 SSEN, Flexibility Services Procurement ([Flexibility Services Procurement - SSEN](#))

13 SSEN, 02/2024, Operational Decision Making (ODM), [SSEN Operational Decision Making ODM](#)
Iver 66kV Grid Supply Point: Strategic Development Plan



4. EXISTING NETWORK INFRASTRUCTURE

4.1. Iver 66kV Grid Supply Point Context

The Iver 66kV GSP network is made up of 66kV, 11kV, and LV circuits. It supplies a predominantly urban area in West London to the North of the M4 motorway and inside the M25. In total, the GSP serves approximately 74,000 customers. Table 1 shows the values for the GSP, and the primary substations supplied by the GSP. 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)	2023/24 Substation Maximum demand in MVA (Season)
Iver 66kV	Grid Supply Point	74,000	146.9 (Winter)
Northolt	Primary Substation	23,100	28.3 (Winter)
Hillingdon	Primary Substation	20,800	26.1 (Winter)
Uxbridge	Primary Substation	11,500	32.7 (Spring)
Yiewsley	Primary Substation	18,700	26.8 (Winter)

Table 1 Customer number breakdown and substation peak demand readings (2023)



4.2. Current Network Topology

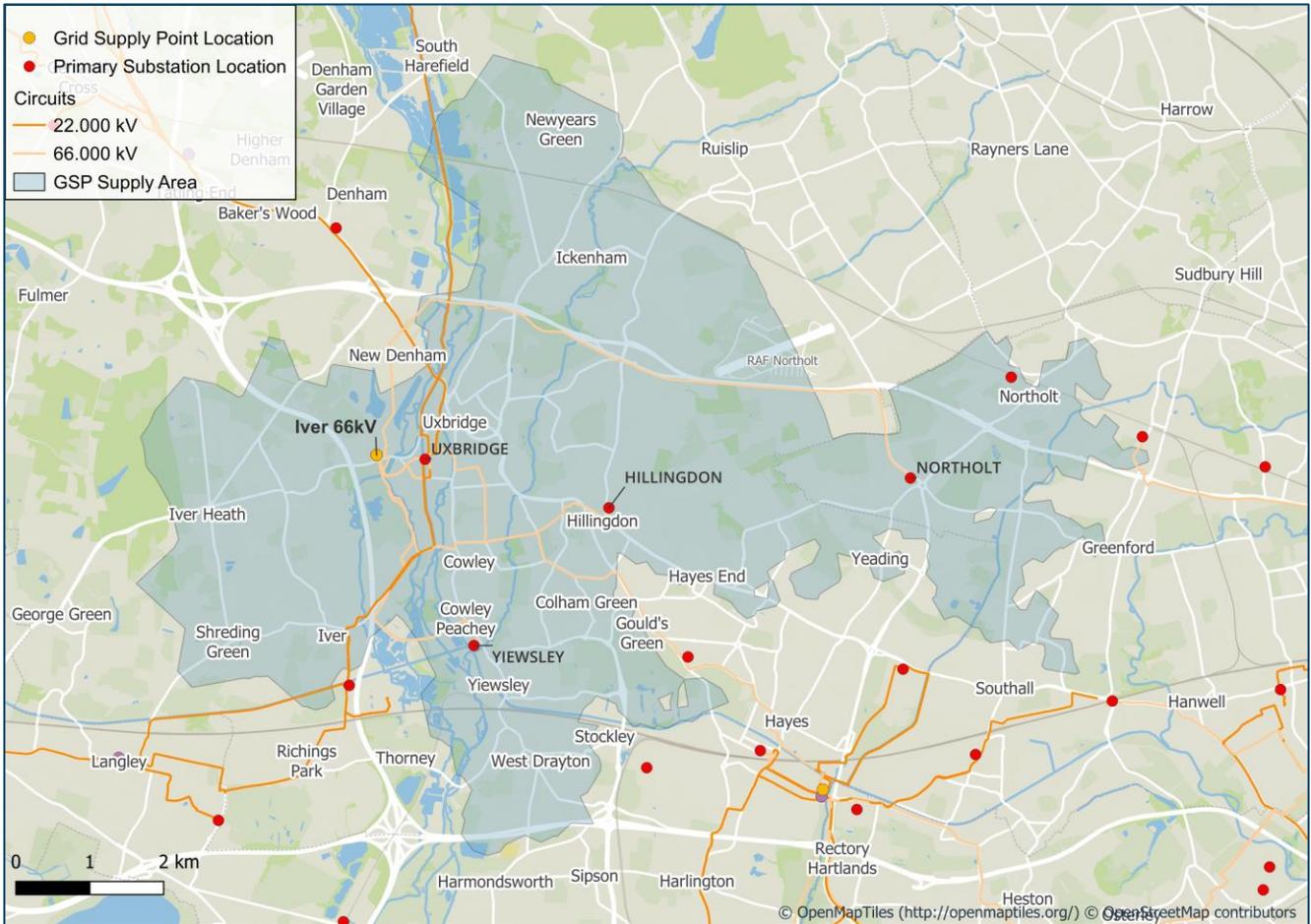


Figure 5 Geographic Information System view of Iver 66kV electricity network.



4.3. Current Network Schematic

The existing network at Iver 66kV GSP is shown below in Figure 6.

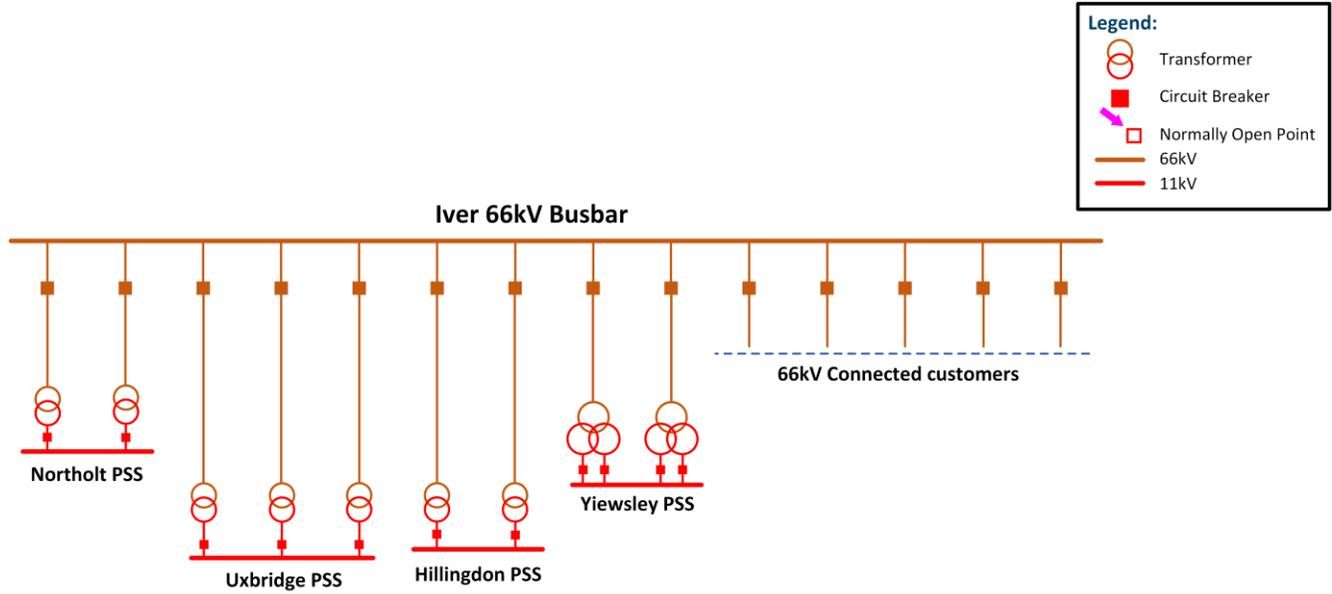


Figure 6 Existing network supplied by Iver 66kV GSP



5. FUTURE ELECTRICITY LOAD AT IVER 66kV 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:

- These projections relate to the GSP supply area highlighted in Figure 3 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. This accounts for the fact that not all demand load connected to the network peaks at the same time.

For consistency with the analysis undertaken, the insights presented here are from the DFES 2023 analysis. Results for the DFES 2024 analysis are presented in appendix A. For future iterations of the DFES, additional work should be carried out to ensure that the demand projections are rationalised against any developing LAEPs across the study area.

5.1. Distributed Energy Resource

5.1.1. DFES Projections

Generation

The Iver 66kV GSP supplies an area of West London to the North of the M4 motorway and mostly inside the M25 motorway (as shown above in Figure 3). As the area is mostly urban built environment, there is limited opportunity for large scale generation projects. However, as shown below in Figure 7, we still see a large uptake in Solar PV across the area with up to 55MW installed by 2050 under the Consumer Transformation scenario. A significant proportion of the projected generation results from small-scale rooftop Solar PV (<10kW), seizing the opportunity for domestic rooftop solar across the area. We also observe decommissioning of Diesel generation in alignment with Net Zero targets in the area.

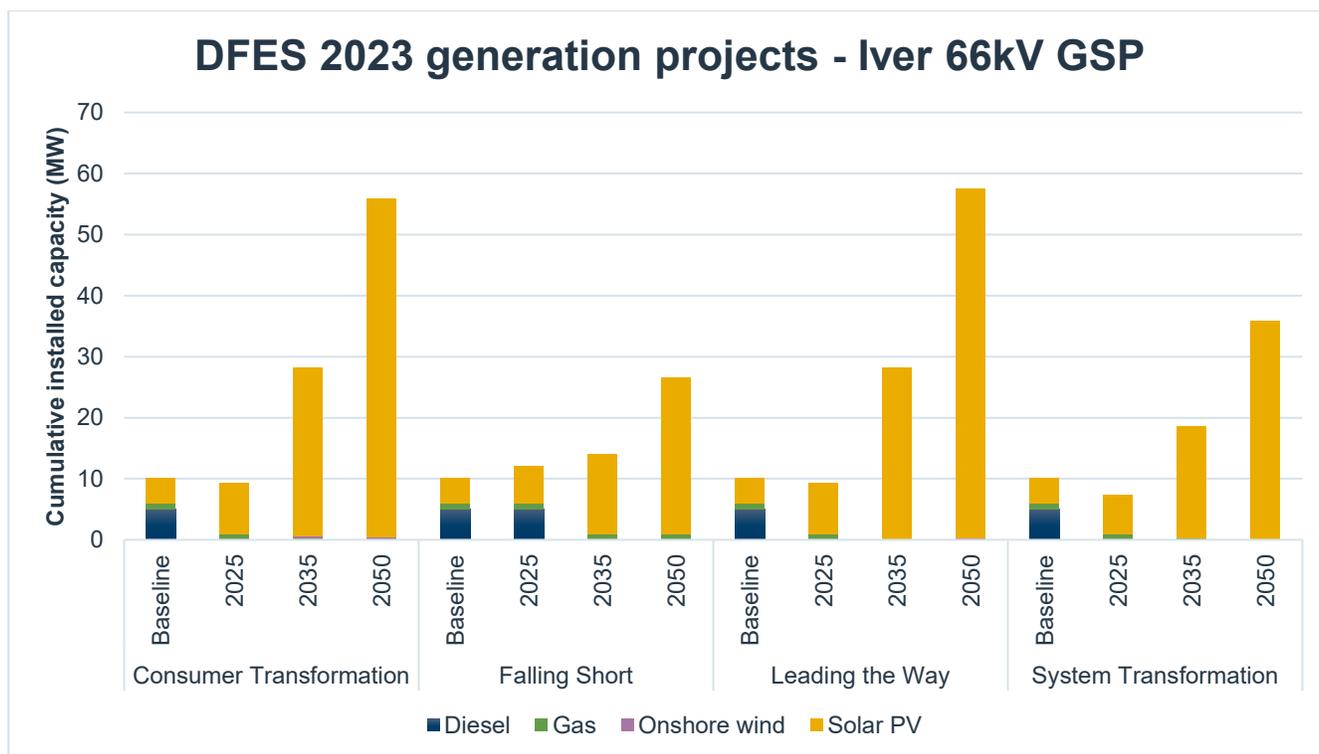


Figure 7 Projected cumulative distributed generation capacity Iver 66kV GSP (MW). *Source: SSEN DFES 2023*

Storage

To accompany the generation projected in the DFES 2023, we also see the development of some Battery Storage across the area. Under the Consumer Transformation scenario, this equates to 19MW of domestic storage and 5MW of battery storage at high energy user sites connected by 2050.

5.2. Transport Electrification

As introduced in section 3.1, local authorities across the study area have plans in place to develop several many publicly available EV chargers. The proximity to large motorways will likely also impact the requirement for more EV charging (although there are no large motorway service areas in the study area). While the study area is close to Heathrow airport, there is not currently an electricity supply from Iver 66kV GSP to Heathrow Airport.

5.2.1. DFES Projections

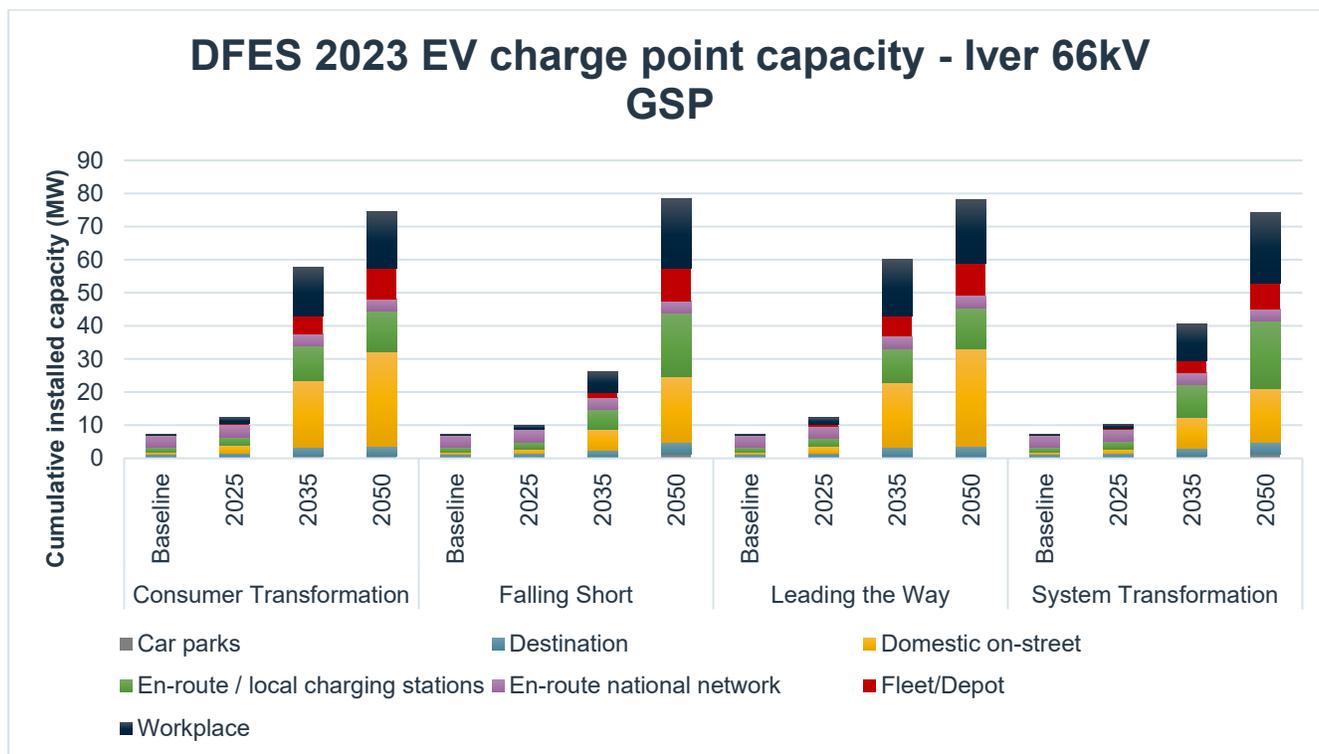


Figure 8 Projected EV charge point capacity across Iver 66kV GSP. Source: SSEN DFES 2023

Figure 8 shows the distribution of projected EV charge point capacity across a range of sub-technologies with Workplace, En-route / local charging stations, and Domestic on-street chargers being the most significant contributors. On top of the sub-technologies covered above, there are also approximately 48,000 domestic off-street chargers that are also projected to connect across the area by 2050 (under the Consumer Transformation scenario). The total number of electric vehicles (cars and Light Goods Vehicles (LGVs)) across the study area is estimated to reach approximately 80,000 vehicles by 2050 under the Consumer Transformation scenario.

5.3. Electrification of heat

The pathway to heat decarbonisation is more uncertain, and as a result we currently see a wide range of credible scenarios. Following the decision by DESNZ on the role of hydrogen for heating in 2026, there will be a clearer view of the impact of heating on the electricity network.¹⁴ This decision will allow both electricity and gas networks to better understand future requirements, and plan to these accordingly. Further to this, engagement has made it clear to us that there are aspirations for the development of heat networks across the west London area. Viable sites have been identified through the West London Local Area Energy Plan (LAEP) and are emerging through the Department for Energy Security and Net Zero (DESNZ) national heat network zoning. Currently, the presence of heat networks is considered through the DFES analysis using heat network project pipelines¹⁵ in the near term and DESNZ opportunity areas for district heating networks in the longer term.¹⁶ This is aligned to targets for heat networks to serve 20% of domestic heating by 2050. The impact this has on DFES

¹⁴ [Decarbonising home heating - Committee of Public Accounts](#)

¹⁵ [Heat networks pipelines - GOV.UK](#)

¹⁶ [Opportunity areas for district heating networks in the UK: second National Comprehensive Assessment - GOV.UK](#)



projections is a decrease in the number of standalone heat pumps projected in areas where there is likely going to be development of heat networks.

5.3.1. DFES Projections

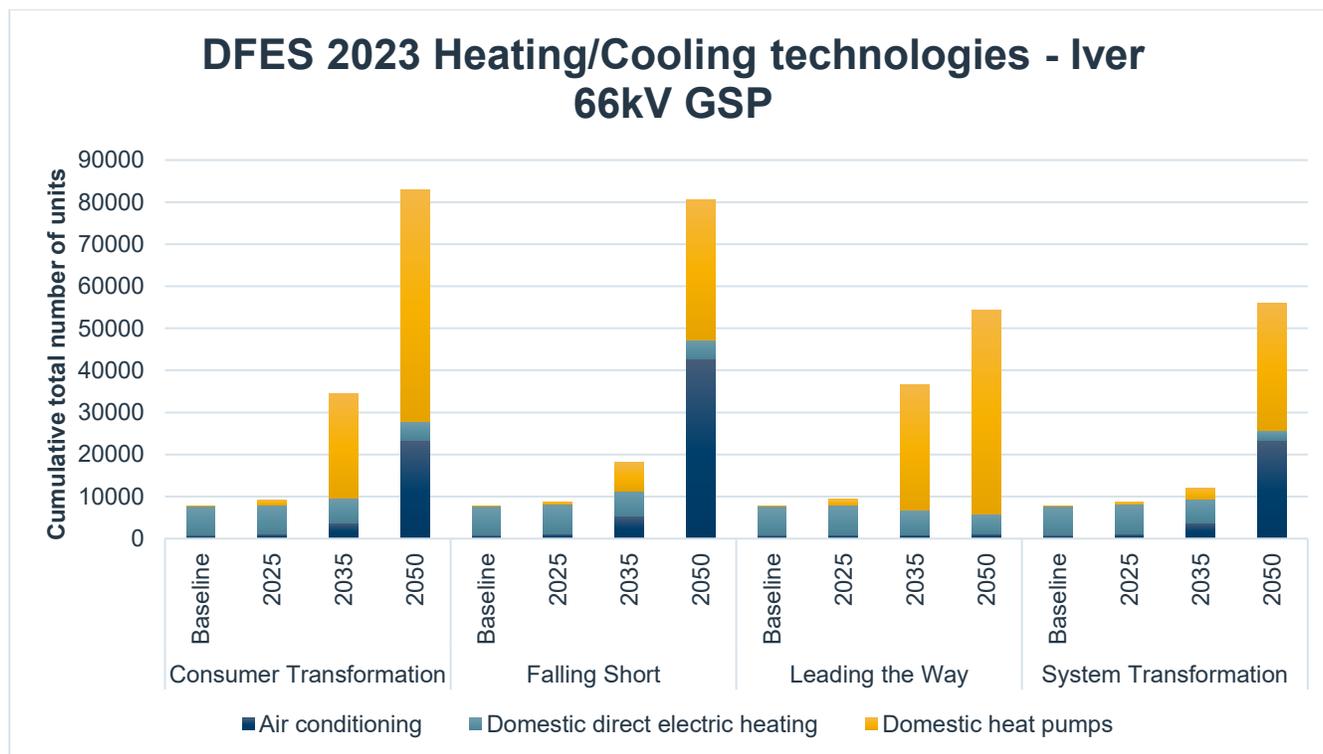


Figure 9 Projected number of heating/cooling technologies across Iver 66kV GSP. Source: SSEN DFES 2023

Under all four scenarios, we see a significant increase in the number of heating/cooling units. The increase in the number of domestic heat pumps is expected to increase to approximately 55,000 under the Consumer Transformation scenario. There is also a notable increase in the number of air conditioning units which varies significantly across the different scenarios. It is important to study the impact of this as this will drive electricity demand in the summer where, due to higher ambient temperatures, assets such as circuits and transformers will have lower ratings.

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 developments across the study area for this SDP.

5.4.1. DFES Projections

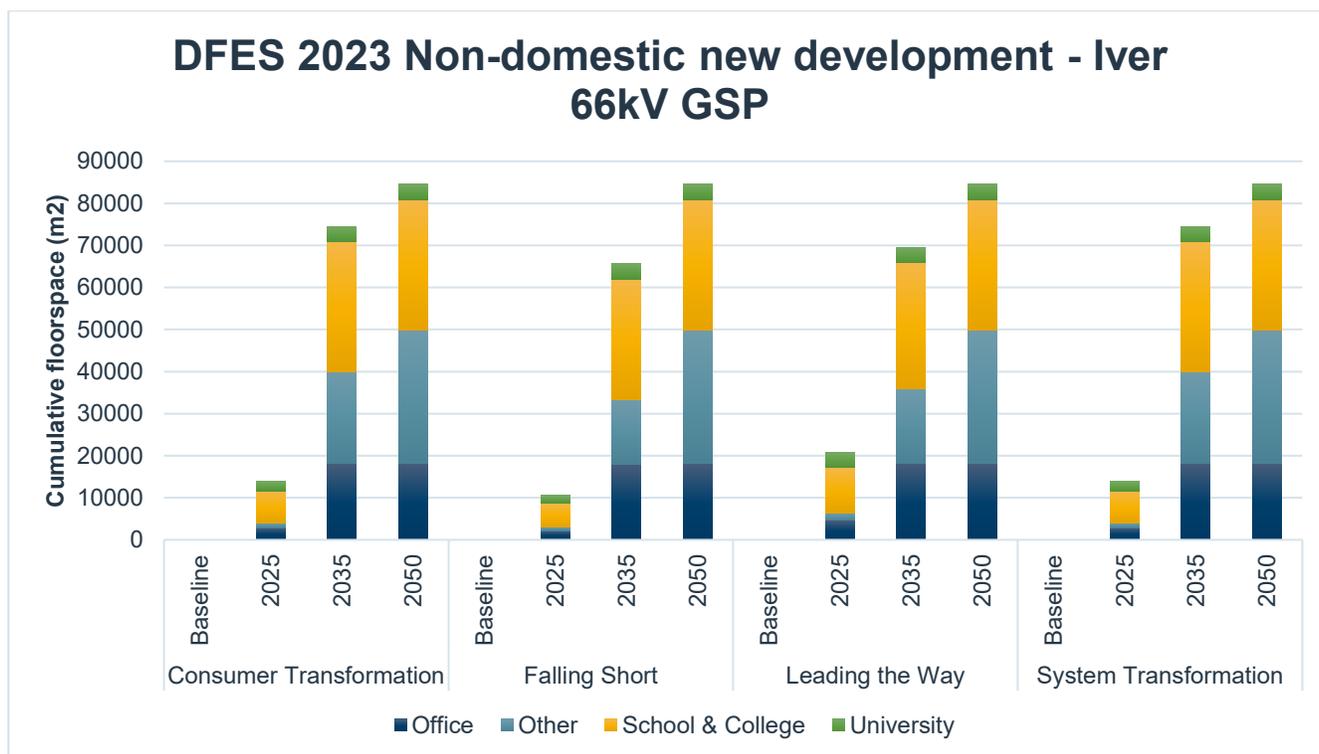


Figure 10 Projected non-domestic new development across Iver 66kV GSP. *Source: SSEN DFES 2023*

Figure 10 shows the new non-domestic development that SSEN have been made aware of through the DFES process. We see a large amount of new Office and School & College floorspace contributing to a total of over 84,000m² of new floorspace. Alongside non-domestic new developments, there is also an anticipated 7,000 new homes projected to be built ahead of 2050 (under the Consumer Transformation scenario).

5.5. Commercial and industrial electrification

There is a significant new development at Pinewood Studios that was highlighted to us by Buckinghamshire Council. The development would result in 20 new purpose-built sound stages with workshops and offices to the south of the existing studios. The £800m scheme is estimated to create over 8,000 new jobs and add around £640m p.a. to economic productivity (Gross Value Added).¹⁷ Continuing proactive engagement with industrial and commercial customers will allow SSEN to develop an understanding of potential increases in electrical demand at Pinewood studios.

Further to the above development, a significant demand is expected to arise across Iver 66kV due to data centre growth. The demand requirements of data centres often mean they require connection at extra-high voltage (EHV). Across Iver 66kV this will be connecting to the 66kV network. In terms of network requirements, this will mean expansion of the 66kV busbar and close engagement with National Grid Electricity Transmission (NGET) to understand any limitations across the whole electricity system.

¹⁷ [Pinewood Studios submits new planning application for Screen Hub * Pinewood Studios](#)
Iver 66kV Grid Supply Point: Strategic Development Plan



6. WORKS 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 Iver 66kV 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. Summary of existing works is tabulated below:

ID (Schematic Reference)	Substation	Description	Driver	Forecast completion	Fully resolves strategic needs to 2050?
1	Uxbridge PSS	Reinforcement of the three existing 66/11kV transformers to higher rated 40MVA units.	DNOA Process	2028	

Table 2 Works already triggered through customer connections and the DNOA process.

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 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.



1.1. Network Schematic (following completion of above works)

The network schematic below in Figure 11 shows the 66kV network with changes highlighted and referenced to the table above.

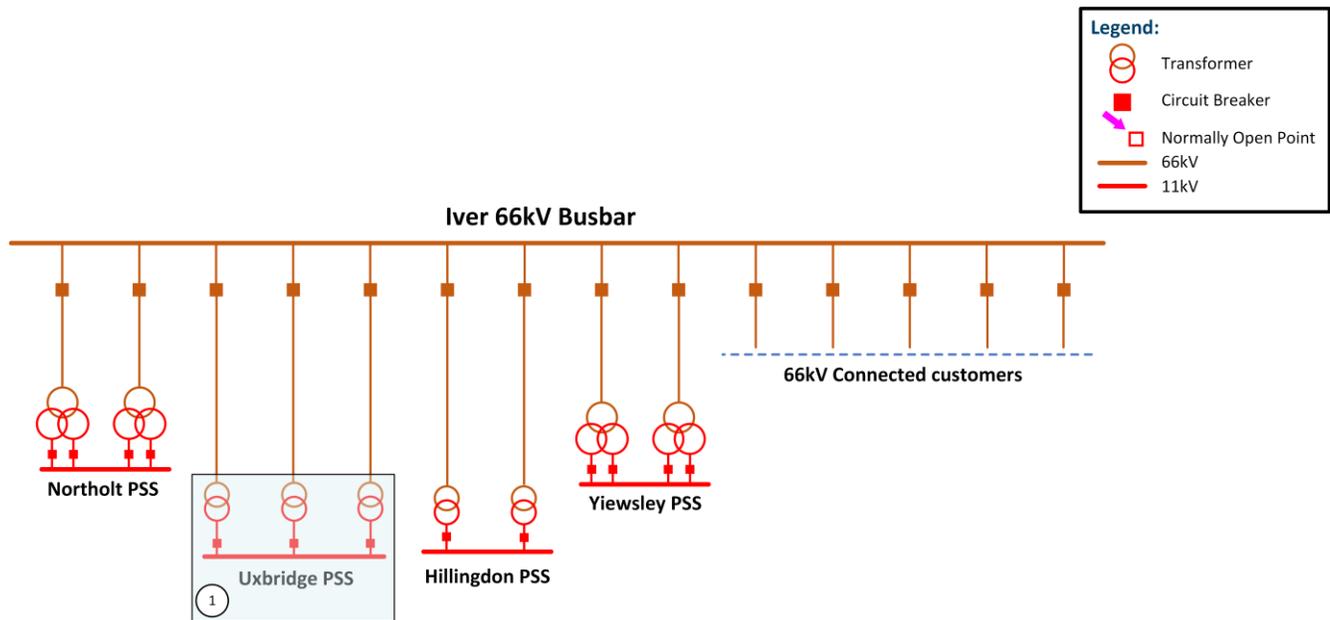


Figure 11 66kV Network schematic following completion of triggered works.



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 Iver 66kV SDP study area. Darker blue shades indicate that there is a projected capacity shortfall whereas lighter blue 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 NSHR is produced annually with the data shown below from the May 2024 publication, where work has been triggered between this date and the publication of this report, future capacity may not be reflected.

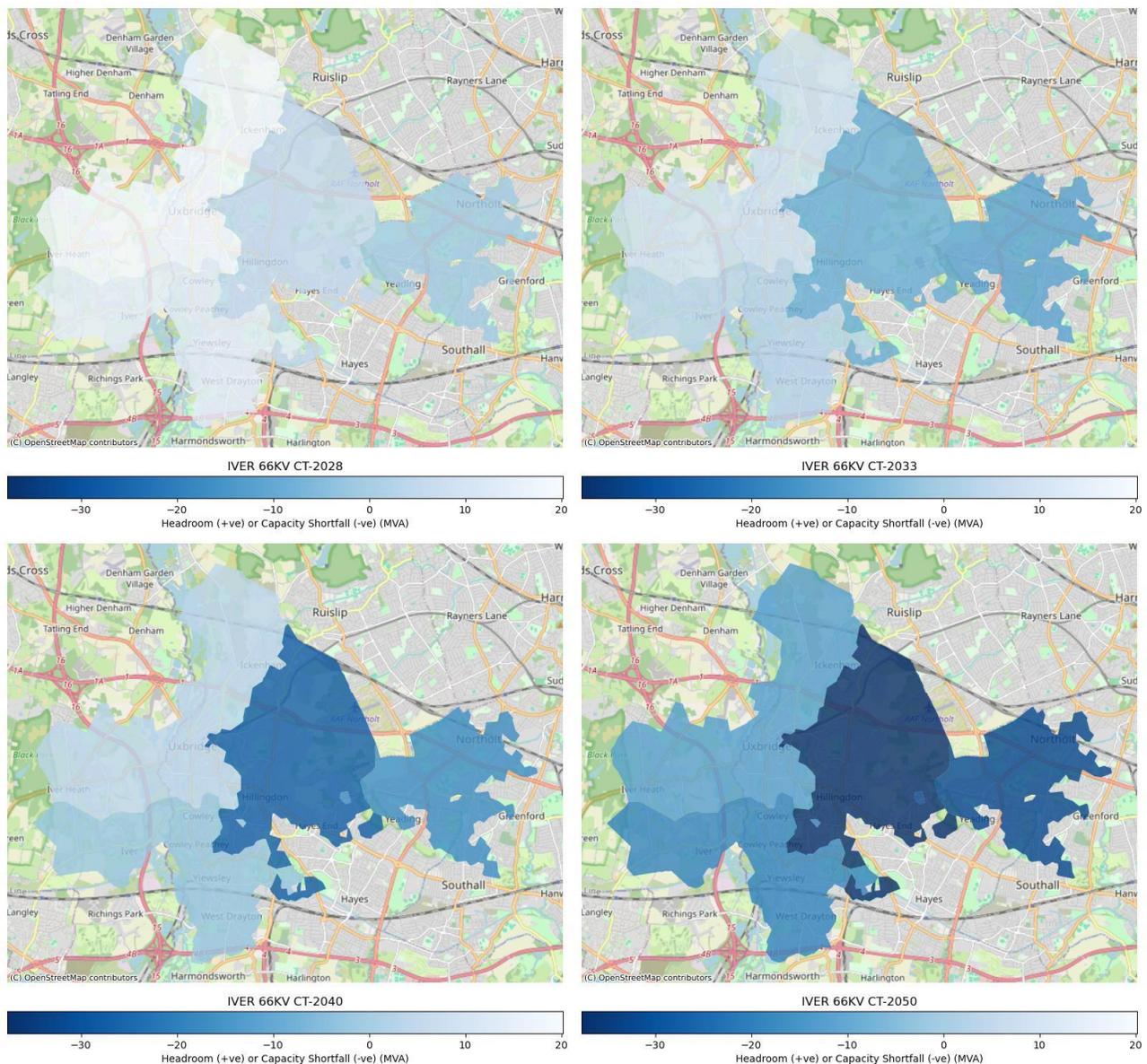


Figure 12 Iver 66kV GSP - EHV/HV Spatial Plans - Consumer Transformation



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 Iver 66kV GSP. The points are coloured 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 scenarios are available in appendix C.

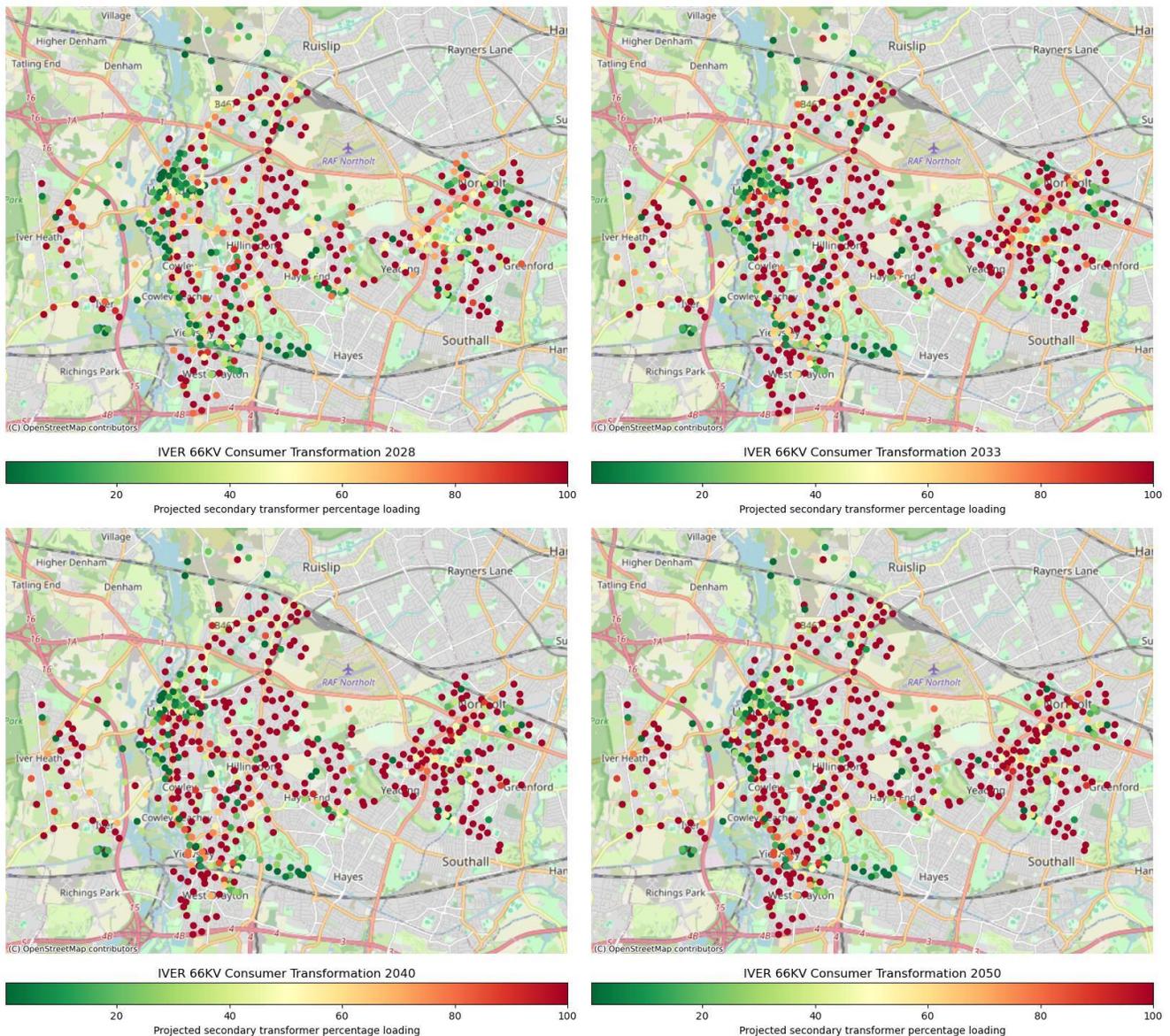


Figure 13 Iver 66kV GSP - HV/LV Spatial Plans - Consumer Transformation



8. SPECIFIC SYSTEM NEEDS AND OPTIONS TO RESOLVE

8.1.1. Overall dependencies, risks, and mitigations

There are a number of 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. Highlight the potential dependencies/risks and what we have done here or plan to do in order to mitigate these risks.

Dependency: Land availability across West London for expansion of existing sites or development of new sites.

Risks: Land scarcity and high costs result in significant investment required to increase network capacity in this area.

Mitigation: Through the SDP process we are proactively identifying any capacity constraints for a long-time horizon. Early identification of requirements allows for more significant time to identify suitable sites and progress any development.

Dependency: Some of the system needs identified here are far into the future (past 2040), when there is an inherent uncertainty with long term forecasting.

Risks: Unnecessary network investment.

Mitigation: The SDP process means that these plans are updated annually with the most up to date forecasts, this allows us to take a view of system needs at regular intervals and recommend projects for detailed optioneering through the DNOA process when there is enough certainty and evidence for load growth.

8.2. Future EHV System Needs to 2050.

The following table details the near-term to medium-term 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.

Location of proposed intervention	CT Year	ST Year	LW Year	FS Year	CT Worst case asset loading (%)	Network State	Proposed option(s) to resolve
Hillingdon PSS 66/11kV transformers	Ahead of 2030	Ahead of 2030	Ahead of 2030	Ahead of 2030	100	N-1	<p>The two primary transformers at Hillingdon primary substation are projected to be overloaded due to projected demand increase. There are two transformers at the existing site. High-level options to resolve could be:</p> <ul style="list-style-type: none"> Reinforcement of the existing transformers with higher rated units – reinforcement to 80MVA rated 3-winding transformers would provide sufficient capacity until approximately 2040 when



Location of proposed intervention	CT Year	ST Year	LW Year	FS Year	CT Worst case asset loading (%)	Network State	Proposed option(s) to resolve
							<p>projected demand currently estimates this capacity would be insufficient.</p> <ul style="list-style-type: none"> • Addition of a third transformer at the site with an equivalent rating to the current transformers would also provide a similar capacity increase to reinforcing the two existing units. From a desktop study, the site seems large enough to accommodate an additional transformer – to facilitate addition of another transformer a 66kV busbar would need to be constructed at the site. • Due to load growth across the area with most of the primary substations projected to reach close to their firm capacity ahead of 2050, a new primary substation could be installed in the area. Re-establishment of the primary substation site at Moat Farm would be a suitable
Northolt PSS 66/11kV transformers	2030-2035	2030-2035	2030-2035	2030-2035	102.4	N-1	<p>The two primary transformers are projected to be overloaded at Northolt PSS due to projected demand increase. To resolve this constraint:</p> <ul style="list-style-type: none"> • In the near-term, Moat Farm PSS should be re-established with new load in the area connecting to this new substation. • It is possible that ahead of 2050, there will be further capacity requirements in the area. This could be resolved through reinforcement of the reinforcement of the two existing 66/11kV transformers with 80MVA units. This would also require reinforcement of the 11kV board at the site.
Yiewsley PSS 66/11kV transformers	2030-2035	2030-2035	2030-2035	2030-2035	100	N-1	<p>Due to space constraints, it is unlikely that expansion of the existing site is possible. To address future load growth here a new Primary Substation will need to be established in the area. As introduced in previous options, this could be at the Moat Farm site or depending on updated load forecasts an additional site maybe required.</p>



Location of proposed intervention	CT Year	ST Year	LW Year	FS Year	CT Worst case asset loading (%)	Network State	Proposed option(s) to resolve
Iver 66kV to Northolt PSS 66kV circuit	2030-2035	2045-2050	2030-2035	2045-2050	106	N-1	<p>The 66kV circuit from Iver 66kV GSP to Northolt is projected to be overloaded due to forecasted demand growth. It should be noted that this occurs assuming that projected DFES load at Northolt connects at Northolt PSS rather than a new substation in the area. Potential options to resolve could be:</p> <ul style="list-style-type: none"> Reinforcement of approximately 20km of 66kV circuit (approximately 10km route for two circuits) to a minimum rating of the transformers that are proposed to be installed at Northolt. Addition of a third circuit is a potential option but would require installation of a 66kV busbar at the primary substation and use a 66kV breaker at Iver 66kV GSP.
Uxbridge PSS 66/11kV transformers	2040-2044	2045-2050	2040-2044	2045-2050	100	N-1	<p>The work currently proposed at Uxbridge PSS releases capacity until approximately 2040. If forecasts are realised, then further intervention will be required. As this is a space constrained site, there is limited opportunity for further reinforcement work or expansion of this site. Potential option to resolve:</p> <ul style="list-style-type: none"> Construction of a new primary substation in the area, this would provide sufficient capacity for further load growth that currently projects Uxbridge and Hillingdon primary substations to be overloaded at a similar time. The Moat Farm site (introduced earlier) would be suitable for re-establishment of the primary substation with the potential for some of the projected load at Uxbridge and Hillingdon able to be transferred to the new site.
Iver 66kV to Hillingdon PSS 66kV circuit	2045-2050	-	-	-	100	N-1	<p>Projected load growth under the CT scenario results in overload of the Iver 66 to Hillingdon PSS 66kV circuits being overloaded just ahead of 2050. It should be noted that the solution of transferring load to a new primary substation (potentially Moat Farm) in the area would mitigate this exceedance as the</p>



Location of proposed intervention	CT Year	ST Year	LW Year	FS Year	CT Worst case asset loading (%)	Network State	Proposed option(s) to resolve
							projected load would be positioned elsewhere on the 66kV network. As a result, the expectation would be that these specific circuits would not require reinforcement.

Table 3 Summary of system needs identified in this strategy through to 2035 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 Iver 66kV 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.¹⁸

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 4 primary substations supplied by Iver 66kV 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.

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.

¹⁸ SSEN Open Data Portal, 2023, SSEN Secondary Transformer – Asset Capacity and Low Carbon Technology Growth. Iver 66kV Grid Supply Point: Strategic Development Plan

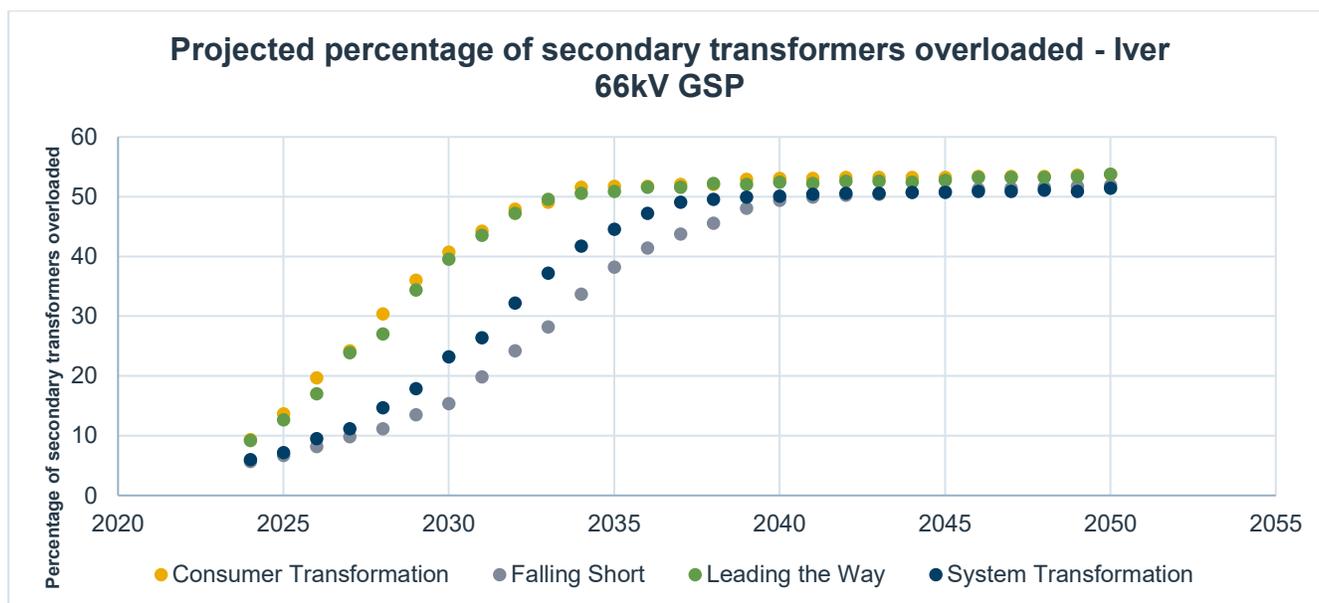


Figure 14 Iver 66kV GSP Projected secondary transformer loading. Source: SSEN Load Model

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.

One of the outputs from this innovation project was the report produced by the Smith Institute.¹⁹ This work groups LSOAs²⁰ 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 Figure 15.

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.
4 – Slightly higher than average	Driven up by larger elder population levels and moderately higher provision of care, reduced by smaller household sizes.

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

20 Lower layer Super Output Areas (LSOAs) ([Statistical geographies - Office for National Statistics](#))
Iver 66kV Grid Supply Point: Strategic Development Plan



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.

Figure 15 VFES Groupings

As shown in Figure 16, 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 to be located within the areas classed as highly vulnerable.

These secondary transformers should be prioritized for load related reinforcement as it will reduce the likelihood of asset failure for load reasons and increase network resilience in these areas.

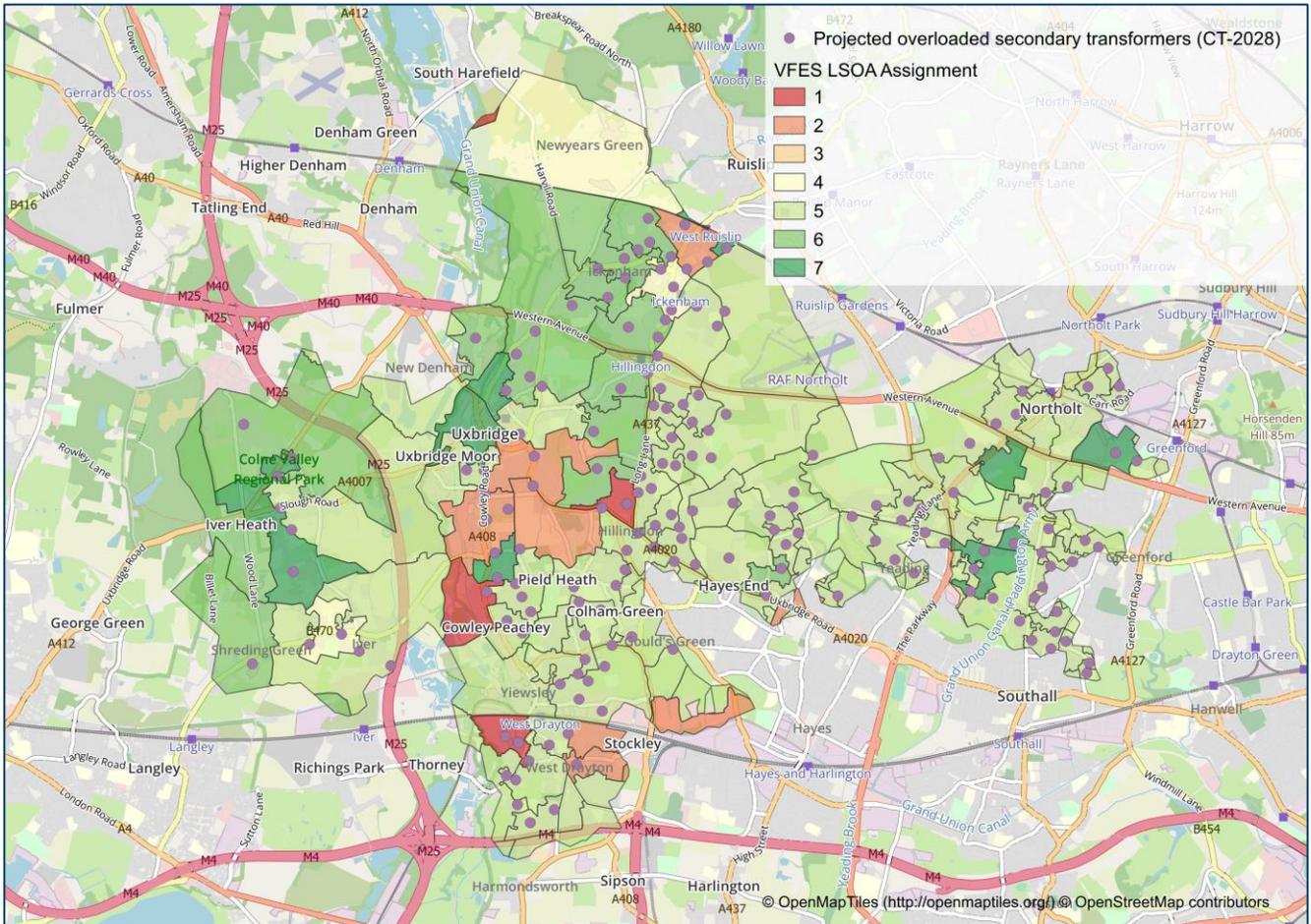


Figure 16 Iver 66kV GSP area VFES output with secondary transformer overlay.



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 of these 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 Iver 66kV 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 25% of low voltage feeders may need intervention by 2035 and 29% by 2050 under the CT scenario as shown in Figure 17. 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.

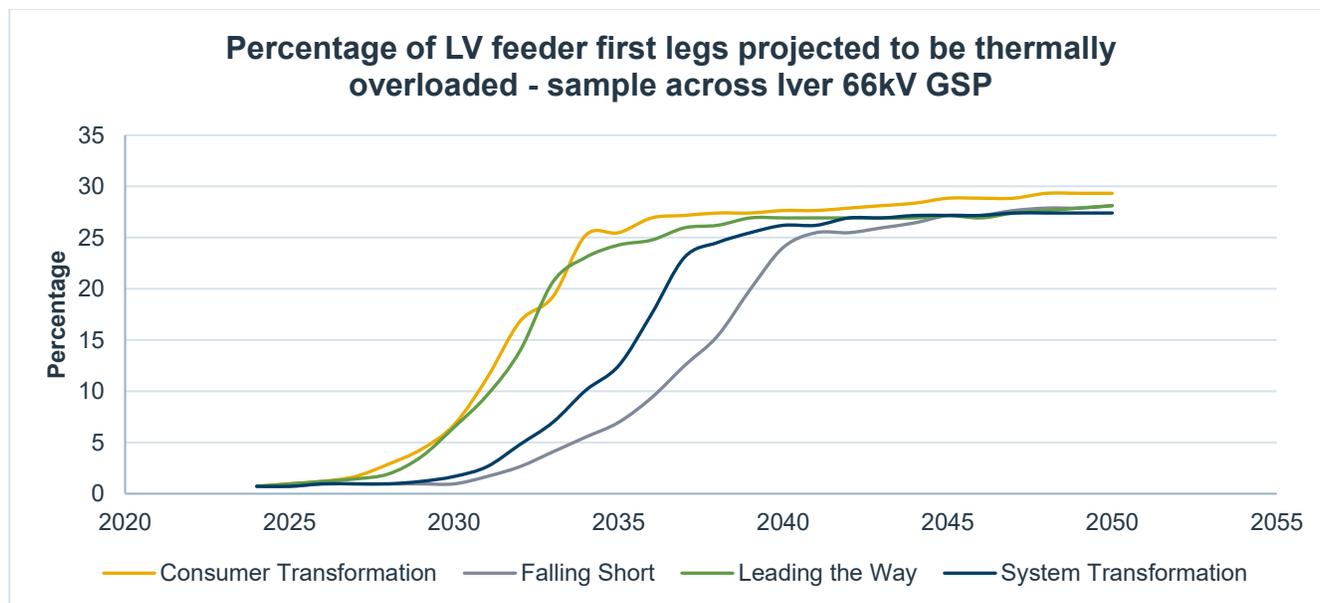


Figure 17 Percentage of LV feeders projected to be overloaded under Iver 66kV GSP



9. RECOMMENDATIONS

The review of stakeholder engagement and the SSEN 2023 DFES analysis provides a robust evidence base for load growth across Iver 66kV GSP group in both the near and longer term. Drivers for load growth across Iver 66kV GSP arise from multiple sectors and technologies. These drivers impact not only our EHV network but will drive system needs across all voltage levels.

The findings from this report have provided evidence for 2 key recommendations:

1. System needs that have been identified to arise in the near-term should be progressed through the DNOA process to develop a more in-depth solution. For this SDP, this includes:
 - a. Hillingdon PSS 66/11kV transformers
 - b. Northolt PSS 66/11kV transformers
 - c. Yiewsley PSS 66/11kV transformers
2. SSEN should continue to reassess the projected network capacity to understand whether the requirement for a new primary substation in the 2040s will be required. This will allow suitable site identification and acquisition so that there are no delays in delivering network capacity when it is projected to arise.

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.



Appendix A DFES 2024 Projections

DFES 2024 Scenarios

NESO publishes the FES framework annually, and this is adopted for the DFES. The 2024 edition outlines three new scenarios (Holistic Transition, Electric Engagement, and Hydrogen Evolution) that achieve net zero by 2050 against a Counterfactual. The scenario framework is shown below in Figure 18.

Pathways framework 2024

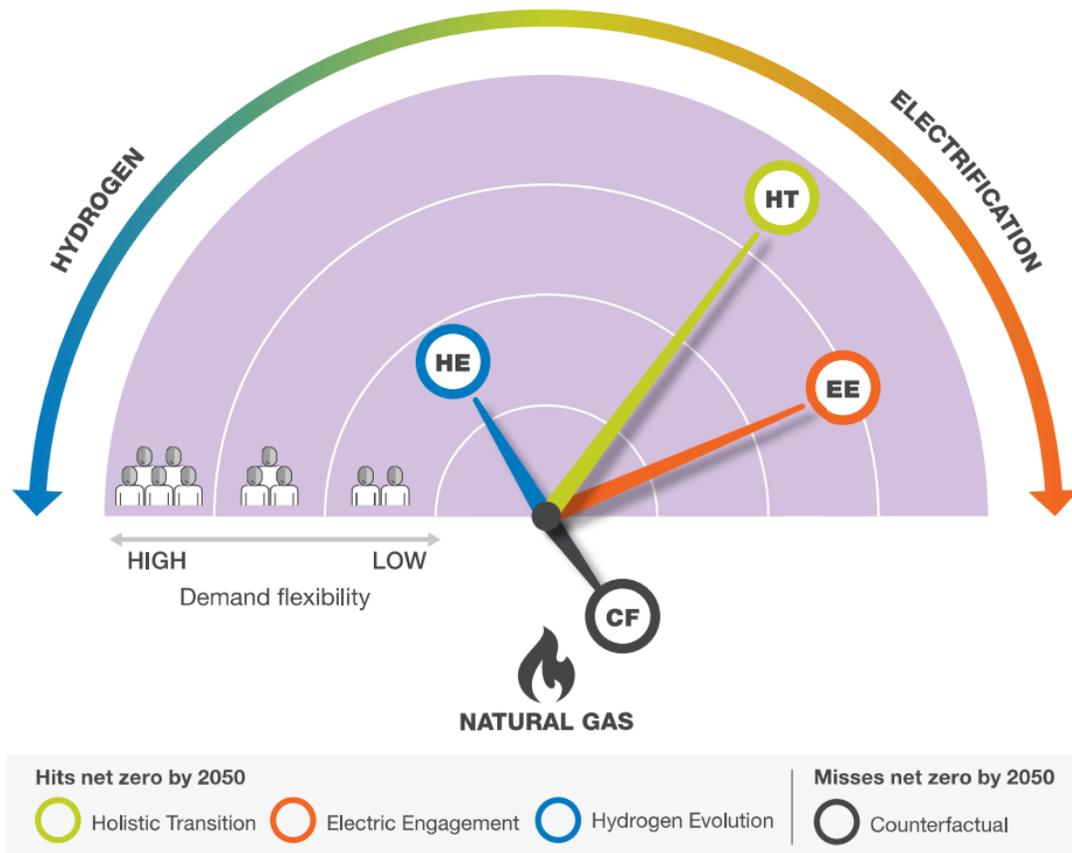


Figure 18 The FES 2024 scenario framework (source: NESO)

Distributed Energy Resource

DFES Projections

Generation

The Iver 66kV GSP supplies an area of West London to the North of the M4 motorway and mostly inside the M25 motorway (as shown above in Figure 3). As the area is mostly urban built environment, there is limited opportunity for large scale generation projects. However, as shown below in Figure 19, we still see a large uptake in Solar PV across the area with up to 98MW installed by 2050 under the Electric Engagement scenario. 78MW of the projected generation results from small-scale rooftop Solar PV (<10kW), seizing the opportunity for



domestic rooftop solar across the area. We also observe decommissioning of Diesel generation in alignment with Net Zero targets in the area. The small amount of Gas projected to arise under some of the scenarios (namely Hydrogen Evolution) refers to the development of a small number of Hydrogen Peaking plants. Note that DFES 2024 forecasts predate the outcome of CP2030 and Connections Reform.

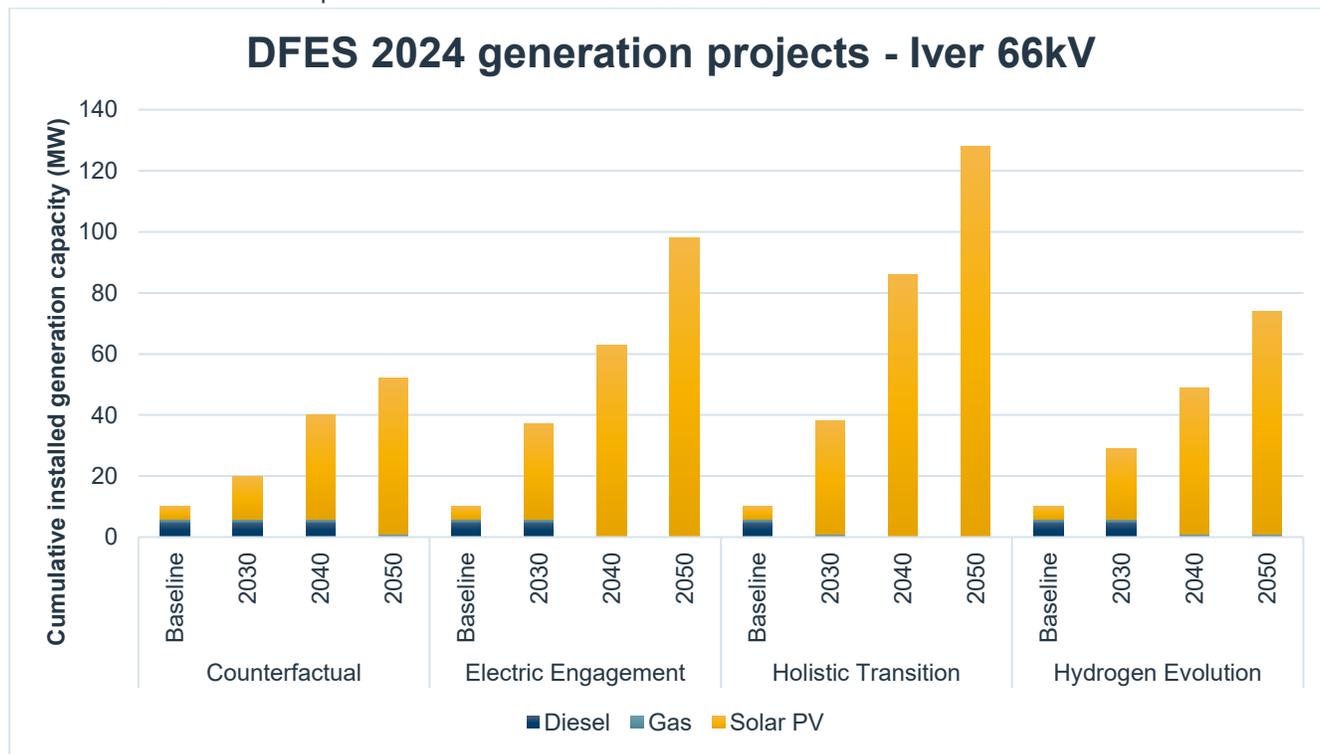


Figure 19 Projected cumulative distributed generation capacity Iver 66kV GSP (MW). Source: SSEN DFES 2024

Storage

To accompany the generation projected in the DFES 2024, we also see the development of some Battery Storage across the area. Under the Electric Engagement scenario, this equates to 32MW of domestic storage and 6MW of battery storage at high energy user sites connected by 2050.

Transport Electrification

As introduced in section 3.1, local authorities across the study area have plans in place to develop several many publicly available EV chargers. The proximity to large motorways will likely also impact the requirement for more EV charging (although there are no large motorway service areas in the study area). While the study area is close to Heathrow airport, there is not currently an electricity supply from Iver 66kV GSP to Heathrow Airport.

DFES Projections

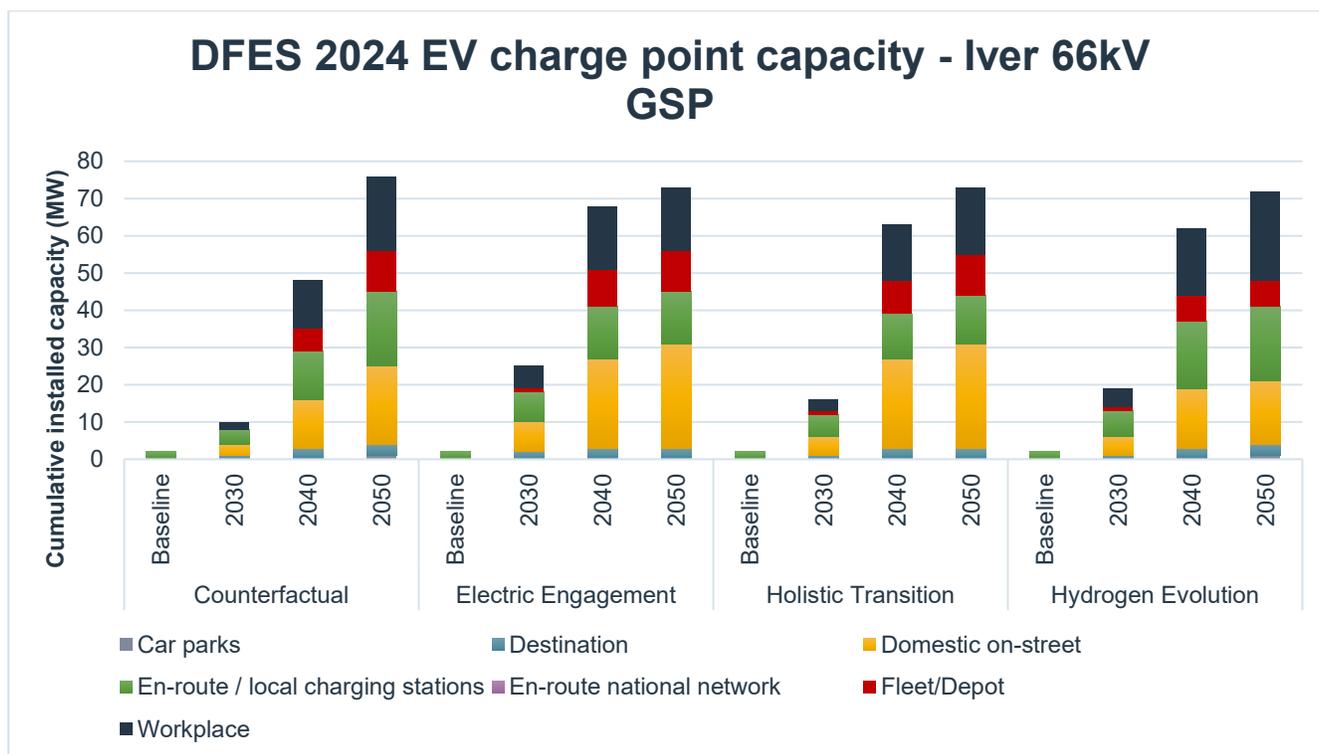


Figure 20 Projected EV charge point capacity across Iver 66kV GSP. Source: SSEN DFES 2024

Figure 20 shows the distribution of projected EV charge point capacity across a range of sub-technologies with Workplace, En-route / local charging stations, and Domestic on-street chargers being the most significant contributors. On top of the sub-technologies covered above, there are also approximately 53,000 domestic off-street chargers that are also projected to connect across the area by 2050 (under the Electric Engagement scenario). The total number of electric vehicles (cars and Light Goods Vehicles (LGVs)) across the study area is estimated to reach between 80,000 and 100,000 vehicles by 2050 with each of the four DFES scenarios falling within this range.

Electrification of heat

The pathway to heat decarbonisation is more uncertain, and as a result we currently see a wide range of credible scenarios. Following the decision by DESNZ on the role of hydrogen for heating in 2026, there will be a clearer view of the impact of heating on the electricity network.²¹ This decision will allow both electricity and gas networks to better understand future requirements, and plan to these accordingly. Further to this, engagement has made it clear to us that there are aspirations for the development of heat networks across the west London area. Viable sites have been identified through the West London Local Area Energy Plan (LAEP) and are emerging through the Department for Energy Security and Net Zero (DESNZ) national heat network zoning. Currently, the presence of heat networks is considered through the DFES analysis using heat network project pipelines²² in the near term and DESNZ opportunity areas for district heating networks in the longer term.²³ This is aligned to targets for heat networks to serve 20% of domestic heating by 2050. The impact this has on DFES

²¹ [Decarbonising home heating - Committee of Public Accounts](#)

²² [Heat networks pipelines - GOV.UK](#)

²³ [Opportunity areas for district heating networks in the UK: second National Comprehensive Assessment - GOV.UK](#)



projections is a decrease in the number of standalone heat pumps projected in areas where there is likely going to be development of heat networks.

DFES Projections

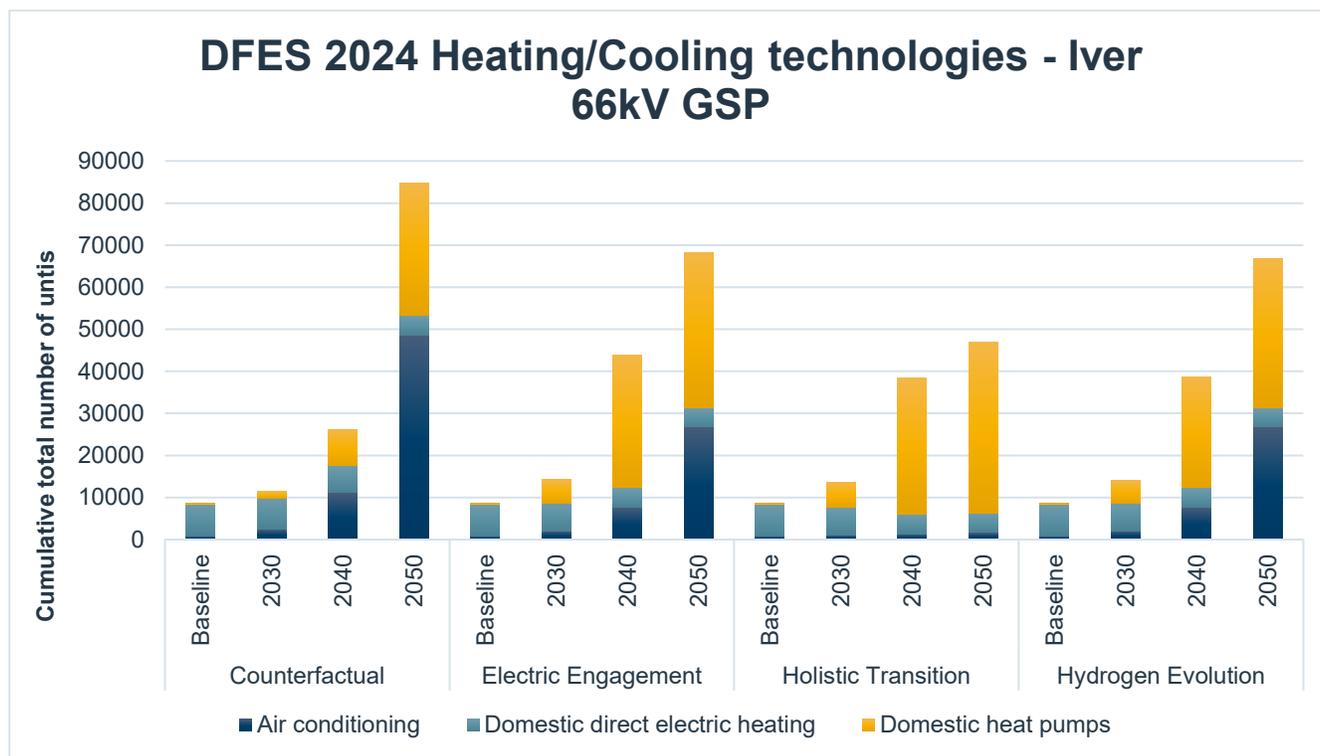


Figure 21 Projected number of heating/cooling technologies across Iver 66kV GSP. *Source: SSEN DFES 2024*

Under all four scenarios, we see a significant increase in the number of heating/cooling units. The increase in the number of domestic heat pumps is expected to increase to approximately 37,000 under the Electric Engagement scenario. There is also a notable increase in the number of air conditioning units which varies significantly across the different scenarios. It is important to study the impact of this as this will drive electricity demand in the summer where, due to higher ambient temperatures, assets such as circuits and transformers will have lower ratings.

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 developments across the study area for this SDP.

DFES Projections

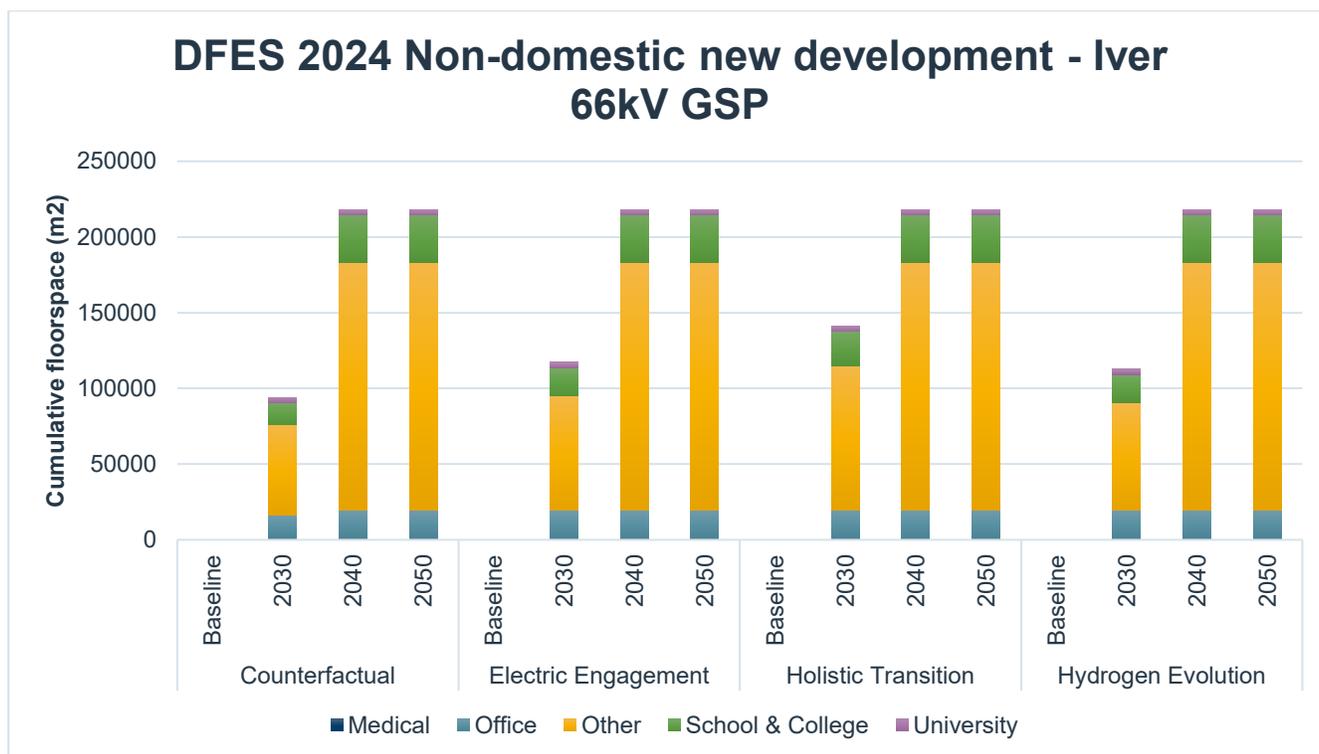


Figure 22 Projected non-domestic new development across Iver 66kV GSP. *Source: SSEN DFES 2024*

Figure 22 shows the new non-domestic development that SSEN have been made aware of through the DFES process. We see a large amount of new Office and School & College floorspace contributing to a total of over 200,000m² of new floorspace. Alongside non-domestic new developments, there is also an anticipated 7,600 new homes projected to be built ahead of 2050 (under the Electric Engagement scenario).

Commercial and industrial electrification

Captured in the DFES there is approximately 160,000m² of new floorspace categorized as *Other*, as shown in Figure 22. This relates to new development at Pinewood Studios that was highlighted to us by Buckinghamshire Council. The development would result in 20 new purpose-built sound stages with workshops and offices to the south of the existing studios. The £800m scheme is estimated to create over 8,000 new jobs and add around £640m p.a. to economic productivity (Gross Value Added).²⁴ It is recommended that SSEN should proactively engage with Pinewood Studios to release capacity in the area so that electricity networks are not a blocker to this development.

Further to the above development, a significant demand is expected to arise across Iver 66kV due to data centre growth. The demand requirements of data centres often mean they require connection at extra-high voltage (EHV). Across Iver 66kV this will be connecting to the 66kV network. In terms of network requirements, this would require connection to 66kV circuit breakers at the GSP. Close engagement with National Grid Electricity Transmission (NGET) should be carried out to understand any limitations across the whole electricity system.

²⁴ Pinewood Studios submits new planning application for Screen Hub * Pinewood Studios
Iver 66kV Grid Supply Point: Strategic Development Plan



Appendix B EHV/HV spatial plans for other DFES scenarios

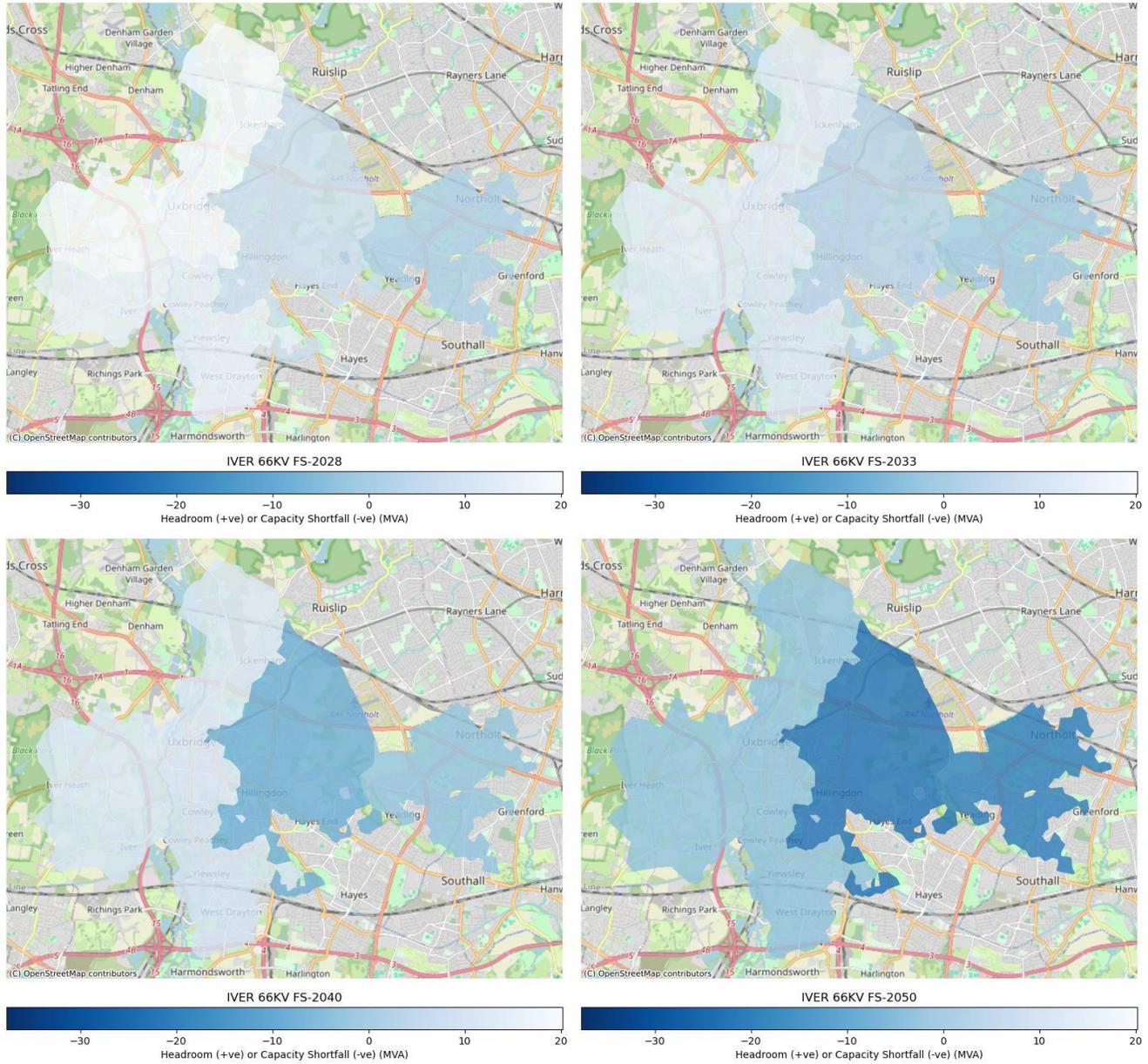


Figure 23 Iver 66kV GSP - EHV/HV Spatial Plan - Falling Short

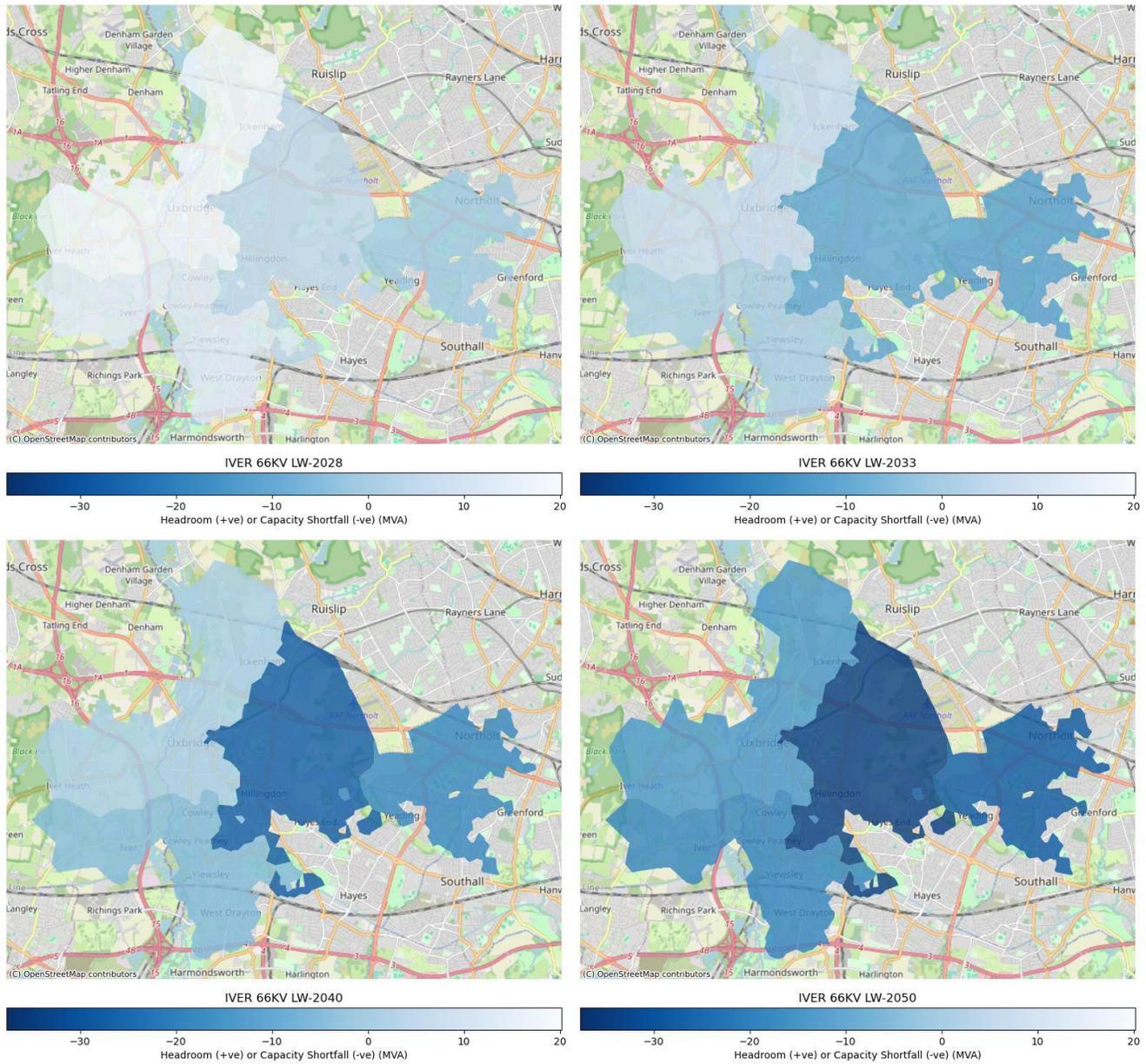


Figure 24 Iver 66kV GSP - EHV/HV Spatial Plan - Leading the Way

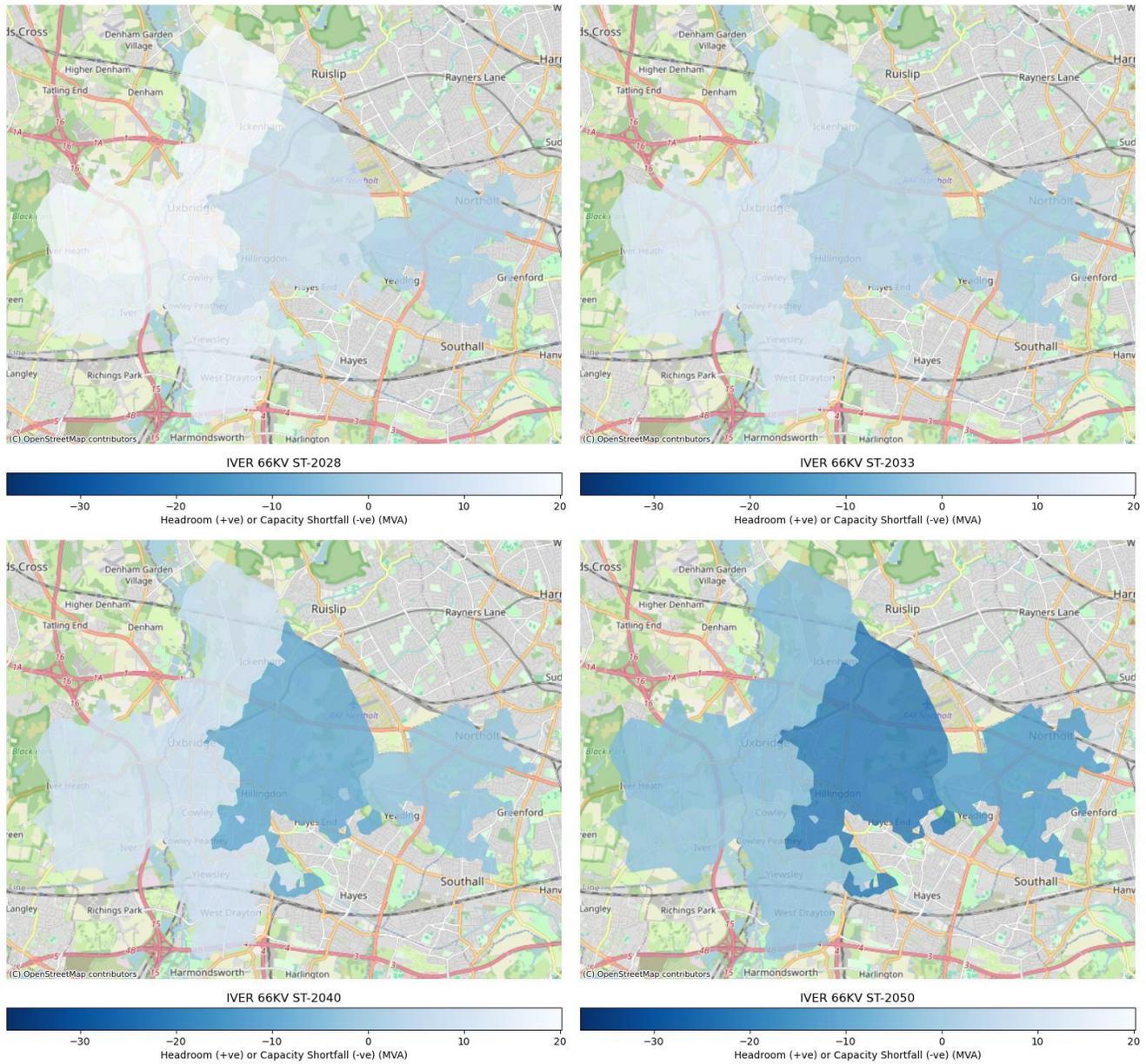


Figure 25 Iver 66kV GSP - EHV/HV Spatial Plan - System Transformation



Appendix C HV/LV spatial plans for other DFES scenarios

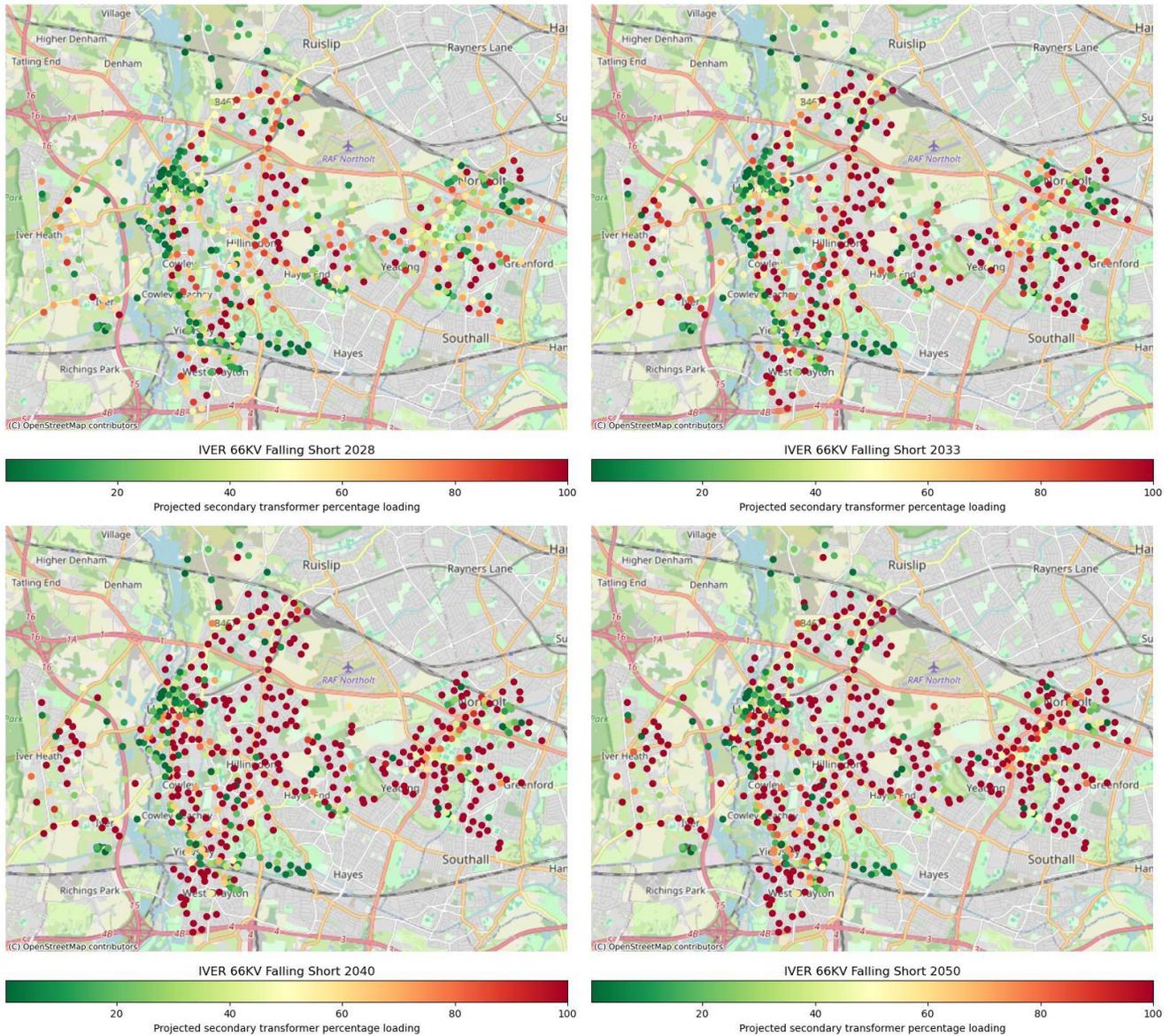
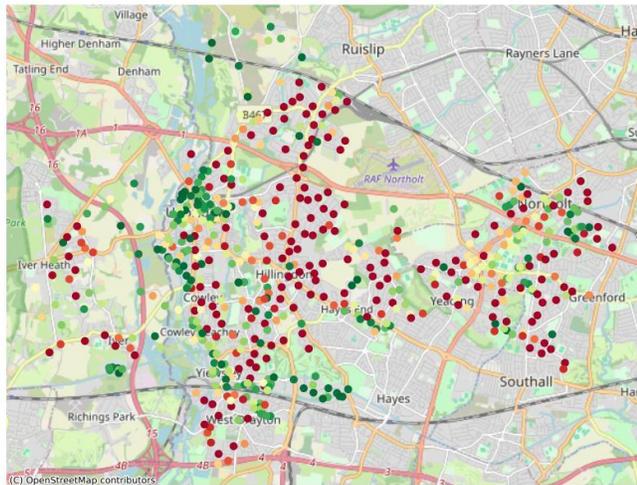
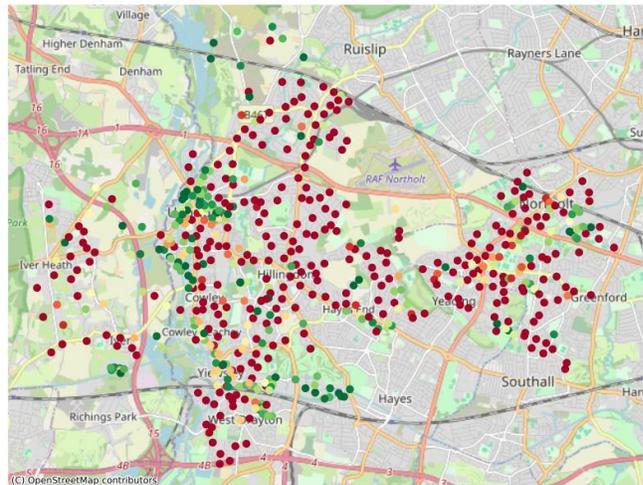


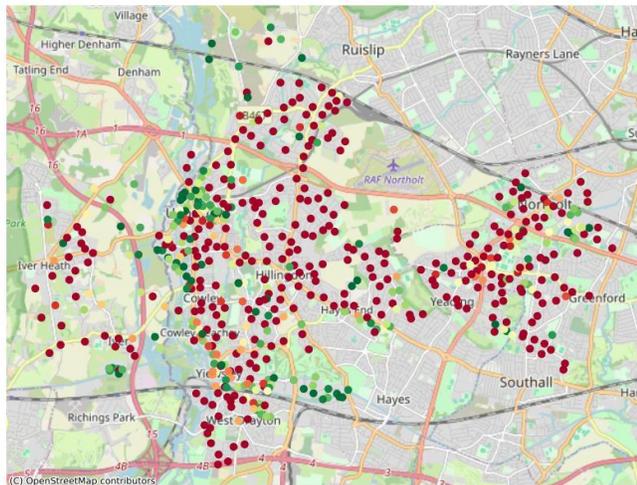
Figure 26 Iver 66kV GSP - HV/LV Spatial Plan - Falling Short



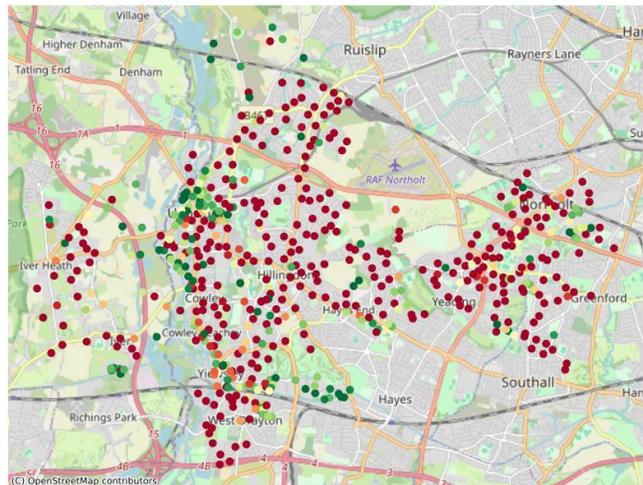
IVER 66kV Leading the Way 2028



IVER 66kV Leading the Way 2033



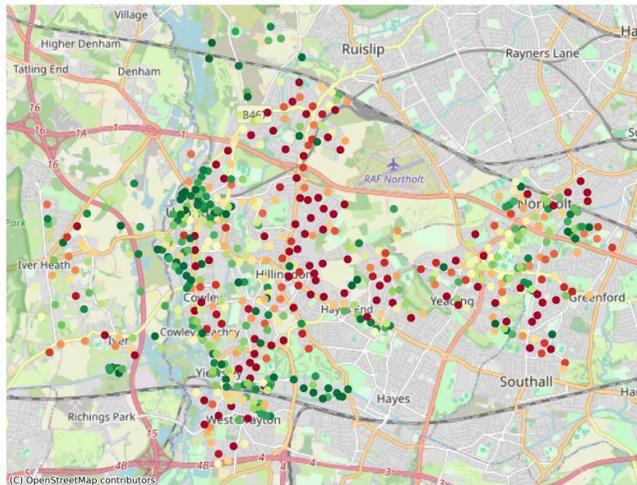
IVER 66kV Leading the Way 2040



IVER 66kV Leading the Way 2050

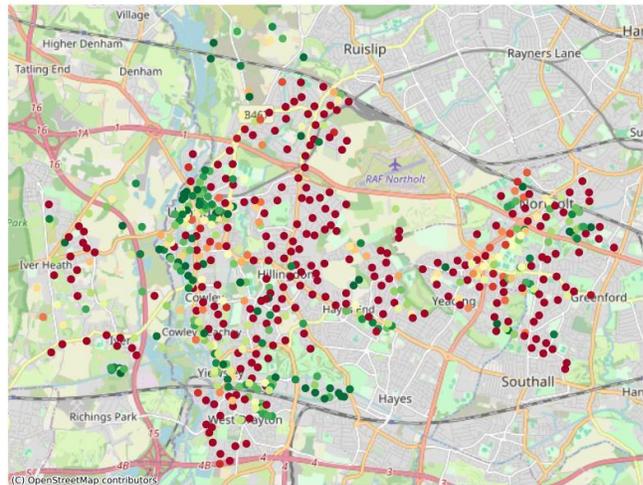


Figure 27 Iver 66kV GSP - HV/LV Spatial Plan - Leading the Way



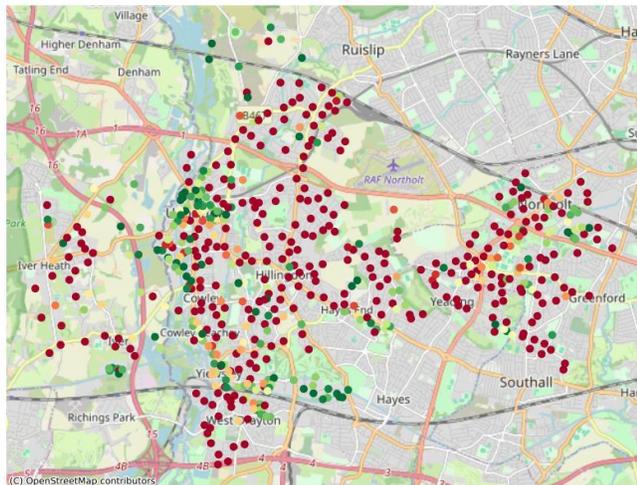
IVER 66KV System Transformation 2028

20 40 60 80 100
Projected secondary transformer percentage loading



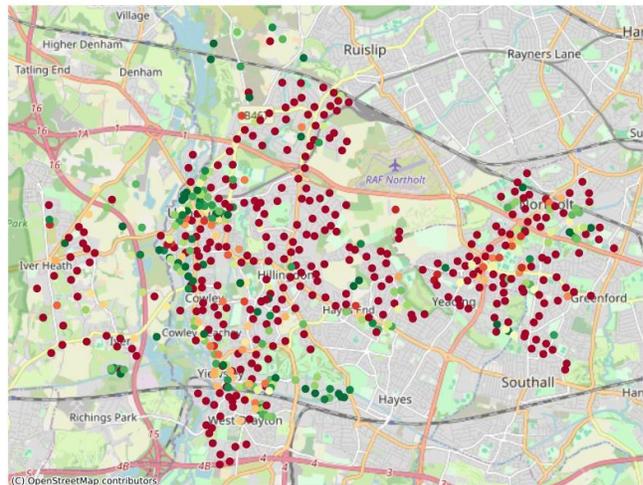
IVER 66KV System Transformation 2033

20 40 60 80 100
Projected secondary transformer percentage loading



IVER 66KV System Transformation 2040

20 40 60 80 100
Projected secondary transformer percentage loading



IVER 66KV System Transformation 2050

20 40 60 80 100
Projected secondary transformer percentage loading

Figure 28 Iver 66KV GSP - HV/LV Spatial Plan - System Transformation



Appendix D Glossary

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
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
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
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 Network
ST	System Transformation
UM	Uncertainty mechanism
VFES	Vulnerability Future Energy Scenarios
WSC	Worst Served Customers



Appendix E Summary of consultation feedback

Following the consultation for this document, several changes have been made to the document to reflect the feedback received from our stakeholders. General feedback has been on providing a less technical summary of the information provided in the SDPs, this has been made available through one page summaries now available to view on the SSEN website here: [Strategic Development Plan \(SDP\) - SSEN](#)

A summary of these changes is tabulated below. Please note that some of the feedback received relates to the SDP methodology or other DSO publications. Where this is the case, feedback has been considered in the SDP methodology update or update of other DSO publications.

Feedback theme	Action taken	Section (page number)
Error in links to relevant publications	Corrected the weblinks to resolve issues.	Section 3 (pg.7)
Update figures to improve accessibility.	Updated figures where possible, some figures where dense data coverage provides insight into scale have not been updated.	Section 3 (pg.9)
Local Authority targets	Corrected Ealing Council's carbon neutral target and confirmed reference. Updated references for the London Borough of Hillingdon's carbon neutral target to the most recent documentation.	Section 3 (pg.7)



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