High Speed 2
High Value Project Reopener, &
Rail Electrification
Reopener Applications – CRC 3F
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SP Manweb Plc

SP ENERGY NETWORKS

HS2 HVP & Rail Electrification Applications – CRC 3F

CONTENTS

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1. EXECUTIVE SUMMARY

This document sets out the application made by SP Energy Networks (SPEN) on behalf of SP Manweb (SPMW) Plc. for an increase to allowed levels of expenditure during the RIIO-ED1 price control period against two uncertain cost reopener criteria.

These submissions are made under the High Value Project (HVP) and the Rail Electrification uncertain cost reopener arrangements of Charge Restriction Condition – 3F (CRC 3F),

The proposed adjustments are submitted in response to the government sponsored High Speed 2 (HS2) rail project. The full extent of this project, including the rail route, was not known prior to the beginning of the RIIO-ED1 price control period. As a result the required levels of expenditure, which are of a material amount, could not be included within the SPMW ED1 business plan submission. High Speed Two (HS2) is one of the largest infrastructure projects to ever be undertaken in the UK. When completed, it will directly connect London, Birmingham, the East Midlands, Leeds and Manchester via a dedicated high speed rail route.

This will significantly impact the SPMW licence area in two main ways;

1. **Additional Capacity -** Electricity demand will increase throughout the following phases of this project: construction works required to deliver the capacity, the enduring ancillary load, and the regional economic growth directly resulting from improved transport links. The prior uncertainty and cost of meeting the capacity challenge are considered by SPEN to qualify for arrangements for the recovery of uncertain costs under the *High Value Project* (HVP) mechanism.

2. **Network Diversions** - The significant number of distribution network diversions required to accommodate the rail route carry significant cost. The costs allocated to the licence for diversions of plant, underground cables and overhead lines are considered by SPEN to qualify for arrangements for the recovery of uncertain costs under the *Rail Electrification Costs* mechanism.

This document contains the submission for an increase of £35.13m in 2012/13 prices to the SPMW allowed level of expenditure to deliver the HVP to accommodate the HS2 rail project.

This document also contains the submission for an increase of £12.06m in 2012/13 prices to the SPMW allowed levels of expenditure to deliver the Rail Electrification network diversions associated with the HS2 project. There remains legal uncertainty pertaining to the party responsible for allocation of these costs, discussed later in this submission.

	HVP Network Capacity	Rail Electrification Diversions
Total Expenditure	**£35.13m**	**£12.06m**

SPEN has adhered to the relevant licence requirements as detailed throughout this submission.

2. INTRODUCTION

This document sets out two RIIO-ED1 reopener submissions made by SP Energy Networks (SPEN) to Ofgem for the SP Manweb (SPMW) licence area. These submissions are made in accordance with Charge Restriction Condition 3F (CRC 3F) of SPMW's electricity distribution licence.

2.1 Background - The HS2 Rail Project

The High Speed Two (HS2[1]) rail project is one of the largest infrastructure projects to ever be undertaken in the UK. When completed, HS2 will provide the new backbone of the national rail network - directly connecting London, Birmingham, the East Midlands, Leeds and Manchester via a dedicated new-build high speed rail route. Part of the route will pass through SPMW's licence area. This is shown in Figure 2-1; the SPMW districts are shown by the highlighted regions.

Figure 2-1: HS2 rail project and SPMW licence area

HS2 will be delivered in multiple stages, two of these stages impact the SPMW licence:

- HS2 Phase 2A – from the West Midlands to Crewe. Construction is planned to commence in 2020, with rail operation planned to start in 2026 and first commercial services in 2027.[2]
- HS2 Phase 2B – from Crewe to Manchester. Construction is planned to start in 2022, with rail operation planned to start in 2031 and first commercial services in 2033.

[1] Throughout this document, HS2 shall be inferred to mean the HS2 rail project, or the company delivering the relevant section of the rail project.

[2] https://www.hs2.org.uk/timeline-2a/ [April 2019]

2.2 Proposed relevant adjustments

Phase 2A and Phase 2B will both involve significant distribution network works in SPMW's licence area. SPEN anticipates that the project will impact SPMW in two main ways:

1. **Additional electrical demand will require new network capacity**. This additional demand consists of the demand associated with HS2 construction works, the enduring ancillary load of HS2, and the regional economic growth directly resulting from improved transport links created by the project.
2. **Network diversions**. A significant number of network diversions will be required where existing network must be relocated to accommodate the chosen rail route.

Both of these will result in costs to the SPMW licence area that could not have been foreseen ahead of the submission of the RIIO ED1 business plan and are due to factors outside SPEN's control. These costs also meet the other requirements of CRC 3F.8. SPEN considers these are eligible for consideration as uncertain cost reopeners.

Therefore this document proposes two relevant adjustments, in accordance with CRC 3F:

1. HVP reopener: an adjustment to SPMW's RIIO-ED1 High Value Project Costs (UCHVP) in respect of the network reinforcements required to accommodate the demand requirements of HS2 and the associated economic growth.
2. Rail Electrification reopener: an adjustment to the RIIO-ED1 Rail Electrification Costs (UCRE) in respect of the required network diversions to accommodate the HS2 rail route.

This document sets out these two proposed relevant adjustments – Section 3 for the HVP reopener, and Section 4 for the rail electrification reopener.

3. HVP REOPENER – ADDITIONAL NETWORK CAPACITY REQUIREMENTS

The HS2 project will increase electrical demand within the SPMW licence area. This demand increase consists of the demand associated with HS2 (the construction works to deliver the project and the enduring load of the project), and the regional economic growth directly resulting from improved transport links created by the project. SPMW will need to create additional network capacity to accommodate this demand. This HVP is for the network investment required to deliver this additional network capacity.

Determining the HVP value of this network investment was in two parts: understanding the magnitude and location of the new demand (the needs case), and then designing the least cost schemes that will need to commence before RIIO-ED2 to deliver that demand (the proposed solutions). Any demand supplied directly from the transmission network, and any scheme costs which are directly recoverable from HS2 via cost-apportionment, are excluded from this HVP reopener submission.

This section sets out the needs case (Section 3.1), and the outputs & deliverables (Section 3.2) that form the HVP reopener, the justification for it against licence requirements (Section 3.3), and the proposed output measures to evaluate its delivery (Section 0).

3.1 HVP – Needs Case

The needs case is determined by the magnitude and location of the new network demand. This new demand consists of two components:

1. The HS2 demand. This includes the construction works to deliver the project and the enduring load of the project. These demand projections came directly from SPMW's engagement with HS2. The HS2 route and requirements are in an advanced stage of planning giving increased certainty to this forecast.
2. The regional economic growth resulting from improved transport links created by the project. These demand projections have come from SPMW's engagement with a wide range of stakeholders and our own experience of connection application volumes. High and low projections have been formed for this demand component.

These are explained in Sections 3.1.1 and 3.1.2 respectively. In addition to these two components there is also approximately XXXMVA demand supplied directly from the transmission network to power the trains themselves. Transmission supplied demand has not been included in the calculations to develop this distribution HVP reopener.

For both demand components, projections have been extended to 2028 to allow for efficient holistic consideration of the demand required by HS2 to be delivered.

3.1.1 HS2 demand

SPEN has engaged extensively with the HS2 project team to understand the total demand requirements which have been advised as per Table 3-1.

Table 3-1: HS2 Total Capacity requirements (MVA) by year

MVA	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
HS2	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx

This demand consists of large supplies for tunnel bore machines (which account for a step increase in demand in early 2024) as well as other construction supplies to be located across the Crewe and Cheshire area of the SPMW network.

Figure 3-1 shows the location of this HS2 demand within the SPMW licence area. SPMW districts are shown by the green and purple shading.

Figure 3-1: Locations of HS2 requested capacity

Table 3-2 shows a breakdown of this HS2 demand by voltage level and EHV network group. The HS2 demand requirement will impact the network across Cheshire at all voltage levels. A summary of HS2 demand requirements is within Appendix A.

Table 3-2: HS2 capacity requirements (MVA) by voltage

GSP Group	EHV Network group	Capacity Requirements (MVA)			
		Phase 2A (11kV)	Phase 2B (33kV)	Phase 2B (11kV)	Total
Cellarhead	**Crewe Area** Coppenhall-Crewe-Radway Green-Whitchurch 33kV Group	xxx	xxx	xxx	xxx
Carrington / Fiddlers Ferry	**Cheshire Plain** Elworth-Hartford-Winsford-Knutsford-Lostock 33kV Group	xxx	xxx	xxx	xxx
	Warrington Area Dallam-Sankey Bridges-Warrington 33kV Group	xxx	xxx	xxx	xxx
TOTAL		**xxx**	**xxx**	**xxx**	**xxx**

To deliver this demand, the associated network infrastructure must be in place by 2024. As such, investment must commence within the RIIO-ED1 period. To deliver projects efficiently, and to avoid revisiting prior works, it is necessary to consider the long term capacity demand growth holistically, and not deliver investments piecemeal. The common driver behind this network investment justifies the holistic design solutions.

3.1.2 Economic Growth demand

HS2 will lead to significant economic growth: HS2's vision is to be a 'catalyst for growth across Britain'. The proposed HS2 rail connections will reduce journey times to/from key business districts such as London and Manchester. These enhanced connections will deliver a more integrated national economy, opening up business opportunities to support UK growth. Rapid travel between Britain's economic hubs will better connect industries and help bridge the North-South divide. Regional authorities aim to leverage the benefits delivered by HS2 to drive local growth through their development plans.

SPEN regularly engages with councils and other stakeholders to continue to refine our understanding of their economic growth plans due to HS2 and other drivers. This helps determine the resultant demand increase and impact on our network.

East Cheshire region

- In November 2018, the Constellation partnership of seven councils and two local enterprise partnerships published their HS2 Growth Strategy.[3] Within Crewe, the Hub Station 'HS2 campus' is expected to generate 3,750 homes and 20,000 jobs, with a further 3,400 homes and 17,000 jobs across the Crewe Masterplan area.
- In January 2019, Cheshire East council published their 'HS2 Station Hub development strategy'.[4] This outlines the primary, secondary and peripheral development opportunity areas in a 190 hectare zone around the HS2 station. ARUP Group Ltd, on behalf of Cheshire East Council, estimated that across the Crewe Masterplan area, by 2040, the opportunities are likely to be ≥XXMVA.
- The Constellation partnership's HS2 Growth Strategy aims to deliver at least 100,000 new homes and 120,000 new jobs by 2040 across the Cheshire, Warrington, Stoke-on-Trent and Staffordshire areas.

Around Manchester Airport

- In January 2019, the Greater Manchester Combined Authority of 10 councils published 'The Greater Manchester Plan for Homes, Jobs and the Environment: the Greater Manchester Spatial Framework' (GMSF)[5]. The GMSF outlines Manchester Airport (and surrounding area) development as a major opportunity to boost the competitiveness and prosperity of Greater Manchester, and to support higher levels of economic growth.

[3] http://constellationpartnership.co.uk/wp-content/uploads/2018/11/hs2-growth-strategy-report-oct-2018.pdf

[4] https://cheshireeast-consult.objective.co.uk/file/5274957

[5] https://www.greatermanchester-ca.gov.uk/what-we-do/housing/greater-manchester-spatial-framework/gmsf-full-plan/

- Manchester Airport is the third busiest passenger airport in the UK, and the largest outside London. It is the only airport in the country other than Heathrow to have two full length runways. A £1bn investment programme is underway to increase passenger capacity from ca. 28 million to over 50 million.
- The provision of a new HS2 station will make the airport area one of the best-connected locations in the country.
- Policy GM-Strat 10 of the GMSF commits to providing sufficient development opportunities to take full advantage of the introduction of HS2. This includes enhancing local transport links by extending the Metrolink tram, enhancing public transport, and completing the development of 'Airport City' immediately around the airport. This will provide a total of around 500,000m^2 of office, logistics, hotel and advanced manufacturing space around the new HS2 station. This also results in around 2,400 new homes to the west of the M56 at Timperley Wedge.
- Policy GM-Strat 11 of the GMSF allocates land around the former Shell Carrington industrial area to accommodate around 6,100 new homes and 410,000m^2 of employment floor space over the period 2018-2037. Part of this allocation falls within our licence area.

SPEN's own experience

Around Crewe and across Cheshire, SPMW has experienced an unprecedented level of demand connection applications and enquiries due to these regional and local growth policies. For example, the Crewe, Nantwich, Alsager, Sandbach, Warrington Town Centre, Congleton and Middlewich conurbations have all seen large numbers of housing scheme applications; ongoing stakeholder engagement suggests many more are in the pipeline. This investment combined with town redevelopment projects currently in the planning stages, accounts for over XXXMVA of connection applications to SPMW.

It is anticipated that the already high level of connection applications will further increase at the end of the year when HS2 Phase 2A is due to receive Royal Assent.

Economic growth demand projections

To determine the economic growth demand projections, the above range of proposed developments have been converted to MVA values and added to current demand connection applications.

To convert the proposed developments, a breakdown by type (e.g. domestic property, office space etc.) was created. Well established design principals have then been applied, including After Diversity Maximum Demand (ADMD) assessments for each type, to give MVA values. Finally, slower and faster growth development timescales have been added to create higher and lower projection scenarios.

Based on this work, the developments we explicitly know about, and our continued engagement with stakeholders we have estimated a low and high projection of economic demand growth by 2028:

- Our low economic demand projection is a least regret view of capacity expectations to 2028. It represents the developments where we have the highest degree of confidence of progression.
- Our high economic demand projection considers timely progression of all known developments and is provided to illustrate the level of potential growth.

These are shown in Table 3-3.

Table 3-3: Economic growth capacity requirements (MVA) by year

Economic Growth (MVA)	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
Low Projection	4	8	18	22	26	30	33	37	41	45
High Projection	6	14	33	41	52	62	72	81	90	99

Table 3-4 shows these low and high economic demand projections disaggregated by the EHV network group that they will affect.

Table 3-4: Summary of economic growth capacity requirements (MVA) by voltage

GSP group	EHV Network group	Economic Growth MVA	
		Low	High
Cellarhead	**Crewe Area** Coppenhall-Crewe-Radway Green-Whitchurch 33kV Group	25	61
Carrington/Fiddlers Ferry	**Cheshire Plain** Elworth-Hartford-Winsford-Knutsford-Lostock 33kV Group	11	17
	Warrington Area Dallam-Sankey Bridges-Warrington 33kV Group	9	21
TOTAL		**45**	**99**

3.1.3 Summary – The Demand Projection Used For This Reopener

The needs case is determined by the magnitude and location of the new demand. This new demand is the sum of the HS2 demand and economic growth demand. Given this, the fixed HS2 demand projection was added in turn to the low and high economic demand projections to form low and high demand scenarios.

These low and high scenarios represent the range of total demand growth that the distribution network would need to accommodate as a consequence of the HS2 rail project.

The low demand scenario was used to develop this HVP. This ensures that the HVP reopener represents a conservative position and removes the risk of unnecessary network investment. This approach is one of a number of measures taken to ensure that the least cost solution is delivered. Other measures include selecting each scheme on the basis of providing minimum costs technically compliant solution (compared with at least one other solution) and pre-construction SPMW commit to reviewing the market for potential flexibility solutions.

The low demand scenario, showing the HS2 construction and HS2 economic components, is shown in Figure 3-2.

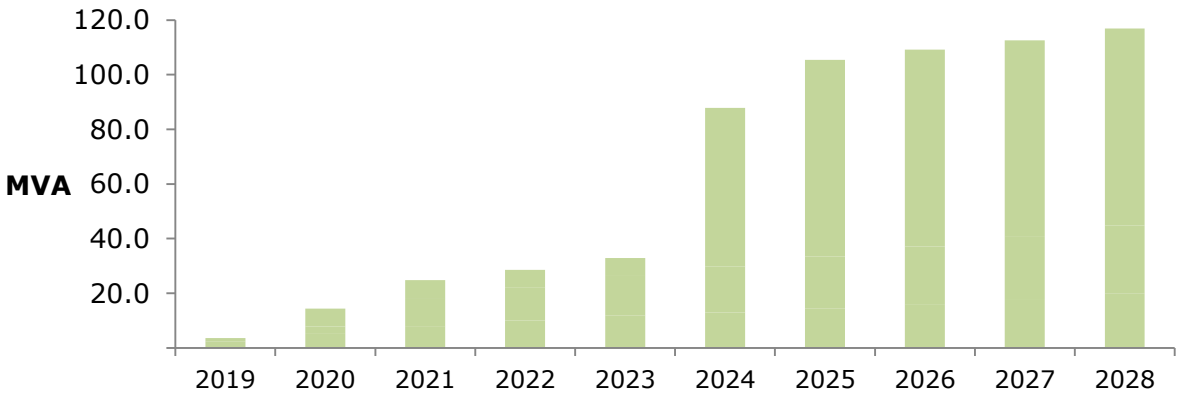


Figure 3-2: Demand growth (low demand scenario)

Figure 3-2 shows that the total demand growth projected is 117MVA. To deliver this demand, network investment is required at 132kV, 33kV and 11kV.

In order to deliver this efficiently over the lifetime of the assets, the investment must consider the rail construction and economic growth elements holistically. In addition both the short and long term requirements must be considered, this prevents previous reinforcement work being revisited in subsequent price controls. Reinforcement must be delivered with a minimum view of the lower forecast requirements.

The required network infrastructure must be in place by 2024 to avoid delays to the HS2 project or inhibiting economic growth. This means work needs to commence within RIIO-ED1 and it is not possible to defer this investment into the RIIO-ED2 period. Section 3.2 sets out the detail of the required network investment.

3.2 HVP – Outputs & Deliverables; Proposed Solution

Once the location and magnitude of demand was ascertained, power flow analysis (covering N-1 and N-1-1 contingency scenarios) was undertaken to determine whether there is sufficient network capacity to accommodate demand.

Where there is insufficient capacity, extensive design work has been undertaken to identify the combination of reinforcements that will deliver the lowest overall cost solution. Industry cost apportionment rules have been applied to determine the value of that is recoverable from individual customers that have triggered reinforcement. The HVP only includes those costs which are not recoverable from individual customers.

This approach, combined with the conservative use of the low demand scenario projection, ensures that the HVP only includes the minimum costs necessary which are not recoverable from other sources.

3.2.1 Network impact

The network impact of the new demand is widescale. A measure of this is the impact on SPMW Load Index (LI) values. LI values are a measure of the ratio of network demand to network capacity, and show how heavily loaded the network is. The scale runs from LI1, meaning the network is lightly loaded, through to LI5, meaning that power flows exceed capacity. A rating of LI5 means the network is constrained and reinforcement is required. The LI values for the affected region of network are shown in Table 3-5 both with and without HS2.

Table 3-5: Load Index impact, mid-Cheshire region (low demand scenario)

Baseline (Without HS2)	LI1	LI2	LI3	LI4	LI5	Low Demand Scenario	LI1	LI2	LI3	LI4	LI5	Number of Groups
132KV	1	1	0	0	0	132KV	0	1	0	0	1	**2**
EHV	0	2	1	0	0	EHV	0	0	1	0	2	**3**
HV	50	6	1	2	0	HV	36	14	1	0	8	**59**

Table 3-5 shows the HS2 project results in 11 network groups becoming LI5. This demonstrates the insufficient network capacity available to accommodate the required demand. Reinforcement is subsequently required at 132kV, 33kV and 11kV.

3.2.2 Overall Least Cost Solution

Extensive network planning studies have been undertaken to assess the minimum holistic network requirements across the whole affected area, and to propose efficient coordinated reinforcement schemes to meet this new demand. In developing these schemes, consideration has been given to:

i. Both the temporary and enduring demand requirements.
ii. The timescales and growth rates of the demand increase. This informs where it is more efficient to deliver a single larger reinforcement to address projected demand instead of multiple smaller interventions over several years.
iii. For each proposed reinforcement a range of alternate schemes have been considered and discounted to ensure the least cost solution is adopted.

For each scheme, industry cost apportionment rules have been applied to determine the value that is recoverable from the individual customers that have triggered the reinforcement. The HVP only seeks to cover those remaining reinforcement costs which are not recoverable from individual customers.

Table 3-6 summarises the outputs from this work – this is the list of reinforcement schemes that are required to accommodate the new demand by voltage level.

Table 3-6: Required Reinforcement Schemes

Voltage	Required Works
132kV	▪ Re-conductor 2 circuits (22.5km Sankey Bridges – Hartford; 10km Cuerdley – Warrington).
132/ 33kV	▪ New 132/33kV substation near Millington (60MVA Grid transformer, 10-Panel 33kV switchboard and 2 x 10MVA primary transformers). ▪ At Crewe Grid: additional 60MVA Grid transformer and replace indoor 33kV Circuit Breakers with Gas Insulated Switchgear. ▪ At Radway Green: replacement of Grid Transformer (45MVA with 60MVA).
33kV	▪ New 33kV substation with 10-Panel switchboard at HS2 Manchester International Airport (MIA). ▪ Installation of new 33kV circuits between Ilfords – HS2 MIA, Mere – HS2 Millington, HS2 Millington – HS2 MIA, Ringway – HS2 MIA, Gravel - Middlewich, and Lymm – Warburton Park. Total route lengths of ca. 50kms. ▪ Upgrade/replace parts of existing circuits between Basford - HS2 Hough - Weston, Kuntsford-Mere, Knutsford-Illfords, Knutsford-Ringway with approx. 6km route length. ▪ Extension of switchgear at Ilfords, Acer Ave, Mere, Gravel, Sandbach, Morrisons and Lymm.

Voltage	Required Works
33/11kV	▪ Additional primary transformers at Acer Avenue, Sandbach, Morrisons and Gravel. ▪ New primary transformer substations at Weston Interchange, HS2 Hough and Warburton Park including 33kV switchboards and 20MVA reactor at HS2 Hough.

Table 3-7 shows the asset volumes required to deliver these network investments with a total cost of £xxxm (2012/13 prices). Of this, £xxxm would be recovered from customers under cost apportionment rules with the remaining expenditure of £35.13m being required from this HVP reopener. All costs are in 2012/13 prices.

Table 3-7: Summary of programme Costs and Volumes, £m (2012/13 Prices)

Asset Category	Volume	Unit Cost (£k)	Total Cost	Customer Funded	HVP Funded
6.6/11kV UG Cable	0.76	xxx	xxx	xxx	xxx
6.6/11kV CB (GM) Primary	61.00	xxx	xxx	xxx	xxx
33kV UG Cable (Non Pressurised)	69.07	xxx	xxx	xxx	xxx
33kV CB (Gas Insulated Busbars)(ID) (GM)	70.00	xxx	xxx	xxx	xxx
33kV Transformer (GM)	6.00	xxx	xxx	xxx	xxx
Batteries at 33kV Substations	15.00	xxx	xxx	xxx	xxx
132kV OHL (Pole Line) Conductor	5.66	xxx	xxx	xxx	xxx
132kV Pole	36.00	xxx	xxx	xxx	xxx
132kV OHL (Tower Line) Conductor	27.39	xxx	xxx	xxx	xxx
132kV Tower	48.00	xxx	xxx	xxx	xxx
132kV Fittings	52.00	xxx	xxx	xxx	xxx
132kV UG Cable (Non Pressurised)	3.94	xxx	xxx	xxx	xxx
132kV CB (Gas Insulated Busbars)(ID) (GM)	1.00	xxx	xxx	xxx	xxx
132kV Transformer	3.00	xxx	xxx	xxx	xxx
Batteries at 132kV Substations	1.00	xxx	xxx	xxx	xxx
Pilot Wire Overhead	35.21	xxx	xxx	xxx	xxx
Pilot Wire Underground	71.57	xxx	xxx	xxx	xxx
Civil Works at 33 kV & 66 kV Substations	-	xxx	xxx	xxx	xxx
Civil Works at 132 kV Substations	-	xxx	xxx	xxx	xxx
Wayleaves/Easements/Land Purchase	-	xxx	xxx	xxx	xxx
Other Costs (Identify Below)	-	xxx	xxx	xxx	xxx
Total	**-**	**xxx**	**xxx**[6]	**xxx**	**35.13**

Additional costs associated with delivery of this work that are not included within the scope of the reopener adjustment include;

- Necessary HV reconfiguration works,
- Environmental Impact Assessment (EIA) costs associated the HS2 project,
- Any other costs to fulfil the specific requirements of HS2.

[6] Total values are correct - summation differences are due to rounding errors.

The summary of HS2 requests, contributing to the reinforcements specified in Table 3-6 is provided in Appendix A, the economic growth areas are illustrated in Appendix B and a detailed summary of reinforcement works is included in Appendix C. The full technical governance paper with all scheme details is available upon request.

In evaluation of the reinforcement schemes, market-delivered flexibility solutions to offset reinforcement have been considered. Provision of flexibility services cannot be guaranteed to be available and will not necessarily be compatible with required network reinforcements. As such, the minimum cost schemes which can be delivered have been included in the HVP. SPEN commit that in advance of each of these schemes being undertaken, an evaluation and flexibility tendering process shall identify if flexibility services can offer lower overall lifetime cost, where this is the case this shall be adopted.

3.2.3 Summary of HVP adjustment

Table 3-8, shows the proposed changes to the licensee's allowed levels of expenditure and the Regulatory Years to which those changes relate (2012/13 prices).

Table 3-8: Summary of Adjustment to Allowed Expenditure, £m (2012/13 Prices)

2019/20	2020/21	2021/22	2022/23	Total HVP Expenditure
4.13	**11.34**	**10.83**	**8.83**	**35.13**

The total HVP costs will be delivered within the RIIO-ED1 period, the expenditure allocation is estimated based on deliverability assessment.

The total proposed UCHVP adjustment to be made under the RIIO-ED1 period to SPENs allowed level of expenditure is £35.13m in 2012/13 prices.

3.3 HVP – Compliance With Licence Requirements

3.3.1 Compliance with CRC 3F.8

CRC 3F.8 of SPMW's electricity distribution licence sets out the conditions that any HVP reopener must meet. SPEN has considered this HVP reopener submission against those requirements:

a) *Is based on information about the actual or forecast level of efficient expenditure on the uncertain cost activity that was either unavailable or did not qualify for inclusion when the licensee's Open Base Revenue Allowance was derived.*

SPEN considers that this submission meets this requirement. Although the nature and likelihood of the HS2 project was in the public domain during preparation of the RIIO-ED1 plan, insufficient details were available for inclusion within the submission and the preferred route was only announced by the Department for Transport (DfT) in November 2016 and final route was published in July 2017[1].

b) *Takes account of any relevant adjustments previously determined under this condition.*

This HVP reopener submission meets this requirement – there have been no previous relevant adjustments under this condition.

c) *For all uncertain cost activities other than High Value Project Costs, constitutes a material amount as specified for the licensee in Appendix 2, 3, 4 or 5.*

This condition is not applicable as SPEN's submission is a HVP reopener.

d) *For High Value Project Costs passes the tests set out in Appendix 1.*

These applications meet this requirement – the below checks against the tests in Appendix 1 of CRC 3F have been completed. All values are in £m, 2012/13 Prices.

A1.2

$$(\max(TUCHVPF - TUCHVPov, \quad TUCHVPov - TUCHVPF)) > MA + (20\% \, x \, TUCHVPov)$$

A1.3

The total adjustment must not exceed:

i) $TUCHVPF - TUCHVPov - (20\% \, x \, TUCHVPov)$
$Where \; TUCHVPF > TUCHVPov$; or

ii) $TUCHVPF - TUCHVPov + (20\% \, x \, TUCHVPov)$
$Where \; TUCHVPF < TUCHVPov$

Term	***Definition***	***SPMW***
$TUCHVPov$	*Means the total opening level of allowed expenditure that is defined as High Value Project Costs as set out in Table 2 plus any additional allowed expenditure determined under previous reopeners under this condition.*	*0.00*
$TUCHVPF$	*Means the proposed revised level of allowed expenditure that is defined as High Value Project costs.*	*35.13*
MA	*Is the material amount set out for the licensee at Table 2 of this Appendix.*	*5.82*

A1.2 - Result

$$\mathbf{35.13 - 0.00 > 5.82 + (20\% \, x \, 0.00)}$$ **Passes**

A1.3 - Result

$$\mathbf{35.13 > 0.00}$$

$$\mathbf{35.13 - 0.00 - (20\% \, x \, 0.00) \leq 35.13}$$ **Passes**

e) *Relates to costs incurred or expected to be incurred after 1 April 2015.*

This HVP reopener submission meets this requirement – all costs will be incurred after 1 April 2015.

f) *Constitutes an adjustment to allowed expenditure that (excluding any Time Value of Money Adjustment) cannot be made under the provisions of any other condition of this licence.*

SPEN Consider this requirement to be met.

SPEN have considered all other mechanisms under the licence and concluded that only the HVP reopener mechanism provides suitable arrangement for this expenditure.

Pg112 of the ED1 Price Control Financial Handbook states "High Value Project Costs means a scheme of works and the associated costs incurred, or expected to be incurred, by the licensee on any investment project with respect to its Distribution System that is reasonably forecast to cost the licensee £25 million or more (in 2012/13 prices)". The summary statement of costs within this submission breaches the £25m materiality threshold required to be considered as a HVP. The uncertainty of these costs qualifies for consideration under as a RIIO-ED1 reopener.

SPEN have also considered and discounted the Load Related Expenditure mechanism as providing suitable alternative funding; Pg139 of the ED1 Financial Handbook states LRE is to "accommodate new and changing patterns of electricity use by electricity consumers". Conversely, Pg70 of Ofgem's Guide to ED1, describes HVPs as "individual Schemes" and the ED1 Financial handbook (Pg80) states "for the purposes of CRC 3F… [HVP] means a scheme of works…". Under these statements, a HVP can be interpreted to refer to works associated with a specific scheme.

Given that all reinforcement within this HVP submission is associated with the HS2 rail project, SPMW believe the HVP mechanism is the most suitable licence condition under which expenditure can be allocated. To efficiently deliver the required capacity, the reinforcement schemes must be considered holistically; the reinforcements within this HVP are non-mutually exclusive. Delivery of one scheme either mandates or drives the delivery of another. It is therefore reasonable to consider all schemes within the scope of a single project.

SPMW have precedent of successfully delivering similar network investment schemes under the HVP mechanism; in DPCR5 Legacy-Oswestry Reinforcement was designed to significantly increase available capacity for demand/generation in the area.

The HVP uncertainty mechanism is designed to adjust a DNOs allowed expenditure where costs have been identified during the price control which could not have been identified when opening allowed revenues were set. The likelihood of encountering uncertain HVPs has been significantly increased by the 8-year RIIO-ED1 period.

3.4 HVP – Proposed Output Measures

Unlike typical reinforcement projects which are measured in outturn MVA increases, SPEN propose that as a HVP, delivery should be tracked volumetrically against the costs and volumes set out in Table 3-7. Volumetric reporting is readily measurable with full transparency and accountability using existing reporting mechanisms.

RIIO-ED1 close-out will be supported by a Performance Assessment Report with detailed analysis papers for each investment scheme demonstrating customer value.

Scheme designs and costs are best estimates at the time of submission. They may be subject to change where HS2 vary requirements. In addition, before undertaking works SPEN will review the market for flexibility solutions to defer reinforcement. Where these are identified, volumes should be appropriately revised at close-out.

Any final RIIO-ED1 close out adjustment to the HVP value shall review the volumes delivered against the target volumes set out in Table 3-7. Any adjustments should also make use of the unit costs presented in the same table.

Materiality

SPEN propose that if any final adjustment required under the above metrics is within the materiality threshold set out in Table 2 of Appendix 1 of CRC 3F, there shall be no positive or negative adjustment to the total proposal value presented in Table 3-8 of this submission.

Double-Counting

SPEN believes there is no risk of double counting under this project as all activity will be recorded against the HVP.

4. RAIL ELECTRIFICATION REOPENER - NETWORK DIVERSIONS

The proposed HS2 route traverses the full length of SPMWs Mid-Cheshire district, and intersects existing distribution network assets at multiple points within the licence area. The affected distribution network assets need to be relocated to facilitate HS2. The significant number of network diversions required to deliver the proposed rail route will have material impact on SPMW's RIIO-ED1 business plan provisions. SPEN considers that these costs for the diversion of plant, underground cables and overhead lines qualify for an adjustment to the RIIO-ED1 Rail Electrification Costs (UCRE).

Table 4-1: HS2 - Phase 2A and Phase 2B Route (SPMW Licence Area)

The HS2 project consists of three Phases; Phase 1, 2A and 2B. This Rail Electrification reopener submission is only for the diversions associated with Phase 2A. Phase 1 does not pass through SPMW's licence area, and the diversion works for Phase 2B do not need to start until after April 2023. In contrast, all Phase 2A diversions will need to be delivered within RIIO-ED1.

Unlike the network capacity investments required for HS2, which should be considered holistically in order to identify the most efficient interventions, diversions can be considered and delivered discretely at minimum cost.

Costs of Phase 2B diversion works will be included in SPMW's RIIO-ED2 submission.

This section sets out the needs case (Section 4.1) and the outputs & deliverables (Section 4.2) that form this Rail Electrification reopener, the justification for it against licence requirements (Section 4.3), and the proposed output measures to evaluate its delivery (Section 4.4).

4.1 Rail Electrification – Needs Case

The Phase 2A process will follow the example of Phase 1. Therefore in considering the Phase 2A needs case, SPMW has examined the precedent set by Phase 1. The Phase 1 Hybrid Bill[7] granted powers to HS2 for constructing rail network, alongside powers to:

- compulsorily acquire interests in the land required;
- affect or change rights of way, including the stopping-up or diversion of highways and waterways (permanently or temporarily); and
- modify infrastructure belonging to statutory undertakers (e.g. utility companies).

These powers came into force upon Royal Assent of the bill, and mean that all the land rights along the Phase 1 route are to be acquired by HS2. Royal Assent for the same powers for Phase 2A is due December 2019. As with Phase 1, SPMW will be requested to relocate or divert the distribution network assets that obstruct the rail route as the right of way for relevant land areas will be secured by HS2.

SPEN considers that the majority of the diversion works will be constructed through public highways or through land owned by HS2. In addition some sections of overhead line (OHL) will require land acquisition, way-leaves and legal easements associated with the diversion works.

The HS2 Phase 2A route crosses 14 OHL sections. As a minimum, all of these network assets will require diversion within the RIIO-ED1 price control period. These diverted assets will be replaced with underground assets. Table 4-2 depicts the summary of the networks diversions required for HS2.

Table 4-2: Summary of network diversions

Voltage Level	Number of Diversions Phase 2a
132kV	4
33kV	1
11kV	9
LV	-
Total	**14**

There remains some uncertainty about the compensation and funding mechanism for the costs incurred in diverting distribution network assets, pending the actual circumstances under which the diversions are instructed.

Regardless, the costs associated with these diversions could not be included within SPMW's RIIO-ED1 business plan as the exact route, project timescales, significant locations (i.e. construction sites and stations) and associated impacts on the SPMW network were not known or defined ahead of RIIO-ED1.

[7] https://www.gov.uk/government/collections/high-speed-rail-london-west-midlands-bill

4.2 Rail Electrification – Outputs & Deliverables; Required Investment

SPMW analysis of the HS2 Phase 2A route has identified that it will impact 14 OHL sections, predominantly around the Crewe area. The overall route length for all the 132kV, 33kV, 11kV and LV diversions is detailed within Table 4-3.

Table 4-3: Network Diversion Volumes by Voltage Level

Phase	Voltage (kV)	No. of Diversions	Route Length (km)
2A	11	9	7.70
	33	1	1.25
	132	4	5.00
	Total	**14**	**13.95**

HS2 has requested that all diversions associated with Phase 2A are to be undergrounded. Detailed route assessments were carried out to identify the least cost technically compliant diversion.

The initial proposed diversion routes aim to follow existing public infrastructure, or newly constructed bridges and/or roads, as closely as is reasonably practicable. In some instances trenchless technology has been identified where the proposed infrastructure will accommodate this. At the implementation stage the proposed diversion options will be subject to detailed design evaluation during the planning and consenting process.

4.2.1 Key considerations

Considering the uncertainty about the compensation and funding mechanism for the diversions costs, the following points have been considered when assessing the costs for the identified diversion options:

- necessary wayleaves and planning consents for the works on HS2 owned land will be secured on behalf of SPEN by HS2,
- HS2 will provide the right of way and easements for the diversion works on HS2 owned land to SPEN without undue restriction,
- necessary wayleaves and planning consents for the works on the public highways and utilities will be secured by SPEN,
- it is assumed that necessary wayleaves and easements for the route through private land can be secured by SPEN,
- if proposed bridges are not suitable to accommodate cables and open cut cable installation is not practicable, then trenchless technology will be considered,
- The termination towers of the diverted 132kV OHL section between existing towers PK10 - PK12, will be installed by WPD, and there will be necessary provision for road access to these towers.

4.2.2 Delivery milestones

Based on the considerations listed in section 4.2.1, the project delivery milestones presented in Table 4-4 have been prepared, under which all diversions will be delivered.

Table 4-4: Delivery plan for HS2 Phase 2A related network diversions

Activity	2020				2021				2022				2023
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1
Site survey													
Pre-Engineering design													
Planning and consenting													
Detailed design													
Tendering and contracts													
Onsite construction													
Outage Works													
Closeout													

In order to efficiently manage, design and deliver the proposed works, SPEN will continue to work closely with HS2 and other key stakeholders involved in the project, including; WPD, NGET, councils and other utility companies.

4.2.3 Delivery Costs

The total cost for the proposed diversion works under Phase 2A is forecast at £12.06m (in 2012/13 prices). A summary of the cost estimates is presented in Table 4-5.

Table 4-5: Delivery Costs of Proposed Phase 2A Network Diversions, £m (2012/13)

	Location Reference	kV	Route Length (m)	Delivery Cost
1	Checkley Lane Crewe	11	460	£xxx
2	Den Lane Crewe	11	1200	£xxx
3	Chorlton Lane Crewe	11	1600	£xxx
4	Chorlton Lane Crewe (2)	11	710	£xxx
5	Newcastle Lane Crewe	11	1400	£xxx
6	Basford Old Creamery Crewe	11	300	£xxx
7	Newcastle Road Crewe (2)	11	1350	£xxx
8	Casey Lane Crewe	11	500	£xxx
9	Weston Lane Crewe	11	180	£xxx
10	Larch Ave Crewe	33	1250	£xxx
11	Tower PK47-PK48	132	500	£xxx
12	Tower PK93-PK97	132	1700	£xxx
13	Tower PK10-PK12	132	600	£xxx
14	Tower DG26 - DG29	132	2200	£xxx
		Total	**13,950**	**£12.06**

Diversion costs have been prepared through detailed design assessments, SPENs internal unit cost allowances and assessment of the land and easement requirements.

£xxx (in 2012/13 prices) has been allocated to progress the overall legal fees associated with the 14 diversions. These legal fees have been pro-rated between the schemes proportional to the diversion length and are included in the values above. This value has been determined from SPENs experience of legal fees when delivering similar schemes in the past.

The detailed route plans for the proposed diversions are presented in Appendix D.

4.2.4 Summary of Rail Electrification Adjustment

The total proposed adjustment to the RIIO-ED1 value is £12.06m (2012/13 prices) for the period between 2019/20 and 2022/23. A breakdown of the proposed adjustment to SPMW's UCRE value by regulatory year is presented in Table 4-6.

Table 4-6: Adjustment for Phase 2A network diversion works, £m (2012/13 Prices)

Description of Works	2019/20	2020/21	2021/22	2022/23	RIIO-ED1
Planning and Design	xxx	xxx	xxx	xxx	xxx
132kV works (cable, telecoms and protection)	xxx	xxx	xxx	xxx	xxx
33kV and 11kV works (cable, telecoms and protection)	xxx	xxx	xxx	xxx	xxx
Civil works, way leaves, easements and Legal Costs	xxx	xxx	xxx	xxx	xxx
Total	**3.67**	**4.82**	**2.33**	**1.25**	**12.06**[8]

4.3 Rail Electrification – Compliance With Licence Requirements

CRC 3F.8 of SPMW's electricity distribution licence sets out the conditions that any Rail Electrification Costs reopener must meet. SPEN has considered the costs within this application against those requirements:

a) Is based on information about the actual or forecast level of efficient expenditure on the uncertain cost activity that was either unavailable or did not qualify for inclusion when the licensee's Open Base Revenue Allowance was derived.

SPEN considers this submission meets this requirement. Although the nature and likelihood of the HS2 project was in the public domain during preparation of the RIIO-ED1 plan, sufficient details for inclusion within the submission were not available and the preferred route was only announced by the Department for Transport (DfT) in November 2016 and final route was published in July 2017[1].

b) Takes account of any relevant adjustments previously determined under this condition.

This application meets this requirement as there have been no previous relevant adjustments under this condition.

c) For all uncertain cost activities other than High Value Project Costs, constitutes a material amount as specified for the licensee in Appendix 2, 3, 4 or 5.

[8] Total values are correct - summation differences are due to rounding errors.

Under Appendix 4 of CRC 3F the following materiality tests must be met (2012/13 prices):

$$\text{Rail Electrification Costs} > \text{Materiality Threshold} = £5.82\text{m}$$

This Rail Electrification Costs reopener submission meets this requirement as the estimated cost for all the uncertain cost activities is £12.06m (2012/13 prices).

d) For High Value Project Costs passes the tests set out in Appendix 1.

This condition is not applicable for Rail Electrification Costs reopener.

e) Relates to costs incurred or expected to be incurred after 1 April 2015.

This Rail Electrification Costs reopener submission meets this requirement – all costs will be incurred after 1 April 2015.

f) Constitutes an adjustment to allowed expenditure that (excluding any Time Value of Money Adjustment) cannot be made under the provisions of any other condition of this licence.

This application meets this requirement – as SPEN considers there is no other available funding mechanism within the licence for the proposed network diversions. Further information is provided further information regarding this condition is provided in section 4.4.

4.4 Rail Electrification – Proposed Output Measures

This reopener proposes an adjustment of £12.1m to SPMW opening level of allowed expenditure for the delivery of 14 network diversions at 132kV, 33kV and 11kV, detailed in Table 4-5.

At close out, SPEN propose an evaluation of the delivered diversions and actual costs on a scheme by scheme analysis of actual vs forecast costs as set out in Table 4-5. This evaluation will be supported by a Performance Assessment Report with detailed analysis papers for each investment, demonstrating scheme efficiency and customer value.

Eligibility for a close out adjustment should be on the basis of over/under delivery breaching a materiality threshold, below.

Materiality

SPEN proposes that if any adjustment required under the above terms is less than the materiality thresholds set out in Appendix 4 of CRC 3F, there shall be no positive or negative adjustment to the total proposal value presented in Table 4-6 of this submission.

Double-Counting

SPEN believes there is no risk of double counting under this project as all activity will be recorded against rail electrification diversions.

HS2 HVP & Rail Electrification Applications – CRC 3F

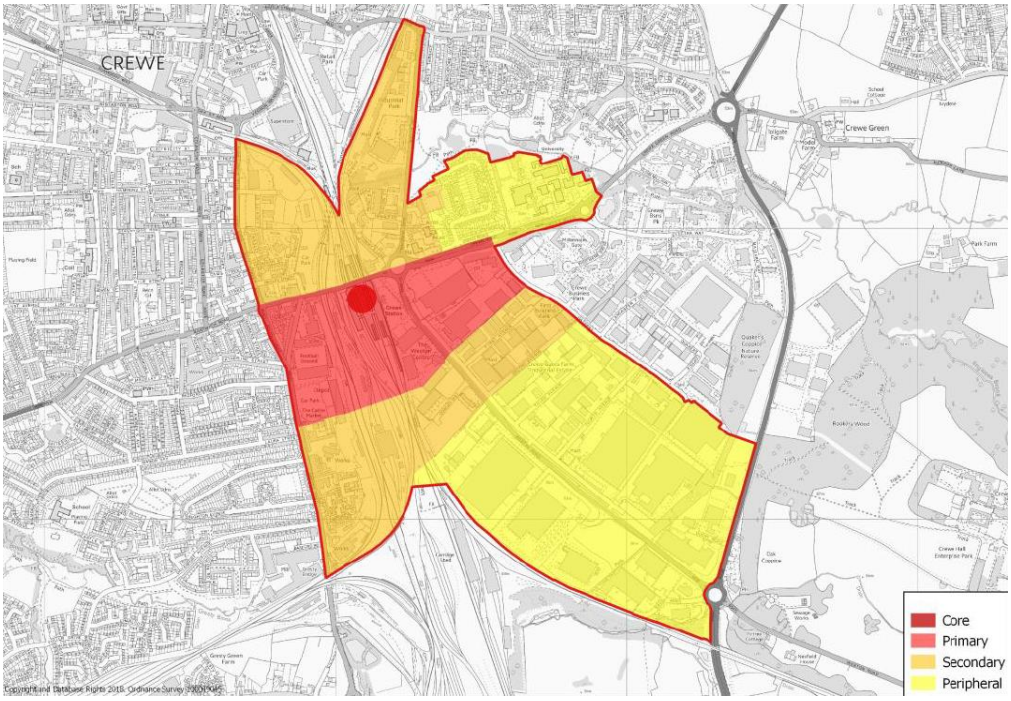
APPENDIX A – HS2 COMPOUND SCHEDULE

Source: SPEN Interactions with HS2 Project Team (Sept 2018)

HS2 HVP & Rail Electrification Applications – CRC 3F

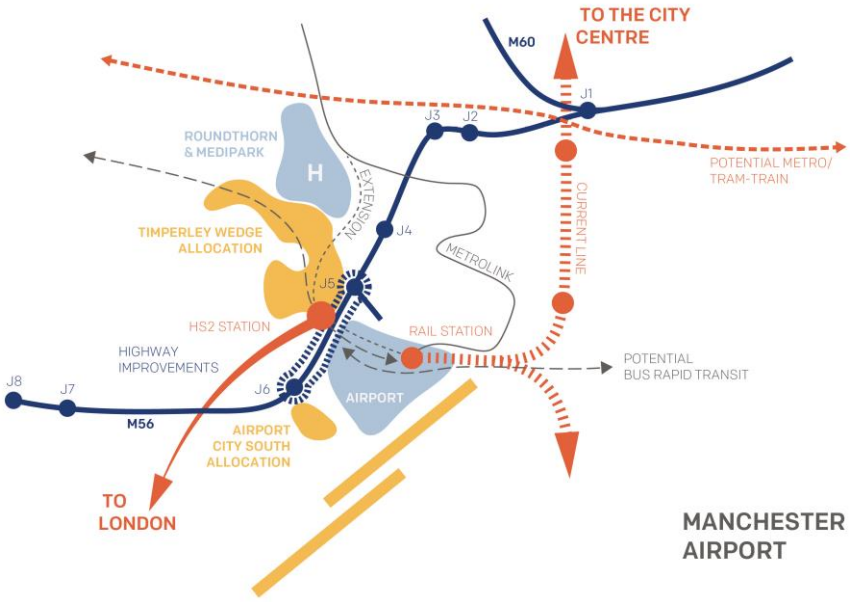
APPENDIX B – KEY ECONOMIC AREAS

Development area around HS2 Crewe Hub Station



Source: HS2 Station Hub development strategy

Development area around Manchester Airport



Source: Greater Manchester Spatial Framework

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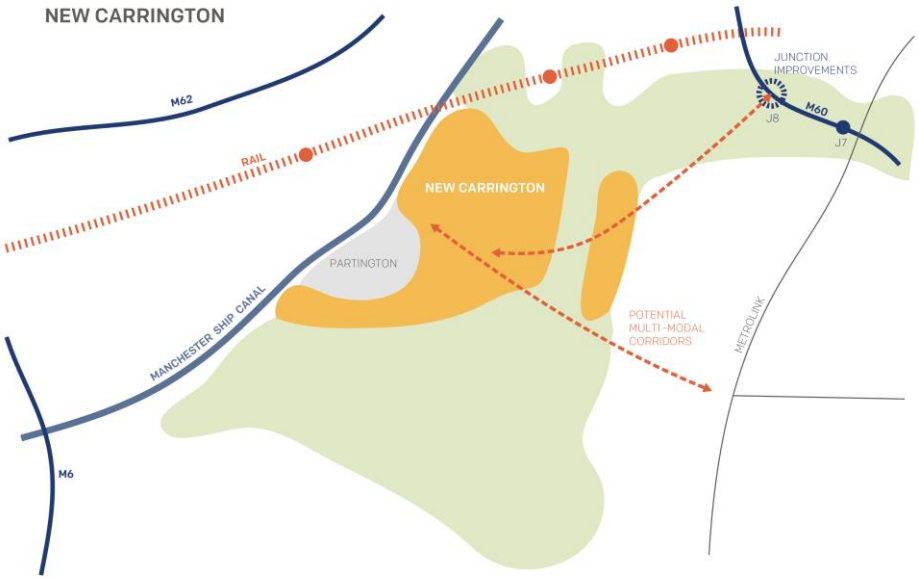
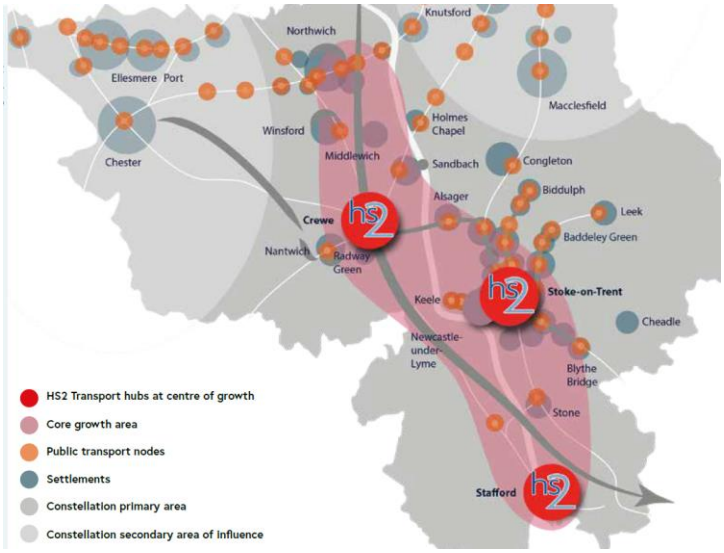
Development area 'New Carrington'



Source: Greater Manchester Spatial Framework

Wider development area outlined by Constellation Partnership



HS2 'hubs' at Stafford and Stoke-on-Trent are connected with the Crewe hub via West Coast Main Line

CONSTELLATION
CREATING THE PLACE WHERE EVERYTHING CONNECTS

APPENDIX C – NETWORK REINFORCEMENT SUMMARY

The detailed technical paper behind the proposed network reinforcements is available upon request; it is not included here due to size and depth of technical analysis.

Voltage	Scheme	Brief description of works	HVP (£m) 2012/13 prices	Customer Contribution (£m) 2012/13 prices	Reinforcement driving factors
33/11kV	HS2 Hough primary substation	Establishing new primary substation with 7-panel 33kV switchboard and 20MVA reactor across the bus-section which will be connected to SPM network by looping into existing cable circuit between Weston-Basford Sidings via 6kms cable (approx route length).			HS2 Temporary supplies.
132/33kV	33kV switchgear replacement and installation of New Grid Transformer at Crewe	Replacement of 33kV outdoor switchboard with 33kV GIS with total 16 breakers. Installation of new 132kV bay at Crewe 132kV substation to accommodate new 60MVA 132/33kV Grid transformer. 2x5kms 33kV cable circuits from Crewe substation to HS2 TBM supplies (20MVA).			HS2 TBM supplies. 33kV group demand >100% (LI5) of firm capacity with HS2 plus the economic demand. Thermal overloading issues in the group.
33/11kV	Weston Interchange primary substation (HS2 Shaft No.1)	New Primary Substation at Weston Interchange with 10MVA 33/11kV transformer.			Demolishing Midland Roll makers primary substation and supplied for HS2 Shaft No.1
33/11kV	Reinforcement of Acer Avenue primary substation	Replacement of 33kV RMU with 5-Panel switchboard along with replacement of HV switchboard. Installation of new 10MVA 33/11kV primary transformer.			HV group demand >100% (LI5) of firm capacity with HS2 plus the economic demand.
33kV	33kV Weston - Basford Sidings circuit reinforcement	Reinforcement of existing 33kV circuit between Weston-Basford Sidings with new 3.27kmscable with 400sqmm XLPE.			Thermal overloading of the circuit during N-1 outages with HS2 plus economic demand.
132/33kV	Grid Transformer replacement at Radway Green Grid Substation	Replacement of 45MVA GT with 60MVA and associated works at Radway Green Grid substation.			Thermal overloading of the 45MVA transformer during N-1 outages with HS2 plus economic demand.
33kV	Mere primary substation reinforcement	Installation of new 3-panel 33kV board. New 3kms (approx.) 33kV cable circuit between Mere to Millington Reinforcement of 0.3kms cable segment between Knutsford to Mere			HS2 temporary supplies
132/33/11kV	New 132/33kV Grid substation at Millington	132kV Tee-connection from circuit between Carrington to Elworth Grid New grid substation substation with 132/33kV 60MVA grid transformer. 10-Panel 33kV switchboard and HV switchboard to connect 2x33/11kV 10MVA primary transformer. New 33kV circuit between Millington to HS2 MIA (Approx length 13kms)			33kV group demand >100% (LI5) of firm capacity with HS2 plus the economic demand. Thermal overloading and voltage issues in the group. Complaince to security of supply (P2/6)
33kV	HS2 Manchester International Aiport (Ringway TBM and other supplies)	New 33kV substation with 10-Panel switchboard at HS2 MIA New 33kV circuit between Illfords to HS2 MIA (Approx 12kms). Loopinto existing 33kV circuits between Knustford- Mere and Knutsford-Ringway (Approx length 4kms). Reinforcement of existing circuits (approx. 1.5kms). Dedicated fiber optic communication channel between Knutsford - HS2 MIA (via Illfords).			HS2 Ringway TBM and other supplies (total 24.5MVA demand)
33/11kV	Gravel and Middlewich Reinforcements	New 5 Panel 33kV switchboard and extension of HV board at Gravel. New 10MVA 33/11kV primary transformer at Gravel. Extension of 33kV switchboard at Middlewich. New 33kV circuit between Gravel to Middlewich (approx 6kms). Reconfiguration and recovery works at Cledford and Elworth Grid			HV group demand >100% (LI5) of firm capacity with HS2 temporary supplies. Thermal overloading and voltage issues during N-1 outages with HS2 demand.
33/11kV	HS2 Warburton Park	Extension of 33kV board at Lymm. New 7kms 33kV circuit from Lymm to HS2 Warburton Park New primary transformer and HV switchboard at HS2 Warburton Park			HS2 temporary supplies
132kV	132kV Circuit Reinforcements (Hartford - Sankey Bridges)	Re-Stringng of 21.2kms of OHL section (including tower works) and overlaying 1.7kms of cable section.			Thermal overloading of the circuit during N-1 and N-1-1 outages with HS2 plus economic demand.
132kV	132kV Circuit Reinforcements Cuerdley-Dallam-Warrington)	Re-Stringng of 11.8kms of OHL section (including pole/tower works).			Thermal overloading of the circuit during N-1 and N-1-1 outages with HS2 plus economic demand.
33/11kV	Reinforcement of Morrisons primary substation	Replacement of 33kV RMU with 5-Panel switchboard along with replacement of HV switchboard. Installation of new 10MVA 33/11kV primary transformer.			HV group demand >100% (LI5) of firm capacity with HS2 plus the economic demand.
33/11kV	Reinforcement of Sanbach primary substation	Extension of 33kV and HV switchboard Installation of 10MVA 33/11kV primary transformer			HV group demand >100% (LI5) of firm capacity with HS2 plus the economic demand.
		Total Reinforcement Prime Costs (£m)			

HS2 HVP & Rail Electrification Applications – CRC 3F

APPENDIX D – NETWORK DIVERSIONS (LARGER VERSIONS AVAILABLE UPON REQUEST)

Overall Diversion Route

132kV Diversions

EHV and HV Diversions