



Title: Chessington/Laleham / West Weybridge

SPN Regional Development Plan

Author: Itayi Utah

Version: 2.2

Date: March 2014

All of the cost numbers displayed in this document are before the application of on-going efficiencies and real price effects.

Version	Date	Revision Class	Originator	Section Update	Details
1.2	22/02/2014	Minor	Itayi Utah	Cover page	Version and date update
1.2	22/02/2014	Major	Itayi Utah	Contents	Updated table
1.2	22/02/2014	Major	Itayi Utah	1.1	Updated Wording
1.2	22/02/2014	Major	Itayi Utah	1.2	Updated Costs and removed unwanted projects
1.2	22/02/2014	Major	Itayi Utah	1.3	Costs update
1.2	22/02/2014	Major	Itayi Utah	1.4	LI's table 2 update
1.2	22/02/2014	Major	Itayi Utah	2.2	Embedded generation update
1.2	22/02/2014	Major	Itayi Utah	2.3	NAMP table 7 and wording update
1.2	22/02/2014	Major	Itayi Utah	3.3	Table 15 and wording update
1.2	22/02/2014	Major	Itayi Utah	3.4	Table 17 FL's update
1.2	22/02/2014	Major	Itayi Utah	4	Wording update
1.2	22/02/2014	Major	Itayi Utah	4.1	Removed unwanted projects, correct dates and add missing projects
1.2	22/02/2014	Major	Itayi Utah	4.2	Remove unwanted projects, correct dates and add missing projects
1.2	22/02/2014	Major	Itayi Utah	4.3	Table 19 removed unwanted projects, correct dates and add missing projects
1.2	22/02/2014	Major	Itayi Utah	4.4	NAMP tables 20 & 21 updates
1.2	22/02/2014	Major	Itayi Utah	4.5	Table 22 update
1.2	22/02/2014	Major	Itayi Utah	5.1	Wording update
1.2	22/02/2014	Major	Itayi Utah	5.2	Wording update
1.2	22/02/2014	Minor	Itayi Utah	6	Updated dates
1.2	22/02/2014	Minor	Itayi Utah	6.2	Version 2 update
1.2	22/02/2014	Major	Itayi Utah	Appendix C	Updated diagram
2.2	26/03/14	Major	Tendai Matiringe	2.2	Updated Embedded Generation Table

All of the cost numbers displayed in this document are before the application of on-going efficiencies and real price effects.

## Contents

<b>1</b>	<b>INTRODUCTION</b>	<b>4</b>
1.1	EXECUTIVE SUMMARY	4
1.2	PROPOSED PROJECTS (>£1M)	5
1.3	COSTS PROFILE	6
1.4	OUTPUT MEASURES	6
1.5	PRINCIPLE RISKS AND DEPENDENCIES	7
<b>2</b>	<b>NETWORK CONFIGURATION</b>	<b>8</b>
1.1	EXISTING NETWORK	8
1.2	EMBEDDED GENERATION (G59/2)	10
2.3	PROJECTS IN PROGRESS	11
<b>3</b>	<b>NETWORK DEVELOPMENT CONSIDERATIONS</b>	<b>13</b>
3.1	DEVELOPMENT AREAS	13
3.2	ASSET HEALTH	15
3.3	SECURITY OF SUPPLY AND LOAD INDEX ANALYSIS	18
3.4	OPERATIONAL AND TECHNICAL RESTRICTIONS	21
3.5	NATIONAL GRID	22
3.6	NETWORK CONSTRAINTS	ERROR! BOOKMARK NOT DEFINED.
3.7	SMART DEMAND RESPONSE	22
<b>4</b>	<b>RECOMMENDED STRATEGY</b>	<b>23</b>
4.1	ASSET REPLACEMENT	23
4.2	REINFORCEMENT	26
4.3	SUMMARY OF PROPOSED INTERVENTIONS	28
4.4	COSTS AND PHASING	31
4.5	HEALTH INDEX AND LOAD INDEX PROFILES POST INTERVENTION	32
<b>5</b>	<b>ALTERNATIVES CONSIDERED</b>	<b>39</b>
5.1	OPTION 1	39
5.2	OPTION 2	39
5.3	OPTION 3	39
<b>6</b>	<b>REFERENCES</b>	<b>40</b>
6.1	APPENDICES	40
6.2	DOCUMENT HISTORY	40
<b>7</b>	<b>DOCUMENT SIGN OFF</b>	<b>41</b>

# 1 INTRODUCTION

## 1.1 Executive Summary

This Regional Development Plan (RDP) reviews UK Power Networks (UKPN)'s SPN EHV network supplied from Chessington 275/132kV, Laleham 275/132kV and West Weybridge 275/132kV Grid Supply Points (GSPs) with an aggregate demand of 669.9MW (Winter-W) and 461MW (Summer-S) across 10 SPN 132kV grid substations and 34 SPN 33kV primary substations. The aggregate firm capacity attributed to the three GSPs is 1,797MW (W) and 1,588MW (S) while aggregate load demand is projected to reach 725.2MW (W) and 513.1MW (S) by 2023. Geographically the associated electricity network covers most of Surrey County and parts of adjacent London Borough councils of Kingston Upon Thames, Richmond and Sutton as illustrated in figure 3 below. Surrey County has a population of 1,132,400 people and 455,800 households based on the 2011 population census. .

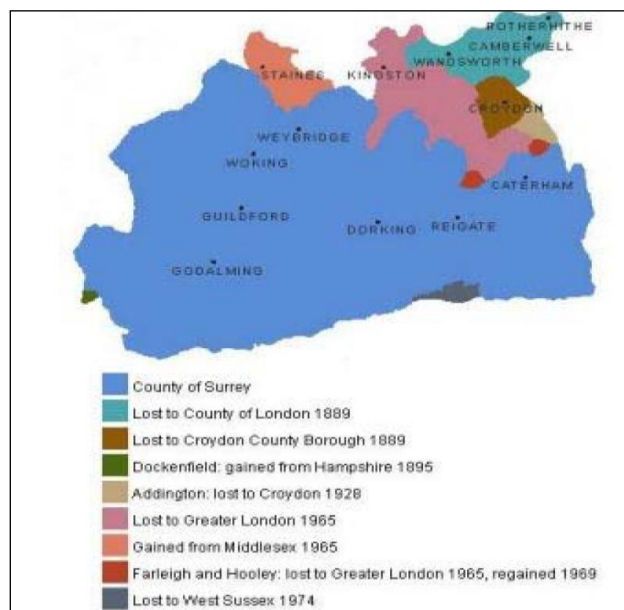
Future load demand and network growth in the area is likely to be influenced by the proposed Gatwick Diamond development and 20,240 new houses proposed by local councils under Surrey County and surrounding areas between 2006 and 2026. The proposed housing developments will require approximately 50MW electricity supply over the period. Adequate supply capacity is available to meet the projected new demand. Future major works identified include Guildford Grid reinforcement, Kingston Grid transformers replacement, Brookwood primary 33kV reinforcement and the reinforcement of the Byfleet/West West Weybridge 132/33kV group. Optimisation between non-load related projects and load related projects has been considered and discussed in this RDP

Figure 1 Surrey County Districts Map



(Source - <http://www.surreycc.gov.uk>)

Figure 2 Surrey County Historical Boundary Map



(Source - <http://www.surreycc.gov.uk>)

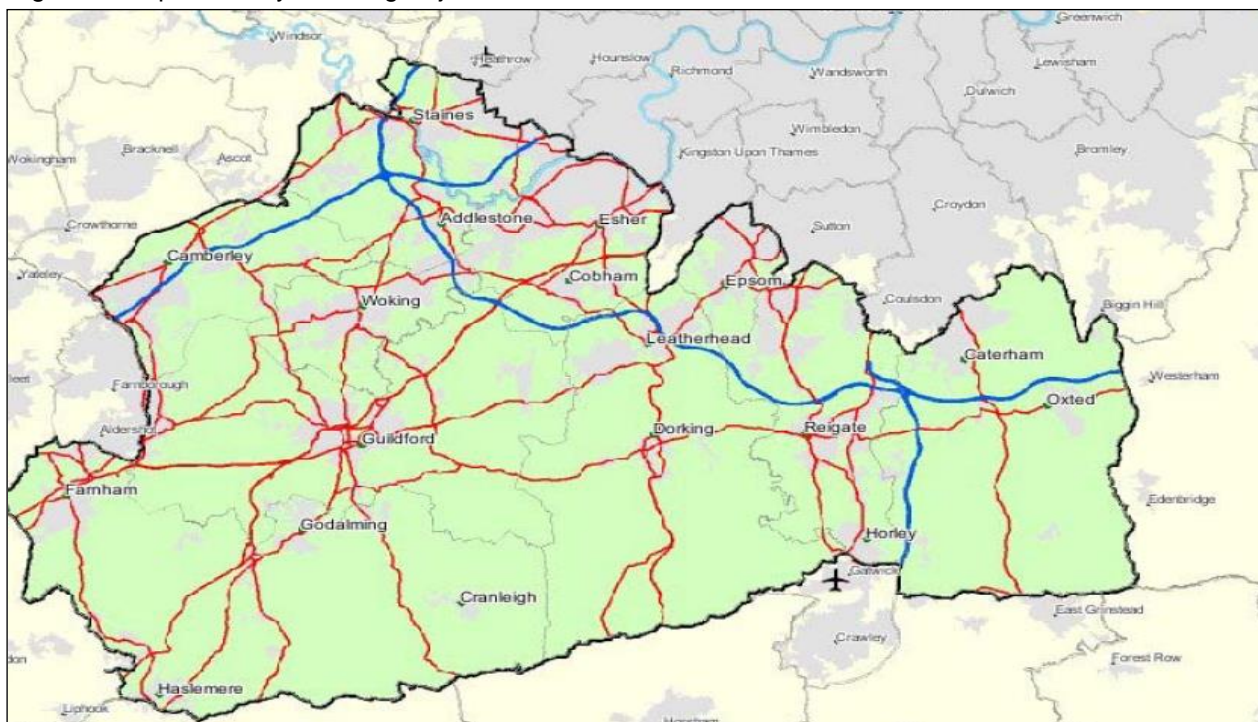
Major works currently under construction or approved and scheduled to start soon include – West Weybridge 132kV Switchgear replacement, Chessington Grid 132kV switchgear, GT1 and GT2 refurbishment, Chertsey primary reinforcement, Dorking Town 11kV switchgear replacement, Dorking Town Primary reinforcement and Old Woking 33/11kV ITC.



## Laleham / West Weybridge / Chessington

All of the cost numbers displayed in this document are before the application of on-going efficiencies and real price effects.

Figure 3: Map of Surrey Showing Adjacent Areas



(Source - <http://www.surreycc.gov.uk>)

## 1.2 Proposed projects (>£1M)

The projects listed below have been identified in this RDP and NAMP

- Ashted 33/11kV substation – Replace 11kV switchgear – £1,085k
- Horsell 33/11kV substation - Replace T1 and T2 - £1,104k
- North Chessington 33/11kV - Replace T1 and T2 - £1,104k
- Chertsey 33/11kV Substation, ITC - £1,235k
- Guildford Grid 132/33kV - ITC-£1,771k
- Guildford Grid 33 kV Switchgear Replacement-£2,124k
- Weybridge 33/11kV substation. ITC. -£ 1,776k
- Weybridge 33kV Reinforcement-Install a Third 33kV Circuit From West Weybridge - £1,497k
- Epsom 33/11kV – Reinforcement -£2,167k
- Capel 33/11kV Substation. ITC. -£1,202k
- Kingston Grid 132kV - Replace GT1, GT2, GT3, GT4-£5,811k
- Merrow 33kV/11kV – ITC – £2,502k
- CERL 33kV/11kV – ITC - £1,381k
- Brookwood 33kV/11kV – ITC – £ 1,790k
- Guildford A 33kV/11kV – ITC - £ 1,152k
- Guildford B 33kV/11kV – ITC - £ 1,051k
- Byfleet 132kV/11kV & 132/33kV group - 132kV OHL conductor replacement - £ 1,676k
- Old Woking 33/11kV Reinforcement - Replace T1/T2 with 12/24 MVA units - £1,058k
- Guildford Grid 132kV Reinforcement for (N-2) - Installation of a 3rd 132kV circuit (Phase 1 Guildford to Effingham) - £ 9,404k
- Guildford Grid 132kV Reinforcement for (N-2) - Installation of a 3rd 132kV circuit (Phase 2 - Effingham to Leatherhead) - £ 6,755k
- Brookwood 33kV Reinforcement - Install 10 km of 33kV UG circuit from Byfleet - £3,682k
- West Weybridge-Guildford 132kV FFC – Replacement - £2,912k
- Chessington Grid-Ewell 33kV FFC Replacement (Circuit 1-2,Circuit3-1) - £1,819k
- Byfleet 132kV/33kV & West Weybridge 132kV/33kV Group Reinforcement - Replace 12 Panel 33kV SWB at West Weybridge, and 1km of 33kV cable on interconnector - £2,910k

All of the cost numbers displayed in this document are before the application of on-going efficiencies and real price effects.

### 1.3 Costs Profile

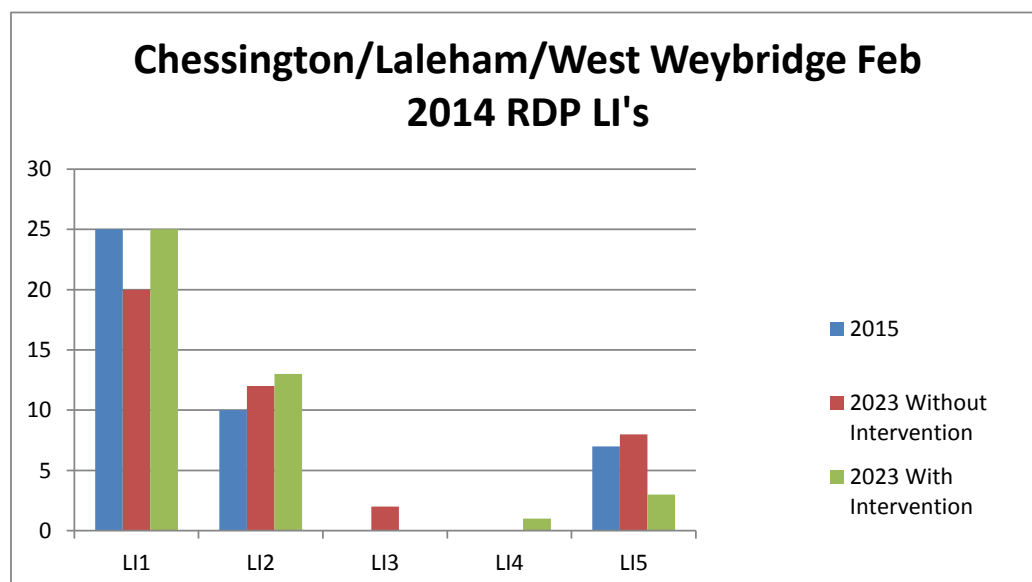
**Table 1.** NAMP Costs Summary (2013-2024)

SR _ Table J - S&R - Baseline_Final_RIIO_ED1 Re-Submission_19 <sup>th</sup> Feb_2014 _15:15 (£)													
Cat	Description	2013/2014	2014/2015	2015/2016	2016/2017	2017/2018	2018/2019	2019/2020	2020/2021	2021/2022	2022/2023	DPCR5 Total	ED1Total
A & H	Total Asset Replacement	4,306,239	1,455,586	660,664	788,923	1,953,596	5,382,831	3,237,909	1,444,573	920,471	2,498,831	5,761,825	16,887,799
Q & R	Total Reinforcement	3,293,773	5,115,791	5,698,541	8,288,052	8,289,864	5,689,972	3,013,975	821,474	1,748,125	2,197,042	8,409,565	35,747,045
	GRAND TOTAL	7,600,012	6,571,378	6,359,205	9,076,976	10,243,460	11,072,803	6,251,884	2,266,047	2,668,596	4,695,873	14,171,390	52,634,843

Table 1 above provides the forecast aggregate NAMP cost for network expenditure under this RDP during the last two years of DPCR5 and the ED1 period subject to project feasibility studies and final approval.

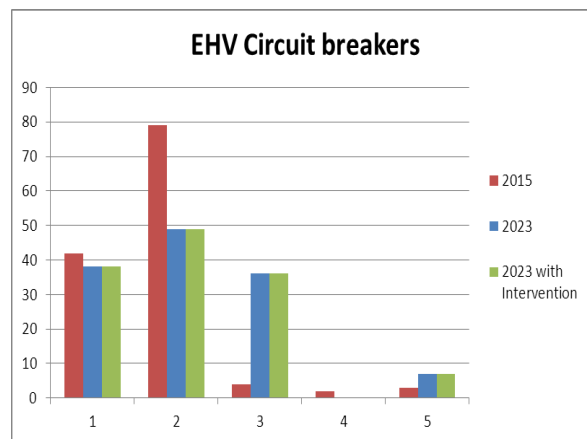
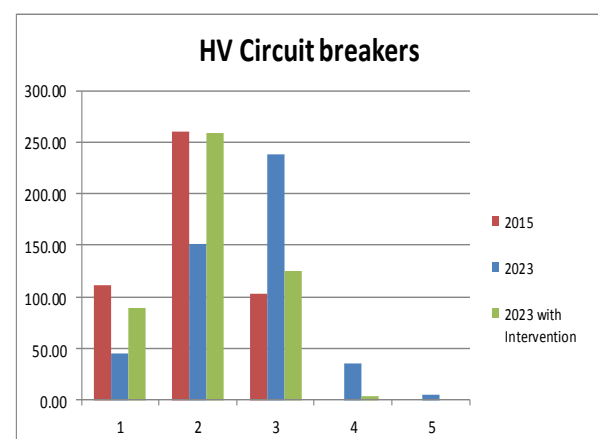
### 1.4 Output Measures

Load Indices (LI) Summary Graph

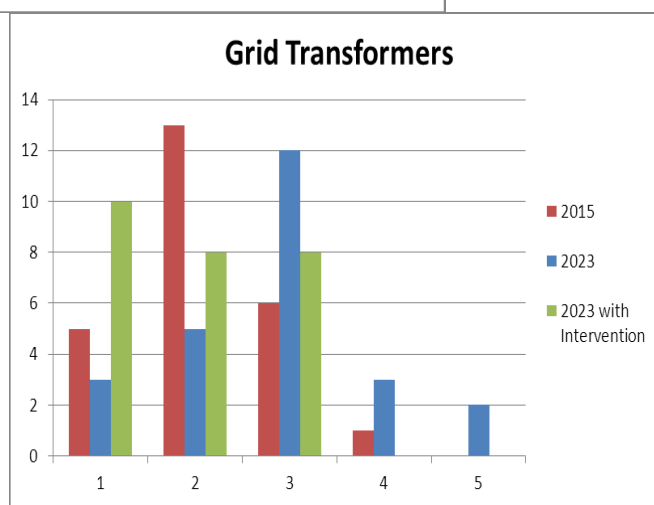
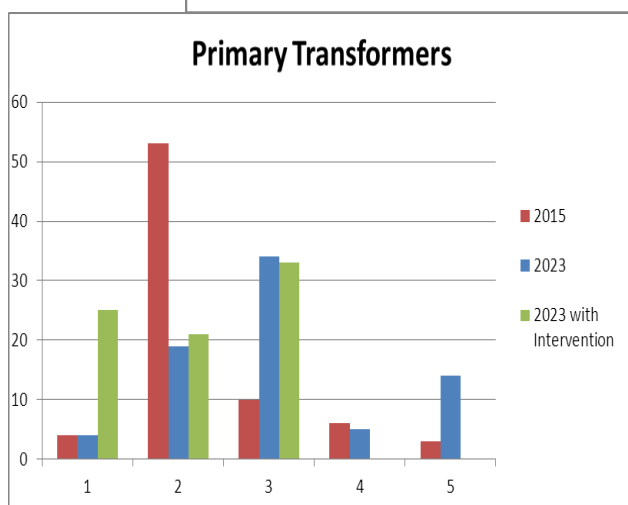
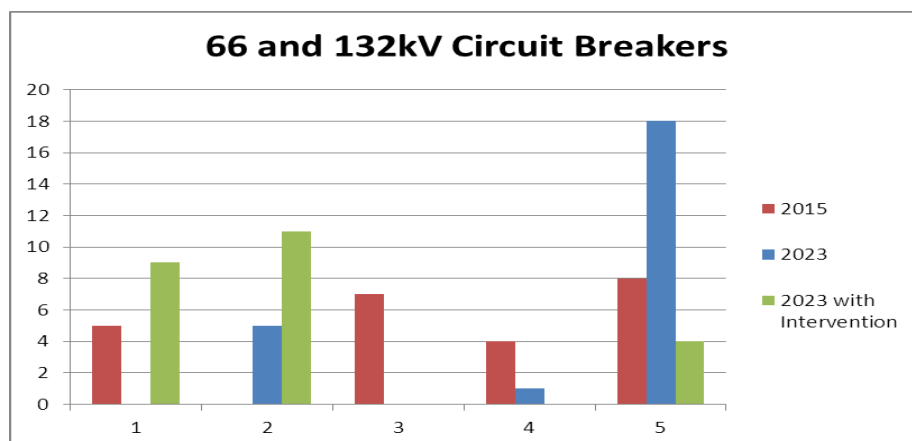


The graph above provides an illustration of load indices before and after proposed investment/intervention strategies for all substations covered in this RDP. Substations with a projected load index of 4 and 5 (LI4 and LI5) during DPCR5 and ED1 periods will be targeted for improvement as discussed in this RDP.

(2015-2023) HI summary graphs



All of the cost numbers displayed in this document are before the application of on-going efficiencies and real price effects.



The graphs above provides projected health indices for network assets considered under this RDP during the ED1 period from 2015 to 2023 without intervention. Eight 132kV oil circuit breakers are already being replaced at West Weybridge Grid out of the 132kV circuit breakers projected to be HI5.

## 1.5 Principle Risks and Dependencies

The timing of most of the projects will be dictated by load growth and/or health/load indices. Other factors such as quality of supply, safety, sustainability and cable pinch points may change the overall priorities and add previously unconsidered priorities.

The 33kV network supplied from Chessington Grid is islanded and not interconnected to any other 33kV system from outside the group.

## 2 NETWORK CONFIGURATION

### 2.1 Existing Network

This Regional Development Plan reviews the SPN EHV network supplied from Chessington 275/132kV, Laleham 275/132kV and West Weybridge 274/132kV Grid Supply Points (GSPs). The three GSP's provide electricity supply to one of UK's most affluent county, Surrey and parts of metropolitan London making them significant and strategic sites for UK Power Networks.

#### Chessington GSP

Chessington 275/132kV GSP supplies Kingston Grid, Leatherhead Grid and Chessington Grid. Chessington Grid is adjacent the NG 275/132kV site and the whole site is surrounded by farming land. The 132kV Chessington AIS substation is fed via 2x240MVA 275/132kV super grid transformers (SGT's) and has 2x132kV outgoing circuits to Leatherhead Grid and 3x90MVA 132kV local grid transformers. Kingston Grid is fed via 2x120MVA SGTs from Chessington GSP and 2x132kV circuits from Wimbledon in LPN.

**Chessington Grid 3x90MVA 132/33kV** – Connection is direct from the 132kV AIS ring busbar system supplied from 2x240MVA SGT's. Firm capacity is limited by the 2000A 33kV L45 switchgear. The site is surrounded by farming land. Primary substations fed from Chessington Grid include Esher, Ewell, North Chessington, Cobham, and Epsom. The 33kV network is islanded and not interconnected to any other 33kV network system.

**Kingston Grid 4x45MVA 132/33kV** – Connection is via 2x9.38km 132kV oil filled cables rated 132MVA (W) and 118MVA (S) from Chessington GSP and 2x10.346km 132kV oil filled cables rated 133MVA (W) and 120MVA (S) from Wimbledon GSP in LPN. The site is located in a commercial business area. Primary substations fed from Kingston Grid include Teddington, Kingston33/11kV, Surbiton, Molesey, Berrylands and Hampton. The 33kV network supply from Kingston Grid is interconnected with Twickenham Grid 33kV network at Ham primary and Hampton Switching Station.

**Leatherhead Grid 3x60MVA and 1x30MVA 132/33kV** – Connection is via 2x132kV composite circuits comprising 2x0.55km 132kV oil filled cables rated 125MVA (W) and 112MVA (S) and 2x5.72km OHL circuits (PSB1-24) rated 130MVA (W) and 105MVA (S) fed from Chessington GSP via a four corner mesh switching station and 2x132kV composite circuits comprising two separate sections of 2x1.05km oil filled cables rated 114MVA (W) and 99MVA (S) on the Leatherhead side and 2x0.883km XLPE cables rated 161MVA (W) and 135MVA (S) on the West Weybridge side while 2x13km OHL circuits (PS1-66) fed from West Weybridge GSP are rated 147MVA (W) and 127MVA (S). The site is located in a residential area. Primary substations fed from Leatherhead Grid include Ashted, CERL, Banstead, Leatherhead Town, Effingham, Dorking Town, part of Betchworth and part of Capel. The 33kV network is interconnected with Leigh Grid 33kV network at Capel Switching Station and Betchworth Station.

#### Laleham GSP

Laleham 275/132kV GSP supplies Twickenham Grid in SPN and some LPN sites. Laleham Grid is adjacent the NG site and the whole site is surrounded by farming land.

The 132kV Laleham GIS substation is fed via 2x240MVA and 2x180MVA 275/132kV super grid transformers (SGT's) and has 2x132kV outgoing circuits to Twickenham Grid in SPN and 6x132kV more feeders supplying sites outside the SPN footprint.

**Twickenham Grid 2x90MVA 132/33kV transformers** – Connection is via 2x11.5km 132kV XLPE cables installed in existing gas pressure cable pipes rated 139MVA (W) and 120MVA (S). The site is at the centre of a residential area. Primary substations fed from Purley Grid include Purley Local, Caterham, Coulsdon and West Croydon



All of the cost numbers displayed in this document are before the application of on-going efficiencies and real price effects.

### **West Weybridge GSP**

West Weybridge 400/275/132kV GSP supplies West Weybridge Grid, West Weybridge 132/11kV, Byfleet Grid, Woking Sentrum 132/11kV, Guildford Grid and Leatherhead Grid. West Weybridge Grid and West Weybridge 132/11kV are adjacent the NG site and the whole site is located in a residential area.

Currently the 132kV AIS is being replaced with GIS at West Weybridge Grid and is fed via 2x240MVA, 2x180MVA and 2x120MVA 400/132kV super grid transformers (SGT's).

**West Weybridge Grid 2x60MVA 132/33kV transformers** – GT3 is connected directly from the 132kV busbars while GT4 is connected via 1x0.16km 132kV underground circuit rated 73MVA (W) and 66MVA (S). The site is adjacent to the NG 400/275/132kV site. West Weybridge Grid is interconnected with Byfleet Grid at 33kV via 2x45MVA series reactors on either side of the 33kV composite circuits rated 64MVA (W) and 58MVA (S). Primary substations fed from West Weybridge Grid include West Weybridge 33/11kV, Chertsey and Walton.

**West Weybridge 132/11kV 2x30MVA and 1x20/30MVA transformers** – All three 132/11kV transformers are currently connected directly from the 132kV busbars but this will change once the new GIS switchboard is completed and will be fed via 0.194km 1000Al XLPE cables rated 161MVA (W) and 135MVA (S). The transformers and 11kV switchboard are located within West Weybridge Grid perimeter fence.

**Byfleet Grid 2x90MVA 132/33kV and 2x30MVA 132/11kV transformers** – Connection is via 2x1.7km OHL (PXA1-10) rated 130MVA (W) and 105MVA (S). The site is located in a residential area. West Weybridge Grid is interconnected with Byfleet Grid at 33kV via 2x45MVA series reactors on either side of the 33kV composite circuits rated 64MVA (W) and 58MVA (S). Primary substations fed from Byfleet Grid 132/33kV include Broadoaks Data Centre, Brookwood, Horsell, Woking and Old Woking

**Woking Sentrum 132/11kV 2x60 dual wound transformers** – Connection is via 2x9km 132kV XLPE cables rated 125MVA (W) and 120MVA (S). This is a dedicated customer site.

**Guildford Grid 2x90MVA 132/33kV transformers** – Connection is via composite circuits comprising 2x1.921km 132kV oil filled cables rated 129MVA (W) and 116MVA (S) on the West Weybridge side, which are going to be jointed 1000mm Al XLPE cables rated 139MVA (W) and 120MVA (S) from the new GIS switchboard and 1x0.563km oil circuit rated 144MVA (W) and 130MVA (S) and 1x0.975km XLPE circuit rated 157MVA (W) and 140MVA (S) on the Guildford side while the 2x13km OHL circuits (PPA1-43) are rated 51MVA (W) and 40MVA (S). The site is located in a residential area. Primary substations fed from Guildford Grid include Guildford A, Guildford B, Guildford 33/6.6, Merrow and Shalford.

**Leatherhead Grid 3x60MVA and 1x30MVA 132/33kV** – Connection is via 2x132kV composite circuits comprising 2x0.55km 132kV oil filled cables rated 125MVA (W) and 112MVA (S) and 2x5.72km OHL circuits (PSB1-24) rated 130MVA (W) and 105MVA (S) fed from Chessington GSP via a four corner mesh switching station and 2x132kV composite circuits comprising two separate sections of 2x1.05km oil filled cables rated 114MVA (W) and 99MVA (S) on the Leatherhead side and 2x0.883km XLPE cables rated 161MVA (W) and 135MVA (S) on the West Weybridge side while 2x13km OHL circuits (PS1-66) fed from West Weybridge GSP are rated 147MVA (W) and 127MVA (S). The 33kV transformer tails are 0.095km long and rated 74MVA (W) and 64MVA (S) for the 60MVA transformers and 36MVA (W) and 28MVA (S) for the 30MVA transformer. The site is located in a residential area. Primary substations fed from Leatherhead Grid include Ashted, CERL, Banstead, Leatherhead Town, Effingham, Dorking Town, part of Betchworth and part of Capel. The 33kV network is interconnected with Leigh Grid 33kV network at Capel Switching Station and Betchworth Station.

All of the cost numbers displayed in this document are before the application of on-going efficiencies and real price effects.

## 2.2 Embedded Generation (G59/2)

**Table 2.** List of Embedded Generators Connected to the Network covered by this RDP

Customer Name (MAVIS)	Site Name	Type	Installed DG (MW)	Operating Voltage (kV)	Substation Name
BP SAFEWAY	ST LEONARDS SERVICE STATION	PV	0.001	0.400	Esher 11kV
BRITISH TELECOM (NON POSTAL)	TELEPHONE EXCHANGE	Diesel	0.800	0.400	Byfleet 11kV
DAVID LLOYD LEISURE	LEISURE CENTRE	CHP	0.206	0.400	West Weybridge 11kV
WHITBREAD PLC DAVID LLOYD LEISURE	NONSUCH GIRLS SCHOOL N/S	CHP	0.206	0.400	Ewell 11kV
M/R N BOATSWAIN		PV	0.002	0.230	Twickenham 11kV
MARKS & SPENCER PLC	ROOM 27/200	CHP	0.500	0.400	West Weybridge 11kV
MINISTRY OF AGRICULTURE	COOMBESLANDS FARM	CHP	1.000	0.400	West Weybridge 11kV
ORWELL HOTEL	SHEPPERTON MOAT HOUSE	CHP	0.132	0.400	West Weybridge 11kV
J SAINSBURY	SAINSBURY SUPERMARKET	CHP	0.144	11.000	Twickenham 11kV
STAR ENERGY UK ONSHORE LTD ( formerly Cairn Energy)	ALBURY GAS STATION	Gas	2.000	11.000	Shalford 11kV
NHS SUPPLIES SOUTH EAST	ROYAL SURREY COUNTY HOSPITAL	Diesel	1.250	11.000	Guildford 'A' 11kV
THAMES WATER UTILITIES LTD (IMPORT)	LOWER MARSH LANE	Biogas	1.540	11.000	Kingston 11kV
THAMES WATER UTILITIES LTD (IMPORT)	SHALFORD RIVER TREATMENT WORKS	Diesel	1.500	11.000	Shalford 11kV
THAMES WATER UTILITIES LTD (IMPORT)	SHALFORD WATER TREATMENT WORKS	Diesel	3.400	11.000	Shalford 11kV
THAMES WATER UTILITIES LTD (IMPORT)	HEMPTON PUMPING STATION	Diesel	5.600	33.000	Twickenham 11kV
THAMES WATER UTILITIES LTD (IMPORT) (NON POSTAL)	WALTON PUMPING STATION	Diesel	1.000	11.000	Kingston 11kV
UNIVERSITY OF SURREY	UNIVERSITY CAMPUS	CHP	1.000	11.000	Guildford 'A' 11kV
Woking Borough Council	CANOPY LIGHTING	CHP	0.083	0.400	Byfleet 11kV
THAMESWAY ENERGY LTD	BROCKHILL	PV	0.036	0.400	Byfleet 11kV
WOKING COUNCIL	IMPORT METER, CIVIC OFFICES S/S	CHP	0.035	11.000	Byfleet 11kV
THAMES ENERGY	1-32 PRIORS CROFT	CHP	0.022	0.400	Byfleet 11kV
THAMESWEY ENERGY LTD	SUNNY SIDE	CHP	0.080	0.400	Byfleet 11kV
	LANDLORDS SUPPLY	CHP	0.080	0.400	Byfleet 11kV
THAMESWEY ENERGY LTD	CPS UNIT	CHP	0.035	0.400	Byfleet 11kV
THAMESWEY ENERGY LTD	EXPORT MPAN	CHP	0.080	0.400	Byfleet 11kV
THAMESWEY ENERGY LTD	CHP UNIT	CHP	0.035	0.400	Byfleet 11kV
THAMESWEY ENERGY LTD	LANDLORDS SUPPLY	CHP	0.035	0.400	Byfleet 11kV
	LANDLORDS SUPPLY	CHP	0.035	0.400	Byfleet 11kV
	CRANMER COURT	CHP	0.035	0.400	Byfleet 11kV
Woking Borough Council	LANDLORDS SUPPLY	CHP	0.035	0.400	Byfleet 11kV
Woking Borough Council	1 STREAM CLOSE	CHP	0.035	0.400	Byfleet 11kV
KINGSTON HOSPITAL NHS TRUST	KINGSTON HOSPITAL	Diesel	1.000	11.000	Kingston 11kV
THAMES ENERGY LTD	CHP SCHEME	CHP	0.900	11.000	Woking 11kV
KENT COUNTY COUNCIL	SWIMMING POOL	CHP	0.700	11.000	OLD WOKING 11kV
LACEY SIMMONS LTD	BTS TO KIOSK ON PROPERTY OF	PV	0.140	0.400	Byfleet 11kV
IGUZZINI HQ	IGUZZINI HQ	PV	0.030	0.400	Shalford 11kV
Hampton School	HAMPTON SCHOOL	CHP	0.150	0.400	Hampton 11kV
Leatherhead Leisure Centre (FUSION LIFESTYLE)	LEATHERHEAD LEISURE CENTRE	Diesel	0.087	0.400	Leatherhead Town 11kV
TESCO STORES LTD	TESCO EXTRA BROOKLANDS	CHP	0.350	11.000	West Weybridge 11kV
TESCO STORES LTD	TESCO	CHP	0.065	0.400	Richmond 11kV
		PV	0.065	0.400	Ham 11kV
HAMPTON SCHOOL	HAMPTON SCHOOL	CHP	0.150	0.400	Kingston 11kV
Blenheim High Sch	BLENHEIM HIGH SCHOOL	PV	0.037	0.400	Ewell 11kV
VENTALUTION LTD	CRANE HOUSE	PV	0.035	0.400	TWICKENHAM 11kV
Joju Solar	Surbiton Library	PV	0.008	0.230	SURBITON 11kV
KENT COUNTY COUNCIL (LASER)	New ent House	PV	0.012	0.400	SURBITON 11kV
Greencap Energy	Chutzpah	PV	0.007	0.230	MOLESEY 11kV
WTG Commercial	Cheam Fields Primry School	PV	0.019	0.230	Ewell 11kV
ESP ELECTRICITY LIMITED	FRANKLANDS DRIVE INSET NETWORK	PV	0.119	0.400	WEST WEYBRIDGE 11kV
THAMES WATER UTILITIES LTD	WOKING SEWAGE TREATMENT WORKS	PV	0.250	0.400	OLD WOKING 11kV
THAMES WATER UTILITIES LTD	RIPLEY SEWAGE TREATMENT WORKS	PV	0.250	0.400	BYFLEET 11kV
Morgan Jones-Hockley - switch2renewable.co.uk	Openview Farm	PV	0.030	0.400	EFFINGHAM 11kV
Solar Above	10	PV	0.010	0.230	Ewell 11kV
Spirit Solar Ltd	Adj. 28 Amberlea	PV	0.004	0.230	C.E.R.L. 11kV
My Planet	Bourne Valley Garden Centre	PV	0.020	0.400	WEST WEYBRIDGE 11kV
Wayne Walbrook - Building Better Health	Surbiton Primary School	PV	0.060	0.400	SURBITON 11kV
AFFINITY WATER LIMITED	WALTON WATER TREATMENT WORKS	Diesel	1.200	11.000	WALTON 11kV

All of the cost numbers displayed in this document are before the application of on-going efficiencies and real price effects.

The total installed capacity of G59/2 embedded generation under this RDP is 26MW with Thames Water Utilities Ltd, Hampton generation contributing the highest output at 5.6MW from its diesel turbine.

## 2.3 Projects in progress

DPCR5 NAMP projects approved to date are listed in table 3 below.

**Table 3.** NAMP Table J Less Indirect (DPCR5 -2013 to2015)

SR Table J - S&R - Baseline_Final_RIIIO_ED1 Re-Submission_19th Feb_2014_15:15 (£)								
Cat	GWPID		Description	2013/2014	2014/2015	2015/2016	2016/2017	2017/2018
A	1.47.62	8372	Chertsey Primary Flood Mitigation - Raise Switchroom Extension, Transformer Bund & Base	180,249	0	0	0	0
A	1.48.01	3126	West Weybridge - Replace 132kV Switchgear	525,122	111,771	0	0	0
A	1.50.01	3286	Chertsey 11kV Primary Switchgear Change	610,298	384,972	0	0	0
A	1.55.02	3751	Chessington 132 kV Switchgear Refurbishment	144,250	40,000	0	0	0
A	1.55.02	5755	Kingston Grid FMVG CT/VT Replacement	190,266	0	0	0	0
H	1.29.02	3537	West Weybridge-Guildford 132kV FFC - Replacement	2,434,250	477,750	0	0	0
Q	1.40.42	8442	Resilience of Chertsey 33kV Circuits at West Weybridge - Divert Cable From Cable Bridge Via Directional Drill	139,747	0	0	0	0
R	1.33.01	3702	Chertsey 33/11kV Substation Reinforcement - Bank T1/T2 and add T3	716,848	517,671	0	0	0
R	1.33.01	3726	Old Woking 33/11kV Reinforcement - Replace T1/T2 with 12/24 MVA Units	518,105	540,092	0	0	0
R	1.33.01	8148	Brookwood 33kV/11kV Reinforcement - Replace T1/T2 with 20/40 MVA Units & Replace 11 Panel 11kV Switchgear	438,272	896,222	455,518	0	0
R	1.35.01	3349	Byfleet 132/33kV Substation - Change GT2A for a 90MVA Unit	108,540	0	0	0	0
R	1.35.05	3269	Byfleet 132/11kV Substation - Auto-Close Scheme to be Installed	16,359	0	0	0	0
R	1.37.01	8149	Byfleet 132kV/11kV & 132/33kV Group - 132kV OHL Conductor Replacement	227,541	429,003	429,003	590,369	0
R	1.37.07	8157	Weybridge 33kV Reinforcement-Install a Third 33kV Circuit From West Weybridge.	0	17,355	176,794	606,297	696,287
R	1.37.07	8500	Chertsey 33kV Reinforcement – Up-rate 33kV Cables Section on Circuit 1 and Circuit 2	274,833	576,572	0	0	0

### Approved Works:

**3126:** Replacement of 132kV AIS switchgear with GIS at West Weybridge is still in progress and scheduled for completion by 2014.

**3751:** Chessington 132kV switchgear is projected to be HI5 during DPCR5 and work is in progress to refurbish the switchgear.

**3702, 3286, 8372, 8442, 8500:** The five Chertsey primary projects have been combined into one single Gate B paper.

**3726:** Replacement of T1 and T2 at Old Woking is in progress

### Laleham / West Weybridge / Chessington

All of the cost numbers displayed in this document are before the application of on-going efficiencies and real price effects.

**8148:** Brookwood 33kV/11kV Reinforcement - Replace T1/T2 with 20/40 MVA Units & Replace 11 Panel 11kV Switchgear and Brookwood 33kV Reinforcement - Install 10 km of 33kV UG Circuit from Byfleet have been approved at Gate B through a customer driven project



### 3 NETWORK DEVELOPMENT CONSIDERATIONS

#### 3.1 Development areas

##### Surrey County Economic Development

Economic development policy activity and research in Surrey is focused on three Functional Economic Areas (FEA), which include Surrey, Gatwick Diamond and Blackwater Valley/Western Corridor. The Surrey County South East Plan (SEP) sets out the broad development strategy for the region up to 2026. SEP allocates 57,920 net additional dwellings to Surrey districts over the period. The Gatwick Diamond Initiative (GDI) is a business led public-private partnership that aims to facilitate and co-ordinate initiatives necessary to maintain a vibrant economy in the area that extends from Brighton to south London and from Dorking to East Grinstead. The Gatwick Diamond is the UK headquarters for ExxonMobil and Unilever. Nestle is likely to relocate their UK HQ to City Place in Crawley by the end of 2012. Major employers include Thales UK, a global aerospace and defense company, which has invested £100 million into state of the art facilities in the area. The fuel cell technology transfer pioneer, Ceres Power has chosen the Gatwick Diamond as its worldwide manufacturing HQ for their innovative fuel cell technology for domestic energy supply. The area is also a key regional centre for major professional services companies, which include KPMG, Price Waterhouse Coopers, Deloitte, BDO Stoy Hayward, Grant Thornton, Thomas Eggar, ASB Law and Shadbolt. On the other hand, the Blackwater Valley and Western Corridor functional economic area generates £15 billion GDP and has a strong, well-balanced and diverse economy covering major urban centres, rural areas and tourism based on wildlife and recreational facilities offered by a 30km stretch of open land. The Western Corridor performs well in knowledge based sectors such as ICT, telecommunications, logistics, financial services, has a growing R&D sector in bioscience and healthcare, and has advanced manufacturing around aerospace and defence supported by three local universities.

Figure 10 – Gatwick Diamond Development Area



### Housing

**Woking** – 4,964 housing units are proposed under the Local Development Framework between 2010 and 2027 for Woking Borough Council, which include Brookwood, Horsell West, Sutton Green, Pryford, Byfleet, and Old Woking districts. This development will require an additional 12MW supply depending on the locality of the various development sites, which will be supplied from Byfleet Grid.

**Banstead and Reigate** – 10,000 new housing units are proposed by 2026 under the Core Planning Strategy for Banstead and Reigate Borough Council, which include Redhill and Horley. This translates to 25MW aggregate load demand, which will be mostly supplied from Bolney GSP via Leigh Grid and Smallfield Grid.

**Elmbridge** - 3,375 new housing units are proposed by 2026 under the Core Planning Strategy for Elmbridge, which include Weybridge, Esher, Cobham, Oxshott, Walton on Thames and Hersham districts. This translates to 10MW aggregate load demand, which will be mostly supplied from Chessington Grid.

**Epsom Ewell** – 2,715 new housing units are proposed by 2026 under the Core Planning Strategy for Epsom Ewell, which include Ruxley, Woodcote, and Stoneleigh and Stamford districts. This translates to 5MW aggregate load demand, which will be mostly supplied from Chessington Grid

**Mole Valley** – 3,760 new housing units are proposed by 2026 under the Core Planning Strategy for Mole Valley, which include Ashted, Capel, Leigh, Betchworth, Leatherhead and Dorking districts. This translates to 5MW aggregate load demand, which will be mostly supplied from Leatherhead Grid and Guildford Grid.

**Runnymede** – 2,226 new housing units are proposed by 2026 under the Core Planning Strategy for Runnymede, which include Chertsey, Egham and New Ham local councils. This translates to 5MW aggregate load demand, which will be mostly supplied from West Weybridge Grid.

**Surrey Heath** – 3,240 new housing units are proposed by 2028 under the LDF for Surrey Heath Borough Council, which include Chobham, Bagshot, Bisley and Windlesham councils. This translates to 10MW aggregate load demand, which will be mostly supplied from West Weybridge Grid

**Guildford** - 3,220 new housing units are proposed by 2022 under the LDF for Guildford Borough Council, which include Horsleys, Shalford and Shre councils. This translates to 10MW aggregate load demand, which will be mostly supplied from Guildford Grid

**Spelthorne** - 3,320 new housing units are proposed by 2026 under the Core Strategy for Spelthorne Borough Council, which include Ashford Common, Laleham, Shepperton Green, Staines and Sunbury councils. This translates to 10MW aggregate load demand, which will be mostly supplied from Twickenham Grid

**Tandridge** - 2,787 new housing units are proposed by 2026 under the Core Strategy for Tandridge District Council, which include Caterham, Warlingham, Whyteleafe, Oxted and Hurst Green councils. This translates to 10MW aggregate load demand, which will be mostly supplied from Purley Grid

**Waverley** – 3,614 new housing units are proposed by 2028 under the Core Strategy for Waverley Borough Council, which include Bramley, Cranleigh, Farnham and Milford councils. This translates to 10MW aggregate load demand, which will be mostly supplied from Leatherhead and Leigh Grid substations.

**Kingston Upon Thames** - 5,625 new housing units are proposed by 2027 under the Core Strategy for London Borough of Kingston, which include Surbiton, Norbiton, Tolworth, New Malden and Chessington neighbourhoods. This translates to 15MW aggregate load demand, which will be mostly supplied from Kingston Grid substation

**Sutton** – 5,175 new housing units are proposed by 2026 under the Core Strategy for London Borough of Sutton, which include Hackbridge, Cheam, Beddington, St Helier, Wallington and Carshalton. This translates to 15MW aggregate load demand, which will be mostly supplied from Sutton Grid substation.

**Richmond** – 3,700 new housing units are proposed by 2027 under the Core Strategy for London Borough of Richmond, which include Twickenham, Hampton and Teddington. This translates to 10MW aggregate load demand, which will be mostly supplied from Twickenham and Kingston Grid substations.

All of the cost numbers displayed in this document are before the application of on-going efficiencies and real price effects.

### 3.2 Asset Health

Health indices for all network equipment covered in this RDP are listed in tables 4 to 8 below. The equipment groups covered include HV circuit breakers (6.6kV and 11kV), EHV circuit breakers (33kV), 66kV&132kV circuit breakers, primary transformers (33/11/6.6kV), grid transformers (132/33/11kV), overhead lines (132kV) and underground cables (33kV and 132kV)

It should be noted that HI's presented in the RDP will not align with the RIGS. The HI's presented in this RDP are the outcome of our ARP models on an asset by asset basis. Different rules are applied for RIGs reporting, as agreed with Ofgem, where assets may be grouped and all assets in the group take the same HI.

**Table 4.** HV Circuit breakers (Without Investment)

Substation	2015					2023				
	No. HI1	No. HI2	No. HI3	No. HI4	No. HI5	No. HI1	No. HI2	No. HI3	No. HI4	No. HI5
ASSTEAD 11KV		2	7					6	3	
BANSTEAD 33/11KV		11					11			
BERRYLANDS 33/11KV		9	2					10	1	
BETCHWORTH 33/11	2	7					2	7		
BROOKWOOD 33/11		11						11		
BYFLEET GRID 132/11 KV	1	10	3				2	12		
BYFLEET GRID 33 KV	2					2				
CERL 33/11KV		2	8					9	1	
CHERTSEY 33/11KV			12						12	
COBHAM (SURREY) 33/11KV		1	9					8	2	
DORKING TOWN 33/11KV	11					11				
EFFINGHAM 33/11		10					10			
EPSOM 33/11KV		2	10					4	3	5
ESHER 33/11KV		19					19			
EWELL 33/11KV		12	6					16	2	
GUILDFORD _A_ 33/11	16					3	13			
GUILDFORD _B_ 11KV		6					1	5		
GUILDFORD 33/6.6	5					5				
HAM 33/11KV		8	1					9		
HAMPTON 33/11KV		7	3					9	1	
HORSELL 33/11KV		10					1	9		
KINGSTON 33/11KV	35						35			
LEATHERHEAD TOWN 33/11KV		9						8	1	
MERROW 33/11		2	8					10		
MOLESEY 33/11KV	2	4	7				2	11		
NORTH CHESSINGTON 33KV		5	5				1	8	1	
OLD WOKING 33/11KV		8					8			
RICHMOND 33/11KV		24	1					24	1	
SHALFORD 33/11		3	9					7	5	
SURBITON 33/11KV		14					9	5		
TEDDINGTON 33/11KV		6	9				1	13	1	
TWICKENHAM 33/11KV	4	22	3			4		23	2	
WALTON 33/11KV	14						14			
WEST WEYBRIDGE 132/11KV	7	13				7		13		
WEST WEYBRIDGE GRID 132 KV	2	1				2		1		
WEYBRIDGE 33/11KV		11					10	1		
WOKING 33/11	3	12				3	12			
WOKING SENTRUM 11KV	4					4				
WOKING SENTRUM GRID 132/11KV	4					4				

All of the cost numbers displayed in this document are before the application of on-going efficiencies and real price effects.

**Table 5.** EHV Circuits Breakers

Substation	No. HI1	No. HI2	2015 No. HI3	No. HI4	No. HI5	No. HI1	No. HI2	2023 No. HI3	No. HI4	No. HI5
BYFLEET GRID 132 KV		2					2			
BYFLEET GRID 33 KV		12					12			
CHESSINGTON GRID 132 KV			2	2	3					7
CHESSINGTON GRID 33KV		13	1					14		
COBHAM 33KV KENT		1					1			
DORKING TOWN SW STN (33KV)	3						3			
GUILDFORD GRID	8	3				7	1	3		
GUILDFORD GRID 132 KV		3						3		
HAMPTON 33KV		1					1			
KINGSTON GRID		23					23			
KINGSTON GRID 132 KV		4					4			
LEATHERHEAD GRID	19					19				
TWA HAMPTON		2					2			
TWICKENHAM GRID 132 KV		2						2		
TWICKENHAM GRID 33KV	2	12				2		12		
WEST WEYBRIDGE GRID	8	1	1			8		2		
WEST WEYBRIDGE GRID 132 KV	2					2				

**Table 6.** Primary Transformers

Substation	No. HI1	No. HI2	2015 No. HI3	No. HI4	No. HI5	No. HI1	No. HI2	2023 No. HI3	No. HI4	No. HI5
ASSTEAD 11KV		2						2		
BANSTEAD 33/11KV		1		1				1		1
BERRYLANDS 33/11KV			2							2
BETCHWORTH 33/11		2						2		
BROOKWOOD 33/11		2					1	1		
CERL 33/11KV				2						2
CHERTSEY 33/11KV		2						2		
COBHAM (SURREY) 33/11KV		2					2			
DORKING TOWN 33/11KV	2					2				
EFFINGHAM 33/11		2					2			
EPSOM 33/11KV		2					1	1		
ESHER 33/11KV		3						3		
EWELL 33/11KV		2	1					3		
GUILDFORD _A_ 33/11		1	1					1	1	
GUILDFORD _B_ 11KV		1	1						1	1
GUILDFORD 33/6.6		1					1			
HAM 33/11KV		2						2		
HAMPTON 33/11KV		2						2		
HORSELL 33/11KV			1		1					2
KINGSTON 33/11KV		2	2				2		2	
LEATHERHEAD GRID 132 KV	1	3				1		3		
LEATHERHEAD TOWN 33/11KV	1	1				1	1			
MERROW 33/11		2					1	1		
MOLESEY 33/11KV		2					1	1		
NORTH CHESSINGTON 33KV			1	1					1	1
OLD WOKING 33/11KV		1	1					2		



All of the cost numbers displayed in this document are before the application of on-going efficiencies and real price effects.

Substation	No. HI1	No. HI2	2015 No. HI3	No. HI4	No. HI5	No. HI1	No. HI2	2023 No. HI3	No. HI4	No. HI5
RICHMOND 33/11KV		2		1				2		1
SHALFORD 33/11		2					1	1		
SURBITON 33/11KV		1		1			1			1
TEDDINGTON 33/11KV		2						2		
TWICKENHAM 33/11KV		3			1		2			2
WALTON 33/11KV		2						2		
WEYBRIDGE 33/11KV		2					2			
WOKING 33/11		1			1		1			1

**Table 7.** 66 and 132kV Circuit Breakers

Substation	No. HI1	No. HI2	2015 No. HI3	No. HI4	No. HI5	No. HI1	No. HI2	2023 No. HI3	No. HI4	No. HI5
CHESSINGTON GRID 132 KV			2	2	3					7
KINGSTON GRID 132 KV	2						2			
LALEHAM GRID 132 KV	2						2			
LEATHERHEAD GRID 132 KV			2	2						4
WEST WEYBRIDGE GRID 132 KV	1		3		5		1		1	7

**Table 8.** Grid Transformers

Substation	No. HI1	No. HI2	2015 No. HI3	No. HI4	No. HI5	No. HI1	No. HI2	2023 No. HI3	No. HI4	No. HI5
BYFLEET GRID 132 KV	1	2				1	1	1		
CHESSINGTON GRID 132 KV		3						3		
GUILDFORD GRID 132 KV		1	1					1	1	
KINGSTON GRID 132 KV			3	1					2	2
LEATHERHEAD GRID 132 KV	1	3				1		3		
TWICKENHAM GRID 132 KV		2						2		
WEST WEYBRIDGE GRID 132 KV	1	2	2				3	2		
WOKING SENTRUM GRID 132/11KV	2					1	1			

All of the cost numbers displayed in this document are before the application of on-going efficiencies and real price effects.

### 3.3 Security of supply and load index analysis

Key: ■ LI5 ■ LI4 ■ DSR

Substation	Season	First Limitation	FC NOW (MVA)	FC ED1 Start (MVA)	RIIO-ED1 without intervention				FC ED1 end (MVA)	2022 (S) 22/23 (W)	P2/6 Class at End of ED1	Capacity added from ED1 Intervention	Notes
					2014 (S) 14/15 (w)	2022 (S) 22/23 (W)	2014 (S) 14/15 (w)	2022 (S) 22/23 (W)					
Ashtead	W	Transformer	19.5	19.5	13.6	14.2	LI1	LI1	19.5	LI1	C	-	
Banstead	W	Switchgear	22.8	22.8	21.0	22.1	LI2	LI2	24.8	LI2	C	2.02	DSR
Berrylands	W	Circuit(s)	21.7	21.7	17.3	18.5	LI1	LI2	21.7	LI2	C	-	
Betchworth Total	W	Transformer	14.9	14.9	7.2	7.5	LI1	LI1	14.9	LI1	B	-	
Brookwood	W	Switchgear	22.8	22.8	25.7	27.1	LI5	LI5	37.0	LI1	C	14.14	
Byfleet 132/11	W	Switchgear	38.1	38.1	25.4	26.5	LI1	LI1	38.1	LI1	C	-	
Byfleet 132/33	S	Transformer	90.0	90.0	74.0	91.4	LI2	LI5	90.0	LI5	D	-	
CERL	S	Transformer	10.0	10.0	11.2	11.2	LI5	LI5	18.0	LI1	B	8.04	
Chertsey	W	Switchgear	22.9	38.1	25.5	26.2	LI1	LI1	38.1	LI1	C	-	
Chessington Grid	W	Switchgear	228.7	228.7	138.8	145.7	LI1	LI1	228.7	LI1	D	-	
Cobham (Surrey)	W	Switchgear	22.9	22.9	20.9	22.3	LI2	LI3	22.9	LI4	C	-	
Dorking	W	Aux Equipment	34.3	34.3	18.9	19.7	LI1	LI1	34.3	LI1	C	-	
Effingham	W	Aux Equipment	23.0	23.0	14.2	15.8	LI1	LI1	23.0	LI1	C	-	
Epsom	W	Aux Equipment	22.9	22.9	23.4	24.6	LI5	LI5	23.0	LI5	C	0.13	
Esher	W	Aux Equipment	48.0	48.0	39.9	41.6	LI2	LI2	48.0	LI2	C	-	
Ewell	W	Aux Equipment	45.8	45.8	33.1	34.6	LI1	LI1	48.0	LI1	C	2.22	
Guildford 6.6kV	S	Aux Equipment	11.5	11.5	5.4	5.4	LI1	LI1	11.5	LI1	B	-	
Guildford Grid	W	Aux Equipment	114.3	114.3	94.9	98.6	LI2	LI2	114.3	LI2	D	-	
Ham	W	Aux Equipment	19.0	19.0	14.5	15.4	LI1	LI2	19.0	LI2	C	-	
Hampton	W	Aux Equipment	22.9	22.9	17.7	18.8	LI1	LI2	22.9	LI2	C	-	
Horsell	W	Aux Equipment	17.8	17.8	15.7	16.4	LI2	LI2	17.8	LI2	C	-	
Kingston	S	Aux Equipment	54.0	54.0	39.5	41.3	LI1	LI1	54.0	LI1	C	-	
Kingston Grid	W	Aux Equipment	175.5	175.5	130.0	138.4	LI1	LI1	175.5	LI1	D	-	
Leatherhead Grid	W	Aux Equipment	171.6	171.6	126.1	131.7	LI1	LI1	171.6	LI1	D	-	
Leatherhead Town	W	Aux Equipment	23.8	23.9	19.4	20.3	LI2	LI2	23.9	LI2	C	-	
Merrow	W	Aux Equipment	23.0	23.0	20.3	21.9	LI2	LI3	48.0	LI1	C	25.00	
Molesey	W	Aux Equipment	22.0	22.0	15.8	16.7	LI1	LI1	22.0	LI1	C	-	
North Chessington	S	Aux Equipment	15.0	15.0	12.0	12.7	LI2	LI2	15.0	LI2	C	-	
Old Woking	W	Aux Equipment	13.0	16.9	13.0	13.9	LI1	LI2	23.9	LI1	C	6.98	
Richmond	W	Aux Equipment	45.8	45.8	28.7	30.3	LI1	LI1	45.8	LI1	C	-	
Shalford	W	Aux Equipment	22.9	22.9	19.9	20.8	LI2	LI2	22.9	LI2	C	-	
Surbiton	W	Circuit(s)	24.0	24.0	16.2	17.4	LI1	LI1	24.0	LI1	C	-	
Teddington	W	Switchgear	22.9	22.9	15.0	16.8	LI1	LI1	22.9	LI1	C	-	
Twickenham	W	Switchgear	68.6	68.6	40.3	42.9	LI1	LI1	68.6	LI1	C	-	
Twickenham Grid	W	Switchgear	114.3	114.3	90.9	96.3	LI1	LI2	114.3	LI2	D	-	
W. Weybridge 132/11	W	Switchgear	70.0	70.0	33.6	33.6	LI1	LI1	70.0	LI1	C	-	
W. Weybridge 132/33	W	Switchgear	68.6	68.6	72.1	74.3	LI5	LI5	114.3	LI1	D	45.68	
Walton	W	Switchgear	38.1	38.1	24.1	25.1	LI1	LI1	38.1	LI1	C	-	
Weybridge	S	Transformer	17.3	17.3	18.3	18.8	LI5	LI5	23.0	LI2	C	5.77	
Woking Town	S	Transformer	20.0	20.0	14.1	14.6	LI1	LI1	20.0	LI1	C	-	
Guildford A 11kV	S	Transformer	17.3	17.3	24.3	24.9	LI5	LI5	22.4	LI5	C	5.14	
Guildford B 11kV	S	Transformer	18.0	18.0	19.9	20.4	LI5	LI5	22.6	LI2	C	4.60	

**Table 9.** Planning Load Estimates Table

All of the cost numbers displayed in this document are before the application of on-going efficiencies and real price effects.

Chessington and Laleham GSP's are class D sites in terms of P2/6 compliance, whilst West Weybridge GSP is a class E site. Chessington GSP is projected to be out firm by 2014 (winter). However this can be resolved by transferring Leatherhead Grid load from Chessington GSP to West Weybridge GSP utilising existing interconnection between the two GSP's. The same strategy will effectively resolve firm capacity issues regarding Chessington SGT1 and SGT4A. All GSP sites are P2/6 compliant for both N-1 conditions and N-2 conditions as required.

The shaded rows in table 9 above depict firm capacity violations at nine different sites over DPCR5 and ED1 periods. The worst affected primary sites are West Weybridge 132/33kV, Weybridge 33/11kV primary, Guildford A 33/11kV primary, Guildford B 33/11kV primary, Epsom 33/11kV primary, CERL 33/11kV primary, and Brookwood 33/11kV primary. Gate B project proposals to address the firm capacity violation at Weybridge 33/11kV and Brookwood primary sites have already been approved by RPfB. Currently P2/6 compliance for all sites with firm capacity violations are being addressed through post fault transfer support.

West Weybridge Grid is currently out firm owing to the limitation of the existing 60MVA transformers. However the substation 33kV switchboard is directly interconnected with Byfleet Grid at 33kV switchboard for P2/6 compliance and post fault transfer support. It is proposed to increase the capacity of the interconnector and switchgear rating during ED1 in order to enhance post fault transfer capacity.

Byfleet 132/33kV substation is projected to be out of firm capacity limited by the existing transformer tails on the newly connected GT2A 90MVA transformer and relies on 33kV post fault transfer support from West Weybridge for P2/6 compliance. Upgrading of the transformer tails is scheduled for 2014.

It is proposed to address firm capacity issues for the following sites: - Weybridge 33/11kV primary, Guildford A 33/11kV primary, Guildford B 33/11kV primary, Epsom 33/11kV primary, CERL 33/11kV primary, Cobham 33/11kV primary, primary and Brookwood 33/11kV primary

**Table 10.** LI Profile (Without Investment)

SUBSTATION	VOLTAGE (KV)	LOAD INDEX	
		2015	2023
<b>Chessington SGT1 &amp;4A</b>	275/132		
<b>Chessington Grid</b>	132/33kV	LI1	LI1
Cobham (Surrey)	132/33	LI2	LI3
Epsom	33/11	LI5	LI5
Esher	33/11	LI1	LI1
Ewell	33/11	LI2	LI2
North Chessington	33/11	LI2	LI2
<b>Leatherhead Grid</b>	132/33	LI1	LI1
Ashted	33/11	LI1	LI1
Banstead	33/11	LI2	LI2
Betchworth T2	33/11	LI1	LI1
Capel T2 (Total)	33/11	LI3	LI4
CERL	33/11	LI5	LI5
Dorking	33/11	LI1	LI1
Effingham	33/11	LI1	LI1
Leatherhead Town	33/11	LI2	LI2

## Laleham / West Weybridge / Chessington

All of the cost numbers displayed in this document are before the application of on-going efficiencies and real price effects.

Substation	Voltage (kV)	Load Index	
		2015	2023
<b>Chessington SGT 2&amp;4B</b>	275/132	LI1	LI1
Kingston Grid	132/33	LI1	LI1
Berrylands	33/11	LI1	LI2
Hampton	33/11	LI1	LI2
Kingston	33/6.6	LI1	LI1
Molesey	33/11	LI1	LI1
Surbiton	33/11	LI1	LI1
Teddington	33/11	LI1	LI1
<b>Laleham GSP</b>	275/132	LI5	LI5
Twickenham Grid	132/33	LI1	LI2
Ham	33/11	LI1	LI2
Mogden STW	33/11	TBA	TBA
Richmond	33/11	LI1	LI1
TWA Hampton	33/6.6	TBA	TBA
Twickenham	33/11	LI1	LI1
<b>West Weybridge GSP</b>	400/132	LI1	LI1
<b>Byfleet 132/11</b>	33/11	LI1	LI1
<b>Byfleet 132/33</b>	33/6.6	LI2	LI5
Broad Oaks Data Centre	33/11	TBA	TBA
Brookwood	33/10	LI5	LI5
Horsell	132/33	LI2	LI2
Old Woking	33/11	LI1	LI2
Woking Town	33/11	LI1	LI1
<b>Guildford Grid</b>	132/33	LI2	LI2
Guildford 6.6kV	33/6.6	LI1	LI1
Guildford A 11kV	33/11	LI5	LI5
Guildford B 11kV	33/11	LI5	LI5
Marrow	33/11	LI2	LI3
Shalford	33/11	LI2	LI2
<b>W. Weybridge 132/11</b>	132/11	LI1	LI1
<b>W. Weybridge 132/33</b>	132/33	LI5	LI5
Chertsey	33/11	LI1	LI1
Walton	132/33	LI1	LI1
Weybridge	33/11	LI5	LI5
<b>Woking Sentrum Grid 132/11</b>	132/11	TBA	TBA



All of the cost numbers displayed in this document are before the application of on-going efficiencies and real price effects.

### 3.4 Operational and technical restrictions

**Table 11.** - Cable constraints

Asset Name	Site Name	Parish	Gis Ref	CB No	Post Code	Voltage
1103	RIVER MOLE WATERWAY ROAD LEATHERHEAD	Leatherhead	TQ1619056370	CB027	KT22 9DQ	HV
1201	RIVER WEY BROOKLANDS PIPE BRIDGE	Weybridge	TQ0687163026	CB001	KT13 0SL	33AB
1202	RIVER WEY BROOKLANDS ROAD BRIDGE	Weybridge	TQ0690262873	CB002	KT13 0SL	HV
	RIVER WEY NAVIGATION	Weybridge	TQ055620		KT14 7HQ	33kV and 132kV

### **3.5 National Grid**

#### **Chessington GSP**

This site is occupied by SPN only and is therefore classified as a sole user site. National Grid's (NG) supply via Chessington SGT1 and SGT4 is secure until at least 2023 based on extrapolated load growth data by NG. However this only applies when Leatherhead Grid is supplied from West Weybridge GSP instead of Chessington GSP or Woking Sentrum load is directed to West Weybridge Grid instead of Leatherhead Grid. SPN owns the busbars, bus-sections and bus-couplers and operates the site. The substation is an outdoor AIS design rated at 15.3kA (3-ph & 1-ph). SPN demand is supplied by 4 off 275/132kV SGTs, 2 of which are coupled onto a solid busbar and the remaining two, each supply a 132 kV cable to Kingston. The demand on each of the separate pairs is <300MW (CAT D). (FCO = 1x240; SCO = 2x240). NG's business plan calls for Chessington GSP to be upgraded to a 400kV site in 2017, which is still subject to confirmation by NG. Upgrading of the site to 400kV will affect the proposed replacement of CHI1 and CHI2 switchgear and replacement of SGT4A and SGT4B during 2024/25. UKPN commissioned Siemens to determine whether the HI5 132kV switchgear would be refurbished or replaced and this is yet to be confirmed.

#### **Laleham GSP**

This site is occupied by SPN and SSE and is therefore classed as a shared site. NG owns the busbars, bus-sections and bus-couplers and operates the site. The substation is an indoor double busbar 132kV GIS substation rated at 31.5 kA. The demand at the site is supplied by 2 off 275/132kV 180MVA SGTs & 2 off 275/132kV 240MVA SGTs. The combined site demand is <300MW (CAT D), (FCO = 1x240; SCO = 2x240). Currently there are no supply issues in connection with this site.

#### **West Weybridge GSP**

This site is occupied by SPN only and is therefore classed as a sole user site. SPN owns the busbars, bus-sections and bus-couplers and operate the site. The substation is an outdoor AIS design rated at 15.3kA (3-ph & 1-ph). SPN demand is supplied by 6 off 400/132kV SGTs. SGTs 1A/3A (115MVA) & SGT 1B/3B (180MV) are banked pairs with SGT2A & 4A being separately connected 240MVA units. SGT1A, 1B & 3B are normally operated on standby. The combined demand at the site is >300MW (CAT E). (FCO = 2x120; SCO = 2x120 + 2x180)

The existing 132kV AIS switchgear is being replaced with 132kV GIS switchgear and scheduled for completion by 2014.

NG reported that SGTs 1B/3B (both 180MVA SGTs) are due for asset replacement in 2015/16 with 240MVA units to ensure continued group compliance after removal of the 120MVA units. The cable restrictions are to be removed when this work occurs. SGTs 2A & 4A (both 240MVA SGTs) are due for replacement post 2022.

### **3.6 Smart Demand Response**

Eight sites under this RDP have been identified for participation in the proposed smart demand response to reduce peak load with a view to delay proposed reinforcement work. The sites include Horsell 11kV, Twickenham 11kV, Old Woking 11kV, Ewell 11kV, Cobham Surrey 11kV, Chertsey 11kV, Brookwood 11kV and Banstead 11kV. Studies are still in progress to determine the level of investment and expected benefits from the proposed smart solutions.

## 4 RECOMMENDED STRATEGY

The network strategy for this area is designed to ensure:

- Continued adherence to the security of supply criteria defined in Engineering Recommendation P2/6
- Maintaining reliable network operation by asset replacement, or refurbishment, of poorly performing equipment identified through asset condition monitoring (HI) techniques

Whenever possible the asset replacement and reinforcement works are to be co-ordinated to achieve balanced economies of scale.

The South East Plan for Surrey County and Gatwick Diamond plan offer both challenges and opportunities for network development. The forecast additional load demand of 50MW attributed to new housing developments can be easily supplied from the existing network.

Chessington GSP is projected to be out of firm capacity by 2014 (W). The site firm capacity is limited by the existing supergrid transformers. However reinforcement of the site is currently not justified since there is an available option to transfer load attributed to Leatherhead Grid to West Weybridge GSP while load attributed to Kingston Grid can be shared with Wimbledon GSP. This strategy will keep Chessington GSP firm beyond 2023 (ED1 period). Replacement of Chessington 132kV switchgear has been revised to refurbishment after successful trial of a refurbishment exercise at the same site.

The peak load at Guildford Grid is currently projected to exceed 100MW, which requires N-2 support for P2/6 compliance. While the site is still firm and P2/6 compliant based on N-2 post fault transfer support from the 11kV network, it is necessary to reinforce the site to a 3x90MVA transformer site in order to maintain N-2 P2/6 compliance into the future. This will be achieved by installing a third 90MVA transformer and a new 132kV cable circuit fed from Leatherhead Grid. It is proposed to develop this project in two stages where the first stage involves installation of a 132kV cable circuit between Effingham and Guildford Grid operated at 33kV and the second stage involves installing a 9km 132kV cable circuit between Effingham and Leatherhead Grid to complete the 132kV reinforcement project.

A new primary site in Tadworth is being proposed in order to relieve load from Banstead primary with a view to improve firm capacity into the future as previous PLE's have recorded a load index of 4. The proposed substation will be constructed on an existing UKPN piece of land with 33kV circuits supplied from Leatherhead Grid or Sutton Grid. However work to develop the new substation has been deferred to ED2 and replaced with DSR intervention.

### 4.1 Asset Replacement

The following projects are identified in this RDP as interventions to address assets with poor health indices: -

#### **3126 - West Weybridge - Replace 132kV Switchgear (2007 - 2014)**

West Weybridge 132 kV substation is equipped with Reyrolle OB14 air blast circuit breakers. The 8 SPN and 6 NGT OB14 Air Blast circuit breakers represent a significant risk to both personnel and system security and projected to be HI5 by 2024. They are currently being replaced in conjunction with works by NGT .

#### **3286 - Chertsey 11kV Primary Switchgear Change (2013 - 2014)**

Chertsey 11kV Primary South Wales C4X switchgear was installed 1962. The switchgear has been identified by AOT as being in poor mechanical condition and projected to be HI5 by 2024. This includes the failure of shutter mechanisms to operate when CB trucks are racked out, and the poor condition of the secondary wiring and the earthing equipment. The CBs regularly fail to operate remotely which necessitates frequent site attendance by maintenance staff thereby increasing OPEX costs. The project provides for the switchgear to be completely replaced with modern vacuum 25kA 630A feeder CBs and 2000A transformer CBs to enable the future upgrading of the transformers to 20/40MVA units when required. An optimised Gate B paper has already been approved by RPFb incorporating 33kV cable reinforcement (3189) and Chertsey ITC (3702).

All of the cost numbers displayed in this document are before the application of on-going efficiencies and real price effects.

**3368 - Chessington Grid - Esher 33kV No.1 and 2 (Section D-F) (2012- 2013)**

The Chessington Grid - Esher 33kV No.1 and 2 (Section D-F) circuits have been identified as requiring refurbishment and projected to be in HI4 by 2024. The other sections of the circuits have been replaced. FFC joints will be refurbished as they are the source of leaks. This project aligns with Fluid Filled Cable (FFC) Management Strategies. Part of the strategy is to refurbish the joints on aluminium sheath cables to extend their operational life and to reduce the likelihood of an environmental incident occurring.

**3751 - Chessington 132 kV Switchgear Refurbishment (2013 - 2014)**

National Grid has scheduled replacement of their Reyrolle OBYR14 Air Blast Circuit Breakers at Chessington on grounds of condition and maintainability. National Grid own four incoming SGT CBs, but the rest of the infrastructure comprising the busbars and 7 in-service feeder bays are owned by SPN. The condition assessment of these 7 x Reyrolle OBYR 14 Air Blast 132kV CBs installed at Chessington Grid 132kV has shown that the probability of failure due to degradation of these assets will become unacceptable . and projected to be in HI5 by 2024. It is not possible to keep these assets in use without compromising operational requirements, therefore this project recommends the refurbishment of this equipment. Completion of this project will see 7 x 132kV CBs refurbished

**4163 - Ashtead Primary - Replace 11KV Switchgear (2017 - 2018)**

Ashtead Primary is equipped with 9 x Reyrolle C-gear which were all manufactured between 1959 and 1963 and projected to be HI4 by 2024. They will be replaced at the end of their nominal life due to age-related deterioration and based on their overall condition.

**4167 - Ewell Primary - Retrofit 11kV switchgear (2020 - 2021)**

Ewell Primary is equipped with 18 X Reyrolle C-gear all manufactured in 1961/1962 and projected to be HI4&5 by 2024. They will be retrofitted at the end of their nominal life due to age-related deterioration and based on their overall condition

**4143 - Richmond 33/11kV Replace T1 (2016-2017)**

The condition of the 1957 T1 transformer installed at Richmond 33/11kV has shown that the probability of failure due to degradation is very high and projected to be HI5 by 2024. It is proposed to replace this transformer to avoid unacceptable interruptions of supply.

**7815 - Leatherhead Town 33/11KV - Replace 11kV S/G (2022-2023)**

The condition assessment of the 1989 GEC VMX Vacuum Switchgear installed at Leatherhead Town 33/11kV has shown that the probability of failure due to degradation is very high and projected to be HI3,4&5 by 2024. It is not possible to keep these assets in use without compromising operational requirements. Therefore this project recommends its replacement. Completion of the project will see 9 circuit breakers replaced with 9 new circuit breakers.

**7832 - Molesey 33/11kV - Retrofit 11kV switchgear (2020-2021)**

The condition assessment of the 1966 Reyrolle LMT Oil Switchgear installed at Molesey 33/11kV has shown that the probability of failure due to degradation is very high and projected to be HI2,3&4 by 2024. It is not possible to keep these assets in use without compromising operational requirements; therefore this project recommends its refurbishment. Completion of the project will see 9 circuit breakers refurbished.

**7835 - North Chessington 33kV - Retrofit 11kV S/G (2020-2021)**

The condition assessment of the 1958 Reyrolle C gear Oil Switchgear installed at North Chessington 33kV has shown that the probability of failure due to degradation is very high and projected to be HI2,3&4 by 2024. It is not possible to keep these assets in use without compromising operational requirements; therefore this project recommends its refurbishment. Completion of the project will see 7 circuit breakers refurbished.

**7848 - Twickenham 33/11kV - Retrofit 11kV S/G (2019-2020)**

The condition assessment of the 1964 Reyrolle C gear Oil Switchgear installed at Twickenham 33/11kV has shown that the probability of failure due to degradation is very high and projected to be HI1,3&4 by 2024. It is not possible to keep these assets in use without compromising operational requirements; therefore this project recommends its refurbishment. Completion of the project will see 8 circuit breakers refurbished.



**7888 - Guildford Grid 132kV - Refurbish GT1 (2021-2022)**

The condition assessment of the 1964 English Electric Grid Transformer with English Electric FDB tap changer installed at Guildford Grid has shown that the probability of failure due to degradation is very high and projected to be HI5 by 2024. It is not possible to keep these assets in use without compromising operational requirements; therefore this project recommends its refurbishment. Completion of the project will see 1 Grid Transformer refurbished.

**7895 - Kingston Grid 132kV - Replace GT1, GT2, GT3, GT4 (2017-2020)**

The condition assessment of the 1960/61 Hackbridge Hewitt Grid Transformers with AEI M52 tap changers installed at Kingston Grid has shown that the probability of failure due to degradation is very high and projected to be HI4&5 by 2024. It is not possible to keep these assets in use without compromising operational requirements; therefore this project recommends its replacement.

**7894 - Kingston 33/11kV - Refurbish T3, T4 (2018-2020)**

The condition assessment of the 1972 Ferranti Primary Transformers with Ferranti DS2 tap changers installed at Kingston 33/11kV has shown that the probability of failure due to degradation will become unacceptable. It is not possible to keep these assets in use without compromising operational requirements. Completion of the project will see 2 transformer refurbished

**7874 - Banstead 33/11kV - Refurbish T2 (2016-2017)**

The condition assessment of the 1960 Hackbridge Hewitt Primary Transformer with Hackbridge M21 tap changer installed at Banstead has shown that the probability of failure due to degradation will become unacceptable. It is not possible to keep this asset in use without compromising operational requirements; therefore this project recommends its refurbishment.

**7875 - Berrylands 33/11kV - Replace T2 (2020-2023)**

The condition assessment of the 1969 Bonar Long Primary Transformer with Fuller F317 tap changers installed at Berrylands 33/11kV has shown that the probability of failure due to degradation is very high. It is not possible to keep this asset in use without compromising operational requirements; therefore this project recommends its replacement.

**7898 - North Chessington 33kV - Replace T1, T2 (2019-2021)**

The condition assessment of the 1958 Ferranti Primary Transformers with Ferranti Rotary tap changers installed at North Chessington 33kV has shown that the probability of failure due to degradation is very high. It is not possible to keep these assets in use without compromising operational requirements; therefore this project recommends its replacement.

**7890- Horsell 33/11kV - Replace T1, T2 (2017-2020)**

The condition assessment of the 1990 ABB Nitran Primary Transformers with ATL AT tap changers installed at Horsell Primary has shown that the probability of failure due to degradation is very high. It is not possible to keep these assets in use without compromising operational requirements; therefore this project recommends its replacement. Completion of the project will see 2 x 12/24MVA Primary Transformers replaced with 2 x 20/40MVA new Primary Transformers.

**7909 - Surbiton 33/11kV - Replace T1 (2016-2019)**

The condition assessment of the 1968 English Electric Primary Transformer with Fuller FBA tap changer installed at Surbiton 33/11kV has shown that the probability of failure due to degradation is very high. It is not possible to keep this asset in use without compromising operational requirements; therefore this project recommends its replacement. Completion of the project will see 1 transformer replaced with 1 new transformer.

**7914 - Twickenham 33/11kV - Refurbish T4 (2014-2016)**

The condition assessment of the 1964 English Electric Primary Transformers with Fuller HS tap changers installed at Twickenham 33/11kV has shown that the probability of failure due to degradation is very high. It is not possible to keep this asset in use without compromising operational requirements; therefore this project recommends its refurbishment. Completion of the project will see 1 transformer refurbished.

### **7917 - Woking 33/11 - Refurbish T1 (2015 - 2016)**

The condition assessment of the 1963 Fuller Electric Primary Transformer with Fuller HS tap changer installed at Woking 33/11kV has shown that the probability of failure due to degradation will become unacceptable and projected to be H15 by 2024. It is not possible to keep this asset in use without compromising operational requirements; therefore this project recommends its refurbishment. Completion of the project will see 1 transformer refurbished.

## **4.2 Reinforcement**

The following projects are identified in this RDP as reinforcement projects to improve network reliability and resilience: -

### **3193 - Epsom 33/11kV – Reinforcement (2019-2024)**

This project involves installing 1 x 12/24 MVA transformer, addition of a 3rd underground cable circuit from Chessington, addition of 1 x 33kV breaker, and replacement of the Reyrolle C5T/6T 12 panel 11kV switchboard in order to increase winter firm capacity from 22.9MVA to 40MVA.

### **3701 - Capel 33/11kV Substation. ITC (2020-2023)**

This project involves replacement of existing transformers with larger units in order to increase winter firm capacity from 10MVA to 24MVA.

### **3702 - Chertsey 33/11kV Substation, ITC. (2014 - 2015)**

This project involves installation of one new 20 /40 MVA transformer and banking the existing transformers. This will give a firm capacity of 25 / 26.5MVA. The 11kV switchgear will also be updated but this will be done as part of project 3286.

### **3726 - Old Woking 33/11kV ITC. (2014 - 2015)**

This project involves installation of two new 12/18/24MVA transformers in place of the existing 10MVA units to increase winter firm capacity to 24MVA

### **3744 - Weybridge 33/11kV substation ITC – (2016-2018)**

This project involves replacement of T1/T2 with 20/40 MVA units, replacement the 11 panel SWB, and installation of two new 33kV circuits from West Weybridge in order to increase summer firm capacity from 17.3MVA to 30MVA. This project interacts with project 3537 which involves replacing the existing 33kV FFC circuits that supply Weybridge substation.

### **3753 - Guildford Grid 33 kV Switchgear Replacement – (FL) Required for 3 txf's in parallel (2014-2018)**

This project involves replacement the existing 33kV switchgear with a new 13-breaker switchboard in order to increase the fault level from 17.5kA to 30kA.

### **5543 - Guildford Grid 132/33kV - ITC (2015 - 2017)**

This project involves installation of a 3rd 132kV UGC circuit and addition of a third 132/33kV grid transformer for N-2 P2/6 compliance.

### **7886 - Guildford A 33kV/11kV - ITC (2016 - 2019)**

This project involves replacement of T5 and T6 with new 2 x 12/40 MVA transformers. It is also proposed to replace 200m of DC 33kV underground cables from Guildford Grid with new 40MVA cables.

### **7887/8154 - Guildford B 11kV – ITC and Replacement of the 11kV switchboard for fault duty (2014 - 2016)**

This project involves replacement of T1 and T2 with new 2 x 20/40 MVA transformer/s, replacing 200 m of DC 33kV underground cables with 40 MVA cable and replacement of a 17 panel 11kV switchboard.

#### **8015 - Merrow 33kV/11kV Reinforcement - Third 12/24 MVA Transformer, 3 km of UGC Circuit & Replace 10 Panel SWB (2020-2023)**

This project involves installing an additional 12/24 MVA transformer, 3 km of underground 33kV cable circuit from Guildford, and replacement of the existing 8 panel switchboard in order to increase winter firm capacity from 23MVA to 48MVA.

#### **8037 - Guildford Grid 132kV Reinforcement for (N-2) - Installation of a 3rd 132kV circuit (Phase 1 Guildford to Effingham) (2015 - 2019)**

This project involves installing a third 132kV circuit from Leatherhead 132kV mesh to Guildford to supply a third 90MVA 132/33kV transformer at Guildford Grid for N-2 P2/6 compliance. This project is linked to project 5543 which will add a third 132/33kV transformer at Guildford (N-2).

#### **8092 - CERL 33kV/11kV – ITC (2014-2017)**

This project involves replacing 2 x 10 MVA transformers with 2x12/24 MVA transformers. This is an optimised project with project 7879 to asset replace T1 and T2 projected to be HI5 by 2024

#### **8148 - Brookwood 33kV/11kV – ITC (2014-2016)**

This project involves installing an additional 1 x 12/24 MVA transformer and a third 9.6 km of underground cable from Byfleet.

#### **8149 - Byfleet 132kV/11kV & 132/33kV group - 132kV OHL conductor replacement (2014 - 2017)**

This project involves replacing 3.4 km of 132kV OHL conductor from West Weybridge Grid to Byfleet Grid with higher rated conductors in order to increase winter firm capacity from 130MVA to 156MVA.

#### **8151 - Byfleet 132kV/33kV & West Weybridge 132kV/33kV Group - ITC (2014 - 2017)**

This project involves replacing the 12 panel 33kV switchboard at West Weybridge with new switchboard indoor switchboard and replace 1 km of 33kV UGC on the Byfleet end of the interconnector in order to increase winter firm capacity from 68.6MVA to 78MVA.

#### **8091 – New Tadworth 33/11kV Substation to Relieve Banstead (2016-2024)**

This project involves constructing a new primary at Tadworth 33/11kV because the existing Banstead primary footprint has limited space to accommodate an additional transformer. This project is deferred and substituted with DSR intervention.

#### **8500 - Chertsey - 33kV cable uprating (2014-2015)**

This project involves replacing the two cabled end sections on each of the existing circuits supplying Chertsey primary to provide fully rated circuits.

### 4.3 Summary of proposed interventions

**Table 12.** – Summary of Project Investments

Substation	Driver	Commissioning Year	Scope of works	Existing Firm Capacity	New Firm capacity
Leatherhead Town 33/11kV	Asset replacement	2023	Replace 11kV S/G	22.9MW	22.9MW
Ashtead 11kV	Asset replacement	2018	Replace 11kV switchgear	19.3MW	19.3MW
Epsom 33/11kV	Asset replacement	2023	Retrofit 11kV switchgear	22.6MW	22.6MW
Ewell 33/11kV	Asset Retrofit	2021	Retrofit 11kV switchgear	45.3MW	45.3MW
Molesey 33/11kV	Asset Retrofit	2021	Retrofit 11kV switchgear	20.9MW	20.9MW
North Chessington 33/11kV	Asset Retrofit	2019	Retrofit 11kV S/G	18.7MW	18.7MW
Twickenham 33/11kV	Asset Retrofit	2020	Retrofit 11kV S/G	67.9MW	67.9MW
Guildford Grid 132kV	Asset Refurbishment	2022	Refurbish GT1	109.7MW	109.7MW
Kingston Grid 132kV	Asset replacement	2018	Replace GT1, GT2, GT3, GT4	166.7MW	166.7MW
Woking Town 33/11kV	Asset Refurbishment	2016	Refurbish T1	23.8MW	23.8MW
CERL 33/11kV	Asset Refurbishment	2020	Retrofit 11kV switchgear	12.5MW	12.5MW
Guildford _A_ 33/11kV	Asset refurbishment	2020	Replace T5 & T6	21.9MW	21.9MW
Kingston 33/11kV	Asset Refurbishment	2019	Refurbish T3, T4	65.4MW	65.4MW
Banstead 33/11kV	Asset refurbishment	2017	Refurbish T2	22.6MW	22.6MW
Twickenham 33/11kV	Asset refurbishment	2015	Refurbish T4	67.9MW	67.9MW
Berrylands 33/11kV	Asset replacement	2021	Replace T1 & T2	21.5MW	40MW
North Chessington 33kV	Asset replacement	2020	Replace T1, T2	18.7MW	24MW
Guildford _B_ 11kV	Asset replacement	2018	Replace T1 & T2	23MW	23MW
Horsell 33/11kV	Asset replacement	2018	Replace T1, T2 (Nitrax)	17.4MW	40MVA

All of the cost numbers displayed in this document are before the application of on-going efficiencies and real price effects.

Substation	Driver	Commissioning Year	Scope of works	Existing Firm Capacity	New Firm capacity
Surbiton 33/11kV	Asset replacement	2017	Replace T1	23.3MW	23.3MW
Richmond 33/11kV	Asset replacement	2018	Replace T1	45.3MW	45.3MW
Epsom 33/11kV	Site Reinforcement		ITC	22.6MW	40MVA
Banstead 33/11kV Substation	Site Reinforcement		ITC	22.6MW	New 12/24MVA site proposed (Tadworth)
Brookwood 33/11kV Substation	Site Reinforcement		ITC	22.6MW	40MVA
Capel 33/11kV Substation	Site Reinforcement		ITC		24MVA
Chertsey 33/11kV Substation	Site Reinforcement		ITC	21.9MW	40MVA
CERL 33/11kV	Site Reinforcement		ITC	12.5MW	24MVA
Guildford A 11kV	Site Reinforcement		ITC.	21.9MW	40MVA
Guildford B 11kV	Site Reinforcement		ITC.	23MW	40MVA
Horsell 33/11kV	Site Reinforcement		ITC.	17.4MW	40MVA
Merrow 33/11kV	Site Reinforcement		ITC.	21.9MW	48MVA
Old Woking 33/11kV	Site Reinforcement		ITC.	12.5MW	24MVA
Weybridge 33/11kV substation.	Site Reinforcement		ITC.	21.9MW	40MVA
Byfleet 132/11kV Substation.	Site Reinforcement		Auto-close scheme to be installed	36.6MW	36.6MW
Guildford Grid 132/33kV -	Site Reinforcement		ITC	109.7MW	228MVA
Capel 33kV	Site Reinforcement		Auto-switching scheme	9.5MW	9.5MW
Guildford Grid 132/33kV	Site Reinforcement		Switchgear Replacement (FL)	109.7MW	109.7MW
Chertsey 33/11kV	Site Reinforcement		33kV cable uprating	21.9MW	40MVA
W. Weybridge 132/33kV	Site Reinforcement		ITC	74.9MW	114MVA



All of the cost numbers displayed in this document are before the application of on-going efficiencies and real price effects.

Table 12 above provides a list of projects identified for implementation during ED1 period. Projects highlighted in similar colour indicate where opportunities for combining or optimisation of asset replacement and reinforcement triggered projects have been identified in order to minimise costs and maximise benefits. Projects coloured in purple text have been approved at Gate B and are either completed or still in progress. New projects identified will be captured in the Common Development Plan (CDP) and allocated NAMP line numbers for budgetary purpose

All of the cost numbers displayed in this document are before the application of on-going efficiencies and real price effects.

### 4.4 Costs and phasing

**Table 13.** NLRE ED1 NAMP Table

SR_ Table J - S&R - Baseline_Final_RIIIO_ED1 Re-Submission_19th Feb_2014_15:15 (£)												
Cat	GWPID	Description	2013/2014	2014/2015	2015/2016	2016/2017	2017/2018	2018/2019	2019/2020	2020/2021	2021/2022	2022/2023
A	1.48.01	3126 West Weybridge - Replace 132KV Switchgear	525,122	111,771	0	0	0	0	0	0	0	0
A	1.50.01	3286 Chertsey 11kV Primary Switchgear Change	610,298	384,972	0	0	0	0	0	0	0	0
H	1.29.02	3537 West Weybridge-Guildford 132KV FFC - Replacement	2,434,250	477,750	0	0	0	0	0	0	0	0
A	1.55.02	3751 Chessington 132 kV Switchgear Refurbishment	144,250	40,000	0	0	0	0	0	0	0	0
A	1.51.03	4143 Richmond 33/11kV - Replace T1	0	0	0	208,101	366,410	0	0	0	0	0
A	1.50.01	4163 Ashted Primary - Replace 11kV Switchgear	0	0	0	0	307,961	776,894	0	0	0	0
A	1.50.01	4167 Ewell Primary - Retrofit 11kV Switchgear	0	0	0	0	0	0	0	86,430	112,181	0
A	1.55.02	5755 Kingston Grid FMVG CT/VT Replacement	190,266	0	0	0	0	0	0	0	0	0
A	1.50.01	7815 Leatherhead Town 33/11kV - Replace 11kV Switchgear	0	0	0	0	0	0	0	0	0	229,925
A	1.50.01	7832 Molesey 33/11kV - Retrofit 11kV Switchgear	0	0	0	0	0	0	0	69,873	65,155	0
A	1.50.01	7835 North Chessington 33kV - Retrofit 11kV Switchgear	0	0	0	0	0	0	0	0	25,809	77,427
A	1.50.01	7848 Twickenham 33/11kV - Retrofit 11kV Switchgear	0	0	0	0	0	0	65,630	53,502	0	0
A	1.51.11	7874 Banstead 33/11kV - Refurbish Primary Transformer (T2)	0	0	0	100,917	49,898	0	0	0	0	0
A	1.51.03	7875 Berrylands 33/11kV - Replace Primary Transformer (T1&T2)	0	0	0	0	0	0	0	96,615	575,727	0
A	1.51.03	7886 Guildford A 33/11kV - Replace Primary Transformers (T5 - NLRE & T6 - LRE)	0	0	46,217	234,613	383,847	486,865	0	0	0	0
A	1.51.03	7887 Guildford B 33/11kV - Replace Primary Transformers (T1-NLRE & T2 - LRE)	221,804	365,125	463,632	0	0	0	0	0	0	0
A	1.51.11	7888 Guildford Grid 132kV - Refurbish Grid Transformer (GT1)	0	0	0	0	0	0	0	0	75,969	74,846
A	1.51.03	7890 Horsell 33/11kV - Replace Primary Transformer (T1, T2)	0	0	0	0	79,344	1,024,961	0	0	0	0
A	1.51.11	7894 Kingston 33/11kV - Refurbish Primary Transformer (T3, T4)	0	0	0	0	0	113,672	187,958	0	0	0
A	1.51.01	7895 Kingston Grid 132kV - Replace Grid Transformer (GT1, GT2, GT3, GT4)	0	0	0	0	76,442	2,867,246	2,867,247	0	0	0
A	1.51.03	7898 North Chessington 33kV - Replace Primary Transformer (T1, T2)	0	0	0	0	0	0	79,344	1,024,961	0	0
A	1.51.03	7909 Surbiton 33/11kV - Replace Primary Transformer (T1)	0	0	0	82,574	492,054	0	0	0	0	0
A	1.51.11	7914 Twickenham 33/11kV - Refurbish Primary Transformer (T4)	0	75,969	74,846	0	0	0	0	0	0	0
A	1.51.11	7917 Woking 33/11 - Refurbish Primary Transformer (T1)	0	0	75,969	74,846	0	0	0	0	0	0
A	1.50.01	7922 Cerl - Retrofit 11kV Switchgear	0	0	0	0	0	0	37,731	113,192	0	0
A	1.50.01	7926 Cobham (Surrey) 33/11kV - Retrofit 11kV Switchgear	0	0	0	0	37,731	113,192	0	0	0	0
A	1.50.01	7932 Hampton 33/11kV - Retrofit 11kV Switchgear	0	0	0	0	0	0	0	0	65,630	53,502
A	1.50.01	7935 Shalford 33/11kV - Replace 11kV Switchgear	0	0	0	0	0	0	0	0	0	243,940
A	1.47.62	8372 Chertsey Primary Flood Mitigation - Raise Switchroom Extension, Transformer Bund & Base	180,249	0	0	0	0	0	0	0	0	0
H	1.29.01	8653 Chessington Grid-Ewell 33kV FFC Replacement (Circuit 1-2,Circuit3-1)	0	0	0	0	0	0	0	0	0	1,819,191
A	1.50.01	8965 Epsom 11kV Switchgear Replacement - Retrofit 12 Panels of 11kV Switchboard (Optimised)	0	0	0	87,873	159,909	0	0	0	0	0

All of the cost numbers displayed in this document are before the application of on-going efficiencies and real price effects.

**Table 14. LRE ED1 NAMP Table**

SR_Table J - S&R - Baseline_Final_RIIO_ED1 Re-Submission_19th Feb 2014_15:15 (£)													
Cat	GWPID		Description	2013/2014	2014/2015	2015/2016	2016/2017	2017/2018	2018/2019	2019/2020	2020/2021	2021/2022	2022/2023
R	1.33.01	3193	Epsom 33/11kV Reinforcement - ITC from 2x11.5/23MVA to 2x20/40MVA & Install 5km of 33kV UGC Circuit From Chessington	0	0	0	0	0	22,664	194,915	507,696	507,696	507,696
R	1.35.05	3269	Byfleet 132/11kV Substation - Auto-Close Scheme to be Installed	16,359	0	0	0	0	0	0	0	0	0
R	1.35.01	3349	Byfleet 132/33kV Substation - Change GT2A for a 90MVA Unit	108,540	0	0	0	0	0	0	0	0	0
R	1.33.01	3702	Chertsey 33/11kV Substation Reinforcement - Bank T1/T2 and add T3	716,848	517,671	0	0	0	0	0	0	0	0
R	1.33.01	3726	Old Woking 33/11kV Reinforcement - Replace T1/T2 with 12/24 MVA Units	518,105	540,092	0	0	0	0	0	0	0	0
R	1.33.01	3744	Weybridge 33/11kV Reinforcement - Replace T1/T2 with 20/40 MVA Units & Replace 11 Panel SWB	0	0	219,851	864,815	691,419	0	0	0	0	0
R	1.36.03	3753	Guildford Grid 33 kV Switchgear Replacement for Fault Duty	36,592	241,508	526,925	526,925	775,750	0	0	0	0	0
R	1.35.01	5543	Guildford Grid 132/33kV Reinforcement - Add GT3	0	437,700	843,137	426,945	0	0	0	0	0	0
R	1.33.01	8015	Merrow 33kV/11kV Reinforcement - Third 12/24 MVA Transformer, 3 km of UGC Circuit & Replace 10 Panel SWB	0	0	0	0	0	0	17,339	260,484	1,025,324	1,198,456
R	1.37.06	8037	Guildford Grid 132kV Reinforcement for (N-2) - Installation of a 3rd 132kV Circuit (Phase 1 - 12 km from Guildford to Effingham)	0	41,384	711,895	2,350,977	2,350,977	3,948,676	0	0	0	0
R	1.33.01	8091	New Tadworth (Banstead Primary) Demand Side Response	0	0	7,500	30,000	30,000	30,000	30,000	30,000	30,000	30,000
R	1.33.01	8092	Cerl 33kV/11kV - Replace T1/T2 with 12/24 MVA Tx's	43,971	232,088	400,703	525,347	0	0	0	0	0	0
R	1.33.01	8148	Brookwood 33kV/11kV Reinforcement - Replace T1/T2 with 20/40 MVA Units & Replace 11 Panel 11kV Switchgear	438,272	896,222	455,518	0	0	0	0	0	0	0
R	1.37.01	8149	Byfleet 132kV/11kV & 132/33kV Group - 132kV OHL Conductor Replacement	227,541	429,003	429,003	590,369	0	0	0	0	0	0
R	1.35.01	8151	Byfleet 132kV/11kV & West Weybridge 132kV/33kV Group Reinforcement - Replace 12 Panel 33kV SWB at West Weybridge, and 1km of 33kV cable on interconnector	313,420	889,079	1,127,667	579,418	1	0	0	0	0	0
R	1.33.03	8154	Guildford B 11kV - Replace 17 Panel 11kV Switchgear for Fault Duty	197,262	297,116	355,976	0	0	0	0	0	0	0
R	1.37.07	8157	Weybridge 33kV Reinforcement-Install a Third 33kV Circuit From West Weybridge.	0	17,355	176,794	606,297	696,287	0	0	0	0	0
R	1.37.06	8345	Guildford Grid 132kV Reinforcement for (N-2) - Installation of a 3rd 132kV Circuit (Phase 2 - 9km From Effingham to Leatherhead)	0	0	45,846	559,698	1,688,632	1,688,632	2,771,721	0	0	0
Q	1.40.42	8442	Resilience of Chertsey 33kV Circuits at West Weybridge - Divert Cable From Cable Bridge Via Directional Drill	139,747	0	0	0	0	0	0	0	0	0
R	1.37.07	8482	Brookwood 33kV Reinforcement - Install 10 km of 33kV UG Circuit From Byfleet	0	0	397,724	1,227,261	2,056,798	0	0	0	0	0
R	1.37.07	8500	Chertsey 33kV Reinforcement – Up-rate 33kV Cables Section on Circuit 1 and Circuit 2	274,833	576,572	0	0	0	0	0	0	0	0
R	1.11.03	8664	33kV Byfleet - Horsell OHL Diversion at Horsell Common	262,285	0	0	0	0	0	0	0	0	0
R	1.33.01	3701	Capel 33/11kV Substation Reinforcement - Replace T1/T2 with 12/24 MVA Units	0	0	0	0	0	0	0	23,294	185,105	460,889

All of the cost numbers displayed in this document are before the application of on-going efficiencies and real price effects.

## 4.5 Health Index and Load Index Profiles Post Intervention

**Table 15.** – LI Table (With Intervention)

Substation	Voltage kV	2023 Load Index	
		Without Investment	With Investment

### Chessington

Ashtead	33/11	1.00	1.00
Banstead	33/11	2.00	2.00
Berrylands	33/11	2.00	2.00
Betchworth Total	33/11	1.00	1.00
CERL	33/11	5.00	1.00
Chessington Grid	132/33	1.00	1.00
Cobham (Surrey)	33/11	3.00	4.00
Dorking	33/11	1.00	1.00
Effingham	33/11	1.00	1.00
Epsom	33/11	5.00	5.00
Esher	33/11	2.00	2.00
Ewell	33/11	1.00	1.00
Hampton	33/11	2.00	2.00
Kingston	33/11	1.00	1.00
Kingston Grid	132/33	1.00	1.00
Leatherhead Grid	132/33	1.00	1.00
Leatherhead Town	33/11	2.00	2.00
Molesey	33/11	1.00	1.00
North Chessington	33/11	2.00	2.00
Surbiton	33/11	1.00	1.00
Teddington	33/11	1.00	1.00

### Laleham

Ham	33/11	2.00	2.00
Richmond	33/11	1.00	1.00
Twickenham	33/11	1.00	1.00
Twickenham Grid	132/33	2.00	2.00

### West Weybridge

Brookwood	33/11	5.00	1.00
Byfleet 132/11	132/11	1.00	1.00
Byfleet 132/33	132/33	5.00	5.00
Capel	33/11	5.00	5.00
Chertsey	33/11	1.00	1.00
Guildford 6.6kV	33/6.6	1.00	1.00

All of the cost numbers displayed in this document are before the application of on-going efficiencies and real price effects.

Substation	Voltage kV	2023 Load Index	
		Without Investment	With Investment
Guildford A & B	33/11	5	1
Guildford Grid	132/33	2.00	2.00
Horsell	33/11	2.00	2.00
Merrow	33/11	3.00	1.00
Old Woking	33/11	2.00	1.00
Shalford	33/11	2.00	2.00
W. Weybridge 132/11	132/11	1.00	1.00
W. Weybridge 132/33	132/33	5.00	1.00
Weybridge	33/11	5.00	2.00
Woking Town	33/11	1.00	1.00
Guildford A 11kV	33/11	5.00	5.00
Guildford B 11kV	33/11	5.00	2.00

Table 15 above provides projected load indices after completion of all proposed intervention projects discussed in this RDP.

**Table 16.** ED1 Health Indices 6.6kV & 11kV Circuit Breakers

Substation	2015					2023 with Intervention				
	No. HI1	No. HI2	No. HI3	No. HI4	No. HI5	No. HI1	No. HI2	No. HI3	No. HI4	No. HI5
ASSTEAD 11KV		2	7			9				
BANSTEAD 33/11KV		11				11				
BERRYLANDS 33/11KV		9	2					10	1	
BETCHWORTH 33/11	2	7				2		7		
BROOKWOOD 33/11		11						11		
BYFLEET GRID 132/11 KV	1	10	3			2		12		
BYFLEET GRID 33 KV	2					2				
CERL 33/11KV		2	8				10			
CHERTSEY 33/11KV			12			12				
COBHAM (SURREY) 33/11KV		1	9				10			
DORKING TOWN 33/11KV	11					11				
EFFINGHAM 33/11		10					10			
EPSOM 33/11KV		2	10				12			
ESHER 33/11KV		19					19			
EWELL 33/11KV		12	6				18			
GUILDFORD _A_ 33/11	16					3	13			
GUILDFORD _B_ 11KV		6				6				
GUILDFORD 33/6.6	5					5				
HAM 33/11KV		8	1					9		



All of the cost numbers displayed in this document are before the application of on-going efficiencies and real price effects.

Substation	2015					2023 with Intervention				
	No. HI1	No. HI2	No. HI3	No. HI4	No. HI5	No. HI1	No. HI2	No. HI3	No. HI4	No. HI5
HAMPTON 33/11KV		7	3				10			
HORSELL 33/11KV		10					1	9		
KINGSTON 33/11KV	35						35			
LEATHERHEAD TOWN 33/11KV		9				9				
MERROW 33/11		2	8					10		
MOLESEY 33/11KV	2	4	7				13			
NORTH CHESSINGTON 33KV		5	5				10			
OLD WOKING 33/11KV		8					8			
RICHMOND 33/11KV		24	1					24	1	
SHALFORD 33/11		3	9			12				
SURBITON 33/11KV		14					9	5		
TEDDINGTON 33/11KV		6	9				1	13	1	
TWICKENHAM 33/11KV	4	22	3				29			
WALTON 33/11KV	14						14			
WEST WEYBRIDGE 132/11KV	7	13				7		13		
WEST WEYBRIDGE GRID 132 KV	2	1				2		1		
WEYBRIDGE 33/11KV		11					10	1		
WOKING 33/11	3	12				3	12			
WOKING SENTRUM 11KV	4					4				
WOKING SENTRUM GRID 132/11KV	4					4				

**Table 17.** HI Profile 33kV Circuit Breakers

Substation	2015					2023 with Intervention				
	No. HI1	No. HI2	No. HI3	No. HI4	No. HI5	No. HI1	No. HI2	No. HI3	No. HI4	No. HI5
BYFLEET GRID 132 KV		2.00					2.00			
BYFLEET GRID 33 KV		12.00					12.00			
CHESSINGTON GRID 132 KV			2.00	2.00	3.00					7.00
CHESSINGTON GRID 33KV		13.00	1.00					14.00		
COBHAM 33KV KENT		1.00					1.00			
DORKING TOWN SW STN (33KV)	3.00						3.00			
GUILDFORD GRID	8.00	3.00				7.00	1.00	3.00		
GUILDFORD GRID 132 KV		3.00						3.00		
HAMPTON 33KV		1.00					1.00			
KINGSTON GRID		23.00					23.00			
KINGSTON GRID 132 KV		4.00					4.00			
LEATHERHEAD GRID	19.00					19.00				
TWA HAMPTON		2.00					2.00			

All of the cost numbers displayed in this document are before the application of on-going efficiencies and real price effects.

Substation	2015					2023 with Intervention				
	No. HI1	No. HI2	No. HI3	No. HI4	No. HI5	No. HI1	No. HI2	No. HI3	No. HI4	No. HI5
TWICKENHAM GRID 132 KV		2.00						2.00		
TWICKENHAM GRID 33KV	2.00	12.00				2.00		12.00		
WEST WEYBRIDGE GRID	8.00	1.00	1.00			8.00		2.00		
WEST WEYBRIDGE GRID 132 KV	2.00					2.00				

**Table 18.** 132kV Circuit Breakers

Substation	2015					2023 with Intervention				
	No. HI1	No. HI2	No. HI3	No. HI4	No. HI5	No. HI1	No. HI2	No. HI3	No. HI4	No. HI5
CHESSINGTON GRID 132 KV			2	2	3		7			
KINGSTON GRID 132 KV	2						2			
LALEHAM GRID 132 KV	2						2			
LEATHERHEAD GRID 132 KV			2	2						4
WEST WEYBRIDGE GRID 132 KV	1		3		5	9				

**Table 19.** ED1 Health Indices (Transformers)

Substation	2015					2023 with Intervention				
	No. HI1	No. HI2	No. HI3	No. HI4	No. HI5	No. HI1	No. HI2	No. HI3	No. HI4	No. HI5
ASSTEAD 11KV		2						2		
BANSTEAD 33/11KV		1		1			1	1		
BERRYLANDS 33/11KV			2			2				
BETCHWORTH 33/11		2						2		
BROOKWOOD 33/11		2				2				
CERL 33/11KV				2		2				
CAPEL 33/11KV			2			2				
CHERTSEY 33/11KV		2				1		2		
COBHAM (SURREY) 33/11KV		2					2			
DORKING TOWN 33/11KV	2					2				
EFFINGHAM 33/11		2					2			
EPSOM 33/11KV		2				1	1	1		
ESHER 33/11KV		3						3		
EWELL 33/11KV		2	1					3		
GUILDFORD _A_ 33/11		1	1			2				
GUILDFORD _B_ 11KV		1	1			2				
GUILDFORD 33/6.6		1					1			
HAM 33/11KV		2						2		
HAMPTON 33/11KV		2						2		
HORSELL 33/11KV			1		1	2				

All of the cost numbers displayed in this document are before the application of on-going efficiencies and real price effects.

Substation	2015					2023 with Intervention				
	No. HI1	No. HI2	No. HI3	No. HI4	No. HI5	No. HI1	No. HI2	No. HI3	No. HI4	No. HI5
KINGSTON 33/11KV		2	2				4			
LEATHERHEAD GRID 132 KV	1	3				1		3		
LEATHERHEAD TOWN 33/11KV	1	1				1	1			
MERROW 33/11		2				1	1	1		
MOLESEY 33/11KV		2					1	1		
NORTH CHESSINGTON 33KV			1	1		2				
OLD WOKING 33/11KV		1	1			2				
RICHMOND 33/11KV		2		1		1		2		
SHALFORD 33/11		2					1	1		
SURBITON 33/11KV		1		1		1	1			
TEDDINGTON 33/11KV		2						2		
TWICKENHAM 33/11KV		3			1		1	3		
WALTON 33/11KV		2						2		
WEYBRIDGE 33/11KV		2				2				
WOKING 33/11		1			1		2			

**Table 20.** HI Profile (Grid Transformers)

Substation	2015					2023 with Intervention				
	No. HI1	No. HI2	No. HI3	No. HI4	No. HI5	No. HI1	No. HI2	No. HI3	No. HI4	No. HI5
BYFLEET GRID 132 KV	2	2				2	1	1		
CHESSINGTON GRID 132 KV		3					2	1		
GUILDFORD GRID 132 KV		1	1			1	1	1		
KINGSTON GRID 132 KV			3	1		4				
LEATHERHEAD GRID 132 KV	1	3				1		3		
TWICKENHAM GRID 132 KV		2						2		
WEST WEYBRIDGE GRID 132 KV	1	2	2			2	3			
WOKING SENTRUM GRID 132/11KV	2					1	1			

## Laleham / West Weybridge / Chessington

All of the cost numbers displayed in this document are before the application of on-going efficiencies and real price effects.

**Table 21.** OHL Abbreviations

OHL	Circuit Name	Voltage
PGC	West Weybridge-Chertsey	33kV
PPA	West Weybridge-Guildford	132kV
PS	West Weybridge-Leatherhead	132kV
PSB	Chessington-Leatherhead	132kV
PUB	West Weybridge-Byfleet	33kV
PXA	West Weybridge-Byfleet	132kV

## **5 ALTERNATIVES CONSIDERED**

### **5.1 Option 1**

#### **3691 - Banstead 33/11kV Substation ITC. (2020-2022)**

The predicted load at Banstead 33/11kV substation will exceed the existing firm capacity plus transfer capacity. It is therefore proposed to install an additional 33/11kV transformer. The existing switchgear is not fully rated for this increased load. It is therefore proposed to replace this 11kV switchgear. An additional 33kV circuit is to be installed.

This option is rejected because an alternative option to relieve Banstead primary is being proposed which involves constructing a new primary at Tadworth 33/11kV under project ID 1.33.01.8091. This is necessary because the existing Banstead primary footprint has limited space to accommodate an additional transformer, while an existing site nearby at Tadworth has enough space to accommodate a new primary substation. However still the proposed alternative solution has also been deferred and replaced with a DSR solution.

### **5.2 Option 2**

#### **8010 - West Weybridge 132kV/33kV - ITC (2013 - 2016)**

The load at W. Weybridge 132kV/33kV currently exceeds the existing rating of the associated transformer circuits. It is not possible to lower the load without compromising operational and planning requirements. It is therefore proposed to increase transformer circuit capacity by replacing 60 MVA transformers with 90 MVA transformer/s and replacing a 12 panel 33kV switchboard. Completion of this project will see the transformer feeder circuit uprated by addition of 2 x 90 MVA 132kV/33kV transformer/s, and addition of 12 panel/s of 33kV switchboard.

This option is rejected because an optimised project to address load issues for the Byfleet/West Weybridge 132/33kV group is the preferred option, which includes the reinforcement of 33kV interconnector between the two grid sites and uprating the switchboard at West Weybridge Grid to 2000A.

### **5.3 Option 3**

#### **8356 - Epsom 33/11kV - Replace 11kV Switchgear (2014 - 2016)**

The condition assessment of the 1954 - 65 Reyrolle C gear Oil Switchgear installed at Epsom 33/11kV has shown that the probability of failure due to degradation is very high and projected to be H13,4&5 by 2024. It is not possible to keep these assets in use without compromising operational requirements. Therefore this project recommends its replacement. The predicted load at Epsom 33kV/11kV will exceed the existing rating of the associated transformer circuits. It is not possible to lower the load without compromising operational and planning requirements. Under project 3193, it is proposed to increase transformer circuit capacity by adding a 3rd 12/24 MVA transformer circuit. It is therefore proposed to replace the 12 panel switchboard with a 14 panel board to facilitate the ITC. This is an optimised project with an end stop date of 2016.

This option is rejected because an optimised project to address load issues at Epsom primary has been put in place. This project will be removed from the NAMP.



## **6 REFERENCES**

<b>References</b>	<b>Description</b>
Reference 1	SPN Planning Load Estimates 2011 – 2023 ( 27 <sup>th</sup> Feb 2013)
Reference 2	SPN 132kV System Diagram East
Reference 3	SPN 132kV System Diagram West
Reference 4	SPN LTDS Network Schematics
Reference 5	NAMP SPN Table J Less Ind 19 <sup>th</sup> Feb 2014
Reference 6	ED1 Update September 2012 v10.3.1

### **6.1 Appendices**

<b>Appendix</b>	<b>Description</b>
Appendix A	Geographical diagram
Appendix B	Single Line Diagram – Existing Network
Appendix C	Single Line Diagram – Recommended Strategy

### **6.2 Document History**

<b>Version</b>	<b>Date of Issue</b>	<b>Author</b>	<b>Details</b>
1	02/12/2012	Itayi Utah	Initial Draft for Review
1.2	24/06/2013	Itayi Utah	ED1 Review
2	19/02/2014	Itayi Utah	ED1 Resubmission

All of the cost numbers displayed in this document are before the application of on-going efficiencies and real price effects.

## **7 DOCUMENT SIGN OFF**

Sign-off of this Mandate certifies that the Sponsor has ratified the above and approval is sought to proceed to the development of the necessary PG&C Gate B documentation.

**Recommended by:**

<b>Name</b>	<b>Role</b>	<b>Signature</b>	<b>Date</b>
Itayi Utah	Infrastructure Planner		
Tendai Matiringe	IDP Coordinator (SPN)		
Chris Winch	Planning Manager ( South)		

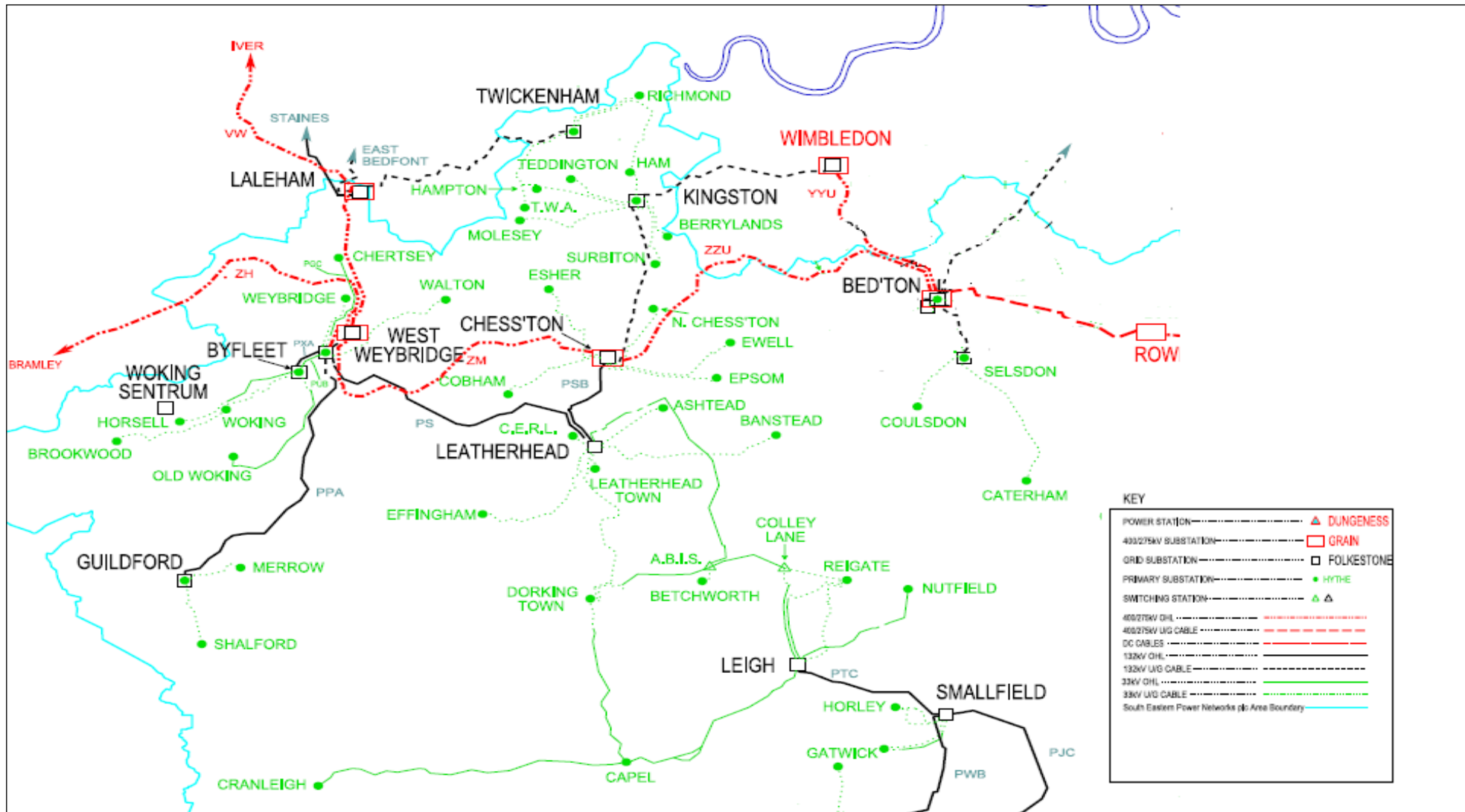
**Approval by:**

<b>Name</b>	<b>Role</b>	<b>Signature</b>	<b>Date</b>
Robert Kemp	Head of System Development	Robert Kemp	
Barry Hatton	Head of Asset Management	Barry Hatton	

# Regional Development Plan

Laleham / West Weybridge / Chessington

## APPENDIX A: GEOGRAPHICAL DIAGRAM





## Laleham / West Weybridge / Chessington

