UTILITY RESULTS

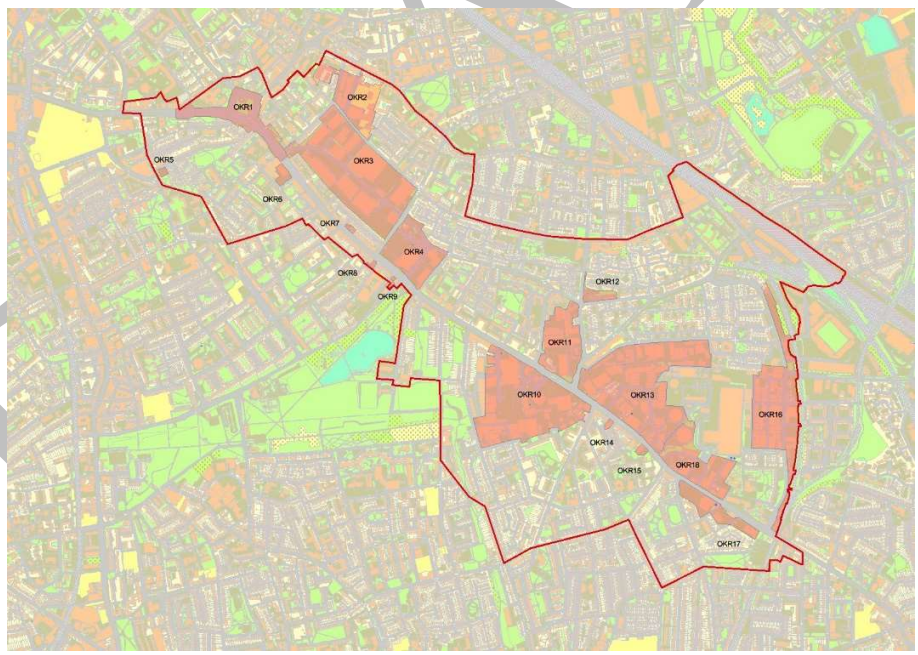
UTILITY INFRASTRUCTURE PLANNING & UTILITY PROJECT MANAGEMENT

Old Kent Road & Aylesbury Estate

Regeneration Electricity Report

July 2019

Version 1.1



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Approval Sheet

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1. Executive Summary

This report has confirmed the following;

- A new development located near Waterloo station has already triggered UKPN network reinforcement. This will be at the UKPN Primary Substation known as 'Bankside'.
- A new development situated in Canada Water has also triggered UKPN network reinforcement. This will be located at a new UKPN Primary known as 'Verney Road'
- All future electrical applications will be subject to The Electricity (Connection Charges) Regulations (ECCR) also known as the 'second comer' charges.
- The target development area has an estimated 80 existing HV/LV packaged substations that range from 500kVA to 1MVA. These assets will need to be investigated with regards to their land rights and whether they serve the localised buildings or the local network outside of the development boundary line.
- Utility Results (UR) have interrogated the development information available and anticipate the proposed Old Kent Road regeneration will require an electrical load in the region of 14MVA (based on gas heating) or 30MVA (based on electrical heating).
- Analysis of the proposed development programme has confirmed that the electrical demand will ramp up very quickly initially over the first five years before plateauing.
- Current forecasted reinforcement completion dates are 2020/21 at 'Bankside' and 2023/24 at 'Verney Road'.
- All new electrical applications to UKPN should allow 6 – 12 months for any required route proving, discussions with highways and third parties. This is due to new 11kV feeder cables that could potentially be required from 'Bankside' and 'Verney Road' depending on what area is developed first.
- UKPN have stated they will not consider cost apportionment of the reinforcement costs. The main reason is that UKPN cannot fund speculative development plans, as they could invest and the sites subsequently not procced. Therefore, the initial developers will fund 100% of the reinforcement costs. The second comer rule then applies for the following 10 years. This is where all sites that follow, will pay an apportionment of the reinforcement costs based on their load, this will then be reimbursed to the initial funder of the works.
- Based on current findings, a new primary substation will not be required as the existing primary substations can currently accommodate the extra demand. However, the utility networks are dynamic and always changing with new sites coming online taking capacity and likewise buildings going offline.

- After the Bankside and Verney Road Primary Substation upgrade works are completed (Bankside Q4 2020/Q1 2021 / Verney Q1 2021). There will be 30MVA & 40MVA available. However, after the upgrades are completed. There will be no space to upgrade further.

Introduction

The London Borough of Southwark Planning Services engaged Utility Results to carry out a high-level assessment for the Old Kent Road (OKR) Opportunity Area and Aylesbury Estate regeneration. The aim was to provide suitable evidence to support the strategic planning and delivery of 23,500 new homes (20,000 at OKR and 3,500 at Aylesbury Estate) across the opportunity area.

The council required Utility Results to develop a primary substation options assessment for the area with the main outputs as follows;

Completed

- Undertake electricity demand and capacity modelling
- Challenge UKPN estimates of loads and infrastructure requirements.
- Advise on additional impact of the Aylesbury Estate redevelopment.
- Review need for any National Grid reinforcement at the New Cross substation and implications for the approach to delivery.
- Produce a concise report setting out the options for delivering the electricity infrastructure required to support the level of growth planned for in the OKR opportunity area and the Aylesbury estate redevelopment

Ongoing

- Support Southwark Council in engaging with UKPN regarding the outputs of the study

The Client Design Team should note that the UKPN networks are dynamic and always changing with new developments coming online taking capacity and likewise buildings going offline freeing capacity. The above information is a desktop study and should be used as a guide only.

Limitations of Report

To obtain formal costings and firm capacity data, formal applications should be made at the appropriate time. As a result, Utility Results does not take any financial liability for the content of this report.

It is recommended that the design team continue dialogue with UKPN to ascertain the programme of the planned upgrades works to the primary substations 'Bankside' and 'Verney Road'. Both have planned works which will require significant localised reinforcement, regular monthly dialogue to assess the impact would be prudent.

2. Existing Electricity Network

The following section gives an overview of the existing UKPN EHV infrastructure in the locality of the Target Development Zone (TDZ).

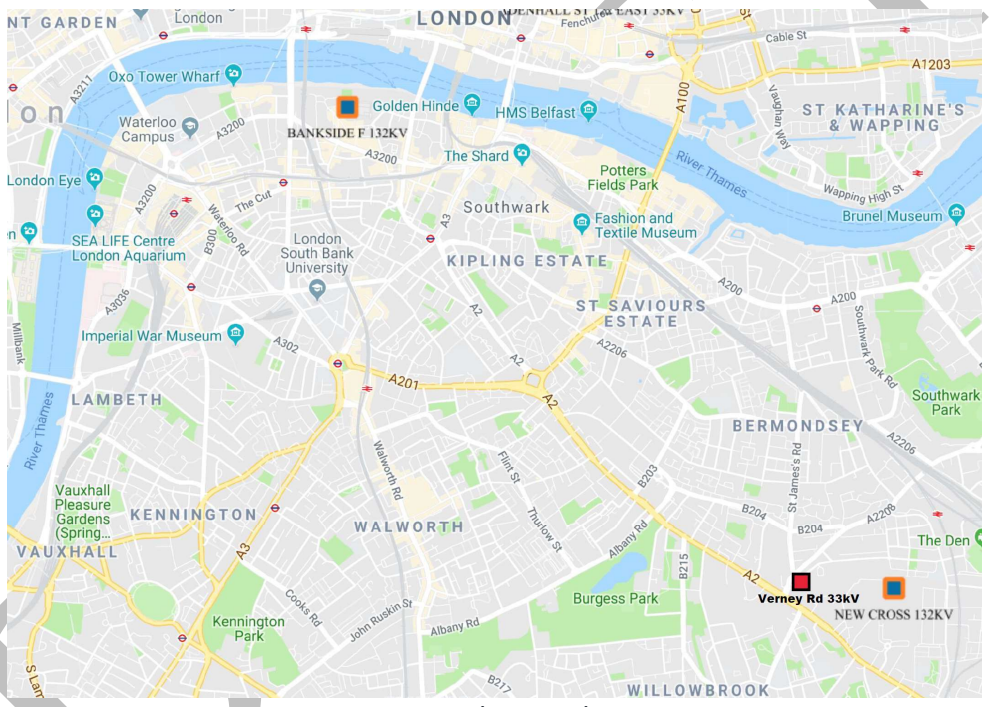

Figure 1 - Local EHV Substations

Figure 1 shows the 132kV and 33kV Primary Substations and Grid Supply Points (GSP) within the local development areas. These are the substations that currently serve the local 11kV HV network that will be utilised to supply power to the development parcels.

New Cross Grid Supply Point (GSP)

A Grid Supply Point (GSP) is a substation fed from the National Grid transmission.

New Cross GSP comprises of 66kV and 132kV infrastructure. Although the current published capacity shows that there is in the region of 15MVA available in the vicinity. This capacity has since been taken up by new applications. Therefore, both Verney Road and Bankside are being upgraded due to now capacity being available.

Table 3 - Load Data

GSP	Substation	Season	Maximum Demand 17/18		Forecast (Maximum Demand) MW					Firm Capacity	Minimum Load Scaling Factor
Please use autofilter to select site			MW	PF	18/19	19/20	20/21	21/22	22/23	MW	%
New Cross 66kV	Bengeworth Rd 11kV	Winter	38.4	0.97	38.8	39.0	39.3	39.8	40.3	56.7	0.0%
New Cross 66kV	Bengeworth Rd 11kV	Summer	26.1	0.90	26.4	26.5	26.7	27.0	27.4	40.5	51.0%
New Cross 66kV	Chadwick Road 33kV	Winter	63.2	0.94	63.8	64.2	64.7	65.5	66.6	109.5	0.0%
New Cross 66kV	Chadwick Road 33kV	Summer	39.8	0.96	40.2	40.4	40.7	41.2	41.8	87.8	85.7%
New Cross 66kV	North Cross Rd 11kV	Winter	24.8	0.98	25.0	25.2	25.4	25.8	26.2	38.2	0.0%
New Cross 66kV	North Cross Rd 11kV	Summer	15.0	0.93	15.1	15.2	15.4	15.5	15.8	27.9	42.8%
New Cross 66kV	South Bank 11kV	Winter	38.0	0.96	38.2	38.3	38.5	38.8	39.1	56.3	0.0%
New Cross 66kV	South Bank 11kV	Summer	34.7	0.94	34.9	35.0	35.1	35.3	35.5	42.2	55.6%
New Cross 66kV	Verney Rd 11kV	Winter	69.5	0.97	70.1	70.5	71.0	71.8	72.8	85.1	0.0%
New Cross 66kV	Verney Rd 11kV	Summer	43.7	0.96	44.1	44.3	44.6	45.1	45.7	64.8	52.1%
New Cross 132kV	Deptford Grid 11kV	Winter	82.0	0.95	82.5	82.8	83.2	83.8	84.7	149.5	0.0%
New Cross 132kV	Deptford Grid 11kV	Summer	70.0	0.89	70.4	70.7	71.0	71.5	72.2	119.6	46.1%

Figure 2

The schematic drawings for UKPN's HV network fed from this GSP is outlined below.

New Cross 66kV GSP

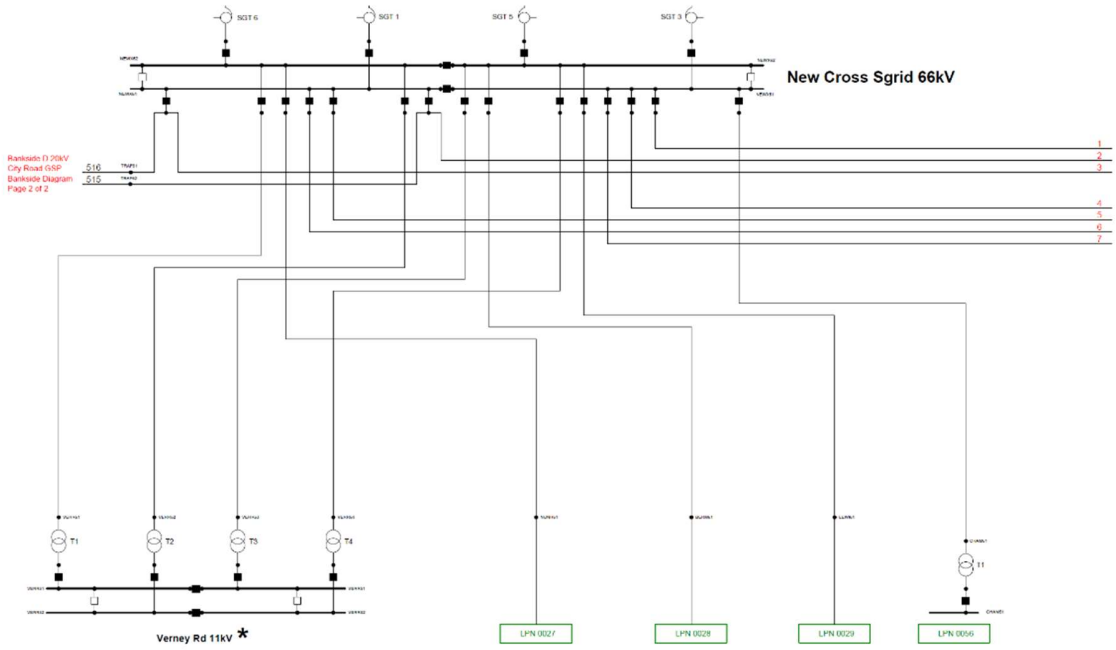

Figure 3

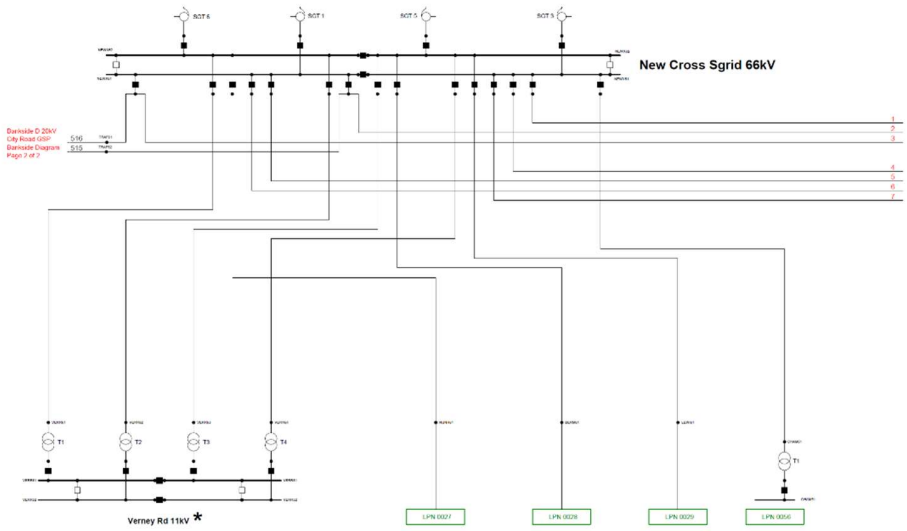

Figure 4

Verney Road is fed from New Cross 66kV

<u>Bankside</u>

City Road is the GSP (Grid Supply Point) that feeds into Bankside Primary Substation. The substation comprises of 132kV, 20kV and 11kV infrastructure. The current site has 2No. 90MVA transformers which have a firm capacity of 110MVA. The current available capacity is 0MVA.

Table 3 - Load Data

GSP	Substation	Season	Maximum Demand 17/18		Forecast (Maximum Demand) MW					Firm Capacity	Minimum Load Scaling Factor
Please use autofilter to select site			MW	PF	18/19	19/20	20/21	21/22	22/23	MW	%
City Road	Bankside C 11kV	Winter	122.0	0.95	123.0	123.4	123.7	93.7	94.4	144.8	0.0%
City Road	Bankside C 11kV	Summer	138.4	0.92	139.6	140.0	140.4	103.1	103.9	140.2	40.9%
City Road	Bankside D 20kV	Winter	49.6	0.96	52.9	54.7	59.7	67.8	80.4	105.6	0.0%
City Road	Bankside D 20kV	Summer	49.4	0.92	52.6	55.0	60.0	68.8	82.5	101.2	47.5%

Figure 5

The schematic drawings for the Bankside HV assets are outlined below.

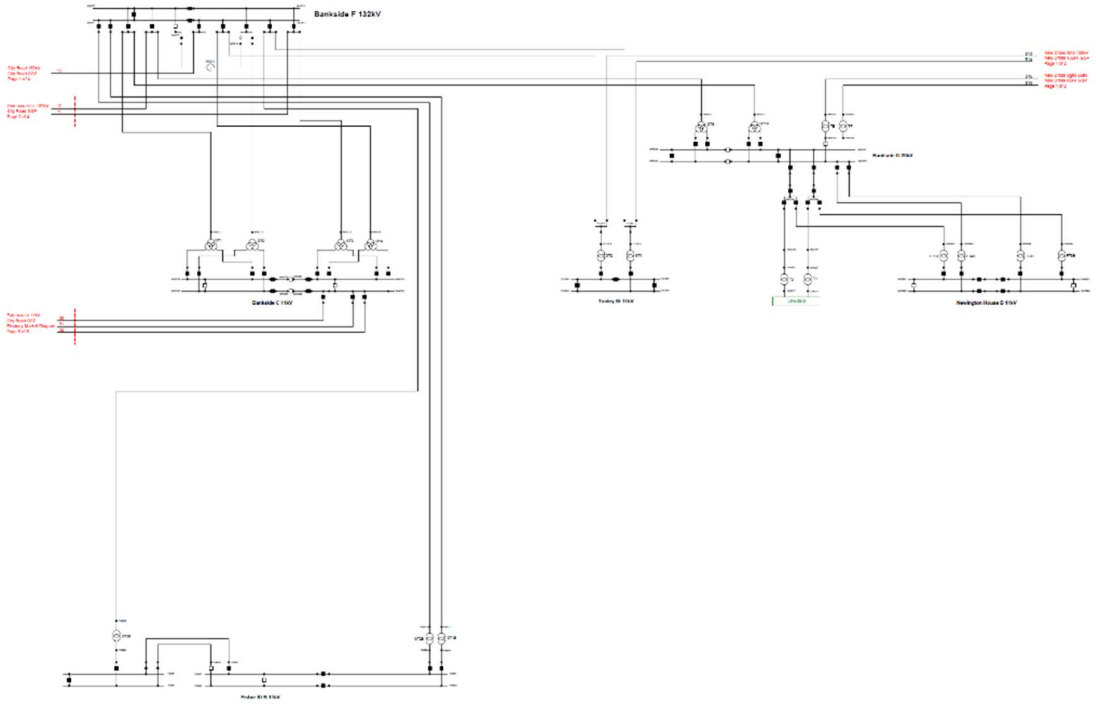

Figure 6

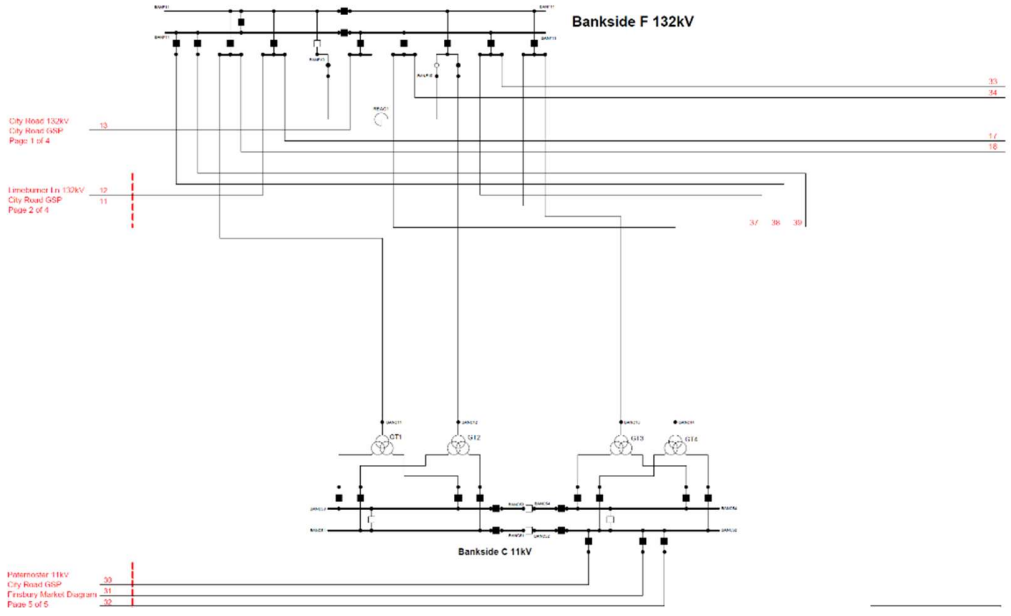

Figure 7

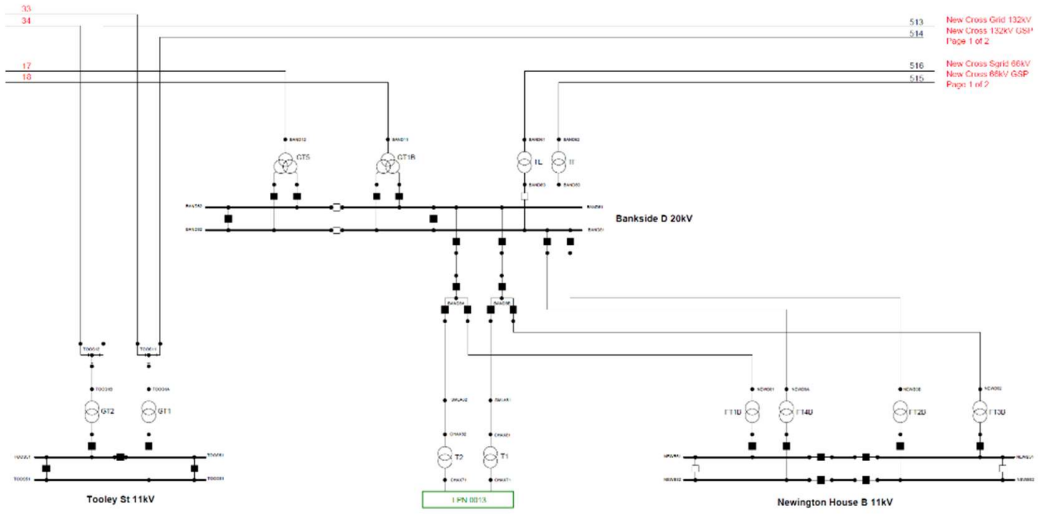

Figure 8

UKPN already had scheduled plans to upgrade the local HV infrastructure which has already been published prior to the development plans.

These are detailed as follows;

- New Cross 66kV to Verney Road
  - Switchboard replacement scheduled to be completed 2021
  - Capacity Reinforcement (total not published)

2.1 Existing Loadings

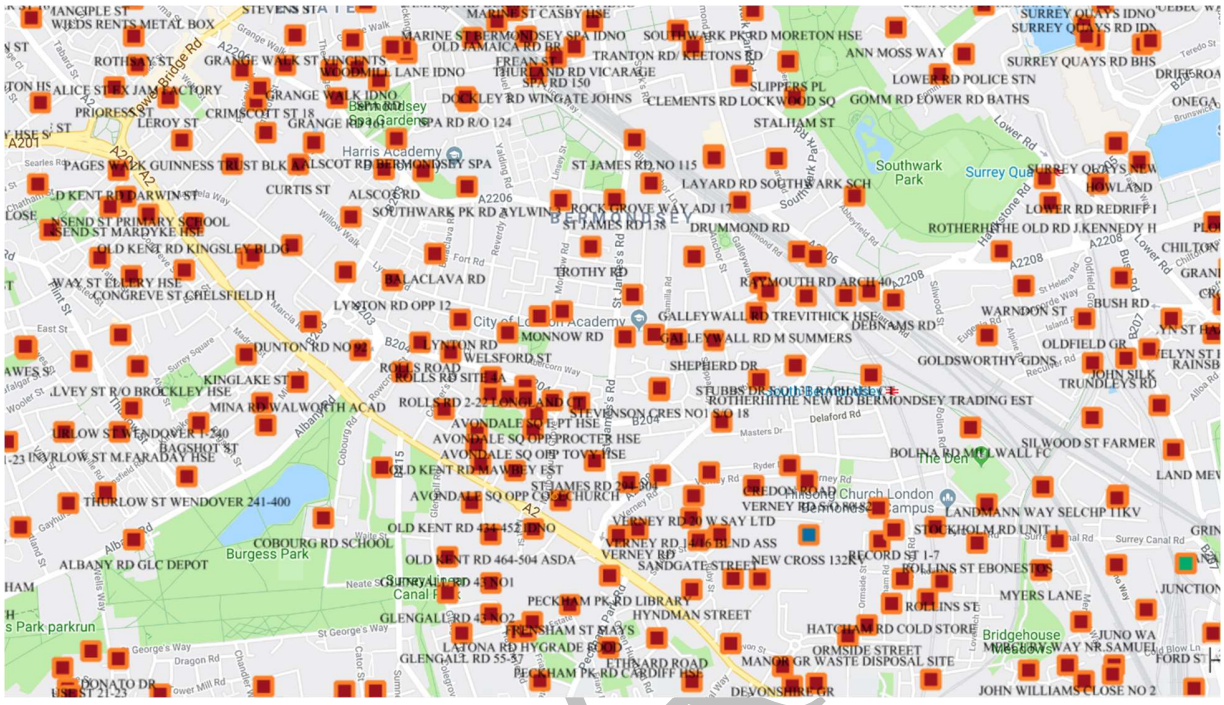

Figure 9

The target development zone (TDZ) area currently has in the region of 80 secondary substations These assets typically contain infrastructure capable of supplying loads between 500kVA to 1000kVA.

The substations currently serve the existing buildings within the red line TDZ and some also serve the local network beyond. The total undiversified load of the secondary substations is estimated to be in the region of 32MVA to 40MVA. The 'actual' assigned capacity is unknown. To find this would require extensive individual investigations by UKPN and would be extremely time consuming. UKPN would be prepared to carry out this works further down the line once some more detailed plans and a programme become available.

Once areas within the TDZ become available for redevelopment and prior to demolition and the service disconnections taking place the existing capacity needs to be captured and reserved. This can be done by collation of the Meter Point Administration Numbers (MPAN) and reviewing the energy bills in liaison with UKPN to maintain the reserved capacity to each building after removal of the meter/energy contract.

2.2 Estimated Development Zone Loads

The following section reviews the anticipated load requirements based on the information available.

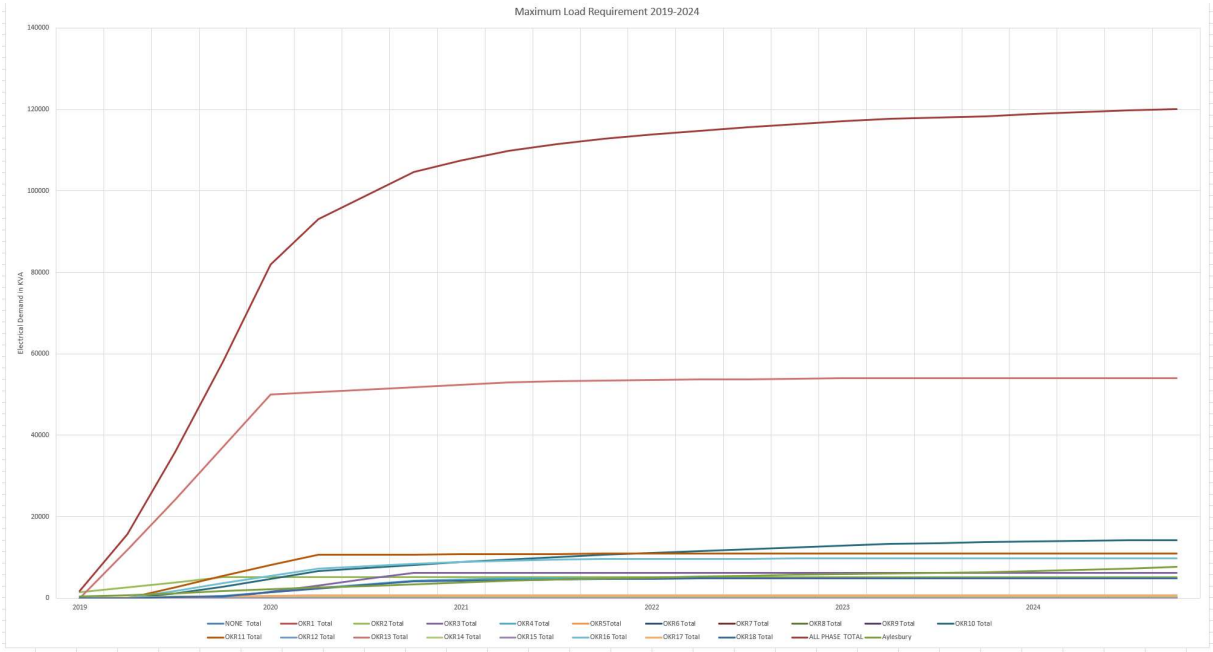

Figure 10

The Old Kent Road development has been estimated by UR to require a peak electrical load in the region of 12MVA in the year 2020. This continues to increase from then, peaking at 15MVA in 2030 (assuming gas heating systems). These calculations are based on UR reviewing the residential loads and applying some 'rule of thumb' loads to the proposed commercial areas. If the developments becoming electrically heated the loads could increase by 50% depending on the mix and specifications. A further increase would be required for EV charging.

Please refer to the loading spreadsheet in Appendix A

2.3 Aylesbury Estate

Figure 11

The Aylesbury Estate development has been estimated by WSP to have a peak electrical load of 5,885 kVA based on gas heating. If the site proceeds with electrical heating. WSP have estimated the load could increase to 20,895 kVA. It is UR's belief that this total load may be unrealistic and should be verified before being used for any further calculations.

3. Review of UKPN Existing and Future Capacity

Please note that the current secondary substation capacity has not been included within this element. Until the existing meters and their associated MPANs have been relinquished the assigned capacity cannot be accounted for. As such, UKPN's system will not see the potential capacity that could be released from the 80 LV/HV substations. The programming logistics of when each existing secondary substation would be relinquished also need to be considered. In that vein, a worst-case scenario should be considered.

UKPN have indicated there is currently no spare capacity within their local network. Any loads in excess of 1MVA (dependant on location) would require the need for offsite reinforcement.

UKPN have indicated there is currently no reason to construct a new primary substation but there is the need to carry out extensive reinforcement to the Bankside & Verney Road Primary Substations which is already underway. The cost of this works will be apportioned to the customers who need the new load.

The lead time for this potential reinforcement is 18 months. Six months should be added to the standard UKPN Service Level Agreement to allow for the undertaking of the load review and for route proving studies as highlighted above. The delivery timescales should also be increased as all applications will need offsite reinforcement by way of new feeder cables. This could mean three month opening notices and lengthy Third-Party liaison, all of which significantly increase the normal delivery timescales.

3.1 Regulatory Position

Ofgem rules do not permit UKPN to invest in infrastructure ahead of confirmed demand/connection agreements being signed (i.e. until sites apply). Therefore, the developers will need to fully fund any reinforcement. However, joint coordination is recommended wherever possible as the development plans will span over 20 years.

Due to there being no capacity within the local infrastructure and the requirements of reinforcement from the first development the Electricity (Connection Charges) Regulations (ECCR) also known as the 'Second Comer' Regulations will be implemented.

The ECCR applies to situations where a developer pays a UKPN for a new or modified connection and a subsequent developers new or modified connection utilises the assets installed for the first customer. When this happens the second customer may be additionally charged a proportion of the costs paid by the first customer to reflect the second customer's requested use. Thus, ensuring all reinforcement costs are apportioned fairly. However, the "second comer" period is

10 years only. Based on the current development plans, this will not be enough, given that development of the whole area is likely to take 20 years or possibly longer.

UKPN are obliged to give the most cost-efficient option and depending on the location of the development. UKPN would NOT therefore necessarily offer a PoC at Bankside until the capacity is exhausted. Depending on the customer's location, the minimum scheme will be determined by the overall costs of scheme, including the costs of cabling to the site.

3.2 Bankside Primary

Aylesbury Estate development have already made formal applications to UKPN which has triggered reinforcement at Bankside Primary Substation. The current site has 2No. 90MVA transformers and currently has a firm capacity of 0MVA available to new customers. The reinforcement at Bankside Primary Substation has been triggered by a project at Waterloo Station.

UKPN have already started the works to install a third 90MVA transformer, which will increase the available capacity to 110MVA. The reinforcement includes extension of the 20kV switchboard, but individual projects will need to fund their own 20kV feeder circuit breaker panels.

It is important to note, that of the extra 110MVA capacity being added, 80MVA has already been reserved by way of formal applications. Therefore, the available capacity is 30MVA.

The 'Second Comer' rules would be enforced and contribution costs towards the works at Bankside Primary would be in the region of £30k per 1MVA. This does not include the associated onsite secondary substations and cabling. Depending on the location of the development in relation to the Point of Connection offsite, cabling would need to be added between the POC and the site.

UKPN's estimated completion date for the reinforcement works are planned for Q4 2020 / Q1 2021.

Please note that due to the fault ratings UKPN have stipulated that all new substations will need to be sized at 1MVA for connection on to the 20kV

3.3 Verney Road

A large development in Canada Water has triggered the reinforcement works at the Verney Road Primary Substation. The 4 x 66kV oil filled cables from New Cross to Verney road do not currently have any spare capacity to facilitate this. As such, UKPN are planning to overlay the four circuits with 4 x 132 kV circuits which in the interim will operate at 66 kV. The current 4 x 22.5MVA 66/11 transformers will then be upgraded to 4 x 33MVA 66/11 transformers. Finally, a new 36 panel 11kv board will be installed. The new development load is to be taken at 66 kV.

Therefore, the available capacity will be 40 MVA.

The 'Second Comer' charges would again be enforced for these works and contribution costs would be in the region of £110k per 1MVA. This does not include the associated onsite HV/LV substations, cabling or HV/LV boards required. Depending on the location of the development in relation to the 'Point of Connection' (PoC) offsite cabling would need to be added also. This is a more expensive option than Bankside due to the complexity of the works. UKPN are obliged to give the most cost-efficient option and depending on the location of the development, UKPN would offer a PoC at Bankside until the capacity is exhausted.

UKPN are obliged to give the most cost-efficient option and depending on the location of the development. UKPN would NOT necessarily offer a PoC at Bankside until the capacity is exhausted. Depending on the customer's location, the minimum scheme will be determined by the overall costs of scheme, including the costs of cabling to the site.

3.4 Next Steps

Further discussions with UKPN are required to ensure the funding is fairly spread for the lifetime of the TDZ area. UKPN although beholden to OFGEM rules, are open to negotiations with regards to contributing to the reinforcements.

UR would recommend a monthly workshop to engage with developers, statutory utility companies, external stakeholders with regards to the off-site works, including Local Authority Highways, local bus companies, police and 3rd party landowners. This will ensure a collaborative approach

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