

RIIO-ED1 Reinforcement Scheme Summary



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PROJECT DETAILS

NAMP	1.35.07.5815	Region	LPN – London Power Networks	RDP	09
Category	Reinforcement	Description	Vauxhall Nine Elms Battersea: Establish new 2x66MVA 132/11kV Substation	Type	N-1
Project	Construct new Nine Elms main substation				
Site/Route	Battersea			Capacity Increase (MVA)	86MVA
Cost (ED1)	£25,815k	NAMP version		Table J Less Indirect Baseline 19th Feb 2014	

Year	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23
Spend Profile	£8,636k	£6,201k	£5,397k	£4,295k	£1,286k	0	0	0

PROJECT APPROVAL

This project is included in the LPN Wimbledon Regional Development Plan

PROJECT NEED

The area around the old Battersea power station is currently supplied from two main substations, Lombard Road and Montford Place, which are expected to reach their firm capacity in ED1. They cannot undergo reinforcement due to space constraints.

In addition, the declaration of this area as a new development and the recent commitments to develop the old Battersea Power Station site is leading to high interest. Based on stakeholder consultations and connection applications the new developments are expected to increase peak demand (over and above organic growth for the area) by between 63MVA and 115MVA.

The growth of demand in the area and the potential development - with the corresponding rise in load-density to what we typically see in central London areas - a substantial increase will be required in the capacity and capability to distribute power in this highly active area.

This forecast demand increase exceeds the supply capacity of adjacent primary substations and therefore it is recommended to establish a new 2x66MVA 132/11kV main substation within the 'opportunity area'. It is proposed to supply the new substation from Wandsworth Grid new 132kV switchboard (project 3667) with new 132kV cables installed in the existing Wimbledon to Pimlico deep cable tunnel which is routed beneath Nine Elms Lane.

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BACKGROUND

Vauxhall Nine Elms Battersea

Vauxhall Nine Elms Battersea (VNEB) is a Mayor of London supported opportunity area located along the south bank of the River Thames between Vauxhall and Chelsea Bridges. The adopted planning framework contains proposals for 16,000 homes, an extension to the Northern underground line from Kennington to Battersea Power Station and support for a tall building strategy. The area includes the new Covent Garden Market, Battersea Dogs Home and construction has commenced on the new United States Embassy and regeneration of Battersea Power Station.

Existing Substation Capacity

The area is supplied by two primary substations:

Substation Name	Nominal Voltage	N-1 Firm Capacity (MVA)	Maximum Demand 2014/5 (MVA)	Maximum Demand 2022/3 (MVA)
Lombard Road	66/11kV	97	61	66
Montford Place	33/11kV	75*	61	65
Total		172	122	131

Substation	Voltage kV	Load Index	
		2015	2023
Lombard Road	66/11	1	1
Montford Place*	33/11	1*	1*

The above load growth data is for organic growth in electricity demand. It does not include the committed connection activity which is currently being built and has not yet materialised as new demand. The 'opportunity area' and its environs are experiencing a rapid surge in construction activity resulting in the existing capacity headroom being fully allocated to committed referrals (where a customer has accepted an offer and paid for the addition of capacity. We have conservatively assumed that this new demand will be diverse and adjusted the capacity requirement by a 0.8 diversity factor – this accounts for varying customer daily demand profiles.

The table below provides an overview of the total connections that are attributed to the nearest existing substations

Substation Name	Nominal Voltage	N-1 Firm Capacity (MVA)	Maximum Demand 2014/5 (MVA)	Committed Referrals and transfers @ 0.8 diversity factor (MVA)	Capacity Headroom (MVA)
Lombard Road	66/11kV	97	61	32	+4
Montford Place *	33/11kV	75	61	39	-25
Total		172	122	71	-21

* note; Montford Place summer firm capacity will increase by 30MVA to 75MVA on completion of scheme 4346. The committed referrals will increase demand above firm capacity thereafter P2/6 compliance is to be maintained by post fault transfers to Moreton Street.

These connections also take the existing spare switch panels at these sites and there is not scope for extension of the switchboards, at either substation.

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Existing Local Substations: Local Factors & Space Constraints

Lombard Road: The substation is located close to Battersea heliport 3.8km from the ‘opportunity area’. Many high rise apartment blocks have been erected along Lombard Road and the immediately adjacent plot of land has been recently sold by the local authority for housing with a new apartment block overlooking the transformer chambers under construction. The site is space constrained with no options for extension.

Montford Place: Is located 2.8km from VNEB close to Vauxhall Bridge. The neighbouring properties are a gas works and a Tesco superstore. The site has recently been reinforced with two new 30MVA transformers which, due to space constraints, required the switch room to be elevated on stilts over the transformer chambers. There is no space within the switch room for additional panels and the site is fully utilised without scope for further extension.

Substations in Adjacent Districts

Looking further afield, other primary substations in adjacent districts do show some available capacity to support the development of the network and the expected rapid growth in the area. However these sites exhibit similar characteristics of those close sites with some transformation capacity, but a shortage of feeder switches to provide the secure connection required by developments. To support the larger high-rise and high load developments would require running multiple 11kV routes from these distant primaries and past our existing substations, through congested roadways to the development area. This is not good engineering or planning practice. The net result would be to strip these adjacent areas of capacity requiring circuits to continuously absorb capacity from further and further out from the load. This will increase losses, due to the length of LV circuits and reduce security of supply, due to increased numbers of joints in long circuits and potential for 3rd party interference, compared to locally distributing power from a Grid substation closer to the Battersea area.

Substation Name	Distance to VNEB (km)	N-1 Firm Capacity (MVA)	Maximum Demand 2014/5 (MVA)	Capacity Headroom (MVA)	11kV Switch Panel Availability
Bengeworth Road	5.9	58	38	20	1
Brixton	4.5	52	46	6	5
Clapham Park Road	3.4	45	43	2	3
Gorringe Park	10.4	58	41	17	0
Newington House	5.1	45	36	9	0
South Bank	5.4	45	30	15	0
Trinity Crescent	7.3	58	53	5	1
Total		361	287	74	10

The preferred location has several advantages, including being close to an existing cable tunnel for connecting into the 132kV network and being able to use existing land areas close to our tunnel shafts seeking to minimise the sterilised land. The establishment of the new site would allow the local 11kV network supplied from Montford Place and Lombard Road to be reconfigured to allow more efficient new connections and improved asset utilisation and to maintain P2/6 compliance at these sites.

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OPTIONEERING

Two alternative approaches have been considered:

1. Construct a new main substation.
2. Supplying the capacity via incremental connection to the existing distribution sites

OPTIONS CONSIDERED

Option 1: Establish a new Battersea 2x66MVA 132/11kV main substation.

Proposed Works:

- Land purchase or lease agreement of an appropriate site.
- Construct a main substation building with three transformers chambers and switch room sized to accept a 66 panel 11kV switch board.
- Install 2 x 66MVA 132/11kV transformers providing 86MVA of firm capacity (30% cyclic rating)
- Install 44 panel double busbar 11kV switchboard
- Install 2x132kV cables from Wandsworth Grid new 132kV switchboard to the new substation installed in the existing deep cable tunnel
- Reconfigure the local 11kV network supplied from Montford Place and Lombard Road to transfer demand groups on to the new substation to increase capacity headroom at adjacent and promote efficient new connections and asset utilisation

National Grid and UK Power Networks are undertaking a combined asset replacement and reinforcement project at Wimbledon GSP with an associated increase in SGT capacity. No up-stream reinforcement is required.

Future Works post ED1 (dependent upon demand growth):

- Install third 66MVA transformer, extend 11kV switchboard and install third 132kV cable from Wandsworth

Estimated Capital Cost: £31,511k (of which £25,815k is incurred during ED1)

The proposed investment phasing is given in the table below.

	DPCR5	RIIO-ED1							
		2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23
Substation	£5,696	£8,636k	£6,201k	£5,397k	£4,295k	£1,286k	-	-	-

Assessment of Project Impact:

- Fully addresses local capacity constraints and provides for organic growth and the VNEB development.
- Improves resilience with consequential improvements in supply quality.
- Land requirements are contained within a single site instead of expansions at multiple sites
- Use of existing cable tunnel reduces the need for disruptive street works

The two significant risks that may impact on both cost and programme are:

- Land availability and cost
- Planning permission approval

Local Authority support for the 'opportunity area' is expected to promote constructive consultation during the planning process.

Option 2: Incremental expansion of existing substation sites

The seven primary substations in the surrounding Districts (Bengeworth Road, Brixton, Clapham Park Road, Gorringle Park, Newington House, South Bank and Trinity Crescent) have an estimated combined capacity headroom of 74MVA (2011/12).

However, it is not considered a deliverable solution to install long lengths of 11kV cables from out-laying areas, due to:

- high delivery risk to confirm long open-cut cable routes due to street service congestion and geographical obstacles, particularly over-ground railways in South London
- long cable routes are more at risk to 3rd party damage reducing network reliability
- network efficiency is reduced with cascading, overlapping and ever increasing lengths of 11kV connections. For example if the local capacity headroom in Gorringle Park is fully utilised to supply VNEB local demand growth would need to be supplied from further remote locations.
- long and overlapping distribution supply groups increase maintenance and operational complexity
- the medium term requirement for new capacity would not be addressed.

Furthermore, whereas incremental local group demand growth can readily be supplied by increased utilisation of existing feeders or over-laying relatively short lengths of cables closest to the substation, supplying remotely located new demand would require dedicated new feeder panels necessitating significant switchboard extensions.

The estimated cost of supplying VNEB from the seven adjacent substations is £85.6M which includes 11kV cabling through densely urbanised areas, switchboard extensions including civil works and transformer reinforcement to supply local increment local demand growth.

Option 3: Do Nothing

The existing capacity headroom would become eroded and incremental demand growth and new connections could not be supplied.

Recommended Option

Option 1 is the recommended option as it satisfies network requirements while providing for future developments.

The key deliverables are:

- land purchase or lease agreement
- construction of a new main substation building with provision for 3x66MVA transformers
- install 2x66MVA 132/11kV transformers and a 44 panel 11kV switchboard
- install 2x 6km 132kV circuits from Wandsworth to the new substation with cables installed in the existing Wimbledon - Pimlico deep cable tunnel
- reconfiguration of the local 11kV network to rationalise connections and reduce overlapping supply groups

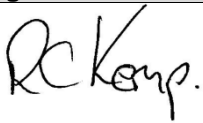
PROJECT RISKS

- Land availability and acquisition costs

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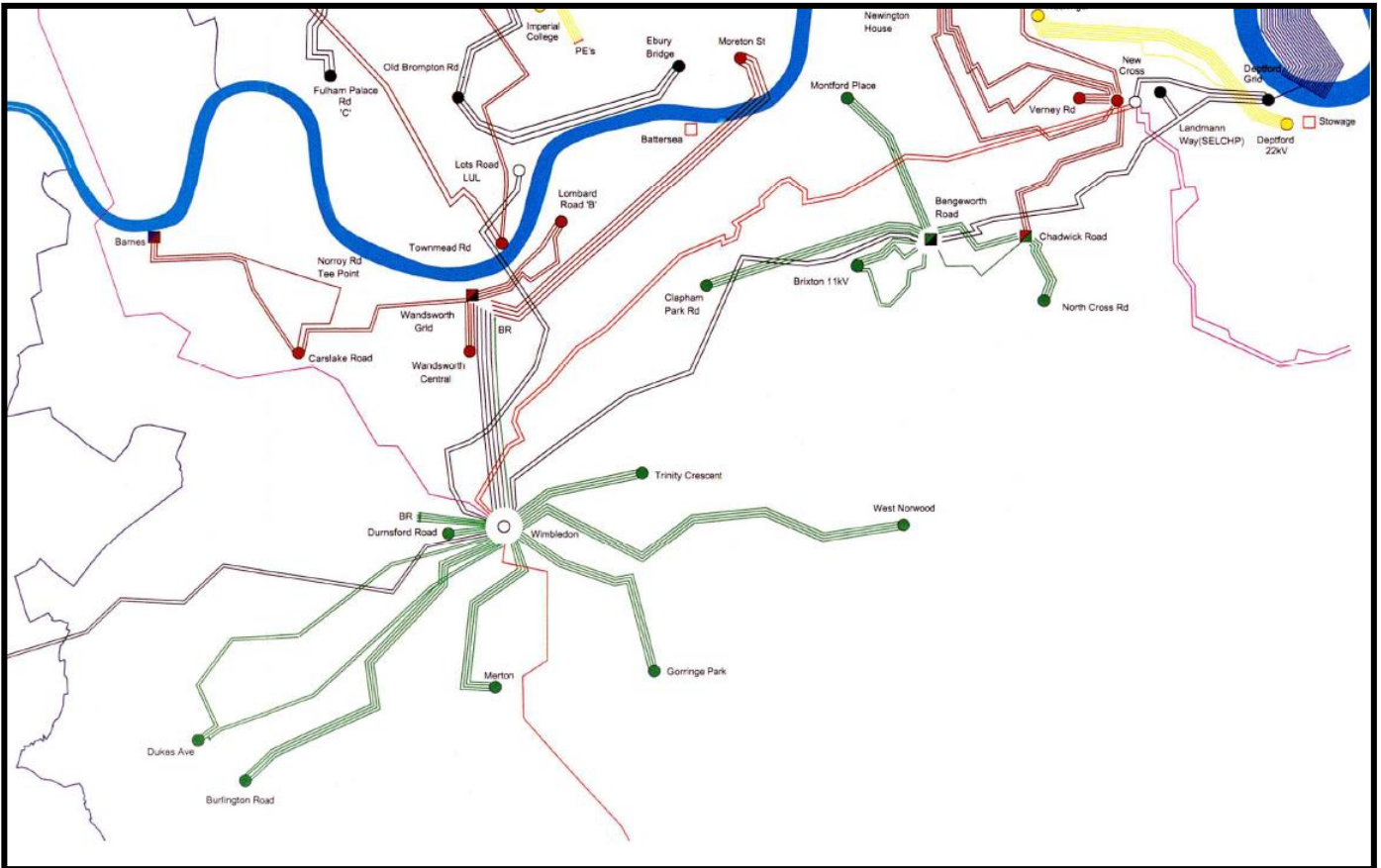
- Obtaining planning permission

Name	Title	Signature	Date
Chris Winch	Infrastructure Planning Engineer	Chris Winch	09/03/2014
Name	Title	Signature	Date
Robert Kemp	Head of System Development		09/03/2014
Name	Title	Signature	Date
Barry Hatton	Director of Asset Management		

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SINGLE LINE DIAGRAM – EXISTING NETWORK



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GEOGRAPHICAL DIAGRAM

