

RIIO-ED1 Reinforcement Scheme Summary



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PROJECT DETAILS

NAMP	1.02.03.3318	Region	SEPN - South Eastern Power Networks	RDP	RDP02
Category	Asset Replacement	Description	Tower Line Refurbishment	Type	N-2
Project	Overhead line PO Route replacement harmonised with Newhaven/ Lewes group reinforcement				
Site/Route	Lewes 132kV	Capacity Increase (MVA)	n/a		
Cost (ED1)	£30,984k	2012/13 Prices	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	5,170k	6,275k	6,201k	5,752k	4,752k	2,834k	0	0

PROJECT APPROVAL

This project is included in the SPN Ninfield Regional Development Plan.

PROJECT OVERVIEW

This project recommends the establishment of a new 2x240MVA 400/132kV grid supply point (GSP) at Little Horsted, East Sussex. The scope of work includes construction of a new Little Horsted 132kV substation and two new cable circuits to the existing Lewes substation.

The new connection is required to maintain secure supplies to the Lewes and Newhaven group replacing the existing 22km single circuit 132kV overhead line (PO Route) from Polegate which traverses part of the South Downs National Park. Retention of the overhead line is at risk due to deteriorating condition, land owner opposition and wayleave terminations.

In addition to the asset condition and grantor issues, the group demand at Lewes is forecast to exceed 100MW during ED1 introducing the need to provide (n-2) resilience. Even if local opposition could be resolved and new wayleaves negotiated, achieving planning permission to rebuild the PO Route as a double circuit is considered to have little, if any, probability of success in this AONB (area of outstanding natural beauty),

The establishment of a new GSP will allow in installation of two new cables to Lewes with the additional 3rd circuit satisfying the requirements of Engineering Recommendation P2/6.

Feasibility studies have been undertaken with National Grid and a suitable location identified for the new substation adjacent to their south coast double circuit 400kV overhead line. The 132kV substation would be co-located within the same operational boundary and a double circuit 11.5km open-cut route installed to Lewes.

BACKGROUND

Lewes 132/33kV substation is supplied from Ninfield and Bolney 400/132kV GSP's. The supply from Bolney is a single circuit trident wood pole line via Southern Cross 132kV switching station (route PLB). The supply from Ninfield is a single circuit steel lattice tower via a tee at Polegate (PO Route).

The continued serviceable operation of the PO Route is at risk due to:

- Wayleave terminations have been served for several spans of the existing line with more expected from other landowners along the route. This circuit traverses part of the South Downs National Park and negotiating agreements with land owners and obtaining planning permission to divert the line is considered to have a low probability of success. A public enquiry may also be required.
- The overhead line is parallel to the south coast and suffers from salt corrosion. Remedial maintenance has been carried out but significant further refurbishment is required. Linked to the local land owner opposition to the overhead line and the wayleave terminations, negotiating access for all but emergency maintenance is proving problematic

In addition to the grantor and condition issues for the PO line, the Lewes/Newhaven demand group is forecast to exceed 100MW during the ED1. Engineering Recommendation P2/6 requires that supplies must be restored to group demands over 100MW within 3 hours in the event of an (n-2) outage. The Lewes group demand is currently 101MVA and whereas compliance can be maintained by demand transfers, reinforcement of the group by installing a third circuit is predicted to be required during ED1. Rebuilding either PO Route or Route PLB to a double circuit is not considered to be a viable solution due to grantor and planning permissions issues.

Overhead Line Condition

The Lewes to Eastbourne 132kV PO Route is a single circuit tower line 22 kilometres in length and comprising 86 steel lattice towers. Condition surveys have confirmed the need to asset replace the overhead line due to deteriorating condition, and this is evidenced by the high average HIs for conductor fittings and tower foundations. The high HI values for tower foundations in particular are an indication that considerable work would be required to maintain the condition of this this line beyond the ED1 period.

Action has been taken to maintain the integrity of the PO Route. Refurbishment work completed in August 2010 replaced rusting tower members and has prolonged the service life by a period of approximately 10 years to 2021, when they are again forecast to reach HI5.

The Southern Cross to Lewes PLB route is constructed with trident towers, and its condition is poor, with 9 of the towers classified as HI 5 in 2012. Replacement work of corroded towers is planned for this line during ED1, which is expected to reduce the average HI of the towers to 1.6. However, by 2023, a majority of the conductors will be HI 4 or 5, indicating that additional rebuilding will be required.

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BACKGROUND - continued

The current and projected HI values of overhead line elements for the two routes supplying Lewes are shown below

Route	Year	Average HI Value					
		Conductor	Fittings	Earth Conductor	Earth Fittings	Tower	Foundation
PO	2012	2.0	4.3	2.6	2.2	3.0	4.2
	2023	2.4	4.7	3.0	3.4	5.0	4.6
PLB	2012	2.7	2.1	2.6	2.6	3.4	2.9
	2023	3.8	3.1	4.0	4.0	1.6	3.9

Land Grantor Issues

As part of a DPCR5 combined asset replacement and reinforcement strategy, it was proposed to rebuild the PO Route as a double circuit tower line. The works could not proceed because of wayleave terminations affecting the rural section. These include two claims in span PO39-PO40, two claims in PO38-PO39, one claim in PO36-PO37, and one claim in PO42-PO43. The loss of rights to maintain the PO Route is a high risk, with landowners anticipating the dismantlement of the line and wayleaves which are unlikely to be renewed. The loss of this route would bring an immediate security of supply issues for the Lewes-Newhaven demand group.

Both the PO and PLB routes traverse parts of the South Downs National Park and any works are likely to be subject to intense scrutiny to minimise the visual impact of the rebuilt line or its replacement on Areas of Outstanding Natural Beauty (AONBs) through which it passes. This is coupled with escalating initiatives by lobby groups to protect Special Sites of Scientific Interest (SSSI's). Any rebuilding, including partial tower rebuilds, in the National Park would require permission from the Local Authorities, the Department of Energy and Climate Change (DECC), National Park Land and the Infrastructure Planning Commission, and it is uncertain if this will be granted.

Lewes / Newhaven Group Demand (extract from Planning Load Estimates MW)

	Year								
	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23
Lewes Newhaven Group Demand (MW)	101.5	102.2	102.9	103.1	103.3	103.6	103.8	104.7	105.5

Future Development of the 132kV Network

The 132kV connections to Lewes provide interconnection between Ninfield and Bolney GSP's and parallel National Grid's south coast double circuit 400kV overhead line with the consequence that faults on the 400kV line force significant power flows through the 132kV network, and this presents risk of cascading outages.

In order to mitigate the security of supply risks arising from the current arrangement, the medium term strategy is to reconfigure the 132kV connections to allow normal operation as a radial rather than interconnected network thereby controlling the impact of abnormal super grid events on the lower voltage distribution network. The establishment of a

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new GSP at Horsted and the removal of the PO Route would facilitate the radicalisation of this part of the network.

OPTIONEERING

The development of specific projects will involve revalidating the reinforcement need nearer the time and will consider applying traditional network reinforcement approaches or ‘smart’ solutions to deliver programme efficiencies. This may entail the use of solutions which have not been developed yet but are currently being researched

Option 1: Establish new 400/132kV Grid Supply Point (GSP) at Little Horsted

Proposed Works National Grid:

- National Grid to construct a new GSP at Horsted Green adjacent to their existing Bolney–Ninfield 400kV overhead line comprising two 400/132kV super grid transformers (SGT’s) and two 132kV circuit breakers.

Proposed Works UK Power Networks:

- Land purchase at Little Horsted (coordinated with National Grid)
- Construct a new Little Horsted 132kV switch house equipped with a five bay double busbar switch board comprising 2 feeder panels to Lewes, 1 bus coupler and incorporating the 2 National Grid SGT circuit breakers.
- Install two new 132kV underground circuits from Horsted Green to Lewes Grid (route length 11.5km)
- At Lewes Grid, install 1 new 132kV circuit breaker and terminate the two Horsted cables onto the new and ex-PO Route circuit breakers
- Dismantle 132kV overhead line towers PO16 to PO86
- Install a spare (third) duct between Little Horsted and Lewes as future mitigation against similar grantor issues affecting the remaining overhead line to Southern Cross, Route PLB.

Estimated Capital Cost: £36,576k (£30,984k in ED1)

DPCR5 (£k)		RIIO-ED1 (£k)							
	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23
	5,592	5,170	6,275	6,201	5,752	4,752	2,834	0	0

Connection Charges: Annual connection changes for the new exit point are estimated at £2.695M per annum.

Risk Impact:

- Removes the network risks due to wayleave terminations
- Removes the network and safety risks from deteriorating tower condition on PO Route
- Maintains P2/6 compliance

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Option 2: Replace PO Route with a new Lewes - Polegate 132kV double circuit underground cable connection

Proposed Works:

- Re-construct Tower PXB6 as a L4 type terminal tower.
- Install two 132kV underground cables from Lewes to tower PXB6 (route length 20km) routed along public highway
- Extend the Lewes Grid 132kV switchboard by one panel
- Decommission single circuit PO Route between Lewes and tower PO16/PXB1
- Connect the two cable circuits to new terminal tower PXB6 and 132kV switchgear panels at Lewes Grid.
- Dismantle the towers PO86 to PO16

Estimated Capital Cost: £41.1M

The proposed investment phasing is given in the table below.

DPCR5		RIIO-ED1							
2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23
		£90k	£230k	£15,000k	£11,000k	£12,000k	£2,780k		

Risk Impact and Delivery issues:

- Removes the network risks due to wayleave terminations
- Removes the network and safety risks from deteriorating tower condition on PO Route
- Maintains P2/6 compliance when Lewes group demand exceeds 100MW
- Modifications to Tower PXB6 will require planning authority approval and wayleave renegotiation
- Open-cut cable installation along the A27 trunk road will cause significant local disruption

Option 3: Establish a new 132kV Grid Substation at Broadoak and install a new 132kV double circuit connection to Lewes

It is proposed to establish a new 132kV substation at Broadoak village during ED1. The scope of work includes upgrading the existing Broadoak to Ninfield overhead line Route PRC (scheme 1.35.01.8812 refers). The new Broadoak 132kV switching station provides an alternative point of connection for new circuits to Lewes.

Proposed Works:

- Two panel extension to the Broadoak 132kV switchboard
- Open-cut installation of a new 132kV double circuit cable connection from Broadoak to Lewes (route length 25.8km)
- Extend Lewes 132kV switchboard by 1 panel.
- Dismantle towers PO86 to PO16

Estimated Capital Cost: £43.7M

The proposed investment phasing is given in the table below.

DPCR5		RIIO-ED1							
2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23
		£90k	£230k	£13,000k	£15,000k	£12,000k	£3380k		

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Risk Impact and Delivery issues:

- Removes the network risks due to wayleave terminations
- Removes the network and safety risks from deteriorating tower condition on PO Route
- Maintains P2/6 compliance when Lewes group demand exceeds 100MW
- The 26km open-cut cable installation will cause significant local disruption

Option 4: Do Nothing

Capital Cost: £0

Risk Impact: The status quo would remain unchanged with continuation of the asset and network risks.

Discussion and Selection of Options

Four options have been identified to mitigate the risks for the Lewes/Newhaven group.

Option	Capital Cost	Exit charges per annum	Risks Addressed?		
			P2/6 Compliance	Asset Condition	Land Rights
Option 1	£37.2M	£2.7M	✓	✓	✓
Option 2	£51.1M	£0	✓	✓	✓
Option 3	£48.7M	£0	✓	✓	✓
Option 4	£0	£0	✗	✗	✗

- Option 1: Provides the maximum mitigation of the existing risks at the lowest capital cost. The estimates exclude National Grid Connection charges.
- Option 2: has the highest capital cost of the identified options. It does not provide mitigation against the possible future removal of Route PLB
- Option 3: provides the mitigation of the existing risks. It does not provide mitigation against the possible future removal of Route PLB
- Option 4: Maintains the status quo and does not resolve any issues

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Recommended Option

The recommended approach is to establish a new Grid Supply Point and two new 132kV underground cable circuits to supply Lewes Grid. This requires National Grid to construct and commission a new 2x240MVA 400/132kV substation in the vicinity of Little Horsted, East Sussex. Subsequently the existing single circuit PO Route will be dismantled.

The substation will:

- Avoid the need to asset replace the existing single circuit overhead line between Eastbourne and Lewes and mitigates grantor issues associated with this route.
- Removes an overhead line from an AONB
- Maintain P2/6 licence compliance for the Lewes/Newhaven demand group
- Facilitate future reinforcement and re-configuration of the local network
- Increased supergrid transformer capacity will defer the medium need for future reinforcement at the adjacent Bolney and Ninfield GSPs


A feasibility study undertaken with National Grid confirms the viability of establishing the new GSP adjacent to their existing 400kV double circuit south coast overhead line.

The UK Power Network project deliverables are:

- New switch house equipped with a two section GIS switchboard
- 132kV double circuit cable connection between Little Horsted and Lewes substation
- One additional 132kV switch panel at Lewes
- Dismantle PO Route

PROJECT RISKS

- Land purchase and planning permission at Little Horsted
- National Grid outage constraints to connect the new supergrid transformers
- Street service congestion impacting on the open-cut cable route to Lewes

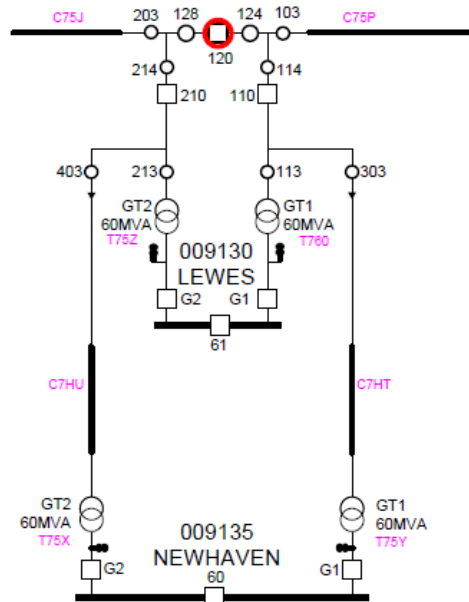
Name	Title	Signature	Date
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Robert Kemp	Head of System Development		02/03/2014
Barry Hatton	Director of Asset Management		

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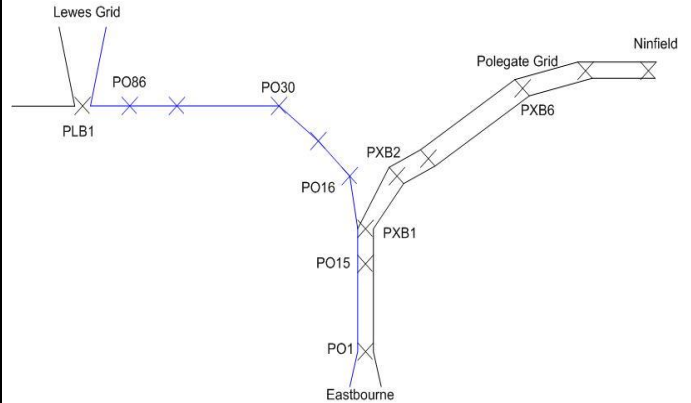
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SINGLE LINE DIAGRAM – EXISTING NETWORK

Lewes – Newhaven network configuration



PO Route



GEOGRAPHICAL DIAGRAM

