# RIIO-ED1 Reinforcement Scheme Summary

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

## PROJECT DETAILS

| | | | | | |
|---|---|---|---|---|---|
| NAMP | 1.36.03.3956 | Region | EPN - Eastern Power Networks | RDP | RDP06 |
| Category | Reinforcement | Description | EHV Reinforcement - Switchgear | Type | FL |
| Project | Little Barford 132/33kV Grid Substation - Replace 33kV Switchboard (Fault Level) | | | | |
| Site/Route | Lt Barford Grid 33 | | | Capacity Increase (MVA) | 0.0 |
| Cost (ED1) | £1,700k 2012/13 Prices | NAMP version | Table J Less Indirect Baseline 19th February 2014 | | |

| Year | 2015/16 | 2016/17 | 2017/18 | 2018/19 | 2019/20 | 2020/21 | 2021/22 | 2022/23 |
|---|---|---|---|---|---|---|---|---|
| Spend Profile | | | | | | £257k | £1443k | |

## PROJECT APPROVAL

Approval has been granted as part of the Regional Development Plan.

## PROJECT NEED

The predicted fault level at Little Barford Grid Substation will exceed the rating of the existing switchgear due to increasing generation connections at EHV and HV. Twelve circuit breakers are Oil insulated EEC OKM4. The fault rating of the oil circuit breakers (circa 1984) is 17.5kA.

It is not possible to lower the fault level without compromising operational and planning requirements. It is therefore proposed to replace the existing 12 breaker AIS compound with a new installation comprising 12 circuit breakers.

## BACKGROUND

At present the potential fault current at Little Barford 33kV bars is 14kA which is within the switchgear rating of 17.5kA.

The three phase RMS fault level at Little Barford Grid 33kV is expected to increase by 2.8kA following the installation of a 3rd Super Grid Transformer at Eaton Socon in 2017 and by 2.0kA due to connection of 92MW of renewable generation in the Little Barford area.

This will result in a potential 3 phase fault level increase of 4.8kA which will result in fault level exceeding the switchgear rating.

## 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.

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

**Options considered**

Option 1 – Install new 33kV switchgear with the appropriate fault rating. Estimated cost £1,700k

| PAIF Header / Category | Total |
|---|---|
| **Cabling Works** | **£157,532.74** |
| 33kV Cables | £157,532.74 |
| **Civil Works** | **£455,060.76** |
| Construction | £455,060.76 |
| **Control / Protection Works** | **£177,116.61** |
| Protection Relay Panels | £143,291.36 |
| SCADA | £33,825.25 |
| **Site Engineering** | **£115,306.23** |
| Management & Prelims | £109,396.08 |
| Testing & Commissioning | £5,910.15 |
| **Substation Works** | **£769,176.42** |
| Electrical Installation Works | £769,176.42 |
| **Sundry Items** | **£26,000.00** |
| Sundry Item | £26,000.00 |
| **Grand Total** | **£1,700,192.76** |

Option 2 – Operate the 33kV bars with the bus coupler open to reduce the fault level on each section. There are single transformer Primary substations connected to Lt Barford. The loss of one incoming 33kV supply will therefore cause loss of supply with consequent CI's and CML's until supply can be restored. This option also limits further connection of low carbon generation. This option is therefore rejected. One HI5 33kV breaker will need to be replaced. Estimated cost £140k.

Option 3 – Do Nothing. Continuing to operate the 33kV switchboard above its fault rating increases the risk of disruptive failure with consequent safety risks, CI's and CML's. This option is therefore rejected

**Recommended Option**

Option 1 – This option provides a more resilient network for the connection of load and generation. Switchgear which would be approximately 40 years old by the end of the ED1 period will be replaced.

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

## OUTPUT MEASURES – LOAD INDICES (LI)

PLE information to Table CV102 (LI) – OFGEM definition and Element Energy growth forecast.

(1) 2011/12 Maximum demand growth based on Element Energy (as per the LRE narrative)

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Site/Route | Lt Barford Grid 33 | Capacity Increase | 0.0 MVA | Year | 2022 | RIGS | CV101 113 |
| Limitation | Switchgear | Season | W | Type of Intervention | FL | Optimised with NLRE | Yes |
| P2/6 Compliance (end of ED1) | Yes | P2/6 Class (end of ED1) | D | | | | |

| | 2010/11 | 2011/12 | 2012/13 | 2013/14 | 2014/15 | 2015/16 | 2016/17 | 2017/18 | 2018/19 | 2019/20 | 2020/21 | 2021/22 | 2022/23 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Maximum Demand (MVA) | 80.2 | 75.6 | 75.1 | 75.3 | 75.7 | 76.3 | 76.9 | 77.5 | 78.3 | 79.1 | 80.0 | 81.3 | 82.7 |
| Firm Capacity without intervention (MVA) | 114.3 | 114.3 | 114.3 | 114.3 | 114.3 | 114.3 | 114.3 | 114.3 | 114.3 | 114.3 | 114.3 | 114.3 | 114.3 |
| Firm Capacity with intervention (MVA) | | | | | | | | | | | | | 114.3 |
| Load Index without Intervention | LI1 | LI1 | LI1 | LI1 | LI1 | LI1 | LI1 | LI1 | LI1 | LI1 | LI1 | LI1 | LI1 |
| Load Index with Intervention | | | | | | | | | | | | | LI1 |

Note: The maximum demand at Little Barford Grid shown in the table above includes the contribution from distributed generation.

Fault level forecast based on EPN Long Term development Statement – Table 4A 3ph Fault Level (May 2013)

| Substation | Node Name | Voltage Level (kV) | Existing System Fault Currents | | Fault Rating | |
|---|---|---|---|---|---|---|
| | | | Peak Make (kA) | rms Break (kA) | Peak Make (kA) | Break (kA) |
| Little Barford 33kV | LBGD31 | 33.0 | 39.9 | 14.0 | 44.6 | 17.5 |
| Network Modifications | (Contribution) | | 7.0 | 2.8 | | |
| Accepted Generation | (Contribution) | | 5.0 | 2.0 | | |
| **Forecast Fault Level** | **LBGD31** | **33.0** | **51.9** | **18.8** | **44.6** | **17.5** |

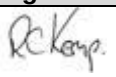
## OUTPUT MEASURES – HEALTH INDICES (HI)

| | ED1 Start (2015) | | | | | ED1 End (2023) No Investment | | | | | End of ED1 (2023) With Investment | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Asset Category | HI1 | HI2 | HI3 | HI4 | HI5 | HI1 | HI2 | HI3 | HI4 | HI5 | HI1 | HI2 | HI3 | HI4 | HI5 |
| 132kV Switchgear | | | | | | | | | | | | | | | |
| 33kV Switchgear | | 11 | | 1 | | | | 9 | 2 | 1 | 12 | | | | |
| 11/6.6kV Switchgear | | | | | | | | | | | | | | | |
| Grid/Primary Transformers | | | | | | | | | | | | | | | |

## PROJECT RISK

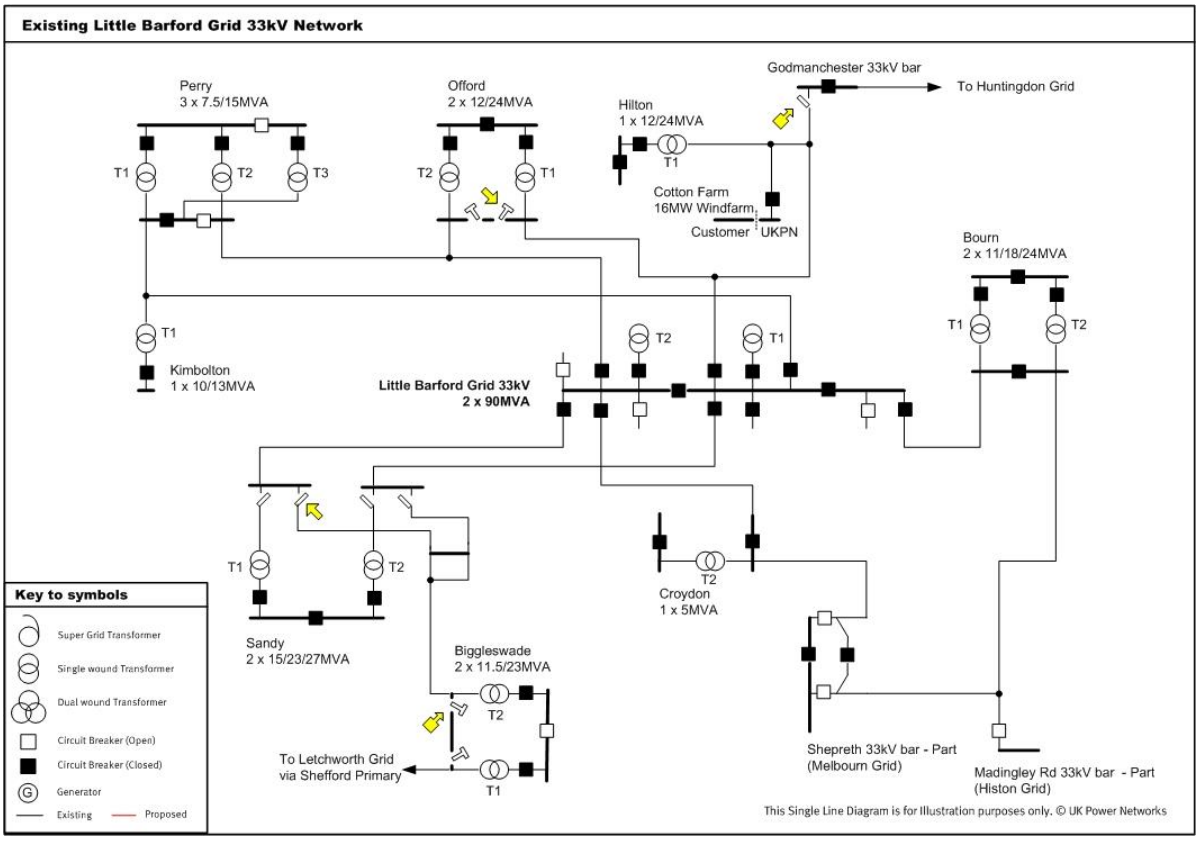
All of the cost numbers displayed in this document are before the application of on-going efficiencies and real price effects.

General
- Details within the estimate have been done as desktop exercise only
- Potential impact of embedded generation within the wider network

| Name | Title | Signature | Date |
|---|---|---|---|
| D J Whiteley | Infrastructure Planner | D J Whiteley | 28/02/2014 |
| **Name** | **Title** | **Signature** | **Date** |
| Robert Kemp | Head of System Development |  | 28/02/2014 |
| **Name** | **Title** | **Signature** | **Date** |
| Barry Hatton | Director of Asset Management | | |

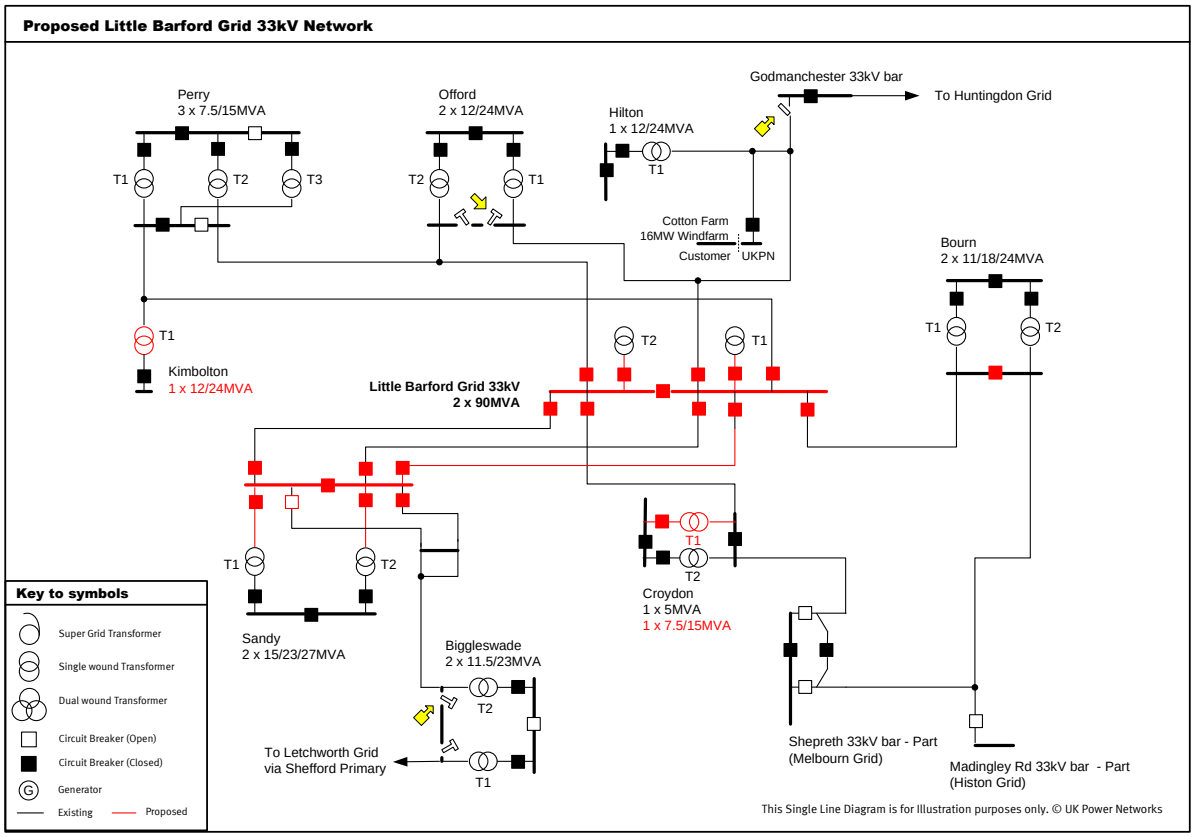
All of the cost numbers displayed in this document are before the application of on-going efficiencies and real price effects.

## SINGLE LINE DIAGRAM – EXISTING NETWORK

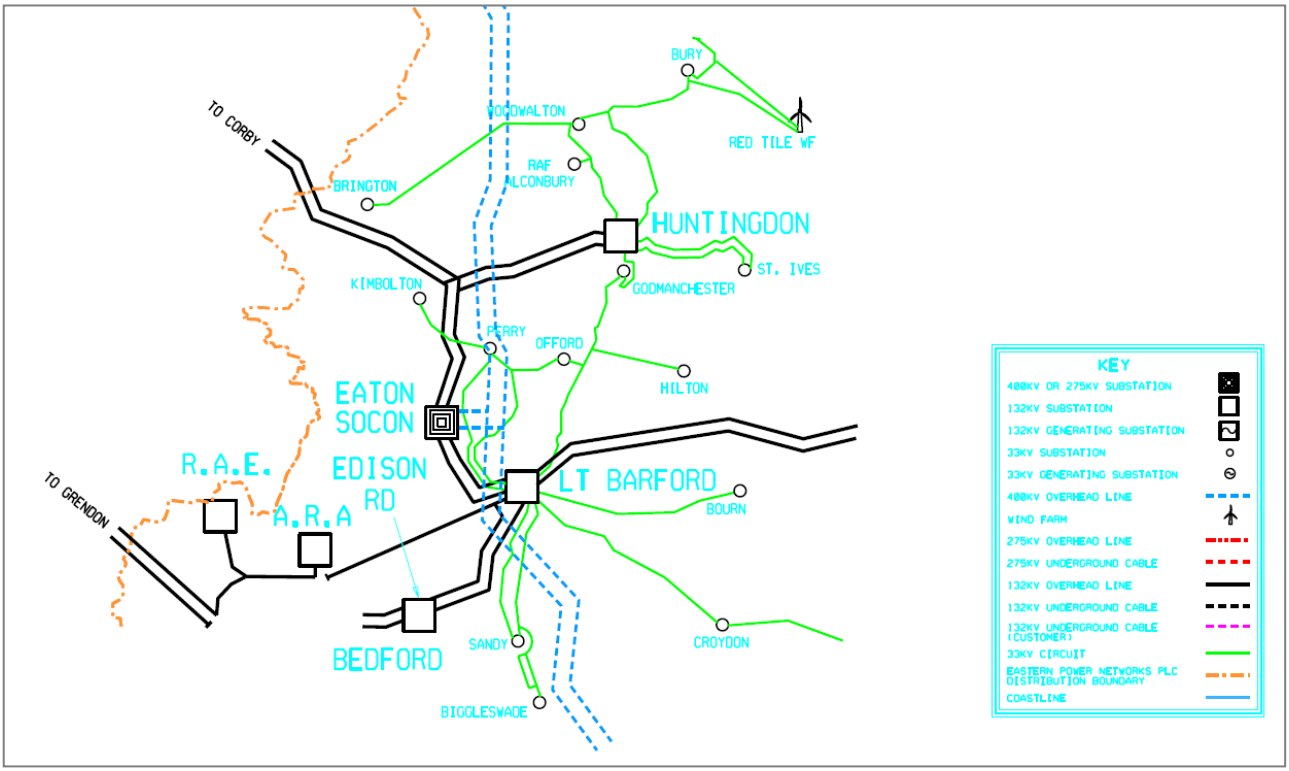



## SINGLE LINE DIAGRAM – RECOMMENDED OPTION

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




## GEOGRAPHICAL DIAGRAM




## AERIAL VIEW – LITTLE BARFORD 33

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