Regional Development Plan

RDP06 Eaton Socon GSP (EPN)

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

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1 Executive Summary

This Regional Development Plan (RDP) reviews sections of UK Power Networks (UKPN) EPN HV and EHV network supplied from Eaton Socon Grid Supply Point (GSP), a 400/132kV National Grid substation located on the western edge of Cambridgeshire, to the south west of St Neots and contains 2 x 240MVA supergird transformers (SGTs). The GSP supplies Huntingdon and Little Barford Grid substations which in turn supply Primary substations within Huntingdonshire, South Cambridgeshire, Bedford and Central Bedfordshire.

Little Barford 132kV Grid is the switching point within the Eaton Socon GSP group and is located to the south of St Neots (approximately 2km south east of the GSP). Little Barford Grid is located at the extreme eastern fringe of Bedford. A 500mm^2 double circuit acting as two transformer tails connects the Grid to the GSP. The Little Barford 132kV Grid site is of double busbar AIS construction, the majority of civil infrastructure dates from the 1940s, there are six grid transformers which feed three remote switchboards at lower voltage levels.

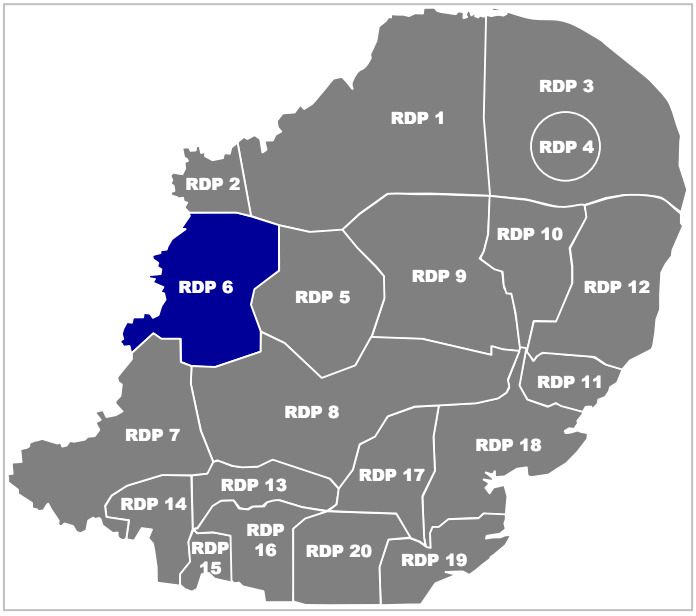

Figure 1 – Area covered by the RDP

1.1 Summary of issues addressed

This RDP is primarily focused on replacement of the Little Barford 132kV AIS double busbar substation and reinforcement at Eaton Socon GSP. In addition reinforcement at Primary substation level ensures that network security is maintained and the planned future load growth can be connected without compromising network security.

The investment in 132kV infrastructure and additional SGT capacity to be installed at Eaton Socon GSP benefits Burwell GSP through the transfer of load and the deferral of reinforcement (4th SGT) to maintain compliance with security of supply standards.

1.2 Recommended Strategy

At 132kV the interaction of Eaton Socon with Burwell and Sundon GSPs has been considered and the required actions identified to ensure security of supply is maintained at both the GSP level and on 132kV interconnecting circuits to both Burwell and Sundon GSPs.

The investment in 132kV infrastructure and additional capacity created at Eaton Socon benefits adjacent GSPs through the transfer of load/deferral of reinforcement and maintaining compliance with security of supply standards.

Investment Profile

Table 1 provides the projected expenditure profile for reinforcement and asset replacement projects (LRE and NLRE) in this RDP for both DCPR5 and ED1. This information is taken from the 19th February 2014 NAMP version and shown overleaf.

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IDP	DPCR5 2013-15	2015 /2016	2016 /2017	2017 /2018	2018 /2019	2019 /2020	2020 /2021	2021 /2022	2022 /2023	RIIO-ED1 Total
LRE	£7.6m	£8.0m	£6.9m	£1.6m	£1.8m	£0.0m	£0.3m	£2.0m	£1.8m	£22.4m
NLRE	£4.7m	£5.1m	£4.9m	£0.1m	£0.2m	£0.4m	£0.0m	£0.1m	£0.0m	£10.8m
TOTAL	£12.3m	£13.1m	£11.8m	£1.7m	£2.0m	£0.4m	£0.3m	£2.1m	£1.8m	£33.2m

Table 1. LRE and NLRE expenditure profile

Output Measures

The figure below provides the expected Load Indices (LI) for all substations covered in this RDP at the end of ED1 period (2022/23). Substations with a projected load index of LI4 and LI5 will be specifically targeted for improvement and are detailed in this document, with the resulting improvement shown in figure below.

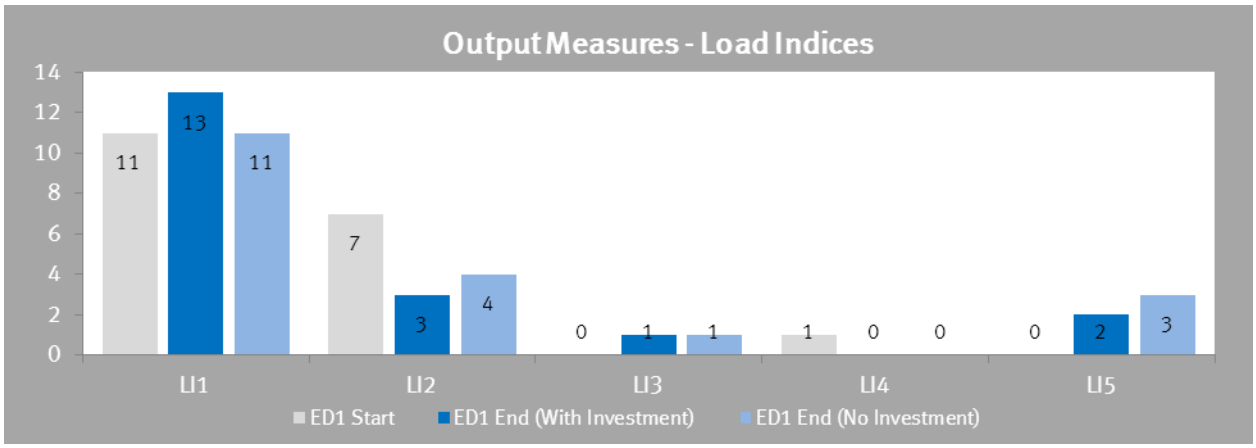
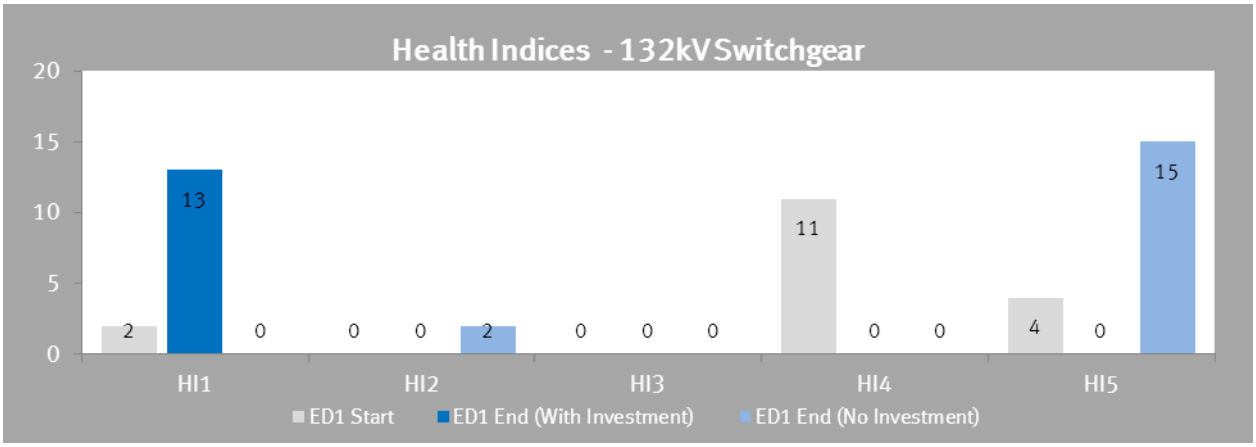


Figure 2.2022/23 Load Indices with and without interventions

The figure below provides the projected health index of various assets covered in this RDP at the beginning and end of ED1, with and without interventions as defined in the NAMP under asset replacement.



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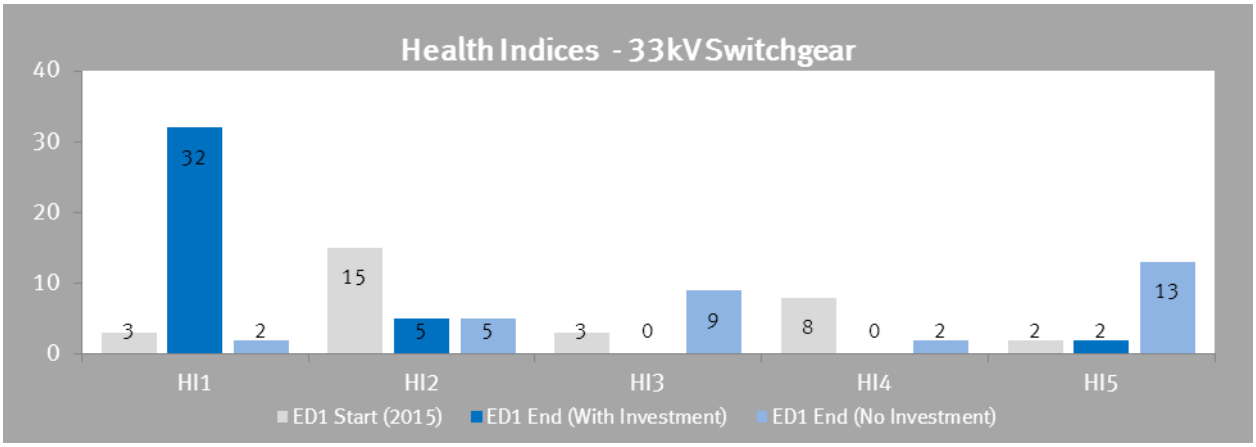

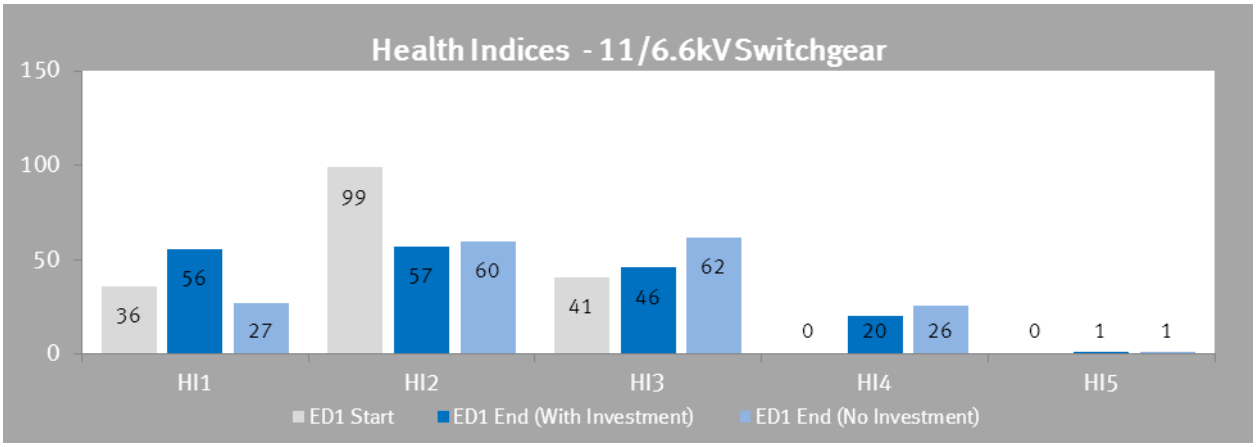

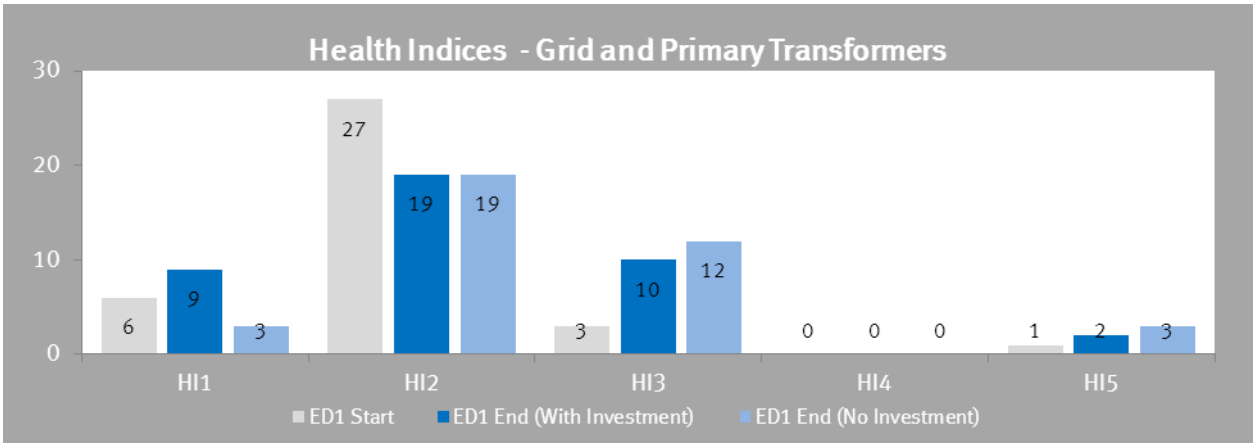

Figure 3.Health Indices by asset category

Scenarios Considered

- Demand growth from Planning Load Estimates (PLE's) up to 2023.
- Major Generation sites disconnected.
- Compliance with P2/6 Standard for Security of Supply and operational flexibility of the 132kV network.

RDP Dependencies and Interactions

At 132kV the interaction of Eaton Socon with Burwell and Sundon GSPs has been considered and the required actions identified to ensure security of supply is maintained.

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The replacement of the Little Barford 132kV switchgear with a new GIS switchboard at Eaton Socon requires circa 25km of 132kV underground cables to be installed to re-connect the existing132kV circuits that terminate at Little Barford Grid. Achieving consents for cable routes presents a risk to the anticipated delivery date / overall project cost. The new indoor switchboard is to located on land owned by National Grid.

Network Rail has identified a programme of works to upgrade electricity supplies to the East-Coast Mainline (ECM) rail route, part of which involves the installation of trackside autotransformers and cables in close proximity to the Little Barford 33kV site as the ECM runs alongside the east side of the 33kV compound. The Network Rail 25kV trackside assets are currently supplied by 2 x 132/25KV 18MVA transformers at the 132kV Grid site.

If Network Rail adopt the above approach the existing 18MVA 132/25kV transformers will eventually be decommissioned and removed (expected 2016) with the new Network Rail autotransformers being supplied from National Grid 400kV exit points. Access to the Network Rail assets is via the access road for the Little Barford 33kV site and a programme of works has been approved to install new 33kV transformer tails in the access road. The UKPN works are expected to be completed within DCPR5 timescales.

2 Network configuration

2.1 Existing Network

Eaton Socon Grid Supply Point (GSP) is a 400/132kV National Grid exit point which is located on the western edge of Cambridgeshire, to the south west of St Neots and contains 2 x 240MVA supergird transformers (SGTs). The GSP supplies Huntingdon and Little Barford Grid substations which in turn supply Primary substations within Huntingdonshire, South Cambridgeshire, Bedford and Central Bedfordshire.

Little Barford 132kV Grid is the switching point within the Eaton Socon GSP group and is located to the south of St Neots (approximately 2km south east of the GSP). A 500mm^2 double circuit acting as two transformer tails connects the Grid to the GSP. Little Barford Grid site is of double busbar AIS construction, the majority of civil infrastructure dates from the 1940s, there are six grid transformers which feed remote switchboards at lower voltage levels:

- 2x 90MVA 132/33kV units – Little Barford 33kV Grid, outdoor AIS single busbar site, oil and SF6 switchgear.
- 2 x 30MVA 132/11kV units – Little Barford 11kV, indoor 1600A oil and retrofit vacuum switchgear.
- 2 x 18MVA 132/25kV units – Network Rail trackside supplies

Little Barford 33kV AIS feeds nine 33/11kV Primary Substations across Huntingdonshire, Cambridgeshire and Bedfordshire. St Neots is supplied from the Little Barford 11kV direct transformation substation.

Huntingdon Grid is teed of the 132kV double circuit that connects Eaton Socon and Corby (Western Power Distribution license area). Huntingdon is normally supplied from Eaton Socon GSP with overhead line (OHL) circuit breakers open at Corby 132kV.

At Huntingdon 132kV Grid there are four grid transformers which feed local switchboards at 33 and 11kV:

- 2 x 90MVA 132/33kV units – Huntingdon 33kV Grid, outdoor AIS single busbar site, oil and SF6 switchgear.
- 2 x 30/30MVA 132/11kV double wound units – Huntingdon 11kV Grid, indoor switchboard.

Huntingdon 33kV AIS feeds six 33/11kV Primary Substations across Huntingdonshire and Cambridgeshire. The town of Huntingdon and the immediate area is supplied from the 11kV direct transformation substation, which was commissioned in 2010 to remove load form the 33kV switchboard.

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At 132kV the interaction of Eaton Socon with Burwell and Sundon GSPs has been considered and the required actions identified to ensure security of supply is maintained at both the GSP level and on 132kV interconnecting circuits.

Geographic diagram are shown in Appendix A and Single Line diagrams (SLDs) in Appendix B.

Within the Eaton Socon RDP area there is 1 generator connected at 33kV which has the potential to cause significant changes in active power flows within the network.

Generation Plants	Type	DNC (MVA)	F (%)	pf	DG Output = F*DNC		
					MVA	MW	MVAr
Red Tile Windfarm	Wind	25.92		0.96		24	

Table 2. Output of generating plants used in the analysis

Note that the output of Red Tile Windfarm is split between Huntingdon and Peterborough Central via a normally open point on the 33kV busbar at Bury (Cambs) Primary. The maximum active power export permitted into the Huntingdon group is 14MW.

Figure 4.Location of Eaton Socon and interconnecting GSPs

2.2 Network changes in progress

The existing Little Barford 11kV 1600A indoor switchboard, is to be replaced and relocated to land on the 132kV Grid site. This project will remove the 1964 Switchgear & Cowan's oil filled switchgear and also removes the requirement for circa 750m 11kV transformer tails which currently run under a busy road used by industrial traffic from the local crane yard and Little Barford combined cycle gas turbine (CCGT) power station.

The Little Barford 33kV transformer tails have a history of faults in recent years. A project has been Gate B approved to replace the paper insulated lead covered (PILC) cores with new copper cores.

3 Summary of Issues

3.1 Development areas

Major development within the Eaton Socon GSP supply area is focussed at St Neots. Information relating to dwelling numbers and dates given below are taken from the Huntingdonshire Housing Land Availability Assessment Update which was published on 22nd January 2010. The assessment of achievability focused on when development may occur and indicates whether a site may be:

a) *deliverable:* a site could be delivered between years 1-5 of the plan period for the Core Strategy with year 1 commencing April 2010.

b) or *developable :* a site could be developed after the first 5 years of the plan period i.e. in years 6-10 (2015-2020) or 11-16 (2020-2026)

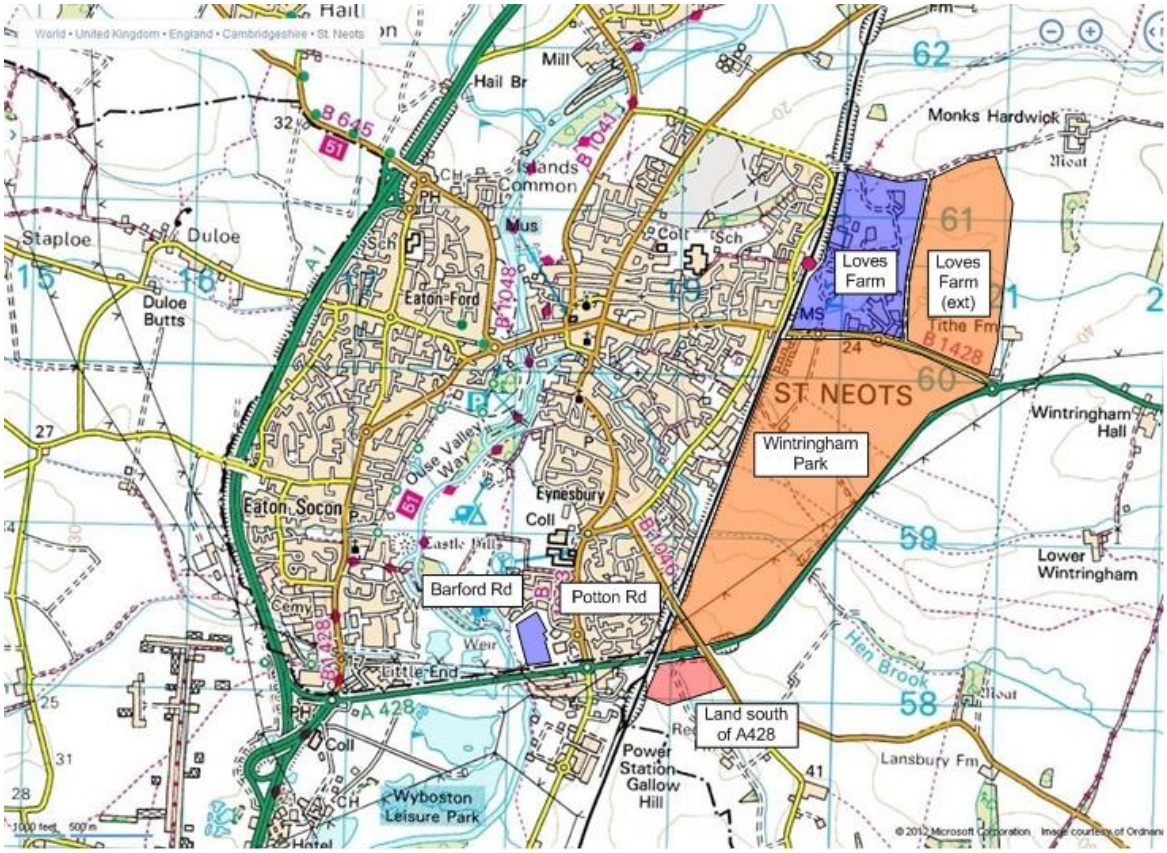

Figure 5. Development areas in St Neots

Committed development: works at these sites is underway / complete

- Loves Farm – 1350 dwellings
- Barford Road – 200 dwellings considered achievable by 2015

Potentially suitable sites:

- Wintringham Park – 3240 dwellings, 1470 by 2015 (phase 1), a further 1770 dwellings post 2026.
- Loves Farm (extension) – 900 dwellings with potential for development across all time phases.
- Potton Road - 90 dwellings with recommendation for development post 2026.

Not suitable for residential development:

- Land south of A248 – Site was submitted in 2009 with anticipated capacity of 250 dwellings

The 2011 Local Plan Housing Trajectory outlined the following levels of development and anticipated load requirements as tabled below:

AREA	DEVELOPMENT PHASE			DWELLINGS	PEAK LOAD
	2011 - 2015	2016 - 2020	2021-2026	2011 - 2026	(kWh)
Huntingdon	994	1,780	141	2,915	8,745
St Neots	2,034	1,689	1,075	4,798	14,394
St Ives	749	175	0	924	2,772
Ramsey	228	218	0	446	1,338

Another significant area for re-development is centred at the RAF Alconbury air base which is located approximately 6km to the North West of Huntingdon. Formal connection applications have been received for loads up to 7MVA, which would see the existing air base re-developed for residential and industrial/commercial usage.

3.2 Asset Replacement

7541 - Girton Tee/Histon 132kV Tower Line (PTD) - 132kV Tower Line Refurbishment.

The condition assessment of the Girton Tee/Histon 132kV Tower Line (PTD) 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 CI and CML performance therefore this project recommends the refurbishment. Completion of the project will see 2 km of 132kV Tower Line refurbished.

7560 - Little Barford/Arbury 132kV Tower Line (PT) - 132kV Insulator & Fitting Replacement

The condition assessment of the Little Barford/Arbury 132kV Tower Line (PT) 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 CI and CML performance therefore this project recommends the replacement of the 132kV insulators and fittings.

5593 - Little Barford 132kV Grid Substation - replace switchboard

Little Barford 132kV Grid substation is the switching point within the Eaton Socon GSP group and contains a 19 bay double busbar AIS switchboard which dates from the 1940s, the existing outdoor OBYR14 air blast circuit breakers were installed circa 1964 and replaced the original bulk oil breakers. The concrete structures on site are suffering from extensive spalling and splitting; the switchboard presents both H&S and operational risks and is at the end of its operational life. A report by London Power Associates (LPA) following an inspection of the site in March 2012 recommended replacement of the AIS switchboard. It is proposed to construct a new GIS switchboard at Eaton Socon on land owned by National Grid to replace the Little Barford 132kV switchboard, the non-standard AIS busbar arrangement at Eaton Socon and facilitate connection of a 3rd supergrid transformer (SGT) at Eaton Socon.

3614 – Eaton Socon / Little Barford 132kV circuit reconfiguration

As a result of establishing a new 132kV GIS switchboard at Eaton Socon (see 5593) the 132kV circuits that terminated Little Barford 132kV Grid require connection to the new switchboard. To achieve this is it proposed that a total of 24.5km of 132kV cables will be installed. In addition the proposed reconfiguration facilitates removing a 132kV tee point and 6 spans of 132kV single circuit OHL which crosses the A1 dual carriageway, the Wyboston Lakes leisure complex and under-sails a National Grid 400kV double circuit. The 132kV network reconfiguration also considers the proposed developments on the east of St Neots and future works which may be required. A map of the St Neots area indicating the positions of Eaton Socon, Little Barford and the proposed cable routes to configure the 132kV circuit routes is shown overleaf.

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The figure below indicates the proposed new 132kV cable routes to reconfigure the 132kV network.

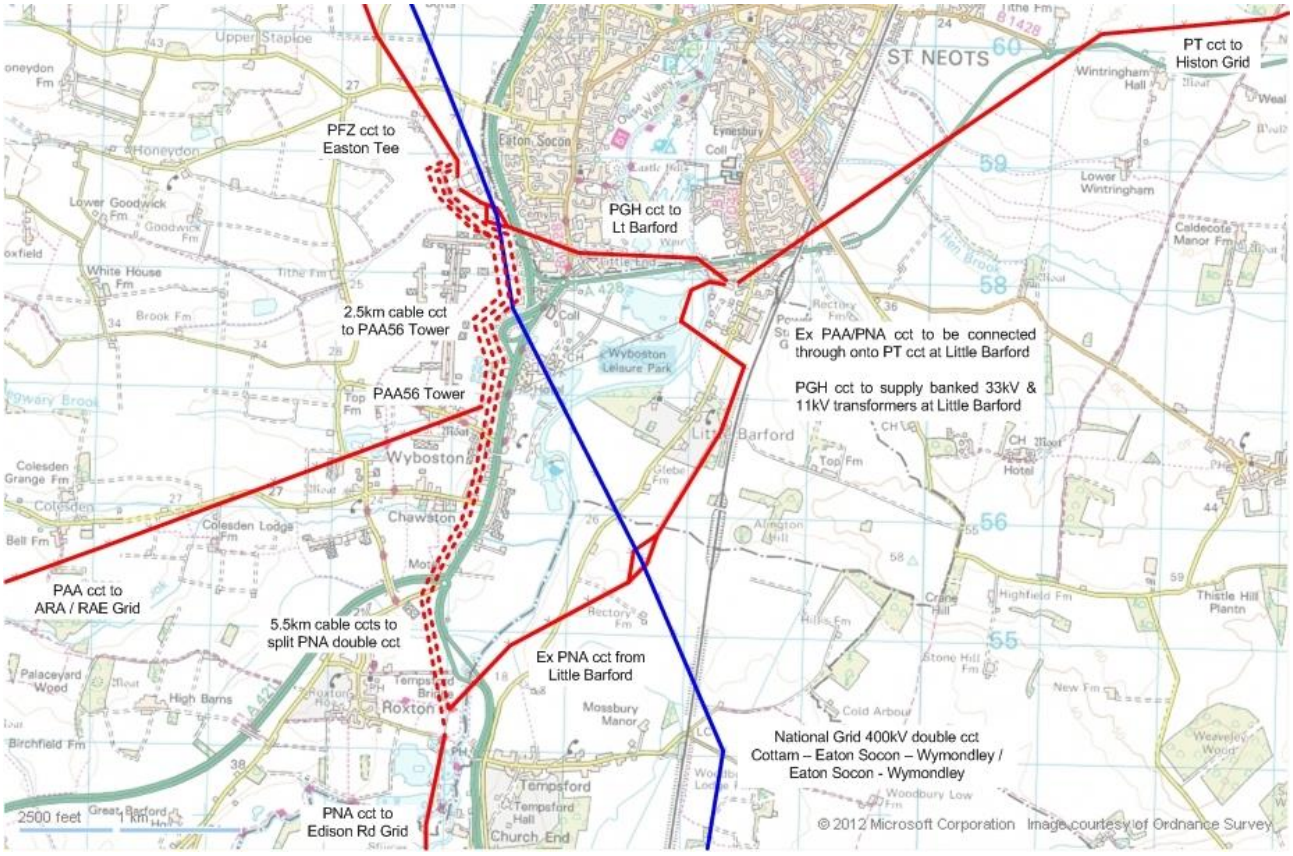

Figure 6. Proposed 132kV cable routes to reconfigure the 132kV network

4046 - Little Barford/Perry/Offord 33kV Tower Line (PA) - 33kV Tower Line Refurbishment

The condition assessment of the Little Barford/Perry/Offord 132kV Tower Line (PA running at 33kV) 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 CI and CML performance, therefore this project recommends refurbishment. Completion of the project will see 5km of OHL refurbished.

5620 - Eaton Socon 400/132kV Grid Supply Point – Replace 6 x 132kV FMJL CTs

The condition assessment and history of 132kV FMJL CTs installed at Eaton Socon Substation has shown that the risk of harm to operators is unacceptable. It is not possible to keep this asset in use without compromising operational requirements; therefore this project recommends the like for like replacement of this equipment. Note that this project is scheduled within DPCR5 timescales.

5748 - Little Barford 33kV transformer tails replacement

The Little Barford 33kV transformer tails have a history of faults in recent years, which have occurred on the paper insulated lead covered (PILC) cores. There are currently 2 x PILC and 1 x 800 Cu cores per phase. It is proposed to replace the 2 x paper insulated lead covered (PILC) cores per phase with new copper cores.

7540 - Little Barford Local 132kV Tower Line (PKW) - 132kV Tower Line Refurbishment

The condition assessment of the Little Barford 132kV Tower Line (PKW) 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 CI and CML performance therefore this project recommends refurbishment. Completion of the project will see the 132kV tower connection from the 132kV AIS busbar to GT4 refurbished.

7558 – Little Barford/Bedford 132kV Tower Line (PNA) - 132kV Tower Line Refurbishment

The condition assessment of the Barford/Bedford 132kV Tower Line (PNA) 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 CI and CML performance therefore this project recommends refurbishment. Completion of the project will see 4km of 132kV OHL refurbished.

7561 - Easton Tee/Huntingdon 132kV Tower Line (PJF) - 132kV Insulator & Fitting Replacement

The condition assessment of the Easton Tee/Huntingdon 132kV Tower Line (PJF) 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 CI and CML performance therefore this project recommends the replacement of the 132kV insulators and fittings.

7611 - Bourn 33/11kV Primary Substation - Replace 33kV Switchgear

The condition assessment of the 1963 CPA OE5 outdoor oil insulated switchgear installed at Bourn 33/11kV Primary Substation 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 therefore this project recommends its replacement.

7764 - Kimbolton 33/11kV Primary Substation - Replace Primary Transformers T1

The condition assessment of the 1964 AEI Primary Transformer installed at Kimbolton 33/11kV Primary Substation 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 therefore this project recommends its replacement. It should be noted that as Kimbolton is a single transformer Primary the planned works to increase the interconnection at 11kV to Brington should be completed prior to the transformer change to avoid compromising CI and CML performance.

8395 - Little Barford 132kV Grid Substation - Replace CVTs & VTs

The history of 132kV VTs & CVTs installed at Little Barford 132kV Grid Substation has shown that the risk of harm to operators is unacceptable. It is not possible to keep this asset in use without compromising operational requirements; therefore this project recommends replacement of this equipment. The replacement of these assets will remove operational restrictions that will impact the future circuit changeover works.

3.3 Security of supply analysis

Substation	Demand (MW)	Supply Class	Demand (MVA)			P2/6	Comments
			2015	2018	2021		
Eaton Socon GSP	217	D	247	263	274	Compliant	None
Eaton Socon GSP with Edison Rd from 2016	217	D	247	286	298	Compliant	N-1 firm exceeded from 2018 with only 2 SGTs. Becomes class E group (>300MW) circa 2023
Eaton Socon GSP with Edison Rd and Histon from 2016	217	D	247	351	373	Compliant	Becomes class E group circa 2016/17

Table 3. P2/6 Assessment table

Consideration of the future predicted group summer loads and n-2 SGT faults following an n-1 planned outage at Eaton Socon indicates that with a transfer of Histon Grid back to Burwell GSP the remaining summer group load could be supported until circa 2029 and combined with an additional transfer of Edison Rd back to Sundon GSP in an emergency situation would secure the remaining load until 2034. The reliance on load transfers

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before planned SGT outages are taken (to secure the subsequent n-2 loss) highlights the importance of maintaining the 132kV interconnectivity between the GSP groups.

3.4 Operational and technical constraints

The combined loads at Huntingdon 33 and 11kV Grids will exceed the n-1 rating of the 175mm^2 Lynx conductor from the Easton Tee (Huntingdon tee point) to Corby 132kV (WDP) from 2013/14, this is driving the requirement for Huntingdon to remain permanently supplied from Eaton Socon GSP. WDP owns the 33km Lynx section from Corby 132kV.

ARA and RAE single transformer Grid Substations, which are located to the north of Bedford and have a combined load of circa 40MVA. These sites are normally supplied from Grendon GSP via a single circuit 132kV OHL (PX route). These sites can also be supplied from Eaton Socon GSP (via the PAA circuit) pending making of jumpers at ARA Grid. The PAA circuit tees with the PNA circuit from Little Barford 132kV Grid at the Wyboston Lakes.

The PAA circuit which extends to the tee point of RAE Grid has been refurbished; conversely the condition of the PX circuit to Grendon is such that refurbishment will required in the near future if it is to remain in service for the foreseeable future. The refurbished PAA circuit could in the future also provide additional support at 132kV for Bedford and the surrounding area. A generation connection application has been received for a 36MW windfarm that would connect to the PX route within the UKPN license area, and require some of the PX route to remain in service; however the remainder of the circuit to Grendon could be decommissioned and removed.

The Little Barford 11kV switchboard cannot be run solid due to fault levels, and the new switchboard once installed will also continue to be run with the bus section normally open with an auto-close scheme operational to reduce the CML impact.

The existing PGH 500mm2 132kV double circuit which connects SGTs 1 & 2 at Eaton Socon to the existing Little Barford 132kV AIS double busbar switchboard has a diamond crossing to the south of the GSP where it passes under the National Grid 400kV Eaton Socon – Wymondley double circuit.

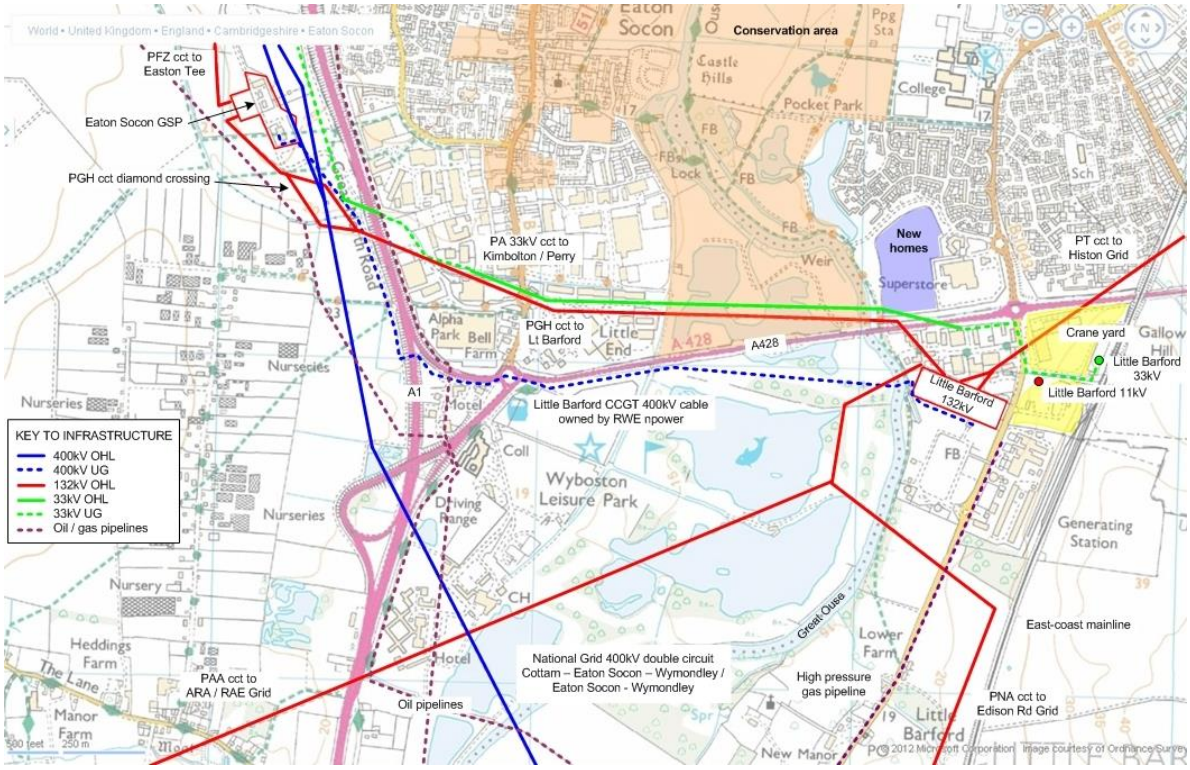

Figure 7.Physical constraints in the St Neots area

Within the immediate St Neots area there are many physical constraints that have to be considered, avoided and overcome, these include:

- Physical separation of Eaton Socon GSP and Little Barford
- Existing OHL and underground circuits (both UKPN and 3rd party assets).
- Major roads – A1 & A428
- Wyboston Lakes leisure complex (sited on former gravel works)
- Industrial areas
- Flooding
- East-coast mainline
- St Neots conservation area
- New housing developments
- Gas and oil pipelines

3.5 National Grid

A modification application has been submitted to National Grid to install a 3rd 240MVA SGT at Eaton Socon GSP and have indicated that due to the planned programme of works on the 400kV network that the 3rd SGT would be installed before 2016. The proposed new 132kV indoor switchboard at Eaton Socon will replace the AIS assets at both Little Barford and Eaton Socon.

National Grid and UKPN own 132kV FMJL CTs with operational restrictions at Eaton Socon. As the risk hazard management zones (RHMZ) overlap UKPN are reliant on National Grid changing their units first. To achieve this Huntingdon demand has to be switched onto Grendon GSP (via Corby) to allow the UKPN FMJLs at Eaton Socon to be de-energised, hence removing the risk of failure whilst the FMJLs on the 132kV SGT circuit breakers.

4 Recommended strategy

4.1 Description

This high level summary highlights the main elements of the future strategy and any estimated costs associated with works to achieve the proposals.

Little Barford 132kV switchgear replaced and 3rd SGT infeed to be connected at Eaton Socon

It is anticipated that following authorisation in 2013 for required feasibility studies that a new switchboard will be constructed at Eaton Socon and 3rd SGT will be on-line for 2016/17. It is anticipated that these works will cost circa £40m of which £37m will be NAMP funded. Post installation of the 3rd SGT and load transfers to Eaton Socon as outlined in the following information it is anticipated that P2/6 n-2 compliance at Eaton Socon can be secured up to circa 2035 with minimal risk to network security.

Huntingdon Grid and the PFZ circuits to Corby

The PFZ circuit from Eaton Socon to Corby (WPD license area) is approximately 45km in length. The UKPN owned portion of this circuit is 25km length, 12km of which from Eaton Socon GSP to the Easton tee (Huntingdon tee point) is constructed with 300mm^2 Upas conductors, the remaining 33km to Corby is constructed with 175mm^2 Lynx. Network studies indicate that the Lynx circuit from Corby will be overstressed under an n-1 situation in winter from 2013/14, this combined with the condition of the WPD portion of the circuit and significant additional reinforcement required in WPDs license area to support the total Huntingdon demand is driving the requirement for Huntingdon to remain on Eaton Socon GSP.

Edison Road Grid transferred to Eaton Socon from 2016

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The load transfer of Edison Road Grid to Eaton Socon is required to prevent overstressing of the 132kV POA circuit from Sundon. The 27km circuits From Sundon to Austin Canons Grid were rebuilt in 2010 with Sycamore 250mm^2 conductors, however based on predicted load growth will become overstressed in a winter n-1 situation from 2016/17.

The 3rd SGT at Eaton Socon will be required to facilitate the transfer else Eaton Socon will become out of firm. The additional capacity at Eaton Socon also allows load to be transferred from Burwell and defer the requirement for a 4th SGT until circa 2023. In addition the predicted load on Eaton Socon GSP is expected to exceed 300MW circa 2023 at this point the GSP would be P2/6 non-compliant without a 3rd SGT as there is a requirement to immediately secure 2/3 group demand for an n-2 event.

Histon Grid transferred to Eaton Socon from 2016.

Removing Histon Grid from Burwell GSP circa 2016 will ensure that Burwell remains P2/6 compliant beyond the ED1 period. The analysis of the GSP and 132kV network indicates increased complexity in maintaining P2/6 compliance in the interim period as there is the potential to transfer Histon temporarily into the Eaton Socon group but until the 3rd SGT is installed it would be reliant on either having an intact 132kV network within the Eaton Socon GSP group and arranging the 132kV network to shed demand for the subsequent n-1 SGT loss at Eaton Socon and thus avoiding a cascade trip situation or switching Huntingdon demand onto Grendon GSP.

Austin Canons Grid transferred to Eaton Socon

The 3rd SGT at Eaton Socon defers the requirement for a 4th SGT at Burwell to maintain P2/6 compliance until circa 2023. When Burwell is eventually reinforced it will be possible to operate the 132kV network (pending circuit reinforcement to Arbury Grid) with Histon transferred back to Burwell GSP from Eaton Socon. Supplying Histon from Burwell GSP is preferred as this means all Grid sites supplying Cambridge and the surrounding area are supplied from the same GSP and Cambridge is both geographically and electrically closer to Burwell GSP.

The SGT capacity created at Eaton Socon will then facilitate transferring Austin Canons to the GSP group and defer any works at Sundon for the foreseeable future. It is not anticipated that Austin Canons would have be transferred to Eaton Socon before 2025.

Supplying Bedford from Eaton Socon is desirable as it is both geographically and electrically closer to Eaton Socon than Sundon.

132kV schemes in Burwell GSP area which interacts with the Eaton Socon GSP Strategy:

The two identified schemes below, although not within the Eaton Socon GSP footprint are worthy of mention as the 132kV interconnection between Burwell, Eaton Socon and Sundon GSPs and the ability to transfer load between them forms an essential part of the strategy.

Arbury Grid to Horningsea Tee 132kV circuit rebuild

This project will see approximately 4km of Lynx 175mm^2 OHL circuit at the north of Cambridge undergrounded to increase the circuit ratings, given that the single circuit masts supporting conductors over-sailing the Cambridge Science Park will not allow the equivalent rating of a Zebra 400mm^2 conductor to be achieved. This project will alleviate a current loading issue and allow Histon Grid to be readily transferred between Eaton Socon and Burwell GSPs in the future to manage load on either site accordingly. It is estimated that these works will cost circa £7.8m

Horningsea Tee 132kV switching station and Horningsea Grid substation

This is considered as a potential future option to provide a secure 132kV network and allow connection of extra transformer capacity into the 33kV network supplying Cambridge. Based on predicted future load growth Arbury, Histon and Fulbourn Grid substations which supply Cambridge and the outlying areas are all due to be fully loaded by the end of the PLE period. A new switching station will allow new transformer capacity to be connected whilst maintaining a secure 132kV network. It is estimated that these works will cost circa £13.5m.

Eaton Socon 132kV Grid Supply Point / Little Barford 132kV Grid – LRE NAMP Projects:

Eaton Socon Proposed 132/33kV Local Grid Substation

The predicted load at Little Barford Grid Substation will exceed the existing firm capacity. It is therefore proposed to install a new Substation at Eaton Socon. This proposed will be supplied from Earton Socon 132kV Grid. Note that this project is outside the time period of both DCPR5 and ED1.

Eaton Socon 132kV Exit Point - 3rd SGT (240MVA)

The predicted load at Eaton Socon GSP Substation will exceed the existing firm capacity, including the transfer capacity to Sundon and Burwell Substations. It is therefore proposed to augment the existing National Grid 240MVA supergrid transformers with another unit. The existing switchgear, at Little Barford 132kV Grid, is not fully rated for this increased load. The 3rd SGT will prevent the GSP becoming out of firm post planned load transfers and defer the requirement for a 4th SGT at Burwell GSP to maintain P2/6 compliance until circa 2023.

Little Barford 33kV Grid and supplied Primary Substations – LRE NAMP Projects.

Little Barford 132/33kV Grid Substation - Replace 33kV switchboard (Fault Level)

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.

Sandy 33/11kV Primary Substation - Replace 11kV switchgear

The predicted load at Sandy Primary Substation will exceed the rating of the existing 1979 AEI vacuum switchgear. It is not possible to lower the load without compromising operational and planning requirements. It is therefore proposed to replace the existing switchgear with a new 2000A installation comprising 11 circuit breakers.

Little Barford/Sandy 33kV OHL Circuits - 3rd underground circuit and new 33kV switchboard

The predicted load on the 33kV circuits supplying Sandy and the Biggleswade tee will exceed the existing rating. It is not possible to lower the load without compromising operational and planning requirements. It is therefore proposed to install a new circuit to provide the required capacity. A 33kV switchboard will be installed at Sandy to which all the Little Barford circuits, the Biggleswade circuit and the local 33/11kV transformers will be connected. Completion of this project will see 9km underground new circuit installed together with an 8 panel 33kV switchboard.

Kimbolton 33/11kV Primary Substation - increase 11kV interconnection

The predicted load on the Kimbolton and Brington substations will exceed the existing rating of the interconnecting 11kV circuits. It is not possible to lower the load without compromising operational and planning requirements. It is therefore proposed to increase the 11kV interconnection capacity. Completion of this project will see 5km of new 11kV cable installed.

Little Barford 132/11kV Grid Substation - Replace 11kV switchgear

The predicted load/fault level at Little Barford 11kV substation will exceed the rating of the existing1964 Switchgear & Cownas oil filled switchgear. It is not possible to lower the load level without compromising operational and planning requirements. It is therefore proposed to replace the existing switchgear with a new 2000A installation.

Croydon 33/11kV Primary Substation - ITC 2nd new 7.5/15MVA

The predicted load at Croydon Primary Substation will exceed the existing transfer capacity. It is therefore proposed to augment the existing transformers with another unit. The existing switchgear is fully rated for this increased load.

Huntingdon 33kV & 11kV Grids and supplied Primary Substations – NAMP Projects.

Huntingdon 132/33kV Grid Substation - Replace 33kV switchboard (Fault Level)

The predicted fault level at Huntingdon Grid Substation will exceed the rating of the existing switchgear due to increasing generation connections at EHV and HV. Nine circuit breakers are Oil insulated EEC OKM4 and OKW3 while the remaining circuit breakers are modern SF6/vacuum type. The fault rating of the oil circuit breakers (circa 1969) 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 11 breaker AIS compound with a new installation comprising 11 circuit breakers.

St Ives 33/11kV Primary Substation - ITC (2 x 18/30/40MVA) and 2000A switchboard

The predicted load at St Ives Substation will exceed the existing firm capacity, including the transfer capacity to Godmanchester and Hilton Substations. It is therefore proposed to replace the existing transformers with larger units. The existing switchgear is not fully rated for this increased load. It is therefore proposed to replace this switchgear. The existing circuits supplying the transformers are not fully rated for the larger units, but are sufficient for the predicted load. Note that this project is scheduled within DPCR5 timescales.

Godmanchester 33/11kV Primary Substation - ITC 2nd new 12/24MVA transformer

The predicted load at Godmanchester Primary Substation will exceed the existing firm capacity. It is therefore proposed to augment the existing transformer with another unit. The existing switchgear is fully rated for this increased load. The existing circuits supplying the transformers are fully rated for the larger units.

Substation	Firm Capacity		Year	Recommendation
	Value (S/W)	Limitation		
Eaton Socon GSP	288MVA (W)	Supergrid Transformer (SGT)	2016	3rd SGT installed by National Grid
Hilton	8.75 (W)	11kV interconnection	2020/21	ITC (2nd transformer) and 33kV circuit
Sandy	23MVA (S&W)	Switchboard	2013/14	switchboard (2013/14) and circuits
Kimbolton	5.9MVA (W)	11kV interconnection	2016/17	Additional 11kV interconnection capacity
Little Barford 11kV	30.5MVA (S&W)	Switchboard	2013/14	New switchroom and 2000A switchboard.
Croydon	4.9MVA (W)	11kV interconnection	2017/18	ITC (2nd transformer)
St Ives	23MVA (W)	Transformers	2013/14	ITC and switchboard
Godmanchester	11.3MVA(w)	11kV Interconnection	2016/17	ITC (2nd transformer)

Table 4. Recommended Reinforcement

Innovation: Flexible Plug and Play

The vision of Flexible Plug and Play is to provide a faster and cheaper method for connecting generators of renewable energy to the electricity distribution network. If UK Power Networks were to connect large amounts of distributed generation, which includes renewable generation, using the traditional approach, where the network already has a high concentration of connections, then network upgrading/reinforcement would be needed. This is expensive and takes time (sometimes years). Flexible Plug and Play will provide an alternative connection choice to renewable generation developers.

The trial area is a rural area of around 700sqkm between Peterborough, March and Wisbech in Cambridgeshire in the East of England. This area has been chosen because, in recent years, UK Power Networks has seen an

increase in the renewable generation connection requests and this area has favourable characteristics for wind generation.

The trial area covers EPN regions of RDP01 (Walpole GSP) and RDP06 (Eaton Socon GSP).

4.2 Financial Appraisal and Benefits

Information regarding Load Indices and Health Indices as part of OFGEM output measures are available in the Appendices.

The financial expenditure is shown in the Appendices.

5 Rejected Strategies

It should be noted that neither of the 132kV strategies outlined below addressed the issue of the asset condition at Little Barford 132kV Grid and due to the associated costs/ benefits were not considered acceptable.

5.1 Alternative supplies for Huntingdon 33kV and 11kV Grids.

5.1.1 Supplying Huntingdon via Western Power Distribution 132kV network.

As an alternative to the 3rd SGT at Eaton Socon, in 2010 a connection application was submitted to Central Networks East (CNE) now Western Power Distribution (WPD) for a firm connection of Huntingdon demand (116MVA based on the predicted winter 2020/21 figure from the July 2010 PLE).

CNE confirmed that Huntingdon load could not be supported without reinforcement of the two 132kV double circuit routes between Grendon and Corby (via Kettering and Irthlingborough), the works are in addition to reinforcement of the PFZ route from Corby to the Easton Tee. A map reflecting the areas of reinforcement required in WPDs license area is shown below.

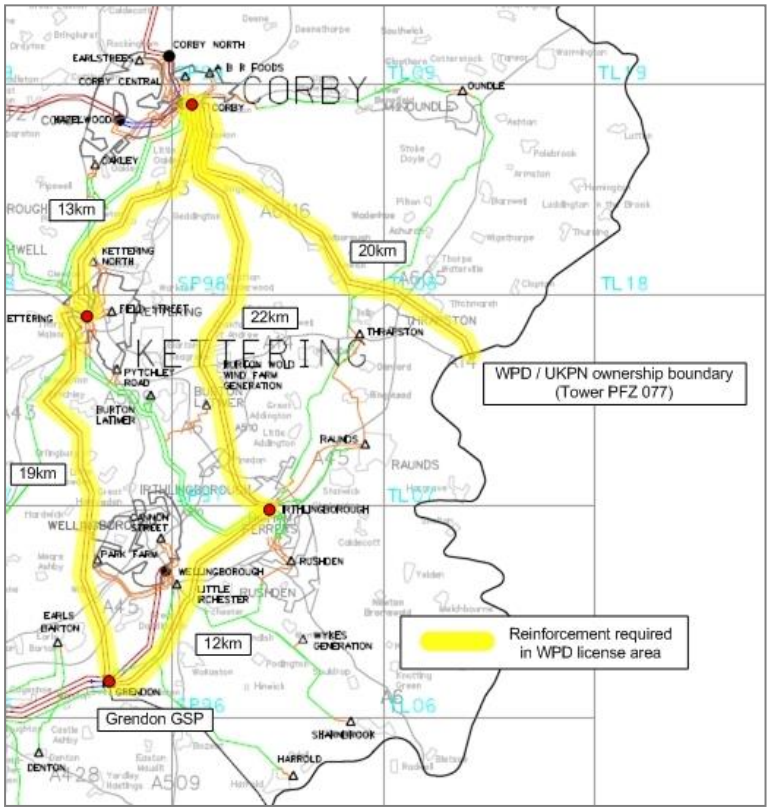


Figure 8.PFZ Route - Corby to Easton Tee

Overall a total of circa 97km of 132kV double circuit including fluid filled cables in and around Kettering and Irthlingborough would require reinforcement. The works required are above and beyond that to support the predicted natural load growth within the CNE license area, and as a result at the time CNE declined to make a connection offer.

5.1.2 Supplying Huntingdon directly from Grendon GSP (estimated £40m).

A pair of new 132kV cables from Grendon GSP to the PFZ route (within UK Power Networks license area) had been considered to supply Huntingdon load. Whilst this avoids any reinforcement within the WPD license area it would require an application be made to National Grid.

A cable route from Grendon GSP to the PFZ circuit within UK Power Networks license area, based on following the highways layout would be approximately 36.5km. A desktop exercise indicated that the cost of installing a pair of 132kV cables, works at Grendon 132kV substation and tower works on the PFZ route exceeded £40m.

5.2 Up-rating the POA circuit form Sundon GSP to Austin Canons (estimated £23m)

The 132kV POA double circuit from Sundon GSP to Austin Canons tee is constructed with approximately 27km of 250mm^2 Sycamore conductors installed in 2010 which replaced the Lynx 175mm^2 conductors. Whilst the 300mm^2 Upas conductor would provide an additional 20MVA capacity per circuit the Upas conductor was not used due to tower constraints.

To utilise the transformer capacity at Marston Rd, Austin Canons and Edison Rd and maintain n-1 security would require conductor ratings in excess of that achievable with 400mm2 Zebra conductors. Installation of 132kV cables to replace the existing OHL was not considered an acceptable solution due to the cost and benefit of the wider 132kV network in addition to the fact that these assets have recently been uprated.

5.3 New 400/132kV Grid Supply Point at Shelton.

The National Grid Grendon – Sundon 400kV double circuit passes to the west of Bedford and in close proximity to Marston Rd Grid Substation and over-sails the 132kV POA circuit from Sundon. This location could provide a new GSP site to support Bedford and remove load from Sundon GSP and remove the requirement to transfer Edison Rd and Austin Canons to Eaton Socon GSP in the future.

Due to the existing circuit configuration with the major 132kV switching point within the Eaton Socon GSP, current PLE loading predictions and the established assets at Eaton Socon it is not considered an acceptable solution to establish a new GSP site at Shelton.

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

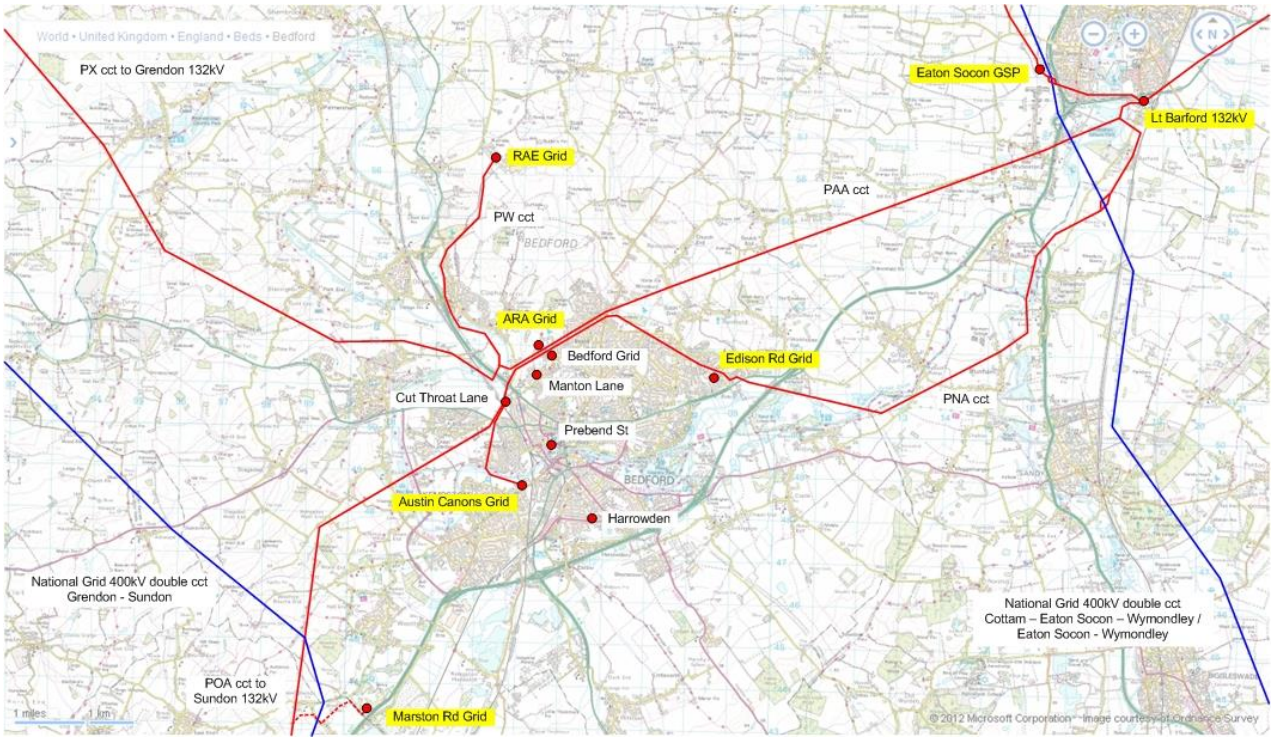


Figure 9.400kV and 132kV circuits in Bedford

6 References

References	Description
Reference 1	20 Aug 2012 Planning Load Estimates EPN Area
Reference 2	132kV Network HV Schematic Operating Diagrams East of England (2012)
Reference 3	33kV Network HV Schematic Operating Diagrams East of England (2012)
Reference 4	Huntingdonshire Housing Land Availability Assessment

6.1 Appendices

Appendix	Description
Appendix A	Geographical diagram
Appendix B	Single Line Diagram – Existing Network
Appendix C	Single Line Diagram – Recommended Strategy
Appendix D	Detailed costs for recommended strategy
Appendix E	Output Measures – Load Index Table (LI)
Appendix F	Output Measures – Health Index Table (HI)
Appendix G	Generation Heat Map

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

6.2 Document history

Version	Date of Issue	Author	Details
1.0	15/02/2013	Paul Ramsbotham	Initial draft for review
1.2	24/06/2013	Paul Ramsbotham	Updates to reflect new position for RIIO-ED1
1.3	20/03/2014	D J Whiteley	Aligned for re-submission

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.

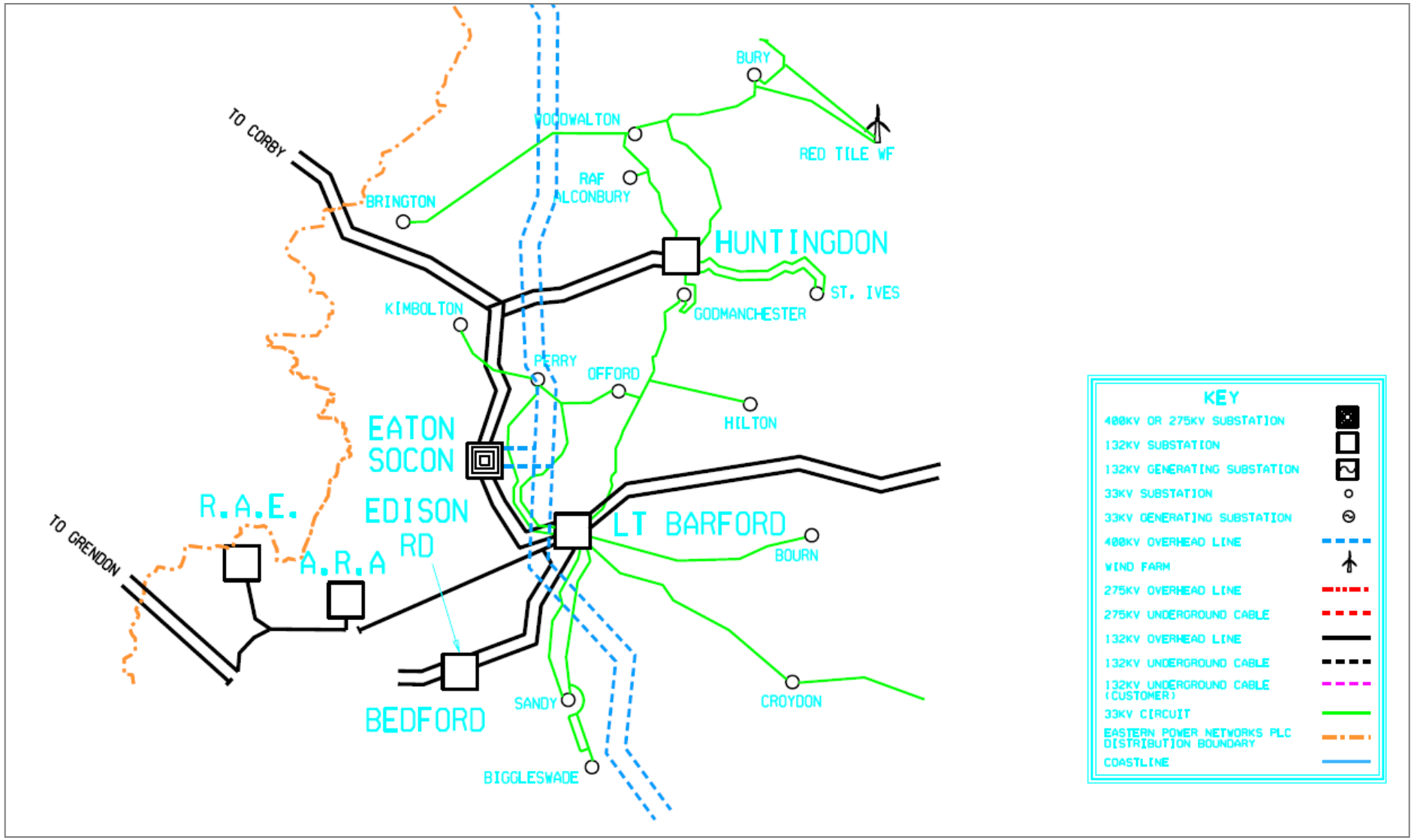
Recommended by:

Name	Role	Signature	Date
Paul Ramsbotham	Infrastructure Planner		
D J Whiteley	Infrastructure Planner		20/03/14
Nuno da Fonseca	Infrastructure Planning Manager (EPN)		

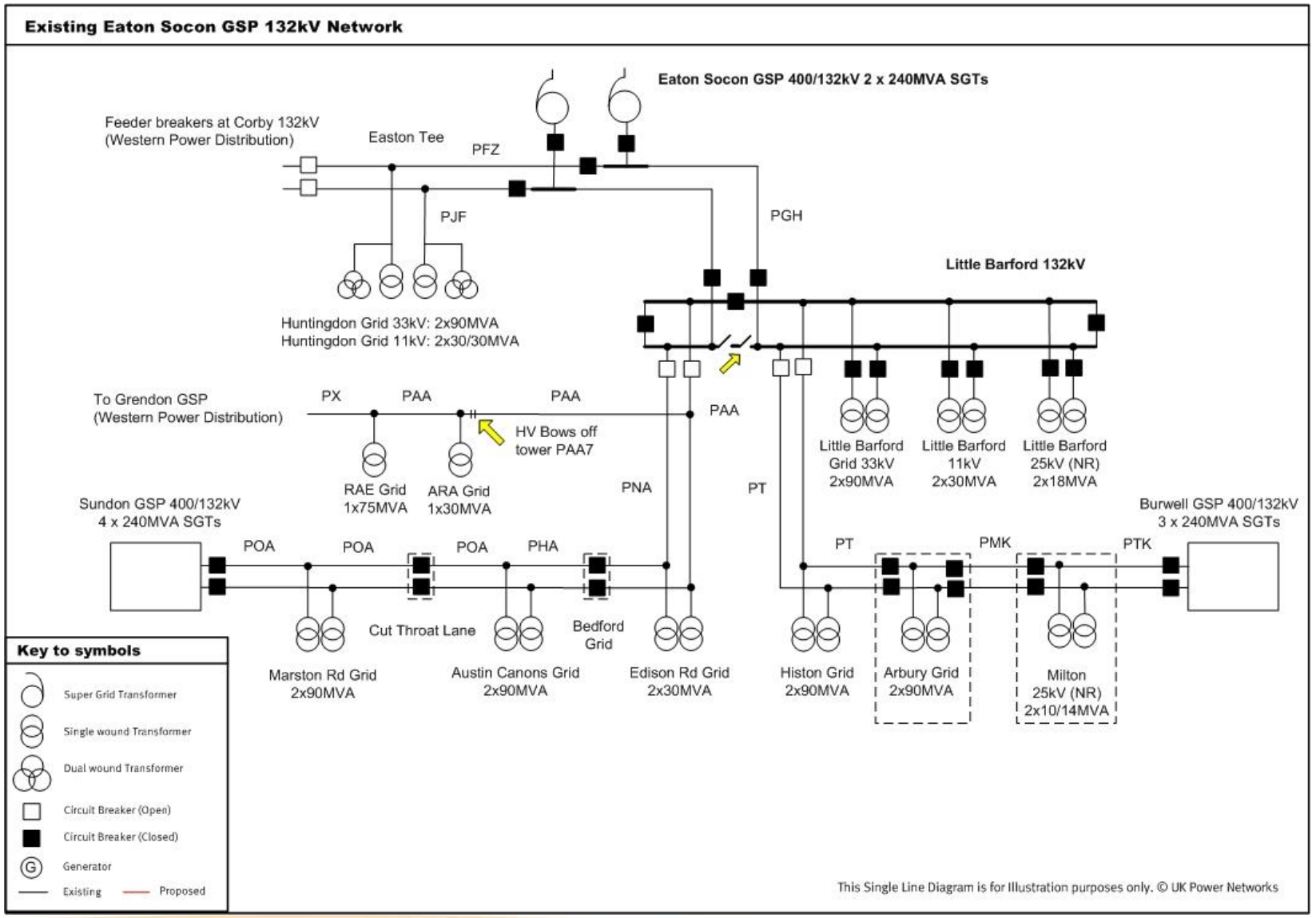
Approval by:

Name	Role	Signature	Date
Robert Kemp	Head of Asset Management		20/03/14
Barry Hatton	Director of Asset Management		

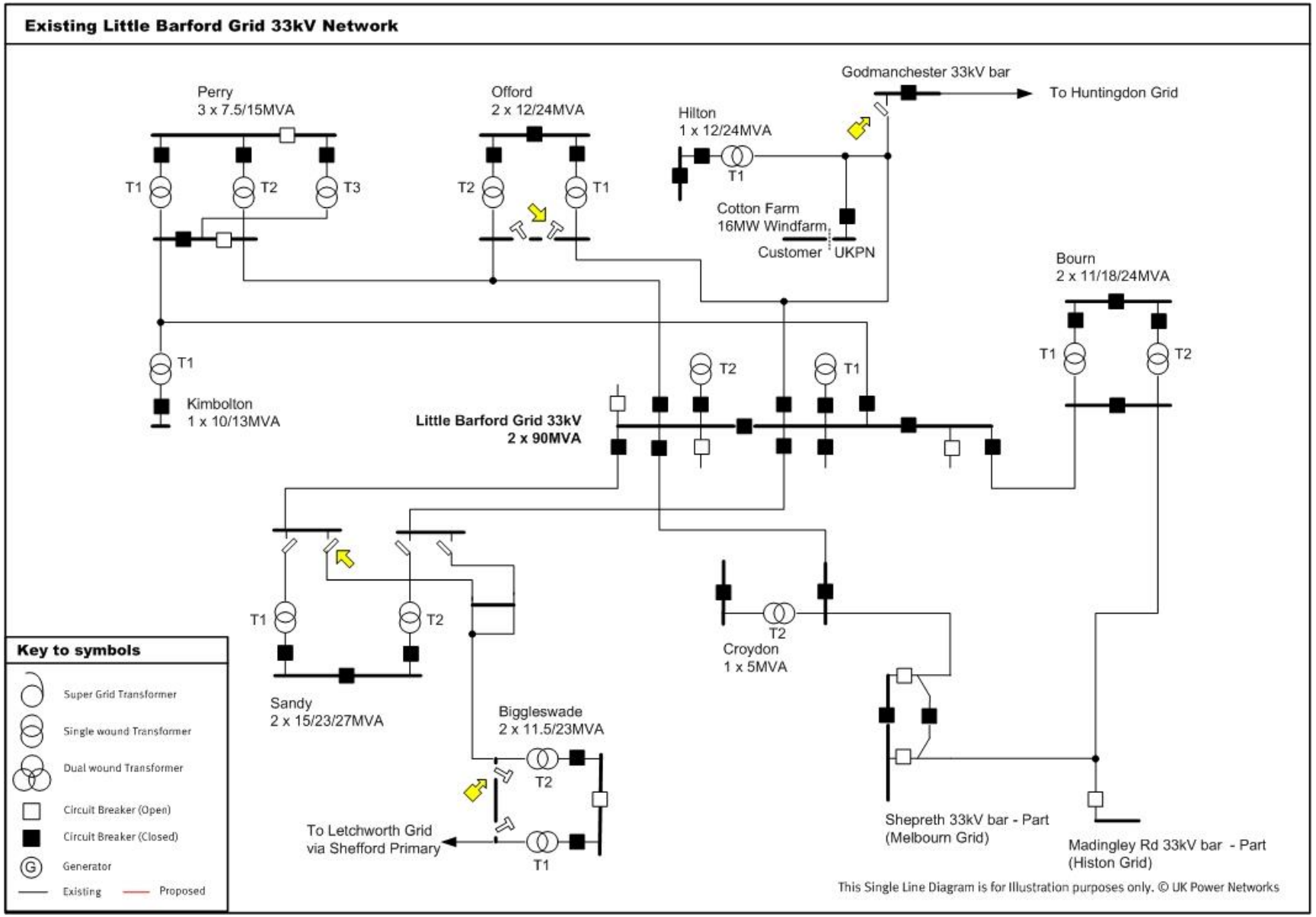
APPENDIX A: GEOGRAPHICAL DIAGRAM



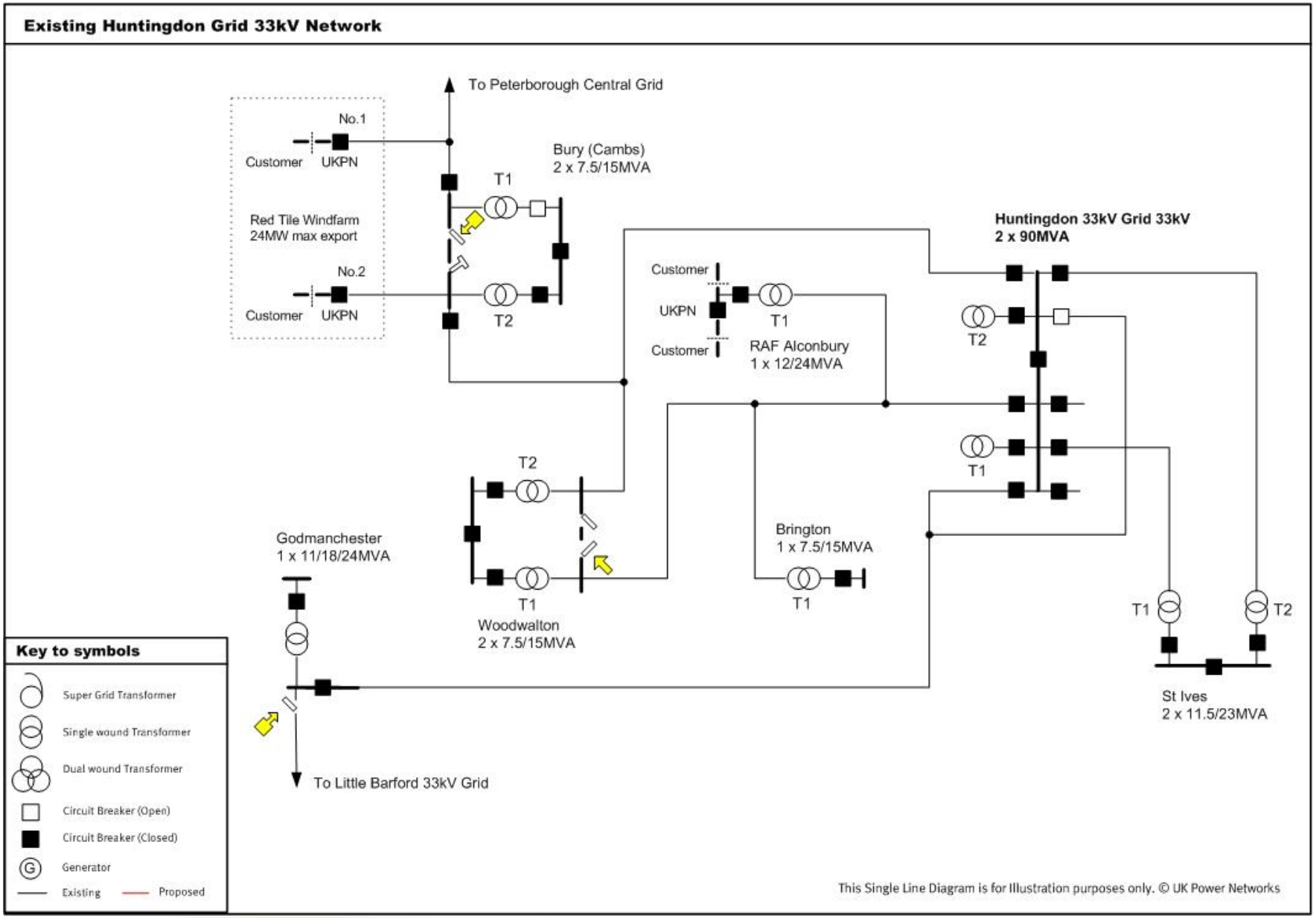
APPENDIX B: SINGLE LINE DIAGRAM – EXISTING NETWORK



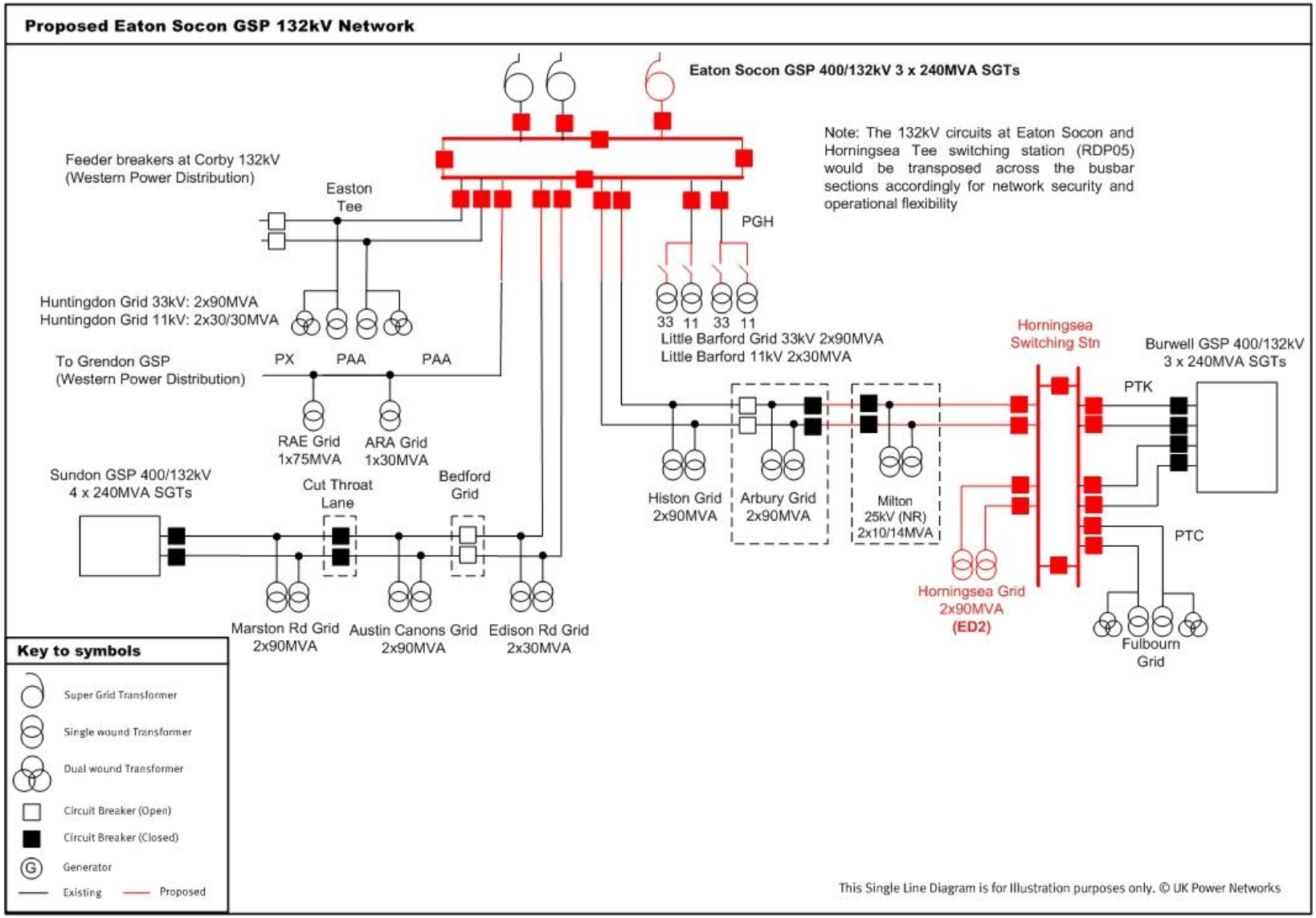
Eaton Socon GSP



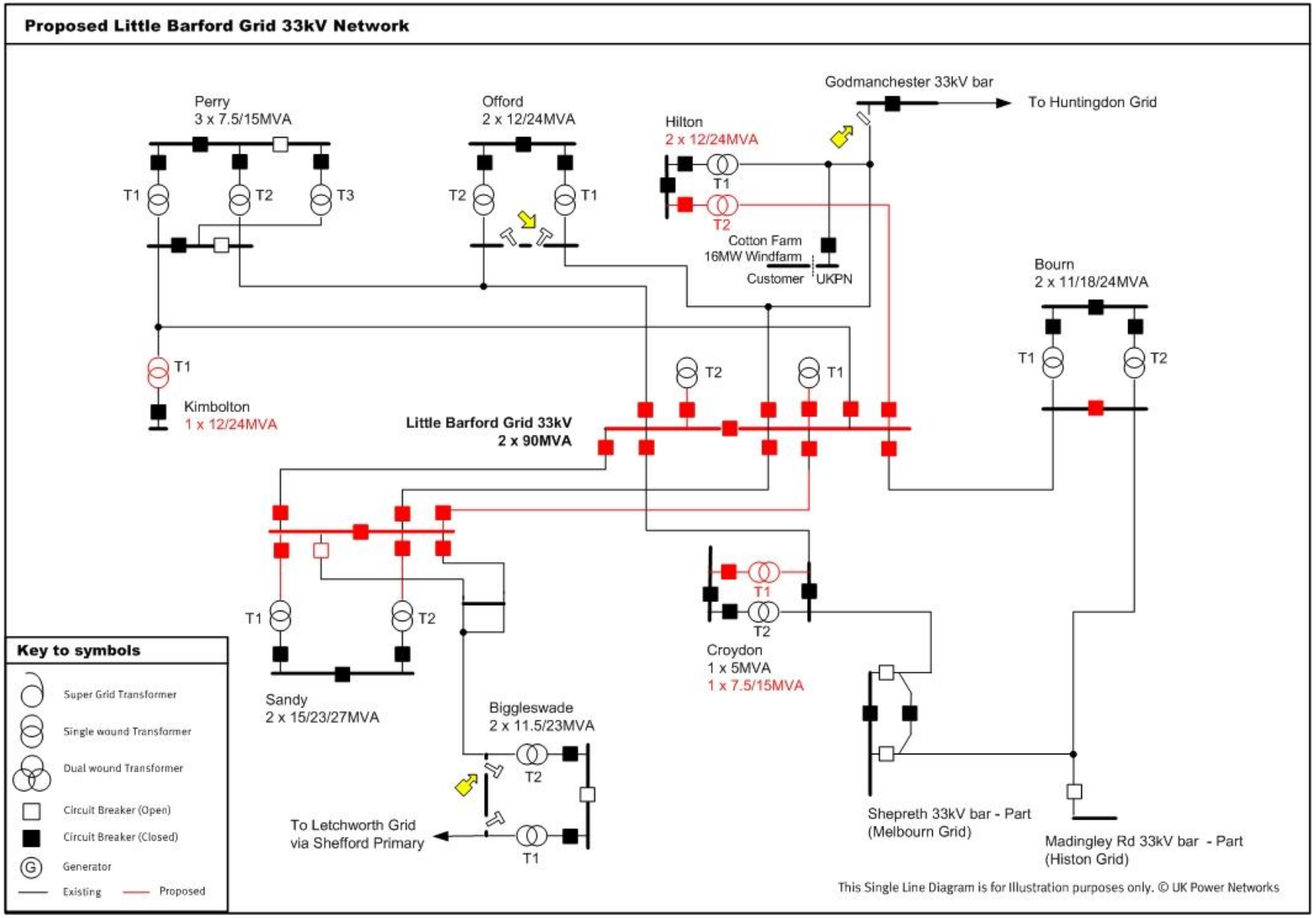
Eaton Socon GSP



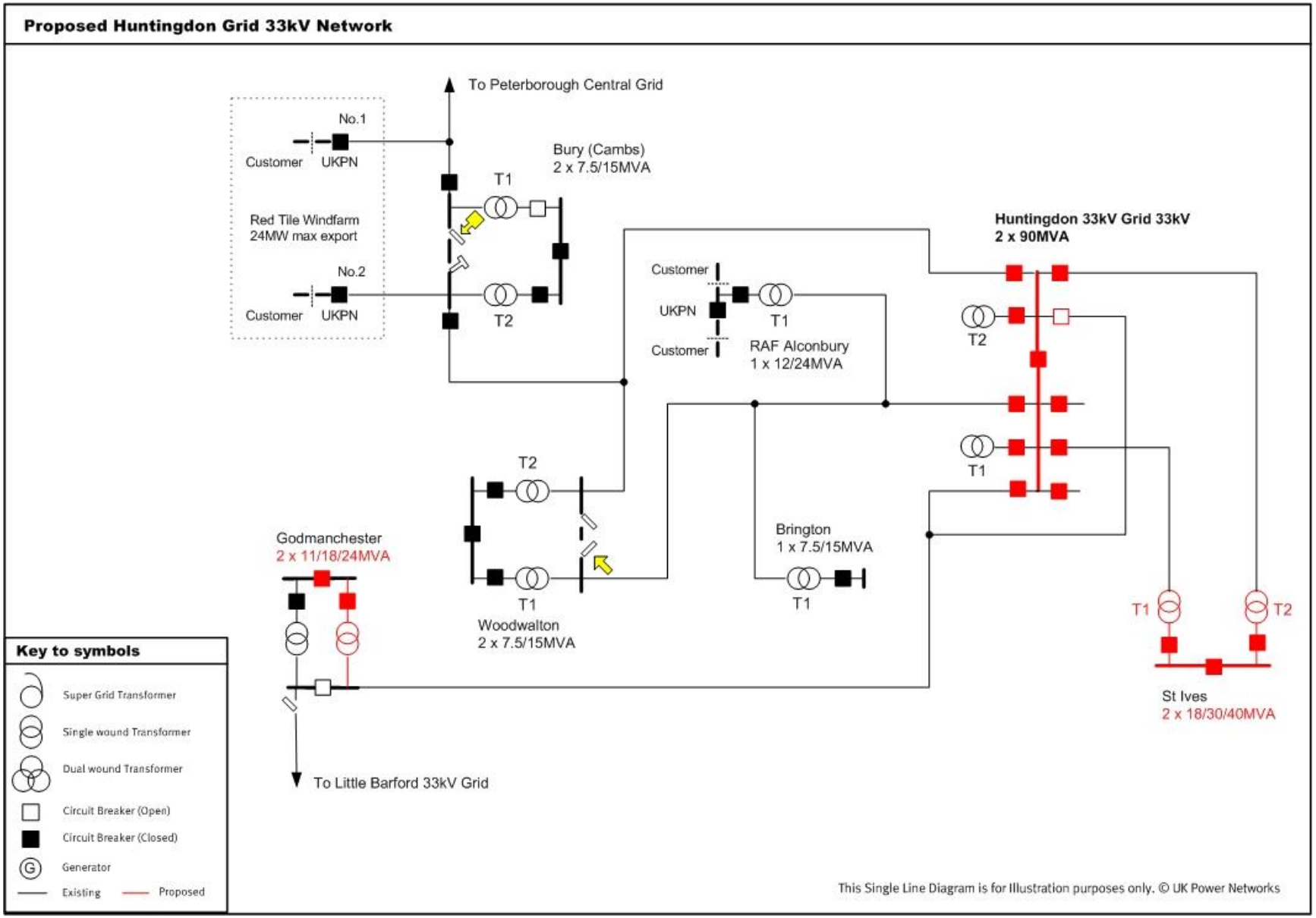
APPENDIX C: SINGLE LINE DIAGRAM – RECOMMENDED STRATEGY



Eaton Socon GSP



Eaton Socon GSP



APPENDIX D: DETAILED COSTS FOR RECOMMENDED STRATEGY

NAMP version: Table J Less Ind Baseline 19th February 2014

Project ID		2013/ 2014	2014/ 2015	2015/ 2016	2016/ 2017	2017/ 2018	2018/ 2019	2019/ 2020	2020/ 2021	2021/ 2022	2022/ 2023
4046	PA - Little Barford/Perry/Offord - Conductor Replacement			77,269	231,806						
7540	PKW - Little Barford Local - Conductor Replacement								15,453	46,360	
7541	PTD - Girton Tee - Histon - Conductor Replacement								30,907	92,722	
7558	PNA - Barford - Bedford - Conductor Replacement			61,815	185,445						
5748	Little Barford Transformer Tails Replacement	841,482									
7611	Bourn 33/11kV Primary Substation - Replace 33kV Switchgear					105,017					
5593	Little Barford 132kV Grid Substation - Replace Switchboard	890,974	2,813,601	4,689,335	3,943,954						
7764	Kimbolton 33/11kV Primary Substation - Replace Primary Transformers (T1)						174,619	396,583			
5620	Eaton Socon 132kV Exit Point - Replace FMJL CT	43,198									
8395	Little Barford 132kV Grid Substation - Replace CVTs & VTs	122,371									
4405	St Ives 33/11kV Primary Substation - ITC (2 x 18/30/40) and Switchboard (2000A)	854,767	774,400								
8183	Godmanchester 33/11kV Primary Substation - ITC (2x12/24MVA)			293,039	1,417,573						
8201	Croydon 33/11kV Primary Substation - ITC (1 x 7.5/15MVA)				10,302	113,324	421,352				
3801	Sandy 33/11kV Primary Substation - Reinforce 11kV Switchboard	244,510	618,883								
5458	Little Barford 132/33/11kV Grid Substation - Replace 11kV Switchboard (2000A)	565,703	287,897								
5008	Kimbolton 33/11kV Primary Substation - Increase 11kV Interconnection			12,755	140,305	683,994					
4068	Little Barford 132/33/11kV Grid Substation - ITC (2 x 18/30/40MVA)										
5619	Eaton Socon 132kV Exit Point - 3rd SGT (240MVA) (N-2)		94,897	284,691							
3983	Eaton Socon Proposed 132/33kV Local Grid S/S - (2 x 60MVA)										
3956	Little Barford 132/33kV Grid Substation - Replace 33kV Switchboard (Fault Level)								257,116	1,443,076	
5698	Huntingdon 132/33kV Grid Substation - Replace 33kV Switchboard (Fault Level)					256,630	1,395,446				
3614	Eaton Socon / Little Barford 132kV Circuit Reconfiguration	673,324	3,461,454	7,407,512	5,342,020	569,386					
5006	Lt. Barford/Sandy 33kV OHL Circuits - 3rd U/G Circuit									557,124	1,798,824

Eaton Socon GSP

APPENDIX E: OUTPUT MEASURES – LOAD INDICES PLE VERSION 27 FEBRUARY 2013 (ELEMENT ENERGY GROWTH FORECAST)

Substation	Season	First Limitation	FC NOW (MVA)	NAMP	FC ED1 Start (MVA)	2014 (S) 14/15 (w)	2022 (S) 22/23 (W)	2014 (S) 14/15 (w)	2022 (S) 22/23 (W)	NAMP	FC ED1 end (MVA)	2022 (S) 22/23 (W)	P2/6 Class	Comply
Biggleswade Total	W	Transformer	23.0		23.0	15.7	17.2	LI1	LI1		23.0	LI1	C	Yes
Bourn	W	Switchgear	23.9		23.9	10.5	12.0	LI1	LI1		23.9	LI1	B	Yes
Brington	W	Backfeed	5.7		5.7	5.4	5.9	LI2	LI5		5.7	LI5	B	Yes
Bury (Cambs.) Total	W	Transformer	15.0		15.0	9.6	10.5	LI1	LI1		15.0	LI1	B	Yes
Croydon	W	Backfeed	4.9		4.9	4.5	5.1	LI2	LI5	8201	7.0	LI1	B	Yes
Edison Road	W	Transformer	36.0		36.0	18.7	20.7	LI1	LI1		36.0	LI1	C	Yes
Godmanchester	W	Backfeed	11.1	5407	11.1	11.2	11.9	LI4	LI5	8183	24.0	LI1	B	Yes
Hilton	W	Backfeed	8.8		8.8	7.5	8.3	LI2	LI2		8.8	LI1	B	Yes
Huntingdon 11 Grid	S	Transformer	60.0		60.0	37.2	39.0	LI1	LI1		60.0	LI1	C	Yes
Huntingdon Grid 33	W	Switchgear	114.3		115.9	55.1	59.1	LI1	LI1		115.9	LI1	C	Yes
Kimbolton	W	Backfeed	6.3		6.3	5.5	6.0	LI2	LI3	5008	6.3	LI3	B	Yes
Lt Barford	W	Switchgear	30.5	5748	38.1	31.7	34.1	LI2	LI2		38.1	LI2	C	Yes
Lt Barford Grid 33	W	Switchgear	114.3		114.3	75.7	82.7	LI1	LI1		114.3	LI1	D	Yes
Offord	W	Transformer	24.0		24.0	10.5	11.2	LI1	LI1		24.0	LI1	B	Yes
Perry	W	Transformer	18.0		18.0	10.7	11.1	LI1	LI1		18.0	LI1	B	Yes
Sandy	W	Switchgear	22.8	3801	27.0	23.1	25.5	LI2	LI2		27.0	LI2	C	Yes
St Ives	W	Switchgear	22.8	4405	32.9	20.7	22.8	LI1	LI1		32.9	LI1	C	Yes
Woodwalton	W	Transformer	15.0		15.0	7.6	8.4	LI1	LI1		15.0	LI1	B	Yes
Lt Barford Local B 33/11kV				5458	0.0	0.0	0.0				0.0			Yes
RAF Alconbury	W	Transformer	3.1		3.1	2.9	2.9	LI2	LI2		3.1	LI2	B	Yes

Eaton Socon GSP

APPENDIX F: OUTPUT MEASURES - HEALTH INDICES (HI)

132kV Switchgear (2013 information)

	132kV Switchgear														
	ED1 Start (2015)					ED1 End (2023) No Investment					End of ED1 (2023) With Investment				
Substation	HI1	HI2	HI3	HI4	HI5	HI1	HI2	HI3	HI4	HI5	HI1	HI2	HI3	HI4	HI5
EATON SOCON GRID	2						2				13				
LITTLE BARFORD 132				11	4					15					
TOTAL	**2**			**11**	**4**		**2**			**15**	**13**				

33kV Switchgear (2013 information)

	33kV Switchgear														
	ED1 Start (2015)					ED1 End (2023) No Investment					End of ED1 (2023) With Investment				
Substation	HI1	HI2	HI3	HI4	HI5	HI1	HI2	HI3	HI4	HI5	HI1	HI2	HI3	HI4	HI5
BOURN PRIMARY					1					1	1				
BURY PRIMARY			2							2					2
CROYDON PRIMARY		1					1					1			
GODMANCHESTER PRIMARY		1					1					1			
HUNTINGDON GRID	2		1	7	1	2				9	11				
LITTLE BARFORD 33KV		11		1				9	2	1	12				
PERRY PRIMARY		2					2					2			
SANDY PRIMARY											8				
STOREYS WAY PRIMARY	1						1					1			
TOTAL	**3**	**15**	**3**	**8**	**2**	**2**	**5**	**9**	**2**	**13**	**32**	**5**			**2**

OUTPUT MEASURES - HEALTH INDICES (HI)

11/6.6kV Switchgear (2013 information)

	11/6.6kV Switchgear														
	ED1 Start (2015)					ED1 End (2023) No Investment					End of ED1 (2023) With Investment				
Substation	HI1	HI2	HI3	HI4	HI5	HI1	HI2	HI3	HI4	HI5	HI1	HI2	HI3	HI4	HI5
BIGGLESWADE PRIMARY		4	8				1	3	8			1	3	8	
BOURN PRIMARY		10					10					10			
BRINGTON PRIMARY		6					1	5				1	5		
BURY PRIMARY	9						9					9			
CROYDON PRIMARY		4	1				1	4			1	1	4		
EDISON RD GRID		13					13					13			
GODMANCHESTER PRIMARY		6	1					6		1	2		6		1
HILTON PRIMARY	1	5				1	5				2	5			
HUNTINGDON GRID	26					26					26				
EATON SOCON GRID															
KIMBOLTON PRIMARY		3					3					3			
LITTLE BARFORD 11KV		12	2				2	12			14				
LITTLE BARFORD 132															
LITTLE BARFORD 33KV	1	2					3								
OFFORD PRIMARY		5	4				1	7	1			1	7	1	
PERRY PRIMARY		8	6				1	12	1			1	12	1	
RAF ALCONBURY PRIMARY		2					2					2			
SANDY PRIMARY			11					1	10				1	10	
ST IVES PRIMARY		5	6				1	4	6		11				
STOREYS WAY PRIMARY		8	2				7	3				7	3		

WOODWALTON PRIMARY			8					3	5					3	5		
TOTAL	**37**	**101**	**41**			**27**	**63**	**62**	**26**	**1**	**56**	**57**	**46**	**20**	**1**

Grid and Primary Transformers (2013 information)

	Grid and Primary Transformers														
	ED1 Start (2015)					End of ED1 (2023) No Investment					End of ED1 (2023) With Investment				
Substation	HI1	HI2	HI3	HI4	HI5	HI1	HI2	HI3	HI4	HI5	HI1	HI2	HI3	HI4	HI5
BIGGLESWADE PRIMARY		2					2					2			
BOURN PRIMARY	2					2					2				
BRINGTON PRIMARY		1						1					1		
BURY PRIMARY		2					2					2			
CROYDON PRIMARY			1					1			1		1		
EDISON RD GRID		1			1		1			1		1			1
GODMANCHESTER PRIMARY	1						1				1	1			
HILTON PRIMARY			1							1	1				1
HUNTINGDON GRID	2	2				1	3				1	3			
KIMBOLTON PRIMARY			1							1	1				
LITTLE BARFORD 132	1	5					5	1				5	1		
OFFORD PRIMARY		2					2					2			
PERRY PRIMARY		3					1	2				1	2		
RAF ALCONBURY PRIMARY		1					1					1			
SANDY PRIMARY		2					1	1				1	1		
ST IVES PRIMARY		2						2			2				
STOREYS WAY PRIMARY		2						2					2		
WOODWALTON PRIMARY		2						2					2		
TOTAL	**6**	**27**	**3**		**1**	**3**	**19**	**12**		**3**	**9**	**19**	**10**		**2**

Eaton Socon GSP

It should be noted that HIs presented in the RDP will not align with the RIGS. The HIs presented in the 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

APPENDIX G: GENERATION HEAT MAP

The heat map presented in this page is indicative of the capability of the high voltage electrical network to accept connection of new generation equipment. The area in red indicates that the network in that area is effectively at saturation point with respect to existing generation connections. The amber and green areas indicate parts of the network that currently have limited and spare capacity to connect new generation equipment at HV or above.