



Regional Development Plan

RDP12 Bramford GSP – Suffolk Coast (EPN)

Planner: Peter Rye

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Date: 06/03/2014

Bramford – Suffolk Coast (EPN)

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

Document History

Version	Date	Revision Class	Originator	Section Update	Details
1.4	6/03/2014	Major	Nuno da Fonseca	1.2, Appendix D	Expenditure aligned to the 19th February 2014 NAMP version J less indirect costs.
1.4	6/03/2014	Major	Nuno da Fonseca	1,2,3,4,5	RDP narrative updated to reflect latest position
1.4	6/03/2014	Major	Nuno da Fonseca	1.2, Appendix E, Appendix F	LI and HI output measures updated in line with current NAMP plan and RIG tables
1.4	6/03/2014	Minor	Nuno da Fonseca	2.2	Network changes in progress updated to reflect interventions to date
1.4	6/03/2014	Major	Nuno da Fonseca	4	Recommended strategy reflects latest position
1.4	6/03/2014	Major	Nuno da Fonseca	Appendix G, Appendix I	Generation activity reflects latest position
1.4	20/03/14	Minor	Steve Mould	All sections	All sections checked for consistent section numbering, content etc.
2.0	27/03/2014	Minor	Regulation	All	Final publication

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1 Executive Summary

This Regional Development Plan (RDP) reviews UK Power Networks (UKPN) EPN HV and EHV network supplied from Bramford and Norwich Grid Supply Points (GSP).

The area is fed via three Grid substations at Wickham Market, Halesworth and Ilketshall, and due to the interconnected nature of the 33kV network, there is also an overlap with Stowmarket and Diss Grids (RDP10) at the 33kV level.

This coastal area of Suffolk and south Norfolk is characterized as mostly rural and includes the main towns of Halesworth, Bungay and Beccles along with several smaller market towns, covering an area of circa 1000 km² and circa 240 thousand people.

The key Infrastructure in the region is the nuclear power station at Sizewell, where new reactors are proposed which feed directly into the National Grid (NG) network at Bramford. A substantial number of generation connection enquiries have been received in this area and in recent months connections have been made for Chediston Solar (12MW), Great Glemham Solar (15MW) and Bentwaters Solar (6MW). Some smaller generators are already connected at 11kV or at lower voltages.

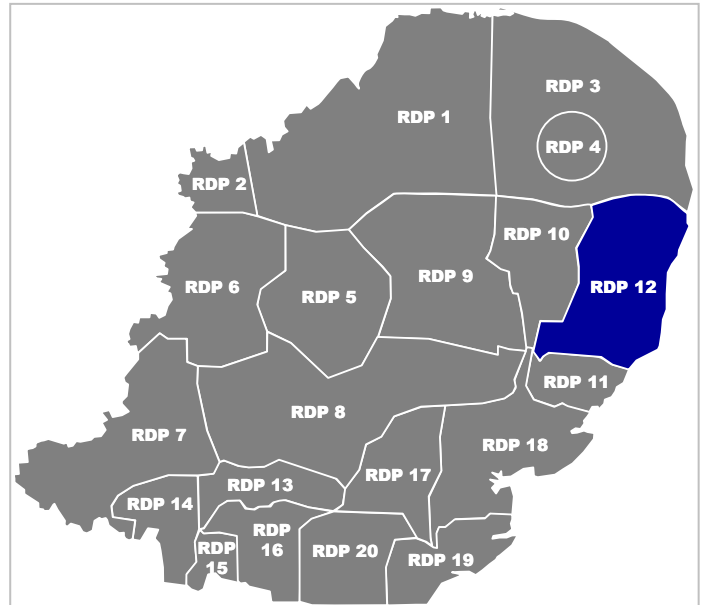


Figure 1 – Area covered by the RDP

1.1 Summary of issues addressed

The area covered in this document is the Suffolk coast from Ipswich in the south, northwards almost to Lowestoft, and inland to Halesworth and Bungay. It includes Sizewell which may require a ‘temporary builder’s supply’ for construction of the new reactor and for other nearby accommodation and material stores.

The three 132/33kV Grid sites at Wickham Market, Halesworth and Ilketshall are fed from the dual circuit tower line between Bramford and Norwich. The present and predicted loads are within the capability of the 175mm² conductor from the Norwich direction and would allow the temporary transfer of the three sites onto either source if necessary. The circuits from Bramford to the Wickham Market tee are 300mm² conductor.

No Primary sites are presently predicted to require reinforcement during the period to 2023, although three sites could require works within this period if employment demand increases faster than anticipated. Additional housing will be relatively small numbers spread across several towns and is not expected to require specific upstream reinforcement.

Leiston is close to Sizewell and would be the source for any additional construction supplies. Some spare capacity is available but above that transformers and switchgear would need replacing. There is adequate capacity on the Leiston-Benhall ring out of Wickham Market for reasonable load growth.

Halesworth is on an industrial area which could be expanded. In this case a transformer change would allow a first stage of expansion prior to any switchgear replacement.

Beccles has an industrial area on the former Ellough aerodrome which is some distance from Beccles Primary. Ellough is designated in the Waveney Council Plan as a site for further expansion and enquiries have been received for this area in the past, although none have progressed. Whilst the Primary has some headroom, the 11kV network has limited capacity and either new circuits or the establishment of Ellough Primary would be required. At Beccles, a transformer change would provide capacity for further load, after which the incoming 33kV cables would be the local limit. Network studies indicate that with 2010/11 winter

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loads, an additional 10MVA could be accommodated before the first n-1 circuit limit on the wider network is reached.

1.2 Recommended strategy

The recommended method for providing adequate supply to the Ellough Industrial area is to build and commission a 33/11kV substation on the reserved site on the edge of the development. The 33kV overhead ring was diverted into this site several years ago so there would be no off-site work other than 11kV outgoing connections. This will enable significant load to be connected with reasonably short new cable routes. The associated transfer of some of the existing Beccles load will then provide extra headroom within the town, although as Barsham, Beccles and Ellough will be on the same 33kV ring, their combined load is the n-1 limiting factor.

DigSilent studies indicate that with present loads, an additional 10MVA can be taken from Ellough before reinforcement of the 33kV ring is needed. An additional factor in this is the possible connection of a significant (30MW requested) PV generator connection a few spans east of the Ellough reserved site (P42). This would be a ring connection onto P57 & P58. (26/3/13 – it is believed that Planning Permission was refused for this generator)

A later stage of the proposal for the area is the installation of the second Grid transformer at Ilketshall. This will remove the dependency of the Ilketshall network on the two 33kV circuits from Halesworth. By running these open (at either Halesworth or Ilketshall) the effect of the 132kV NOP position at Ilketshall will be reduced. A 60MVA transformer is planned to be removed from Stowmarket around 2015 and its re-use at Ilketshall should be seriously considered.

The timing of any of these stages is entirely dependent on confirmed requests for new load on the Ellough industrial area, and is therefore difficult to predict. The need for reinforcement at other sites such as Halesworth will be dependent on employment growth.

Investment Profile

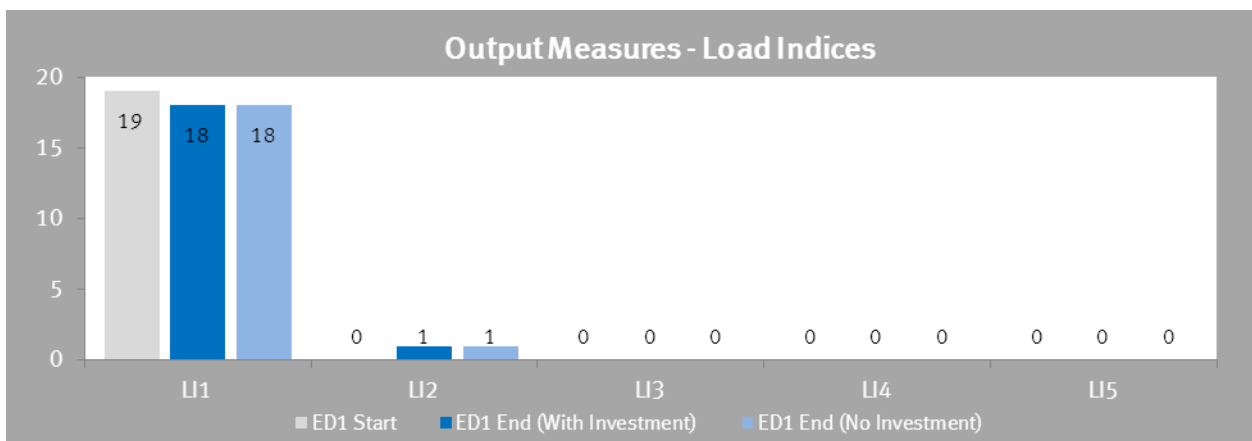
Figure 1 provides the projected expenditure profile for reinforcement and asset replacement projects (LRE and NLRE) in this RDP for both DCPR5 and ED1. This information is taken from the NAMP version 19-02-2014.

Type	DPCR5 2013-15	2015 /2016	2016 /2017	2017 /2018	2018 /2019	2019 /2020	2020 /2021	2021 /2022	2022 /2023	RIIO-ED1 Total
LRE	£0.0m	£0.0m	£0.0m	£0.0m	£0.0m	£0.0m	£0.0m	£0.0m	£0.0m	£0.0m
NLRE	£1.2m	£0.3m	£0.7m	£0.1m	£0.4m	£1.9m	£0.9m	£0.0m	£0.2m	£4.6m
TOTAL	£1.2m	£0.3m	£0.7m	£0.1m	£0.4m	£1.9m	£0.9m	£0.0m	£0.2m	£4.6m

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 also shown in figure 3.

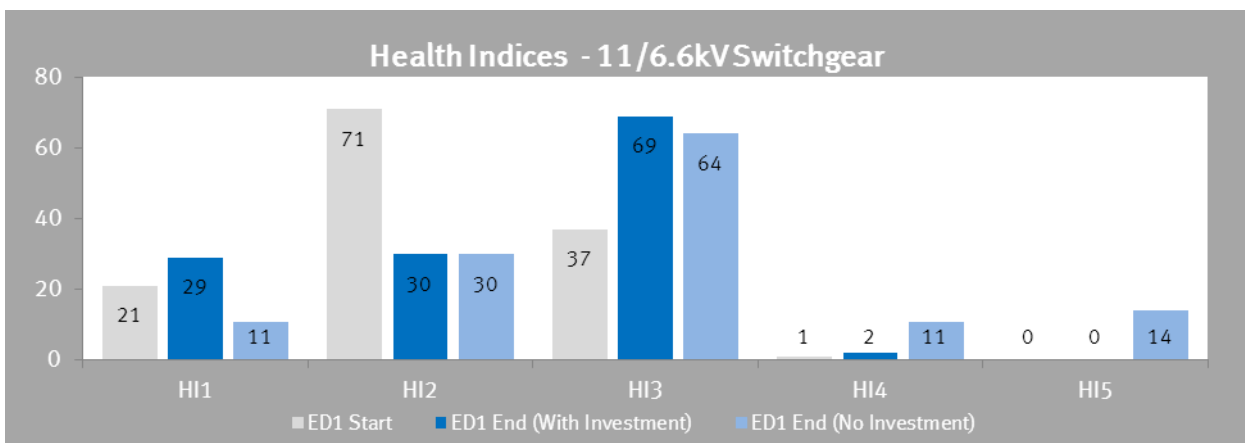
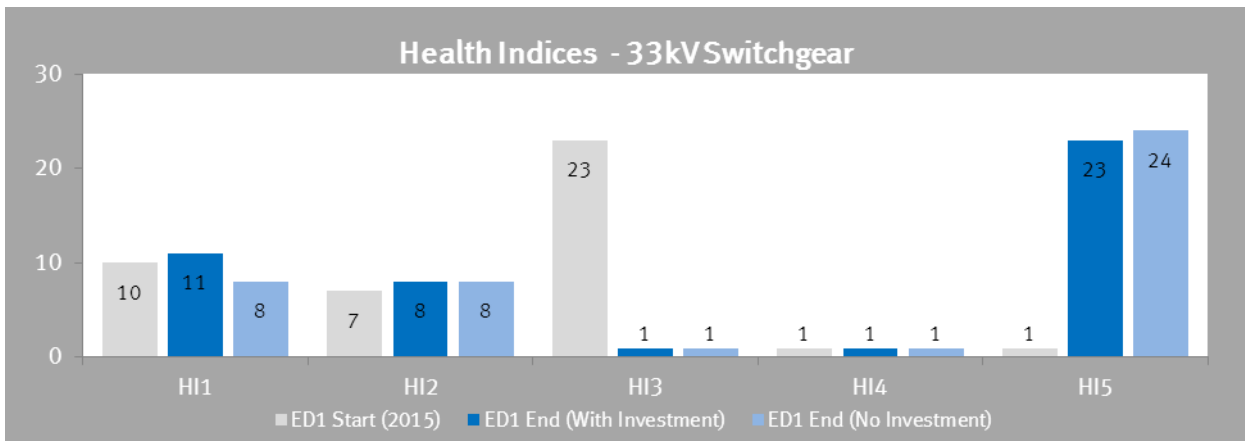
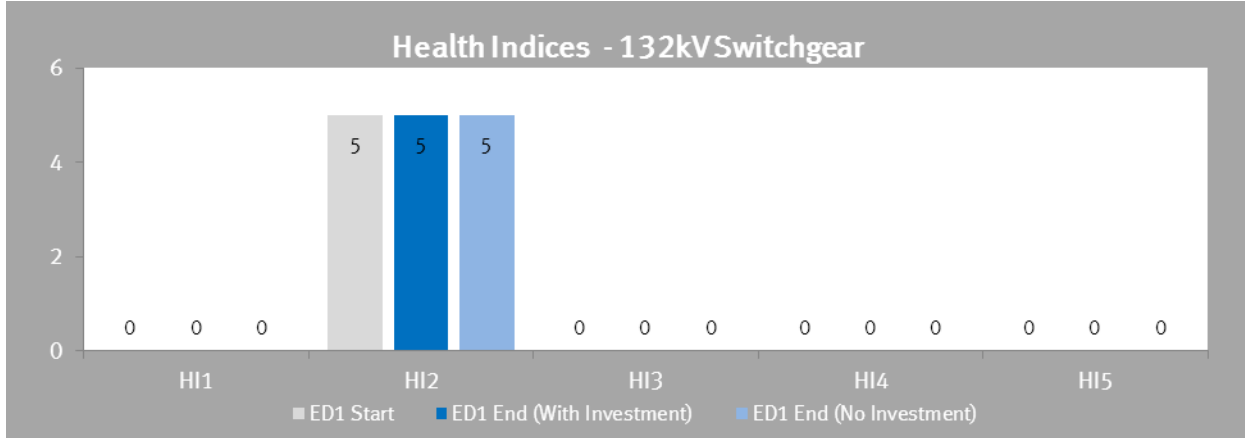


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Figure 2.2022/23 Load Indices with and without interventions

The figures 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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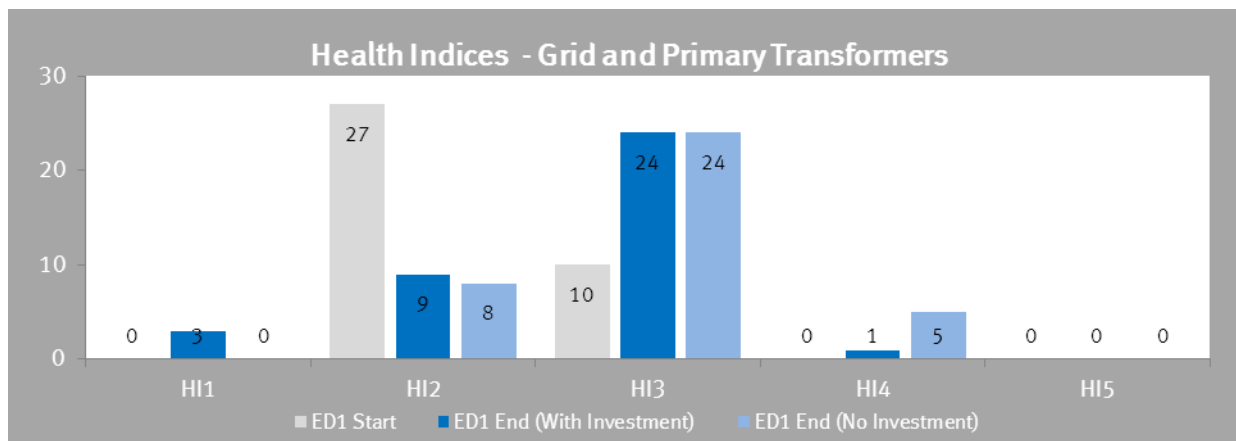


Figure 3. Health Indices by asset category

Scenarios Considered

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

RDP Dependencies and Interactions

No direct impact to other Regional Development Plans.

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2 Network configuration

2.1 Existing Network

This area is fed from Bramford on a dual-circuit 132kV tower line which continues through the area and connects to Norwich Main. It runs normally-open on in-line CBs at Ilketshall Grid, with the single transformer at Ilketshall fed from the Norwich direction. There is an additional switching site at Rumburgh which would also allow Halesworth to be fed from Norwich. The circuit is 300mm² conductor from Bramford to the tee point to Wickham Market, the remainder being 175mm². Halesworth and Ilketshall run in parallel on the 33kV dual circuit teed into Bungay and on a longer single circuit ring via Henstead and Reydon. This single circuit between Barsham and Henstead has previously been diverted onto a reserve site (Ellough) which is adjacent to the industrial zone on the former airfield on the southern edge of Beccles.

There are at present several significant generators on the network connected at 11kV and 33kV, 6MW Solar PV connected on the 11kV busbars at Bentwaters Primary, Chediston 12MW connected on the 33kV circuit between Halesworth Grid and Harleston Primary and Great Glemham (previously Parham Airfield) 15MW Solar PV connected to the 33kV circuit between Wickham Market and Benhall Primary. There have been several enquiries for PV installations in the areas supplied by Wickham Market, Ilkesthall and Halesworth Grids and a total of 94.5MW is currently under construction.

The 33kV network in this area runs interconnected across the three Grids, with out-of-zone connections to Lowestoft (normally open at Long Road), in parallel to Diss via Harleston and to Stowmarket via Debenham and Manor Road.

2.2 Network changes in progress

Rumburgh/Halesworth 132kV Tower Line (PGC) – refurbishment

The condition assessment of the Rumburgh/Halesworth 132kV Tower Line (PGC) circuits has shown that the probability of failure due to degradation of these assets will become unacceptable. Completion of this project will see 2 x 5 km refurbished circuits.

Earl Soham Junction - Wickham Market (PQB) Refurbishment

The condition assessment of the Earl Soham / Wickham Market 132kV tower line (PQB) has shown that the probability of failure of the insulators and associated fittings will become unacceptable. Completion of this project will therefore replace these fixtures and fittings over the 7.7km route.

Framlingham 33/11kV Primary Substation - Replace 33kV Switchgear

The condition assessment of the 1970 EEC OKM4 outdoor oil insulated switchgear installed at Framlingham 33/11kV Primary Substation has shown that the probability of failure due to degradation will become unacceptable. Completion of the project will see 1 circuit breaker replaced with 1 new circuit breaker.

Leiston 33/11kV Primary Substation - Retrofit 11kV feeder circuit breakers

The 11kV switchboard at Leiston Primary is primarily made up of SWS type C8X/C4X. As part of the asset replacement strategy it is proposed to retrofit eight circuit breakers.

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3 Summary of Issues

3.1 Development areas

Suffolk Coastal Council covers the area between the rivers Orwell and Waveney, inland to the eastern edge of Ipswich and northwards on a rough line parallel to the coast. The main areas of employment and development within this Council area are contained within RDP11 (Ipswich fringe, Martlesham and Felixstowe).

The remainder of this Council area is rural with market towns and smaller villages, although some further spread of influence from Felixstowe port is expected in the south of the area. Small employment areas exist at Melton, around Bentwaters former airfield and around Leiston associated with Sizewell. There will be minor employment increases in these locations, with a greater temporary increase if Sizewell C is built. The new housing will be similarly biased, with ~3500 new homes expected in this part of the area to 2027. These will be split among the market towns and villages and should not in themselves require major reinforcement of any one location.

Waveney Council covers a small area in the north within this RDP, mainly concerned with the towns of Beccles, Bungay and Halesworth and their surroundings. The main focus of both employment and housing will be Beccles and Halesworth, with a total predicted 1250 jobs and 600 homes. Small numbers of homes will be allowed in the other villages. In general the housing increase will not require major reinforcement. The main employment area in Halesworth is near Halesworth Grid/Primary. Here the Primary may require reinforcement towards the end of the period if significant industrial load appears.

At Beccles the main employment area is at Ellough (former airfield) and is a significant distance from Beccles Primary which is in the centre of the town. This location is further compromised by the existing small-section cables on the older part of the town network. A reserved site exists at Ellough, with the 33kV circuit from Barsham to Henstead having already been diverted onto it. The expansion of this industrial area has been halted by the present economic situation and by the requirement for a significant reinforcement contribution from any major new load. Network analysis shows that approximately 10MVA additional load can be accommodated at either Beccles or Ellough before an n-1 circuit overload is reached – on Ilketshall to Barsham when the other Ilketshall- Barsham circuit is out (with the associated transformers at Barsham and Beccles).

Mid Suffolk Council covers the strip of countryside down the western edge of the area in this RDP. There are no major settlements here and any housing or employment increases are likely to be small and within the capability of the existing network.

3.2 Asset Replacement

A list of plant recommended for replacement has been included in the ED1 NAMP plan. Dates given are provisional and will change for operational or other reasons such as reinforcement. Costs are generic for the specific plant only and do not take account of any associated equipment which may need replacing at the same time (e.g. structures/bus/line isolators on outdoor CBs).

Wickham Market/Melton Tee 33kV OHL circuit - 33kV wood pole OHL replacement (575A)

The condition assessment of the Wickham Market/Melton Tee 33kV OHL circuit has shown that the probability of failure due to degradation will become unacceptable. Completion of the project will see 17 km of 33kV OHL circuit replaced.

Laxfield 33/11kV Primary Substation - Replace 33kV Switchgear

The condition assessment of the 1964 EEC OKM4 outdoor oil insulated switchgear installed at Laxfield 33/11kV Primary Substation has shown that the probability of failure due to degradation will become unacceptable. Completion of the project will see 1 circuit breaker replaced with 1 new circuit breaker.

Barsham 33/11kV Primary Substation - Retrofit 11kV Switchgear

The condition assessment of the 1967 SWS C4X indoor oil insulated switchgear installed at Barsham 33/11kV Primary Substation has shown that the probability of failure due to degradation will become unacceptable. Completion of the project will see 8 circuit breakers retrofitted.

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Halesworth 33/11kV Primary Substation - Replace 11kV Switchgear

The condition assessment of the 1962/63 SWS C4X/D8-12X indoor oil insulated switchgear installed at Halesworth 33/11kV Primary Substation has shown that the probability of failure due to degradation will become unacceptable. Completion of the project will see 10 circuit breakers replaced with 10 new circuit breakers.

Manor Road 33/11kV Primary Substation - Retrofit 11kV Switchgear

The condition assessment of the 1970 AEI BVP17 indoor oil insulated switchgear installed at Manor Road 33/11kV Primary Substation has shown that the probability of failure due to degradation will become unacceptable. Completion of the project will see 9 circuit breakers retrofitted.

Peasenhall 33/11kV Primary Substation - Replace 11kV Switchgear

The condition assessment of the 1962 SWS C4X indoor oil insulated switchgear installed at Peasenhall 33/11kV Primary Substation has shown that the probability of failure due to degradation will become unacceptable. Completion of the project will see 8 circuit breakers replaced with 8 new circuit breakers.

Leiston 33/11kV Primary Substation - Replace Primary Transformers (T1, T2)

The condition assessment of the 1966 BRU Primary Transformer installed at Leiston 33/11kV Primary Substation has shown that the probability of failure due to degradation will become unacceptable. Completion of the project will see 2 Primary Transformers replaced with 2 new Primary Transformers.

3.3 Security of supply analysis

The Load Index table in Appendix E shows that no site reaches firm capacity during the period to 2023, and the rate of growth will allow some years after that date.

There are four substations on the ring between Ilketshall and Halesworth which affect the possible construction of a new substation at Ellough – these are Barsham, Beccles, Henstead and Reydon. Only Beccles has shown very gradual but consistent load growth, with a winter maximum timed at the early evening peak; the others have historically been 'off-peak' but are now at about parity with early evening. Both Barsham and Henstead have a significant single-customer load so their maximum demands will somewhat depend on the fortunes of those establishments. Reydon daytime load shows little long term variation and is unusual as it nearly always peaks on 31st December.

3.4 Operational and technical constraints

The 132kV Normal Open Point at Ilketshall does tend to create issues of load balance/power flow across the interconnected 33kV network with Halesworth, although it does not at present generally cause any overloads. The overhead circuit from Halesworth to Harleston was recently rebuilt to 200ACSR for this reason. A second Grid transformer at Ilketshall would allow the direct interconnection towards Halesworth to be broken. The longer route via Reydon would have significant impedance and would therefore limit any flow across the 132kV open point.

It has recently been identified that this open point configuration also creates some issues with operation of the protection systems as the network was originally designed to be split at Rumburgh. Analysis is therefore ongoing to ascertain whether it would be practical to revert to this running arrangement, which would see Ilketshall and Halesworth fed from the Norwich direction and Wickham Market from Bramford.

3.5 National Grid

The fifth SGT at Bramford will be run on hot standby and will therefore not impact on this section of network. In the future the 132kV switchgear at Bramford will need to be changed for fault level to allow the Bramford SGTs to be run in parallel due to increased load. For that stage the balance across the 132kV NOP should be checked.

Connection of Generation - Heat Map

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It is generally possible to connect generation equipment to the electricity network at all voltages, but this capability can be restricted by a number of elements which may be:

- a) The amount of new generation that can be connected relative to the existing load/demand on the system;
- b) The proposed location and size of the generator;
- c) The nature of the existing equipment;
- d) The amount of generation connected or committed to connect

The heat map presented in the Appendices is indicative of the capability of the high voltage electrical network to accept connection of new generation equipment.

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4 Recommended strategy

4.1 Description

The main aspect of the strategy for the Bramford Coast region of the network is concerned with the method of supplying the Ellough industrial area to the south-east of Beccles town. At present, industrial development has been stifled due to the step change in the network needed to reinforce that area. The recent Waveney Council long-term development statement will provide a further boost for load enquiries which may then turn into genuine jobs.

Table 2. Reinforcement options to supply Ellough Industrial area

New load	n-1 Limiting plant	Solution	Cost £k
0 to 10MVA	(11kV network from Beccles)	Establish Primary on reserve site 11/18/24MVA	3100
>10MVA	200SCA ohl Ilketshall – Barsham (circuit outage)	New circuit Ilketshall – Ellough ~7.5km u/g	3300
>14MVA	Halesworth – Ilketshall interconnectors (GT busbar out at Ilketshall)	Second GT at Ilketshall and strap Ilketshall-Ellough circuit onto both busbars at Ilketshall for alternative feed.	1940
>24MVA	Ellough transformers. (33kV busbar outage at Ellough)	ITC to 18/30/40MVA and strap Ilketshall-Ellough circuit onto both busbars at Ellough for alternative feed.	1200
TOTAL			9540

The recommended strategy is to establish Ellough Primary on the previously acquired site on the edge of the industrial area. This will provide short and relatively easy cable runs to the new and existing loads rather than an extended urban route. The table above shows the stages needed to obtain the full 40MVA potential of the site, although it is most unlikely that the loads will ever reach more than 24MVA at most.

When the site is first established, some load will naturally be transferred off the existing Beccles network, but as the whole area is still fed via the Ilketshall – Barsham circuits, the 10MVA overall new load is the limiting factor before the next reinforcement.

The second stage will need a circuit from Ilketshall (GT bar) to Ellough (Henstead bar). This is needed to cater for the loss of the Barsham-Ellough circuit, as the alternative from Halesworth via Henstead will not be adequate. At Ilketshall the circuit should be connected to the GT bar. The loss of the GT bar will force sufficient load to be taken via Henstead to prevent overload of the remaining Halesworth- Ilketshall circuit.

At some stage a second Grid transformer will be needed at Ilketshall. A scheme is being prepared to replace the two 60MVA transformers at Stowmarket Grid. The younger of these should be considered for use at Ilketshall, even in advance of absolute need. This would remove the need for the direct parallel between Ilketshall and Halesworth and thus lessen the impact of any load/circulating current across the 132kV NOP at Ilketshall.

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.

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5 Rejected Strategies

There is little demand growth in the area supplied from the HV and EHV network defined in this RDP therefore no rejected strategies have been considered.

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6 References

References	Description
Reference 1	Planning Load Estimates EPN Area 2011 - 2023
Reference 2	132kV Network HV Schematic Operating Diagrams East of England (July 2012)
Reference 3	33kV Network HV Schematic Operating Diagrams East of England (July 2012)
Reference 4	Council Masterplans
Reference 5	Current and forecast asset health information (HI) as per 2013 RIIO-ED1 submission

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	Area Geographic Plans
Appendix H	Generation Heat Map

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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
Peter Rye	Infrastructure Planner		19/03/14
Nuno Da Fonseca	Infrastructure Planning Manager (EPN)		

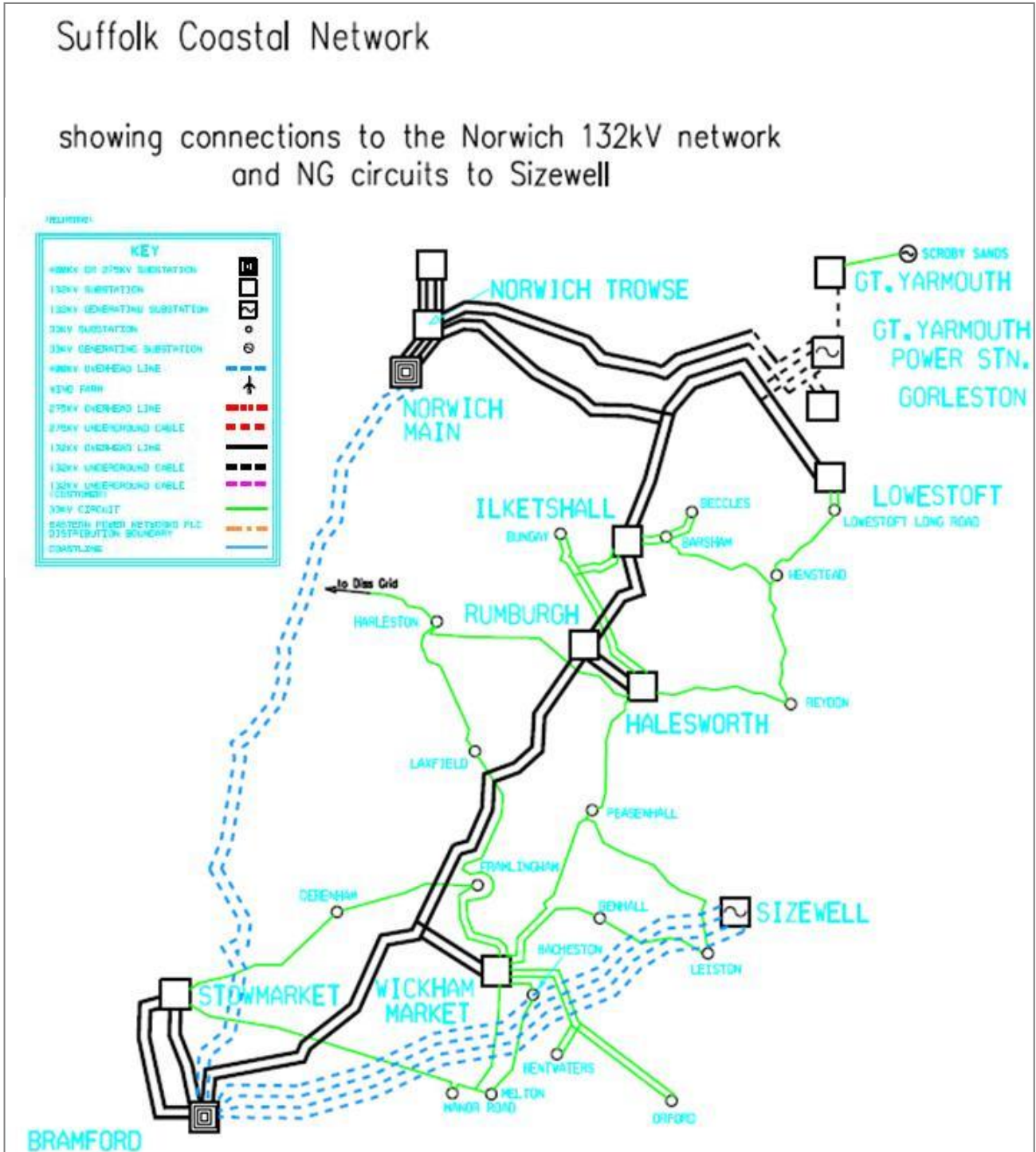
Approval by:

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

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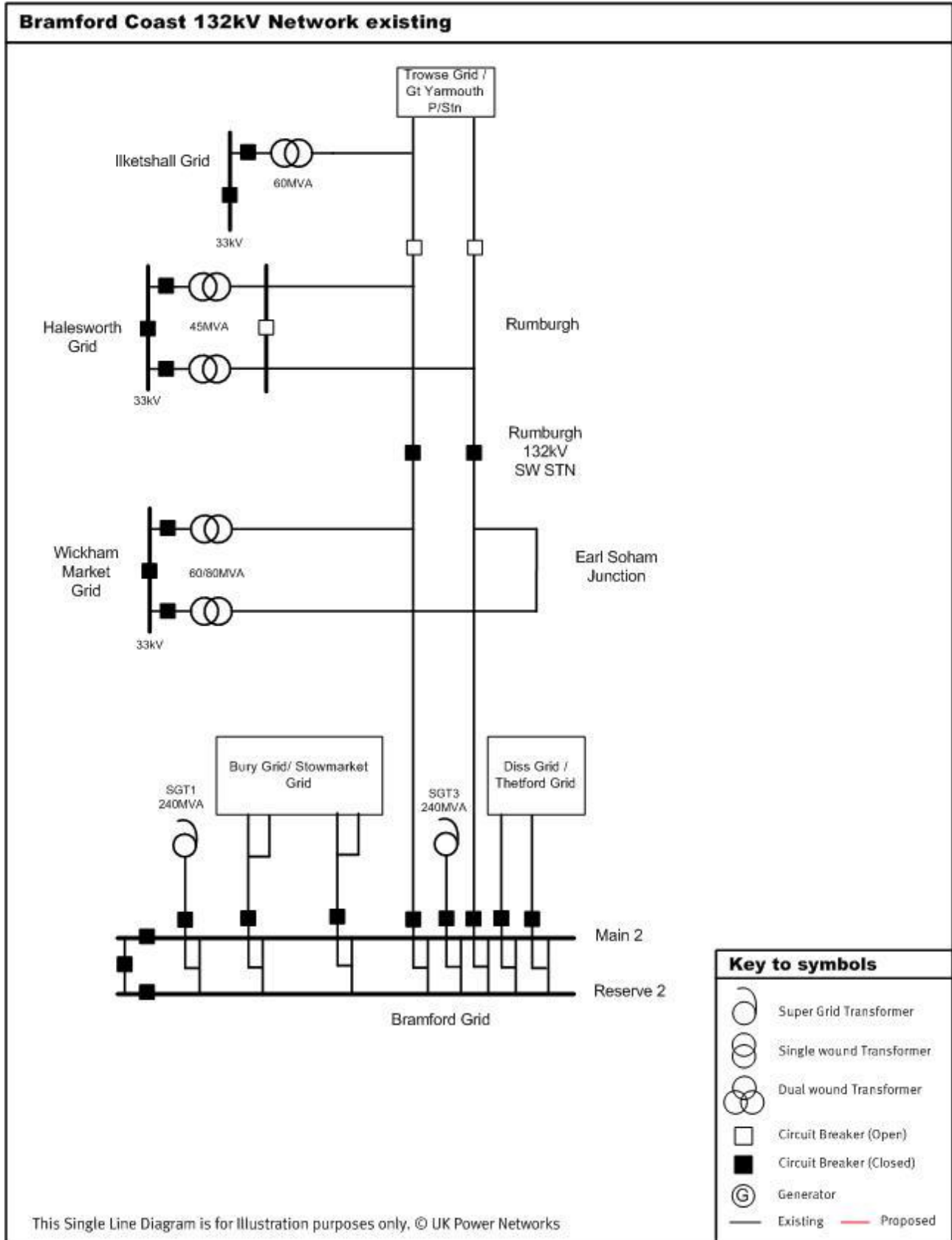
APPENDIX A: GEOGRAPHICAL DIAGRAM



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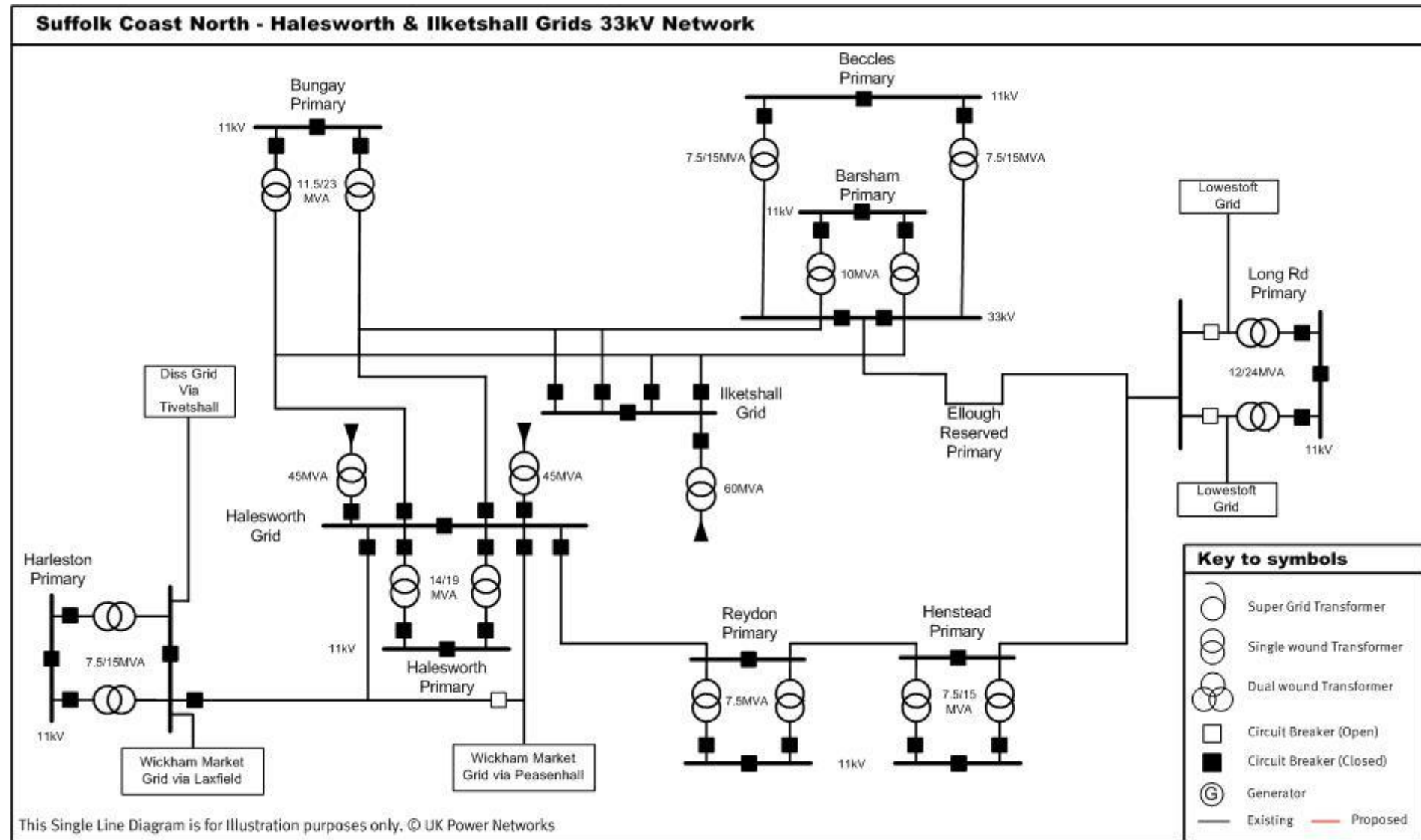
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APPENDIX B: SINGLE LINE DIAGRAM – EXISTING NETWORK



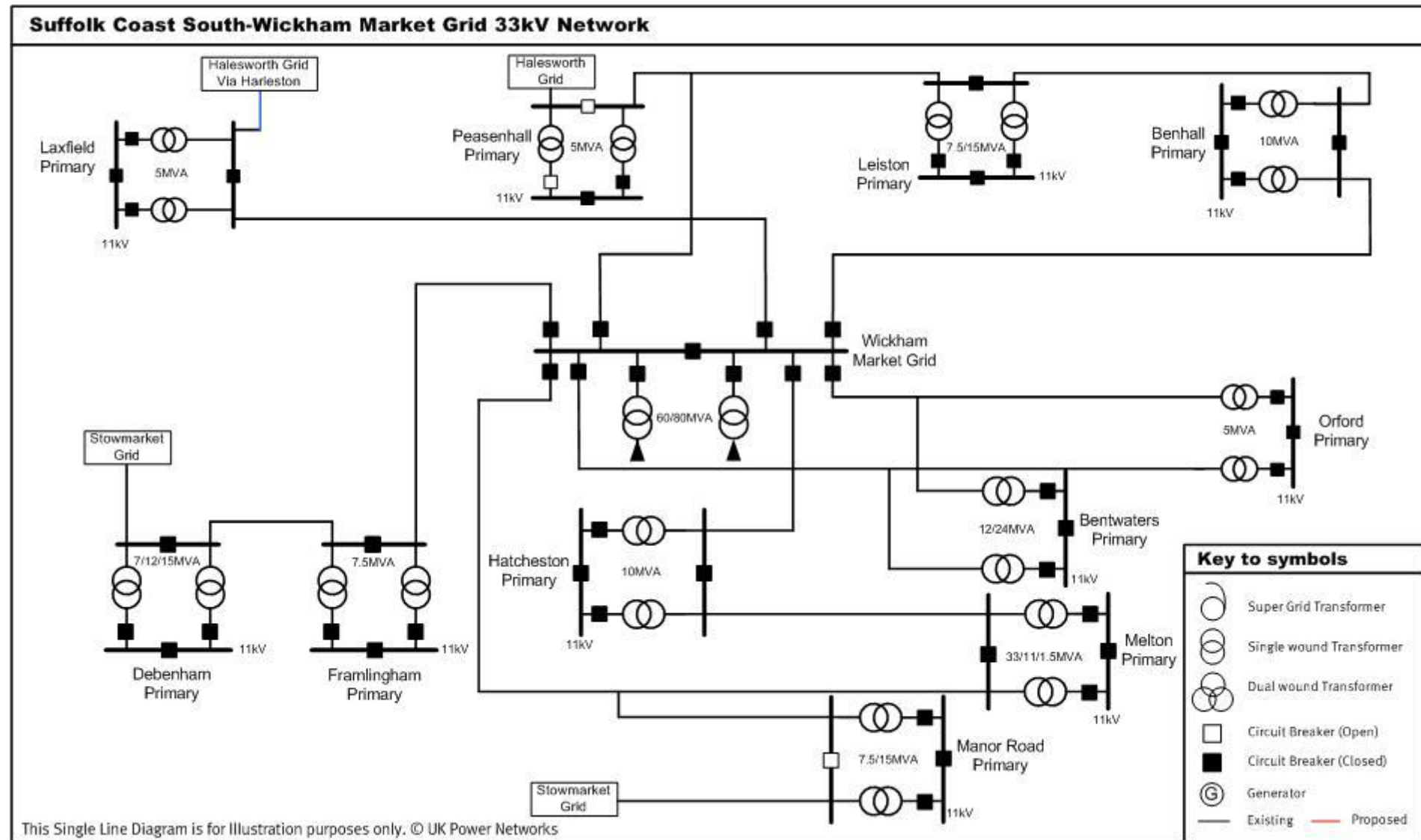
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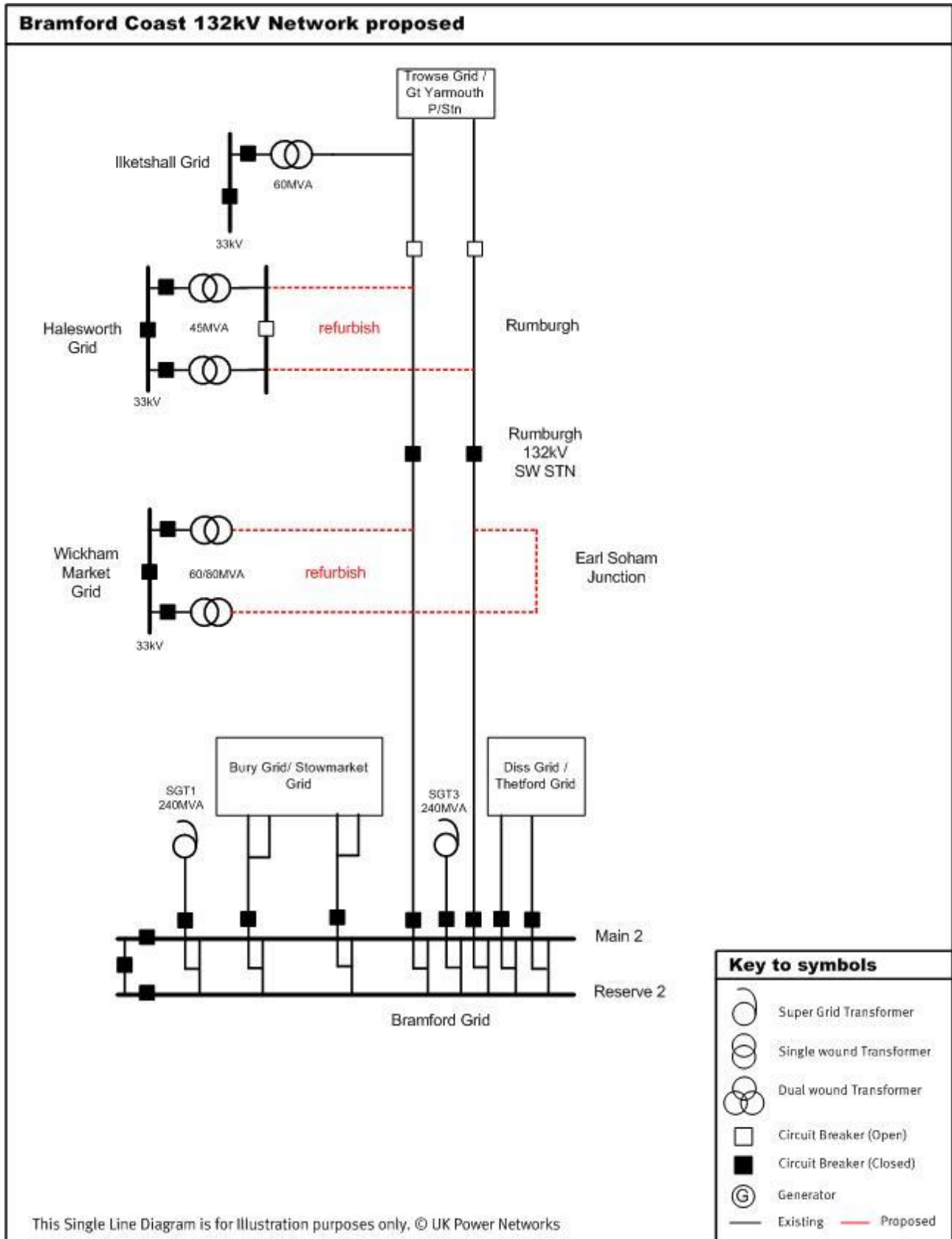
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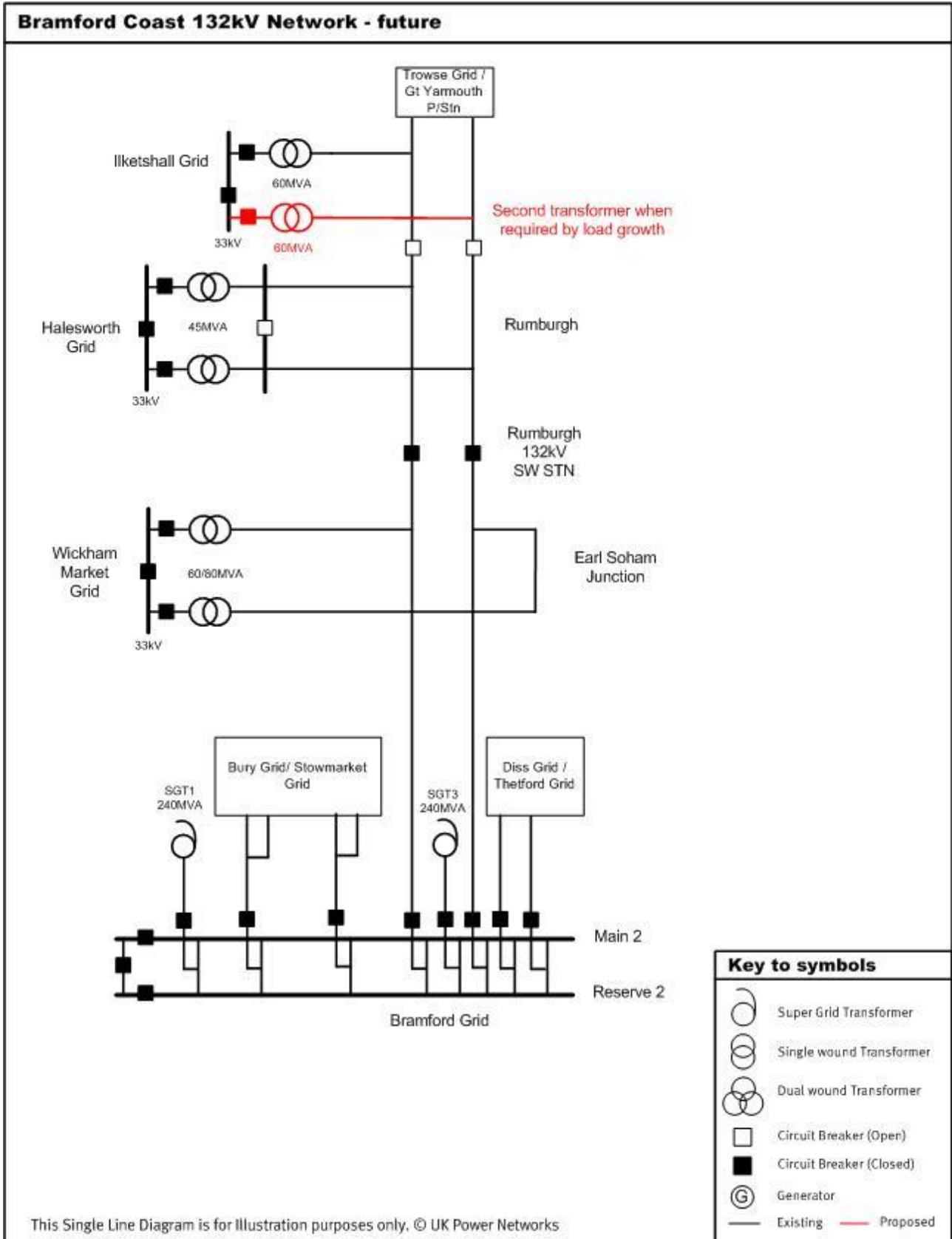
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APPENDIX C: SINGLE LINE DIAGRAM – RECOMMENDED STRATEGY

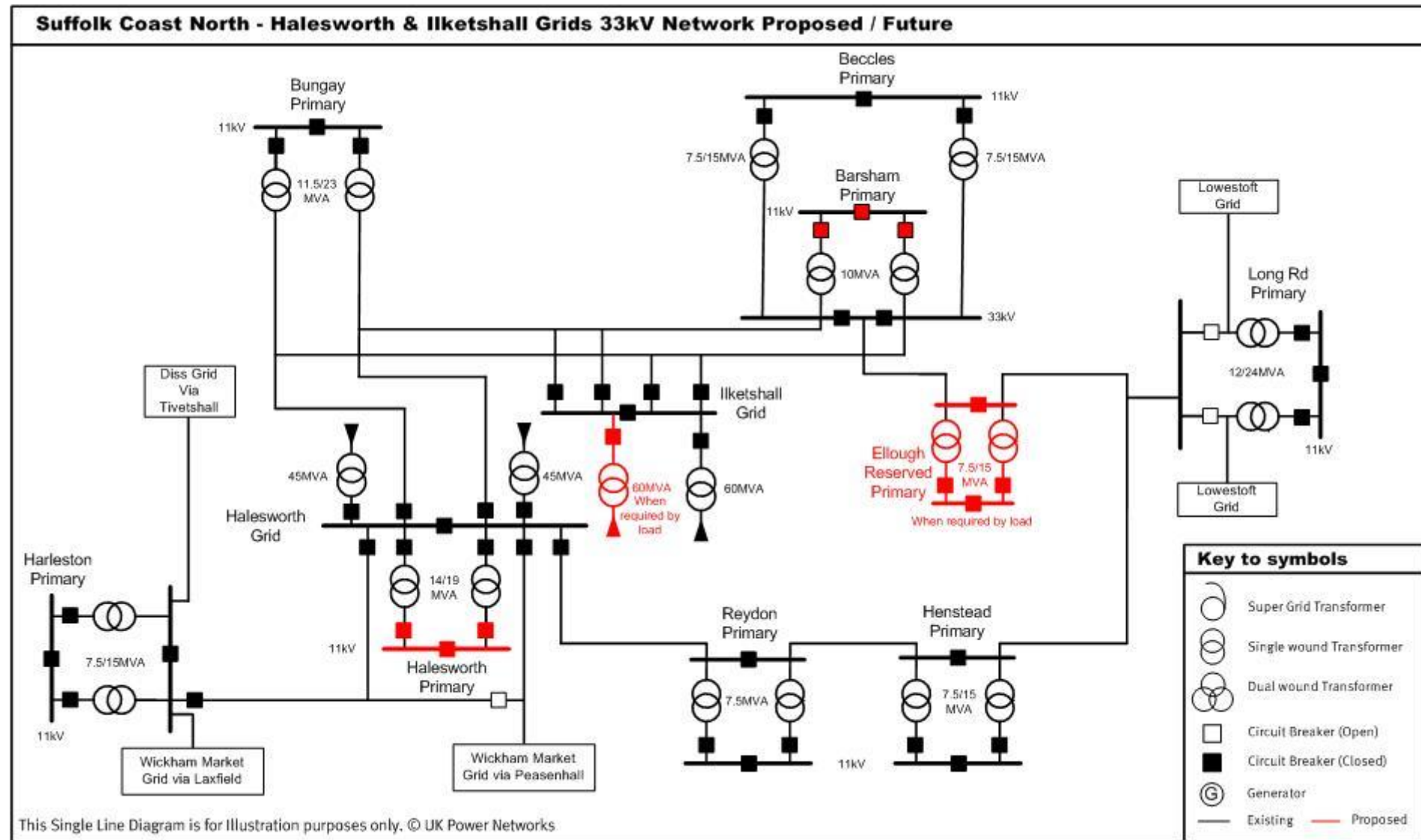


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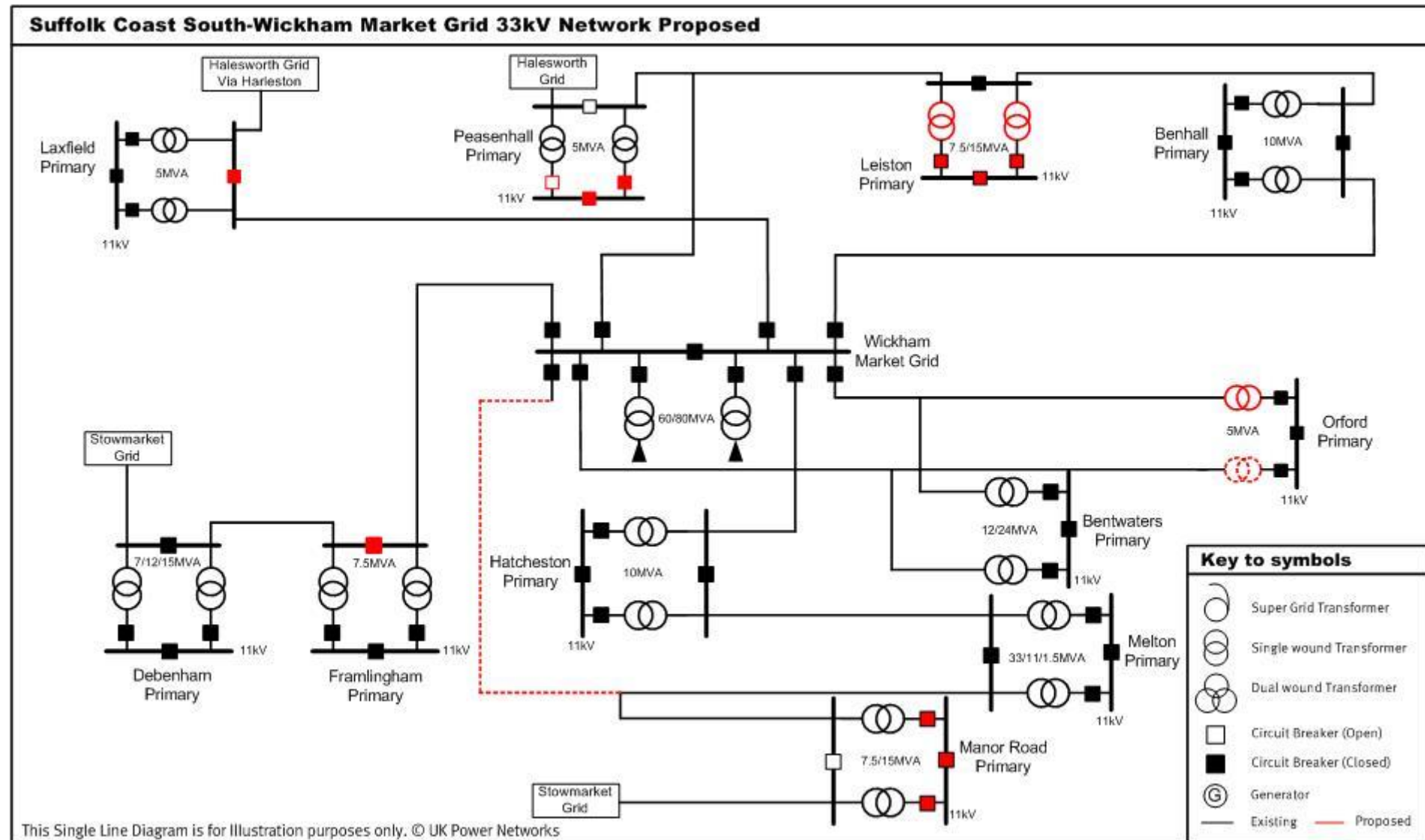


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APPENDIX D: DETAILED COSTS FOR RECOMMENDED STRATEGY

NAMP version: Table J Less Indirect Baseline 19th February 2014 ED1 resubmission (£)

Cat	Namp Line	Project ID	Description	2013/2014	2014/2015	2015/2016	2016/2017	2017/2018	2018/2019	2019/2020	2020/2021	2021/2022	2022/2023
A	1.02.03	2789	PGC - Rumburgh/Halesworth - Conductor Replacement	821,467									
A	1.02.03	5849	PQB - Earl Soham Junction - Wickham Market - Insulator and Fittings Replacement	171,163									
A	1.09.01	2214	Wickham Market/Melton Tee 33kV OHL Circuit - 33kV Wood Pole OHL Replacement (575A)			347,712	684,056						
A	1.48.02	2215	Framlingham 33/11kV Primary Substation - Replace 33kV Switchgear	12,837	38,667								
A	1.48.02	7613	Laxfield 33/11kV Primary Substation - Replace 33kV Switchgear					105,017					
A	1.50.01	5865	Leiston 33/11kV Primary Substation - Retrofit 11kV Feeder Circuit Breakers	143,300									
A	1.50.01	7671	Barsham 33/11kV Primary Substation - Retrofit 11kV Switchgear						130,611				
A	1.50.01	7689	Halesworth 33/11kV Primary Substation - Replace 11kV Switchgear						47,275	994,981			
A	1.50.01	7696	Manor Road 33/11kV Primary Substation - Retrofit 11kV Switchgear								146,937		
A	1.50.01	7703	Peasenhall 33/11kV Primary Substation - Replace 11kV Switchgear						234,119	539,771			
A	1.51.03	7765	Leiston 33/11kV Primary Substation - Replace Primary Transformers (T1, T2)							394,040	748,364		
A	1.51.03	7766	Orford 33/11kV Primary Substation - Replace Primary Transformers (T1)										174,619
A	1.51.11	7734	Orford 33/11kV Primary Substation - Refurbish Primary Transformers (T2)										25,510

Bramford – Suffolk Coast (EPN)

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

APPENDIX E: OUTPUT MEASURES – LOAD INDEX TABLES (LI)

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

Substation	Season	First Limitation	FC NOW (MVA)	DPCR5 Intervention		RIIO-ED1 without intervention				RIIO-ED1 with Intervention			P2/6 at End of ED1	
				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
Barsham	W	Transformer	11.5		11.5	7.4	7.6	LI1	LI1		11.5	LI1	B	Yes
Beccles	S	Transformer	11.5		11.5	7.9	8.6	LI1	LI1		11.5	LI1	B	Yes
Benhall	W	Transformer	13.0		13.0	5.8	6.4	LI1	LI1		13.0	LI1	B	Yes
Bentwaters	S	Transformer	18.0		18.0	3.7	3.5	LI1	LI1		18.0	LI1	B	Yes
Bungay	S	Transformer	17.3		17.3	9.0	9.3	LI1	LI1		17.3	LI1	B	Yes
Framlingham	W	Transformer	10.0		10.0	6.4	6.9	LI1	LI1		10.0	LI1	B	Yes
Hacheston	W	Transformer	12.0		12.0	4.9	5.2	LI1	LI1		12.0	LI1	B	Yes
Halesworth Grid 33	S	Transformer	45.0		45.0	12.6	13.2	LI1	LI1		45.0	LI1	C	Yes
Halesworth Primary	S	Transformer	14.0		14.0	11.0	11.6	LI1	LI2		14.0	LI2	B	Yes
Harleston	S	Transformer	11.5		11.5	7.2	7.5	LI1	LI1		11.5	LI1	B	Yes
Henstead	S	Transformer	11.5		11.5	6.3	6.8	LI1	LI1		11.5	LI1	B	Yes
Ilketshall Grid 33	S	Transformer	60.0		60.0	35.4	37.5	LI1	LI1		60.0	LI1	C	Yes
Laxfield	W	Transformer	6.0		6.0	3.7	3.8	LI1	LI1		6.0	LI1	B	Yes
Leiston	W	Transformer	15.0		15.0	9.7	10.8	LI1	LI1		15.0	LI1	B	Yes
Melton	W	Transformer	13.0		13.0	9.2	9.7	LI1	LI1		13.0	LI1	B	Yes
Orford	W	Transformer	6.0		6.0	2.9	3.0	LI1	LI1		6.0	LI1	B	Yes
Peasenhall	W	Transformer	6.5		6.5	5.0	5.0	LI1	LI1		6.5	LI1	B	Yes

Regional Development Plan



Bramford – Suffolk Coast (EPN)

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

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

Substation	Season	First Limitation	FC NOW (MVA)	DPCR5 Intervention		RIIO-ED1 without intervention				RIIO-ED1 with Intervention			P2/6 at End of ED1	
				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
Reydon	W	Transformer	9.0		9.0	5.0	5.5	LI1	LI1		9.0	LI1	B	Yes
Wickham Market Grid 33	W	Transformer	78.0		78.0	55.9	59.4	LI1	LI1		78.0	LI1	C	Yes

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

APPENDIX F: OUTPUT MEASURES – HEALTH INDEX TABLE (HI)

Substation	132kV Switchgear														
	ED1 Start (2015)					ED1 End (2023) No Investment					End of ED1 (2023) With Investment				
	HI1	HI2	HI3	HI4	HI5	HI1	HI2	HI3	HI4	HI5	HI1	HI2	HI3	HI4	HI5
HALESWORTH GRID		1					1					1			
ILKETSHALL GRID		2					2					2			
RUMBURGH 132KV SW STN		2					2					2			
TOTAL		5					5					5			

Substation	33kV Switchgear														
	ED1 Start (2015)					ED1 End (2023) No Investment					End of ED1 (2023) With Investment				
	HI1	HI2	HI3	HI4	HI5	HI1	HI2	HI3	HI4	HI5	HI1	HI2	HI3	HI4	HI5
BARSHAM PRIMARY		1			1			1		1			1		1
BENHALL PRIMARY			1							1					1
FRAMLINGHAM PRIMARY	1					1					1				
HACHESTON PRIMARY	1					1					1				
HALESWORTH GRID			10							10					10
HARLESTON PRIMARY			2							2					2
HENSTEAD PRIMARY			1						1		2			1	
ILKETSHALL GRID		6					6					6			
LAXFIELD PRIMARY				1						1	1				
LEISTON PRIMARY	1						1					1			
MELTON PRIMARY	3					3					3				
PEASENHALL PRIMARY			1							1					1
REYDON PRIMARY	1						1					1			
WICKHAM MARKET GRID	3		8			3				8	3				8
TOTAL	10	7	23	1	1	8	8	1	1	24	11	8	1	1	23

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

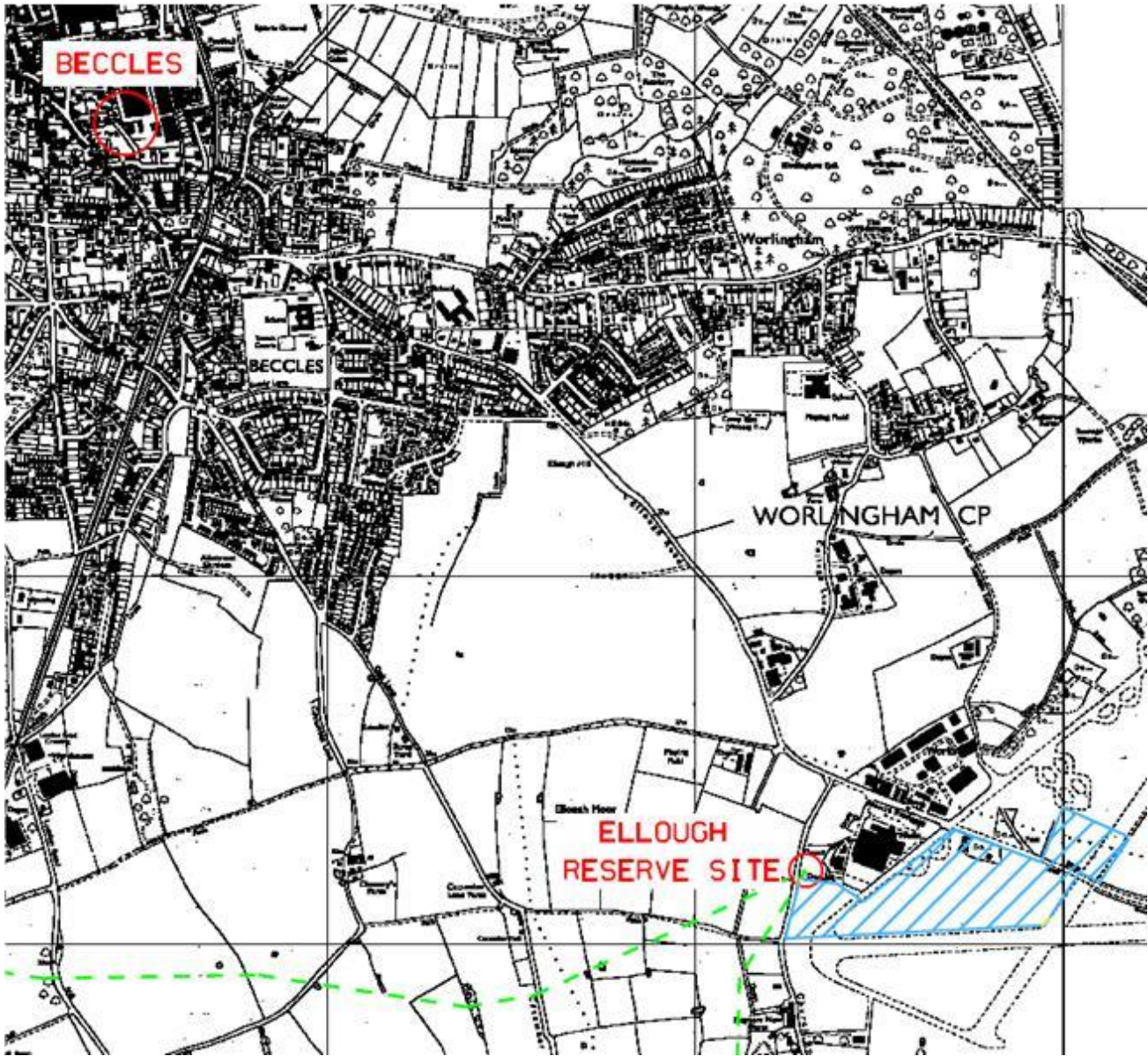
Substation	11/6.6kV Switchgear														
	ED1 Start (2015)					ED1 End (2023) No Investment					End of ED1 (2023) With Investment				
	HI1	HI2	HI3	HI4	HI5	HI1	HI2	HI3	HI4	HI5	HI1	HI2	HI3	HI4	HI5
BARSHAM PRIMARY		2	6					3	1	4			8		
BECCLES PRIMARY		6	4					8	2				8	2	
BENHALL PRIMARY		6					3	3				3	3		
BENTWATERS PRIMARY		7					7					7			
BUNGAY PRIMARY	11					11						11			
FRAMLINGHAM PRIMARY		8					6	2				6	2		
HACHESTON PRIMARY		4	3				1	6				1	6		
HALESWORTH GRID															
HALESWORTH PRIMARY		1	8	1				3	6	1	10				
HARLESTON PRIMARY		8	1					9					9		
HENSTEAD PRIMARY		6	1					7					7		
LAXFIELD PRIMARY		6	1					7					7		
LEISTON PRIMARY		3	5					3		5			8		
MELTON PRIMARY		8						8					8		
ORFORD PRIMARY	8						8					8			
PEASENHALL PRIMARY			8					2	2	4	8				
REYDON PRIMARY	2	6					5	3				5	3		
TOTAL	21	71	37	1		11	30	64	11	14	29	30	69	2	

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

Substation	Grid and Primary Transformers														
	ED1 Start (2015)					End of ED1 (2023) No Investment					End of ED1 (2023) With Investment				
	HI1	HI2	HI3	HI4	HI5	HI1	HI2	HI3	HI4	HI5	HI1	HI2	HI3	HI4	HI5
BARSHAM PRIMARY		2						2					2		
BECCLES PRIMARY		2					2					2			
BENHALL PRIMARY		2						2					2		
BENTWATERS PRIMARY		2					2					2			
BUNGAY PRIMARY		2						2					2		
FRAMLINGHAM PRIMARY		2						2					2		
HACHESTON PRIMARY		1	1					2					2		
HALESWORTH GRID		2						2					2		
HALESWORTH PRIMARY		2						2					2		
HARLESTON PRIMARY		2					2					2			
HENSTEAD PRIMARY		2						2					2		
ILKETSHALL GRID		1					1					1			
LAXFIELD PRIMARY			2					2					2		
LEISTON PRIMARY			2						2		2				
MELTON PRIMARY		2						2					2		
ORFORD PRIMARY			2						2		1	1			
PEASENHALL PRIMARY		1	1					2					2		
REYDON PRIMARY			2					1	1				1	1	
WICKHAM MARKET GRID		2					1	1				1	1		
TOTAL		27	10				8	24	5		3	9	24	1	

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

APPENDIX G: AREA GEOGRAPHIC PLANS

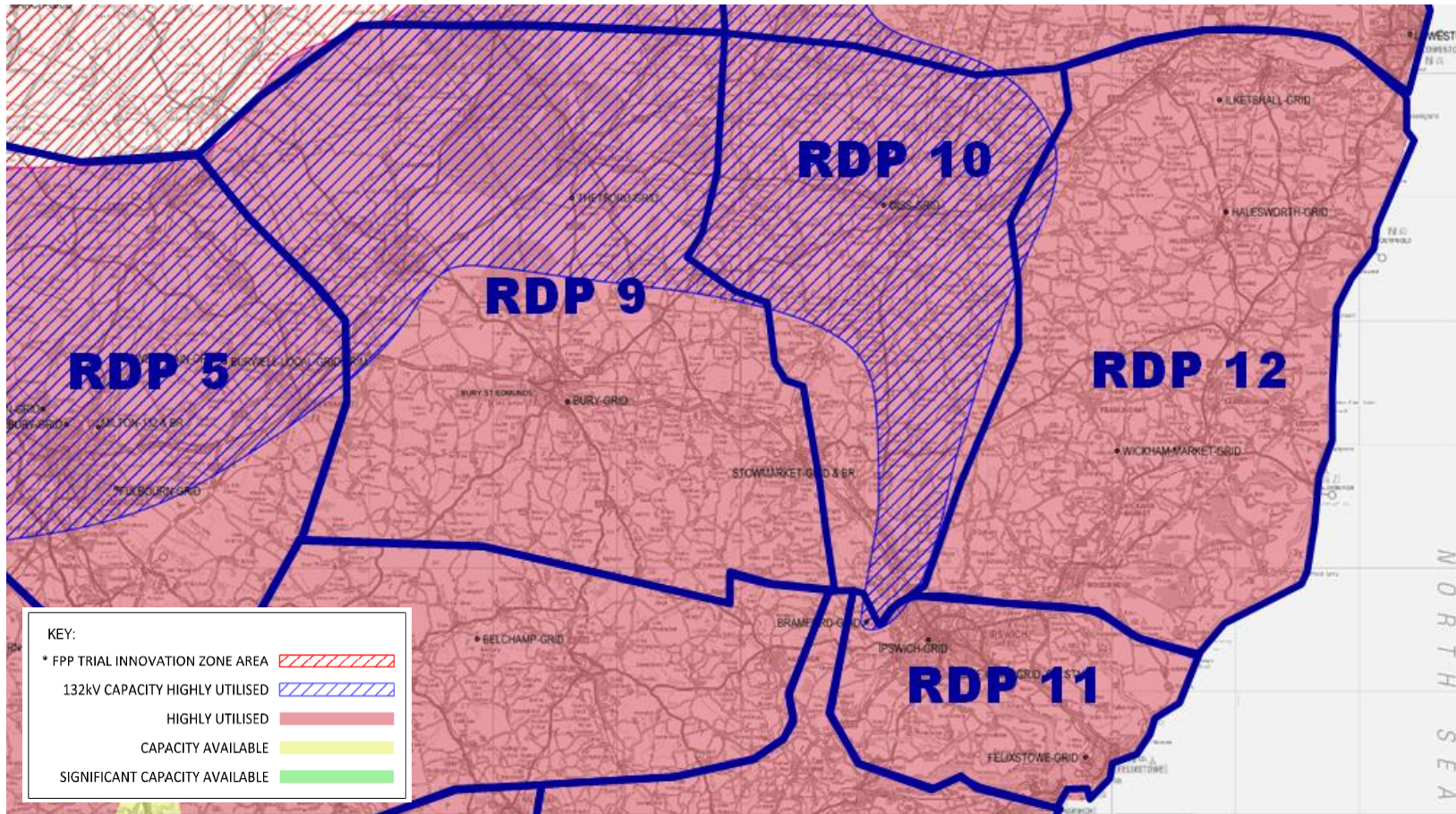


Map showing location of Beccles Primary, Ellough reserve site and the industrial area remaining, with the 33kV line previously diverted

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

APPENDIX H: 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 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.



Eastern Power Networks Generation Capacity Map 14-01-2014