MULBARTON PARISH COUNCIL

Norfolk Boreas - Deadline 16

23rd September 2020

Introduction

This contribution brings together several issues related to the overall question of need, and responds to the Examining Authority's requests for comments (including, for example, Q 5.4.0.10, Q 5.16.01, Q 5.16.0.3 and Q 5.16.0.4, etc.), and other related representations.

Need for electricity

The UK typically needs a peak winter electricity supply of about 40 GW. This figure is reducing slowly year by year, and has dropped further during the pandemic. Government statistics show, however, that over the last few years the average annual consumption has been about 300 TWh per year (i.e. an average usage of 34 GW for a period of one year).[1]

In the last full quarter up to 30th June 2020, the demand for electricity dropped further by 12% to the lowest level recorded in published government statistics for the time of year.

The supply of electricity can come from several different sources, including imports from continental Europe. These account for about 7% of the total supply, partly because peaks in local demand occur at different times in different time zones. Imports from Europe also dropped slightly in the last quarter, despite the introduction of new interconnector capacity.

This shows that the UK has adequate access to electricity supply for the next few years.

Need for renewable energy

The need for renewable energy in particular is a matter of public policy and debate, and its relevance to the Norfolk Boreas project is entirely dependent upon an effective means of connection to the onshore transmission grid and on to the main centres of demand – the greater the need, the more important it is to bring the renewable energy ashore effectively.

In the first quarter of this year renewable electricity generation reached over 40 TWh, (an average of 14 GW), equal to 47% of total electricity generation. This was a new record, and the first quarter in which renewables generated a greater share of electricity than fossil fuels. Generation was higher for both wind and solar power (up by 35% to 28.0 TWh) with the largest increase being shown for offshore wind generation (up by 53%). This was partly due to higher wind speeds, although offshore wind generation capacity has also increased by 18.5% compared to the previous year. The share of electricity supplied from low carbon sources, including nuclear energy, reached 62.1% – the highest level recorded to date.

Government statistics also show record levels of electricity transfers from Scotland to England in the first quarter of this year, up by 53% from last year's level, to 6.5 TWh. This reflects an increase in the amount of wind generation taking place in Scotland, which now provides about 40% of the UK's total wind energy generation capacity.

Whilst these are all beneficial outcomes, they also show that there is no great urgency to introduce additional wind capacity off the East Coast at this time. Furthermore, there is a shortfall of east-to-west transmission capacity from the East Anglia region to the main centres of demand in London and the south east, and a significant risk that the onshore transmission grid will increasingly become saturated by north-to-south energy flows.

1 Quoted from the government statistical publication *Energy Trends: Electricity*, updated 27th August 2020.

Carbon footprint and climate change

The project team has provided a high level report setting out the carbon footprint of the Norfolk Boreas project over its operational life. The principal conclusion of the report is that the 'carbon payback' of emissions arising from construction of the Norfolk Boreas project is likely to occur within 1 to 2 years from the date of first power generation.[2]

This conclusion seems to assume, firstly, that the whole of the renewable energy output from the Norfolk Boreas project is able to reach the main centres of demand throughout a 30-year project lifetime; that no onshore grid constraints come into effect during that time; and that an equivalent amount of non-renewable energy generation is withdrawn, as soon as the project is completed. All of these assumptions are open to alternative points of view.

The maximum impact of the nominal 1.8 GW generating capacity of the Norfolk Boreas project can be estimated at approximately 2.5% of the total UK electricity demand. This is relatively small in comparison to the changes in demand which have occurred over the last few months. Assuming that the Norfolk Boreas project produces emission-free electricity, and replaces other types of energy generating capacity, and that the entire output reaches the main centres of demand, then the impact on climate change could be as shown below.

Region / project	Year	CO^2 emissions (kt)	CO^2 emissions (% of 2017 global total)
Norfolk	2007	6,710.6	
	2017	5,139.2	0.01%
Greater London	2007	46,842.1	
	2017	29,709.1	0.09%
UK total	2007	514,830.7	
	2017	351,501.3	1.07%
Global total	2016	32,316,000.0	
	2017	32,770,000.0	100.00%
	2018	33,415,000.0	101.96%
Norfolk Boreas	2027	- 8,787.5	- 0.02%

Table 1: Climate impact of the Norfolk Boreas project

Thus, the maximum potential benefit of the Norfolk Boreas project is a net reduction in global CO^2 emissions of approximately 0.02%, whereas the annual rate of increase has recently been approximately one hundred times larger, at a rate of about 2.0% per year.

This evaluation is based on statistics produced by the UK government, and in the public domain, for the period prior to the pandemic. Since then, there has been a general drop in both electricity consumption and fossil fuel usage, as shown by movements in oil prices.

These figures show that there is no compelling urgency to connect the Norfolk Boreas project to the grid, but it is important to do it right, if it is to have any beneficial effect at all. This issue is relevant because the central purpose of the project is to connect a supply of renewable energy to the main centres of demand.

2 Document reference EN010087-002432, *Carbon Footprint Assessment,* August 2020

Transmission capacity

Planning for the Round 3 offshore wind farms began as long ago as 2007, with the first tenders submitted in 2008, and the initial zone development agreements reached in 2009.

From this point onwards, it was apparent that the high-voltage transmission network in East Anglia would need to be improved, and the Bramford to Twinstead Tee upgrade was brought forward to provide the necessary increase in out-of-region transmission capacity. By 2013, however, this nationally significant infrastructure project had been put on hold.[3]

The IOTP (East) feasibility study seems to have been completed on the assumption that the Bramford to Twinstead upgrade would not be available. Alternative grid connections for the two more northerly East Anglia zone offshore wind farms were shown at Bacton and Lowestoft, rather than at Bramford. Nevertheless, the study found substantial advantages arising from the adoption of integrated offshore transmission for the East Coast wind farm projects; it not only provides an effective means of connection for offshore wind farms, but also provides additional north-to-south capacity, thus helping to reduce the expected level of onshore transmission constraints. The benefits arising from offshore transmission may be even greater, if the Bramford to Twinstead project is included in the design calculations.

The decision to develop the Norfolk Vanguard and Boreas projects, together with the increase in the planned capacity of Hornsea Three, provided a signal that this original plan should be carried out, including the Bramford to Twinstead Tee upgrade. Five years later, it seems that nothing has been done to set these essential infrastructure plans in motion. By contrast, a new interconnector, Nemo Link, became operational in 2019, and the Western Link (a high-voltage DC offshore link) was brought into full operation in January 2020. The level of constraint payments made during outages of the Western Link demonstrates the need for additional East Coast capacity, as anticipated in the IOTP (East) feasibility study.

The environmental statement for Norfolk Boreas states that the reason for discounting Bramford as a grid connection point was ‘insufficient capacity’. It is apparent, however, that no additional out-of-region transmission capacity is obtained by moving the grid connection point north from Bramford to Necton, as it then lies on the far side of capacity restrictions between Norwich and Bramford, and must still pass through Bramford to reach London. In the same way, moving the Hornsea Three grid connection from Walpole to Norwich Main places it on the far side of the capacity restriction between Norwich and Walpole. Together, these changes increase the net shortfall in out-of-region transmission capacity by 6.0 GW.[4]

Appendix 1 draws upon more recent evidence submitted by the Offshore Wind Industry Council to explore these issues in more detail. It also shows that there are no remaining coal-fired power stations in East Anglia that can be closed to provide the full climate impact benefits claimed for the Norfolk Boreas project. The full environmental and climate benefits would seem to be dependant upon an effective grid connection giving access to the main centres of demand, where other forms of fossil fuel power generation are still in use. Even after completion of the Bramford to Twinstead Tee upgrade project, however, there will still be a significant shortfall in out-of-region transmission capacity from the East Anglia region.

Increasing sea floor congestion, and potential environmental impacts at the Wash and Bawdsey, provide further reasons to proceed with a single integrated offshore transmission scheme as soon as possible for the remaining Round 3 offshore wind farm projects.

3 Planning Inspectorate project reference *Bramford to Twinstead Tee*, EN020002-000254, February 2013.

4 Environmental statement, Appendix 4.3, *Strategic Approach to Selecting a Grid Connection Point*, page 9, paragraph 29: ‘Other sites were discounted for the following reasons: - Sites with insufficient capacity for the Projects (Bramford and Sizewell).’

Government reviews

The IOTP (East) feasibility study of 2015 is one of many reports that have examined the East Coast transmission network over the last few years, all of them leading to broadly the same conclusion. The network in East Anglia has not been built for high-capacity east-to-west throughput; the Bramford to Twinstead upgrade project will do no more than bring the Bramford junction up to a similar level of capacity as at Walpole, and there will still be a shortfall. Restoring the original plan of connecting the larger Round 3 offshore wind farms to Bramford and Walpole is nevertheless the best way to bring forward the government's 'increased ambition' to bring renewable energy into the UK onshore grid at an early date.

In July this year the government announced an Offshore Transmission Network Review, and in August an open letter was published by Ofgem requesting inputs from interested parties on feasible opportunities for co-ordination. If the outcome of this review is limited to recommendations for Round 4 offshore wind farm projects only – which may well include a scheme for integrated offshore transmission, with landing points at Walpole and Bramford – then the government's 'increased ambition' for higher levels of renewable energy will be delayed. By not including the Hornsea Three, Norfolk Vanguard and Boreas projects within the scope of such an integrated scheme, the business case for early investment would be weakened, and the benefits postponed until the Round 4 projects are commissioned. By locking the Round 3 projects in to Necton and Swardeston, some benefits would be lost.

At a hearing of the UK parliamentary Environmental Audit Committee on 4th June 2020, representatives of the Offshore Wind Industry Council (OWIC) commented that there are 'many actors', but little incentive for action. By specifying the appropriate landing points, and mandating the immediate use of integrated offshore transmission, it would appear that an incentive for investment and innovation could be initiated. In our view, responsibility for such a decision lies with Ofgem as the economic regulator, and not with National Grid as the regulated entity, and should be fully open to public scrutiny and accountability.

Project timescales

The most important timescale for consideration is the successful transmission of clean energy across the grid, including east-to-west flows across East Anglia, and the increasing level of north-to-south flows described above. The Hornsea Three, Norfolk Vanguard and Boreas projects are scheduled to be built in phases over a period of many years. Given the recent reductions in electricity demand, additional time is now available to ensure that the onshore aspects are properly carried out, including the Bramford to Twinstead project, on the basis of a scheme of integrated offshore transmission. There does not seem to be an urgent need to deliver offshore wind energy to the villages of Necton and Swardeston.

Hornsea Three and Norfolk Vanguard

It has been suggested that because the Norfolk Vanguard project has been approved, Norfolk Boreas should also be approved, because of similarities between the two projects.[5]

Whilst this argument may be appropriate to house-building developments, infrastructure projects tend to have different characteristics. In terms of environmental impact alone, it is apparent that two large scale construction projects between the same end-points are likely to have greater cumulative effects than a single project. In the case of offshore wind, these cumulative impacts extend through to the performance of the onshore transmission grid, and the overall costs passed on to electricity consumers over the lifetime of the projects.

5 As set out in document reference EN010087-002356 *Implications of the Norfolk Vanguard decision and Hornsea Three letter for Norfolk Boreas.*

Conclusion

For reasons previously stated, Mulbarton Parish Council objects to the onshore portion of the Norfolk Boreas DCO application in its entirety. Other parties have also raised issues concerning the offshore impacts. In our view, the potential benefits of the project, as it is currently formulated, are not sufficient to justify either the onshore, or the offshore impacts.

In view of all the many studies, reports, consultations and recommendations of the last few years, the best way forward to secure the benefits of renewable energy seems to be:

- connect Hornsea Three to the grid at Walpole, and not at Norwich Main;
- connect Norfolk Vanguard, followed by Norfolk Boreas, to the grid at Bramford;
- provide an offshore transmission link between Norfolk Boreas, and Hornsea Three;
- set in motion the Bramford to Twinstead Tee upgrade project without any further delay;
- connect the Dudgeon and Sheringham Shoal extension projects to the grid at Necton, or at the connection points of their respective original Round 2 projects, Necton and Salle, thus allowing for a planned UK-Denmark interconnector to be connected at Norwich Main.

On this basis, the significant negative environmental and economic impacts that would still be imposed across Norfolk would bear some proportion to the use it is able to make of clean energy, including offshore wind, nuclear power, modern combined cycle gas turbine power stations, and access to lower cost electricity supplies from interconnectors. In our view, this would be a reasonable and balanced outcome, and a greater degree of public support could therefore be expected from local communities.

This approach should then be used as the basis for a longer term scheme of integrated offshore transmission, capable of connecting the proposed Round 4 wind farm projects off the East Coast and any further UK-Europe interconnectors to the main centres of demand in London and the south east. It could potentially offer a much higher economic advantage, with lower costs for electricity consumers, and could also bring forward the government's 'increased ambition' to introduce higher levels of renewable energy by several years.

Appendix 1

Out-of-region transmission capacity

The level of existing and proposed electricity generation in East Anglia and the available out-of-region capacity has recently been addressed by the Offshore Wind Industry Council (OWIC). An illustration from its report of November 2019 to Ofgem is reproduced below.

Table 2a overleaf shows the existing and proposed individual sites and their capacities, classified by type of fuel, together with the current and upgraded out-of-region capacity.

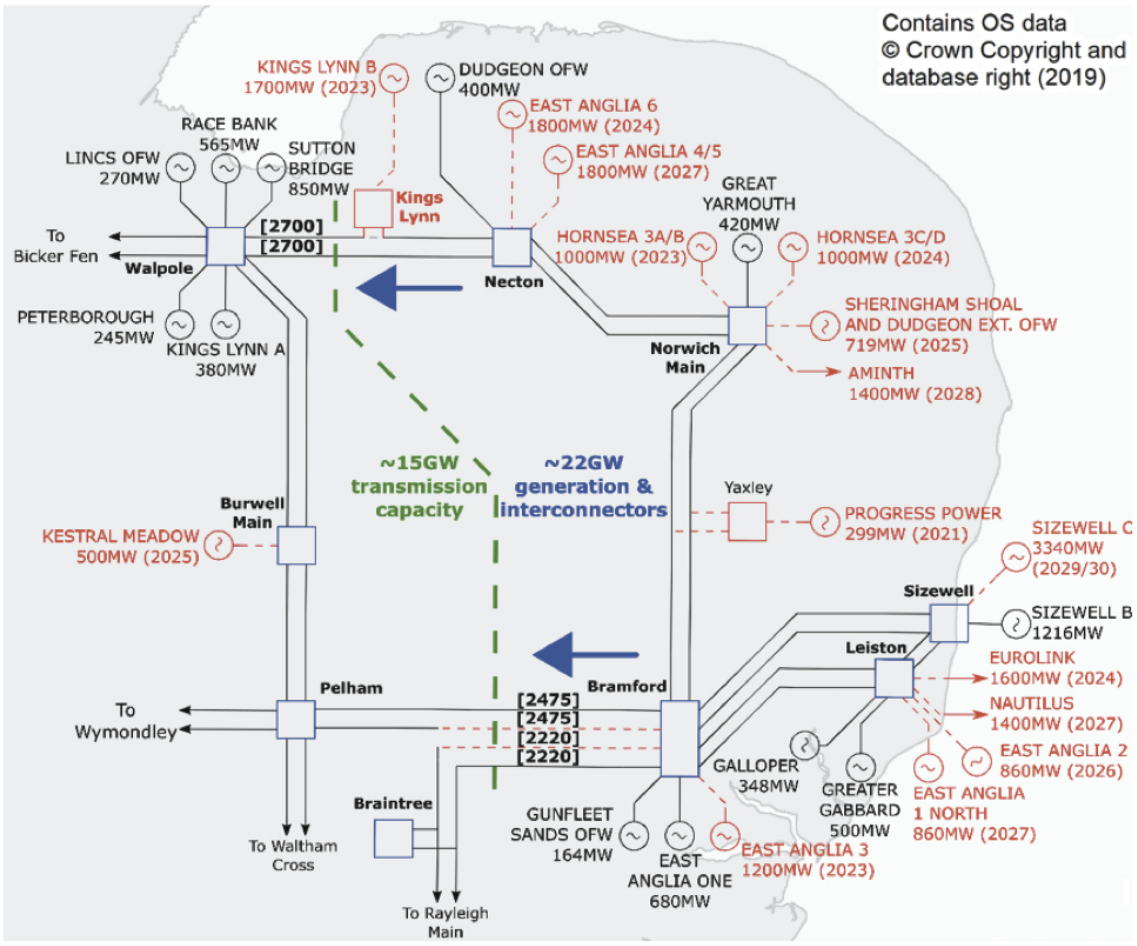
Table 2b summarises the overall picture of supply and demand, and shows the effect of connecting Hornsea Three, Norfolk Vanguard, and Boreas to their grid connection points.

Figure 1 sets out the planned Bramford to Twinstead Tee upgrade project in more detail.

Figures 2 and 3 illustrate the different network constraints arising from the current DCO applications, as compared with a scheme of integrated offshore transmission.

This analysis does not include the Round 4 offshore wind projects, which are expected to contribute a further 7.0 GW of renewable energy supply off the coast of East Anglia. In the absence of integrated offshore transmission via Walpole and Bramford, it seems likely that this would simply be a further addition to the out-of-region capacity shortfall.

Figure 2.3: East Anglia out of region transmission capacity current and future



Existing generators

	Energy source	*Capacity*	*Grid connection*
Sutton Bridge	Gas	850	Walpole
Kings Lynn A	Gas	380	Walpole
Peterborough	Gas	245	Walpole
Great Yarmouth	Gas	420	Norwich Main
Sub-total		1,895	
Sizewell B	Nuclear	1,216	Sizewell
Lincs	Offshore wind	270	Walpole
Race Bank	Offshore wind	565	Walpole
Dudgeon	Offshore wind	400	Necton
Sheringham Shoal	Offshore wind	320	Salle (not shown)
Greater Gabbard	Offshore wind	500	Leiston (Sizewell)
Galloper	Offshore wind	348	Leiston (Sizewell)
East Anglia One	Offshore wind	680	Bramford
Gunfleet Sands	Offshore wind	164	Bramford
Sub-total		3,247	
Total (MW)		6,358	= 6.4 GW

Proposed generators

Kings Lynn B	Gas	1,700	Walpole
Progress Power	Gas	299	Yaxley (Diss)
Sub-total		1,999	
Sizewell C	Nuclear	3,340	Sizewell
East Anglia 6 (Vanguard)	Offshore wind	1,800	Necton
East Anglia 4, 5 (Boreas)	Offshore wind	1,800	Necton
Hornsea 3 (3A/B, 3C/D)	Offshore wind	2,000	Norwich Main
DEP & SEP	Offshore wind	719	Norwich Main
East Anglia 2	Offshore wind	860	Leiston (Sizewell)
East Anglia 1 North	Offshore wind	860	Leiston (Sizewell)
East Anglia 3	Offshore wind	1,200	Bramford
Sub-total		9,239	
Total (MW)		14,578	= 14.6 GW

Proposed interconnectors

Aminth (Denmark)	Interconnector	1,400	Norwich Main
Eurolink (Netherlands)	Interconnector	1,600	Leiston (Sizewell)
Nautilus (Belgium)	Interconnector	1,400	Leiston (Sizewell)
Total (MW)		4,400	= 4.4 GW

Transmission capacity

		Existing	*Upgraded*	
At Walpole	2,700 + 2,700 =	5,400	5,400	
At Bramford	2,475 + 2,220 =	4,695	9,390	
Total (MW)		10,095	14,790	= 14.8 GW

Table 2a: Regional generation and transmission

Demand

	Existing	
Walpole	692	
Norwich Main	535	
Bramford	558	
Total peak demand (MW)	1,785	= 1.8 GW

Supply

	Existing	*Proposed*	*Offshore*
Gas	1,895	3,894	3,894
Nuclear	1,216	3,340	3,340
Offshore wind	3,247	12,486	10,086
Interconnectors	0	4,400	4,400
Total nominal supply (MW)	6,358	24,120	21,720
Export requirement			
Nominal supply	6,358	24,120	21,720
Less: Peak demand	1,785	1,785	1,785
Total requirement (MW)	4,573	22,335	19,935
Out-of-region capacity			
Necton towards Walpole	5,400	5,400	5,400
Bramford towards London	4,695	4,695	9,390
Total capacity (MW)	10,095	10,095	14,790
Capacity shortfall			
Out-of-region capacity	10,095	10,095	14,790
Less: Export requirement	4,573	22,335	19,935
Total shortfall (MW)	5,522	- 12,240	- 5,145

Table 2b: Out-of-region transmission capacity

Notes:

The demand figures shown are as published by National Grid. The peak of demand is assumed to occur at the same time as the total supply. If this is not the case, then the out-of-region capacity requirement could be slightly larger than estimated above. The local distribution network in Norfolk is very unlikely to be able to support significantly higher levels of demand in the near future.

Sizewell C is assumed to fully replace Sizewell B, leading to an increase of only 2,124 MW in nuclear generation, compared to existing supply. The main purpose of sub-sea interconnectors is to import electricity into the UK, so they are added to the nominal supply in all three scenarios.

The *Proposed* scenario uses grid connections as currently shown in the DCO applications. For the *Offshore* case, Hornsea Three is connected at Walpole, and is outside the capacity restrictions. Norfolk Vanguard and Boreas are connected at Bramford, and the Bramford to Twinstead upgrade is assumed to be in place. As a result, the transmission capacity shortfall is at least halved.

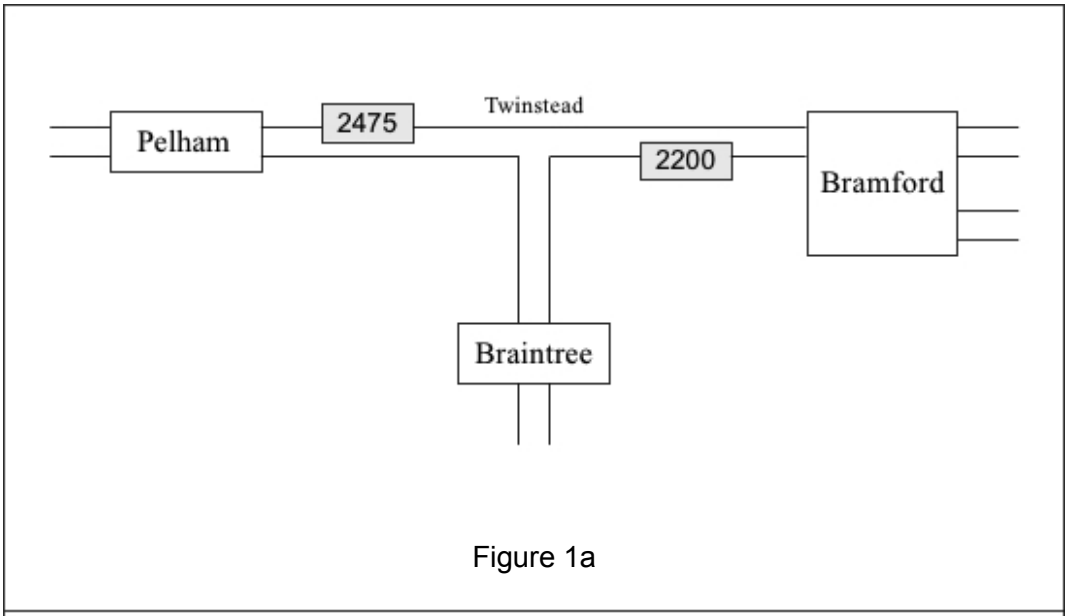


Figure 1a

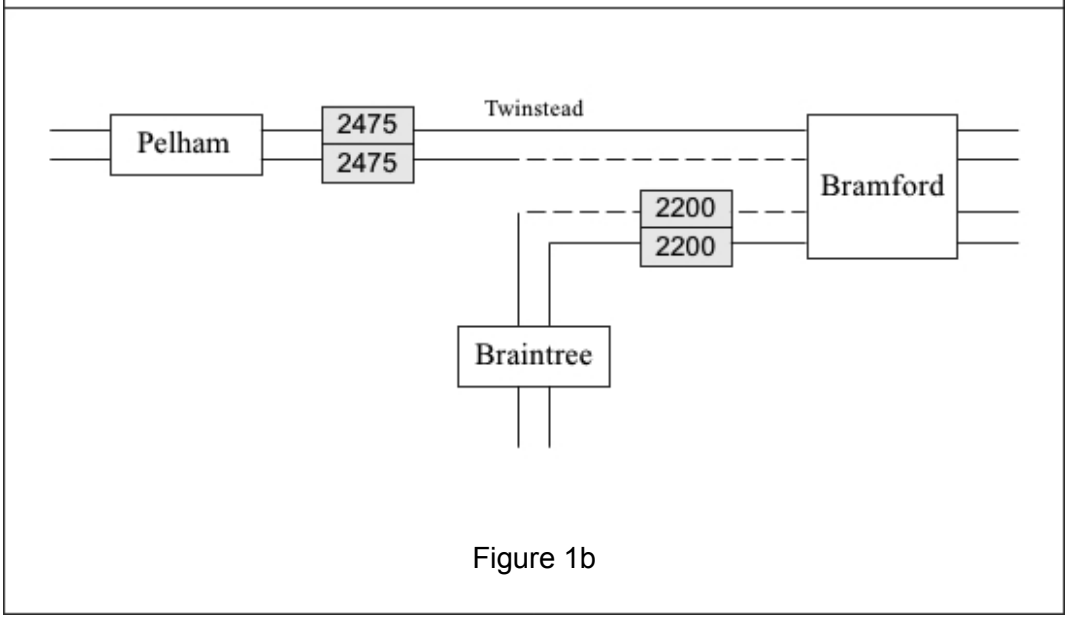


Figure 1b

Figure 1: Bramford to Twinstead Tee upgrade

Notes:

Figure 1a above shows that out-of-region transmission capacity at Bramford is currently limited to 4,675MW (4.7GW), consisting of 2,475MW towards Pelham, and 2,200MW towards Braintree.[6]

Figure 1b shows that after completion of the Bramford to Twinstead Tee upgrade, the available out-of-region capacity at this point is doubled from 4.7GW to 9.4GW, and is increased to a level similar to that available at Walpole. There is no plan for any major capacity increase at Walpole.

The purpose of the upgrade is to provide additional transmission capacity for the Kings Lynn B gas-fired power station, Sizewell C nuclear power station, and the East Anglia offshore wind zone, which includes the projects now known as Norfolk Vanguard and Norfolk Boreas.[7]

6 As described in the Offshore Wind Industry Council evidence to Ofgem, November 2019, Figure 2.3, p6.
7 As described on the National Grid website at http://www.bramford-twinstead.co.uk on 18th August 2020.

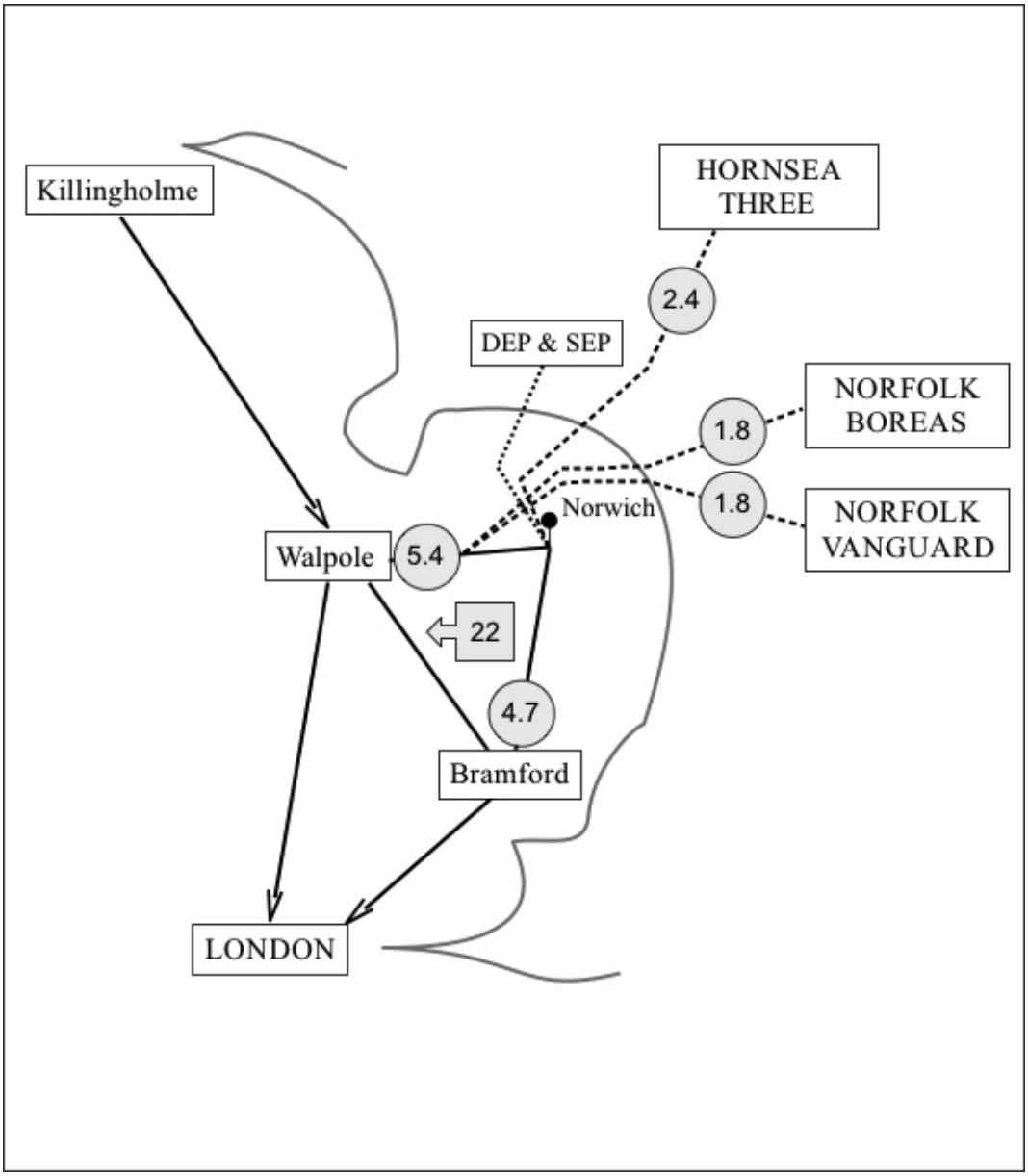


Figure 2: Onshore transmission

Notes:

The Hornsea Three project is connected to the grid at Norwich Main, on the far side of the capacity restriction between Necton and Walpole, which is limited to 5.4GW. There is a similar restriction between Norwich Main and Bramford, and there are no plans to upgrade these capacity limits. Without the Bramford to Twinstead upgrade, capacity through Bramford is limited to 4.7GW.

The Norfolk Vanguard and Boreas projects are connected to the grid at Necton, on the far side of the capacity restrictions from Necton to Walpole, and from Norwich to Bramford. The Dudgeon and Sheringham Shoal extension projects are connected at Norwich Main, also on the far side of these capacity restrictions. The total out-of-region capacity requirement is approximately 22GW.

All of these projects must co-operate, and co-ordinate, to try to reduce the negative impacts of their onshore export cable routes in North Norfolk and elsewhere. These negative environmental, social and economic impacts are not necessary for the successful completion of the projects.

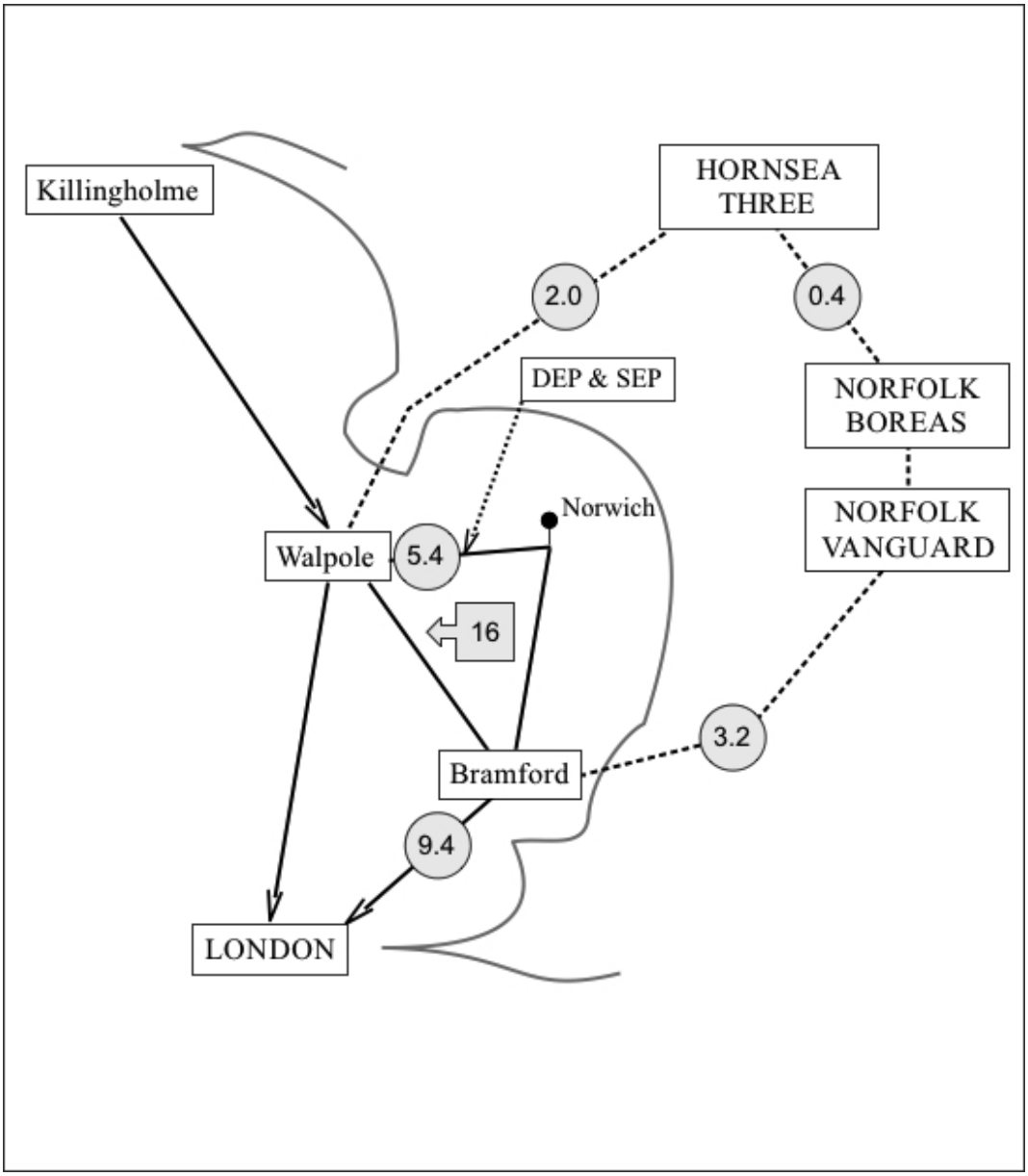


Figure 3: Offshore transmission

Notes:

The Hornsea Three project is connected to the grid at Walpole, thus avoiding the east-to-west capacity restriction at Necton. In this scheme, there is also an offshore transmission link between Hornsea Three, and Norfolk Vanguard and Boreas, to accommodate all of the available output.

The Norfolk Vanguard and Boreas projects connect to the grid at Bramford. With completion of the Bramford to Twinstead upgrade, out-of-region transmission capacity at Bramford is increased from 4.7GW to 9.4GW. The out-of-region capacity requirement is reduced from 22GW to 16GW.

The Dudgeon and Sheringham Shoal extension projects (DEP & SEP) share a grid connection of 0.72GW at Necton. This leaves connection capacity available at Norwich Main for other projects, such as the planned Aminth UK-Denmark interconnector, which has a nominal capacity of 1.4GW.