National Grid Grimsby to Walpole Stage 1 Consultation

At a meeting of WPM on Thursday 8th February 2024, it was agreed that the Chairman would write a comment to National Grid (NG), which would be copied to other affected parishes. This document reflects the issues discussed at the meeting. It has been written with the lay-person in mind and so, if you already have a broad understanding of the electricity market, distribution etc. please feel free to skip to Part 2.

Part 1: The fundamental principles of electricity generation, distribution and supply:

a. Electricity (electron flow) goes to the point of use.
b. Generation should be as close to the point of use as possible. The need for any distribution is really the result of failure to achieve this.
c. Electricity can be generated DC or AC:
   (i) DC (Direct Current) is capable of being transmitted long distances with lower losses than AC but has to be converted to AC for connection to the transmission system. Conversion requires firstly, inversion and synchronisation, (DC to AC), then step-up transformers to covert the voltage to that required by the Grid (275kV or 400kV), before the Grid can accept the power;
   (ii) AC (Alternating Current) is how electricity is distributed around the Grid at very high voltage (400,000 volts, via 400kV pylons, and some lower 275,000 volt via 275kV pylons). Everything else with lower voltage is the local transmission system with ever dropping voltage to point of offtake. You cannot mix DC and AC in the same cable/wire;
d. Grid points are where projects and the distribution system connect to the Grid. Each grid point will have a net position of either import or export depending on the supply/demand balance of the local transmission system. Large urban conurbations (London, Birmingham, Manchester, Leeds, Sheffield), are energy sinks where demand far outstrips generation. In addition, the Southern counties of England can be viewed as one large sink due to the lack of any real generation in the region, either fossil fuelled or renewable;
e. Types of generation (ignoring coal-fired which is being phased out), include:
   (i) CCGT (Combined Cycle Gas Turbines): the cleanest of the fossil fuels, highly responsive in terms of time to generate (3-5 minutes from Black Start to generation), and reliable in terms of megawatts supplied (e.g. two 325 MW sets will produce 650MW), and will run for days (i.e. high availability so long as there is fuel supply). You can build CCGTs close to points of use/area of demand as long as there is a gas supply;
   (ii) Hydro: large infrastructure is required plus water storage. To generate power, hydro plants require large volumes of flowing water and therefore tend only to be utilised to provide short bursts of generation, typically 5-20 minutes. Hydro is therefore a highly responsive source of power but not relevant to daily demand and never a solution to provide the bulk of energy demand in the U.K.;

(iii) Nuclear: large infrastructure projects (typically 3GW), high degree of availability (for all intents and purposes 100%), therefore meet constant demand (baseload). There is an agenda to build smaller nuclear facilities (based upon Rolls Royce nuclear submarine technology). If substations are installed at, say, Alford, the coast would become a candidate for one of these, since most nuclear generation requires large amount of water cooling, even though they should be sited at points of net demand;

(iv) Wind turbines: these have an envelope of generation related to wind speed: very low or very high wind-speeds result in little or no generation. The generation achieved varies with respect to location and time (due to varying wind-speeds over any given period). Offshore wind generation is more reliable than onshore wind generation. However, even offshore, to achieve any meaningful generation you end up building much more capacity than is achieved i.e. 80GW capacity may only reliably generate 40-55 GW over a given period. The technology itself has proved highly unreliable to date and refits have already been necessary on many turbines;

(v) Solar (photovoltaics - PV): uses solar panels to collect photons from the sun to generate electricity. It generates at very low voltage and the generation is highly dependent on the latitude of the site and whether the solar panels track the sun or not. Mid-latitude countries like the U.K. with high cloud cover are extremely poor locations for this technology, and utilising multiple arrays of solar panels (solar farms), is particularly stupid as the cost per unit of generation is ridiculously high. Therefore solar farms should really play no part in new renewable project generation, with the possible exception of the southernmost parts of England, and Channel Islands. However, as solar is low voltage generation, it can be used on buildings/structures etc., industrial, domestic or commercial, to provide power at point of use. The cities in particular (and all new builds), should be clad in solar panels;

(vi) Fuel Cell: needs a source of very cheap electricity to split water. Typically these plants are sited in areas of stranded hydro or high ground heat flow (e.g. Iceland), otherwise the cost of generating renewable electricity (i.e. through windfarms or PV), plus the infrastructure costs associated with using that electricity (i.e. capex of a fuel cell plant, plus associated battery plant), makes this arrangement extremely onerous and expensive;

(vii) Battery Storage: this is the storage of excess generation in large or medium scale battery plants, discharging it when demand is high. This has a role in providing shape to any electrical system with net demand. Battery storage can be positioned anywhere on the Grid or the transmission system. It makes most sense to put storage as close as possible to the demand, at the appropriate voltages. Most storage capacity should be positioned off the Grid, at lower

voltages in the transmission system, to meet local demand surges in areas of net import, thus reducing the need for capacity in the Grid infrastructure;

(viii) Hydrogen: Splitting water to produce rough oxygen and hydrogen gases where the rough oxygen is vented (or purified and sold to industry), and the hydrogen is injected into the existing natural gas infrastructure could result as additional development on any new source of electricity. Hydrogen is a small molecule and there are technical difficulties in substituting it for methane, however there is active research/development to try and achieve this.

f. Where do projects connect? Be in no doubt, NG tells every project where to connect onto their network. There is one area in which the Chairman has some sympathy with NG. Under their governing rules set out by Ofgem (the Government), NG are 'not allowed to be pro-active on the network'. They respond to requests of new demand (new town construction, electrification of a railway line, large new factory etc.), and requests for new supply. It is Government who is responsible for all this mess. The issues of placing new generation in areas of already net spill were known years ago. The Government did little to accommodate this, or mitigate the associated problems. It could have planned and organised an offshore DC grid years ago rather than needlessly connecting, say, 10GW at Bicker Fen and Weston Marsh where it's not required.

g. Permits, licences and project development. Be in no doubt, the Government dictates and controls all permits and licensing rounds and so, effectively, where any new generation project is positioned.

h. The positioning of new pylon routes, substations and associated infrastructure comes under National Infrastructure Development where the relevant Secretary of State (SoS) makes a unilateral decision on approval. It is not subject to conventional planning processes or law. This whole procedure is undemocratic as it removes the people, and local government (in all its forms), from the decision process.

i. National Grid is a regulated business. It is allowed to make a post-tax and amortisation return on its investments. The more investments it makes, the bigger the business; the more its directors earn and can be returned to shareholders. NG is therefore incentivised to build as much new capacity (pylons/substations etc.), as it can. NG likes pylon technology: it provides easy access for maintenance etc. and is easy to extend in a piecemeal fashion. An offshore Grid would not be part of NG: it would most likely be a separate company.

j. The role of the Operations Controller (OC) NG, is to ensure that energy supply is greater than demand at any given moment in time, otherwise the system will experience power outages or brown-outs.

k. Issues and hidden costs of new pylons and onshore infrastructure:

(i) it is fair to say for the majority of people, any new pylons and associated infrastructure detracts from (harms) the visual landscape amenity;

(ii) for those property owners that are proximal to any new pylon sets, there will be a reduction in property value (how much, you can debate), but it can have a material effect;

(iii) the passage of high currents down suspended cables results in induced electromagnetic fields (EMFs). The higher the current, the bigger the EMF. At the Alford meeting, NG representatives were claiming that their proposed pylons would each carry two circuits with a combined capacity of 6GW. They will carry 2,500 to 3,000 Amps, creating a large EMF. Humans are actually very low voltage electrical creatures: we use electricity to communicate within our bodies. People are affected differently by EMF's. There is a vast literature on the detrimental health effects on humans and other animals of exposure to EMFs. Those that suffer badly will have no redress other than to move away;

(iv) the cabling from pylons produces low frequency noise: again people are affected differently but for some, the detrimental effects are intolerable;

(v) substations require buzz-bars and connectors/ breakers to the Grid (that is only what NG is declaring). However, every project has its own additional requirements in terms of Grid connection infrastructure. DC interconnectors and DC renewable generation projects will each require large acreages of invertors plus their own large-scale transformers to step up the voltage to 400KV, dependent upon their input voltage. Multiple large transformers will produce a continuous low-grade, low-frequency, hum that may be audible for miles. (Such low frequency i.e. long wavelength noise penetrates buildings and can therefore be audible inside and outside. Some people are badly affected by this nuisance noise and find it utterly debilitating). In addition, each project will require 400KV duplex connectors to the substation i.e. multiple sets of pylons with their own associated low grade noise and EMFs. The length and location of these lines will depend on the distance of each project to any new Grid Point. Grid point energy storage will be circa. 250-500MW capacity and necessitate large industrial buildings to house the batteries which will be visible for miles: this will also be necessary for the housing of fuel cells. If hydrogen production for methane substitution in the gas network is included, water treatment and bunds against catastrophic failure will be required, plus large scale hydrogen storage; industrial compressors (these are particularly noisy); high level security and fire management facilities. These will demand a large footprint and further add to the industrialisation of the environment. A new GGCT would generate AC current and have its own pylons to the substation, as would any new small nuclear facility. These would be duplicated and the latter would run from the coast to Alford, again with low frequency noise and associated EMFs. NG claim that each of their substations will take up only an area of 200x700m,

however the total area delineated on their plans is designated at 60Ha per substation (148.26acres) i.e. a total of 120Ha (296.52 acres). This is actually the area that would be taken up by the infrastructure required for the planned interconnectors and, possibly, some of the projects already proposed. Additional projects would require more land;

(vi) with respect to the Grimsby to Walpole connection and the two proposed substations at Alford: according to NG, two substations are required to ensure security of supply but only one line of pylons rated at 6GW (this is understated, see below). This doesn't make sense. If there is a serious concern about security of supply at two new grid points/substations, you would surely require more than one line of pylons to ensure secure supply. Be in no doubt: once NG has wayleaves for their corridors, they can put as many sets of pylons along the route as they like.

NG has a policy of paying a small sum to those living very close to pylons (a circa £8,000 one-off payment): this would in no way compensate anyone affected by part or all of these developments.

Part 2: A Proposal without Merit

The current situation with respect to generation and demand in East Lincolnshire is that this region does not require any more generation to meet local needs. We already have ample generation and, indeed, are model citizens: we already spill excess renewable energy to the rest of the country. There are plenty of onshore and offshore wind farms operating here. It is nonsense to contemplate approving any new generation in this area, and, as a result, necessitating reinforcement and extension of the Grid.

The Projects (with emphasis on the Grimsby to Walpole Section):

NG claims that it has to accommodate the following projects, necessitating the building of two substations at Alford and extending the Grid along the coast (from Grimsby to Walpole):

CCGT (Combined Cycle Gas Turbine with Energy Storage):
Mablethorpe Storage 1500MW

Any new CCGT capacity should be positioned where there is net demand i.e. not in Lincolnshire. Why build new CCGT capacity here, only to have to build pylons and associated infrastructure to get the power away, when it can be built anywhere in the country with net demand and existing infrastructure (Grid). The Government issues permits for any new energy project like this, and NG should inform the Government that it is utterly pointless issuing permits for a CCGT project in Lincolnshire (or anywhere else), where the net position is spill. It should be sited at Didcot.

Solar farms/energy storage:
Mablethorpe Green Energy Centre 1025MW

EcoMablethorpe 249MW
Solar farms are not economic in the U.K. We suggest NG and the Government consult the World Bank and various serious studies of the economics of solar farms. We do not have the climate/latitude to make solar generation work. Solar farms should play no part in any attempt to achieve net zero in the U.K. It's plain stupid to consider siting solar farms in Lincolnshire. In addition, any energy storage project should be sited (if high voltage), at the grid points where there in net demand (London, the South, Birmingham, etc.). Energy storage helps provide shape to the system. You do not put shape on the grid entry points because you end up requiring excess transmission capacity to move the power to where it's needed. High voltage shape should be positioned where the demand is. It is nonsensical to put shape at the inlet to the grid in an area of net spill.

Interconnectors to Alford (Lincolnshire Connection) substations A/B:
Aminth Energy 1200MW* (to/from Denmark)
Seneca Nu-Link 1400MW* (to/from Germany)
Eastern Green Link from Peterhead, Scotland (EGL3) 2000MW or Eastern Green Link from Westfield area, Scotland (EGL4) 2000MW
A total of 4.6MW of DC interconnectors from/to Scotland, Denmark and Germany.
All these should make landfall in parts of the U.K. that need energy i.e. London and the South. Anyone that tells you otherwise is misinformed. DC lines can be readily extended long distances and comprise the most efficient and economically prudent method of moving power. They shouldn't make landfall until they reach a part of the country where the power is required i.e. into the Humber or down to London and the South. NG is telling the projects to make landfall at Anderby to help justify the needless siting of two substations at Alford.
* The NG Project Background Document has these interconnector capacities transposed.

N.B. A word of warning on international interconnectors: two of the proposed links (Aminth & Seneca Nu-Link), are between Europe and the U.K. Many years ago, the U.K. government allowed a gas interconnector between mainland Europe and the U.K. This resulted in Germany (in particular), importing substantial volumes of U.K. gas which depleted the U.K. gas reserves decades earlier than if the gas had been used only for U.K. demand. Consequently, the U.K. has had to replace economical, domestically produced gas with expensive imported LNG from the U.S., substantially raising the cost of energy for U.K. consumers. The situation could end up that Europe imports U.K. renewable electricity (at a subsidised (i.e. fixed) price), to set against their own net zero targets at the expense of the U.K. taxpayer/consumer. Also, no-one sane lands a DC cable, converts it to AC synchronised to the grid from one set of interconnectors only to reconvert to DC and then export to another country. Multiple long distance interconnectors from say Scotland, Denmark and Germany should be connected to an offshore DC Grid. The net DC position (after intra-country export-import) should then make landfall where the power is needed, in multiple locations. For example, to the East Coast (Humber?) to fill the Sheffield/ Leeds sink, and

most certainly the London ring and major south coast cities (Brighton, Portsmouth, Southampton, Plymouth?). This is the most efficient method of transporting/ allocating power.

New Offshore wind and/or Offshore wind extensions:
Offshore windfarms HVDC Link (HND1) 1800MW
Race Bank Extension 565MW: Race Bank currently connects at Walpole (incidentally where the power is not needed). There is no need for any future extensions to connect at Alford or indeed Walpole.
All additional generation from offshore wind should be gathered together and form part of a new offshore grid with DC generation only and HVDC transmission. HND1 above is already an example of this bundling. Connecting new DC generation from offshore wind farms to an offshore grid is not difficult (at all). They can be tied into simple subsea connections. All such links should make landfall in the parts of the country where the power is required (i.e. the London Ring and southern England). There is little point in landing all this new generation in Lincolnshire, converting it to AC and putting it on new pylons only to transport it on new grid extensions, to London and the South where the demand is.

All these claimed projects total a capacity of 9.739 GW. None of them needs to make landfall or connect to the Grid in East Lincolnshire, or Norfolk, or Suffolk at all, as explained above. Nor do any future projects. Our area already exports renewable power. The new NG pylons have a maximum carrying capacity of 6GW, 9.739 GW means at least two lines of pylons.

In addition, pylons, substations, interconnector arrays, transformers, buildings with endless batteries connected in series (storage) etc., provide little in the way of meaningful employment once constructed. NG's proposal doesn't benefit our communities. We don't even get cheaper electricity.

The current Grimsby to Walpole proposal is part of a new Grid from North Yorkshire, across the Humber, across Lincolnshire, across Norfolk, Suffolk and Eastern Essex. This would create a whole new business segment for NG, and transfers a vast amount of project infrastructure (pylons, substations, inverters, convertors. transformers etc.), onto mainly rural populations that don't need the power. This infrastructure should be next to the populations that do need the power i.e. London and the South. Storage should be at grid points with net demand.

<u>Supplying the Energy Sinks:</u>
Fundamentally there are 4 main energy sinks:

a. Sheffield/Leeds conurbation. Supplying renewable energy from offshore to these cities should readily be achieved by running HVDC cabling up the Humber by a

combination of the new Dogger Bank developments and/or elements of the HVDC Scottish interconnectors or better still a connection from an offshore grid. There must be plenty of grid capacity from the decommissioning and further reduction of fossil fuel generation in that area (e.g. Eggborough, Retford).

b. Manchester and North West conurbations: This energy sink will be supplied predominantly from the massive new windfarms offshore North Wales and the Wirral, in fact with the scale of new projects envisaged, there will be massive overcapacity of renewable generation. This will result in the need for further North South Grid reinforcement, this time on the western side of England ;
c. London and the South, including Birmingham. Southern England is by far the biggest sink, formed as a result of (i) the closure of all coal capacity in London and beyond (e.g. Didcot), with little or no alternative energy generation sources; (ii) the complete lack of new onshore and offshore windfarm capacity in the area. Little windfarm capacity has been added in the south because Government has bowed to pressure from local groups, ensuring that they have not had to put up with much in the way of new renewable generation at all. In reality, southern England (particularly hilly areas like the Chilterns, Cotswolds, North & South Downs for onshore windfarms; and the south coast for offshore windfarms i.e. Kent, Sussex, Hampshire, Dorset, Devon, Cornwall coasts), should be clad in wind turbines to meet local demand. In addition, the pricing for off-taking power from the grid ringing London and Birmingham is fundamentally mispriced: it should carry a massive premium to the points of net spill and frankly the rest of the country. The rest of the U.K. is effectively subsidising the south of England by overpaying for power. If pricing for off-take from either of the London and Birmingham rings was correctly costed, i.e. much higher, then business/consumers would be clamouring to install PV capacity on their buildings. This is the only really sensible application of PV in the U.K. i.e. low voltage generation being consumed at the same voltage. Excess demand in London and the south should be supplied from local offshore wind farms with HVDC connections to the London ring and to cities like Brighton, Portsmouth and Southampton. To optimise this system, any new offshore windfarm developments should be concentrated offshore London, Southern England and the Bristol Channel, either through conventional windfarms or floating windfarms where the substrate does not permit ready installation into the sea bed. That way, the South would carry the necessary onshore infrastructure to meet their net demand.

To implement this, the Government should scale back licences for offshore windfarms off the Lincolnshire, Norfolk, Suffolk and NW England coastlines and re-visit licencing of onshore windfarms on the North & South Downs, Chilterns etc. and offshore in the Thames estuary, along the entire Southern coast and up the Bristol channel. There would then be no need whatsoever to reinforce the N-S onshore grid carrying capacity.

North -South existing grid capacity and the case for an integrated offshore grid

According to NG, as a result of low new renewable generation in the south, the carrying capacity of the Grid north-south (Northern England to southern England), needs to be increased by c.14GW by 2030 (Figure B, Page 9, NG Strategic Options Report). Modern pylons can run two circuits, each with 3GW carrying capacity i.e. 6GW per line of pylons. Therefore, if the general N-S carrying capacity of central England is constrained as they say, any upgrade and reinforcement should first be concentrated on the existing main grid before any new infrastructure is proposed: where pylon lines and wayleaves already exist, an upgrade to new 2x3GW pylons will not inconvenience the population. In theory, NG only actually requires nine N-S lines of pylons, each with 6GW capacity to deliver 54GW of N-S capacity (which is 7GW greater than existing UK maximum demand). In sympathy with NG, allowing multiple c.10MW connections at the likes of Bicker Fen and Weston Marsh has caused unnecessary bottlenecks in distributing the power: these projects should never really have been connected as they have (this was due to the lack of a coherent national energy strategy by Government). The country needs to stop the present piecemeal addition of projects into existing NG infrastructure and to develop a coherent energy strategy.

The obvious and most efficient solution is an integrated offshore grid as we have repeatedly stated in Part 2. Landing multiple HVDC cables into the London Ring north and south of the Thames and along the south coast would largely remove the need for major reinforcement of the existing N-S English grid capacity, resulting in absolutely no need for the proposed north Yorkshire to Essex grid extension. But an effective offshore grid can only be achieved through coherent strategic planning by Government (i.e. integrated offshore grid design connecting and distributing DC generation to landfalls where the power is actually needed). For this, the Government should only permit/license DC generation offshore (no more AC projects like Outer Dowsing Offshore Wind [ODOW]) and, as stated above, these permits and licences should be primarily focused along the southern coast and east of London. A separate operating company would be required to lay a main N-S offshore DC cable system with mini-platforms for boosters/ metering and any necessary control systems (connection nodes etc.). None of this technology is rocket science and any necessary platforms would be small and remotely operated (i.e. unmanned). Other countries (e.g. Denmark), are already doing this.

Note: An integrated offshore grid is not one of the Strategic Options mentioned in the NG Grimsby to Walpole Project Background Document.

Part 3. NG consultation strategy: divide and rule.

NG have cleverly split their whole aim of building a new N-S grid extension from North Yorkshire to Essex into several sections: even the Grimsby-Walpole length is divided into 11 subsections, and the process started first in Essex. Once one section of new grid is approved by the SoS, it increases the chances of the next section being approved. This ‘divide and rule’ consultation process works to the detriment of all the communities along the route

since it encourages everyone to consider only their small section, not the entire project. It does not anywhere account for the full impact of issues like EMF and loss of property values over the whole route. The project has to be challenged with one voice. If NG gains approval to reinforce the Grid through Essex, Suffolk and Norfolk to Walpole, it is almost inevitable that they will gain approval from Walpole to Grimsby.

What is required for effective objection is for all the affected communities to focus on the big picture. And to some extent 'No Pylons: Offshore Grid' is a good slogan/ rallying cry.

How to achieve a re-think by Government? As we've tried to outline, you cannot divide energy from politics. This is a National Infrastructure Project i.e. NG and Government imposing upon local communities. It is Government policies, particularly on where to place offshore wind generation, and NG wanting to connect interconnectors too far north, that is causing the issue, and NG's fundamental unwillingness to be involved in an integrated offshore grid.

The south of England does not want much renewable generation/infrastructure either onshore or offshore but they need renewable energy in their supply mix. As it stands, they are having their cake and eating it because all the infrastructure and associated onshore development is being carried by rural communities from North Yorkshire to Essex. Despite all the consultation, the ultimate decision is taken by the SoS based in London, therefore objecting to NG is akin to 'talking to the Hand'. The SoS will only see a summary report from the Planning Inspectorate (PINS), and is not obliged to comply with their recommendations.

How to replace the current piecemeal approach and the 'give it all (infrastructure) to the North' (i.e. Southern-centric) Government view? While there is serious lobbying by affected regions for an integrated offshore Grid, I believe **the most effective way for communities to express their anger/frustration to Government is for an Independent 'No Pylons: Offshore Grid' candidate to stand in <u>every constituency</u> along the whole route at the upcoming General Election**. Candidates could crowd-fund their deposits. Central Government would then calculate how many votes they risk losing over this issue, and how many sitting MPs might lose their seats. There is no guarantee of a government re-think but I believe this is a unique opportunity to achieve it.

Chairman, Well Parish Meeting 04/03/2024
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Disclaimer: We are a small Parish Meeting with no resources. These comments are based upon the best analysis we can put together from largely publicly available literature. We apologise for any inaccuracies or omissions. We've also had to write this whilst abroad so have been unable to spend as much time on it as we would have wished. It is somewhat

repetitive, as the same issues keep coming up. Apologies for that. We are apolitical, however our investigations/ researches have highlighted that the Government is largely responsible for all this (not NG).

Sources:
Various World Bank reports and academic reviews of PV, Wind Generation and renewable energy reports in the UK. NG Strategic reviews and presentations for the case for Grid Reinforcement and discussions with Electrical Engineers with specialist knowledge of the subject and the issues involved.

A final thought, if the Government really wants to allocate resources and not waste money, some 14 (plus) GW of electricity demand needs to be transferred from Southern England northward. The Bank of England and its new cryptocurrency (which is pure electricity), should be moved to Hull; all Government departments to Newcastle, Leeds and Sheffield; Parliament to Manchester; Oxford University to Lincoln etc., etc. In fact, this is a future necessity because south-eastern England, including London, is sinking (due to isostatic flexing following the last Ice Age). It could be called Carbon Net Zero Levelling Up.