OFFSHORE 4 SURE

GREAT BRITISH

OFFSHORE GRID

The faster, cheaper way to Net Zero

Contents

Executive Summary

In its Manifesto for the 2024 General Election, the Labour Party stated that it wished to accelerate the transition to a decarbonised economy, setting goals for the Net Zero energy infrastructure system to be established by 2030. Climate Change is one of the biggest threats to global stability and wellbeing. The members of the Offshore4Sure campaign network support these goals wholeheartedly.

Current plans devised by National Grid plc are based on a mix of old thinking and elements of new technology initiated by other North Sea countries. These plans are flawed and sub-standard. For NG plc, they are opportunistic and self-serving, but definitely not in the best interests of the British people, British ecology and the British economy.

In this short paper, we aim to show that there are significantly better solutions than the current (and historical) NG plc piecemeal approach. These alternative solutions will deliver substantial savings in overall cost and implementation time, whilst minimising long-term damage to the natural environment, biodiversity and alienation of local communities.

THIS IS THE CASE FOR AN OFFSHORE GRID WITH:

- **RESILIENCE**
- **SECURITY OF SUPPLY**
- **FLEXIBILITY**
- **SPEED OF DEPLOYMENT**
- **ECONOMIC GROWTH OPPORTUNITIES**
- **COST EFFECTIVENESS**

"This is a once in a lifetime opportunity to transform our energy infrastructure"

Jenny Riddell-Carpenter, MP Suffolk Coastal

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Introduction

In this paper, we consider the following:

1. Historically, short-term tactical planning has been the norm for Britain's offshore energy infrastructure.

2. Climate change and energy security challenges demand better strategic planning for the mid and long term.

3. The environmental and community impacts in Devon, Kent and Suffolk are a microcosm for the issues which need to be addressed with a new, transformational strategic approach.

4. Communities should be involved at the outset, not midway through the planning process when it is too late to change the key sites.

5. Brownfield sites close to demand are not being fully utilised. This must change. There are a number which need regeneration and provide the space for additional storage systems to be developed over 20 plus years. Nature-based tourism locations should not be used for these large industrial nodes/hubs.

6. National Grid plc is no longer the appropriate organisation to determine the future strategy for British Energy. Its financial duties to shareholders are incompatible with the major overhaul required. Their current plans are needlessly destructive.

7. A new public/private partnership modelled along the lines of Orsted or Tennet could ensure that a new framework is established that accelerates the transition and minimises adverse impacts, whilst boosting the British economy.

8. Taking just three months to plan and agree a more robust and flexible offshore system will result in a win/win for ALL stakeholder groups.

9. These proposals deliver faster and cheaper:

    - Faster delivery because less than half the onshore infrastructure needs to be constructed and community buy-in will be swifter, hence a shorter planning cycle
    - NG ESO published a report in December 2020 showing a £2 billion CAPEX saving for East Anglia alone if offshore integrated solutions were adopted. Savings include sharing of infrastructure. Note this CAPEX saving is for all stakeholders, not just National Grid's narrow and simplistic figures which only cover their own costs. For Britain as a whole, THERE IS A SAVINGS OF AT LEAST £6 BILLION IF WE PIVOT NOW TO A MESHED OFFSHORE GRID.
    - Avoids £1bn estimated cumulative loss of tourism revenue, over 12 years of construction.

How things have gone wrong

Offshore windfarms in the North Sea have been a major success in the move to renewables, with the advantages of energy security, lower long-term costs and meeting climate change targets.

The British onshore electricity grid was not designed to handle the geographically diverse and weather dependent pattern of generation that has arisen with the growth of renewable energy, especially from offshore wind. The Grid was primarily built to bring power south from fossil-fuel generators in northern England. Offshore windfarms delivered electricity via radial connections and both landfall and connection points were chosen using short-term cost criteria. It was recognised by 2011 that there was no master plan for offshore wind delivery nor for import/export of wind power. Over the last 10 years, various papers have put forward proposals for a spatial energy strategy where Design Principles should apply using a set of criteria that take into account wider impacts and not simply lowest short-term price. The Nick Winser Report (July 2023), the most recent such report, recognised that with rapid advances in technology and significantly increased goals for wind energy, Britain needed to establish a Future Framework without delay and that the system operator should become a neutral entity, no longer part of National Grid plc. It was clear that the seemingly random choice of connection points was becoming an issue for more and more communities. It was also acknowledged that the radial system was not the most cost-efficient.

A typical example of National Grid's disingenuous approach is in the area of Suffolk near to Aldeburgh. In 2017/2018, the existing grid connection on the Suffolk coast near to Sizewell (adjacent to Aldeburgh) was designated by National Grid plc as a suitable connection point for power coming from ScottishPower EA1N and EA2 offshore wind farms. Over several years, the list of projects proposed to land in this small area has significantly lengthened to include multiple windfarms, several interconnectors from the Continent and a network reinforcement (Sea Link). These electrical infrastructure projects are in addition to the immense construction task at the new nuclear power station at Sizewell C.

There are many objections to these proposals, but in summary the key ones are:

- This is an area of great natural beauty and environmental sensitivity and therefore is not the best choice for this degree of industrialisation.
- The road network is rural and very limited, so the cumulative traffic impact of these projects over a 12–15-year construction period will be significant, impacting the successful tourism-based economy and blighting the area for residents.

The environmental dislocation and the blight on local communities cannot be quantified, but the cumulative impact on tourism has been estimated at £1bn over 12 years of construction, estimated by the Destination Management Organisation (DMO). The jobs impact would be severe in this area - the tourism industry employs people of all skills and experience and provides a mix of full-time and part-time opportunities. The infrastructure projects, on the other hand, will use predominantly outside labour during construction and result in very few permanent, local positions.

Who are we?

Offshore4Sure is a network of like-minded groups emerging around the country as National Grid progressively reveals their piecemeal plans. The issue is the abject lack of consideration of environmental, biodiversity and community impacts, other than box-ticking compliance - which always seems to get their plans accepted.

Suffolk Energy Action Solutions (SEAS) was set up in 2019 in response to the proposal for an energy hub in the Friston/Saxmundham area, near Sizewell. SEAS has now become part of the wider national campaign, "Offshore4Sure", which brings together groups across Great Britain who share the common view that far more of the offshore power should be pooled and transmitted offshore, rather than just being dumped at the nearest convenient (and most profitable) point for National Grid plc. Offshore meshed grids and the use of brownfield (pre-industrialised) sites closer to demand for landfall and connection to the onshore grid have been promoted as a smarter solution to meet Britain's future energy needs. We are fully committed to Net Zero and specifically the extensive use of offshore wind generation.

North Sea countries including Belgium, Holland, Germany and Denmark have been pioneering offshore grids and energy platforms/islands. Their ESO equivalent is typically run by their government using a public/private partnership model, which seems to work well, not only for investment support but also because strategic decisions are taken factoring-in holistic design criteria and recognising that the adverse impacts/cost to communities, micro economies and ecologies must not outweigh the advantages of those plans. This structure reaps many benefits: one notable example is careful design selection of sites for major hubs and why brownfield sites closer to demand in Rotterdam and Zeebrugge have been chosen in preference to sites at Nature based tourism resorts.

This is not a “nimby” campaign group. In 2019 we discovered that there was a better alternative solution to that being proposed and that is why this campaign has continued for five years and drawn in more and more communities from across Britain and has become a national campaign, because we must protect future generations from the damage and the greed which has got us where we are, now. We cannot destroy more biodiversity on which this planet rests in the name of progress when the alternative is cheaper, faster, better all round.

“Wherever we can, we are going to do this without damaging the environment at all.

Wherever we can, we’re going to do the sums right and that means not what it’s going to cost now but what it will cost over the years to come.

Wherever we are, we think about the future and the generations we are protecting from what we have done.”

Lord Deben (John Gummer) – Chair, Climate Change Committee 2013-2023

NB As Offshore4Sure is a recently formed group, many documents and web content will still be locally branded – please bear with us whilst we re-brand coherently into the Offshore4Sure campaign.

The Alternative: global best practice and technology

Energy generation and delivery systems are advancing rapidly. We are witnessing a technology revolution. We are open to these new opportunities recognising the significant benefits on many levels.

Offshore Hybrid Assets (OHAs) importing and exporting energy from the Continent as well as transporting windfarm power are going to play a key role in the future GB energy strategy and the ability to deliver flexibility and achieve cost benefits (e.g. Nautilus and LionLink).

There are also opportunities for larger wind farms to pool energy. From 2032 onwards, superconducting cables will be available, and 10 GW electricity can be delivered via these cables (in place of the current 2GW HVDC cables). For Britain, this means ’s larger wind farms can be built at sea and the generated energy taken to offshore platforms, where it can be pooled and then taken directly to brownfield sites closer to demand, such as West Grain and Bradwell-on-Sea. There are efficiency and synergy benefits to be gained with both these technologies. Less electricity is lost if it is mainly delivered by HVDC and *less than half of the onshore infrastructure needs to be built* because an individual substation per wind farm is no longer required.

Offshore grids can enable electricity to flow North or South directly to hubs closer to demand, instead of going directly westwards in the way that the first radial connections were designed. The North Sea can become the main arterial corridor with a meshed grid enabling greater flexibility for import/export and fewer constraints.

Energy security is becoming a more critical priority. Energy self-sufficiency is one element of energy security. Another element is the need to protect major energy hubs from cyber and other modern forms of attack. Concentrating too much power generation and distribution in one location, as in the Sizewell/Friston area, is a major risk.

“The war in Ukraine has shown how energy infrastructure is a prime target in modern conflicts. Britain must ensure that our power supply is resilient against any attack or catastrophic event. A traditional point-to-point HVDC system is vulnerable: if just one end of a connection fails, power flow stops entirely. In contrast, an offshore HVDC grid, where multiple cables are connected at sea, would continue to operate even if several shore stations are compromised. Power only stops flowing when all but one converter station fails, offering a vastly superior level of resilience. Offshore platforms would be easier to defend, with minimal risk to civilian populations. Armed and ready 24/7, these platforms could serve as the first line of defence, protecting both our energy infrastructure and our national security.” (Source: Peter Blem, Software Engineer). It should also be noted that Norway is currently constructing a subsea energy island.

Great British Energy (GBE) provides a new model to encourage and facilitate public and private sector partnerships. GBE can stimulate investment in new technology and attract private investors to join in. This initiative is to be welcomed as it could free up the market and introduce new competitors to assist in the development of the offshore grid, the platforms as well as new superconducting underground and subsea cables. New engineering jobs in this growing sector will attract students to study engineering, marine science, and technology design. Britain can and should aim to be a leader in this dynamic sector.

Offshore4Sure supports the thinking behind GBE. We think that National Grid plc should no longer be the architect and chief builder of the offshore grid. Through GBE, other developers should be allowed and encouraged to play important roles in designing and building the necessary future GB grid structure including an offshore grid.

The ESO that will be separated from National Grid plc should be run by an independent team of strategic grid specialists, who have demonstratable expertise in the design of offshore grids. This may require a rethink on the leadership team heading up the NESO. It may be necessary to supplement the new ESO team with fresh thinking from organisations such as Orsted, Elia, Tennet & other leading System Operators.

How to achieve the Government's stated goals quicker

The future grid GW generation goals have increased exponentially since 2017 when Friston was chosen as a grid connection point for Scottish Power Renewables EA1N and EA2 windfarms.

A future framework should be drawn up urgently to give a truly holistic view, following the four Holistic Network Design (HND) principles encompassing resilience, economy, environment and community. National Grid plc has not done that job. It was never really their task or brief. They are incentivised to deliver profits to their shareholders, not to create frameworks where the payback may be well over 20 years. We cannot therefore agree that their current proposals are in the best interests of Britain. That is why the new Government should insist on a short moratorium and bring in an impartial specialist team (i.e. not on the payroll of National Grid plc). This would ideally include specialists from other North Sea countries, to see the bigger picture which balances the four HND principles, giving equal consideration to each factor. The proposed projects could then be delivered faster:

- Communities would be consulted at the outset, not when it's too late to change anything. There would be fewer delays due to JR challenges going through the courts and more community acceptance.
- The investment model would be set out clearly and investors would join in faster because the spatial energy strategic framework would have been established at the outset by impartial specialists.
- Within the framework there is opportunity for competition to offer faster implementation, value for money and greater flexibility.

New manufacturers and existing suppliers would be ready and willing to provide services and products tailored to meet the requirements.

It is recognised that HMG will have to build some new onshore grid reinforcements to enable effective power distribution, but the key point about building an offshore meshed grid is that it massively reduces the required number of such onshore new builds, as an interconnecting offshore network can move electricity from where it is generated i.e. wind farms to offshore platforms and then directly to near to the location of demand, without the redundant necessity of any geographical deviation to a place of zero demand. Most importantly, an offshore grid can be built much, much faster than any equivalent onshore infrastructure, with inbuilt flexibility and resilience.

Design Principles

Design principles are crucial to ensure an enduring spatial energy strategy, which has been so noticeably absent in Britain and is long overdue. Building on the HND principles, SEAS proposed the following principles (to be applied sequentially) to the ESO in January 2024:

Proposed Design Principles for Holistic Onshore/Offshore Network

1) Refurbish/upgrade onshore infrastructure to optimise capacity

2) Use existing brownfield sites first

3) Pool offshore windfarm power offshore

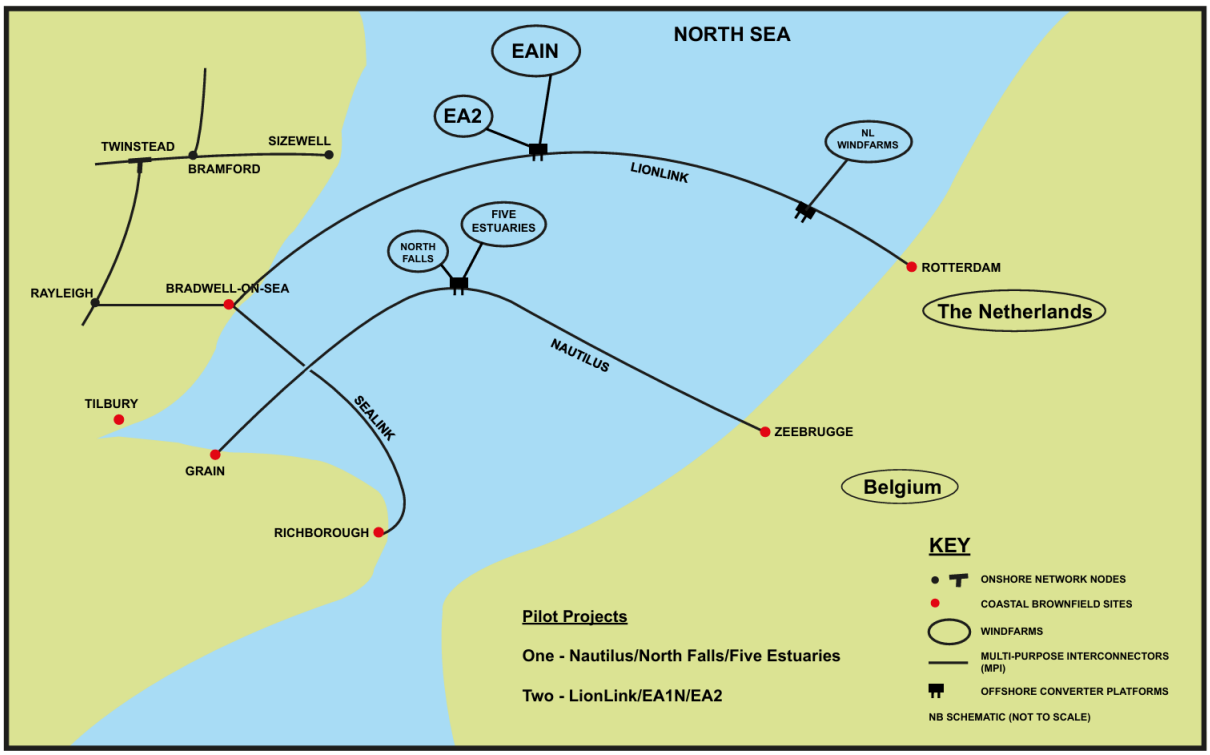
4) Route power offshore to the centres of demand

Regarding the selection of brownfield sites, we note that Belgium and the Netherlands have chosen to locate their hubs close to demand, to minimise adverse impacts on communities, ecology and micro economies. In both those countries, major hubs are not allowed to be constructed near nature-based tourism destinations such as Knokke or Zandvoort/ Kenner Merland National Park, unlike Aldeburgh and Minsmere in Britain.

The offshore network meshed grid has to be designed now but implemented over a 20-year period. The investments are high but will give long term payback. Projects facilitated by GBE could be amortised over these long periods, justifying a proportion of public funding as seed capital and risk reduction.

Hubs at brownfield sites such as West Grain may not immediately be attractive propositions to National Grid plc because they could be more costly to build, especially if the onshore grid connection needs an upgrade, and the need to factor in shareholder dividends. More crucially, when each project is considered in isolation, piecemeal investments may not justify the capital costs. Conversely, the capital investment in a hub will improve its payback and returns as it adds further incremental projects and other energy related investment (e.g. hydrogen and synthetic fuel plants). A longer term, holistic approach is needed.

By way of illustration, SEAS has proposed numerous alternative network designs as the number of projects has increased and technological advances have allowed. The diagram below shows how the HND/SEAS principles can be applied. In this scheme, only brownfield sites have been used. OHAs have also been introduced combining offshore cable investments to reduce onshore infrastructure and costs.



[N.B. For example only. More detailed, technical evaluation of the options is required]

N.B. Whilst the Design Principles were originally developed with the Suffolk situation in mind, they are generic and can be applied throughout Great Britain.

Conclusions

National Grid's latest plans should be applauded in terms of the following:

- offshore hybrid assets are now part of the plan ✔
- infrastructure coordination is now part of the plan ✔
- but Friston/Aldeburgh is most definitely NOT a brownfield site ✖

Friston is adjacent to one of the Britain's most successful nature-based tourism destinations. Yes, it was given consent in a previous era when the Inspectors were not privy to the new concentrated industrial zone now envisaged. The Suffolk Coast and Heaths region stands to lose £1 billion over 12 years of construction (source: Destination Management Organisation 2019 independent quantitative study). The limited rural lanes and A roads will be gridlocked as HGVs compete with tourists to get to the coast - over 90% visitors here are day trippers and they will not bother to make the journey as it will be a constant struggle and full of uncertainty.

If we make a step change now to an offshore grid and choose brownfield sites closer to demand, Britain could reap many benefits:

- Economic growth is boosted with increased jobs in these specialist sectors.
- GB achieves its Net Zero goals faster because less time is wasted along the journey as community buy-in has already taken place and the requirement for onshore infrastructure is halved.
- The hugely successful tourism sector, which in the Suffolk Coast and Heaths is worth £800 million annually, is protected and jobs are protected for SMEs, individuals and cooperatives.
- The pivot to a sustainable and flexible energy infrastructure framework designed for the 21st century not the 20th is accelerated.
- The adverse impacts on communities and ecologies are minimised.
- Prices to the consumer are reduced because there is a cost saving of at least £6 billion, as shown in the National Grid ESO 2020 report.

It is a win-win for all British stakeholders

Next Steps

The immediate next steps are to bring into operation under public ownership a truly independent NESO alongside the publicly owned GBE. The newly established NESO should revise the holistic network design for East Anglia in line with HND/SEAS principles. Brownfield onshore hubs need to be identified quickly, amending the Grid Upgrade programme as required. Onshore infrastructure should be minimised using Offshore Hybrid Assets, where appropriate, thus starting the shift towards more offshore coordination.

In the medium term, emerging technologies such as energy islands and super-conducting cable can be explored and piloted to extend a flexible and resilient offshore grid.

Under the oversight of a publicly owned GBE, Britain can achieve the FASTEST transition to decarbonisation if it starts to build an offshore meshed grid now and start with Stage One - the choice of brownfield sites closer to demand.

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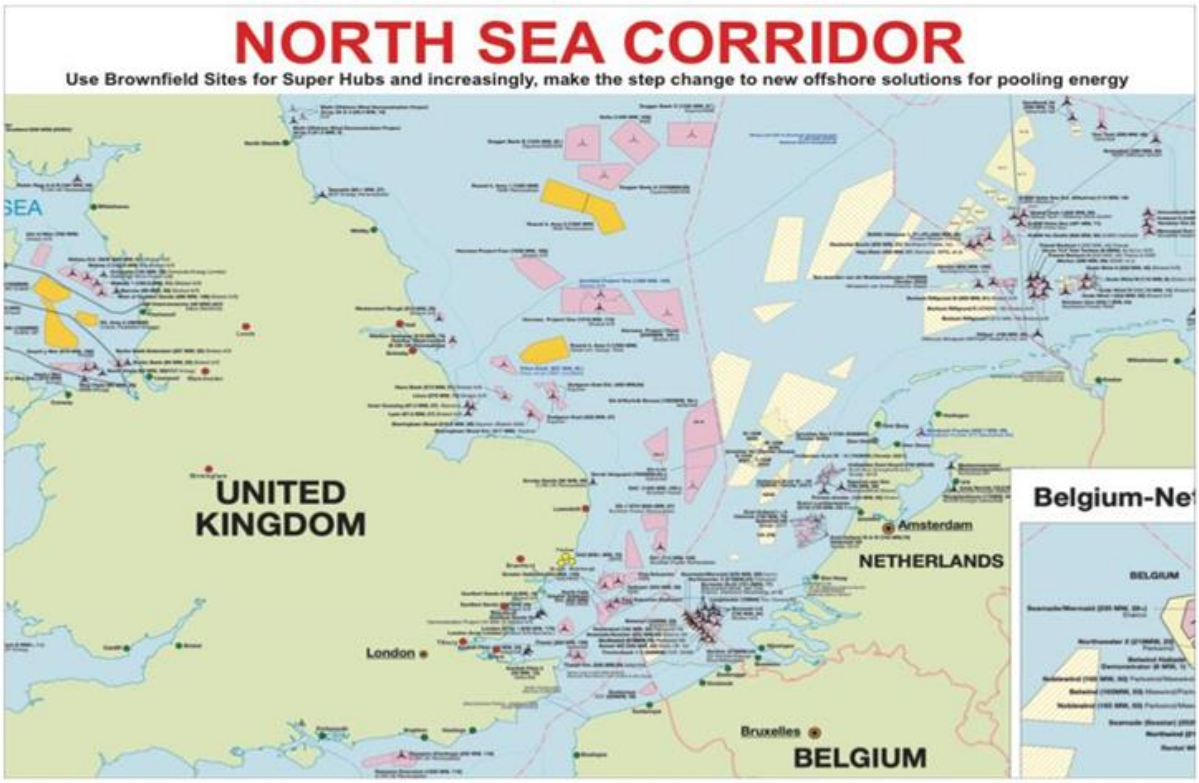
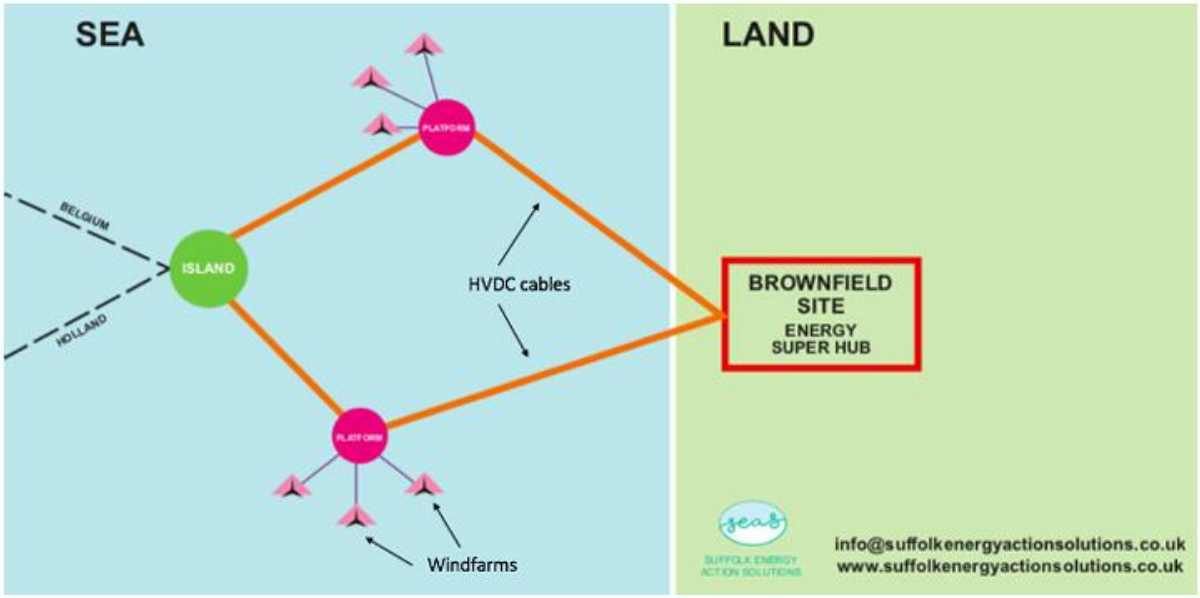
APPENDIX – Conceptual Approaches

1. North Sea Corridor



Given the concentration of power offshore in the North Sea and the concentration of demand in London, it would make sense to find landfalls in the Thames Estuary as close to the London grid as possible.

2. Offshore Grid Theoretical Model



[N.B. Interconnectors to Belgium and Holland illustrated, but these could equally be floating wind farms (e.g. Celtic Sea)

A simplified diagrammatic model for an offshore grid in which offshore platforms pool wind energy and carry it to landfall at brownfield sites. Offshore platforms can be located where wind farm subsea cables/converter cable routes intersect to maximise pooling opportunities. In the mid-term artificial islands could be constructed to support further energy infrastructures (e.g. green hydrogen electrolysers). A series of brownfield sites along the shoreline close to demand should be considered, designed to provide for future energy infrastructures (e.g. energy storage). Larger brownfield sites could develop into super hubs, to share more diverse energy storage/conversion. This system is called a Modular Offshore Grid (MOG) and has been implemented successfully by Elia for Belgium. There are cost efficiencies for developers and consumers with faster implementation benefits. By 2032, this offshore grid can be GB's main arterial corridor for offshore wind.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