

ENERGY

A POTENTIAL NORTH SEA GRID POWERHOUSE

The North Sea Grid was conceived as an initiative to harness wind power more effectively through an interconnected offshore grid while helping to meet European carbon emission targets. But does progress to date measure up to its ambitions, and what can be done to deliver on the project?

PURPOSE OF THIS WHITE PAPER

An offshore grid could deliver a range of socioeconomic benefits to countries bordering the North Sea and provide commercial opportunity for investors and operators in offshore wind. Crucially, such a project would require the development and construction of offshore grid interconnectors. However, any such project would also need to overcome significant challenges before any benefits could be realised. These challenges include regulation, financing, environmental concerns, political support, and uncertainty over risks and impacts. Crucial to the success of this ambitious project is consensus and alignment of stakeholders on ways to address these challenges.

To support the development of consensus and alignment around the North Sea Grid (NSG), Navigant and Ecofys have combined their experience to provide an early stage overview of the current development of an NSG based on an analysis of stakeholder views. This paper is the first in a series of thought leadership pieces on the potential of a North Sea offshore powerhouse. The second piece is titled *The North Sea as a Hub for Renewable Energy, Sustainable Economies, and Biodiversity*.

Navigant and Ecofys have a long track record in advising leading utilities and working with many of the stakeholders involved in the development of the NSG. This work is independent and not funded by a third party; it is undertaken as part of our contribution to the development of the industry.

Navigant and Ecofys spoke to stakeholders that included transmission system operators (TSOs), utilities, policymakers, regulatory authorities, investors, and other participants in countries around the North Sea. We asked for their opinions on the initiative, as well as their level of involvement, what they believed the key issues and anticipated benefits of such a grid to be, their opinions on the timeline for implementation, and about how they had been engaged with as stakeholders. Finally, we analysed stakeholders' reaction to a set of hypotheses presented across various topics.



The following organisations were contacted in writing this white paper:

- DONG Energy
- European Commission
- European Investment Bank
- Energy Networks Association
- ENTSO-E
- Ofgem
- Ministry of Economic Affairs, The Netherlands
- Scottish Hydro Electric Transmission
- TenneT
- Transmission Investment LLP

ORIGINS OF THE NORTH SEA GRID INITIATIVE

In 2010, 10 European countries signed a Memorandum of Understanding titled “The North Seas Countries’ Offshore Grid Initiative (NSCOGI).” The objective of the memorandum was to establish a cooperative framework for the development of grid infrastructure in the North Sea¹ to provide energy security, cost-efficiency, and a low-carbon sustainable energy solution for the region. This work was later given new stimulus via the political declaration of member states and the European Commission (EC) signed in June 2016 that included a joint work program for coming years. The European Union included the North Sea offshore grid as one of its four electricity infrastructure priority corridors, reflected in Regulation (EU) 347/2013 on guidelines for trans-European energy infrastructure. The diagram below illustrates indicative designs for a future North Sea offshore grid of a recent EC study.

FIGURE 1: RADIAL (LEFT) AND MESHED (RIGHT) DESIGNS FOR A FUTURE NORTH SEA OFFSHORE GRID



Source: “Study of the Benefits of a Meshed Offshore Grid in Northern Seas Region,” 2014, Ecofys, PWC, Tractebel Engineering

The best technical option of a coordinated offshore grid could deliver significant benefits to countries bordering the North Sea, including Belgium, Germany, Denmark, France, Ireland, the United Kingdom, the Netherlands, Norway, and Sweden.

1. We define the North Sea countries here as Belgium, Germany, Denmark, France, Ireland, the United Kingdom, the Netherlands, Norway, and Sweden..

SURVEY FINDINGS

1. LACK OF CLEAR VISION

When asked for their views of the NSG initiative, stakeholder groups exhibited mixed levels of understanding. Most were supportive and positive about the opportunity for more integration but were also wary of challenges. The NSG was identified as an important project to support the decarbonisation of the energy sector and is seen as part of an evolution of the sector.

Many stakeholders wanted further clarification on how to define the NSG, suggesting that the initiative is currently not clear across all groups. There was a diversity of views from the non-governmental sector. For example, one interviewee thought the NSG should be viewed as a framework for asset ownership but not a proactive rollout, and another saw it only as an opportunity to get more licenses. In contrast, the governmental sector tends to take a more holistic view, seeing the NSG as one large project.

There was no consensus across the group on a question around a timeline or roadmap for the NSG. The majority were either not aware of a roadmap or were of the opinion that no clear roadmap is in place.

2. TECHNOLOGICAL HURDLES CAN BE OVERCOME IF POLICY AND REGULATORY QUESTIONS ARE SOLVED

Our survey identified a number of issues that may challenge the advancement of the NSG. These have been clustered into four categories: Policy & Regulation; Financing; Permitting & Contracting; and Technology & Physical Assets (see graphic below). Political and regulatory challenges were highlighted as the most important issue across the stakeholder groups, whereas challenges such as technology compatibility were considered easier to overcome.



Some stakeholders discussed a perception that the situation currently exists where policymakers and developers are each expecting the other to be the catalyst to create incentives for behaviour change. Our research highlighted the importance of practice over theory and recommended developing commercial case studies to help support the initiative. Establishing the real need and necessity for a NSG were also cited as key issues. The importance of collaboration across all stakeholder groups was raised in a number of interviews.

Stakeholders agreed that the NSG would be beneficial in the following ways:

- More sites would be opened to generation – there would be increased security of supply due to greater levels of interconnection between countries, as well as increased grid stability.
- Upscaling of offshore wind would be helped through enhanced collaboration and lower costs, even though stakeholders felt that a NSG was not essential for offshore wind development.
- The impact of intermittency would be reduced through improving interconnections and making better use of the low correlation of generation across the region by coordinating strengths across the North Sea region, such as the UK's leading position in offshore wind and Norway's reliance on hydro.

3. TOP-DOWN DIRECTION IN POLICY & REGULATION WILL DRIVE CHANGE

Stakeholders recognised that policy harmonisation must occur across participating countries. There was also a question over the involvement of countries outside the EU (such as Norway) and the implications of this. Although the survey was conducted prior to the referendum vote, this could also apply to the UK when the Brexit decision comes into force.

A number of interviewees, especially outside government, felt that the potential impact of policy on the market was not well-understood. Others thought the impact on markets was well known through either the ENTSO-E Ten-Year Network Development Plan (TYNDP) or at a high level. Interestingly, one government participant indicated that if developers came up with real commercial cases, a regulatory framework supporting it could be created.

Most respondents accepted that more integration would be beneficial in terms of need, necessity, and value. It was acknowledged that more research is required on a case-by-case basis and a coordinated approach is best given the number of stakeholders.

There was consensus around the NSG's potential impact on member states, as most agreed that it was too early to ascertain. Some modelling has been undertaken, but many of the components (such as configuration and layout) have not been confirmed, nor has the role the grid will play in the future.

4. ENGAGEMENT IS INADEQUATE

When asked their opinion about the level of engagement, the majority of stakeholders considered that although a high-level understanding of the objectives existed, stakeholders had not been adequately engaged, and in some cases had not been engaged at all.

Engagement is happening through platforms such as NSCOGI, EC PCI groups, and ENTSO-E, but these platforms do not reach all stakeholder groups. Some within the non-governmental sector felt they were marginalised from the discussions by governmental agencies, while these agencies in turn think the opposite is true.

The perceptions, goals, and objectives of stakeholders differ across the groups, and there was uncertainty over who will ultimately gain from the NSG proposal. Further engagement and collaboration, as envisaged in the June 2016 political declaration, could support the advancement of the agenda.

5. CRITICAL FINANCIAL QUESTIONS REMAIN

Most respondents did not think that an NSG would deliver adequate levelised cost of electricity (LCOE) for offshore wind and make offshore wind subsidy free, but they did agree that it would contribute to a lower LCOE at the onshore connection point. There was a strong belief that a NSG would not result in subsidies being lifted, though some did agree this might be possible. Others suggested that areas outside LCOE – such as social welfare – are more important financial considerations.

There was uncertainty around:

- Who would get the revenue
- The value of ancillary services
- The value of feed-in tariffs
- How regulation would work, given that currently each member state has a different set of policies for transmission and interconnection

One participant believed that the very long timeframe of the NSG project also dilutes some of the project's benefits, as developers' expected transmission cost reductions are outside their current short-term projects.

Stakeholders agreed that the business models for NSG interconnection were not well-understood and many uncertainties remain. Some highlighted that business models had not been considered at all at this stage of the conversation and more long-term thinking/planning was required. Regulation may dictate which business model is used.

Some stakeholders thought the cost of trading electricity might fall as capacity increases. However, others discussed the mechanisms for trade given the different regulatory regimes. If some approaches are mandated, they may incur additional costs.

6. MOVING THE NSG FORWARD

Interviews with project stakeholders revealed that many are unclear of the project objectives and the necessity of a NSG (at least from an economic perspective). Secondly, while some of the economic benefits are understood, it is unclear how these would be shared among the stakeholders.

The interviews presented a potential impasse where industry and developers require more certainty over renewable policy matters (such as which country's support scheme applies for a wind farm in the middle of the North Sea) and how adequate returns could be encouraged versus a simple high-voltage direct current (HVDC) link. However, some regulators are waiting for developers to bring commercial proposals to them before they lay out a specific support plan.

Up to this point in time, the NSG initiative has been led by government and regulators with some consultation with market participants. Given that the benefits and risks of the NSG are long-term in nature and require market participants to put significant capital at risk, there is a real need for increased engagement to make tangible progress compared to current transmission spur lines.

To a large degree, the NSG objectives relate to longer term development ambitions for offshore wind in the North Sea. If the countries involved have this policy objective, then the initiative needs to be integrated in policy. To date, this has not been a clear committed element in government policy but more a matter of discussion between regulators.

Further analyses and recommendations are included in our companion paper, titled *The North Sea as a Hub for Renewable Energy, Sustainable Economies, and Biodiversity*. This paper highlights the role of a future NSG in providing a robust foundation for a carbon-neutral European electricity system, to serve as an economic driver for the countries around the North Sea, and to contribute to healthy marine biodiversity in the region.

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APPENDIX I

GLOSSARY OF TERMS

ENTSO-E	European Network of Transmission System Operators
EC	European Commission
EU	European Union
HVDC	High-Voltage Direct Current
LCOE	Levelised Cost of Electricity
NSG	North Sea Grid
NSCOGI	The North Seas Countries' Offshore Grid Initiative
TSO	Transmission System Operator
TYNDP	Ten-Year Network Development Plan

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