Baltic InteGrid

Integrated Baltic Offshore Wind Electricity Grid Development

Assessment of Baltic hubs for offshore grid development

A summary report for the Baltic InteGrid project

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1. Introduction

Offshore wind energy (OWE) is playing an increasingly important role in a diversified and sustainable future energy mix. Offshore wind capacity in Europe totals 15.8GW (2017), the vast majority of which is located in the North Sea (WindEurope, 2018). The Baltic Sea Region (BSR) offers good conditions for offshore wind development: compared with the North Sea, waters are relatively shallow, wave height is lower, tides are less pronounced and potential sites are close to shore, resulting in lower manufacturing, installation and grid infrastructure costs. By 2030, the BSR could have 9.5GW in offshore wind capacity (Baltic InteGrid, 2018), of which only about 1.8GW has been installed by the end of 2017 (WindEurope, 2018).

The Baltic InteGrid project is exploring the potential of a meshed offshore electricity transmission grid for the BSR. It aims to contribute to sustainable electricity generation, to integrate the regional electricity markets further, and to enhance the security of supply around the BSR. The Baltic InteGrid project supports research efforts to equip its stakeholders with insights on the development of a regional meshed grid across a range of fields, including market and supply chain analysis.

The purpose of this study is to identify potential hubs for the manufacture, installation and maintenance of components involved in offshore wind transmission grid development. The study describes the port infrastructure requirements for the defined elements of the offshore wind transmission grid, identifies Baltic port hubs with the capability to contribute to the future development of the offshore grid in the BSR, and provides conclusions about sites identified as suitable for supporting this market.

This report is a summary of the full report, which contains the full details of the work and the results. This study is not meant to advocate for specific port improvements or for realignment for any particular use of the opportunity ports.

2. Approach

The study considered the work packages of the OWE transmission supply chain and the port infrastructure required to deliver them. An overview of the existing supply chain capability in the BSR was then described.

To identify the opportunity ports, a list of 306 Baltic ports from an online database was considered and filtered initially on water depth and ability to accommodate vessels used in the OWE transmission market. From the remainder of the list, the opportunity ports were identified based on their proximity to current and future offshore wind transmission projects, accessibility, availability and synergies with the existing supply chain. A large number of ports were found to accommodate crew vessels for substation servicing. The study identified 14 opportunity ports for further assessment.

For each opportunity port the port characteristics were assessed against indicative port infrastructure requirements for export cables and substation at each supply chain lifecycle stage: manufacture, installation and maintenance. Assessments were made using publically available information and supported by engagement with the port authority where necessary.

3. Baltic hubs

3.1 Existing Baltic capability

3.1.1 Export cables

Several of the market leaders in export cable supply operate facilities in the BSR due to historical high demand for subsea interconnector cables. Current port infrastructure to meet cable supply demand in the BSR is adequate.

There are several cable installation companies operating in the BSR. Baltic demand for cable installation is small and this will be met by cable installers from both inside and outside the BSR. The primary opportunities for Baltic hubs will be in short-term storage of cable prior to installation and accommodation of vessels, where current port infrastructure is likely to be adequate.

Several cable suppliers and installers in the BSR also have capability to provide cable service work packages. The opportunities for Baltic hubs will likely be in long-term storage of spare cable and accommodation of vessels for cable survey and repair.

3.1.2 Substation structure

There are several large fabrication yards operating in the BSR that have supplied substation structure components. Baltic market demand for substation structure supply is small and current port infrastructure for this is likely to be adequate. Substation structure demand in the BSR could also met by suppliers from outside the region.

There are substation installation companies operating in the BSR. Demand for substation installation is the same as for manufacture and so current port infrastructure for this is likely adequate. Also as with manufacture, substation installation demand in the BSR could also be met by suppliers from outside the region.

The BSR will require some infrastructure to accommodate large vessels used in major substation component replacement and repair, but there is little demand for this activity. Crew vessels are required to access the substation for structural maintenance and service. There is a moderate demand for this activity and it does not require a high specification port. There are companies in the BSR with the capability to perform substation structure maintenance services.

3.1.3 Substation electrical

Owner-furnished equipment, primarily power electronics equipment, can arrive by truck, rail, barge, or ship to the substation structure fabrication yard from outside the BSR. Supply of this equipment does not require a high specification port or dedicated infrastructure as most general cargo vessels, if required, can self-load and unload using onboard cranes. Electricals may be imported and exported through Baltic ports, however in small quantities. The current port infrastructure for is adequate for substation electrical supply.

Crew vessels are required to access the substation for high voltage electrical installation but demand is low and this does not require highly specialised infrastructure. Some specialist substation electrical work packages can be performed by BSR companies.
Maintenance of substation electrical systems has the same port infrastructure requirement as for the substation structure.

3.2 Opportunity ports

The 14 opportunity ports identified for further assessment are listed in alphabetical order in Table 1 and their location in the BSR shown in Figure 1. Assessments for the port were made considering the port authority area as a whole rather than specific facilities or locations within them.

	Port	Country
1	Gdynia	Poland
2	Karlskrona	Sweden
3	Klaipėda	Lithuania
4	Koverhar	Finland
5	Liepāja	Latvia
6	Lübeck	Germany
7	Muuga	Estonia
8	Norrköping	Sweden
9	Rønne	Denmark
10	Rostock	Germany
11	Sassnitz-Mukran	Germany
12	Stralsund	Germany
13	Świnoujście	Poland
14	Wismar	Germany

Table 1 List of Baltic Sea opportunity ports included in the study.

Figure 1 Location of opportunity ports in the Baltic Sea region.

4. Conclusions

The BSR is well placed to deliver export cable manufacturing and installation, based on a strong existing supply chain including port infrastructure at the point of supply.
There are a high number of cable manufacturing facilities in the BSR due the regional demand for interconnectors. These manufacturing facilities have since been utilised for the supply of high voltage export cables for offshore wind transmission, for both Baltic Sea projects and exported to projects outside the BSR. The strength of this supply means there is no clear demand for major new manufacturing and installation infrastructure in the BSR. Some ports will find opportunities to benefit from nearby manufacturing facilities or offshore wind farms such as in the provision of vessel services or short term cable storage.

The BSR has sufficient port infrastructure in place to meet demand for substation structure and electrical supply and installation.
The BSR has some capability to produce substations but the demand for these is low and supply will also come from outside the BSR. There is not a strong demand for new supporting infrastructure for substation structure and electrical manufacture and installation.

There will be more opportunities for BSR hubs in the transmission maintenance supply chains than in manufacture and installation.
The Baltic offshore grid it set to grow from 1.8GW of current installed capacity to up to 9.5GW in 2030. There are many ports in the BSR capable of establishing themselves as hubs for the maintenance supply chains of offshore transmission assets. These operations do not require specialist port infrastructure and so ports that are yet to develop experience in the OWE sector, such the eastern Baltic ports, may have an opportunity to support transmission maintenance. Offshore transmission maintenance supply chains are also more sensitive to distance from the installed transmission system. Manufacture and installation will more readily come from outside the BSR (such as the Baltic 2 export cable being manufactured by NSW General Cable in Nordenham) whereas maintenance is typically carried out from hubs close to where the transmission system is installed.

BSR ports can take advantage of their expertise to improve transmission manufacture, installation and maintenance.
There are several major ports in the BSR that can offer an advantage through the project lifecycle from their experience in areas such as cargo handling and logistics, and through close or even co-location of supply chain for export cables and substation manufacture, installation and maintenance. This then offers the opportunity to build hubs around these facilities to further drive economies of scale and co-location

Barriers to developing the optimal port infrastructure in the BSR are competition from outside the region and the relatively low level of demand.
There is also competition for space and quays from within the port areas themselves. Publically owned ports are more likely to accept a new industry entering the port authority based on the economic benefit for a wider municipal area, whereas privately owned ports will assess a change to the utilisation of port infrastructure purely on financial merit. There

is also lack of certainty about the dates and total volumes of transmission grid that will be needed, which is a risk to ports considering investing in further infrastructure.

German ports are the most likely to develop into and remain as hubs for the offshore transmission sector.

The study identified more opportunity ports from Germany than any other country. Current BSR transmission supply chains are predominantly located in Denmark and Germany. Although Denmark has the highest installed capacity within the BSR, Germany is anticipated to install a greater volume of capacity by 2030. German ports have the most infrastructure, due in part to the strength of the connection to central European industries. German ports and supply chains will likely continue to serve the offshore transmission sector in the BSR beyond projects installed in German waters. Ports in countries whose OWE sectors are in their infancy, such as Poland, Lithuania, Latvia and Estonia, will have to compete against the experience and track record of German hubs when their projects are ready to be developed.

References

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