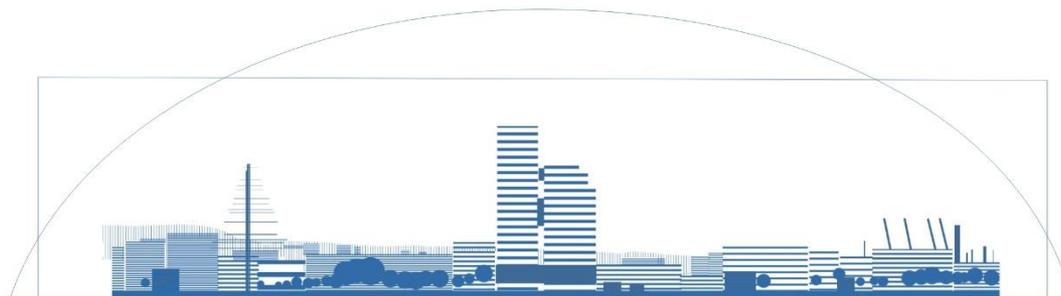


NeptHyne – from Innovation to International Cooperation

June, 5th 2021



About NEXUS Consultants

- **NEXUS Consultants** is a Polish consultancy firm based in Gdynia. Since 1993, we have actively participated in the process of the transformation of the Polish economy and other EU countries (Slovakia, Slovenia). We support companies in their market development by identifying effective solutions based on modern management tools for marketing, finance and organisation. Our consultancy activities take full account of the needs of our clients and their potential.
- **NEXUS Consultants** has completed major hydrogen projects in Poland in the field of production of pure hydrogen, distribution of hydrogen in the gas system and storage in salt caverns.
- The experience gained led to the initiation of the **Cluster of Hydrogen Technologies** - the Cluster has been operating for five years now.
- **NEXUS Consultants** is the initiator of the project of the Pomerania Voivodeship and the Cluster of Hydrogen Technologies which goes by the name of Pomeranian Hydrogen Valley.
- Based on our knowledge and experience, the NeptHyne project was created.

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NeptHyne project

- The NeptHyne project aims to manufacture hydrogen within the premises of the offshore wind farm. Depending on the selected energy distribution technology (direct current or three-phase current), the system can be located on the transformer substation or station.
- On one hand, this provides the opportunity to store and process excess energy which cannot be collected by the National Power System (grid / KSE). On the other, it provides the opportunity for supplying servicing ships (including but not limited to CTV – crew transfer vessels), which must deliver the maintenance workers performing the planned servicing work on a daily basis in order for the offshore wind farm to perform/operate in accordance with the provisions of the servicing agreement.
- An important element of the NeptHyne project is that it is presently one of three projects in the world concerning the design of a transformer substation (station), which – besides being equipped for power engineering purposes – is equipped with a system for salt water desalination and subsequent demineralisation, hydrogen production, compression, storage, and ultimate supply to servicing units (which is our original solution).



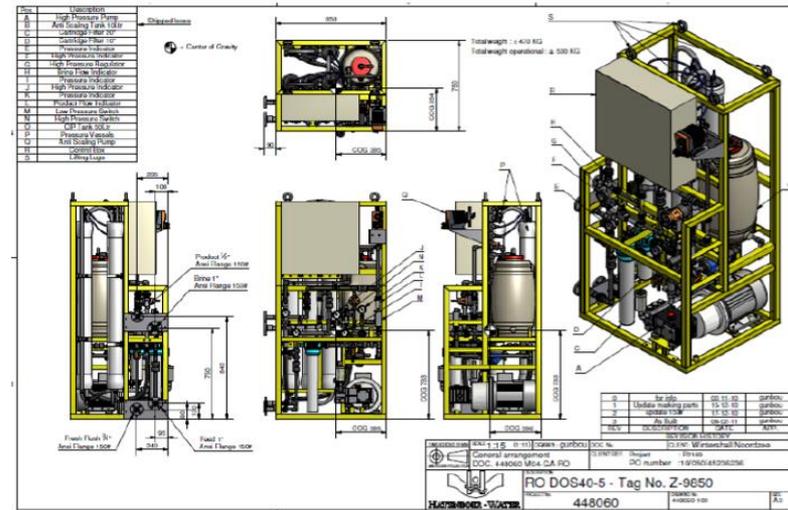
NeptHyne project

- The NeptHyne project may constitute a key element in investments in offshore wind farms. The project fulfils all criteria associated with the planned 'local content' as well as the provisions of the law on promotion of energy production in offshore wind farms, where the investors are responsible for specifying the investment expenditures, initiatives, and expected actions for the benefit of entities with main office or branch in Poland, including for assessing the number of jobs – the 'offshore' law.
- The transformer substations (stations), the system used to produce hydrogen from salt water, and the fleet of servicing ships fulfil the provisions of the 'offshore' law in scope of supply chain development – 'local content'.
- Promotion of using hydrogen as the main fuel for the fleet of servicing ships provides an additional opportunity of development, including potential export of the solutions, technologies, and finished products.
- The NeptHyne project is also a tremendous development opportunity for Polish economy.



NeptHyne project

- Besides elements associated with electrical energy transmission, the NeptHyne project requires designing of the following devices and systems :
 - Salt water desalination and demineralisation system (this process can take advantage of the heat produced from the power engineering devices and the heat produced by the electrolysis process);
 - Electrolyser battery – hydrogen production;
 - Compressor system – hydrogen compression (attention: the key here will be the value of the pressure required for purposes of vessel fuelling);
 - Hydrogen storage facility;
 - System for fuelling ships with hydrogen;
 - Automation system responsible for local ‘energy balancing’ and using said energy for purposes of hydrogen production;
- Some of the designing work is already completed (transformer station project, CTV project, prototype of the first alkaline electrolyser, and the hydrogen storage solution).



NeptHyne project

- The NeptHyne project is entered into the Polish National Recovery Plan.
- NetHyne SA, which will administer development of the NeptHyne project, was accepted as member of the European Clean Hydrogen Alliance.
- The NeptHyne project was submitted to the list of potential projects aimed at development of renewable and low-carbon hydrogen technologies and solutions in line with the objectives of the EU Hydrogen Strategy.
- We are currently in the process of signing letters of intent in scope of cooperation and development of the NeptHyne project with wind farm project investors in Poland.

International cooperation - project concept

- The NeptHyne project may serve as grounds for establishing international cooperation in scope of developing the hydrogen market and hydrogen technologies in the Baltic Sea.
- The cooperation of Poland, Estonia, Finland and other Baltic countries may determine new standards for offshore wind farm servicing.
- Manufacturing hydrogen from seawater electrolysis in offshore transformer stations and storage of such hydrogen opening the potential to fuel ships provides the opportunity of development in scope of manufacturing of the following:
 - Electrolysers;
 - Hydrogen compressors;
 - Hydrogen warehouses;
 - And hydrogen fuelling systems for ships
- Selection of hydrogen as the main technology powering CTV (crew transfer vessel) servicing ships can help develop the following markets :
 - Hydrogen-powered servicing ship building;
 - Production of:
 - Fuel cells;
 - Hydrogen warehouses (ship tanks);
 - Ship hydrogen systems.
- The NeptHyne project provides the opportunity of technical and technological development of the hydrogen market in the aforementioned Baltic states

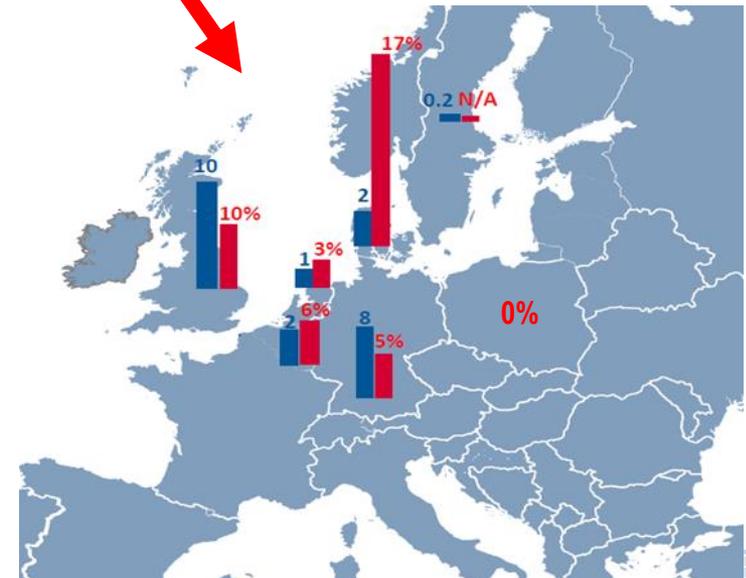
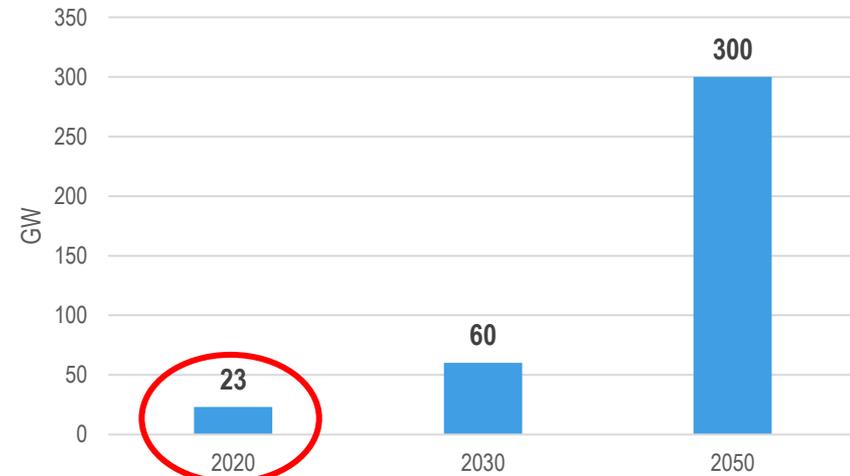


Market

- The European Offshore Strategy will be announced on **18 November 2020**. The key aspect of the strategy is the planned raise of the installed capacity of offshore wind farms (OWF). Therefore:

 - We currently have 23 GW installed in OWF on the seas around Europe (including just under 2.3 GW in the Baltic Sea);
 - According to plans, there will be > 60 GW by 2030 (three times as much as there is now);
 - There will be 300 GW installed by 2050 in order to reach climate neutrality of the European continent.
- Pursuant to the provisions of the Polish Energy Policy, the installed capacity in Polish offshore wind farms will reach 6 GW by 2030 and 11 GW by 2040.
- According to the projections resulting from the requirements of the European Green Deal, over **28 GW** should be installed in Poland by 2050 (in order to fulfill the criteria of climate neutrality).

Offshore – Installed capacity

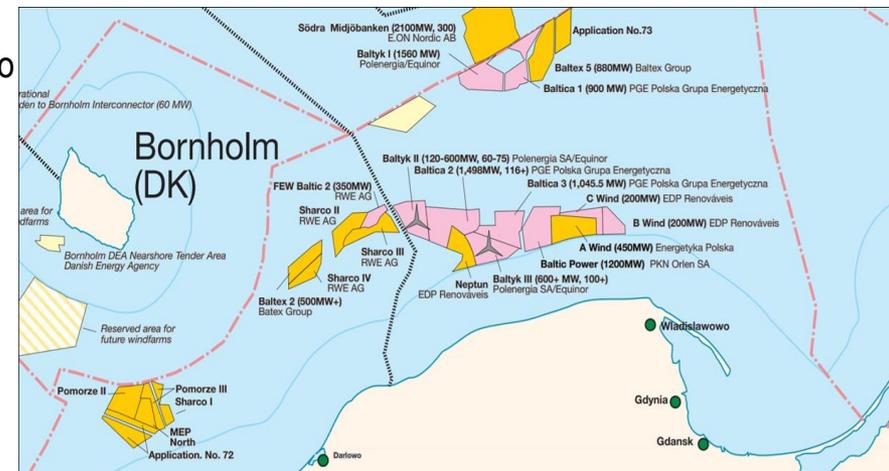


Market potential

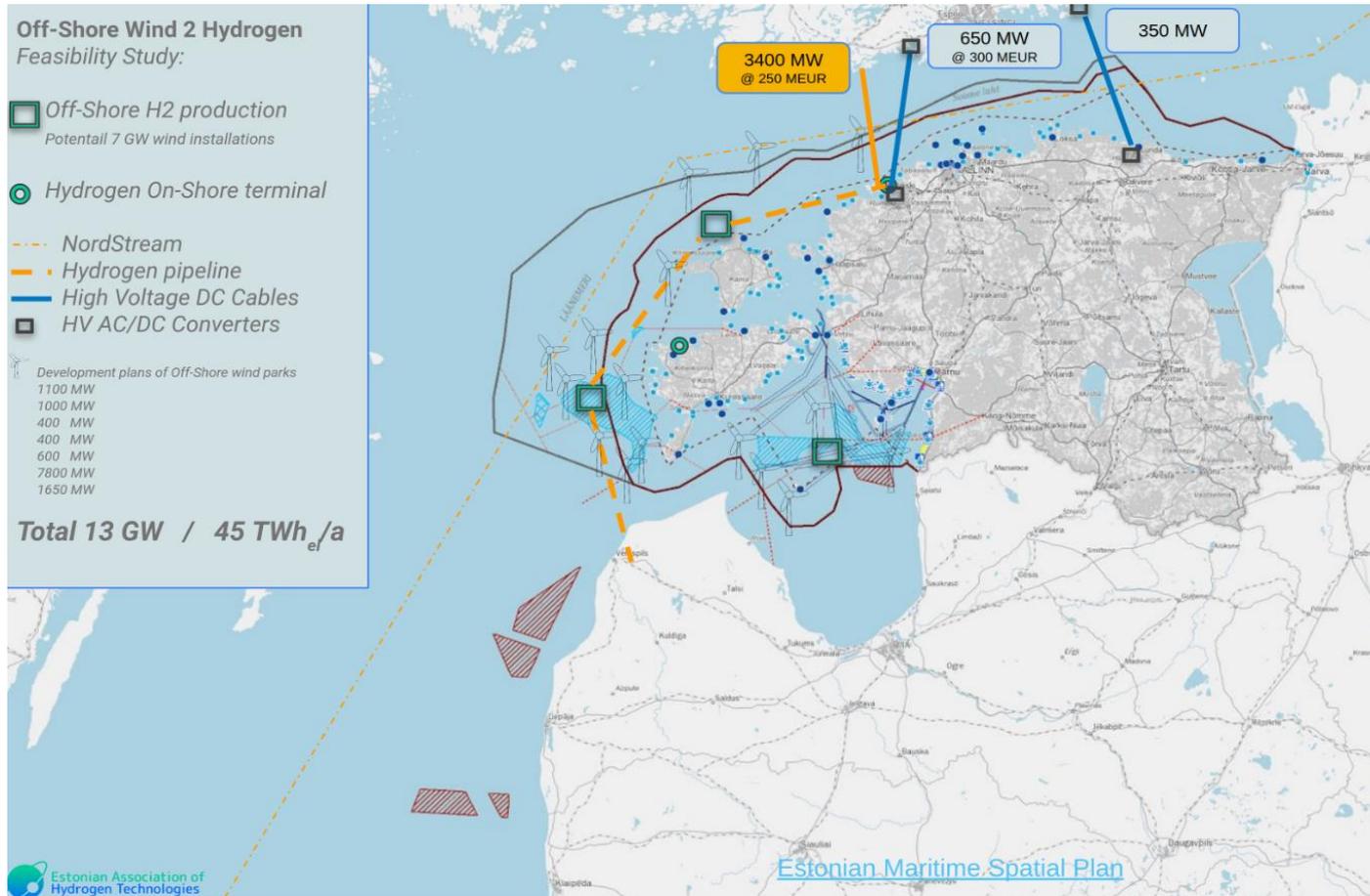
- Finland has 26 offshore wind farm projects, 3 of which are currently in service.
- Finland is planning on reaching up to **10 GW** in offshore project by 2040 – source: *Finish Energy Lithuanian Embassy's Hydrogen Seminar, Helsinki 20.04.2021 by Kimmo Siira*



- According to Poland's Energy Policy – PEP 2040 – Poland plans to install **11 GW** in offshore projects in its economic zone by 2040



Market potential



- Estonia's plans indicate wind energy development potential of up to **13 GW** of capacity installed in offshore wind farms

Key figures

- Approx. 34 GW of power in offshore wind farms is planned to be installed in Finland, Estonia, and Poland in total by 2040.
- If the decision is made to use the aforementioned projects for purposes of developing the hydrogen market, it will be possible to generate projects associated with offshore hydrogen production through seawater hydrolysis with capacity between 5 and 10 GW – depending on the way the hydrogen is distributed (industry, transport, storage, and processing of energy).
- A decision on having the developed offshore wind farms serviced by hydrogen-powered CTV units opens the potential for market development for shipyards located on the Baltic Sea with parameters as follows.
- Assuming that servicing of 1 GW of capacity installed in offshore wind farms requires 10 CTV units - Report prepared by Zeeheven Ijmuiden, Port of Amsterdam, and Port of Den Helder entitled *‘The economic contribution of offshore wind in the province of North Holland’* - these premises were used as the basis for the market estimations.

Country	Planned installed capacity by 2040	Number of servicing ships (CTV only)	Estimated market value (EUR)
Finland	10	100	450 million
Estonia	13	130	585 million
Poland	11	110	495 million
Total	34	340	1 530 million

Key figures

- Assuming the following:
 - Performance (construction) requires between 6 and 8 months;
 - Designing a unit (including the hydrogen-hybrid drive) requires 12 months;
 - Developing a prototype requires 12 months;
- There is a realistic chance for a well-organised production shipyard to release one CTV unit for use per month;
- **This means that for e.g. three shipyards involved in development of the aforementioned units, we will ensure continuous production over almost 10 years!**
- The projected production plan also covers delivery of 340 fuel cells, the same number of hydrogen tanks, and the same number of hydrogen systems. This is an enormous impulse for development of the hydrogen market in Poland, Estonia, Finland and other Baltic countries, which also multiplies the benefits stemming from the presented cooperation approach.
- The presented approach provides the opportunity to carry out the project with financing from EU programmes and funds.

Next steps

- Approval of the key significance of the NeptHyne project in establishing mutual cooperation in scope of developing the hydrogen market in Poland, Estonia, Finland and other Baltic countries.
- Establishment of relations with the government and among business organisations.
- Signing of appropriate agreements and understandings among companies involved in the NeptHyne project.