

Offshore wind power business development and operation in South Korea

- BIXPO, November 2021
- Eric Arends, Pondera

Content of this presentation

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3. Phases in EU offshore wind development and lessons learned
4. Supply chain development

Who is Pondera?

- Specialist in the development of **renewable energy** projects
 - Focus on **(offshore) wind** energy
 - **Consultant, Engineer and Investor**
 - Operates globally
 - Offices in the Netherlands, Indonesia and **South Korea**
 - Medium sized group of companies with 70 employees
 - Operates since 2007
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- **Eric Arends**, Partner/Director/VP



Pondera Services Overview

Pondera's services range from renewable policy studies for governments, to renewable energy project development in **all stages of the project life cycle** for project owners.

The Pondera Services Wheel shows an overview of the services we provide.

Clients / partners

- Developers
- Industry
- National and local government
- Utility companies
- Manufacturers
- Farmers
- Grid operators



and many more ...



Ambitious targets for offshore wind energy for 2030

Targets **Offshore Wind Korea**

- Transition to a renewable energy system
 - Share **increase of renewables to 20% in 2030** and to 30-35% by 2040
 - Significant reduction in coal-fired plants and no lifespan extensions of aged nuclear plants
 - **Investment for relevant job creation and cultivating new business in renewable energy**
 - Low-carbon energy
- Offshore wind capacity
 - 2020: 124.5 MW
 - **2030: 12,000 MW**

Policy plans

- 2017: Renewable Energy 3020 Implementation plan (RE3020)
- 2019: 3rd Energy Master Plan
- 2020: 9th Basic Plan for Long-term Electricity Supply and Demand
- 2020: Basic Plan for New and Renewable Energy
- 2020: Green New Deal
- 2021: Carbon neutral declaration by 2050

Offshore wind power business development and operation in South Korea

Question:

- How to develop a prosperous offshore wind energy industry in South Korea and reach the ambitious goals for 2030?
- These are two things that go hand in hand: a good local market with a **steady roll-out** means that the Offshore Wind Energy supply chain can develop well because there is a **perspective for investment** in products, production capacity, knowledge and training

How do we achieve dynamic development of the wind energy industry in Korea?

- **Europe** has achieved rapid **growth of offshore wind at low costs**
- Interesting to see how things went in Europe and what we can learn from this for the situation in Korea
- Certainly not to say that Europe knows it all better
- **Korea can go faster than the EU** because technology and practices have been proven and new technology can be applied immediately
- Korea has a **good starting point** due to advanced industry, prepared policies and good natural conditions
- Let's take a look at the **development history, lessons learned** and current situation in Europe's Offshore Wind

Four Phases in (European) offshore wind energy development

- | | |
|---|----------------|
| 1. Pioneering phase | (2000 to 2007) |
| 2. First realizations | (2008 to 2016) |
| 3. Upscaling offshore wind | (2016 to 2025) |
| 4. Expansion and (new) bottlenecks | (2025 to ...) |

Note: exact time periods vary considerably by European country



1. Pioneering Phase (2000 to 2007)

- A **growing number of developers** see opportunities and seek area exclusivity and permits wherever they see an opportunity (**unplanned**)
- Uncertain development process
- Governments are questioned about guidelines and principles that developers must comply with in order to obtain a license
- The **rules are drawn up** and adjusted during the game
- A system is gradually being created in which parties can obtain exclusivity for an offshore area under certain conditions and then can apply for subsidy
- In order to gain knowledge and experience, various non-commercial **pilot projects** for offshore wind farms are being built (e.g. OWEZ wind farm in the Netherlands).



2. First realizations (2008 to 2018)

- A few parties emerge from pioneering phase and receive government subsidy
- **First commercial wind farms** are being built
- Steep learning curve and emergence of the first real experts with hands on experience
- **Professionalization** of the wind energy sector
- Construction of **specialized installation vessels** and tools
- Knowledge transfer and transition of personnel from offshore oil and gas to offshore wind energy
- **Supply chain** starts to build up

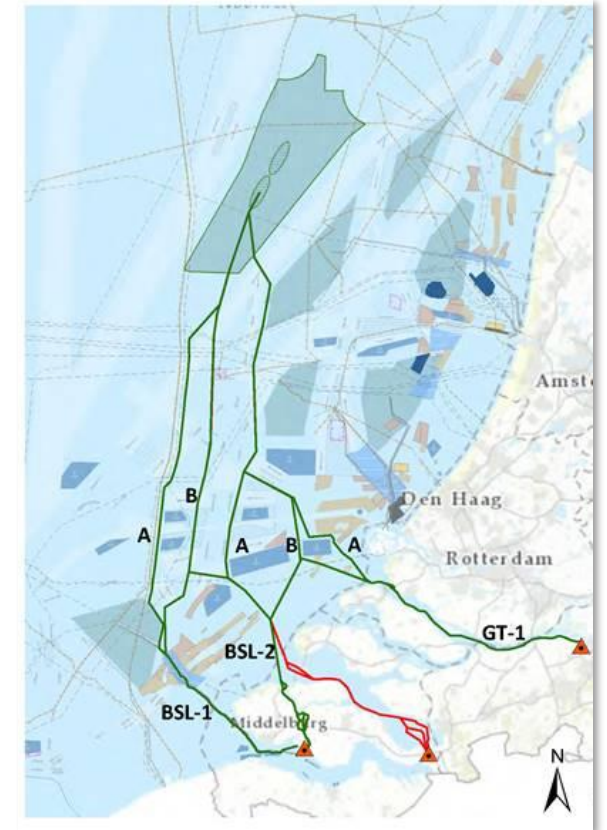
3. Upscaling offshore wind (2018 to 2025)

- **Clear rules** for the development of offshore wind: **Tender systems** and auctions
- **Governments take a leading role** in marine spatial planning to efficiently use limited space at sea
- Government creates a **one-stop-shop** permitting system
- **Larger wind farms** (750 MW - 1.5 GW) constructed to take advantage of cost reduction through economies of scale and produce more sustainable energy faster
- Expansion of turbine dimensions and associated foundations
- Specialized installation vessels
- Developing dedicated harbor facilities
- **Grid connection issues** are resolved so that developers are no longer confronted with them (greatly reducing development risk)
- The government partly takes up part of the development itself, creating a level playing field with **more competition and lower MWh prices** (various models, The Netherlands has extensive government involvement in preparation of offshore wind sites (offshore grid connection preparation, offshore site surveys etc.)



4. Expansion and (new) bottlenecks (2025 to ...)

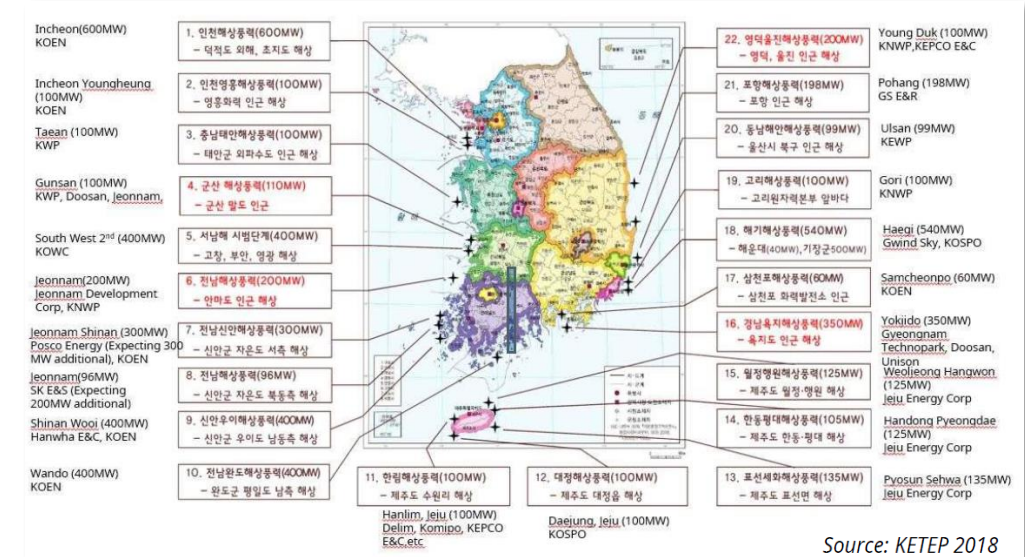
- Standardization and serial production
- Areas **far offshore** are being developed
- Even larger wind farms
- Further expansion of turbine dimensions and associated foundations
- Larger number of specialized installation vessels
- New techniques applied: **floating wind**, XXL monopiles, digitalization
- **Bottlenecks due to the strong growth** in number of operational windfarms: **ecology** (birds), **fishing** sector complaints, ...
- Bottlenecks due to strong growth in the number of wind farms under construction: **shortages** of qualified personnel, specialized ships and equipment, long delivery times for wind turbines
- **Bottlenecks in grid connection** and grid capacity: looking at alternatives like (offshore) production of Hydrogen



Where is Korea now in offshore wind development?

Current Korean Offshore wind characteristics:

- **Open-door principle** to developers with exclusivity by EBL system
- Small average wind farm size (approx. 180 MW)
- **Large uncertainty** and risk allocated to developer with costly early-stage investments
- Scattered permitting process, involving several ministries and governments, resulting in delays
- Stakeholder engagement: **community acceptance** is a complex process
- Grid connection: optimization is needed, timely grid connection and capacity for offshore wind is uncertain
- Unclear **local content** expectations: often foreign OEM's preferred by developers ...
- REC price decline, difficulties with economic feasibility



Source: KETEP 2018

Where is Korea now in offshore wind development?

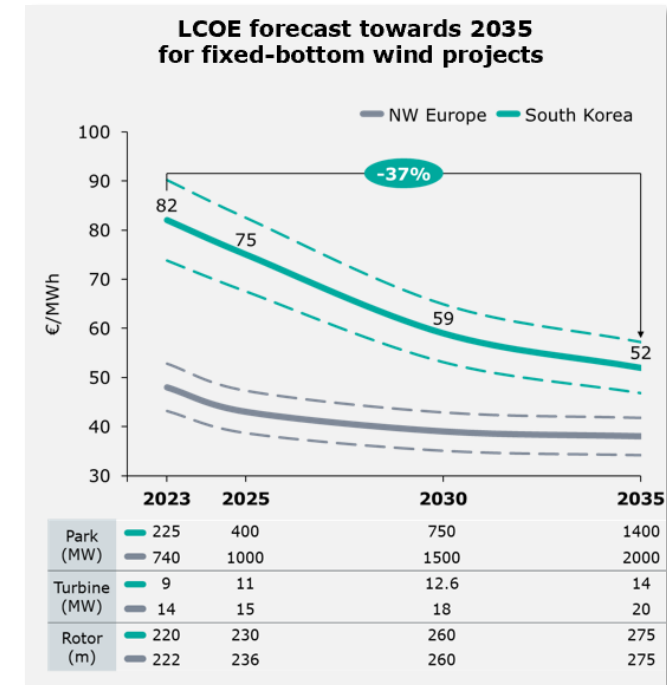
- Position comparable to **Pioneering phase** in Europe, with first steps in Phase 2 :
- Many developers are trying to gain exclusivity and take the first development steps
- Positive:
 - a lot of **experience and expertise** is being built up and many international contacts established
 - **Policy plans** are made with solutions for the bottlenecks and delays
- Negative: relatively **slow realization** of wind farms and a lot of uncertainty
- How do we get to Phase 3, in which upscaling is achieved through rapid realization at low costs?

How do we get to Phase 3 Upscaling offshore wind?

Because lessons learned from Europe can be used and the technology has already been developed, it is **possible to move more quickly** from phase 1 Pioneering to phase 3 Scaling up

This requires:

- **Long-term certainty** (across elections) of deploying offshore wind (clear targets and budgets) anchored in legislation
- Place risks where they can be controlled, for example **solve grid connection problems**
- Implementing a **one-stop-shop** permitting mechanism (as already drafted in policy plans)
- Marine spatial planning by government to use available space efficiently and **ensure larger parks** can be built
- Solve the **Community acceptance** issues as a government
- Facilitate the development of a **Korean supply chain** in **close cooperation** with international suppliers



Source: Accelerating South Korean Offshore Wind Through Partnerships, COWI, AEGIR, PONDERA, April 2021

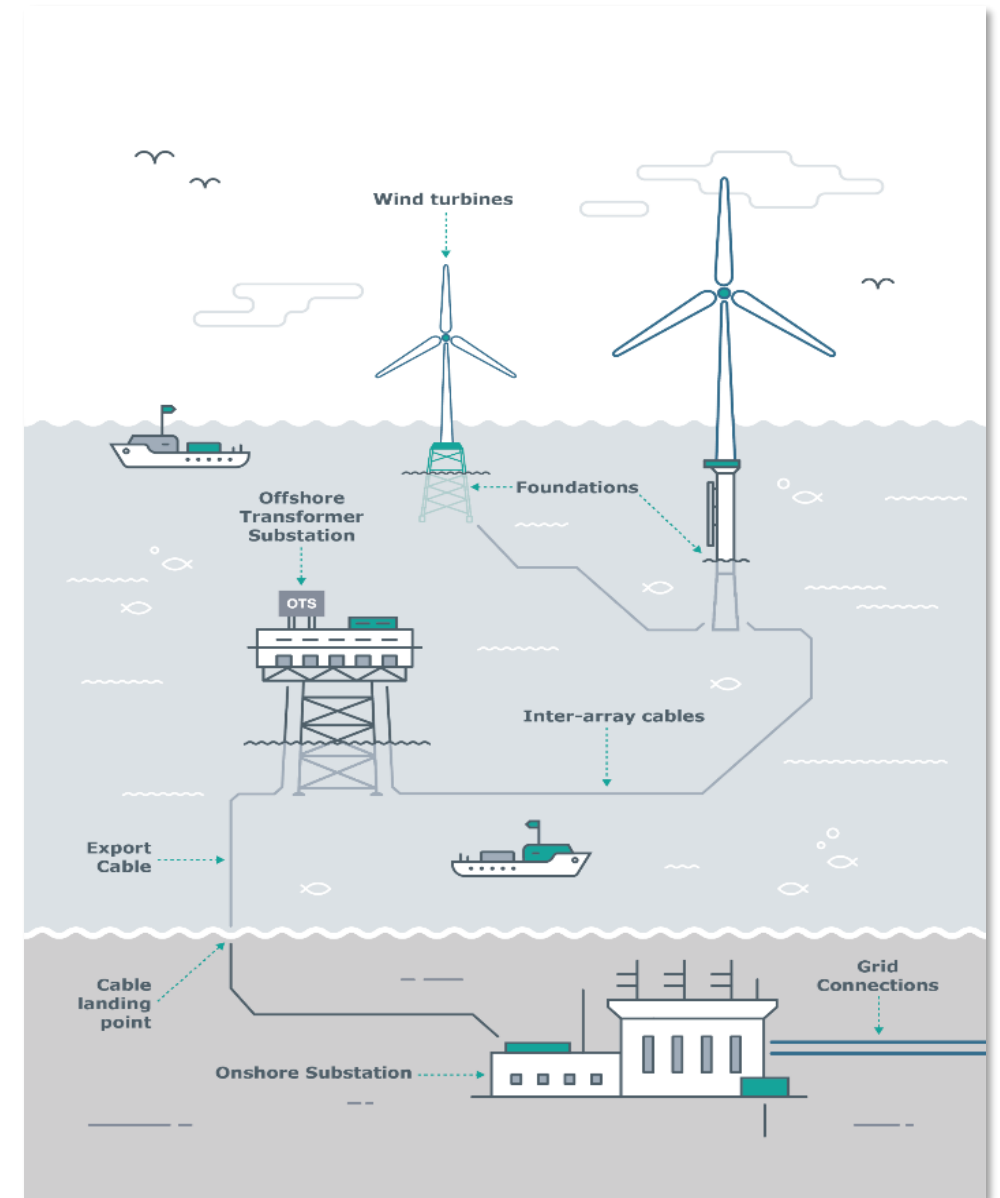
Development of Korean supply chain

- Korea has a **strong ‘we do it by ourselves mentality’** with amazing results in past decades
- Looking at the Korean offshore wind supply chain we see **lots of strength** and opportunities for growth
- **Fast realization** of offshore wind farms at reasonable costs is needed to reach the ambitious 12 GW in 2030 goal
- **Working in partnerships** with international suppliers will strengthen and build up Korean supply chain and result in faster realization and lower costs of offshore wind energy

Development of Korean supply chain in partnerships

Supply chain elements / components:

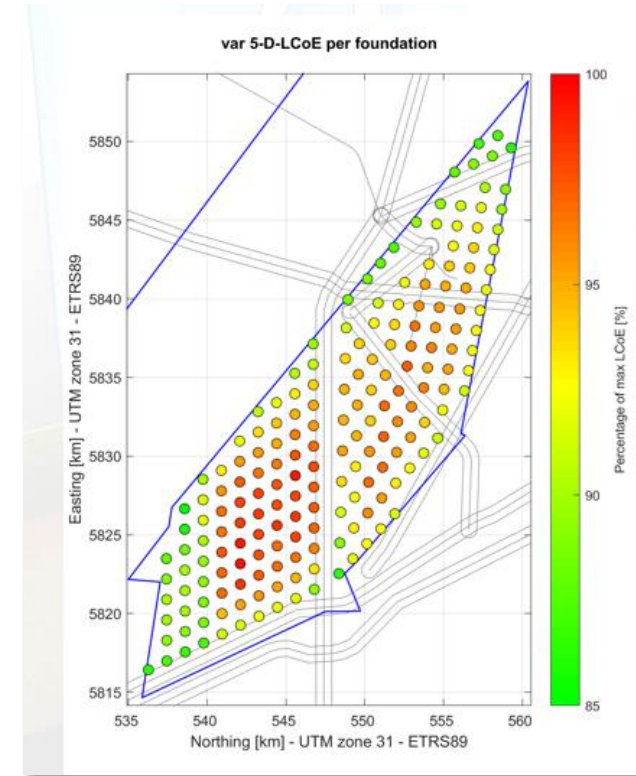
- Project **development**
- Wind **turbines**
- Balance of plant (**BOP**)
 - Foundations
 - Cables
 - Substations
- **Installation** and commissioning
- Operation and maintenance (**O&M**)



Source: Accelerating South Korean Offshore Wind Through Partnerships, COWI, AEGIR, PONDERA, April 2021

Partnerships in project development

- Strengths
 - European: rich **experiences** and **early risk detection** systems
 - Korean: rich Insights into **Korean Conditions and requirements**
- Partnership suggestions
 - European: formation of **suppliers JV** to strengthen weak links
 - Korean: take advantage of proven methods in development and to build a supply chain
 - **Shared ownerships and risks**



Partnerships in wind turbines

- Strengths
 - European OEM' s: **extensive experiences**
 - Korean OEM' s: market entrant
 - Korean components suppliers: good track records
- Partnership suggestions
 - **European OEM' s + Korean suppliers:** to satisfy local content expectations
 - European OEM' s + Korean OEM' s: **possible future joint development (?)** of models specific to the Asia-Pacific region



Photo: GE

Partnerships in BOP

- Strengths
 - Korean: expected to **supply most BOP** except XL monopiles
 - European: capable of **XL monopile** manufacturing
- Partnership suggestions
 - Korean suppliers + European manufacturers
 - **Floating foundations:** jointly developed, expected to supply from 2025 upon



Photo: Tennet

Partnerships in installation and commissioning

- Strengths
 - Korean:
 - Rich understandings in Korean circumstances
 - Track record in vessel design and construction
 - High potential due to experience of **shipbuilding industry**
 - Create specific port facilities
 - European:
 - **Special installation vessels** and **track records**
- Partnership suggestions
 - Increase installation speed with special vessels with experienced crews
 - **Knowledge transfer** by partnerships between contractors (ships and crews), training of Korean crew



Photo: Van Oord

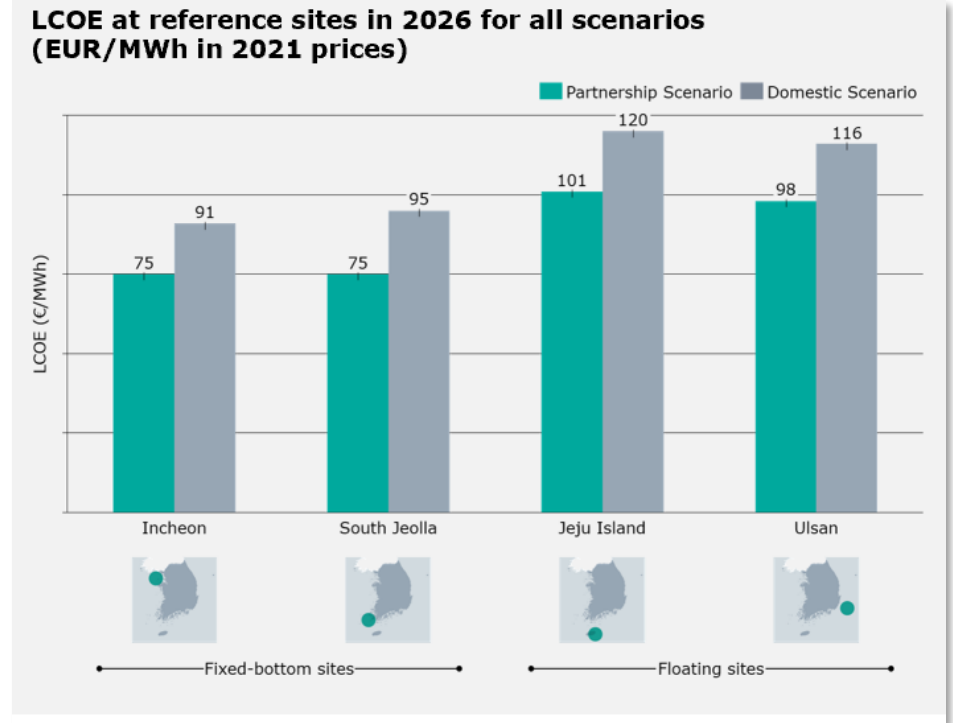
Partnerships overall

Strengths of partnership approach

- **Make use of each other's strengths**
- Korean: rich understandings in Korean circumstances, participation of competent supply chain partners
- European: expertise and experience from mature markets, delivering parts of the supply chain that are not (yet) available in Korea
- **Faster and cheaper realization** of offshore wind farms: contributing to achieve the government's objectives on time

Partnership's spin-off

- **Knowledge transfer**, contribute to the creation of **skilled workforce**
- Opportunity to jointly develop specific elements like wind turbines and floating foundations
- Solid partnerships can develop and build multiple wind farms in a row and become active in the **wider regional ASEAN markets**



Source: Accelerating South Korean Offshore Wind Through Partnerships, COWI, AEGIR, PONDERA, April 2021

To conclude



Photo: Van Oord

- Korea has **ambitious goals** for 2030 and prepared policies to achieve them
- However, offshore wind development is still in the **Pioneering phase**
- A **huge leap** in development is possible with:
 - Rapid **implementation of policy plans**, setting up a **one-stop-shop** issuance system for offshore wind locations, marine spatial planning for large wind farms, expansion of port facilities
 - Development, preparation, construction and installation in **partnerships** of domestic and experienced international supply chain partners using each others specific strengths
- Keep sharp eye on **bottlenecks** in availability of vessels, equipment, wind turbines and human capital
- **Offshore wind energy has a bright future in Korea!**

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