



Unique renewable energy ecosystem  
with arctic expertise

empowered by *g a i a* 

Team Renewable Arctic Finland enables the green transition, even in harsh environments



# Societies and businesses globally are shifting towards carbon neutrality and low carbon solutions



**Strong experience and broad offering** of low emission solutions as well as **shared vision** to respond to the global emission reduction targets brought organizations together to establish the unique renewable energy ecosystem – **Team Renewable Arctic Finland.**

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# Team Renewable Arctic Finland 2021-2022

## - Competencies with great synergies



**ABB**

 **Corporatum**

 **FSS**  
Finnish Sea Service

**HYÖTY  
TUULI®**

**skarta**

**Aker Arctic**  
The Ice Technology Partner

**Danfoss**

 **fortum**

**NOKIA**

 **STEERPROP**

  
**ARCTIA**

**DESTIA**

 **EPV**

**—PONVIA—**

**VTT**

 **Boskalis**  
Terramare

 **enersense**

 **ESL Shipping**

 **RAUMA MARINE  
CONSTRUCTIONS**

**SAVCOR**

  
**WÄRTSILÄ**

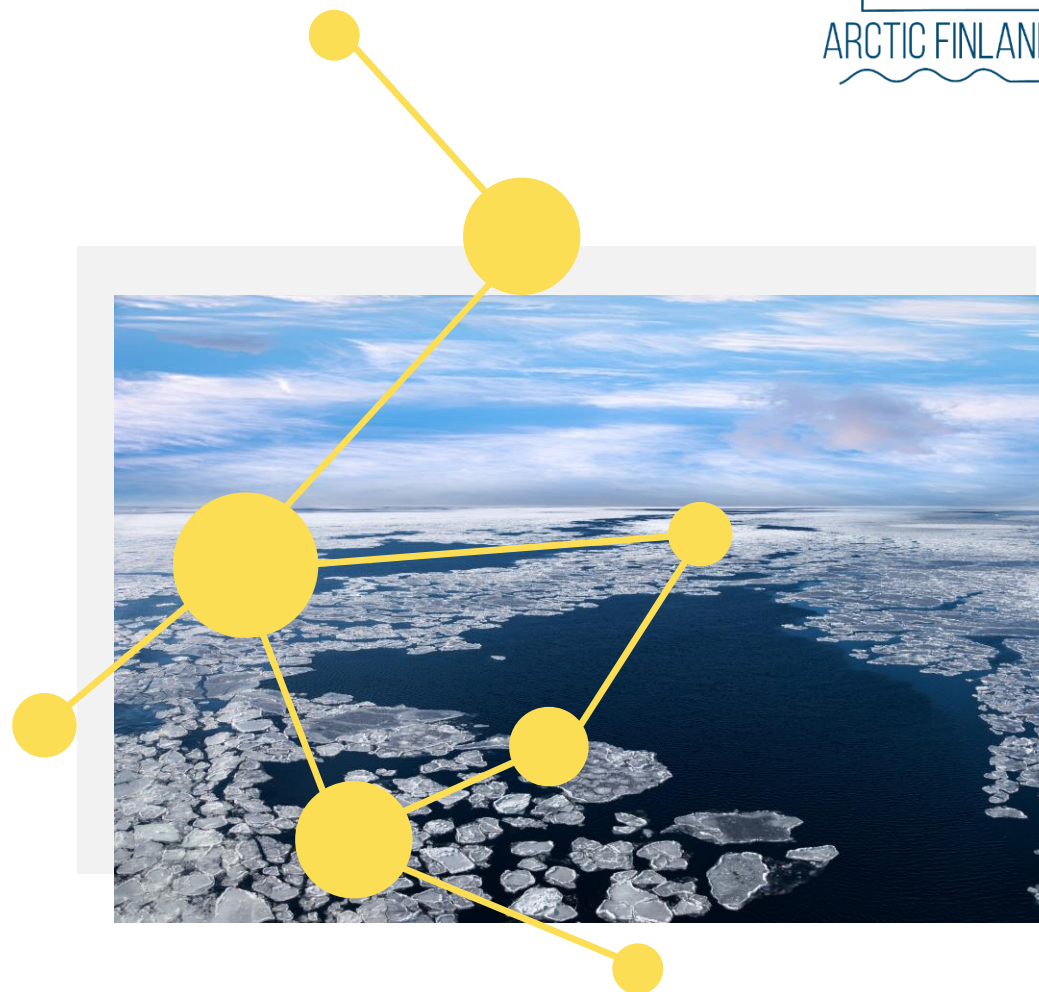
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empowered by *gaia* 

# Partner with strong networks

The Team Renewable Arctic Finland ecosystem **brings together** all relevant stakeholders, investors, businesses, technology and service providers and governmental institutions for creating a competitive offshore domain expertise with a scalable and global export potential.

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# Our customer promise



More value with less  
management efforts

- One contact point
- Access to all relevant players in Finland in one shot

Market-based implementation  
of offshore wind power

- Maximum value and efficiency with integrated, optimized (OPEX, CAPEX) and innovative solutions
- Optimized solutions with concrete total cost reduction opportunities

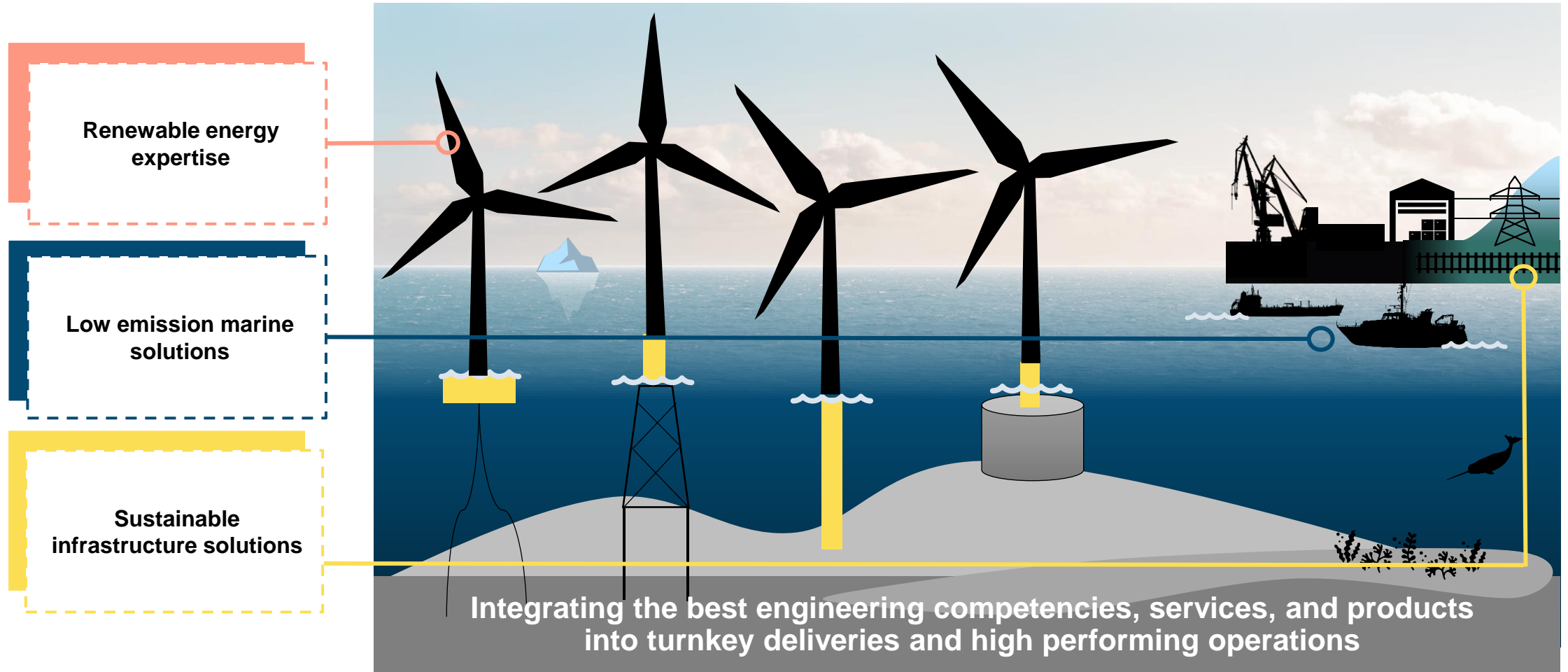
Innovation power with  
reduced design time

- Broad spectrum of competencies with great synergies
- Innovative concept development

Reducing the environmental  
impact throughout  
the value chain

- Sustainable life-cycle solutions
- Environmentally conscious installation techniques
- Low emission solutions

# Total Concept Offering





# Innovations on offshore wind development and construction



## Offshore windfarm development & planning

- Surveys, assessment, measurements
- Design & engineering



## Offshore wind infrastructure & smart solutions

- Offshore wind foundations for harsh conditions
- Structural monitoring & corrosion protection
- Energy transmission
- Grid connection and development
- Power system management



## Offshore wind construction & operations support

- Installation, handling and transport of turbines and foundations
- Seabed preparation, dredging, blasting, slipform casting
- Cable laying and maintenance services
- Shipping and cargo logistics



# Services and solutions for offshore windfarm operations and maintenance



## Maintenance of offshore structures and cables

- Corrosion prevention
- Ice management services



## OW special vessel services

- Work & crew vessel operations
- Vessels suited to local shallow water conditions
- Life-cycle maintenance services
- Remote and machinery condition monitoring services

# Innovations on optimizing logistics, vessel performance and decarbonizing vessels and fleets in extreme environments



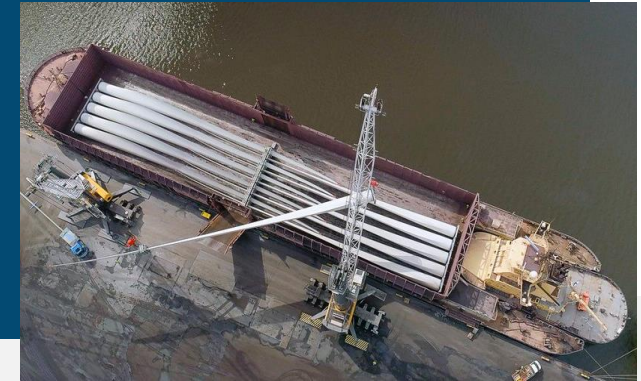
## Design, construction and engineering solutions for special vessels

- Tailored concept and basic design, model testing for freezing seas
- Newbuildings and retrofit upgrades
- Integrated navigation, electrical and automation systems
- Positioning systems



## Technology enabled decarbonization and improved vessel performance

- Wide range of energy efficient and zero emission propulsion solutions
- Advanced vessel power, equipment and solutions
- Fuel efficient engines and hybrid power systems



## Optimization of total logistics and cost-efficiency of offshore wind farms with floating storage solutions

- Special vessel services for local shallow water conditions

# Sustainable infrastructure solutions for high performing offshore operations and logistics



## Port engineering, design & construction

- Offshore base facilities
- Winterization supporting all-year operation of ports
- Fairway construction
- Underwater monitoring and corrosion protection
- Dredging, blasting, slipform casting



## Solutions for smart grid and electrification

- Shore-side electricity
- Electricity and new fuels
- Energy storage solutions
- Power conversion



## Smart solutions for optimal, cyber secure and reliable operations

- Fixed networks and mobile digital platforms
- Digital connected workers
- Situational awareness

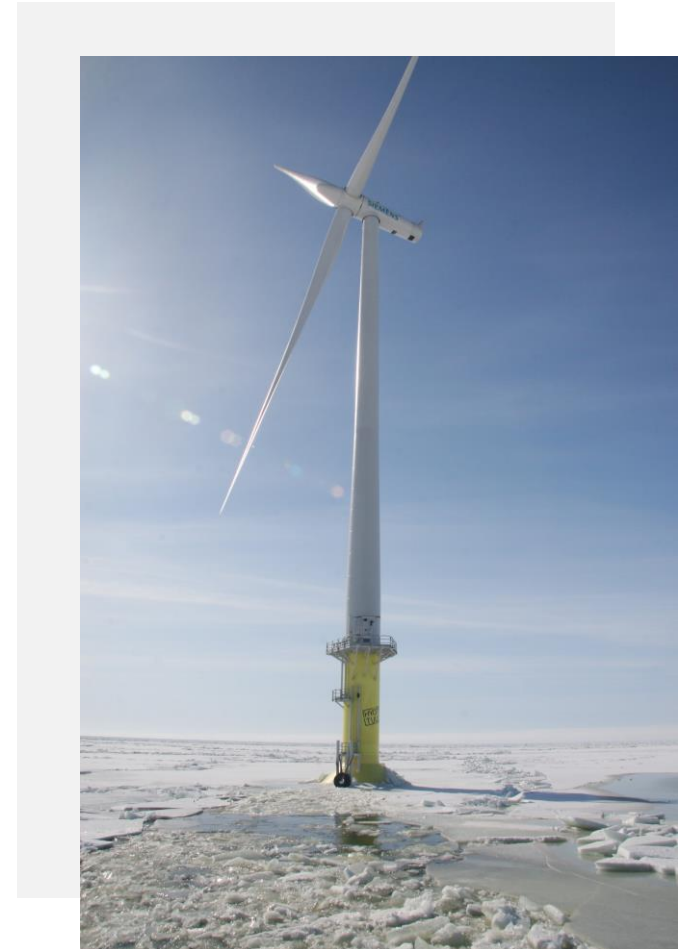
Proven know-how with  
several successful demanding projects  
in remote areas and harsh conditions



# Capabilities for local presence and condition knowledge (e.g. Baltic Sea)



- The world's first offshore windfarm designed for demanding ice conditions is located in Tahkoluoto, Pori, Finland.
- The cold and icy conditions have required special technical solutions
  - Foundations by Enersense Offshore
  - Maintenance vessels by Finnish Sea Service
  - Operated by Suomen Hyötytuuli
- Estimated annual power production approx. 155 GWh

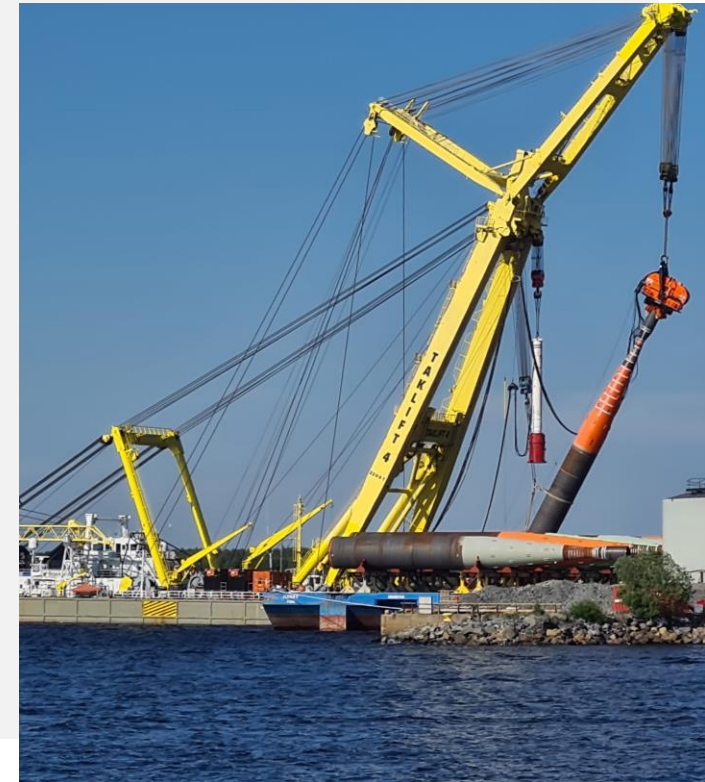




# Reliable and proven execution expertise



- Monopile foundations for sea marks in Oulu's new fairway (2020)
- Offshore structures designed and manufactured by Enersense Offshore
- Monopile foundations installed by Boskalis Terramare





# Broad spectrum of sustainable and low-carbon marine technologies, solutions and services



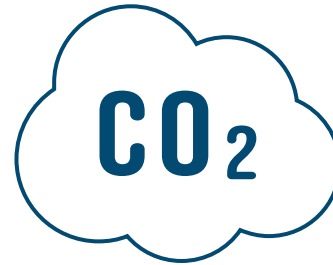
Versatile ice strengthened and LNG powered fleet built for the demanding conditions in Arctic and remote waters.

# Vision and facts of the OW investment environment in Finland



## **Knowledge-based and innovative economy**

Finland as a dynamic and stable society and economy with multiple innovation funding possibilities, active in private-public sector dialogue and international networking



## **Carbon-neutral Finland by 2035**

Government's climate policy



## **Offshore transmission**

National plan to strengthen the main transmission network by 2035

# Maritime Spatial Plan supports Offshore Wind development



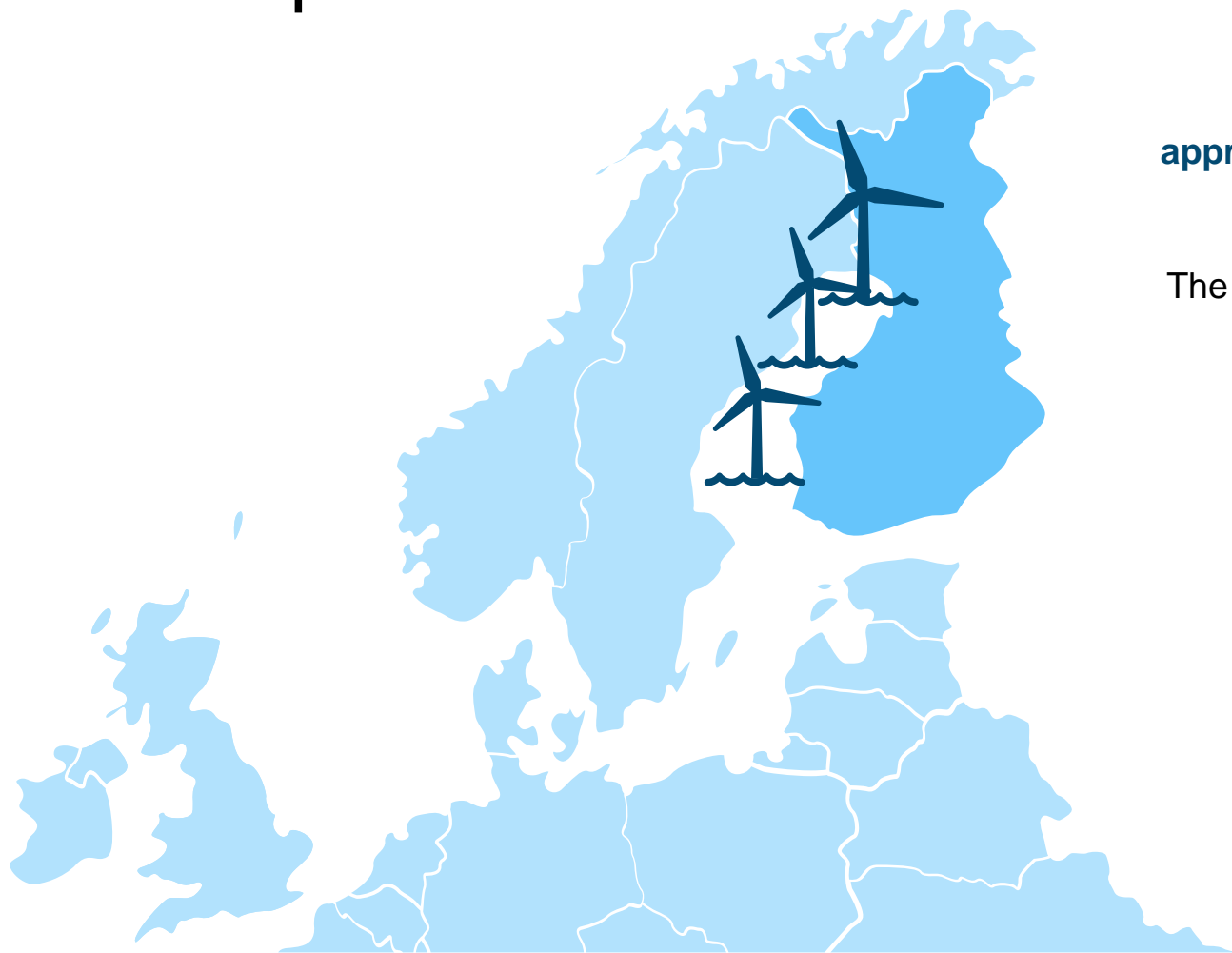
The Maritime Spatial Plan designates a total surface area of **approx. 3,500 km<sup>2</sup>** to offshore wind power production, which will enable an output of **approx. 15.7 GW**.

The designated sites are large enough to accommodate also big **(1000 MW) windfarms**.

Areas for offshore wind power are mainly located in the outer archipelago and outer coastal water, and open sea zones, **at least 10 kilometres from the coast and in a depth of 10–50 metres**.

Existing port facilities supporting OW development

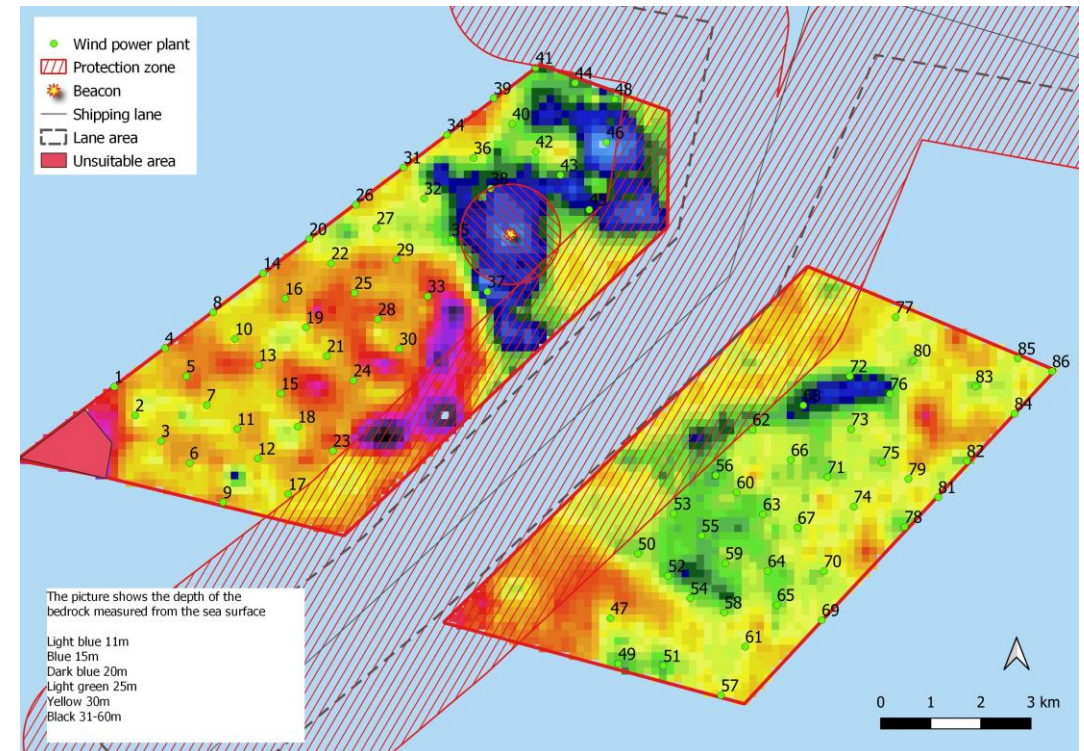
**Seafaring areas, depth, Natura 2000 areas and other nature values, landscape values and national defence requirements**, among other things, have been considered when indicating the potential areas.  
(merialuesuunnitelma.fi)



# Hypothetical modelling of 1 300 MW Windfarm



- The hypothetical windfarm consists of 86 x 15 MW turbines
- Modelling and calculations support the understanding of cost and risk factors and provide data for concrete concept development



The areas under review have been selected on the basis of the energy areas identified in the Marine Spatial Plan

Data on seabed soil types, bedrock depth and sediment layer thickness is provided by the Finnish Geological Survey

Team Renewable Arctic Finland is Your versatile  
partner to support the joint journey towards cleaner  
world



# One contact point to manage the optimal network

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# Team Renewable Arctic Finland Ecosystem



## TRAF partners

Bladefence	Ramboll
Flexens	Saab
Foreship	Sweco
Hitachi ABB Power Grids	Teknos
MacGregor	Vaisala
Millog	Selected Finnish ports
Mobimar	
Prysmian	



## Key stakeholders

Aalto University	Metsähallitus
Centre for Economic Development, Transport and the Environment	Ministry of Defence
Fingrid	Ministry of Economic Affairs and Employment
The Finnish Defence Forces	Ministry of Environment
Finnish Environment Institute	Natural Resources Institute Finland
Finnish Meteorological Institute	Regional State Administrative Agency
Finnish Wind Power Association	Ålands Landskapsregering
Geological Survey of Finland	

## Client segments

energy, infra, marine