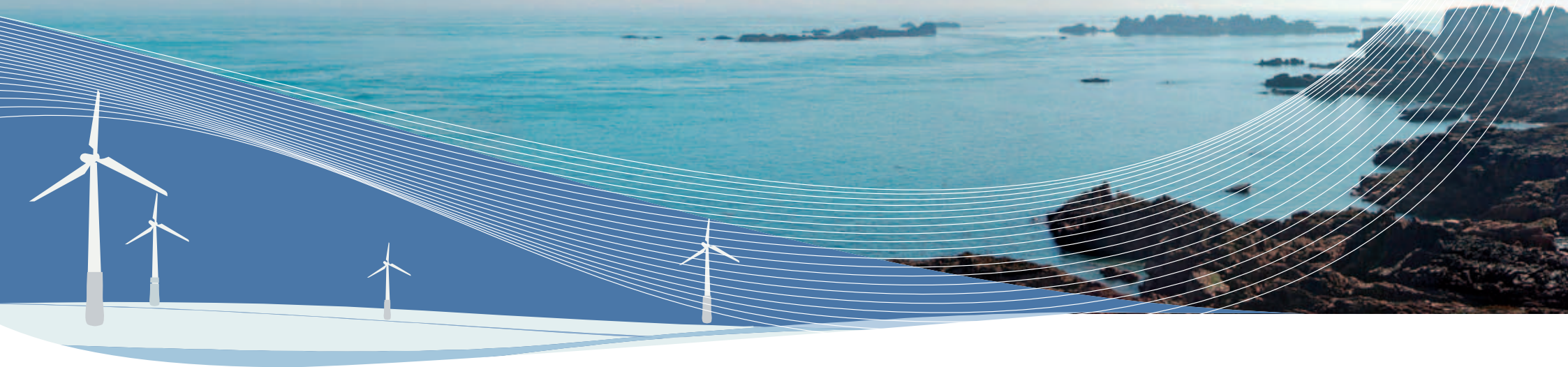


Wind farm project in the Bay of Saint-Brieuc

SUMMARY of the contracting authority's file

Public debate March-July 2013



Ailes Marines S.A.S.
créée par

**eole
res**

 **IBERDROLA**

Why an offshore wind farm in the Bay of Saint-Brieuc?

Due to diminishing energy resources worldwide, and the reality of global warming

Nearly 80% of the world's energy consumption (transport, industry, heating)⁽¹⁾ results from fossil fuels (oil, coal, etc.). However, according to the International Energy Agency, oil stocks will run out around 2050, while gas stocks will run out in 2070.

Global warming related to increased greenhouse gases, notably produced by the combustion of fossil fuels, is now a reality. If a proactive energy policy is not implemented soon, the temperature of the planet's surface could experience an increase ranging from 1.8 to 4.0°C by 2100⁽²⁾.

The situation in France

Growing electricity demand

In France, electricity represents 42% of the overall energy consumption. Electricity usage is increasing faster than is the case with other types of energy. The 10 historical consumption peaks recorded by the Réseau de Transport d'Électricité (RTE), the public electricity grid company, have all occurred in the last 6 years.

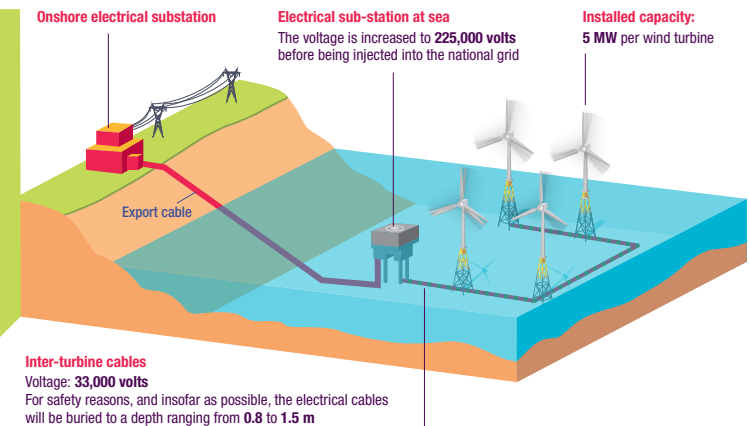
What is the source of this electricity?

In 2011, 77.7% of the national electricity production was of nuclear origin, 9.5% of so-called "classic" thermal origin (i.e. electricity produced from fossil fuels), 9.3% of hydroelectric origin and 2.2% of onshore wind origin⁽³⁾.

Increasing the production of electricity from renewable energies would help to improve the diversification of the resources, and therefore France's energy independence. This would also mean a decrease of greenhouse gas emissions.

THE OPERATION OF A WIND FARM AT SEA

Wind turbines are used to transform wind energy into electrical energy. The wind turns the rotor, that has 3 blades, and drives a generator that produces electricity. For the greatest possible efficiency, the blades are always oriented to adapt to the wind. All of a wind farm's turbines are connected, via a network of cables at sea, to an electrical sub-station, thanks to which the energy produced by the wind turbines (33 kV) is transformed in order to comply with the voltage of the on-land network (225 kV). Via a submarine cable, this energy is then routed to the public grid, and thus to consumers.



AREVA
M5000-135
wind turbine

The wind turbine model

Wind turbines, clean energy

Wind energy is considered to be a clean energy, since it does **not directly produce CO₂ or pollution within its surroundings on the operating site**. Today, more than 4 million people in France are supplied by the 600 land-based wind farms installed throughout the country.

The difference between wind farms on land and at sea

Compared to a land-based wind turbine, an offshore wind turbine **offers a greater yield**, but must take into account the specifics of the marine setting, notably in the design of the wind turbines, their foundations and also their operation. There are currently no commissioned offshore wind farms in France. And yet, France has the best wind “potential” in Europe after the United Kingdom⁽⁴⁾.

In Europe, offshore wind farms are developing very quickly

By late 2011, 53 offshore wind farms were in service in 10 European countries: the United Kingdom, Denmark, Netherlands, Germany, Belgium, Sweden, Finland, Ireland, Norway and Portugal. **Looking ahead to 2020, European countries wish to increase the installed offshore capacity by tenfold.**

The State's commitments

The State has been committed to renewable energies since the early 2000s. Launched on 6 July 2007, the Environment Roundtable confirmed this strategic direction with the objective of increasing the share of renewable energies (wind, solar, hydroelectric, biomass, biogas and biofuels) **to 23% within the overall energy usage**

DIALOGUE AT THE HEART OF THE AILES MARINES PHILOSOPHY

For Ailes Marines, the project's success is based to a large extent on considering the stakeholders involved in building a project which is based locally. Since late 2009, more than 200 meetings have been organised with the stakeholders in question: elected officials, socio-economic players, users of the sea, environmental and citizen associations. In this way, the expressed needs and expectations regarding various aspects of the project – notably technical – have been taken into account.

Some of these meetings were also held within the framework of a committee from the renewal energy sector, working groups and a local consultation body. The public debate will serve to extend and complete this initiative with local dialogue and information systems maintained after the confirmation of the project's continuation by Ailes Marines.

by 2020. Specifically regarding wind energy, it set the target: **installed capacity of 25,000 megawatts (MW) by 2020, including 19,000 MW of onshore wind farms and 6,000 MW of offshore wind farms and marine energies**. Today, the considerations surrounding the evolution of the energy policy in France are continuing, with the national debate on the energy transition that began on 29 November 2012.

Brittany, an “electric peninsula”

Brittany only produces 10% of the electricity that it consumes⁽⁵⁾, which makes it an importing territory with a major deficit in this domain. To reduce the region's electrical dependency and to guarantee a constant power supply for the inhabitants (and thereby avoiding any risks of electricity cuts), the Brittany Regional Council, the State, the ADEME, the Agence nationale de l'habitat (ANAH) and RTE signed the “**Brittany electrical pact**” in 2010.

This pact has 3 objectives:

- > **controlling the electricity demand;**
- > **securing the sourcing;**
- > **the massive rollout of renewable energies, including offshore wind farms.**

On the planning for the offshore wind farm invitation to tender

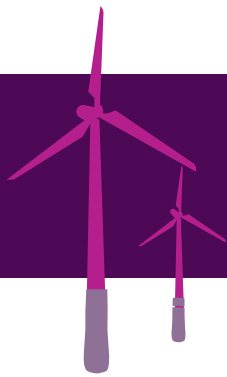
At the end of a planning and consultation process carried out in all maritime regions of mainland France (including Brittany), for the purpose of identifying areas off the French coasts that would be suitable sites for offshore wind farms, the State decided to launch an invitation to tender for the construction and operation of wind farms on 5 sites: Le Tréport (Seine-Maritime), Fécamp (Seine-Maritime), Courselles-sur-Mer (Calvados), Saint-Brieuc (Côtes-d'Armor) and Saint-Nazaire (Loire-Atlantique).

Three main criteria were used to separate the candidates: the price of the electricity, the industrial plan and the consideration of existing activities and the environment.

On 6 April 2012, the company Ailes Marines SAS was awarded lot n°4 (Saint-Brieuc).

Sources: (1) AIE, Key World Energy Statistics, 2009. (2) World Bank report, November 2012 (3) RTE, Bilan électrique 2011. (4) ADEME. (5) Bilan électrique RTE, 2011.





What project for the Bay?

A balanced installation, respectful of the existing activities

The invitation to tender specifications included the primary objective of producing a wind farm with a power rating of 480 to 500 MW within a predefined boundary of 180 km².

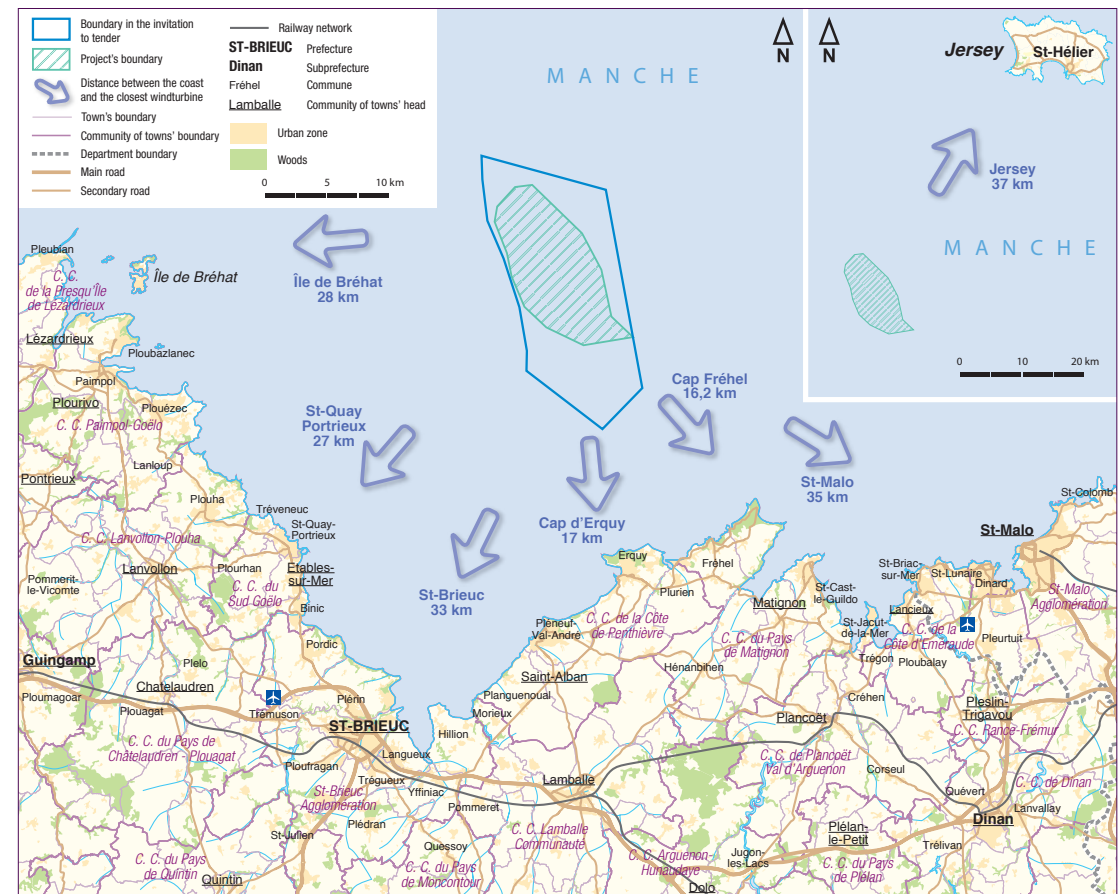
Within this framework, Ailes Marines designed a project with a minimal impact, with the aim of technical and environmental optimisation. Ailes Marines considers that this is the best compromise between:

- > the project's technical and economic feasibility;
- > the expectations and demands expressed by the local stakeholders during the consultation carried out by Ailes Marines, with the necessary consideration of existing activities (most notably fishing);
- > the integration of the project-related environmental and landscape matters.

In an effort to reduce the wind farm's footprint on the maritime domain, Ailes Marines proposes a site covering 77 km², i.e. 43% of the boundary in the invitation to tender. In this way, this location will serve to:

- > avoid the favoured areas for commercial fishing;
- > limit the impact on the landscape quality of the coast of Northern Brittany;
- > avoid the presence of wind turbines in the Natura 2000 area.

THE PROJECT'S BOUNDARY



THE WIND FARM'S KEY FIGURES

PLANNED NUMBER OF WIND TURBINES: **100**

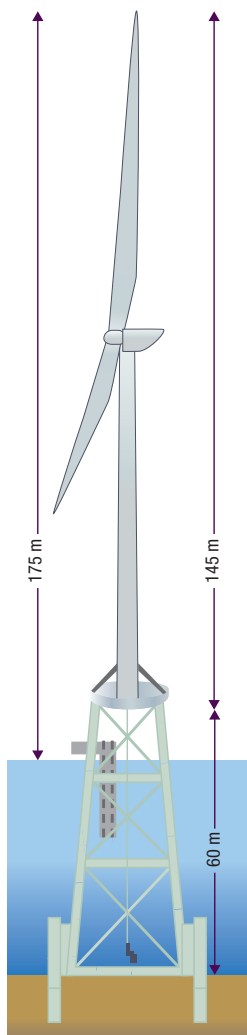
WIND FARM AREA: **77 km²**

DEPTH: **34 m on average**

DISTANCE FROM THE COAST: **16.2 km at the closest point**, 76% of machines 20 km or more from the coast

TOTAL OUTPUT OF THE FARM: **500 MW**

ANNUAL ELECTRICITY PRODUCTION OF THE FARM: **around 1,750 GWh**, i.e. the equivalent of the annual electricity usage in 2010 of 790,000 inhabitants (including heating)



AREVA M5000-135 wind turbine on a jacket type foundation

The wind turbines: M5000-135 model selected

Several criteria led Ailes Marines to select the M5000-135 wind turbine produced by AREVA, with a unit power rating of 5 MW, including:

- > **reduction of the number of wind turbines and therefore of the farm's footprint on the maritime public domain**, while reaching the capacity indicated in the invitation to tender (i.e. between 480 and 500 MW);
- > **reliability and technological maturity**. Indeed, amongst the high power models designed to resist maritime conditions, the AREVA M5000 wind turbines have already proven their reliability since 2009 at the Alpha Ventus wind farm at sea (Germany).
- > **optimisation of maintenance operation**. The M5000 wind turbine was designed such as to reduce the frequency of on-site maintenance operations, through the use of a remote control and command system.

From the foot of its tower to the tip of the blade, the M5000-135 wind turbine measures 145 m. Its weight is 738 tonnes (excluding foundations).

The foundations: the jacket solution is the preferred choice

Amongst the various types of existing foundations (monopile, tripod, gravity base, floating), **jacket type foundations** (iron lattice) provide:

- > **a technical solution suited to the significant and variable water depths** from one end of the site to the other, and to the conditions on the seabed within the Bay;
- > **a solution supported by fishing organisations**, which in fact expressed a preference for this type of foundation;
- > **a lasting industrial solution**, since this type of foundation can be exported, notably to European wind farms in the project stage, resulting in the potential continuation of their manufacturing activity;
- > **an optimised solution for installation at sea**;
- > **a solution that facilitates dismantling**, as their steel structure is suitable for recycling.

An optimised cabling plan at sea

The purpose of the inter-turbine cabling is to gather the energy produced by each wind turbine and route it to the electrical sub-station at sea. It was on the basis of the layout plan for the machines that Ailes Marines was able to define, during the consultation process, **a cabling plan that would respect sea users**. Insofar as possible, the cables will be buried (between 0.8 and 1.5 m in depth), with the aim of reducing the risks of fishing gear getting caught up in the cables. The number of kilometres of cable will also be reduced as much as possible, such as to limit the impact on fishing practices.

Special note

The description of the connection of the wind farm's electrical network to the onshore electrical grid, for which RTE is responsible, is presented in detail in **a document appended to this document**.

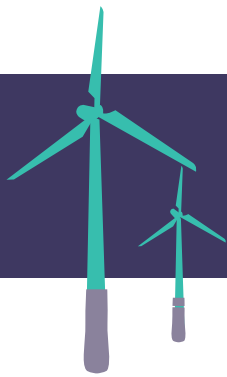
THE PROJECT'S COST AND THE PRICE OF THE ELECTRICITY PRODUCED BY THE FARM

Excluding the connection to the electrical grid, the project's investment cost is estimated at **€2 billion**. To a large extent, this corresponds to the cost of buying the machines, the foundations, the electrical sub-station at sea and the cables, as well as the cost of installing all of this equipment at sea. The investment is entirely private, with no public subsidy.

The price of the electricity was one of the three awarding criteria during the invitation to tender. The price proposed by Ailes Marines is within the range in the specifications, i.e. between 140 and 200 euros per megawatt-hour. Under French law, this electricity of renewable origin must be purchased by EDF. Its cost is financed by the Electricity Public Service Contribution (French acronym CSPE) that is fairly applied to each electricity invoice (individuals and companies).

GUARANTEEING THE BEST SAFETY CONDITIONS

One of the primary concerns of Ailes Marines is maritime safety in and around the wind farm, during both the installation and operational phases. Measures intended to reduce and limit the risks related to the farm's presence (set-up of new navigation routes, illuminated beacons...), will be defined in collaboration with the competent authorities. In the end, it is these authorities that will validate the Ailes Marines proposals in this area.

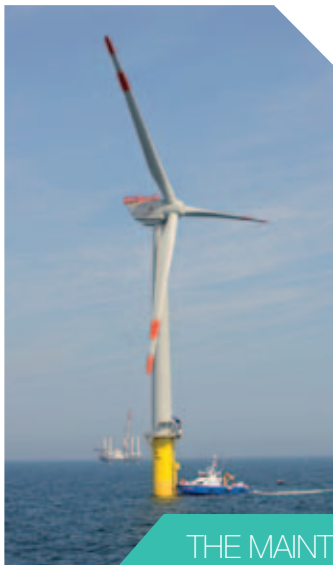


An industrial plan for Brittany and Western France

A lever for socio-economic development

A job-generating project

The project for the offshore wind farm in the Bay of Saint-Brieuc will create **2000 direct jobs** primarily located in Western France, with a potential of up to **1000 jobs in Brittany**. 1860 jobs will be dedicated to the manufacturing of the elements comprising the farm (wind turbines, foundations, electrical sub-station, etc.) and to their installation at sea (engineering activities, logistics and the installation process itself). Moreover, Ailes Marines plans to create **140 jobs related to the maintenance of the installed wind farm** (operations at sea, personnel transportation and supervision). For operational and logistical reasons, they will be **located in the Bay of Saint-Brieuc** (near the selected maintenance port) for the entire lifespan of the wind farm, i.e. a minimum of 20 years.



THE MAINTENANCE PORT

The maintenance operations will primarily be carried out from a so-called “maintenance port”. The main criteria taken into account for the choice of this port are: the distance from the wind farm, the port’s maritime and road accessibility and its ability to accommodate the necessary related structures (quays, buildings...). Also influencing the final choice is the timeframe needed to build these infrastructures, which depends on technical and legal constraints specific to each site. The 3 ports selected by Ailes Marines are Erquy, Saint-Cast-le-Guildo and Saint-Quay-Portrieux. In view of the constraints and needs expressed by Ailes Marines, the Côtes-d’Armor General Council, the owner of these ports, has studied each port’s technical proposals. A departmental consultative commission in charge of hearing from each of them met in January 2013. The departmental assembly will express its preference for the choice of the maintenance port in 2013.

On top of the direct jobs, there will be **indirect jobs** notably through industrial subcontracting and service aspects (accommodation, food services, transportation, etc.) for each of the phases of the wind farm’s manufacturing, installation and operation.

The ports, key elements for the project

For the construction of the elements comprising the wind farm, the landing sites for the equipment must **guarantee a large reception area and storage capacity, and good maritime, road and railway accessibility**. The port of Le Havre has been selected by AREVA for the construction of the M5000-135 wind turbines. The new industrial base will consist of an assembly plant for the nacelles, a production plant for the blades, a test bench and a pre-assembly and storage area for the components.

Regarding the manufacturing of the electrical sub-station and jacket foundations, STX France and Eiffage have been shortlisted. For Ailes Marines, the preferred solution for the installation of the plants would be the **port of Brest**. Brest is the only port in Brittany capable of accommodating the manufacturing and storage area for these elements, given its capacity (available surfaces) and accessibility.

Identifying and supporting Breton suppliers

Ailes Marines and its partners have undertaken, with the help of the regional economic organisations, to seek potential suppliers in France, but most specifically in Brittany and Western France. The aim is to give regional SMEs an opportunity to take part in the manufacturing of the wind farm’s various elements.

- > **For the manufacturing of the wind turbines:** from 2011, the AREVA group has made efforts to identify, regroup and involve the industrial, socio-economic and institutional stakeholders in Brittany and Normandy, around possibilities for collaboration in the manufacturing of the wind turbines.
- > **For the manufacturing of the foundations and electrical sub-station:** in order for the installation of a foundation plant in the port of Brest to be accompanied by the development of a large network of specialised suppliers, STX France and Eiffage are working to identify and qualify suppliers from within the Breton economic fabric. A similar initiative will be undertaken for the activities related to the wind farm’s installation phase at sea.

The development of an on-going and exporting French industrial sector

Lasting jobs

As part of its development, the offshore wind industry is creating **qualified and lasting jobs**. The deployment of wind farms at sea is now taking shape as a promising business sector in Europe: the EWEA⁽⁶⁾ considers that by 2020, the European wind energy sector could employ 462,000 people, including 169,500 jobs in the offshore business⁽⁷⁾.

The creation of a French industrial sector

Ailes Marines and its partners will participate in the **creation of a competitive industrial sector for offshore wind in France**. There is also the possibility for the companies involved to access **new outlets and export markets**.

Taking environmental and landscape sensitivities into account

This potential is notably encouraged by the consortium's firm establishment in the British market, by AREVA's choice to set up shop in Le Havre and by the manufacturing of the foundations and sub-station in the port of Brest, since all of these sites are ideally suited for supplying offshore wind farms in the south of the United Kingdom.

Employment and Training Plan with the local stakeholders

Professional training and qualifications for future employees are crucial for the project's completion and the creation of a new industrial sector in France.

Two major challenges must be met:

- > adapting existing training possibilities in Brittany (electro-mechanical, industrial mechanics, maintenance technicians...) to the specifics of offshore wind farms, and reviving some of the training that is losing momentum (boiler-making, for example);
- > training and/or qualifying resources needed for the construction and operation of new industrial sites.

⁽⁶⁾ Source: European Wind Energy Association.

⁽⁷⁾ Source: *Le journal de l'éolien* n°10, Euroserv'er, February 2012

SUSTAINABLE FISHING PROJECTS IN THE BAY OF SAINT-BRIEUC

As of the design of its project, Ailes Marines wished to involve the fishing authorities from the Bay of Saint-Brieuc in the project's definition. Over and above this desire, Ailes Marines has lent its support to sustainable fishing projects that relate to the territory's current needs and issues. Several projects have been selected, in agreement with the fishing authorities, including: campaigns to eradicate slipper shells and to reseed cleared areas with millions of scallop broods, the installation of refrigerated lobster crawls, as well as a study on the "artificial reef" effect of the jacket foundations.

Environmental sensitivities

The preliminary environmental studies carried out by Ailes Marines during the invitation to tender phase led to the definition of a project that respects the environment.

These studies relate to the physical setting (current, tide, swell, geology, sedimentology, water quality), the living environment (benthic fauna and flora, fishery resources, marine mammals, birds and bats), natural and heritage settings, as well as the landscape.

The initial identified impacts take into account all of the phases of the wind farm's life, namely installation, operation and dismantling. These impacts have been assigned measures intended to mitigate, reduce and even eliminate them.

The main effects of the installation phase will be noise and the production of sediment suspended in the water, caused by the

installation of the foundations and electric cables. These effects could have an impact on marine mammals, fishery resources or even the benthos (flora and fauna living on the seabeds) that are present within or near the area of the works. **The project's envisaged technical choices** (foundation type, work methods, progressive start-up of the installation operations, water quality monitoring...) **will help to reduce the potential impacts.**

The possible effects on avifauna primarily involve the operational phase. Indeed, the presence of very high structures could result in a risk of collisions and the possibility of a modification to flight trajectories.

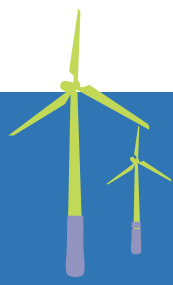
To complete its understanding of the considerations in this area, **Ailes Marines is currently undertaking additional studies in order to more accurately identify how the area is used, and how often.** This information will lead to a more detailed assessment of the project's impacts and, accordingly, to the proposal of measures that will be implemented during each of its phases. Also, monitoring throughout the life of the project will help to confirm and, if necessary, adapt these measures.

Landscape optimisation

The project's visual impact is one of the major criteria in the choice for setting up the offshore wind farm in the Bay of Saint-Brieuc. Indeed, many remarkable natural sites dot the coast of the Bay. For Ailes Marines, the objective is twofold: **integrating the wind farm into the landscape and safeguarding the dynamic tourism**, which represents the department's second economic sector.

In this context, the approach by Ailes Marines has been to stay as far away as possible from the coasts, within the limits of technical possibilities, in order to limit the visibility of the wind turbines, notably for emblematic classified sites such as the Cap d'Erquy and the Cap Fréhel. **As such, the closest wind turbine is 16.2 km from coast, with 76% of the machines more than 20 km from any point along the coast.**

We note that while wind turbines are large structures, their actual perception must be assessed while considering several factors, including the observer's distance and altitude, the curvature of the earth, but also the meteorological and atmospheric conditions in the Bay.



About AILES MARINES

In partnership with AREVA, TECHNIP and NEOEN MARINE, IBERDROLA and EOLE-RES responded to the invitation to tender launched by the French government in 2011, relative to offshore wind farm installations off mainland France. Selected for the offshore wind farm project in the Bay of Saint-Brieuc in April 2012, IBERDROLA and EOLE-RES decided to create a simplified joint stock company (SAS) called Ailes Marines, with 70% and 30% respective ownership. It is in charge of the wind farm's development, construction and operation. IBERDROLA and EOLE-RES both have

extensive experience in renewable projects throughout the world, including a significant number of projects for wind farms at sea.

In France, IBERDROLA and EOLE-RES have been working together on onshore wind farm projects since 2007. Building on this experience, the two companies were able to set up an integrated project team for Saint-Brieuc by combining the skills and expertise of both entities.

IBERDROLA	EOLE-RES
<ul style="list-style-type: none"> – Energy producer and supplier – International group established in 40 countries, 30,000 employees, 46,300 MW of installed capacity – Worldwide leader in the wind energy sector with 14,300 MW of installed capacity (September 2012) – Major player in the offshore wind industry in Europe, with a project portfolio of more than 12,500 MW – Historical player in onshore wind farms in France 	<ul style="list-style-type: none"> – Renewable energies developer and operator – Group resulting from the merger of Eole Technologie (development of wind farms since 1995) and of Renewable Energy Systems (RES) – Major presence in offshore wind farms in the United Kingdom, notably in the Irish Sea (4,000 MW in project phase) – In France, 420 MW of installed renewable energies (wind and solar) and 3,000 MW in project phase

THE PARTNERS AND MAIN SUPPLIERS OF AILES MARINES

To successfully carry out this project, IBERDROLA and EOLE-RES have set up a consortium with three additional partners:

- > a major French industrial company in the energy sector: AREVA, in charge of manufacturing and maintaining the future wind farm's turbines;
- > a French specialist in complex works at sea: TECHNIP, in charge of the wind farm's installation at sea;
- > an historical French developer of wind farms at sea: NEOEN MARINE, contributing its knowledge of the territory and of the project's stakeholders.

This consortium also includes 2 additional major French suppliers: Eiffage and StX, for the manufacturing of the foundations and electrical sub-station at sea.

The consortium considers that the combination of skills, industrial expertise and know-how of these companies will provide the full range of necessary resources for the Saint-Brieuc project.

The project's provisional schedule through to dismantling

