Offshore wind farm of Calvados

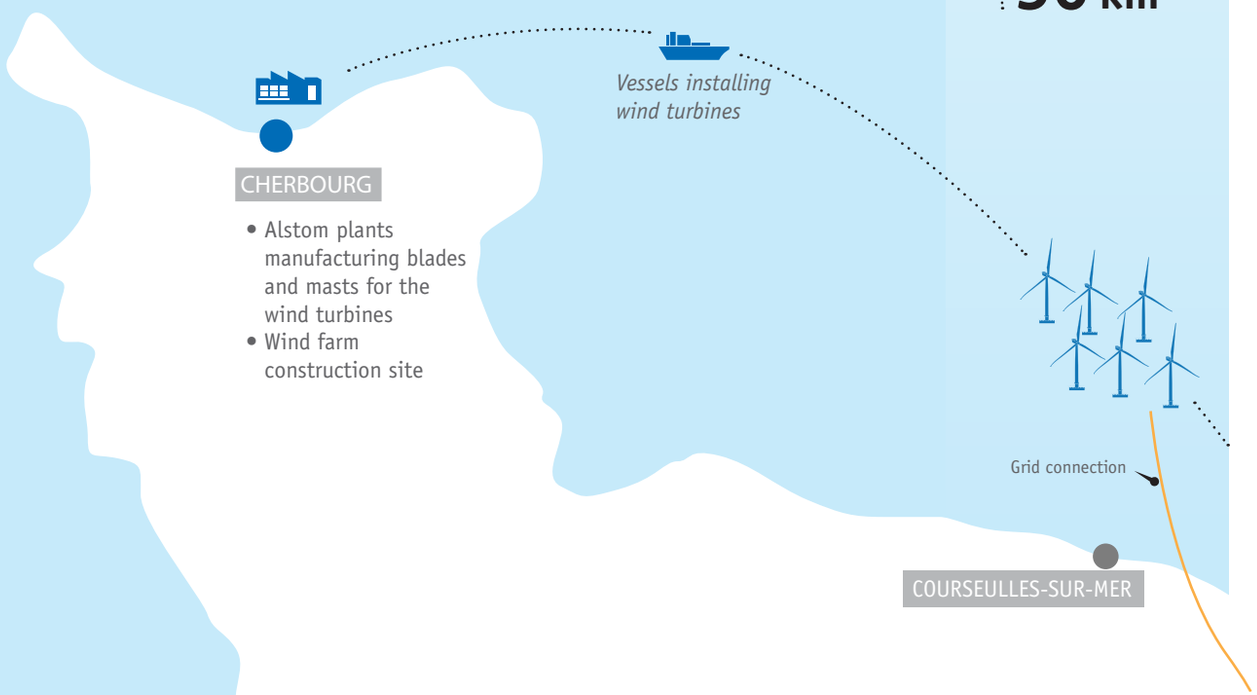
An energy of the **future** coming from the sea

MAP
showing the location of the Calvados offshore wind farm

Calvados offshore

75
wind turbines

surface area of
50 km²



Why do we install wind turbines off the coast of Calvados?

PIONEER LOCATION OF OFFSHORE WIND IN FRANCE, THE CALVADOS WIND FARM WILL BE A SHOWCASE IN BASSE-NORMANDIE REGION

LAURENT BEAUVAIS
President of the Basse-Normandie Region

« This project links the energetic transition to local economic development. It fits perfectly with the Europe-wide objectives for 2020 of developing clean, carbon-free energies while injecting fresh economic impetus into the Basse-Normandie region. »

JEAN-CLAUDE LECHANOINE
President of the CCI of the Basse-Normandie Region

« Our goal for the Calvados offshore wind farm is to spark the creation of an industry devoted to renewable marine energies in Normandy. It represents a major growth opportunity for local subcontractors and co-contractors. »

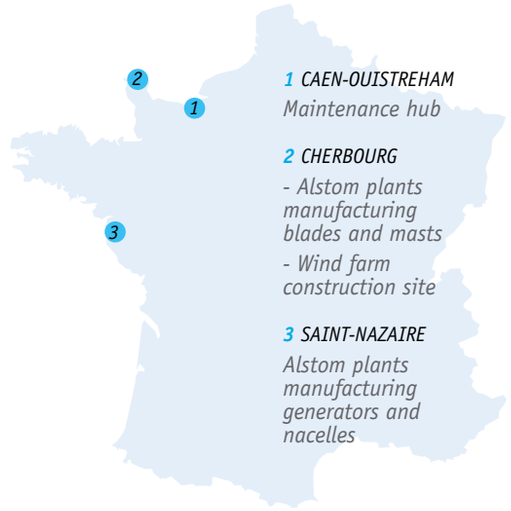
***1,000 jobs** will be mobilized by the project in Basse-Normandie*

7,000 JOBS CREATED BY THE FRENCH PROJECTS

The Calvados offshore wind project is the centrepiece of a large-scale industrial drive.

Alstom is building the Haliade wind turbines in Saint-Nazaire and Cherbourg, and this will create 1,000 direct and 4,000 indirect jobs.

Across the three projects being equipped with the Alstom turbine, the construction of the foundations and the wind farms and the operations & maintenance activities will provide work for around 2,000 people.



Start of the consultation — **2007**

Start of technical and environmental studies — **2008**

Call for tenders by the French state — **2011**

Objective for 2020 : generate 23% of energy consumed in France from renewable sources — **2020**

MAP
showing the location of the Calvados offshore wind farm

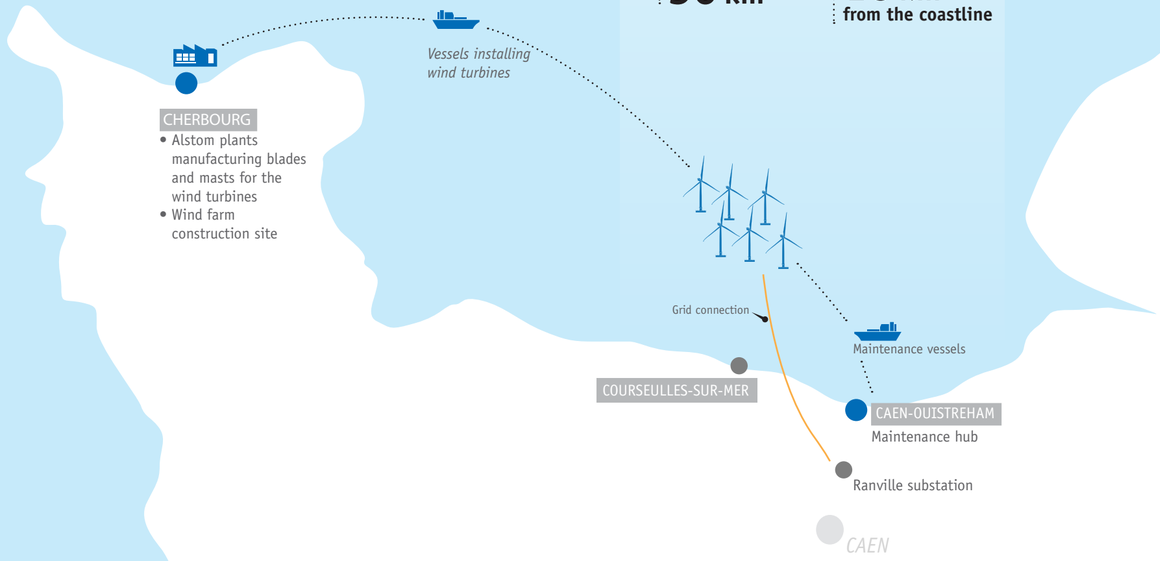
Calvados offshore *wind farm*

75 wind turbines

installed capacity totalling **450MW**

surface area of **50 km²**

further than **10 km** **from the coastline**



What will be viewed from the coast ?

The wind farm will be located further than 10 km offshore

View the photomontages of the site
www.parc-eolien-en-mer-du-calvados.fr

Did you know ?

The wind farm will generate the equivalent of the annual electricity consumption of 630,000 people, or 40% of the inhabitants of Basse-Normandie

Strategic location in Basse-Normandie

BASSE-NORMANDIE OFFERS EVERYTHING THE PROJECT NEEDS TO SUCCEED : A LONG COASTLINE, STRONG AND STEADY WINDS AND DYNAMIC REGIONAL INDUSTRIAL NETWORK

FACILITY MAINTENANCE

The wind farm will be maintained from the harbor of Caen-Ouistreham, creating around a hundred jobs for technicians, sailors and engineers.

MANUFACTURE OF THE BLADES AND MASTS AND CONSTRUCTION OF THE WIND FARM

The key wind turbine components (blades and masts) are due to be manufactured in Cherbourg. Once more, the construction of the windfarm will mobilize up to 400 jobs during the construction period.

GRID CONNECTION

The wind farm will be connected via submarine and underground cables to the public electricity grid of RTE, the network operator.

How to select a location for offshore wind turbines ?

The Bay of Seine has all the main assets for an offshore wind farm to be successful :

- strong and steady winds

- moderately deep waters

- harbour infrastructure nearby

2007	2008	2011	2013	2014	2015	2016-2020	2018 - 2020
Start of the consultation	*Start of technical and environmental studies*	*Call for tenders by the French state*	*Public debate*	*Submission of requests for authorisation*	*Public enquiry*	*Manufacturing of the components and construction of the offshore wind farm*	*Gradual commissioning*

How does it work?

THE OFFSHORE WIND FARM TOTALLING 75 ALSTOM'S HALIADE TURBINES WITH OVERALL GENERATING CAPACITY OF 450MW WILL SUPPLY THE EQUIVALENT OF 630,000 PEOPLE'S ELECTRICITY CONSUMPTION

Technical specifications of the Haliade wind turbine :

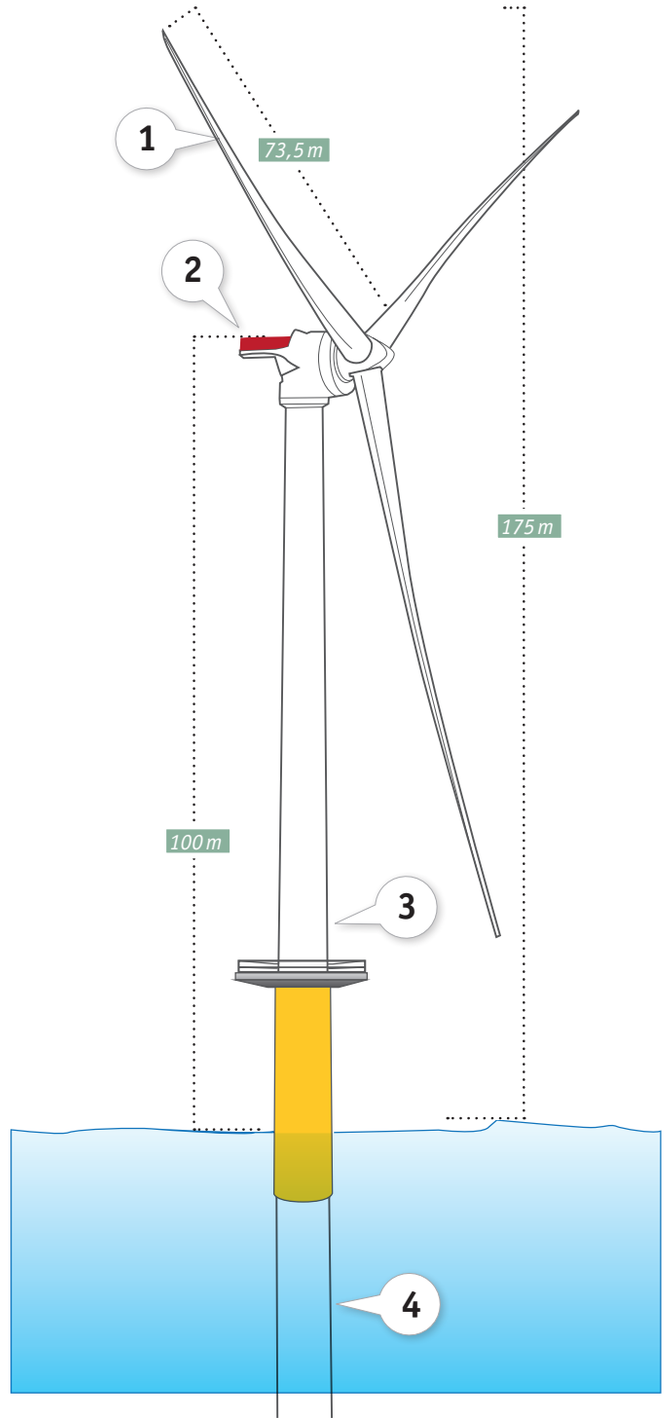
- *Generating capacity : **6MW***
- *Operates at wind speeds of between **10 km/h et 90 km/h**, i.e. 90% of the time*

1/ Blade
It can harness the maximum possible energy from the wind thanks to its profiled shape.

2/ Nacelle
The nacelle houses the generator. This is where the electrical power is generated.

3/ Mast
This supports the nacelle and the blades. It also houses the electrical components.

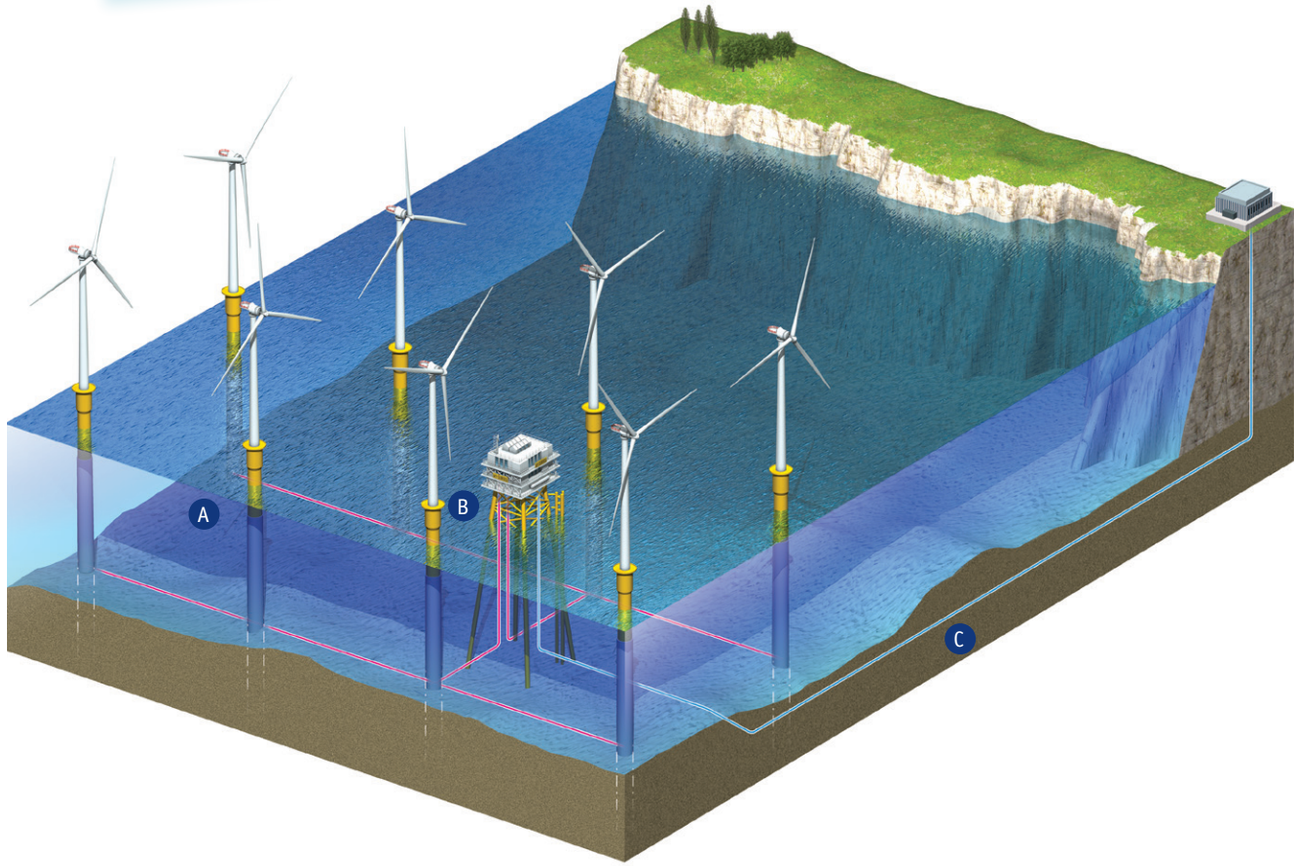
4/ Monopile foundation
This is a large-diameter steel pile installed several tens of meters deep into the seabed to keep the equipment stable.



THE HALIADE 150, A NEW GENERATION WIND TURBINE

Specially developed by Alstom for offshore locations, the Haliade turbine is currently one of the world's most powerful. Choosing this wind turbine meant that fewer of them had to be installed to achieve the same generating capacity.

BASIC DESIGN
of an offshore wind farm



A *The wind turbine converts the wind's energy into electrical power*

B *The wind turbines are linked by buried cables to a substation at sea*

C *The offshore substation is connected to the electrical grid via submarine and underground cables*

After around 25 years in service, the wind farm will be completely dismantled

The wind turbines and all the offshore installations will be decommissioned, removed and recycled through specialised channels.

A consultation-based project designed with input from local players

A CONTINUOUS DIALOGUE SINCE 2007 HAS SHAPED A PROJECT TAKING INTO ACCOUNT LOCAL CONCERNS

A PROJECT THAT TAKES INTO ACCOUNT ITS ENVIRONMENT...

The project is the result of several years of technical and environmental studies by engineering offices and environmental protection associations. Special attention has been paid to protecting marine fauna and flora and to integrating the wind turbines into the landscape and in particular from the symbolic Arromanches site.

...AND SEA USERS

The positioning of the wind turbines and the submarine cables within the farm has been chosen to maintain a high level of maritime safety within the area of and close to the project. A consultation and monitoring unit operating under the authority of the regional and maritime prefects makes sure that the needs of existing users and especially professional fishermen are taken into account.

Public debate : a key stage in the project consultation and enrichment process

« The public debate led to fruitful discussions. It gave us a chance to answer questions from the public and involve them in developing the project. Going forward, we hope to continue this information and refinement process. »

BERNARD GUITTON
Project Director of the Calvados offshore windfarm

EMPLOYMENT, TRAINING AND PROFESSIONAL INTEGRATION

Several commitments have been taken to assist the region with this new industrial challenge such as meeting with school, university students and job seekers. We are also working with the regional authorities, job centres, educational authorities and training and integration bodies to adapt trainings offered to the future jobs.

FOCUS ON TWO JOBS

Offshore crane operator

Trained to CAP level (vocational training certificate), s/he operates and manoeuvres all lifting equipment at heights or very large heights. The crane operator may be involved throughout the construction and operation of the wind farm.

Offshore maintenance technician

Trained to BTS level (higher national diploma), s/he maintains and repairs wind turbines to make sure that they operate as effectively as possible. Aside from technical expertise, s/he must pay considerable attention to safety at sea and working at heights.

Key figures concerning the public debate :

- ***4 MONTHS*** *OF DEBATE*
- ***11*** *PUBLIC* ***MEETINGS*** + ***2 WORKSHOPS*** *IN HIGH SCHOOLS*
- *CLOSE TO* ***2 000*** *PARTICIPANTS*

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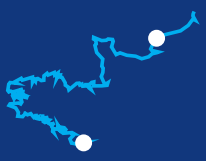
For all the latest news about the project :
www.parc-eolien-en-mer-du-calvados.fr

The project leaders are also developing :



- *The Fécamp offshore wind farm*
  www.parc-eolien-en-mer-de-fecamp.fr
- *The Saint-Nazaire offshore wind farm**
  www.parc-eolien-en-mer-de-saint-nazaire.fr

THE PROJECT IS BEING LED BY RENEWABLE ENERGY PROFESSIONALS :

EDF Energies Nouvelles : one of the world's leading renewable energies companies and a subsidiary of EDF
Dong Energy : world leader in offshore wind energy, 80%-owned by the Danish State
wpd offshore : one of the European leaders in offshore wind energy, has been developing the project since 2007

Partner supplying wind turbines :

Alstom : one of the world leaders in industrial power generation equipment

*except for wpd offshore

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