



COAST CAEN 2023: International Conference on Oceanography

19th French-Japanese Symposium of Oceanography

EDF Renewables' offshore wind development perspectives in Japan, and

Calvados Offshore Wind Farm

# EDF Renewables in a few figures (at 31 December 2022)



**€2,158 M**  
consolidated revenue

**€909 M**  
EBITDA

**11.4**  
GW net\*  
of installed capacity

**30 TWh**  
of electricity generated in  
2022\*\*



**4,514**  
Employees



**2**  
net GW  
commissioned



**2.3**  
net GW  
under construction



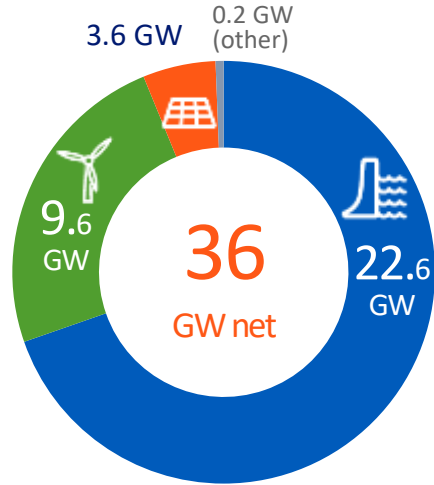
More than **20**  
Countries

\* For own distribution or on behalf of third parties.

\*\* Annual economic output, including the proportion of output from jointly controlled assets.

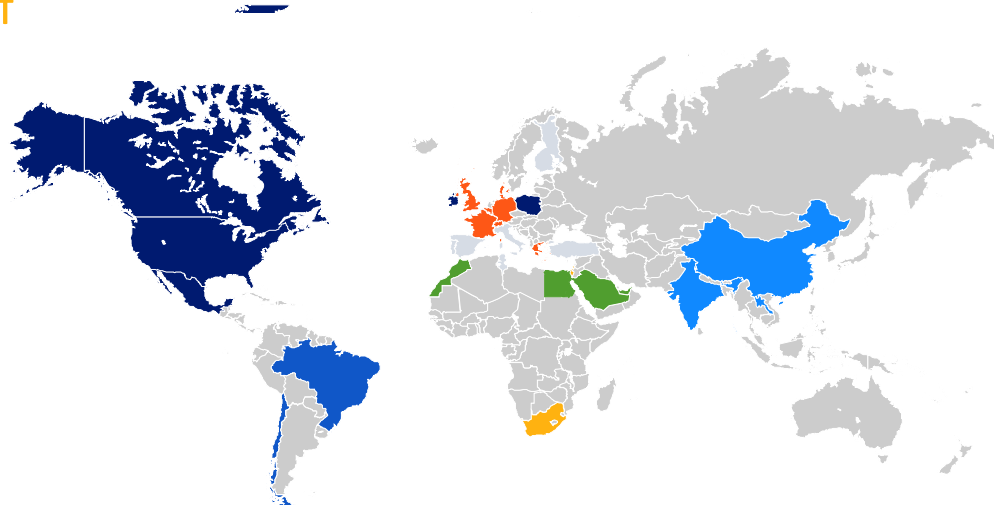
# EDF: global leader for low-carbon electricity generation

A diversified mix of renewables



$\frac{1}{4}$   
of the Group's  
strength

Net installed capacity of  
renewables:  
36 GW



**No 1 FOR RENEWABLES IN FRANCE:**



#1 for hydro



#1 for offshore wind



#2 for onshore wind



#5 for solar



**for renewables in  
the European  
Union**



**for renewables  
worldwide**

# A key player in offshore wind worldwide

10 years  
of experience in  
offshore wind

21GW  
of projects under  
construction or  
development

600 people  
dedicated to  
offshore wind

## UNITED STATES

**New York Bight**  
3 GW  
Under development

**Atlantic Shores**  
1,5 GW  
Under development

## ASIA PACIFIC

**Dongtai IV**  
302 MW  
In operation

**Dongtai V**  
200 MW  
In operation

**Wei Lan Hai  
Changhua**  
440 MW  
Under development

### FLOATING OFFSHORE WIND

 Under development/construction

### FIXED OFFSHORE WIND

 In operation

 Under development/construction

## EUROPE

**Neart Na Gaoithe**  
450 MW  
Under construction

**Blyth II**  
58.4 MW  
Under development

**Blyth**  
41.5 MW  
In operation

**Codling**  
1.3 GW  
Under development

**Teesside**  
62 MW  
In operation

**Manche Normandie**  
1 GW  
Under development

**C-Power**  
300 MW  
In operation

**Courseulles-sur-Mer**  
≈450 MW  
Under construction

**Dunkerque**  
600 MW  
Under development

**Saint-Nazaire**  
480 MW  
In operation

**Fécamp**  
≈500 MW  
Under construction

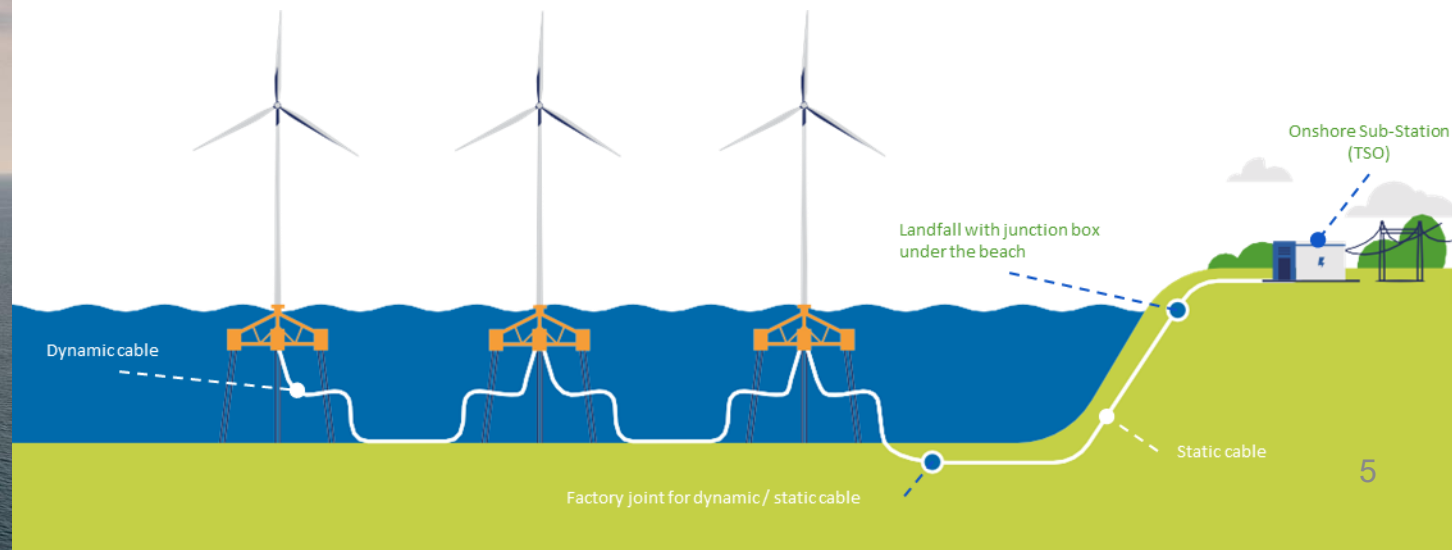
**Provence  
Grand Large**  
25 MW  
Under construction

# EDF Renewables positioned itself very early on in the floating wind sector

## Provence Grand Large, France

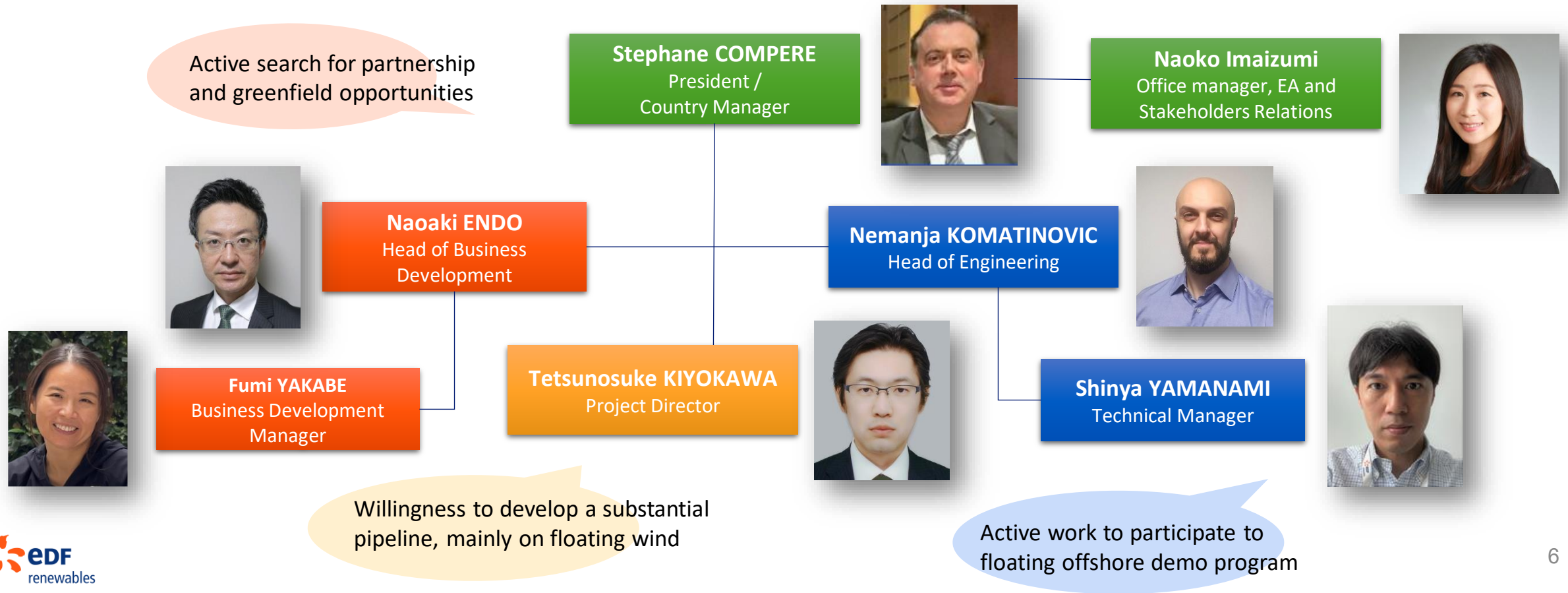
One of the world first floating wind projects, using Tension-Leg Platform (TLP) technology for the first time

- 3 turbines of 8 MW
- 17 km from Port-Saint-Louis-du-Rhône (close to Marseille)
- Water depth : 100 m
- Average wind speed: 10 m/s
- 19km of offshore export cable and 9km of onshore cable
- **Estimated COD : 2024**



# In Japan, a team of experts in offshore wind

- A team of experts in offshore wind, established in June 2022
- Our objective : support Japan's goals in offshore wind power with a 10 GW objective for 2030 and 30 ~ 45 GW in 2040



# Offshore wind in Japan

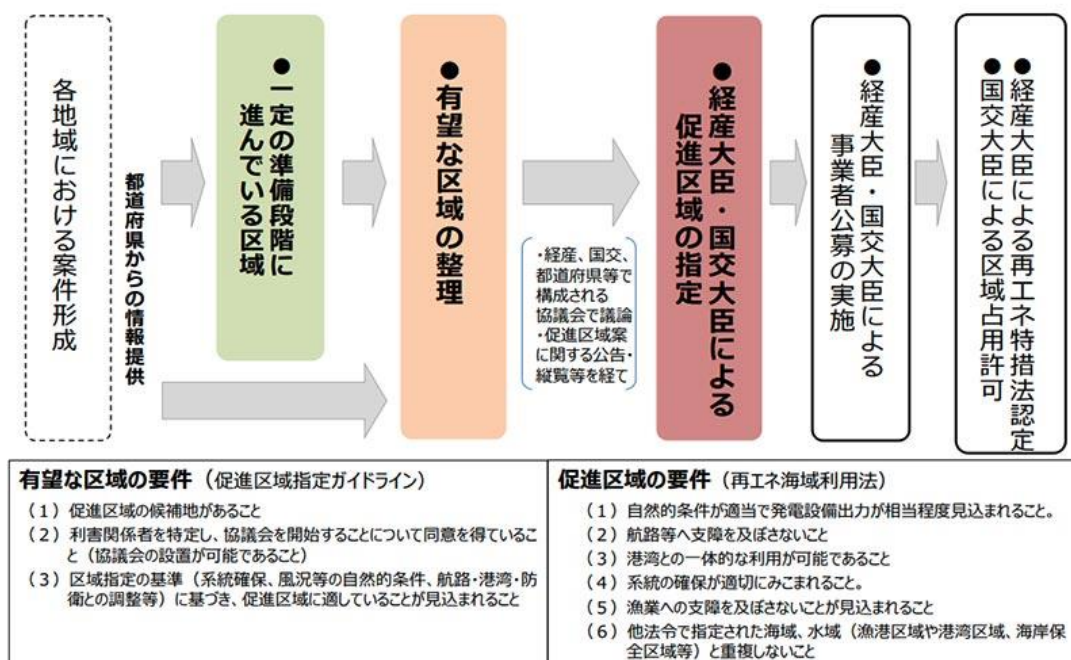
## Act on Promoting the Utilization of Sea Areas for the Development of Marine Renewable Energy Power Generation Facilities

海洋再生可能エネルギー発電設備の整備に係る海域の利用の促進に関する法律

➤ Entered into force in April 2019

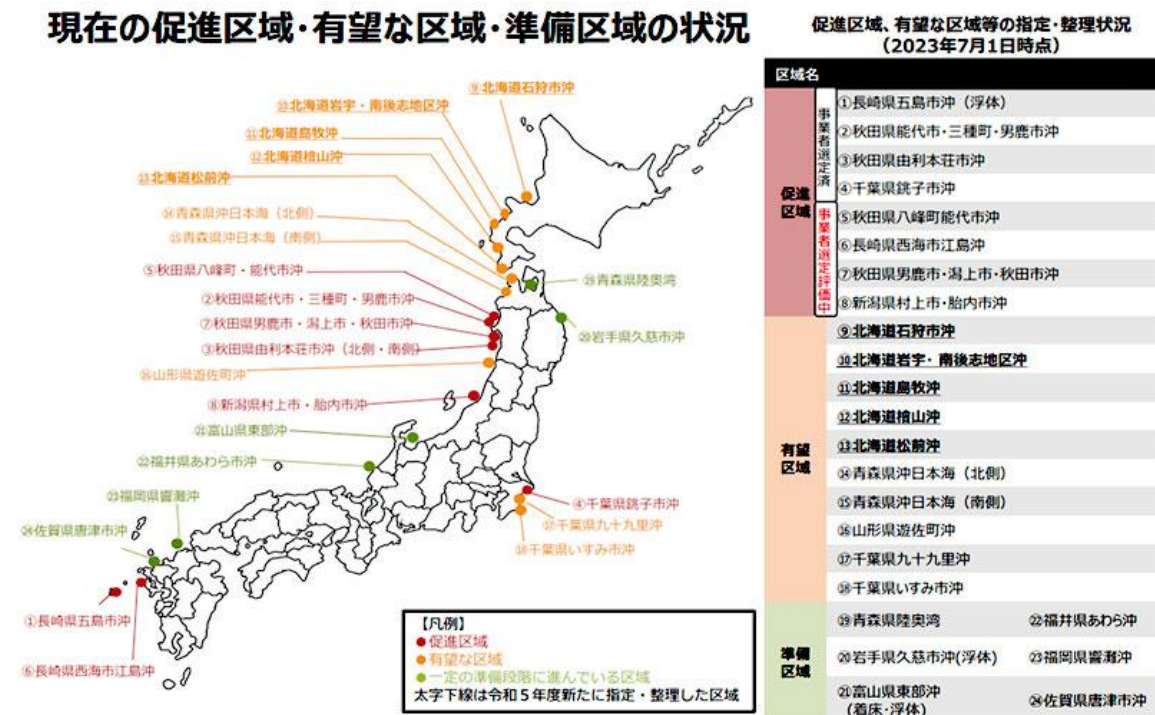
### Sea area designation and auction for 30 years occupancy

#### 再エネ海域利用法に基づく区域指定・事業者公募の流れ



### Sea areas under progress

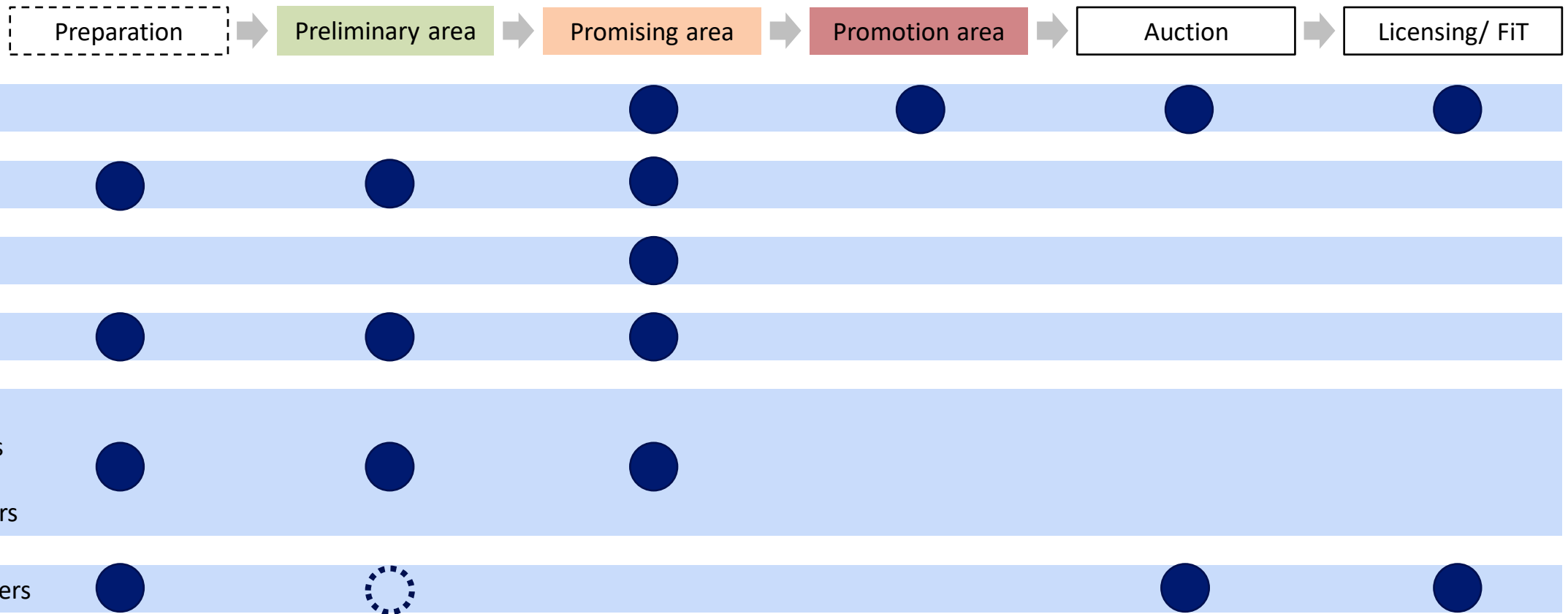
#### 現在の促進区域・有望な区域・準備区域の状況



# Offshore wind in Japan

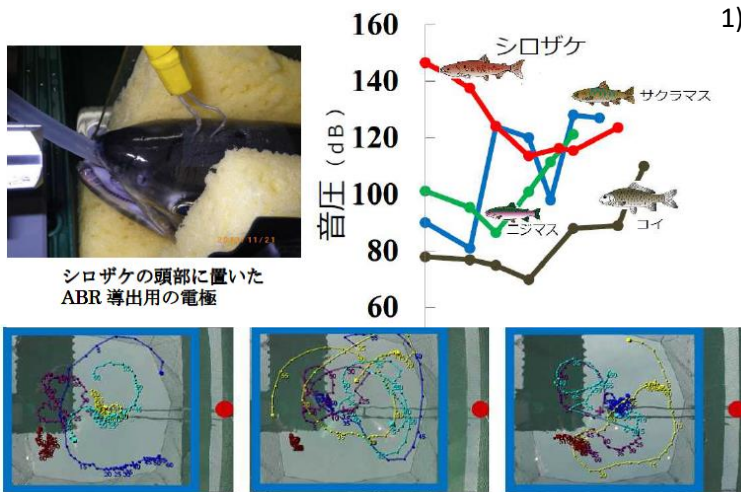
Act on Promoting the Utilization of Sea Areas for the Development of Marine Renewable Energy Power Generation Facilities  
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## Key players in steps for sea area designation and auction for 30 years occupancy



# Offshore wind in Japan

*harmonization with fisheries, conservation of the marine environment, and ensuring the safety of the ocean* – Article 6, the Act



Survey on the impact of offshore wind on marine resources



Creation of new fishing grounds with offshore wind developers



Decarbonization through the electricity from offshore wind

Parc éolien  
en mer du Calvados



**Calvados offshore wind farm**

# Actors of the project



France's leader in offshore wind energy and a major player in renewable energies worldwide, a subsidiary of EDF

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EIH S.à r.l. owned by Enbridge Inc. And CPP Investments

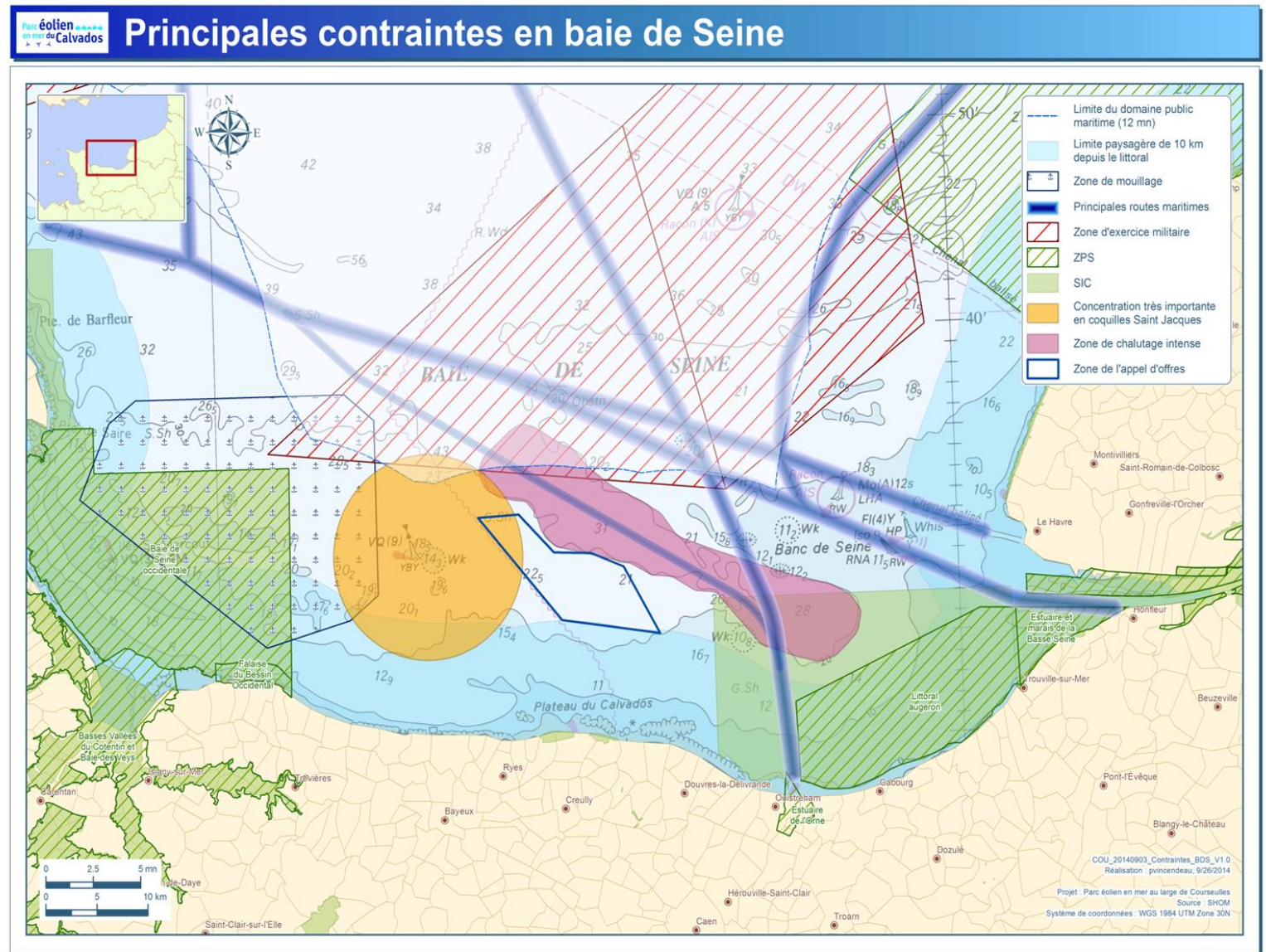


A major player in offshore wind energy

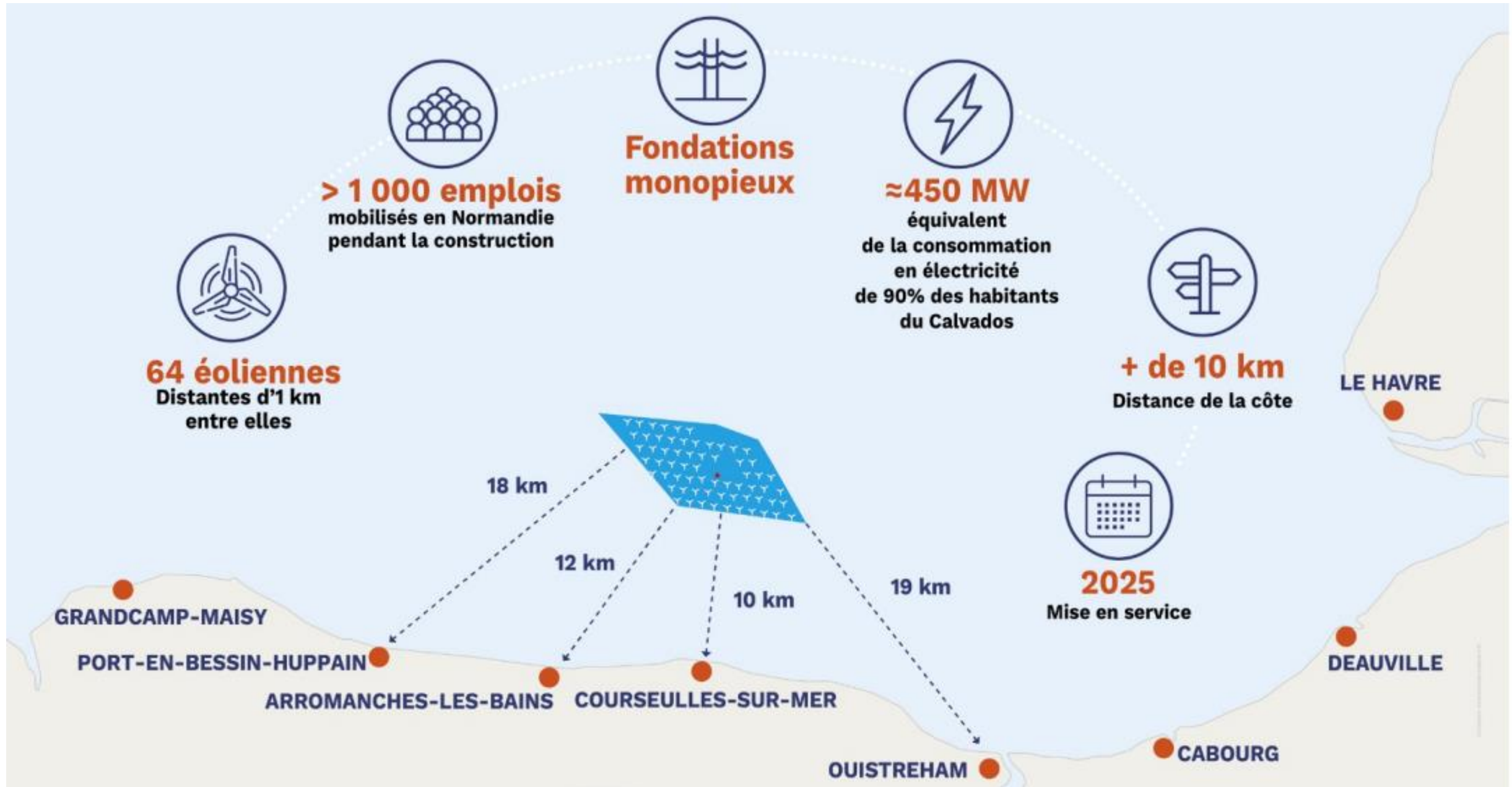


# Why an offshore wind farm here?

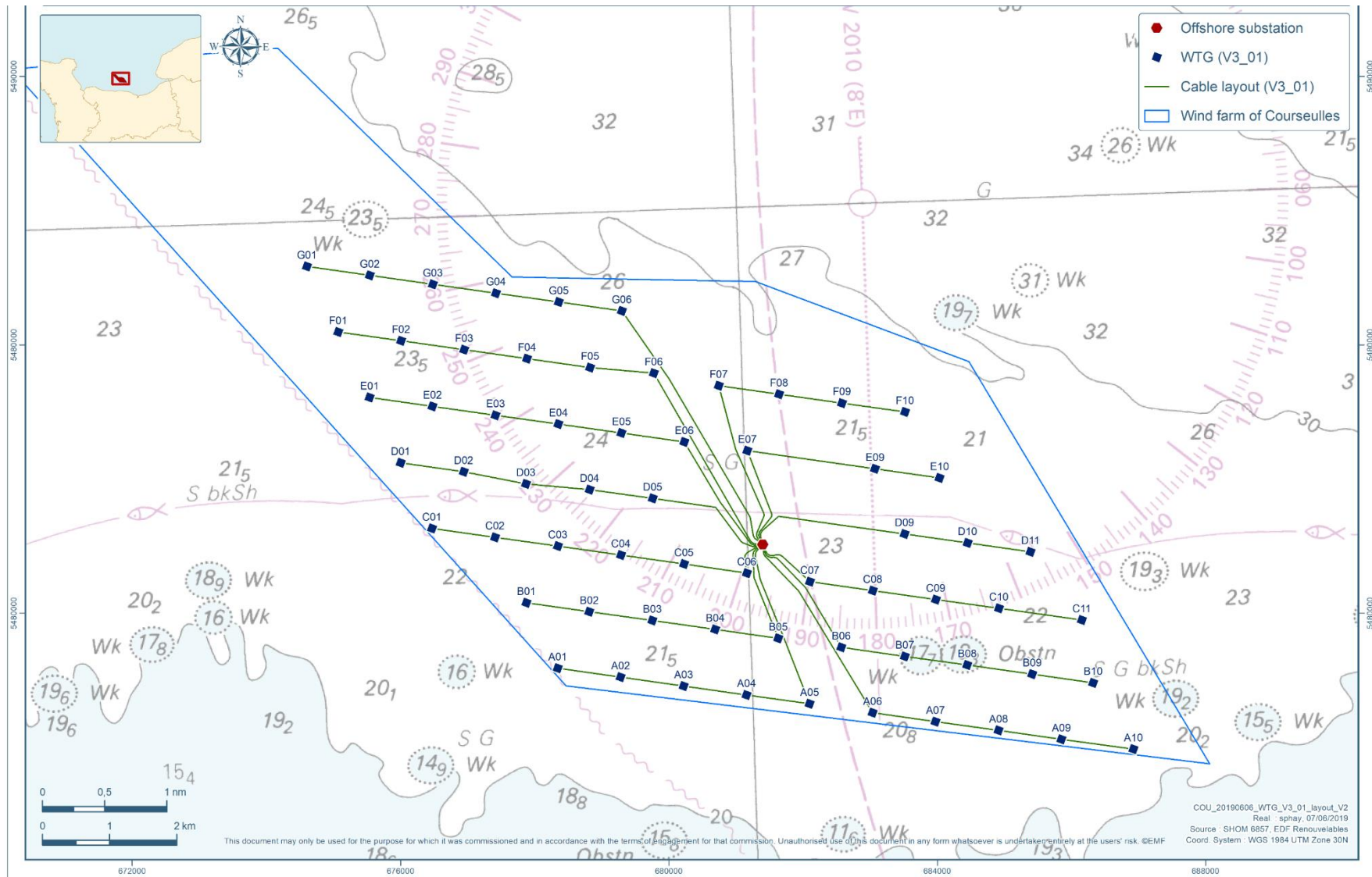
- Planning exercise launched in March 2009: consultation and planning body set up on each coastline (bringing together government departments, local and regional authorities, wind farm developers, sea users, environmental associations, etc.).
- Identification of areas suitable for offshore wind power development, taking into account the issues at stake :
  - **Technical** (bathymetry less than 40 metres, minimum distance of 10 km from the coast to limit visual impact)
  - **Regulatory** (radar easements, military exercise zones, navigation routes, anchorage zones, etc.)
  - **Environmental and socio-economic** (particular attention paid to respecting activities linked to professional fishing: distance of more than 5 nautical miles from the Cussy buoy)



# Key figures of Calvados OWF



# Focus on the layout of the wind turbines, the offshore substation and the inter-array cables



# Already achieved

**April 2022**

**Monopiles all manufactured**



**May 2022**

**Installation of the  
underwater piles of the  
substation**



**May 2022**

**Installation of the two export  
cables by RTE**



# What was achieved this year

**18th of march 2023**

**Installation of the OSS foundation**



**28th of March 2023**

**Offshore installation of the OSS**



**11th of april 2023**

**Official opening of the O&M base**



# Next steps

**From the end of 2023  
(for approximately 12  
months)**

**Drilling and installation of  
foundations by vibro  
hammering**



**From the end of  
2024 (for about 6  
months)**

**Installation of inter-array  
cables**



**From spring 2025 (for  
about 6 months)**

**Installation of the turbines and  
commissioning of the windfarm**



# Environmental monitoring

## Offshore



Studies carried out by independent environmental experts: **consultancy firms, environmental associations** or **scientists**.



UNIVERSITÉ  
CAEN  
NORMANDIE



## Environmental studies at each stage of the Calvados project

From 2011

### Étude d'impact (impact assessment)

The result of several years' work prior to the submission of permit applications

2020–2021

### État de référence

in progress over 1 to 2 years.  
First stage of the environmental monitoring program

2022–2025

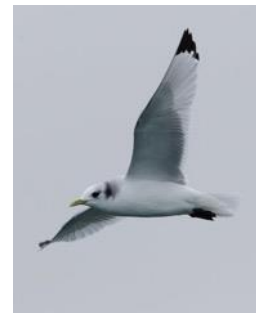
### Suivis environnementaux

throughout the construction period and for the duration of the operation (25 years)

## Des suivis environnementaux sur chaque compartiment biologique



Marine mammals



Birds



Halieutic resources



Bio-sédimentaire and water quality



underwater acoustics

# Focus on the ERC sequence:

**Eviter/avoid**

**Réduire/reduce**

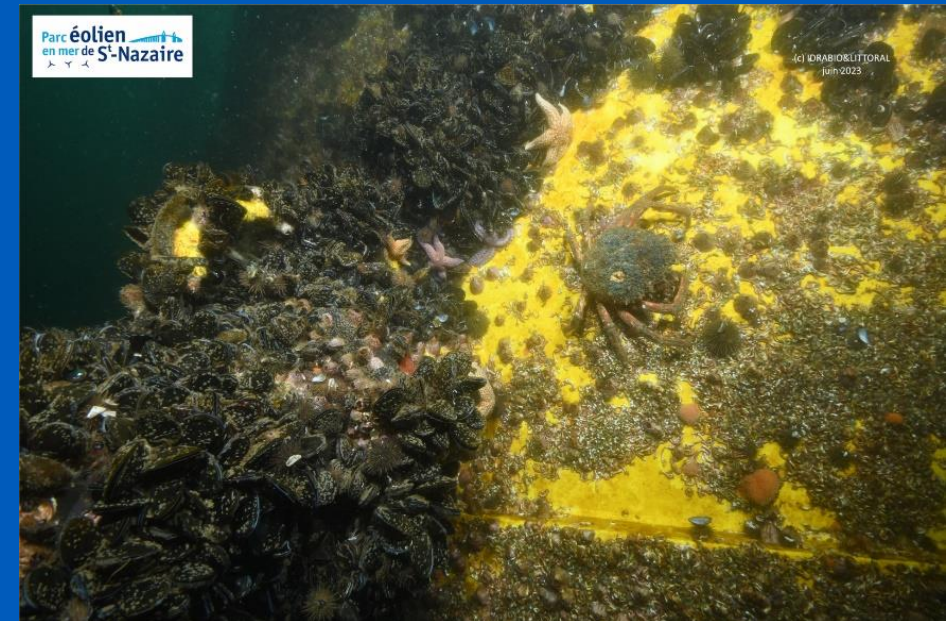
**Compenser/compensate**

- **Avoid, reduce and compensate for environmental damage,**
- **A hierarchical sequence,**
- **ERC measures are always designed in response to an identified potential impact on a given target,**
- **Based on a legal foundation (L.122-3 of the Environment Code)**

## **Examples of ERC measures on Calvados OWF:**

**ME2: No use of antifouling paint on foundations,**

**MR3: Reduction of noise linked to the works following the abandonment of pile-driving of monopiles in favour of the drilling-vibrofonçage technique,**



# Focus on environmental monitoring : Large-scale aircraft monitoring of marine mammals and birds



Survey with  
airplanes

## Monitoring frequency :

- 1 year before construction, in addition to the 2012 and 2024 campaigns
- During the construction period

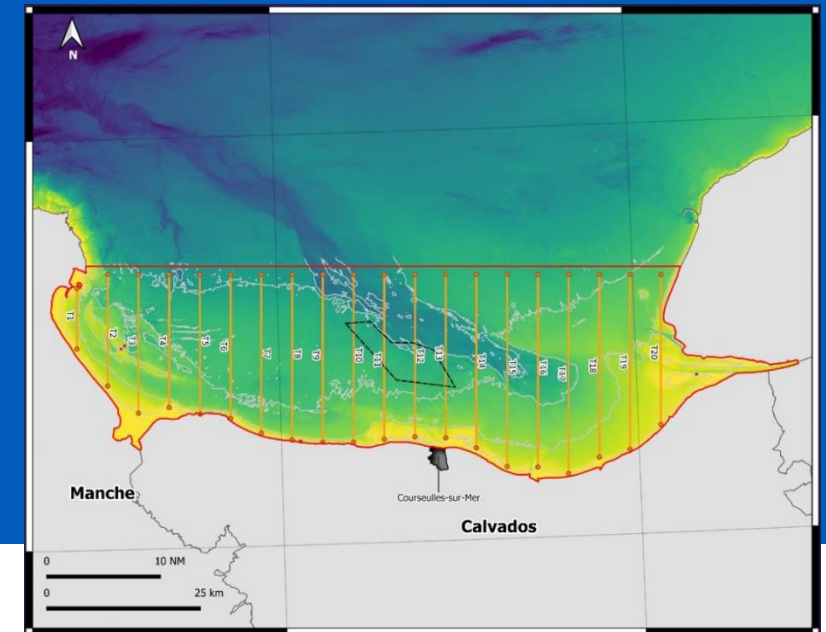
March and April 2022

February and April 2023

- 3 years of post-construction monitoring
- 1 year, 3 years before dismantling

## Sampling :

- Linear transects spaced 5 km apart in the "Seine Bay" study area. Presence of 1 pilot,
- 1 navigator and 2 observers. Observer/navigator relay every 2 hours
- Observation in a strip of 200 m on either side of the aircraft



# Focus on environmental monitoring : Large-scale aircraft monitoring of marine mammals and birds



Marsouin commun



Phoque veau marin

## Results for mammals:

- In 2022 :
  - 208 cetaceans, including 1 humpback whale and a pod of 55 common dolphins
  - 11 seals
- In 2023 :
  - 39 cetaceans
  - 1 seal

## Results for birds:

- In 2022 → 3694 individuals
- In 2023 → 4183 individuals
- 41 species identified
- Main species : Fou de Bassan ; Pingouin torda ; Guillemot de Troil ; Goéland argenté

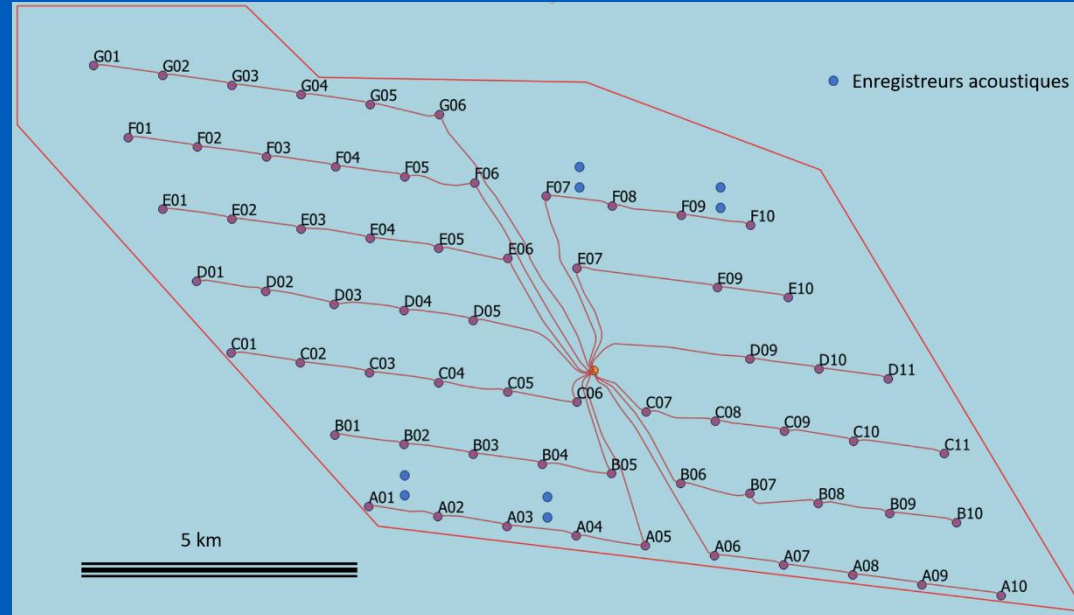


Fou de Bassan

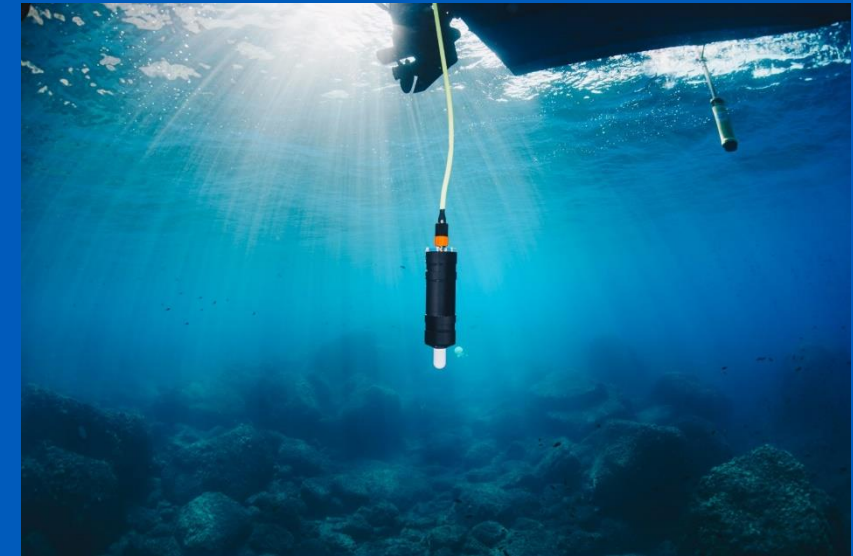


Pingouin torda

# Focus on environmental monitoring : Marine mammal and noise monitoring during drilling workshops in winter 2023-2024



Position of recorders during foundation drilling workshops



Example of a hydrophone used  
during recording campaigns

## Monitoring protocol :

- 2 acoustic recorders simultaneously placed at 750m and 1500m, for 15 days
- Monitoring spread over two electrical areas with different soil types
- Recorders deployed at 4 points, monitoring 2 boreholes per point, for a total of 8 workshops

# Focus on an environmental support measure : Thesis on the impact of anthropogenic noise on the movements and behaviour of harbour seals at sea

## Objectives of the thesis:

- Modelling of the sound levels perceived by seals during the reference state and the construction phase
- Analysis of the diving behaviour of seals and any changes in response to perceived sound

CIFRE thesis supervised by the University of La Rochelle/CEBC-CNRS and the SOMME design office.

The thesis will be carried out between 2023 and 2025, starting in September 2023.

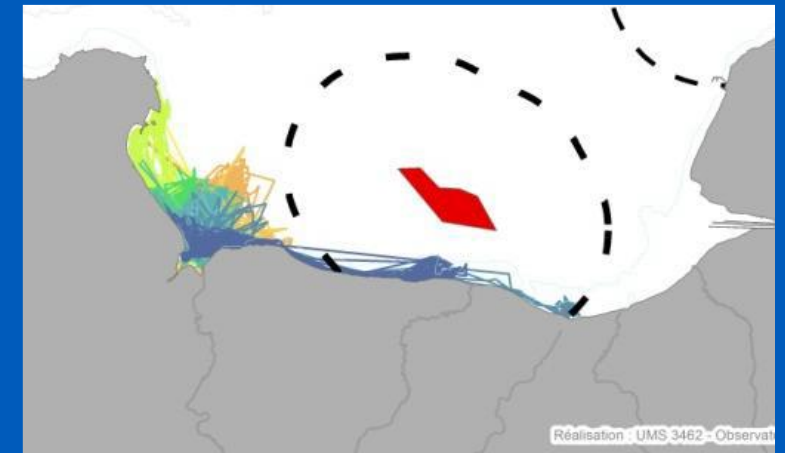


The modelling of sound levels perceived by seals during the reference state is based on environmental monitoring measure 11.

MSu11: Telemetric monitoring (GPS/GSM) of the Baie des Veys harbour seal colony



Seal fitted with a GPS/GSM beacon



Example of telemetric monitoring carried out on seals in the Bay of Veys

# Dialogue with fishermen

**Numerous initiatives and a park designed from the outset with a view to cohabitation of uses**

**Wind turbines 5 nautical miles from the Cussy buoy** (heart of the scallop beds in the Baie de Seine)

**Spacing of 1000 metres between each wind turbine**

**Aligning wind turbines and power cables with the direction of the sea current 100°**

**Reduction in the size of the park to 45 km<sup>2</sup>.** (-40% compared with the area proposed in the call for tenders)

A **"fisheries liaison unit"** to regularly discuss the project, the next steps and our respective challenges.

**Full-scale experiments: a "scallop experiment"** in January 2018 and a **"fishing study trip"** to the United Kingdom.

An iterative process that led to the definition of **proposed fishing rules within the park**, which were shared by the "maritime safety" working group.

Presentation of the "Diverseaty" study (**feedback on the impactx of offshore wind farms on fish stocks**) in several fishing ports of Normandy during the winter of 2022-2023.

**Environmental monitoring** of the construction and operation of the offshore wind farm on the development **of scallops**



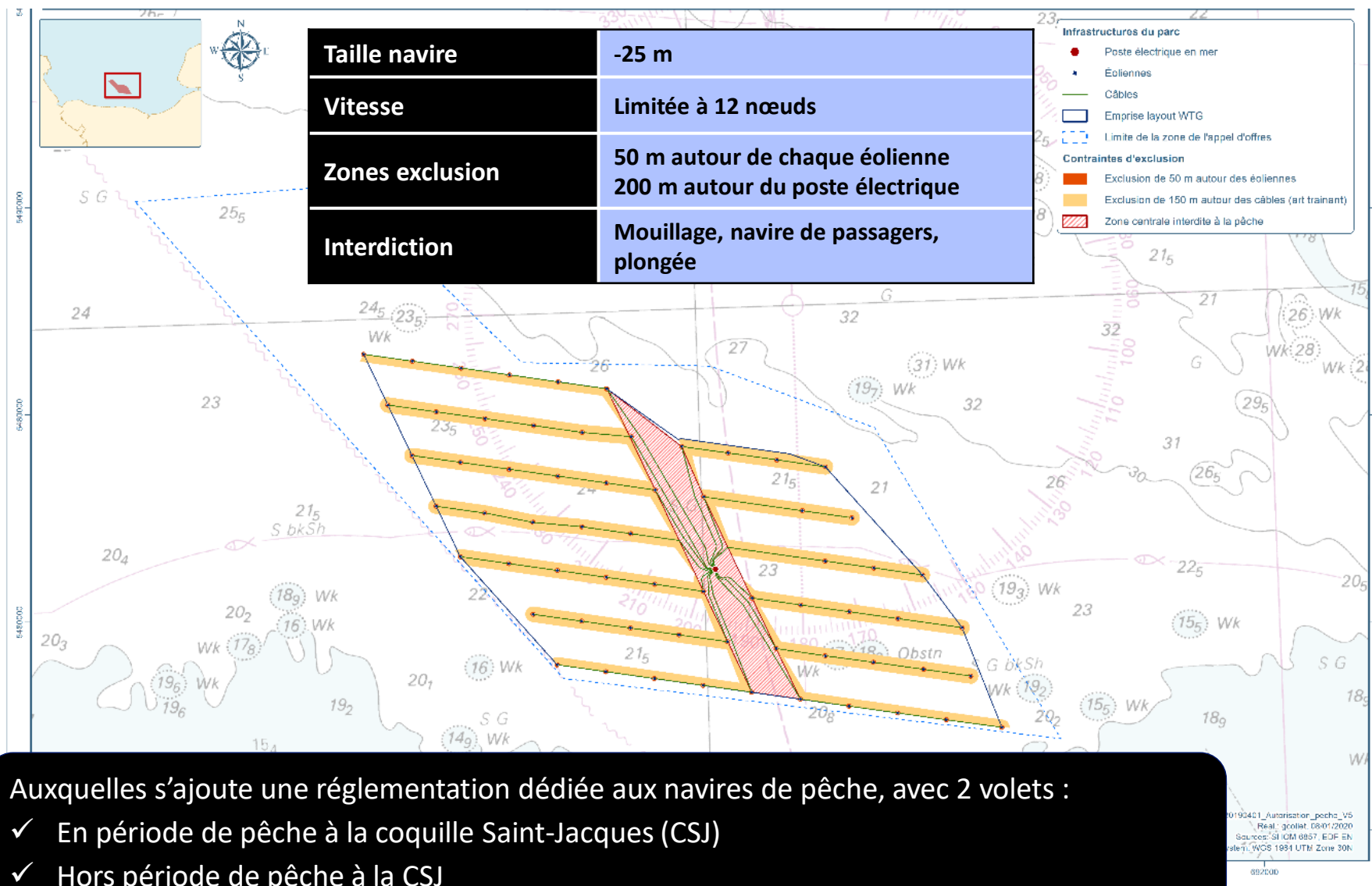
Embarkations on fishing vessels



Study trip to the Westermost Rough wind farm (UK) in 2019

# Propositions de règles de navigation et d'usages

## Règles générales

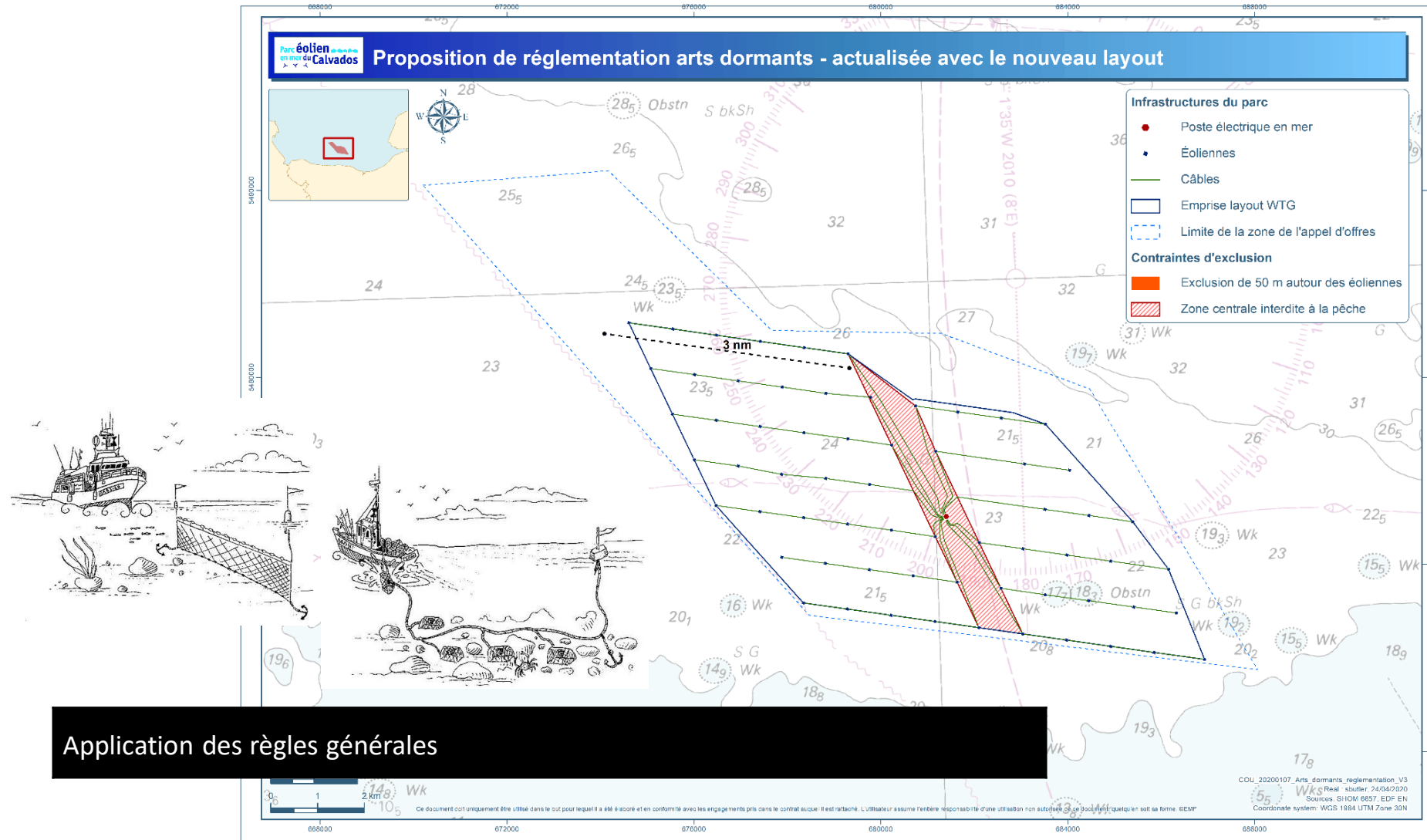


Auxquelles s'ajoute une réglementation dédiée aux navires de pêche, avec 2 volets :

- ✓ En période de pêche à la coquille Saint-Jacques (CSJ)
- ✓ Hors période de pêche à la CSJ

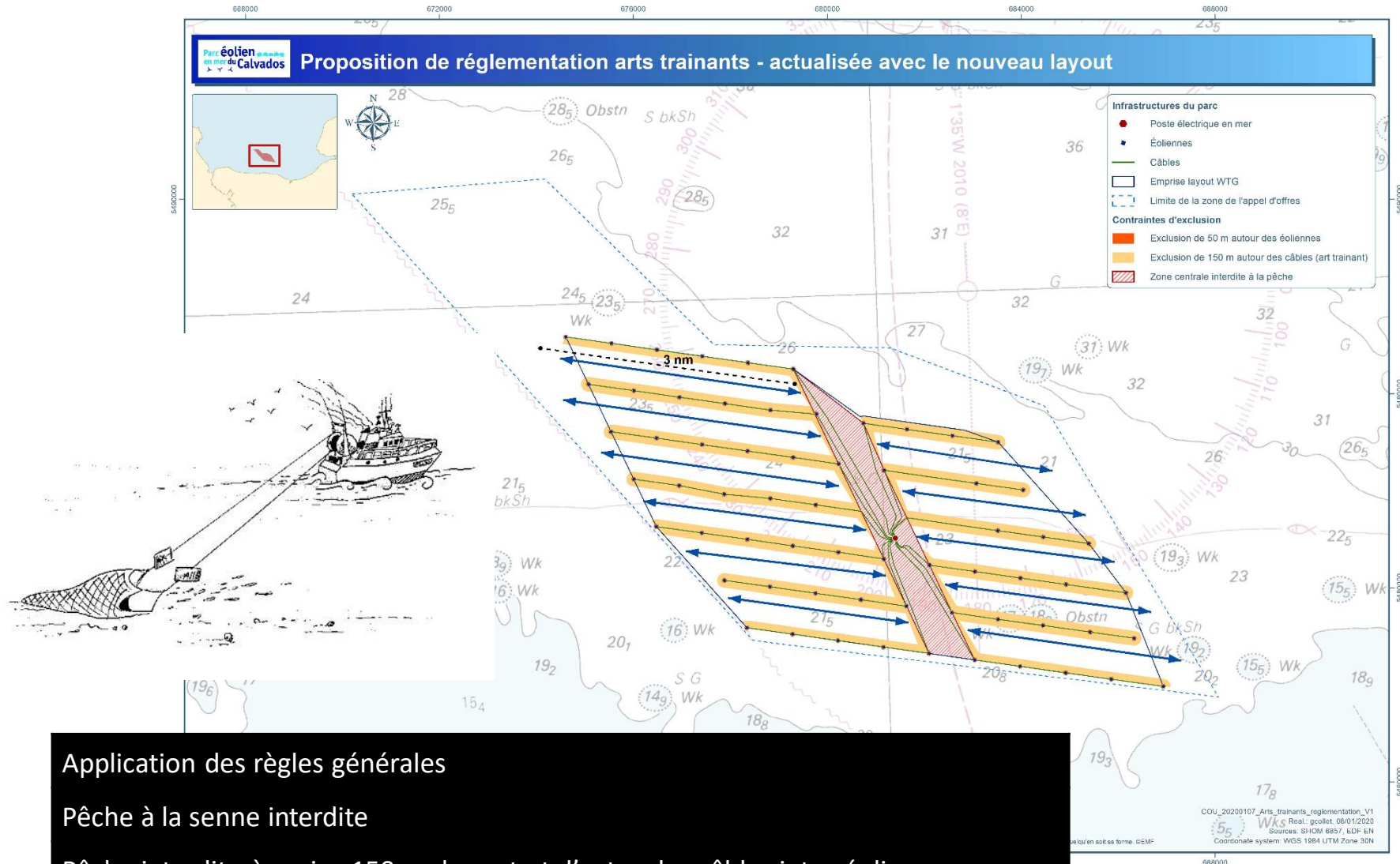
# Propositions de règles d'usages pour la pêche professionnelle

## Règles (hors période de pêche à la CSJ) pour les arts dormants



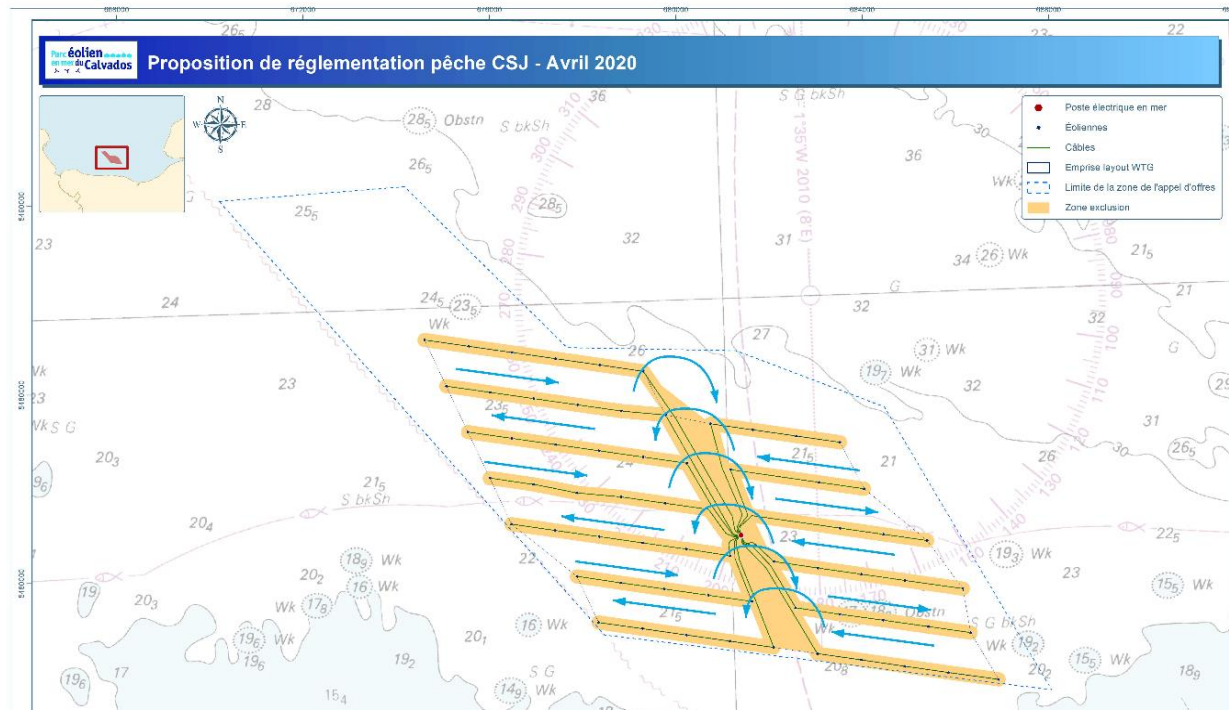
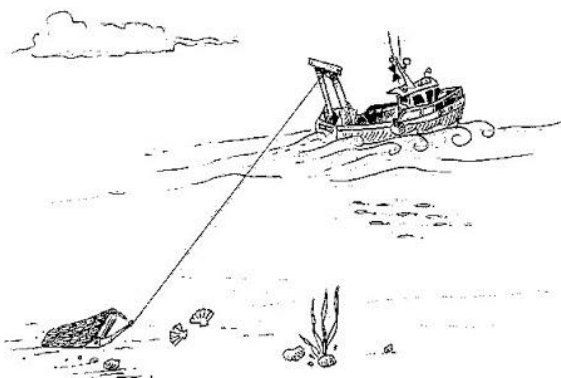
# Propositions de règles d'usages pour la pêche professionnelle

## Règles (hors période de pêche à la CSJ) pour les arts trainants



# Propositions de règles d'usages pour la pêche professionnelle

## Règles en période de pêche à la CSJ (horaires d'ouverture)



Application des règles générales

Interdiction de toute activité de pêche à l'exception de la pêche à la CSJ

Sens de navigation/pêche imposé dans chaque corridor Est - Ouest

Demi-tour dans un corridor interdit

Possibilité de passer d'un corridor à un autre, dragues relevées

Possibilité de franchir le couloir central Nord-Sud de convergence des câbles inter-éoliennes, en navigation, dragues relevées



# Thank

# you