Impact on seabirds of new offshore wind energy test and demonstration projects in the Biscay Marine Energy Platform (BiMEP, N. Spain)

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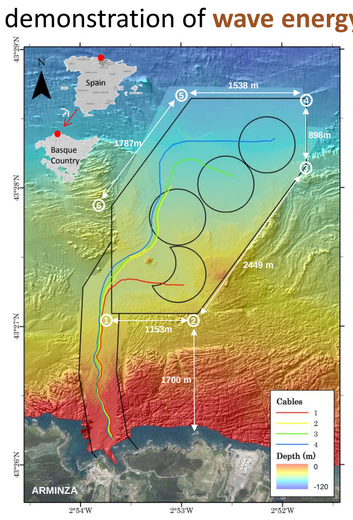
1. Introduction and objectives

Promoted by the **Basque Energy Board (EVE)**, **BiMEP** represents an **offshore test site** for the demonstration of **wave energy converters (WEC)** in Armintza (Bizkaia, Basque Country, Northern Spain).



Recent developments have promoted the interest of BiMEP facilities for the testing and demonstration of **offshore wind developments** as well, allowing the installation of a maximum of **2 offshore floating wind mills of 5 MW** each (physical dimensions showed in the picture on the left). Consequently, new and different environmental impacts from the original projects are expected. Among others, an impact over **seabirds** was foreseen taking into account that BiMEP project is inside an **Special Protection Area (SPA) for birds** declared under the Birds Directive (Directive 2009/147/EC), the **ES0000490 Mundaka-Cabo de Ogoño Special Bird Protection Area**.

The **ES0000490 Mundaka-Cabo de Ogoño SPA** encompass an area of 175 km^2 all along 30 km of coastline. It was declared in 2014 for the protection of a total number of 27 seabird species. **Five** of them are considered as **key species** (due to their endangered conservation status and their representativeness) for the SPA. These species are the following:

The main objective of this work is to assess the impact on seabirds protected under the ES0000490 Mundaka-Cabo de Ogoño SPA of the new offshore wind energy demonstration projects in BiMEP

3. Methodology

As wide-ranging, long-lived birds with delayed sexual maturity and low annual productivity, many species of seabirds and coastal waters birds are potentially at risk to impacts from offshore wind. The main risks are from fatal **collision** with blades; **displacement** from the wind farm area due to disturbance; barrier effects; and habitat loss. Based on the methodology developed by Bradbury *et al*. (2014) a **sensitivity index to collision and to displacement** was calculated for each of the 27 species of the ES0000490 Mundaka-Cabo de Ogoño SPA.

Conservation index (CI) = a+b+c+d

Collision risk index (CRI)= (e*(f+g+h)/3)*CI)

Displacement risk Index (DRI)= ((i*j)*(CI))/10

Where:

a = percentage of the biogeographic population that occurs in Basque country waters during any particular season (taking into account turnover of individual birds)

b = adult survival rate

c = threat status in Spanish protection laws

d = status in relation to the Birds Directive

e = estimated percentage at blade height

f = flight manoeuvrability

g = percentage of time spent flying

h = nocturnal activity

i = disturbance susceptibility

j = habitat specialization

Scores: **1 = low** and **5 = high** (% of the biogeographic population that occurs in Basque country; survival rate; threat status; manoeuvrability; % of time spent flying, etc)

The **expected impacts** over seabird communities were evaluated taking into account the values of these **sensitivity indexes** together with the **specific characteristics of the project** (number of devices, dimensions, distance to the main resting communities of seabirds in the shore, etc.) for the installation and operational stages of the project according to the requirements of the EIA Spanish law.

4. Impact assessment on seabirds

- **Installation and decommissioning:** during installation and decommissioning stage some disturbances can be expected due to noises produced during installation, vessel traffic, etc. Only the **Shag (*Phalacrocorax aristotelis*)** presents a moderate risk of being disturbed during this phase of the project (see table below). Taking into account that the number of windmills is only of 2 devices, it is expected that the installations works wont last more than 10-12 days and thus the impact associated to displacement-disturbance is expected to be **Moderate**.
- **Operation:** during the operation stage only the **Northern gannet (*Morus bassanus*)** present a high risk of collision (see table below) and the Shag a moderate risk of displacement. Taking into account the number of windmills (2 devices)and the distance to the main breeding birds colonies in the shore (more than 2 km), the impact of the project during the operation stage it is expected to be **Moderate**.

Displacement Risk index:

Especie	a	b	c	d	CI	e	f	g	h	i	j	DRI	Risk
Red-throated diver (Gavia stellata)	1	3	3	5	12	5	5	2	1	5	4	24	High
Great northern diver (Gavia immer)	1	4	4	5	14	5	5	2	1	5	3	21	High
Common scoter (Melanitta nigra)	1	2	1	3	7	3	3	2	3	5	4	14	Moderate
Common guillemot (Uria aalge)	1	5	3	5	14	1	4	1	2	3	3	13	Moderate
Shag (Phalacrocorax aristotelis)	1	3	5	3	12	8	3	2	1	3	3	11	Moderate
Razorbill (Alca torda)	1	5	3	3	12	0,5	4	1	1	3	3	11	Moderate
Little tern (Sterna albifrons)	1	4	3	5	13	10	1	5	1	2	4	10	Moderate
Red-breasted Merganser (Mergus serrator)	1	3	1	3	8	5	4	2	2	3	4	10	Moderate
Black tern(Chlidonias niger)	1	4	5	5	15	10	1	4	1	2	3	9	Low
Sandwich tern (Sterna sandvicensis)	1	4	3	5	13	10	1	5	1	2	3	8	Low
Common tern (Sterna hirundo)	1	4	3	5	13	10	1	5	1	2	3	8	Low
Arctic tern (Sterna paradisaea)	1	4	3	5	13	5	1	5	1	2	3	8	Low
Mediterranean gull (Larus melanocephalus)	1	3	3	5	12	25	1	2	2	2	2	5	Very low
Black-legged kittiwake (Rissa tridactyla)	1	3	4	3	11	15	1	3	3	2	2	4	Very low
Great black-backed gull (Larus marinus)	1	5	1	3	10	35	2	2	3	2	2	4	Very low
Black-headed gull (Larus ridibundus)	1	3	1	3	8	20	1	1	2	2	2	3	Very low
Northern gannet (Morus bassanus)	2	5	3	3	13	12	3	3	2	2	1	3	Very low
Lesser black-backed gull (Larus fuscus)	1	5	3	3	12	30	1	2	3	2	1	2	Very low
Yellow-legged gull (Larus michahellis)	2	5	1	3	11	30	1	2	3	2	1	2	Very low
Great skua (Stercorarius skua)	2	4	1	3	10	10	1	4	1	1	2	2	Very low
Balearic shearwater (Puffinus mauretanicus)	4	4	5	5	18	0	3	3	3	1	1	2	Very low
Cory's shearwater (Calonectris diodomea)	1	5	5	5	16	0	3	3	3	1	1	2	Very low
Pomarine skua (Stercorarius pomarinus)	1	4	1	1	7	10	1	5	1	1	2	1	Very low
European storm-petrel (Hydrobates pelagicus)	1	4	4	5	14	2	1	3	4	1	1	1	Very low
Manx shearwater (Puffinus puffinus)	1	5	5	3	14	0	3	3	3	1	1	1	Very low
Arctic skua (Stercorarius parasiticus)	1	3	1	1	6	10	1	5	1	1	2	1	Very low
Sooty shearwater (Puffinus griseus)	1	5	3	3	12	0	3	3	3	1	1	1	Very low
Great shearwater (Puffinus gravis)	1	5	3	1	10	0	3	3	3	1	1	1	Very low

Collision Risk index:

Especie	a	b	c	d	CI	e	f	g	h	i	j	CRI	Risk
Great black-backed gull (Larus marinus)	1	5	1	3	10	35	2	2	3	2	2	817	High
Lesser black-backed gull (Larus fuscus)	1	5	3	3	12	30	1	2	3	2	1	720	High
Yellow-legged gull (Larus michahellis)	2	5	1	3	11	30	1	2	3	2	1	660	High
Mediterranean gull (Larus melanocephalus)	1	3	3	5	12	25	1	2	2	2	2	500	High
Northern gannet (Morus bassanus)	2	5	3	3	13	12	3	3	2	2	1	416	High
Black-legged kittiwake (Rissa tridactyla)	1	3	4	3	11	15	1	3	3	2	2	385	Moderate
Sandwich tern (Sterna sandvicensis)	1	4	3	5	13	10	1	5	1	2	3	303	Moderate
Little tern (Sterna albifrons)	1	4	3	5	13	10	1	5	1	2	4	303	Moderate
Common tern (Sterna hirundo)	1	4	3	5	13	10	1	5	1	2	3	303	Moderate
Black tern (Chlidonias niger)	1	4	5	5	15	10	1	4	1	2	3	300	Moderate
Black-headed gull (Larus ridibundus)	1	3	1	3	8	20	1	1	2	2	2	213	Moderate
Great skua (Stercorarius skua)	2	4	1	3	10	10	1	4	1	1	2	200	Moderate
Shag (Phalacrocorax aristotelis)	1	3	5	3	12	8	3	2	1	3	3	192	Low
Great northern diver (Gavia immer)	1	4	4	5	14	5	5	2	1	5	3	187	Low
Pomarine skua (Stercorarius pomarinus)	1	4	1	1	7	10	1	5	1	1	2	163	Low
Red-throated diver (Gavia stellata)	1	3	3	5	12	5	5	2	1	5	4	160	Low
Arctic tern (Sterna paradisaea)	1	4	3	5	13	5	1	5	1	2	3	152	Low
Arctic skua (Stercorarius parasiticus)	1	3	1	1	6	10	1	5	1	1	2	140	Low
Red-breasted merganser(Mergus serrator)	1	3	1	3	8	5	4	2	2	3	4	107	Low
European storm-petrel (Hydrobates pelagicus)	1	4	4	5	14	2	1	3	4	1	1	75	Low
Common scoter (Melanitta nigra)	1	2	1	3	7	3	3	2	3	5	4	56	Low
Common guillemot (Uria aalge)	1	5	3	5	14	1	4	1	2	3	3	33	Very low
Razorbill (Alca torda)	1	5	3	3	12	0,5	4	1	1	3	3	12	Very low
Balearic shearwater (Puffinus mauretanicus)	4	4	5	5	18	0	3	3	3	1	1	0	Very low
Great shearwater (Puffinus gravis)	1	5	3	1	10	0	3	3	3	1	1	0	Very low
Manx shearwater (Puffinus puffinus)	1	5	5	3	14	0	3	3	3	1	1	0	Very low
Sooty shearwater (Puffinus griseus)	1	5	3	3	12	0	3	3	3	1	1	0	Very low
Cory's shearwater(Calonectris diodomea)	1	5	5	5	16	0	3	3	3	1	1	0	Very low

5. Prevention measures and Environmental Monitoring Plan (EMP)

Even if no significant impacts were foreseen and consequently, according to the EIA Spanish law no protection or amendment measures are required and the implementation of a EMP is not mandatory, taking into account the values of the ES0000490 Mundaka-Cabo de Ogoño SPA, five monitoring tasks were suggested:

1) Compile and assess the data of breeding seabirds monitored by the regional government every year.

2) Biweekly monitoring of seabirds in BiMEP in the three stages of the project (preoperational, operational and decommisioning).

3) Installation of nanotransmitters during ringing campaigns of the European storm-petrel in the Basque Country

3) 4) Monitoring of dead birds in the surrounding of wind mills in the operational stage

5) Installation of a **DTBird ® System for Bird Monitoring and/or Mortality Mitigation at On&Offshore Wind Turbines** (www.dtbird.com). In operating Wind Farms, DTBird® System includes specific modules that take automatic actions to reduce the collision risk of birds with the WTGs: DTBird® Collision Avoidance Module, and DTBird® Stop Control Module. In addition, DTBird® Collision Control registers bird collisions.

a) **DTBird® Collision Avoidance Module:** This module automatically emits warning sounds at birds flying in potential collision risk and discouraging sounds for birds flying in the high collision risk area. Adjustable to target species, wind turbine dimensions and local sound regulations. No energy production loss and useful for all bird species.

b) **DTBird® Stop Control Module:** automatic wind turbine stop and restart according to real-time bird collision risk evaluation. Adjustable to target species/groups.

c) **DTBird® Collision Control Module:** HD cameras survey 360º around the Wind Turbine, detecting birds in real-time while storing videos and data. Potential and accidental bird collisions can be recorded and checked in videos with sound through Online access

6. Conclusions

1. **No significant environmental impacts over** seabirds protected under the **ES0000490 Mundaka-Cabo de Ogoño SPA** are expected in relation with the new offshore wind developments in BiMEP.

2. However, a **strict and ambitious environmental monitoring plan** has been suggested in order to detect any potential unexpected impact and, consequently, to implement the corresponding management measures.

Acknowledgements

This work has been funded by BiMEP, S.A.