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ENVIRONMENTAL IMPACTS OVER THE SEABED AND BENTHIC COMMUNITIES OF SUBMARINE CABLE INSTALLATION IN THE BISCAY MARINE ENERGY PLATFORM (BIMEP)

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ABSTRACT

On the 1st of June 2009, the General Council on Environmental Quality Assessment of the Ministry of Rural, Marine and Natural Environment of the Spanish Government, on the light of the Environmental Impact Study (EIS) of the Biscay Marine Energy Platform (*bimep*) project carried out by AZTI-Tecnalia, decided that whole Environmental Impact Assessment (EIA) process was not required. Nevertheless, the Environmental Impact Statement (EISt) of the above mentioned Ministry, taking into account the great uncertainties about some predicted environmental impacts, underlined the need to implement the Environmental Monitoring Program (EMP) proposed in the EIS. Among other environmental factors, substratum alteration was foreseen to occur during the commissioning stage of the submarine cables and consequently, may affect benthic habitats and species. Funded by BIMEP S.A. (www.bimep.com) and carried out by the Marine Research Division of AZTI-Tecnalia (www.azti.es), the EMP of the submarine cables installation in *bimep* showed that the observed impacts were in the range of those predicted in the EIS an assessed as non-significant.

INTRODUCTION

The Biscay Marine Energy Platform (*bimep*) is an offshore infrastructure for the demonstration and testing of marine energy harnessing devices promoted by the Basque Entity of Energy (Ente Vasco de la Energía - EVE). *Bimep* is located close to Arminza town (Basque Country, Northern Spain) and it consists on a 5.3 km^2 sea area between 50 and 90 m depths where four static submarine cables will be placed, operating at 13kV and 5MW (Figure 1, www.bimep.com). Marine energy harnessing devices will be connected to these cables through dynamic submarine cables and ultimately to land. On land, *bimep* will establish a research centre in Arminza town where developers will be able to monitor de behaviour and performance of the devices and data about oceanographic conditions of *bimep* area.

On the 1st of June 2009, the General Council on Environmental Quality Assessment of the Ministry of Rural, Marine and Natural Environment of the Spanish Government, on the light of the Environmental Impact Study (EIS) of the *bimep* project undertaken by AZTI-Tecnalia in 2008, decided not to submit the project to the whole Environmental Impact Assessment (EIA) process. Nevertheless, the Environmental Impact Statement (EISt) of the Ministry, taking into account the great uncertainties about some predicted environmental impacts, underlined the need to implement the proposed Environmental Monitoring Program (EMP) of the EIS. Among other environmental factors, substratum alteration was foreseen to occur during the commissioning stage of the submarine cables and consequently may affect related benthic habitats and species.

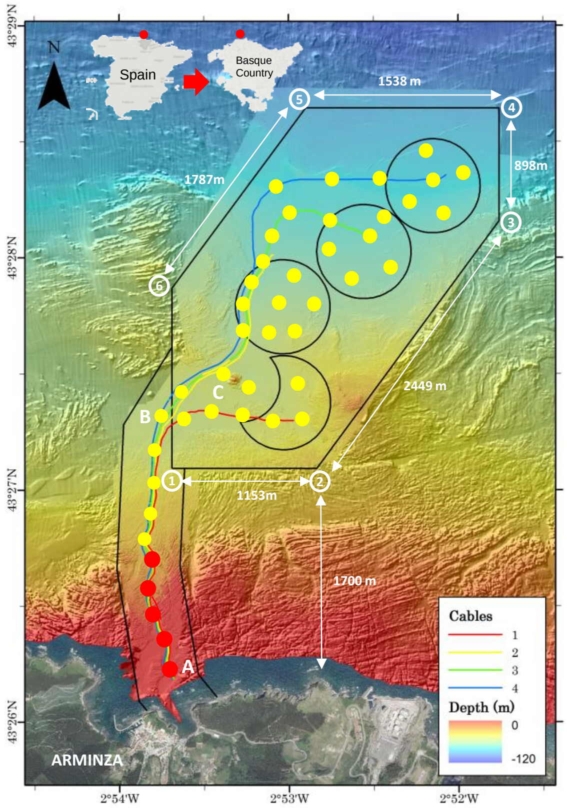

Figure 1. *bimep* project. The route of the four cables are shown. Dark line delimits the area of *bimep* closed to other users. Red and yellow points correspond to the visual inspection of the EMP of the seafloor and benthic communities by divers and ROV respectively.

According to the EIS undertaken by [1], there are various submarine cable installation methods depending on the seabed typology. Cable lay

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methods include trenching in rocky sediments, and ploughing and jetting in soft sediments. In all cases, the cable is located on the trench and the extracted sediment is put back in a natural way immediately after the machinery passes by covering the trench. The cable route sometimes needs to be cleared of obstacles. Different methods can be used, among them a Pre-Lay Grapnel Run (PLGR) which consist on a hooking device (grapnel) towed at low speed (approximately 1 knot) along the planned route to remove any material, such as abandoned ropes or fishing nets. In the case of *bimep* the installation of the submarine cables began on the 11th of September 2013 with the PLRG of the cable route and ended between the 20th and 27th of September 2013 with the laying of the four submarine cables. After de laying of the cables, an attempt was done in order to bury the cable route from the outcrop of the cables at 15 m depth, until the *bimep* perimeter by means of an hydraulic fan, but finally this option was discarded and the cables were simply lay down in the seafloor (Figure 2).

Figure 2. Details of submarine cable installation (above) and burial machine (below).

According to the EIS undertaken by [1], the impact of cable laying over the seafloor integrity was estimated as non-significant. Such impact is usually restricted to an area of 2-3 m at each side of the cable depending on the installation equipment used and recovery is strongly dependant on the substratum characteristics. These alterations during the commissioning stage may affect related habitats and species. This impact was assessed to have a moderate impact by the EIS undertaken by [1]. Moreover, in order to protect a singular biological structure known as “Isla de las Lubinas” or “Punta Zuri” (Point C in Figure 1), a security distance of 100 m from cable route from this element was established in the EIS. This singular structure consist on a rock outcrop that goes approximately from 20m down to 60 m depth and according to the EIS [1] and the preoperational EMP [2] host a high marine biodiversity and richness.

According to [3] an EMP must have the following functions: (i) to check the magnitude of the impacts which are difficult to predict; (ii) obtain data to improve future EIA processes; (iii) to check if the observed impacts match with the predicted ones and, if not, to implement the corresponding mitigation measures; (iv) to check the fulfilment of mitigating measures proposed in the EIS, together with the efficiency of these measures. Hence, on August 29 of 2013, BIMEP S.A. entrusted to AZTI-Tecnalia to carry out the EMP of the installation of submarine cables in *bimep.* Among other environmental factors, the EMP focused on the impacts over the seafloor integrity and benthic communities which is the subject of the present paper.

METHODOLOGY

The EMP of the environmental impacts of the installation of submarine cables in *bimep* over the seafloor integrity and benthic communities was undertaken in December 2013, two months after the end of the installation tasks, by means of: (i) a seabed characterisation using a high-resolution RESON SeaBat 7125 multibeam echosounder. Its operational frequency is 400 kHz producing 256 beams in a 128º angle swath, using up to 50 swaths per second. As a result of that methodology, a 0,5m resolution seafloor digital elevation model was produced in projected coordinate UTM and zone 30 N (ETRS89); (ii) a characterization of benthic communities and seabed disturbance by means of a visual inspection with a submarine camera attached to a Seaeye Falcon Remote Operated Vehicle (ROV) in 38 points distributed all along the submarine cable route and the mooring areas (Figure 1).

OBSERVATIONS

One of the most significant alterations can be observed in the outcrop of the submarine cable coming from the beach man hole through a tunnelling and channelling technique known as Horizontal Directional Drilling (HDD) (Point A in the Figure 1). As we can see in the Figure 3, a trench of about 60 m long and 2-3 m at each side of the cable was undertaken for each cable route. These results are in line with those described by [4]. Benthic communities in this part of the cable route are characterized by and unbalanced community with low densities, biomass and richness, which could be also related with the high hydrodynamism in this area [1], [2].

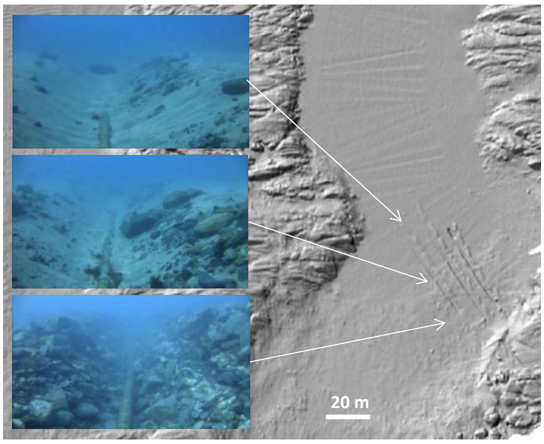

Figure 3. Submarine cable outcrop. Details of substrate alteration in different parts of the trench are showed.

Another alteration which can be observed is the effect on the seafloor of the cable burial attempts in some stretches of the cable route (Point B in the Figure 1). Hence it was observed a removal of sediments and benthic communities in an area of 2-3 m at each side of the cable (Figure 4), once again, in line with the alterations described by [4].

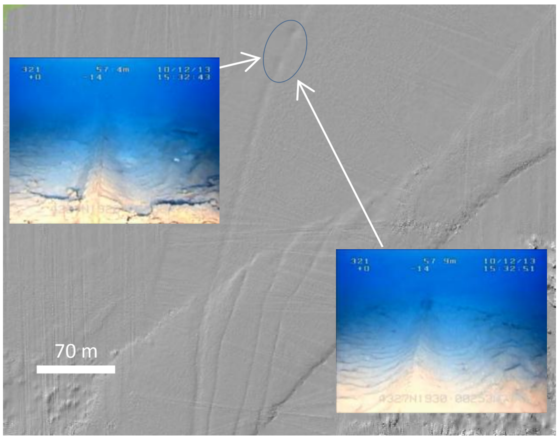

Figure 4. Details of substrate alteration done by the burial attempts of the cables.

Regarding the rest of the cable route, according to the visual inspection undertaken, no significant alterations of the seafloor and benthic communities were observed and the cable simply remains lay down in the seafloor and even buried by the sediment dynamics itself. In some stretches of the cable route, this has been lay-down over rocky substratum but there have not seen impacts over the benthic communities in this substrate (Figure 5).

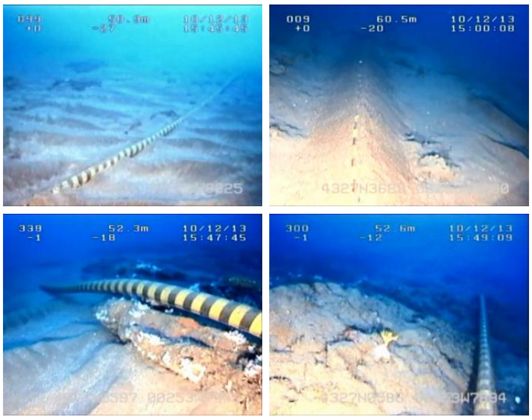

Figure 5. Details of submarine cables.

Regarding the submarine mountain known as "Isla de las Lubinas" or "Punta Zuri" (Point C in Figure 1), the distance between the cable and the mountain is about 70 m (Figure 6), 30 m below the minimum distance established in the EIS. Nevertheless, no impacts where observed over the benthic communities in this geological structure which maintain the biological richness and value observed in the EIS and in the preoperational EMP (Figure 7), demonstrating the effectiveness of the protection measures proposed in the EIS of *bimep*.

CONCLUSIONS

Funded by BIMEP S.A. and carried out by the Marine Research Division of AZTI-Tecnalia, the EMP of the submarine cables installation in *bimep* showed that the observed impacts are in the range and even below of those predicted in the EIS of *bimep* (assessed as non-significant) and the effectiveness of the protection measures proposed in the EIS of *bimep* for the preservation of the biological values of the singular submarine mountain known as "Isla de las Lubinas".

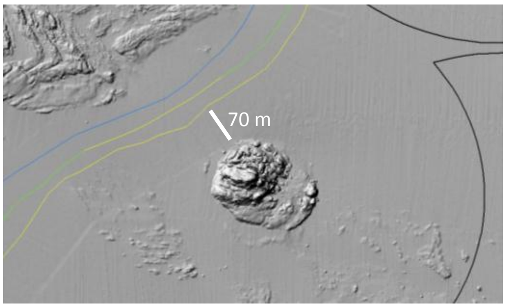

Figure 6. Submarine cable routes near the submarine mountain known as Punta Zuri.

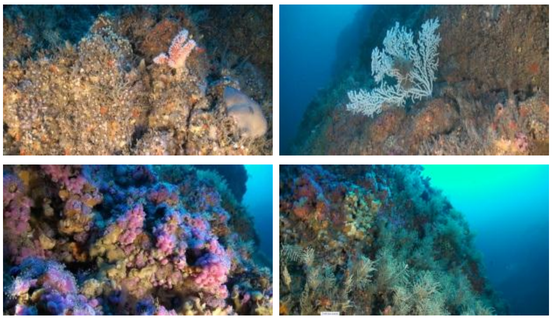

Figure 7. Biological covertures in the submarine mountain known as Punta Zuri or Isla de las Lubinas at 50 m depth.

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