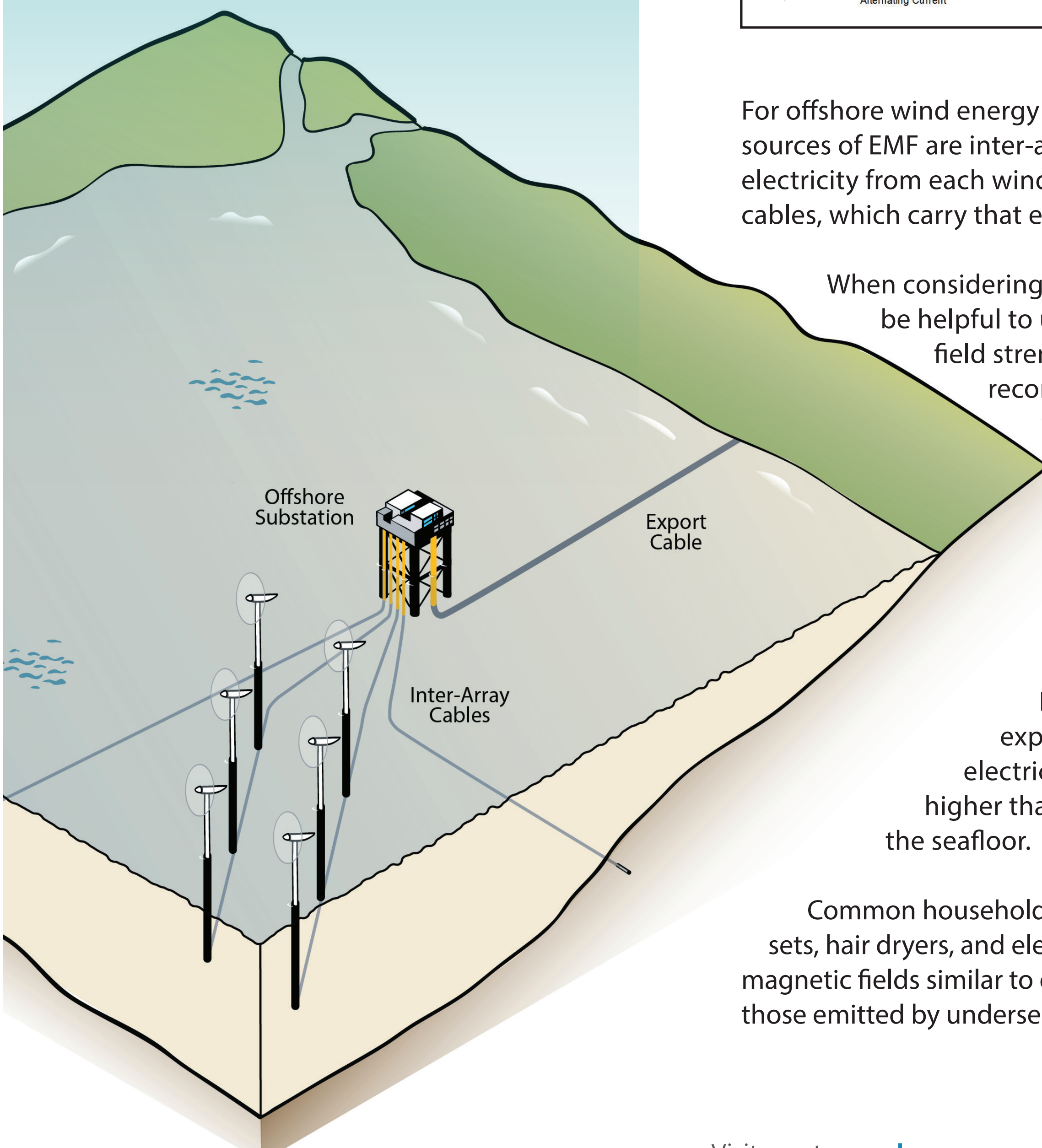
BOEM
Bureau of Ocean Energy Management

January 2020

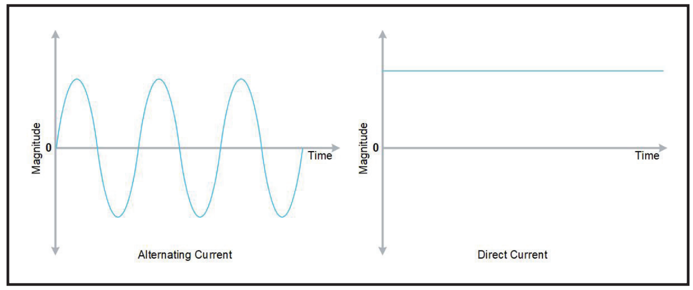
ENVIRONMENTAL STUDIES

Electromagnetic Fields (EMF)

from Offshore Wind Facilities



Naturally occurring EMF are present everywhere in the oceans. Undersea cables used for power transfer are known sources of EMF, but telecommunication cables and undersea communication cables also generate alternating current (AC) and direct current (DC) EMF.



For offshore wind energy projects, the primary sources of EMF are inter-array cables that carry electricity from each wind turbine to the export cables, which carry that electricity to shore.

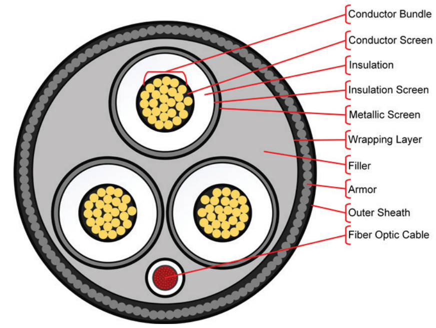
When considering effects of EMF, it may be helpful to understand the weak field strengths are well below the recommended threshold values for human exposure.

For example, the guidelines set forth by the International Commission on Non-Ionizing Radiation Protection for human exposure to time-varying electric fields are 12 to 100 times higher than the fields measured at the seafloor.

Common household items, including television sets, hair dryers, and electric drills, can emit magnetic fields similar to or higher in intensity than those emitted by undersea project power cables.

Offshore Wind Facilities

Offshore wind energy projects may employ inter-array cables that are 34.5- or 66-kV and approximately 6 inches in diameter, while export cables may be 138- to 230 kV cables and approximately 8- to 11 inches in diameter. These cables will transmit AC at 60-Hz (hertz) or cycles per second.



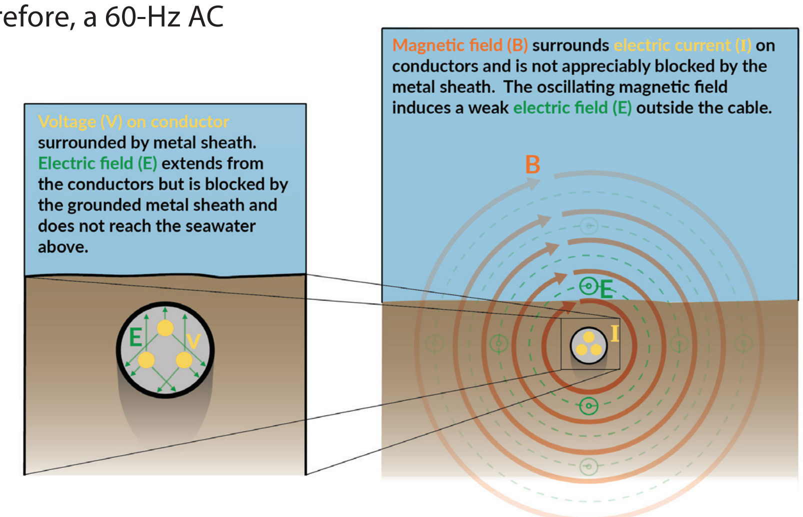
Cable cross-section

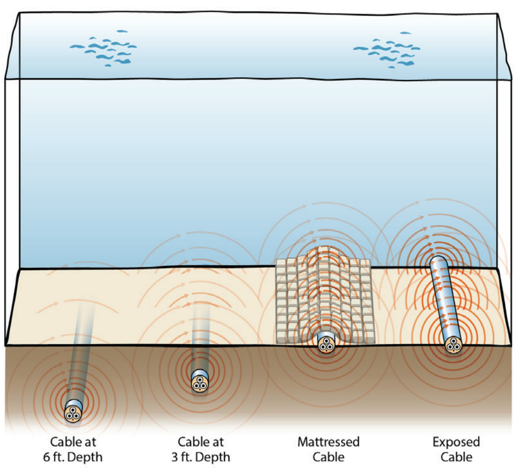
The **power cables do not produce an electric field** on the seafloor or within the ocean because the voltage on the copper conductors within the cable is blocked by a grounded metallic covering on the cable.

However, the **magnetic field from the undersea power cable is shielded** far less by this metallic covering; therefore, a 60-Hz AC magnetic field would surround each cable.

The 60-Hz AC magnetic field induces a weak electric field in the surrounding ocean that is unrelated to the voltage of the cable but instead is related to the amount of current-flow through the cable.

This means that when the current flow on the undersea power cable increases or decreases, both the magnetic and the induced electric fields increase or decrease.





Burying cables reduces EMF

Reducing the EMF

In addition to the metallic covering around the cable, undersea power cables are typically buried under the seafloor for their protection. As EMF from undersea power cables decrease rapidly with distance from the cable, burying the cables substantially reduces the levels of magnetic and induced electric fields in seawater.

Most inter-array and export cables are buried to a target depth of between 3 and 6 feet. Increasing the burial depth from 3 feet to 6 feet reduces the magnetic field at the seafloor approximately four-fold.

Where hardbottom seafloor conditions or existing infrastructure is encountered, the power cables are often covered with 6- to 12-inch thick concrete mattresses, rock berms, or other measures to protect the cable. While this covering does not achieve the same level of EMF reduction as burial and distance, beyond about 10 feet from the cable, the field levels for buried and mattress-covered cables are quite similar.

For More Information:
Dr. Mary Boatman | mary.boatman@boem.gov | boem.gov/Renewable-Energy-Environmental-Studies