NATIONAL WILDLIFE FEDERATION

Electromagnetic Fields and Offshore Transmission

To advance clean energy and use offshore wind resources, we must address electromagnetic field (EMF) impacts. We are committed to developing offshore wind and transmission projects responsibly by incorporating best practices to minimize EMF effects on marine life and coastal ecosystems, ensuring both environmental protection and the advancement of renewable energy.

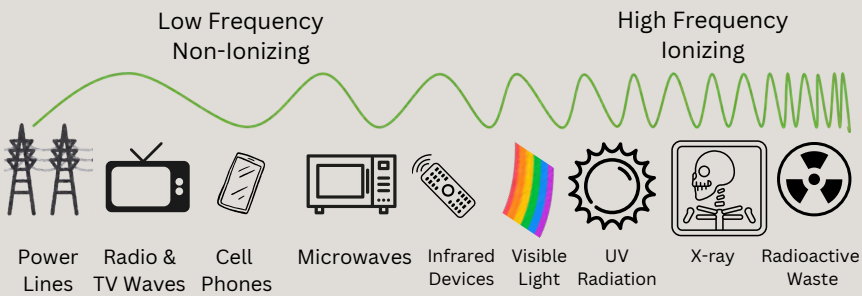
Electromagnetic Fields (EMFs)

Electromagnetic fields (EMFs) are made of invisible **electric and magnetic forces**. These fields are generated by stationary electric charges and by electric currents that produce magnetic fields.

EMFs can occur naturally, such as in the Earth's geomagnetic field and during thunderstorms, or they can be created by human-made sources like power lines.

The characteristics of an EMF depend on factors such as the strength and orientation of the electric or magnetic fields, as well as the frequency, which is the rate at which the waves fluctuate.

Electromagnetic Spectrum



Types of EMFs

Non-Ionizing Radiation:
This includes radio waves and microwaves, which are low-frequency and do not cause cellular or DNA damage.

Ionizing Radiation:
This type includes X-rays and other high-frequency waves. Prolonged exposure to ionizing radiation is harmful and can cause cellular and DNA damage.

Submarine Power Cables

Submarine power cables have been installed, operated, and maintained for almost 150 years. These cables, like those used in offshore wind farms, emit low-frequency, **non-ionizing** radiation. This type of EMF falls on the **non-harmful** side of the electromagnetic spectrum. According to the National Cancer Institute at the National Institute of Health **there is no proven link between cancer and non-ionizing radiation.**

An offshore wind substation in the Vineyard Wind offshore wind site
Raquel C. Zaldívar / New England News Collaborative

The Bureau of Ocean Energy Management has determined that the steps being taken to reduce impacts of EMFs are highly effective and the best available science demonstrates negligible to minor impacts on species, while continued research will seek for additional protections.

POTENTIAL IMPACTS

- Certain marine species can detect EMFs and rely on naturally occurring electric and magnetic fields for essential activities such as locating prey, avoiding predators, communication, and navigation.
- Artificial EMF may be indistinguishable from natural EMF sources for wildlife. There is **no indication** that behavioral responses will translate to negative impacts on the species.
- Research is ongoing to determine how species encounter and perceive cable EMFs throughout their lifetime. Adaptive management measures may ensure effective protections for wildlife.

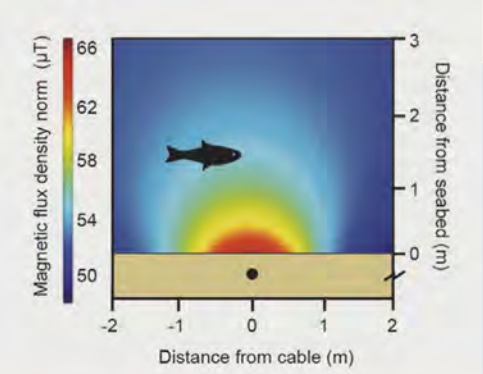
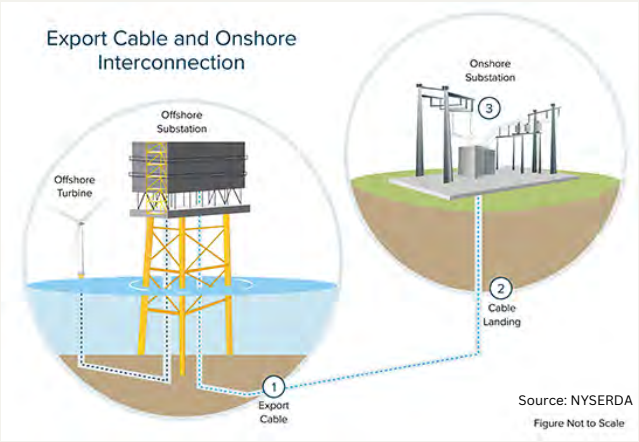
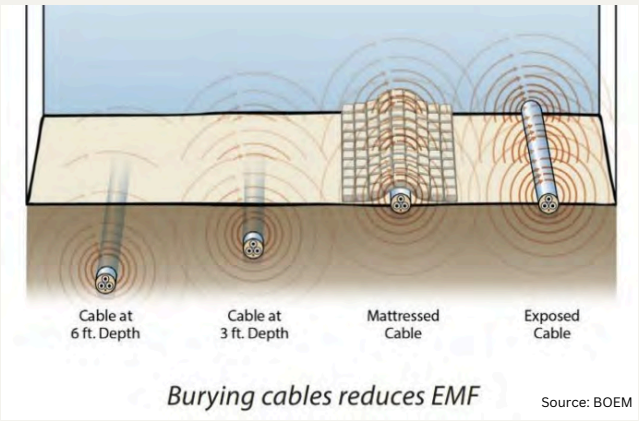


Figure 7. *Modeled magnetic field strength of a DC cable buried 1.5 meters beneath the seafloor. The magnetic field strength is highest just above the cable and then decreases with distance from the source. Fish not to scale. Image adapted from* ***Hutchison et al. 2021.***

Source: SEER Educational Research Brief: Electromagnetic Field Effects on Marine Life





MITIGATION MEASURES

- **Proper siting** of cables, which avoids areas of greatest importance to sensitive species, is one of the most effective ways to avoid impacts.
- Subsea power cables are designed with protective measures to minimize their environmental impact.
- Cables are "**shielded**," meaning they are wrapped in a conductive material that prevents electric fields from escaping and interfering with nearby electronic systems, while also protecting the cables from external electric fields.
- "**Grounding**" ensures the cables are connected to the earth, allowing any stray or excess electrical charge to safely dissipate, reducing the risk of electrical shocks and maintaining the stability of the cable's operation. While these measures effectively block most electric fields, the magnetic fields generated by the cables cannot be entirely eliminated and will still be present around the cable.
- Most subsea cables are **buried 3-7 feet** below the seafloor and covered in concrete to protect them from damage and to increase the distance between the EMF produced by the cables and the surrounding environment.

Sources

- SEER Educational Research Brief: EMFs, https://tethys.pnnl.gov/sites/default/files/summaries/SEER-Educational-Research-Brief-Electromagnetic-Field-Effects-on-Marine-Life.pdf
- National Institute of Environmental Health and Sciences, https://www.niehs.nih.gov/health/topics/agents/emf

NATIONAL WILDLIFE FEDERATION

LEARN MORE
www.offshorewindfacts.org

CONTACT
Amber Hewett
Senior Director, Offshore Wind Energy
HewettA@nwf.org