

Electric and Magnetic Fields

Factsheet

Introduction

This fact sheet had been produced to provide more detail about electric and magnetic fields (EMFs) in connection with the Seagreen Offshore Wind Farm project and, in particular, in relation to their onshore high voltage cables which will run underground for approximately 19 kilometres from the landfall at Carnoustie to a new substation at Tealing.

EMFs are present everywhere in our environment, originating from both naturally occurring and man-made sources, and can be considered as the regions around anything that uses or carries electricity in which effects can be measured.

This fact sheet sets out the predicted EMF levels from the Seagreen underground cables. It explains that these will be significantly within the safe levels established by UK government guidelines, and consistent with the levels of exposure found in the normal domestic environment.

Electric fields

Electric fields are produced by voltage, which is the pressure behind the flow of electricity and can be likened to the pressure of water in a hose. Voltage is measured in volts (V), with high voltages often described in kilovolts (kV), where $1 \text{ kV} = 1000 \text{ V}$. Electric field strengths are measured in volts per metre (V/m) or kilovolts per metre (kV/m).

The size of an electric field depends on the operating voltage of the electrical equipment and it will exist even when there is no current flowing.

Electrical equipment can be designed to avoid producing an external electric field through the use of metal screening or coverings.

High voltage underground cables, such as those that will be installed at the Seagreen project, are designed with an internal metal screen and no measurable electric field external to this screen is expected.

Magnetic fields

Magnetic fields are produced by the flow of electricity, the current. The current can be likened to the flow of water in a hose when the tap is on.

Magnetic fields are typically measured in teslas (T), which is a very large unit, so the normal unit of measurement of magnetic fields is the much smaller microtesla (μT), where $1\text{T} = 1,000,000 \mu\text{T}$.

Generally, the higher the current that flows in a cable, the higher the magnetic field.

Magnetic fields are normally at their highest immediately above or below an electrical cable, falling rapidly with separation distance.

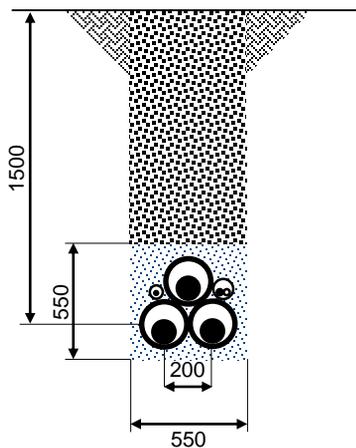
Industry guidelines

A number of international organisations have reviewed the scientific evidence and have produced guidelines on acceptable levels of exposure to EMFs. One that is widely recognised is the International Commission on Non-Ionising Radiation Protection (ICNIRP). ICNIRP guidelines were first published in 1998 (ICNIRP 1998), with new guidance recommending higher acceptable limits following in 2010 (ICNIRP 2010).

For public exposure there are, so far, no statutory exposure limits in the UK. However, the UK Government sets guidelines for exposure to EMFs in this country on advice from the Health Protection Agency (HPA). In 2004, the UK adopted the more restrictive ICNIRP 1998 Guidelines. This policy was reaffirmed in October 2009 and remains in force.

These guidelines describe 'basic restriction levels' and 'reference levels' for public exposure. The basic restriction is the recommended exposure limit for the public which the Health Protection Agency specified based on the 1998 ICNIRP guidelines. Reference levels are those beyond which further investigation would be required to ensure that the basic restriction is not reached. The 'reference level', which is based on easily measured criteria, is set conservatively at 100 μ T to ensure that the 'basic restriction level' is not exceeded under any circumstances.

Seagreen cables



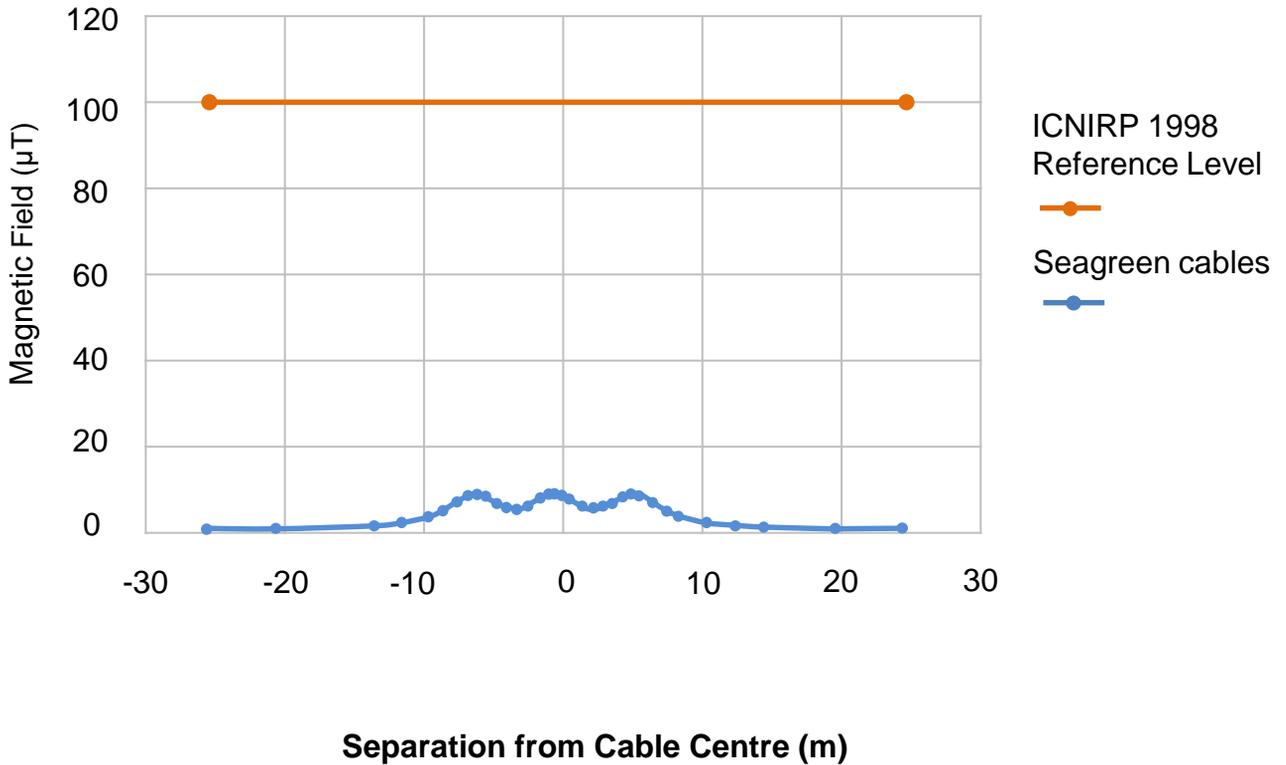
The proposed high voltage alternating current (HVAC) cables will operate at a voltage of 220kV and will be installed as three separate circuits in three trenches. Each circuit will consist of three power cables laid in a trefoil ('triangle') formation, each cable enclosed in a plastic duct.

Two fibre cables will also be installed with each circuit to be used for temperature sensing and control. The cables will be buried at a depth of around one and a half metres. A typical installation of one circuit is shown to the left.

Typical magnetic fields immediately above these cables (measured at 1m above ground level, in accordance with UK Government guidelines) would be around 10 μ T. This is 10% of the Reference Levels and is therefore significantly lower than the recommended reference levels.

The strength of a magnetic field decreases very quickly and significantly with increasing distance from the source. The following charts illustrate the reduction in magnetic field from a single cable circuit with separation from the centre line of the circuit:

Seagreen Cables – Magnetic Fields (Three Cable Trenches)



Separation from Cable Centre (m)

	Seagreen Cables (1m above ground level)	Seagreen Cables (20m from the nearest cables)	ICNIRP 1998 Reference level of exposure	Estimated Field Required to Exceed ICNIRP 1998 Basic Restriction
Electric Field	Negligible	Negligible	5000 V/m	9000 V/m
Magnetic Field	<10 µT	<0.2 µT	100 µT	360 µT

Typical values of magnetic field levels from common domestic devices can be seen in this table:

Magnetic Field (µT)

	Close to appliances	1 metre away
Vacuum cleaner	800	2
TV, washing machine, microwave	50	0.2
Electric oven	10	0.02
Fridge	2	0.01

Seagreen is committed to best practice health and safety in all of its activities. In relation electric and magnetic fields, this means ensuring that its proposed electrical infrastructure for the Seagreen Offshore Wind Farm complies with Government policy and with the compliance limits set.

The Seagreen figures are significantly lower than the limits recommended in the ICNIRP guidelines which have been adopted as UK government policy. Furthermore, they are consistent with the levels of exposure found in the normal domestic environment.

This information sheet has been completed in accordance with the requirements of UK Government Policies and Codes of Practice.

For more information

This factsheet is a summary of electric and magnetic fields in relation to Seagreen. For more reading on EMFs, please refer to these websites:

- http://www.emfs.info/wp-content/uploads/2017/09/EMF_The_Facts_250917.pdf
- <http://www.emfs.info/>

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