

# EMF ELECTROMAGNETIC FIELD

What is EMF?

• EMF means Electric

### **Average Magnetic Fields in the Home\***

Median EMF levels in milligauss (mG) from the

- and Magnetic Fields
- Electric Fields are produced by voltage
- Magnetic Fields are produced by current
- Together, when an electronic is plugged in and turned on, they produce both an Electric and Magnetic Field EMF
- Strength of EMF decreases rapidly with increasing distance from the electronic

### source of magnetic fields

	6 inches	1 foot	2 feet	4 feet
Personal Computer	14	5	2	-
Hair Dryer	300	1	_	_
Electric Shaver	100	20	-	-
Ceiling Fan	* *	3	_	_
Window Air Conditioner	* *	3	1	_
TV	* *	7	2	_
Blender	70	10	2	-
Coffee Maker	7	_	_	_
Dishwasher	20	10	4	_
Garbage Disposal	80	10	2	_
Electric Can Opener	600	150	20	2
Electric Range	30	8	2	_
Electric Oven	9	4	_	_
Refrigerator	2	2	1	_
Toaster	10	3	_	_

## (source)

International, national and state health agencies and scientific agencies have reviewed research on EMF from all three research areas in tandem to arrive at well-formulated conclusions. None of these agencies, including the Virginia Department of Health, World Health Organization and European Commission's European Health Risk Assessment Network on Electromagnetic Fields Exposure, have conclusive evidence that exposure to low-frequency EMF—from household electrical sources including power lines—at the levels typically found in our communities is causally associated with any health hazards. Links to the reports published by these agencies, as well as other EMF information, can be found at DominionEnergy.com/emf.

<b>Electric Clothes Dryer</b>	3	2	_	_
Washing Machine	20	7	1	-
Iron	8	1	_	_
Vacuum Cleaner	300	60	10	1
Power Saw	200	40	5	_

**NOTE:** Dash (–) means that the magnetic field at this distance from the operating appliance could not be distinguished from background measurements taken before the appliance had been turned on.

- \* **SOURCE**: *Electric and Magnetic Fields Associated with the Use of Electric Power*, National Institute of Environmental Health Sciences (NIEHS) and National Institutes of Health, June 2002. The report is available at DominionEnergy.com/emf.
- \*\* NIEHS did not measure the magnetic field at this distance from the operating appliance.





**Actions Speak Louder** 



# EMF CALCULATIONS ONSHORE OVERHEAD

These field levels were calculated at mid-span where the conductors are closest to the ground and the conductors are at the load operating condition specified.

**Existing 230 kV Transmission Line Historical Average Loading (2020)** 380 amps for Line #271, 0 amps for Line #1-74, 116 amps for Line #2118, and 270 amps for Line #147 and at an operating voltage of 120.75 and 241.5 kV when supported on the existing structures

Transmission Line Number	Left Edge of Right of Way (looking to Harpers)		Right Edge of Right of Way (looking to Harpers)		
	Electric Field (kV/m)	Magnetic Field (mG)	Electric Field (kV/m)	Magnetic Field (mG)	
Line 271	0.517	24.587	0.117	9.532	
Line 2118 & 147	1.194	18.482	1.194	18.482	

**Existing 230 kV Transmission Line Historical Peak Loading (2020)** 1006 amps for Line #271, 0 amps for Line #1-74, 344 amps for Line #2118, and 541 amps for Line #147 and at an operating voltage of 120.75 and 241.5 kV when supported on the existing structures

Transmission Line	Left Edge of Right of Way	Right Edge of Right of Way
Number	(looking to Harpers)	(looking to Harpers)
NUTIDEI	(looking to harpers/	(looking to harpers)

Electric Field (kV/m) Magnetic Field (mG) Electric Field (kV/m) Magnetic Field (mG)

Line 271	0.508	66.728	0.012	25.484
Line 2118 & 147	1.198	41.120	1.198	41.120

### **Proposed Projected Average Loading (2025)**

396 amps for Line #271 and 121 amps for Line #2118, 281 amps for Line #147, and 914 amps for the 3 CVOW circuits and at operating voltages of 120.75 kV and 241.5 kV when supported on the proposed Project structures

Transmission Line Number	Left Edge of Right of Way (looking to Harpers)		Right Edge of Right of Way (looking to Harpers)		
	Electric Field (kV/m)	Magnetic Field (mG)	Electric Field (kV/m)	Magnetic Field (mG)	
CVOW 3 Circuits (2252, 2253, 2254)	0.692	46.785	0.883	48.909	
+Line 271	0.698	64.258	0.594	34.123	
+Line 2118 & 147	1.318	23.756	0.891	51.728	

### **Proposed Projected Peak Loading (2025)**

1047 amps for Line #271, 358 amps for Line #2118, 563 amps for Line #147, and 2175 amps for the 3 CVOW circuits and at operating voltages of 120.75 kV and 241.5 kV when supported on the proposed Project structures

Transmission Line Number	Left Edge of Right of Way (looking to Harpers)		Right Edge of Right of Way (looking to Harpers)		
	Electric Field (kV/m)	Magnetic Field (mG)	Electric Field (kV/m)	Magnetic Field (mG)	
CVOW 3 Circuits (2252, 2253, 2254)	0.667	116.848	0.868	122.815	
+Line 271	0.677	161.895	0.572	83.296	
+Line 2118 & 147	1.323	54.882	0.878	129.070	



**Actions Speak Louder** 

# EMF CALCULATIONS ONSHORE UNDERGROUND AND OFFSHORE UNDERSEA

In an **onshore underground** XLPE cable, the electric field is contained entirely within the cable sheath. Therefore, **there is no electric field** at any point external to the circuits.

**Maximum EMF Level at 1.0 Meter Above Ground (Peak Loading)** The magnetic fields listed below were calculated at 1 meter above grade, 3' depth and 10' separation for the Onshore Export Circuits. The calculations were completed at peak loading (852 Amp).

Conductor Type/Duct bank Configuration	Peak Loading EMF Level at 1 meter above ground (mG)			
	Edge of Right of Way	Peak		
5000 kcmil AI (Open Trench/Three Duct bank)	18.4	88.7		

In the **offshore undersea** export circuits, the actual burial depth of the Trenchless Installation conduits will be 82 to 98 feet. At this burial depth, calculated field levels, even directly above the cable will be much less than 0.1 mG and 0.1 mV/m, and likely near background levels. Electric fields that are produced by the voltage applied to electrical conductors of the Inter-Array Cables and Offshore Export Cables are effectively blocked from the marine environment by the metallic sheaths and steel armoring of the cable. The Offshore Export Circuits in Trenchless Installation conduits are modeled with a burial depth of 3.3 feet to the top of the cable, providing a conservative estimate of field values.

Summary of Calculated Magnetic- and Induced Electric-Field Levels for 3.3 feet Burial Depth and Peak Loading at Specified Horizontal Distances (measured from the centerline of the cable)

		Magnetic Field (mG)			Electric Field (mV/m)		
Cable Configuration	Evaluation Height	Max	+/- 5 feet	+/- 10 feet	Max	+/- 5 feet	+/- 10 feet
Offshore Export Circuit	At the seabed	112	15	0.7	1.9	0.3	<0.1
	3.3 feet above seabed	8.7	2.7	0.2	0.2	0.1	<0.1
Offshore Export Circuit: Trenchless Installation	At the seabed	112	16	0.7	1.9	0.3	<0.1
	3.3 feet above seabed	8.7	2.8	0.3	0.2	0.1	<0.1

Transitory exposures to magnetic fields at the seabed above the buried cables were found to be at levels below reported thresholds for effects on the behavior of magnetosensitive marine organisms. The weak electric fields induced in seawater and in local electrosensitive marine organisms also were found to be below reported detection thresholds. Thus, the operating cables are not projected to affect the populations or distributions of fish in the Offshore Project Area.



Actions Speak Louder



## EMF CALCULATIONS OFFSHORE ABOVE WATER

Maximum calculated volume-averaged magnetic fields (mG) and induced electric fields (mV/m) around the Wind Turbine Generators (WTG), the Offshore Substations, and protected, surface-laid Offshore Export Cable.

Project Element (Volume of Water)	Maximum volume-averaged calculations		
	AC Magnetic-Field (mG)	AC Electric Field (mV/m)	
WTG (Inter-Array Cables at the skirt)	120	1.28	
Offshore Substation (east-face water column)	256	2.70	
Offshore Substation (south-face at base)	209	2.51	
Protected Offshore Export Cable (above the covered cable)	243	3.48	

Field levels, both above buried cables and at structures, decrease very quickly with distance from the cables, so the calculations summarized above are applicable only in the immediate vicinity of the Project cables (both individually and at structures) which represents approximately one percent of the total marine habitat in the Offshore Project Area.

The available literature indicates that the EMF produced by the Project's cables would not be detectable by resident magnetosensitive fish or invertebrates. As such, operating cables are not projected to have any adverse effects the populations or distributions of fish in the Offshore Project Area.





**Actions Speak Louder**