Everlasting Battery

1. Introduction

Electrons have a magnetic dipole moment of known value, the Bohr magneton μ_B. This dipole within a non-uniform B field endures a force F that in its simplest form is given by

$$F_x = \mu_B \frac{dB_x}{dx} cos(\theta) \quad (1)$$

where θ is the angle between the dipole axis and the x axis. Conduction electrons within iron that is non-uniformly magnetized along its x axis will tend to align with the internal field hence $\cos(\theta)=1$. The electrons will be driven along the x axis, and this can be the basis of an everlasting battery if the magnetization comes from a permanent magnet. Here we consider iron wire placed between two permanent magnets delivering permanent voltage into an open circuit or permanent current into a resistive load. If we consider the Bohr magneton as a tiny current loop the source of the seemingly free energy would be the generator supplying that loop current, so the source is whatever creates the perpetual spin of the electron.

2. Field in Iron wire

Here we have used FEMM to show the field within the iron wire. Figure 1 is the FEMM input alongside its output showing the field lines. Figure 2 is the field along the centre of the wire.

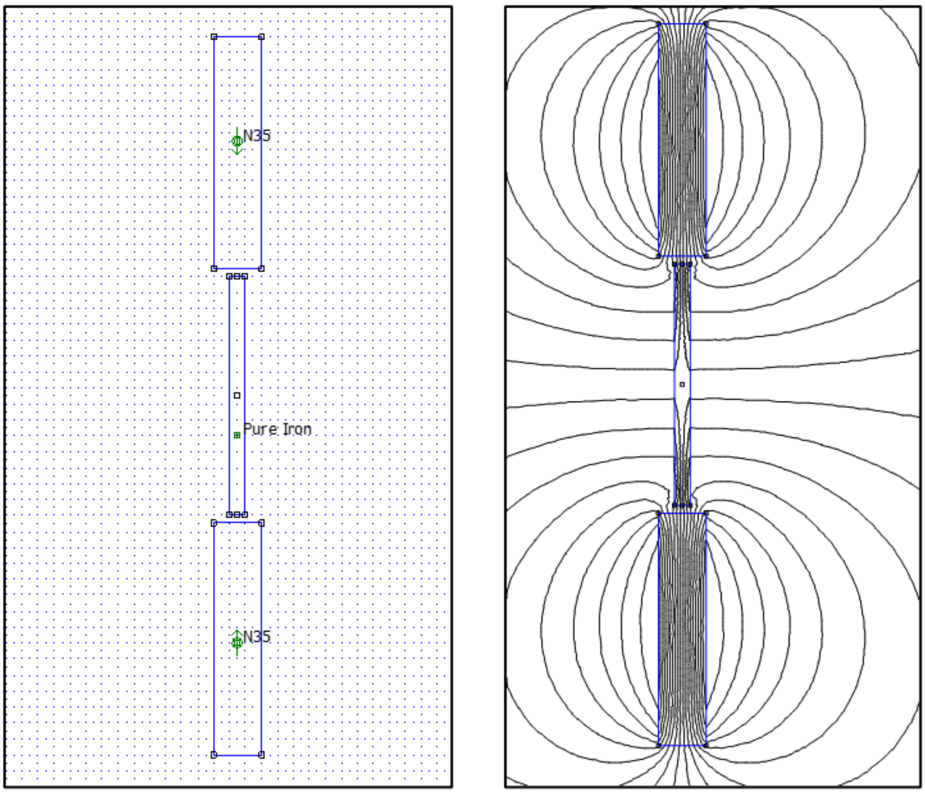

Figure 1.

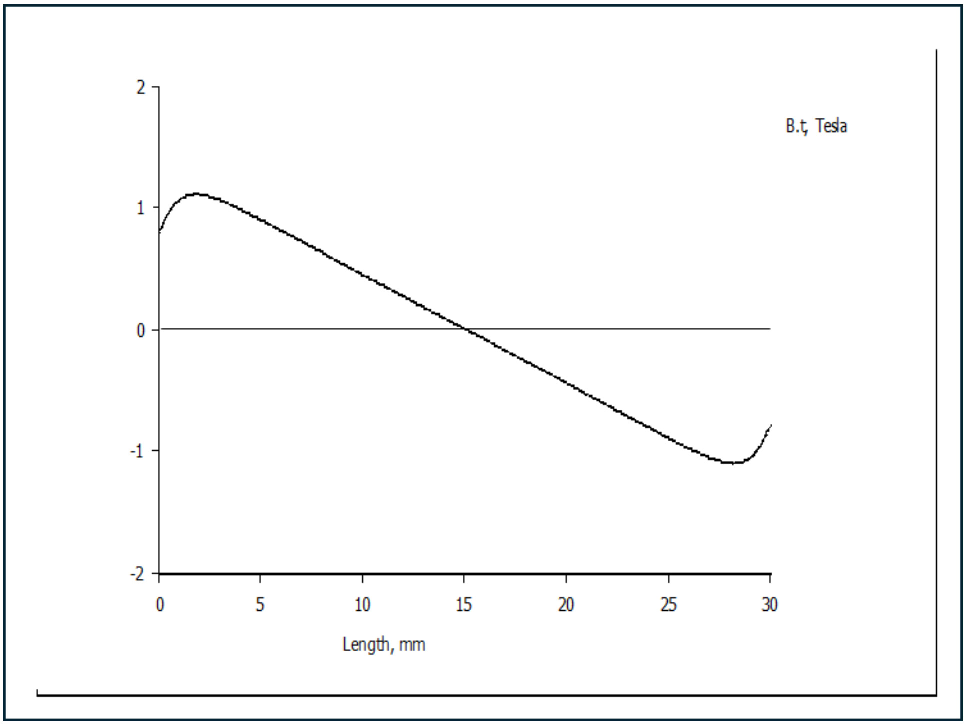

Figure 2.

FEMM is a 2D simulator, so it applies to a system that is infinitely long in the z direction. It can usefully be used for systems that have dimension in the z direction that is considerably longer than their x and y dimensions. Thus, it can apply to the setup shown in Figure 3 where an array of iron wires is placed between two long rectangular permanent magnets.

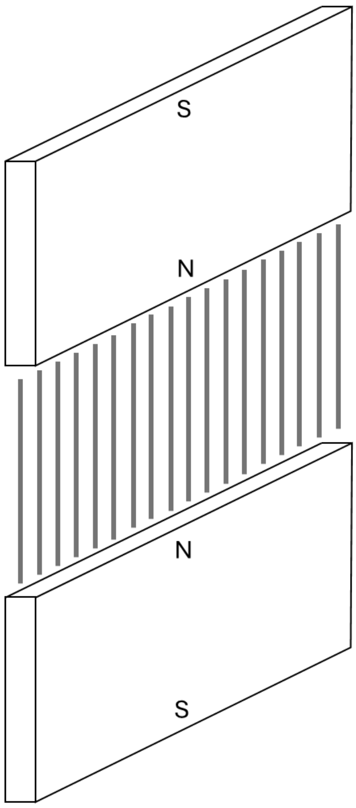

Figure 3

With the itinerant electrons in the iron drawn towards the magnets the outer ends of the wires will be negative while the centres will be positive. It only requires interconnections using copper wire to get an overall voltage for N wires that is N times that of a single wire. This is shown in Figure 4, and Figure 5 is the equivalent circuit.

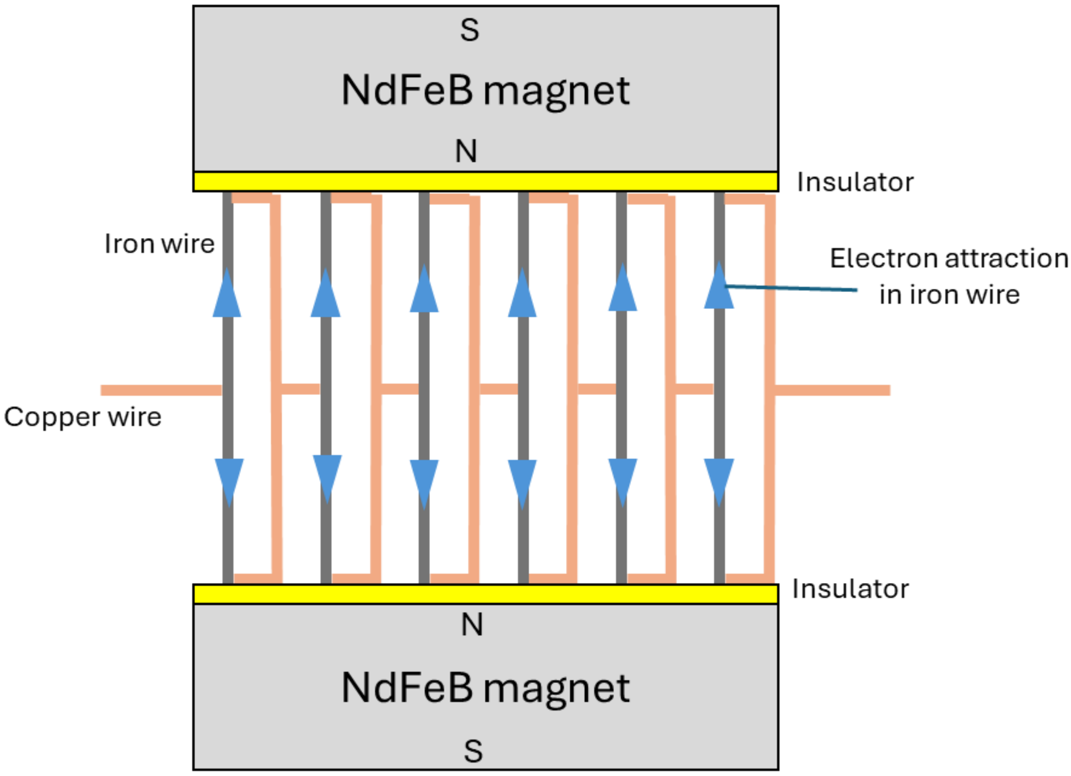

Figure 4.

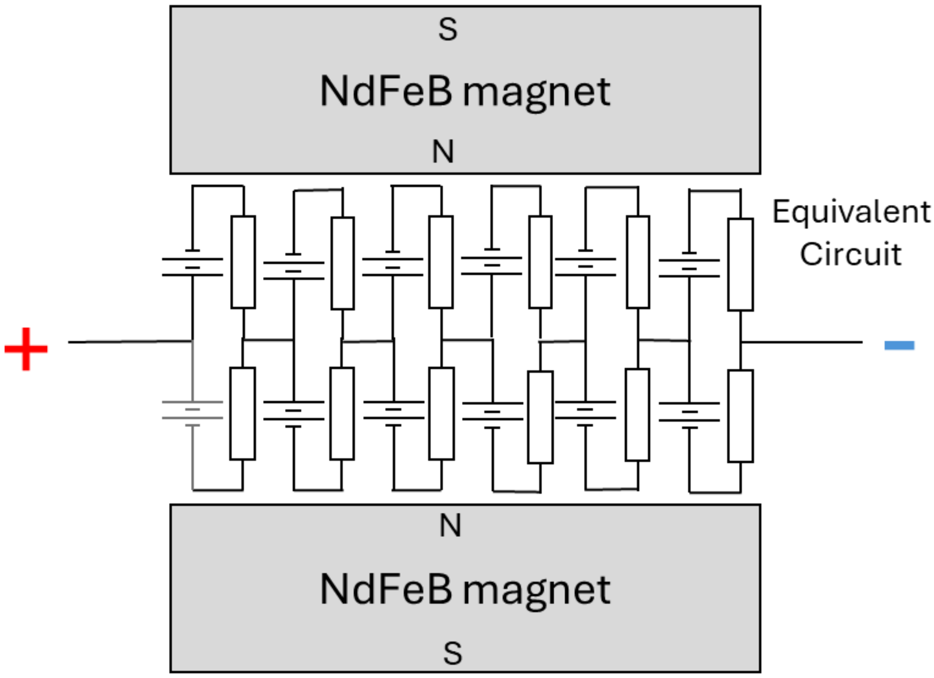

Figure 5

The resistors in Figure 5 represent the DC resistances of the iron and copper wires.

3. Math

Conduction electrons in iron have a spin-polarization that varies with the degree of magnetization, being zero with no magnetization and 100% when saturated. We can consider polarization *P* as following

$$P = \frac{B_S}{B} \quad (2)$$

Where B_S is the saturation value. Equation (1) then becomes

$$F_x = \mu_B P_{(x)} \frac{dB_x}{dx} \quad (3)$$

Where *P* is a function of x due to the non-uniformity of *B* along x. This force is equivalent to an electric field δE acting on the electron charge *e*

$$\delta E = \left(\frac{\mu_B}{e}\right) P_{(x)} \frac{dB_x}{dx} \quad (4)$$

Over the full wire length from B=0 position to B=max, integration of (4) yields an induced voltage *V* of

$$V = \left(\frac{\mu_B}{e}\right) \int_0^X P_{(x)} \frac{dB_x}{dx}.dx \quad (5)$$

Applying (5) to the B field values shown in Figure 2 and taking B_S of iron as 1.7 Tesla yields 10.6μV. Figure 3 shows 18 wires and that would produce 190μV.