



## DISCOVERY OF THIRD MEANS OF IMPLEMENTING FARADAY'S LAW OF ELECTROMAGNETIC INDUCTION TO GENERATE ELECTRICITY

By

Romanus Ejike UGWOKÉ

Department of Physics, Federal University of Technology, Owerri, Nigeria

**Abstract:** A third means of implementing Faraday's law of electromagnetic induction in the generation of electricity has been discovered. In the previous implementations either a magnet which magnetic field linked a coil is in motion while the coil is fixed or the coil is made to move relative to the magnet. In this discovery, neither the magnet nor the coil moves but a magnetic shield moves in the gap between a coil and a magnet which magnetic flux linked the coil. This discovery also shows that magnetic potential gives rise to magnetic field and what we call field is actually a dynamic energy. The reason for the generation of reversed current (or back electromotive force) is given.

**Key words:** energy: vacuum - magnet: induction - virtual photons.

### INTRODUCTION

Someone may wonder if all the laws of thermodynamics are obeyed when electrodynamic processes are going on. Electrons have always been in motion in atoms and will continue to do so as long as they are bound in their respective atoms. This may provoke in someone a thought process that require explaining if a permanent magnet is continuously doing work.

If someone lifts a bag of cement 2m above the ground against gravity, he will be doing work to have it remain 2m above ground. The longer he holds it at this position the more energy he spends. When a magnet lifts a heavy object, one assumes it must be doing work to hold it above the ground.

It is known that work is done when a force moves a body through a distance. If a magnet is fixed near the bottom of an inclined plane and a metal ball is rolled down the plane, the magnet does work when it changes the direction of the metal. The same applies when instead of a metal ball another magnet is rolled down the inclined plane. How many metals or magnet could be rolled down the inclined plane before the fixed magnet exhaust energy stored in it? This thought provoking question lead to the experimental discovery made.

### THE EXPERIMENTAL SET UP

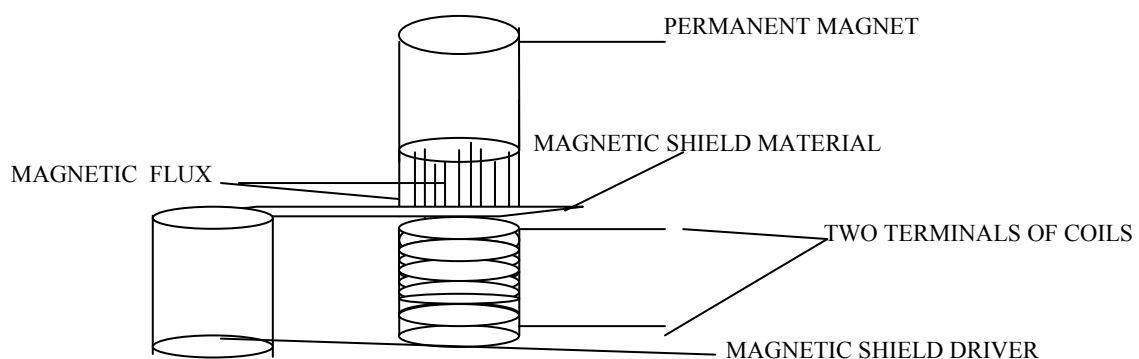


FIG.1.0 ELECTRICAL GENERATOR WITH THE MAGNETIC FLUX BLOCKED FROM REACHING THE COILS

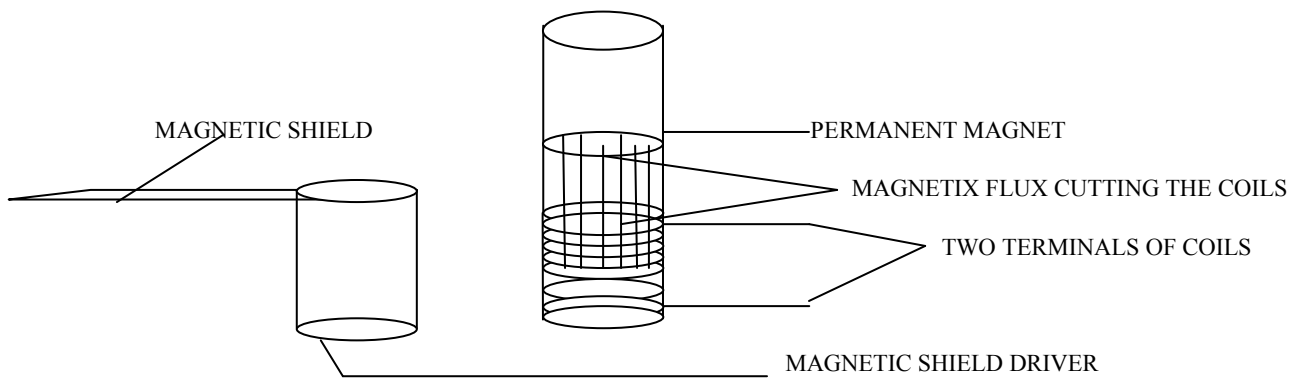


FIG. 2.0 ELECTRICAL GENERATOR WITH THE MAGNETIC FLUX REACHING THE COILS

### OPERATION OF THE ELECTRICAL ENERGY GENERATOR

Faraday's law of electromagnetic induction states that an electromotive force is set up in a coil whenever the magnetic flux linking the coil changes. All electrical generators now either have the circuit (turns of coil) move relative to the magnetic flux or the source of the magnetic flux ( permanent or temporary magnet ) move relative to the circuit. In this research, a knife made of iron and steel (both of which are ferromagnetic materials) was made to pass through the gap between the coil and the magnet. Three light emitting diodes arranged in parallel were placed at the output of the coil. Each time the knife passes between the coil and the magnet, a flash of light is shown on the diodes. Before using the knife, the magnet was first brought close to the coil but the light was not shown. However at the time of removing the magnet, the light was shown. When the pole of the magnet was changed, the light was shown at the time of bringing it close to the magnet but not at the time of removing it. This was actually expected because the diodes allow current to flow only in one direction.

When the magnetic shield made of ferromagnetic materials come between the magnet and the coil, the flux flow through the shield and will not get to the coil. When the shield is moved away, the lines of flux cut through the coil again. This action causes the magnetic flux linking the coil to change and electromotive force set up in the coil. Though not tested, if a non magnetic material such as copper were used as the shield, eddy current set up on the copper during its motion between the coil and the magnet would have generated magnetic field that redirect the magnetic flux from reaching the coil thereby producing the same effect.

All electrical generators including wind turbine can be reverse engineered for better efficiency using this method.

### INTERACTION OF PERMANENT MAGNET WITH VACUUM ENERGY

In his general theory of relativity, Einstein introduced the cosmological constant to ensure an equation that corresponds to a static Universe. He had believed that the Universe is not expanding. When it was shown through the Hubble's telescope that the Universe was expanding, he felt he made the greatest mistake of his life by introducing the cosmological constant. However scientists felt the need for the cosmological constant to account for the agreement between the Standard Model of Cosmology and observations (Chuss, 2013).

The cosmological constant is called energy density of the vacuum in field theory (Carroll, 2013). Vacuum energy which can also be called Zero-Point Energy in quantum mechanics is the energy that remains when all other energy from matter and radiation has been removed from a region of space and is also the lowest energy of any state (Carroll, 2003. Haisch, 2013). It is believed to be responsible for helium remaining in liquid state at zero degree Kelvin. Casmir effect has also been explained in terms of zero point radiation pressure. Casmir effect is an effect in which two parallel conducting plates in a vacuum experience attractive force between each other when placed close together (Chuss, 2013).

According to Wright (2012), a more general form of the vacuum energy density than the cosmological constant is Dark energy. It is believed that Dark energy permeates all of space and tends to accelerate the expansion of the Universe. The Universe is made up of about 70% of Dark energy (Carroll, 2013). This value was arrived at after considering the gravitational contribution of all other matter and radiation in the universe including dark matter, baryonic and non baryonic matter.

Since energy and mass are related by Einstein's equation  $E= mc^2$ , the theory of general relativity predicts that this energy will have a gravitational effect (Haisch, 2013). Indirect evidence of the Dark energy according to (Carroll,2013) are from;

- (i) Observation of high red shifts (Z) of Type 1a Supernovae
- (ii) Measurement of the Cosmic Microwave Background
- (iii) Gravitational Lensing
- (iv) Large scale structure of the Universe.

In 1860, James Clerk Maxwell unified both electricity and magnetism into electromagnetism (Evwaraye et al. 2008). It has been explained that the force carrier of electromagnetism is photon. Consider two charged particles say two electrons brought close to each other so that they interact. As long as they remain close together they interact by the exchange of virtual photons. This goes on for as long as they remain within the field of one another. Where then do they get the energy for this continuous interaction without violating the law of conservation of energy? In his explanation for the source charge problem, Bearden (2003) interpreted the source of this energy to be from Vacuum energy. This means that all separated charged particles interact with the vacuum energy. In the same way, according to Bearden (2003) all permanent magnets interact with the vacuum energy and continuously output magnetic energy to its surroundings. It is a cyclic process in which the energy that goes into the magnet from the vacuum is the much that it outputs to its surrounding.

## CONCLUSION

It can be inferred from this experiment that a permanent magnet does not just store energy in its field but output dynamic energy by its interaction with vacuum energy as pointed out by Bearden (2003). By definition, the flow of charged particles is called electric current. However a vibration motion of charged particles gives rise to what is commonly called alternating current. It can be understood from this experiment that the reason for forward and backward flow of current is that in the forward case, dynamic energy from the magnet pushes or squeezes the charged particles and as soon as the energy is removed the charged particles force themselves apart causing reversal of the current. In both cases, the charged particles were in motion, hence the flow of current. A more difficult puzzle should be the point of flow of electric energy itself.

While the flow of charges is called current it would be wrong to say that the flow of charged particles is the flow of electrical energy. Electrical energy flows at a speed close to that of light but charged particles flow at few centimeters per second in a conductor (Beaty, 2013. Galili and Goihbarg, 2013). Electrical energy is always bi-directional from the source but the same cannot be said of the flow of charged particles (Feynman et al. 1964. Beaty, 2013. Galili and Goihbarg,2013). It is known that whenever charges flow, electrical energy also flows through these charges. Fenyman et al. (1964) has stated that electrical energy flows not through the wire but around it from the source and enters into the resistor. In a steady state case (direct current) where an electric cell is the source, it is understood that the energy comes from the cell. It appears as if the energy in this generator flows into the system from the environment.

#### **ACKNOWLEDGEMENT**

I wish to acknowledge all Physics Lecturers who at one time or the other were managing our departmental Library. My profound thanks go to Prof. C.E. Akujor who always advised me to make out time for research.

#### **REFERENCES**

- Beaty, W. (1995). Why is Electricity so hard to understand? <http://amasci.com/miscon/whyhard1.html> retrieved 22/02/2013.
- Bearden, T.E. (2003). The Source Charge Problem: Its solution and Implication. <http://www.cheniere.org/techpapers/vanflandern.htm> retrieved 04/02/2014.
- Carroll, S.M. (2013). Cosmological constant. <http://ned.ipac.caltech.edu/level5/Carroll2/frames.html> retrieved 05/07/2013
- Chuss, D.T. (2012). What is Cosmological Constant. [http://map.gsfc.nasa.gov/universe/uni\\_accel.html](http://map.gsfc.nasa.gov/universe/uni_accel.html) retrieved 05/07/2013
- Evwaraye, A.O. et al. (2008). Electromagnetism and Modern Physics. Spectrum Book Limited, Ibadan. P. 206.
- Feynman, R. et al. (1964). Feynman Lectures on Physics. Addison-Wesley Vol.2.PP 27-28.
- Galili, I. and Goihbarg, E. (2005). Energy Transfer in Electrical Circuits: A qualitative account. Am. J. Phys., Vol.73, No.2, PP. 141-144.
- Haisch, B. (2013). Zero Point Energy and Zero Point Field. <http://www.calphysics.org/zpe.html> retrieved 05/06/2013
- Wright, E.L. (2012). Glossary of Astronomical and Cosmological Terms. [www.astro.ucla.edu/~wright/glossary.html](http://www.astro.ucla.edu/~wright/glossary.html) retrieved 05/07/2013

#### **ABOUT THE AUTHOR**

Romanus Ejike Ugwoke is a graduate of Physics and Astronomy of the University of Nigeria, Nsukka. He holds M.Sc. Astrophysics from the same university and is now a PhD student there. For about five years, he has been a lecturer at the Federal University of Technology Owerri, Imo State Nigeria with kin interest in finding solutions to energy problems especially as it affects climate changes. He always seeks to find a means of using knowledge from Astrophysics to solve problems here on earth.