



8. The Role of Electrical Engineering in Solving Environmental Degradation Issues

Reshma C. A.

*Lecturer In Electrical & Electronics Engineering,
S.S.M Polytechnic College, Tirur, Kerala.*

Shamrin Mohammedkutty. P

*Lecturer, (M Tech), Electrical & Electronics Engineering,
S.S.M Polytechnic College, Tirur, Kerala.*

ABSTRACT:

Most of the materials that go into the socio-economic chain's infrastructure (production — transportation/distribution — electricity use) are obtained from finite natural resources via technological processes that consume large amounts of energy while also releasing pollutants and/or collateral waste. Components and apparatuses of electrical systems that are no longer needed become waste when they are taken out of service (often containing toxic, non-biodegradable compounds).

Reducing emissions and recovering and reusing waste materials is a top concern for sustainable development, and it is a multifaceted, cross-disciplinary challenge. Knowledge-based societies and long-term ecological education are vital if mankind is to have a healthy future. The various electromagnetic fields emitted by electrical and communication devices pose a danger to human health.

The utilisation of renewable energy sources helps alleviate social, environmental, and economic issues because these resources are regarded environmentally beneficial, emitting little or minimal exhaust and harmful gases like carbon dioxide, carbon monoxide, sulphur dioxide, and so on.

KEYWORD:

C.I. Engine, Zirconium dioxide, catalytic, mesh wire, ZrO₂.

Introduction:

We rely on electrical and electronic engineers to improve the equipment and systems that we use on a daily basis. Every aspect of society's communication, technology and energy

needs is addressed by our research and development efforts. Power production, transportation, medical, quantum information, computers, artificial intelligence, cryptography, and communications are just a few of the many applications that rely on electricity today. What is the difference between electrical and electronic devices? When it comes to power and its distribution, electrical engineers are responsible, while electronic engineers are responsible for the products we use every day. [1]

Power is provided by equipment's electronic components. Although many types of equipment are still controlled by electrical devices, electronic components are used to control them.

The (Career Information) Center In the generating station, electrical and electronic engineers may supervise crews of electricians who perform basic tasks. When diagnosing electrical workers, they frequently draw on their expertise in electrical engineering technology. Some electrical and electronic engineering technicians are employed by industrial units that rely on energy for their operations. [2]

In their work, electrical engineers use their understanding of science to deal with equipment that creates and distributes energy, like generators and transformers. Additionally, they design and manufacture electric motors, electrical machinery, and ignition systems for automobiles, planes, and other engines. [3]

Additionally, their research focuses on determining the environmental implications of current and future technology. Our ability to push the boundaries of energy science and engineering has been greatly aided by advances in electronic technology. [4]

By investigating new solar cell materials, environmentally friendly electronic materials, new power electronics circuits, advanced atmospheric measurements, more energy efficient computer architecture, and novel algorithms and devices for data collection, processing, and security in energy systems. [5]

On April 4, 2004, the European Commission published a Directive (2004/40/EC) that made it plain that electromagnetic fields must be closely monitored and mitigation measures sought. Electrical use materials' environmental impact is mostly defined by their ageing under the coordinated and synergistic action of stress factors particular to the operational environment when these conditions are in place [6]

Renewable energy sources have the potential to meet all of the world's energy needs, safeguard the environment, and ensure a reliable supply of energy for all people on Earth.

Wind and hydroelectric power plants have some drawbacks, such as seasonal fluctuations in output that necessitate particular design and consideration, which can be met by the hardware and software thanks to the advancement of computer technology in the field of renewable energy.

Table 1[7] categories the most common renewable energy sources and how they're used in various forms.

Energy source	Energy conversion and usage options
Hydropower	Power generation
Modern biomass	Heat and power generation, pyrolysis, gasification, digestion
Geothermal	Urban heating, power generation, hydrothermal, hot dry rock
Solar	Solar home system, solar dryers, solar cookers
Direct solar	Photovoltaic, thermal power generation, water heaters
Wind	Power generation, wind generators, windmills, water pumps
Wave	Numerous designs
Tidal	Barrage, tidal stream

Table 1: Main renewable energy sources with their usage form

Lifetime of components and subassemblies for electrical use:

The deterioration of the functional features and ageing of the component materials is a major factor in determining the useful life of both power plant systems and electricity-consuming equipment.

Remediation/maintenance operations may be required in certain cases to replace components that have reached the end of their service life, and in other cases, the entire piece may need to be replaced.

Mineral oil has been drained into the earth (with all the ramifications for soil and groundwater) and the water supply of thousands of subscribers/consumers was disrupted for several days (social consequences and material damage difficult to estimate). [8]

Review of Literature:

Objectives:

- To learn about the various applications of electrical engineering.
- To investigate sustainable energy sources.
- To investigate the effects of electromagnetic fields on a human.
- It is important to investigate the efficiency of power generation.

Research Methodology:

It is the systematic, theoretical investigation of the procedures used in a given field of research. Methodology Theoretical analysis of the methods and principles linked with a particular field of study is included. Concepts like paradigm, theoretical model, stages and quantitative or qualitative methods are typically included.

To prepare this work, I relied on data that has already been published in numerous places. The information gathered for this research came from a variety of sources, including the Internet.

Result and Discussion:

The 50 Hz electromagnetic field radiation (Fig 1), which corresponds to ordinary household power supply, has genetic effects on the fibroblasts (the dermal layer of the skin) and the melanocytes (cells for the generation and storage of melanin) as well as some animal cells. [9]

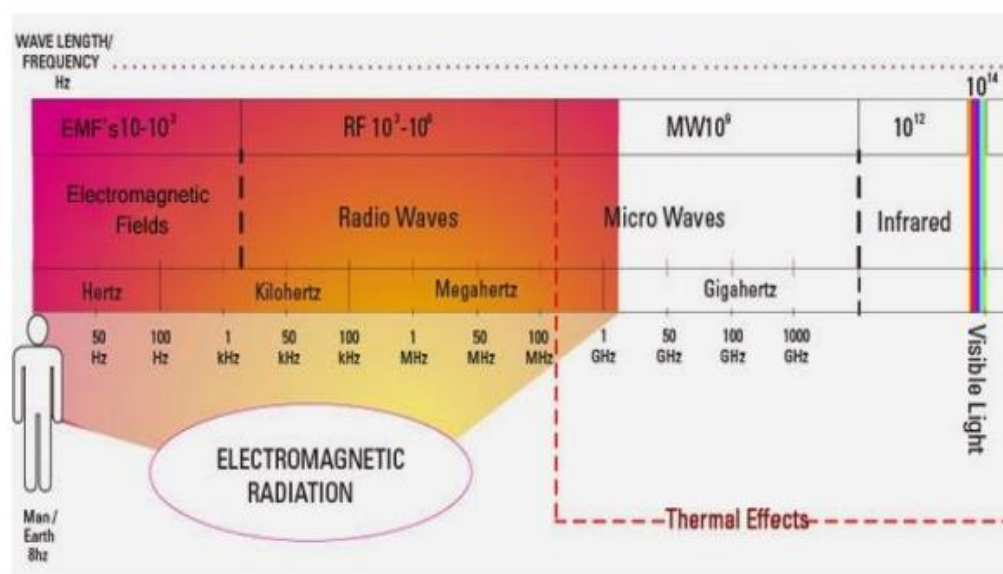


Fig.1: Effects of electro-magnetic field on a human.

In addition to reducing carbon dioxide emissions and educating the public about the effects of global warming, renewable energy initiatives have helped to improve environmental outcomes.

According to the findings, there were only little effects on the people who live in the affected area, tourism, energy costs, and educational outcomes. [10]

There was a significant improvement in the quality of life as well as the building of social links and the development of communities.

It is possible to keep water contamination at a minimum by using renewable energy sources properly [11-12].

Table 2 shows how this can be done.

Category of impact	Relationship to conventional sources	Comment
Exposure to harmful chemicals		
Emissions of Hg, Cd and other toxic elements	Reduced emissions	Emissions reduced a few hundred times
Emissions of particles	Reduced emissions	Much less emissions
Exposure to harmful gases		
CO2 emissions	Reduced emissions	A big advantage
Acid rains– SO, NO_x	Reduced emissions	Reduced more than 25 times
Other greenhouse gases	Reduced greenhouse gases	Big advantage – global warming
Other		
Spouts of fossil fuels	Total or partial elimination of oil spills	Heavy fuel oil and other petroleum products spills
Water quality	Better water quality	Reduced water pollution
Soil erosion	Smaller loss of land	In most cases, there is no penetration deep into the earth

Table 2: Summary of environmental effects

An essential issue in determining whether renewable energy sources can be used to create power is their availability and technological limitations. Limitations are inherent in all resources. Table 3[14] categories energy sources based on their efficiency.

Engine/process	Efficiency %
Otto (gasoline) engine	20–30
Diesel engine	30–40
Gas turbine	30–40
Steam turbine	35–45
Nuclear, steam turbine	30–40
Combined gas/steam turbines	40–60+
Fuel cell (hydrogen, etc.)	40–60+
Photovoltaic cell	10–25
Geothermal plant	5–15
Windmill	30–40 (59% limit)

Table 3: Efficiency of electricity generation

Conclusion:

It is necessary to produce trash [99-101] and release considerable noxious dispersions in order to generate electricity in thermal power plants. For the sake of humanity's health in the future, we must establish a civilization built on knowledge and grounded in environmental stewardship. Education systems must also be reevaluated in order to comprehend the relevance of waste management activities, activities where environmental and natural resource aspects—certainly not economic ones—must take precedence. Conventional energy supplies like oil, gas, and coal are critical to a country's economic growth. Every factor, from greenhouse gas emissions to resource availability to land needs to water consumption to social implications to price of power generated is taken into account when classifying renewable energy sources. The proper use of renewable energy systems can lead to local employment, improved health, more job prospects, increased consumer choice, a higher standard of living, stronger social ties, increased income, a positive impact on the demographics, and a stronger sense of community. We must build a civilization built on knowledge and grounded in environmental awareness if we are to preserve the future well-being of our species.

References:

1. Swanson J, Kheifets L (2006) Biophysical mechanisms and the weight of evidence for EMF. *Radiat Res*165:470–478
2. Ibraheem Fayed, Mouldi Bedda, Electromagnetic Radiation and its effects on human beings: Survey and Environmental Recommendations, 15th Scientific Symposium for Hajj, Umrah and Madinah visit - Scientific Portal for 1436AH, May 2015.
3. Sosnina EN, Maslayeva OV, Pachurin GV, Bedretdinov R. Sh., On the safety of power transformers. *Fundamental research*. - 2013. - No. 10-5. - P. 1023-1026.

4. Decree № 6 of June 26, 2006 and indicators of environmental noise, taking into account the degree of discomfort in different parts of the day, limit values of noise indicators environment, methods of assessing the performance levels of noise and harmful effects of noise on the health of the population
5. Karady, G.G. and Holbert, K.E., "Novel technique to improve power engineering education through computerassisted interactive learning", IEEE Transactions on Power Systems, Vol. 19, pp. 81-87, 2004.
6. Karady, G.G. and Heydt, G.T., "Increasing student interest and comprehension in power engineering at the graduate and undergraduate levels", IEEE Transactions on Power Systems, Vol. 15, pp. 16-21, 2000.
7. Amin, M., "Evolving energy enterprise-"grand challenges": possible road ahead and challenges for R& D", IEEE Power Engineering Society Winter Meeting, 2002, pp. 1456-1458, 2002.
8. Takanezawa K, Nishio K, Kato S, Hashimoto K, Watanabe K. Factors affecting electric output from rice-paddy microbial fuel cells. Biosci Biotechnol Biochem 2010;74:1271–3.
9. Bacilio-Jiménez M, Aguilar-Flores S, Ventura-Zapata E, Pérez-Campos E, Bouquelet S, Zenteno E. Chemical characterization of root exudates from rice (*Oryza sativa*) and their effects on the chemotactic response of endophytic bacteria. Plant Soil 2003;249:271–7.
10. Chiranjeevi P, Mohanakrishna G, Mohan SV. Rhizosphere mediated electrogenesis with the function of anode placement for harnessing bioenergy through CO₂ sequestration. Bioresour Technol 2012;124:364–70.
11. Kuzyakov Y. Review: factors affecting rhizosphere priming effects. J Plant Nutr Soil Sc 2002;165:382
12. ADEME. Les Chiffres Cles 2016: Climat, Air et Energie. 1st ed. Angers: ADEME Editions, 2016. ISBN 979-1-0297-0310-2.
13. TOLIYAT, H. A., S. NANDI, S. CHOI and H. MESHGIN-KELK. Electric Machines: Modeling, Condition Monitoring, and Fault Diagnosis. 1st ed. Boca Raton: CRC press, 2013. ISBN 978-1-138-07397-5.
14. YANG, B.-S. and A. WIDODO. Introduction to Intelligent Machine Fault Diagnosis and Prognosis. 1st ed. Hauppauge: Nova Science Publishers, Inc., 2011. ISBN 978-1-60692-263-7.