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The Role of Electrical & Electronic Engineer in Achieving Net-Zero CO_2 Emission and Clean Energy Future in Nigeria.

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Abstract
Due to the energy sector been responsible for about three-quarters of global greenhouse gas (GHG) emissions. There exist many possible solutions to achieve net-zero CO_2 emissions globally by 2050 and factors that could hinder achieving the net-zero target. The net-zero emissions by 2050 aligns with key energy related United Nations Sustainable Development Goals (SDGs). This is aimed at achieving universal energy access by 2030 and major improvements in air quality. Thus, limiting the global temperature rise to 1.5 °C without a temperature overshoot (with a 50% probability). Here, we discuss the role of the Electrical & Electronic Engineer in achieving zero CO_2 emission and clean energy future.
Keywords: Millimetre*, Net-zero, CO_2, Emission, Clean energy, Global greenhouse gas*

1. Introduction

Climate change is impacting human lives and health in a variety of ways. It threatens the essential ingredients of good health such as clean air, safe drinking water, nutritious food supply, and safer shelter and has the potential to undermine decades of progress in global health [1].

It was estimated that between 2030 and 2050, climate change is expected to cause approximately 250,000 additional deaths per year, from malnutrition, malaria, diarrhea and heat stress alone. The direct damage cost to health is estimated to be between USD 2-4 billion per year by 2030 [1].

Areas with weak health infrastructure – mostly in developing countries will be the least able to cope without assistance to prepare and respond.

Climate change refers to long-term shifts in temperature and weather patterns. These shifts may be natural, such as through changes in solar cycle. Since the beginning of the 18th century, human activities have been the major contributor of climate change which is primarily due to combustion of fossil fuels like coal, oil and gas. Burning fossil fuels generates greenhouse gas emissions that acts like a blanket wrapped around the earth trapping the sun's heat and raising temperatures [1].
Carbon dioxide (CO_2) and Methane (CH_4) are examples of greenhouse emissions causing climate change. CO_2 emission is largely due to combustion of gasoline in automobiles, coal for heating a building, clearing land and

forest by bush burning can also lead to release of CO_2. Landfills for garbage are a major source of methane emissions. Energy, industry, transport, building, agriculture and land use are among the main emitters of greenhouse gases [1],[2].

2. Excerpts From the 2021 National Conference "Coal-City 2021"

Sambo reinstated that the increasing effects of global warming which enhances climate change (unprecedented variation in temperatures and weather conditions) are mainly due to

Carbon dioxide (CO_2) and Methane (CH_4) emissions. The damaging effects of climate change globally prompted the United Nations to establish the Sustainable Development Goals (SDGs) to be achieved by the year 2030. The SDGs was signed in 2015 and ratified in 2017 [3].

African Nations were enlightened that climate change problems are also African problems by the United Nations Framework on Climate Change (UNFCCC) and the Africa Union adopted agenda 2063 mandating its member states to produce their National Determined Contributions (NDCs) for abating climate change [3].

He also asserted that the International Energy Agency (IEA) came up with 2050 Net-zero emission plan for substantial reduction of CO_2 emission after noting that the implementation of the SDGs worldwide will not limit global rise in temperature to 1.5 degrees Celsius. This was the crux of the topic discussed at the November 2021 Glasgow Climate Conference (COP26). The Nigerian government represented by President Buhari promised to end the use of gas by 2040 and attain Net zero greenhouse gases (GHGs) emission by 2060 [3].

The Energy Commission of Nigeria based on her energy projection, developed a new Electricity Generation Expansion Plan (EGEP). The EGEP was inaugurated by integrating the new policy statements on energy transition and on reduced emission but with expanded energy mix.

Sambo concluded that if the Nigeria Society of Engineers will want to recommend the use of gas beyond 2060, and also use of coal then it will be necessary for a detailed study to be conducted on development of more gas field, on mining of coal and processing it, on the entrenchment of circular carbon economy, on job creation potentials as well as a detailed cost benefit analysis of the whole matter [3].

This conclusion was what gave rise to the question. Why recommend the use of gas beyond 2060 with reported challenges it poses to human health and the environment? In our attempt to answer this question, we thought about the role of the Electrical & Electronic Engineer in achieving zero emission and green energy future.

3. The Roles of The Electrical/Electronic Engineer in Achieving Green Energy Future

The achieving of zero net emission will depend on the growing demand for renewable electricity (for example in electric vehicles and reduction in methane gas components in LPGs).

This implies that the power generating sector has a central role to play because it is responsible for one-third of the total global carbon emissions.

Global power industries are making efforts toward reducing Carbon dioxide (CO_2) and Methane (CH_4) emissions by switching for fossil-fuel fired power generation to predominantly wind and solar photovoltaic (PV) power.

Though, the incessant demand of renewables in the power mix comes with new challenges. These challenges are structural strains on existing power generation, and distribution infrastructure created by net flow of electricity and by inherent variability of renewables, including potential imbalances in supply and demand changes in transmission flow patterns, and the potential for greater instability [4].

These challenges lead to the need for long-duration energy storage (LDES). McKinsey and company argue that timely development of a long duration energy storage market with government support would enable the energy system to function smoothly with a large share of power coming from renewables, and would contribute immensely to decarbonizing the economy [4].

LDES encompasses a group of conventional and novel technologies, including mechanical, thermal, electrochemical, and chemical storage, that can be deployed competitively to store energy for prolonged periods and scaled up economically to sustain provision, for days or even weeks [4].

The Electrical & Electronic Engineer have significant roles to playing in achieving zero greenhouse gasses emissions. Some of these roles are listed below

1. Engaging in Research
2. Design and construction of rechargeable batteries for energy storage (Lithium-ion Batteries, etc).
3. Engaging government in implementation of policies to achieve COP26 goals
4. Information delivery
5. Design of components and semiconductor materials for electric vehicles
6. Manufacturing of Equipment needed for renewable energy Installations

3.1 Limitations and Challenges

1. Poor funding of Research
2. Poor policy implementation
3. Lack of adequate information
4. High cost of equipment for renewable energy installations
5. Poor manufacturing/production sector

4. Conclusions

Electrical engineering majors can look forward to learning more about power electronics, new materials for power transistors, and magnetic materials for power applications, along with the use of new materials such as silicon carbide and gallium nitride, and wider bandgap semiconductors — all areas of potential research and engagement for students.

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