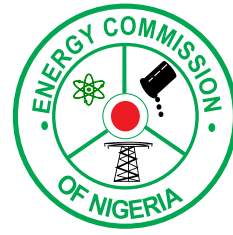


# ***ENERGY COMMISSION OF NIGERIA***

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**Promoting Sustainable Energy  
Development in Nigeria**

**2019 | ANNUAL  
REPORT**



# ENERGY COMMISSION OF NIGERIA

(Promoting Sustainable Energy Development in Nigeria)

# 2019

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## ANNUAL REPORT

October, 2020

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## FOREWORD

We are delighted to present our Annual Report for 2019. This report showcases our achievements, activities and partnerships for the year 2019 in our strides towards promoting sustainable energy development in Nigeria. Energy Commission of Nigeria is the Federal Government Agency charged with the responsibility for the strategic planning and co-ordination of national policies in the field of energy in all its ramifications. In so doing, we make recommendations for the exploitation of new sources of energy as well as monitoring the performance of the energy sector in the execution of government policies on energy. The Commission also amongst others in energy matters, liaise with all international organisations in energy matters.

The Commission commenced operation in 1988, and after the decision of the Heads of ECOWAS on 29<sup>th</sup> May 1982 in Cotonou, Benin Republic that each member state should establish a government agency to be called Energy Commission of the member state to supervise and coordinate energy development.

Energy Commission of Nigeria is fully funded by the Federal Government through its annual appropriations. In 2019, it had a total appropriation of N5.455 billion; out of which 64% was capital, 30% for personnel cost and 6% overhead. While, only 40% of the capital appropriations and 75% of the overhead were released; however, all personnel costs were fully paid in this year under review. The Commission was able to pay Nigeria's assessed contribution to the International Renewable Energy Agency (IRENA); installed 1,196 number of solar powered streetlights, 2 number of solar powered water boreholes and 3 number of solar pv mini-grids in various communities of the country.

I would like to thank the Honourable Minister of Science and Technology, Dr Ogonnaya Onu, Directors of the Ministry, Management and staff of the Commission and our friends, for their commitment and support for making 2019 a successful year in our mission of making sustainable energy development a reality in Nigeria.

**Prof. Eli Jidere Bala**, FNSE, FAEng  
Director-General/CEO



# BOARD MEMBERS OF ENERGY COMMISSION OF NIGERIA (ECN), 2019



President, Commander-In-Chief of The Armed Forces, Federal Republic of Nigeria,  
**MUHAMMADU BUHARI, GCFR;**  
Chairman of The Commission



**DR. OGBONNAYA ONU**  
Mins. of Science & Technology



**HAJIYA ZAINAB SHAMSUNA AHMED**  
Mins. of Finance, Budget & National Planning



**ENGR. SULEIMAN HUSSEIN ADAMU**  
Mins. of Water Resources



**ENGR. SALEH KWAGYANG MAMMAN**  
Mins. of Power



**CHIEF TIMIPRE SYLVA**  
Mins. Of Petroleum



**ALH. SABO NANONO**  
Mins. Of Agriculture & Rural Development



**ARCH. OLAMILEKAN ADEGBITE**  
Mins. Of Mines & Steel Development



**GEOFFREY ONYEAMA**  
Mins. Of Foreign Affairs



**MAJ. GEN. BASHIR SALIHI MAGASHI (RTD.)**  
Mins. of Defence



**ENGR. PROF. ELI JIDERE BALA, FNSE, FAEng, FSES.N.**  
Director General/CEO  
Secretary of the Commission



## 1. Introduction

The Energy Commission of Nigeria came to being through the enabling Act No. 62 of 1979, as amended by Act No. 32 of 1988 and Act No. 19 of 1989, now encapsulated in ECN Act E10, LFN (2004). The Commission commenced operation in 1989 after the meeting of the Heads of ECOWAS on 29<sup>th</sup> May 1982 in Cotonou, where a decision was taken that each member state should establish by law, a body within the machinery of government, to be charged with the responsibility for coordinating and supervising all energy functions and activities within each Member State and may be called **ENERGY COMMISSION** of each Member State. This decision is conveyed in the Official Journal of ECOWAS, Protocols, Decisions & Directives, Vol. 4, June 1982, pg 50.

## 2. Mandate

The primary legal mandate of the ECN is to produce strategic plans and co-ordinate national policies on energy in all its ramifications and, without prejudice to the generality of the foregoing, the Commission shall:

- a) Serve as a centre for gathering and disseminating information relating to national policy in the field of energy development;
- b) Serve as centre for solving any inter-related technical problems that may arise in the implementation of any policy relating to the field of energy;
- c) Advise the Government of the Federation or a State on questions relating to such aspects of energy, as the Government of the Federation or a State, may from time to time refer to it;
- d) Prepare, after consultation with such agencies of government whose functions relate to the field of energy development or supply as the Commission considers appropriate, periodic master plans for the balanced and co-ordinated development of energy in Nigeria and such plans shall include –
  - a. Recommendations for the exploitation of new sources of energy as and when considered necessary; and
  - b. Such other recommendations to the Government of the Federation relating to its functions under this Act as the Commission may consider to be in the national interest;
- e) Lay down guidelines on the utilization of energy types for specific purposes and in a prescribed sequence;
- f) Inquire into and advise the Government of the Federation or of the State on the adequate funding of the energy sector including research and development, production and distribution;
- g) Collate, analyze and publish information relating to the field of energy from all sources, where such information is relevant to the discharge of its function under the Act;
- h) Monitor the performance of the energy sector in the execution of government policies on energy;

- l) Liaise with international organizations in energy matters such as International Atomic Energy Agency (IAEA), World Energy Conference and other similar organisations;
- j) Carry out such activities as are conducive to the discharge of its functions under the ECN Act.

### 3. Vision

To ensure secured, (adequate and reliable), equitable (accessible and affordable) and environmentally sustainable energy supply for the nation's economic and socio-political development.

### 4. Mission

To promote sustainable energy development in Nigeria as elucidated in the legal mandate.

### 5. Staff Strength: 754

#### a. Headquarters: **357**

##### Departments

- i. Energy Planning and Analysis
- ii. Energy Information Systems
- iii. Renewable Energy
- iv. Energy Management, Training and Manpower Development
- v. Nuclear Science and Technology
- vi. Human Resource Management
- vii. Finance and Accounts
- viii. General Services

#### b. Research Centres:

- a. National Centre for Hydropower Research & Development (NCHRD), Ilorin: **47 (North Central)**
- b. National Centre for Energy Research & Development (NCERD), Nsukka: **97 (South-East Zone)**
- c. National Centre for Energy & Environment (NCEE), Benin: **53 (South-South Zone)**
- d. National Centre for Energy Efficiency & Conservation (NCEEC), Lagos: **42 (South-West Zone)**
- e. National Centre for Petroleum Research & Development (NCPRD), Bauchi: **61 (North-East Zone)**
- f. Sokoto Energy Research Centre (SERC), Sokoto: **97 (North-West Zone)**

## 6. Senior Management Staff of Energy Commission of Nigeria



**PROFESSOR (ENGR.) ELI JIDERE BALA**  
*PhD (Applied Energy) FNSE, FNIMechE, FSES, FAEng, MIAEE*  
Director-General/Chief Executive Officer



**DR ABUBAKAR MALAH UMAR**  
PhD (Physics), PGD (Radiation Protection) FSES, FIDFPM, MNIP  
Director, Nuclear Science & Technology Department



**DR. (MRS) ROSELINE KELA**  
PhD (Biochemistry)  
Director, Energy Management, Training and Manpower Dev.



**ENGR. JOSEPH SUNDAY OLAYANDE**  
B.Sc., M.Sc. (Petr. Engrg); MNSE, MSPE, MIAEE/NAEE  
Director, Energy Planning & Analysis



**ENGR. OKON N. EKPENYONG**  
B. Eng. (Electrical), Cert. SHP (China)  
Director, Linkages and Consultancy



**BARR. FUNMI TENIOLA ABIODUN**  
LL.B, B.L.  
Director, Legal Services



**MR. NATHANIEL ALI OMALE**  
B.Ed Chemistry, ADPM, MPA  
Director-General Services & Special Duties





**FATUME CIROMA-ZARMA (MRS)**  
B.Sc. (Sociology and Antropology) MNIM  
Director, Adminstration & Finance



**MR. ABDULKAREEM OZI ALIYU**  
B.Sc. (Statistics)  
Director, Energy Information Systems



**DR. MAHMOUD GARBA**  
Ag. Director, SERC, Sokoto



**PROF. PAULINUS EKENE UGWUOKE**  
Director, NCERD, Nsukka



**PROF. ABUBAKAR MOHAMMED BELLO**  
Director, NCPRD, Bauchi



**PROF. ENGR. WAHAB ADEBAYO SALAMI**  
Director, NCHRD, Ilorin



**PROF. DENNIS IGBINOMWANHIA, PHD.**  
Director, NCEE, Benin



**DR. EMMANUEL OGEDENGBE**  
Ag. Director, NCEEC, Lagos

## 7. 2019 Budget Performance

S/N	ECN Location	Appropriations (A)			Released (B)			Expenditure (C)			Performance		
		Personnel (N)	Overhead (N)	Capital (N)	Personnel (N)	Overhead (N)	Capital (N)	Personnel (N)	Overhead (N)	Capital (N)	Personnel (%)	Overhead (%)	Capital (%)
1	Headquarters, Abuja	1,626,155,307.00	246,181,559.00	2,395,779,072.00	1,619,801,736.15	150,451,468.84	958,311,628.80	1,619,801,736.15	150,451,468.84	958,311,628.80	100	100	100
2	NCEEC, Lagos		7,083,000.00	122,619,860.00		4,873,1467.39	49,047,944.00		4,681,885.95	32,988,904.20		96.08	67.26
3	NCEE, Benin		18,556,439.00	29,933,364.57		12,537,626.00	27,606,007.20		11,173,416.69	27,398,817.70		89.12	99.25
4	NCPRD, Illorin		21,176,997.00	355,386,574.00		14,784,660.88	142,147,411.00		14,757,682.45	142,144,694.76		99.85	100
5	Sokoto, SERC		15,414,420.00	72,590,000.00		10,442,946.62	29,036,000.00		10,427,065.78	28,669,239.65		99.85	98.74
6	NCERD, Nsukka		15,685,758.00	331,121,217.00		10,623,838.68	132,448,486.80		10,532,336.01	132,438,088.75		99.14	99.99
7	NCPRD, Bauchi		24,575,110.00	173,480,000.00		16,550,073.36	69,392,000.00		16,538,444.98	69,123,136.00		99.93	99.61
	<b>Total</b>	<b>1,626,155,307.00</b>	<b>348,673,283.00</b>	<b>3,480,910,087.57</b>	<b>1,619,801,736.15</b>	<b>264,122,081.77</b>	<b>1,407,989,477.80</b>	<b>1,619,801,736.15</b>	<b>218,562,300.70</b>	<b>1,391,074,509.86</b>	<b>100</b>	<b>82.75</b>	<b>98.80</b>

## 8. 2019 IGR

Year	Tender Fee (N)	Stamp Duty (N)	WHT (N)	VAT (N)	TOTAL (N)
2019	4,797,701.66	20,415,308.46	71,170,167.42	66,830,638.35	163,213,815.89

## 9. Liabilities as at end of 2019

S/No	Year	Amount Outstanding (N)
i.	2009	234,317,276.36
ii.	2010	3,431,688,673.13
iii.	2011	1,111,190,355.68
iv.	2012	1,518,643,016.89
v.	2013	Nil
vi.	2014	Nil
vii.	2015	Nil
viii.	2016	Nil
ix.	2017	Nil
x.	2018	Nil
xi.	2019	Nil
<b>Total</b>		<b>6,295,839,322.1</b>

## 10. 2019 Promotions and Staff Training

a) 2019 Promotion Exercise		
S/No	Designation	No of Staff
1.	Director -15	8
1.	Deputy Director - 14	4
2.	Chief - 13	15
3.	Asst. Chief - 12	8
4.	Principal - 11	25
5.	Snr. II - 09	33
6.	Officer I - 08	9
7.	Executive Officer/Conf. Sec - 07	1

8.	Works Supt – o6	15
9.	Junior Staff	11
<b>Total</b>		<b>129</b>
<b>b) 2019 Staff on Training</b>		
<b>S/No.</b>	<b>Course of Study (Study Leave)/Workshops</b>	<b>No of Staff</b>
1.	PGD	Nil
2.	M.SC/M.ENGR./M.TECH	4
3.	PhD	4
4.	Officer sent on short Courses/Workshops from Headquarters and Centres	48
<b>Total</b>		<b>56</b>

## 11. Exits from Service

During the period under review a total of seven (7) staff left the service of the Commission. Three (3) of them left the service through resignation, one through withdrawal and two retired, while one through death.

S/no	Name	Designation/ CONRAISS	Date	Mode of Departure
1	Barr. George E. Ezeh	Snr. Special Asst./ 11-2	28 Feb 2019	Withdrawal from service
2	Mr Usman Abdullahi	Chief Driver/5	02 March 2019	Retirement
3	Mr. Isaac Tinu-Emu Yavala	Snr. Scientific Officer/9-4	27 May 2019	Death
4	Osazuwa Osamudiamen	Higher Tech. Off. I/7-2	25 September 2019	Resignation
5	Mrs Osilike Joy Nwakaego	Senior Typist I/8- 3	November 2019	Retirement
6	Abubakar Sirajo	Research Off.II/7- 2	13 November 2019	Resignation
7	Aisha Mohammed Halidu	Admin Officer II/7-2	31 December 2019	Resignation



## 12. 2019 Due Process on Capital Appropriation

### a) ***Establishment of Procurement Planning Committee***

-	Director General/CEO	-	Chairman
-	Director, Legal	-	Member
-	Director Admin & Finance	-	Member
-	Director (EPA)	-	Member
-	Director (NST)	-	Member
-	Deputy Director (Finance)	-	Member
-	Asst Chief Scientific Offr. (Procurement)	-	Member
-	Deputy Director Procurement)	-	Secretary

### b) ***Tenders Board***

-	Director General/CEO	-	Chairman
-	Director, NST	-	Member
-	Director, EMTMD	-	Member
-	Director, EPA	-	Member
-	Director, LEGAL	-	Member
-	Director, A&S	-	Member
-	Director, RE	-	Member
-	Ag. Director, F&A	-	Member
-	Secretary, PPC	-	Secretary

### c) ***Observers/Monitors Invited at Pre-Qualifications and Tender Openings***

- Bureau for Public Procurement (BPP)
- Nigerian Society of Engineers (NSE)
- Transparency International of Nigeria (TIN)

## 13. Projects, Reports & Activities - Headquarters

### a. **Execution of 2019 Capital Projects**

In 2019 Capital Appropriation, a total of 1,196 Poles for Solar Streetlight, 3 nos Mini-Grid and 2 nos Solar Powered Borehole were executed in various Communities across Nigeria.

#### **Benefits of the project: -**

- Enhance Security to the Communities at Night
- Enhanced Lighting for Learning at Night
- Provides Enabling Environment for Commercial Activities in the Night
- Provide Potable Water for Drinking and Sanitation
- Reduced greenhouse gas emissions
- Creation of Jobs and increase in income in the communities
- Creation of more opportunities for social gatherings and events which strengthen the community.

- Provision of cold storage for vaccines and medicines in rural Primary Health Centres (PHC).

## SUMMARY OF 2018 & 2019 RENEWABLE ENERGY CAPITAL PROJECTS

YEAR	WIND		SOLAR PV STREETLIGHT		SOLAR PV MINI-GRID		SOLAR PV WATER PUMPING		TOTAL
	QTY	MW	QTY	MW	QTY	MW	QTY	MW	MW
2018	-	-	1,142	0.2075	9	0.027	12	0.0144	0.249
2019	-	-	1,196	0.07176	3	0.009	2	0.0024	0.08316
<b>TOTAL</b>									<b>0.34</b>

### b. Reports & Publications;

The Commission prepared and produced the following Energy Planning Reports/Studies in line with its mission of promoting sustainable energy development through the production of strategic plans and coordination of national policies in all its ramifications:

- Energy Demand and Supply Projections (MAED and MESSAGE) up to 2020 and beyond.
- Key Performance Indicators (KPIs) for the Nigerian Energy Sector for Performance Monitoring 2018
- Energy Investment Risk Assessment of Nigeria Energy Sector in collaboration with IEC.
- Report on Investment Climate and Exceptions to National Treatment for Nigeria in Collaboration with IEC 2018.
- Energy Efficiency Accession Report for Nigeria.
- Draft Report on Harmonization of Laws & Regulations with the Provision of the Treaty.
- Identify Financial De-risking Instruments and Propose and Implement means of Capitalization
- Compendium of Renewable Energy Investment Incentives in Nigeria
- Development of Comprehensive Sectoral NAMA Technology Action Plans for Solar, Wind and Biomass.

### c) **Activities & Achievements;**

- Participated in the Technical Working Group Meeting of GIZ Nigerian Energy Support Programme (NESP) held 31<sup>st</sup> January 2019. NESP advises the Nigerian Government on how best to provide reliable and sustainable electricity to its populace by promoting investments in renewable energy, energy efficiency, and rural electrification.
- Sokoto Energy Research Centre (SERC) in collaboration with ECOWAS Centre for Renewable Energy and Energy Efficiency (ECREEE) conducted training to build capacity on Solar Thermal Systems for Experts and Professionals on solar thermal and applications in February and December, 2019. The training was for participants from the Private Sector, Research Centres and Public Institutions in the Northern part of Nigeria.
- Participated in a two (2) day Experts Peer Review/Work group meeting for the rapid assessment and gap analysis of the National Energy Policy (Sustainable Energy Bill) from 30<sup>th</sup> to 31<sup>st</sup> May 2019.
- Represented the Honourable Minister at the International Conference on Science and Sustainable Development (ICSSD 2019) at Covenant University, Ota, Ogun state 6-8 May 6, 2019.



*Fig 1: Prof. Bala accepting a plaque for the HMST, Dr. Onu at the 3rd International Conference on Science & Sustainable Development (ICSSD 2019) at Covenant University, Ota, Ogun State, May 6-8, 2019.*

- The Commission held a three (3) day Induction/Training for the newly employed staff at the Public Service Institute of Nigeria from 23<sup>rd</sup> to 25<sup>th</sup>, July 2019.



*Fig 2: DG/CEO with New staff of the Commission during the Induction Ceremony at the Public Service Institute, Kubwa, FCT.*

- In line with Management's commitment for transparency and zero tolerance to corruption in tandem with the Federal Government's agenda. The Independent Corrupt Practices and Other Related Offences Commission (ICPC) inaugurated the Commission's Chapter of the Anti-Corruption and Transparency Unit (ACTU) on 30th July 2019.



*Fig 3: Members of the ECN ACTU during the swearing-in ceremony at the ECN Headquarters*

- SERC in collaboration with European Union, GIZ and USAID, organized Professional Training on Solar Photovoltaic Installation from 11<sup>th</sup> June to 10<sup>th</sup> July 2019.
- SERC organized training for fifty (50) Women and Youths from Sokoto, Kebbi and Zamafara on Renewable Energy Technologies from 12<sup>th</sup> to 16<sup>th</sup> August 2019.
- Participated in the Mid-Term Review of GIZ NESP Sustainable Energy Access (Off-grid) in October, 2019.
- Created nationwide sensitization and awareness on IRENA's inaugural youth event held on 10 January 2020, during the tenth Assembly.



- ECN through the NCPRD Bauchi and in collaboration with the Nigerian National Petroleum Corporation (NNPC), Nigerian Geological Survey Agency (NGSA), Abubakar Tafawa Balewa University (ATBU) and other stakeholders organised a two (2) day Summit on the Nigerian Frontier Basins, themed: ***Nigeria's Frontier Basins, Vehicle for Reserve Expansion***, held Abuja on the 2<sup>nd</sup>-3<sup>rd</sup> December 2019.
- Part of the Technical Group Meeting on Access to Finance For Up-scaling Renewable Energy and Efficiency held in December, 2019.
- ECN established partnership with United Nations Development Programme (UNDP) through which the Commission is chairing the Steering Committees and hosting the Management Units of the following UNDP-GEF supported projects:
  - Sustainable Fuelwood Management;
  - De-risking Renewable Energy NAMA/NDCs for the Nigerian Power Sector, refocused on, Interconnected Solar Solar PV Mini-Grids”.
- Hosted a Regional Training Course in collaboration with the International Atomic Energy Agency (IAEA) on the modelling tool MESSAGE (Model for Energy Supply Strategy Alternatives and their General Environmental Impacts) for Energy Supply Analysis held in Abuja on 14<sup>th</sup> to 25<sup>th</sup> January 2019.



*Fig4: Participants at the IAEA Regional training in Abuja*

- Participated in 9<sup>th</sup> Assembly of the International Renewable Energy Agency (IRENA) in Abu Dhabi, UAE. Nigeria was elected as the Vice President of the Assembly in January 2019. The ninth session of the Assembly of IRENA took place from 11 - 13 January 2019 at the St Regis Saadiyat Island, Abu Dhabi, United Arab Emirates. The Assembly is the Agency's supreme decision-making body and brings together Heads of State, Ministers, government officials, and representatives from the private sector, civil society and other international organisations to reaffirm the global renewable energy agenda and make concrete steps to accelerate the global energy transition.
- Hosted the International Renewable Energy Agency (IRENA) Regional Training for West Africa on Renewable Energy Statistics held from the 26<sup>th</sup> – 28<sup>th</sup> February 2019 in Abuja, Nigeria. It brought together members of the different West African countries for training in renewable energy statistics.



*Fig 5: A cross section of participants at the IRENA Renewable Energy Statistics training in Abuja*

- Conducted pilot testing of residential Woodfuel Supplementary Module (Wood fuel Survey Module – WSM) in the North-West Geopolitical Zone of Nigeria (Jigawa, Kaduna, Kano, Katsina, Kebbi and Sokoto states) in April and June, 2019. Funded in collaboration with International Renewable Energy Agency (IRENA).
- Participated in the 17<sup>th</sup> Meeting of IRENA Council and other related meetings held 24<sup>th</sup>-27<sup>th</sup> June 2019. The meeting helps to facilitate cooperation among members converging to consider the challenges and opportunities facing the exploitation of renewable energy technologies and ease multilateral cooperation amongst IRENA members.



*Fig 6: Prof. Bala during an intervention for Nigeria at the 17th IRENA Council Meeting in Abu Dhabi*

- Participated in the 53<sup>rd</sup> annual conference of the Science Association of Nigeria (SAN) at the Usmanu Danfodiyo University, Sokoto, Sokoto state on July 14<sup>th</sup>, 2019.





*FIG 7: Prof. Bala on the high-table at the SAN Conference*

- Organised the Inter-Ministerial Committee Meeting on Nigeria's participation in the Africa Renewable Energy Initiative (AREI) hosted in Abuja on 23<sup>rd</sup> July 2019.
- The Commission partnered with UNIDO to organize a One-Day Capacity Building Workshop on Small Hydropower held in Abuja on the 28<sup>th</sup> October 2019.



*Fig 8: Cross section of participants at the UNIDO-ECN capacity building workshop on Small Hydropower in Abuja*

- Participated in Second Inter-Ministerial meeting preparatory to second session of the Strategic Dialogue Mechanism (SDM) between Nigeria and Brazil: Held on 13<sup>th</sup> August, 2019 in Abuja at the Ministry of Foreign Affairs.
- Hosted the first stakeholder consultative meeting in Nigeria in partnership with the United Nations Environment Programme (UNEP) and Frankfurt School of Finance and Management for the implementation of a regional project titled: Clean Captive Installations for Industrial Clients in Sub-Sahara Africa (CICSA) in four African Countries (Ghana, Kenya, South Africa and Nigeria) as part of efforts towards meeting the climate and development goals of the Paris agreement, the 2030 Agenda, as well as the Agenda 2063 of the African Union on 18<sup>th</sup> November 2019. The consultative meeting was for Industrial Clients in Nigeria aimed at creating country's ownership and buy-in for effective and efficient implementation of the project in Nigeria.



*Fig 9: The DG Prof. E.J Bala with members of the UNEP & Frankfurt School of Fin & Mgmt*

- Participated and made interventions at the 18<sup>th</sup> International Renewable Energy Agency (IRENA) Council and other related Meetings held 5 and 6 November 2019 in Abu Dhabi, United Emirates. The meeting helps to facilitate cooperation among members converging to consider the challenges and opportunities facing the exploitation of renewable energy technologies and ease multilateral cooperation amongst IRENA members.
- ECN participated in the Committee work of the 74<sup>th</sup> Regular Session of the United Nations General Assembly (UNGA), where we submitted to the Federal Ministry of Foreign Affairs, the Energy Commission of Nigeria's inputs to the Draft Compendium and Mr. President's Draft Statement regarding "17 (J) Ensuring Access to Affordable, Reliable, Sustainable and Modern Energy for All (Resolution 73/236)" for the General Debate at the 74<sup>th</sup> United Nations General Assembly, New York held from 17<sup>th</sup> September to 28<sup>th</sup> December 2019.
- Partnership with UNIDO for the Implementation of two UNIDO-GEF-supported projects: "UNIDO-GEF Mini-grid Based on Renewable Energy (Biomass) to Augment Rural Electrification in Nigeria" and UNIDO GEF-5 project on Scaling-Up Small Hydropower in Nigeria.
- Participated and presented a paper at the Expert Group Meeting on the Role of Bio-Energy in Clean Energy Transition in Developing Countries and LDCs held at VIC, Vienna, Austria from 3-5 December 2019.
- Participated in the Second Inter-Ministerial meeting preparatory to second session of the Strategic Dialogue Mechanism (SDM) between Nigeria and Brazil held on 13<sup>th</sup> August 2019 in Abuja.
- Promotion and Sensitisation on Energy Efficiency and Conservation in Public Buildings in Federal Government Colleges and their host Communities in six (6) Geopolitical Zones of Nigeria (Kano, Bwari, Port Harcourt, Nise, Owerri, Bauchi and Gusau and also the Ransome Kuti Memorial Grammar School, Lagos).
- Loaned a staff to the IRENA Innovation Centre in Bonn, Germany for training and research in the formulation of the Renewable Energy Roadmap for Nigeria (REmap) from January to April, 2019.



#### d. International Trainings

- A staff of the NCPRD, Bauchi was on a six (6) month programme at the United Nations University – Geothermal Training Programme (UNU-GTP) from April – October, 2019. This is the first time Nigeria is participating in the six month programme and the staff was nominated to present the graduation speech on behalf of the graduating class at the ceremony. As a fellow of the UNU-GTP, he specialized in Reservoir Engineering and Borehole Geophysics.
- A staff participated in the Regional Training on Energy Statistics, Residential Sector Energy Efficiency Data Collection and Initial Step towards the creation of Energy Efficiency Database for Industrial Sector organized by the African Energy Commission (AFREC) in October 2019 in Addis Ababa, Ethiopia. The training will enhance and strengthen capacity for all AFREC's Focal Points in the collection of data on Energy Balance and Energy Efficiency in Residential Sector using the AFREC standardized questionnaires.



*Fig 10: Participants at the Regional Training on Energy Statistics in Addis Ababa*

- Five (5) staff attended the 2050 Calculator International Conference at Windsor, United Kingdom from the 13<sup>th</sup> to 15<sup>th</sup> November 2019. With over 100 delegates of the international Calculator community attending the three day conference, which was an opportunity to showcase and give updates on their national/country Calculators, learn from best practice and network with other 2050 Calculator teams. The conference concluded with emphasis on how the Calculator can support policy engagement and development for a more sustainable future.



*Fig 11: Participants at the 2050 Calculator International Conference, Windsor, UK*

A staff of the Commission participated in the Training of the Trainers Programme (on Energy Statistics for African Energy Experts) of the African Energy Information System (AEIS) organized by the African Energy Commission (AFREC) in Cairo, Egypt in December, 2019. The trainers designed and developed questionnaires on energy efficiency, online data collections and evaluation of energy vis-vis SDGs. The trainers are expected to train other energy experts in their countries and ensure data sharing is accomplished.



*Fig 12: Participants at AFREC Training of the Trainers Programme in Cairo, Egypt*

A staff went on secondment to the International Energy Charter (IEC) Secretariat in Brussels, Belgium to write "Energy Efficiency Accession Report for Nigeria" from September to November, 2019. Three countries from the ECOWAS region of West Africa (Nigeria, Senegal and Gambia) continued working in close cooperation with the IEC Secretariat by designating officials seconded by their governments to work on Energy Charter Treaty (ECT) accession reports. All three countries had completed or were completing their final accession reports by the end of 2019.



e. **Courtesy Visits**

- A team of experts in energy and emission modeling, known as *UK 2050 Calculator* paid a courtesy visit to the Commission on 24th May 2019. The Team consisted of Dr. Jeremy Wood as the Head, Dr. Onesmus Nwabonje, Dr Gbemi Oluleye all from Imperial College London and Ms. Sandy Domangue of British High Commission, Abuja.
- The Director-General, Prof. E.J. Bala paid a visit to Professor Abdullahi Audu Zuru, Vice Chancellor of Usmanu Danfodiyo University, Sokoto on July 14, 2019.



*Fig 13: Prof. E.J. Bala and Prof. Zuru during a courtesy visit to the Vice Chancellor Uthman Danfodio University, Sokoto*

- Prof. E.J. Bala paid a courtesy visit to the Sokoto Energy Research Centre at the Usman Danfodio University Sokoto, Sokoto State on Monday, July 15 2019 in line with the Director-General's agenda for an inclusive management.



*Fig 14: Prof. Bala in a Town Hall meeting with Management & Staff of SERC*

- Prof. Eli Jidere Bala visited the **2 MW solar Hybrid** Power plant project site. It is an Energizing Education Programme (EEP) project site located at the Usmanu Danfodio University main campus. EEP is an initiative of the Federal Government of Nigeria (FGN) to provide sustainable and clean power supply to the Universities and teaching hospitals.



*Fig 15: Front view of the EEP 2 MW solar project site, UDUS, SOKRT inspection by DG ECN, Prof. E.J. Bala*

- Prof. Bala toured the **60 KW Solar PV Mini-grid** project located at Torankawa village in Yabo Local Government, Sokoto state. It is an initiative by the Department of Renewable and Rural Power Access (RRD) of the Federal Ministry of Power, Works and Housing under the Renewable Energy Micro-Utility (REMU) programme.



*Fig 16: Prof. E.J. Bala inspecting the 60KW solar PV grid interconnected mini-grid project in Torankawa, Sokoto State by FM Power*

- Professor Eli J. Bala paid a courtesy visit to the Vice Chancellor of Sokoto State University, Sokoto, Prof. Sani Mohammed Dangoggo in July 2019.



*Fig 17: Prof. Bala paid courtesy visit to Sokoto state University by Prof Sani Dangoggo*



- Members of the Nigeria HydroPower Professional Association paid a courtesy visit to the Commission requesting for strategic partnership with the Commission on Friday, September 20, 2019.
- There was a courtesy visit by the Institute for the Studies & Practice of Non-Violence Nigeria (ISPN) for areas of collaboration with the Commission on Thursday, October 10, 2019.
- A delegation from the Power Project of Nigeria paid a courtesy visit to the Commission for possible areas of collaboration and consultancy services on Friday, August 23, 2019.
- A delegation from the Centre for Renewable Energy and Industrial Maintenance of Carbo Verde (CERMI) financed by the European Union and implemented by LuxDev on a promotional mission to the Commission on the 18<sup>th</sup> October 2019.
- The Vice Chancellor of the University of Abuja paid a courtesy visit to the Commission on Thursday, October 24, 2019 and the visit was centered on possibilities for further collaborations and partnership.
- The EXCO and some members of the Deans of Engineering and Technology of Nigerian Universities (CODET) paid a courtesy visit to the Commission on Friday, November 15, 2019.
- The Management paid a courtesy visit to the Group Managing Director and Management of the Nigeria National Petroleum Corporation (NNPC) on Thursday, November 21<sup>st</sup> 2019.



*Fig 18: DG/CEO ECN exchanging pleasantries with GMD, NNPC*

- A courtesy visit by the Director-General of the Bauchi State Sustainable Development Goals (SDGs) on Thursday, December 19, 2019.
- Management of the Energy Commission of Nigeria, led by the Director General/CEO, Prof. Eli Jidere Bala, paid a courtesy visit to Hon. Minister of State for Petroleum Resources, His Excellency, Hon. Timipre Sylva, on 9th December 2019.



*Fig 19: DG, ECN Prof E.J Bala and management with Hon Minister of State for Petroleum Resources at NNPC Towers, Abuja*

## **f. Monitoring of the Energy Sector**

### **i) Petroleum (Oil and Gas) Sub-Sector**

#### **a) Crude oil and Condensates:**

Nigeria had in 2019 a crude oil and condensate reserve of about 37 billion barrels. It produced about 0.74 billion barrels or 2.01 million barrels/day of crude oil and condensates. About 99.7% of the production was exported, while only about 0.3% utilized domestically. The capacity utilization of the three domestic refineries in Port Harcourt, Warri and Kaduna was abysmally low about 2.3% only.

#### **b) Natural gas:**

Nigeria has a natural gas reserve of about 203 TSCF in 2019. Its production level was about 2.865 TSCF/year. About 91.5% of the production was utilised, while 8.5% was flared. Gas exports accounted for about 44% of production, with LNG accounting for the largest share at about 39%. The WAGP and others NGTLs accounted for only 5% of production. Domestic market accounted for about 15% of production, with gas-to-power taking 9% and industrial feed stock 6% of production, respectively. Non-commercial use of gas (re-injection, fuel gas in production, and flare) took about 41% of gas produced in 2019.

### **ii) Electricity Sub-Sector**

Nigeria had an installed grid-electricity generation capacity of about 13Gw with 15% renewables (hydropower) and 85% thermal (natural gas fired) plants. No variable renewable energy is yet connected to the grid though a grid-connected 10MW wind farm in 2019 in Katsina will soon be ready for grid-connection. Average availability of the grid-connected plants was about 44%. Consequently, grid electrical energy generated was 33.44 million MWh from which 25% was from renewable (hydropower) plant and 75% from the gas thermal power plants. About 247 bscf of natural gas was used in the thermal power plants, and it is about 9% only of the total natural gas produced in 2019 in the country. About 7% of the generated electrical energy was exported to Benin and Niger Republic in ratios of 54% to 46% respectively. Peak power demand in 2019 was 5,462.25MW. Table 1 compares Nigeria with South Africa and Egypt in North Africa.

<b>Country</b>	<b>Population (million)</b>	<b>Installed Grid Electric Capacity (GW)</b>	<b>GDP (billion USD)</b>
Nigeria	201	13	448.1
South Africa	59	58	351
Egypt	100	31	303

Table 1: Comparison between Nigeria, South Africa and Egypt in 2019

## 14. Projects, Reports & Activities - Energy Research Centres

### A. **Sokoto Energy Research Centre (SERC), Sokoto, Sokoto State**

- SERC was established in 1982 as a multi and interdisciplinary research, development (R&D) and innovation outfit focusing on renewable clean energy resources and technologies development and energy efficiency for sustainable livelihood. The Centre is headed by Dr. Mahmoud Garba, Acting Director to SERC and some of the activities carried out by the Centre:
- Professional Training Course on Solar Photovoltaic Installation (SPVI) for a period of four weeks from 11<sup>th</sup> June to 10<sup>th</sup> July 2019. Thirty (30) participants were trained and training course was in collaboration with European Union (EU), GIZ and USAID.
- Granted patent for the invention of Cantilever Direct River Hydropower Plant invested by the Centre.
- Women and Youth Empowerment on Renewable Energy Technologies. In which women and youths were trained on Renewable energy Tecgnologies. The trainees were drawn from Sokoto, Kebbi and Zamafara States. The training was for one week from 12<sup>th</sup> to 16<sup>th</sup> August 2019 and a total of Fifty (50) participants were trained.
- Professional Training on Solar Photovoltaic Installation (SPVI) for Indigenes of Kebbi State. Kebbi state Government sponsored fifty (50) youths and women in the two weeks to introduce them SPVI installation for self-reliance.
- Zamfara State Government Sponsored Professional Training Course on Solar Photovoltaic Installation (SPVI) for Indigenes. In training was from 15<sup>th</sup> October to 1<sup>st</sup> November 2019, the state government sponsored twenty eight (28) youths for four weeks on SPVI installation.
- The Centre carried out sensitization on the benefits of social and economic benefits of Solar Pumping solutions to one hundred farmers in Kebbi State.
- Training on Solar Thermal Systems for Experts and Professionals in Collaboration with ECOWAS Centre for Renewable Energy and Energy Efficiency between 12<sup>th</sup> to 16<sup>th</sup> February 2019 and the second training was conducted in December 2019. The training brought participants from the private sector, academia and public institutions in the Northern part of the country.
- The Centre in collaboration with the University of Durham, UK and University of Jos hosted the 2<sup>nd</sup> Country Consultative Group meeting on “Energy on the Move: Longitudinal Perspectives on Energy Transitions among Marginal Populations in Abuja Peri-urban settlements on 28<sup>th</sup> June 2019.
- The Centre in collaboration with the Energy Commission of Nigeria (ECN) participated in an exhibition on informing the general public on the different alternative sources of energy available for exploitation with support from the different public institutions.
- The Centre participated in training and demonstration of the batch A of the National Youths Service Corps (NYSC) in Lokoja, Kogi State. So as to introduce the corps members on alternative means of employment and entrepreneurship for use after completing the national service.
- The Centre received several visitors from both public and private organizations and there were numerous requests for linkages and collaborations for benefits from relationship in research, training, post graduate programs and patenting of some research and development output.



## **B. National Centre for Energy Efficiency & Conservation (NCEEC), Lagos, Lagos State**

The National Centre was established in 2008 but officially commissioned March 16, 2010 and saddled with the responsibility of organizing and conducting research and development in energy efficiency and conservation. The Centre is located in the University of Lagos, Akoka, Lagos state. The Centre is headed by Dr. Emmanuel O.B. Ogedengbe, the Acting Director of NCEEC and the Centre has conducted Training-of-Trainers (ToT) on Energy Audit and Energy Management under the Nigerian Energy Support Program (NESP) funded by the German Government in collaboration with United State of America and Nigerian Government. The Centre has also carried out Energy Audits for the host University, University of Lagos and other organizations.

It also conducts retrofitting of Incandescent Lamp with Compact Fluorescent Lamps (CFL) activities to help reduce energy consumption and to demonstrate energy efficiency. The Centre also went into contract consultancy for ISO 9001: 2015 Quality Management System Phase II to certify that the Centre becomes ISO 9001: 2015 Quality Management System Standard and the personnel are certified Energy Auditors. The Centre's New Administrative Building is about 80 percent complete and the building has been under construction since April 2012 and as of 2019 it has progressed significantly.

## **C. National Centre for Petroleum Research & Development (NCPRD), Bauchi, Bauchi State**

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- The Centre was established on July 28<sup>th</sup> and charged with the primary objective of conducting research into; exploration and exploitation of fossil fuel resources of Nigeria, environmental problems and climate-responsive solutions associated with the exploration and exploitation of the resources, and training high level manpower in fossil fuel technologies (including clean coal technology). It has also been recently saddled with research and development in the areas of geothermal energy and nuclear resource exploration and exploitation. The Centre is located in the Abubakar Tafawa Balewa University, Bauchi, Bauchi state. Dr. Bappah A. Umar is the Acting Director of NCPRD.
- The Centre has lead in valuable research activities on petroleum potentials of North-eastern Nigeria particularly in the tectonostratigraphic models for evolution of the Northern Benue Trough were developed, geological maps of some parts of Lamurde anticline and Gombe areas were constructed in addition to several lithofacies logs.
- As part of its innovative activities in the exploration of geothermal activities this made possible, the start of the Nigerian Gethermal Association (NGA) leading to a 6 months training fellowship award by the United Nation University – Geothermal Training Programme to one of the Centre's Staff on Geothermal Energy in Iceland.
- The Centre also organized the 2<sup>nd</sup> Summit on Research Activities on Nigeria's Frontier Basins in collaboration with the Nigerian National Petroleum Corporation, Abubakar Tafawa Balewa University, Bauchi & Nigerian Geological Survey Agency from 2<sup>nd</sup> – 3<sup>rd</sup> December 2019.

- It also constructed and furnished a block of two new laboratories with three offices and a block of furnished e-library with V-Sat facilities, a plynological laboratory (first of its kind in the region). The Centre was able to attract a special intervention programme from the National Information Technology Development Agency (NITDA) for a Digital Divide Bridging Centre equipped with computers, solar and e-learning facilities. The Digital centre was created to provide a workplace for petroleum related software that will serve the university community and its environs. The centre's permanent administrative building located at the Gubi campus of ATBU is still ongoing and it is expected to be completed in 2021.

In the areas of R&D Outputs, the Centre was involved in the following:

- Providing evidence of a petroleum system in the Nigerian sector of the Chad Basin.
- Sighting of passive oil seep at the Gongola arm of the Northern Benue Trough in Nigeria.
- Showing evidence of oil residue occurring in exhumed Precambrian rocks of the Northern Benue Trough in Nigeria and the Regional Aeromagnetic Analysis of Awe Area, Central Benue trough in Nigeria.
- However, on a lighter note, the NCPRD football team won for the third time the Vice Chancellor's inter-clubs 7 aside football competition.

#### **D. National Centre for Hydropower Research & Development (NCHRD), Ilorin, Kwara State**

- The Centre was established in July 2008 and charged with the responsibility of organizing and conducting research and development in hydropower management and technologies located at the University of Ilorin, Ilorin, Kwara State and Prof. Adebayo W. Salami is the substantive Director of the Centre.
- The Centre in its achievements was able identify and assess streams, rivers, dams/falls in some locations with complete feasibility study and their power potentials under the Hydropower Resource Assessment program and the sites are listed below:

S/No.	Title of Research	Power Potential
1	Retrofitting of Asa Water Supply Dam for Power Generation in Ilorin, Kwara State	1.17MW
2	Hydroelectric Power Potential of Kampe (Omi) Dam, Kogi State	1.175MW
3	Adapting Dedicated Hydrodam for Electric Power Generation: University of Ilorin	0.4MW (400Kw)
4	Assessment of Hydroelectric Potential of Owu and Ero-Omola Falls, Kwara State	8.81MW and 8.64 MW for Owu and Ero-Omola falls respectively

5	Assessment of Hydropower Potential of River Oshin at BudoUmoru Via Babaloma in Ifelodun, Kwara State	0.36MW
6	Resource Assessment of Rivers in the Lower Niger River Basin for Hydrokinetic Energy Conversation Technology	a. River Awun at Aderan (20kw) b.
7	i. Resource Assessment of Little OSe River Dam, Akoko South LGA, Ondo State. ii. Resource Assessment of Agua River Akoko North East LGA, Ondo State	300 kW 200 kW
8	Feasibility study on small hydropower potential of Okpokwu and Ideme Rivers in Okpokwu LGA, Benue State, North Central, Nigeria	Okpokwu (200kW) Ideme (100kW)
9	Retrofitting of Doma Dam for Power Generation, Nassarawa State	0.70 MW (700kW)

- The Centre under its program of Development of Small Hydropower Turbines and Generator for Deployment to Streams in Rural areas designed and fabricated different types of (prototype) wheel turbines; 24-CUP Pelton Whell Single-Jet Small Hydropower Turbine System and the Split Cup Pelton Wheel Two-Jet Small Hydropower Turbine System.
- The Centre also designed and fabricated a permanent magnet generator that does not require initial excitation current for use by both wind and small hydro generators. It also designed and fabricated a double-stage Savonius turbine that can be used as a prime mover to generate electric power using the hydrokinetic technology.
- The Centre also carried out environmental studies with significant impact on the following:
  - i. Assessment & Modeling of the Impact of Hydropower Reservoir Operations on the Ecological Integrity of Jebba Lake, Nigeria.
  - ii. Assessment of Corrosion Potential of Reservoir Inflow: Case Study of Kainji and Jebba Hydropower Stations;
  - iii. Environmental Impact of Hydropower Operations of Major Dams;
  - iv. Development of Data Bank on Hydropower Resources of Nigeria;
  - v. Impact of Climate Change on Stream Flow of Kainji and Jebba Lake;
  - vi. Sustainable Sediment Management of Upper Watershed of Jebba Dam for Improved Power Generation

- The Centre designed and constructed an overhead tank storage system for performance evaluation of fabricated SHP Components at the Centre and it also developed software to serve as a compendium for hydropower resources for Nigeria.

### **E. National Centre for Energy and Environment (NCEE), Benin, Edo State**

- The Centre was established on 12<sup>th</sup> of March 2009 with the mandate of organizing and conducting research and development programmes in renewable energy and environment and it is situated in the University of Benin, Benin, Edo state. Prof. Dennis A. Igbinomwanhia is the substantive Director of NCEE.
- NCEE developed some waste management techniques that bring financial returns at the end point of waste cycle. Some of the techniques involved the following:
  - i. Inventory of farms involved in livestock production in Edo and Delta State and their potentials as sources of animal waste biomass for energy generation and biogas production. The findings from the project determined that both Edo and Delta states have animal population to sustain biogas plant on the farm and enough waste for biogas production and energy production.
  - ii. Environmental Waste Management through Biogas Technology. The project was carried using a two-phase study plan with the design and construction of the biogas plants and running of the plant for performance test. The study was relevant to the Sustainable Development Goals (SDGs) by bringing financial returns at the point of the waste and strengthening of the bio-based value chain thereby facilitating environmental and socio-economic sustainability leading to reduced carbon foot print and solid waste accumulation.
  - iii. Local Design and Development of Bio-ethanol production Plant from Agricultural waste. The project involved a two-phase study plan-design and construction of a bioethanol plant and performance system which was designed and fabricated at the NCEE. The result showed ethanol distillate of 60% which produced blue flame on ignition.
- Production of Biodiesel from Jatropha seed. The Centre developed experimental production of Biodiesel from a blend of bioethanol and jatropha seed oil. Three pilot jatropha farm projects were cultivated at the NCEE permanent site, a Jatropha Manual were produced by the Centre and contains the processes of oil extraction and bio diesel production from the Jatropha plant and also the process of cleaning the extracted vegetable oil and it will serve as handbook for farmers.
- The Centre also carried research on ecotoxicology and environmental forensics and management. By determination of safe concentration of industrial chemicals and pesticides disposed into the Niger delta environment using ecotoxcological instruments. It also carried out documentation and remediation of oil spill sites in western Niger Delta. NCEE also researched on the environmental effects of charcoal production from woody biomass and the health impacts of charcoal production from woody biomass. It also researched on the profile of water quality and pollution index in Edo state.
- NCEE is in collaboration with the Edo state Government in the areas of Waste-to-Energy, feasibility study for Geothermal Energy and as part of its social responsibility the Centre organizes two public Awareness Programmes every year for the host community and south-south Nigeria.

## F. **National Centre for Energy Research & Development (NCERD), Nsukka, Enugu State**

- The National Centre for Energy Research and Development located at the University of Nigeria, Nsukka was established by an Act of the National Assembly in 1980 along with three other research centres and the Centre started operation fully in 1982.
- The mandate of the Centre is to carry out research, development, dissemination and manpower training in the various areas of renewable and non-renewable energy resources such as Solar, Biomass, Wind, Hydro, Geothermal, Coal, Petroleum, Energy Management and Environment etc. Prof. Paulinus E. Ugwuoke is the substantive Director of NCERD.
- The Centre completed the survey on Indoor air pollution and Household energy use focused on determining the prevalence of various cooking energy sources and penetration of renewable and clean energy fuels as well as air pollution among households in South East Nigeria. A total of 1698 households were included from 2017 to 2019.
- The Centre carried out monitoring of the concentrations of air pollutants (NO<sub>2</sub>, SO<sub>2</sub>, O<sub>3</sub> and VOCs) linked to cooking fuels among households in Nsukka Urban and surrounding rural areas from June 2018-September 2019.
- Monitoring of two solar water heating systems FROM January to September 2019, under the auspices of SOLTrain West Africa (ECOWAS solar thermal demonstration programme coordinated by ECREEE).
- The Socio-Economic Impact Assessment of Solar Photovoltaic (PV) Systems within Nsukka Local Government Area of Enugu State.
- Thermal performance investigations and analysis of pulverized wood sawdust waste and water hyacinth blend into solid biomass briquette fuel for domestic and industrial uses as alternative fuel source to fuel wood.
- Determination of concentrations of polycyclic aromatic hydrocarbons (PAHs) in extracts of coals mined at Onyeama, Enugu State and Okobo, Kogi State. PAHs are harmful to the environment and health of the people due to high degree of mutagenicity and carcinogenicity.
- Preliminary studies on preparation of coal-water slurries for different ratios of coal-water mixtures in engines.
- Carried studies and production of biogas scrubber for removal of CO<sub>2</sub>, CO and H<sub>2</sub>S and moisture contents from biogas to combustion efficiency and reduce emissions to the environment.
- Production of biogas from organic waste such as (Alibino rat dung, water hyacinth and goat dung).
- Cooking test comparative studies: biogas, NNPC gas, charcoal and kerosene.
- Investigating the effect of bigester shape in biogas production yield.
- The production of biogas scrubber for removal of CO<sub>2</sub>, CO and H<sub>2</sub>S and moisture content from biogas to combustion efficiency and reduce emissions to the environment.
- Capacity building and manpower development, the Centre participated in ECN-NYSC South-West Zone training on designs, fabrication, operation and maintenance of solar crop dryers, biogas digesters, and solar PV systems design and installation and energy efficient biomass cookstoves held in Akure, Ondo State in June 2019.

- Training of twenty-five rural women on the design and fabrication of energy efficient wood and charcoal stoves using metal sheets and clay. Also for the provision of energy efficient charcoal cookstoves to thirty rural women from Igbo-Eze South and Nsukka Federal Constituency, Enugu State in May 2019.
- Training of twenty-five youths from Igbo-Eze South and Nsukka Federal Constituency, Enugu State on solar water heaters in May 2019.
- Training of ENAPT Students of University of Nigeria Nsukka on design of biogas digester, construction of biogas digesters, production of biogas and electricity from biogas using: sewage feedstock, municipal solid waste, industrial effluent.
- Six months intensive training of twenty undergraduate university students of engineering, physical sciences, Agricultural science, plant science and biotechnology and twelve months training of Polytechnic in the Student Industrial Work Experience Scheme (SIWES) 2019.
- The Centre had International collaboration on research and development with Germany-Africa Research Project: Yield Analysis and Socio-economic impact assessment of Solar PV and PV supported greenhouses in tropical Nigeria and Benin Climates (YESPV – NIGBEN) in August 2019.
- SOLTrain West Africa (ECOWAS solar thermal demonstration programme coordinated by ECREEE) held at NCERD, UNN in September 2019.
- Participated in the National Council on Science and Technology Meeting and Exhibition of R&D products of the NCERD held in Awaka, Anambra State in November 2019.
- Participated in the Federal Ministry of Science and Technology, Technology and Innovation Expo, 2019.
- Participated and presented six papers at the 37<sup>th</sup> National Solar Energy Forum held in Nnamdi Azikiwe University, Awka, Anambra State in 2019.
- The Centre designed, constructed and did a performance evaluation of a passive indirect solar air heater built with auxiliary paraffin oil blend as heat storage medium for drying wood slab for continuous drying off-sun hours.
- Designed and fabricated institutional rocket type energy efficient wood cookstove with chimney for use by Vaneta Industry Ltd, Auchi Okene, Edo State and one customized 20 litres pot for blending biomass feedstock for biogas production.
- Designed, constructed and tested hybrid photovoltaic/thermal solar water heater for improved output power performance of PV system.
- Designed, constructed and carried out performance evaluation of active mixed mode solar dryer with three rack trays and vertical chimney powered by solar PV system for drying fruits and vegetables.
- Designed, constructed and performance evaluation of an active mixed mode solar dryer with three rack trays and horizontal chimney powered by solar PV system for drying fruits and vegetables.
- Designed, constructed and performance evaluation of mini-sized laboratory Kiln for firing clay body use for producing the insulating body part of the energy efficient biomass cook stoves.
- Enhancement of the performance of ZnO based natural dye sensitized solar cells via PVA morphology controlled nanorods.

- Comparative photo-response performances of dye sensitized solar cells using dyes from hibiscus rosa-sinensis, helianthus annus, mimosa pudica, luffa cylindrical and lonchocarpus cyanescens.
- Influence of annealing temperature on the performance of TiO<sub>2</sub> based Dye sensitized solar cells.
- Effects of Cr dopants on the performance of ZnO based Dye sensitized solar cells.
- Fabrication and evaluation of the photoelectrical performance of dye sensitized solar cells using dye from Bougainvillea glabra flower and TiO<sub>2</sub>, ZnO and TiO<sub>2</sub>/ZnO photoelectrodes.
- Evaluation and understudying the effect of dust by volume on PV module by self-simulating insolation.
- Experimental research activities on Phytochemical and In Vitro Antimicrobial Properties of Premna hispida (Verbenaceae) Linn.
- Total Alkaloids, Tannin Content, and Antiulcer Assay of Four Selected Medicinal Plants in Nigeria.
- Determination of Calorific Value of coal samples using bomb calorimeter.

## 15. Challenges and Way Forward

### a. *Challenges*

- Inadequate requisite personnel
- Inadequate physical infrastructure
- Inadequate funding
- Rising demand for welfare from staff
- Heavy debt burden from NASS constituency projects (2009-2012)

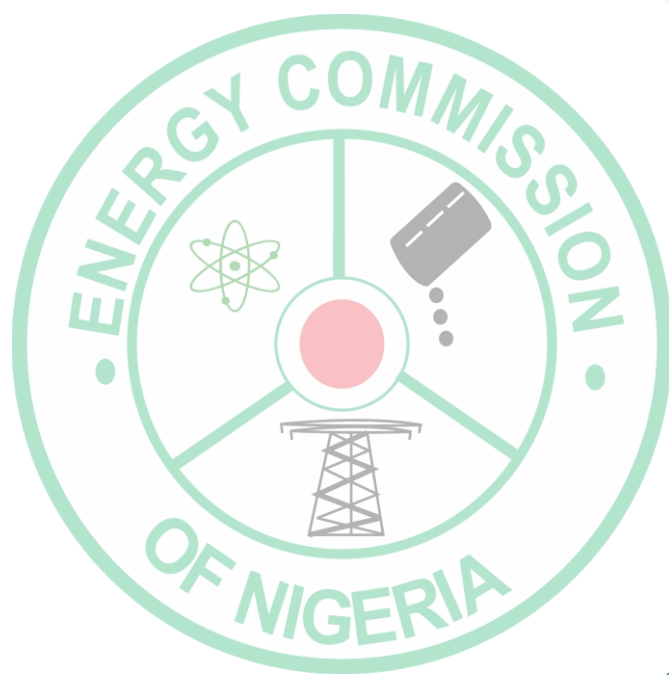
### b. *Way Forward*

- Adequate appropriation and release of funds
- More training of Officers on ground
- Recruitment of additional requisite Officers
- Need for new and befitting office complex at the Headquarters

## 16. Conclusion

Energy Commission of Nigeria is achieving its mandate and is contributing to the change agenda of the Government. However, needs more funding to enable it perform better and to be relieved from the heavy debt burden of N6.3 billion unpaid National Assembly constituency project executed 2009-2012.





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