



IPECON

**INTERNATIONAL POWER ENGINEERING
EXHIBITION & CONFERENCE, NIGERIA**

IPECON 2019
APRIL 17-18
Second Edition



Theme:
Strategic Focus to Achieving
SUSTAINABLE ELECTRIC POWER IN AFRICA
(NIGERIA IN FOCUS)

BOOK OF PROCEEDINGS

Date: 15th - 18th July, 2019

Venue: National Engineering Centre, Central Business District, Abuja



Organized by:
**THE NIGERIAN
INSTITUTION OF
POWER ENGINEERS (NIPE)**
www.nipe.org.ng



IPECON2019



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Engr. Chief Akinwumi A.S. Bada, FNSE
MD/CEO, SZOTYOLA Energy Services Int'l Ltd.

WELCOME TO IPECON 2019, ABUJA



I am deeply elated to welcome you all to the Second Edition of the International Power Engineering Exhibition & Conference tagged "IPECON 2019, Abuja". It is a platform for erudite professionals in the Electric Power industry to, yet again, further brainstorm and explore new frontiers.

At the IPECON 2018 closing discussions, the audience were informed of the proposed Theme for the second edition as "**Enactment and Operationalising of Nigerian Content Act on Power across Africa as a vehicle to ensuring indigenous capacity production and Manpower development**". The suggested theme was borne out of the need to get the electric Power industry to be indigenized for sustainability. However, interactions and sundry counter submission were of the view that the IPECON Initiative is still at its infancy and so need to take in

as many general issues from all stakeholder for at least the first three editions before settling for individual issues. For now, they contend such individual issues can be x-rayed by committees and other special technical groups for resolutions that will aid NIPE to carry out its numerous advisory and advocacy interfacing. Thus, a new Theme was chosen and sub-themes generated for this Conference.

The Theme for this year IPECON conference is "**Strategic Focus to Achieving Sustainable Electric Power in Africa (Nigeria in Focus)**". The Theme like last year's theme may as previously noted be undoubted the reoccurring discourses at different power industry conferences and Summits but their relevant to critical issues of growth of Africa energy and indeed Nigeria remains the cross to be borne if Africa's economy is to grow sustainably. The **IPECON 2019 Conference** is therefore designed to provide a platform that will host all participants in the Electric Power industry worldwide for the brainstorming on all issues hindering the growth of the industry, especially in Africa.

I wish to once again reiterate that African as a Continent is highly endowed with both human and natural resources that require effective tapping

to create a power hub that will feed the rest of the world in the light of dwindling resources. African is the Continent under the SUN and the centre point of the world, thus the curator of its greatest source of energy (Power), the world is going GREEN (Renewable) and Africa needs to lead the world by leveraging on its comparative advantages to feed the entire globe with her energy need and obtain a robust economy that will wipe out poverty in the midst of plenty. Power is central to every indices of development and the emergence of a truly robust economy.

Most other regions of the world have put measure to culture their sources of energy and advance their technologies to adequately maximize same. We need to equally measure up using empirical knowledge and best industry practice initiative to achieve our collective goals of efficient and affordable power to our citizens and industries through smarter apparatus and control.

The 2019 Conference Planning Committee (CPC/MOC), for the purpose of robust engagements has structured the transaction at the conference into Two plenary and Three (3)

WELCOME TO IPECON 2019, ABUJA...[CONTD.]

concurrent Technical Session. In all, Twenty-Two (22) Papers will be presented covering Seven sub-themes; Adherence to professional ethics and Strict enforcement of industry rules on Market Participants (I n d u s t r y Operators/Companies) as a panacea to a viable power industry in Africa; Strategies and Policies for local production of power equipment and Machinery in Africa as a nexus for sustainable Electric Power industry; Enactment and Operationalisation of Nigerian Content Act on Power across Africa as a vehicle to ensuring indigenous capacity production and Manpower development; The role of ICT in achieving sustainable Electric Power delivery in Africa; A review of existing

power sector's procurement guidelines for tender preparation, evaluation and award of contract; A review of existing Acts, Regulations and Policies Electric Power industry; A post-mortem analysis of the impact of Privatization and emerging Public Private Partnership (PPP) initiative and Policy direction in the Nigerian Electric Power Industry. Other subtle areas like Codes of Practice, Research & Development, Quality Control & Quality Assurance, Effective Maintenance Strategies, Consultancy, etc were included in Papers submitted for this Conference.

The IPECON 2019 Conference Theme "**Strategic Focus to Achieving Sustainable Electric Power in Africa (Nigeria in Focus)**" is a yet a clarion call on Africans Electric Power Professionals

(Nigerian Power Engineering Technocrat in context) to reappraise their role on how to get the industry back on progressive path. The expected discourse will exhaustively dwell on the proffering of needed solutions to answer the varied questions posed by the Conference Theme and Sub-Themes.

Distinguished Guest, Ladies and Gentlemen, I once again heartily welcome you, your spouses and acquaintance for making it a date with us at this great event. I wish us all fruitful deliberation.



Engr. Israel Abraham, MNSE MIEEE MNIM FNIP E MBA
National Chairman, NIPE & Curator, IPECON

CHAIRMAN, CPC WELCOME ADDRESS IPECON 2019, ABUJA

Distinguished
Conference
Participants,

It is my great pleasure to formally welcome you all to the International Power Engineering Exhibition & Conference tagged "IPECON 2019, Abuja". It is the second edition of this power conference and a second time too that the City of Abuja is hosting same. For those of you attending for the second time, your presence here is a testimony of your commitment and alignment to being part of the discourse towards the growth of the Electric Power industry and for those attending for the first time, I believe it will be a worthwhile experience.

Abuja is unique city and had always played host to countless of conferences annually, thus, participants from other part of the country or the globe will have a swell time to savouring the serene environment that Abuja offers.

The ultimate goal of the IPECON Conference is to make available an uncommon syndicated platform that will host major players in the Electric Power industry worldwide with special references to Nigeria. It is expected to be



a platform where all actors in the industry will converge to examine all the sides; government agencies, private business, industrialist, business leaders, researchers, innovators, academics and power engineering practitioners. It is the biggest gathering of egg-heads and a networking one-stop hub for all players in the Electric Power business in Africa.

The Theme and sub themes for this year Conference were carefully chosen by the Conference Planning Committee to ensure that Participants discourse will be robust and indeed dwell on the proffering of answers in response to posers by the conference theme. The issues on the table is as varied as the intricacies of the industry and thus interaction and brainstorming sessions will yet once again open up new area of interest or postulate

new thoughts to unraveling the African Energy crisis. At the end of the exercise, Participants would have exchange thoughts and experiences while the Nigerian Institution of Power Engineers (NIPE), the Curator and organizers of the Conference will be further armed with knowledge on how to contribute to the development of the Electric Power industry.

Once again, I welcome you all to the gathering of the "EAGLES" in the Electric Power industry



ENGR. MRS. BERNICE
ADEDAYO LIJOFI, FNSE
FIEEE FNIFE
Chairman, CPC



CONFERENCE PLANNING COMMITTEE



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APPRECIATION

I Engr. Mrs. Bernice A. Lijofi, FNSE, FIEEE on behalf IPECON Conference Planning Committee wishes to extend our warm appreciation to all Individuals (Members) and Organizations for their immense contributions towards the success of the Conference. We pray that you will have a safe journey back to your respective destinations and may you experience the blessing of Almighty God (Amen).
Once again, I thank you all.

ENGR. MRS. BERNICE A. LIJOFI, FNSE, FIEEE, FNIFE
Chairman,

IPECON 2019 Conference Planning Committee



ENGR. MRS. BERNICE A. LIJOFI,
FNSE, FIEEE, FNIFE
CHAIRMAN, CPC



PROGRAMME IN BRIEF

SUNDAY, 14TH JULY, 2019

10.00am - 5.00pm	Arrival of Participants
04.00pm - 5.00pm	Registration of Participants

MONDAY, 15TH JULY, 2019

09.00am - 05.00pm	Registration of Participants
09.00am - 10.30am	Opening Press Briefing
09.00am - 11.00am	Arrival of Guests
11.00am - 01.30pm	Opening Ceremony
01.30pm - 02.00pm	Opening Exhibition /Tech Posters
02.00pm - 03.00pm	Lunch Break / Tea Break
03.00pm - 04.30pm	
04.30pm - 04.35pm	1 st Plenary Session – Presentation on key is Closing
06.30pm - 08.00pm	Welcome Cocktail Party & NIPE Fellowship Conferment ceremony

TUESDAY, 16TH JULY, 2019

09.00am - 5.00pm	Registration of Participants
10.00am - 2.30pm	
10.00am - 12.30pm	2 nd Plenary Session - Discussions Power Student Program 12.30am - 01.00pm Exhibition /Technical Posters
01.00pm - 01.30pm	Tea Break/ Lunch Break
01.30pm - 02.30pm	Presentation Session - Papers
02.30pm - 04.30pm	Break out/Thematic Parallel Tech session
04.30pm - 05.30pm	Lunch Break

WEDNESDAY, 17TH JULY, 2019

09.00am - 5.00pm	Registration of Participants
09.00am - 12.00pm	Break out/Thematic Parallel Technical Session Presentations to Plenary
09.00am - 12.00pm	Power Students Program
12.00am - 12.30pm	Tea Break & Exhibitions Platform visits
12.30am - 01.30pm	Corporate Presentation by ICRC/AEDC 01.30pm
02.00pm	Lunch Break
02.00pm - 05.00pm	Closing of Plenary, General Discussion wrap up sessions & generation of Communiqué

NIPE AFFAIRS:

05.15pm - 06.45pm	NIPE Annual General Meeting 2019
06.45pm - 07.15pm	Corporate Members Induction Ceremony
07.15pm - 08.00pm	Gala & Award Night/Dinner
08.00pm - 08.15pm	Final Closing & Departure by NIPE Members

THURSDAY, 18TH JULY, 2019

09.00am - 10.00am	Registration of Participants
09.00am - 10.00am	Closing Press Conference/ Communiqué
10.00am	Departure of Participants & Guests

CONFERENCE PAPERS

THEME PAPER

Strategic Focus To Achieving Sustainable Electric Power
In Africa - Nigeria In Focus

Prof. Barth Nnaji Former Minister, Federal Ministry of Power

THEMATIC PAPERS

Effective Maintenance as Strategies to Achieving Sustainable Electric Power In Africa.
Engr. Bernard A. Asuquo, MNSE MNTE MNIM

The Challenges Of Regulating Firms in the Nigerian Power Industry.
Engr. Emmanuel U. O. Ezekwere, FNSE

Power Industry Liquidity Challenges; Enforcement Of MAP Initiative as a Panacea.
Engr. George Chiatula, FNSE - Former, MD/CEO, PHEDC

Nigerian Electricity Industry Regulation as the Albatross to investment in the Distribution value Chain
Engr. John Kingsley Achife, FNSE - Former, MD PHEDC

SUBMITTED PAPERS

Artificial Neutral Network Based Transmission Usage Allocation Technique For Bilateral Trades in Deregulated Environment.

Engr. Dr. Haruna Musa,
Department Of Mechatronics Engineering, Bayero University, Kano.

Nigerian Power Grid: Model Development, Validation And Standardization For Research and Development.

S. S. Adamu^{1**}, A. A. Sadiq^{2*}, and J. G. Ambafi^{2*}

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Review on Optimal Siting of Electric Vehicle Charging Infrastructure

Ahmadu Adamu Galadima; Tahir Aja Zarma And Maruf A. Aminu
Department of Electrical and Electronics Engineering, Nile University of Nigeria, Abuja.

Review on Metric Range Extension of Energy Storage System for Electric Mobility.

Salami A. Nasirudeen; M. A. Aminu; M. S. Haruna; Okafor E. N. C.
Department of Electrical/Electronics Engineering, Faculty of Engineering, Nile University of Nigeria, Abuja.

Experimental Determination of Panel Generation Factor for Apo Area of Federal Capital Territory in Nigeria.

Jessica A. Onwuzuruike; Maruf A. Aminu
Department of Electrical and Electronics Engineering, Nile University of Nigeria, Abuja.

Power System Transient Stability Improvement On Jos - Gombe 330kv Line Using SVC

Joseph F. Udo; Maruf A. Aminu
Department Of Electrical And Electronics Engineering, Nile University Of Nigeria, Abuja



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ARTIFICIAL NEURAL NETWORK BASED TRANSMISSION USAGE ALLOCATION TECHNIQUE FOR BILATERAL TRADES IN DEREGULATED ENVIRONMENT

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Transmission usage allocation for bilateral trades based on ANN is proposed in this paper. The proposed ANN adopts line usage allocation outputs determined by each conventional method respectively as a teacher to train the neural networks. The proposed ANN based method provides the results in a faster and convenient manner with very good accuracy. Accordingly, the proposed method has been successfully tested and demonstrated on the modified IEEE 14-bus system. The method could be adapted to other larger systems by modifying the neural network structure. This technique can be used to resolve some of the difficult real power pricing and costing issues and to ensure fairness and transparency in the deregulated environment of power system operation.

Keywords : Usage allocation, Bilateral trades, Power pricing, Deregulated market, Neural Network

1.0 Introduction

Power contribution by each generator in a network to each line flows is the transmission usage allocation. This concept is associated with many advantages that may include loss allocation associated with each path, congestion management, cost assignment to transmission line pricing and decision on scheduling generators [1]. During operation under competitive market, the lines are controlled by the independent market operators and equal access rights are given to all generating companies involved. In this situation all generating companies are no longer having the ownership of transmission facilities. Therefore, the role of generating companies is restricted to selling power. They are made to operate under a pool or bilateral trade model. Presently, power pool is the most common form of market due to its simple structure [2].

The customers and generating companies can both bid for selling and buying power at the central power pool. The central power pool can conduct diverse types of auctions on the basis of day ahead market or real time market of buying and selling power from the market. Bilateral transactions enable consumers to make their best price deals for generation supply with whoever in the competitive market is most effective to meet their load demand. It was recently reported that the trends in the bulk power consumer have been towards bilateral transactions service with electric power utilities in order to avoid price fluctuations of energy market in a deregulated environment [3]. The situation is such that electric power utilities need to know the actual cost of providing unbundled services in order to make accurate economic decisions. As part of these trends, the emphasis on the knowledge of providing unbundled transmission service has been important and increases steadily.

This paper proposes a method of allocating transmission usage for pool and bilateral market models in deregulated power industry. The effort is on creating an appropriate artificial neural network (ANN) to allocate transmission usage for pool and bilateral trades separately in a simpler and faster manner. The modified IEEE 14-bus network is utilized as a test system to illustrate the effectiveness of the ANN output is evaluated based on the idea of supervised learning paradigm that trains the ANN. The goal of this paper is to incorporate the ANN to calculate line usage associated with the pool and bilateral transactions between purchasing and selling entities.

2.0 Unbundling line usage in bilateral model

Transaction pair here refers to a sending bus and receiving bus, the real and reactive transactions losses are taken into account in the calculation of power flow solution. The bilateral energy transaction also refers to each transaction pair and it is assumed that each sending bus, is only associated with a single or multiple transactions.