

**Electrical Engineering Service Design for Residential Buildings: A Critical Step in  
Planning for Adequate Power Supply Solution**

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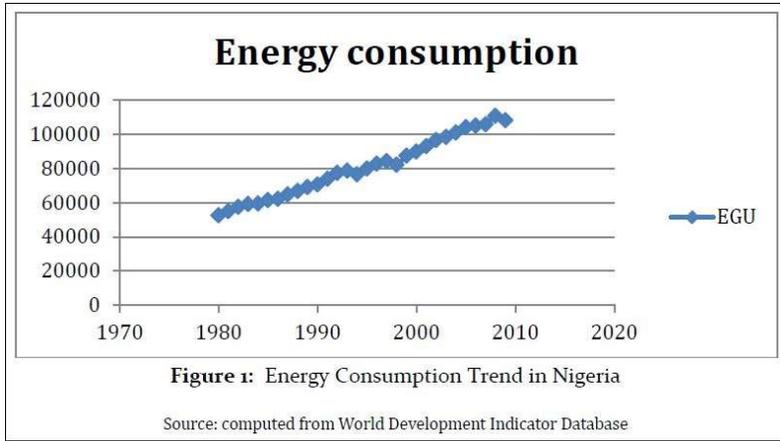
***ABSTRACT***

*Electrical building plan has been relegated to the background in the list of building approval documents in Nigeria. As a matter of fact, it is treated as an appendix to other documents such as architectural and structural engineering design in building plan approval documentation. This ought not to be so. More than 90% of residential buildings in particular are bungalows and rooming houses, but their electrical design diagrams are not required during building approval processes. Thus a very large percentage of electrical building design plan are left undone and their power demand and consumption unaccounted for. This paper examines benefits of electrical services building plan and need for proper load calculations for the least of all buildings that intend to add to the National Grid power demand.*

Keywords: Building, Plan, NIEEEE, COREN.

**1. Introduction**

Nigeria with an estimated population of 170 million and combine electrical generation capacity of 10,396.0 MW and available capacity of 6,056 MW [1] is still wallowing in frequent power outages. The fundamental reason for this has everything to do with lack of power consumption planning. Although the government of the day is doing everything possible to improve the daily generating capacity, there is little known about the residential electricity demand of consumers in the industrial, commercial and residential sectors of the economy. As witness in most other developing countries, Nigerian power consumption has increased with an upward trend of over 23% increment between 2000 and 2008 [3]. see Figure 1 below.



According to data from (Maxwell et al 2014) [2], comparative analysis of electricity consumption in residential, commercial and industrial sectors accounted respectively for 51.3, 26.7 and 22 percent of total electricity consumption. It is highly important for government to take into account proper utility planning at the residential sector of the consumption.

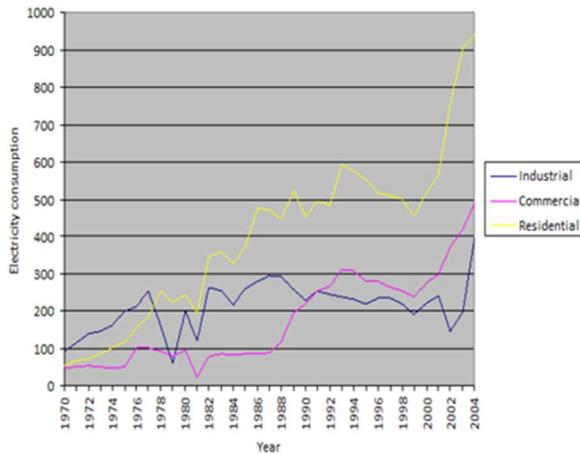


Figure 2: Trends of electricity consumption 1970 to 2004 [2]

## 2. Present State of Electrical Building Approval Demand

Over the last century, electricity has progressed from being inquisitiveness of ancient scientists and engineers of the likes of Michael Faraday and James Prescott Joule, to daily necessity for the people of the world, electricity is almost indispensable in our daily lives. Modern society requires smart, safe, reliable electric power infrastructure for social, political, and economic activities. It is

the responsibility of the government and her regulatory agencies to ensure that electrical facilities are well designed, comply with building codes, efficient, easy to maintain and operated under safe conditions irrespective of the types of buildings. Currently in Nigeria, what we have at best is partial demand for electrical design plan by statutory bodies as such, there is no wholesome record of load demand and consumption of some categories of buildings (bungalows and one storey building) which falls in the majority category of buildings in our environments. In Europe and some African countries, it is a legal requirement for all works on fixed electrical installations in residential and associated buildings to comply with relevant building codes and standards. These relevant standards cover requirements for design, installation, inspection, testing, verification and certification.

As shown from figure 2 above, residential buildings place more demand on the national utility grid, and in Nigeria substantial numbers of buildings are residential [4]. From general observation and a research carried out in Niger state, bungalows account for 31.9% (which is more than any other type) of residential buildings in Nigeria. [4].

S/N	Building Type	Frequency	Percent (%)	Cumulative Percent (%)
1	Traditional Compound	364	30.2	30.2
2	Rooming House	317	26.3	56.4
3	Semi-Detached Bungalow (Flats)	110	9.1	65.5
4	Semi-family bungalow	385	31.9	97.4
5	Storey Building	31	2.6	100
Total		1207	100	

Source: Olagunju R.E's data analysis, 2010 [4]

Ironically there is no adequate knowledge of the quantity of electricity being consumed by these buildings. The chief reason for this is the lack of demand of an electrical plan by authorities before those buildings were erected.

Subsequent sections of this paper focus on relevance of implementing electrical services design and plan for every level and category of buildings by professional engineers and asserting on them being part of compulsory building approval documentation

### **3. What is Electrical Building Design Diagram?**

An electrical building design diagram is a technical drawing that shows information about power, lighting, and communication for an engineering or architectural project. It usually consists of lines, symbols, dimensions and notations to accurately convey an electrical engineering design to the workers (technicians) who install the electrical system on the job. The electrical design diagram forms part of documents intent for owners and can be tendered as evidence in court cases involving contractor unethical practice, or failure to comply with the intentions of the drawings and specifications [5].

Electrical design diagram serves three major functions.

- i. Describes in details the electrical services of the building project; which enables electrical contractors to use the drawings in estimating the cost of materials, labour, and services when preparing contract bids.
- ii. Provides guidance to electricians in performing the required wiring of lighting and power installations while also warning them of potential hazards such as existing wiring, HVAC pipes, or plumbing systems.
- iii. Provides the owner with an “as-built” record of the installed electrical services for the purposes of maintenance or planning future expansion.

#### **Components of an Electrical Diagram**

- General electrical requirements; which includes receptacles (sockets)
- Specialized electrical requirements such as specialized office equipment, microwave ovens, washing machines etc.
- Lighting systems
- Electrical distribution systems

- Load calculation
- Schematic or line diagrams

#### **4. Importance of Electrical Design Drawings for all Categories of Buildings**

Just as the architectural design of a proposed building is a necessary requisite for the erection of all cadre of buildings so is the electrical plans also imperative. The primary reason is not far-fetched, electrical design drawing presents a potential direct additional load demands on the national grid, as such there is need for authority to be aware of this new requirements and adequately plan for growth. Also electrical building diagrams contain specific designs information for both installation works and load schedule estimates in conformity with all required building codes. Therefore, its importance towards adequate electric power supply are enumerated below:

- Electrical design drawing eliminates tendencies of over loading of existing distribution facility. Appropriate expansion plans for additional feeders as the case may be would have been factored into the utility design plan for the particular area.
- Realistic projection or forecast of future load demand are easily made.
- Adequate record of buildings that are connected to the national electricity grid are captured by the regulatory bodies.
- Electrical design diagram makes maintenance work easier from an informed point of view. Thus, preventive and proactive maintenance is enhanced rather than repair and replacement.
- It enables professionals and regulatory bodies to advice the public appropriately on energy efficiency and conservation.
- It ensures compliance with relevant electrical building and installation codes.
- Electrical design diagram offers improved safety against electrical shocks and fire out breaks.

## 5. Recommendations and Conclusion.

As the government is making efforts in improving generating capacity of electricity to meet the peak and off-peak demands of all consumers. There is need to focus on the regulation of the activities of electrical installations from design to commissioning stage. For proper utility planning and projections, the government needs to ensure proper load summary and analysis are done at residential, commercial and industrial sectors of power consumptions. Finally, the government and professional stakeholders should ensure the followings are done immediately.

- A bill should be passed to make the electrical design approval of a building a mandatory document to be presented before individuals are connected to the National Grid.
- Re-presentation of Nigerian Building Code bill to the National Assembly.
- NIEEE should work with other building professional bodies to ensure that Electrical Engineering building service is adequately presented in the proposed Nigerian building code document.
- Building plan approval bodies should ensure compliance
- COREN should team up for regulation and enforcement
- Awareness program for Nigerian populace on the importance of electrical design drawing for all cadre of buildings.

In conclusion, the importance of proper electrical services drawings for all Cadres of buildings cannot be over emphasised. It enhances proper present and future planning, aids maintenance and power optimization, creates room for compliance with relevant building codes among other things and ultimately aids addressing our power supply situation from a very informed point of view since solving problem successfully starts from proper understanding of questions. However, for success to be achieved, electrical engineers and our noble professional bodies must strategically promote its relevance in this dimension.

## 7. References

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