

ABSTRACT

The centralised energy generation system has been constantly criticised for not meeting the demand of Nigerian consumers. Recent studies on Nigeria's energy crises suggest that there should be an urgent adoption of decentralized generation (DG) as a means of alleviating energy poverty in the country, and as a way of reducing greenhouse gas emission (GHG) from the popular fossil-fuel based standalone generators. However, businesses today are anxiously trying to find ways to lower their energy related expenditures.

In line with these assertions, and using a case study of the Department of Architectural Office Building (DAOB) to incorporate rooftop solar PV system, the study uses a Design Builder and Energy plus simulation software to model and analyse the DAOB. This study is based on primary and secondary data sources. The study assessed policy regulatory and market structures which could stimulate the increased deployment of such systems in Nigeria.

The electricity bills for one year reported an annual consumption of 12,407 kWh, at the cost of N297, 762 (\$945) and likewise the cost of operating a building on diesel generator for a period of one year was calculated at N2, 688,000 (\$8,513) while the status-quo baseline energy consumption of the building from simulation and the cost implication per annum was 69,733 kWh and ₦1,673,592 (\$5,579) respectively. Optimisation of the baseline consumption through a combination of three feasible energy efficiency initiatives reduced the baseline annual consumption by 47% from 69,733kWh to 37,298 kWh.

The roof had the capacity to generate 155,347kWh which could cover for both the baseline and the optimised annual electricity consumption. The analysis revealed further that the roof could generate a surplus of 118,045 kWh/annum based on the optimised energy consumption. Using financial analysis tools of payback period, return on investment and net present value, the study undertook a number of business case scenarios to establish a viable business model. Based on the financial analysis performed, a Solar Power Purchase Agreement (SPPA) business model was identified as the most suitable to overcome the barrier of upfront cost.

Keywords: Business model, distributed energy generation, Energy efficiency, greenhouse gas, optimization.