Feasibility Study of Solar Photovoltaic Systems for Energy in Residential Homes:

A Case Study of Metropolitan Lagos, Nigeria

ECREEE
TOWARDS SUSTAINABLE ENERGY

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RESEARCH QUESTIONS

1. What is the technical feasibility for the use of solar PV systems in meeting the energy demand (as a stand-alone or back-up for grid energy) of residential buildings in Lagos?

2. What is the economic benefit for the integration of a solar PV in buildings in Lagos compared to the use of back-up diesel generators?

3. To what extent will energy use from solar PV in buildings reduce greenhouse gas emissions in Nigeria?

COUNTRIES AND REGIONS

Country: Nigeria

Region: Five Local Government Areas (Ajeromi, Alimosho, Mushin, Oshodi and Kosofe) in Lagos State, South West Nigeria.

METHODS

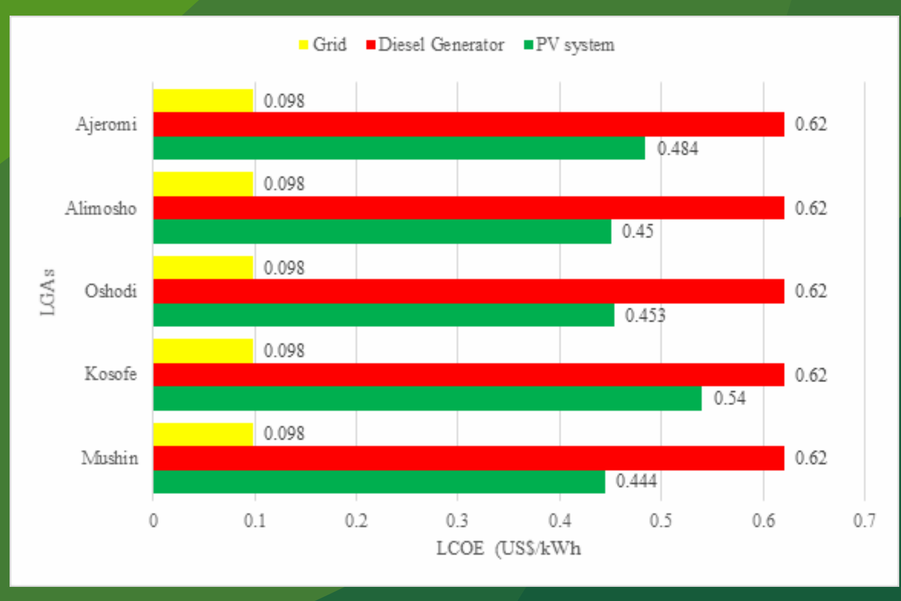
Multi-methods approach including:

- Extensive literature review
- Survey of 250 households for the collection of energy data – survey cut across 5 LGAs in Lagos and the five main building types in Nigeria ("Flat, face-me-I-face you", Duplex, Single family Bungalow and Traditional Court Yard)
- Inputting survey data in Microsoft Excel to generate electricity load profile of buildings
- The load profiles of the buildings (50 buildings at various sensitivity levels) was used to model a stand-alone PV systems using Homer Pro software
- GHG emission savings associated to the use of PV in residential buildings was computed using Microsoft Excel

Olatunji Adetunji, 2013

FINDINGS

- Diesel generator is a prominent source of electrical energy for households as they were used in all the building types in the study location.
- Overall, PV systems possess potential for generating electricity to meet the entire electricity demand (100%) of residential buildings.
- A duplex building in our study had a rooftop area that was not large enough to accommodate the required size of the PV array, implying that small buildings with very high energy demands may not be able to have 100% of their load satisfied by PV systems.
- The Levelized Cost of electricity (LCOE) generated by the PV systems is higher than electricity from the grid but cheaper than the LCOE of diesel generators (Figure 1).
- The use of PV generated electricity in the buildings has potential for reducing grid related GHG emissions by 63.2% (Studies by Abanda et al., 2016 revealed a GHG emission reduction of 81% for Cameroon)



Comparison of the LCOE of three energy options for use in traditional courthouse in five LGAs

KEY MESSAGES FOR PLANNERS OR POLICYMAKERS

- The promotion of an enabling environment for the adoption and use of solar PV in residential buildings possess potentials for supporting the attainment of Nigeria's mitigation target under the NDC.
- A mix of policy options should be used – to increase uptake of PV on the one hand and the adoption of low consumption household appliances on the other hand.
- Climate finance constitutes a window of opportunity for investment in the solar sector – for instance, Green Climate Fund (GCF).

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