Chapter 27
Policy Influence of Solar PV Diffusion into the Nigerian Rural Energy Mix

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ABSTRACT

The study in this chapter examined policy options for promoting solar PV diffusion into the energy mix of six selected remote villages that were pilot sites for national and foreign assisted solar electrification programs in three ecological regions of Nigeria. A total of 910 questionnaires were administered on the solar PV users, suppliers, and government agencies to elicit information on alternative energy sources for provision of energy services. The results showed that solar PV usage was 49.9 kWh per/day, which constituted an insignificant share of about 14% in the total lighting requirement and less than 2% of the total requirement for energy services. The demand would rise to 73.3 kWh per/day by 2019 at the same 14% share of the total lighting requirement. Firewood demand maintained over 80 percent share (2383.5 kWh per/day) in the total energy mix in 2009. It also revealed that the best policy option of 200 percent increase in solar bulbs' share for lighting by 2014 would require 50% reduction in kerosene share. The study concluded that increasing utilization of solar PV for lighting, entertainment, refrigeration, and ventilation in the study areas could lead to decrease in the use of energy from alternative sources.

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1.0 BACKGROUND INFORMATION

Model for Analysis of Energy Demand (MADE-II) was used to carry out energy demand analysis while Model for Energy Supply System Analysis and their General Environmental Impacts (MESSAGE-V) was used for optimizing the solar PV supply required to meet the desired demand and the associated environmental impacts.

Greater reliance on environmentally sound energy systems, particularly new and renewable sources of energy to provide solution to the world energy demands is estimated to double within the next 20 years (UNDP, 1992). With depletion of fossil fuels at a faster rate than ever before and serious concerns by governments worldwide for global warming and its associated climatic change (WEO 2010), solar PV energy as an elegant and effective renewable energy resource is increasingly being seen as a promising candidate for provision of clean and sustainable power (Jesuleye et al, 2010). This invariably explains the reason for the steady increase in world solar photovoltaic (PV) market installations which reached a record high of 7.3 gigawatt (GW) in 2009, representing growth of 20 percent over the previous year. For this year, three European countries (Germany, Italy and Czech Republic) collectively recorded a world market installation share of 68 percent. Germany and Italy maintain the 2009 first and second largest market share, while the USA and Japan emerged as the third and fourth respectively. Their performances show clear demonstration of policy framework and strategic plan of action capable of harnessing opportunities for clean and sustainable power provided by PVs (Solarbuzz, 2010).

The Nigerian Government launched her Renewable Energy Master plan in 2006, which among others, articulated her short, medium and long term plans for penetration of PVs in her Energy Demand and Supply mix (ECN, 2005). This effort is commendable because PVs development option was incorporated into her integrated rural development strategy for increased access to energy services to two thirds of the Nigerian population living in the rural areas. This is because; grid electricity might be too expensive or may take a long time before reaching them, especially as the sub-sector becomes market driven. Decentralized renewable energy sources such as PVs may be more convenient and cost-effective alternatives than the centralized sources (Zuru, 2007).

Presently, as a result of insufficient energy services to process food, people have had to pay more especially from the rural areas out of their meager income. Many people in Nigeria like in other developing countries spend up to a third of their income on energy, most of which is for cooking and lighting. As a result, women spend up to three hours in a day collecting firewood, walking up to ten kilometres and carrying 35kg of wood. Millions depend on bio-mass (wood, charcoal and dung) to meet their household energy needs (NBS, 2008). A major challenge will be to provide electricity to the rural poor. At the moment, nominal generating capacity in Nigeria is less than 6,000MW which is a far cry from the needed energy supply in the cities alone, not to talk of the rural areas (PHCN, 2006).

Studies have shown that billions of naira are wasted annually on consumption of energy which otherwise could have been saved (Jesuleye *et al*., 2007). Apart from these direct losses, using energy inefficiently has major implications to the national economy.

The first relates to the capital requirements for energy. Energy supply infrastructure cost money and its marginal cost increases as more of it is demanded. What this means is that, with inefficient energy utilization, resource wastage is inevitable.

Second, excessive energy consumption has added to the cost of goods produced in the economy especially energy intensive industries like cement, steel and refinery (Adegbulugbe *et al.,* 1990). More so, the Nigerian energy statistics