Self-Generation and Households' Willingness to Pay for Reliable Electricity Service in Nigeria

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Executive Summary

Despite the importance of reliable energy services to consumer welfare, access to uninterrupted electricity services remains a critical challenge facing households in developing countries. For instance, the average Nigerian household experiences power outages for around 19 hours daily. This poor provision is a result of underinvestment in new generation capacity and a lack of adequate maintenance of existing facilities due to low private investment. For most Nigerians, tackling the poor electricity supply means the installation of private backup generators. Approximately one in four Nigerian homes has a gasoline- or diesel-powered generator, purposely installed to reduce the welfare losses associated with poor reliability. Although backup generation reduces the welfare losses associated with unreliable public provision, it equally poses serious environmental and health risks due to the non-negligible carbon emissions.

Finding a permanent solution to the low-quality power supply in Nigeria in order to consequently reduce the dependence on backup generation, as in many other developing countries, requires active private investments in power provision, especially given the recent decline in government revenue due to the rapid decrease in oil prices. However, securing active private investors' involvements in the power sector would require an increase in tariffs and the use of a cost-reflective pricing system that guarantees a return on investment. Thus, it is important to understand the costs of outage, which are particularly important for comparing costs to benefits when deciding on investments to improve quality of service. It is also crucial to evaluate the WTP of potential users, especially given the high rates of backup generation in Nigerian homes, in order to come up with empirically informed policy frameworks. Some policy related questions this study attempts to answer include: Would Nigerian households be willing to pay for improved reliability and, if so, how much? What are the determinants of households' backup generator adoption? Then, conditional on backup generator ownership: What is the household's response to the proposed reliability-bill trade-offs? How much does it cost a household to self-generate electricity, and how does the self-generation cost (i.e., outage cost) relate to their WTP for improved grid service reliability?

I use data collected from a survey of Nigerian households to estimate the costs of power outages to residential users, and then evaluate the extent to which these costs might affect their WTP. I first show that the decision of a household to maintain its own generation capability is driven by a variety of factors. Our empirical analysis shows that unreliable public power supply, though a constraint to consumer welfare, is far from being the only, or the largest, factor driving generator ownership. Household characteristics such as income, size, age, gender differentials, and ownership of electrical appliances all have a major influence. I also show that, conditional on engagement in self-generation, households owning a backup generator are willing to pay more for service reliability than comparable non-backup households because of the expensiveness of backup generation – a measure of outage cost.

The estimated WTP suggests that Nigerian households, regardless of their income, would be willing to pay more than the current tariff for improved service quality. This implies that households would

value the reliability of a more expensive supply above the current highly subsidised tariffs that come with low quality. The government should consider optimal tariffs that are cost recovering for new investment, and regulatory incentives for reliability. Such reforms would encourage private investments in electricity provision and raise reliability. At the very least, the 'open' subsidy regime currently operated needs to be replaced by targeted subsidies designed to protect only the low-income and vulnerable groups. Lost subsidies on energy might be replaced by a new benefit scheme (e.g., a school feeding programme) so that overall consumer welfare is not lost. The government could also consider a cash transfer or an alternative benefit scheme holding an approximately equal value, net the deadweight loss that accrues from inefficient allocation. Alternatively, the government can use the subsidies removed from electricity tariffs to subsidise the uptake of environmentally friendly renewable energy generation including solar photovoltaic power plus storage as an alternative to both the grid and diesel generation. Lastly, another policy option for the government is to implement rising block tariffs.