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A Socio-technical Study of Electricity Demand, Efficiency and Flexibility in the Urban Housing Sector of Burkina Faso

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Extended Abstract

Availability, accessibility and a secure supply of electricity are significant development indicators and are a prerequisite for providing essential services and economic growth [1]. Almost 75% of people without access to electricity in the world today live in Sub-Saharan Africa [2]. The deficiency in the region's electricity sector contributes to social and economic poverty, under-development, unemployment, a high level of illiteracy and increased emigration [3]. The burning of fossil fuels for the production of electricity also leads to environmental and health impacts [4]. Accordingly, universal access to a secure and clean electricity supply has become a significant development goal for most Sub-Saharan African countries, including Burkina Faso.

In Burkina Faso, electricity demand has increased 8.4% per year since 2010, driven by an average 4.1% growth in urbanisation per year. Urban areas consume 74% of total electricity use [5]. The country's generation capacity is struggling to keep up, resulting in frequent power outages, especially in hot periods due to increasing electricity use for cooling [6]. The country depends on energy imports (45% dependence) from neighbouring countries Ghana and Côte d'Ivoire. Burkina Faso is therefore highly vulnerable to disruptions in supply and consumers experience high and volatile energy costs. Upgrading the electricity supply system is a long-term challenge, but in the short-term, demand side management (DSM) programmes (electricity efficiency and flexibility) could present a significant opportunity to better balance supply and demand. The housing sector accounts for 33% of the nation's electricity use and is seen as a key target for DSM, but there is almost no data at present for a successful and evidence based implementation.

Alongside improving reliability and security of the electricity supply, the Government of Burkina Faso has committed to reduce electricity demand to cut Green House Gas (GHG) emissions and help mitigate the effects of climate change [7]. The Sahel region, where Burkina Faso is located, is "one of the most vulnerable to climate change with the largest number of people disproportionately affected" (Ibrahim Thiaw, UN Special Adviser). Again, lack of evidence on electricity use of homes and the opportunities for demand reduction limit effective action. The warming conditions in the country, driven by climate change, is itself further exacerbating the demand for electricity as households are increasingly using air conditioning (AC) to keep cool at home (26.5% increase in AC sales from 2016-2020 [8]). It has also been modelled that Burkina Faso will suffer the second highest increase in absolute cooling degree days globally if global temperatures rise by 2.0°C [9]. A vicious positive feedback loop also exists, where households use electricity for AC to stay cool, this generates GHG emissions, due to the high prevalence of fossil fuels (47%) in the country's energy mix, temperatures increase due to climate change, and then there is a greater need for AC.

The project "A Socio-technical Study of Electricity Demand, Efficiency and Flexibility in the Urban Housing Sector of Burkina Faso (2SEDEF)" aims to respond to these challenges by addressing a substantial gap in knowledge about the electricity demands and opportunities for DSM in homes in Burkina Faso. A key focus of the project will be on the rapidly growing electricity demand for cooling triggered by the improving economic status of households and climate change. The research will provide insights into current AC use in homes as well as alternative methods for staying cool, such as passive cooling, low powered fans, etc., in a warming climate.

The research will use a socio-technical approach combining the socio-economic characteristics, lifestyles and energy behaviours of households with the technical characteristics of the dwellings in which they reside, coupled with detailed monitoring of the total electricity consumptions and internal temperatures. Such data for Burkina Faso is almost non-existent at present. The project team comprises universities, industry and government to ensure the evidence collected is able to inform future energy policy and the potential implementation of DSM programmes in the housing sector.

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