

# Policy Brief: Households' valuation of power outages in urban Ethiopia

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*How much value do urban households attach to the avoidance of power outages? Do these values differ across household poverty categories? We provide insights on the value urban households attach to different characteristics of power outages and differences across household poverty categories in Ethiopia by applying discrete choice experiment and contingent valuation methods.*

## Key messages and recommendations

- Households strongly value greater electricity reliability and are willing to pay for it. This suggests that policy-makers should work to allow utilities to raise electricity tariffs when they invest in such improvements.
- Households in Ethiopia are willing to pay approximately 13% –16% of the average monthly electricity bill (or 33 – 42 times the average electricity tariff per kwh) to avoid a 3-hour power reduction.
- Households are willing to pay 11 birr (US\$ 0.4) for a one-unit reduction in the number of outages and 53 birr (US\$ 1.8) to avoid a daytime or night-time outage relative to morning outages. Moreover, households prefer a day prior outage notification to a week prior notification, with a willingness to pay of 23 birr (US\$ 0.8).
- There is a continued need to identify better ways to target pro-poor electricity subsidies, given the lower demand and affordability challenge facing this group.

## Introduction

Despite rapid progress in electrification in many low-income countries like Ethiopia, electricity supply for those connected often remains highly unreliable. Households who maintain alternatives to reduce frequent and long-lasting disruptions of electricity supply incur additional costs for energy services – and many of these alternatives also lead to pollution of the environment. Households also cope with productivity loss for activities that are curtailed, with damaged electric appliances and/or limited ability to use them, insecurity at night, and children being unable to study after the sun goes down. These coping costs harm economic development and may perpetuate energy poverty.

The private and social costs of unreliable electricity can be reduced with investment in increased generation capacity, more robust transmission and distribution infrastructure, and enhanced utility management. However, such improvements also entail significant costs

that may be hard to finance or otherwise create long-term sustainability challenges, especially where tariffs are kept well below levels needed for cost recovery and poverty levels are high as is the case in Ethiopia.

A key challenge in assessing the costs and benefits of unreliable electricity is that the adverse effects of power outages on consumers are not readily reflected in market prices. One way to assess these is to use 'revealed preference measures' such as costs incurred to cope with or avert power outages. An example of this is the cost of using diesel generators during power outages. However, they represent only a partial accounting of these costs for a range of reasons, including technology limitations, credit constraints, or differences in the quality of those alternatives. For example, credit constraints would imply that those who would like to use alternatives such as diesel generators may not be able to do so if they do not have the cash and have no access to credit. These aspects are likely to be

### Data and methods

Overall, our study covers a sample of over 2,180 urban households in major cities of Ethiopia. About 54% of the sample is from Addis Ababa, the capital. The household survey was administered from August to October 2019 through face-to-face interviews and using computer-assisted personal interviews. The study used both discrete choice experiment (DCE) and contingent valuation (CV) methods to elicit households' valuation for changes in power outages.

In the DCE, we examine the value that urban Ethiopian households attach to changes in the following four attributes of outages: reduced frequency; shorter duration; the time of day of such disruptions; and advance notification of outage events. With CV surveys, we use willingness to pay (WTP) framing to estimate the value that households attach to a three-hour reduction in the duration of power outages in the evenings in the next week, while with the willingness to accept (WTA) compensation framing we estimate the compensation that would be required for households to be equally well off given a similar increase in the next week's duration of outages.

especially binding for the energy poor, who have limited resources to invest in alternatives. For this reason, such measures may understate both the true cost of poor-quality power and the policy case for improved reliability.

Considering that there are market and nonmarket consequences involved, we use stated preference methods to obtain more complete measures of economic value. We do this based on carefully designed survey questionnaires built around hypothetical scenarios or situations to directly elicit

respondents' preferences. We use dual methods to estimate the value that urban households attach to attributes of power outages in Ethiopia: contingent valuation (CV) and discrete choice experiment (DCE) which are already discussed in the box above. We also examine values according to different definitions of energy poverty (income poor, electricity poor and polluting fuel poor (i.e., poor households spending a large proportion on polluting fuels).

### Households value attributes of power outages

We find that households, on average, are willing to pay (WTP) about 11 birr (US\$0.40) for a reduction in frequency of one outage per month, and 53 birr (US\$1.80) per month to avoid daytime or evening outages, relative to morning outages. We also find that households prefer day-ahead outage notification to a week-ahead notification, with a marginal WTP of 23 birr (US\$0.79) per month. Results of our CV studies show consistency across the WTP and willingness to accept (WTA) measures with demand for 3 fewer evening outage hours of 33–42 birr (US\$1.1–1.4). This is equivalent to approximately 13%–16% of the average monthly electricity bill of 257 birr (US\$8.9) and 33–42 times the average electricity tariff of 1 birr/kWh (3 US cents/kWh).

### There are differences in preferences of households by poverty category

Overall, we observed considerable variation in sample households' preferences among groups classified as energy poor or non-poor (Figure 1).

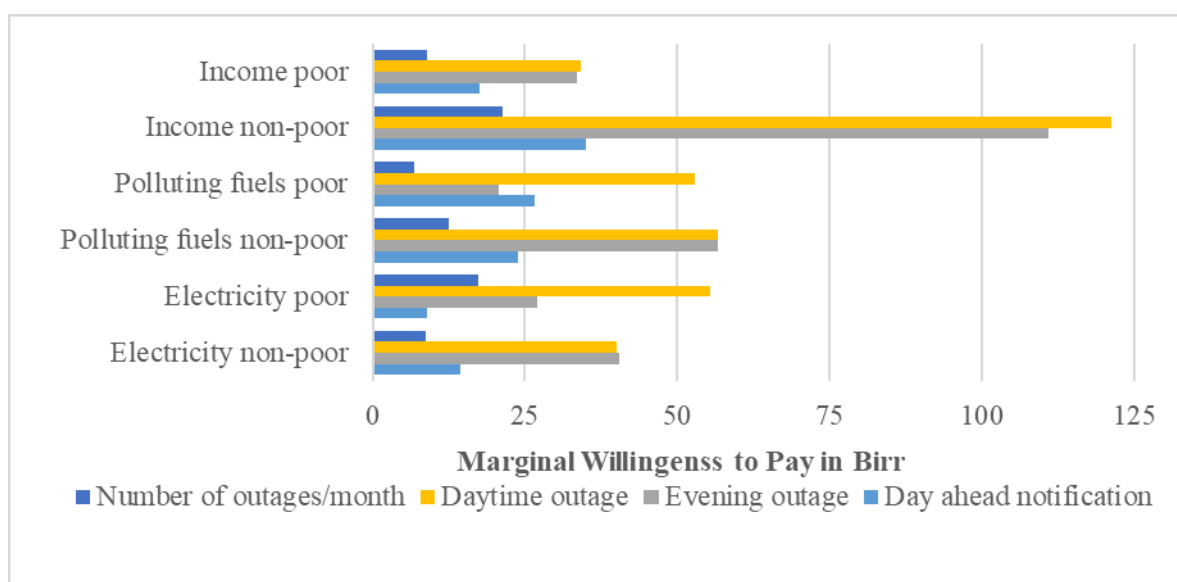


Figure 1. Marginal willingness to pay of households in Birr for different attributes of power outage by poverty category of households (based on DCE analysis)

Energy poor and non-poor households are found to be different on a wide range of characteristics, but not in their exposure to outages measured by reported frequency and duration of power outages. And yet, our results show that households spending a large proportion of their income on electricity placed especially high value on reduced outages. In contrast, income poor households, and to lesser extent households spending a greater amount on polluting fuels have somewhat lower demand for the improvements. However, we find some evidence of a divergence between WTP and WTA, with WTA being almost 50% higher for the group that may be particularly income constrained with respect to additional payments for electricity. This could imply that income poor households would like to receive more as a compensation for the same reduction in duration than wealthier households. It could also indicate altruism among wealthier households, who may wish others to benefit also from reduced outages or increased electricity supply.

### **Policy-makers should allow utilities to raise rates when they invest in improvements taking poverty status into account**

As households generally strongly value greater electricity reliability and are willing to pay for this, policy-makers should allow utilities to raise electricity tariffs when they invest in such improvements. This would incentivise utilities to undertake required maintenance and reliability-driven upgrades to generation capacity and transmission infrastructure. Policy-makers must ensure that investments in improved service quality accompany the current tariff reform in Ethiopia with a phased approach of annual rate increases. At the same time, there is a continued need to identify better ways to target pro-poor electricity subsidies, given the lower demand and affordability challenge facing this group. It is important to continue carefully considering and finding ways to confront the circular relationship between energy poverty and energy demand to achieve the United Nations Sustainable Development Goal 7 objective of “access to affordable, reliable, sustainable and modern energy for all”. This may require continued dialogue among policymakers and corporate decision-makers, and additional research as well.

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