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This electricity is intended to benefit us low-income people...but I am surprised...because we were told this electricity is cheap and for that we agreed to pay all the costs, and we got connected, but the service is expensive. When it comes to bills, for example, personally I bought 32,000 TZS electricity units in December last year. In mid-April I bought another 10,000 TZS worth of units, but I was told I had to pay more. I gave them 20,000 TZS. Again I was told to pay more. When I asked the reason, it was because there is a monthly service line charge of 7,000 TZS, so for those four months I have to pay 28,000 TZS, then buy new electricity units.

What kind of electricity is this? Is it there to help us or torture us because this is not electricity for the poor? It has become electricity to be used by people of high class, not us poor people. I paid 28,000 TZS, then bought units for 12,000 TZS and stayed like a month. I went again to pay and was told 10,000 TZS for units was insufficient. I had to buy 15,000 TZS. I said to myself: "This kind of electricity is annoying to us low-income people. It does not help us at all." I have a fridge I no longer use as I have seen its costs are high. The electricity...honestly it is not helping us.

Nevertheless, most respondents found the usage costs of grid electricity *more* affordable than other energy sources. For example, one household FGD respondent said, "compared to battery, I could use up to 40,000 TZS at the end of month but for now am paying 17,000 TZS per month." Similarly, a school respondent said, "A good example is that we were using a generator that needed three liters from 8 p.m. to 11 p.m. A liter is sold at 2,500 TZS, so you needed 7,500 TZS a day. Now you just need 1,000 TZS for week. Don't you see a relief?" And another household FGD respondent said:

There is a big difference, as the use of electricity has enabled us to save money, and it has simplified our lives. For instance, you may buy the electricity to use for a month just for 5,000 TZS and you may get your 41 electricity units that you might use for the whole month. In using kerosene, we could spend up to 20,000 TZS per month to purchase that source of energy.

### **3. Quality of and satisfaction with electricity**

The majority of household focus group participants reported that they were satisfied with the overall quality of electricity from the MCC lines. Although there were outages, they were not frequent. One respondent explained: "The electricity has the good quality most of the time. It does not go off frequently. It does not change into low voltage. And if it goes off, it does not come back with high voltage that could cause some problems." Although respondents agreed that power surges and fluctuations did occur, few respondents reported this was a major problem or that equipment or appliances had been ruined by surges.

Regarding the frequency of outages, respondents agreed that outages were less frequent with MCC lines compared to other lines and that outages were more common in the rainy season: “Mostly during the raining seasons, the power cuts off more frequently because the poles will be falling, and TANESCO will be busy making repairs so we just wait for them to finish, but in dry season everything is okay.” It was also noted that whereas outages used to last for three or four days, they were now only a few hours long. There was, however, a concern about being charged for electricity even during outages: “The thing that I do not understand for me is that every time the electricity cuts off, the units are deducted.”

Finally, community observers did not report evidence of any broken lines (Table IV.1).

### C. Economic outcomes

Connecting to the grid can directly improve economic outcomes across communities. First, grid electricity can be much cheaper than many other forms of fuel. This is supported by research we have done in the T&D communities (Chaplin et al. 2012) and by the findings of this report (Section B, above). Second, grid electricity may increase income by improving options for creating and running businesses.

To assess the potential impacts on businesses of getting grid electricity, we interviewed 40 owners of businesses or income-generating activities. These tended to be household- or kiosk-based businesses, but also included local shops. The businesses were relatively small, with few or no employees. Of the 40 business owners we interviewed, 25 were male, and 15 were female; 21 were connected to electricity, and 19 were not (Table IV.2).

**Table IV.2. Owners of businesses and income-generating activities**

IGA owners	Connected	Not connected	Total
Male	14	11	25
Female	7	8	15
Total	21	19	40

Respondents’ businesses included maize mills, bars, salons, mobile phone charging stations, restaurants, retail shops, pharmacies, clothing shops, food vendors, bars, tailoring, welding, video shows/cinema, and repair shops. Some respondents owned several businesses.

Business owners reported using electricity for lighting; running refrigerators, stoves, and milling machines; welding; charging phones; playing music; and raising poultry and increasing egg production in hens. For example, some IGAs that previously sold unrefrigerated beverages had begun to sell cold beverages such as beer, sodas, and water. Business owners who did not have access to grid electricity described similar uses to which they would put electricity if they had it.

Both household FGD and business respondents mentioned increases in their chicken-raising businesses resulting from use of electricity. For example, one business respondent said, “I used

to keep 10 local chickens, but now I keep 100 because you have the techniques and tools to preserve them. It means the business is expanding.”

The most common outcomes reported by IGA respondents were that connecting to electricity meant that the businesses were able to stay open longer because lighting was available or cheaper with grid electricity compared to other energy sources. For example, “The other advantage of doing business here is that I can do business till 21:00 or 22:00 as opposed to those people who do not use electricity who are forced by the situation to close their shops at 18:00 every evening.” Another said, “I used to make 50,000 [TZS] a day, but that has gone up to 80,000 [TZS] a day, to 90,000 [TZS], so you can see the increase. Back then, since I used to close at 9 p.m., I would make 40 to 50 thousand [TZS]. I now close down around 10 p.m., so there is an increase in revenue in my business.”

Business respondents also noted improved communication with their customers and suppliers. Phones could be charged more reliably, so communication was easier. For example, “After being connected to this electricity, I have electricity all the time, my mobile is available all the time, so when my customers want to meet me, they always call me and tell me where we can meet easily. This is quite different to the time before having the electricity.”

Many businesses reported increased profits since connecting to grid electricity although several others reported decreased profits. Increased profits came from being open longer hours and selling more items such as cold drinks and ice cream, which led to more sales and more customers. Businesses that offered cell phone charging and those operating milling machines said that they could operate their business at a lower cost and stay open for longer each day. In contrast, other business owners who reported reduced profits explained that they lost business when their customers connected to the grid. For example, business owners who charged cell phones reported that some business was lost because people were charging their own phones with electricity at their homes and that the demand for certain products like batteries had decreased.

Community leaders also told us that a number of types of new businesses had emerged, such as maize mills, ice cream sellers, men’s salons, cell phone charging vendors, and welding shops. These may increase employment opportunities and income, and reduce the cost of goods and services (mainly by eliminating travel costs to other towns to obtain those goods and services).

#### **D. Educational outcomes**

Having grid electricity may affect educational outcomes if students perform better in school because they are able to study more. In fact, respondents frequently discussed how electric light allows students to study at night either at school or at home. While we did not collect data on student outcomes, several parents asserted that their children were doing better in school because they were studying more. For example, one FGD respondent said,

In reality, I find it a bit difficult to explain the relief we have, but all the same there is, because in most cases our children, especially those who are students, were facing difficulties in their studies as they were sometimes forced to use traditional methods of lighting. Now that electricity is available, you can find that they can read anytime as they wish. One may decide to read before

sleeping or may decide to sleep first and wake up at any time and study. I think that is also one of the advantages.

Respondents also mentioned ways in which grid electricity might change schools. We asked eight school leaders about these changes. Only two of the schools were connected, so six school leaders' responses were about potential effects of electrification. School respondents explained that if they were connected, they would use electricity for lighting to study, lighting for security, TV, printers, photocopying, cooking, and cell phone charging. They also hoped to use computers and science and lab equipment. For example, one respondent said, "We will use electricity for teaching children in the extra evening classes, especially teaching those who have little ability in their studies (slow learners); therefore, we will be able to help them, especially standard seven and four who are waiting for their national exams." A household FGD respondent also discussed benefits while at school:

At school, pupils can now do things which are quite different as compared to what they used to do before. I can see that if they are given electricity, they can have computers which will assist them. Also at home, children are now motivated to read at home because adequate light is there. This is opposed to how the situation was before, when they were told that now time is over we have to switch off the light and go to sleep. But now [they] can wake up even at 4 a.m. and switch on the light and start reading.

#### **E. Health outcomes**

Respondents believe that getting access to grid electricity can affect health outcomes by improving health care facilities or by making it easier to stay healthy at home or school. We focus first on the health benefits likely to accrue from having electricity in homes and schools, and second on effects accruing from improvements in health facilities.

At home, when electricity replaces other types of fuels, air pollution may be reduced, which in turn can improve lung and eye health. Electricity may produce better lighting, which may also reduce eyestrain. Similar benefits can occur at school.

Here, one household FGD respondent refers to a number of the potential health benefits of grid electricity via household use:

I think the relief I get when using electricity is that I get adequate light unlike the dim light that I used to get. The use of electricity as opposed to the former sources of energy enable[s] me to get an adequate light that I can use for reading purposes or in order to do any activity without causing any problems to my eyes. In addition to this, the use of kerosene energy did not generate adequate light and used to produce smoke which causes flu and disturbance to the users, but the use of electricity has not been causing such disturbances to me.

Another respondent focuses more directly on the pollution-related issues in homes:

I may say in general that the health of the community has improved due to the presence of electricity. For those who are using electricity, problems like flu are minimized because the smoke from kerosene lamps has been eradicated. Locally made lamp sometimes cause flu, there is another problem of eyes. People suffering from eye diseases have been minimized because all these are caused by smokes.

Several women explained how important it was for them to use electricity for cooking because it reduced health problems, such as smoke inhalation, caused by using firewood or kerosene for cooking. However, as noted above, cooking with electricity can be quite expensive, so it is not clear how many households will end up benefiting through changes in cooking fuel.

When used in schools, electricity may have similar health benefits. For example, one school respondent said, “We will use electricity for preserving some chemicals which are open in our first aid kit; we can preserve them in the refrigerator which will also help to preserve various things for the students and the surrounding community.”

Although few of these communities had local health facilities, respondents reported visiting neighboring health facilities when necessary. We start with a discussion of outcomes for health facilities that were not connected and then discuss those that were.

The facilities that were not connected to the grid reported significant operational challenges, some of which had effects on patient well-being.<sup>22</sup> Some statements by health facility staff are particularly striking. For example, one respondent describes using a cell phone to help a mother give birth:

A pregnant woman can come for the service at midnight. To assist her in delivery, we use mobile phone torch. Okay, you have successfully managed to support her on delivery, where are you going to make her rest at 2 a.m.? We have one house that we use. There is neither solar nor electricity at that house, so she also needs to use a mobile phone torch. If she has not come with those Chinese dry cells, then they have to stay in darkness till morning.

Health facility respondents who were connected to grid electricity described how they used electricity to improve health outcomes. Respondents emphasized the importance of light when treating patients at night. They also described the importance of using appropriate and sanitized medical and diagnostic equipment, and the need to refrigerate vaccines and medicines.

Community leaders also reported expecting positive impacts on health outcomes. For example, one said, “Yes, because if you go to the health center when there is a light it is easy to know what the patient is complaining about, even the nurses and patients can see each other. So they can understand someone by seeing them.” Another said, “There is a new business of

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<sup>22</sup> In addition to the solar power, kerosene, gas, and batteries, the not-connected facilities used cell phones for lighting. Respondents reported energy shortages and that high-cost energy sources, such as kerosene, meant that they required patients to bring kerosene fuel and a lantern with them to the facility when they needed treatment. Solar power was not a reliable energy source because it depended upon sunlight and they had little storage capacity.

pharmacy, so we get quick treatment of our wounds whenever we get injured, as one may rush to a pharmacy where they will put a spirit and bandage, and one may start feeling well instantly.”

One potential way in which grid electricity might improve health is by increasing access to clean water; however, no respondents mentioned this. Also, the data collectors noted only one community that was using MCC lines for their water system. Most communities had piped water for at least some households. One relied on lake water and another on wells and rainwater.

## **F. Safety outcomes**

Electricity from the grid has the potential to improve safety. First, light at night can reduce injuries from accidents and dangerous animals, as well as crime. Second, reduced use of candles, kerosene lamps, and open cooking fires can minimize the number of accidental fires that burn down homes and businesses.

One household FGD respondent mentioned snakes: “Additionally, we can freely walk around at nights because one can avoid dangerous animals like snakes.”

Communities with electricity lines now had less crime at night, according to community leaders, because robbers and thieves were thwarted by lights. Both men and women reported that new lighting around their homes and local markets reduced worries about robbers and thieves. For example, one FGD respondent said:

The other advantage of electricity is that it has enhanced security at our home. During the night on the roads or in our courtyards, there is satisfactory security, as nowadays thieves do not come at my home frequently, as I have a dog and an electric light during the night for security purposes. Thus, the electricity has chased away theft in our rural areas as we are free from theft these days.

School leaders and health facility respondents also mentioned the potential safety benefits of grid electricity. For example one school leader said, “We have been robbed in this year, because of those rains which we had in this year, the place was very dark, and so the watchman was robbed thrice. Some school items were stolen, and up to now doors are broken and that has been reported to the police. And the police also advised us to be connected to electricity.” Similarly, one health facility respondent said, “Generally, the presence of electricity enhances the security for the dispensary all the time as it has the security lights.”

A number of household FGD respondents mentioned how grid electricity reduces the likelihood of a fire. One said, “Sometimes we use candles to avoid the effects of smoke. We use candles, but these candles have a lot of effects because in the family are children. We need to blow off the candle so that they [children] sleep. If you do not put off the candle, it might set the net aflame and hurt the children.” Another said:

I am now scared of using a “koroboi” (a local small oil lamp) as well as a candle. They cause fire, and our children burn in houses. So I incur the cost of buying torches and batteries because I cannot use a candle or a koroboi.... My



house burnt down, and I lost everything except that I only saved my children. That is why I am crying for electricity.

### **G. Other household outcomes**

Among respondents who had connected to grid electricity, the most commonly reported uses of electricity were for indoor and outdoor lighting, doing household chores like cooking and ironing, charging phones, refrigeration, watching TV, and listening to the radio, and starting income-generating activities. Respondents were mixed on whether they reported using electricity for cooking.

**Entertainment.** Grid electricity supports use of lights for reading at night, TV, and radio. Household FGD respondents expressed particular interest in entertainment via TV and radio. For example, one said, “Sometimes when you come back from work, because it is dark, we used to go to the bar to watch football. But when the service is at home, we have enjoyed it a lot. You cannot leave the house when you can watch football at home. That service is good.”

**Communication and family relationships.** Respondents noted that grid electricity can improve communication and relationships in the family in several ways. First, as discussed earlier, grid electricity improves access to cell phones by making them easier to charge, thus enabling family members to more easily communicate with each other when outside of the home. Second, electricity can be used for lights, making it easier for household members to see each other’s facial expressions, which helps spouses feel closer to each other. Also, by increasing the benefits of staying at home at night, grid electricity can increase the amount of time that household members spend together, which could also increase communication.

In discussing the benefits of lights, one household FGD respondent said:

In the past, when you are resting with your wife after work, it was difficult to see my wife’s face directly because of darkness in the house. It was difficult, but nowadays I can look her in the face easily. When you switch on the lights, you look into each other’s face. You can tell your wife: “Please, look at me.” In the past, when a person asked their spouse to look into their face while in darkness, the person had to guess how her spouse looked and vice versa. But nowadays, you just switch on the lights. So, both sides have benefited because of this electricity.

Both male and female FGD participants reported that having electricity meant the family could spend more time together at home. One male participant said, “Well, there are changes especially in relationships between men and women. As for us men, we have to go to the neighbors. For instance, I would go to [...] to watch TV, and my wife would be wondering about my whereabouts at that hour, but if I had access to the service, I would be at home watching my own TV.” A female FGD participant noted:

The presence of electricity adjusts a bit the schedule of our husbands as they may be trying to come home early rather than staying for a long time outside their homes. This makes him come home early and stay with his family and talk to his children since there is an electric light. He may not be roaming

around till 22:00 p.m. or 23:00 since there is electricity at his home. This will enable his children to converse with their father, and it will be useful even in adjusting the schedule for the love matters of the couple.

**Household chores.** Household FGD respondents noted the ways in which grid electricity can reduce the time spent on household chores like cooking and ironing, as well as time spent traveling to get services. Because electric stoves are quite expensive to operate, respondents reported that those households with more disposable income used electricity for cooking, refrigeration, and ironing, whereas lower-income households were only able to afford enough units for lighting and cell phone charging, although some used electric hot-pots that can boil water quickly and cheaply. Thus, one respondent said, “I can’t use it for cooking because when you use electricity stove or iron, the cost is high, the meter runs fast, but I use it...for reading.” Another said, “We did not have heaters for boiling water but now, one is obliged to boil water.”

Many household FGD respondents mentioned the benefits of having a refrigerator at home. For example, one said, “There will be some changes for example in the evening, and you will be hearing people enjoying themselves drinking cold soda. These are changes because we never saw something like that before.” Another said:

...one can prepare food in a short period of time and then go to do other things. More importantly, one can go to [...] to buy fruit—something which was very rare in the past days—because one may come to keep them in a freezer. One may keep them there and eat them day by day even for a week or more. Therefore, one may gradually build his health by eating fruit.

Among households that could afford irons, some respondents said that electric irons can be both faster and cleaner than the traditional coal irons. For example, one respondent said, “The truth, electricity has benefited us... You can iron your man’s clothes with good quality rather than charcoal iron which can put dirt on the clothes. Really, when you have electricity, life is great.”

A number of respondents reported having more time and the ability to do chores at night as a result of having electricity. One said:

[Chores] have changed a lot.... For example, my wife had to wake up early around 5 and light the fire. She had to light the local lamp and start preparing beans. But as for now, once she wakes up, she has little work to do because once she gets up she switches on the light and starts doing her chores. So compared to the time we did not have electricity, the time [needed for chores] has been reduced.

Lastly, living in a community with access to grid electricity reduced the amount of time community members spent traveling to get services. They reported that they were happy that there were more goods and services available to purchase in their local area since the MCC lines were constructed. One said, “Well, we are glad the milling machines that use electricity have been opened so the women don't have to go all the way to [...] for the service.”

## H. Migration outcomes

Getting access to the grid may increase in-migration and reduce out-migration by making a community more attractive. Thus, differential migration may be a symptom of the effects of grid electricity on the perceived value of a community. Many respondents mentioned the possibility of increased in-migration, and at least one mentioned the possibility of decreased out-migration.

FGD participants and interview respondents were asked whether households and businesses had relocated or would relocate in the future in order to access grid electricity. At least one respondent from each study location knew of households or businesses that had relocated to access electricity; however, such perceptions of migration were not common (which is not surprising, given that the lines were not completed until 2013). Respondents anticipated that their communities would become more popular with electricity and would be a preferred location to migrate to, compared to areas that were not yet electrified. Health workers and headmasters agreed that their staff preferred posts where there was electricity to other locations. Since such individuals tend to have higher incomes than other Tanzanians, especially in rural areas, they might be in a better position to migrate than others. One FGD respondent said,

There are people who have migrated into our village. For instance, a certain man from [another village in that ward] bought a piece of land and opened a milling machine there and he started to provide the milling services there the day before yesterday. Apart from that man, there are so many other people who used to live in the mountainous area who have bought plots here and built their houses in our village. These people want to open businesses here.

Similarly, a community leader said, “The number of people residing there has increased and others have built.”

At least one community leader believed that grid electricity would improve the community because the new immigrants would bring new ideas. That respondent said:

People’s lives are good because after connecting the community to electricity, the number of people who move into the community has increased. People with different ideas are living together with people who were here before. So, there is a high level of interaction among people with different backgrounds and ideas. If the old community did not know something people moving in might be aware of it. So, when they see it being done by the newly moved-in people, they may also start doing it. So, the old community does their activities by imitating the ones who started doing the activity in the community.

At least one household FGD respondent noted that getting access to the grid could reduce the chances that he or she would leave the community. For example, one said, “There are lot of advantages.... It’s a big thing getting connected... because in my entire life I had never imagined that I will get connected to electricity here. But now I have changed. I no longer have those thoughts of shifting to town.”

## I. Variation in outcomes by gender

Male and female FGD participants described how men, women, and children benefited from the new MCC lines. For the most part, respondents thought that whoever's workload was most reduced and whoever enjoyed using electrical appliances benefited the most. For example, respondents reported that women benefited by not having to walk so far to buy kerosene, children benefited if they no longer had to travel far to charge phones, and everyone who watched and enjoyed television benefited. Men frequently said that women benefit the most from electricity because they spend more time at home, so they can enjoy lighting and various small appliances. Most women agreed that they benefited the most from electricity in the home, which made their work easier and allowed them to complete it at different times of the early morning and evening. Still, several women thought men benefited more because they were no longer asked every day for money to buy kerosene or batteries. All those respondents who had electricity believed that everyone benefited from the service: "I think both men and women have benefited and experience changes through the use of electricity, because you cannot compare the previous time before we were connected to electricity and this time. Therefore, both men and women have benefited."

Respondents at schools were also asked whether boys or girls benefited more from electricity. The answers were mixed, but the majority thought all students would benefit, particularly those students who made an effort to study:

I said performance may improve, provided purposive effort is made especially by those residing near the school as far as night study is concerned. Leaving alone these students near school premises, those staying in streets where there is electricity are likely to outperform those who still use oil lamps.

Really, electricity is very important as it even improves kids' thinking ability. Kids think that when they will be adults; they will stop using little oil lamps, and they will be using electricity.

Still one respondent explained that he thought that male students would benefit the most:

Most of the male students are so inquisitive. They like to know many things in general. You can see in the street, you are the witness; there is a certain center where children go to play computer games. In such areas, a greater percentage is the boys. I think it will motivate students to learn if there will be computers. We could have other things that use electricity. This makes them to become more proactive. On the loss side, for the boys, it may cause problems if they are not controlled. The absence of proper use of such items may bring detrimental effects.... Yes! In the case of girls, when the boys have high capacity of using such items, they [the girls] will also be motivated to know how their fellows do; therefore, it will motivate the female children to learn how to use computers, too.

Respondents at health facilities thought that women and children would benefit the most from electricity at health centers but that both women and men would benefit from improved patient care. Respondents from health facilities explained:

This situation [without electricity] causes much trouble to the little children and the pregnant women since this is the category of people to whom we give priority as they are the ones who get infected with many diseases. A mother is a person who comes to deliver a baby at night, and most of these babies get cold, and hence they should be placed on that bed which has one side which gives out heat and the other side which gives out cold. All these things need energy.

The patients who would benefit the most, for sure, are mothers. We mothers suffer a lot.

It is not only women who would benefit; even men would. They will all benefit equally. For instance, a male can fall sick at night and, likewise, he can also benefit from electricity. Also, when someone's wife is pregnant, it implies that both the husband and the wife have to take responsibility. It is not only the pregnant mother who would be concerned but also the husband, especially when they come here and [I] tell them that I do not have a lamp to use to provide service to your patient, therefore, take her to [...] hospital. In this scenario, the one who will take trouble is the husband. The wife will only experience pain, but the money to use will come from the husband. In fact, both would be involved in the problem.

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## V. SUMMARY AND CONCLUSIONS

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As part of its energy project in Tanzania, MCC invested in building new lines (the T&D activity) and offered low-cost connections to randomly selected communities that received the T&D lines (the FS initiative). Using qualitative evidence, this report assesses the implementation of these two components of the energy project and discusses respondent reports on outcomes that might have been affected by access to electricity.

This chapter synthesizes the findings from the analysis presented in this report and describes the limitations of the qualitative evaluation. Implications of the findings for policy and practice are discussed. The chapter concludes by identifying implications of the findings for future data collection under the ongoing evaluation of the T&D activity and FS initiative.

### A. Summary of findings

1. *Lines built.* Under the T&D activity, more than 2,000 km of transmission and distribution lines have been built, providing increased access to electricity for hundreds of communities in seven regions in Tanzania. The activity also improved infrastructure for the local electric supply company.
2. *Management challenges.* Key informants described project management challenges resulting from capacity constraints, the length of the chain of command, less-than-optimal stakeholder engagement during the design phase that led to changes between the planning and building phases, and problems implementing resettlement and compensation due to weak coordination between key stakeholders.
3. *Suboptimal locations of lines.* Many respondents were concerned that the lines were not optimally placed within communities. The final design did not reflect new housing in the communities. Moreover, concern was expressed that lines followed existing roads too rigidly and thus did not extend to reach many households located far from roads. Respondents were also concerned about the criteria used to determine which communities were chosen. Respondents expressed the need for more explicit criteria to help determine where infrastructure is placed.
4. *Barriers to connecting.* The barriers to connecting to the electric grid were on both the supply and demand side. On the supply side, pole and line placement outside of populated areas, the 30-meter rule about the proximity of lines to buildings, transformer size, TANESCO capacity to serve customers, and material and supply limitations presented barriers to households, businesses, and public facilities connecting to the grid. On the demand side, costs (application, connection, and internal wiring), the application process, extended wait times, housing materials not being suitable for electric connections, and the season when connections were offered all presented barriers to connecting.
5. *Usage costs.* Respondents had less consistent views on usage costs. Some respondents suggested that electricity was cheaper than other sources of energy, such as kerosene or diesel. Other respondents who relied on more basic energy sources, such as candles and batteries before electrification struggled to afford their energy bills after electrification, especially if they tried to use certain types of high-consumption appliances like

refrigerators, stoves, and even irons. Some respondents expressed distrust of TANESCO because they had not realized that they would have to pay a monthly fee for electricity in addition to the units of electricity they consume. The lack of trust of TANESCO could be misplaced as this could happen with TANESCO's offer of a low-cost tariff plan without a monthly service charge, but that was only for customers willing to consume no more than 75 kilowatt hours per month.

6. *Uses of electricity.* Among respondents who had connected to the grid, the most common reported uses of electricity were indoor and outdoor lighting, appliances for household chores, charging mobile phones, refrigeration, watching TV and listening to the radio, and starting income-generating activities. A few respondents also reported using electricity for cooking, but others suggested that other energy sources (such as charcoal and firewood) were more affordable than hot plates.
7. *Reported benefits of electricity.* There was consensus on the importance of electricity and the wide range of benefits that accrue to households, businesses, and other community institutions from accessing grid electricity. Respondents reported a range of benefits from using electric lighting, including increased hours of business operations, help with things like poultry production, increased hours for study in the evening, increased family communication, enhanced ability of health workers to serve patients at night, reduced crime, improved safety by protecting people from snakes, and reduced likelihood of fires by replacing candles and kerosene lamps. Other important domestic uses of electricity were for lighting, entertainment, communication, and household chores. Refrigeration was mentioned as important for storing vaccines and medicines and for business and social uses like cooling drinks and storing food.
8. *Gender differences.* Respondent reactions to benefits of electrification by gender were mixed. Most female respondents agreed that women benefited the most from electricity in the home, which made household chores easier (for example, using electric water heaters or not having to wait in line or walk far to purchase kerosene) and allowed them to complete chores at different times of the day. Men also mentioned benefiting from the ability to watch a TV show or games at home, whereas all would benefit from greater awareness about domestic and world affairs by watching or listening to the news. Both boys and girls enrolled in school were expected to benefit from electricity equally. Health facilities also expected to benefit all who need care, but particularly pregnant women and children.

## **B. Limitations of the qualitative analysis**

Although we collected data from a large number of stakeholders, we did not talk to all types of stakeholders involved in implementing the energy project. We collected information from community leaders, household heads, business owners and managers, staff from schools and health facilities, TANESCO staff, and MCA-T staff. We also observed the target communities, and incorporated our own understanding based on years of having worked with many of the key stakeholders. However, we were not able to interview ESBI, Pike, Symbion, Africare, or EWURA staff. Such interviews would have helped provide a more complete picture of the implementation successes and challenges, and allowed us to derive additional relevant lessons learned for future investment in the energy sector.



Another important limitation of the analysis is that this is a qualitative study. Given the small number of stakeholders from whom we collected data, findings from the analysis may not be generalizable beyond the study sample as the informants' shared their individual perspectives which may not be widely held views. The study provides insights into the types of customer outcomes that had been influenced by access to electricity, but it does not provide estimates of the size of those impacts or suggest how widespread the impacts were. Moreover, some of the data collected were about impacts that might happen in the future. Thus, this study describes themes and compares similar and disparate reports in order to understand the full scope of experiences.

Although the sample from which we collected qualitative data was designed to elicit a range of opinions and perspectives, it was not exhaustive. Households and businesses in other regions or neighboring communities may have had different experiences. However, the locations from which we collected qualitative data for the study were purposively selected in order to provide a range of perspectives from different regions. In addition, within these communities, we randomly selected the participants for focus group discussions to gain information that would be representative of the households in the study communities.

### **C. Implications for policy and practice**

These findings have implications for building new electricity lines and related infrastructure, encouraging new connections, and for maintaining the existing network in Tanzania.

1. *Benefits of electrification are well recognized.* As discussed above, respondents overwhelmingly expressed positive views towards having electricity. This suggests that there is room for policymakers to help provide more Tanzanians with access to electricity and potentially improve a broad set of outcomes. Although determining how to increase access to electricity in a cost-effective way might still be a challenging issue for policymakers, they may not need to worry about a lack of understanding of the potential benefits as they craft policies designed to increase use of grid electricity. Policymakers in Tanzania could encourage more connections by reducing connection costs, improving the communication and education around the connection process, making the connection process shorter, and strengthening capacity within TANESCO.
2. *Increase TANESCO capacity.* Although TANESCO is in the process of building internal capacity, findings from the qualitative analysis suggest the need to bolster its capacity to maintain the new MCC-funded lines as well as to implement any future expansion of the T&D system. TANESCO could be more effective at installing new service lines and providing maintenance and repair if it built capacity in a number of areas, particularly by increasing the number of electricians in local offices and providing its engineers and technicians with adequate supplies and transport. Capacity building may need to be balanced against the company's financial health, but an assessment of how improved capacity would contribute to the company's financial condition in the future would be useful.
3. *Improve procurement process.* During the procurement process, the implementing entity needs to ensure that the scope of work for implementation contractors is reasonable and that contractors have sufficient capacity and commitment to design and construct new

electricity distribution lines well and on schedule. Further, it is important for stakeholders to anticipate competing demands for consultants or contractors operating in distant locations and managing multiple projects.

4. *Improve contracts.* MCA-T should consider various changes to their contracts. In particular they should consider developing a Conditions of Particular Application (COPA) that simplifies processes so that decisions on the ground can be made more quickly and efficiently. They should also investigate methods of reducing the lengthy chain of communication among the implementation partners in ways that balance the need to reduce delays while ensuring project quality. In addition to developing more flexible agreements, MCA-T may want to consider including positive and negative incentives that motivate consultants and contractors to stay on time and implement a high quality project.
5. *Optimize locations of transformers and lines.* The locations of the transformers and low-voltage lines need to be optimized both within and between communities. Considerations should be given to the benefits and costs of serving a new community in planning the locations of new lines.
6. *Optimize involvement of local stakeholders.* Local stakeholders can be optimally engaged at the design stage to ensure that the project benefits from the knowledge of local conditions, local stakeholders such as TANESCO district-level staff, community leaders, and community members can be consulted at the design stage. Such efforts would likely result in a project design that is sensitive to local conditions and reduces the need for large modifications to the plan during implementation.
7. *Improve partner coordination.* Implementation would benefit from improved coordination among partners. Coordination could include sharing of project maps and documents at multiple points in the design stage, consistent use of differential GPS units, and more-complete preparation to ensure availability of materials (for example, mounting brackets) needed for installing new connections. Such preparation would ensure smoother implementation and, ultimately, faster installation of connections for the end users.
8. *Keep community members informed about line locations.* Community members need to be informed where lines will be built. Respondents noted that many individuals built new homes where they were told that the lines would be built, only to find out later that the lines would be built elsewhere. It might make sense to inform community members that the final decision about where lines will be built cannot be made until the lines are actually energized, since even after poles are put up they are sometimes moved. This type of clear communication would reduce the likelihood of potential customers moving to the wrong locations in an attempt to access the new lines, and thus could increase the demand for new connections.
9. *Improve outreach efforts regarding connection process.* Effective sensitization and outreach is needed to inform community members about the connection process and monthly costs. Such efforts will ensure that potential customers are well informed about the process and all costs. Early communication would give individual and institutional customers adequate time to acquire funds needed to cover the costs of connecting. Moreover, new customers may lack clear understanding of the usage costs and may not

anticipate all costs. It might be helpful to design a brochure that provides illustrative examples of how much a potential customer should expect to pay for electricity units based on consumption and perhaps even depending on which appliances are used. Community members would also benefit from clear communication about the difference in application fees between rural and urban areas.

10. *Clarify community selection process.* Greater outreach to share information with communities that do not directly benefit from an intervention may reduce social tension. If interventions are undertaken in selected communities (such as the FS initiative), the selection process should be public and transparent and the reasons for it well communicated to all communities in the area, including those that do not benefit directly from the intervention. This could reduce chances of confusion and social tension in these communities.
11. *Facilitate sharing of lessons learned.* Facilitate sharing of connection lessons across schools and health facilities. Although respondents clearly agree how important electricity is to schools and health facilities, only some of these public institutions were able to connect to the grid. It might be helpful to share with the Ministries of Education and Health lessons on how connected facilities managed to raise funds, in order to inform other local institutions that may want to connect in the future.

#### **D. Implications for future data collection for the evaluation**

1. *Add questions in the follow-up survey.* Findings from the qualitative analysis provide us with a clearer understanding of the outcomes for households and businesses that gain access to electricity. Although these outcomes are broadly in line with what we anticipated based on existing research, having the supportive evidence from Tanzania is reassuring. In addition, some findings are new and will inform development of the instrument for the follow-up community and household surveys. For example, we may decide to add questions regarding the use of lights for poultry farming, the use of electric irons, the presence of electric lights for safety from crime and wild animals, and how electric energy might facilitate interactions between family members.
2. *Consider doing follow-up survey in the fall of 2015.* It is also reassuring that households and businesses that connected to the electric grid are already recognizing changes in their socioeconomic outcomes. This suggests that if MCC decides to conduct a follow-up household survey in fall 2015, households that connected are likely to have had a long enough time with electricity to experience changes in some of the intermediate outcomes on which the impact evaluation would focus. These include sources of energy, expenditure on energy, time use among adults and children, and hours of business operations.

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## **APPENDIX A**

### **DOMAINS AND MEASURES FOR THE QUALITATIVE EVALUATION**

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**Table A.1. Domains and measures for the qualitative evaluation**

Domains	Measures
<b>Implementation</b>	
Short- term implementation outcomes	<ul style="list-style-type: none"> <li>• Infrastructure installed including medium and low voltage lines, poles, and transformers</li> <li>• Overall connection rate</li> <li>• General satisfaction levels of those connected</li> <li>• TANESCO satisfaction with materials</li> </ul>
Processes and inputs	<ul style="list-style-type: none"> <li>• TANESCO capacity</li> <li>• Communication chain</li> <li>• Local stakeholder involvement</li> <li>• Timeline</li> <li>• Resettlement process</li> <li>• Availability of materials</li> </ul>
Sustainability	<ul style="list-style-type: none"> <li>• Responses to customer complaints</li> <li>• Maintenance of new lines</li> <li>• Illegal connections</li> <li>• Financial sustainability</li> </ul>
<b>Outcomes</b>	
Connecting to the electric grid	<ul style="list-style-type: none"> <li>• Connection process</li> <li>• Costs of connecting</li> <li>• Usage costs relative to other energy sources</li> <li>• Quality of and satisfaction with electricity</li> </ul>
Economic outcomes	<ul style="list-style-type: none"> <li>• Uses of electricity in businesses</li> <li>• Types of businesses</li> <li>• Goods/services available in the community</li> </ul>
Education, health, and safety outcomes	<ul style="list-style-type: none"> <li>• Education/health/safety behaviors and outcomes related to electricity</li> <li>• Education/health/safety services in community due to electricity</li> </ul>
Other household usage and outcomes	<ul style="list-style-type: none"> <li>• Changes in the use of time</li> <li>• Household chores,</li> <li>• Communications and access to information</li> <li>• Entertainment</li> </ul>
Migration	<ul style="list-style-type: none"> <li>• Immigration</li> <li>• Outmigration</li> </ul>
Gender outcomes: who benefits more from electricity usage	<ul style="list-style-type: none"> <li>• Education/health/safety</li> <li>• Time spent in chores and child care</li> </ul>

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**APPENDIX B**

**IMPLEMENTATION AND EVALUATION TIME LINE**

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**Table B.1. Timeline for the T&D activity and the FS initiative: implementation and evaluation**

	2007	2008	2009	2010	2011				2012				2013				2014				2015				2016			
					Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	
<b>Project design</b>																												
Hatch Mott MacDonald: due diligence	█																											
ESBI: surveying and design		█																										
Africare: valuation for resettlement				█	█	█	█	█	█																			
<b>Project implementation</b>																												
Pike and Symbion: begin T&D work				█	█																							
Camco: FS communication campaign													█	█	█	█	█	█										
T&D line extension completed												█	█	█	█	█												
FS initiative completed																█	█	█										
<b>Project evaluation</b>																												
Baseline community survey						█																						
Baseline household survey							█	█																				
Connection data from TANESCO																█	█			█	█							
Qualitative data																					█	█						
Follow-up community survey																						█						
Follow-up household survey																							█	█				
Reporting																BR												

Notes: The figure only shows completion of the T&D activity and FS initiative; implementation of each component started earlier.

Q1 = January–March, Q2 = April–June, Q3 = July–September, and Q4 = October–December.

BR = Baseline report, IR = Interim impact report, IQR = Interim qualitative report, IM = Interim impact memo, FR = Final impact report.

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## **APPENDIX C**

### **STAKEHOLDERS COMMENTS AND EVALUATOR RESPONSES**

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**APPENDIX D**

**FOCUS GROUP AND KEY INFORMANT  
INTERVIEW PROTOCOLS**

**(UNDER SEPARATE COVER)**

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