Tanzania Energy Sector Impact Evaluation: Findings from the Zanzibar Baseline Study

March 18, 2011

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ACRONYMS

ERR	Economic rate of return
GDP	Gross domestic product
ITT	Indicator Tracking Table
kW	Kilowatt
kWh	Kilowatt hour
MCA-T	Millennium Challenge Account – Tanzania
MCC	Millennium Challenge Corporation
MDI	Minimum Detectable Impact
MW	Megawatt
O&M	Operations and maintenance
TSh	Tanzanian shilling (local currency)
ZECO	Zanzibar Electricity Company

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I. INTRODUCTION

Lack of access to reliable, high-quality electricity can be a major constraint on economic growth and improved living standards (Barnes 1988). Roughly one-third of the world's population does not have access to electricity and, for many of those in developing countries who do, the supply is subject to frequent service interruptions and voltage fluctuations. In Tanzania, fewer than 14 percent of households (and only 2 percent of rural households) are connected to electricity distribution networks. Service interruptions and voltage fluctuations are common. The Zanzibar archipelago, in particular, has suffered two major blackouts since 2008. The most recent, and most severe, lasted three months, between December 2009 and March 2010.

Home to 40 million people, Tanzania is one of the poorest countries in the world. Gross domestic product (GDP) per capita was $509 in 2009 (World Bank 2009). Nearly 33 percent of the mainland population and 49 percent of the population on the Zanzibar archipelago live below the poverty line (Ministry of Finance, Tanzania 2009; Government of Zanzibar 2009). Economic growth has been steady over the past two decades fueled by growth in gold production, tourism and agriculture (World Factbook 2011). Annual real GDP growth averaged 4.8 percent in the last two decades, climbing to 6.5 percent annually in the last decade (World Bank 2009). The Zanzibar archipelago has also seen vibrant economic growth; GDP per capita at current prices more than tripled between 1990 and 2008 (UN Statistics Division 2009).

In an effort to promote economic growth and reduce poverty in Tanzania, the Millennium Challenge Corporation (MCC) is funding an energy project that includes a number of activities. One of these activities is designed to increase the supply of reliable and high-quality electricity service on Unguja, Zanzibar's largest island. A key component of this activity is the installation of a new submarine cable that will connect Zanzibar's Unguja Island to mainland Tanzania (the "cable activity"). MCC, through the Millennium Challenge Account-Tanzania (MCA-T), is funding the new 100-Megawatt (MW) cable to supplement, and eventually replace, an older 45-MW cable, which is reaching its limits in terms of both capacity and lifespan.

It is anticipated that, by improving the reliability and quality of electricity supply on Unguja Island, the cable activity will have a range of economic benefits that will contribute to economic growth and poverty reduction in Zanzibar. MCC and MCA-T expect that more reliable and better quality supply will: (i) allow the Zanzibar Electricity Company (ZECO) to connect more customers, as the greater cable capacity allows it to meet greater demand; (ii) allow existing customers to consume more energy; and (iii) reduce the costs associated with having poor power quality and reliability, the most substantial of which is the cost of backup power.

MCC contracted with Mathematica Policy Research (Mathematica) to conduct an impact evaluation of the cable activity. Mathematica, in collaboration with DHInfrastructure, will assess whether the cable activity increased electricity use and improved electricity quality and reliability on Unguja Island, and whether there were any other potential costs or benefits of this activity.

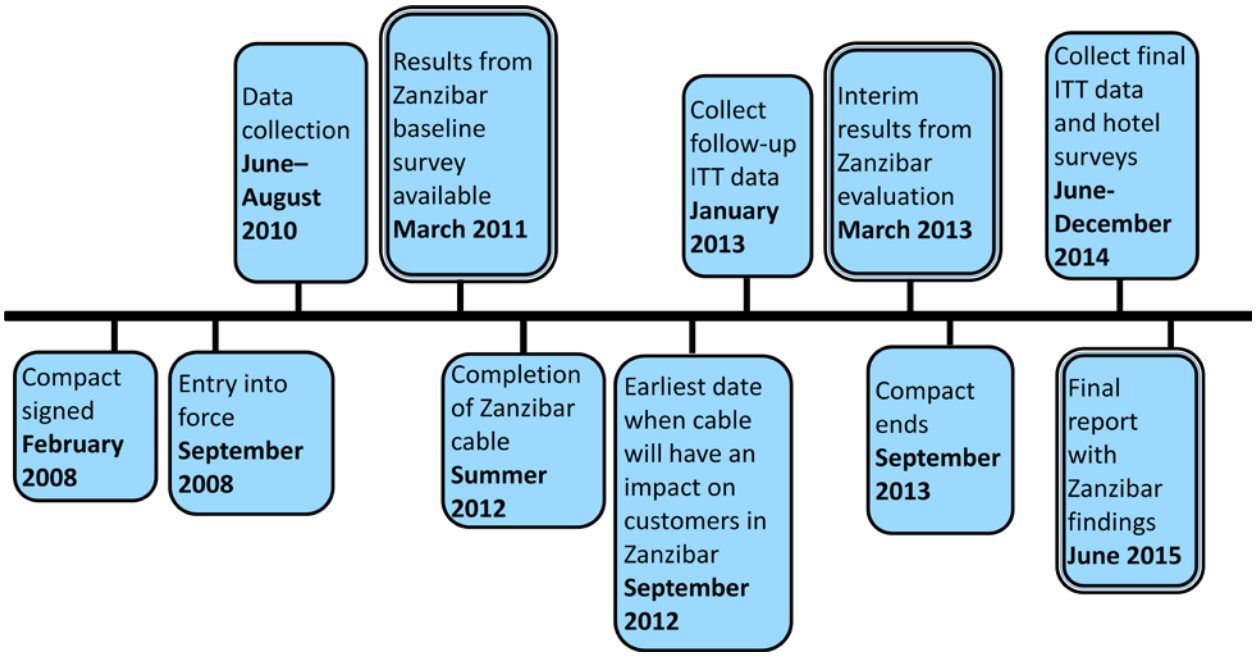
The impact evaluation is designed as a "pre-post" analysis that will compare key outcomes collected before installation of the new cable (the baseline period) to those same outcomes after its installation (the follow-up period). We will analyze the monthly administrative data from the indicator tracking table (ITT) that ZECO compiles for MCA-T on electricity use, reliability, and quality for all of Unguja before and after the laying of the cable. To obtain the most precise estimates possible, we will use all months of the ITT data that are available when estimating impacts

on use, reliability, and quality, except for data during the blackout months, by which we mean power outages that lasted more than one day.[1] We are also conducting a case study of hotels in Unguja Island to better understand the impact of installation of the new cable on the hotel industry, which is a key sector of the economy of Zanzibar. The hotel case study consists of two components. First, we will use a pre-post evaluation design to estimate the impacts of the cable activity on key outcomes such as electricity use, reliability, and quality. The second component of the hotel case study is a description of what hotels reported about the impacts of the two recent blackouts on their business activities. Together these components will help us to develop a richer understanding of the impacts of the cable activity. Figure I.1 shows the overall timeline for the evaluation.

This report presents findings from the analysis of data collected during the baseline period. Data collected from ZECO and the Indicator Tracking Table (ITT) compiled by MCA-T cover electricity consumption, quality, reliability, and connectivity in Zanzibar. The Mathematica team also designed and administered—in close cooperation with MCC and MCA-T—a hotel survey focused specifically on hotels on the Unguja Island for the case study. For the survey, we randomly selected 30 hotels from among the 45 largest hotels on Unguja Island, so that the findings from the hotel case study represent the hotels that are likely to have the largest impact on the economy of Zanzibar.

Unguja Island is home to a population of more than 621,000 (NBS, 2004), roughly 63 percent of the population of Zanzibar. The hotel industry is an important segment of electricity consumers on Unguja Island, and an increasingly important contributor to the Zanzibari economy. At approximately US$ 108 million in revenues in 2010, the tourism industry in Zanzibar—driven largely by hotel revenues—constitutes 22 percent of GDP, is the source of about 80 percent of Zanzibar's

Figure I.1. Timeline for the Zanzibar Impact Evaluation



[1] Because of power rationing ("load shedding") and faults on the cable, there are intermittent power outages in Unguja Island, but these interruptions usually last less than a day and are not identifiable in the monthly ITT data.

tax revenues, employs roughly 10,000 people directly, and is an indirect source of income for another 44,000 people (The Citizen, 2010). The 30 hotels in the case study employed about 1,322 Zanzibaris in 2010, or approximately one-eighth of the total employment in Zanzibar's tourism industry.

The hotel survey supplements the pre-post analysis, by offering a more detailed look at how the cable activity will affect an industry that is very sensitive to electricity reliability and quality. It includes questions about the level of quality and reliability of electricity hotels receive, and how electricity affects their operations and finances. Baseline data on these outcomes have already been collected from the sampled hotels. We will collect data on these same outcomes from the same hotels after placement of the cable, allowing for a pre-post comparison of the outcomes of the hotels affected by the cable activity.

As noted above, Zanzibar has experienced two major blackouts since 2008. These blackouts reduced the quality of basic services for the population on Unguja Island, increased the risk of environmental and health hazards, and have frustrated efforts to further expand the economy and implement anti-poverty policies. Understanding the effects of the blackouts relates directly to the impact of the cable activity because, had the cable activity not been initiated, prolonged blackouts might have become increasingly prevalent as the existing cable aged. Since there were only two major blackouts, we do not have enough information from the ITT to provide reasonably precise estimates of how many major blackouts there would have been had the new cable not been installed. Nevertheless, in order to provide some information about the benefits the new cable may create by reducing blackouts, the hotel survey includes questions about the effects of the most recent blackout on hotels. The purpose of these questions is to describe what Zanzibar might continue to experience from time to time if the new cable is not installed.

The next chapter (Chapter II) of this report describes in more detail the data and methodology for the study. Chapter III presents findings from our analysis, including baseline statistics on the effects of the blackout based on hotel survey data. Chapter IV presents conclusions from the baseline analysis, and next steps for the Zanzibar cable activity evaluation.

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II. METHDOLOGY AND DATA

This chapter describes the design of the impact evaluation, and how data were collected and analyzed, and how the data will be used after the follow-up period for evaluating impacts. Section II.A describes the overall design of the evaluation. Section II.B describes data sources and data quality issues. Section II.C describes how the data will be used for estimating impacts at follow-up.

A. The Evaluation Design

The Mathematica team designed the impact evaluation of the cable activity in close cooperation with MCC, MCA-T, and stakeholders in Zanzibar. The impact evaluation will address four research questions. These research questions are answered with different sets of data, but together contribute to answering an overarching question about the extent of the cable activity's impact.

The four research questions are:

- **Research question 1**—What is the impact of the cable activity on the reliability and quality of electricity supply on Unguja Island?
- **Research question 2**—What is the impact of the cable activity on the financial performance of hotels on Unguja Island?
- **Research question 3**—What were the effects on hotel operations of the extended power outage ("blackout") in Unguja Island from December 2009 through March 2010?
- **Research question 4—**Is the cable activity warranted based on the benefit-cost analyses? (Re-estimation of the project's economic rate of return.)

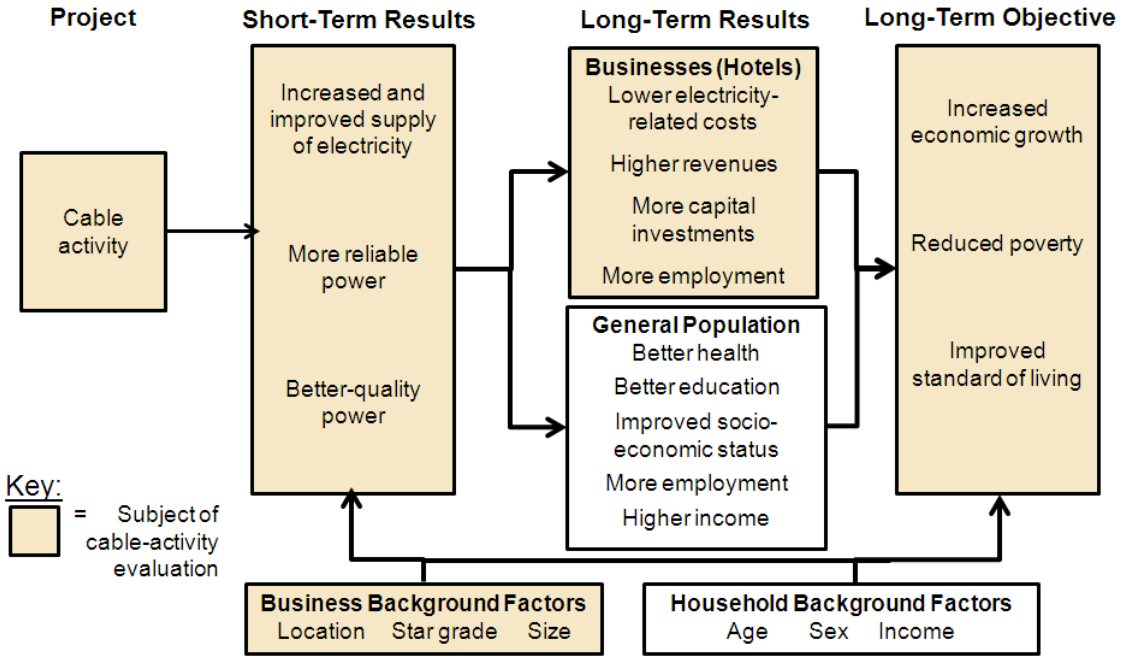
A pre-post study is at the heart of the impact evaluation, using ZECO data on aggregate electricity consumption, reliability, quality, and connectivity in Zanzibar. The hotel survey is meant to be a case study to add important context to the aggregate–level data, by focusing on a specific key industry that is sensitive to electricity supply. This case study is used as a proxy for how other businesses may be affected by power quality and reliability. The survey questions related to the blackout are meant to provide some indication of the nature and potential magnitude of the impacts that can be expected from the cable activity by reducing blackouts.[2]

Figure II.1 illustrates the conceptual framework for the evaluation. As described in Chapter I, the cable activity is expected to improve the reliability and quality of electricity supply on Unguja Island. Better reliability will allow the ZECO to connect more customers, and allow existing customers to consume more energy. Better reliability and quality should also allow electricity consumers to reduce costs associated with providing their own backup power and replacing equipment damaged by voltage fluctuations. These changes are expected to benefit individuals and business alike by allowing them to use more electricity, and use it more productively.

For businesses in particular, better reliability and quality of electricity supply may also increase revenues, as they are able to improve the quality of existing services that depend on electricity, and

[2] These questions will not be repeated in the follow-up survey, because the questions are about an event that has already passed.

Figure II.1. Conceptual Framework for the Cable Evaluation



Note:

[a] Star grade of hotels refers to the number of stars as assigned by an international hotel grading system.

provide additional services. Higher revenues and lower costs may, in turn, increase both employment and investment in Zanzibar, which can lead to higher incomes, higher standards of living, and a consequent reduction in poverty levels.

The Mathematica team will answer Research Question #1 using a pre-post analysis of data from ZECO and data from an Indicator Tracking Table (ITT) regularly compiled by MCA-T.[3] Research Question #2 will be answered using a pre-post analysis of data from repeated surveys of 30 hotels on Unguja Island. Thirty hotels were surveyed three times each before the cable activity began, in the months of June, July, and August 2010. The survey contains mostly quantitative questions about the reliability and quality of electricity hotels receive, and their revenues and costs that may be affected by electricity. A series of three follow-up surveys are planned for June, July, and August 2014, about two years after the expected completion of the cable activity. Research question #3 is answered using descriptive statistics from hotel reports on the costs of the most recent blackout.

Mathematica will address Research Question # 4 by using our estimates of the impact of the cable activity and calculating the realized economic rates of return (ERR) for the activity. Because prior research has led to mixed conclusions about the cost-effectiveness of electrification programs (IEG 2008), an important element of the cable activity evaluation is to assess whether the interventions yield the economic improvements that were anticipated. Findings generated from this evaluation, together with estimates of the costs of the interventions from MCA-T, will be used to

[3] Information on the MCA-T monitoring indicators and data can be found on MCC's website http://www.mcc.gov and on MCA-T's website http://www.mca-t.go.tz/.

calculate the realized economic rates of return (ERRs) of the program. In calculating the realized ERR, we will use our estimates of the impact of the cable activity on electricity quantity, quality, and reliability. In addition, if we have strong evidence regarding the impacts of the cable activity on any other outcomes we will also incorporate that information in calculating the realized ERR. The realized rates can then be compared against the projected ERR to test whether the original projections differ from the realized outcomes, and to investigate which components of the original calculations contribute to any observed differences.

The following section of this chapter describe in more detail the data to be used for the impact evaluation, and how it will be used to answer Research questions #1 and #2. The results for research question #3 are presented in Chapter III.

B. Data

The impact evaluation will use two sets of data to answer the first three research questions. For the baseline study, the study team collected electricity supply data from ZECO and carried out surveys of hotels. Data from ZECO will be used to answer Research Question #1 of the impact evaluation. Data from the hotel surveys will be used to answer Research Questions #2 and #3.

1. Data for Research Question #1

Data source

Data were collected directly from ZECO and from the Indicator Tracking Table (ITT), a monthly performance report ZECO submits to MCA-T. The ITT includes monthly performance data on electricity consumption, outages, and quality collected by the Monitoring and Evaluation Directorate of MCA-T from ZECO and the other implementing entities. MCA-T has collected ITT data since the start of the MCC Compact with Tanzania (the Compact) in October 2008 and plans to continue until the Compact ends (August 2013) at which time MCC will continue to monitor progress on the key outcomes of its investments. The cable activity is slated for completion in the summer of 2012. Thus, the impact analysis will use ITT data for 45 months before the completion of the cable activity and 24 months after.

The Mathematica team also collected monthly pre-Compact data from ZECO on the same indicators as those in the ITT, in order to expand the number of observations in the study. ZECO staff provided data on two indicators—monthly billing and monthly consumption—for 2007 through 2009. They provided data on three indicators—outage duration, outage frequency, and frequency of voltage fluctuations—for 2008 and 2009 only.

Table II.1 lists the outcome indicators for which data were collected. By the time of the follow-up analysis in 2015, we expect to have 48-68 months of data for each indicator for the Pre-Post analysis.

Quality of data from ZECO

The data collected during the summer 2010 period generally appear to be of good quality. However, the Mathematica team has identified a few limitations and inconsistencies, including:

- **Inconsistencies between the ITT data and data collected from ZECO.** The ITT and ZECO data contain the same indicators but do not always match. The Mathematica

Table II.1. List of Outcome Indicators from ZECO and MCA-T M&E Plan Included in Pre-Post Analysis

Outcome Indicator	Definition
Consumption	Total amount of electricity (in kWh) consumed per month[a]
Monthly billings	Total amount billed to customers (in TSh) per month for consuming electricity supplied by ZECO[a]
Outage duration	Total amount of time (in hours) of power cuts to the power supply of Unguja Island per month
Outage frequency	Total number of power cuts to the power supply of Unguja Island per month
Collection efficiency	A ratio of total revenue collected in the current month to the previous month's total billings
Frequency of voltage fluctuations	An index of how often the voltage supplied by the mainland deviates from an acceptable range, defined as plus or minus 10 percent from 132 kV [b]
Technical and non-technical losses	A ratio of total kWh billed to customers to total power received at Mtoni Substation Note: This ratio includes both technical losses (power generated that is lost as a result of physical resistance in the system) and non-technical losses (power generated that is lost primarily as result of electricity theft)

Source: ITT data from ZECO.

[a]May also be analyzed by the following customer categories: Prepaid and Post-paid, and within those categories,, Domestic, Commercial, Small Industry, Medium Industry, Large Industry, Streetlight.

[b]Because ZECO has analog instruments with no real-time recording capabilities, a technician at Mtoni Substation records the incoming voltage on the hour and half hour, 24 hours per day (i.e., 48 daily observations). At the end of each month, the number of deviations (expressed in "half-hour" increments) from the acceptable range is reported.

team followed up with ZECO on these inconsistencies and was told that ITT data are more accurate.[4] Consequently, this report focuses on the ITT data rather than the ZECO data for those indicators where inconsistencies were present

- **Missing data.** The following data are missing from the electricity supply data set: Consumption and billing data disaggregated by tariff category in 2010 were missing. Data disaggregated by tariff category were compiled by ZECO but are not gathered for the ITT. In order to include consumption disaggregated by tariff category as an indicator in the evaluation, this data will need to be gathered from ZECO for months after December 2009

- **Quality of specific indicators.** The Mathematica team has concerns about the quality of data on three indicators:

[4] ZECO explained these discrepancies to have originated from systematic updates and adjustments made to billing data over time.

- *Consumption.* The most recent set of consumption data collected from the ITT (November 2009 to September 2010) shows a major decrease in consumption following the 2009–2010 blackout. We believe that the apparent decrease in consumption may result from a change in how the ITT recorded consumption after the blackout. Specifically, it appears that consumption data from March to September 2010 may exclude consumption data from pre-paid customers.
- *Frequency of voltage fluctuations.* The Mathematica team discovered that ZECO had made discretionary adjustments to these data, which made comparisons difficult for six data points. The methodology for collecting voltage fluctuation data is such that all reported data should be in 30-minute increments. However, during the compact period, some of the data reported are in other fractions of hours (e.g. 5.67 hours in March 2009). Adjustments were made when it appeared that it would have been unrealistic for voltage to be so far outside the acceptable range for 30 minutes. The adjustments were made for the following six months: October 2008; January, February, March, May and July 2009.
- *Kilowatt hours billed.* From October 2008 to February 2010, data for "kWh billed" show numbers equal to data on "quantity of electricity sold." After February 2010, data on "kWh billed" show numbers significantly higher than those for "quantity of electricity sold."

MCA-T expects to finance an independent data quality audit in mid-2011 that may help uncover some of the inconsistencies in data, and help improve monitoring information for the project going forward.

The impact analysis could also be affected if ZECO changes the manner in which it collects and reports before the follow-up data collection and surveys in 2014. Any substantive changes could make it difficult or impossible to make meaningful comparisons over time. This seems unlikely to occur for all outcomes, but may occur for some subset of the outcomes described in Table II.1.

2. Data for Research Question #2

Data source

Surveys of hotels on Unguja Island will be used to answer Research Question #2. Thirty hotels were surveyed three times each in the months of June, July, and August 2010. We used a master list of 306 hotels provided by the Zanzibar Commission for Tourism as the sampling frame to select the 30 hotels that we sampled for the survey.[5] To remain in the sample, hotels were required to have: (i) ten or more rooms, to distinguish the hotels in the sample from smaller guesthouse-like operations; and (ii) an international grade of at least one star. After applying those restrictions, 45 hotels were put into the potential sample pool. The remaining hotels were then randomly assigned a number and sorted from lowest to highest. The Mathematica team made initial contact with the hotels based on the order of that list. If a hotel was out of business, was not connected to the ZECO's electricity network, or refused to participate in the survey, it was replaced with the next hotel on the list. A

[5] The master list was based on data from 2008.

local Zanzibari consultant worked with a representative from the Zanzibar Commission for Tourism to make first contacts with the hotels.

The survey instrument was pilot tested in May 2010 and revised to incorporate lessons learned during the pilot. The questionnaire for the first round of the survey, administered in June 2010, included questions about (i) hotels' experience with electricity reliability and quality in the 30 days leading up to the survey, and (ii) the effects of the December 2009-March 2010 blackout on hotel operations and finances. The questionnaire contained both quantitative and qualitative questions. Most of the qualitative questions were about the blackout. Most of the questions about hotels' recent experiences with electricity reliability and quality were quantitative. The questionnaire was revised for the second round of the survey (administered in July 2010), to eliminate questions about the blackout, as well as general informational questions (for example, contact information, and number of years in operation). The questionnaire for the third round of the survey (administered in August 2010) included additional questions to clarify earlier survey responses on voltage protection, and to understand respondents' expectations about the cable activity. The Appendix contains the three versions of the survey instruments used by the team.

A series of three follow-up surveys is planned for June, July, and August 2014, following the completion of the cable activity. The data will then be analyzed to assess impact. Table II.2 lists the outcomes that will be included in the analysis.

Quality of data from hotel surveys

Table II.2 lists only some of the indicators that could have been used from the summer 2010 surveys. Some indicators were not used because of data quality problems. The data quality problems and limitations were caused by:

Table II.2. List of Outcome Indicators from the Hotel Survey Included in the Pre- Post Analysis

Outcome Indicators	Definition
Outage frequency	Total number of outages per month
Outage duration	Total amount of time (in minutes) of outages per month
Back-up generators	Total number of back-up generators
Generator fuel costs	Cost of fuel (in US$) per generator
ZECO monthly bill	Average amount billed by ZECO (in US$) per month
Occupancy rate	Percentage of rooms occupied by guests per month
Room rate	Average nightly rate (in US$) charged to customers
Average revenue per room	Room rate multiplied by the occupancy rate[a]
Cost of repairing and replacing ACs	Total spent per month per hotel on repairing and replacing air conditioners
Cost of Repairing and Replacing Select Appliances	Total spent per month per hotel on repairing and replacing air conditioners, fans, and TVs

Source: Zanzibar cable activity evaluation baseline hotel survey, June–August 2010.

Note: [a]Because we expected that many respondents would be reluctant to give us data on their revenues, the questionnaire only included questions about hotel booking rates and room tariffs. Those figures were multiplied to come up with an estimate of average monthly revenues.

- **Missing Data.** For several key variables where the Mathematica team would expect to observe an impact, data were missing because respondents refused to answer, didn't know the answer or enumerators were unable to record an answer for some other reason. As a result, two key indicators cannot be used for the follow-up analysis, including kWh electricity usage and the number of voltage fluctuations experienced.

- **Difficulty answering specific questions.** In the first round of surveys, respondents did not know how to answer a question about how the hotel copes with voltage fluctuations. The third round of surveys corrected this problem by including a more explicit question about the use of various protective devices. Some respondents, especially but not exclusively in larger hotels, were unable to provide accurate counts of appliances and voltage protection devices.

- **Different methods used to answer questions.** Respondents used a mix of recall and records to answer survey questions. For example, fewer than 10 percent of respondents used hotel records to answer questions about costs, and fifty percent of hotels used records to answer questions about the monthly electricity bill from ZECO. There are limitations to relying on either methodology. While recall is known to be subject to error, record keeping methodology and reliability likely differed between hotels.

3. Data for Research Question #3

To look at the impact of the 2009-2010 Blackout on hotel operations, the Mathematica team primarily used open-ended qualitative questions. The questions were aimed to help respondents describe the experiences of the hotels during the blackout, and the various coping strategies utilized. There were three types of questions:

- Facts and figures about generator use, occupancy rate, and spending.
- Yes/no questions about whether the hotel had specific experiences, and room to explain if the hotel had that experience.
- Open ended questions about experiences and actions.

The content of the yes/no questions were shaped by the experiences of respondents during the piloting phase. Open ended questions gave respondents ample opportunity to explain other experiences beyond what was captured in previous questioning.

The questions focused on five areas of interest: (1) how experiences during the blackout compared to experiences in previous years, and how experiences changed over the course of the blackout; (2) actions taken by the hotel to cope with electrical power, including use of electrical appliances and alternatives to electrical appliances; (3) changes to hotel staffing and salaries, services and facilities provided, and food and water costs; (4) communicating or working with other hotels, the government, or the tourism association; and (5) changes in investment plans as a result of the blackout.

The survey enumerators took notes on open-ended questions during the interview and then wrote the notes in prose in a "post-interview write-up" document after the interview. During the coding stage, the coders collated answers to each question from the post-interview write-ups. At that point, hotel names and other identifying information were removed from written answers; coders relied on identification numbers only to maintain confidentiality.

C. Analytical Approach and Minimum Detectable Impacts

The Mathematica team will use similar approaches in analyzing the ZECO and hotel survey data. To estimate impacts of the cable activity, we will compare average monthly data on electricity usage, reliability and quality in the baseline period to average monthly outcomes after the activity's completion (the "follow-up period"). To estimate impacts using the hotel survey data, we will also compare average outcomes in the baseline period to average outcomes in the follow-up period.[6]

Statistically significant differences between average baseline and follow-up outcomes will not necessarily reflect the causal effects of the cable activity, as differences could be caused by other changes that occur during the same time (for example, improvements in the grid in Zanzibar paid for by non-MCC funds). While the pre-post design may not produce impact estimates that are conclusively causal, they may provide a good basis for future work.

The following subsections describe in more detail how the data from ZECO and the data from the hotel surveys will be analyzed.

1. Analysis of ZECO Data

The following equation will be used to estimate the impact of each outcome indicator identified in the ZECO data (Table II.3).

(1) $$Y_t = \beta * POST_t + \Sigma\alpha_m + e_t$$

where

β is the estimated impact of the cable activity,

$POST_t$ is an indicator variable identifying periods after the completion of the cable activity,

Y_t is the outcome in month t,

α_m are fixed-month effects assumed to be constant across years, and

e_t is a residual capturing other factors that impact the outcome in period t.

The analysis will exclude months during which there were complete blackouts in 2009 and 2010 because the blackouts are relatively rare events that have a tremendous influence on electricity usage and other outcomes. To some extent, this will understate the cable activity's impacts if blackouts become less frequent following the new cable's installation (an effect that could not be estimated with any degree of reliability, given the rarity of the event). We therefore will also estimate alternative models that include the blackout months, and assess the sensitivity of the estimated impacts to the inclusion or exclusion of the blackout months.[7] In addition, if we observe a time trend in the data, we will account for it in our analysis.[8]

[6] The methods used to estimate the standard errors of the estimated impacts differ for the two data sets. The method for the ZECO data is based on variation over time (by month), whereas the method for the hotel survey data is based on variation across months and hotels

[7] We will allow for heteroskedasticity when estimating our standard errors using the robust variance estimators available in Stata.

[8] In this case we would be estimating an interrupted time series model.

Table II.3. Minimum Detectable Impact of Indicators Reported by ZECO

Indicator	Mean	Minimum Detectable Impact (MDI)	% Change (MDI/Mean)
Consumption (thousand kWh), by customer category			
All customers	14,076	1,533	11%
Prepaid	4,497	476	11%
Domestic	4,326	513	12%
Commercial	1,258	372	30%
Small Industry	37	7	20%
Medium Industry	1,229	443	36%
Large Industry	3,325	237	7%
Streetlight	51	29	57%
Monthly billings (thousand TSh), by customer category			
All customers	1,669,150	328,636	20%
Post-paid Only	1,210,665	213,944	18%
Prepaid	490,525	114,355	23%
Domestic	396,625	65,535	17%
Commercial	171,192	35,214	21%
Small Industry	6,572	2,033	31%
Medium Industry	220,311	94,235	43%
Large Industry	364,188	66,555	18%
Streetlight	20,316	5,967	29%
Outage duration (hours)	19	52	276%
Outage frequency	1	1	66%
Collection efficiency	1.071	0.838	78%
Frequency of voltage fluctuations	4.87	6.48	133%
Technical and non-technical losses[a]	0.252	0.041	16%

Source: ITT data from ZECO and authors' calculation.

Note: [a]The MDI for this indicator excludes data from May 2010 to September 2010, given concerns regarding data on kWh billed, which is used to calculate technical and non-technical losses.

Using baseline data from ZECO, we estimated the minimum detectable impact (MDI) for several outcomes. The MDI is an estimate of how large a true impact of the cable activity would have to be in order to detect it with some certainty. If the true impact is larger than the MDI, we are likely to be able to detect it. If the true impact is smaller than the MDI then there is a good chance that we will not be able to detect it.[9] The following formula was used to estimate the MDIs:

$$(2) \qquad MDI = 2.8 * \text{square root (variance } (y_t)*(1/N_{pre}+1/N_{post}))$$

where

$y_t = (Y_t - \alpha_m)$ and α_m is the average for that month across all years of data,

N_{pre} = number of months in the summer 2010 period with non-missing data, and

N_{post} = number of months in the follow-up period.

[9] Our ability to detect impacts is expressed through statistical significance, by which we mean the probability that we would observe an impact by chance alone. If the data suggest that the pattern we see is not likely due to chance (i.e. has less than a 5 percent probability of occurring by chance), then we say it is detectable or statistically significant.

This formula provides MDIs for two-tailed hypothesis tests with 80 percent power and a 5 percent significance level. The variance of each outcome is estimated from the summer 2010 data.

Table II.3 presents MDIs for each indicator. Consider for example, the MDI shown for electricity consumption by all customers: the 11 percent MDI estimate shown in the right-most column in Table II.3 suggest that the evaluation is expected to detect any difference in consumption of electricity by all customers which is at least as large as 11 percentage points higher than the average consumption of 14,076 thousand kWh observed at baseline. For any change smaller than the MDI shown in the table, the evaluation may not be able to conclusively determine whether the change is statistically different from zero.

2 Analysis of Hotel Survey Data

The hotel survey responses include both quantitative and qualitative data. As noted earlier in this report, most of the qualitative questions were about the December 2009-March 2010 blackout.

The following equation will be used to analyze the quantitative hotel survey data:

$$(3) \qquad Yit = \beta^* POST_{it} + \Sigma\alpha_m + \Sigma\delta_i^* H_i + e_{it}$$

where

β is an estimate of the effect of the cable activity,

$POST_{it}$ is a dummy variable identifying periods after the cable is completed,

Y_{it} is the outcome for hotel i in month t,

α_m are fixed-month effects assumed to be constant across years,

H_i are hotel fixed effects, and

δ_i parameters are for hotel fixed effects.

The results from this regression will be used to estimate an average impact across the three months of the hotel surveys in 2010 and 2014, adjusting for the covariances between the estimates by month.

The formula used to calculate MDIs is the following:

$$(4) \qquad MDI = 2.8 * \text{square root (variance } (y_{it})^*2/N)$$

where

$y_{it} = (Y_{it} - \alpha_m)$,

Y_{it} is the outcome for hotel i in month t,

α_m is the average for that month across all hotels, and

N = number of hotel/month observations with non-missing data in the summer 2010 period.

This formula provides MDIs for two-tailed hypothesis tests with 80 percent power and a 5 percent significance level. It takes into account the fact that observations for the same hotel are correlated by taking deviations from the mean across the three months for each hotel. The variance of each outcome is estimated from the summer 2010 data. MDIs for each outcome are shown in Table II.4.

Table II.4. Minimum Detectable Impact of Select Variables, Hotel Data, Baseline Period

Variable	Mean	MDI	% Change (MDI/Mean)
Supply Reliability			
Number of outages	18.55	15.15	82%
Duration of outages (minutes)	117.01	73.54	63%
Number of back-up generators	1.83	0.71	39%
Energy Costs			
Generator fuel costs (US$ per generator)	369.55	359.15	97%
ZECO monthly bill (US$)	3082.43	2230.80	72%
Revenue			
Occupancy rate	0.40	0.12	30%
Room rate	111.68	41.72	37%
Average revenue per room	53.36	27.54	52%
Operations and Maintenance (O&M) Costs			
Cost of repairing and replacing ACs	175.00	178.42	102%
Cost of repairing and replacing selected appliances[a]	237.00	219.69	93%

Source: Zanzibar cable activity evaluation baseline hotel survey, June–August 2010, and authors' calculation.

[a]Appliances include ACs, fans, and computers.

As noted in the discussion of data quality, the difficulty in answering a particular question created a large variation between hotel responses. Large variations in responses lead to MDIs well above any effects that might plausibly be caused by the cable. This was the case for several cost variables: cost of generator maintenance and repair, cost of alternative sources of energy, total cost and unit cost of repairing or replacing various appliances. Data for these variables will still be gathered during the follow-up survey and analysis will still be carried out. However, it may not be possible to conclusively determine for these variables whether changes in outcomes observed during the follow-up survey are statistically different from zero..

The qualitative hotel survey data (about the blackout) was analyzed by coding the qualitative responses into categories. The coders read all answers to each question to look for common themes, and created answer categories to capture all possible answers. The coders balanced the desire to capture the unique experiences of each respondent with the need to create answer categories that would facilitate data analysis, by aggregating answers into broader categories. For example, to describe changes in electrical appliance use during the December 2009 blackout, "reduced use of water heater" and "turned off air conditioners in guest rooms at night" turned into a larger category "reduced use of electrical appliances in guest rooms."

To capture diverse and oftentimes elaborate responses, answers to open-ended questions produced multiple dummy variables. For each category, a hotel either received a "1" if the information was true, or a "0" if not. In cases where the respondent answered a question with information which was better suited to be a response for another question, the information was recorded for the more appropriate question.

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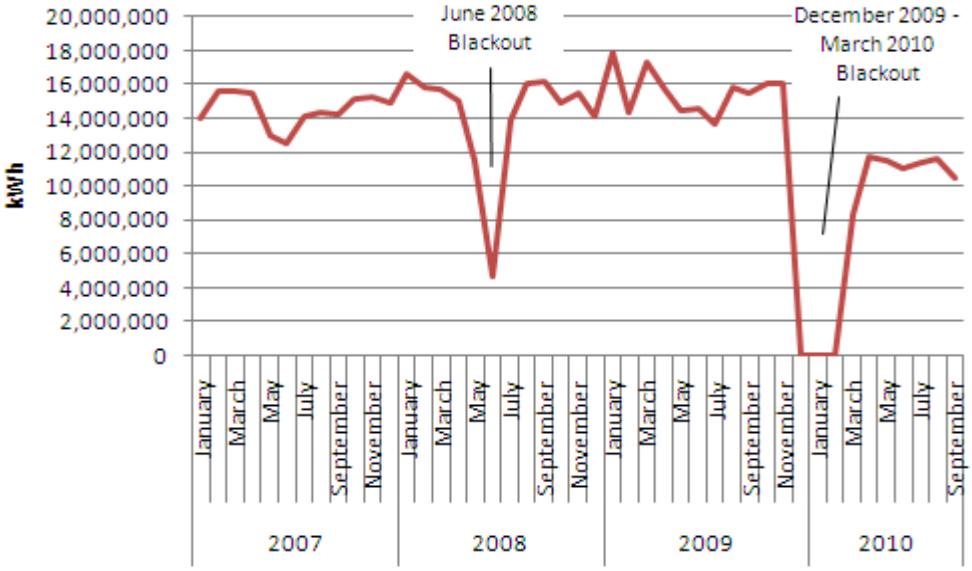
III. INITIAL FINDINGS

In this section, we describe the quality and reliability of the electricity supply and the financial performance of the hotel industry on Unguja Island prior to the installation of the new MCC-funded submarine cable. We then describe the effect of the 2009–2010 blackout on Zanzibar hotels.

A. Electricity Reliability on Unguja Island

Unguja Island has experienced two major interruptions to its power supply in recent years. The first lasted from May 21 to June 19, 2008 ("the 2008 blackout") and the second from December 10, 2009 to March 23, 2010 ("the 2009–2010 blackout"). Electricity consumption decreased by 60 percent during the 2008 blackout and 100 percent during the 2009–2010 blackout.[9] Figure III.1 illustrates this, showing monthly electricity consumption on the island since 2007. [10]

Figure III.1. Electricity Consumption on Unguja Island, January 2007–September 2010



Source: ITT data from ZECO.

Electricity reliability, as measured by outage frequency and duration, improved from 2007 to 2008 but has since worsened. As shown in Table III.1 (which excludes blackout periods), outages have become more frequent since 2008, with an average of 1.27 and 1.20 power cuts to the island per month in 2009 and 2010, respectively, compared to 0.9 power cuts per month in 2008. Similarly, the length of outages fell by more than half in 2008 but rose again in 2009 and 2010. Roughly one-quarter of electricity received from the mainland is lost due to technical and non-technical losses in

[9] Figure 3 shows consumption during June 2008 because the 2008 blackout began in mid-May and did not last the entire month of June.

[10] The data in Figure 3 appear to demonstrate that consumption decreased significantly after the 2009–2010 blackout, relative to the pre-blackout period. However, we believe the drop in monthly consumption during non-blackout months is a result of a change in how the data were collected and may not reflect an actual decrease in consumption. The Appendix contains a description of the methodology used to collect the data and an analysis of data quality.

Table III.1. Indicators of Electricity Reliability During Non- Blackout Periods

Indicator	Units	2007	2008	2009	2010[a]
Average Consumption	kWh/month		15,390,339	15,564,211	10,855,714[b]
Average Customers	number/month	no data	69,000	71,286	73,446
Outage Frequency	number/month	1.50	0.90	1.27	1.20
Outage Duration	hours/month	2.69	1.31	2.49	2.65
Technical & Non-technical Losses	%	24%	25%	26%	38%

Source: ITT data from ZECO.

[a]Averages include data through September 2010.

[b]Drop in consumption from 2009 to 2010 is believed to be a result of inconsistency in the method of data collection and may not reflect an actual decrease in consumption during non-blackout periods. See the Section 2 for further detail.

transmission and distribution on the island. Nevertheless, demand for electricity has grown, even as reliability has worsened. The number of customers increased roughly 3 percent annually between 2008 and 2010. Consumption growth averaged 3.6 percent annually between 2007 and 2009.

B. Electricity Reliability and its Cost for Zanzibar Hotels

To understand the effects of the electricity supply on Zanzibar hotels, Mathematica surveyed 30 hotels in Zanzibar over a three-month period. Of the 306 hotels listed on the Zanzibar Commission for Tourism website, 45 were included in the potential sample pool and 30 were randomly selected to participate in the survey.[11] We surveyed 30 hotels three times each, in June, July, and August 2010. The surveys included questions about how the hotels used electricity, the reliability and quality of the electricity they received, and the financial implications of the reliability and quality of electricity. The surveys also included questions about the hotels' general characteristics to allow for an analysis of how hotels' responses differed by size, grading, location, staffing, years in operation, energy-consuming services, and amenities offered.

In this section, we begin with a description of the hotels' general characteristics and then summarize their responses to questions about electricity supply, reliability, quality, and cost.

1. General Characteristics of Hotels

Table III.2 shows the distribution of the hotels in our sample by region, grade level, size, years in operation, and number of staff. The sample includes hotels from all four regions of Unguja Island—Stone Town and Ng'Ambo (7 hotels), Suburb/Town Vicinity (6 hotels), North and East Coast (11 hotels), and South and East Coast (6 hotels). Although the cable is expected to impact all regions of Unguja Island equally, differences in the quality of transmission and distribution infrastructure may cause differences in electricity reliability across the regions. Thus, some of our analyses focus on differences in hotel responses across regions.

[11] To be included in the potential sample pool, hotels needed to have 10 or more rooms—to distinguish the hotels in the sample from smaller guesthouse-like operations—and an international hotel grading.

Table III.2. General Characteristics of Survey Hotels

Characteristics	Number	Percentage
Region		
Stone Town and Ng'ambo	7	23.3%
Suburb/Town Vicinity	6	20.0%
North and East Coast	11	36.7%
South and East Coast	6	20.0%
Grading		
1-star	10	33.3%
2-star	6	20.0%
3-star	3	10.0%
4-star	5	16.7%
5-star	6	20.0%
Number of Rooms		
Fewer than 15 rooms	6	20.0%
15–30 rooms	14	46.7%
31–100 rooms	5	16.7%
More than 100 rooms	5	16.7%
Mean (rooms per hotel)	50.9	
Years in Operation		
Less than 5 years	6	20.0%
5–10 years	7	23.3%
11–15 years	11	36.7%
More than 15 years	6	20.0%
Mean (years)	11	
Number of Staff		
Fewer than 25 staff	10	33.3%
25–75 staff	8	26.7%
More than 75 staff	12	40.0%
Mean	79.5	
Number of Zanzibar Staff*		
Fewer than 25 staff	11	39.3%
25–75 staff	10	35.7%
More than 75 staff	7	25.0%
Mean	48	
Total Number of Hotels	30	100%

Source: Zanzibar cable activity evaluation baseline hotel survey, June–August 2010.

*Data missing on number of Zanzibar staff for two hotels.

The sample also includes hotels from each of the five grade levels. About 33 percent of the sample are one-star hotels, 20 percent are two-star, 10 percent are three-star, 17 percent are four-star, and 20 percent are five-star. Higher-quality hotels tend to consume more electricity and are expected to provide more reliable service. We expect, therefore, that improved electricity reliability as a result of the cable will have a relatively more positive impact on reducing costs and potentially increasing revenues at higher-quality hotels. Some of our analyses thus focus on differences in hotel responses across grade levels.

The hotels in the sample have been in operation for an average of 11 years. There are an average of 51 rooms and 108 beds per hotel. Across all regions, there was an average of 79.5 staff per hotel, of which 55 percent were from Zanzibar, 40 percent from mainland Tanzania, and 5 percent from other countries. Table III.3 shows how these characteristics vary across region. Newer

Table III.3. Select Characteristics of Survey Hotels, by Region

	Stone Town and Ng'Ambo	Suburb/Town Vicinity	North and East Coast	South and East Coast
Years in Operation	12	12	8	13
Hotel Rating (# of stars)	2.1	2.7	3.6	1.8
Number of Rooms	19	29	81	54
Staff:	25	51	145	52

Source: Zanzibar cable activity evaluation baseline hotel survey, June–August 2010.

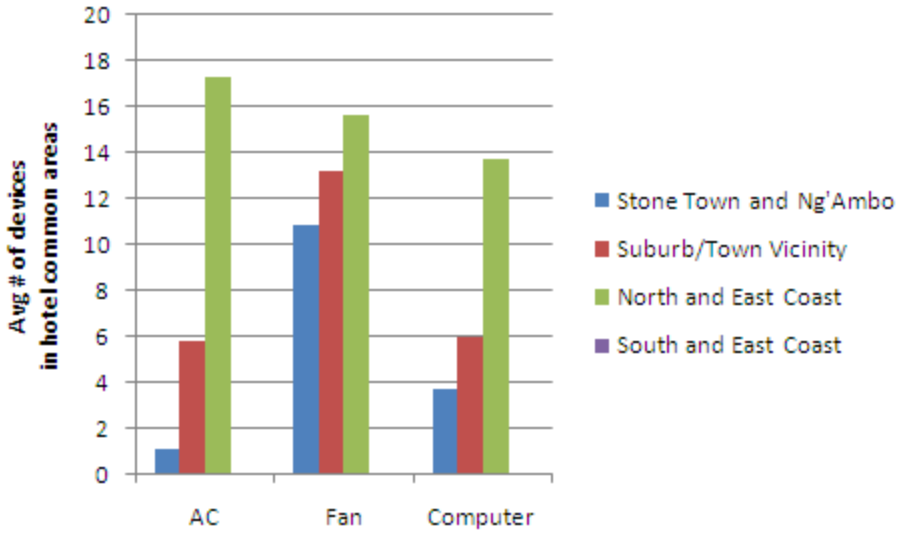
hotels tend to be more highly graded (four or five stars) and located in the North and East Coast region. Larger hotels also tend to be located in the North and East Coast region, with an average of 81 rooms per hotel. Smaller hotels tend to be located in Stone Town.

Some services and amenities were common to all hotels surveyed. For example, all hotels except one had a restaurant. Most of them (83 percent) used bottled gas as their primary cooking fuel. Most (87 percent) used electricity to heat water. A small portion (13 percent) heated water with solar panels.

Electrical devices typically located in common areas included air conditioners, fans, computers, computer accessories (for example, printers or scanners), refrigerators, and water heaters. Hotels in the North and East Coast region tended to have a greater number of each device. Figure III.2 shows the average number of the three main devices in common areas—air conditioners, fans, and computers—by region.

Hotels provided a number of electrical devices in guest rooms, including air conditioners, fans, TVs, refrigerators, kettles, hairdryers, and water heaters. Fans were most common, followed by air

Figure III.2. Average Number of Electrical Devices in Common Areas, by Region



Source: Zanzibar cable activity evaluation baseline hotel survey, June–August 2010.

conditioners, refrigerators, and water heaters. Higher-grade hotels (more stars) were more likely to have air conditioners in their guest rooms, whereas lower-grade hotels were more likely to have fans. All four- and five-star hotels had air conditioners in their guest rooms, compared with 53 percent of one-star hotels. Nearly 100 percent of one- and two-star hotels had fans in their guest rooms (90 percent of one-star hotels had fans in guest rooms; 100 percent of two-star hotels had them). Only 67 percent of guest rooms at five-star hotels had fans.

Table III.4 shows the percentage of hotels with each device in their common areas, the average number of devices located in those common areas and, where applicable, the percentage of guest rooms with each device.

Table III.4. Electrical Devices in Hotel Guest Rooms and Common Areas in Zanzibar

Device	% of hotels with each device in common areas	Average number in hotel common areas (#)*	Average % of guest rooms with each device
Fan	70%	14.2	86%
Air conditioner	90%	12.1	78%
Computer	93%	8.7	N/A
Refrigerator	100%	6.1	65%
Computer accessories	87%	6.2	N/A
Water pump	93%	3.2	N/A
Water heater	59%	4.8	65%
Washer	64%	3.9	N/A
Pool pump	57%	3.9	N/A
TV	80%	1.7	44%
Telephone	23%	5.4	N/A
Stove/Oven	50%	2.5	N/A
Kettle	N/A	N/A	42%
Hairdryer	N/A	N/A	49%

Source: Zanzibar cable activity evaluation baseline hotel survey, June–August 2010.

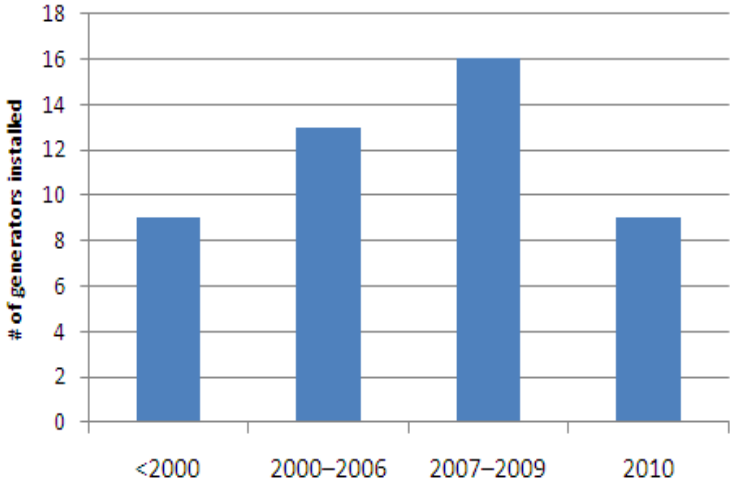
N/A = Not applicable.
*Average for hotels with at least one device in the common areas.

2. Characteristics of Hotels' Electricity Demand and Supply

Hotels in Zanzibar use a combination of grid-supplied electricity (from ZECO's electricity network) and back-up generators. All hotels surveyed use the grid as their main source of electricity. Hotels' grid-supplied consumption averaged 30,323 kWh per month during the summer of 2010. Hotels in the North and East Coast consumed more than in any other region. Twenty-nine out of 30 had back-up generators, with an average of 1.9 generators per hotel and a capacity of roughly 230 kilowatts (kW) per generator. Like grid-supplied electricity, hotels in the North and East Coast had the most back-up generators, with an average of 2.5 per hotel. These generators were also much larger, with an average capacity of 418 kW, likely as a result of the larger size of hotels in this region.

In contrast, hotels in Stone Town had the fewest back-up generators, with an average of 1.2 per hotel and an average capacity of only 78 kW. As Figure III.3 shows, almost half of the back-up generators at the surveyed hotels had been installed since 2007. It is not clear that this means that the need for generators has increased in recent years since many of these generators may have been installed as replacements.

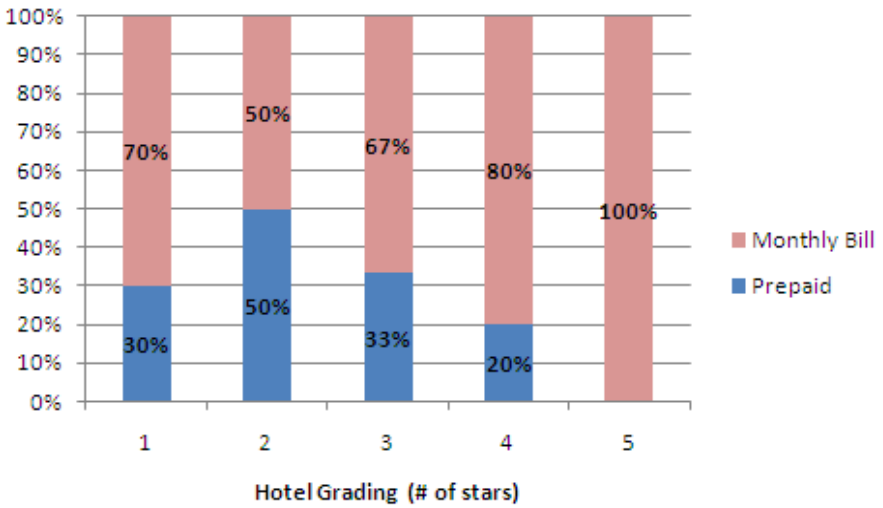
Figure III.3. Installation Dates of hotels' back- up generators



Source: Zanzibar cable activity evaluation baseline hotel survey, June–August 2010.

Most of the hotels surveyed (73 percent) paid a monthly electricity bill they received from ZECO. Twenty-seven percent of hotels prepaid ZECO for electricity consumption. Higher-grade hotels tended to receive a monthly bill for electricity consumption, whereas lower-grade hotels were more likely to prepay. Thirteen percent of hotels had more than one ZECO account (and hence multiple meters). Figure III.4 shows the breakdown of hotels that prepaid versus those that received a monthly bill, by their hotel grading status.

Figure III.4. ZECO Billing and Payment Method, by Hotel Grading

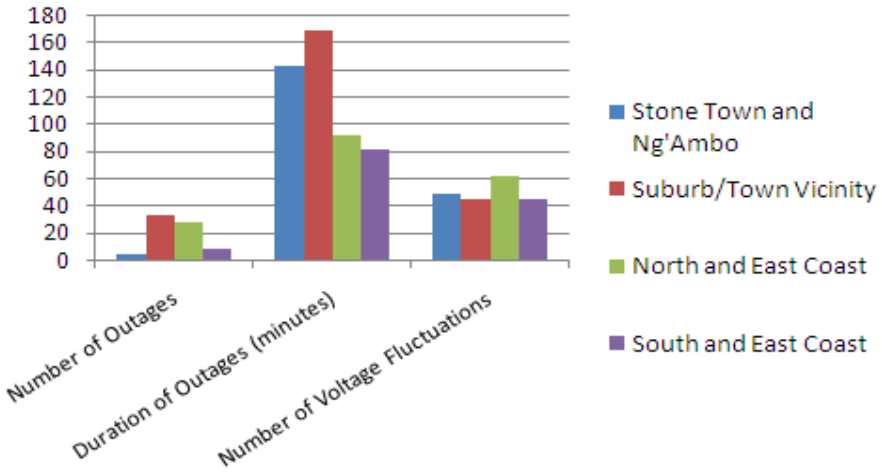


Source: Zanzibar cable activity evaluation baseline hotel survey, June–August 2010.

3. Reliability and Quality of Electricity Supplied to Hotels

In general, the electricity supply to hotels in the sample was unreliable, with frequent and sometimes lengthy outages. The reliability and quality of the electricity supply varied considerably between the hotels surveyed and over the course of the three-month survey period (the "summer 2010 period"). Reliability and quality were measured in terms of number and duration of outages and number of voltage fluctuations. Although power quality, as measured by voltage fluctuations, was relatively consistent across regions, reliability was far worse in some regions than others. For example, reliability, as measured by total duration of outages, was more than eight times worse in Suburb/Town Vicinity than in the South and East Coast.[12] Similarly, reliability in the North and East Coast region was about four times worse than in the South and East Coast region. Figure III.5 summarizes, by region, hotels' responses to questions about the number and duration of outages and the number of voltage fluctuations.

Figure III.5. Electricity Reliability, by Region



Source: Zanzibar cable activity evaluation baseline hotel survey, June–August 2010.

Survey findings on each reliability and quality indicator were as follows:[13]

- **Number of outages.** On average, hotels reported 18.6 outages per month. The average number of outages reported peaked in June 2010, at 22.5, declining to 16.2 in August. However, outages were not common at all hotels. For example, one hotel reported only five outages in June and none in July or August. Outages were much more frequent in the Suburb/Town Vicinity and North and East Coast regions than in Stone Town or the South and East Coast region.
- **Duration of outages.** Hotels reported that outages lasted an average of two hours. Their reported duration varied widely over the summer 2010 period. For example, in June, hotels reported outages lasting an average of 100 minutes, dropping to 60 minutes

[12] The total duration of outages is equal to the average duration per outage multiplied by the number of outages.

[13] There are some concerns that responses to questions about the reliability and quality of electricity supply were unreliable. For example, because some power outages last only a few minutes or even seconds, some respondents may have counted the same type of event as voltage fluctuations, while others categorized them as blackouts.

in July, and increasing to nearly 90 minutes in August. The duration of outages also varied widely between hotels. One hotel in the Suburb/Town Vicinity reported an average outage duration of 13 hours, whereas another in the North and East Coast reported an average of 90 seconds, both in August.

- **Number of voltage fluctuations.** Hotels reported an average of 52 voltage fluctuations per month. They reported 55 voltage fluctuations in June, peaking at 60 in July, and dropping to 40 in August. Higher-grade hotels reported more voltage fluctuations than lower-grade hotels.[14]

4. Financial Performance of Hotels

In this section, we analyze indicators that serve as a proxy for measuring the financial performance of hotels. We group the indicators into the following categories: revenues and costs.

Revenues

Hotel revenues fluctuated substantially over the course of the summer 2010 period.[15] Average hotel revenue increased steadily, from US$38,175 in June to US$58,345 in July, peaking at US$160,350 in August, reflecting the transition from the off-peak to peak season. Table III.5 shows the distribution of hotel revenues, room rates, and occupancy across the hotels in the sample during the summer 2010 period. The survey's findings for each indicator were as follows:

- **Room rates.** On average, hotels charged US$110 per room over the course of the survey period. Average rates ranged from US$89 in July to US$146 in August. The highest room rates were reported in the North and East Coast region (US$153 per room) followed by the South and East Coast region (US$97 per room). Not surprisingly, hotels charged higher rates for rooms at four- and five-star hotels than at lower-grade hotels.
- **Hotel occupancy.** Occupancy rates at hotels averaged 40 percent and were fairly consistent across regions and among different grades of hotels. Hotels in the Suburb/Town Vicinity region reported the lowest occupancy rate (36 percent) over the three-month period. Hotels in Stone Town recorded the highest occupancy rate (43 percent). Average occupancy rates increased steadily over the period, reflecting the transition from off-peak to peak season for tourism in Zanzibar.
- **Hotel cancelations.** Several hotels reported guests canceling or shortening their stays because of problems with the electricity supply. Cancelations peaked in July, with 12 percent of hotels reporting that guests canceled their reservations because of electricity supply problems, and 20 percent reporting that guests shortened their stays. Cancelations were highest among one-star hotels (with 19 percent reporting cancelations and 15 percent reporting shortened stays) and lowest among four-star hotels (with no hotels reporting cancelations and 7 percent reporting shortened stays).

[14] Voltage fluctuations can cause a number of problems for electrical appliances, including data errors, memory loss, equipment shutdown, flickering lights, stalling or stoppage of motors, and reduced motor life.

[15] As indicated in Section II, hotels' average booking rates and average room tariffs were multiplied to come up with an estimate of average monthly revenues.

Table III.5. Indicators of Revenue at Surveyed Hotels

Characteristics (on monthly basis)	Minimum	Maximum	Median	Average
Average monthly revenue	$0	$1,139,250	$33,480	$89,294
Average room rate	$0	$523	$90	$112
Average hotel occupancy	0%	100%	40%	40%

Source: Zanzibar cable activity evaluation baseline hotel survey, June–August 2010.

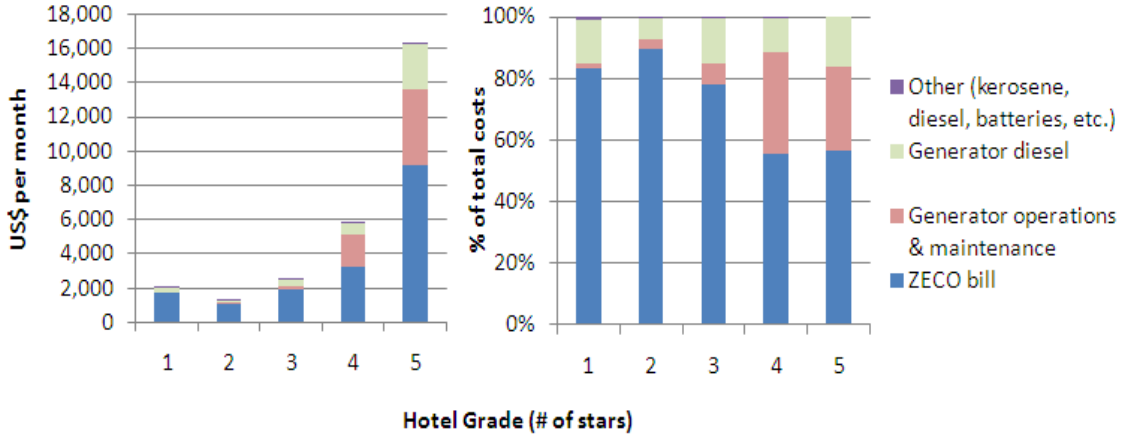
Costs

Hotels' electricity-related costs include the direct costs of purchasing electricity from ZECO, the cost of providing replacement or back-up power, the cost to repair or replace electrical equipment damaged by voltage fluctuations, and the cost of protecting that equipment.

The hotels surveyed had average ZECO bills of US$2,967 per month. On average, ZECO bills at five-star hotels were 2.5 times the average of all hotels surveyed, ranging from roughly US$5,080 in July to US$14,200 in August.

Hotels must purchase, repair, and fuel their generators to supplement the unreliable electricity supply. Expenditure on generator purchases or repairs comprised most of the spending on alternate fuel sources, accounting for 64 percent of spending over the three-month period. Spending on diesel fuel for back-up generators comprised another 35 percent.[16] Figure III.6 shows average monthly energy costs by hotel grade, broken down by type of cost, including ZECO bills, generator maintenance, generator fuel, and other fuel expenses. The figure shows that higher-grade hotels spent significantly more on energy per month than lower-grade hotels. Higher-grade hotels also spent more on fuel and maintenance of back-up generators to maintain a reliable supply of power. Spending on back-up generators constituted 43 percent of monthly energy costs at five-star hotels, compared with only 16 percent at one-star hotels.

Figure III.6. Breakdown of Monthly Energy Costs, by Hotel Grading

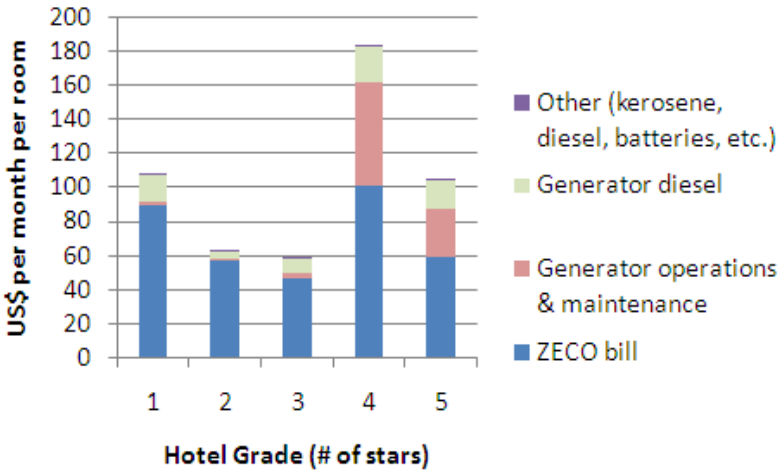


Source: Zanzibar cable activity evaluation baseline hotel survey, June–August 2010.

[16] Expenditure on kerosene, batteries, and candles, primarily at lower-grade hotels, accounts for the remaining one percent.

On aggregate, larger hotels tend to have larger energy expenditures per month. To account for the fact that many higher-grade hotels also tend to be larger, Figure III.7 shows average monthly energy costs by hotel grade, broken down by type of cost on a per-room basis. Noticeably, total energy expenditures were not higher at five-star than one-star hotels. However, four- and five-star hotels spent significantly more on generator diesel and generator operations and maintenance (O&M) than lower-grade hotels. Higher spending on generators likely was the result of the hotels' efforts to ensure the higher level of electricity reliability expected by guests at higher-grade hotels.

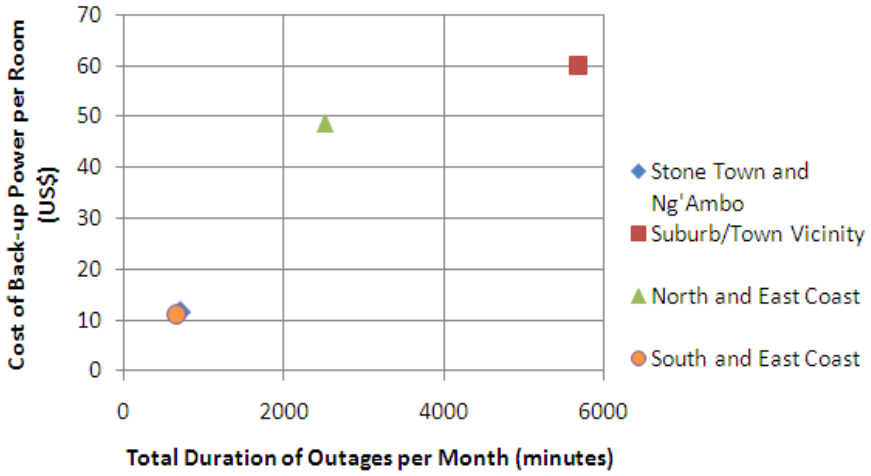
Figure III.7. Breakdown of Monthly Energy Costs Per Room, by Hotel Grading



Source: Zanzibar cable activity evaluation baseline hotel survey, June–August 2010.

Hotels also spent significantly more on generator diesel and O&M in regions with poor reliability. For example, reliability as measured by total duration of outages was 3.8 times worse in the North and East Coast region than in the South and East Coast region. Spending on generator diesel, and O&M was also higher in the former region: hotels in the North and East Coast region spent 4.3 times more on generators than hotels in the South and East Coast region. Figure III.8 shows duration of outages compared to spending on generators for each region on a cost per room basis.

Figure III.8. Cost of Back- Up Power and Reliability of Electricity on Unguja Island by Region



Source: Zanzibar cable activity evaluation baseline hotel survey, June–August 2010.

Hotels spent a significant amount on repairing and replacing devices damaged by voltage fluctuations. Table III.6 shows the average amounts hotels spent to repair or replace these devices, as well as the total number of times they repaired or replaced them.

Table III.6. Average Cost per Month to Repair and Replace Electrical Devices

	Repair		Replace	
Device	# of hotels reporting any costs	Average monthly cost (US$) per hotel*	# of hotels reporting any costs	Average monthly cost (US$) per hotel*
Fan	5	149	---	---
Air conditioner	19	381	6	1,068
Computer	13	348	4	307
Refrigerator	14	159	2	1,054
Computer accessories	2	66	4	162
Water pump	8	103	6	338
Water heater	3	107	8	641
Dryer	1	170	2	3231
Washer	7	911	---	---
Pool pump	1	1020	2	571
TV	12	83	1	69

Source: Zanzibar cable activity evaluation baseline hotel survey, June–August 2010.

*Average cost includes only those hotels that spent some amount repairing or replacing devices. Hotels that did not spend anything were not included in the average.

C. Effect of the December 2009–March 2010 Blackout on Zanzibar Hotels

Respondents to the hotel survey reported that the December 2009 to March 2010 blackout negatively affected hotel revenues, primarily as a result of reduced occupancy rates. They also reported that costs increased significantly as hotels spent more money to fuel and maintain back-up generators and as the cost of various goods and services, including food and water, increased. As a result, hotels' profits declined and some were forced to reduce investment plans. In the remainder of this section, we describe in further detail the perceived effects of the 2009–2010 blackout on the financial performance of hotels in Zanzibar, as reported by hotel managers.

> "The hotel would have closed completely if the blackout had continued even for one more week… preparations to go out of business were underway when the power came back on." – Manager of a three-star hotel, Suburb/Town Vicinity

The blackout appears to have affected hotel revenues primarily through changes in bookings rather than changes in room rates.[17] The majority of hotels (72 percent) did not change their room rates during the blackout period, and only 14 percent of hotels reduced their rates. However, hotel bookings declined during the blackout, particularly in Stone Town and the North and East Coast region. Of the 30 hotels surveyed, 48 percent reported that the blackout led to lower than normal occupancy rates. In Stone Town and the North and East Coast region, 57 and 60 percent of hotels, respectively, reported lower occupancy. One hotel operator noted the long-term impact of the blackout on occupancy rates, remarking that tour operators and travel agents were increasingly redirecting tourists to Mauritius and Seychelles because of power quality problems. Thirty-eight percent of hotels reported some guest cancelations during the blackout, 28 percent reported that bookings fell over the course of the blackout, 14 percent reported shortened stays, and 3 hotels reported closing during the blackout. Two five-star hotels in the North and East Coast region closed for 5 and 40 days, respectively. Another one-star hotel in the South and East Coast region closed for 14 days. Only eight hotels (27 percent) reported that they experienced normal occupancy rates during the blackout period.

> "Reservations were at 100%, but when people arrived at the hotel, many canceled their reservations or left early, so that the actual occupancy rate was about 10%. Before the hotel bought a new generator, guests came and saw that there was no power, and so left the hotel. After the hotel bought the generator, guests saw that it was very loud and difficult to fall asleep, so people left early." – Manager in a one-star hotel, Stone Town

> "The hotel is now considering adding a third generator because [we] found that having only two was a stretch during the blackout. There was a week when the hotel had only one generator because the other one broke down." – Manager of a five-star hotel, North and East Coast

The blackout substantially increased the need for hotels to use back-up generators. All of the hotels surveyed ran back-up generators, for an average of 18.6 hours per day. Six hotels bought new generators and two bought additional accessories for their generators. Hotels spent four times more on maintenance of back-up generators and almost 30 times more on diesel fuel to operate generators during the blackout compared with the summer 2010 period covered by the surveys, during which no prolonged blackouts occurred. In general, spending on back-up generators and generator fuel was highest in the North and East Coast region. Figure III.9 shows average monthly spending on generators and diesel fuel during the blackout and summer 2010 periods.

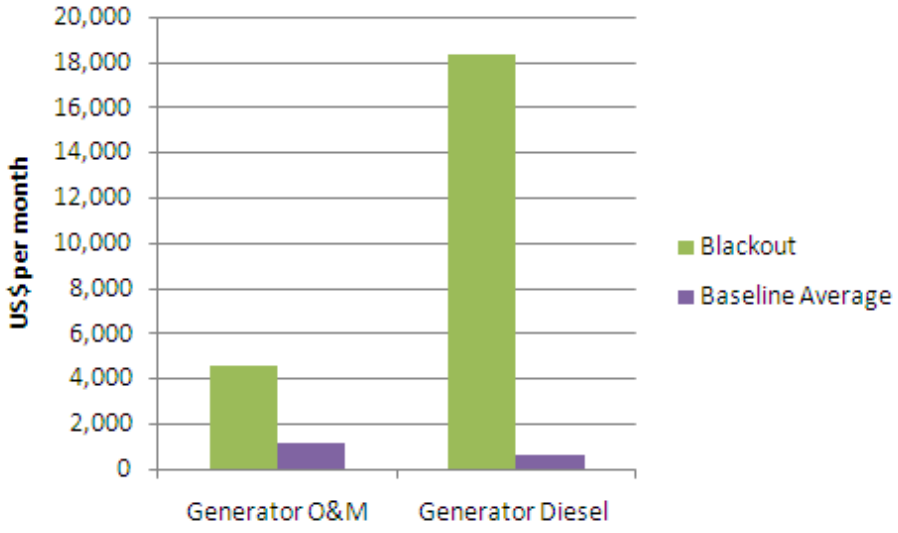
> "Meat got more expensive because it was difficult to store. Water costs went up considerably – the hotel spent 200,000 TSh [roughly $133] for a trip to pick up water. We had to pick up water every two days." – Manager of a two-star hotel, Suburb/Town Vicinity

Hotels also reported spending more during the blackout on services and service-related expenditures than prior to it. Sixty-three percent of hotels reported higher than usual food costs during the blackout. Fifty-two percent reported higher water costs during this period. Water costs were, on average, more than US$4,000 higher than usual for nine hotels. One respondent remarked that the hotel started giving water for free to villagers because poor hygiene resulting from the lack of pumped water led to a cholera outbreak in the local village. Reasons cited for increased water costs included:

[17] As with the quantitative questions about hotels' recent experience with power reliability and quality (in the non-blackout periods), we use observations about hotels' room tariffs and booking rates as a proxy for hotel revenue.

- Higher transport costs because hotels had to truck in water during the blackout (6 hotels)[18]
- Providing water to the local village (2 hotels)
- Providing water to another hotel (1 hotel).

Figure III.9. Spending on Back- up Generators, Blackout Versus Summer 2010 Period



Source: Zanzibar cable activity evaluation baseline hotel survey, June–August 2010.

Nearly three-quarters of hotels reduced their use of certain electrical devices or equipment during the blackout period. Most common changes included:

- Reduction of devices offered in hotel guest rooms (43 percent)
- Reduction in laundry and dryer use (23 percent)
- Reduction of refrigerator/freezer use (17 percent).

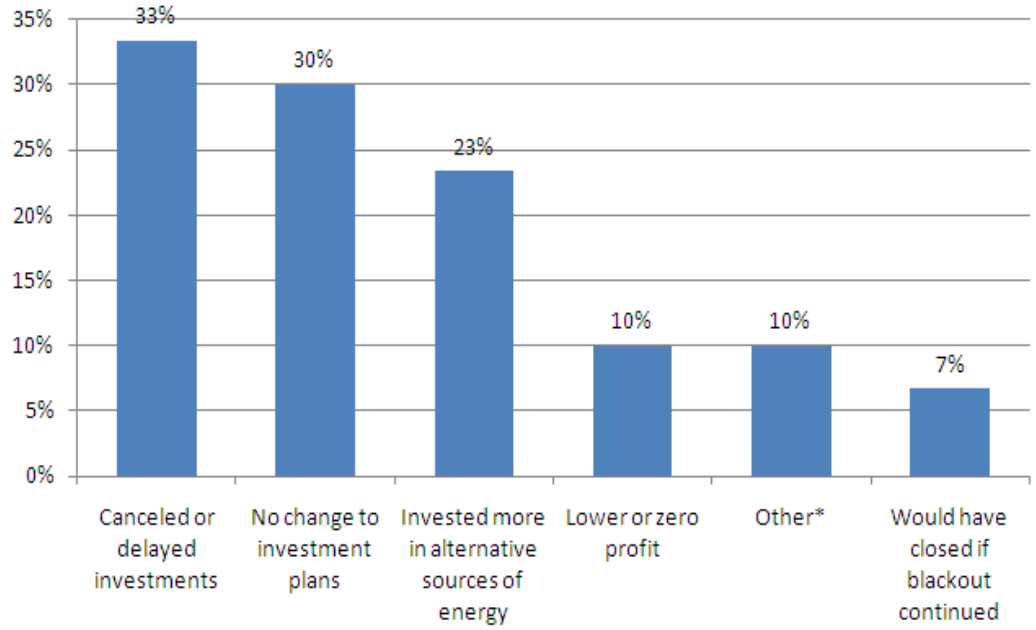
Hotels also noted the negative effects of the blackout on hotel staff. Twenty percent of the hotels reduced their staff and seven percent reported that that the blackout affected the hotels' ability to pay employees. Additionally, 17 percent of hotels noted the added stress experienced by employees as a result of reduced number of staff trying to keep the hotel operating as usual, and still having dissatisfied guests. As a result, several hotels reported greater staff absences and the loss of educated staff, including one hotel's general manager, who returned to the mainland during the blackout period.

[18] Electric water pumps could not operate during the blackout, forcing hotels that usually relied on electric pumps to transport water by truck.

> "The hotel currently has a small spa, and before the blackout had plans to build a large spa. We had already taken out building permits for the project. Now the project has been delayed, and will not happen for two more years." – Manager of a four-star hotel, North and East Coast

The blackout also appears to have affected hotels' long-term investment plans. Some hotels reported having canceled or delayed planned investments. Most did not purchase alternatives to electrical devices or equipment as a result of the blackout, but some did make capital investments in alternative sources of energy, including additional back-up generators and green energy sources, such as solar panels. Figure III.10 shows a breakdown of hotels' responses to the question of how the blackout changed their investment plans.

Figure III.10. Fractions of Hotels Reporting Effects of the Blackout on Investment Plans



Source: Zanzibar cable activity evaluation baseline hotel survey, June–August 2010.

*Other includes unique responses recorded for only one hotel. For example, one hotel mentioned that the parent company considered withdrawing financial support. Another hotel considered installing a power line to connect to the back-up generator of another hotel with the same owner.

IV. CONCLUSIONS

Electricity reliability in Zanzibar has deteriorated significantly in recent years. The island has experienced two major blackouts since June 2008. Reliability during months without a major blackout has also worsened. Additionally, transmission and distribution losses are high. Roughly one-quarter of the power delivered to the island does not reach customers and so has no productive value. Nevertheless, the number of customers and total consumption on the island has grown.

The relatively low levels of reliability and quality of the electricity supply in Zanzibar appear to have negatively affected the hotel industry. Hotels reported substantial direct costs associated with purchasing equipment to supplement the unreliable electricity supply and with replacing equipment damaged by poor-quality electricity. It also is likely that poor reliability and quality led to lost revenue, as evidenced by hotel reports that guests shortened or canceled their stays as a result of electricity supply problems.

Consistent with these results, the survey findings about the effects of the 2009–2010 blackout suggest that an unreliable electricity supply increases hotel costs and decrease revenues. The blackout of December 2009 to March 2010 affected hotels in Zanzibar in four principal ways:

- **Higher direct costs.** Hotels reported spending significantly more on maintenance of back-up generators and on fuel to operate generators during the blackout compared to the summer 2010 period. Additionally, water and food expenditures increased for some hotels.
- **Lost revenue.** Hotels reported that revenue suffered as occupancy rates fell during the blackout period and guests canceled or shortened their stays.
- **Reduction in available services and appliances.** Some hotels said that they cut services, including food and beverage services, in response to the blackout. Others reduced their use or provision of certain appliances to save on electricity costs.
- **Changes to investment plans.** Many hotels reported changing their investment plans as a result of the blackout. Some hotels canceled or postponed investment plans, while others increased investments in alternative sources of energy.

If the cable activity improves the reliability and quality of the electricity supply to Unguja Island, it is likely to reduce costs and improve revenues for one of Zanzibar's most important industries, thereby advancing MCC's longer-term goals of increasing economic growth, reducing poverty, and improving the standard of living in Zanzibar.

> "When customers call, they always ask if there is electricity or a generator. A [new] cable means there will be less problems at the moment, meaning when people call we will be able to say 'Yes, there is power'." – Manager of a two-star hotel, Suburb/Town Vicinity

The cable activity is scheduled to be completed in the summer of 2012. We will collect follow-up electricity data from ZECO once in October 2012 and then again in December 2014. In the summer of 2014, we will conduct follow-up surveys of the same set of hotels covered in the baseline survey. These data will be used to describe the impact of the cable on the quantity, reliability, and quality of electricity supply on Unguja and the impact of the activity on the financial performance of hotels. A final report on Zanzibar will be produced in June 2015.

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APPENDIX

INSTRUMENTS FOR BASELINE HOTEL SURVEY: JUNE – AUGUST 2010

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Zanzibar Cable Activity Evaluation

HOTEL INFORMATION ***[Note to interviewer: As much of the following information as possible should be filled in before the interview, and checked at the beginning of the interview]***	
Hotel Name:	**Hotel ID Number:** ☐☐☐
Area:	**Location:**
Street Name:	
Phone:	**Fax:**
Manager Name:	**E-mail:**
Other Interviewee Name(s):	

INTERVIEWER VISITS		**RESULT CODES**
Visit No. 1		
Interviewer name:		*01. Interview complete* *02. Manager out* *03. Manager not available, appointment set* *04. Incomplete* *05. Refused* *88. Other*
Date of Visit: ☐☐/☐☐/☐☐☐☐ *DD MM YYYY*	*Result Code:* ☐☐ *Other (specify):_____*	
If the manager is not available, make an appointment to return later.		
Date of Next Visit: ☐☐/☐☐/☐☐☐☐ *DD MM YYYY*	*Time:* ☐☐:☐☐ *HH : MM*	
Visit No. 2		
Interviewer Name:		
Date of Visit: ☐☐/☐☐/☐☐☐☐ *DD MM YYYY*	*Result Code:* ☐☐ *Other (specify):_____*	
If the manager is not available, make an appointment to return later.		
Date of Next Visit: ☐☐/☐☐/☐☐☐☐ *DD MM YYYY*	*Time:* ☐☐:☐☐ *HH : MM*	
Visit No. 3		
Interviewer Name:		
Date of Visit: ☐☐/☐☐/☐☐☐☐ *DD MM YYYY*	*Result Code:* ☐☐ *Other (specify):_____*	
If the manager is not available, make an appointment to return later.		
Date of Next Visit: ☐☐/☐☐/☐☐☐☐ *DD MM YYYY*	*Time:* ☐☐:☐☐ *HH : MM*	

Zanzibar Cable Activity Evaluation

Notes to Interviewer: Use this protocol to guide semi-structured interviews with hotel representatives who are knowledgeable about the hotel's operations and power usage. If more than one person is responsible for the hotel's operation and facilities, the interview may be conducted in a small group setting. If a respondent cannot address to questions on a particular topic, inquire regarding alternative respondents or sources of information and note them for future reference. The interview is expected to last about an hour.

My name is _____, and I work for [Mathematica Policy Research/the Millennium Challenge Corporation], [an independent research firm based in Washington DC/a United States foreign aid agency based in Washington DC]. We are conducting a study on electricity reliability and quality in Zanzibar. The study is funded by the United States' Millennium Challenge Corporation (MCC), through the Millennium Challenge Account of Tanzania (MCA-T), with the aim of evaluating how the reliability and quality of electricity supply affects hotels in Zanzibar. In Zanzibar, MCC is funding a new subsea electric transmission line between the mainland and Unguja Island.

Your participation in this study is an important part of the process required to plan, implement and evaluate this project and possible future investments in the energy sector in Zanzibar. We therefore wish to express in advance our gratitude for your willingness to spend some of your valuable time working with the research team and answering their questions.

If you agree to participate in the survey, all the answers that you provide will be kept private – only members of the survey team will have access to this information. You would be free to choose not to answer any question that you would prefer not to answer. You can stop the interview at any time, ask me to clarify any question, or ask me to repeat something if you don't understand. You may also choose to withdraw from the study at any time. Your decision to participate or not will not affect your eligibility for any current or future services that may be offered to hotels in your area. You can contact us any time at the address and telephone given to you in this handout [give handout to interviewee with contact information for Minki Chatterji].

Would you be willing to answer some questions to help with this important study of hotels in Zanzibar?

Yes	**1**
No	**0**

If no, STOP and thank respondent for their time.

Thank you very much for participating in this interview. I'll be taking notes on our discussion so I can remember details later. We will be reporting on the experiences and viewpoints expressed in the interviews, but no comments will be attributed to specific individuals or hotels. No one will be quoted by name in our reports. The interview will last about 45 minutes. We will want to meet with you again for a shorter version of the survey in July and August, at roughly the same time of the month. We will contact you in advance for those follow-up interviews. Do you have any questions about the study or the interview before we begin?

Zanzibar Cable Activity Evaluation

A. General Hotel Information

[Note to interviewer: Questions 1-4 are for the hotel manager.]

A. 1 What is your name?

First Name:	Last Name:

A. 2 What is your job or role here at this hotel?

Position:

A. 3 How long have you been in this position at this hotel?

Years: ☐☐	Months: ☐☐

A. 4 Please tell me how many staff work in the hotel who are…

	Number	***Don't Know***	***Refused***
a. … from Zanzibar		98	77
b. … from the mainland		98	77
c. … from other countries		98	77
Did the respondent use hotel records to answer?			

Zanzibar Cable Activity Evaluation

A. 5 Does the hotel have a restaurant?

No	*Yes*	*5a. What is the main type of fuel used for cooking?*		*Don't Know*	*Refused*
0	1	Electricity	1	98	77
		Paraffin/Kerosene	2		
		Diesel/petrol	3		
		Bottled gas	4		
		Charcoal	5		
		Firewood	6		
		Other (specify):_____	7		

A. 6 What is the main type of fuel used for heating water?

		Don't Know	*Refused*
Electricity	1	98	77
Paraffin/Kerosene	2		
Diesel/petrol	3		
Bottled gas/liquid propane gas (LPG)	4		
Charcoal	5		
Firewood	6		
Other (specify):_____	7		

A. 7 How many guest rooms and beds does this hotel have?

Rooms: ☐☐☐☐ Beds: ☐☐☐☐

A. 8 For the past 30 days, what was the occupancy rate of this hotel? *Occupancy rate is defined as the percentage of rooms with one or more guests in them each night.*

Occupancy rate (percent): ☐☐☐

A. 9 For the past 30 days, what was the average nightly room rate at this hotel? *(circle currency)*

$ Tsh: ☐☐☐ ☐☐☐ ☐☐☐ . ☐☐

B. Electricity Consumption

B. 1 How many of the guestrooms have…

[Note to interviewer: if respondent offers a qualitative answer such as "some" or "most," ask respondent to estimate a percentage. If respondent offers numbers of rooms, convert to percentages.]

	Number	*Percent*	*Don't Know*	*Refused*
a. Air conditioning?			98	77
b. A fan?			98	77
c. A television?			98	77
d. A refrigerator?			98	77
d. A hot water kettle?			98	77
e. A hair dryer?			98	77
f. Other electrical appliance? (specify) _____			98	77
g. Other electrical appliance? (specify) _____			98	77
h. Other electrical appliance? (specify) _____			98	77
i. Other electrical appliance? (specify) _____			98	77

B. 2 Does the hotel have central air conditioning? [*Note to interviewer: question need not be asked aloud if answer is readily observed.]*

Yes	*No*	*Don't know*	*Refused*
1	0	98	77

B. 3 I'm going to go through a list of electrical devices. Can you tell me how many of each your hotel has outside of the guest rooms?

	Number	*Don't Know*	*Refused*
a. Air conditioners		98	77
b. Fans		98	77
c. Computers		98	77
d. Computer accessories (printers, scanners)		98	77
e. Portable telephones		98	77
f. Other office equipment (fax machines, copiers)		98	77
g. Televisions		98	77
h. Refrigerators		98	77
i. Stoves		98	77
j. Ovens		98	77
k. Water heaters		98	77
l. Pool pumps		98	77
m. Other water pumps		98	77
n. Exercise/fitness equipment		98	77
o. Laundry machines		98	77
p. Other _____		98	77
q. Other _____		98	77
Did the respondent use hotel records to answer?			

B. 4 Please tell me a little bit about the electricity to your hotel. What is the main source of this hotel's electricity?

[Note to interviewer: only ask respondent if ambiguous, otherwise answer based on interviewer observation.]

Grid	*Generator*	*Solar*	*Other*
1	2	3	88 Specify_____

B. 5 Do you receive a bill from ZECO each month?

Yes	*No*	*Don't know*	*Refused*
1	0	98	77

B. 6 What was the amount of this hotel's electricity bill from ZECO for last month?

In thousand Tsh: ☐☐☐,☐☐☐,000

Did the respondent use the actual bill to answer?

B. 7 What was the hotel's electricity usage in kilowatt hours for last month?

[Note to interviewer: ideally respondent should produce ZECO bill. Copy numbers from ZECO bill below. Politely request to see a copy if not offered by respondent and easily accessible.]

Units (kWh): ☐☐☐☐☐☐☐☐ kVA: ☐☐☐☐

Factor: ☐☐☐☐

Current month's reading:

☐☐☐☐

Previous month's reading:

☐☐☐☐

Billing period start (DD/MM/YYYY): ☐☐ ☐☐ ☐☐☐☐

Billing period end (DD/MM/YYYY): ☐☐ ☐☐ ☐☐☐☐

ZECO Account Number: _____

Did the respondent use the actual bill to answer?

B. 8 Does to hotel have a second ZECO account?

Yes	*No*	*Don't know*	*Refused*
1	0	98	77

→ *If NO, DON'T KNOW, or REFUSED, skip to B.9*

B. 9 If yes, what was the hotel's electricity usage in kilowatt hours for last month?

Units (kWh): ☐☐☐☐☐☐☐☐ kVA: ☐☐☐☐

Factor: ☐☐☐☐

Current month's reading:

☐☐☐☐

Previous month's reading:

☐☐☐☐

Billing period start (DD/MM/YYYY): ☐☐ ☐☐ ☐☐☐☐

Billing period end (DD/MM/YYYY): ☐☐ ☐☐ ☐☐☐☐

ZECO Account Number: _____

Did the respondent use the actual bill to answer?

B. 10 How does the hotel keep records of expenditures (computer, log book, receipts)? *[Note to interviewer: Refer to Question number 1 in the write-up template]*

C. Power Supply Disruptions in the Last 30 Days

C. 1 In the past 30 days, how often did your hotel experience …

[Note to interviewer: if respondent offers a qualitative answer (often, never, etc.), prompt respondent to estimate a number. Voltage drops happen when lights dim or equipment with voltage protection shuts off automatically. Voltage surges happen when equipment burns out or when voltage protection shuts off automatically.]

	Number of times	***Average duration (minutes/ hours)***	***Don't Know***	***Refused***
a. Power outages			98	77
b. Voltage fluctuations (drops and surges)		NA	98	77

C. 2 How do you deal with the problem of voltage fluctuations or surges? *[Note to interviewer: Refer to Question number 2 in the write-up template]*

C. 3 Now I'm going to go through a list of electrical devices. If you have had any equipment fail in the last 30 days due to voltage fluctuations, can you tell me how much have you spent to repair or replace it?

Have any of the following failed in the last 30 days?	***Currency* (circle)**	***Repair Costs***	***Replacement Costs***	***Not Applicable***	***Don't Know***	***Refused***
a. Air conditioners	$ TSh			99	98	77
b. Fans	$ TSh			99	98	77
c. Computers	$ TSh			99	98	77
d. Computer accessories (printers, scanners)	$ TSh			99	98	77
e. Portable telephones	$ TSh			99	98	77
f. Other office equipment (fax machines, copiers)	$ TSh			99	98	77
g. Televisions	$ TSh			99	98	77
h. Refrigerators	$ TSh			99	98	77
i. Stoves	$ TSh			99	98	77
j. Ovens	$ TSh			99	98	77
k. Water heaters	$ TSh			99	98	77
l. Pool pumps	$ TSh			99	98	77
m. Other water pumps	$ TSh			99	98	77
n. Exercise/fitness equipment	$ TSh			99	98	77
o. Laundry machines	$ TSh			99	98	77
p. Other _____	$ TSh			99	98	77
q. Other _____	$ TSh			99	98	77
Did the respondent use hotel records to answer?						

C. 4 Now I'll go through the same list again, but this time we will focus on devices to protect these appliances from voltage drops and surges. Please tell me what protective devices have been installed and how much the hotel has spent on them.

How much have you spent on the following?	***Type of Equipment (e.g., surge protectors, AVS/AVR)***	***Currency* (circle)**	***Costs of Protection***	***Not Applicable***	***Don't Know***	***Refused***
a. Air conditioners		$ TSh		99	98	77
b. Fans		$ TSh		99	98	77
c. Computers		$ TSh		99	98	77
d. Computer accessories (printers, scanners)		$ TSh		99	98	77
e. Portable telephones		$ TSh		99	98	77
f. Other office equipment (fax machines, copiers)		$ TSh		99	98	77
g. Televisions		$ TSh		99	98	77
h. Refrigerators		$ TSh		99	98	77
i. Stoves		$ TSh		99	98	77
j. Ovens		$ TSh		99	98	77
k. Water heaters		$ TSh		99	98	77
l. Pool pumps		$ TSh		99	98	77
m. Other water pumps		$ TSh		99	98	77
n. Exercise/fitness equipment		$ TSh		99	98	77
o. Laundry machines		$ TSh		99	98	77
p. Other _____		$ TSh		99	98	77
q. Other _____		$ TSh		99	98	77
Did the respondent use hotel records to answer?						

C. 5 In the last 30 days, how much did you spend on these alternate sources of energy as a result of electricity supply interruptions?

	Currency (circle)	*Amount*	*Don't Know*	*Refused*
a. Generator maintenance and repair?	$ TSh		98	77
b. Diesel for the generator?	$ TSh		98	77
c. Paraffin/Kerosene?	$ TSh		98	77
d. Diesel/petrol for purposes other than electricity generation?	$ TSh		98	77
e. Bottled gas?	$ TSh		98	77
f. Charcoal?	$ TSh		98	77
g. Firewood?	$ TSh		98	77
h. Solar power?	$ TSh		98	77
i. Batteries	$ TSh		98	77
j. Candles?	$ TSh		98	77
k. Flashlights/torches?	$ TSh		98	77
l. Other _____	$ TSh		98	77
m. Other _____	$ TSh		98	77

C. 6 In the past 30 days, have any guests…

	Yes	*No*	*Don't Know*	*Refused*
a. Cancelled their reservations due to electricity-related problems?	1	0	98	77
b. Shortened their stays due to electricity-related problems?	1	0	98	77
c. Complained to management about electricity-related problems?	1	0	98	77

C. 7 Are there other kinds of losses or damages we haven't discussed already that this hotel experienced in the last 30 days due to problems with electricity supply? *[Note to interviewer: Refer to Question number 3 in the write-up template.]*

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D. Impact of 2009-10 Blackout

D 1. During the blackout of December 2009-March 2010, did the hotel close for any period of time as a result of the blackout? If yes, how long?

Months: ☐☐	Days: ☐☐

D 2. Did you use a backup generator during the blackout?

No	*Yes*	*2a. If so, how many hours/day did you run it?*	*Don't Know*	*Refused*
0	1		98	77

D 3. I would like to ask about how the blackout affected your booking rates and costs. We understand that you may want to look at records of expenditures for the months of December 2009 through March 2010 to answer these questions.

	Monthly Average *(circle currency where applicable)*
a. Occupancy rate	
b. Average room rate	$ TSh
c. Generator (purchase, maintenance or repairs)	$ TSh
d. Diesel/petrol for generators	$ TSh
e. Paraffin/kerosene	$ TSh
f. Diesel/petrol for other purposes	$ TSh
g. Bottled gas	$ TSh
h. Charcoal	$ TSh
i. Firewood	$ TSh
j. Solar power	$ TSh
k. Batteries	$ TSh
l. Candles	$ TSh
m. Flashlights/torches	$ TSh

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D 4. How did your occupancy rate change over the course of the blackout? [Note to interviewer: *Refer to Question number 4 in the write-up template.]*

D 5. How did your room rate change over the course of the blackout? [Note to interviewer: *Refer to Question number 5 in the write-up template.]*

D 6. How did your alternate sources of power change over the course of the blackout? [Note to interviewer: *Refer to Question number 6 in the write-up template.]*

D 7. What steps did you take regarding electrical power for your hotel during the blackout? [Note to interviewer: *Refer to Question number 7 in the write-up template.]*

D 8. Did you reduce your use of electricity for certain appliances or equipment during the blackout? [Note to interviewer: *Refer to Question number 8 in the write-up template.]*

No	***Yes***	***8. a. If so, how?***	***Don't Know***	***Refused***
0	1		98	77

D 9.Did you purchase alternatives to electric appliances or equipment as a result of the blackout (for example, gas stoves instead of electric)? [Note to interviewer: *Refer to Question number 9 in the write-up template.]*

No	*Yes*	*9. a. If so, describe?*	*Don't Know*	*Refused*
0	1	→	98	77

D 10. What were some of the other steps your hotel took to cope with the blackout? *[Note to interviewer: Refer to Question number 10 in the write-up template.]*

D 11. Did you make any changes in terms of staffing or salaries? *[Note to interviewer: Refer to Question number 11 in the write-up template.]*

No	*Yes*	*9. a. If so, describe?*	*Don't Know*	*Refused*
0	1	→	98	77

D 12. Did you close some services or facilities or change the way you used them during the blackout? *[Note to interviewer: Refer to Question number 12 in the write-up template.]*

No	*Yes*	*12. a. If so, describe what you did?*	*Don't Know*	*Refused*
0	1		98	77

D 13. Did you lobby government, work with ZATI and / or other hotels during the blackout? *[Note to interviewer: Refer to Question number 13 in the write-up template.]*

No	*Yes*	*13. a. If so, describe what you did?*	*Don't Know*	*Refused*
0	1		98	77

D 14. Did you experience any changes in food costs as a result of the blackout? *[Note to interviewer: Refer to Question number 14 in the write-up template.]*

No	*Yes*	*14 a. If so, describe?*	*Don't Know*	*Refused*
0	1		98	77

D 15. Did you experience any changes in the cost of water as a result of the blackout? *[Note to interviewer: Refer to Question number 14 in the write-up template.]*

No	***Yes***	***15 a. If so, describe?***	***Don't Know***	***Refused***
0	1		98	77

D 16. Were there any other effects of the blackout that we have not yet discussed? *[Note to interviewer: Refer to Question number 15 in the write-up template.]*

D 17. How did the blackout change any of the hotel's investment plans *(such as investing in solar energy, building more rooms, building different types of rooms, adding or discontinuing certain services, etc.*)? *[Note to interviewer: Refer to Question number 16 in the write-up template.]*

D 18. Do you have any questions for us? *[Note to interviewer: Refer to Question number D 17 in the write-up template.]*

[Note to Interviewer: We will gladly provide them with a copy of any official MCC, MCA-T, or MPR publication that results from this study, once it is completed, and thank them again for their participation. You may get questions regarding project implementation, such as timing for finishing the cable. Please refrain from answering questions not directly related to your scope of work and the survey. You can politely take note of the question and pass it along to an MCA-T/MCC representative].

Zanzibar Cable Activity Evaluation

INTERVIEWER OBSERVATIONS

1. ACCESS

Please describe the process by which you located the correct person to answer your questions, how willing the person was to share information/records with you, and why the person was willing or unwilling to share information/records.

2. MEASURES

Was the respondent able to provide information on all items included in the survey? If not, which items did they not have records of? If not, which items did the respondent not provide information about?

3. CALCULATIONS

Was it easy or difficult to record costs as they were asked in the instrument? If difficult, what was difficult? What sorts of calculations were needed, if any?

4. OTHER COMMENTS

Zanzibar Cable Activity Evaluation

WRITE- UP TEMPLATE FOR INTERVIEWS WITH HOTEL REPRESENTATIVES

Notes to Interviewer: Use this template to record qualitative information gathered during interviews.

1. ***How does the hotel keep records of*** **expenditures (computer, log book, receipts)*?*** *[Note to interviewer: Refer to question B. 9 in the questionnaire]*

2. **How do you deal with the problem of voltage fluctuations or surges?** *[Note to interviewer: Refer to question C. 2 in the questionnaire]*

3. **Are there other kinds of losses or damages we haven't discussed already that this hotel experienced in the last 30 days due to problems with electricity supply?** *[Note to interviewer: Refer to question C. 7 in the questionnaire.]*

4. **How did your occupancy rate change over the course of the blackout?** *[Note to interviewer: Refer to question D 4 in the questionnaire.]*

5. **How did your room rate change over the course of the blackout?** *[Note to interviewer: Refer to question D 5 in the questionnaire.]*

6. **How did your *alternate* sources of power change over the course of the blackout?** *[Note to interviewer: Refer to question D 6 in the questionnaire.]*

7. **What steps did you take regarding electrical power for your hotel during the blackout?** *[Note to interviewer: Refer to question D 7 in the questionnaire.]*

8. **How did you reduce your use of electricity for certain appliances or equipment during the blackout?** *[Note to interviewer: Refer to question D 8 in the questionnaire.]*

9. **What alternatives to electric appliances or equipment did you purchase as a result of the blackout?** *[Note to interviewer: Refer to question D 9 in the questionnaire.]*

10. **What were some of other steps your hotel took to cope with the blackout?** *[Note to interviewer: Refer to question D 10 in the questionnaire.]*

11. **What changes did your hotel make to staffing or salaries, if any?** *[Note to interviewer: Refer to question D 11 in the questionnaire.]*

12. **What services or facilities did you close, or what changes did you make to the way in which you use them?** *[Note to interviewer: Refer to question D 12 in the questionnaire.]*

13. **What did you do to work with ZATI and / or other hotels during the blackout?** *[Note to interviewer: Refer to question D 13 in the questionnaire.]*

14. **What changes did you experience in food or water costs during the blackout?** *[Note to interviewer: Refer to questions D 14 and D 15 in the questionnaire.]*

15. **What were other effects of the blackout, not yet discussed?** *[Note to interviewer: Refer to question D 16 in the questionnaire.]*

16. **How did the blackout change any of the hotel's investment plans (such as investing in solar energy, building more rooms, building different types of rooms, adding or discontinuing certain services, etc.)?** *[Note to interviewer: Refer to question D 17 in the questionnaire.]*

17. **Do you have any questions for us?** *[Note to interviewer: Refer to question D 18 in the questionnaire.]*

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Zanzibar Cable Activity Evaluation

Round 2

HOTEL INFORMATION ***[Note to interviewer: As much of the following information as possible should be filled in before the interview, and checked at the beginning of the interview]***	
Hotel Name:	**Hotel ID Number:** ☐☐☐
Area:	**Location:**
Phone:	**Email:**
Interviewee Name:	**Interviewee Position:**
Other Interviewee Name(s) and Postion(s):	

INTERVIEWER VISITS		**RESULT CODES**
Visit No. 1		
Interviewer name:		*01. Interview complete*
Date of Visit: ☐☐/☐☐/☐☐☐☐ *DD MM YYYY*	*Result Code:* ☐☐ *Other (specify):_____*	*02. Manager out*
If the manager is not available, make an appointment to return later.		*03. Manager not available, appointment set*
Date of Next Visit: ☐☐/☐☐/☐☐☐☐ *DD MM YYYY*	*Time:* ☐☐:☐☐ *HH : MM*	*04. Incomplete*
Visit No. 2		*05. Refused*
Interviewer Name:		*88. Other*
Date of Visit: ☐☐/☐☐/☐☐☐☐ *DD MM YYYY*	*Result Code:* ☐☐ *Other (specify):_____*	
If the manager is not available, make an appointment to return later.		
Date of Next Visit: ☐☐/☐☐/☐☐☐☐ *DD MM YYYY*	*Time:* ☐☐:☐☐ *HH : MM*	
Visit No. 3		
Interviewer Name:		
Date of Visit: ☐☐/☐☐/☐☐☐☐ *DD MM YYYY*	*Result Code:* ☐☐ *Other (specify):_____*	
If the manager is not available, make an appointment to return later.		
Date of Next Visit: ☐☐/☐☐/☐☐☐☐ *DD MM YYYY*	*Time:* ☐☐:☐☐ *HH : MM*	

Zanzibar Cable Activity Evaluation

Round 2

Notes to Interviewer: Use this protocol to guide semi-structured interviews with hotel representatives who are knowledgeable about the hotel's operations and power usage. If more than one person is responsible for the hotel's operation and facilities, the interview may be conducted in a small group setting. If a respondent cannot address to questions on a particular topic, inquire regarding alternative respondents or sources of information and note them for future reference. The interview is expected to last about 20 minutes.

My name is _____, and I work for the Millennium Challenge Corporation, a United States foreign aid agency based in Washington DC. We are conducting a study on electricity reliability and quality in Zanzibar with the aim of evaluating how the reliability and quality of electricity supply affects hotels in Zanzibar. The study is funded by the United States' Millennium Challenge Corporation (MCC), through the Millennium Challenge Account of Tanzania (MCA-T).

If you agree to participate in the survey, all the answers that you provide will be kept private; only members of the survey team will have access to this information. You would be free to not answer any question that you prefer not to answer, stop the interview at any time, or ask me to clarify or repeat something if you don't understand. You may withdraw from the study at any time, and your decision to participate or not will not affect your eligibility for any current or future services that may be offered to hotels in your area. You can contact us any time at the address and telephone given to you in this handout [give handout to interviewee with contact information for M&E at MCC and MCA-T].

I'll be taking notes on our discussion so I can remember details later. We will be reporting on the experiences and viewpoints expressed in the interviews, but no comments will ever be attributed to specific individuals or hotels; all answers are anonymous. The interview will last about 20 minutes.

Would you be willing to answer some questions?

Yes	**1**
No	**0**

If no, STOP and thank respondent for their time.

Thank you. This interview is meant to be a follow up from the interview we conducted in June, to get updated information on the hotel's experiences in the last 30 days. Please limit your responses to reflect only what has happened since our previous interview, unless otherwise instructed. We will want to meet with you again to ask the same questions at the beginning of August.

Do you have any questions about the study or the interview before we begin?

Zanzibar Cable Activity Evaluation

Round 2

A. General Hotel Information

A. 1 How long have you been in this position at this hotel?

Years: ☐☐	Months: ☐☐

A. 2 For the past 30 days, what was the occupancy rate of this hotel? *Occupancy rate is defined as the percentage of rooms with one or more guests in them each night.*

Occupancy rate (percent): ☐☐☐

A. 3 For the past 30 days, what was the average nightly room rate at this hotel? *(circle currency)*

$ Tsh: ☐☐☐ ☐☐☐ . ☐☐

B. Electricity Consumption

B. 1 What was the amount of this hotel's electricity bill from ZECO for last month?

In thousand Tsh: ☐☐☐,☐☐☐,0 0 0
Did the respondent use the actual bill to answer?

B. 2 How does the hotel pay for electricity?

Monthly	***Pre-paid***	***Other***
1	2	88 Specify_____

→ *If PRE-PAID, skip to B.7*

B. 3 What was the hotel's electricity usage in kilowatt hours for last month?

[Note to interviewer: ideally respondent should produce ZECO bill. Copy numbers from ZECO bill below. Politely request to see a copy if not offered by respondent and easily accessible.]

Units (kWh): ☐☐☐☐☐☐☐☐ kVA: ☐☐☐☐
Factor: ☐☐☐☐
Current month's reading: ☐☐☐☐
Previous month's reading: ☐☐☐☐
Billing period start (DD/MM/YYYY): ☐☐ ☐☐ ☐☐☐☐
Billing period end (DD/MM/YYYY): ☐☐ ☐☐ ☐☐☐☐
ZECO Account Number: _____
Did the respondent use the actual bill to answer?

B. 4 Does to hotel have a second ZECO account?

Yes	*No*	*Don't know*	*Refused*
1	0	98	77

→ *If NO, DON'T KNOW, or REFUSED, skip to Section C*

B. 5 If yes, what was the amount of this hotel's second electricity bill from ZECO for last month?

In thousand Tsh: ☐☐☐,☐☐☐,0 0 0

Did the respondent use the actual bill to answer?

B. 6 If yes, what was the hotel's electricity usage in kilowatt hours for last month?

Units (kWh): ☐☐☐☐☐☐☐☐ kVA: ☐☐☐☐

Factor: ☐☐☐☐

Current month's reading:

☐☐☐☐

Previous month's reading:

☐☐☐☐

Billing period start (DD/MM/YYYY): ☐☐ ☐☐ ☐☐☐☐

Billing period end (DD/MM/YYYY): ☐☐ ☐☐ ☐☐☐☐

ZECO Account Number: _____

Did the respondent use the actual bill to answer?

B. 7 If PRE-PAID, what is the meter number and tax number?

Meter Number: _____

Tax Number: _____

Did the respondent use the actual bill to answer?

Zanzibar Cable Activity Evaluation

Round 2

C. Power Supply Disruptions in the Last 30 Days

C. 1 In the past 30 days, how often did your hotel experience …

[Note to interviewer: if respondent offers a qualitative answer (often, never, etc.), prompt respondent to estimate a number. Voltage drops happen when lights dim or equipment with voltage protection shuts off automatically. Voltage surges happen when equipment burns out or when voltage protection shuts off automatically.]

	Number of times	***Average duration (minutes/ hours)***	***Don't Know***	***Refused***
a. Power outages			98	77
b. Voltage fluctuations (drops and surges)		NA	98	77

C. 2 In the past 30 days, have any guests…

	Yes	***No***	***Don't Know***	***Refused***
a. Cancelled their reservations due to electricity-related problems?	1	0	98	77
b. Shortened their stays due to electricity-related problems?	1	0	98	77
c. Complained to management about electricity-related problems?	1	0	98	77

Zanzibar Cable Activity Evaluation

Round 2

C. 3 Now I'm going to go through a list of electrical devices. If you have had any equipment fail in the last 30 days due to voltage fluctuations, can you tell me how much have you spent to repair or replace it?

Have any of the following failed in the last 30 days?	***Currency* (circle)**	***Repair Costs***	***Replacement Costs***	***Not Applicable***	***Don't Know***	***Refused***
a. Air conditioners	$ TSh			99	98	77
b. Fans	$ TSh			99	98	77
c. Computers	$ TSh			99	98	77
d. Computer accessories (printers, scanners)	$ TSh			99	98	77
e. Portable telephones	$ TSh			99	98	77
f. Other office equipment (fax machines, copiers)	$ TSh			99	98	77
g. Televisions	$ TSh			99	98	77
h. Refrigerators	$ TSh			99	98	77
i. Stoves	$ TSh			99	98	77
j. Ovens	$ TSh			99	98	77
k. Water heaters	$ TSh			99	98	77
l. Pool pumps	$ TSh			99	98	77
m. Other water pumps	$ TSh			99	98	77
n. Exercise/fitness equipment	$ TSh			99	98	77
o. Laundry machines	$ TSh			99	98	77
p. Other _____	$ TSh			99	98	77
q. Other _____	$ TSh			99	98	77
Did the respondent use hotel records to answer?						

C. 4 In the last 30 days, how much did you spend on these alternate sources of energy as a result of electricity supply interruptions?

	Currency (circle)	*Amount*	*Don't Know*	*Refused*
a. Generator maintenance and repair?	$ TSh		98	77
b. Diesel for the generator?	$ TSh		98	77
c. Paraffin/Kerosene?	$ TSh		98	77
d. Diesel/petrol for purposes other than electricity generation?	$ TSh		98	77
e. Bottled gas?	$ TSh		98	77
f. Charcoal?	$ TSh		98	77
g. Firewood?	$ TSh		98	77
h. Solar power?	$ TSh		98	77
i. Batteries	$ TSh		98	77
j. Candles?	$ TSh		98	77
k. Flashlights/torches?	$ TSh		98	77
l. Other _____	$ TSh		98	77
m. Other _____	$ TSh		98	77

C. 5 Are there other kinds of losses or damages we haven't discussed already that this hotel experienced in the last 30 days due to problems with electricity supply? *[Note to interviewer: Refer to Question number 1 in the write-up template.]#*

C. 6 Do you have any questions for us? ***[Note to interviewer: Refer to Question number 2 in the write-up template.]***

[Note to Interviewer: We will gladly provide them with a copy of any official MCC, MCA-T, or MPR publication that results from this study, once it is completed, and thank them again for their participation. You may get questions regarding project implementation, such as timing for finishing the cable. Please refrain from answering questions not directly related to your scope of work and the survey. You can politely take note of the question and pass it along to an MCA-T/MCC representative].

Zanzibar Cable Activity Evaluation
Round 2

INTERVIEWER OBSERVATIONS

1. ACCESS

Please describe the process by which you located the correct person to answer your questions, how willing the person was to share information/records with you, and why the person was willing or unwilling to share information/records.

2. MEASURES

Was the respondent able to provide information on all items included in the survey? If not, which items did they not have records of? If not, which items did the respondent not provide information about?

Zanzibar Cable Activity Evaluation
Round 2

3. CALCULATIONS

Was it easy or difficult to record costs as they were asked in the instrument? If difficult, what was difficult? What sorts of calculations were needed, if any?

4. OTHER COMMENTS

Zanzibar Cable Activity Evaluation

Round 2

WRITE- UP TEMPLATE FOR INTERVIEWS WITH HOTEL REPRESENTATIVES

Notes to Interviewer: Use this template to record qualitative information gathered during interviews.

1. **Are there other kinds of losses or damages we haven't discussed already that this hotel experienced in the last 30 days due to problems with electricity supply?** *[Note to interviewer: Refer to question C. 7 in the questionnaire.]*

2. **Do you have any questions for us?** *[Note to interviewer: Refer to question D 18 in the questionnaire.]*

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Zanzibar Cable Activity Evaluation

Round 3

HOTEL INFORMATION ***[Note to interviewer: As much of the following information as possible should be filled in before the interview, and checked at the beginning of the interview]***	
Hotel Name:	**Hotel ID Number:** ☐☐☐
Area:	**Location:**
Phone:	**Email:**
Interviewee Name:	**Interviewee Position:**
Other Interviewee Name(s) and Position(s):	

INTERVIEWER VISITS		**RESULT CODES**
Visit No. 1		
Interviewer name:		*01. Interview complete*
Date of Visit: ☐☐/☐☐/☐☐☐☐ *DD MM YYYY*	*Result Code:* ☐☐ *Other (specify):_____*	*02. Manager out*
If the manager is not available, make an appointment to return later.		*03. Manager not available, appointment set*
Date of Next Visit: ☐☐/☐☐/☐☐☐☐ *DD MM YYYY*	*Time:* ☐☐:☐☐ *HH : MM*	*04. Incomplete*
Visit No. 2		*05. Refused*
Interviewer Name:		*88. Other*
Date of Visit: ☐☐/☐☐/☐☐☐☐ *DD MM YYYY*	*Result Code:* ☐☐ *Other (specify):_____*	
If the manager is not available, make an appointment to return later.		
Date of Next Visit: ☐☐/☐☐/☐☐☐☐ *DD MM YYYY*	*Time:* ☐☐:☐☐ *HH : MM*	
Visit No. 3		
Interviewer Name:		
Date of Visit: ☐☐/☐☐/☐☐☐☐ *DD MM YYYY*	*Result Code:* ☐☐ *Other (specify):_____*	
If the manager is not available, make an appointment to return later.		
Date of Next Visit: ☐☐/☐☐/☐☐☐☐ *DD MM YYYY*	*Time:* ☐☐:☐☐ *HH : MM*	

Zanzibar Cable Activity Evaluation

Round 3

Notes to Interviewer: Use this protocol to guide semi-structured interviews with hotel representatives who are knowledgeable about the hotel's operations and power usage. If more than one person is responsible for the hotel's operation and facilities, the interview may be conducted in a small group setting. If a respondent cannot address questions on a particular topic, inquire regarding alternative respondents or sources of information and note them for future reference. The interview is expected to last about 20 minutes.

My name is _____, and I work for the Millennium Challenge Corporation, a United States foreign aid agency based in Washington DC. We are conducting a study on electricity reliability and quality in Zanzibar with the aim of evaluating how the reliability and quality of electricity supply affects hotels in Zanzibar. The study is funded by the United States' Millennium Challenge Corporation (MCC), through the Millennium Challenge Account of Tanzania (MCA-T).

If you agree to participate in the survey, all the answers that you provide will be kept private; only members of the survey team will have access to this information. You would be free to not answer any question that you prefer not to answer, stop the interview at any time, or ask me to clarify or repeat something if you don't understand. You may withdraw from the study at any time, and your decision to participate or not will not affect your eligibility for any current or future services that may be offered to hotels in your area. You can contact us at any time.

I'll be taking notes on our discussion so I can remember details later. We will be reporting on the experiences and viewpoints expressed in the interviews, but no comments will ever be attributed to specific individuals or hotels; all answers are anonymous. The interview will last about 30 minutes.

Would you be willing to answer some questions?

Yes	**1**
No	**0**

If no, STOP and thank respondent for their time.

Thank you. This interview is meant to be a follow up from the interviews we conducted in June and July, to get updated information on the hotel's experiences in the last 30 days. On questions related to the last 30 days, please limit your responses to reflect only what has happened since our previous interview. We will share a brief report on the results of this survey with any interested participants. The next activity on this survey will take place in 2013, after the planned installation of the cable.

Do you have any questions about the study or the interview before we begin?

Zanzibar Cable Activity Evaluation
Round 3

A. General Hotel Information

A. 1 *Interviewer only*: was this respondent interviewed last time?

[*Note to interviewer: use skip only if there is one respondent who is the same person interviewed in July. Otherwise, please record all respondents.]*

Yes	*No*	*Don't know*
1 [SKIP to A5]	0	98

A. 2 What is your name?

First Name:	Last Name:

A. 3 What is your job or role here at this hotel?

Position:

A. 4 How long have you been in this position at this hotel?

Years: ☐☐	Months: ☐☐

A. 5 What is your nationality?

Response:

A. 6 For the past 30 days, what was the occupancy rate of this hotel? *Occupancy rate is defined as the percentage of rooms with one or more guests in them each night.*

Occupancy rate (percent): ☐☐☐

A. 7 Is this occupancy rate higher, lower, or about the same as your occupancy rate around this time last year?

Higher	*Lower*	*About the same*	*Don't know*	*Refused*
1	2	3	98	77

If ABOUT THE SAME, DON'T KNOW, OR REFUSED, skip to Question A.9

A. 8 Why do you think your occupancy rate has increased/decreased compared to this time last year? *[Note to interviewer: Refer to Question 1 in the write-up template.]*

A. 9 For the past 30 days, what was the average nightly room rate at this hotel? *(circle currency)*

$ Tsh: ☐☐☐ ☐☐☐ . ☐☐

Zanzibar Cable Activity Evaluation

Round 3

B. Electricity Consumption

B. 1 What was the amount of this hotel's electricity bill from ZECO for last month?

In thousand Tsh: ☐☐☐,☐☐☐,0 0 0

Did the respondent use the actual bill to answer?

B. 2 How does the hotel pay for electricity?

Monthly	***Pre-paid***	***Other***
1	2	88 Specify_____

→ *If PRE-PAID, skip to B.7*

B. 3 What was the hotel's electricity usage in kilowatt hours for last month?

[Note to interviewer: ideally respondent should produce ZECO bill. Copy numbers from ZECO bill below. Politely request to see a copy if not offered by respondent and easily accessible.]

Units (kWh): ☐☐☐☐☐☐☐☐ kVA: ☐☐☐☐

Factor: ☐☐☐☐

Current month's reading:

☐☐☐☐

Previous month's reading:

☐☐☐☐

Billing period start (DD/MM/YYYY): ☐☐ ☐☐ ☐☐☐☐

Billing period end (DD/MM/YYYY): ☐☐ ☐☐ ☐☐☐☐

ZECO Account Number: _____

Did the respondent use the actual bill to answer?

B. 4 Does hotel have a second ZECO account?

Yes	*No*	*Don't know*	*Refused*
1	0	98	77

→ *If NO, DON'T KNOW, or REFUSED, skip to Section C*

B. 5 If yes, what was the amount of this hotel's second electricity bill from ZECO for last month?

In thousand Tsh: ☐☐☐,☐☐☐,0 0 0

Did the respondent use the actual bill to answer?

B. 6 If yes, what was the hotel's electricity usage in kilowatt hours for last month on the second electricity bill?

Units (kWh): ☐☐☐☐☐☐☐☐ kVA: ☐☐☐☐

Factor: ☐☐☐☐

Current month's reading:

☐☐☐☐

Previous month's reading:

☐☐☐☐

Billing period start (DD/MM/YYYY): ☐☐ ☐☐ ☐☐☐☐

Billing period end (DD/MM/YYYY): ☐☐ ☐☐ ☐☐☐☐

ZECO Account Number: _____

Did the respondent use the actual bill to answer?

B. 7 If PRE-PAID, what is the meter number and tax number?

Meter Number: _____

Tax Number: _____

Did the respondent use the actual bill to answer?

C. Technology to Cope with Power Fluctuations and Interruptions

Note to interviewer: pre-fill any questions or subparts of questions that were adequately addressed in the Round 1 interview. For C2 and C3, you may want to note the number of devices previously reported, verify the number and ask if there were any that were missed in the first interview.

C. 1 ..... Does your hotel have an all-site voltage regulator?

No	*Yes*	*1a. If yes, what year was it installed?*	*Don't Know*	*Refused*
0	1		98	77

C. 2 ..... Does your hotel have UPS (uninterruptable power supply) units?

No	*Yes*	*2a. If yes, how many?*	*Don't Know*	*Refused*
0	1		98	77

C. 3 ..... Does your hotel have surge protectors, fridge guards, or other similar devices (other than UPS) to protect from voltage fluctuations?

No	*Yes*	*3a. If yes, number and type?*	*Don't Know*	*Refused*
0	1		98	77

C. 4 .....I would like to get a better understanding of the generator(s) used by this hotel. Could you tell me how many generators you have, the capacity of each in KVA, and when each was installed?

Generator #	*Capacity (KVA)*	*When installed*	*Don't Know*	*Refused*
			98	77
			98	77
			98	77
			98	77
Notes:				

D. Power Supply Disruptions in the Last 30 Days

D 1.In the past 30 days, has the hotel experienced voltage fluctuations (drops or surges)?

Yes	*No*	*Don't know*	*Refused*
1	0	98	77

D 2.In the past 30 days, how often did your hotel experience …

[Note to interviewer: if respondent offers a qualitative answer (often, never, etc.), prompt respondent to estimate a number. Voltage drops happen when lights dim or equipment with voltage protection shuts off automatically. Voltage surges happen when equipment burns out or when voltage protection shuts off automatically.]

	Number of times	*Average duration (minutes/ hours)*	*Don't Know*	*Refused*
a. Power outages			98	77
b. Voltage fluctuations (drops and surges) ***[If respondent answered "no" for D1, record 0]***		NA	98	77

D 3.In the past 30 days, have any guests…

	Yes	*No*	*Don't Know*	*Refused*
a. Cancelled their reservations due to electricity-related problems?	1	0	98	77
b. Shortened their stays due to electricity-related problems?	1	0	98	77
c. Complained to management about electricity-related problems?	1	0	98	77

D 4. Now I'm going to go through a list of electrical devices. For each device, please tell me if the hotel has spent any money in the last 30 days to repair or replace equipment damaged by voltage fluctuation.

Have any of the following failed in the last 30 days?	***Currency* (circle)**	***Repair Costs***	***Replacement Costs***	***Not Applicable***	***Don't Know***	***Refused***
a. Air conditioners	$ TSh			99	98	77
b. Fans	$ TSh			99	98	77
c. Computers	$ TSh			99	98	77
d. Computer accessories (printers, scanners)	$ TSh			99	98	77
e. Portable telephones	$ TSh			99	98	77
f. Other office equipment (fax machines, copiers)	$ TSh			99	98	77
g. Televisions	$ TSh			99	98	77
h. Refrigerators	$ TSh			99	98	77
i. Stoves	$ TSh			99	98	77
j. Ovens	$ TSh			99	98	77
k. Water heaters	$ TSh			99	98	77
l. Pool pumps	$ TSh			99	98	77
m. Other water pumps	$ TSh			99	98	77
n. Exercise/fitness equipment	$ TSh			99	98	77
o. Laundry machines	$ TSh			99	98	77
p. Other _____	$ TSh			99	98	77
q. Other _____	$ TSh			99	98	77
Did the respondent use hotel records to answer?						

D 5. In the last 30 days, how much did you spend on the following alternate sources of energy as a result of electricity supply interruptions?

	Currency (circle)	*Amount*	*Don't Know*	*Refused*
a. Generator maintenance and repair?	$ TSh		98	77
b. Diesel for the generator?	$ TSh		98	77
c. Paraffin/Kerosene?	$ TSh		98	77
d. Diesel/petrol for purposes other than electricity generation?	$ TSh		98	77
e. Bottled gas?	$ TSh		98	77
f. Charcoal?	$ TSh		98	77
g. Firewood?	$ TSh		98	77
h. Solar power?	$ TSh		98	77
i. Batteries	$ TSh		98	77
j. Candles?	$ TSh		98	77
k. Flashlights/torches?	$ TSh		98	77
l. Other _____	$ TSh		98	77
m. Other _____	$ TSh		98	77
Did the respondent use hotel records to answer?				

D 6. Are there other kinds of losses or damages we haven't discussed already that this hotel experienced in the last 30 days due to problems with electricity supply? *[Note to interviewer: Refer to Question number 2 in the write-up template.]*

D 7. Are you aware of plans to install an undersea electrical cable between the mainland and Zanzibar?

Yes	*No*	*Refused*
1	0	77

→ *If NO or REFUSED, skip to Question D.13*

D 8. Do you expect that your electricity-related costs will change after the cable is installed (for example, your costs for purchasing electricity or for protecting, repairing, or replacing electrical equipment)?

Yes	*No*	*Don't know*	*Refused*
1	0	98	77

If NO, skip to Question D.10

D 9. If yes, please tell me specifically how you expect your electricity-related costs will change? *[Note to interviewer: Probe for changes in electricity rates, costs of repairing or replacing equipment, costs of generator use, changes in use of electrical appliances, etc. Refer to Question 3 in the write-up template.]*

D 10. Do you expect that your ability to attract guests to your hotel or your occupancy rate will change after the cable is installed?

Yes	*No*	*Don't know*	*Refused*
1	0	98	77

If NO, skip to Question D.12

D 11. Please tell me specifically how and why you expect your ability to attract guests to your hotel or your occupancy rate will change. *[Note to interviewer:* Probe for expected changes in hotel marketing strategies, changes in hotel amenities, increases in the number of travelers, etc. *Refer to Question 4 in the write-up template.]*

D 12. Are there any other types of changes you expect in your hotel's operations or business after the cable is installed? *[Note to interviewer: Probe for plans for expansion or improvements to the hotel, staffing changes,etc. Refer to Question 5 in the write-up template.]*

D 13. Do you have any questions about this study? ***[Note to interviewer: Refer to Question 6 in the write-up template.]***

[Note to Interviewer: We will gladly provide them with a copy of any official MCC, MCA-T, or MPR publication that results from this study, once it is completed, and thank them again for their participation. You may get questions regarding project implementation, such as timing for finishing the cable. Please refrain from answering questions not directly related to your scope of work and the survey. You can politely take note of the question and pass it along to an MCA-T/MCC representative].

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Zanzibar Cable Activity Evaluation
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DIRECTLY AFTER QUESTION D7, IF THE RESPONDENT ANSWERS YES.

D 7. B. From where did you hear about the cable? *Record at most three answers.*

TO BE INSERTED BEFORE QUESTION D13.

E: Presenting information to participants

Read out loud: As you know, this is our third and final interview. We have conducted the same survey with 30 hotels all around Unguja Island. After we analyze the results of these interviews, we would like to present them to you, and the other data providers.

E 1. Based on the information gathered in these surveys, what information would be most useful or interesting to you? *Check all that apply.*

	Yes
a. General hotel information (occupancy rate, room rate, staff)	
b. Electricity consumption (equipment used, as well as costs)	
c. Coping with power fluctuations and interruptions	
d. Power supply disruptions during the period of the questionnaire (including damages and associated costs)	
e. Impact of the 2009-2010 blackout	
f. Other, specify:	

E 2. How would you like to receive this information? *Check all that apply.*

	Yes
a. Written memo via email (2-4 pages)	
b. Meeting in Stone Town (sometime between October-January)	
c. Other, specify:	

Zanzibar Cable Activity Evaluation

Round 3

Addendum sheet

If A or C, skip to Question E 4.

E 3. If you chose a meeting, what would be the most convenient time? *Check all that apply.*

	Yes
a. Weekday, 9-5	
b. Weekday, evening	
c. Saturday, morning	
d. Saturday, evening	
e. Sunday, morning	
f. Sunday, evening	

E 4. Why do you want to receive the information in that form? ***Please note whether the interviewer has a strong preference for or against any of the given options.***

E 5. What other hotels do you see as your main competitors? *This question is to help us understand how to categorize the hotels. Comparison hotels should be in terms of customer base, as well as services offered.*

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