Scientific Research Publishing

Modern Economy, 2021, 12, 1424-1448
https://www.scirp.org/journal/me
ISSN Online: 2152-7261
ISSN Print: 2152-7245

Consumer's Perception of the Quality of Electricity Supply in Côte d'Ivoire: The Case of Households and Very Small Enterprises (VSES)

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How to cite this paper: Tehero, R., & Aka, E. B. (2021). Consumer's Perception of the Quality of Electricity Supply in Côte d'Ivoire: The Case of Households and Very Small Enterprises (VSES). *Modern Economy, 12,* 1424-1448.
https://doi.org/10.4236/me.2021.129073

Received: June 24, 2021
Accepted: September 26, 2021
Published: September 29, 2021

Abstract

Though Electricity quality is important for development and economic growth, its performance remains relatively low in Côte d'Ivoire due to many factors such as grid aging, lack of necessary investment program, etc. This paper analyzes consumer's endorsement and willingness to pay (WTP) for an improved quality of electricity service. This matter is all the more important required investment for improving electricity quality that should be supported by consumers. Therefore, by using contingent valuation method, 1073 households and 98 Very Small Enterprises (VSEs) in 4 cities of the south-east of Côte d'Ivoire have been interviewed. Data have been analyzed by using, Chi square, correlations and OLS methods. The findings highlight that, neither households nor VSEs endorse to pay more for an improved quality of electricity for various reasons such as low income. For instance, 59.7% of household respondents do not endorse by mentioning having other priorities related to shelter, food, clothes or health. In the same way, VSEs mentioned their low incomes and tax level, etc. Moreover, the average amount of electricity bill and the willingness to accept (WTA) in compensation of abusive outages have a positive effect on household's WTP. Idem, the number of sensitive equipment, the willingness to accept in compensation of abusive outage and the cost per hour incurred by VSEs have a positive effect on the WTP. The average value of household's WTP is XOF 1003.07 and their WTA for outages lasting more than six hours is XOF 1595.41. The average value of VSE's WTP is XOF 4130.95 and their WTA in compensation of outages lasting more than two hours is XOF 4546.15.

Keywords

Reliable Electricity Service, Contingent Valuation, Households, Very Small Enterprises, Côte d'Ivoire

1. Introduction

Quality problems of electricity are causing a lot of damages for all the categories of consumers by affecting the proper functioning of equipment and household appliances, comfort in terms of living standards and the productivity of firms, commerce or services (RTE, 2011; Amadi et al., 2016). Indeed, electricity quality has a positive impact on education and has a collective benefit for society (UNDESA, 2014). However, this quality is quite low in many countries and depends on many factors including the level of income and education, the size of the family, electricity bill value (Zoric & Hrovatin, 2012; Shi et al., 2013), and losses or marginal benefit. Moreover, at the scale of the country, electricity deficiency can affect the country's economy.

In Côte d'Ivoire like in many sub-Saharan countries, significant efforts are necessary for improving electricity quality and the State seems to have made the development of the sector his workhorse. In addition to interruption or electricity load-shedding, losses in the grid in recent years were above 20% of the total energy conveyed. The targeted performance, which is 86%, has never been reached since 1990. According to the 2017 annual report of the electricity regulator in Côte d'Ivoire (ANARE, 2017), the average selling price of one kWh of electricity was lower than its production cost by XOF 3.5 per kWh. However, it must be recognized that the literature about electricity quality is scarce, and that dealing with this subject in Côte d'Ivoire is almost non-existent.

This paper aimed at analyzing how far households and VSEs are ready to pay to avoid outages. Indeed, the development of power sector requires increasing and improving generation [sustainable and at lower costs] and grid infrastructures. For this purpose, high investments including private players are necessary and consumers should support extra charges (Taale & Keyremeh, 2015) to the extent that tariffs should reflect costs at the risk of being a handicap for investment. However, the country experienced manifestations of discontent following the last increase in power tariffs in many localities in 2016. Therefore, price adjustments (or cost reduction efforts) were necessary while looking for quality improvement purposes. Also, the weakness of the literature evoking Côte d'Ivoire suggests drawing inspiration from the experiences of countries living similar realities such as Ghana (Taale & Kyeremeh, 2015) or Zambia (Batidzirai et al., 2018). In this regard, this paper seeks answers to the following two questions: 1) Do consumers endorse paying more for improved quality of electricity supply? 2) What are the determinants of household's and VSE's endorsement and willingness to pay to eradicate outages?

In this study will be presented conclusions of a survey conducted by using a paper questionnaire for assessing the endorsement of households and Very Small Enterprises (VSEs) also called Micro-Enterprises (less than 10 employees) to support higher tariffs in order to improve the quality of electricity and their Willingness to Pay (WTP). Contingent valuation techniques have been used to collect data, before proposing an analysis using the Chi square to test the de-

pendency of customer endorsement to pay higher price for an improved quality with qualitative variable; cross analysis of average value statistics for testing test customer's endorsement to pay and quantitative variables; and finally, OLS regression for analyzing customer WTP. This study consisted in a first step to analyze the relationship between household's endorsement to pay for an improved quality of electricity and the level of income and how consumer perceives the present quality of electricity supply; and to show the effect the average value of electricity bill and household's Willingness to Accept (WTA) in compensation abusive outage on their WTP. In a second step, the effect of quantitative variables such as the number of sensitive equipment, the average amount of electricity bill and the WTA in compensation of "long" outage on VSE's WTP as well as the dependency between qualitative variables such as price or quality satisfaction level and VSE's endorsement and WTP.

This article will present in a first section a literature review for evoking results of survey about consumer WTP for improved quality of electricity before detailing the methodology adopted for the analysis. The third section presents the results of the survey before proposing a discussion in a final step.

2. Survey to Assess Customer's WTP to Avoid Outage in the Literature

In the literature, contingent valuation method for assessing customer's WTP has always been a favored approach in economics and marketing. However, research paper evoking survey about electricity reliability is not vast. The main preoccupation lies in the consequences of power outage which may be damageable for the economy at different level, and the impact of blackout is an evident example. For this reason, improving electricity reliability is a major concern for all the players (government, operators and consumers) and requires enhancing the performance of infrastructures in the power system. Undeniably, it will necessitate heavy investments which should be supported by customer. Most exclusively, demand for quality has always been addressed in the literature in terms of outages costs which is more tangible for industries and commercial customers and less tangible for residential customers (Caves et al., 1990).

One example of research paper addressing residential customers is the article written by Ozbafli and Jenkins (2015) aiming at analyzing household's WTP for more reliable electricity in the north of Cyprus. They defend that households are ready to support an increase of 13.5% of their monthly bill. They also conclude after a cost-benefit analysis a net benefit since their WTP is large enough to finance the necessary investments to eradicate outage. Also in Europe, similar studies about residential customer's WTP have been achieved with different conclusion. For instance, Pepermans (2011) analyzed the influence of perception, socio-economical context and demographic factors on customer's WTP in Flanders. Indeed, this part of Belgium is performing relatively well in terms of reliability indicators (sic). The most interesting information from this paper is

probably the findings revealing that the perception of reliability may be different depending on customers and regions. One consequence is that some customers would prefer "low" reliability if it supposes the reduction of the cost of electricity.

An identical observation has been done in Hong Kong through the study of Woo et al. (2014) conducting a telephone survey toward 1876 households. Indeed, the reliability of power energy is "almost perfect" in Hong Kong. The authors supposed that depending on outage cost, some costumers may probably accept lower quality in compensation of paying lower bill while other would reject reliability reduction. However, through ordered-logit regression technique, they concluded that residents in Hong Kong preferred the very high existing reliability level.

Moreover, in Asia, an article written by Kim et al. (2019) about "the rolling blackout" in South Korea in 2011, describes its consequences on the residential sector. That rolling blackout was occasioned by the rapid increase of the electricity demand. Indeed, during the month of May 2018, the authors achieved a residential-based survey to assess residential customer's WTP to eradicate outages. They estimated the average WTP to US$1.41 per month that should be sufficient to support necessary investments to prevent outages.

In Africa, few studies about WTP for reliable electricity have been found. Taale and Kyeremeh (2015) completed a survey considering 950 households responding to a written questionnaire in Cape Coast (in Ghana). Results from tobit regression showed the impact of the income level, the number of family members, the prior notice of electricity supply failure, ownership of business. Also, Nkosi and Dikgang (2018) conducted a survey by using electronic gadget in order to assess household's WTP for facing frequent power outage in South Africa, and the necessary investments for dealing with welfare loss. By using different methods [random panel tobit and cross-sectional heterogeneity], they defend that the WTP increases with outage duration.

Carlsson and Martinsson (2008) while analyzing the marginal WTP of Swedish households share this conclusion. They proceed by random parameter logit model of experiment survey to conclude that the "marginal" WTP for reducing power outage increases during winter or weekend. They finally suggest the government to care about negative effect of power outage.

Some authors such as Reichl et al. (2013) adopted a more global study analyzing the economic impact of electricity interruption and a survey for determining household and non-household WTP in Austria. By using the assessment tool "APOSTEL", these authors simulated different situations by considering interruption duration, the week, the day and the hour for calculating the economic effects. As an example, their study assessed for one kilowatt-hour not supplied and one-hour interruption in summer during morning workday, an economic cost of €17.1. In addition, assessing customer's WTP may suggest looking into the cost of power outage. For this purpose, Kufeoğlu and Lehtonen (2015) propose a very interesting paper on customer survey conducted in Finland which

assess the cost of power outage. Based on added value information to assess economic cost, they analyze econometrics and survey methods by mentioning strengths and weaknesses of each approach, and proposing a hybrid model.

Bliem (2009) by means of an empirical study based on a survey establishing preferences of households and enterprises put into evidence the link between price cap [$P_i = P_{i-1} + NPI \pm Q$; with Q factor representing customer preference for reliability] and electricity quality in Austria. The author explains that the regulator focuses on indicators such as System Average Interruption Duration Index (SAIDI), by assessing an *ex post* "realized" value compared to a reference defined *ex-ante*. A reliability index Δ_i [$\Delta_i = \text{SAIDI}_{ref} - \text{SAIDI}_i$] linked to customer's WTP of businesses and enterprises is evoked to benefit continuous supply. In the same vein, the importance of adapting legislation when necessary for improving an efficient allocation of available capacities has been underlined by a study carried out in Chili by Serra and Fierro (1997). They remind the difficult context of electricity restriction of 1989 and its impact on the allocation of electricity supply. Their findings [from a survey shortly thereafter and an equiproportional restriction in the current legislation] estimate outage cost in industry to US¢7.7 per kWh which drop to US¢3.2 per kWh for limited selective restrictions.

Some studies only focused on Enterprise's WTP. As an example, a study in a neighboring country of Côte d'Ivoire carried out by Doe and Asamoha (2014) highlighted the importance of electricity for better productivity of Small and Medium-sized Enterprises as evoked by while analyzing via a cross-sectional survey of 70 SMEs and mixed methods to put into evidence the importance of the quality of electricity in Accra (Ghana). The author proved that the failure of power quality increases operating costs. A similar study in Nigeria, proposed by Amadi et al. (2016), analyzed the impact of the weakness of electricity quality in terms of optimization of capacity use, productivity, competiveness and marginal profit. The methodology adopted by the authors was based on random representative sample of industries of different sizes and domain of activity in three States [Kano, Lagos and Rivers] of Nigeria. 250 industries out of 350 participated in the survey and results highlighted possible severe impacts, mainly for firms functioning 6 days a week and 24 hours out of 24. In Zambia, about 50% of respondents are willing to pay ZMW 0.09/kWh according to Batidzirai et al. (2018). Indeed, by using a tobit method, they proved that consumption level, profitability, age of the enterprise, and energy mix do not affect WTP, while the working hours negatively affect WTP and, profit level has a positive impact.

3. Methodology of Analysis

A survey focused on households and VSEs was conducted in the south-east of the country. It was highly inspired and adapted from the approach adopted by Taale and Kyeremeh (2015), Batidzirai et al. (2018) and to a lesser extent Niu et al. (2016) and Ardito et al. (2003). It aimed at identifying the opinion of con-

sumers—households and VSEs—and has been conducted in the district of Abidjan, which houses around 20% of the population of Côte d'Ivoire, in Bingerville, Grand-Bassam and Bonoua.

A representative sample of the population in Côte d'Ivoire in terms of living standard and education has been targeted. The study took place over a period of four months (April, May, June and July 2019). Many techniques were possible to estimate outages [proxy methods using observable behaviors, case studies analyzing direct and/or indirect costs, indirect analytic methods using official data such as tariffs/gdp/annual consumption, customer survey] (Amadi & Okafor, 2015). But this section opted for contingent valuation which is one of the most widely used approaches to achieve stated research objectives.

Design and implementation of the survey

Survey techniques and contingent valuation have been completed to assess the WTP of consumers in the perimeter of analysis. Indeed, the material used is a questionnaire and the sample is made up of 1073 households and 98 VSEs to a face-to-face interview randomly drawn in a geographical coverage including four cities which are Abidjan, Bingerville Bonoua and Grand-Bassam. Investigations were carried out and interviewees were chosen from various areas of the city. The questionnaire described the specificities of electricity and hypothetical circumstances about quality attached to it. It takes into account the observation of respondents about the sequence of questions, required time to fill the questionnaire, the fact of thinking aloud, paraphrasing and confident rating (Statistics Canada, 2010). The survey also deals with singularities of households or VSEs which have been interviewed.

The team responsible for conducting this survey went to the field to gather data by door-to-door interview in order to avoid any ambiguity and the risks of dealing with illiterate respondents. Every interviewer holds at least a bachelor's degree or was completing the last year of this degree. Information was collected directly from the head of the house (the person in charge of paying the electricity bill) or the VSE's responsible. Also, an experimental period (pre-test or pilot test) involving a sample of 10 households and 5 VSEs was previously instigated to get an idea of the overall reaction and adjust the questionnaire "draft". Most of the time, interview with households have been conducted during the week-end because interviewers wanted to ensure the presence of family head for the survey toward households.

The content of the questionnaire

First, the questionnaire provides information on customers' awareness on electricity quality problems and impacts. It aims to know the consequences on customers, and the most inopportune moment for outages. Secondly, information on consumer's endorsement and WTP for improved quality of electricity will be analyzed. Indeed improving electricity quality may require new investments in generation and transport infrastructures or new technologies implying metering activities. These investments have to be financed and recovered most

probably by an increase in tariffs.

For decades, valuing public goods has always been a challenge for researchers. A questionnaire was designed to assess the impact on households of electricity quality problems. The Government of Côte d'Ivoire is actively working on electricity quality for economic and political reasons. Indeed, electricity is a strategic input for VSEs and, dissatisfaction due to power outage can influence elector's choice.

This study was conducted among households and VSEs, all are customers of the CIE, to know if they were satisfied or not with the quality of electricity supply in Ivory Coast and if they would agree or not to pay more for improving its quality. It aims to:

- evaluate the consequences of power outages for households and VSEs;
- know if respondents would endorse to pay more for improving the quality of electricity supply;
- determine consumer's WTP for better electricity quality.

Value of the data

The survey gives useful information about electricity consumption of residential and VSEs customers and their preferences. According to the available report or studies, it is by far the first study analyzing the quality of electricity supply, consumer's preference and WTP in Côte d'Ivoire. Also, data providing evidence on differences between customer types can be helpful for benchmarks with other places and a useful support for policy implementation in the power sector.

Analytical methods

The report of the survey presents all the results of the study through:

- *Basic sorting*: for descriptive analysis in the form of tables. When many choices are possible, the sum up of responses may be higher than hundred percent.
- *Average and Cross-sorting*: for analyzing the relationship between two variables.
  - The Chi square contingency test aims to verify the existence of this link of association between two qualitative variables. In an objective way, it indicates if such a relationship observed "with the eye" is the reflection of a reality or a coincidence. It can detect an association but it gives neither the direction nor the intensity of this relationship. Theoretically, it supposes two qualitative variables at respectively p and q categories which are measured over N statistical units. The crossing of these two variables is described by a probability table.

$$\chi^2 = \sum_{k=k,l=1}^{p,q} \frac{\left(n_{kl} - \left(n_{k.} \cdot n_{.l}/N\right)\right)^2}{n_{k.} \cdot n_{.l}/N} \quad \begin{cases} \mathrm{H}_0 : \text{the variables are independents} \\ \mathrm{H}_1 : \text{the variables are not independents} \end{cases}$$

N is the number of observations.

Under the null hypothesis, this statistic follows the Chi-square distribution by [$dof = (k-1)\cdot(l-1)$] degree of freedom, with k and l the modalities of the [qualitative] variables in which interdependency is tested.

- In other circumstances, a cross-analysis of average value will be preferred to observe the relationship between a qualitative variable and a quantitative one.
- Furthermore, a Bravais-Pearson linear correlation analysis will be done for describing the relationship between two quantitative variables.
- Finally, effects of variables on the CAP will be envisaged by using multivariate regression analysis. The basic [matrix] model is as follows:

$$y = \beta X + \varepsilon \ ;$$

This model is established based on the following assumptions:

- β_i constant;
- the error term (ε) is independent of the joint distribution of exogenous variables, which are therefore assumed to be deterministic;
- $E(\varepsilon_i) = 0$ and $Var(\varepsilon) = \sigma^2 I$, but eventually $\varepsilon\left(N\left(0, \sigma^2 I\right)\right)$.

List of Variables

As indicated in Table 1, the variables of analysis are quantitative and qualitative.

The following hypotheses, inspired by the literature and research objectives, will be tested for these two types of consumers:

Table 1. Description of the variables of analysis.

Variables	*Meaning*	*Nature*
AAEB	Average Amount of Electricity Bill;	*XOF* (*monetary unit*)
CPH	Cost Per Hour for VSEs;	*XOF* (*monetary unit*)
FTEE	Full-Time Equivalent Employee;	*Numerical*
HS	House size, the number of persons living in the house;	*Numerical*
NSE	Number of Sensitive Equipment;	*Numerical*
WTP	Willingness to Pay (additional amount by electricity bill) to avoid outages, it is the dependent variable, estimated by the average value;	*XOF* (*monetary unit*)
WTA	Respondent's Willingness to Accept in compensation of abusive outages;	*XOF* (*monetary unit*)
WH	Working Hours;	*hours*
Satisfaction level	To describe how satisfied customers are. This variable can be used either for qualitative or quantitative analysis;	*Numerical* (1. 2. 3. 4. 5.) *Qualitative:* 1. Not at all satisfied; 2. Not satisfied; 3. Indifferent; 4. Satisfied; 5. Very satisfied;
ETP	Endorsement to Pay;	*Yes/No*
TV Time	Time spent watching TV;	*Hour* (*s*)
Outage Impacts	Perishable goods; Production losses; delay in operations; Breakdown of essential equipment; others (education, security, disturbed, sleep, etc.); No consequence;	*Yes/No*
Disapproval arguments	Low income level; Price level; country's potential; others [Price in neighboring countries, lack of trust vis-à-vis CIE]; the government should support costs.	*Yes/No*

- *Hypothesis* 1*:* there is a relationship of dependency between on the one hand, customer's endorsement to pay higher tariff for improved quality and, on the other hand, price satisfaction, impact of outages on equipment (electrical appliances), quality satisfaction and reasons evoked by respondents mainly the income level;
- *Hypothesis* 2: there is a positive impact of the number of sensitive equipment (electrical appliances), the family size, the average amount of electricity bill and household's WTA in compensation on their WTP on the household's WTP;
- *Hypothesis* 3: the number of full-time equivalent employees, average amount of electricity bills, the number of sensitive equipment, the working time and incurred costs per hour of outage, have a positive effect on VSE's WTP.

-*Comments*: some comments will be done to highlight the most relevant results.

4. Analysis of the Results of the Survey toward Household's Perception of the Quality of Electricity Supply

The aim consisted for respondents to assess the overall functioning of the concessionaire in monopolistic situation. It should be noted that the opinions of interviewees converge on many points. Their assessment of the CIE is not good. Indeed, complaints multiplied as the investigation progressed. The following table gives the general opinion of interviewees about electricity service they are using to receive.

Table 2 reveals meaningful information about the perception of respondents related to the overall quality encountered in the sector. Indeed, 58.2% of respondents are not satisfied with the quality of electricity supply, and 23% remain indifferent. A higher percentage of them pretend to be "not satisfied" neither of the price (82%) which looks expensive nor the response time following incidents (73.7%). Moreover, 74% of interviewees think that the warning time before interruption or outage risk for preventive or curative maintenance is not adequate, 23.6% remain indifferent. As noted above, the operator may envisage warning

Table 2. Household's satisfaction about quality service.

Customer's Satisfaction level	Quality of electricity supply	Price	Response time following incidents	Warning time before outage	Updated Website
Not at all satisfied	27.8%	50.1%	41.2%	42.4%	5.7%
Not satisfied	30.4%	31.9%	32.5%	31.6%	6.6%
Indifferent	23%	11.3%	22.1%	23.6%	84.2%
Satisfied	18.2%	6.3%	3.3%	2.1%	2.4%
Very satisfied	0.6%	0.3%	0.9%	0.3%	1.2%
Total	100%	100%	100%	100%	100%

consumers for preventive or corrective maintenance as well as new projects or coming phenomenon which are able to affect the quality of electricity. That is what is called *planned outage*. However, the majority of respondents do not really know the meaning of this expression so far as 74.3% of them do not know the meaning of "planned outage" while 25.7% pretend to know, but only 17.3% really know.

Moreover, power energy outages may affect equipment, perishable goods, schedule of consumers and different aspects of the life. Table 3 is trying to sum up the impact of quality failure for households.

In Table 3, "others" includes disturbance of children education, disturbed sleep, insecurity, delays in completing tasks, being late at work, charging phone which can become problematic, loss of data, internet. Curiously, 9.6% of respondents pretend not to be affected by electricity outages. Nevertheless, to protect their equipment, respondents (27.5% of them) are using to have a voltage stabilizer.

Endorsement to pay higher price for better electricity quality

Improving the quality of electricity supply requires heavy investments, either from public or private players, in power infrastructures. As long as price should support costs, it seemed relevant to question customers about their endorsement or not to pay higher price to support relative investments.

The survey reported in Table 4 reveals that 22% of respondents would endorse paying more for improving power quality. 78% of them would not endorse paying more to eradicate outages for various reasons:

- 59.7% of [total] respondents evoked an income problem which would be relatively low to justify their refusal;
- 29.6% of them esteem a price already too high and meter not reliable;
- 24.6% of them evoked various reasons such as the price of electricity is lower in neighboring countries, or there is a lack of trust vis-à-vis CIE.

Table 3. Impact of electricity outages on households.

Consequences of outages	Nb. Respondents	Frequency
Degradation of perishable goods in the refrigerator	413	38.5%
Breakdown of essential equipment or household appliance (bulbs, TV, computers, etc.)	833	77.6%
Others	362	56.5%
No consequence	103	9.6%

Table 4. Household's endorsement to pay higher price to avoid outages.

Endorsement to pay more for improved quality	Nb. Cit.	Freq.
Yes	236	22%
No	837	78%
Total	**1073**	**100%**

- 20.9% of them refuse insofar the country produces electricity and 10.3% are thinking that the government should assume additional costs incurred;

Also, respondent's endorsement varies depending on the locality. Indeed, those from localities where outages are frequent seem more prompt to accept than those living in areas where the quality of electricity is better.

Cross-analysis

Table 5 is proposing a cross-analysis of the average values analyzing qualitative variables and quantitative variables on the one side, and qualitative variables on the other side. Also, the first one is evoking the average amount of electricity bill in the second column and price satisfaction in the third column. In the first column is reported respondent's choice to endorse or not paying a higher price for benefiting from better electricity quality. The aim is to analyze tendencies of respondent's endorsement vis-à-vis these two variables (Table 5).

Respondents agreeing to pay higher price are those who are already paying higher electricity bill. Also, by referring on the price satisfaction index, 1.78 in average for those responding "yes" and 1.74 for the others, it is possible to conclude that these two groups of respondents are not satisfied about the current price level.

Table 6 puts into evidence the dependency of household's endorsement to pay for an improved quality of electricity. From these results, four important points

Table 5. Relationship between household's endorsement and price satisfaction and average amount of electricity bill.

Endorsement to pay more for improved quality	Average amount of electricity bill (XOF)	Price satisfaction
Yes	35,417.91	1.78
No	28,951.41	1.74
Total	30,244.78	1.75

[Price satisfaction: 1. Not at all satisfied; 2. Not satisfied; 3. Indifferent; 4. Satisfied; 5. Very satisfied]

Table 6. Dependency of household's endorsement to pay higher price.

	Endorsement to pay for improved quality
Satisfaction of electricity quality	$\chi^2 = 9.30$ $(1 - p = 94.60\%^{+})$ Dof: 4
Disapproval arguments	$\chi^2 = 391.81$ $(1\text{-}p \geq 99.99^{+++})$ Dof: 4
Consequences of outage	$\chi^2 = 3.84$ $(1 - p = 42.69\%)$ Dof: 5
Price satisfaction	$\chi^2 = 8.54$ $(1 - p = 79.88\%)$ Dof: 6

$(^{+++})$ $p < 1\%$; $(^{++})$ $1\% < p < 5\%$; $(^{+})$ $5\% < p < 10\%$; Dof: degree of freedom.

can be drawn:

1) there is a relationship of dependency between respondent's satisfaction level of electricity quality and their decision to endorse or not to pay more;

2) there is a very strong dependency between the refusal to pay more for reliable electricity supply and the reasons evoked by respondents such as their low level of income (59.7% of respondents);

3) there is no link of dependency between respondent's endorsement to pay more or not and the consequences of electricity outages;

4) the "price satisfaction" and the decision to endorse or not to pay a higher price are independent.

Household's Willingness to Pay for improved electricity quality

This section aims at analyzing quantitative variables which are described by numerical and monetary values as presented in Table 7.

The average value of household's WTP for more reliable electricity is *XOF* 1003.07, a minimum of XOF 0 and a maximum of XOF 15,000. The majority of respondents proposed the same amount whether for planned or unplanned outages. Furthermore, the percentage of respondent endorsing to pay higher price when an engagement of compensation is proposed is higher than in the context when they were not talked about it. Also, 74% of the respondents would accept to pay between XOF 0 and XOF 2000 maximum, while and 97% of interviewees would be included if the limit is raised up to XOF 6000. Only 2 % of respondents are willing to pay more than XOF 10,000.

About compensation, the question has been asked to respondents about their Willingness to Accept (WTA) in case of abusive outage. Benchmark duration of six hours has been selected in so far the cumulative frequency of households thinking that they deserve compensation for outages lasting from two to six hours reached 57.7%, whether the outage is planned or unplanned. As a result, on average, households are willing to accept XOF 1595.41 for interruption longer than six hours. This value is an average of interviewee's WTA for unplanned outages (XOF 1721.1) and planned outages (XOF 1469.72). The compensation can be done by tariff abatements for instance.

The sample of analysis is varying in terms of size. On average, the size of a household is around 4.91 persons. These values range from 4.6 which is the average value in Abidjan and 5.3 the one in the Sud Comoé, which is the region

Table 7. Descriptive analysis of variables for households.

Variables	Average	Min	Max
HS	4.91	1	18
WTP	XOF 1003.07	XOF 0	XOF 15,000
WTA	XOF 1595.41	XOF 0	XOF 20,000
TV time	49.13 hours	0 hour	130 hours
NSE	5.58	1	15
AAEB	XOF 30,244.78	XOF 3000	XOF 180,000

including Bonoua and Grand-Bassam[1]. There are houses of persons living alone, young couples with one child or not, and residences such as "family house" where much more persons can be met. According to that survey, on average, households are watching TV for 49.13 hours per week. Also, the number of sensitive equipment depends on respondent's point of view. Indeed, they may consider, computer, air conditioner, TV, ventilator, refrigerator, etc. as delicate devices.

This analysis aims to identify variables which are able to affect household's WTP. Indeed, it will consider the WTA as a compensation for outages lasting more than six hours, the number of sensitive equipment (NSE), the time spent watching TV (TV Time) during a week, the house size (HS) which is the number of persons in the house and the average amount of electricity bill (AAEB).

This model (Table 8) explains 78.8% of the variance of WTP. A parameter is significant when the ratio of the slope by the standard deviation (std) is higher than 1.96. Base on this model from the sample of analysis, it is possible to conclude a significant effect of the WTA, with a slope of 0.52, and the average amount of electricity bill on the household's WTP with a slope of 0.03. This statement is supporting results from the cross analysis of average value analyzing respondent's endorsement to support higher price for more reliable electricity supply. Indeed, respondents supporting higher electricity bills on average are those endorsing paying higher price for improved quality.

If household's WTP is highly correlated with WTA with a coefficient of correlation of 0.81, the significance is less strong between WTP and AAEB (0.53). Ultimately, TV time, and HS do not have a significant correlation. Indeed, the correlation between WTP and HS is 0.19, as well as TV time, 0.33.

5. Analysis of the Results of Very Small Enterprise's Perception of the Quality of Electricity Supply

An important purpose of this survey consisted to assess VSE's point of view

Table 8. Effects of variables on household's WTP.

	Model	(1)	(2)	(3)	(4)	(5)	(6)
(1) WTP	Dependent variable	1.0					
Constant	−461.552***						
(2) HS	−48.93 (47.37)	0.19	1.0				
(3) AAEB	0.03 (0.01)***	0.53	0.47	1.0			
(4) WTA	0.52 (0.04)***	0.81	0.16	0.46	1.0		
(5) TV Time	3.9 (4.18)	0.33	0.49	0.53	0.30	1.0	
(6) NSE	−36.65 (60.14)	0.44	0.23	0.68	0.43	0.40	1.0
R-square 0.788							

$^{+++}p < 1\%$; $^{++}1\% < p < 5\%$; $^{+}5\% < p < 10\%$; (std) standard deviation.

[1]Institut National de la Statistique (INS) [National Institute of Statistics]: http://cotedivoire.opendataforafrica.org/pwffiqd/m%C3%A9nages (last visit, 03/07/2019).

about the quality of service delivered by the CIE. It can be noticed that in general, respondents do not really appreciate the overall service quality provided by CIE as presented in Table 9.

These results (Table 9) about the overall service quality assessed by VSEs are not different with results from households. In general, interviewees are not satisfied about parameters addressed in Table 9. Indeed, 52% of respondents are not satisfied with the quality of electricity supply, 28.6% remain indifferent and 19.4% pretend to be satisfied. The majority of respondents (72.5%) are not satisfied with the price and 68.3 % of them are not satisfied with the response time after an incident has occurred while 7.1% declare to be satisfied. The others (30.6%) remain indifferent. Likewise, 76.5% s are indifferent with the state of the website whether updated or not and 63.3% of interviewees are not satisfied with the warning time before interruption for preventive or curative maintenance or outage risk, 30.6% are indifferent.

Consequences of electricity outages for Very Small Enterprises vary depending on the main activity or services provided by the enterprise. Mostly, electricity outages have an impact on equipment, productions and operations of VSEs. For 7.1% of respondents, insecurity, inactive alarm, are possible consequences of electricity outages. Nevertheless, the majority of respondents are denouncing the breakdown of essential equipment for 72.4 percent of them, production losses for 52% of them and a delay in operations (61.2%). Only 3% of interviewees evoked degradation of perishable goods.

This result does not really include inactivity cost of workers. Indeed, some VSEs seem to be unaware of that. Also, to protect their equipment around 18% of respondents have voltage stabilizer. None of those who have been interviewed has a power generator. Also, the concept of *planned outage* is not really known by this category of consumers since 12.2% of them pretend to know its meaning but 10.2% really know what it means. 87.8% of respondents do not know the meaning of "planned outage".

Endorsement to pay higher price for improved electricity quality

According to Table 10, VSEs do not agree to pay higher price to eradicate outages.

Only 24.5% of interviewees would agree to pay higher price for improved

Table 9. VSE's satisfaction about quality service.

Customer's Satisfaction level	Quality of electricity supply	Price	Response time following incidents	Warning time before interruption	Updated Website
Not at all satisfied	21.4%	42.9%	27.6%	28.6%	10.2%
Not satisfied	30.6%	31.6%	40.8%	33.7%	10.2%
Indifferent	28.6%	18.4%	24.5%	30.6%	76.5%
Satisfied	19.4%	7.1%	4.1%	5.1%	3.1%
Very satisfied	0%	0.0%	3.0%	2%	0%
Total	100%	100%	100%	100%	100%

Table 10. VSE's endorsement to pay higher price to avoid outages.

Endorsement to pay for improved quality	Nb. Cit.	Freq.
Yes	24	24.5%
No	74	75.5%
Total	**98**	**100%**

Table 11. VSE's endorsement, price satisfaction and average amount of electricity bill.

Endorsement to pay more for improved quality	Average amount of electricity bill (XOF)	Price satisfaction
Yes	42,291.67	1.71
No	35,465.54	1.98
Total	37,137.24	1.90

[Price satisfaction: 1. Not at all satisfied; 2. Not satisfied; 3. Indifferent; 4. Satisfied; 5. Very satisfied]

quality and 75.5% of would not accept to pay more to eradicate outages for various reasons. A deep analysis reveals that 40.8% of total respondents affirm that their activity is not profitable enough to support an extra charge for an improved quality of supply while 28.6% are not satisfied with the current price level by contesting meters or the price-quality ratio. 14.3% of respondents are evoking the capacities of the country in terms of power generation. For all these reasons, 9.2% are thinking that for no reason electricity should be more expensive than in neighboring countries.

Cross-analysis

Table 11 is presenting the relationship between VSE's decision to endorse or not to pay more for eradicating outages and, the average values of their price satisfaction and amount of electricity bill.

Respondents endorsing paying higher price are those who are already paying higher average amount of electricity bill. However, they are not satisfied about the electricity price because they think to deserve better quality for the current price level. The other VSEs are not pleased to pay more, and, although on average they pay lower amount of electricity bill with a higher indicator value of price satisfaction, they remain unsatisfied like the previous group.

As indicated in Table 12, it can be noticed that:

1) the dependency is significant between quality satisfaction and the decision of respondents to endorse or not to pay more;

2) there is a very high dependency between the refusal to pay more for better quality and the reasons evoked by respondents;

3) there is no link between the endorsement to pay more or not and outage consequences;

4) the decision of VSE to endorse or not a higher price is independent of their opinion about price satisfaction.

VSE's Willingness to Pay for reliable electricity supply

As indicated in Table 13, the average value of VSE's WTP for more reliable

Table 12. Dependency of VSE's endorsement to pay higher price.

	Endorse or not to pay more for better quality
Satisfaction of electricity quality	$\chi^2 = 8.65$ $(1 - p = 96.57\%^{+})$ Dof: 4
Disapproval arguments	$\chi^2 = 115.00$ $(1 - p \geq 99.99^{+++})$ Dof: 4
Consequences of outage	$\chi^2 = 2.28$ $(1 - p = 42.69\%)$ Dof: 5
Price satisfaction	$\chi^2 = 3.21$ $(1 - p = 64.02\%)$ Dof: 3

$(^{+++})$ $p < 1\%$; $(^{++})$ $1\% < p < 5\%$; $(^{+})$ $5\% < p < 10\%$; Dof: degree of freedom.

Table 13. Descriptive analysis of numerical variables for VSEs.

Variables	Average	Min	Max
FTEE	5.06	1	10
WTP	XOF 4130.95	XOF 0	XOF 20,000
WTA	XOF 4546.15	XOF 0	XOF 21,000
CPH	XOF 2235	XOF 0	XOF 10,000
NSE	4.03	1	15
AAEB	XOF 37,137.24	XOF 6000	XOF 200,000
WT	10.90	10	14

electricity supply is XOF 4130.95 and it implies the whole sample.

Also, the average value of their WTA in case of interruption longer than two hours is XOF 4546.15, XOF 4880.13 in case of unplanned outages and XOF 4212.17 while not. Indeed for 74.2% of VSEs, an interruption is becoming "very" annoying after two hours and they deserve compensation for inconveniences caused to them. The maximum number of employees is ten, the minimum is one and the average is around five. Costs incurred declared by respondents themselves in case of electricity interruption vary from XOF 0 (sic) to XOF 10,000 depending on the nature of the core business of the enterprise and the attitude of customer in case of delay in delivery.

Table 14 is proposing different models by considering the WTP as dependent variable.

The constants of the two multivariate models are very high. Also, the model 1 is explaining 72.3% of the variance of WTP with CPH and NSE having a "p value" inferior to 5%, i.e. the electrical devices and losses incurred by enterprises are significantly affecting respondent's WTP. The second model (model 2) is considering more exogenous variables and has a R^2 value of 0.816. This second model is revealing the significant effect of WTA and confirming the one of NSE.

Table 14. Effects of variables on VSE's WTP.

	Model 1	Model 2	(1)	(2)	(3)	(4)	(5)	(6)	(7)
(1) WTP	Dependent variable		1.0						
Constant	287.894	−1649.09							
(2) NSE	533.6 (192.42)***	411.66 (145.67)***	0.76	1.0					
(3) FTEE	186.87 (226.91)		0.60	0.58	1.0				
(4) AAEB	0.010 (0.03)	−0.03 (0.02)	0.74	0.81	0.62	1.0			
(5) WTA		0.634 (0.11)***	0.87	0.69	0.67	0.76	1.0		
(6) CPH	0.40 (0.19)**	0.12 (0.16)	0.61	0.50	0.60	0.55	0.67	1.0	
(7) WT		172.82 (255.22)	−0.19	−0.07	−0.16	−0.09	−0.28	−0.31	1.0
	R square: 0.723	R square: 0.816							
	Sample size = 98								

Standard errors are in parentheses. ***$p < 0.01$; **$p < 0.05$; *$p < 0.1$.

With a value of 0.76, the number of sensitive equipment (NSE) is positively correlated with VSE's WTP. Also, there is an average value of correlation (54%) between the average amount of electricity and WTP. This result has to be apprehended in adjunction of the conclusion of the cross analysis of average value defending that customer endorsing to pay higher tariff for more reliable electricity are already those who are paying higher amount of bill. Also, the correlation is very high between WTA and WTP (+0.87), and there is a low significant effect between the cost per hour (CPH) and respondent's WTP.

6. Interesting Information and Discussion

From the questionnaire, many interesting information have been put into evidence. For instance, the limit duration after which power outage is becoming a problem depends on the *type* of customer. Indeed, for 75% of household, after two hours, an outage is becoming "very" embarrassing while it becomes the case for 51% of VSEs after the first two minutes. Also, 57.7% of households admitted to deserve compensation for outages lasting more than six hours (45.1%) of them were concerned for outages lasting up to four hours) while this duration remains at two hours for VSEs (74.2%). In addition, this study is drawing the same observation as Nkosi and Dikgang (2018) asserting that respondents are more vulnerable to unplanned outages in so far as they are not prepared to face it. According to customers, very long outages should not be unplanned and many of them proposed a same amount to pay while they were asked about their WTP.

Depending on the location, respondents have different experiences about electricity outages. In Bingerville for instance, interviewees were complaining about electricity interruptions which seem to become an everyday fact. Also, in other areas interviewers have been greeted with hostility by local population who were expressing their desperation. Indeed, many cases of irregular connections,

voltage drops or interruptions have been reported in different areas. This is the case in Abobo, Adjamé, Treichville, Bingerville and Yopougon, where cases of frauds, admitted by the consumers themselves, were affecting the quality of the power energy and the proper functioning of electrical devices. According to them, though it has been reported to CIE, the situation remains unchanged since CIE is not prompt to react.

Since electricity outages are undergone by consumers, this survey has been an opportunity to clarify the concept "electricity quality" and make these two categories of consumers aware of the impact of outages. The majority of interviewees (households and VSEs), more than 84% are considering that long but very rare outages are less embarrassing than short and frequent ones because of the impact on equipment. Most specifically, households declare to be more embarrassed by outages occurring during the weekend (86.5% of respondents) than other weekdays, or after 6 pm (55.5% of respondents) than before. As a reminder, in 2017, the consumption peak has been reached the 10th of May at 10'47 pm. The situation is different for VSEs because they have to adapt to the specificities of their customers. Nevertheless, whether for households or VSEs, the large majority of respondents (more than 86%) prefer to be informed by short message system (SMS) and by radio announcement.

In many areas and for many respondents, prepaid smart meters are contributing to improve the quality of electricity supply, protect equipment and avoid sanctions for fraud and illegal connection. As an example, the majority of households subscribing for 5 amps through the "*electricity for all program*" (PEPT)[2] policy are claiming benefit from better and safer energy quality and less malfunctioning of devices. They also pretend to have a better control on their consumption. As testified by Poznaka et al. (2015), this study is admitting a positive impact which is not only technical but also psychological of smart meter.

The WTP predominantly depends on the income level of household. Indeed this situation is not typical to Côte d'Ivoire since it has been mentioned by many prior studies (Zoric & Hrovatin, 2012; Taale & Kyeremeh, 2015). In general, households having higher incomes are expecting reliable services including power energy and have a tendency to accept to pay more for energy comfort (AEMC[3], 2012).

However, many studies mentioned an inverse relationship between the WTP for reliable electricity and the income level, probably due to the high consumption level for basic necessities for family members. Indeed, in most of developing countries, families have other priorities and much more worry about food, health or even clothes, shelter etc. The literature largely evokes human needs by establishing priorities as did Maslow in 1943 by proposing a pyramid of human's needs and supported by many authors (Streeten et al., 1981).

According to Batidzirai et al. (2018), household's WTP can also be influenced by the tendency of recent (or current) electricity outages. Indeed, customer's WTP is increasing with the recent intensity of outages. For instance, it is possible

[2]PEPT: Programme Electricité pour Tous.

[3]Autralian Energy Market Commission.

for a household to have a high WTP while experiencing recent electricity quality problems before the survey is instigated (Taale & Kyemereh, 2015), idem for situations of longer outages whatever the social class of respondents (Carlsson & Martinsson, 2008; Otegbulu, 2011).

Furthermore, the majority of respondents are expecting more competition in the sector since firm's competitive environment can have an impact on the quality level. Though the economic literature does not express a categorical opinion as to the incentive to improve quality for competitive and noncompetitive environment, Musa and Rosen (1978) demonstrate that monopolist has the possibility to implement different prices to different category of customers, even for an identical quality level. Also, clients can benefit from the same quality comparing to perfect competition but at higher purchasing price. For a defined quantity of product, the competing firm will be offering a higher product quality than the monopolist. This argument is limited by the fact that the monopolist offers lesser quantities. Spence (1975) believes that this pretext can be used both in favor and in disfavor of an improvement in quality. The literature review describing empirical studies proposed by Coestier and Marette (2004: p. 30) concludes that deregulation and liberalization have a positive impact on quality.

Finally, many VSEs in the tertiary sector in Côte d'Ivoire cannot really assess the costs of electricity outages on their activities. Many of them do not take into account idle time for instance or overtime damages (breakdown) on equipment, etc. A report by Lacommare and Eto (2004) shows that the characteristics of the cost of interruptions for consumers (CIC) evolve in a way almost linear during the first eight (8) hours. In this regard, Kufeoğlu and Lehtonen (2015) point out that the CIC can be defined in relative terms as follows:

CIC = Wages + Profit + Perishable. As a reminder, 1) the turnover is the sum of the cost of materials, value added (VA) and other expenses, and 2) the VA is the sum of salaries, profit and depreciation. Also, by neglecting depreciation [CIC = VA + DP] and supposing that for planned interruptions consumers minimize outage consequences, CIC can be limited to VA.

Knowing that for informing customers about anticipated outage the operator may envisage different means of communication, preferences of interviewees vary (**Table 15**):

Table 15. Consumer's preference to being informed about outages.

Communication means for warning of outage	Frequencies for households	Frequencies for VSEs
SMS	87.5%	89.8%
Radio	44.8%	32.7%
TV	42.4%	28.6%
Social network	9%	7.1%
Operator's employee	5.7%	2.0%
Operator's website	2.7%	1.0%

Listed in order of preference, interviewees (households and VSEs) would like to be informed of planned outage by SMS/radio/TV/social network/Operator's employee/Operator's website.

7. Conclusion

Consequences of poor electricity quality vary depending on the type of customer and both households and VSEs understood very well the questionnaire. Indeed, electricity outages have many consequences on customers. Households no longer benefit from lighting, internet, losses of computer data, or are victim of reinitialization of equipment or conservation problems resulting in the loss of perishable products, elevator interruption, etc. In addition, VSEs in the tertiary sector are undergoing the loss of sales, time lost for both customers and employees, or the safety of people. Hence, the survey was necessary since it reveals meaningful information about consumer's perception and preferences.

Firstly, as admitted by different reports, customers are very sensitive to electricity interruption, or voltage stability. However, respondents in terms of quantum do not endorse paying more for reliable electricity supply because they pretend to have a low income, the price is already too high with too many taxes, the country has huge production capacities, the electricity price in neighboring countries and in many African countries would be lower and the State has to assume extra charge related to quality or they are not satisfied with the price-quality ratio of electricity in their locality. But most importantly, the main reason according to households remains the income level which is not enough to satisfy living priorities such as shelter, food, clothing, health etc. Nevertheless, they would endorse a price increase if there is a kind of compensation with a firm commitment of the operator (CIE) in case of abusive outages, or that the situation will positively evolve. Indeed, there is a lack of trust since many respondents do not believe in promises from the operator. No matter what the context, as defended by Wedgewood and Samson (2003), consumers will prefer to pay higher tariff, although unhappy, than doing without electricity service.

Secondly, household's WTP is positively impacted by the average value of their electricity bill but also the compensation which might be proposed (WTA). Based on the sample, the CAP of the households is XOF 1003.07 while their CAR when the outage lasts at least six hours is XOF 1595.41. In the same vein, the number of sensitive equipment and the WTA have a positive impact on VSE's WTP as well as the average amount of electricity bill and cost per hour incurred by VSEs. Based on this sample, the CAP of the VSEs is XOF 4130.95 and their CAR for outages lasting two hours is XOF 4546.15.

The results of this survey are closed to many previous studies by putting in evidence the importance of socio-economic parameters defining the profile of consumers or quality perception. About consumer preferences, the survey reveals that they opt to be informed about outage by SMS and radio announcement, etc. The methodology adopted proposed a qualitative and quantitative

analysis to avoid analytic bias while considering, through a unique approach, qualitative and quantitative variables. Moreover, the geographic coverage has been selected because the analysis cared about the quality of electricity which means that populations should already benefit an access to electricity. However, future studies can investigate other areas of the country, the access rate or specific parameters related to quality including environmental concerns.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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Annex: Consumer's Endorsement and WTP for Improved Electricity Quality

QUESTIONNAIRE ON THE QUALITY OF ELECTRICITY IN CÔTE D'IVOIRE

Respondent's Name……
Location……..……..
Consumer type: Household ☐ VSE ☐
Profession of the head of the family/ ore activity of the VSE ……..
Average Amount of electricity bill XOF ……
Subscription: 5 Amps ☐ 10 Amps ☐ 15 Amps ☐ Others ☐

meter type: Postpaid ☐ Prepaid ☐ old meter (Taurus) ☐ Smart meter ☐

Do you know the price of one kWh (the one of which you are charged)?
Yes ☐ XOF……
No ☐

1. What does the "quality of electricity" contain? Do you know some indicators?

…… ……

2. Do you know what "planned outage" means?
Yes ☐ (explain briefly) ……
No ☐
(Does the respondent really know it? Yes ☐ No ☐ // reserved for the interviewer).

3. What are the desired communication ways to be notified of the occurrence of planned outage? (several choices possible).
Radio ☐ SMS ☐ TV ☐ Social network ☐ Website ☐ CIE's Employee ☐

4. What are the consequences of electricity outage for you?
[for VSE, Loss of production ☐; delay in operations ☐], perishable goods ☐,
appliances or equipment [tv, computers, celphone, bulb, fridge, air-conditioner, etc.] ☐,
Others: (*Education of children (home work), * Insecurity, * Disturbed sleep, * internet, *delay in completing task) ☐;
No incidence ☐ .

5. Do you own: a voltage stabilizer Yes ☐ No ☐ // your own generator Yes ☐ No ☐
How many (in number)…… how much did it cost to you XOF……..…

6. Would you endorse to pay higher tariff for improved electricity quality?
Yes ☐

No ☐

- If "No", for what reasons (several choices possible)? 1. Low income level ☐
  2. The country produces electricity ☐; 3. State must bear additional costs ☐;
  4. Prices are lower in neighboring and many African countries ☐; Lack of trust in CIE ☐).

7. Are you satisfied with the quality of service of the CIE? (Give an appreciation: 1. Not at all satisfied; 2. Not satisfied; 3. Indifferent; 4. Satisfied; 5. Very satisfied)

- Electricity quality ☐
- Metering and billing ☐ (Your opinion on the sincerity of metering or the reliability of the meters...)
- Price ☐
- Response time ☐ (subsequently to the occurrence of an outage)
- Website updated ☐
- Warning time ☐ (before the occurrence of a planned outage or a risk of failure)

8. Do you think you deserve compensation in case of "abusive" outage? Yes ☐ No ☐

9. Will you endorse to pay more for more reliable electricity if there is an engagement of CIE for compensation in case of "abusive" outage. (For those responding "NO' to the question 6). Yes ☐ No ☐

10. According to you, how many hours of outage deserve compensation for consumers?

1 h ☐ 2 h ☐ 3 h ☐ 4 h ☐ 5 h ☐ 6 h ☐
8 h ☐ 10 h ☐ 12 h ☐ 24 h ☐ 48 h ☐

11. How much are you willing to pay to avoid outages lasting more than:

1 h? XOF…… 2 h? XOF …….
3 h? XOF…… 4 h? XOF…….....
5 h? XOF…..…….. 6 h? XOF…….…..
8 h? XOF……..…….. 10 h? XOF……..……...
12 h? XOF……..……. 24 h? XOF ……

12. How many sensitive equipment do you have? ……
And which ones are they? ……

13(Households). How many people are there in your house (the size of your household)? ..... person (s)
13(VSE). How many full-time equivalent employees are there in your enterprise? ..... person (s)

18(Households). How much time per week on average the television is on at your home? …… hours
18(VSE). How much do one hour electricity outage costs to you? XOF.....

14. How much would you accept in compensation for power outages lasting:

1 h without having been warned? XOF……....; 1 h having been warned? XOF ……
2 h without having been warned? XOF……; 2 h having been warned? XOF ……
3 h without having been warned? XOF……; 3 h having been warned? XOF……..
4 h without having been warned? XOF……; 4 h having been warned? XOF…….

6 h without having been warned? XOF ……..…..; 6 h having been warned? XOF…….
8 h without having been warned? XOF ……...……; 8 h having been warned? XOF……..…….
10 h without having been warned? XOF…….…….; 10 h having been warned? XOF……...
12 h without having been warned? XOF …….……; 12 h having been warned? XOF……..
24 h without having been warned? XOF ……..…; 24 h having been warned? XOF……..

15$^{(\text{Households})}$. How much time per week on average the television is on at your home? …… hours
15$^{(\text{VSE})}$. How much do one hour electricity outage costs to you? XOF.....

16. What is the least embarrassing for you?
- Outage during the day ☐ Outage during the night ☐
- Outage during weekdays ☐ Outage during week-end ☐

17$^{(\text{VSE})}$. What is the daily working time in your enterprise? ……. hours

18. After how many hours does an outage become very embarrassing for you and deserve compensation?
1 hour ☐ 2 hours ☐ 3 hours ☐ 4 hours ☐ 5 hours ☐
6 hours ☐ 7 hours ☐ 8 hours ☐ 12 hours ☐ 24 hours ☐
48 hours ☐