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Electricity issues in Lebanon: Let the people talk

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ABSTRACT

This paper presents an important issue which is the recurrent electricity outages in Lebanon which affects customers at all levels: residential, commercial, and industrial. People resort to buying electricity from local and private providers to fulfill their needs which seem to be an expensive choice due to high fuel prices. The paper focuses on the residential sector. In that sector, the need for electricity will continue to grow as reliance on electricity-driven appliances in each household will increase and also the population is increasing. So there is a desire to consume more electricity which will lead to more power outages in the future if no appropriate measures are taken. As to where the situation is heading, it all depends on many factors such as political will and availability of fund. This paper presents the results of a survey conducted by the authors during August 2018 on this permanent problem in Lebanon. The survey's objective is to hear the opinion of the participants on this problem and to show how they have managed to face it until now.

KEYWORDS

Electricity outage, survey, Lebanon, Households

1 INTRODUCTION

The Civil War has ended in Lebanon from more than 28 years but Lebanon's problems with electricity shortage is still topical. Electricite du Liban (EDL), the state-owned electricity company, is still incapable to provide electricity all the day despite successive promises by different governments to provide a constant supply [1, 2]. In fact, EDL company is failing to cover more than 50% of the market demand [3]. Lebanon needs more than three

thousand megawatts; the demand for electricity reaches 3500 megawatts at peak time, while existing plants can only produce 1600 MW at best[4]. In summer 2013, in the capital Beirut, people have suffered nine rather than the usual three hours of electricity cuts. People in rural areas go even longer without power [5]. In Sidon, where this present study is conducted, the power cut is more than 15 hours per day. Radical solutions combined with a honest political will that aims at rehabilitating and developing the electricity sector must be urgently performed [6, 7, 8] (see Fig.1 an example of the poor situation of EDL electric installation). A temporary solution to increase the power



Figure 1. An example of on the electrical installation of EDL.

supply was to rent Turkish floating power stations: "Fatima Gul", "Orhan B", and more recently "Esra Sultan". These power-generating ships provide in total around 630 megawatts that are added to EDL production [9]. Still there is a gap to fill. In order have power for 24 hours a day, Lebanese buy electricity from private providers that fix their subscription fees in function of EDL outages periods and price of fuel. Figure 2 shows an electric board with

circuit breakers of a private provider.



Figure 2. An electric board of a private provider in a building.

This study has been conducted during summer 2018 (more precisely in August) in Sidon, the third largest city of Lebanon with around 80000 inhabitants. In this time of the year, a lot of Lebanese return to their country for the vacation and to visit their families. The weather is hot and humid. This leads to an increase of the usage of air conditioners and fans. Consequently, there is an increase in the electricity demand that deteriorates the already poor electricity network. Unluckily, Lebanese are obliged to adapt their life style to these periods of electricity cuts and have to organize the usage of their appliances in function of these cuts. This present work aims at reporting on the opinion of the Lebanese on the electricity problem and their suggestions to solve it. The study's final objective is to approach the scientific world to the normal people in order to see their real problems independently of the political or economical issues of their country.

The paper is organized as follows. In Section 2, the survey questions are presented in details. The results of the survey are commented in 3. The paper ends in section 4 with some conclusions.

2 THE SURVEY

This survey presented in this study has been conducted by the authors during a visit to

Lebanon in August 2018 (Fig.3). 67 families of the middle class has been asked 14 questions. The questions were asked by the authors in Arabic, English or French depending on the languages of the asked person. In this section, only the answers to these questions are presented. A more detailed analysis will be given in section 3.



Figure 3. One of the authors while asking a Lebanese woman in a public place.

2.1 How many electrical appliances do you have at your home?

The first question of the survey aims at knowing more the participants and their needs. They have two possible answers: *More than five appliances* or *less or equal to five*.

The answers are the following. 20.8% of the participants have five electrical appliances or less at their apartment while 79.1% of them have more than five appliances at their homes.

2.2 Which one is the most important?

This question is a tricky one. Normally all the electrical appliances are important when we need them. The choice of the participants is divided into two main appliances: The refrigerator (70.1%) and the washing machine (19.4%). The rest of the answers listed the air conditioner, television, and even the the iron machine.



Figure 4. An example of a refrigerator in a Lebanese house.

2.3 How many times you use the washing machine per day?

Since an important portion of the participants consider that the washing machine as the most important appliance in the house. This question tries to find the frequency of usage of this appliance. The answers were distributed as follows: once per day (28.9%), twice per day (20.8%), three times per day (22.3%) The rest of the answers are divided into: two times per week (11.9%), three times per week (8.9%) and four times per week (2.9%). The frequency of using the washing machine depends on the number of the family members, their profession and their activities (like sports for example).



Figure 5. An example of washing machine in a Lebanese house.

2.4 Are you ready to use this washing machine at night?

The aim of this question is to explore the possibility of using the washing machine in a time where "less power" is needed or in a scenario where the price of the electricity is not expensive. Three quarters of the participants are ready to use the washing machine at night (even after midnight). The rest (23.8%) of the participants are not ready to this scenario and prefers to avoid to use the washing machine at night.

2.5 Do you have an air conditioner at your home?

This answer to this questions shows the important of the air conditioner for the Lebanese (Fig.6). 85% of the participants in this survey have one or more air conditioner at their apartments. The rest of the participants (15%) do not have an air conditioner at their homes.



Figure 6. An example of an air conditioner in a building in Sidon.

2.6 Do you have a heating system at your home?

The answer to this question is evident since the weather in Sidon is not so severe in winter. 34.3% of the participants use gas stoves while 22.3% uses electric ones. Half of the participants thinks that it is not necessary to use a heating system in a city like Sidon.

2.7 Do you like to have a microwave at your home?

To cook in Lebanon, almost all the households are equipped by a gas operated ovens. In Lebanon there is no public gas installations because of the problems of the infrastructure. The answers to this question shows the position of the participants toward the usage of a microwave. 56.7% of the participants have and use a microwave. The second half doesn't have a microwave at their house and they are even against its usage because of what they think "harmful" effects on the health.

2.8 To have hot water you use?

To have a hot water in Lebanon, electric heaters tanks are mainly used. 88.0% of the participants use this solution. A new solution using thermal panels has been emerged. 11.9% of the participants have adopted this solution.

2.9 In your opinion what is the main problem of electricity in your country?

This is the main question of the survey. Four possible answers were proposed for the participants: *Power outage*, *electricity price*, the *origin of the electricity* (fuel, hydraulic, etc), and "*other*". The majority of the participants (70.1%) suggest that the main problem of electricity in Lebanon is its recurrent cuts. Only 10% answered that the electricity price is the main problem. The other answers where about the electricity origins (8.9%), power quality (4%). Less than 4% of the participants think that the problem of electricity in Lebanon is mainly a political problem and the government is not able to solve this permanent problem and the worst cases it does not want to find a solution for it.

2.10 What is the mean budget per month you are ready to pay to have electricity (24/24)?

For this question, the participants has to choose between two options: *Less than \$50* or *more than \$50*. The answer are as shown in figure 7. The participants that are willing to pay more

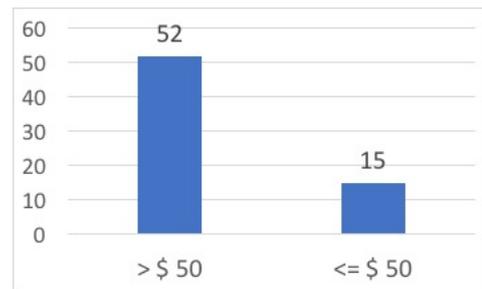


Figure 7. The mean budget per month the Lebanese are prone to pay to solve thier electricity problem. The y-axis represents the number of participants.

than \$50 per month (77.6 %) are distributed as presented in figure 8.

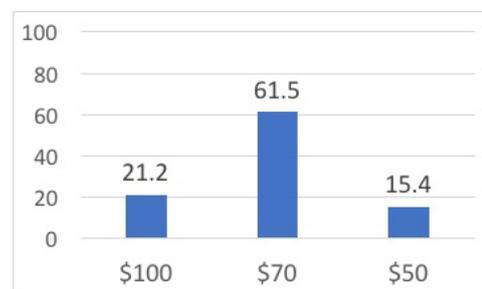


Figure 8. The percentage of particpatants with a budget more than \$50.

2.11 Are you interested in having an independent clean electricity?

Clean electricity designates an electricity that uses sustainable and renewable sources such as wind or sunlight. By "independent", the authors mean that the participants install and operate their own photovoltaic panels, wind turbines, or other solutions. The participants have three possible answers to this question: *Yes*, *No*, and *Maybe*. The answers are presented on figure 9.

2.12 Have you heard about the concept of micro-grid?

The following simple definition of a micro-grid is given: *A micro-grid is a small scale distributed energy system with heterogeneous energy resources coupled with energy storage devices and an energy management system.* This question is some how technical and it aims at knowing the awareness of the participants on

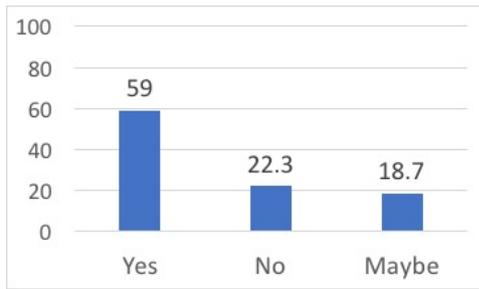


Figure 9. The percentage of participants interested in having an independent clean electricity.

new trends in energy systems. Three answers were possible: *Yes*, *No*, and *Maybe*. The majority of the participants have not heard about this concept (%86.5) as shown on figure .

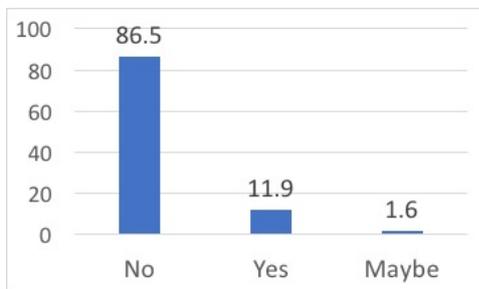


Figure 10. The percentage of participants asked on the concept of a microgrid.

2.13 Some personal information

The last question is about personal information on age range of the participants (figure 11), the presence an elevator in the building (figure 12) and the number of children less than 15 years old (figure 13). These questions aims at know-

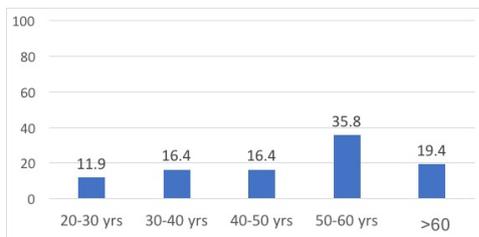


Figure 11. The percentage of the age range of the participants.

ing more on the environment of the participants and their life quality.

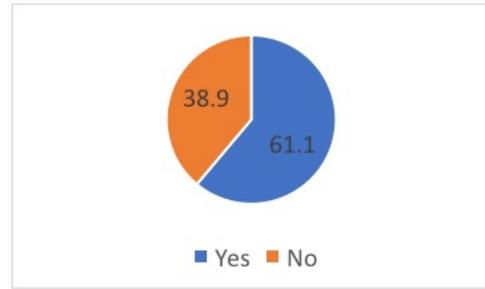


Figure 12. The percentage of the participants using elevators.

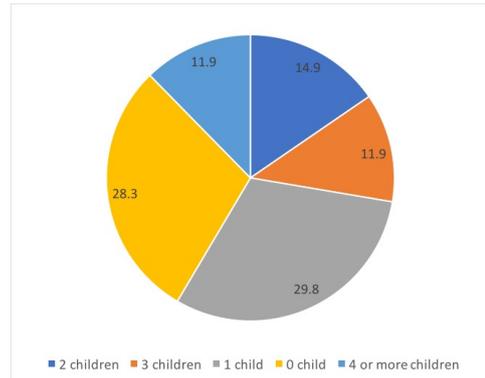


Figure 13. The percentage on the number of participants' children (less than 15 years old).

3 SOME COMMENTS

Although the number of participants is small but the study, in the authors' opinion, reflects a true image on the Lebanese society (see the age range, number of family members, equipment, etc.). These results of this study show clearly the dependence of Lebanese on electricity and their need to have all-the-day supply since more of the three quarters of the participants live in households that are equipped with more than five electrical appliances (like refrigerator, washing machine, air conditioner, microwave, etc). Refrigerator takes the first place of the most important electrical appliances with the washing machine in the second place. This washing machine is used daily for the three quarters of the participants. This can be justified since the survey has been conducted during the summer vacation where the weather is known to be humid in Sidon and people need to change their clothes more than once per day.

Despite the hot humid weather, 15% of the households are not equipped by air condition-

ers. This percentage can be explained in two ways. The first way is that people cannot afford to buy or to use an air conditioner in such a difficult electrical situation. The second reason is simply that the location of participant's homes makes the air conditioner unnecessary and a simple use of a fan is enough.

Lebanese are suffering from the actual situation of electricity in Lebanon and its recurrent cuts. They are paying two electric bills. The first bill is for EDL and it is about 20 \$ per months. The second bill is for the private providers and it varies from 150\$ to 300\$ in function of the subscribed power and the fuel price. For this they are ready to pay more the 50\$ per month in order to get a clean independent 24h electricity. In their opinion, politicians also have to propose concrete and urgent solutions to simplify the life of Lebanese. They want a fast change toward renewable energy which explains the increased usage of rooftop solar and thermal panels.

4 CONCLUSIONS

In this paper, we have presented the results of a survey aiming at understanding the electricity cuts in Lebanon. It shows the awareness of the Lebanese people of this problem and their will and hope to change it despite different difficulties. To radically remedy the problem, an investment is needed on a national level to develop the power sector (both increase the power generation and renovate the grid). Such development will have economical, technical, and environmental benefits. Renewable energy resources should play an important role in this development since they are abundant in Lebanon especially solar energy and wind energy. Another problem that might be contributing to the power outages is the illegal use of electricity (electricity theft).

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