



Domestic Consumer Awareness of Energy Consumption Practices in Pakistan

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ABSTRACT

Electricity waste is a bottleneck in availing clean, green, uninterrupted, and sustainable electricity supply. The synthesis of the studied literature portrays that irresponsible behavior indulges consumers to take irresponsible action, which leads to electricity waste and crisis. Therefore, to get the know-how of irresponsible behavior, this study aims to investigate the role of awareness concerning electricity consumption, wastage, gadget efficiency, and conservation. A questionnaire-focused survey was carried out to collect data and performed descriptive analysis to critically evaluate the data. The results explicate that consumers possess a low level of wasteful consumption awareness and “lack-of-information” is a big issue in waste management. Thus, the study concludes that unawareness is the key determinant that creates and strengthens a sense of irresponsibility in consumer behavior. The academicians and practitioners need dire attention to take precautionary measures for developing prominent awareness campaigns and strategic policy guidelines to distort irresponsible human nature by including fearful promotional contents in marketing campaigns.

Keywords: Electricity Awareness, Electricity Conservation, Electricity Efficiency, Electricity Waste, Irresponsible Behavior, Electricity Crisis

JEL Classifications: Q4, Q40, D1

1. INTRODUCTION

In the era of technological advancement, human socio-economic prosperity heavily depends on electric energy. Each sector of the economy including, industrial, agricultural, commercial, and domestic households utilized electricity (Zafar, et al., 2018). In Pakistan households utilize almost half of the total electricity supply in the country (Pakistan Economic Survey, 2018) to make life fast, comfortable, and luxurious. Modern electricity-driven home appliances like; space cooling, heating, cooking, drying, freezing; laundry, computer, television, ceiling fans, mobile phones, laptops, and lightning (International Energy Agency, 2020) are causative in enhancing electricity dependency and its wastage.

In Pakistan, domestic consumer electricity consumption share is constantly rising at an incredible pace of 10% on average despite the country is experiencing an alarming electric energy

deficiency (Pakistan Economic Survey, 2018). Electricity shortfall was started in 2007 (Qazi et al., 2018), reached 6097 megawatts in 2017 (National Electric Power Regulatory Authority, 2018) and presently deficiency is above 5000 megawatts although the government is struggling to increase electricity production (Pakistan Economic Survey 2018). The electric energy power quality remains poor due to unstable voltages (Masih, 2018). Electricity blackout is almost 6-8-h on average and 17.95% of rural areas are not connected with the electric grids (National Electric Power Regulatory Authority, 2018).

The households spend almost 30 billion rupees per year to buy an uninterruptable power supply (UPS) and batteries to compensate electricity shortfall effect (Pakistan Economic Survey, 2020). Thus, figures (discussed above) are projecting that situations can be more problematic for economic progress and household survival as domestic sector electric energy dependency and wastage is rising smoothly despite an alarming electricity shortfall.

1.1. Sectoral Electricity Consumption in Pakistan

The Pakistan economic survey (2018) report indicated that commercial, agricultural, industry, and other sectors electricity consumption share is 25%, 10%, 8%, 4% respectively. The electric energy-based commercial, industrial, and other sector’s economic activities have started decreasing since 2016 onward (National Electric Power Regulatory Authority, 2018) while domestic sector electricity consumption share is going upward. The sectorial electric energy consumption pattern is presented in Figure 1.

Figure 1 is expressing the consistent increase in the domestic sector electricity demand 46% (2016), 47.48% (2017), and 51% (2018) respectively despite the distressing electricity crisis in the country. The electricity demand growth rate is 10% and its generation is not more than 7% (NEPRA, 2018). Rafique and Rehman (2017) study predicted that electricity demand of 45,000 megawatts and electricity shortfall will touch to 13000 MW till 2030. Therefore, the major electricity-consuming sector presented in Figure 1 is taken under study consideration to deal with the serious electricity crisis.

To find out the grounds of electricity shortfall an extensive literature has been studied and concluded with a synthesis that consumer irresponsible actions lead to electricity waste. Therefore to know the key trigger of irresponsible behavior, the role of awareness (electric energy consumption awareness, wastage, gadgets efficiency, and conservation) are comprehensively examined in this study.

1.2. Electric Energy Awareness

Awareness is the initial step to save electricity. Energy awareness provides knowledge and guidance to consumers for

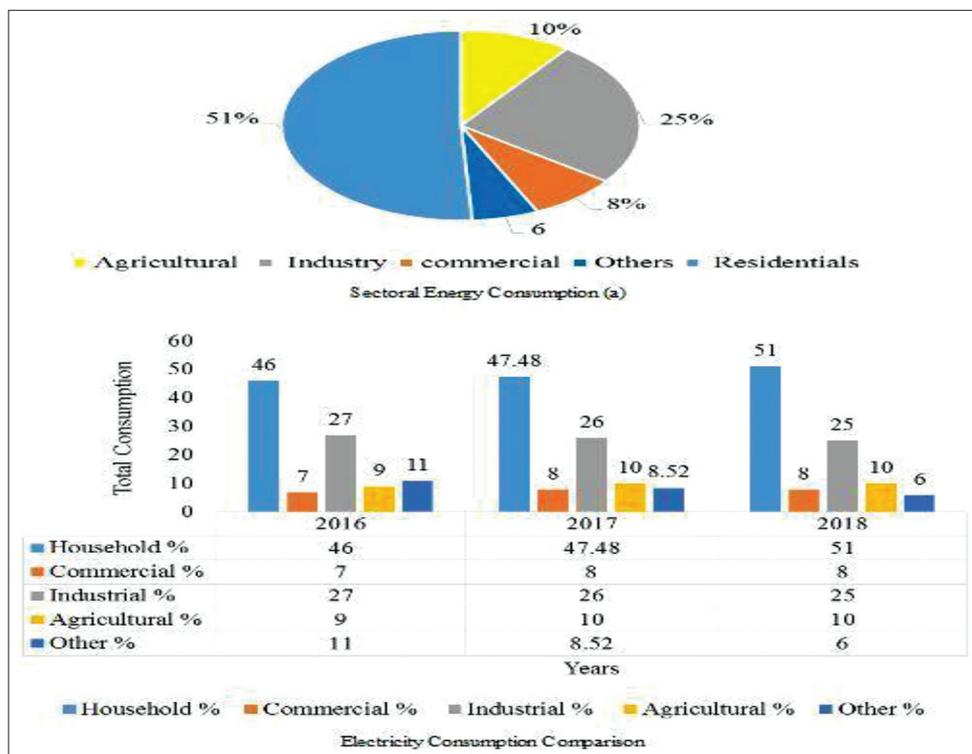
electricity production, consumption, economic, and its harmful environmental consequences on society (Ishak and Zabil, 2017). It leads to a responsible electricity consumption pattern. The study of Sorrell (2015) portrays that governments of many countries are focusing on diverse promotional strategies to convey knowledge and make the general public more aware of the efficient use of electricity to save costs. But the majority of domestic consumers are unaware of the efficient use of electricity (Ahmed et al., 2017).

So far various awareness strategies and promotional campaigns are carried out in Pakistan to raise electric energy awareness like advertisements on the back of electricity bills (NEPRA) and ads on television but still the efficiency achievement results are unsatisfactory and debatable. For example, the study of Khan and Ashraf (2015) concludes that the wasteful consumption portion of domestic consumers in Pakistan is more than 25% and rising with the increasing electricity dependency (Samaa Digital 2016). We observed in a routine life that individuals behave unconsciously and do wasteful electricity consumption. For example, households use conventional and inefficient electricity-driven gadgets (do not practice conservation practices) and keep unnecessary electricity-driven gadgets active or put on standby mode. Consequently, lack of awareness accounts for approximately 30% to 40% of the total electricity consumed in the domestic sector of Pakistan. In a nutshell, un-awareness creates, develops, and boosts irresponsible behavior in households.

1.3. Irresponsible Behavior

Behavior significantly influences the pattern of energy consumption (Irfan, Cameron and Hassan, 2018) and considered the composite mixture of human actions, emotions, habits, moralities, normative

Figure 1: Sectoral electricity consumption



and social factors. The disequilibrium in any of the states can lead to distorting human nature (Martiskainen, 2014) and evolves irresponsible behavior (IB). IB is displeasing, immoral, (Gupta and Vick, 2007), and considered as social transgression (Grappi et al., 2013). It is based on illegal actions that are considered against the laws (Gupta and Vick, 2007). According to Collins (2019) actions are considered irresponsible that are taken without considering the consequences. In China, the inefficient electricity consumption portion is 23% of the total electricity consumption despite China is the topmost country investing in energy efficiency around the world (Sheng and Guo, 2018). Unless and until consumers do not know why and how irresponsible behavior develops, the ratio of wastage will increase over time.

Unconscious electricity wastage occurs due to deploying conventional appliances (Akbar et al., 2014) and unknowingly keeping appliances on standby mode (Ding et al., 2017). Unconscious irresponsible actions trigger consumers to practice wasteful electricity consumption in a routine life that perturbs economic progress and cause climate change.

1.4. Economic Impacts of Electricity Crisis

The electricity crisis puts stern economic implications on the domestic and business sector of Pakistan. Zaman's (2017) study revealed that the trade deficit of Pakistan is almost \$ 32.58 billion. The imports are almost \$ 53.02 billion while the volume of exports is \$ 20.44 billion. Pakistan is the twenty-fifth (25) largest oil importing country which spends a huge amount on import bills. Oil importation is widening the trade deficit of the country every year. Pakistan imports 85% crude oil at the cost of PKR 51,337 million to generate 35.2% of the total electricity production (State Bank of Pakistan, 2017). Table 1 contains trade figures, which indicate a weak position in Pakistan's economy (Pakistan Economic Survey, 2018).

1.5. Environmental Impacts of Electricity Crisis

The International Energy Agency (2020) report shows that 80% of worldwide and 66% of electricity in Pakistan is produced through fossil fuel. Pakistan rank at 33rd emitting maximum carbon dioxide in the atmosphere (World Bank 2015). Vassileva and Campillo's (2014) study portrays that fossil fuels are the major cause of climate change. The burning of fossil fuels causes an increase in Corban dioxide (CO₂) emissions which creates heatwaves, acid rains and had changed the temperature by 1.8-2% in the last few decades (Khairunnisa 2015). The electricity generation through fossil fuel has stern environmental implications on Pakistan's environment. Pakistan is the 7th most-affected country that is vulnerably affected by climate change (World Economic Forum 2020).

- Objective 1: The key objective of the study is to explore the level of awareness of electricity consumption, gadget's

efficiency, and the conservational response of domestic consumers. Our focus in this study is, to understand the nature of consumer behavior for reducing electricity wastage without compromising the living quality standards of domestic consumers

- Objective 2: The second objective of the study is to explore the main barrier that resists applying efficient practices and appliances in the domestic sector.

The rest of the paper is managed as follows: Section 2 contains the methodology adopted in the study. Section 3 evaluates the results of the study. Section 4 concludes the study with brief limitations, implications, and further research directions are identified.

2. RESEARCH METHODOLOGY

This section discusses the implemented methodology. A survey was carried out in Abbottabad, Pakistan. This target population is selected based on the maximum per kilowatt consumption in Hazara circle (Abbottabad, Pakistan) lies under Peshawar Electric Supply Company. We used the convenience sampling technique. A standardized questionnaire was adopted from 'Ministry of Economic Development and the German Society for International Corporation' (Gedner, 2011) to collect primary data. A few alterations have been done in the questionnaire according to the requirements of Pakistan's scenario.

The questionnaire constituted various broad aspects such as demographic factors, consumer behavior, electricity consumption awareness, gadgets efficiency awareness, conservational behavior, major hurdles resisting in implementing energy star appliances, and importance of promotional campaigns in electricity saving. Each question included in the questionnaire holds its scale (multiple choices and closed-ended questions). All of the questions are evaluated through descriptive analysis (percentages) and the results are discussed in pie charts, graphs, and tables.

The scale for this research is limited to domestic consumers who own their homes/apartments. To accomplish this objective a filter question is added at the beginning of the questionnaire, "If an individual owned a house or apartment then he/she is the part of our target audience." The data collected from September 2020 to December 2020 by distributing questionnaires. The sample size was found 384 by using a statistical formula.

3. DATA ANALYSIS AND RESULTS

A total of 400 questionnaires were distributed among target respondents and the number of returned questionnaires was 360 (response rate 90%). After evaluating returned questionnaire we found 300 (75%) questionnaires that were error-free and could be used for data analysis. Table 2 below contains the data of sample distribution.

The respondent's questionnaire's feedback is transformed into a Microsoft Excel sheet to arrange, analyze, process, and descriptively evaluate results through summaries. In the next

Table 1: Economic impacts of electricity crisis

Year	Imports \$ Billion	Exports \$ Billion	Trade Deficit \$ Billion	Import Growth Rate %	Export Growth Rate %
2016	45	25.5	19.5	16.06	-0.78
2017	53.5	25.1	28.4	21.02	-6.34

Table 2: Sample of the study

Target population	Total questionnaire	Returned questionnaire	Error/misleading	Error free questionnaire
Hazara circle Abbottabad	400	360	40	300
Response rate		90%	10%	75%

step, measures of created summaries are presented into graphs, pie charts, and tables.

3.1. Demographics Factors

Population's socio-economic characteristics are expressed in the form of gender, age, education, marital status, and income. A detailed picture of demographic factors is paraded in Table 3. "Gender distribution" showed: 38% were female respondents and male were 62% of study target markets. Age factor has been divided into five categories with an equal interval of 4 years. The results of the study showed that target respondents mostly lie between the ages of 22 and 26 years.

Education is an important demographic factor. Most of our target market constituted those households who had at least a post-graduate level education. This portion contributed 37% of our targeted sample. The second major chunk is of those residents who held graduate-level education (28%). Married respondents were 53% and the unmarried portion was 47%.

Income level is divided into three classes. The first category consisted of those respondents, their income was <40,000 (33%), the second category based on those respondents who earn monthly between 40 and 80 thousand (33%) and the last category is based on that audience who earn monthly more than 80 thousand (34%) per month. There is a notion that people with maximum earning consume more electricity because they have enough money to pay their utility bills than those people who have less earning. Finally, the results of the study showed that 86% of residents are those who are living in their own homes and 14% were those who were living in the apartments both self-owned. Only required results are presented in tables, extra data can be provided on demand.

3.2. Electricity Consumption Behavior

Households entail one or group of people who live in the same dwelling, share living accommodation, meals, and may consist of single-family or grouping of people. Their living standards, beliefs, and behaviors are mostly the same. The behavior is a way which elaborates that how individual respond or behave in a particular situation. Therefore, household behavior toward electricity consumption explains that how individuals, group, and families express their emotions and feelings while electricity consumption process.

3.2.1. Domestic consumer attitude toward electricity saving

A significant positive attitude household showed regarding the electricity-saving attitude as they are asked about "attitude towards electricity saving." Almost 78% of the respondents displayed positive intentions towards electricity saving. 17% of respondents had a neutral response. While to the response of "how they think about electricity saving as an important activity or not"? Only 6% of respondents showed that electricity saving is not important. These consumers think that it is necessary to consume electricity for enhancing the quality of life. Consumption of electricity

Table 3: Demographics of the study

Demographics	Percentage	Total (%)
Gender		
Male	62	100
Female	38	
Age		
17-21	2	100
22-26	37	
27-31	28	
32-36	22	
37-Above	11	
Education		
Intermediate	1	100
Bachelor	28	
Master	11	
M. Phil	47	
PhD	13	
Marital status		
Un-Married	47	100
Married	53	
Income		
<40,000	33	100
40,000- 80,000	33	
80,000 or above	34	
Live in		
Home	86	100
Apartment	14	

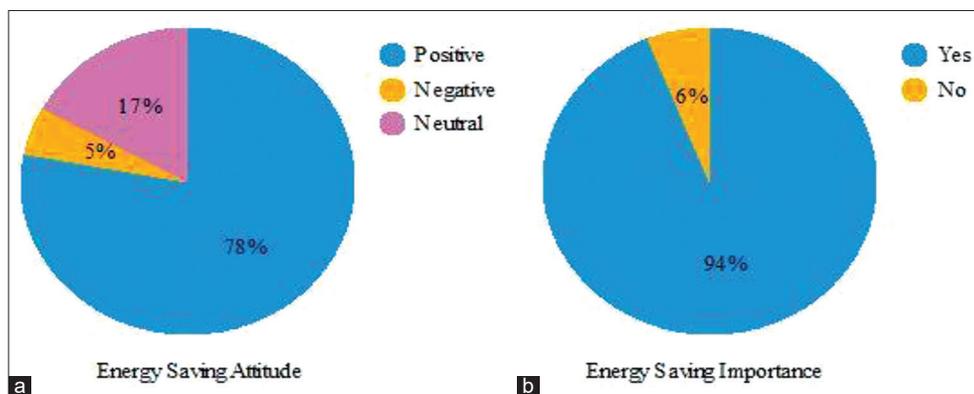
provides country benefits, in an open discussion with them they said that it is necessary for the development to consume electricity as much as possible, that will benefit the economy of our country. 94% of respondents thought that it is necessary to save electricity as much as achievable. Responses are mentioned in Figure 2.

3.2.1.1. Demographical responses towards electricity saving importance

The motivation for taking the electricity-saving initiative is measured by gender, income, and marital status. The difference between the gender response is not too high: 95% male respondents and 93% female believed it is necessary and important to save electricity. They conjectured that this could help them to reduce their electricity-related bills. Lower-income residential had a positive perspective on the importance of conservation importance (87.60%). However, the middle-income households depicted a less positive attitude towards electricity-saving importance (80.3%). Less importance is depicted by the higher income respondents (77.60%). Married or single individuals did not show a marked difference towards the importance of saving electricity (95.30%, 93.60%). Married respondents are more in favor of saving electricity in their homes rather than unmarried respondents. Table 4 portrays the detail summary of consumer behavior towards electricity saving practices.

3.2.2. Efficient electricity consumption awareness

The most important question asked from respondents to validate the basic arguments of this study unawareness indulges consumers

Figure 2: (a and b) Electricity saving behavior

to take irresponsible action was, “*Are you aware of the efficient electricity consumption.*” In response to this question, a large number of the audience is unaware of the efficient electricity consumption at home. The majority of respondents are unaware of, what efficient electricity consumption is basically (65%).

The results provided in (Figure 3a) are quite alarming for researchers and policymakers. Almost, 21% are those individuals who are just sure about efficient electricity consumption. The remaining 14% defined that they are not aware of the efficient electricity consumption. The source of the concept of electricity efficiency is mostly learned through watching television (34%), friends and relatives (23%), electricity efficiency websites create (21%) awareness in households (Figure 3b).

3.2.3. Electricity efficiency and promotional TV broadcasts

The localized perception of a concept greatly defines how it would work and that it can be successfully implemented. The 45% of the targeted sample presented in (Figure 4a) thought that the term electricity efficiency could be explained as saving electricity, whilst 30% of households choose the terminology as rational electricity consumption. 15% of residents said it could be an electricity conservation method.

Finally, 10% of respondents elaborate on electricity efficiency as something else which they are not surely aware of. The residential response presented in (Figure 4b) was also not satisfactory when they asked about “*how you perceive Television broadcasting regarding electricity*”. 62% of respondents considered electronic media broadcast as a useless tool for promoting electricity efficiency awareness. 19% thought that these ads do not communicate anything advantageous and they do not generate that much interest and consider as boring. 7% of respondents believe that TV advertisements are humorous, and finally, 12% of respondents said advertisements are informative to some extent.

3.2.4. Awareness of electricity efficiency information help line and its usage

For respondents to understand user needs and efficiency, it was inquired that these respondents are “*aware of any information conduit from which they could get information about electricity usage proficiently. If it does, did they ever inquire about how to utilize this resource?*” Figure 5 portrays that almost 75% of the

target sample is unaware of the “Energy Information helpline.” Only one-fourth (25%) of respondents had any knowledge or information about the “efficiency information helpline.”

3.2.5. Awareness of energy star product labeling

Labeling is defined as displaying information on the product container, the product itself, or on the package. When residents are asked about the efficient product labeling (Energy Star), most (64%) of the target respondents are unaware. So, response depicted in Figure 6 is horrifying situation that a big audience is still unaware of efficient product labeling. The remaining 36%, however, show awareness about energy star product labeling.

3.3. Energy Efficiency/Conservation

Respondents are asked about the extent to which they are familiar with taking current awareness of electricity efficiency/conservational measures. Following are the responses.

3.3.1. Consumption reduction opportunity

Figure 7 contains query about “*any opportunity presented himself/herself to reduce electricity uses in their homes.*” In response to this question, almost 73% of respondents replied that “yes” they had facades many times opportunities to reduce the electricity at homes, but it does not mean that they take advantage of these opportunities always. In an open discussion, they respond that laziness and money are the key factors that force them not to take any action in conserving electricity. The remaining, 27% of respondents said that they had never come across any such type of opportunity in their lives. It means that a huge portion of the population rarely thought about reducing electricity at homes. The result is the same as the study of Pakistan has presented in their survey conducted in 2018 (Ghani, 2018).

3.3.2. Awareness of monthly electricity bills

When it is asked, “*Are you aware of your monthly electricity bills?*” A considerable amount of the targeted sample exhibited impetus towards decreasing their electricity bills (47%), and they said that they are aware of their monthly bills and also likes to decrease their bill to their maximum and exhibited different techniques for the reduction of their bills. Figure 8 however the remaining 53% of the respondents are unaware of how much electricity bills they pay each month. They respond that the household head remains accountable to pay electricity

bills. This is one of the most critical situations for the authorities and policymakers that their huge market is unaware of their electricity bills and per unit rate of electricity. They only pay attention to their bills when they face a huge amount of shift in their bills.

3.3.3. Electricity saving practicing (efficient appliances)

Electricity efficiency techniques are conducts used to maintain check and balance over electricity. The results are very alarming when it is asked that “are you practicing electricity efficient techniques in your homes or apartments?” Figure 9 clearly shows that from our target audience, 27% of respondents argued that they had applied techniques in their homes and apartments to save electricity. The remaining respondents (51%) never adopt any type of effective technique and the other 22% are using sometimes as they get the chance to implement efficiency techniques. So still a huge target market is missing to implement electricity efficient appliances in their homes/apartments.

3.3.3.1. Demographical response toward electricity saving

Male respondents are 33.8% who had practiced electricity saving techniques in their homes or apartments while 20.2% female responded positively towards practicing electricity saving techniques. Hence, female respondents use less conscious to implement electricity efficiency practices than males (34.4%, 67.6%).

Income based consumer responses are figured out in Table 5 below, which explains consumers mixed responses. Individuals or households who have a monthly income of 40,000 rupees or less, practiced 37.8%, households having mid-level income 40 to 80, thousand rupees practice 47%, and those who earn above 80,000 practice more (50.7%). The households that have less income are practicing less than those households that have a higher income. Almost 35.9% of households having an income of more than 80 thousand never try to practice electricity efficiency techniques at their homes. A married person (58.5%) practices electricity-efficient techniques more than an unmarried person (43.6%).

Thus, indicating more responsibility for their home than the more casual attitude from the unmarried individuals. The notion has been proved that households who are married try to practice the electricity efficiency technique at their homes/apartments. 27.7% of single individuals responded that they never tried to practice electricity efficiency practicing at home. While 25.5% of married households respond that they never tried to practice.

3.3.4. Electricity conservation practice (consumption monitoring)

Figure 10 discusses electricity conservation practices include consumption monitoring which is measured by the question “have you ever monitored your electricity consumption at homes.” To answer this question respondent showed a quite negative response. 38% of respondents replied that they monitor the electricity, consumed at home. While the remaining 62% considered it useless to monitor electricity used in homes by applying any electricity consumption monitoring gadget.

Table 4: Consumer behavior toward electricity saving

Importance of electricity saving		Responses		
		Yes	No	
Gender	Male	95	5	
	Female	93	7	
Marital status	Married	95.3	4.7	
	Single	93.6	6.4	
		Positive	Negative	Neutral
Income	<40000	87.6	1	11.4
	40,000–80,000	80.3	6.1	13.6
	>80,000	77.6	14.9	7.5

Table 5: Electricity saving practices

Practicing electricity saving techniques		Responses		
		Yes	No	Sometime
Gender	Male	33.8	34.4	31.8
	Female	20.2	67.6	12.2
Marital status	Married	58.7	25.5	16
	Unmarried	43.6	27.7	28.7
Income	<40,000	37.8	32.8	29.4
	40,000–80,000	47	34.8	18.2
	>80,000	50.7	35.9	13.4

Table 6: Electricity consumption monitoring

Importance of electricity saving		Male	Female
		Yes	No
Gender	Male	60.7	39.3
	Female	15.3	84.7
Marital status	Married	67.1	32.9
	Unmarried	48.9	51.1
Income	<40000	60.3	46.5
	40,000–80,000	53.5	60.7
	>80,000	39.3	32.9

3.3.4.1. Demographical base responses towards monitoring electricity consumption

The Table 6 presented below gives a detailed view that “how respondents thought to cut their electricity consumption.” Males showed more concern than the female respondents to decrease the electricity consumption (bills) in their homes or apartments (60.7% male, 15.5% female). So results rejected the notions that females are more thoughtful about their electricity bills rather than male. However, we found that lower-income respondents showed more concern towards occasionally being cautious about electricity bills (60.3%). On the other hand, respondents having higher incomes showed less interest to save electricity (39.3%). Married, unmarried households kept the same response regarding the decrease in the electricity consumption (bills) of their houses or apartments. When exploring from “marital status” it appeared that the married households preferred more than unmarried households (67.1%, 48.9%) to save electricity consumption (bills).

3.3.5. Energy-generating resources used at home in different seasons

In this question, we focus to know on the types of energy-generating resources which are used to fulfill the needs of energy at homes to prepare food, lightning, space and water heating cooling, during winter and summer, either through electricity, gas or woods.

To that respond (Figure 11a) contains a mixed response provided by the respondents. 71% of the products used in the household are based on electricity, 20% were wood-based, while 9% are those products that used natural gas. People use electricity for heating and cooling purposes during summer and in winters for heating purposes. Figure 11b shows, 67% of individuals responded mostly used electricity in winter for heating purposes. 16% were those who preferred timber in winters remaining 17% of respondents use gas to fulfill the needs of energy at home.

3.3.6. Implemented efficient electrical appliances at home

The respondents are most familiar with energy-saver light bulbs to save energy and cooling fans, stoves, and washing machines (70%, 30%, 21%, and 28% respectively). Figure 12a portrays that microwave oven is the least most installed product in homes. Only 13% audience has yet installed. Figure 12b depicts that a considerable portion of the sample is willing to use and install electricity-saving light bulbs in their homes. This portion was 91% of the total sample, also, a willingness to install the cooling fan, washing machine, refrigerator, and air condition (83%, 78%, 71%, and 60% respectively) if government facilitate and support them properly.

3.4. Barriers to Apply Energy Star (Efficient) Product

One of the most important questions which are used to find out or identify the main factors which are responsible for restricting the audience not to apply electricity efficient products and appliances in their homes. Figure 13 contains the results show that the major issue in installing or applying the electricity-efficient product is the lack of information. Half of the respondents (50%) elaborated that they are unaware of the electricity efficiency and electricity efficient appliances. Awareness is the most important critical factor. So researchers and government should focus on this vital aspect. Lack of financial resources is also considered as a barrier while implementation of electricity efficient technique or appliances (36%). Finally, the common residential buildings also contribute (14%) to the implementation of Energy Star appliances in the residential sector of Pakistan.

3.4.1. Implementation barriers to in terms of demographics

Table 7 provides the detail summary of consumers response towards "awareness of efficient products". Most of the respondents were unaware of the electricity-efficient products in the product awareness question. The same situation arose with the question posted for the barriers towards implementing electricity-efficient products. 50% of the target sample said that they were unaware of these efficient products and 36% said they couldn't bear the expenses of these products as they were expensive compared to the conventional products. Considering barriers to Implement (Gender, Income, and Marital Status) with segmented respondents; 43.8% of male respondents responded said that they have lack of information

Table 7: Barriers toward electricity efficiency

Barrier	Lack of awareness	Responses % financial issues	Common residential building
Gender			
Male	43.8	37.1	19.1
Female	56.2	34.9	8.9
Income			
<40,000	53.7	35.9	10.4
40,000-80,000	50.0	33.3	16.7
>80,000	46.3	38.8	14.9
Marital status			
Married	47.2	39.6	13.2
Single	53.2	31.9	14.9

and 37.1% said that they do not have money to spare for electricity efficient products in their homes or apartments. While 19.1% said that they have common residential buildings so they didn't get the chance to apply such electricity efficient techniques in their homes or apartments. Female respondents' responses were quite similar. 56.2% of respondents whose income was <40,000 responded that due to lack of information they didn't apply electricity efficient techniques, 34.9% responded that financial resources are the main reason of not applying the electricity-efficient products. Married and unmarried responses think differently as married and unmarried (47.2%, 53.2%), they pointed to the lack of information for not using electricity efficient products in their homes.

3.5. Electricity Saving Campaigns

The campaign is a planned set of activities undertaken by management to achieve a specific goal in a given period. Most of the targeted sample agreed and are willing to take part in future activities undertaken for electricity efficiency promotion purposes. This portion was 89% of the total Figure 14. While the remaining 11% audience responds that it is not necessary to take such type of activities in the future.

3.5.1. Critical analysis of domestic consumers behavior

Finally, household responses on gender basis are presented in Table 8. This concise table can be helpful for the researchers, consumers, and policymakers to understand, critically analyze, and evaluate the behavior of the respondents that would quite helpful for electricity suppliers and the government to revise public policies. A large target audience (Male 83.2%, female 72.8%) attitude is positive toward electricity saving. Respondents are unaware of the efficient electricity consumption (Male 51.3%, female 78.7%). Male showed a more positive attitude toward efficient electricity consumption (males 27.6%, female 14.4%). Females spend their maximum time at home and do their home duties so they avail themselves more opportunities to reduce electricity consumption (53.6 Male, 92.4 Female). But as compared to female, the male is more curious to monitor the electricity consumption charges than females (Male 58.8%, Female 35.2%).

4. DISCUSSION AND CONCLUSIONS

The study gained in-depth insight into the level of domestic consumers' electric energy consumption awareness. This study

Table 8: Detail picture of key factor of electricity conservation, and efficiency

Electricity consumption behavior							
S. No	Gender attitude toward saving electricity	Male			Female		
		Positive	Negative	Neutral	Positive	Negative	Neutral
1	78% of respondents hold a positive attitude, neutrals are 17%, and 5% of respondents hold a negative attitude towards electricity saving. The ratio of efficient electricity consumption at home	81	2.8	16.2	75	7.2	17.8
2	65% of respondents are unaware of efficient electricity consumption Efficient electricity practices	Yes 36.1	No 51.3	Not Sure 12.6	Yes 5.9	No 78.7	Not Sure 15.4
3	51% of respondents are not implementing any kind of electricity efficient practices at home. The barrier for implementation of efficient appliances	Yes 33.8	No 34.4	Sometime 31.8	Yes 20.2	No 67.6	Sometime 12.2
4	50% of respondents believed that lack of information is the main barrier in implementing energy-efficient appliances at home. Electricity saving (importance, conservation, measurement, advertisement campaign)	Lack of information 43.8	Financial resources 37.1	Common building 19.1	Lack of information 56.2	Financial resources 34.9	Common buildings 8.9
5	94% of respondents believe that electricity saving is important. Avalied opportunity to reduce consumption at home	Yes 95	No 5		Yes 93	No 7	
6	73% of respondents avail themselves the opportunity for electricity reduction but it rarely happens that they practice conservation techniques to save electricity	Yes 53.6	No 46.4		Yes 92.4	No 7.6	
			Male			Female	
7	Monitoring monthly bills 53% of respondents are unaware of their monthly electricity charges	Yes 58.8	No 41.2		Yes 35.2	No 64.8	
8	Monitoring the electricity consumption 62% of respondents never monitor their electricity consumption	Yes 60.7	No 39.3		Yes 15.3	No 84.7	
9	Energy star product labeling” 64% of respondents are unaware of energy star labels)	Yes 56.2	No 43.8		Yes 15.8	No 84.2	
10	Electricity saving information helpline 75% of respondents are unaware of energy efficiency landline service	Yes 28.6	No 71.4		Yes 21.4	No 78.6	
11	Electricity saving campaigns 89% of respondents are willing to participate in campaigns	Yes 79.6	No 20.4		Yes 98.4	No 1.6	

Figure 3: (a and b) Efficient electricity consumption awareness

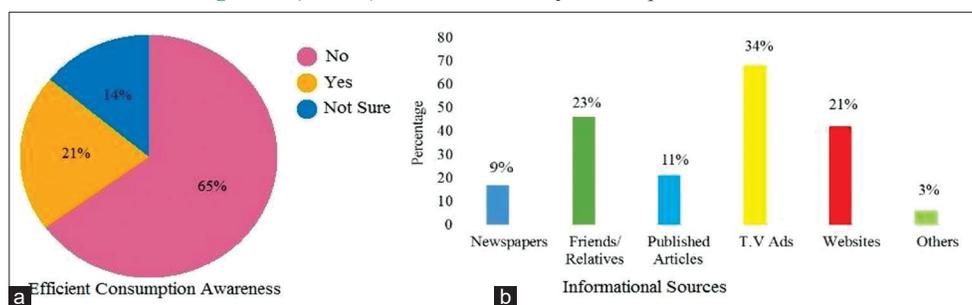


Figure 4: (a and b) Perception about electricity efficiency

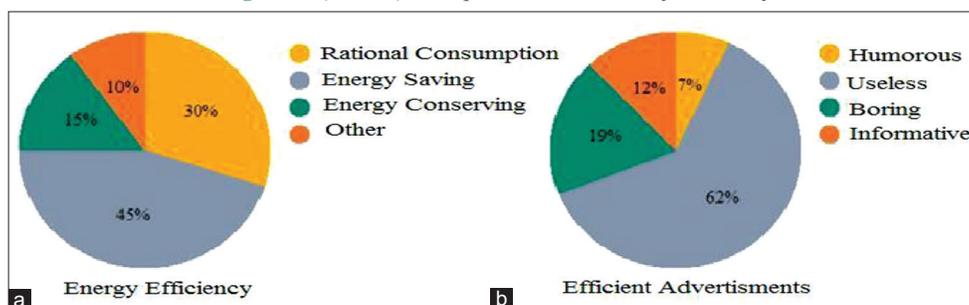


Figure 5: Energy information helpline

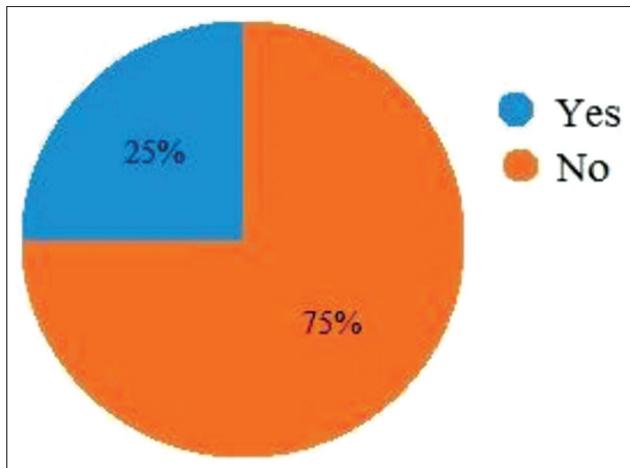


Figure 8: Electricity bills awareness

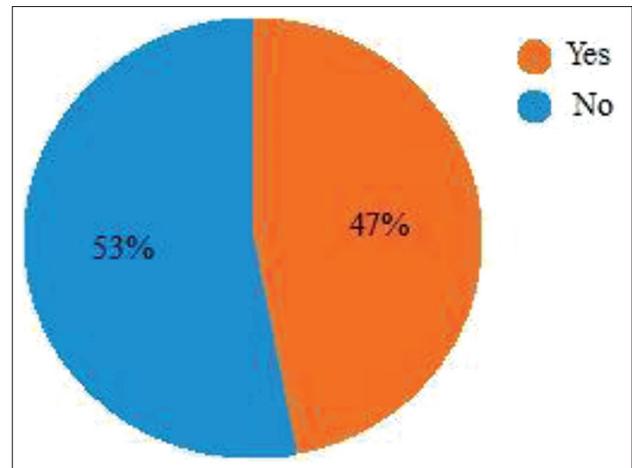


Figure 6: Energy star product label awareness

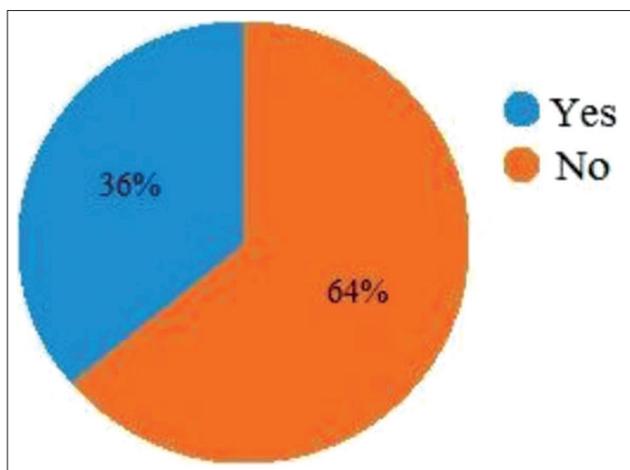


Figure 9: Electricity saving practices

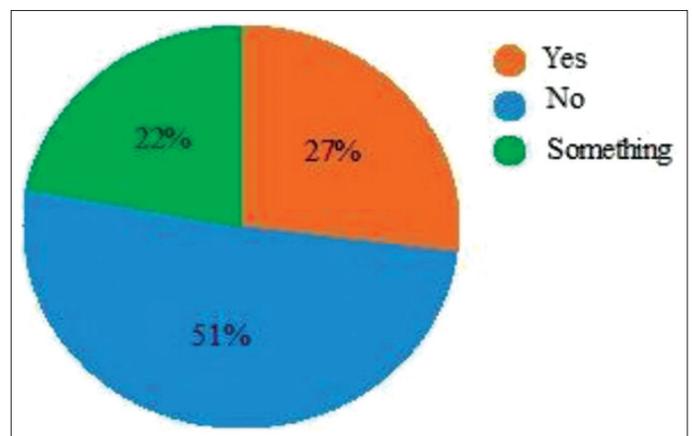


Figure 7: Consumption reduction opportunity

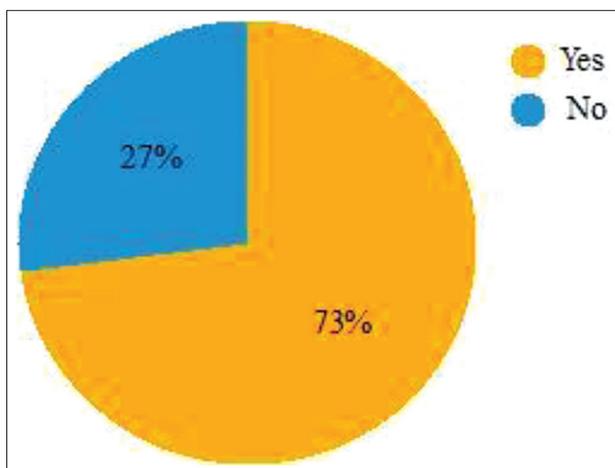
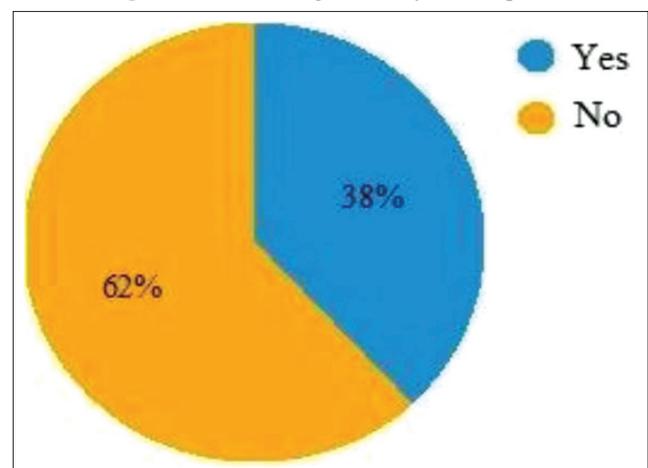


Figure 10: Monitoring electricity consumption



result portrays that majority of domestic consumers are unaware of the various aspects of electricity consumption and saving practices in Pakistan. Generally, due to lack of awareness households do excessive (utilized much more than of the actual needs) wasteful or inefficient consumption. But 94% of the target audience holds a will and great positional to save electric energy if they know-how.

The lack of awareness is the foremost concern that requires researchers and policymakers' dare attention to deal with. The results conclude that a significant portion of the educated class in the country is unaware (65%) about efficient electricity consumption. They do not monitor their total (daily/monthly) electricity consumption (62%) and even do not think about how much electricity (KWH) a specific appliance consumes. They even do not bother to monitor and calculate per unit and per appliance's

Figure 11: (a and b) Energy generating product used in different seasons

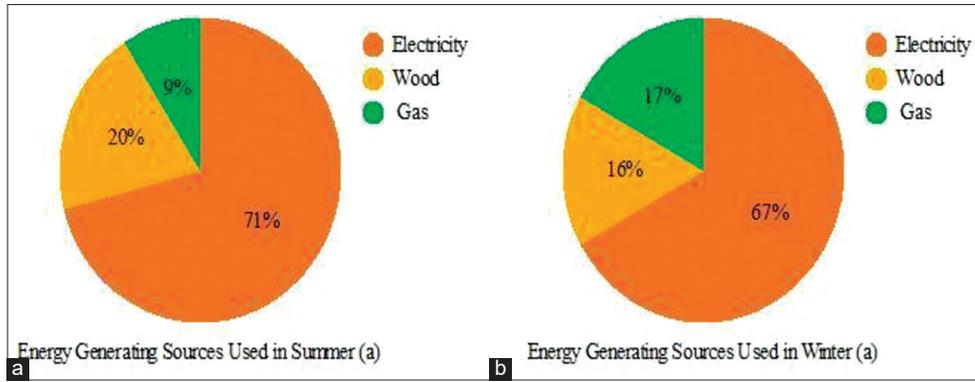


Figure 12: Appliances used in homes (a) and Willingness to apply (b)

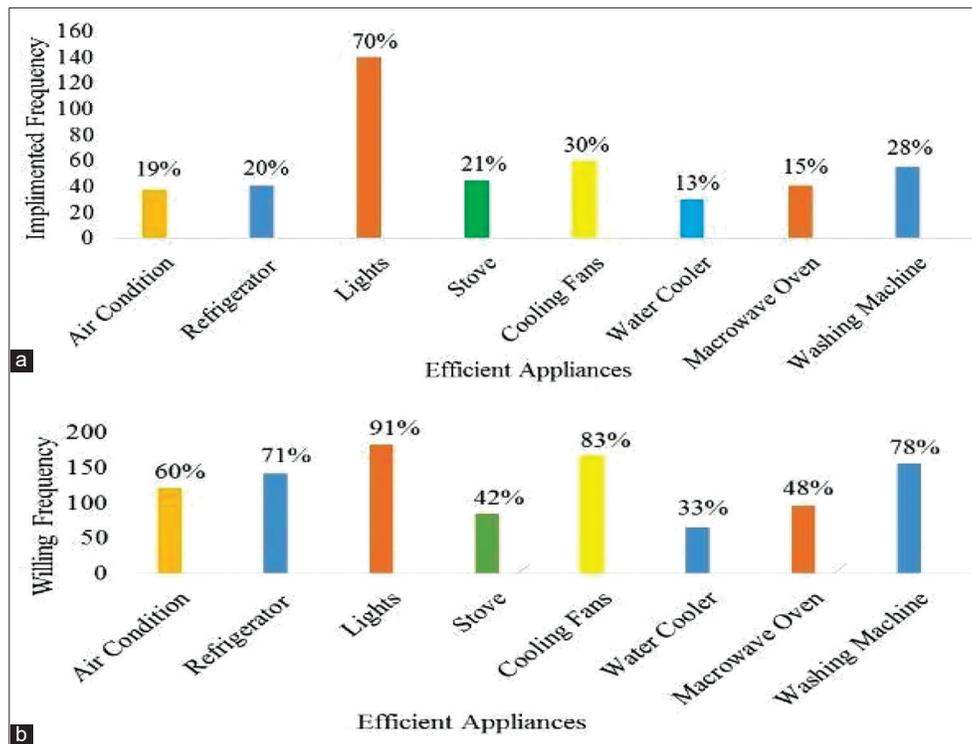
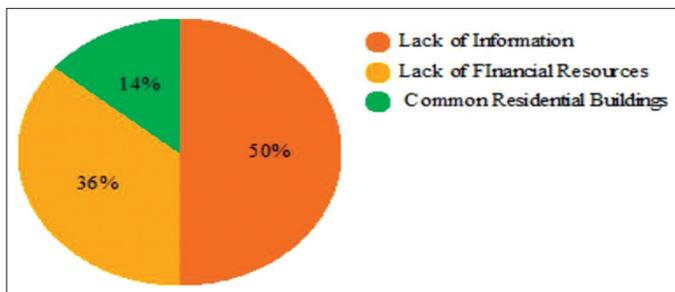


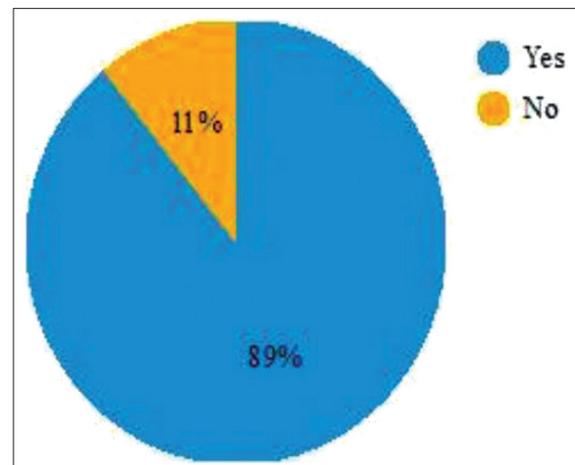
Figure 13: Barriers toward energy efficiency



electricity consumption charges (53%) until they do not face a huge shift in monthly bills.

The majority of the Pakistani female portion stays at home and considered housewives. They avail opportunity (73%) to reduce electricity consumption but they do not try to do so. A major portion of the target population is living without conducting any

Figure 14: Campaigns for efficient electricity consumption



electricity-efficient practice (51%) in their homes. Almost 64% of respondents are those who are unaware of energy star product

labeling. They are unfamiliar with the type of product they are using. Two-third (75%) of the population is unfamiliar with the country's electricity information helpline. Despite these results, a huge population (94%) believes that it is important to save electricity and reduce electricity charges but according to our observations domestic consumers waste almost 25%-35% of electricity in their homes.

The implications of this literature can provide strategic policy guidelines and support to government and related authorities including, the Water and Power Development Authority (WAPDA), National Transmission Distribution Company (NTDC), and National Electric Power Regulatory Authority (NEPRA) to concentrate on the important aspects of electric energy awareness. The study results explicate that lack of awareness is indulging consumers to take irresponsible actions while consuming electricity in their homes. While the synthesized literature already portrayed that irresponsible actions are the main cause of electricity wastage. Thus, lack of awareness facilitates irresponsible behavior, which is extending the supply-demand gap and led the shortfall to 6097 MW.

The government has cut down industrial sector electricity supply share for fulfilling the demand of the domestic sector. Due to this, the gap between import and export has been increased at an alarming stage because industries are shutting down or have shifted the manufacturing plants to other countries. The government is taking initiatives to raise electricity generation capacity to fulfill the demand of the industrial sector but the results are still blurry.

4.1. Objectives Conclusions

This study concludes that a significant portion of electricity waste can be saved in the domestic sector. But for this, it is pre-requirement for the government to design and implement convincing, fearful promotional campaigns, public policies, and disseminate the information through a proper platform such as television advertisement which is a cheap source of distributing information to a large audience.

The objectives pondered in the study came to the following conclusions:

4.1.1. *The level of awareness for energy consumption, efficiency, conservation*

The study results explicate that consumers possess a very low level of awareness about the various aspects of electric energy. Approximately, 47% of the respondents are unaware of the efficient electricity consumption pattern. Almost 50% of the respondents' admitted that "lack-of-information" is a big issue in adopting electricity efficiency and 51% of the respondents are unaware of their monthly electricity charges. Thus the results of this study conclude that unawareness creates and strengthens a sense of irresponsibility in consumer behavior.

The conclusion explicates that electricity efficiency and consumer awareness are not at par to be significant contributors. The level of awareness is quite low. This study results are validating the study result of Vessileva's (2014) study conducted in Sweden.

4.1.2. *Electricity efficiency practices and major hurdles*

The major hurdle domestic consumers are facing to implement electricity saving practices (efficiency and conservation) is the

lack-of-information. Almost half (50%) of the target population argued that there is no efficient and influential awareness campaign on electricity saving practices. Media advertisements such T.V commercials are not so much attractive to influence and motivate consumers to save electricity. A huge targeted population (62%) responds that media advertisement is useless and boring (19%). These findings are validating the previously conducted survey on public opinions on the level of awareness of electricity efficiency (Guo et al., 2018; Gedner, 2011). The fearful promotional campaign should design in a way that can hit the sentiments of domestic consumers to adopt energy star appliances and save electricity for themselves and their future generation in a shorter period.

4.2. Study Implication

The results conclude that majority of the target audience (94%) has a consensus on practicing electricity saving practices which is beneficial for consumers and society in general. But lack of information is the major hindrance towards the utilization of the idea and the resources. The audience simply does not possess the required knowledge and the know-how to practice electricity-saving techniques for reducing wasteful consumption. While Rahman (2016) study conducted in Malaysia (2016) concluded that knowledge and energy awareness has a strong positive relationship to save energy.

This study finding can provide pivotal information to concerned authorities including government, national electric power and regulatory authority, water, and power development authority, and for consumers to take initiatives for raising electric energy awareness for bringing sustainability in consumer's responsible behavior.

Domestic consumers have a consensus for reducing electricity consumption and wastage if they get proper awareness about various aspects of electricity utilization. This will help domestic consumers to save electricity costs. Secondly, Government will be able to save a billion-dollar amount of investment which is paid in return for oil importation. Thirdly, remarkable climate impacts can be reduced. Fourth, the government will be able to rescue the natural reservoirs (fossil fuel) by producing less electricity and will be able to increase the lead time of reservoir depletion and can be able to generate renewable in that cycle. By achieving a potential level of awareness, community will be able to attain a sustainable electricity supply in the economy.

4.3. Limitations and Future Recommendations

The scope of the study did put some constraints on the conclusions. Firstly, the focus was to measure the limited aspects of awareness for electricity consumption in the domestic sector. The results of awareness and actual implementation thereof may lead to different results in reality. In future research, it would be advised to consider and include all the practices that are applied currently or can be done so in households in their daily lives.

Secondly, time constraints and finite resources are always an important consideration. Due to these constraints, this study's focus was on the limited number of questions related to electricity consumption awareness. Here two fields are specified; the first

limited number of questions related to awareness of electricity consumption and the second is a specified sector which was residential. In further studies, the researcher can focus on other sectors (commercial, industrial, transportation sector) of electricity consumption in the country to take the well-established results.

Third, to evaluate the cause of irresponsible behavior, the level of consumer's energy awareness has been observed and analyzed descriptively. No doubt, results are meaningful and significant. But for further studies, the researcher may analyze various other factors that may be possibly contributing to excessive consumption like; financial status, higher income, or laziness. Such factors can contribute significantly to develop irresponsible consumer behavior.

The fourth constraint is related to the methodology section. This study is carried out through a descriptive method of analysis, which may not be an appropriate tool to provide true representative results. The researcher should adopt a statistical analysis method to empirically test the data for obtaining the best fit results for the study. These results can draw a generic picture and path to tread in future research.

REFERENCES

- Ahmed, M.S., Mohamed, A., Homod, R.Z., Shareef, H., Khalid, K. (2017), Awareness on energy management in residential buildings: A case study in Kajang and Putrajaya. *Journal of Engineering Science and Technology*, 12(5), 1280-1294.
- Akbar, U., Khan, K., Akhtar, M. (2014) Energy intensity: A decomposition exercise for Pakistan. (Winter), 53, 531-549.
- Collins English Dictionary. (2019) Irresponsible Definition and Meaning Collins English. Collins English Dictionary.
- Ding, Q., Cai, W., Wang, C., Sanwal, M. (2017), The relationships between household consumption activities and energy consumption in China an input-output analysis from the lifestyle perspective. *Applied Energy*, 207, 520-532.
- Gedner, B.Y. (2011), Survey on Public Opinion on the Level of Awareness of Energy Efficiency.
- Ghani, B. (2018), Electricity Gallup Pakistan. Available from: <http://www.gallup.com.pk/topic/economy/energy/electricity>.
- Grappi, S., Romani, S., Bagozzi, R.P. (2013), Consumer response to corporate irresponsible behavior: Moral emotions and virtues. *Journal of Business Research*, 66(10), 1814-1821.
- Guo, Z., Zhou, K., Zhang, C., Lu, X., Chen, W., Yang, S. (2018), Residential electricity consumption behavior: Influencing factors, related theories and intervention strategies. *Renewable and Sustainable Energy Reviews*, 81, 399-412.
- Gupta, S., Vick, M. (2007), How do consumers judge celebrities' irresponsible behavior? An attribution theory perspective. *Journal of Applied Business and Economics*, 10(3), 1-10.
- International Energy Agency. Available from: <https://www.iea.org>.
- International Energy Agency. (2020), Available from: <https://www.data.worldbank.org/indicator/EG.IMP.CON.S.ZS?end=2014&locations=PK&start=1980&type=shaded&vie=chart>.
- Irfan, M., Cameron, M.P., Hassan, G. (2018), Household energy elasticities and policy implications for Pakistan. *Energy Policy*, 113(1), 633-642.
- Ishak, S., Zabil, N.F.M. (2012), Impact of consumer awareness and knowledge to consumer effective behavior. *Asian Social Science*, 8(13), 108-120.
- Khan, S., Ashraf, H.F. (2015), Analysis of Pakistan's Electric Power Sector, March.
- Khairunnisa, A.R., Yusof, M.Z.M., Salleh, M.N.M., Leman, A.M. (2015), The development of energy efficiency estimation system (EEES) for sustainable development: A proposed Study. *Energy Procedia*, 79, 527.
- Martiskainen, M. (2014), Affecting Consumer Behaviour on Energy Demand Final Report to Energy.
- Masih, A. (2018), Thar coalfield: Sustainable development and an open sesame to the energy security of Pakistan Thar Coalfield: Sustainable development and an open sesame to the energy security of Pakistan. *Journal of Physics: Conference Series*, 989, 012004.
- Ministry of Finance Pakistan (Economic Survey of Pakistan). Available from: <http://www.finance.gov.pk>.
- National Electric Power regulatory Authority (NEPRA). Available from: <https://www.nepa.org.pk>.
- National Electric Power Regulatory Authority. (2020), State of Industry. Available from: http://www.nepa.org.pk/publications/state_of_industryreports/state_of_industryreport2017.pdf.
- NEPRA. (2018). State of Industry Report. National Transmission and Distribution Company. Available from: <http://www.ntdc.com.pk>.
- Qazi, U., Ali, M.R., Moqueet, A. (2018), An estimation of the impact of uninterpretable power supply systems on electricity distribution utility of Pakistan. *Journal of Basic and Applied Sciences*, 14, 92-97.
- Rafique, M.M., Rehman, S. (2017), National energy scenario of Pakistan current status, future alternatives, and institutional infrastructure: An overview. *Renewable and Sustainable Energy Reviews*, 69, 156-167.
- Rahman, K., Leman, A.M., Yusof, M.Z.M., Salleh, M.M.N. (2016), Consumer awareness in energy efficiency for residential in Peninsular Malaysia. *The International Conference on Green Design and Manufacture 2016*, 1-7.
- Samaa Digital. (2016), Pakistani Households Waste 25 Percent of Electricity Study Samaa Digital. Available from: <https://www.samaa.tv/news/2016/07/pakistani-households-waste-25-percent-of-electricity-study>.
- Sheng, P., Guo, X. (2018), Energy consumption associated with urbanization in China: Efficient- and inefficient-use. *Energy*, 165, 118-125.
- Sorrell, S. (2015), Reducing energy demand: A review of issues, challenges and approaches. *Renewable and Sustainable Energy Reviews*, 47, 74-82.
- State Bank of Pakistan (Central Bank of Pakistan). Available from: <https://www.sbp.org.pk>.
- State Bank of Pakistan. (2017), The State of Pakistan's Economy, Third Quarterly Report, for the Year 2016-17. The Board of Directors of State Bank of Pakistan. Available from: <http://www.sbp.org.pk/reports/quarterly/fy17/third/Complete.pdf>.
- Survey, P.E. (2020), Overview of the economy of Pakistan. *South Asia*, (iv), pp. 1-40. doi: 10.1016/B978-0-323-06551-1.00190-1.
- Vassileva, I. and Campillo, J. (2014), Increasing energy efficiency in low-income households through targeting awareness and behavioral change. *Renewable Energy*, 67, 59-63.
- World Bank (Data site). Available from: <https://www.worldbank.org>.
- World Economic Forum (WEF). Available from: <https://www.weforum.org>.
- World Economic Forum. (2019), Available from: <https://www.data.worldbank.org/products/wdi>.
- Zafar, U., Rashid, T.U., Khosa, A.A., Khalil, M.S., Rashid, M. (2018), An overview of implemented renewable energy policy of Pakistan. *Renewable and Sustainable Energy Reviews*, 82, 654-665.
- Zaman, S. (2017), Pakistan Bureau of Statistics, Karachi. Available from: <http://www.pbs.gov.pk/sites/default/files//PAKISTAN%20STATISTICAL%20YEAR%20BOOK%2C%202016.pdf>.