

Renewable Energy and Energy Crises in Pakistan

Rizwan Ahmed Usmani¹, Dr. Muhamamd Asim², Mr. Salman Manzoor³

¹Research Scholar, University of Karachi (UoK): rizwanahmedusmani@hotmail.com

²Associate Professor, University of Karachi (UoK): masimku@hotmail.com

³Assistant Professor, University of Karachi (UoK): salmankubs@gmail.com

Abstract

The research was carried out to highlight the long-lasting issue of the energy crisis in Pakistan. The study was conducted to determine whether renewable energy is the solution to the increasing issue of the crisis in the country. Initially, the energy crisis within Pakistan has been identified, which illustrates that developing countries such as Pakistan require a steady supply of cheap and clean energy. The renewable sources of energy and technological advancements can deliver the solutions to the long-standing energy issues faced by developing countries. Secondly, Pakistan's renewable energy potential has been discussed along with the primary sources of renewable energy available: solar, thermal, biomass, and wind energy. Lastly, the strategies that could be adopted to deal with the energy crisis issue have also been discussed in this study. The statistics of the demand and supply have also been identified in the carried out research. It has been concluded that through applying the recommended strategies, the issue of the energy crisis could be resolved quickly in Pakistan.

Keywords: *Renewable Energy, Crises, Pakistan, Issue, Strategies*

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1 Introduction

1.1 Background

Pakistan is amongst the most populated economies in South Asia, contributing around 2.56% of the overall worldwide population. Pakistan is a semi-industrialized country with a presentable agriculture base, food processing textile, and a per capita GDP of 1561 USD. As per the World Bank, Pakistan has essential development and endowment capacities. Globally, Pakistan's labor market stands at number 10 in terms of being the largest, and the country stands at the position of 67 amidst the global exporters. The country is anticipated to act as a global energy and trade hallway in the forthcoming because of its strategic location. Therefore, amidst different political, economic,

and social aspects, Pakistan ought to ensure its energy supplies satisfy the country's indirect and direct demands for sustainable economic development and the facilitation of the global and regional initiative (Bint Faheem, 2016). The broad difference between supply and demand for electricity was 26.82, recorded in 2009-2010. The figure jumped in the summer of 2012 and reached 50%. However, the electricity supply of Pakistan has improved in recent years. As per the Pakistan Economic Survey 2019-2020, the capacity of equipped electricity production made it 37,402 MW in 2020. The optimum overall demand from industrial and residential estates is approximately 25,000 MW, while the distribution and transmission capability is stopped at around 22,000 MW (Gondal, 2019). However, the issue

has slightly improved but not eliminated. Common issues are that electricity supply could not be sustained during peak hours, leading to regular power shutdown commonly known as load shedding of 16 to 19 hours in rural regions and around 13 to 14 hours in an urban area.

Consequently, most industrialists and entrepreneurs have invested and shifted their business to other bordering countries (Irfan, Zhao, Ahmad, and Mukeshimana, 2019). Therefore, both long and short-term mechanisms and approaches are needed to deal with the current energy issues. The current indigenous energy resources of Pakistan primarily comprise coal (3%), gas (20.44%), oil (49.78%), and hydro (50%). The fundamental supply of energy accumulates to more than 70 million Tonnes of Oil Equivalent (TOE). Oil and gas are in the dominant position having more than 705 of compound share. Pakistan imports gas from Iran, and the Middle East exports oil-primarily to Saudi Arabia and Pakistan.

Furthermore, Pakistan uses Coal, Liquefied Petroleum Gas, and Liquefied National Gas (LNG) (Javed et al., 2016). Pakistan currently had, four power plants having an overall potential of 755 MW; a further three are under construction. Developing economies, such as Pakistan, require a consistent supply of clean and cheap energy. The use of fossil fuels is dissolving, and the cost is rising every day. Renewable energy technologies and sources obtain the capacity to deliver the solution to Pakistan's long-term energy issues experience. Presently, a crucial energy crisis has been experienced by Pakistan, and the best alternative considered for this issue is sources of renewable energy, which includes wind energy, biomass energy, solar energy, along fuel cell technology could be consumed to deal with the energy crisis or shortage in Pakistan (Raheem et al., 2016).

1.2 Research Objectives

This research paper's core aims are "Renewable energy deployment to combat Pakistan's energy crisis." Based on the aim mentioned above, the following are the objectives that have been set

and will be addressed in the entire research paper. The objectives include;

- To determine the energy crisis in Pakistan
- To identify how much renewable energy potential does Pakistan has
- To recommend strategies which Pakistan could utilize concerning renewable energy and energy crisis in Pakistan

1.3 Research Questions

- What Energy crises in Pakistan currently facing?
- What strategies should be implemented to resolve the energy crisis in Pakistan?

1.4 Rationale

This research paper obtains undeniable importance and impact on the growing economy of the country. Considering Pakistan's situation, the energy crisis is the most significant leak in the economy, reducing gross domestic product progress by over 2% every year. This crisis's arrival is from the fuel mix transformation policy the country is utilizing, which was introduced at least 20-25 years back, when imported furnace oil turned out to be the fundamental means of power generation, instead of greater diversification of energy. Pakistan is facing a more than 9% yearly increase in demand for energy, and overall demand had risen four times in the previous 20 years. This demand is more probably to double in the coming decade. This study is of great significance, as there is a higher proportion of gap in this study field. This research paper aims to decrease the research gap and provide knowledge and understanding of Pakistan's energy crisis and how it can deal with it.

2. Literature Review

2.1 Energy Crisis in Pakistan

Javed et al. (2016) reported that developing countries such as Pakistan require a continuous supply of clean and cheap energy. The frequent

fear worldwide that fossil fuel will be useless soon and the energy rates are rising daily. The renewable sources of energy and technological advancement can deliver remedies to the long-standing energy issues experienced by developing countries. Presently, Pakistan is going through a precarious energy crisis, and the resources of energy might be the best replacements for quick stopping the necessity for fossil fuels. Energy sources, such as wind energy, biomass energy, and solar energy pooled with fuel cell technology, might triumph over energy scarcity in Pakistan.

It is also reported that the industry of Pakistan is declined because of the energy deficiency in the shape of the natural gas, electricity, domestic and sectors of transport are the victims of the crises. Javed et al. (2016) reported that all major sectors are demanding more energy to run unceasingly. This request is resulting in an energy shortage and demanding more energy to run the run continuously. This request is causing the energy shortage and discount in the current energy sources. In the sector of power generation, however, Pakistan installed capacity of the generation of power is higher than its demand; there is a long gap between the supply and demand of electricity in the country. This gap in the supply-demand turns out to be serious in the summer reason. Electricity production cost has enhanced significantly in Pakistan, impacting the commercial user and domestic consumers cautiously in terms of affordability.

The Bint Faheem (2016) study highlights the burning issue of the crisis of Energy in Pakistan. Energy crisis is badly impacted the agricultural, industrial and economic sectors of the country. It has stemmed from the high social evils, inflation, frustration rimes in the poverty, masses, and unemployment. On the other hand, the energy crisis is a humanitarian crisis, and electricity has become a simple commodity. Blackouts and load shedding make society frustrated, increase the crime rate, lack tolerance, murders, rate disputes, and other social evils. Employees on daily wages or labor are suffering more because of this crisis. Besides, agriculture sectors are also impacted because of the power crisis because productivity

depends on electronic machinery. However, failure in the production of electricity decline the agricultural output, which is the backbone of the economy of Pakistan (Bint Faheem, 2016)

Raheem et al. (2016) reported the considerable lack of electricity because of the considerable dependence on the fuels imported has become the critical obstacle to the socio-economic development or progress in Pakistan. These situations enhance the local fuel prices and limit the development of the newer industrial zones. The present gap among the production and demand of electricity in Pakistan is 5000–8000 MW, with a constant enhancement of 6–8 % per annum. However, more renewable and sustainable sources of energy are needed to prevail over the current issues. Pakistan is gifted with likely renewable energy resources, for example, biomass, hydro, solar, and wind. Such resources have the volume to be primary contributors to the future energy production environment, sustainable energy development, and efforts for climate change reduction.

2.2 Renewable Energy Potential in Pakistan

Pakistan obtains four significant sources of renewable energy. These four sources include biomass, hydro, solar, and wind. These resources obtain the substantial potential to offer resolutions to the enduring energy crisis in Pakistan. Therefore, stable development and growth of these resources are critical to deal with the current energy crisis and difficulties in an eco-friendly way. Amidst the various renewable energy sources, solar energy had attained the most attention from researchers (Raheem et al., 2016). Xu et al. (2019) analyzed solar photovoltaic (PV) power generation potential with 14% useful PV panel across the area of 100 km² which is 0.01% of the overall area of Pakistan. The outcomes determined that occupying 100 km² of an area with PV panels could generate energy equal to 30 million tons of oil equivalent (MTOE) in Pakistan (Xu et al., 2019). Gondal (2019) measured urban regions of 0.45% for PV installations to anticipate the overall capacity of energy generation based on the solar PV system. The interior parts of Pakistan

are primarily agricultural land, which is adequate for establishing biomass feedstock.

On the contrary, a southern and northern corridor obtains substantial solar, wind, and hydro capability. These researches are helpful as they may enhance the distinct energy supply market and reduce reliance on imported fuels and ecological pollution (Gondal, 2019). It has been estimated that Pakistan would supply more than 10,000 MW to the energy mix via renewable energy sources by 2030. Thus, adequate and timely progress to utilize various natural energy sources' capacity would have a remarkable impact on satisfying future projections (Irfan et al., 2019).

Wind Energy –Pakistan's Meteorological Department (PMD) has associated with National Renewable Energy Laboratories (NREL), US, to survey the wind speed of 46 diverse sites in the provinces of Baluchistan and Sindh from height starting from 10-30 m, The information from viability research was evaluated, and it was determined that broad area of 9750 km having a high speed of wind for founding and zoned as "Gharo-Corridor." The district has an essential capacity to generate approx—50,000 MW of electricity. Nevertheless, just 25% of the location could be consumed because of different economic activities, which will generate around 11000 MW(Shah and Solangi, 2019).

Solar Energy –Pakistan having 796,096 km is the situation among 62° and 75° longitude east and 24° and 37° latitude north. The unique climate conditions and geographical location is beneficial for the utilization of solar energy.

Biomass – Biomass is generally extracted from agricultural, animal, and plant waste. It is categorized into four main groups; forest residue, animal residue, municipal solid waste, and agricultural waste. Over 220 billion tons of biomass is generated across the globe from plants and animals, generating a significant amount of energy without diffusing a high concentration of CO₂. Pakistan being an agricultural country, has much potential of generating energy from this source(Bint Faheem, 2016).

Hydro – Water generates electricity from the kinetic energy present in the drops of water. Hydropower is a primary renewable energy source in Pakistan, having an exceptional capacity in locations among the Arabian Sea and mountainous locations like Karakorum, Himalayas, and Hindu Kash(Raheem et al., 2016).

2.3 Strategies to Overcome Issues concerning Renewable Energy and Energy Crisis in Pakistan

It has been reported that besides emphasizing conventional or traditional resources of energy, there is the necessity to assess the sources of non-traditional energy. They are capable solutions from renewable energy sources with less emission of carbon and high efficiency. However, the competence of renewable energy sources is less than that of non-renewable energy sources. The renewable energy sources are biomass energy, wind energy, solar energy, and others(Javed et al., 2016).

Javed et al. (2016) reported biomass as the core solution to the crisis of energy. It can be converted into different energy types such as heat, methane, hydrogen, ethanol, and methanol. All these energy forms might easily be transformed into electricity by utilizing flue cell technology with high competence of up to 70 percent. On the other hand, biogas could also be utilized for the combined heat and power generation (CHP) as well as production of the biogas makes the new jobs relent to the transport and collection of the feedstock, the construction, construction of biogas plant equipment, maintenance and function of biogas plants.

Aman, Ahmad, & Mehr-e-Munir (2017) study is most important for minimizing Pakistan's electricity loss. Short tenure solution to deal with the line losses, enhancing the capacity of power generating, long tenure solutions of replacing the thermal power fuel, standalone power projects, the myth of Thar coal, standalone power projects as well as also to pull to pieces the national grid to overcome such crisis are also provided. It is reported that to get each province's profit,

Pakistan should disassemble the National grid. As if they are linked to the national grid, they could not provide their rights against the 18th adjustment. If the government can take this step, it helps make much energy and might sell it in the other regions.

Aman, Ahmad & Mehr-e-Munir (2017) also reported that the governments get ridiculed due to each province's demand from their local or provincial government and not blaming the federal government. It is known as "Provincialization," not "Privatization;" however, the federal government must inspire the province that produced increased electricity for their individuals. In relation to this, the provincial government must enhance their grids and decrease line losses and electricity theft to a considerable level and provide cheaper electricity for their individuals. However, it is a long-term solution.

On the other hand, the medium tenure solution is solar energy. According to Aman, Ahmad &

Mehr-e-Munir (2017), in Pakistan, most of the rural areas there is no facility of the electricity, and they are not linked easily with the national grid it is since they are either too remote or often have low population; thus installation of the solar PV in those areas it will be less costly and also reduce the most of the load on the National grid. Pakistan must use solar energy in the road lights, street lights, and Public Parks to the national grid and reduce the demand and supply gap.

2.4 Conceptual Framework

The research objectives are evaluated in the shape of the conceptual framework that paths the course to attain the sustainable stipulation of Energy to Pakistan and the deployment of renewable energy to combat Pakistan's energy crisis. This issue underpins the conceptual framework to highlight the significance of energy and renewable energy to deliver the enhanced supply of electricity in Pakistan. Following is the illustration of the conceptual framework.

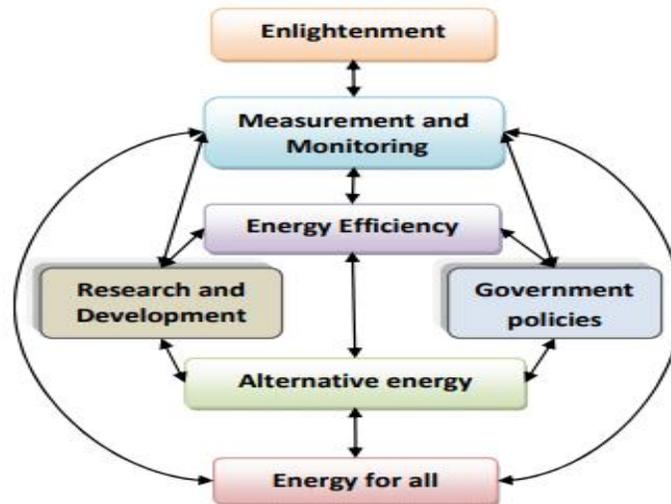


Figure 1 The conceptual framework; source (Yasmin & Grundmann, 2019).

The whole procedure begins with the evaluation of the current situation of energy. It is the most significant element to consider as it provides the ground for the energy revolution's start-up. This method proceeds with the monitoring and measurement of the usage of Energy in Pakistan. The proposed conceptual framework comprises

of essential factors, which are briefly described below:

2.4.1 Enlightenment

Making energy users know the difficulties they face in making enough and sufficient energy to satisfy their needs is crucial in the right path. When a customer knows; they would utilize their

knowledge to make the sound decision on the use of energy that is crucial to make sustainable energy accessible to all.

2.4.2 Measurement and Monitoring

For the result-based movement in an optimistic way, execution and the energy industry's influence have to be observed. Problems to be regarded involve; the amount of energy accessible, its use, and seek methods to optimize them. It is because enhance the production of electricity deprived of the best possible utilization would lead to the lack of some areas (Nazir, 2020).

2.4.3 Energy Management and Efficiency

Potentials of cost-effective energy competence would be helpful for the consumers of energy and the economy. For instance, saving energy costs might be utilized to generate energy-saving domestic services and goods. The cost-effective energy enhancements are realized; extra lucrative enhancement opportunities would continue to open up as the research outcome (Nazir, 2020). Considering this, the energy efficacy scheme that fits the developing atmosphere must be researched and adopted in Pakistan.

2.4.4 Renewable energy

The present energy consumption worldwide is equal to 13 terawatts (TW), leading to energy's most crucial issue of the 21st century. Pakistan has four renewable energy sources as biomass, hydro, solar, and wind. These sources have the critical potential to deliver the solution to energy's long-lasting crisis in Pakistan (Raheem et al., 2016). The main requirement to combat the angry crises is by making fair use of the plentiful sources of renewable energy available in Pakistan.

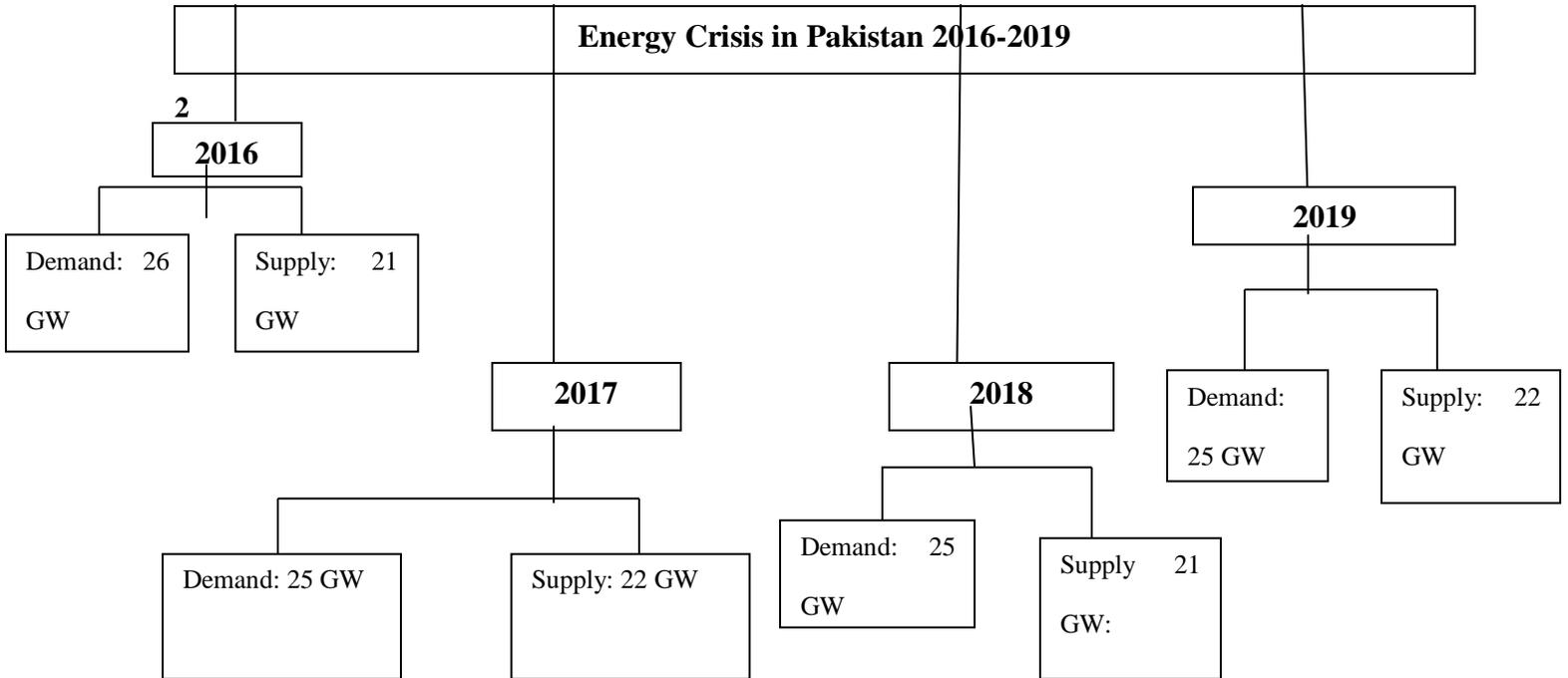
2.4.5 Research and development

Research makes the basis of the economy's growth, and there has to be the expansion of the native technology grounded on the available resources.

2.4.6 Government Policies

There is a necessity to assess national energy policies to represent the state's priorities and the significance of the energy supply. BACIP, CPEC, Power Generation Policy, National Energy Efficiency, and Conservation Act, 2016 are some Energy initiatives in Pakistan.

Energy Crisis in Pakistan 2016-2019



3.

Methodology

3.1 Research Philosophy

The notion of the belief regarding the phenomenon is that data about the concept or the topic must be collected, analyzed, and utilized (Hodgson, 2016). There are two significant philosophies of research such as interpretive and positivist. Interpretivism research philosophy is based on the concepts and principles that show that the researcher carries out the precise role in observing the world. It is chosen because it depends on the interests of the researcher. This study uses the positivism approach as primary data has been collected in this research. Positivism sees society as shaping the people and believes that 'social facts' shape people's actions. This approach is used as the most reliable

method, and it allows a well-defined structure, but it is inflexible.

3.2 Research Approach

There are two types of approaches such as inductive and deductive. The inductive approach includes starting with the empirical observations, seeking patterns in such observation, and then theorizing about such patterns. On the other hand, the deductive approach is the individual link with the scientific investigation (Sangodoyin, Akinsolu, & Awan, 2020). This study uses the deductive approach because it can measure the concepts quantitatively and generalize the research findings. Deductive research is a focused technique, but sometimes it does not encourage opposing thinking. However, it might restrict the scope of creativity.

3.3 Research Strategy

The research strategy defines the method to conduct the work. The strategy includes several different action research approaches, experimental research, surveys, interviews, and systematic literature review. In this research, the survey is performed as it is linked with the deductive approach. It is one of the economic and finest research strategies. This strategy helps to form observe contributing variables among diverse data. It allows the collection of massive data, which will be used to answer the research question (Hulland, Baumgartner, & Smith, 2018).

3.4 Data Collection

There are two sources through which data can be collected such as primary data and secondary data. Primary data is direct data. This first-hand data is collected, whereas secondary data is the indirect data. Other researchers' data has been used; for instance, data can be collected through books, articles, and others. This study uses the primary data sources as the survey is performed, and it ensures the authenticity, specific nature, and up-to-date information. In contrast, secondary data is cheap and not time-consuming.

On the other hand, primary data is most reliable because it is objective and collected directly from the source (Zotnick, 2015). However, this method is time and cost-consuming. The data has been collected through the 50 solar energy users chosen randomly from the social media platforms such as Twitter and Facebook.

3.5 Data Analysis

Quantitative and qualitative research methods are used to analyze the data. Qualitative data is statistical and structured data. Its results are conclusive and objective. In this study, the collected data from the primary source is analyzed through a quantitative approach. This method is used to collect the numerical data that might be used to measure the variables. It ensures the accuracy of the results and can be made with this broader study, including more subjects and generalization of results (Antwi and Hamza, 2015). Also, the quantitative data is analyzed through the help of pie charts as the size of the circle made proportional to the total quantity it shows and summarises the large set of data in the visual form.

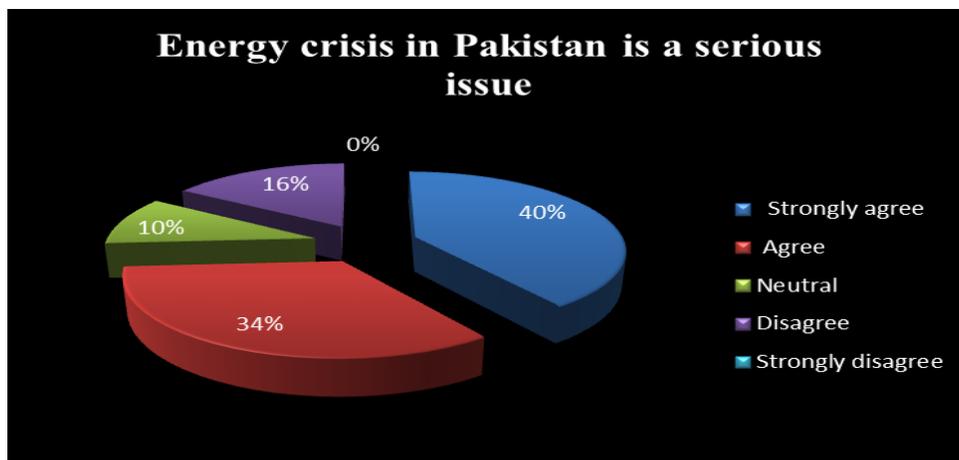
3.6 Expected Results

The eradication of corruption can ensure the consistent supply of electricity in Pakistan and solar energy panels help reduce the energy crisis. Pakistan is gifted with potential renewable energy resources, for instance, solar, hydro, wind, and biomass. Such resources can be the main contributors to future energy production matrices, sustainable energy development, and efforts to reduce climate change.

4. Results & Discussion

Following is the pictorial description of the results in the form of pie charts and interpreted schematically under each figure:

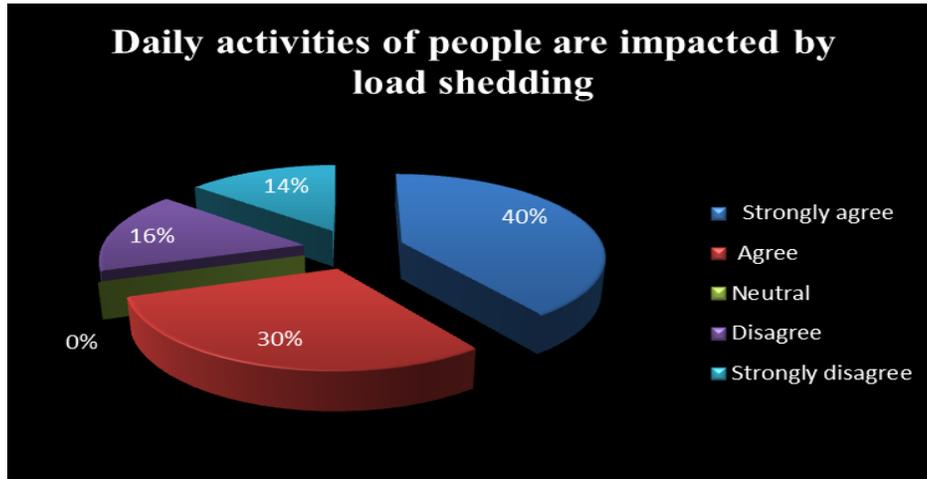
Figure 1



Above figure shows that most solar energy user strongly agrees with the statement that energy crisis is a severe issue of Pakistan and 34 percent

agree with this statement. On the other hand, 10 percent of users responded neutrally, whereas 16 percent disagree with the statement.

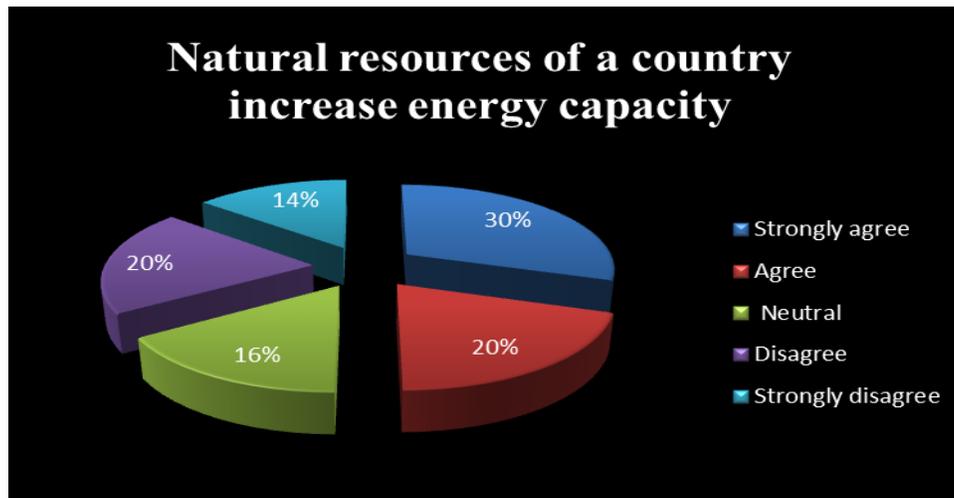
Figure 2



This figure shows that 40 percent are strongly agreed and 30 percent are agreed with the statement that load shedding impacts the

individual's daily activities. Whereas 16 percent have disagreed, and 14 percent strongly disagreed with the statement.

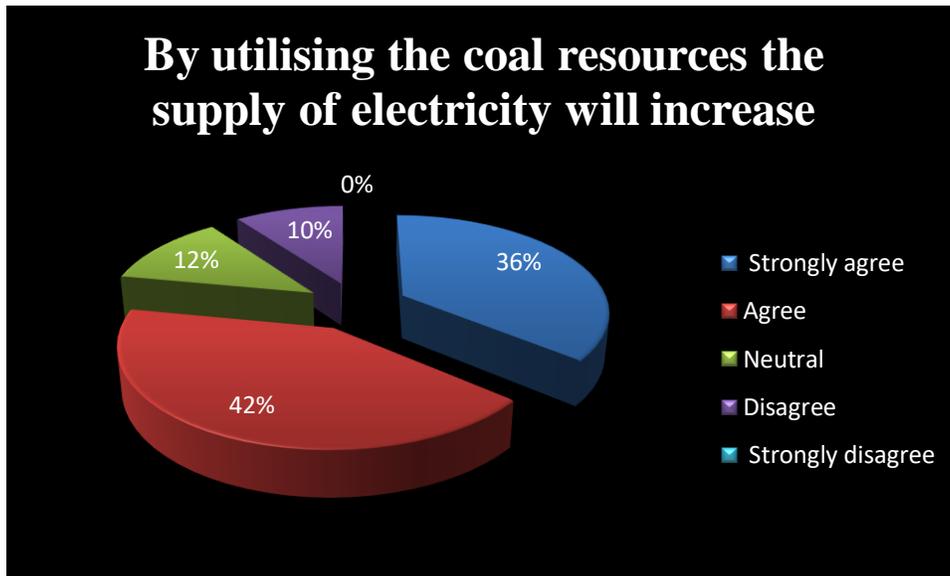
Figure 3



The above figure depicts that 30 percent of users strongly agree and 20 percent of employees strongly disagree with the statement whereas 16

percent of employees responded neutrally. On the other hand, 20 percent have disagreed, whereas 14 percent are firmly disagreed.

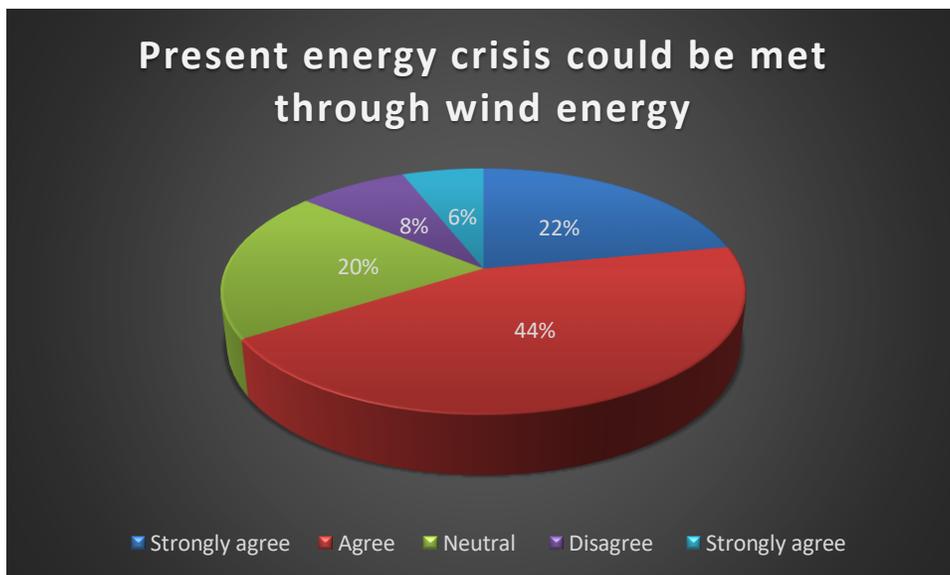
Figure 4



As per the above illustrative representation of the survey question response, the respondents' maximum percentage, e. e., 42%, agree that the supply of electricity is likely to be increased by using coal resources. 36% of the respondents

strongly agree. At the same time, no such respondents have shown a strong disagreement in this regard. Besides, only 12 % have responded that using coal resources would not increase the electricity supply.

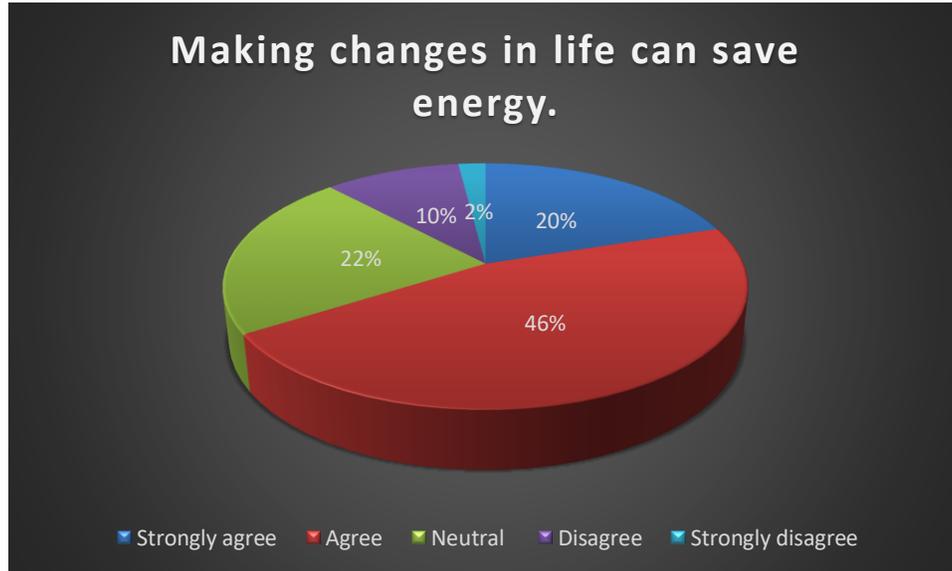
Figure 5



The depiction above shows a massive agreement that wind energy can meet the current energy crisis that is 44 percent. On the other hand, 20 percent of the sample included in the survey

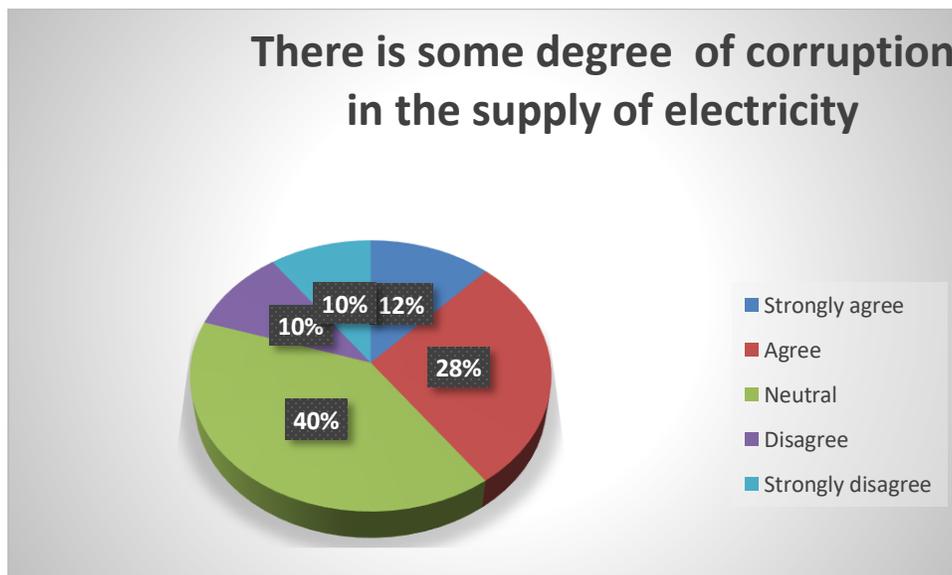
demonstrates a neutral response. Twenty-two percent of respondents strongly agree that utilizing wind energy can address the current energy crises.

Figure 6



The above figure shows a large proportion of the survey respondents agreeing that making life changes can save energy. Twenty percent are strongly agreed, while 22 percent have responded neutrally. They have neither shown agreement nor disagreement. Moreover, among the entire **Figure 7**

survey candidates, 10 percent have denied the significance of making life changes in saving energy. Only a negligible proportion of the respondents, that is 2 percent, have shown strong disagreement in their response.



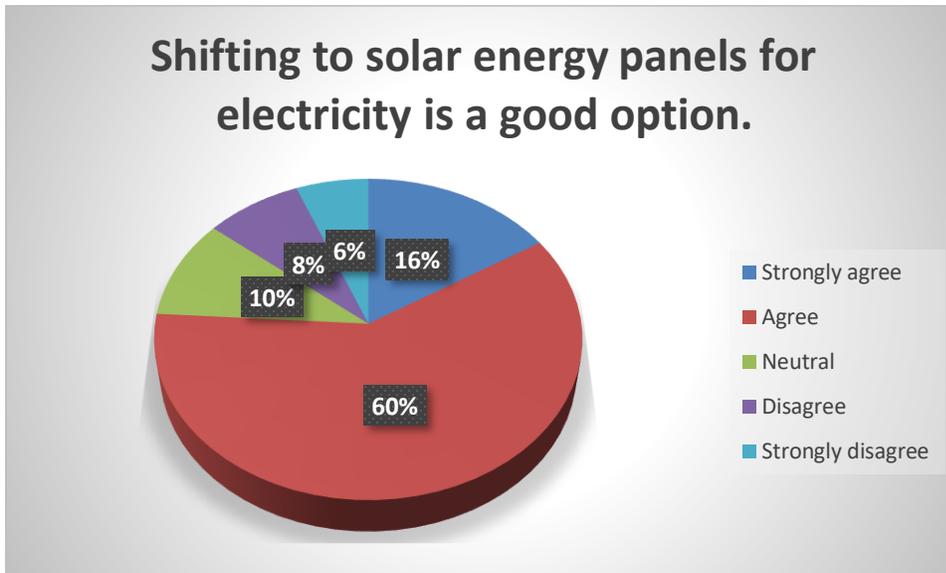
The above picture represents a significant chunk of survey respondents, 40 percent, which has shown a neutral response against the degree of corruption in electricity supply. Twelve percent

have shown strong agreement on the presence of some degree of corruption in the electricity supply. Twenty-eight percent have agreed that there is a certain degree of corruption in the

electricity supply. On the other hand, 10 percent have shown disagreement, and they do not feel any corruption in the electricity supply. While the

Figure 8

same percentage, i.e., 10 percent, has shown strong disagreement in the response.



The figure represents the survey responses showing 60 percent of respondents agreeing to the statement that switching to solar panels for obtaining electricity is a good option. Among these, 16 percent have shown strong agreement. While, contrarily, 10 percent have answered that they are neutral. Furthermore, 8 percent out of 50 survey candidates have shown that they do not feel that shifting to solar panels for electricity is a good option. Moreover, only 6 percent strongly disagreed.

4.1 Discussion

The findings of this study show that the energy crisis is a severe issue in Pakistan. Due to this, the activities of the individual are impacted by the load shedding. However, it is assessed from the findings that natural resources might enhance energy in Pakistan. These findings are supported from the review as it is reported in the study of Irfan, Zhao, Ahmad, and Mukeshimana (2019) that supply of electricity could not be sustained during peak hours, leading to regular power shutdown commonly known as load shedding of 16 to 19 hours in rural areas, and around 13 to 14 hours in an urban area. Moreover, load shedding

causes frustration in society, lack of tolerance, rate of disputes and other issues, and employees' daily wages or labor are suffering more because of this crisis. Given this, it can be said that timely progress to using the different energy sources would have an extraordinary impact on fulfilling future projections. According to Javed et al. (2016), renewable energy sources and technologies can develop the solution to the long-standing energy problems experienced by developing countries. Pakistan is going through an uncertain energy crisis, and energy resources are considered the best and most effective replacement for quick terminating fossil fuel requirements. Thermal resources have the highest capacity for generating Energy in Pakistan (Javed et al., 2016). The shortfall of energy has many impacts. It has been reported that Pakistan's industry has deteriorated because of energy shortage in the shape of transport sectors, domestic, electricity, and natural gas are the victims of crises. It has been determined from different studies that the massive gap in the demand and supply of electricity in Pakistan becomes severe in the summer season. The electricity generation cost has highly increased in Pakistan and affects domestic consumers and

commercial users cautiously regarding affordability.

It has been reported by Raheem et al. (2016) that the shortage of electricity is due to high dependence on the imported fuels, which has turned out to be a significant impediment to the socio-economic growth across Pakistan. The study has also identified renewable energy potential in Pakistan. It has been identified that Pakistan acquires four key renewable energy sources, including solar, hydro, biomass, and wind. These renewable resources have a significant capacity to provide adequate solutions to Pakistan's increasing energy crisis (Raheem et al., 2016). A survey was also conducted from 50 solar energy users, and the result demonstrates that the energy crisis is a severe issue in Pakistan. It was also asked whether load shedding impacts daily activities, and the majority of the respondents agreed. Respondents also agreed that using the country's natural resources will increase the country's energy capacity. Respondents also agree that making life changes could save energy. Solar energy panels have gained popularity in recent years in Pakistan. It was asked whether shifting to solar energy panels is a good option. More than 70% of the people agreed with the statement, which demonstrates that people are aware that renewable energy sources can solve Pakistan's energy crisis.

5. Conclusion

Because of the ground realities, it has been concluded that Pakistan's energy crisis is not a new issue, and Pakistan is not the only developing country experiencing this issue. However, this issue has impacted severely to different areas and industries of the country. Not only the developing countries, but the energy crisis also threatens several developed economies. Pakistan obtains many natural resources or renewable energy resources, providing adequate solutions to resolve Pakistan's energy crisis. Pakistan has started working on utilizing renewable energy resources to resolve the long-lasting issue of energy shortage. It has been determined that there is a gap of almost 4000-5000 GW between the supply and demand of electricity within Pakistan.

The shortage of supply leads to increased load shedding within the country. It has also been determined that some Pakistani areas experience more than 14-16 hours of load shedding in the summer season. Till 2016, Pakistan experienced a massive energy crisis. However, a decrease in load shedding could be seen after 2016. Pakistan already has sufficient installed potential or capacity to meet the current demand for electricity if every installed unit functions and provides the optimum possible results.

Furthermore, as per the records given, Pakistan obtains several untapped fuel reservoirs which might meet the rising demands. Effective planning from the government of Pakistan is needed to resolve the country's increasing issue quickly. Moreover, efforts are needed from Pakistan's residents through wise consumption of energy to enhance concerned departments' efficacy.

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