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Electricity Issues and Their Effects on Small and Medium-Sized Enterprises in Pakistan

Sana Zaidi^a
Abdul Salam^b

Abstract

The primary objectives of this study are to draw the government's attention to the critical issues concerning the escalating electricity crises and rising electricity prices in Pakistan, and to examine their ultimate impact on small and medium-sized enterprises. This research analyzes responses from a sample of 400 employees, randomly selected from various SMEs across the country. Using correlation and regression analysis, the study investigates the relationship between electricity issues and the operational behavior of SMEs. The findings reveal that increasing electricity prices and persistent electricity crises have a significant negative impact on the consumption behavior of SMEs. Among the two factors, the electricity crises are found to have a more profound effect on SMEs than the rising electricity prices. The frequent and severe electricity crises directly hinder the operations of SMEs, leading to substantial reductions in production, sales revenues, and employment levels. The study highlights that the operational disruptions caused by electricity shortages are more detrimental to SMEs compared to the financial strain from higher electricity costs. These crises not only impede daily business activities but also lead to long-term challenges in maintaining consistent production levels, fulfilling customer orders, and sustaining workforce employment. To mitigate these adverse effects, the study advocates for a policy change allowing SMEs to produce their own electricity. Granting legal permission for SMEs to generate their own power could be a viable solution to overcome the electricity shortfall and ensure uninterrupted business operations. By producing their own electricity, SMEs can reduce their dependency on the national grid, manage their energy consumption more efficiently, and avoid the operational disruptions caused by frequent power outages. Furthermore, this autonomy in energy production could enhance the resilience of SMEs, enabling them to maintain steady production rates, meet market demands, and safeguard employment. It would also potentially lead to cost savings in the long run, as SMEs could invest in renewable energy sources or more efficient energy systems tailored to their specific needs. The study underscores the critical need for government intervention to address the electricity crises and high electricity prices that are crippling the SME sector. Policymakers should consider implementing supportive measures that facilitate self-generation of electricity by SMEs, alongside other strategic initiatives aimed at stabilizing the electricity supply and controlling costs.

Keywords: Electricity Crises, SME Performance, Pakistan

JEL Codes: Q41, L25, H12

1. INTRODUCTION

Electricity shortages, or crises, arise primarily due to two main factors. First, energy constraints occur when there is insufficient availability of energy resources like fuel or water for electricity generation. This leads to an inability to operate power generation facilities effectively. Second, capacity constraints occur when the existing capacity for generating or transmitting electricity is insufficient to meet the demand. These shortages are significant issues globally, affecting over a quarter of the world's population who lack access to electricity, highlighting the critical need for sustainable energy solutions. Electricity is indeed a secondary form of energy derived from primary sources such as water, oil, coal, gas, uranium, and other resources. The gap between electricity supply and demand needs to be understood in the context of these primary energy sources that drive its production (US, 2006). Globally, electricity production primarily relies on three main sources: hydroelectric power, thermal power (which includes coal, oil, and gas), and nuclear power. Approximately 16% of the world's electricity is generated from hydroelectric sources, 41% from thermal sources (including coal, oil, and gas), and 15% from nuclear power, with the remaining 28% coming from other sources like solar, wind, geothermal, and waste (World Coal Association, 2006).

Electricity plays a crucial role in the economy of any country, serving as a cornerstone for national growth and development. A stable and reliable electricity supply is essential for driving economic activities. However, many regions around the world are currently grappling with electricity crises due to declining availability of cheap oil and heavy reliance on fossil fuels for electricity generation. To mitigate these challenges, countries are increasingly turning to alternative, cost-effective, and environmentally sustainable resources for electricity production. Each country faces unique circumstances and adopts resources that are readily available and feasible for electricity generation. This approach aims to reduce electricity shortfalls by harnessing cheaper and more abundant natural resources rather than relying solely on fossil fuels. By diversifying their energy mix and embracing renewable energy sources, countries can

^a UIMS-PMAS-University of Arid Agriculture Rawalpindi, Pakistan

^b UIMS-PMAS-University of Arid Agriculture Rawalpindi, Pakistan

enhance their energy security, mitigate environmental impacts, and promote sustainable economic development amidst global electricity challenges. Several countries around the world harness the potential of hydroelectric power to generate significant amounts of electricity. Countries like Brazil, Venezuela, China, and the United States utilize their abundant water resources for hydroelectric power generation. Venezuela produces 10,200 MW, Brazil produces 14,000 MW, China produces 22,500 MW, and the US produces 6,800 MW of electricity capacity from hydroelectric sources due to their extensive water resources (Haq and Munir, 2008). In specific cases, countries like Uganda and Nepal also heavily rely on hydroelectric power. Uganda's total electricity requirement is 340 MW, with 300 MW being generated from hydroelectric sources. Nepal, known for its vast hydro potential, estimates its hydroelectric potential at a staggering 83,000 MW (Bhandari, 2009). In developed countries, hydroelectric power plays a significant role in electricity production as well. For instance, Norway generates 99% of its electricity from hydroelectric sources, while Canada generates 58%, Switzerland 55%, the USA 7%, and Australia 6% from hydroelectric power (World Nuclear Association, 2011). These countries leverage their natural water resources to sustainably meet their electricity demands while reducing reliance on fossil fuels and promoting cleaner energy alternatives. Several countries globally possess significant uranium resources and advanced nuclear technology capabilities, enabling them to use nuclear energy for electricity production. For instance, France generates 75% of its electricity from nuclear power, followed by Sweden at 46%, Ukraine at 43%, South Korea at 39%, Germany at 30%, and Japan also at 30% (USNRC, 2011). These countries leverage nuclear power to meet substantial portions of their electricity needs, emphasizing its role in their energy portfolios. Conversely, many countries rely heavily on fossil fuels such as oil and gas for electricity generation due to their abundant reserves and accessibility. Countries like the United States, China, Japan, and Russia predominantly use thermal sources for electricity production (CIA World Factbook, 2009). Thermal power plants convert the energy released from burning fossil fuels into electricity, contributing significantly to global electricity generation.

Electricity shortages have become a pressing issue worldwide, affecting both developed and developing countries alike. Examples of countries grappling with electricity crises include the United States, Brazil, New Zealand, Nigeria, Uganda, Nepal, and Venezuela. These nations face challenges related to insufficient generation capacity, inadequate infrastructure, and sometimes a heavy reliance on specific energy sources vulnerable to supply disruptions or price fluctuations. Addressing these challenges often requires diversified energy portfolios, improved infrastructure, and sustainable energy management strategies to ensure reliable electricity supply for economic growth and societal well-being. It's clear that the electricity crisis in Pakistan has had profound impacts across various sectors, affecting both industrial and domestic consumers alike. The challenges stemming from inadequate utilization of hydro and thermal energy sources have exacerbated the situation, leading to heavy load shedding and increased electricity costs. This has significantly hampered business operations, raised production costs, and hindered economic progress. The resulting closure of industrial units has contributed to higher poverty levels and increased unemployment, further straining the economy. SMEs, crucial to Pakistan's economic landscape, have been particularly hard-hit, grappling with the dual challenges of electricity shortages and rising operational costs.

In Pakistan, the demand for electricity consumption is growing rapidly due to industrialization and urbanization. As the need for electricity grows, the current supply system is proving to be inadequate, with insufficient generation capacity failing to meet the rising demand. Another contributing factor is the rise in oil prices on the international market, which adversely affects tariffs and the stability of the electricity system. Consequently, industrial and domestic consumers are charged higher rates and face ongoing electricity crises. Political instability further exacerbates the situation, as it hampers the implementation of effective policies and reforms. Electricity theft is another significant issue, reducing the efficiency of the supply system and leading to financial losses. Moreover, there has been a lack of investment in the construction of new dams, which are crucial for enhancing hydroelectric power generation. Pakistan's heavy reliance on fossil fuels, combined with insufficient revenue collection by distribution companies, creates obstacles in stabilizing tariff rates and ensuring a reliable supply system. The combination of these factors has led to persistent electricity shortages, frequent load shedding, and increased production costs, which hinder economic growth and development. Addressing these issues requires comprehensive reforms, investment in infrastructure, and the adoption of alternative energy sources to create a sustainable and stable electricity supply system.

According to statistics provided by the Private Power and Infrastructure Board, in 2010, Pakistan faced an electricity deficit of 849 MW. This deficit has been increasing yearly, highlighting a growing crisis. Despite this, the government of Pakistan has not been proactive in generating power from new sources, such as constructing dams or properly utilizing existing and alternative sources of energy. As a developing country, Pakistan finds it challenging to overcome these problems amidst the global energy crisis. Restrictions imposed by donor agencies like the IMF, World Bank, and Asian Development Bank, which mandate phased tariff increases, further escalate the price of electricity. This ultimately burdens consumers, who suffer the adverse effects of these price hikes. The rapidly rising furnace oil prices in the international oil market add to the strain, while the government's failure to utilize existing and alternative renewable resources exacerbates the situation. Additionally, there is a significant lack of competence in budgeting, formulating, planning, and implementing strategies and policies in the power sector. The primary objectives of this study are to draw the government's attention to the critical issues of the increasing electricity crises and escalating prices, and to highlight their ultimate effect on SMEs. These businesses, which form the backbone of Pakistan's economy, are particularly vulnerable to the adverse impacts of energy shortages and rising costs. Addressing these challenges requires urgent and comprehensive action to ensure a stable and affordable electricity supply, fostering economic growth and development.

2. LITERATURE REVIEW

Research is conducted to provide people with new knowledge and discoveries. Reviewing previous work on the same topic is essential to build upon existing knowledge and understand the context of the study. Health and Sitkin (2001) assert that organizational behavioral change originates from individual behavior change, emphasizing the significant connection between individual and organizational behavior. They argue that behavioral change becomes easier when there is consistency and a strong link between positive personal attitudes and the organizational environment. They suggest that interventions in the personal domain, such as education and information, can effectively influence organizational behavior. This perspective highlights the importance of aligning individual attitudes with organizational goals to foster meaningful and sustained change within organizations. Ali and Badar (2010) examined the Circular Debt issue in Pakistan's energy sector, identifying two primary reasons behind its creation. Firstly, electricity prices are too low to cover production costs, exacerbated by fiscal constraints preventing the government from providing necessary subsidies to the Pakistan Electric Power Company (PEPCO). Secondly, there are significant difficulties in recovering dues from consumers and defaulters. They emphasize the necessity of adjusting electricity prices appropriately, providing subsidies to PEPCO, and improving debt recovery mechanisms to mitigate Circular Debt. They also highlight the challenge of managing Circular Debt across various sectors, particularly in ensuring continuous energy supplies for electricity production. The International Energy Agency (IEA), in 2005, recommended behavioral changes in energy consumption, advocating for public education through media support and detailed information on energy savings. They suggested imposing higher prices on high energy consumption to encourage conservation. This approach aims to create awareness and incentivize consumers to adopt more energy-efficient practices, thereby reducing overall energy demand and alleviating pressure on the energy supply system.

McMakin et al. (2002) observed that behavioral patterns related to energy consumption depend on either investment efforts or continuous efforts, influenced by both societal and personal factors. Their study highlights the importance of understanding these influences to promote energy-efficient behaviors effectively. The National Electric Power Regulatory Authority (NEPRA) in Pakistan publishes an annual report with a mission statement focused on developing and pursuing a regulatory framework that ensures the provision of safe, reliable, efficient, and affordable electric power to consumers. NEPRA's goal is to facilitate the transition from a protected monopoly service structure to a competitive environment where various power sector entities operate in an efficiency-oriented or market-driven setting. The authority aims to maintain a balance between the interests of consumers and service providers, aligning with the broad economic and social policy objectives of the Government of Pakistan.

Brestein and Griffin (2006) analyzed significant regional and state differences in the relationship between price and demand for both domestic and commercial electricity, as well as for domestic natural gas. Their findings reveal a tendency for consistency within states in a region, while differences emerge between regions in terms of consumption and price trends. They particularly focused on domestic electricity use, noting a significant relationship due to its discretionary nature compared to commercial electricity or natural gas. In the domestic sector, consumers can reduce usage by turning off appliances and lights or using energy-efficient bulbs. In contrast, the commercial sector and domestic natural gas users have limited options to alter electricity usage in the short run. Most commercial businesses, in particular, have less flexibility to change their electricity consumption patterns quickly.

Nazar et al. (2011) measured the global economic crises and their impact on SMEs in Pakistan, providing insights into the opportunities and challenges faced by SMEs during global and economic recessions. Their study highlights the negative impact of global financial crises on the growth of SMEs in Pakistan. They utilized various techniques and exercises, concluding that the Computable General Equilibrium (CGE) model is an effective tool for analyzing policy impacts. According to their findings, over the past two years, the global and economic recession has significantly hampered the growth of SMEs in Pakistan. Using a framework of simple static analysis relying on simulations, they indicated that the global economic recession has adversely affected Pakistan's economy.

Khattak et al. (2011) explored the challenges related to exports and SMEs in Pakistan, identifying both internal and external barriers that impede progress and impact SMEs. Their study revealed that internal barriers are more prevalent than external ones, with 68% of barriers being internal and 32% external. It is noted that while internal barriers are more numerous, they are easier to manage compared to external barriers. The study concluded that Pakistani SMEs face more internal problems than external ones, which significantly hinder their ability to export effectively to foreign markets. Among the internal barriers, energy crises constitute 39%, making it the most significant internal barrier, followed by functional barriers at 29%. Environmental and marketing barriers account for 19% and 13% of internal barriers, respectively. In terms of external barriers, competitive barriers pose the greatest challenge, accounting for 45% of external barriers, as Pakistani SMEs face strong competition from countries like China, India, and Bangladesh. The study emphasizes the need for concerted efforts from all stakeholders to address these internal barriers to enhance the export potential of Pakistani SMEs.

The rate of export products is lower in these countries, with 33% of external barriers comprising procedural barriers such as documentation, quality clearance, and delays in payments. Environmental barriers, including unstable political situations, cultural effects, and economic problems, account for 22%. This study focuses on the export barriers of SMEs in Pakistan, identifying two types of barriers: internal and external (Leonidou, 2004). The study concluded that internal barriers are more impactful than external barriers. Internal barriers include functional barriers, marketing barriers, energy crises, and environmental barriers. Energy crises are linked to high prices for electricity, gas, and tools, as well as shortages of electricity, which hinder industrial capacity to fulfill orders. As a result, production costs rise when the rates of electricity, gas, and oil increase. Environmental barriers encompass political, economic, social, and

technological factors. Economically, Pakistan is among the poorer countries and cannot afford frequent investments in the SME sector. Fluctuations in the country's currency make it challenging for investors to invest in SMEs, which often suffer from a lack of funds.

The unstable political conditions, stringent rules and regulations, and high utility rates hinder investors and lead to hesitancy in investing in the country. Lack of access to the local language, cultural differences, and difficulties in understanding export procedures, as well as marketing barriers related to product size, price, distribution, and promotions, all fall under socio-cultural barriers. Developing new products for foreign markets, designing export products according to foreign preferences and styles, and meeting quality, standards, packing, and labeling criteria are challenges related to product barriers. From a marketing perspective, products that fail to satisfy customers' expectations are considered unsuccessful. Such products experience reduced demand in the market, diminishing their future prospects. Issues related to price fixing, offering unaffordable prices, and inadequate management of credit facilities for foreign customers are categorized under price barriers. These challenges collectively contribute to the barriers faced by SMEs in Pakistan when attempting to export their products internationally. In global competition, pricing a product correctly is crucial for maintaining competitiveness. Setting an unmatched price can devalue the product in the competitive market. Challenges related to distribution include issues such as supplying inventory to foreign countries, lack of access to warehouses, and insufficient distribution channels. If a product fails to reach customers, whether domestically or internationally, its production efforts are rendered futile.

Promotion plays a vital role in making products visible to consumers. Even if a product is well-made and competitively priced, its success can be hindered without effective promotional efforts to draw attention to it. Functional barriers pertain to the capabilities of SMEs, encompassing issues like inadequate working capital, production capacity limitations, and a shortage of skilled workers. These factors can lead to challenges in managing exports, such as insufficient production capacity to meet demand and inadequate resources to finance export activities. Addressing these functional barriers is essential for SMEs to effectively compete in the global market. Functional barriers indeed pose significant challenges in meeting supply demands effectively. These barriers include limitations in production capacity, inadequate working capital, and shortages of skilled labor, all of which can impede an SME's ability to scale production according to market demand. External barriers such as environmental, competitive, and procedural factors also play critical roles. Competitive barriers arise from global competition where foreign competitors offer products at lower prices or with superior quality, thereby challenging local SMEs. Price competition intensifies when consumers prioritize lower prices, potentially overshadowing products from SMEs that cannot match these prices. Quality issues may also arise when competitors introduce higher-quality products, further impacting the market position of local SMEs.

Navigating these external barriers requires strategic planning, innovation, and possibly collaboration to enhance competitiveness and overcome challenges in global markets. Addressing functional constraints alongside external barriers is essential for SMEs aiming to thrive amidst global competition. The challenges stemming from political, economic, social, and technological factors collectively contribute to environmental barriers for SMEs. These barriers can include regulatory instability, economic downturns affecting consumer spending, social unrest impacting business operations, and technological advancements requiring continual adaptation and investment. Procedural barriers, on the other hand, involve challenges related to export processes and documentation. Delays in payment collection from foreign customers, communication issues, and bureaucratic hurdles in paperwork all fall under procedural barriers. These obstacles often lead exporters to shy away from international trade, thereby stifling export growth and economic potential. Previous studies, such as that by Al-Hyari et al. (2011), emphasize the critical role of supportive guidelines and interventions in reducing export barriers for SMEs. By addressing these challenges through streamlined procedures, enhanced support mechanisms, and effective guidance, SMEs can significantly contribute to economic growth and industrial development. Efforts to mitigate these barriers are essential for enabling SMEs to compete effectively in global markets and expand their export capabilities.

3. RESEARCH METHODOLOGY

In the study focusing on the impact of electricity crises on the consumption behavior of small and medium enterprises (SMEs) in Pakistan, several key variables are critical to understanding the dynamics and challenges faced by these businesses. Firstly, the fluctuating rates of electricity tariff play a pivotal role. SMEs are highly sensitive to changes in tariff rates as they directly affect operational costs. Variations in tariffs can disrupt budgeting and planning, making it challenging for SMEs to maintain stable financial projections and profitability. Secondly, the issue of electricity shortfall is paramount. Pakistan frequently experiences electricity shortages, leading to load shedding and unreliable power supply. For SMEs, these shortages disrupt production schedules, decrease operational efficiency, and can lead to increased costs through the need for backup power solutions or downtime losses. The impact on productivity can be severe, affecting delivery schedules and customer satisfaction. Government policies and regulations represent another critical variable. Policies related to electricity production, distribution, and pricing significantly influence SMEs' access to reliable electricity. Changes in regulations or delays in policy implementation can exacerbate electricity crises, further straining SME operations. Moreover, incentives or subsidies aimed at mitigating high energy costs can provide relief but depend heavily on government effectiveness and financial stability.

Energy efficiency measures are essential mitigating factors. Initiatives aimed at improving energy efficiency within SMEs can help reduce overall energy consumption and costs, making businesses more resilient to electricity shortages and tariff fluctuations. Adoption of renewable energy sources also plays a role, although challenges such as initial investment costs and infrastructure limitations may hinder widespread adoption among SMEs. Financial support and

subsidies are crucial for SMEs coping with high electricity costs. Access to affordable financing or government subsidies can enable SMEs to invest in energy-efficient technologies or alternative energy sources, thereby reducing dependency on grid electricity and mitigating the impact of electricity crises on their operations. Technological adaptation is another critical aspect. SMEs that integrate energy-efficient technologies and practices into their operations can optimize energy use, improve productivity, and reduce operational costs. However, technological adoption requires investment and expertise, which may pose barriers to smaller enterprises. Consumer behavior is also impacted by electricity crises. SMEs may adjust pricing strategies, production schedules, or customer interactions in response to electricity shortages and cost increases, influencing market dynamics and competitiveness. Understanding these behavioral adjustments is essential for policymakers and businesses alike. Finally, the broader economic impact cannot be overlooked. Electricity crises affect not only individual SMEs but also employment levels, sectoral growth, and overall economic stability. Addressing electricity challenges requires a comprehensive approach that considers these interconnected variables to foster sustainable economic development and resilience among SMEs in Pakistan.

The size of a sample in research is crucial for ensuring adequate precision, reliability, and quality of findings. It primarily depends on the variability within the population being studied. When the population exhibits high variability, a larger sample size is typically required to accurately represent its diversity and provide more robust analysis and findings. Additionally, the confidence level desired in the study also influences the sample size. A higher confidence level necessitates a larger sample size to reduce the margin of error and increase the reliability of the results. This decision often balances against the cost considerations involved. Increasing the sample size typically leads to higher research costs due to expenses related to data collection, analysis, and other logistical factors. In the study involving approximately 400 employees from small and medium industries, random selection of respondents helps ensure that the sample is representative of the broader population of interest. This approach enhances the validity of the findings and allows for insights into the perspectives and behaviors within these industries. In this study, the questionnaire used for data collection was adapted from previous studies by Gyamfi et al. (2010) on residential demand response and Ketelhodt and Wöcke (2008) on the impact of electricity crises on small and medium enterprises' consumption behavior. These studies were chosen because of their relevance to the current investigation. The questionnaire comprised two parts: Part A and Part B. Part A gathered personal information about the respondents, including their name, field of work, experience, organization, and qualification. Part B consisted of items designed to elicit responses related to the study variables. At the beginning of Part B, respondents were instructed to rank each question based on their professional experience and skills.

The questionnaire utilized a 5-point Likert-type scale for rating, where 1 indicated "strongly disagree" and 5 indicated "strongly agree". The scale was structured as follows: strongly disagree = 1, disagree = 2, neutral = 3, agree = 4, strongly agree = 5. To analyze the collected data, the Statistical Package for the Social Sciences (SPSS) was employed. The questionnaires were personally delivered to the respondents to ensure that none were missed and to facilitate a higher response rate. This approach aimed to gather comprehensive data on the impact of electricity crises and electricity prices on the consumption behavior of small and medium enterprises, utilizing a methodologically sound and validated questionnaire format.

4. RESULTS AND DISCUSSION

The study focused extensively on presenting its results with clarity and supporting evidence, using concise tables to facilitate understanding. The findings were thoroughly discussed in relation to the research objectives, which primarily aimed to explore the relationships between different variables. Various statistical tests were employed to analyze the collected data comprehensively. Descriptive statistics played a crucial role in summarizing the responses from the survey participants, providing insights into the distribution and trends of opinions regarding electricity crises, electricity prices, and consumption behavior among SMEs. These statistics helped in painting a clear picture of how these variables were perceived and understood by the respondents. Regression analysis was another pivotal technique used in the study. It delved into the relationships between the independent variables (electricity crises and prices) and the dependent variable (consumption behavior). By employing regression, the study aimed to quantify and understand the impact and significance of electricity-related challenges on SMEs' consumption patterns. This analysis provided insights into the strength and direction of these relationships, highlighting which factors had the most substantial influence. Throughout the analysis, the study emphasized the importance of statistical significance testing. This step was crucial in determining whether the observed relationships between variables were robust and meaningful, ensuring that the findings were not merely due to random chance but had substantive implications for understanding SMEs' behavior in the face of electricity challenges. Overall, the study sought to contribute valuable insights into how electricity crises and pricing dynamics affect SMEs, aiming to inform policy decisions and strategic planning in the energy sector.

Table 1 displays the frequency distribution of respondents categorized by gender in a sample of 400 individuals. The data reveals that males make up the majority of the respondents, comprising 99.0% of the total sample, which amounts to 396 individuals. In contrast, females are significantly underrepresented, accounting for only 1.0% of the sample, with a total of 4 individuals. The cumulative total of respondents, reflecting both genders, reaches 100.0%, totaling 400 individuals in the study. This distribution highlights a notable gender disparity within the sample, indicating a much higher proportion of male respondents compared to female respondents. The percentages provided in the table depict the relative distribution of males and females, emphasizing the imbalance in gender representation in the surveyed population.

Table 1: Frequency Distribution

Gender	Frequency	Percent	Valid Percent	Cumulative Percent
Male	396	99.0	99.0	99.0
Female	4	1.0	1.0	100.0
Total	400	100.0	100.0	

The findings from Table 1 indicate that out of a total of 400 respondents in the research, 99% were male (198 respondents), while only 1% were female (2 respondents). This stark gender disparity raises important questions about the representation of women in the manufacturing sector of Pakistan. Several factors could contribute to the low participation of women in this study. Firstly, it may reflect broader trends in Pakistan's workforce, where women are historically underrepresented in certain industries, including manufacturing. Cultural norms and societal expectations often influence women's participation in the labor force, potentially limiting their involvement in sectors perceived as male-dominated. Additionally, issues such as sexual harassment in the workplace could be significant barriers that deter women from entering or remaining in manufacturing jobs. The cultural values and societal norms in Pakistan sometimes create environments that are less conducive to women's full participation in industrial settings. Addressing these challenges requires comprehensive efforts to promote gender equality, enhance workplace safety, and create inclusive environments that encourage women's participation and advancement in all sectors of the economy. Understanding and addressing these dynamics are crucial steps towards fostering a more diverse and equitable workforce in Pakistan.

Table 2 provides the frequency distribution of respondents categorized by age in a sample of 400 individuals. The data is segmented into four age groups: 16-21 years, 22-27 years, 28-33 years, and over 33 years. The youngest age group, 16-21 years, comprises 56 individuals, representing 14.0% of the total sample. The next group, 22-27 years, consists of 140 individuals, accounting for 35.0% of the sample. The 28-33 years age group includes 90 individuals, making up 22.5% of the sample. Lastly, the group aged over 33 years totals 114 individuals, representing 28.5% of the sample. Cumulatively, these figures sum up to 100.0%, reflecting the entire sample size of 400 individuals. The distribution underscores the varying age composition within the surveyed population, highlighting the distribution of respondents across different age brackets.

Table 2: Frequency Distribution

Age	Frequency	Percent	Valid Percent	Cumulative Percent
16-21	56	14.0	14.0	14.0
22-27	140	35.0	35.0	49.0
28-33	90	22.5	22.5	71.5
More than 33	114	28.5	28.5	100.0
Total	400	100.0	100.0	

Table 3 displays the frequency distribution of respondents categorized by their educational qualifications in a sample of 400 individuals. The qualifications are classified into five categories: Matriculation, Intermediate, Bachelor, Master, and Other. Among the respondents, 188 individuals hold Matriculation as their highest qualification, representing 47.0% of the total sample. The Intermediate qualification is held by 68 individuals, accounting for 17.0% of the sample. A total of 96 respondents hold a Bachelor's degree, constituting 24.0% of the sample. The Master's degree is held by 30 individuals, making up 7.5% of the sample. Lastly, 18 respondents have other qualifications, comprising 4.5% of the sample. Cumulatively, the percentages add up to 100.0%, reflecting the entire sample size of 400 individuals. This distribution provides an overview of the educational background of the respondents, illustrating the diversity in educational qualifications within the surveyed population. The frequency distribution table regarding qualifications shows that among the 400 individuals surveyed, the highest proportion, 47%, have Matriculation qualifications. This is followed by 24% who hold Bachelor's degrees, 17% with Intermediate qualifications, and 7.5% who have attained Master's degrees. Additionally, 4.5% of respondents fall into the "Other" category. The cumulative percentages indicate the distribution across these qualification categories, with Matriculation being the most prevalent and Master's degrees the least represented in the sample.

Table 3: Frequency Distribution W. R. T "Qualification" (N=400)

Qualification	Frequency	Percent	Valid Percent	Cumulative Percent
Matriculation	188	47.0	47.0	47.0
Intermediate	68	17.0	17.0	64.0
Bachelor	96	24.0	24.0	88.0
Master	30	7.5	7.5	95.5
Other	18	4.5	4.5	100.0
Total	400	100.0	100.0	

Table 4 presents data on consumer perceptions and preferences regarding electricity prices and related factors. The first item in the table addresses the percentage increase in electricity prices that consumers would consider significant. The responses indicate that 178 respondents disagreed, 22 were neutral, and 200 agreed with considering a large percentage increase above their last bill. On average, respondents indicated they would find a 3.075% increase significant, with a standard deviation of 1.739, suggesting some variability in tolerance levels among respondents. The second item concerns the percentage of non-renewable power generation that respondents perceive as too high. Here, the majority of respondents (286) disagreed, while 88 were neutral, and only 26 agreed that the current percentage of non-renewable power generation is too high. On average, respondents perceived 1.980% as the threshold for "too high," with a standard deviation of 1.060, indicating a more concentrated view compared to the first item. The third item asks about the acceptable number of power cuts during winter mornings or evenings. Responses show that 208 respondents disagreed, 36 were neutral, and 156 agreed with a certain threshold for acceptable power cuts over the winter season. On average, respondents indicated they would consider 2.780 power cuts too many, with a standard deviation of 1.742, suggesting varying degrees of tolerance for power interruptions among the surveyed population. Overall, Table 4 provides insights into consumer perceptions regarding electricity prices, non-renewable power generation levels, and tolerance for power cuts, highlighting the diversity of opinions and thresholds among the surveyed individuals.

Table 4: Frequency Distribution and Descriptive Statistics with respect to “Electricity Prices”

Items	Disagree	Neutral	Agree	Mean	St. Dev
If your electricity price were to go up, what percentage increase above your last bill would you consider large?	178	22	200	3.075	1.739
What percentage of non-renewable power generation (e.g. coal, gas, and diesel) would you consider too high?	286	88	26	1.980	1.060
How many power cuts on a winter morning or evening would you consider too many over the winter season?	208	36	156	2.780	1.742

Table 5 presents the results of a regression analysis with coefficients, standard errors in parentheses, and statistical measures. The model includes three variables: a constant term, Electricity Prices, and Electricity Crises. Starting with the constant term, which is estimated at 0.917 with a standard error of 0.105. The high t-statistic of 8.766 indicates that this intercept is statistically significant, suggesting that when all independent variables are zero, the dependent variable's expected value is close to 0.917. Moving to the coefficient for Electricity Prices, it stands at 0.103 with a standard error of 0.046. The associated t-statistic of 2.229 indicates statistical significance at the conventional level (typically $p < 0.05$). This positive coefficient suggests that higher electricity prices are associated with an increase in the dependent variable. Next, the coefficient for Electricity Crises is 0.534, accompanied by a standard error of 0.049. The very high t-statistic of 10.988 underscores its strong statistical significance, indicating that the presence of electricity crises significantly increases the dependent variable. The model's overall fit is reflected in the R-Square of 0.643, meaning approximately 64.3% of the variance in the dependent variable is explained by the independent variables included in the model. This indicates a reasonably good fit, considering the complexity of factors influencing the dependent variable. Lastly, the F-Statistics of 177.606 tests the overall significance of the regression model, providing a comprehensive evaluation of whether the included independent variables jointly contribute significantly to explaining the variation in the dependent variable. This statistic is typically compared against a significance level to determine the model's overall significance. In conclusion, the regression analysis in Table 5 illustrates that both Electricity Prices and Electricity Crises are significant predictors of the dependent variable. Higher electricity prices and the occurrence of electricity crises have a positive impact on the dependent variable, as indicated by their respective coefficients and statistical significance. The model as a whole provides a reasonable explanation of the variation in the dependent variable, supported by the high R-Square value.

Table 5: Regression coefficients, standard errors in parentheses

Constant	Electricity Prices	Electricity Crises	R-Square	F-Statistics
0.917 (0.105)	0.103 (0.046)	.534 (0.049)	0.643	177.606
[8.766]	[2.229]	[10.988]		
0.000	0.027	0.000		0.000

The situation faced by SMEs due to high electricity prices and severe electricity crises in Pakistan is deeply impactful and multifaceted. SMEs consumers are understandably frustrated with the mismatch between their electricity bills and actual consumption, exacerbated by inconsistent supply and management issues from PEPCO and WAPDA. The reliance on renewable energy sources and stable electricity supply is emphasized as crucial to alleviate these challenges. Throughout both winter and summer seasons, SMEs experience consistent electricity shortages, significantly hindering their operations and pushing them into severe recessionary periods. While some SMEs have adapted by using

alternative sources like generators, many face disruptions in production due to their equipment not being designed to withstand sudden electricity shocks. The current crises have eroded trust among industrialists and investors, leading to widespread reluctance for further investment in Pakistan unless there is a guarantee of stable electricity supply. This sentiment underscores a critical future challenge for Pakistan's economy, as SMEs play a vital role in economic growth and employment. Despite frustrations with PEPCO and WAPDA's management, there is a desire among a large portion of SMEs consumers to improve relations for the betterment of the electricity network. They advocate for stronger collaboration to address the existing energy challenges and ensure sustainable progress in their business operations. However, there is skepticism among SMEs consumers regarding the government's commitment to long-term energy conservation strategies. They express hope that the government will prioritize urgent actions to address the power sector's deficiencies and reduce electricity shortages across the country, reflecting their aspirations for a more supportive business environment. The sentiments of SMEs consumers reflect a complex landscape where the need for reliable electricity supply intersects with broader economic concerns and expectations from governmental and regulatory bodies.

5. DISCUSSION AND CONCLUSION

In concluding this study, a comprehensive analysis was conducted based on extensive research, insights from previous studies across various countries, empirical data, concurrent events, underlying causes of escalating crises and prices, and public opinions from affected nations. The conclusions drawn from these investigations are pivotal for understanding and addressing the complex issues surrounding electricity crises and prices in Pakistan. Throughout the study, several key findings emerged: Firstly, the study underscored the severe impact of electricity crises on SMEs in Pakistan, highlighting how high prices and inconsistent supply disrupt business operations and hinder economic growth. Secondly, it became evident that the root causes of these crises include both systemic issues within the energy sector, such as mismanagement and infrastructure deficiencies, as well as broader economic and political factors that contribute to the instability. Moreover, the study revealed a significant disparity in gender representation among respondents, with a notable lack of female participation, which may reflect broader societal and cultural barriers within Pakistan's workforce. Practical implications arising from these findings suggest urgent reforms and investments in the energy infrastructure, including the promotion of renewable energy sources and improvements in governance and regulatory frameworks. Enhancing transparency and accountability within organizations like PEPCO and WAPDA is crucial to restore trust and efficiency in electricity management. Furthermore, the study's recommendations emphasize the need for collaborative efforts between government agencies, private sector stakeholders, and international partners to develop sustainable solutions. This includes implementing energy conservation measures, enhancing technical capabilities, and fostering a supportive environment for SMEs to thrive amidst energy challenges. Looking ahead, future research directions should focus on monitoring the implementation of policy interventions, assessing their effectiveness, and exploring innovative solutions to mitigate the impact of electricity crises on economic sectors and societal well-being in Pakistan. This study provides valuable insights into the multifaceted nature of electricity crises in Pakistan, offering a foundation for informed decision-making and strategic actions aimed at achieving sustainable energy security and economic prosperity.

Electricity crises and high prices have significantly disrupted the consumption and sales of SMEs in Pakistan, thereby exerting a detrimental impact on the country's economy. SMEs have borne the brunt of these crises more acutely than the effects of high electricity prices alone. Consumers within the SME sector express heightened frustration towards the prolonged duration of electricity crises, which surpasses similar challenges faced by other nations globally. The protracted nature of these crises in Pakistan can be attributed to several factors. Firstly, there has been a historical lack of effective policies and budgetary allocations directed towards enhancing electricity generation capacity. Instead, emphasis has primarily been on rural electrification projects and expanding the network of electricity connections, which have not adequately addressed the growing demand and supply gap. This shortfall in strategic planning and infrastructure development has left the country vulnerable to recurring electricity shortages, exacerbating the challenges faced by SMEs and hindering broader economic stability. As a consequence, SMEs struggle to maintain operational continuity, manage production costs, and meet market demands, thereby limiting their growth potential and competitiveness. Addressing these issues requires a concerted effort towards implementing comprehensive energy policies that prioritize sustainable generation capacity, integrate renewable energy sources, and improve the efficiency of electricity distribution. Such measures are essential not only for alleviating the immediate impacts on SMEs but also for fostering long-term economic resilience and prosperity in Pakistan.

The Pakistan Development Forum's assessment in 2004 highlighted significant challenges and goals related to electricity infrastructure in Pakistan. At that time, out of 125,000 villages in Pakistan, approximately 78,000 were electrified, with plans to electrify the remaining 47,000 villages by 2015. The total electricity generation capacity in Pakistan was targeted to double from 20,000 MW to 40,000 MW by 2015, but achieving this goal has proven to be unattainable. One of the critical issues identified was the rapid increase in the number of household appliances. For instance, between 2005 and 2006, there was a substantial rise from 7.7 million to 9.8 million electric home appliances, which significantly increased electricity demand from 2250 MW to 3530 MW. This increase of 2.1 million appliances within just one year exacerbated the imbalance between electricity supply and demand. The gap between electricity generation and the escalating demand due to the surge in electrification efforts has strained Pakistan's electricity infrastructure. Despite efforts to expand generation capacity, the rapid growth in electricity consumption has outpaced these expansions, leading to frequent electricity shortages and disruptions across the country. These challenges

underscore the critical need for sustainable energy policies, efficient infrastructure investments, and innovative solutions to bridge the gap between supply and demand in Pakistan's electricity sector. Pakistan possesses substantial untapped potential in various renewable and traditional energy sources that could significantly enhance its electricity generation capacity. The country has approximately 54,000 MW of hydroelectric potential, which remains underutilized despite its vast capacity. Hydroelectric power is a clean and reliable source of energy, but its development has faced various challenges, including funding constraints and environmental concerns. Similarly, Pakistan holds immense potential for coal-based power generation, with estimates suggesting the capability to generate up to 100,000 MW of electricity from coal reserves. However, despite the abundance of coal resources, there has been limited progress in effectively harnessing this potential due to environmental impacts and technological challenges associated with clean coal technologies.

Renewable energy sources like wind and solar also present promising opportunities for Pakistan. The country experiences strong wind patterns in certain regions, making it suitable for wind power generation. Additionally, Pakistan enjoys ample sunlight throughout the year, which could support widespread deployment of solar energy technologies such as solar panels. Despite these favorable conditions, there has been insufficient investment and policy support for the development of wind and solar energy infrastructure. Overall, while Pakistan possesses abundant resources for electricity generation, including hydro, coal, wind, and solar, effective utilization and development of these resources have been hindered by various factors such as policy gaps, financial constraints, and technological limitations. Addressing these challenges and prioritizing sustainable energy development could play a crucial role in meeting Pakistan's growing energy demands while reducing reliance on imported fuels and enhancing energy security. Based on the findings and conclusions drawn from the study on electricity crises and prices impacting SMEs in Pakistan, several recommendations can be proposed to address these critical issues effectively. Firstly, there is a crucial need to enhance Pakistan's electricity generation capacity through diverse sources. The country possesses significant hydroelectric potential, estimated at 54,000 MW, which should be exploited through accelerated development of hydroelectric projects. This entails overcoming financial, environmental, and social barriers to ensure sustainable energy production. Furthermore, Pakistan's abundant coal reserves, capable of generating up to 100,000 MW, should be tapped with the implementation of modern, environmentally friendly coal technologies to mitigate pollution and climate impacts. Additionally, investing in renewable energy such as solar and wind power, leveraging the country's ample sunlight and wind resources, is essential. Encouraging private sector participation in solar panel and wind turbine installations through incentives and policy support can diversify the energy mix and reduce dependency on fossil fuels. Secondly, significant improvements are needed in the transmission and distribution infrastructure across Pakistan. Upgrading and expanding the existing infrastructure will help minimize transmission losses and ensure more reliable electricity delivery nationwide. Adopting smart grid technologies can further enhance the efficiency and resilience of the electricity distribution network, reducing outages and enhancing overall system reliability. Policy reforms and regulatory frameworks play a pivotal role in addressing electricity sector challenges.

Strengthening the regulatory oversight of the power sector through NEPRA (National Electric Power Regulatory Authority) is crucial. This includes ensuring transparent and fair tariff setting processes that balance the interests of consumers and electricity providers. Long-term energy policies should prioritize sustainability, affordability, and reliability of electricity supply, aligning with Pakistan's economic and developmental objectives. Operational efficiency improvements within WAPDA (Water and Power Development Authority) and KESC (Karachi Electric Supply Company) are essential. Enhancing maintenance practices, grid management, and technical capabilities can minimize technical losses and improve service delivery. Investing in workforce training and capacity building will empower employees to effectively manage and maintain the electricity infrastructure. Public awareness campaigns on energy conservation should be intensified to promote responsible energy use among consumers, including SMEs. Encouraging the adoption of energy-efficient technologies and practices can help reduce overall electricity demand and operational costs for businesses. Incentives should be provided to industries, particularly SMEs, to invest in energy-saving equipment and technologies. Lastly, fostering collaboration among government agencies, private sector entities, academia, and civil society organizations is crucial. This collaborative approach can drive innovation, leverage technical expertise, secure financial resources, and implement best practices in energy sector reforms. Engaging with international organizations and development partners can further support Pakistan's efforts to modernize its energy infrastructure and achieve sustainable energy security. Implementing these recommendations requires a comprehensive and coordinated effort from all stakeholders. By addressing the underlying causes of electricity crises and prices, Pakistan can strengthen its energy resilience, support economic growth, and improve the overall quality of life for its citizens.

This study underscores the critical roles of regulatory bodies and the private energy sector in addressing Pakistan's electricity challenges. Regulatory bodies, such as NEPRA, must prioritize the establishment of long-term plans for power generation projects. These plans should ensure sustainable electricity supply and provide relief to all consumers, including industrial, commercial, and domestic sectors. By implementing transparent and efficient tariff policies, regulatory bodies can mitigate the financial burden on consumers, thereby fostering economic growth across sectors. Private energy sector reforms are equally essential. These reforms should focus on reducing tariff burdens that currently affect both large enterprises and SMEs. By enhancing operational efficiencies and promoting competitive pricing, the private sector can facilitate access to affordable and uninterrupted electricity, which is crucial for sustaining industrial production and business operations. This, in turn, supports revenue generation, boosts export competitiveness, and attracts foreign investment, contributing to overall economic expansion. Moreover, this study emphasizes the significant

contributions of various sectors—agricultural, services, and manufacturing—to leveraging affordable electricity tariffs and a reliable energy supply. Access to cost-effective electricity enables these sectors to optimize production processes, increase productivity, and improve business outcomes. A conducive business environment, supported by stable electricity infrastructure, fosters economic growth, enhances domestic infrastructure, and identifies areas needing improvement at both domestic and commercial levels. In conclusion, this study advocates for the formulation of robust policies and strategies that integrate Pakistan's internal infrastructure. By addressing weaknesses and inefficiencies in the electricity sector, Pakistan can accelerate its path towards development. This comprehensive approach not only supports economic growth and increases GDP and GNP figures but also lays the groundwork for sustainable development and enhanced global competitiveness.

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