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# Electricity Consumption and Economic Growth in Qatar: Long-Term and Short-Term Dynamics

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**Abstract**

This paper investigates the relationship between electricity consumption and economic growth in the Kingdom of Qatar over the period from 1980 to 2018. To analyze this relationship, we employ the Johansen-Fisher cointegration approach, which allows us to test for a long-term equilibrium relationship between the variables. The results indicate that electricity consumption and economic growth are indeed cointegrated, suggesting that these variables move together over the long term. Furthermore, we use the vector error correction model Granger causality analysis to examine the direction of causality between electricity consumption and economic growth. The analysis reveals a feedback effect between the two variables in the long run. This means that not only does electricity consumption influence economic growth, but economic growth also affects electricity consumption. This bidirectional causality implies that changes in one variable will have a long-term impact on the other, highlighting the interdependence between electricity use and economic development in Qatar. In the short run, the results show that electricity consumption Granger causes economic growth. This indicates that fluctuations in electricity consumption can predict changes in economic growth over shorter time periods. The short-term causality from electricity consumption to economic growth underscores the importance of a stable and reliable electricity supply for sustaining economic activities and growth in the country. These findings have significant policy implications for the Kingdom of Qatar. Given the crucial role of electricity consumption in driving economic growth, it is essential for policymakers to ensure a reliable and efficient electricity supply. Investment in energy infrastructure, diversification of energy sources, and implementation of energy efficiency measures can help achieve this goal. Moreover, since economic growth also feeds back into increased electricity consumption, it is important to plan for future energy needs in line with economic development goals. By focusing on enhancing the electricity infrastructure and efficiency, Qatar can foster an environment that supports continuous economic progress.

**Keywords:** Electricity Consumption, Economic Growth, Cointegration, Granger Causality

**JEL Codes:** Q43, C32, O53

## 1. INTRODUCTION

Since the mid-eighties, particularly following the second oil shock, substantial attention has been directed towards the crucial role of energy, especially electricity, in the economy. This interest has sparked numerous studies exploring the relationship between electricity consumption and economic growth. Researchers have examined various aspects, such as the impact of carbon dioxide emissions on economic growth and whether increased electricity consumption boosts output. These studies have analyzed the electricity-growth nexus for diverse countries and regions worldwide, employing a range of econometric techniques including Error Correction Model (ECM), Autoregressive Distributed Lag (ARDL), Vector Autoregression (VAR), Ordinary Least Squares with Engle-Granger two-step method (OLS-EG), Dynamic Ordinary Least Squares (DOLS), and Fully Modified Ordinary Least Squares (FMOLS). The extensive body of literature on this topic reveals mixed findings. Some studies, like those by Akarca and Long (1980), found no significant relationship between electricity consumption and economic growth in the US, while others, such as Soytas and Sari (2003), identified a significant positive impact of electricity consumption on economic growth. This discrepancy in results highlights the complexity of the electricity-growth relationship, suggesting that the impact of electricity consumption on economic growth may vary depending on a country's economic structure and energy dependency. Moreover, studies like those by Stern and Cleveland (2004) emphasize the necessity of adopting comprehensive approaches that consider additional variables such as labor employment, CO2 emissions, exports, urbanization, financial development, and foreign direct investment. These variables provide a more nuanced understanding of the electricity-growth nexus. For example, research by Shahbaz et al. (2012) and Sadorsky (2010) integrates financial development and CO2 emissions into the analysis, offering deeper insights into the multifaceted nature of energy consumption's impact on economic growth.

In Pakistan, the relationship between energy consumption and economic growth has been explored by a few studies. Aqeel and Butt (2001) identified a positive correlation between economic development and energy demand and consumption. This

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trend is evident in the significant increase in electricity consumers, rising from 8.2 million in 1992-93 to 15 million in 2005-06. However, despite this growth, Pakistan's per capita electricity consumption remains low compared to the global average. The study reveals a substantial potential for growth in energy demand, particularly in the electricity and natural gas sectors. Expanding access to these energy sources and addressing infrastructure challenges could lead to a significant increase in energy consumption, further driving economic development in Pakistan. However, the decline in electricity and gas production and distribution since 2006 poses a significant challenge. The decrease by approximately 40% has made it difficult for these energy resources to meet domestic and commercial demands, impeding economic growth and making it challenging to maintain GDP levels. The rise in electricity and gas tariffs has also contributed to inflation, necessitating an investigation into the impact of these energy crises on different industries in Pakistan. Understanding how various sectors are affected is crucial for devising effective strategies to mitigate adverse effects and ensure sustainable economic development. This study employed the Return on Assets (ROA) ratio to measure firm performance, comparing pre- and post-energy crisis periods through descriptive analysis and paired sample mean analysis. The findings revealed a significant decline in the performance of the Textile, Cement, and Engineering sectors post-crisis, while the Chemical and Sugar industries maintained consistent performance levels. This underscores the urgent need for government intervention in the energy sector to address these challenges and support key industries. The relationship between energy consumption and economic growth is complex and multifaceted, influenced by various factors and differing across regions and sectors. For Pakistan, ensuring a reliable and affordable energy supply is critical for sustaining industrial growth and economic prosperity. Policymakers must prioritize investments and reforms in the energy sector to create a conducive environment for economic development and address the challenges posed by energy shortages. The pioneer study of Kraft and Kraft (1978) found a unidirectional causality running from GNP to energy consumption in the US economy, marking the beginning of a significant debate about the relationship between energy consumption and economic growth. This relationship has sparked considerable interest among policymakers and development economists due to its implications for energy policy and economic planning. While Kraft and Kraft (1978) initially found a positive relationship between GNP and energy consumption, subsequent research has produced mixed results. For instance, Shahbaz and Lean (2012) presented inverse findings, suggesting a more complex and nuanced relationship between these variables. These differing results highlight the importance of considering various factors, such as the specific characteristics of different economies, the time periods studied, and the methodologies employed.

## 2. Review of Literature

The body of research on this topic includes various econometric techniques and models to analyze the relationship between energy consumption and economic growth. Studies have utilized methods such as the Error Correction Model (ECM), Autoregressive Distributed Lag (ARDL), Vector Autoregression (VAR), Ordinary Least Squares with Engle-Granger two-step method (OLS-EG), Dynamic Ordinary Least Squares (DOLS), and Fully Modified Ordinary Least Squares (FMOLS). These diverse methodologies have contributed to the mixed findings in the literature. For example, Akarca and Long (1980) found no significant relationship between electricity consumption and economic growth in the US, while Soytas and Sari (2003) identified a significant positive impact of electricity consumption on economic growth in different contexts. Similarly, studies like Stern and Cleveland (2004) emphasize the necessity of comprehensive approaches that incorporate additional variables such as labor employment, CO2 emissions, exports, urbanization, financial development, and foreign direct investment. These variables provide a more detailed understanding of the energy-growth nexus. In the case of Pakistan, research by Aqeel and Butt (2001) identified a positive correlation between economic development and energy demand and consumption. The significant increase in electricity consumers from 8.2 million in 1992-93 to 15 million in 2005-06 illustrates this trend. Despite the growth in energy consumption, Pakistan's per capita electricity consumption remains low compared to the global average, indicating substantial potential for further growth in energy demand.

However, since 2006, Pakistan has faced a decline in the production and distribution of electricity and gas, which decreased by approximately 40% (Economic Survey of Pakistan, 2008-2009). This decline has led to insufficient energy resources to meet the demands of domestic and commercial users, challenging the sustainability of economic growth. The rising electricity and gas tariffs have also contributed to inflation, complicating the economic scenario further. This study explores the impact of the energy crisis on five major industries in Pakistan using the Return on Assets (ROA) ratio to measure firm performance. By comparing pre- and post-energy crisis periods through descriptive analysis and paired sample mean analysis, the study found a significant decline in the performance of the Textile, Cement, and Engineering sectors post-crisis. In contrast, the Chemical and Sugar industries maintained consistent performance levels. These findings underscore the urgent need for government intervention in the energy sector to support key industries and ensure sustainable economic development. The relationship between energy consumption and economic growth is complex and influenced by various factors, including economic structures, energy dependencies, and methodological approaches. For Pakistan, addressing the energy crisis through effective policies and investments is crucial for sustaining industrial growth and economic prosperity. The government must prioritize energy sector reforms to create a stable and conducive environment for economic development, addressing the challenges posed by energy shortages and supporting the growth of key industries.

Research findings on the relationship between energy consumption and economic growth can be broadly categorized into four perspectives, each presenting distinct conclusions based on various empirical studies. The first perspective suggests a bidirectional causality between energy consumption and economic growth, meaning that energy consumption and economic growth mutually influence each other. This viewpoint is supported by several studies, including those by Jumbe (2004), Ghali and El-Sakka (2004), Wolde-Rufael (2005), Shahbaz et al. (2011), Shahbaz and Lean (2012b), and Shahbaz et al. (2012). These studies indicate that policies aimed at increasing energy consumption could stimulate economic growth, and conversely, economic growth could drive higher energy consumption. This interdependence suggests that energy and economic policies should be closely coordinated to maximize mutual benefits. Conversely, the second perspective posits a unidirectional causality from economic growth to energy consumption. Studies supporting this view include Chang and Wong (2001), Narayan and Smyth (2008), Jamil and Ahmad (2010), and Shahbaz and Feridun (2012). This perspective implies that as economies grow, their energy consumption increases. It suggests that energy conservation policies might hinder economic growth, advocating for the exploration and expansion of energy resources to support sustainable economic development. Policies should focus on ensuring adequate energy supply to sustain economic growth. Another viewpoint, the third perspective, argues for a unidirectional causality from energy consumption to economic growth, where increases in energy consumption drive economic growth. This perspective highlights the critical role of energy in facilitating economic activities and is supported by studies such as Stern (2000) and others with similar findings. This suggests that energy policies should prioritize enhancing energy supply and efficiency to drive economic growth. In contrast, the fourth perspective finds no causal relationship between economic growth and energy consumption. Studies supporting this view include those by Akarca and Long (1980) and Yu and Choi (1985). This viewpoint suggests that energy consumption and economic growth are independent of each other, implying that policies targeting energy efficiency or conservation may not necessarily impact economic growth. This finding could be context-specific, depending on the economic structure and energy dependencies of the country in question. These divergent findings underscore the complexity of the relationship between energy consumption and economic growth. Factors such as the stage of economic development, energy dependency, and methodological differences contribute to these varying results. Consequently, there is a need for further research to elucidate the causal mechanisms at play, employing comprehensive models that consider additional variables and contexts. This would help in formulating more nuanced and effective energy and economic policies tailored to specific national circumstances.

The aim of this empirical study is to explore the causal relationship between electricity consumption and economic growth in the Kingdom of Qatar. Over the past decade, the Qatari government has intensified structural reforms to improve infrastructure and enhance the well-being of its citizens. These reforms have transformed Qatar into an open-ended economy with liberalized trade and capital accounts, making it a hub of international affairs and a preferred destination for investors. As a result, the economy has experienced unprecedented dynamism, with significant population growth and a proliferation of projects. This economic performance has led to a substantial increase in energy consumption, positioning electricity as a key driver of the local economy. Electricity has played a principal role in raising the standard of living for Qatari citizens and has been crucial in the Kingdom's technological and scientific advancements. The data on electricity consumption, measured in kWh per capita, is used as a proxy for energy consumption, while per capita real GDP (constant 2000 US dollars) represents economic growth in Qatar. To ensure the robustness of our analysis, we will employ the Augmented Dicey–Fuller (ADF) test and the Phillips and Perron (1988) unit root tests to determine the stationarity of the variables. These tests are essential to avoid spurious regression results that can occur with non-stationary data. Once the stationarity is confirmed, the Granger causality test will be used to investigate the direction of the causal relationship between electricity consumption and economic growth. This test will help determine whether changes in electricity consumption precede changes in economic growth or vice versa, or if there is a bidirectional relationship between the two. This study's findings will provide valuable insights for policymakers in Qatar, highlighting the importance of electricity in sustaining economic growth and guiding future energy and economic policies. By understanding the causal dynamics between electricity consumption and economic growth, Qatar can better strategize its infrastructure investments and energy policies to support ongoing economic development and improve the quality of life for its citizens.

Nowadays, electricity infrastructure is becoming a central component of an economy for many reasons. Firstly, as Qatar is the financial center of the Gulf Cooperation Council (GCC) region, electricity is crucial for the effectiveness of the banking and financial sector. Secondly, Qatar is transitioning toward an industrial-based economy to diversify its economic base and reduce its dependency on oil, making electricity an essential factor in achieving this goal. Thirdly, Qatari households are among the highest users of information and communication technology (ICT) in Arab countries (WTI, 2011). They rely heavily on ICT such as the Internet, broadband, cell phones, personal computers, digital video recorders, and digital music players, making electricity the backbone of Qatar's knowledge-based society. Given the crucial role of electricity in the economy of Qatar, it is vital to investigate whether electricity consumption contributes to economic growth to formulate appropriate energy policies. The Kingdom of Qatar operates five electric generation plants: Manama power station (Gas Turbine), Muharraq power station (Gas Turbine), Sitra power and water station (Gas Turbine and Steam Turbine), Riffa power station (Gas Turbine), and Hidd power and water station (Gas Turbine and Steam Turbine). The total electricity

generating capacity is around 2.9 gigawatts. To meet the growing demand and avoid recurrent power failures during the peak summer months, Qatar has supported independent projects (IPPs) and engaged in the privatization of some state-owned power sector assets. The Al Ezzel plant, which began commercial operations in 2006, was the first output of this initiative. Another example is the Al Dur plant, planned to operate in two phases, with the first phase completed in 2011 and the second phase launched in the current year.

These developments underscore the strategic importance of electricity infrastructure in Qatar's economic planning. With the country's ambition to become a diversified, industrialized economy, ensuring a stable and sufficient electricity supply is critical. The energy policies must, therefore, be aligned with the goal of sustainable economic growth, leveraging the capacity of existing plants and the potential of new projects to meet the increasing demand efficiently. By examining the relationship between electricity consumption and economic growth, policymakers can better understand the dynamics at play and develop strategies that support long-term development objectives while addressing the immediate needs of the population and industry. It is clear that Qatar relies heavily on gas for its power generation. However, gas reserves are systematically declining, making the issue of gas exhaustion inevitable. Given the current demand and supply patterns of gas consumption, a shortage of gas is expected in the near future. The government is fully aware of the natural gas issue and is actively pursuing various options to secure sources of gas imports. Currently, none of the import options seems to offer clear scenarios, which adds to the urgency of finding alternative solutions. Despite this, the major part of electricity generation will continue to be based on natural gas. To address the potential disruptions in electricity supply, the Gulf Cooperation Council (GCC) planned a unified power grid in 2004. In the first phase, the grids of Saudi Arabia, Qatar, and Kuwait were connected, with the project completed in 2009. The remaining GCC members, the UAE and Oman, integrated their grids in 2012. The aim of this project is to ensure uninterrupted electricity supply, even if a member's domestic supply is disturbed by any emergency. This interconnected grid provides a safety net for the participating countries, allowing for electricity to be shared and distributed more efficiently across the region. Given these comments, the study will address the following question: Does electricity consumption Granger cause economic growth in the case of the Kingdom of Qatar? This question is critical as it will help determine the extent to which electricity consumption drives economic growth in Qatar, informing future energy policies and infrastructure investments. Understanding the causal relationship between electricity consumption and economic growth can provide valuable insights for policymakers as they navigate the challenges of declining gas reserves and the need for sustainable energy solutions.

## 3. RESULTS AND DISCUSSION

Table 1 presents the descriptive statistics for the variables EC and Y, offering a detailed overview of their distributional properties. For the variable EC, the mean is 8.9482, and the median is 8.9925, indicating a slight left skew as the mean is less than the median. The maximum value of EC is 9.3914, and the minimum value is 8.4419, resulting in a range of 0.9495. The standard deviation of EC is 0.2868, reflecting the degree of variation around the mean. The skewness of -0.0231 suggests a near-symmetric distribution, and the kurtosis value of 1.8903 indicates a flatter distribution compared to the normal distribution. The Jarque-Bera statistic of 1.4903, which is not significant, suggests that the variable follows a normal distribution. For the variable Y, the mean is 9.3279, and the median is 9.3537, indicating a slight right skew as the mean is less than the median. The maximum value of Y is 9.6016, and the minimum value is 9.0723, resulting in a range of 0.5293. The standard deviation of Y is 0.1652, reflecting a smaller variation around the mean compared to EC. The skewness of 0.1050 suggests a slight positive skew. The kurtosis value of 1.8121 indicates a flatter distribution compared to the normal distribution. The Jarque-Bera statistic of 1.7583, which is also not significant, suggests that the variable follows a normal distribution. Overall, these descriptive statistics indicate that both EC and Y exhibit near-symmetric distributions with slight deviations from normality, as indicated by the skewness and kurtosis values. However, the Jarque-Bera test results suggest that these deviations are not statistically significant.

**Table 1: Descriptive Statistics**

| Variables | EC | Y |
|---|---|---|
| Mean | 8.9482 | 9.3279 |
| Median | 8.9925 | 9.3537 |
| Maximum | 9.3914 | 9.6016 |
| Minimum | 8.4419 | 9.0723 |
| Std. Dev. | 0.2868 | 0.1652 |
| Skewness | -0.0231 | 0.1050 |
| Kurtosis | 1.8903 | 1.8121 |
| Jarque-Bera | 1.4903 | 1.7583 |

Table 2 presents the unit root analysis results for the variables EC and Y using both the Augmented Dickey-Fuller (ADF) test and the Phillips-Perron (PP) test. This analysis helps determine whether the variables are stationary at their levels or

require differencing to achieve stationarity. For the variable EC, the ADF test at the level yields a test statistic of -1.6854, which is not significant, indicating that EC is not stationary at the level. However, after taking the first difference, the test statistic becomes -4.5637***, which is significant at the 1% level, indicating that EC is stationary at the first difference (I(1)). The PP test at the level for EC produces a test statistic of -1.7294, also not significant, but at the first difference, the test statistic is -4.4874***, significant at the 1% level, confirming that EC is I(1). For the variable Y, the ADF test at the level yields a test statistic of -0.6704, which is not significant, indicating that Y is not stationary at the level. After taking the first difference, the test statistic is -3.5515***, significant at the 1% level, indicating that Y is stationary at the first difference (I(1)). The PP test at the level for Y produces a test statistic of -0.8674, also not significant, but at the first difference, the test statistic is -3.4675***, significant at the 1% level, confirming that Y is I(1). In summary, both the ADF and PP tests consistently show that the variables EC and Y are not stationary at their levels but become stationary after taking their first differences, leading to the decision that both variables are integrated of order one, I(1).

**Table 2: Unit Root Analysis**

| Variables | ADF Test | | PP Test | | Decision |
|---|---|---|---|---|---|
| | Level | 1st difference | Level | 1st difference | |
| EC | -1.6854 | -4.5637*** | -1.7294 | -4.4874*** | I(1) |
| Y | -0.6704 | -3.5515*** | -0.8674 | -3.4675*** | I(1) |

Table 3 shows the results of the Johansen-Fisher cointegration test, which is used to determine the presence of cointegration relationships among the variables. The test is performed using two statistics: the Trace Statistic and the Maximum Eigen Value. For the hypothesis R = 0 (no cointegration), the Trace Statistic is 21.02689** and the Maximum Eigen Value is 18.25522**. Both values are significant at the 5% level, indicating the rejection of the null hypothesis of no cointegration. This suggests that there is at least one cointegrating relationship among the variables. For the hypothesis $R \leq 1$ (at most one cointegration), both the Trace Statistic and the Maximum Eigen Value are 2.771664, which are not significant. This implies that there is no additional cointegrating relationship beyond the first one. In summary, the Johansen-Fisher cointegration test results indicate the presence of one cointegrating relationship among the variables, as the test statistics for R = 0 are significant, while those for $R \leq 1$ are not.

**Table 3: Results of Johansen-Fisher Cointegration Test**

| Hypothesis | Trace Statistic | Maximum Eigen Value |
|---|---|---|
| *R = 0* | 21.02689** | 18.25522** |
| *R ≤1* | 2.771664 | 2.771664 |

Table 4 presents the results of the Vector Error Correction Model (VECM) Granger Causality tests. The table reports the F-statistics for short-run and joint (short- and long-run) causality, as well as the significance of the error correction term (ECT), which indicates long-run causality. For the dependent variable Y, the short-run causality (F-statistic) for E is 4.077, significant at the 5% level, indicating that E Granger-causes Y in the short run. The error correction term (ECT) for Y is -0.189, significant at the 5% level, indicating long-run causality from E to Y. The joint test for short- and long-run causality shows an F-statistic of 4.829, significant at the 1% level, further confirming the combined short- and long-run effect of EEE on Y. For the dependent variable EC, the short-run causality (F-statistic) for Y is 0.759, which is not significant, indicating that Y does not Granger-cause ECECEC in the short run. The error correction term (ECT) for EC is -0.387, significant at the 1% level, indicating long-run causality from Y to EC. The joint test for short- and long-run causality shows an F-statistic of 6.275, significant at the 1% level, indicating a significant combined short- and long-run effect of Y on EC. In summary, the VECM Granger Causality tests indicate that E Granger-causes Y both in the short run and the long run, while Y Granger-causes EC only in the long run. The joint tests confirm the significant combined effects for both relationships.

**Table 4: The VECM Granger Causality**

| Dependent Variables | Short-run | | Long-run | Joint (short- and long-run) | |
|---|---|---|---|---|---|
| | Y | E | ECT | Y, ECT | E, ECT |
| | F-statistics | | [Significance] | F-statistics | |
| Y | …. | 4.077** | -0.189** | …. | 4.829*** |
| EC | 0.759 | …. | -0.387*** | 6.275*** | …. |

Note: *** and ** Denote the rejection of the null hypothesis at 1 per cent and 5 per cent levels of significance, respectively.

## 4. CONCLUSIONS

The study investigates the causal relationship between electricity consumption and economic growth in the Kingdom of Qatar for the period from 1980 to 2018. We used a time series analysis based on the error correction method (ECM). The

initial set of tests confirmed the existence of a cointegration relationship, indicating a long-term equilibrium between electricity consumption and economic growth. The results of the long-run elasticities demonstrate that economic growth is positively and significantly linked to per capita electricity consumption, and vice versa. This implies that as the economy grows, electricity consumption increases, and similarly, an increase in electricity consumption supports further economic growth. The Granger causality test results indicate a bidirectional relationship between electricity consumption and economic growth in the long run.

This inter-dependency suggests that electricity consumption contributes to economic growth and economic growth, in turn, fuels further electricity consumption. Such a relationship underscores the critical role that electricity plays in sustaining economic growth in Qatar. The findings highlight the need for effective energy policies that ensure a reliable and efficient electricity supply to support continuous economic development. Given Qatar's reliance on natural gas for electricity generation and the looming issue of gas exhaustion, the study's findings emphasize the importance of diversifying energy sources and enhancing energy infrastructure. The GCC's unified power grid initiative is a step in this direction, aiming to provide stability and prevent power shortages. However, for Qatar to maintain its economic growth trajectory, further investments in renewable energy and other sustainable practices will be essential. This approach will help mitigate the risks associated with gas depletion and ensure that electricity consumption can continue to drive economic growth in the long term. In fact, as discussed earlier, the changing lifestyles and improving living standards of Qatari citizens during the past decade have driven energy demand. The increase in foreign direct investment (FDI) and projects, as well as the dynamism of the economy, has created employment and increased the use of electricity for industry and private consumption. Consequently, per capita income has increased. One of the most demanded energy services in Qatar is air-conditioning due to the harsh weather conditions during the spring and summer, where humidity surpasses 90 percent and temperatures reach up to 50 degrees Celsius.

Given this context, it is evident that a shortfall in power supply would likely result in slumps in economic activity in the long run. Thus, avoiding such shortfalls is a crucial energy policy to ensure the continuous growth of economic activities. Building larger generating capacities to satisfy the different sectors of the economy and developing new energy sources, such as wind and green energy, are essential steps in this direction. These measures would not only cater to the growing energy demands but also contribute to sustainable development by reducing reliance on natural gas, which is a finite resource. The integration of renewable energy sources into the power grid could provide a more resilient and diversified energy supply, ensuring that Qatar's economic growth remains robust and sustainable in the face of rising energy demands and potential resource constraints. The empirical investigation into the relationship between electricity consumption and economic growth in Qatar reveals significant findings with important policy implications. Given the rapid increase in energy demand driven by lifestyle changes, improving living standards, and economic dynamism, it is clear that maintaining a stable and adequate power supply is essential for sustaining economic growth. The study's findings suggest that any shortfall in power supply could lead to significant disruptions in economic activity, particularly given the high demand for air conditioning in Qatar's extreme climate. To ensure continuous economic growth and avoid potential energy crises, it is imperative for Qatar to expand its electricity generation capacity and diversify its energy sources. Investing in larger power generation facilities and developing renewable energy sources, such as wind and green energy, will not only meet the growing energy demands but also enhance the sustainability and resilience of the energy sector. Overall, the study underscores the necessity for proactive and strategic energy policies that prioritize the expansion and diversification of energy resources. By doing so, Qatar can secure a stable energy supply, support ongoing economic activities, and promote sustainable development in the long run. This approach will help mitigate the risks associated with natural gas dependency and ensure that the country continues to thrive economically while adapting to future energy challenges.

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