Institute of Policy Studies
Islamabad

Powering Progress: Investments and Digitization to Overcome Pakistan's Power Sector Challenges

Seminar Report

Executive Summary

The energy and power sector of Pakistan has been facing issues that hinder the country's progress towards energy independence. For example, there are problems with capacity charges imposed on independent power producers (IPPs), contributing to the mounting circular debt. There are several problems faced by consumers as well, such as load shedding and high electricity rates due to an outdated transmission and distribution system. Also, the issue of electricity theft has been a challenge, requiring improvements in the governance system and law enforcement. In order to address the challenges, the power industry must integrate new solutions such as digitization, smart metering, and targeted investments.

There is a need to introduce digitization as an out-of-the-box solution. Digitization is a major tool to overcome challenges in the power sector, but governance improvements are necessary to yield desired results. Inconsistent decision-making, use of low-quality transformers, and procedural delays in implementing digitization projects are major hindrances in this regard. While digitization could improve the efficiency of the power sector, it is crucial for the government to address constraints in the transmission and distribution system through proper planning and policy implementation to effectively reduce power sector losses.

Introducing smart metering systems is another solution. The integration of advanced metering infrastructure (AMI) would reduce technical and commercial losses in the feeders in which it is implemented. However, there is a disparity in this regard. The cost implications of introducing net metering systems, particularly in rural areas, are a source of concern.

Investments in improving the transmission system, expanding its capacity, and enhancing efficiency are essential to reducing the cost of electricity. There is also a dire need for improved asset management to prevent transformer failures. Investments in transmission and distribution systems, automation, digitization, as well as transition towards renewable sources would address the inefficiencies of the power sector and rationalize power tariffs. Moreover, investment in technology and digital solutions would result in reduced transmission and distribution (T&D) losses, achieved through the use of aerial bundled cables, smart meters, and digital meter readings. Apart from technology and infrastructure investment, renewable energy must also be given attention to increase its share in power generation through solar, wind, and hydel sources.

These investments must be aimed to benefit consumers. The National Electric Power Regulatory Authority (NEPRA) and K-Electric have made considerable efforts in this regard. For example, NEPRA reviewed the indicative generation capacity expansion plans submitted by the distribution companies (DISCOs) and aimed to prevent excessive charges to consumers by carefully evaluating IPP licenses and tariffs. Similarly, K-Electric, despite having a monopoly, expressed openness to more players entering the market to foster a competitive environment and provide more choices for consumers.

In the context of these challenges and issues, the Institute of Policy Studies held a hybrid seminar titled 'Powering Progress: Investments and Digitization to Overcome Pakistan's Power Sector Challenges' on April

17, 2023. The discussion was held by a penal of experts including Ashfaq Mahmood, former federal secretary, water and power, Khalid Rahman, chairman IPS, Mirza Hamid Hassan, chairman, IPS' steering committee for energy, water and climate change and former federal secretary, water and power, Mazhar Iqbal Ranjha, registrar, NEPRA, Sadia Dada, CMCO, K-Electric, Salahuddin Rifai, former GM National Transmission & Despatch Company (NTDC), and eminent energy experts associated with IPS including Asad Mehmood, Ahmed Ammar Yasser, and Ameena Sohail.

Takeaways from the Seminar

Q. What are the key concerns regarding the electricity crisis in the country and proposed measures to address the challenges and reduce the mounting circular debt in the energy sector?

Despite having a surplus of electricity production, the prevailing electricity crisis in the country is a cause of concern. Paradoxical situations where consumers continue to experience power outages despite paying higher rates for electricity have arisen due to an outdated and deficient transmission and distribution system that is unable to effectively deliver the available electricity to consumers. There is an urgent need to address this issue, as it significantly affects the daily lives of the citizens and hampers economic growth.

In addition to the transmission and distribution challenges, the issue of capacity charges imposed on the IPPs is also a major concern. The government requires IPPs to pay for the capacity of electricity generation, even if their electricity is not fully utilized. This policy has led to increased financial burdens on the IPPs and contributes to the mounting circular debt in the energy sector. The circular debt, which has now reached a staggering Rs4 trillion, poses a significant challenge to the stability and sustainability of the energy sector. To overcome the energy crisis and reduce the circular debt, a comprehensive debate is necessary on reducing the capacity charges imposed on IPPs. By lowering these charges, the burden on the producers would be reduced, potentially leading to more affordable electricity rates for consumers. Moreover, it is important to find a sustainable solution that balances the financial viability of the IPPs with the need to provide affordable electricity to the public.

Furthermore, digitization and collaboration between the government and the private sector to explore innovative and out-of-the-box solutions through digital technologies are necessary. By leveraging digitization, the energy sector can enhance its efficiency, reduce losses, and optimize the utilization of available resources. These efforts would not only help overcome the crisis but also provide much-needed relief to the common people who bear the brunt of high electricity rates and frequent power outages.

While digitization is a powerful tool, its effectiveness is contingent upon improving the level of governance within the power sector. The presence of an inconsistent decision-making environment, which leads to uncertainty among domestic, commercial, and industrial users, is a key challenge. Moreover, rapid changes in tariffs without proper communication or predictability create a sense of instability and hinder long-term planning for energy consumption.

The use of indigenously manufactured or recycled transformers without proper quality checks has also negatively impacted the efficiency of the power sector, e.g. reputable manufacturers like Siemens have ceased their operations in Pakistan, possibly due to these quality concerns. Additionally, the unchecked use of recycled transformers compromises the overall efficiency and reliability of the power supply.

In order to address these challenges, the importance of improving governance practices within the power sector is paramount. This includes establishing consistent and transparent decision-making processes, ensuring quality control measures for transformers, and creating an environment that fosters investment and innovation.

There is also the dire need for improvements in the governance system as many people still do not consider electricity theft a crime and law enforcement agencies do not prioritize this issue adequately. In some cases,

perpetrators are released on tendering a mere apology letter, which indicates a need for stricter enforcement measures.

In addition, the frequent mismanagement of technology and digitization initiatives in the power sector has resulted in consumers bearing the associated costs, making the goal of affordability unachievable. To address these issues, there is a need to prioritize consumer interests and optimizes costs. The establishment of a professional board to advise the government on planning, incorporating the input of energy experts, would ensure effective decision-making that considers the latest industry trends and knowledge.

Q. How can transmission and distribution (T&D) and technical and commercial losses in the power sector be reduced? Is there any successful case study?

Digitization can help reduce T&D losses. Efforts are being made by the Planning Department of the NTDC to enhance transmission and distribution efficiency through investments in digitization. This forward-thinking approach aims to leverage technology to optimize the transmission and distribution processes, ultimately leading to improved overall efficiency and reliability in the power sector. Despite the challenges faced by the power sector, private equity continues to invest in it as long as there is economic viability. The import of 2 GW of solar panels over the past three years indicates the economic viability, interest, and confidence in the power sector.

Advanced metering infrastructure (AMI) can provide potential benefits in reducing technical and commercial losses. Empirical evidence demonstrates that the implementation of AMI in feeders can lead to a significant reduction of up to 20 percent in losses. This highlights the potential benefits of leveraging technological advancements to improve the efficiency of power distribution and minimize losses.

In order to reduce technical and commercial losses, it is also important that closer attention is paid to asset management system to minimize incidents of transformer failures as it can have a significant impact on the stability and reliability of the power sector.

Case Study of K-Electric

K-Electric took proactive steps to improve its asset management system during the monsoon season of 2022, successfully minimizing damage and ensuring the reliability of power supply.

Despite having a monopoly, K-Electric chose not to extend its exclusivity license and expressed the desire to introduce more players into the market. This move aims to create a competitive environment and provide consumers with more options for power services. The company has also emphasized the role of technology and digital solutions in reducing T&D losses. Through investments in advanced technology, K-Electric successfully decreased T&D losses from 34.2 percent in 2005 to the current level of 15.3 percent, which aligns closely with NEPRA's benchmark.

Several strategies contributed to this reduction, including the conversion of 40 percent of power management transformers (PMTs) to aerial bundled cables, making theft through illegal connections more challenging. Additionally, all industrial customers have transitioned to smart meters, enabling more accurate monitoring of electricity usage. Meter readings are now conducted digitally using handheld units with GPS tracking to ensure the honesty of readings. However, technology alone cannot fully address power theft in the sector.

K-Electric also introduced the smart metering system to grid stations and large industrial users, which has yielded positive results. However, the decision-making process is influenced by bureaucracy and development financing institutions, where the smart metering system was introduced in state-owned DISCOs with lower line losses (9 percent) instead of those with higher losses (over 30 percent) like SEPCO, MEPCO, QESCO, or PESCO. Moreover, $120 million was already spent on the procurement of net metering systems, and the cost would significantly increase to $9 billion when net metering is introduced in far-flung areas and villages. Ultimately, consumers would have to bear this cost in the long run.

K-Electric achieved the desired results by spending only Rs3-4 billion on smart metering. However, there has been a waste of money and resources in providing net metering to consumers who use only 50 to 100 units of electricity. Such a practice is neither cost-effective nor efficient.

Regarding renewable energy, K-Electric currently generates only 3 percent of its power from renewable sources. However, the company has ambitious plans to increase this share to 30 percent by the year 2030. Solar energy will be the major component, contributing approximately 900 MW, with the remaining share coming from wind and hydel sources.

Q. What are the challenges faced by state-owned DISCOs in implementing digitization initiatives, and how does the governance structure of the power sector need to be reformed to address these challenges effectively?

The DISCOs encounter difficulties in implementing digitization projects because they are required to obtain approvals from the Public Procurement Regulatory Authority (PPRA) for any such initiatives. Another issue is the procedural delays faced in obtaining approval for the advanced metering infrastructure (AMI) project and a lack of skilled human resources leading to project mismanagement and failure in achieving the desired results. For example, IESCO faced challenges in its transition towards digitization and the implementation of smart metering. This case also highlights the importance of developing a long-term plan to approve and implement AMI effectively.

One of the significant challenges in the digitization process is the issue of ownership, timeline, and empowerment of the board, which needs to be addressed for more effective decision-making. The governance structure of the power sector itself needs reform to ensure more efficient roles for the boards involved. The government should not be directly involved in the decision-making process for digitization initiatives. The power sector in Pakistan has been influenced by political and economic factors, and a comprehensive systemic overhaul is necessary to effectively address these issues and ensure successful digitization efforts.

Q. How can the burden on consumers in Pakistan's power sector be addressed, and what are suggested areas of priority investment?

The burden on consumers in Pakistan is largely attributed to the outdated and inefficient power transmission system. Investing in power transmission should be prioritized alongside energy transition and digitization efforts. By upgrading the power transmission system, the power sector can reduce transmission losses and enhance the reliability and efficiency of electricity supply. This, in turn, will contribute to more affordable electricity prices for consumers.

There is a need for significant investment in the transmission system, considering that the installed capacity of the power sector is 43,000 MW, while the outdated transmission infrastructure can handle only up to 22,000 MW. As improving the capacity and efficiency of the transmission system is crucial for reducing costs associated with electricity generation and distribution. Moreover, the coal power plants in Thar have the capacity to generate 2,800 MW of electricity, but due to transmission constraints, only 1,800 MW is being provided to the national grid. This underscores the importance of addressing transmission constraints to fully utilize the potential of power generation sources.

In addition to upgrading the transmission system, the importance of investing in energy transition and digitization is paramount. These initiatives can modernize the power sector, making it more efficient and sustainable in the long term. By prioritizing investments in these areas, the power sector can better meet the needs of consumers, and ensure a more secure and stable electricity supply in Pakistan.

As NEPRA welcomes investment in automation and digitization, the DISCOs or IPPs must justify their investments and demonstrate their benefits to consumers. NEPRA's approval for these investments is contingent upon the potential benefits they offer to consumers, as, ultimately, consumers bear the cost of these investments.

NEPRA is currently reviewing the indicative generation capacity expansion plans submitted by all DISCOs. This review process ensures that the licensing and tariff decisions made by NEPRA are justified and aligned with the best interests of consumers. NEPRA's objective is to prevent the IPPs from charging excessive tariffs that could burden consumers.

Moreover, a comprehensive approach is needed that includes investments in power transmission, energy transition, and digitization to address the challenges and improve the affordability and reliability of electricity

in Pakistan. To develop a comprehensive and improved approach to achieve greater power security in Pakistan, the relevant stakeholders must conduct case studies on various aspects, including tariff indexation, investments, planning, and digital transformation, to gain valuable insights and develop practical solutions for the challenges facing the power sector. Moreover, there is a need for a collaborative approach involving all stakeholders, including policymakers, regulators, investors, and consumers, to ensure the successful implementation of effective solutions in the power sector.

Q. What areas need to be prioritized for investment and policy planning in the power sector?

Focusing on power investment, policy planning, and digitization in the transmission system rather than generation needs to be prioritized. The affordability and accessibility of electricity prices to customers depend on a well-functioning and efficient transmission system. The transmission system plays a critical role in distributing electricity effectively to consumers, but inadequate investments in this area have resulted in high electricity prices for consumers.

There is a need for a financing plan and investment strategy to address the challenges faced by the power sector. This would require collaboration between the government, private sector, and other stakeholders to ensure that sufficient funding is available for investments in the power sector, particularly in the transmission infrastructure. By prioritizing transmission investment, the power sector can improve efficiency and reliability, ultimately leading to more affordable electricity prices for consumers.

It must be accompanied by proper planning, implementation of the right policies, and addressing the constraints that exist in the transmission and distribution system. Without these measures, the power sector will not be able to effectively reduce its losses and improve efficiency. By prioritizing transmission investment, developing a financing plan, and implementing effective policies, it is possible to improve the efficiency and affordability of the power sector in Pakistan.

Picture Gallery

Prepared by:

Lubna Riaz
Researcher
IPS Steering Committee for Energy,
Water and Climate Change

For queries:

Naufil Shahrukh
General Manager Operations
Institute of Policy Studies, Islamabad
naufil@ips.net.pk | www.ips.org.pk