



Beyond Access: Rethinking Electricity Equity in Pakistan

Assessing the 2025 National Policy

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Executive Summary

Despite a high rate of electrification, electricity in Pakistan remains inequitable. Electricity equity goes beyond access; it also requires reliability, affordability, and reduced burden on vulnerable households. There are significant gaps in electricity accessibility and reliability across provinces and regions. Many communities face unreliable and inconsistent supply, even though they are connected to the grid. Electricity affordability for low-income households largely hinges on total subsidies, which constitute cross-subsidy, intra-DISCOs subsidy, and government subsidy; without such support, affordability is at serious risk for vulnerable groups. Pakistan urgently needs to reform its electricity subsidy system to ensure that subsidies are targeted only toward intended households, which is an essential to ensure equitable electricity, for achieving SDG 7 and advancing energy justice.

Introduction

Sustainable Development Goal (SDG) 7 seeks to ensure universal access to reliable, affordable, sustainable, and modern energy for all. Intuitively, it implies that true electricity equity goes beyond connections to include reliability, affordability, and a manageable energy burden, particularly for low-income and vulnerable households (Tarekegne, 2020). Affordable and uninterrupted energy is pivotal as a driver of economic growth and foundation for effective health and education systems, resilient infrastructure, and digital inclusion (UNDP, 2025). In the absence of equitable electricity access, initiatives aimed at poverty alleviation, livelihood enhancement, and inclusive development are likely to yield only partial and unsustainable outcomes (Mendelson, 2013).

In line with SDG 7, this study defines and evaluates electricity equity across four dimensions, i.e., accessibility, reliability, affordability, and energy burden across Pakistan using recent household data and international benchmarks. By identifying equity gaps and their evolution over time, the analysis provides evidence to guide reforms toward a more equitable and sustainable energy

Electricity Accessibility

Electricity access is commonly measured as the percentage of households in an area with an electricity supply, often referred to as the electrification rate (IEA, 2017). Access to electricity is pivotal for economic inclusion, as it underpins human development by improving quality of life and fostering economic growth (Acheampong et al., 2022). On the other hand, unequal access across countries and regions highlights disparities in wealth, opportunities, and levels of development (Sarkodie & Adams, 2020). Globally, an estimated 733 million people, primarily in rural areas of Africa and Asia, still lack access to electricity, underscoring the persistent challenge of energy poverty (IEA, 2015; World Bank, 2022).

Table 1 provides details on the electrification rate in Pakistan. Based on the HIES 2018-19 data, around 88.99% of households in Pakistan had electricity access, with urban areas having a high electrification rate of 96.8%, in contrast to rural areas, which had a lower rate of 84.21%, emphasizing the urban-rural gap in energy services. The 7th Population and Housing Census (2023) shows an updated national electrification rate of 84.03%. It also indicates a growing reliance on off-grid solar systems, which are now utilized by 7.73% of households, highlighting both innovation and gaps in grid access. Pakistan has made significant strides in expanding the electricity network. However, there are still significant disparities between provinces and urban and rural areas.

Table 1: Electricity Accessibility in Pakistan

| Region | HIES 2018-19 | | 7th Population and Housing Census-2023 | | |
|--------------------------|----------------------------|-------------------|--|-------------------|----------------|
| | Total Households (Million) | Electrification % | Total Households (Million) | Electrification % | Solarization % |
| Pakistan | 33.34 | 88.99 | 38.29 | 84.03 | 7.73 |
| Pakistan Rural | 20.67 | 84.21 | 23.27 | 76.69 | 11.19 |
| Pakistan Urban | 12.67 | 96.80 | 15.02 | 95.41 | 2.37 |
| Punjab | 19.40 | 95.11 | 19.84 | 94.95 | 1.69 |
| Punjab Rural | 12.10 | 92.76 | 11.71 | 92.92 | 2.18 |
| Punjab Urban | 7.30 | 99.01 | 8.13 | 97.87 | 0.97 |
| Sindh | 7.69 | 83.36 | 9.86 | 70.33 | 12.57 |
| Sindh Rural | 3.54 | 70.83 | 4.72 | 46.22 | 22.04 |
| Sindh Urban | 4.15 | 94.05 | 5.14 | 92.45 | 3.89 |
| KPK | 4.73 | 77.99 | 5.86 | 79.90 | 13.06 |
| KPK Rural | 3.94 | 75.05 | 4.95 | 76.89 | 15.00 |
| KPK Urban | 0.788 | 92.64 | 0.913 | 96.23 | 2.51 |
| Balochistan | 1.52 | 73.62 | 2.32 | 57.11 | 26.39 |
| Balochistan Rural | 1.09 | 65.87 | 1.66 | 45.36 | 33.89 |
| Balochistan Urban | 0.429 | 93.34 | 0.654 | 86.98 | 7.33 |

Source: HIES 2018-19 & 7th Population and Housing Census (2023)

The last column in Table 1 highlights the solarization process as a substitute for electricity accessibility. Punjab records the highest grid connectivity, with near-universal access in urban areas and extensive rural coverage, resulting in limited reliance on solar energy compared to other provinces. Sindh shows stark urban–rural disparities, where rural households (22%) increasingly turn to off-grid solar systems for electricity accessibility. Khyber Pakhtunkhwa also faces access gaps, driving greater solar adaptation for stability and reliability. Balochistan remains the most underserved province, with widespread lack of electricity, mainly due to poor infrastructure and line losses, and a significant number of rural households (approx. 34%) relying on independent solar energy systems not connected to the primary electricity grid.

Electricity Reliability

Electricity reliability is a core dimension of energy equity, reflecting the power system's ability to consistently meet demand, withstand technical or weather-related disruptions, and recover quickly from outages. The reliability of electricity supply is shaped by multiple factors, including the adequacy of generation capacity, the state of power system infrastructure, the financial and operational performance of utilities, and the effectiveness of energy sector regulation (Arlet et al., 2017).

Pakistan ranks 115th out of 137 economies for electricity supply reliability, and its per-capita electricity consumption has remained stagnant for nearly a decade (Global Competitive Report, 2018). For the household sector, the conservative estimate of the annual income loss due to unreliable electricity access is \$4.5 billion, approximately 1.7% of the GDP (Samad & Zhang, 2018). For industrial and commercial sectors, electricity reliability is estimated through the Value of Lost Load (VoLL), which is estimated to be at USD 6.0–9.0 per kWh for commercial consumers and USD 4.0–7.5 per kWh for industrial consumers, varying by sector and region. Needless to say, small businesses face this disproportionate burden badly due to a lack of access to backup solutions like generators or solar panels. On aggregate, power supply outages and interruptions have resulted in an estimated total economic cost equivalent to 4–7 percent of Pakistan's gross domestic product (Zhang, 2018).

Tables 2 present electricity supply reliability through the number of load-shedding hours per day and the System Average Interruption Frequency Index (SAIFI), which represents the average annual power interruptions per customer.

Table 2: Electricity Reliability in Pakistan

| Region | DISCOs | Daily Load-shedding (Hr) | | | | | System Average Interruption Frequency Index (SAIFI) | | | | |
|-------------|--------|--------------------------|---------|---------|---------|---------|---|---------|---------|---------|---------|
| | | FY 2020 | FY 2021 | FY 2022 | FY 2023 | FY 2024 | FY 2020 | FY 2021 | FY 2022 | FY 2023 | FY 2024 |
| Federal | IESCO | 1.83 | 1.00 | 2.50 | 1.50 | 2.50 | 0.06 | 0.05 | 20.56 | 17.97 | 16.33 |
| Punjab | GEPCO | 0.00 | 0.33 | 0.40 | 0.85 | 0.22 | 25.64 | 24.78 | 23.02 | 22.01 | 55.86 |
| | LESCO | 3.00 | 3.00 | 0.50 | 0.50 | 0.50 | 33.03 | 34.66 | 32.86 | 29.13 | 28.19 |
| | FESCO | 0.00 | 0.00 | 1.00 | 0.56 | 0.00 | 35.65 | 35.53 | 35.20 | 34.94 | 34.66 |
| | MEPCO | 0.32 | 0.66 | 0.60 | 1.15 | 0.70 | 375.98 | 471.00 | 43.94 | 34.26 | 31.57 |
| Sindh | HESCO | 5.67 | 6.00 | 8.00 | 8.66 | 10.60 | 162.85 | 137.10 | 134.05 | 133.04 | 131.41 |
| | SEPCO | 2.33 | 7.30 | 2.30 | 2.33 | 2.30 | 478.00 | 441.04 | 410.70 | 117.50 | 80.85 |
| | K-E | 2.73 | 1.94 | 2.60 | 5.21 | 8.52 | 27.56 | 28.00 | 25.95 | 25.34 | 71.31 |
| KPK | PESCO | 2.92 | 1.80 | 6.00 | 4.50 | 11.00 | 187.93 | 193.70 | 188.92 | 184.67 | 180.59 |
| Balochistan | QESCO | 6.00 | 8.00 | 11.30 | 10.25 | 10.00 | 99.12 | 97.96 | 97.11 | 98.37 | 97.89 |

Distribution companies showed varying levels of performance in terms of supply reliability. Among distribution companies, Islamabad's IESCO and Punjab DISCOs stood out of high reliability, experiencing minimal daily power cuts and outages as compared to other province DISCOs. In Sindh, HESCO, SEPCO and K-E experienced frequent outages and consistently high SAIFI values, reflecting persistent reliability challenges. QESCO in Balochistan had moderately high daily power cuts and significantly high SAIFI values, raising concerns about the overall system reliability. In Khyber Pakhtunkhwa, PESCO had one of the longest average durations of power cuts and fluctuating SAIFI numbers, indicating enduring reliability challenges and infrastructure strain, particularly in rural service regions.

The differences shown in Table 2 reveal significant disparities in the quality of electricity services across the regions. This situation hinders the achievement of goals for equitable access to energy. According to Abbas (2023), this situation is a result of ineffective operations in DISCOs due to demand-management practices. In an attempt to improve performance, DISCOs in areas with low bill recoveries have either completely or partially ceased supplying electricity to certain regions, rather than improving bill recovery. However, electricity theft and bill recoveries are operational challenges for DISCOs. Linking them with fair distribution of electricity is not justified, as it is unfair to penalize good consumers who pay their bills on time, bear the burden of others' inefficiencies, and face electricity reliability issues due to consumers who do not pay their bills on time or engage in electricity theft.

Electricity Affordability

According to the Sustainable Energy for All initiative, a practical benchmark states that the cost of using 30 kWh of electricity per month, essential for basic needs such as lighting, phone charging, and a fan, should not exceed 5% of the household's total monthly income or expenditures (World Bank, 2015). This threshold serves as a global affordability standard to ensure that the poorest segments of the population can access essential electricity services without facing financial hardship. Exceeding this limit could push households, especially those in the lowest income brackets, into energy poverty, where they might have to decide between paying for electricity and meeting other essential needs like food, education, or healthcare. This benchmark is widely used to determine electricity prices, allocate subsidies, and develop policies that enhance energy access for low-income individuals in developing countries. To evaluate electricity affordability in Pakistan, this study utilizes the World Bank's standard, which considers electricity affordable when 30 kWh of electricity costs less than 5% of total monthly household expenses. Using the most recent available data from HIES 2018–19, we estimated affordability under two scenarios:

Scenario 1: Electricity Affordability with Current Tariff (inclusive subsidies, figure 1)

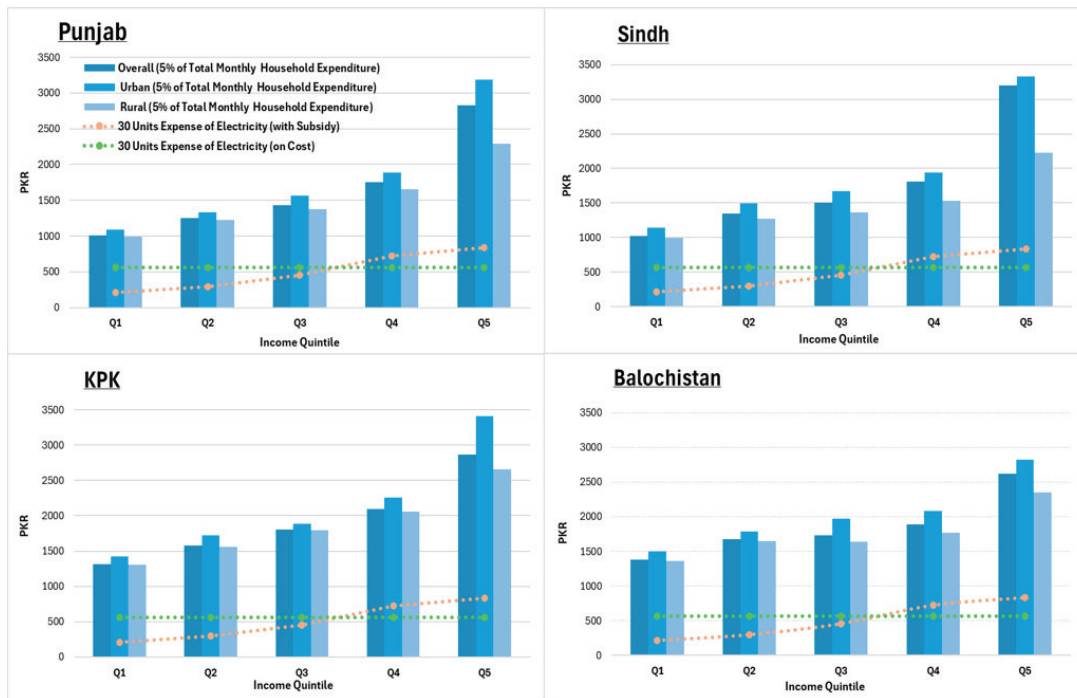
Scenario 2: Electricity Affordability with Cost-reflective Tariff (exclusive subsidies figure 2)

In both cases, the expense of 30 kWh (inclusive of taxes) stayed under the 5% affordability limit for all income quintiles in 2018–19. This suggests that electricity was generally affordable during that period, even in the absence of subsidies. Nevertheless, significant disparities arise when applying the same benchmark to FY 2025 tariffs. The cost-reflective tariff (NEPRA-determined tariff) for June 2025 stands at Rs. 41.13 per kWh (Rs. 33.99 base tariff + 21% all taxes), bringing the total cost of 30 kWh to approximately Rs. 1,234. Figure 2 shows that when this updated expense is compared to FY 2025 expenditure¹ levels, the affordability threshold is breached for lower-income quintiles of Punjab and Sindh provinces. In contrast, under the current implemented (subsidized) tariff, affordability remains unchanged for most households.

1. For FY 2025, household expenditure was estimated using the last two HIES datasets (2015-16 and 2018-19). The increase observed between HIES 2015-16 and 2018-19 was applied twice for FY 2025, as the gap between these surveys (2015-16 and 2018-19) is three years, while the gap between HIES 2018-19 and FY 2024-25 exceeds six years.

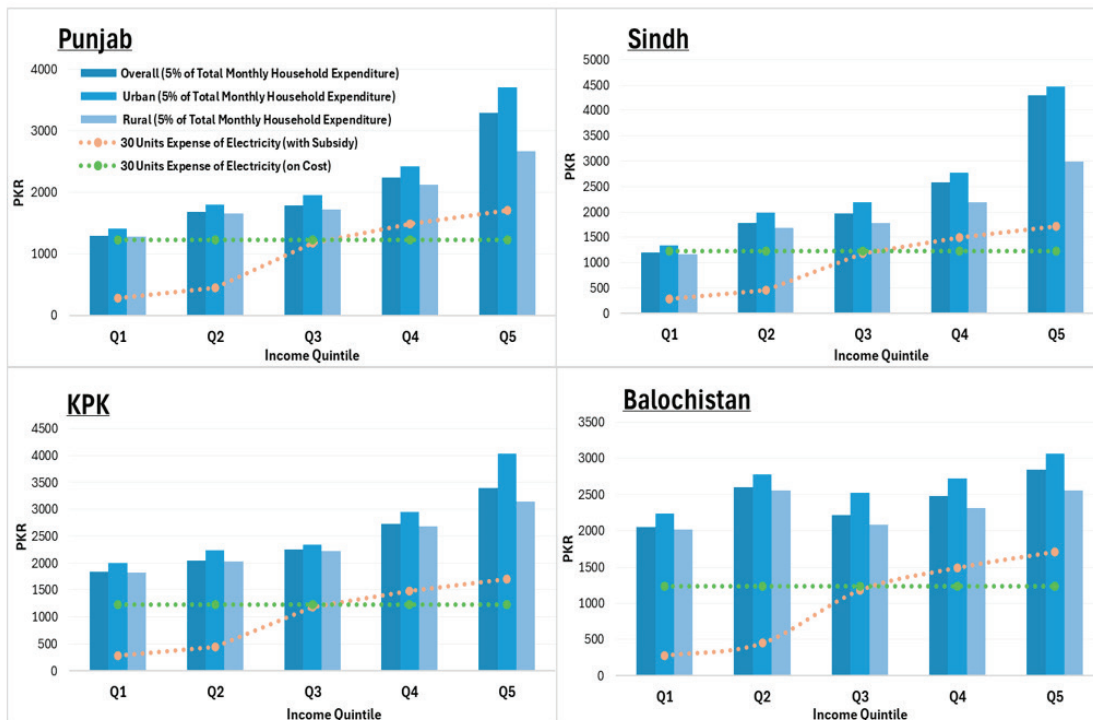
The results, displayed in Figure 1, illustrate the affordability of electricity across five income quintiles, ranging from the least affluent to the most affluent households in Pakistan.

Figure 1: Electricity Affordability FY 2019



Source: Authors' estimation based on HIES 2018-19. Q1 to Q5 are low to high income quintiles.

Figure 2: Electricity Affordability FY 2025



Source: Authors' estimation through extrapolation based on HIES 2018-19.

Extrapolation: Twice the increase, between last two HIES datasets (2015-16 and 2018-19).

These findings underscore two important points:

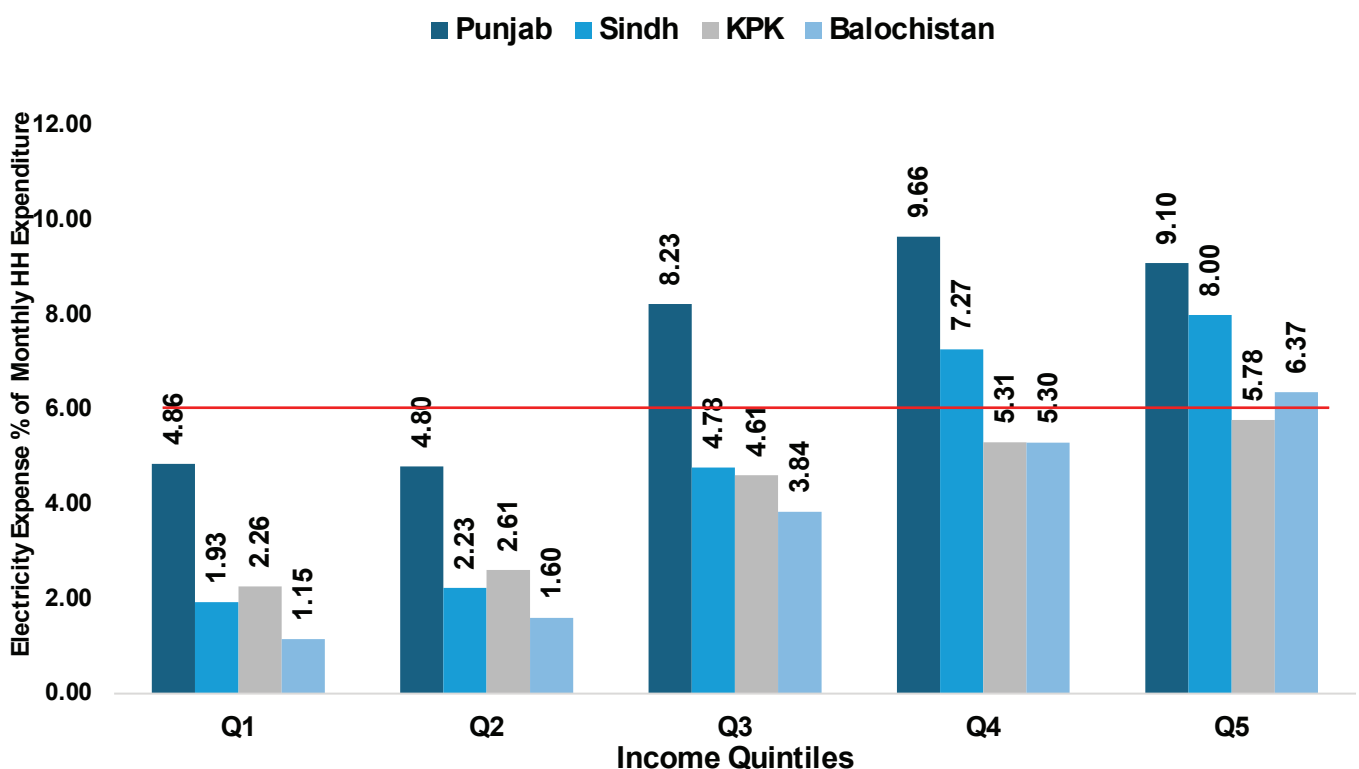
- Affordability continues to exist under the current implemented (subsidized) tariff.
- Under the cost-reflective tariff (NEPRA-determined tariff) structure without subsidies, electricity may not be affordable for lower-income households, highlighting the correlation between electricity affordability and subsidies in maintaining electricity affordability.

Several studies, such as ADB (2021), Malik (2022), and Malik & Urooj (2022), emphasize the need to eliminate subsidies to improve efficiency and implement cost-reflective tariffs. While these policy suggestions align with financial efficiency, they neglect the objective of affordability for vulnerable households. It's essential to consider that although a cost-reflective tariff can improve financial efficiency, it may also make it harder for vulnerable households to afford electricity, leading to a trade-off. Moreover, this underscores the urgent need to redesign subsidies to reach only the intended households, which would guarantee affordability and improve financial efficiency as well.

Electricity Burden

Electricity burden refers to the percentage of a household's income that is spent on electricity costs. A high burden means that even basic electricity consumption limits a household's ability to pay for other essentials like food, education, or healthcare. Internationally, an electricity monthly expenditure exceeding 6% of household monthly income is deemed unaffordable (Drehobl & Ross, 2016; Bednar et al., 2017; Cook and Shah, 2018; Brown et al., 2020). The 2018-19 HIES data show that while the electricity burden varied across provinces, it remained under 6% for all income quintiles nationwide, suggesting that electricity was generally affordable. During FY2019, the lower-income quintiles (Q1 and Q2) spent an average of 4.7% of their monthly income on electricity (subsidies applied). It also validates our policy stance that affordability and energy burden are directly correlated for vulnerable households (Q1 & Q2) with subsidies. Without subsidies, many households may struggle to afford the electricity burden.

Figure 3: Energy Burden FY 2025



Source: Authors' estimation through extrapolation based on HIES datasets (2015-16 and 2018-19).

Figure 3 illustrates that, for FY 2025, middle- and higher-income quintiles (Q3, Q4, and Q5) in Punjab and Sindh had already surpassed the 6% threshold for energy expenses. Nevertheless, lower-income quintiles (Q1 and Q2) in all provinces exhibited a consistent pattern with FY 2019, primarily due to the cross-subsidy mechanism, which shifts most cost hikes to higher-income quintiles (Q3 to Q5). However, middle- and higher-income quintiles (Q3 to Q5) of KPK and Balochistan spend an average of nearly 5.5% of their monthly income on electricity, showing that many households face an energy burden surpassing the 6% threshold for energy expenses.

SDG 7 primarily aims to make energy affordable for lower-income households (Q1 and Q2). In Punjab, Q1 and Q2 are close to the 5% threshold on average, and reducing the subsidy may result in many households in Punjab exceeding the 6% energy burden benchmark. Given fiscal constraints and donor conditionalities, removing subsidies would expose low-income households to an unaffordable energy burden. Furthermore, it validates our policy stance that affordability and energy burden are directly correlated with subsidies for vulnerable households (Q1 & Q2).

Conclusions and Recommendations

In Pakistan, despite significant improvements in electrification rate, reliability of electricity stark disparities persists between provinces and regions. Electricity affordability and burden was considered broadly affordable in 2018–19, even without subsidies. However, current tariff levels (FY 2025) have exceeded this threshold for poorer households when subsidies are removed, highlighting that one of the major dimensions of electricity equity—affordability—relies heavily on subsidies in Pakistan. Where the affordability of vulnerable households depends heavily on subsidies, a significant proportion of households currently benefiting from electricity subsidies are not the intended recipients. In FY 2024, approximately 51.5% of domestic consumers (classified as lifeline and protected) received electricity subsidies. This figure highlights the inequitable distribution of subsidies within the power sector. Enhancing the efficiency and targeting of these subsidies would not only improve fiscal discipline and resource allocation but also help reduce the overall electricity cost burden for all consumers by minimizing cross-subsidization and leakages.

Pakistan urgently needs to reform its electricity subsidy framework to ensure that subsidies are effectively targeted toward the households that genuinely require it. However, identifying the truly deserving beneficiaries poses significant challenges, yet it is not an impossible task. Integrating data from key government institutions such as the FBR, BISP, and NADRA can facilitate the creation of a comprehensive National Electrification Registry (NER). This registry would consolidate electricity consumer information and enable accurate identification of subsidy-eligible households. For instance, individuals who are registered taxpayers yet receive subsidized electricity could be automatically excluded, ensuring that subsidies are directed exclusively toward low-income and vulnerable segments of the population.

This targeted approach will lower electricity costs for a broader range of households, ensuring affordability for all. Enhance the reliability of the distribution system and prioritize investment in regions lacking adequate services, while providing more reliable electricity. According to the World Bank estimates, Pakistan has the potential to boost its economy by 4-7% by achieving universal 24/7 electricity access. Overlooking these fundamental challenges will impede progress toward equitable electricity access.

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