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Reimagining the Future of Electricity in Pakistan: An Analysis of IPP Agreements and Power Sector Reforms

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ABSTRACT

Pakistan's power sector continues to face significant challenges despite substantial expansion in generation capacity over the past three decades through the induction of Independent Power Producers (IPPs) under Power Purchase Agreements (PPAs). Persistent issues including financial instability, high electricity tariffs, and structural inefficiencies have constrained the sector's overall performance. Contractual rigidities in IPP agreements, coupled with weaknesses in transmission and distribution infrastructure, have contributed to rising circular debt, increased fiscal pressure, and reduced affordability of electricity. This paper examines the evolution of IPP model in Pakistan since 1994 Power Policy and stresses upon contribution of dollar indexed capacity payments irrespective of actual utilization of energy, reliance on imported fuels and veil over contractual terms to the structural misalignment of cost and demand impacting affordable electricity. There is no caveat to the fact that initially these agreements attracted investment over USD 5 billion and added 4500 MW of capacity by late 1990s, however, they on the other hand led to entrenched financial liabilities accumulating overtime to make this unsustainable fiscal burden. An analysis of external and internal factors via PESTLE (Political, Economic, Social, Technological, Legal, Environmental) and TOE (Technological, Organizational, Environmental) frameworks indicates multifaceted challenges including political interference, inconsistent policy formulation, outdated grid infrastructure, weak regulatory oversight abetted by overall macroeconomic vulnerabilities straining negatively on the sectoral performance. Internal dynamics unearth the chronic governance failures of DISCOs, transmission and dispatch losses, and low-cost recovery eating the base of the sector. Resultantly, circular debt has become a monster with venomous PKR 2.39 trillion by June 2024. Unless the underlying reasons are not addressed, reforms will not serve the purpose. Immediate reforms should focus on financial stability through efforts to renegotiate contracts with IPPs, realign targeted subsidy mechanism with handholding of the deserving, better recovery performance and automatic timely tariff adjustments. Medium measures should aim at diversification of generation mix tilting towards indigenous sources, removal of trans-

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mission constraints, empower NEPRA and implementation of Competitive Trading Bilateral Contract Market (CTBCM) to induce competition for better performance and service delivery. For resilient financial sustainability of power sector in long term, competitive market with modernized grid infrastructure, integration of renewable/distributed generational sources and professional cadre management shall be essential.

Keywords:

Independent Power Producers (IPPs), Power Purchase Agreements (PPAs), PESTLE, DISCOs, Bilateral Contract Market (CTBCM)

1. INTRODUCTION

The power sector is the foundation for superstructure of national economic growth providing crucial lifeline to individuals and essential for industrial growth leading to national development and to solidify the social cohesion of the country. Pakistan's power landscape however has been struggling to keep afloat amidst prolonged crisis and policy shifts for reforms. The target of generation capacity enhancement was achieved via introduction of private sector as Independent Power Producers (IPPs) but that did not help the sector achieve stability and security from vulnerabilities, external as well as internal. By June 2024, the installed generation capacity touched 45,888 MW compared with the average annual utilization of 33.88%, forcing consumers to pay for the rest of unutilized capacity (NEPRA, 2024). This is further complicated by the twin monsters of persistent tariff hikes and load shedding pointing out deep rooted structural as well as systemic deficiencies.

A big performance blocker is the ever-rising menace of Circular Debt (CD) contributing to financial deficit. The root cause of CD is non-payments to suppliers which has cascading effect in the whole supply chain ranging from the distribution entities to generation companies and their suppliers. This results in generation of debt, more than electricity, and contributes to increased costs for generation, delayed tariff determination and inefficient revenue recovery by DISCOs. Commencing from the year 2006, the amount of CD has attained the zenith with PKR 2.3 trillion in the financial year 2024. The transmission and distribution losses, 18.31% in FY 2023 against NEPRA's allowance of 11.77%, coupled with outstanding receivables of around PKR 1 trillion from chronic defaulters intensifies the pressure on the system (NEPRA, 2024). The energy sector is constrained for excessive bank exposure for borrowings to tackle CD and that further puts pressure on tariff structure

for raising revenue to offset the borrowing cost, cycling down to increment of debt.

The distribution system led by the DISCOs is also marred with ageing infrastructure and outdated management practices resulting in inefficiency, poor delivery, heavy losses and corrupt practices. The transmission system similarly does not correspond to the current demand requirements due to its old transmitting and grid structures and even cheaper, more efficient generation options often remain underutilized or idle, as the transmission system cannot adequately transport power from generation sources to demand centers. Neither the government nor the cash stressed DISCOs are in position or willing to invest in upgradation of the infrastructure causing interruptions and disruptions of provision of electricity.

The induction of IPPs in the 90's was projected as the cure for all ills of power sector as public sector could not respond to the rising electricity demand by the ballooning population. It was also seen as harbinger of private investment in the country. This did address the issue of generational capacity however, could not stabilize the system for provision of affordable and reliable energy to the masses and industries. The contractual obligations in the form of idle capacity payments irrespective of actual generation and offtake and their indexation with USD put undue burden on the government. These capacity payments have also contributed to the piling up of CD. The secrecy around these agreements does not allow an independent assessment and raises questions about their efficacy and efficiency.

1.1 Statement of Problem

Despite reformative initiatives regarding generational capacity expansion, Pakistan's power sector faces significant challenges, inter alia including transmission as well as distribution inefficiencies, circular debt and high tariffs, resulting in suboptimal performance of the sector having negative impact on economic growth of the country. The country's reliance on Independent Power Producers (IPPs) and contractual frameworks lopsided in favor of IPPs has raised concerns about sustainability and affordability. In view of foregoing, a critical review is necessitated of the power sector policies with respect to the IPP agreements and power sector reforms, identifying root causes and exploring alternative solutions to envision a more efficient, sustainable, and equitable electricity future for Pakistan.

1.2 Scope and Significance of the Study

This study will carry out a critical review of the power sector's policies with specific focus on Independent Power Producer (IPP) agreements and their impact. It focuses on IPPs' contractual induced hazards of capacity payments, rising circular debt and hike in tariffs and their effect on the performance and efficiency of the power systems of transmission and distribution. The research also aims to identify root causes of below par performance of the sector with the view to explore alternate recipe for reimagining the future electric landscape of Pakistan with suitable reforms.

The primary goal of this paper is to provide policy recommendations to strengthen Pakistan's energy security and promote economic growth. This research, however will not have ingress into the technical and engineering analysis of sector's infrastructural components and will also refrain from detailed analysis of various power policies especially not related to IPPs besides the alleged corruption issues pertaining to IPPs.

This research paper aims for a critical review of power policies regarding IPP agreements and their impact on power sector; identification of root causes of below par sectoral performance, inherent systemic and structural deficiencies; and exploration of alternative solutions and interventions for overhaul of power sector enabling long term energy security for the country.

2. LITERATURE REVIEW

Most of the literature available on Pakistan's energy sector highlights the structural deficiencies and inefficient operations being the heart of energy crisis with insufficient capacity superimposed later on to which government responded by introducing IPPs. Fraser (2005) cautioned that notwithstanding resolution of capacity issue by IPPs, Pakistan got trapped in expensive power and rigid financial model of guaranteed returns which aggravated circular debt issue. Pakistan opted for quick fix instead of sustainability and affordability. Ali & Fayyaz (2007) also pointed out structural financial risks embedded in IPPs contracts forcing the country in circular debt trap that is indicative of short sightedness of policymakers. Ali, S.B. (2010) treated circular debt issue as systemic inefficiency and he contended that tariff issues, bad governance and wrong policy choices pushed the sector into cyclical trap which requires comprehensive reforms. Bacon (2019) opined that while Pakistan did achieve success in

attracting private investment in generation however, it could not incentivize cost. The reforms were good on paper but not politically sustainable in reality. He further contended that imported formulas can only be successful if they are institutionally adaptable which unfortunately could not be done. Abidullah (2023) hummed the same tune that lopsided contracts with inbuilt expensive capacity payments strangulated the economy with unsustainable cost structure and the malaise with power sector is more about contractual issues and institutional mismanagement stemmed from IPPs. Hussain & Khalid (2021) framed circular debt as governance crisis which persists due to inefficient infrastructure making mismanagement in DISCOs and political interference substantial contributors to the crisis than financial constraints. We chose political expediency over systemic reforms. Ashar Awan & Bilal (2024) have argued that inconsistent and partial reforms create hybrid inefficiencies neither fully controlled by the government nor by liberalized system. Reforms in Pakistan have always been ambitiously announced but always deflate owing to weak enforcement and vested interests.

3. RESEARCH METHODOLOGY

This research primarily employs qualitative methodology based on articles, policy documents and other published papers available on the Power Sector and Independent Power Producers (IPPs). Relying on secondary data sources obtained from credible policy reports and databases as well as official publications, like Indicative Generation Capacity Expansion Plans (IGCEP), NEPRA annual reports, Power Division, World Bank, ADB, PIDE, SDPI etc., this study aims to review the contractual and policy frameworks of IPPs and their impact on the performance of power sector besides their impact on health of economy.

For the purpose of analysis, sectoral performance indicators such as affordability, sustainability, and efficiency in electricity provision are taken as dependent variables, while IPP contractual structures, regulatory frameworks, and governance arrangements are taken as independent variables.

3.1 Organization of Paper

The paper is organized into three sections. Section I details about the historical evolution of Power Sector in Pakistan and successive power policies, specially focusing on introduction of IPPs under 1994 Power Policy. It examines the policy rationale, contractual designs, tariff

mechanisms, capacity payments issue cumulatively impacting generation capacity, circular dent phenomenon, and consumer tariffs. Section II makes a critical assessment of the performance and implications of IPPs with reference to their contract agreements on operational efficiency, affordability and sustainability of the sector. Economic consequences of these frameworks have also been evaluated and their extent in shaping or distorting sectoral as well as policy reforms measures. A brief comparative insight from countries with reforms undertaken there successfully has also been made. Section III applies diagnostic policy analysis to identify structural and institutional factors underlying persistent challenges to the sector. The analysis of external and internal factors led to an outline of potential reformative measures including but not limited to renegotiation of agreements, energy mix optimization, and improvement in transmission and dispatch systems. Thereafter, suitable and actionable recommendations for efficient, economical and sustainable power sector have been charted out.

4. HISTORICAL PERSPECTIVE AND EVOLUTION OF POWER SECTOR IN PAKISTAN

An explicit exposition is not required to determine the importance of Power Sector in enabling the industrialization and social development leading to overall economic stability, however, in Pakistan, it has remained embrangled in systemic challenges notwithstanding the efforts undertaken by successive governments to enhance generational capacity. The induction of Independent Power Producers (IPPs), a significant measure to increase electricity generation, was result of the policy shift consequent to limitations of the public sector to shoulder the financial impact required for such enhancements. IPPs entry did impacted the electricity generation to more than required, nonetheless, the sector kept on grappling with the issues of high tariffs, inefficient operational performance and rising as well as unsustainable menace of circular debt which then led to cascading effect in the form of slow GDP growth and increasing fiscal deficits negatively effecting the investment environment as well public trust in governance.

The succeeding narration highlights the historical evolution of power sector emphasizing policy frameworks and contractual arrangements surrounding IPPs; examine the 1994 Private Power Policy and subsequent policy detours; structural reforms; and, their cumulative effects on capacity, cost and financial sustainability. Comparative international

precedents have been employed to contextualize Pakistan's policy sojourn, with identification of crossroads where alternative route could have resulted in better outcomes.

Table 1
Installed Capacity Vs Electricity Generation

Year	Installed Capacity (MW)	Electricity Generation (GWh)
2016	25421	114093
2017	28712	120622
2018	35979	133588
2019	38995	137005
2020	38719	134242
2021	39772	143589
2022	43835	154056
2023	45738	138539
2024	45888	137196

Sources: NEPRA Reports, Economic Survey of Pakistan

4.1 The Foundational Years

Pakistan's skeletal electricity infrastructure in 1947, with meagre 60MW generational capacity, was focused on urban areas and industrial centers with non-existent rural coverage. Hence, Water and Power Development Authority (WAPDA) was established, in 1958, to focus on meeting electricity demands of industries and agriculture by prioritized measures for increasing the production of electricity. Its mandate included development of water as well as power resources coupled with management of the national grid and infrastructure growth for future requirements. Mangla Dam and Tarbela Dam were completed in 1967 and 1976 respectively with financing from the World Bank and other financers thereby transforming the generation mix tilting towards more than 70% electricity generation through hydropower. It was low cost, reliable with cushion against oil price volatility in international markets.

The country saw its population growing at a considerable rate, with expanding industrial base in the decades of 50 and 60. This was dovetailed with increasing electrification of rural landscape which hiked the electricity demand. The pressure on Power Sector was intensified with the oil shocks of 1973 and 1979 which exposed the vulnerabilities of imported

fuel dependent thermal power plants. It was further compounded by politically set tariffs at lower than cost, transmission and distribution losses, and inefficient billing and collection systems. Obviously, the public sector could not meet the challenging situation of rising demand warranting substantial investments forcing it to consider other options to bridge the gap.

4.2 Policy Transition – Luring Private Sector in Electric Arena

The World Bank guided Private Sector Energy Development Program (PSEDP), initiated in 1986 by the government, was the first corridor for accessing the otherwise restricted area of power generation. PSEDP offered private investors to develop power projects backed by sovereign guarantees and foreign exchange risk coverage. This however attracted lukewarm response owing to the uncertain and instable political environment, absence of transparent regulatory framework and unattractive tariff structure. No substantial investment could be magnetized to enhance generation.

At the onset of 90s, the situation got gruesome by increased power outages due to supply shortage. It was coincided by the global trends advocating for liberalization of energy sector and this forced the government to scale up its response by resorting to formulate a comprehensive private power policy which could also dealt with the donor pressures besides lessening the burden on public sector.

4.3 Private Power Policy 1994

The launch of Private Power Policy (PPP) was premised on policy construct to push market-oriented reforms viz. deregulation in infrastructure sectors and privatization which was in line with the 'Washington Consensus' at international level in the decade of 90s. It also was in sync with the exhortations of the World Bank and Asian Development Bank to switch to IPP model to attract foreign capital thereby reducing fiscal burden of sectoral expansion. Needless to reiterate impact of the acute load shedding due to supply shortfall of est. 2000-3000 MW by 1993-94 aggravating the disruption of industrial output and eroding export competitiveness which became a chronic issue for the government to pay heed to on priority. Hence the PPP 1994 was launched offering the most investor friendly construct and designed for rapid addition in the generational capacity to offset the ever-rising demand of electricity. It did deliver but that was at the cost of long-term implications relating to fiscal domain.

The salient features of the PPP 1994 are enumerated below to understand the contours of policy:

- Long term (15-30 years) guaranteed Power Purchase Agreements (PPAs) wherein the government was the sole buyer via WAPDA/KESC.
- Cost-Plus Tariff structure was built in to ensure fixed returns with almost 18% Internal Rate of Return (IRR) for foreign investors with exchange rate and fuel cost adjustments.
- Purchase of electricity on the basis of take or pay agreement providing for fixed monthly payments covering debt servicing, fixed operational and management expenses irrespective of the utilization of plant and offtake of electricity. This is popularly termed as Capacity Payments.
- Foreign Exchange Risk Insurance was incorporated whereby SBP covered depreciation risks with cost borne by the WAPDA (off-taker).
- Fiscal Incentives were also offered by way of corporate tax exemptions, import of duty-free equipment and facility of full profit repatriation.
- Private Power & Infrastructure Board (PPIB) was established to streamline the approvals

4.3.1 Policy Appraisal

The years from 1994 to 1998 bore testimony to upscale generational capacity by virtue of unprecedented investment influx by private sector resulting into increased capacity of more than 4500 MW besides foreign and domestic investment of around USD 5 billion. Hub Power Company (HUBCO), being a success story, was South Asia's largest private power project indicative of Pakistan's rapid growth of private sector participation in the energy sector. IPPs started supplying to the tune of 17% of country's total electricity by 1998.

Notwithstanding impressive performance in generation, the foundation of energy sector consisted of fault lines and structural weaknesses shaping the challenges for the years to come. Against the immediate requirements of 2500 MW, the government issued Letters of Support (LoS) for around 9000 MW private capacity and this over commitment bogged down the government in long term payment obligations in disregard of the actual requirement. The IPPs being predominantly dependent on imported fuel forced the energy generation costs susceptible to international price fluctuations and volatility. This affected the provision of electricity at affordable rates besides putting

pressure on the balance of payments. Toeing along was the issue of dollar denominated capacity payments pushing up the cost due to currency depreciation exposing the government to recurring fiscal pressure. It is pertinent to note that the contracts executed with IPPs were kept under veil and the garb of secrecy led to erosion of public confidence besides hatching of conspiratorial plots of political favoritism which was further corroborated by the low tariff setting even below the cost. The undercurrents of dollar linked payments, low tariffs, weak and inefficient recovery of bills culminated into first wave of circular debt phenomenon in late 90s and since then it has not let the sector stay afloat with stability.

4.3.2 Responsive Policy and Structural Recalibrations

The government in reaction sought to make readjustments in the policy framework and institutional alignment initially by intended diversification of generation mix through the Hydel Power Policy in 1995 to attract investment in small and medium hydropower projects. It could not kick off prima facie owing to absence of dedicated financing mechanism aided by the ambiguity about provincial governments' ability for sponsoring these projects.

However, in 1997, a substantial step was taken by unbundling the WAPDA into Generation Companies (GENCOs) for thermal plants; National Transmission and Dispatch Company (NTDC) for high voltage network and dispatch operations; and, Distribution Companies (DISCOs) for electricity supply in regions. WAPDA was left with hydel power generation and water management.

National Electric Power Regulatory Authority (NEPRA) was established in 1997 for independent oversight and was assigned with functions of licensing, tariff determination and formulation of service standards. Though conceived as an independent regulatory setup, NEPRA was not beyond compromise in its autonomous exercise of powers regarding tariff determination wherein interference was made by the controlling Ministry of Water and Power to keep electricity prices palatable in tune with political requirements. This created tariff differential subsidy adding further to the fiscal burden.

Subsequently, in 1998 Power Policy, in order to check overpricing and capacity overshoot, competitive bidding replaced the negotiated tariffs and focus was shifted to hydel and coal resources in the country. Again, in 2002 Power Policy, investors were exposed to more risks by way of removal of guaranteed fuel supplies and reinforced competitive

procurements. The policy also denominated tariffs in PKR however it retained dollar indexation for key components.

Concomitantly, efforts were started for privatization which saw the sale of majority shares of Karachi Electric Supply Company (KESC) to private investors in 2005. Change of ownership of KESC, later K-Electric, in 2009 led to upgradation of infrastructure and improved recovery of bills though significant challenges remained in the field. However similar efforts for other DISCOs remained unsuccessful due to more of a political resistance.

Central Power Purchasing Agency (CPPA), later CPPA-Guarantee (CPPA-G), was established in 2009 for all procurements and settlement of issues between generation companies and DISCOs.

The Power Generation Policy 2015 introduced differentiated returns on equity for various fuel types – 15 % for gas/LNG and 17% for hydropower. These returns were indexed with both local as well USD price indices. Going further, 2021 National Electricity Policy, aiming for sustainability and reforms, coincided with the approval of Competitive Trading Bilateral Contract Market (CTBCM) allowing DISCOs for direct contracting with the generation companies but the implementation of CTBCM has been sluggish and reasons for that include systemic inertia and vested interests coupled with complex regulations.

4.3.3 Fall Outs of IPPs - Capacity Expansion, Distorted Tariffs and Financial Stress

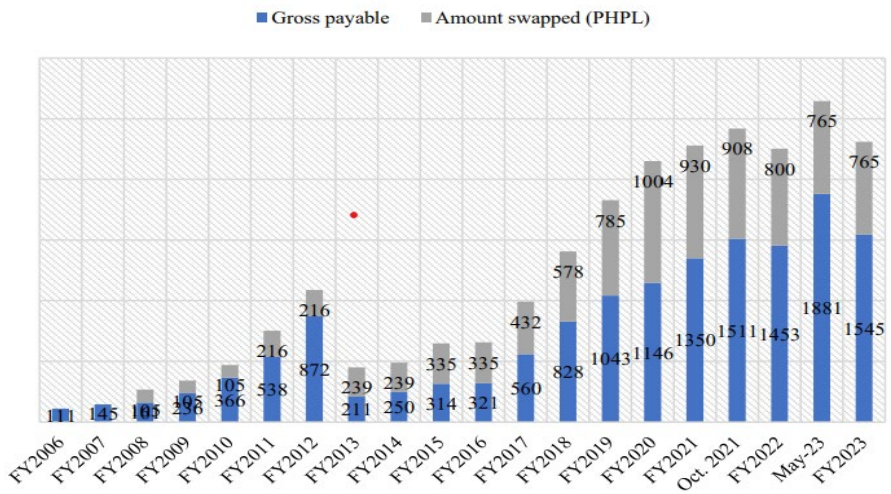
Courtesy IPPs, the installed generation capacity reached at 46,221 MW by June, 2024 evenly distributed between public and private ownership. Though the generation exceeded the demand of electricity in the country, the power sector could not come to terms with the operational inefficiencies and financial stress. The issue lies in the utilization of plants which is far south with average utilization of just 33.88% in FY 2023-24 meaning thereby that 2/3rd of the capacity is idle. Meanwhile, the transmission network is unable to transmit energy from efficient nuclear, Thar coal and renewable plants in the south to the demand centers in the north forcing to resort to rely on more expensive source of electricity severely undermining cost efficiency.

Circular debt is the most obvious and intense symptom of these structural inefficiencies. Skyrocketing to PKR 2.4 trillion of power sector alone by June 2024, it further ascends to PKR 5.422 trillion of complete

sector including power and gas. Capacity payments in USD for idle plants, transmission and dispatch losses touching 18.31% against 11.77% permitted by NEPRA, delayed tariff adjustments, poor cost recovery with arrears cumulating to PKR 1.09 trillion in FY 2023-24 and unfunded subsidies of around PKR 1.19 trillion in 2025 are feeding factors for circular debt stock. The borrowings by Power Holding Private Limited (PHPL) for offsetting the payments shortfall in turn further add to the horrendous phenomenon of circular debt.

Figure 1

Circular Debt in Pakistan



Source: PIDE (2024)

Another stream of systemic stress pertains to high tariffs pitching Pakistan amongst the most expensive electricity markets in South Asia. The average generation cost, as of July 2024, was US cents 12.76/kWh which is double than cost in Bangladesh. The increase in tariffs is corresponded by the demand depression, theft and increased revenue shortfall further straining the sector.

A glance at other countries indicates Pakistan's divergence from the frequently used route to stabilize power sector. Turkey managed to reduce distribution losses below 20% via privatization with strict contractual performance. Vietnam has tagged the competitive market reforms with investment in efficient generation to ensure affordability and reliability. Bangladesh balanced IPPs incentives with fuel mix planning and loss control to rationalize generation costs. It leads to inference that private

sector participation in power sector per se is not counterproductive if it entails stringent regulatory regime and foolproof contract formulation aligning incentives with the efficiency and performance. Pakistan has not been able to reap the fruits of such policies due to lack of strategic farsightedness and performance oversight leaving the sector imbalanced warranting serious efforts for reformation.

5. IPPs – A CRITICAL IMPACT ASSESSMENT

The introduction of IPPs in power sector, opening the field for private investment, marked a significant policy change in 90s necessitated by urgency of the increasing demand supply gap which was not financially and technically feasible for the public sector to tackle with and strong policy advocacy by the International Financial Institutions (IFIs). The investors were incentivized with highly secured returns in the long term with contracts backed by sovereign guarantees which facilitated the success of the initiatives and billions of rupees were mobilized and injected into generational capacity enhancement. However, the primary success of generation led to the chronic issues of fiscal strain due to cost escalations inherently owing to rigidity of the contracts. Notwithstanding transformation of the generational landscape to the extent of provision of 38% supply of electricity by 2017 by these IPPs, the sector is still grappling with the malaise of low assets utilization, high tariffs, circular debt, inefficient transmission and dispatch system incurring losses pushing the sector in financial distress.

5.1 Contractual Design

The contractual framework of IPPs, under 1994 Private Power Policy, focused on minimizing investor's risks. The following features of these contracts vividly indicates the subsequent effect of such provisions.

Tariffs setting was based upon 'cost-plus' concept. Initially set at US cents 6.5/kWh and later at US cents 6.1/kWh, these were payable in PKR but indexed to USD insulating the investors from currency risk but exposing the government to long term vulnerability in the form of currency depreciation increasing the cost under these obligations.

These contracts were finalized on the principle of 'take or pay' which though attracted private investor but there was no incentive for efficiency improvement or fuel cost minimization. Further, payments under these contracts were split into 02 components. Capacity Price was guaranteed fixed payment encompassing fixed O&M, administrative overheads, debt

servicing and return on equity irrespective of the utilization of the plant. Energy Price, which fluctuated with the fuel cost linked with international fuel prices.

Another allowance given through these contracts was 'fuel choice flexibility' intended for rapid generational capacity and infrastructure enhancement. Most investors opted for imported fuel (furnace oil and HSD) based plants for generation which came with exposure to global volatility in international fuel prices and variations in foreign exchange rates leading to long term insecurities given Pakistan's financial and economic situation.

Besides, the projections about electricity demand in the country was not based on correct forecasting rather was over shooed. HUBCO, in 1998, operated at 55% of its total generation capacity but WAPDA was bound contractually to pay full capacity payment. This became a constant factor, in view of demand supply mismatch, pushing the cost up and feeding to the circular debt also.

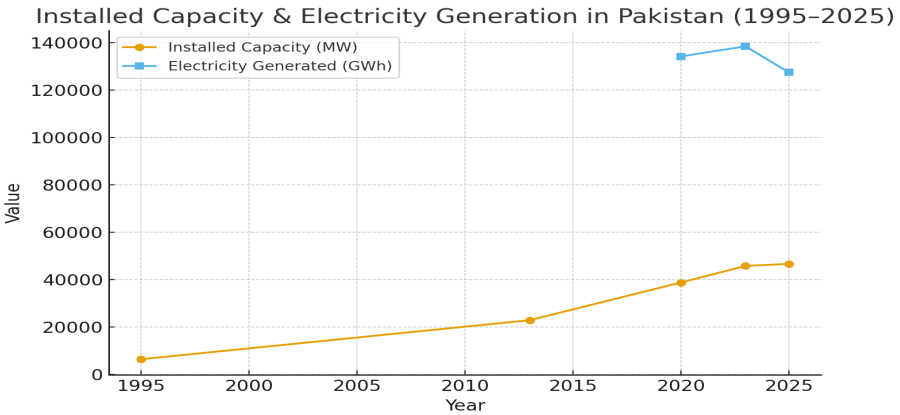
5.2 Performance overview of operations

IPPs plants performed better as compared to the state owned GENCOs owing to proper maintenance, availability and updated technology, however, their performance was offset by the systemic inefficiencies of more installed capacity than demand leading to capacity payments and transmission bottlenecks.

Transmission constraints forced the power sector to resort to more expensive plants near the demand centers in north instead of utilizing cheap and efficient nuclear as well coal plants due to inability of evacuation from south where most of them are located. The high generation cost jacks up the weighted average cost of supply of electricity.

Another issue pulling the system down is underutilization of IPPs plants. In 2023-24, average utilization of these plants was around 33.8%, which could not affect the revenue streams for IPPs in presence of guaranteed capacity payments. It nonetheless increased per unit cost of electricity burdening the consumers. This also clarifies the phenomenon of load shedding, in view of higher installed capacity viz-a-viz demand, which occur due to these transmission and distribution constraints besides shortage of finance.

Figure 2
Installed Capacity & Electricity Generation



Source: NEPRA (2024)

Table 2
Installed Capacity & Electricity Generation by Source (FY2024-25)

Source	Installed Capacity (MW)	Share of Total Capacity (%)	Electricity Generated (GWh)	Share of Generation (%)
Fossil Fuels	25937	55.6	58333	45.7
Hydro	11368	24.4	39902	31.3
Nuclear	3620	7.8	23155	18.2
Renewables	5680	12.2	6133	4.8
Total	46605	100	127523	100

Source: NEPRA Reports, Economic Survey of Pakistan

5.3 Persistent Issue of Circular Debt – IPPs Contribution

One of the most visible corollaries of IPPs framework is the structural manifestation of circular debt which is defined as net unpaid liability of DISCOs to CPPA-G rippling down to IPPs, GENCOs and suppliers of fuel. The circular debt has grown from PKR 111 billion in 2006 to PKR 2.39 trillion in June 2024.

The contributory factors having links with IPPs include fixed USD linked capacity payments, high generation costs relying on imported fuel and cost-plus tariff structures, transmission and dispatch losses with average of 18.3% in 2023-24 against NEPRA set target of 11.7%, shortfall in revenue recovery of more than 7%. Delayed tariff notifications, delayed

payments of Tariff Differential Subsidies (TDS) and high financing cost on PHPL borrowings to plug liquidity gaps which in turn facilitated the rise in circular debt. This became a vicious circle whereby high fixed costs led to inflated tariffs prompting reduction/suppression in demand and egging on power theft which in turn increased underutilization of plants thereby increasing burden of capacity payments.

5.4 Efforts for Reforms and Politics

Various efforts to carry out reforms to fix these issues plaguing the power sector could not succeed due to political as well as contractual intricacies and complexities. The very nature of contracts premised on 'take or pay' made it impossible to escape payment of capacity charges even if the plants were shut down. Latest effort in 2020 to renegotiate with 40 IPPs resulted in some savings via lowering return on equity and early debt repayment to reduce long term interest costs but it did not have much impact as they didn't amend fundamental issues of indexation or payment structure.

The political economy got complexed owing to direct or indirect connections of IPPs with the political Influentials and business elites. Mishandling the issue of HUBCO in late 1990s for reluctance to honor its sovereign guarantees tarnished Pakistan's investment reputation leading to high-risk premiums in future contracts.

Tariff determination role of NEPRA also remained conspicuously shadowed by the government letting the political considerations to get in way of cost recovery initiatives. Dispute resolution mechanism was thought to operate under the English law by many plants heightening the tension with domestic legal fora besides complicating enforcement.

5.5 Comparative Sectoral Situation

The precedents of private participation in power sector in different countries were not detrimental for operations and fiscal position of those countries.

- **Turkey** privatized its distribution companies under binding performance contracts which helped in reduction of system losses below 20% in less than a decade by dovetailing the enforcement with strict penalties to ensure operational efficiency.
- **Bangladesh** renegotiated successfully contracts with selected IPPs bringing investors' returns in line with market conditions while

diversifying into domestic gas and renewables. Its generation cost remained lower hovering around US cents 4.78/kWh to 6.8/kWh.

- **Vietnam** focused on strengthening of transmission network and regulatory capacity first before resorting to introduction of competitive markets. This avoided wayward capacity payment and ensured matching of system upgrades with the growth generation.
- **South Africa** opted for competitive reverse auctions for procurement in IPP program in renewables avoided long-term cost-plus contracts burdening the government with all risks.

These examples highlight the factors of competitive process, balanced risk sharing mechanism, enforcement of performance obligations with no political interference at all.

5.6 Implications – Fiscal and Macroeconomics

The IPP heavy generation mix fueled fiscal deficits at an average of 2.8% of GDP in the last ten years. Added to that, sector specific subsidies, budgeted at PKR 1190 billion in 2025, consume large fiscal space with no or very little room for essential social and infrastructure spending.

The macroeconomic vulnerability was also augmented by the USD indexation of capacity payments and every currency depreciation increased the burden of these payment obligations putting pressure on foreign exchange at the same time. During peak currency depreciation raised the capacity payment costs without any change in generation of power. Industrial competitiveness was also severely affected by high tariffs tracing active contribution from IPPs further deterring investment and suppressing growth. With every increase of 10 % in electricity costs, real GDP takes a hit by 4.6%. It also has an economic drag by way of public welfare losses from sectoral inefficiencies which stood at USD 13 billion.

5.7 Priorities for Reforms

In view of above, there is a dire need for recalibration of strategy for addressing structural cost drivers in IPP framework and systemic inefficiencies in transmission and distribution of power.

The strategy should aim for renegotiation of USD indexation of capacity payments especially for plants nearing end; diversification of fuel sources with enhanced focus on indigenous energy sources; strengthening regulatory oversight and tariff setting independence; focusing in demand growth strategies; implementation of Competitive Trading Bilateral

Contract Market (CTBCM) allowing direct contracting between generators and buyers; and, transparency tagged with accountability in contracting and performance auditing of IPPs.

These reforms in IPPs regime is needed to tackle entrenched financial obligations and contractual inefficiencies in order to pull the power sector out of quagmire of high tariff costs, underutilization and fiscal challenges having negative impact on country's economic outlook.

6. ANALYSIS OF ISSUES AND CHALLENGES

The chronic malaise of dysfunctional electricity sector of Pakistan under the contractual framework of IPPs is not comprehensible in isolation rather it needs to be seen with the broader lens of political economy, regulatory framework, technological landscape and institutional performance indicators. The problems have a logical fallout from policy lacunas, structural issues and macroeconomic vulnerabilities which shaped up as a menace of high tariffs, below par service delivery and persistent yet unsustainable debt.

The systematic diagnosis of these challenges warrants dual lens approach of PESTLE framework (to review broader external factors and environment shaping this sector) and TOE framework (to assess internal weaknesses and deficiencies of the system). The combined view shall facilitate a holistic picture of IPPs role in creation as well as persistence of these problems of the sector.

6.1 External Factors – PESTLE

This framework analyses the sector based on the factors ranging from political, economic, social, technological, legal and environmental aspects.

6.1.1 Political Factors

Political expediency to respond to the acute shortages of power in the country and public sector's failure to cater to the rising demand in early 90s resulted in the governments' decision to introduce the IPPs via 1994 Power Policy. The same urgency to scale up the development and respond to the situation led to concessional policy framework prioritizing private investment in generation instead of long-term efficiency and affordability.

The instability in political realm, with frequent change of governments since 1990s, amplified these structural weaknesses by introducing energy policies which were reactive and short lived. Investors' confidence was

shaken with every new government coming and trying to renegotiate or selectively implementing its earlier commitments. These reform efforts were adhoc in nature and further contributed to the bad sectoral performance.

The political interference also badly effected NEPRA's performance which was envisioned to be an independent regulatory body for tariff determination and monitoring of performance. As highlighted above also, consumer related tariff issues were kept under the domain of federal cabinet which caused delays in tariff determinations culminating as an aiding agent for circular debt due to mismatched recovery against actual costs.

Further, bad governance in public sector entities like DISCOs, GENCOs and NTDC were result of politicization in appointments which were made on political connections instead of merit compromising the operational efficiency and institutional capacity. The political fragility translated into uncertain policies, payment delays to IPPs, efforts in vain for renegotiating with IPPs triggering legal issues straining the sector even more.

6.1.2 Economic Factors

The rough edges of IPPs contracts became more obvious in the light of economic situation of the country which has been constantly grappling with chronic fiscal deficits (averaging 7% in recent years). Energy Sector deficit alone ticked around 2.8% of GDP in ten years from FY 2014 to FY 2024 constraining the government to pay the arrears to IPPs or finance energy subsidies leading to perpetuating and unsustainable fiscal burden.

Dollar indexation in these contracts further compounded the situation of macroeconomic instability and circular debt which ballooned with every episode of currency depreciation as happened in 2018 and then again in 2022-23, inflating the capacity payments to be made to IPPs. It projected a textbook circle wherein the tariffs were increased by NEPRA to offset ballooned capacity payments owing to rupee fall, which suppressed the energy demand reducing revenue collection and underutilization of plants and finally to again tariff hike.

Reliance on imported fuels including LNG, furnace oil & coal made it more gruesome as it exposed the generation costs to international price volatility. Recent Russian war with Ukraine in 2022 skyrocketed

Pakistan's fuel import bill pushing generation costs and made capacity payments even more burdensome for the government.

The more troublesome aspect is the erosion of Pakistan's exports competitiveness due to high tariffs severely affecting sectors like textile, steel and cement etc. The recession in business again contributes to reduction in electricity demand exacerbating trap of capacity underutilization but payment of full amount as per contractual agreements.

6.1.3 Social Factors

With 22% population living below the poverty line, tariff hike attracts severe criticism and public resistance. The government responds to the sentiment by providing blanket subsidies for both poor and affluent, draining the resources yet failing to shoulder the truly needy ones.

The public perception at large is premised on perceived corruption in these contracts in view of element of secrecy around this framework, giving away very or no information at all. Public distrust is further aggravated by poor service quality of power sector entities coupled with load shedding due to losses topped up with high cost of electricity. This is incentive enough for energy theft further worsening T&D losses consequently. All these forms the perception basis aligning the IPPs and government in the same frame with ill motive of fleecing the masses.

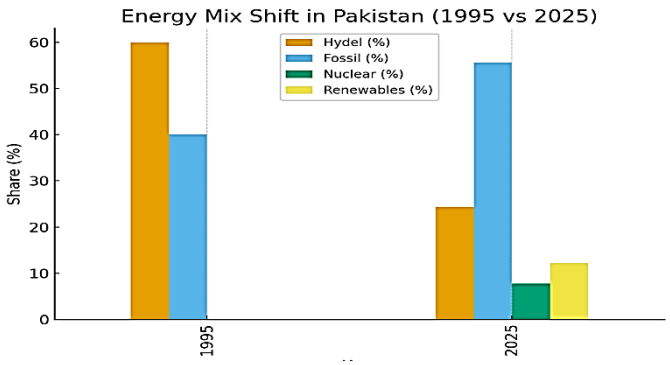
6.1.4 Technological Factors

The power generation is skewed towards thermal plants, in contrast to dependence on hydel generation in 1995, which have low efficiency and there is low adoption of renewable energy apparently due to inflexible contracts.

Power sector has severe transmission constraints and NTDC frequently had been unable to evacuate cheap electricity from southern power plants in Sindh to demand centers in the north of country. This forces the sector to rely on pricier power plants closer to demand points undermining the Economic Merit Order principle.

Most of DISCOs have ageing distribution networks prone to high technical losses. The implementation and deployment of Advanced Metering Infrastructure (AMI) is sluggish limiting theft detection and management of demand. Even country like Vietnam introduced nationwide smart metering system with real time grid management to reduce losses.

Figure 3
Energy Mix in Pak



Source: NEPRA Report (2024), Pakistan Economic Survey

6.1.5 Legal Factors

IPPs contracts are backed by sovereign guarantees under the English law for assurance of investors' security. The credibility of Pakistan was eroded by its unilateral efforts to renegotiate or to default on these obligations as happened in the HUBCO episode in late 1990s.

There has been a consistent lack of enforcement of NEPRA's decisions and tariff petitions as well as penalty decisions have regularly been challenged in courts delaying & disrupting financial flows to IPPs. Further, comprehensive disclosure and independent auditing has been absent in these IPPs contracts. Transparent as well open contracting can improve the legal and social environment as is evident from precedents in Chile and South Africa.

6.1.6 Environmental Factors

With 60% electricity from fossil fuel sources, Pakistan's current generation mix is carbon intensive which has implications for climate change commitments and cost stability also. A shift to cleaner energy sources may be required in view of global happenings for reducing carbon footprint and potential carbon tax by major export markets. Hydel generation is also linked with climate change issues due to glacial lake outburst flood and seasonal water shortages further necessitating need to diversify generation capability.

6.2 Internal Factors – TOE

TOE framework highlights internal constraints regarding technology, organization and environment.

6.2.1 Technological Constraints

- Outdated Generation Assets & Infrastructure of public sector GENCOs with low efficiency; plant load far below international benchmarks

- NTDC's transmission system constraints in evacuating energy from south to utilization in demand centers of north resulting in costly despatch deviating from economic merit orders.

- Limited grid flexibility for integrating renewables into the grid; IPPs payment structure requiring payment once for capacity charges and again for new renewable output.

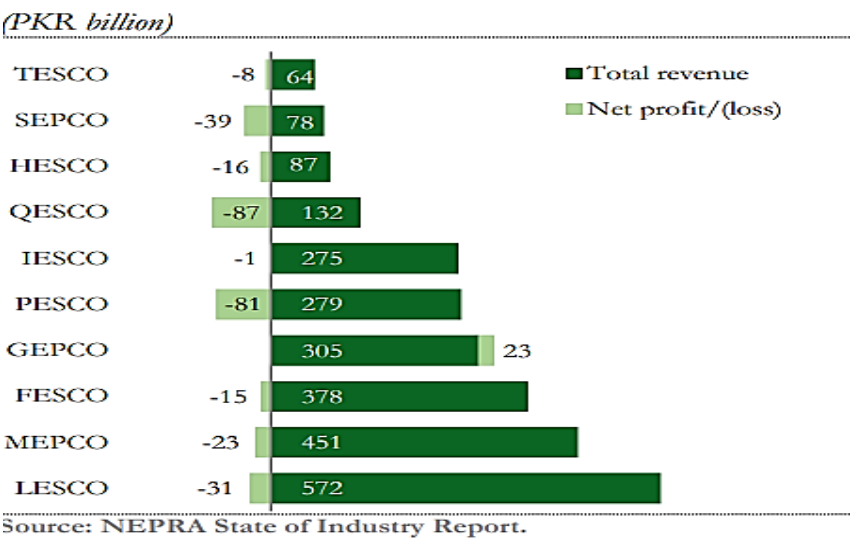
- Sluggish digitalization; lack of AMI and real time monitoring bars grid operations optimization; limited use of SCADA upgrades

6.2.2 Organizational Issues

Inefficient operational capacity of DISCOs with high transmission & Dispatch losses (18.31% in FY 2023-24) and poor recovery collection at 92.44%. Except GEPCO, all DISCOs were in loss in FY 2023 as depicted under:

Figure 4

Profit/Loss of DISCOs



- Poor coordination amongst various entities like NEPRA, CPPA-G, NTDC and DISCOs resulting in inconsistent reforms implementation.

- Limited in-house contract negotiations capacity and poor follow up and enforcement led to lopsided contractual obligations over extended period of time.

- Political appointments on considerations other than merit; political interference in management.

6.2.3 Environmental Factors

- Structural imbalance based on single buyer model whereby CPPA-G is purchaser of all electricity hindering competitiveness in generators.

- NEPRA's regulatory regime and enforcement is weak and compromised also allowing non- compliance and inefficient operations.

- Erosion of investor's confidence due to payment delays to IPPs in pursuance of contractual obligations.

7. CONCLUSION

Pakistan's power sector has remained in a quagmire and stands at defining crossroads, consequence of policy options prioritizing short term way out and crisis management over long term and sustainable comprehensive reforms in the sector. The introduction of Independent Power Producers under the 1994 Power Policy was a significant intervention that addressed acute generation shortages and attracted unprecedented private investment. However, the contractual and structural choices made at that time including dollar indexation, guaranteed capacity payments, and an overreliance on imported fuels have created persistent and unsustainable fiscal as well operational vulnerabilities.

This research is indicative of the fact that electricity sector of Pakistan is battling with the challenges deep rooted in the interplay of bad governance, inconsistent policies, weak regulatory autonomy, and a political economy that has historically resisted meaningful structural change. The persistent circular debt has transformed into a major economic risk reflecting deep systemic weaknesses. In effect, the sector's fragility is both a cause and a consequence of broader governance weaknesses, a feedback loop in which institutional inertia and contractual rigidity reinforce each other.

Global practices in the energy sector reveal that sustainable electricity systems are built on three interlocking pillars: cost-reflective and transparent tariff structures, credible and independent regulation, and a diversified, resilient generation mix that minimizes exposure to fuel price volatility. Pakistan's current status and configuration struggles on all three counts. The overcapacity trap, exacerbated by underutilized plants and non-merit dispatch, not only burdens consumers with high tariffs but also undermines industrial competitiveness, constraining economic growth and job creation.

Nonetheless, the past should not spill over into the future. The country's geographic and resource endowment (abundant hydropower potential, solar, wind corridors, and domestic coal reserves) offers a route toward a more self-reliant, affordable, and environmentally sustainable electricity system. The ongoing global energy transition, coupled with technological innovations in grid management and renewable integration, presents opportunities for Pakistan to leapfrog entrenched inefficiencies rather than remain captive to them.

Political will, however, is the prerequisite to confront vested interests, renegotiate legacy contracts where feasible, and dismantle the structural incentives that perpetuate inefficiency. It will demand a shift from crisis-driven policymaking to an integrated, long-term energy vision that aligns investment, regulation, and market structure toward the public interest. Above all, it will require restoring public trust through transparency in contracts, accountability in governance, and fairness in cost distribution.

Pakistan's electricity sector can either remain a drag on national development, a case study in how poorly aligned incentives and weak institutions can hollow out a strategic industry, or it can be transformed into an engine of competitiveness, fiscal stability, and inclusive growth. The choice will be determined not by technical potential alone, but by whether the political will exists to realign the sector's governance, economic incentives, and contractual framework with the imperatives of sustainability, affordability, and national resilience.

7.1 Recommendations

A comprehensive, well-coordinated and actionable transformational plan is warranted focusing on addressing the immediate fiscal issues, medium term structural challenges and long-term sustainability goals. The recommendations as a logical consequence of aforementioned discourse are delineated as under:

7.2 Immediate (2 years)

7.21.Renegotiation of Irritants in IPP Contracts

Immediate renegotiations with the IPPs under 1994 Power Policy should be undertaken to sort out issues of unsustainability arising out of contractual obligations with focus on the following:

- ✓ Debt repayment period extension to scatter fiscal pressure
- ✓ Rupee based capacity payments to mitigate foreign exchange volatility issues
- ✓ Insertion of clauses regarding efficiency linked performance tying plant availability as well as operational performance with investors' returns keeping costing audits and fuel efficiency as evidential backing for revision in contracts.

7.2.2 Reduction of Losses in DISCOs and Efficient Revenue Recovery

Urgent attention should be given to the issues of low revenue recovery and electricity theft, a major feeder to circular debt, by following measures:

- ✓ Deploy Advanced Metering Infrastructure (AMI) and installation of smart meters initially in high loss areas/feeders
- ✓ Disclosure of feeder level loss and revenue recovery; Dovetail loss reduction plans with performance benchmarks tied with incentives and accountability on lack of performance
- ✓ Establishment of a dedicated task force on anti-theft with powers of prosecution

7.2.3 Adjustments

Strict adherence of automatic quarterly tariff revisions based on fuel price & FX rate variations in order to avoid mismatching between actual cost of generation and corresponding revenue inflows.

7.2.4 Mechanism of Targeted Subsidies

Prevalent mode of blanket subsidies including Tariff Differential Subsidy is disproportionate as it benefits high income households and industrial consumers as well burdening exchequer. Explicitly budgeted subsidies to be channeled as direct cash transfers to the most vulnerable low-income households employing NADRA's registry data as well as BISP beneficiaries' data to benefit the deserving sections of population.

7.3 Medium Term (3-5 years)

7.3.2 Diversify Generation Mix

Pakistan needs to make an integrated energy plan carefully calibrating the generation expansion in alignment with the demand projections keeping in view the transmission capacity. Emphasis should be on well thought out expeditious recourse to indigenous and renewable generational resources involving expansion of hydel-power based generation through large dams and run of the river projects, deployment of solar and wind power projects on competitive basis to ensure cost economy, utilization of thar coal for generation with environmental safeguards.

7.3.3 Removal of Transmission Constraints

Forced reliance on costlier plants undermining the economic merit order due to lack of electricity evacuation from south to demand points in north should be addressed by focusing on:

- ✓ Operationalization of Matiari-Lahore (660KV) line
- ✓ Transmission capacity of NTDC to be upgraded with regional interconnections
- ✓ Invest in flexible transmission systems for incorporation of renewable energy

7.3.4 Empower Regulator – NEPRA

NEPRA should operate independently, empowered by legally enforceable framework, for determination of tariffs for all consumers' categories and enforcement of penalties for bad performance and violations. Government should have no interference in NEPRA's affairs.

7.3.5 Implementation of Competitive Trading Bilateral Contract Market (CTBCM)

Single buyer model should be replaced by allowing DISCOs, industrial consumers and others to directly contract with generators via operationalization of CTBCM model. It will encourage competition and efficiency in the sector besides reducing government's obligations.

7.3.6 Reforms of DISCOs/Public Sector Utilities

Comprehensive reforms to be undertaken in DISCOs and GENCOs to adopt corporate governance rules in line with SECP regulations and follow merit-based appointments and performance-based contracts. Independent

Boards to oversee the entities without any political pressure or angling. Entities sustaining high losses should be handed over to private management with broader goal of privatization of these entities in the long run.

7.4 Long term (5-10 years)

7.4.2 Smart Grid Infrastructure and Modernization

Nationwide deployment of smart grids capable of integrating renewable energy sources and enabling demand side management with provision of real time data analytics is the future target. Focus should also be made on investment in battery storage and grid automation.

7.4.3 Privatization of Distribution System Entities

Phased approach to be pursued with induction of private management in high loss-making entities to build their performance and make them marketable for future privatization. Strict contract performance for service delivery and efficiency by those private managers.

7.4.4 Energy Cadre – Human Capital Development

Build a professional cadre of energy experts, managers, engineers and commercial specialists etc. for long term sectoral resilience. Establish a Power Sector Leadership Program in coordination with academia and international institutions for steady induction of capable professionals.

7.4.5 Transition to Competitive Electricity Market

Eventually, the transition to fully competitive, multi buyers and sellers' market should be the strategic target wherein government has minimal role. This will require strengthening the financial solvency of all market participants; expanding market access for renewable/distributed generation; and, integrating regional power trade through cross border projects including CASA-1000.

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