POWER STRUGGLES & FAULT LINES: Pakistan's Power Market

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This paper seeks to challenge common misconceptions about the so-called "villains" blamed for Pakistan's high electricity tariffs. By analyzing governmental decisions, we aim to shed light on the real causes of the energy sector's current crisis and foster a more informed debate that could lead to viable solutions.

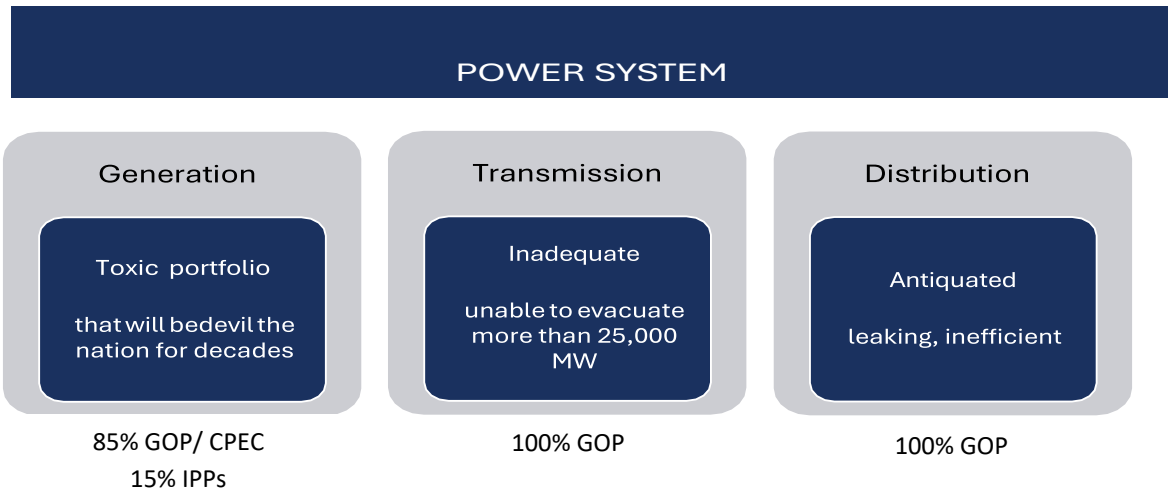
Exploding Circular Debt

One of the most pressing issues in Pakistan's power sector is the escalating circular debt (CD), a financial burden that threatens to destabilize the economy. Circular debt refers to the cash shortfall within the power supply chain, where payment delays to generators lead to further payment issues down the line, affecting oil and gas suppliers. While it is often seen as a symptom rather than a cause, CD has grown from near zero in 2013 - following a government payment of Rs 480 billion - to a staggering Rs 1,954 billion as of the latest data from NEPRA, with projections reaching Rs 2,112 billion for FY23-24.

Of the estimated PKR 2 trillion in **capacity payments, 45% are tied to government-owned plants, 40% to CPEC projects, and only 15% to private Independent Power Producers (IPPs).** This situation is exacerbated by multiple factors, including high tariffs due to an expensive energy mix, inefficiencies in DISCOs leading to significant losses, poor bill recovery rates, and inadequate infrastructure in transmission and distribution.

How Have We Reached This Precarious Stage?

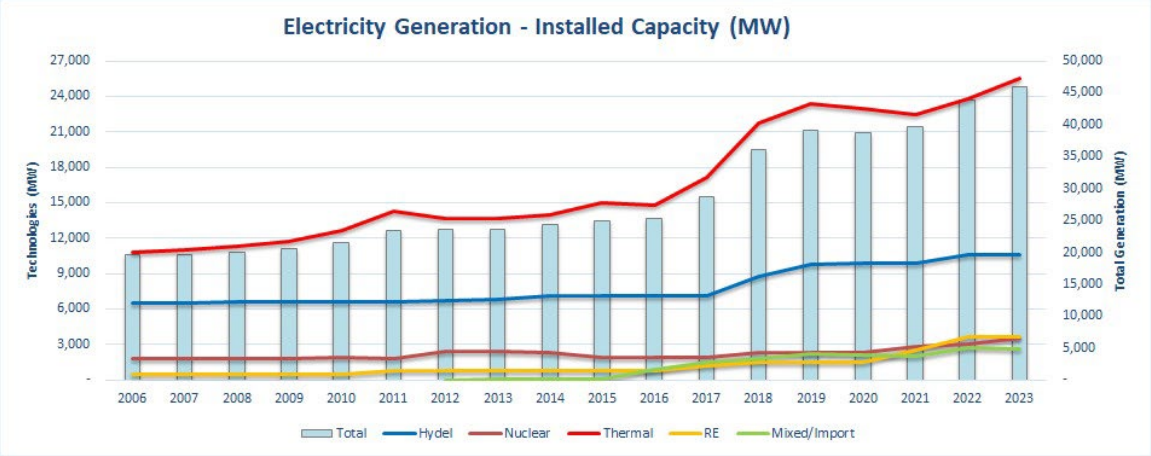
It will be useful to have to look at the main components of a power system and analyze how each component has contributed towards the elements that have resulted in high electricity tariffs.



GENERATION

The accompanying graph below shows the total installed capacity yearly, with the red line highlighting the significant contribution of thermal energy - a key fatal issue in overall planning.

In 10 year period, from 2006 to 2016, only 5,000 MW were added to the grid, but from 2016 to 2023, over 20,000 MW (mostly based on imported fuels) were added in undue haste.



This raises critical questions: Why has capacity far exceeded our actual demand? And why were the necessary transmission lines not constructed to effectively utilize this increased power generation?

Absence of Coherent Planning

Over the past 20 years, there has been a glaring absence of 5-year, or 10-year power generation and transmission plans grounded in demand and supply projections tied to economic conditions. As a result, **Pakistan now faces an excess of installed capacity, a key driver of the soaring capacity payments**.

Absence of Coherent Planning

leading to Fatal Flaws

- Unrealistic tariffs (un-indexed)
- Heavy reliance on imported fuels
- Policy Deviations

Heavy Reliance on Thermal Plants Fueled by Imports

The Power Ministry and political leadership have shown a strong preference for thermal generation, despite its reliance on costly imported fuels. **Four RLNG pl**ants - Haveli Bahadur Shah, Balloki, Bhikki, and Trimmu - **totaling 4,900 MW, were constructed hastily**. A similar trend exists with **imported coal** projects, where four plants of 1,320 MW each (**totaling 5,280 MW**) were planned, with three now operational and the Jamshoro plant in its early construction stages.

Shortsighted Tariff Decisions (*looking only at Reference tariffs*)

Electricity consumers are billed based on generation costs determined by NEPRA's indexed tariffs. However, new plants are often approved based on unindexed Reference Tariffs, reflecting a shortsighted approach by politicians. National power policies must anticipate inevitable currency devaluation and reduce reliance on imported fuels to avoid skyrocketing tariffs due to rupee depreciation.

Even Thar coal projects have their costs linked to the US dollar, leading to significant cost escalations over time. The graph below shows the real electricity cost over a 30-year PPA term. For example, NEPRA's Tariff Determination sets the initial cost at Rs. 9/kWh for Year 1, with a notional decrease to Rs. 6/kWh in Year 30. However, once indexed, the true cost could soar to Rs. 219/kWh by the 30th year—like estimates for RLNG plants.

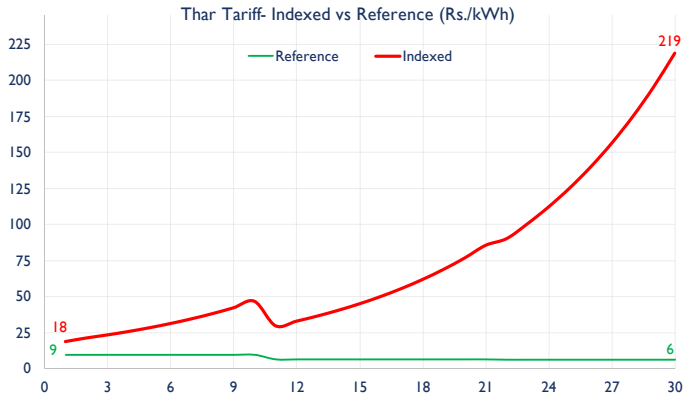
Currently, electricity costs from these plants average around PKR 54/kWh, a burden that has become unbearable for the public. Can Pakistan’s domestic and industrial consumers sustain operations when tariffs potentially exceed PKR 100 to 200/kWh?

ELECTRICITY TARIFFS

Reference vs. Indexed

The reference tariffs are on a reducing scale, but the duly indexed tariffs, increase to **astronomical levels** over time and are undoubtably unaffordable

Hope of cheap power remains a distant dream



Reference Tariff represents Tariff determination by NEPRA for Engro PowerGen Thar dt. 13 Mar 2015 (Case No. NEPRA/TRF-301/EPTPL-2015), Indexed Tariff represents applicable indexations on the reference tariff as follow:

(i) FX (6.6%),

(ii) US CPI (1.5%),

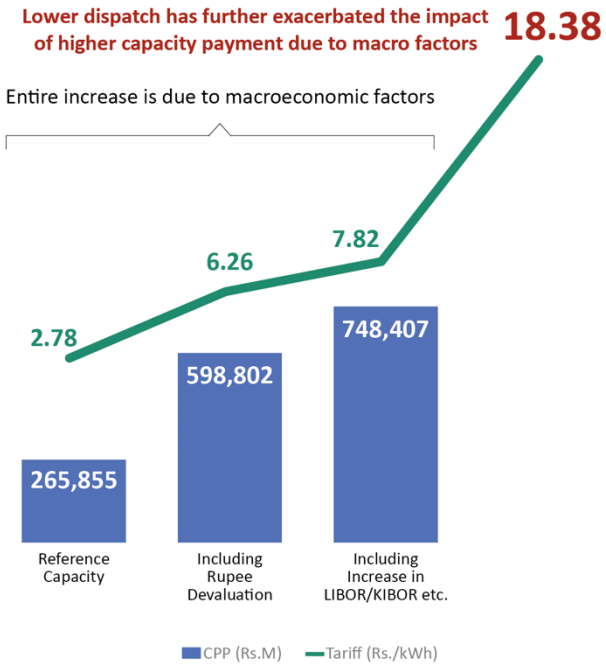
(iii) Pak CPI (8%) and

(iv) Fuel Prices (5.91%)

Capacity Payment increased primarily due to rupee devaluation, increase in LIBOR, KIBOR and lower dispatch

- The capacity payments to 2015 Power Policy plants including Imported coal, Thar coal and RLNG based plants with a cumulative installed capacity of 11,500MW

- Capacity payment of 11,500MW has jumped from originally determined NEPRA's reference of Rs. 265b to ~Rs. 748bn i.e. increase of Rs. 500bn due to adverse macro environment
  - Rupee devaluation as PKR went down from 97/USD to 278/USD
  - LIBOR increased from 0.45% to 5.5% per annum, and KIBOR also jumped increasing the debt servicing component

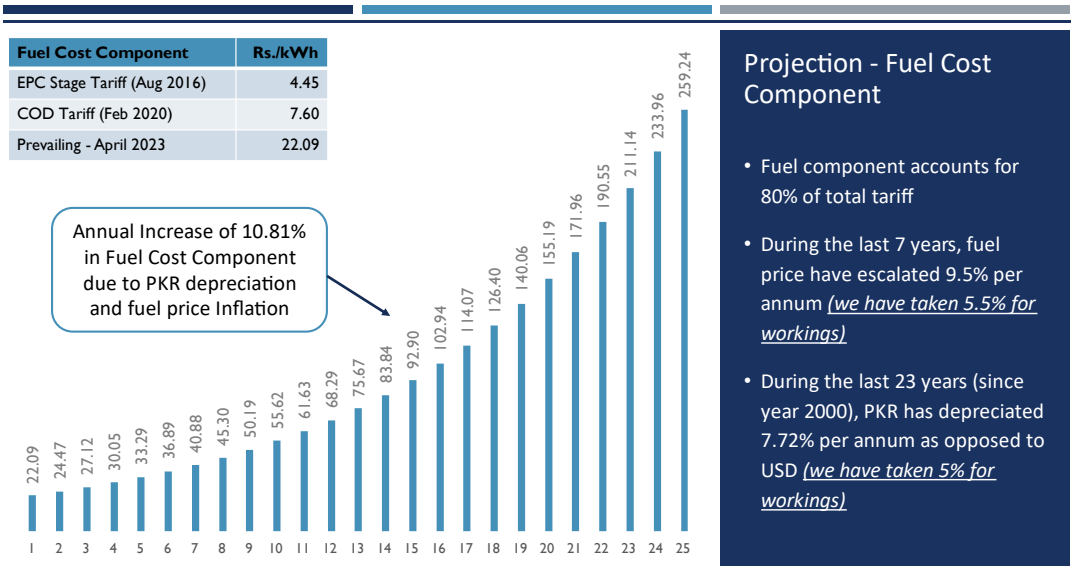


- Lower than anticipated dispatch considering average load factor of less than 45% compared to reference load of 85%

- Their average capacity tariff was less than Rs. 3/unit upon tariff determination in 2015-16,

however, now adds over Rs. 18/unit due to macro factors and lower dispatch as explained above

The table below shows the fuel cost projections. Can Pakistani consumers pay electricity tariffs in excess of PKR 200/kWh? This is what we have committed to by putting up 15,500 MW of imported fuel-based plants in recent years.



Policy Deviations

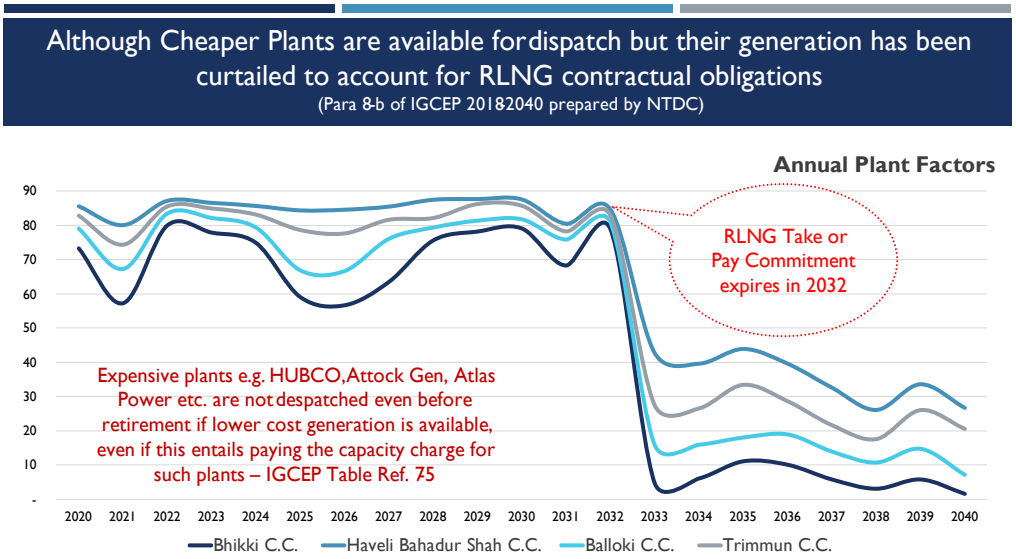
Thermal plants typically operate under standardized Power Purchase Agreements (PPAs), which include a "Merit Order" clause - meaning plants are only dispatched if they produce electricity at a lower cost than others in the system. However, RLNG plants have been structured differently, with the "Merit Order" clause replaced by a "Must Run" clause. This alteration is highly problematic, as it obligates power purchasers to pay both capacity and fuel costs based on 66% load, even if cheaper generation is available. This issue was brought to the attention of the PTI government and has likely been amended.

Low Capital Cost, High Fuel Cost

While the capital cost of Combined Cycle Gas Turbine (CCGT) plants is relatively low, their operating costs - especially for imported fuel - are extremely high. For instance, the Haveli Bahadur Shah CCGT plant, constructed at a cost of $854 million, consumes $279 million worth of RLNG annually - nearly one-third of its initial project cost each year.

It burns almost half of the project cost each year! Proving it is an infected part of the power portfolio which will become worse after indexation and drag the power sector down for years to come.

The NTDC IGECP report confirms that once the “Must” dispatch clause expires in 2032, these plants will be hardly used. See graph below taken from IGECP Report.



Transparency in Merit Order Utilization

In an open NEPRA hearing, I urged that NTDC should publish a true merit order utilization list, free from contractual constraints. This transparency would reveal that most RLNG and imported coal plants should never have been constructed, as their high electricity costs would place them low on the merit order, making them unlikely to be dispatched.

Forex Burden

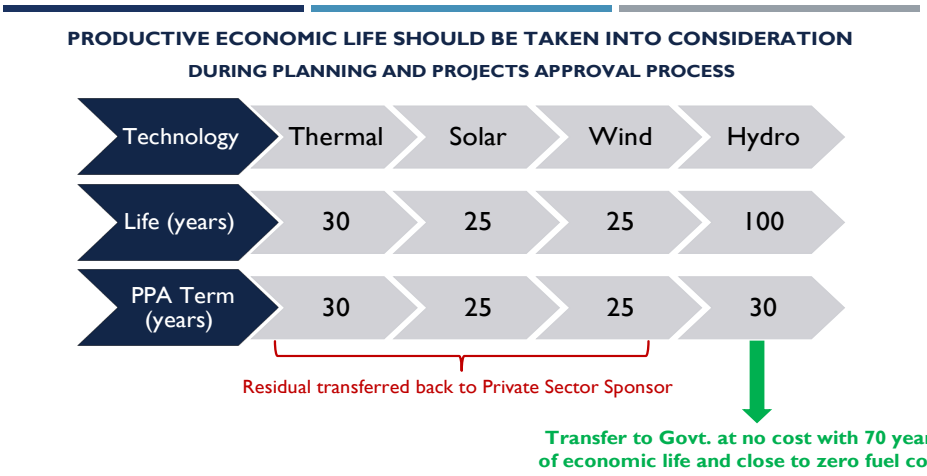
The four LNG plants and five coal plants impose a substantial forex burden of $3.64 billion annually to purchase the fuel required to operate them. This not only strains foreign exchange reserves but also undermines energy security. It's paradoxical that we are depleting our forex reserves to produce some of the most expensive electricity.

Hydropower & Renewables: Path to Energy Security

Pakistan has a hydropower potential of 60,000 MW, yet only about 9,387 MW has been developed by WAPDA in 72 years, with the private sector adding or developing another 5,000 MW in the past eight years. Hydropower development is complex, involving land acquisition, resettlement, environmental approvals, and various geological risks. Consequently, financing for these projects is challenging, as lenders prefer the simplicity and lower risk of thermal projects.

The "Thermal Mafia" and their political allies have stifled hydro project development. Over 14 private sector hydro projects have struggled for a decade and have now largely given up due to frustration, initial development costs, and the reluctance of international lenders to finance Pakistan's energy projects. We've missed a critical opportunity.
This intentional or inadvertent planning of future power shortages seems designed to justify adding more thermal capacity to meet anticipated load shedding and demand surges.

Wind and solar power, despite their intermittency, have continued to decrease in cost and should be integrated in large volumes to lower the overall cost of power. While solar peaks during the day and wind at night, both are somewhat seasonal. Hydropower, with its long life and low cost, complements renewables effectively, offering a sustainable path forward.



The Banning of Solar Projects and stalling private sector hydro's: A Policy Misstep

It's almost unthinkable that a country would ban solar projects, yet in 2015, Pakistan's government did just that. Through office order 4(08)2012 dated April 20, 2015, a moratorium was placed on the induction of new solar plants. This decision, along with stalling ongoing private sector hydropower projects, shocked industry experts. Many believe it was done to pave the way for RLNG thermal plants. Thermal plants can only be dispatched if they are economically viable, meaning they must produce cheaper electricity than other generation options. Solar and hydropower, being less expensive, were seen as a threat. Today, the nation is bearing the brunt of this misguided policy.

Capacity Payments: A Universal Burden

A common misconception is that capacity payments (CP) are exclusive to Independent Power Producers (IPPs). In reality, capacity payments are a feature of both private and public sector power plants.

Understanding the Tariff Structure

Capacity Purchase Price (CPP): This includes debt servicing, equity pay-back with returns, and fixed costs for operations, as well as plant insurance and mandatory repairs and maintenance. For public sector plants, equity pay-back typically ranges between 12-18%, depending on the lender providing debt financing. These fixed costs are particularly burdensome because they are paid regardless of whether the plant is operational, resulting in significant expenses for under-utilized capacity.

Energy Purchase Price (EPP): This is the variable cost of generation, encompassing fuel and other operating costs such as consumables and general maintenance.

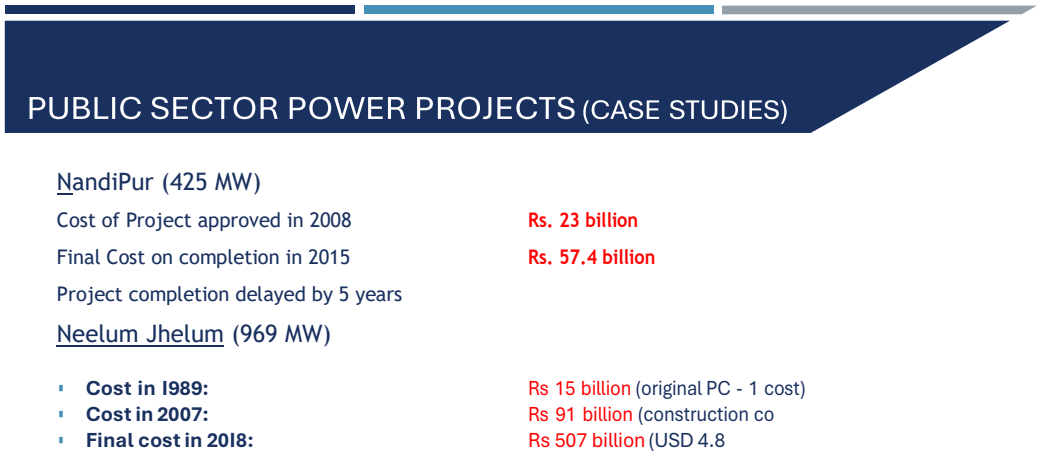
Public Versus Private Sector

PUBLIC VS. PRIVATE

	Private Independent Power Producers	Public Sector Power Projects
Time Overruns	In time construction as Risk of time -overruns with the Sponsors with no adjustment in tariff	Huge construction delays, resulting in hefty extra costs burden to national exchequer to complete the project
Cost Overruns	Tight budget controls as risk of cost -overruns with the Sponsors with no adjustment in tariff	Massive cost-overruns funded through PSDP or additional national loans
Capacity Payment	Yes – to retire loans and to fund fixed costs	Yes – Fixed costs, including loans, being borne by the various governmental departments e.g. loans handled by finance ministry, salaries by WAPDA or relevant implementing agency
Efficiency	Highly efficient plants with CCGT running at 60% efficiencies	Inefficient – Govt. GENCOs running at efficiencies as low as 20-25%
Performance LDs	110% of the tariff for any performance lag	No LDs mechanism for performance shortfalls
Funding	Privately funded through limited -recourse project finance, future cash flows of PPA being prime security in addition to the Project itself being mortgaged, with no recourse on public assets	Funded through combination of PSDP, sovereign loans (public debt), additional levy (e.g. surcharge on public), public sector assets being pledged and highly expensive commercial loans etc.

Public sector power plants face no penalties for delays, cost overruns, or operational failures, unlike Independent Power Producers (IPPs), which are bound by strict Power Purchase Agreements (PPAs). If the same rules applied to public plants, they'd face bankruptcy. This lack of accountability led to a 1984 World Bank covenant preventing the government from building thermal plants, paving the way for IPPs.

Check the NTDC's Merit Order list any month: IPPs consistently produce cheaper electricity than government-owned GENCOs, defying public perception. The data speaks for itself.



TRANSMISSION:

Unavailability of Transmission Corridors for Evacuation of Power

Previous governments have primarily focused on power generation to address load shedding, neglecting the crucial aspect of transmission capacity. Despite having an installed power generation capacity of around 45,000 MW, our transmission lines can only handle about 25,000 MW.

Power Purchase Agreements (PPA) are only signed after NTDC or CPPA approves a grid connectivity study, meaning they have ample advance notice to plan transmission infrastructure. Yet, their performance has been inadequate. For example, the Patrind hydro project (145 MW) received its LOI in October 2005 and became operational in 2017. Despite a 10-year lead time, transmission lines were delayed by 224 days, resulting in $22.45 million in liquidated damages.

DISTRIBUTION:

Out of the 3 main components of power system (Generation, Transmission, Distribution), the largest damage caused to power sector is due to highly corrupt electricity Distribution network of Pakistan.

The ideal power electricity equation requires that the cost of producing electricity and revenue generated by its sale is at least in balance. It is calculated as follows:

Cost: Generation + Actual Transmission & Distribution Losses (including non-collection of bills)

Revenue: Bills collected + subsidy received.

Look at the following factual data in NEPRA Annual Report FY 23:

Units generated in 2022-2023	129 billion kWh
Units sold in 2022-2023	97 billion kWh (24.8% losses)
Payment collected from sale	90 billion (92.5% collection)
LOSS (before subsidy)	**PKR 396 billion**

Government Monopoly in the Power Sector:
The Government of Pakistan (GOP) controls 100% of the country's distribution and transmission systems, except for the Matari Line. It also owns 85% of power generation, with private Independent Power Producers (IPPs) contributing only 15%. Despite their limited role, IPPs are often scapegoated for the sector's problems.

In reality, the GOP retains control over all major decisions related to IPPs, from determining the need for new generation to setting tariffs and deciding on fuel types. IPPs are also restricted to selling electricity solely to the GOP. However, the real financial burden stems from inefficiencies in the state-owned transmission and distribution systems. Despite repeated calls for reform, no government has privatized these systems or shut down loss-making government generating companies (GENCOs).
GENCO Performance: given below is summary of GENCO's performance from NEPRA FY23 Report

- **GENCO-I:** Only one of four units provided power in FY 2022-23, with others drawing electricity from the National Grid without contributing.
- **GENCO-II:** Three of four steam turbines were out of operation, with the fourth underperforming.
- **GENCO-III:** Utilization was dismal, with average energy purchase prices from Muzaffargarh and Nandipur at Rs50.01/kWh.

- **GENCO-IV:** Has been non-operational for years.

These inefficiencies increase generation costs, burdening the power sector.

Implications of Anti-IPP Campaigns:
Vilifying private investment in infrastructure deflects attention from the root causes of high electricity tariffs, making new investments more expensive. The 1994 Power Policy attracted global companies and was praised by the World Bank, but backlash against IPPs in the late 1990s led to disinvestment, halting new projects and causing load shedding to hurt the economy. The 2002 Power Policy's concession allowing returns in USD for equity in PKR has led to exorbitant tariffs.

Frequent renegotiations of sovereign contracts and the blocking of Chinese state-owned companies' dividend repatriation have deterred further investment. These actions have not reduced tariffs but instead raised the country's risk profile, closing international capital markets to Pakistan's energy sector and driving up lending costs, ultimately making electricity more expensive.

We must accept the reality that in the global financial world we are not the market makers; we are price takers.

The factual situation is that **Transmission & Distribution** losses of PKR 396 billion are unsustainable. **High-Capacity Payments** are due to gov't over-optimistic demand forecasts, and an inadequate transmission system have led to underutilization of investments. **High Generation Costs is due to** reliance on imported energy makes Pakistan vulnerable to external price shocks, leading to unaffordable tariffs. State-owned plant inefficiencies further exacerbate the problem. All these missteps are due to atrocious decisions on part of government.

The focus on blaming IPPs ignores deeper issues within state-owned enterprises, which continue to suffer from inefficiencies, losses, and corruption, causing significant harm to the economic and social fabric of the country.