

Essay

Pakistan's power sector at crossroads

1 Introduction

a Overview of Pakistan's power sector

3 Multivariate challenges which keep power sector at crossroads

a Over population with resources constraints and over reliance on imported fuel-

b Inefficient and outdated power infrastructure which ensure transmission and distribution losses.

c Independent Power Producers (IPPs) contracts and capacity payments

d Seasonal variations fluctuating consumption patterns-

e Widening gap between installed capacity and power generation stimulate power outages.

Over-billing, hiked electricity prices and additional deduction culminating downward trends in recoveries and subsidies

Increased circular debt deteriorates Pakistan's financial capacity.

h Lack of technological innovations for energy transitions.

b Poor regulatory framework undermines investor confidence due to policy inconsistency.

4 Opportunities for reforms to mitigate the challenges of Power sector.

a Diversification of energy resources by shifting to renewables and utilizing green energy resources.

b Maintenance of power infrastructure and curbing theft and line losses through centre-provinces collaboration

- c Renegotiating IPPs contracts and phased shutdown of underperforming IPPs.
- d ~~Encouraging~~ Incentivizing solarisation of household, commercial and industrial consumption; and revising net-meter policy.
- e Upgrading grids, integrating smart meters and ~~automation~~ introducing technological innovation in power sector.
- f Enhancing power finance through Public-Private partnership
- g Privatization of loss making Distribution companies (DISCOs).
- h Reviving energy contracts with energy rich countries to diversify the energy resources.

5 Conclusion

In 21st century, power sector is crucial and principle driver for economic and social change of any country. Pakistan, with meagre energy resources, has always entangled in the mesh of power crisis, which significantly hindered Pakistan's socio-economic progress trajectory. Power outages, over billing and electricity ~~price~~ ^{price} hike have deteriorated Pakistan's capacities to pave a way for sustainable growth. Declining per capita consumption in the region paints a grim picture. Meanwhile, Pakistan's power sector encompasses thermal, solar, hydel, wind and nuclear energy resources. However, over-reliance on thermal resources has triggered deficit in national exchequer. Therefore, Pakistan's power sector is at crossroads due to multivariate challenges such as circular debt, aging infrastructure, over-reliance on imported fuel, lack of innovation for energy transition and IPPs contracts; however, ~~the~~ shifting to renewables, upgrading grids, and

Proper maintenance of power infrastructure can mitigate the existing challenges of power sector.

Since the inception, Pakistan has remained as energy-stressed state. Nascent Pakistan state had over-relied on coal-fired power plants to meet the electricity needs. Due to financial constraints, Pakistan failed to diversify its energy resources. In 1960s, Pakistan had started exploring new energy avenues to meet increasing electricity demands and invested in hydroelectric power and built several reservoirs. In late 1970s and 1980s, Pakistan has switched to furnace oil to generate electricity for household, commercial and industrial consumption. ~~The~~ Meanwhile, in the decade of 1990, world has embraced journey on trade liberalization and privatization to stimulate economic activities. Pakistan has signed electricity power contract with Independent Power Producers to invest, ~~and~~ generate ~~power~~ and sell electricity, to the national grid. These

impacted affordability. ~~the~~ agreements have triggered circular debt and impacted affordability due to excessive hike in electricity rates. In recent years, Pakistan is poised to shift to renewables and integrate latest technology to expedite the energy transition ~~from~~ ~~set~~ to alternative and Renewable Energy (ARE). Over time, Pakistan has expanded its energy resources to overcome the power crisis.

As world is moving towards renewable and indigenous energy resources, Pakistan has employed multiple energy policies to transform its power sector by utilizing untapped green energy resources. Yet there are multiple obstructions that ~~has~~ hinder Pakistan's self-reliance. ~~energy security~~ power availability. First and foremost, over population with resources constraints have exacerbated the power crisis. In Pakistan, population rises by 2.55% by every

year which needs electricity for ~~house~~ household and commercial consumption. Menage energy resources and financial crunch leads to power outages and load shedding. Rapid population growth is driving demand for more power supply, especially youth bulge require uninterrupted power supply for education, skill development and digital connectivity. Second, Pakistan has always over-relied on imported ~~fuel~~ oil to generate electricity. Imported fuel bills cost huge burden on Pakistan's dwindling foreign exchange reserves and disturbs financial stability. According to Pakistan Bureau of statistics (PBS), ~~energy~~ energy imports make largest chunk of ~~total~~ ^{overall} imports bill and cost approximately \$28 billions. Imported fuel includes crude oil, ~~and~~ LNG and coal are significantly fuel for power generation. Hence, it poses a serious challenge to ~~gener~~ power generation capacity of Pakistan. Furthermore, Inefficient and aging

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Pakistan has ^{entered} ~~undergone~~ ~~with~~ into contractual obligation with private entities - Independent power producers - to invest, generate and sell electricity to national grid. with the ~~pass~~ passage of time, IPPs have been crucial in expanding power generation in Pakistan. However, under the "Take-or-Pay" contract obligates government for fixed capacity payment, even if

no electricity is supplied or produced. Additionally, these contracts obligate Pakistan to pay capacity payment in dollars which has amplified the financial constraints. Due to IPPs, Pakistan faces the circular debt. Take-or-pay are often ~~criticized~~ criticized for lacking competitive bidding and poor negotiation. According to Budget statement of FY 2025-26, IPPs account third largest debt obligation after defense and ~~total~~ foreign debt. So these agreements have failed to steer Pakistan to power self-sufficiency. Additionally, seasonal variation plays a pervasive role to impact power sector. In Pakistan, weather-driven fluctuating consumption patterns have caused imbalances between demand and supply. In summer, consumers demand surge due to increase use of cooling appliance; However, in winter ~~lower~~ demand is lower. According to NEPRA, ~~the~~ electricity demand in Pakistan remained at 12,000 Mega Watt (MW).

but in ^{the} summer, demand rises to approximately 30,000 (MW). which creates a ~~diff~~ significant difference of nearly 18,000 (MW). Therefore, such power demand fluctuation has stimulated policy inconsistencies and often result in power outages, particularly, in summer season.

Since Pakistan has expanded its installed capacity, yet decline in power generation stimulate power outages. This fact is met with irony ^{that} despite installed capacity of 45,000 MW, Pakistan only produces 33% of total installed capacity.

The under utilization of power plants are due to poor regulatory frameworks. It is evident that widening gap between ~~an~~ installed capacity and electricity generation will further the power crisis in Pakistan. Seasonal variations and transmission incapacibilities are two ~~was~~ major reasons behind the gap. Hence it demonstrates institutional

inabilities to allocate the additional electricity for better utilization.

Moreover, overbilling, hiked electricity prices and ~~additi~~ imposing additional deductions are major drivers for culminating downward trends in revenue recoveries. Mal administration

~~often~~ leads to overbilling and consumer often fails to pay bill on prescribed dates. Additional ~~tariffs~~ tariffs, ~~and~~

surcharged taxes and fuel adjustment charges have risen the electricity

prices, making it more difficult for DISCOs to collect ~~left~~ remaining bills.

According to PIDE, Lahore Electricity supply company has been investigated by FIA for overbilling consumers

by 830 million units. Therefore, it result in lower collection and always

compel government to redirect and allocate financial resources for the

subsidy of power sector.

Increasing circular debt is most

~~per~~ pertinent issue. It potentially

deteriorates Pakistan's fiscal capacity and

entangled it into a vicious cycle of loans. circular debt is most pressing issue and jeopardize Pakistan financial stability. When DISCOs fail to recover bills to pay generation companies (GENCOs), who in return can not pay their fuel suppliers. It is complex situation where chain of unpaid debts accumulate between ~~different~~ different government entities.

According to Economic ~~See~~ Survey report of 2024-25, Pakistan's power sector circular debt stands at 2.66 trillion. The continuous increase in debt can drag Pakistan towards insolvency.

In addition, lack of integration of technological innovations in power infrastructure have pushed Pakistan to stuck with outdated power infrastructure. Previously installed power plants are not cost-effective and generate electricity at expensive input price. ~~Lack~~ Lack of Human resources and ~~financial~~ monetary restraints

have hampered Pakistan's trajectory towards energy transitions plans. It is ~~imp~~ ~~imp~~ imperative for Pakistan to induct technology in ^{power} upgrading infrastructure, particularly, in ^{transmission} lines and power grids. Pakistan's energy transition from non-renewables to renewables energy resources can be materialize through inducting latest technology into power sector. Therefore, it is arduous for Pakistan to be self-reliant without a comprehensive energy transition plans.

Lastly, poor regulatory framework of power sector induces losses and undermines investor ~~can~~ confidence. Without sovereign guarantees, foreign or domestic investors are ~~exte~~ ~~exte~~ extremely ~~re~~ reluctant and uncertain to invest in power sector.

Many times government has unveiled several incentives, tax exemptions and full repatriation of profits but investors don't intend with loss making power entities. Policy inconsistency

and absence of legal frameworks have fueled ~~disseminate~~ pessimism among fellow investors. Therefore, lack of investments in power sector aggravate the existing ~~at~~ crisis as power entities unable to accumulate investments for ~~up~~ upgrading infrastructure.

Despite several ~~at~~ challenges faced by Pakistan, there are many opportunities for reforms to mitigate/address these problems of Power sector. Pakistan possesses huge potential to make resilient and reliable power infrastructure ~~in~~ to navigate ~~future~~ through these challenges in future.

First and foremost, Pakistan must explore new avenue for energy resources. Many countries are ~~shifting~~ shifting towards the cheap energy resources as conventional resources become expensive and gradually decreasing in the wake of current geopolitical landscape. Pakistan must diversify its energy resources by transforming power plants to

and utilize untapped green energy resources. For example, solar, wind and Biomass. These are sustainable and ~~reliable~~ cost-effective resources and Pakistan must harness the maximum potential of green energy resources to reduce dependency on imported fuel. It also helps Pakistan to ~~establish~~ ^{create} indigenous ^{and green} resources.

Hence ~~and~~ ^{hence} it creates opportunity to overcome the power crisis.

Second, Maintenance of power infrastructure to control curb the transmission and distribution losses is pre-requisite for uninterrupted power availability and save electricity. Theft and line losses ~~are~~ ^{all} ~~major~~ ^{breed} compound problems, which ~~stem~~ ^{breed} further issue like unscheduled power interruptions and raise the cost of electricity for regular-paying consumers. A unified centre-province collaboration is essential to curb theft through joint action task force. whereas stringent punitive measures must be introduced for electricity by amending existing

laws. Meanwhile, existing laws must be enforced through robust inspection mechanism.

Third, all existing IPPs contracts must be re-negotiated and government must encourage a competitive bidding process to award IPPs ~~and~~ agreements to desired companies. Renegotiating will produce tangible results, if the issue of capacity payment is resolved on priority cause. Moreover, the government must emphasize to alter the very nature of IPPs contract ^{from} "Take-or-pay" to "Take-and-pay". This move will terminate government's obligation to pay extra amount for unutilized power.

Additionally, a phased shutdown of underperforming IPPs is imp. critical to reduce burden on national exchequer, ^{create fiscal space} and redirect resources in the public welfare.

Moreover, the world is undergoing a transformative shift toward solar

energy. It ~~creates~~ ^{generates} cheap electricity ^{with} ~~and~~ minimum maintenance expenses and zero carbon foot-prints. Pakistan has embarked on journey to switch ~~and~~ household, commercial and industrial consumption to solar energy. Government has initiated various incentives for rooftop solar such as, net-metering policy, ~~and which aims~~ imposing minimum tax on solar panels.

Besides upgrading grids, and integrating smart meters, Pakistan ~~must~~ must take concrete steps to introduce latest technological innovation in power sector. These technologies will help ~~the~~ power entities to curb line-losses, theft and develop cost-effective power infrastructure. These measures will improve efficiency and reliability of power sector. ~~However,~~ ^{Meanwhile,} it reduces operational cost, and load ~~mis~~ mismanagement. Therefore, Pakistan must employ these policies to upgrade and alleviate the power sector.

Public-Private ~~part~~ partnership is potential avenue to enhance power financing. PPP investment can be utilized to phasing out fossil fuel, accelerating energy transition from non-renewables to renewables and ~~updr~~ advancing power infrastructure. Government is poised to accumulate maximum investments under green financing. ~~That~~ This partnership can resolve longstanding issue of circular debt and capacity payment. Hence this financing method can steer Pakistan to power secure nation. Furthermore, ~~Private~~ Pakistan is ~~read~~ ready to undertake bold ~~measures~~ measures like privatization of loss-making distribution companies (DISCOs) and generational companies (GENCOs). ~~Huge financial losses~~ ~~have incurred~~ several power power entities have incurred huge financial loss. According to NEPRA report, power sector has posted approximately

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Rs 281 billion losses. Recurring losses in power sector have forced government to take strong measure against loss-making power entities and pave the way for privatization.

Lastly, Pakistan is eager to revive energy contracts with energy rich countries to diversify the energy resources. Pakistan has entered in ~~co~~ contracts with Central Asian Republics (CARs) for a ~~gas~~ major natural pipeline project. TAPI stands for Turkmenistan, Afghanistan, Pakistan and India.

New opportunities of direct electricity transmission have been considered by Pakistan under central Asia-South Asia (CASA-1000). Hence Pakistan

is trying to explore new energy ventures globally, in order to provide cheapest electricity at domestic level.

To sum up, power sector is pivotal agent of changing socio-economic landscape of any nation. Almost every civilized ~~con~~ country aim to

explore new energy opportunities to serve and provide uninterrupted power at reasonable rates. Pakistan's power sector is at crossroads due to longstanding mismanagement, poor regulatory framework and lack of technological innovation in power sector. However, Pakistan has adopted comprehensive and broad-based reforms to ~~fac~~ facilitate the power sector and end consumer. Incentizing solarization, renegotiating IPPs contracts and reviving energy contracts with Central Asian Republics (CARs) can pave the way for reforms. Hence these measures will help Pakistan to achieve power self-sufficiency.