

IMBALANCE OF ENERGY MIX IN PAKISTAN AND ITS CONSEQUENCES

Thesis Statement:

Pakistan's nation wide outage is a symptom of deeper malaise. It has been hit by the worst energy crisis in its history, which much to its dismay is self wrought due to the lack of planning and management. The crisis, lead by the imbalance of energy mix is both slowing the pace of economic activity and causing public unrest with prolonged outages of electricity and gas shortages. This imbalance has been severely aggravated due to Russia-Ukraine war starting in April 2022 which has led to skyrocketing of energy prices across the globe. Pakistan urgently needs to make some strategic decisions and change the national energy mix and save the country from catastrophic consequences.

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OUTLINE

- (a) Introduction
- (b) Extent of imbalance of energy mix in Pakistan:
- (i) Source of electricity generation in Pakistan have remained predominately conventional.
 - (ii) Gaps in demand and supply of energy facing acute shortages due to mismanagement.
- (c) Cause of imbalance of energy mix in Pakistan:
- (i) Circular debt of energy companies which has eaten precious revenue of the government.
 - (ii) Incompetence of rulers to address the issue speaks volume about the neglect.
 - (iii) Below capacity utilization of power plants led to high payments to independent power plants.
 - (iv) Lack of development of hydropower with the passage of time.
 - v) Institutional and organizational insufficiency rooted in the energy sector.

(d) Consequences of imbalance of energy mix in Pakistan:

- (i) Retarding growth of economy which could plunge the country in deep recession.
- (ii) Damage to the industry in terms of its output and sagging sales.
- (iii) Decline in the production of industrial output of fertilizers, textiles and pesticides.
- (iv) Social effects such as unemployment, poverty, electricity theft and crime.
- (v) Reduced efficiency of national energy grid due to issues in production, transmission and distribution networks.
- (vi) Expensive imported fossil fuels used for power generation, increases the cost of electricity generation.

(e) How to fix the imbalance of energy mix in Pakistan:

- (i) Fixing the energy mix will be possible by achieving the objective of lower import bill.
- (ii) Reliance on indigenous production of electricity through solar parks.
- (iii) Use of alternative biofuel to supplant methane as a chief house fuel.
- (iv) Less dependence on electricity generation via IPPs and Thermal power plants.

(F) Conclusion -

③ Introduction

Pakistan is the only nuclear power in the Muslim world which suffers from 8 to 10 hours of power outages in a day. Not only strange, but weird too for a nuclear power that is incapable to generate more than 2-4 percent of its annual demand from nuclear energy. Countries like France, Germany and UK make a substantial use of nuclear power to generate their energy since they have diversified their energy generation portfolio. Estimates show that 140 million Pakistanis either have no access to the power grid or suffer over 10 hours of load-shedding daily. Pakistanis who do not have access to electricity are often poorer than those on the grid which essentially means that energy is empowerment. This gross imbalance of energy mix is mainly caused by the gap created between the demand and supply. There are various reasons for the less production of electricity in Pakistan which include lack of new power projects, rising burden of circular debt, power theft and non-payment of bills. Besides, people usually do not try to save electricity. The situation clearly shows that gross imbalance of where and how energy is produced and consumed in Pakistan. On top of it, energy generation has become a costly affair due to recurrent fuel price adjustment and fluctuation in the price of dollar versus rupee. Close analysis shows that energy crisis in Pakistan is purely self created based on profligacy and there is

nobody else to blame for it. Propping up claims that there were no energy crisis in the gas sector has miserably taken the country to the brink of a huge catastrophe. The imbalance of energy mix in the national grid of Pakistan is double-edged: in summer we are short of electricity and in winter we are short of gas. No doubt, Pakistan is in midst of one of the worst energy crisis in its history, which is both slowing the pace of economic activity and causing public unrest with prolonged outages of electricity and gas. Pakistan urgently needs to make some strategic decisions and change the national energy mix and save the country from catastrophic consequences.

In 2023, Pakistan generated 14,839 gigawatt-hrs of electricity - half of what Indonesia generated - despite having a comparable population size. And the real problem lies with how the power is distributed - its obsolete and inefficient. This creates an imbalance of energy mix in national grid of Pakistan. Electrical consumption per resident

5) In Pakistan is about a quarter of the global average. And just 74.1% of its population is connected to the power grid compared to the global average of 90%. This unequal power distribution has created the financial crisis of almost 10 billion \$.

Pakistan needs an annual economic growth of more than 6 percent of GDP to create conducive environment for its population of 230 million which remains a distant dream in the wake of energy crisis. The current situation of the energy sector isn't helpful for the nascent economy given the fact that adequate amount of electricity is primarily a way towards the industrial growth, transportation, infrastructural development, sustainable development, education, agricultural advancement, research and development and almost all aspects of a developed and advanced economy. Adequate energy distribution facilitates the provision of jobs and hence better living conditions. But unfortunately, for the past couple of years Pakistan finds itself stuck in the web of electricity short-falls and energy shortages. In Pakistan, the electricity and power generation is one of the most imminent challenges in the way of economic uplift and industrial advancement. Hydro, oil and natural gas are three primary energy resources of Pakistan used to fulfil the energy needs of economy. Sustainable energy generation, curtailment of transmission, and line losses and energy pricing are unaddressed areas

Circular debt has become a recurrent problem that produces an imbalance of energy mix in the national grid of Pakistan's energy sector.

Circular debt is an intercorporation debt that exists between the fuel suppliers, energy producers, distribution companies and end consumers.

Although the power distribution is linear in a sense that every person in the chain owes something to someone, it becomes circular in a way that it keeps circulation for the purpose of recovery of outstanding dues. Circular debt arises due to the failure of government to pay capacity payments for installed capacity

to independent power producers for making energy. The other part of the circular debt is the energy payments charged to distribution companies for energy supplies - which the distribution companies often fail to recover due to electricity theft, line losses, distribution losses etc.

Some experts blame many of Pakistan's energy problems on the 'circular debt' which mainly arises because of the poor recovery of receivables by the distribution companies. According to the estimates of energy experts, for every 100 units of electricity provided by a distribution company, it gets paid for 30. Of the remaining 70 units, nearly 40 are pilfered and the bills for remaining 30 go to long-term receivables. Shambolic distribution networks, line losses and collusion of corrupt

⑤ Utility executives contributes to the dismal state of recovery by distribution companies. Failure to recover distribution costs and energy price is a glaring example of corrupt practices and gross negligence of power and distribution companies.

Successive governments in Pakistan have been trying to put out the energy crisis fire with oil. In 2013, the government came up with two policy decisions: pay half a trillion rupees to energy companies and announce a new power policy. Both steps were aimed at resolving problem and bringing change to Pakistan's energy mix to optimize the average cost of electricity generation. But, surprisingly, both these steps backfired, without yielding any positive results. In 2014, Pakistan's government paid Rs 260 billion in cash to independent power producers to clear outstanding debt. After clearing the debt, it was expected that they would be able to generate 1,700 MW in additional electricity attenuating the shortfall that currently exceeds 6,000 MW but what to do with the capacity building of these plants to meet the ever growing demand?

To increase the capacity building of independent power plants, government of Pakistan in 2019, introduced the Alternative and Renewable energy policy to assist and promote the development of renewable energy policy resources in the country. The government has considered a seven-point agenda to provide a supportive environment for

renewable power projects and increase the share of green energy capacity to 20 pc by 2025 and 30 pc by 2030 by attracting private capital. The Seven-point agenda include: first, increase the energy supply through utilization of renewable energy resources, second - provide low interest financing to increase the purchase of efficient appliances, third - reduction in subsidies, fourth - modernizing tariffs, so that power gets cheaper when its plentiful and expensive when the system is under stress. Fifth - providing incentives to customers to install solar panels, as was mentioned by world bank. Sixth - promoting resilience during power blackouts by pairing solar panels with batteries. Seventh - Shelve the plans to electrify transportation. Pakistan's citizens deserve a grid that caters to the need of 21st century.

Pakistan has a total installed power generation capacity of 43,775 MW as on June, 2023. Which includes 26,683 MW thermal, 10,635 MW hydroelectric, 1,838 MW wind, 530 MW solar, 369 MW baggase and 3,620 MW nuclear. The installed capacity of Karachi Energy supply company is not a part of national grid. But the actual power generation hovers around 15,000 MW, partly because of outdated and inefficient power plants and partly because of a cash crunch, which often does not permit power plants to operate at optimum capacity because of the inability to buy the required furnace oil.

(Ahmed faruqi - Ending Pakistan
recurring electricity crisis - a seven
point action plan - 2023)

⑥ Demand-supply gap in energy sector is dependent on several fluctuating factors which makes the energy expensive or lead to shortages. Every generation is highly dependent on prices of fuel since more than 61% of generation of energy in the country comes from thermal power. The output of hydel power plants is dependant on water availability in the dams - decrease in generation during the winter season; energy production can fall to as low as 2,500 MW when water levels drops drastically. And, as has already been indicated, IPPs output is limited by fluctuating price of thermal fuel. This means a vicious cycle out of which Pakistan see no way out. The inflow of the dams cannot be increased, as it depends on natural causes like rain and glacier melting, nor can the output of IPPs be increased due to lack of liquid cash. In this way, the negative correlation has taken almost a permanent position in the energy sector of the country.

Thermal generation is used as a backup power source in most of the developed countries of the world. Pakistan has over-relied on costly thermal power generation. Its energy woes have been exacerbated by excessive reliance on thermal power plants, mainly using furnace oil. Two factors contributed to the emergence of this situation: a change in the lenders from public to private sector, and Pakistan's failure to complete a hydroelectric project in recent decades. The last

mega dam, Tarbela, was completed in mid-70s and no other dam has been constructed since.

It needs to be kept in mind that hydro-power projects require more time to execute and complete as compared to thermal or nuclear power, costs along with the integration with the national grid. After the signing of Indus water treaty with India, Pakistan was required to complete construction of one mega-size hydroelectricity plant per decade to ensure year-round availability of low-cost electricity and irrigation water. But no steps in this regard were taken. The politicians kept bickering and buried their heads in the sand waiting for the storm of energy crisis to dissipate, or at least till the end of their political tenure. The worst sufferer in the situation is the country and its public, whose woes sees no end.

Load shedding of electricity have adversely affected the operations of the business and manufacturers. Pakistan can not expect to uplift its people out of poverty and reduce the gap between haves and have nots, if it does not eliminate power distribution imbalance in the energy sector. The imbalance of energy in Pakistan has cost the national economy dearly, not only the loss to GDP in terms of missing energy due to the demand-supply gap ~~can~~ but also the loss to industrial and commercial activities due to load-shedding and flight of capital from the country. The continuous shortage of energy has also adversely affected the capacity utilization in some

① Key industries whose production has fallen to nearly 50%. Worst affected is the fertilizer industry, which faces interruptions to its gas supply and forced closures. This has also eroded the country's foreign exchange reserves and effectively entailed the payment of million of dollars in subsidies, being the difference between the costs of locally produced and imported goods.

Pakistan's per capita availability of energy is lowest among the developing countries of South Asia except Afghanistan. Energy available to a person is the barometre of the output he can generate and contribute to economy. Low economic growth due to energy crisis also results in increasing poverty. Currently, around 25% of our population is living beyond poverty line and this ratio is increasing day by day. Unemployment rate is hovering around 6.5% and several households are affected by unemployment as business have been forced to shut down due to energy shortages. About 40% of Pakistani households have some form of UPS as a backup for selected appliances during power cuts and shortages. Backup power sources are a stopgap solution, both wasteful and inefficient. (CNBCC report, 2)

The recent war between Russia and Ukraine has skyrocketed energy prices globally. Pakistan is spending more than 5 billion \$ on its RLNG import and 10 billion \$ on fuel imports. Analyses of causes and effects will help in finding the remedies to

resolve the energy crisis. The question is that: can the government tackle the energy crisis? Doing so in the long run maybe possible, but in the immediate term, consumers must begin using more energy efficient products in order to mitigate the issue. A more immediate solution to the problem is the conservation and efficient use of energy, as about 67% of domestic energy consumption stems from inefficient appliances such as lights and fans. Although the government is adding capacity to Grid in order to remedy the persistent power shortages, these measures will take time to come into effect. To overcome its electricity shortages, Pakistan has to come up with policies for the short-, medium- and long-term - policies must be prepared and implemented to ensure that circular debt does not rebuild. This requires stopping theft, and improving recovery. A hike in electricity tariff could improve cash flow at distribution companies, but opponents argue that a higher tariff itself provides an incentive to pilfer electricity. They say the government should ensure an uninterrupted supply of electricity at affordable cost. (Sabina Babar - fixing the energy mix - 2023)

Pakistan needs to overhaul its existing thermal power generation sector to improve the efficiency of plants and cut down the cost of generation. As a medium-term policy, all power plants operating in the public sector need to be refurbished to improve efficiency and cut down the cost of generation. However, the focus should be on achieving the highest possible output from hydro power, where the cost of generation is still

8) Rs 2:00 unit, compared to the bulk power purchase tariff of US 0.70 \$ until being paid to IPPs, mostly being run on furnace oil. Simultaneously, efforts should be made to switch power plants from furnace oil to coal. Gas should be avoided to begin with, power plants could use imported coal, but ultimately they will need to use an indigenous source. In this endeavour, Lakhta power plant near Karachi, which has been closed for sometime, must be reactivated as soon as possible. It uses coal produced at nearby mines.

There is an opportunity in every crisis, and this certainly applies to Pakistan's energy sector. Notwithstanding the significant challenges of security and political stability - which are a prerequisite for any foreign direct investment - a large market and an enthusiastic government could attract investors, local and foreign. Renewable energy is important to overcome the shortfall and construction of small hydro-electric power station on the run of river. Short Term solution to overcome line losses, improving power generating capacity, medium Tenure solution of installation of renewable energy and long tenure solutions of replacing thermal power fuels, stand-alone power projects and also to dismantle the national grid to overcome these crisis are also given. Some disparities have been reported in the implementation of solar energy policy by the large businesses in which they have told that government has not facilitated the impor

of solar energy generation equipment. Moreover, a significant challenge to remain to save foreign exchange reserves by exploiting indigenous sources of solar panel production and batteries.

(Khalid Hamdani, Foreign Direct Investment in Pakistan, 2019)

Pakistan's economic growth is constrained by bottlenecks in the energy sector which threatens its future survival. Pakistan needs to grow at a consistent rate of 7% annually so that it can industrialize itself and create more jobs for its unemployed youth. Its energy requirements are increasing day by day due to a burgeoning population of more than 230 million; and its demand for energy in the coming decades will rise substantially. Energy demands on this scale will put increasing pressure on energy resources and distribution networks. This is unsustainable for economic growth without a fundamental transformation of energy system. Dependency on the dominant fossil energy resources, especially oil is risky in the wake of astronomical rise in

④ energy prices. Energy security is essential because the kind of disruption seen in the demand-supply gap is a potential threat to economic well-being of country. Exploration and exploitation of the more indigenous - than coal project - and renewable resources is key to have energy security and a healthy energy mix. There have been efforts by successive governments to bring in transformation changes in the power system by exploring alternate sources of energy in the country. The exploration and alternate and renewable sources of energy will also help to ensure energy security and sustainability. Pakistan is actively following the policy of a shift from conventional sources of energy to the utilization of indigenous renewable and environment friendly clean energy generation resources. There is a significant transformation and the contribution of alternate and renewable sources of energy is increasing. There is a need to overhaul the energy production system which reduces energy theft, line losses and circular debt. Without significant energy reforms, the revenue production from one side of generation will be used to balance the losses of other side of generation.

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