

Q NO: 03

1- INTRODUCTION

The challenges within Pakistan's power sector have led to the exorbitantly high electricity costs, profoundly impacting the nation's economy, social well-being, and political stability. This sombre image of the power sector is multi-faceted. Problems like inadequate infrastructure, heavy dependence on fossil fuels, high level electricity theft, circular debt, political influence in the energy sector, inefficient investment, dwindling water resources, rapid population growth and urbanization, capacity payments, and lack of diversity have resulted into multiple effects like frequent power outages (load shedding), expensive oil imports, reduced revenue for power companies, financial instability in the energy sector, inefficient management, limited capacity expansion, reduced hydropower generation, increased pressure on the energy grid, slowed economic activity, and vulnerability to supply disruptions respectively. Thus, it necessitates certain remedial measures like invigoration of infrastructure, usage of domestic resources and renewable resources, transmission and distribution loss reduction measures, investment in small off-grid power stations, renegotiating with ZPPs, and also turning towards the water resource which has huge potential to reduce power sector challenges.

2 - Problems in the Power Sector and ~~the~~ Their Implications

(a) Inadequate Infrastructure: The ubiquitous concerns of inadequate infrastructure has stunted the ~~cap~~ capability to provide electricity to remote areas. KPK and Balochistan are most affected provinces by this malaise of either devastated infrastructure or no infrastructure at all. Electrification rate in Balochistan province is only 26%, as compared to national rate of 72%. KPK on the other hand, has tremendous potential to generate more than 30,000 MW of electricity, but it only generate about 6,000 MW.

This lagour of infrastructure not only affects the industrial growth, but also affects the commoners. This may lead to the disruptions in operations and prevent companies from reaching their production targets. This, in turn, results into economic loss and also invite anger among the citizens.

(b) Heavy dependence on Fossil Fuel: Pakistan's power sector's need for fossil fuel leads to almost 23% of imports only for this sector. LNG, RLNG and crude oil are the ones which overburden the national exchequer to more \$18Bn of imports. This is the reason why Pakistan has fallen into the winter debt.

Heavy imports not only burden the exchequer, but also increases the rate of electricity units which in turn increases the cost of production. All this furthers the inflation in the

country. A unit generated by Hydropower is almost 7-8 times less expensive as it is Rs.7/unit and that of generated through imported oil is Rs.55/unit. That is a huge difference and has tremendous repercussion for a country like Pakistan.

① High level Electricity Theft: When we talk about theft it not only include theft, but also losses through Transmission & Distribution (T&D), metering losses and other relevant losses. As per the report of National Electricity Power Regulatory Authority (NEPRA), power sector incurs almost 20% or to be exact 18.5% losses due to above mentioned reasons. The losses incurred by PESCO is almost 37.47%; TESCO, 9.33%; IESCO, 8.11%; GESCO, 9.07%; LESCO, 11.52%; MEPCO, 14.84%; FESCO, 9.11%; HESCO, 33%; SEPCO, 35.62%; and QESCO, 28.07%. With overall average of 18.47% loss. It means if Electricity generated by GESCOs is 130,158 ~~GW~~ GWh, then losses are about 22,298 GWh. ~~GW~~

Such homogenous losses are unsustainable for any country and even leads to less recovery and can only be recovered by taxing the populace, which not only reduces the production and shutting down of industries, but also impairs poor's ability to pay even for basic commodities. This also results in the vicious cycle of circular debt now stands above \$2650 Bn, which was about \$1600 Bn in 2018, as per the data provided Institute of Policy Studies.

(d) Capacity Payments & Lack of Diversification

Capacity Payment is a payment to the IPPs no matter what. Pakistan has to pay to the IPPs even if the demand is much less than that of provision by the IPPs, and that too in dollar terms. Such agreements with IPPs started in 1994 and since then has strained the exchequer. Whereas, lack of diversification has always been a problem for the Pakistan's power sector. With huge potential of solar energy all around the country, wind energy in Thinpri, Thatta and Chasro, and other resources like ~~Water~~ Water have never been utilized by the power generation. This leads to the prevalence of dependence on imported fossil fuels.

Capacity payment deplete the ~~foreign~~ reserves of Pakistan and further add more to the circular debt. Also IPPs have been laundering the government of Pakistan. As per the report presented in National Assembly, IPPs in 2021 have over budgeted the exchequer by about Rs. 38.5Bn more than their due share. Such dubious acts ~~also~~ ^{Law} also in the future affects the economic stability. Dawn reports that in the next fiscal year, Pakistan has to make a payment of more than Rs. 2 Trillion to IPPs which is far more than ~~the~~ the budget for PSDP, defense, education and health. In the exact same manner, lack of diversification is also impacting the reserve due to the imported fuels.

(e) Other Power Sector Problems: There are also many other recurring and devastating concerns regarding the power sector are: circular debt, dwindling investment in energy sector, political influence in the energy sector, rapid population growth, and urbanization. ~~These~~ These issues has tremendously affected power sector. Ensuing influence of political actors in this sector has been the talk of the town, as almost Rs. ~~3.5~~ 3.5 Bn have been recovered which were used by political workers and representatives, even MNAs. Increase in circular debt also results in the less investment in power sector, which, in turn, has not delivered the demands of increasing population and urbanization.

Above mentioned issues affect the financial stability, inefficient management and corruptions limited capacity to the expansion of this sector, and also increased pressure on the energy grids. These concerns are a genuine concern which debilitate the economy, social and political stability in the country.

3 - Feasible Recommendation for the Power Sector:

A holistic and comprehensive reform plan is needed to tackle the inefficiencies in the power sector. ~~Strongly with~~ Transparency, accountability, and sound governance structures must be integrated into the reform process to ensure effective decision-making and implementation.

Following are the suggested recommendations:

(a) Reinvigorating the Infrastructure: ~~Loss/Save~~

By installing advanced meters and leveraging technology, Advanced Metering Infrastructure (AMI) enables more accurate measurement of electricity consumption, detects theft or tampering, and facilitates real-time data monitoring. Empirical evidence suggests that implementing AMI in feeders can lead to a significant reduction in losses.

(b) Emp. Usage of Renewable Energy:

Renewable energy can play a significant role in reducing both technical and commercial losses in the power sector, when used and managed via digitization of the system. Integrating renewable energy in the power sector can improve losses reduction, system efficiency, and minimum commercial losses. Embracing renewable energy as a sustainable and reliable source of power contributes to more resilient and efficient power sector.

(c) Transmission Loss Reduction Measures:

When strategically located near demand centres, renewable energy projects, along with other projects can help reduce transmission losses by minimizing the distance over which electricity has to be transported. This can result in lower technical losses during long-distance transmission.

(d) Small off-grids or micro-grids development:
 Micro-grids can involve public-private partnerships, international funding organizations, development banks, and also government incentives to attract investments and support the financial sustainability of micro-grid projects. These projects are most beneficial for the provinces Balochistan and KPK. As these projects don't need any alignment with main stations or grids; these can work on their own. The best micro-grid is the one based on renewable energy. One of the most brilliant example is INVELOX microgrid. These are more efficient than traditional wind turbines which may align with the policy framework set forth by the 'Alternative and Renewable Energy Policy of 2019.

(e) Dams and Run of the River based Hydro-power Projects:

Pakistan is one of the most fortunate country ~~which~~ that can provide supply more than power demands only through Hydro-power projects. As per the statement by the chairman of ~~NERA~~ NEPRA, Pakistan can generate 60,000 MW of electricity only through water based projects, which almost 20,000 MW more than our current demand. If utilized and developed, it would not only provide cheaper electricity and reduce burden on the Forex reserves, but can also be exported to neighbouring countries. Such is the potential of Hydro-power projects.

Along with above mentioned collective

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encouragement of Public-Private Partnership, collaboration with International organizations, Governments and Industry Experts, long-term Planning and sustainability, and policy and regulatory frameworks to support the adoption of digitization technologies, can also be looked into as well.

Cause - Effect Analysis of the Problems in Power Sector

S.NO:	CAUSES	EFFECTS
1-	Inadequate Infrastructure	Frequent Power outages, Load shedding
2-	Heavy Dependence on Fossil Fuels	Expensive oil Imports.
3-	High level Electricity Theft	Reduced Recovery for Power Companies.
4-	Capacity Payments	Slowed Economic Activity.
5-	Lack of Diversification	vulnerability to supply Disruptions.
6-	Rapid Population Growth / Urbanization	Increased Pressure on the Energy Grids
7-	Political Influence on Energy Sector	Inefficiency Management.
8-	Inefficient Investment in Energy sector.	Limited Capacity Expansion.

Now Cause - Effect Analysis of Recommendations for Power Sector.

S.NO:	CAUSES	EFFECTS
1-	Reinvigoration of Infrastructure	End to Power Disruptions
2-	Use of R. Energy	Less Import Bill
3-	T&D Loss Prevention	High Recovery of Bills
4-	Micro-grid Development	less Dependence on main grid
5-	Hydro-power Projects	More Provision of power.

4- Conclusion:

Overcoming the challenges in Pakistan's power sector and driving progress towards demands a comprehensive and strategic approach. The power sector can chart a path towards positive transformation by addressing issues such as electricity charges, shortages, technical and commercial losses, governance limited capacity expansion, hydropower projects, rapid population, etc. With brief emphasis on recommendations and with a resolute commitment to these recommendations and a concerted effort to surmount the challenges, Pakistan's power sector can advance a future characterized by a more reliable, efficient, and sustainability electricity supply, ultimately benefitting economy, social and political life of the country.

Q NO: 06

1- INTRODUCTION

"Pakistan is absolutely ready to contribute towards Chinese President Xi Jinping's vision of the shared destiny of progress and prosperity," said the former Prime Minister of Pakistan on the occasion of celebration of 10th anniversary of CPEC. CPEC is one of the integrative economically and strategically corridor in the South Asia. Developments of which have had some bumpy rides, but added much to the advancement of Pakistan's economy and investment. Investments in energy sector, civil nuclear reactor, hydroelectric power projects, wind power plants, transmission line system, motorways and highways, ML-1, seaport, special economic zones (SEZs), agriculture, development of Gwadar, etc, are some to mention. At the same time delays leading to cost escalation, disruptions in projects planning, legal battles and protests, security challenges uncertainty and diplomatic failures are among most failures incurred by the CPEC over the past decade, and these failures are casualties of security challenges, political instability, land acquisition and compensation issues, bureaucratic red tapism, local opposition are tips of the icebergs.

2 - Successes of CPEC Project

CPEC has been one of the most important project in the history of Pakistan. It has brought tremendous investments, developments and has increased Pakistan's overall image as CPEC is BRI's flagship project. Following are the successes brought up by the CPEC:

(a) Investments in Energy Projects:

Energy projects were the need of the hour when the flagship projects was introduced. Pakistan, a country which never faced load shedding before 1990, became impaired by the crisis of loading shedding lately. CPEC helped Pakistan to address to this vicious concerns, and through CPEC, \$36 Bn were ^{to be} invested for energy project of production of 18,000 MW. This investment is highest ever in energy sectors. Following are the energy projects:

(i) Coal-based Power Projects:

Pakistan is a country having one of the biggest reserves of coal in Thar. CPEC helped to establish and operationalise four coal-based projects, each of 320 MW and each costing almost \$1.02 Bn. Other than that, Block-1 and Block-2 energy projects in Thar of 1320 MW and 660 MW respective. Both blocks have been operationalised and accumulating to the generational capacity. Block-1 and Block-2 are also excavating

coal by open bid coal mining. \$7 Bn have been invested for: Underground coal gasification (100,000 barrel diesel), to reduce carbon emission and production of green energy, and three other rental projects based on coal in Karachi, Hub, and Sahiwal, each producing 1320 MW electricity. Overall generation through CPEC is 5,800 MW. Though the target is 10,000 MW.

(ii) Civil Nuclear Reactor:

Other than coal, civil nuclear reactors also are being utilized for electricity generation. Kamup projects in Karachi (K₂ and K₃) are operationalised, producing 1100 MW each, and each costing \$6 Bn. Another civil nuclear reactor based power project is Chashma (CS) project, which will produce 1100 MW and investment will be more than \$10 Bn. But this project is not yet in progress.

(iii) Hydro electric Power Projects:

Hydro electric power projects are most sustainable and cheaper ways of electricity production. Hydro-power projects under CPEC are Karot Project which will produce 720 MW at the cost of \$1.72 Bn; Suki Kumbi, 884 MW at the cost of \$2 Bn; Kohala project, 1124 MW at the cost of \$2.4 Bn; Atad Pattan project, 700 MW; Piri Mahal Project, 700 MW; and others. Most of the Hydel projects are installed in KP as KP need more electricity.

(iv) Wind Power Project and Matiari-Lahore T-L System:

After Hydel, wind is another potential renewable energy can be utilized for power generation. CPEC has helped Pakistan to generate 4500 MW wind power, along with 3000 MW is also envisaged by solar power projects. Whereas, Matiari-Lahore transmission line system has started operation along between Lahore and Matiari, with 900 km between them. It will transmit ± 600 Bipole HVDC and 4000 MW electricity evacuation.

(b) Investment in Transportation

The investment in transportation is yet another success of CPEC. It is ~~used~~ usually said that China's transport-based investment is a way to reach Arabian Ocean and it would be a small route for her. But transporting routes are also important infrastructure for Pakistan as it already needed investment. Following are the projects either operationalised or are ~~under~~ in the pipeline.

(i) Motorway and Highways.

The projects for motorways and highways were also envisaged under CPEC project. And these can be divided into four alignments: Northern, Eastern, Southern, and Western alignment. Northern alignment is almost an expressway between Khujdarab and Burehan. Eastern alignment starts from Burehan to Faisalabad - Multan - Sukkur - Hyderabad - Karachi -

- Rathodero - Gwadar. Southern alignment has both starting and ending points in Balochistan i.e from Gwadar - Basura. And lastly, Western alignment is a motorway starting from Burhan - Hakla (Islamabad) - Dera Ismail Khan - Quetta - Gwadar. These projects have reduced tremendous distance and transportation became very easy.

(ii) ML-1 (Main Line 1)

It is the largest and biggest ever railway project envisaged in the history of Pakistan. It is a double track signal free from Karachi - Lahore - Havelian - Peshawar. It would cost more than \$ 8Bn (\$6.8Bn initially) and creating jobs as most as 24,000. Once operationalised, will be clubbed with Uzbekistan from Tashkent - Peshawar Railway track and would usher transient trade and large transportation. It is said by the ministry of Railway, the work on this project will start soon.

(iii) Sea port

Gwadar seaport is the largest and the deepest seaport in Asia-Pacific. It is a key transportation point and is a back up port industry. It will have 120 berths, along with 3km trunk ahead in sea with oval shape. It would spread 22km east and 16km west ward.

© Special Economic Zones

Special economic zones would enhance Pakistan's industrial production and increase exports and bring investments. So far nine special economic zone would be developed. Among these SEZs are Allama Iqbal EZ which will be largest textile city in South Asia spread at area of 3217 acres. Pakashai EZ would be spread over 1000 acres and having 830 industrial plots. Guwadar EZ, Bustan EZ, Dhabiji EZ, Rahim-Yar Khan EZ, Murremand EZ, ATK EZ, and Makawandas EZ are the nine SEZs. Industries of textile, engineering, electrical and electronic, chemical and paints, food processing, automobiles, home appliances, silver, copper, gold, pharmaceutical, agriculture, and other. Much work is yet to be done. But even their plan to establish is a very big achievement.

② Agriculture and Development of Guwadar

Agriculture, lately, has been facing setbacks, so investment under is crucial for the increase in yield. CPEC has introduced modernization of irrigation techniques, seed development, hybrid seeds and investment in livestock. CPEC envisages the production of agriculture of \$100bn from Pakistan, which she would be import to fulfill her demand. On the other hand, master plan 2020 was approved, that will develop coast, sea port, coastal tourism. It has achieved much and more is yet to achieve.

3- Failures of CPEC

There are some failures, along with successes which has misanthropeal the CPEC's credibility.

Security challenges, political instability, bureaucratic red tapism, and others have brought failure and to complete projects has become a sisyphian task.

Following are some failures of CPEC:

(a) Delays leading to Cost Escation:

Delays has brought fear among the leadership of China as certain challenges furthers the time line even further. Security challenge is one of the reasons why delays occur. Attack carried out at chinese workers at Dasu project and chinese teacher has cause much delay. Change in Political governmental party is yet other reasons. Such delays are evident from the ML-1 project which was to start in 2018, but delays in progress has escalated it cost from \$6.8Bn to above \$8Bn. Coronavirus was one of the other reasons for the delay.

(b) Legal Battles and Protests.

Still for all economic and commercial projects within and outside the national borders, and protests are yet other challenges and constant failure of the authorities to resolve protest and reservations. People of Balochistan are rising up in protest across the province, threatening a stumbling country, upsetting dreams of Chinese, of a transnational corridor project. ~~Legal~~ Land acquisition and cooperations are among

concerns leading to battle legally and protests. Such concerns due to inadequate compensation for the land and a decline in the financial situations. The land acquisition process of western alignment under CPEC was slow due to financial problem. Even financial committees were established to look into the problem and also briefed the parliament.

③ Difficulties in Project Design

Several projects within CPEC have faced difficulties in projects design for various reasons. Such challenges range from technical issues to environmental concerns. Diamer-Bhusha dam project has faced challenges related to its design due to its massive and complex engineering requirements. Seismic considerations, reservoir management, and the resettlement of local communities were needed to be accounted for. Like need for advanced mining techniques, environmental safeguards, and ensuring better power generation from Thar's lignite coal were yet another challenges for Thar coal Project. Gwadar port, M-9, orange line metro train, and others projects faced certain design concerns, and resulted into delays.

④ Loans Related Concerns:

There were/are also financial concerns of CPEC related to the terms of loans acquired for infrastructure projects, their impact on Pakistan's debt sustainability, and the potential for over reliance on Chinese financing. For example, the construction

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of Gwadar Port and related projects involved substantial Chinese loans, leading to debates over their repayment and the risk of debt dependency. There are also concerns to the feasibility and profitability of certain ventures, like power plants and economic zones.

4- Conclusion

The CPEC has witnessed both successes and failures over the past decade. While it has brought significant infrastructure developments, investments, and economic opportunities to Pakistan, it has also faced delays, cost escalations, security threats, protests, and other concerns. The success of the CPEC and its failure only depends on how such concerns are being addressed, only then will it ensure the benefits coming along the completion of the CPEC projects.

Cause - Effect Analysis of Failures of CPEL Projects

CAUSES	EFFECTS
Security Challenges	Delays Leading to Cost Escalation
Political Instability	Disruptions in project planning
Land Acquisition & Compensation Issues	Legal Battles & Protests & Reservations
Bureaucratic Red Tape	Project Delays
Funding Gaps	Slow Progress
Local Oppositions	Protests
Projects Designs Difficulties	Technical & Environment Concerns.
Loans Related Concerns	Debt Sustainability.