

CPEC's Power Dilemmas and the Case for a Just Transition



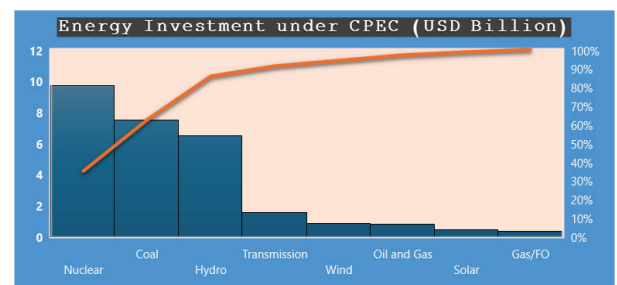
Picture courtesy of CPEC Secretariat
884MW Suki Kinari Hydropower Project, Khyber Pakhtunkhwa

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The China-Pakistan Economic Corridor (CPEC) has long been hailed as a transformative engine for Pakistan's economic development. As a flagship project under China's Belt and Road Initiative, CPEC was designed to tackle long-standing challenges in energy supply and infrastructure, with a view to catalyzing growth across the country. Central to CPEC's portfolio is a diverse mix of power generation and transport projects intended to boost capacity, modernize the grid, and stimulate industrial development.

Among the many projects initiated under CPEC, energy infrastructure has received considerable attention. Rapid construction of coal-fired power plants, along with investments in renewables and transmission networks, provided an immediate remedy to chronic power shortages. However, these efforts have also introduced new economic and operational challenges. In particular, imported coal power plants—financed through capacity payment arrangements—have become a double-edged sword.

While they helped end years of debilitating power outages, they also locked Pakistan into significant fixed costs, even as many of these plants operate far below their full capacity. This article examines the economic implications of these challenges and outlines policy recommendations to steer Pakistan toward a just energy transition that is both sustainable and equitable.



Source: Ministry of Planning, Development and Special Initiatives

CPEC has mobilized billions of dollars into Pakistan's energy sector, focusing on rapid capacity expansion to meet an urgent demand for electricity. Among the projects initiated, coal-fired power plants have been prominent. These plants, built with the expertise and financing of Chinese companies, were designed to deliver large amounts of base-load power quickly. Projects like the Sahiwal and Port Qasim coal plants, with capacities exceeding 1,320 MW each, exemplify the drive to eliminate long-standing power deficits.

Alongside coal projects, CPEC has also financed nuclear, hydro and renewable energy initiatives, such as solar parks and wind farms, and improved the transmission network. The strategy was straightforward: solve the immediate crisis by ensuring a steady power supply while laying the foundation for long-term economic development. In the short run, these projects did achieve their goal—load shedding was significantly reduced, industrial productivity improved, and overall confidence in Pakistan's economic prospects grew.

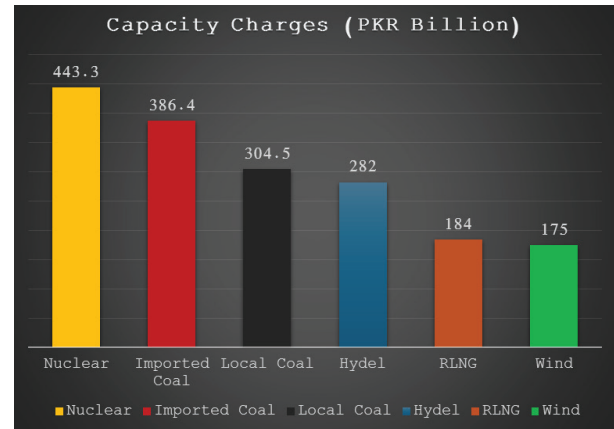
Yet, the rapid expansion of capacity was not without drawbacks. Many of the coal plants were built with a view toward future demand, but economic slowdowns and miscalculations in demand growth have left these plants underutilized. This overcapacity, coupled with rigid financial arrangements, has strained Pakistan's energy finances and raised important questions about the long-term sustainability of the country's energy mix.

CHALLENGES WITH IMPORTED COAL POWER PLANTS

Capacity Payments and Financial Burdens

A central challenge facing Pakistan's energy sector today is the system of capacity payments tied to many of the imported coal power plants. These payments are fixed charges that the government must pay to power plant operators irrespective of how much electricity the plants actually generate. The purpose is to cover the plants' capital costs and ensure a reliable supply; however, this arrangement has a significant downside. When power plants are underutilized, Pakistan ends up paying for generation capacity that it does not use, leading to a heavy financial burden on the national budget.

These fixed payments have become a source of fiscal strain, as they contribute to rising debts and force the government to subsidize electricity tariffs. The cost of maintaining these capacity payments can exceed the entire defense budget, and they are not easily reduced even if the plants are rarely in operation. In effect, the country is locked into paying for idle capacity, which diverts resources away from other critical areas and contributes to a growing circular debt in the power sector.



Source: State of Industry Report 2024, NEPRA

Underutilization: Causes and Consequences

The underutilization of coal power plants stems from several factors. First, the demand for electricity did not grow as quickly as projected when these plants were being contracted. Economic slowdowns and unforeseen recessions meant that the anticipated load never materialized, resulting in excess capacity once the plants came online. Second, grid constraints and transmission bottlenecks have prevented some plants from operating at full capacity, limiting their output despite being available for dispatch. Finally, existing contracts often favor keeping these plants online at minimal loads, simply to avoid penalties and maintain contractual commitments, even when cheaper or cleaner alternatives exist.

This combination of overcapacity and fixed capacity payments creates a scenario where Pakistan is effectively paying for assets that are not being fully utilized. The economic implications are significant: higher electricity tariffs for consumers, increased subsidies from the government, and mounting national debt. The excess capacity, rather than being a buffer against shortages, has become an economic liability that constrains the nation's fiscal space and hampers long-term investment in more efficient and sustainable energy sources.

Policy Recommendations for a Just Energy Transition in the CPEC Context

Given the structural inefficiencies and financial burdens in Pakistan's power sector, a well-managed transition toward clean energy is imperative. A just energy transition should focus on early retirement of costly and inefficient fossil fuel-based plants, leveraging sector coupling to optimize renewable energy integration, and aligning China-Pakistan Economic Corridor (CPEC) investments with sustainable energy solutions. The following policy measures can guide Pakistan's transition toward a financially and environmentally viable energy future.

Firstly, Pakistan must facilitate the early retirement of fossil fuel plants through Just Energy Transition Partnerships (JETPs) and the Energy Transition Mechanism (ETM) to secure financing for the phased decommissioning and repurposing of high-cost imported coal plants. These financing mechanisms, supported by international climate funds and multilateral institutions, can be leveraged to retire inefficient plants while repurposing their infrastructure for renewable energy generation or industrial applications. Imported coal plants, in particular, should be evaluated for conversion into solar or wind-powered hybrid stations, flexible peaking plants, or industrial steam production facilities. To ensure financial sustainability, the government should negotiate with Chinese investors to restructure CPEC power sector investments, aligning future projects with renewable energy goals.

Secondly, Pakistan should expand sector coupling approaches to maximize renewable energy utilization and reduce curtailment losses. A major challenge in renewable energy integration is the wastage of surplus generation due to grid constraints. To overcome this, wind and solar projects must be directly linked to Special Economic Zones (SEZs) under CPEC, ensuring a stable demand for variable energy supply. Industrial clusters can be powered through dedicated renewable energy microgrids, reducing their reliance on grid-based fossil-fuel generation. Additionally, Power-to-Gas (PtG) projects, particularly green hydrogen production from excess wind power, should be explored as a means of storing renewable energy and creating an exportable commodity. Investments in grid-scale energy storage solutions, such as pumped hydro and advanced battery storage, will also help balance fluctuations in renewable energy generation and stabilize the power sector.

Thirdly, Pakistan must reform Power Purchase Agreements (PPAs) to reduce capacity payments and improve financial sustainability while ensuring a win-win situation for all stakeholders. The rigid structure of take-or-pay contracts has led to significant financial liabilities in the form of fixed capacity payments for underutilized power plants. To address this, Pakistan should transition to take-and-pay models, where payments are linked to actual consumption rather than guaranteed capacity. Performance-based tariff structures should also be introduced, incentivizing industries to increase electricity usage by offering declining tariffs for higher consumption. While renegotiating PPAs, the sanctity of contracts must be preserved to maintain investor confidence, ensuring that modifications do not lead to legal disputes or a negative investment climate. A collaborative approach should be adopted, where concessions from power producers are matched by policy incentives, such as extended debt repayment terms or refinancing options, creating a mutually beneficial framework for the government, investors, and consumers.

Fourthly, Pakistan must modernize its transmission and distribution infrastructure to integrate renewable energy efficiently. The existing grid is inflexible and outdated, limiting the ability to accommodate intermittent renewable energy sources. To overcome these constraints, high-voltage direct current (HVDC) transmission corridors should be developed, connecting Sindh's wind and solar zones with Punjab's industrial hubs. Smart grid technologies, such as real-time demand response systems, smart metering, and AI-based load forecasting, should also be deployed to improve grid flexibility and reduce technical losses. Expanding the grid interconnection between Pakistan and regional energy markets, such as China, Iran, and Central Asia, could further enhance energy security and facilitate cross-border electricity trade.

Fifthly, Pakistan must ensure that workers and communities affected by the transition away from fossil fuels are adequately supported. A Just Energy Transition Task Force should be established to oversee reskilling programs for coal-sector workers and create employment pathways in the renewable energy industry. Financial transition packages should be introduced for regions dependent on fossil fuel revenues, and targeted economic diversification strategies should be implemented in coal-producing areas. This could include investments in alternative industries such as critical minerals mining (lithium, rare earth elements) for renewable energy technologies, as well as renewable-powered manufacturing clusters in former coal-dependent regions.

Sixthly, Pakistan should institutionalize a Just Energy Transition Framework to ensure a long-term, stable policy environment. A national roadmap should be developed for coal phase-out and renewable integration, aligned with Pakistan's Nationally Determined Contributions (NDCs) under the Paris Agreement. Additionally, CPEC energy investments should be reoriented towards sustainable energy projects, ensuring that future Chinese-funded infrastructure aligns with Pakistan's renewable energy ambitions. A dedicated regulatory authority should be established to monitor the progress of the energy transition, ensure policy coherence across government agencies, and create a transparent mechanism for stakeholder engagement, including industry, labor unions, and civil society. By implementing these policy measures, Pakistan can achieve a just, sustainable, and economically viable energy transition, reducing its reliance on costly fossil fuel imports while leveraging CPEC for a green industrial transformation.

CONCLUSION

The China-Pakistan Economic Corridor (CPEC) has undeniably played a pivotal role in addressing Pakistan's energy crisis, expanding power generation capacity, and modernizing infrastructure. However, the economic and operational challenges associated with imported coal power plants—particularly the burden of capacity payments and underutilization—have highlighted the urgent need for a strategic shift. The current trajectory, if left unaddressed, risks exacerbating Pakistan's financial vulnerabilities, increasing electricity costs, and stifling investment in cleaner, more sustainable energy solutions.

A just energy transition offers a viable pathway to rectify these inefficiencies while ensuring economic stability and environmental sustainability. By prioritizing early retirement initiatives for high-cost fossil fuel plants, embracing sector coupling to maximize renewable energy integration, and reforming power purchase agreements without compromising contractual sanctity, Pakistan can realign its energy sector with long-term national interests. Additionally, modernizing the transmission network, supporting affected workers, and embedding a structured energy transition framework into policy decisions will enable Pakistan to harness CPEC investments for green growth.

The success of this transition depends on political will, institutional coordination, and international collaboration. Engaging with China and multilateral development partners to restructure energy investments under CPEC is crucial for ensuring that Pakistan's energy future is both affordable and sustainable. A well-managed transition will not only reduce fiscal pressure and electricity tariffs but also create new economic opportunities in renewable energy industries, positioning Pakistan as a key player in the global clean energy economy. With deliberate action and forward-looking policies, Pakistan can transform its energy landscape, making CPEC a true engine of sustainable development rather than a financial burden.

Dr. Khalid Waleed is a Research Fellow at the Sustainable Development Policy Institute (SDPI), Islamabad with over a decade of experience working on the Energy Sector. His areas of expertise include Energy Markets, Energy Poverty, Energy Transition and Sustainable Future Resources.



Picture courtesy of CPEC Secretariat

1320MW Sahiwal Coal-Pred Power Plant 1320MW Sahiwal Coal-Pred Power Plant