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NAVIGATING GEOPOLITICS: PAKISTAN'S ENERGY SOLUTIONS THROUGH CENTRAL ASIAN COLLABORATIONS

Syed Ehsan Ali*[1], Muhammad Shahab[2]

[1] *MPhil American Studies, Area Study Centre for Africa, North and South America (ASC), Quaid-I-Azam University (QAU), Islamabad, Federal Capital, Pakistan
[2]MPhil ASC, QAU, Islamabad, Pakistan

Corresponding Author: [1]*syedehsanali08@gmail.com

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ABSTRACT

The Central Asian states (CAS) - Kazakhstan, Uzbekistan, Turkmenistan, Kyrgyzstan, and Tajikistan - are rich in natural resources but face the challenge of not having direct access to open seas for exporting their goods. Despite not sharing a border with any of the CAS, Pakistan has sought to benefit from these natural resources through initiatives such as TAPI/TKPI and CASA-1000. However, these projects have faced difficulties due to passing through Afghanistan, which poses security challenges. Pakistan is also grappling with a significant energy and circular debt crisis, requiring a cost-effective energy source to meet its energy demands and address the circular debt. The objective of the paper is to identify potential ways to alleviate Pakistan's energy crisis through collaboration with the Central Asian states. The research methodology used is qualitative, applying thematic analysis to explore the energy potential of the CAS and the benefits of collaboration with them for Pakistan's energy challenges.

Keywords: Central Asian States, Pakistan energy crisis, China's BRI, landlocked countries, CPEC.

INTRODUCTION

Pakistan is at the crossroads of three significant regions: South Asia, Central Asia, and West Asia.[1] As a result, its location has strategic importance for major powers like the US and China. Despite this, Pakistan has not been able to fully utilize its geographic potential due to rivalry with India in the east, instability in Afghanistan, US sanctions on Iran, and the resource-rich, landlocked Central Asian nations. These factors, however, have massive potential to bridge energy requirements and uplift Pakistan's economy.

Central Asia also has the potential to bring economic boom to the region.[2] Many projects in Pakistan have been launched to connect with Central Asia but have not been completed for various reasons. The landlocked Central Asian nations need access to warm waters to export their resources. This could be possible either through Iran, which is hit by international sanctions, or through Afghanistan and into Pakistan to reach the sea. However, due to instability and security challenges in Afghanistan, this potential remains untapped. Central Asian nations share borders with Iran and Afghanistan in the south, and China in the southeast. Pakistan does not share direct borders with these nations; the shortest route which is 16km wide is through the Wakhan Corridor of Afghanistan to reach Tajikistan.[3] Another possible route is to connect the CPEC trade from Kashgar China to Central Asian nations either through the

[1] Mir Sher Baz Khetran. 2016. "Economic Connectivity: Pakistan, China, West Asia and Central Asia." *Quaterly Journal of the Institute of Strategic Studies Islamabad* 36 (04). Accessed June 5, 2024. https://issi.org.pk/economic-connectivity-pakistan-china-west-asia-and-central-asia/.

[2] Khetran, Economic Connectivity

[3] Umbreen Javaid, and Azhar Rashid. 2015. "Oil And Gas Potentials of Central Asian Republics and Relations With Pakistan." *South Asian Studies* 30 (1): 127. http://pu.edu.pk/images/journal/csas/PDF/9%20Umbreen%20javaid_30_1.pdf.

Qolma pass or through the Irkeshtam and Torugart passes, bypassing Afghanistan.

Considering the current geopolitical situation in the Middle East, sanctions on Iran will not be lifted anytime soon. Hence, Pakistan cannot import gas and oil from Iran or through Iran from Central Asia. After the US withdrawal from Afghanistan, security conditions have deteriorated, making improvement seem difficult. Therefore, the next viable option for Pakistan is to exploit the potential of China Pakistan Economic Corridor (CPEC) and connect it to Central Asia with China's help.

Pakistan's population is rapidly increasing, leading to higher energy demands.[4] There are several options to increase the energy supply, including importing from the Middle East, utilizing domestic resources, importing gas from Iran, or importing from Central Asia.

1. Pakistan is facing a major balance of payment crisis[5] due to low exports, minimal foreign direct investment, stagnant remittances, and imports exceeding exports. Import-driven energy will further exacerbate the issue.
2. While exploiting natural reserves is a viable option, it requires investment, political stability, and consistent policies. Currently, ongoing hydro, wind, and solar power projects are insufficient to meet the energy demand. As gas reserves are depleting and solar capacity is inadequate, local production is unable to keep up with the growing energy demands.
3. Although Iran holds natural gas reserves, Western sanctions prevent exports. It has the potential to meet Pakistan's increasing energy needs. However, challenges exist in trading due to international sanctions.[6]
4. Previous attempts to connect with Central Asia through Afghanistan have been hindered by instability and security challenges. An alternative solution involves connecting through China, as the CPEC links Kashgar in Xinjiang with Pakistan via the Karakoram Highway (KKH). Integration of Central Asian trade with CPEC with the support of the Chinese government is crucial.

Literature Review:

Central Asia consists of five former Russian republics that gained independence in the 1990s. These states are rich in natural resources such as oil, gas, coal, and water sources but lack sea access to export these resources. There is also significant potential for wind and solar power plants in the region. According to a report by the Organization for Security and Co-operation in Europe in 2022, Kazakhstan boasts the largest oil and coal reserves in Central Asia and also has good potential for harnessing solar and wind power. Uzbekistan and Turkmenistan possess abundant natural gas reserves and have promising opportunities for developing solar power as well. Tajikistan and Kyrgyzstan are blessed with large water resources and utilize them to meet power demands, with surplus electricity available for export to other states. The Central Asian states previously had a centralized power system called the Central Asian Power System (CAPS), which enabled them to meet their energy demands. Tajikistan and Kyrgyzstan would supply their surplus cheap energy during the summer season, when the flow of water was at its peak, to the other three states. Meanwhile, during winters when their energy demands peaked and the water flow receded, the hydrocarbon-rich Kazakhstan, Uzbekistan, and Turkmenistan would supply energy to Tajikistan and Kyrgyzstan. This system allowed for the close connection of electricity, fuel, and water consumption. Turkmenistan and Uzbekistan left the system in 2003 and 2009, resulting in the collapse of the CAPS.[7] The region heavily depends

[4] A. R. NAWAZ, & MAHMOOD, W. (2023, July 23). BEYOND THE BRINK: PAKISTAN'S POPULATION EXPLOSION. *Express Tribune*. https://tribune.com.pk/story/2427592/beyond-the-brink-pakistans-population-explosion

[5] Aadil Nakhoda, 2023. "Explaining Pakistan's Balance of Payments Crisis: A Comparative Analysis." *DAWN.COM*, April 19, 2023. https://www.dawn.com/news/1745350.

[6] Arab News Pakistan. 2024. "Pakistan Doubles Down on Completing Iran Gas Pipeline Despite Threat of Sanctions." *Arab News PK*, April 25, 2024. https://www.arabnews.pk/node/2499146/pakistan.

[7] Farkhod Aminjonov, 2016. "Security of the Central Asian Energy System Institutional Versus State Interests." *ResearchGate*, February. https://www.researchgate.net/publication/343193709_Security_of_the_Central_Asian_Ener

on mountain water to fulfill its arid landscape's water needs. Mountain areas receive the highest precipitation in the region, and they serve as a water source for hydropower and agriculture, as well as the only renewable source of fresh water. Large rivers in the region find their source in the mountains and are supported by dams and reservoirs for power generation and irrigation. Additionally, the mountainous countries, the Kyrgyz Republic and Tajikistan, rely almost entirely on hydropower for their energy needs. The region also shows potential for alternative energy sources such as wind and solar power, as well as biogas and biofuel production from agriculture. Oil and gas pipelines now crisscross the region, with Kazakhstan being the biggest oil exporter and Turkmenistan and Uzbekistan relying heavily on natural gas for their energy needs.[8]

Pakistan is facing an energy crisis, as around 60% of its energy comes from hydrocarbons, but there is not enough coal and gas to meet the demand of the population. To bridge the energy gap, Pakistan imports oil, gas, and coal from other countries. Despite having ample water resources for hydropower, only 30% of electricity in Pakistan comes from hydropower, and a mere 2.4% comes from renewables like wind and solar power. The energy crisis in the country has been exacerbated by the issue of capacity payments to Independent Power Producers (IPPs), which has significantly added to the circular debt. This debt has been mounting at an alarming rate, with an average increase of Rs68 billion per month. By January 2024, it had reached a staggering 2.866 trillion, equivalent to 2.7% of the country's GDP. Inefficient planning and substantial subsidies within the power sector have led to widespread inefficiencies, resulting in unreliable energy supply and substantial deficits. Notably, Pakistan has the highest energy subsidies in South Asia, totaling about 0.9% of the GDP, which amounts to Rs 976 billion. Two-thirds of these subsidies are allocated to electricity consumption. The increasing cost of energy bills is further reducing energy consumption, compounding the burden on the government to pay capacity charges to IPPs. To address the circular debt, the government is imposing higher tariffs on the per unit cost of electricity.

The potential of the Central Asian States:

Central Asia is widely acknowledged as a region abundant in natural resources, particularly hydrocarbons such as oil, gas, and coal. In addition to these traditional energy sources, the region also exhibits huge potential for solar, wind, and hydropower. Specifically, Kazakhstan is renowned for its substantial oil and coal reserves, while also demonstrating favorable conditions for the development of solar and wind energy projects. Uzbekistan and Turkmenistan are notable for their extensive natural gas reserves, alongside promising opportunities for solar energy development. Furthermore, the geographic attributes of Tajikistan and Kyrgyzstan are well-suited for the harnessing of hydropower, making these countries particularly primed for the expansion of renewable energy infrastructures.[9] In 2019, Kazakhstan had the highest oil reserves in Central Asia, totaling 30 billion barrels, while Turkmenistan possessed the highest gas reserves, with 19.5 trillion cubic meters. Additionally, Kazakhstan had the highest gold reserves in the region, approximately 22.6 billion tonnes. Tajikistan and Kyrgyzstan are abundant in freshwater, which is efficiently utilized for generating inexpensive electricity. Tajikistan generates around 5,270 GWh per year from water, and Kyrgyzstan produces 16,300 GWh per year. These countries also have great potential for solar and wind power, with Kazakhstan producing 3,660 GWh from solar and 354 GWh from wind, while Kyrgyzstan produces 655 GWh from solar.[10]

Previously, the Central Asian states operated a connected electricity system called the Central Asian Power System (CAPS). However, this system weakened after Turkmenistan's departure in 2003 and officially ended when Uzbekistan withdrew in 2009. [11] The interconnected system

gy_System_Institutional_Versus_State_Interests.

[8] "Central Asia Atlas of Natural Resources." 2019. Asian Development Bank. February 18, 2019. https://www.adb.org/publications/central-asia-atlas-natural-resources.

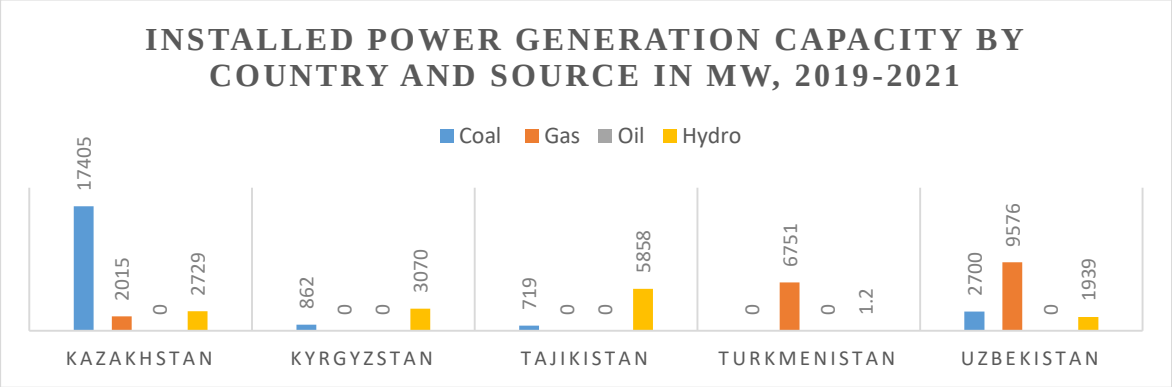
[9] "Advancing Energy Security in Central Asia." 2022. Organization for Security and Cooperation in Europe. March 2022. https://www.osce.org/oceea/513787.

[10] Advancing Energy Security in Central Asia, 2022

[11] Farkhod Aminjonov, Security of the Central Asian Energy System

was designed to manage the distribution of electricity, fuel, and water resources among Tajikistan, Kyrgyzstan, Kazakhstan, Turkmenistan, and Uzbekistan. During the period of growing season, Tajikistan and Kyrgyzstan would release water from their reservoirs to benefit downstream countries, while also utilizing the full reservoirs to generate and supply electricity. In return for this water release and electricity supply, Kazakhstan, Turkmenistan, and Uzbekistan would reciprocate by providing upstream neighbors with oil, natural gas, and thermally generated electricity during periods of low water. This collaborative system was crucial in ensuring the adequacy and reliability of energy supplies across the region. Operations were carefully coordinated from a central dispatch center located in Tashkent, Uzbekistan.[12] Currently, Kyrgyzstan is utilizing only 13 percent of its total hydro potential and has identified the development of large-scale hydropower as a strategic priority for achieving energy security.[13] The Naryn River, in particular, is a crucial water source for the country's hydropower, with 90 percent of current or planned hydropower generating capacities located along this river.[14] There are plans to construct seven additional cascades, incorporating a total of 33 hydropower stations.[15] The large-scale project is expected to significantly increase Kyrgyzstan's power generation capacity. By 2027, the addition of new and renovated hydropower facilities is projected to increase the power generation capacity by more than 700 MW, effectively more than doubling the current capacity.[16]

Tajikistan and Kyrgyzstan's significant hydropower potential could help meet Pakistan's increasing energy demands in summer, while Pakistan could export surplus energy to Tajikistan and Kyrgyzstan during winters when energy demands peak in those countries. This may also aid Pakistan in reducing its energy debts.



Source: Organization for Security and Cooperation in Europe. 2022

Pakistan has made attempts to access the energy-rich Central Asia through projects such as CASA-1000, and TAPI/TKPI. Unfortunately, none of these projects have been completed. They all involved passing through Afghanistan, and due to ongoing security challenges and instability there,

[12] Sarah Lain, and Raffaello Pantucci. "Energy Security Issues in Central Asia and Beyond: Twenty-Five Years of Independence." Royal United Services Institute (RUSI), 2017. http://www.jstor.org/stable/resrep37263.

[13] Tazabek. 2020. "Links of the Energy Network of Kyrgyzstan From Production to Consumers - From Export to Import." *Tazabek.KG*, June 12, 2020. https://www.tazabek.kg/news:1623686.

[14] Shamil Dikambaev, "National Sustainable Energy Action Plan of the Kyrgyz Republic," UNECE, 2019, https://unece.org/fileadmin/DAM/project-monitoring/unda/16_17X/E2_A2.3/NSEAP_Kyrgyzstan_ENG.pdf

[15] Farkhod Aminjonov, Energy Security Policies of the Central Asian Countries: Hydrocarbons and Electric Power Sectors (Almaty: ERI Book, 2018), 87, https://eurasian-research.org/wp-content/uploads/2020/07/Energy-Security-Policies-of-the-Central-Asian-Countries.pdf

[16] Jogorku Kenesh, "The Development Program of the Kyrgyz Republic for the period 2018-2022. Unity. Trust. Creation," 2018, https://www.unfpa.org/sites/default/files/2022-02/Kyrgystan%20CPE_0.pdf

none of the projects were finished. If these projects had been completed, Pakistan would be in a much better position than it is currently. The alternative to Afghanistan was either importing gas from Iran through a pipeline or connecting to Central Asia through Iran, but both options are not viable due to sanctions.

CASA-1000

The Central Asia South Asia (CASA-1000) hydropower project is a significant initiative with a total estimated cost of $1.17 billion. At present, the project is in the construction phase. Its primary objective is to facilitate the export of excess hydroelectric power from Tajikistan and Kyrgyzstan to Afghanistan and Pakistan. This collaborative effort will involve the export of 1300 megawatts of electricity specifically during the summer season, which coincides with the period of surplus electricity generation in Tajikistan and Kyrgyzstan. The electricity will be transmitted through a 1222-kilometer power transmission line.[17] Both Tajikistan and Kyrgyzstan produce surplus electricity during the summer due to summer rainfall and significant water flow from the mountains. In the South Asian region, Afghanistan and Pakistan grapple with persistent shortages of electricity, particularly exacerbated during the sweltering summer season. This shortage results in frequent power outages, significantly hampering industrial production, forcing small businesses to close, and posing a threat to the population, especially those who lack access to cooling amid heat waves.[18]

TAPI/TKPI:

The Turkmenistan-Afghanistan-Pakistan-India or TAPI gas pipeline is a major energy infrastructure project led by the Galkynysh – TAPI Pipeline Company Limited. Considering the importance of this project in meeting the energy demands of the participating countries, the Asian Development Bank promised substantial backing.[19] The pipeline will transport 30 billion cubic meters of natural gas annually from Turkmenistan's Dauletabad gas field to Afghanistan, Pakistan, and India. It spans a distance of around 1700 km and will transport natural gas to meet the energy demands of the participating countries. [20] The pipeline project was originally planned to be finished by 2019. However, due to challenges and difficulties with Afghanistan fulfilling its commitments and the resurgence of the Taliban in the region, the project was delayed. The Taliban government has now announced its readiness to work on the project,[21] and India has also renewed its efforts to advance the long-delayed pipeline project.[22] The TAPI pipeline will run from Dauletabad in Turkmenistan to Herat and Kandahar in Afghanistan, and then connect to Pakistan through Multan. An alternative route has also been proposed, starting from Termez, the southernmost city in Uzbekistan, and connecting to Kabul via Mazar-i-Sharif, and subsequently extending to Peshawar and India (TKPI). This new route is half the original 1700 km length of TAPI and passes through mostly densely populated areas while still reaching the same destinations in Pakistan and India. If the route is extended to India, it will only be 250 km via Lahore and Amritsar.[23]

[17] Catherine Putz, 2016. "World Bank Tries to Answer CASA-1000 Criticisms." *The Diplomat*, May 11, 2016. https://thediplomat.com/2016/05/world-bank-tries-to-answer-casa-1000-criticisms/.

[18] "CASA-1000 – HOME." n.d. https://www.casa-1000.org/.

[19] "TAPI CJSC Office to Appear in Dubai." 2016. Azernews.Az. January 20, 2016. https://www.azernews.az/region/91865.html.

[20] Zahid Anwar, 2011, "Development of Infrastructural Linkages Between Pakistan and Central Asia." *A Research Journal of South Asian Studies* 26 (01): 103–15.

[21] Daniel Onyango, 2024. "Taliban Announces Readiness to Begin Work on Afghan Portion of TAPI Gas Pipeline Project." *Pipeline Technology Journal*, February 29, 2024. https://www.pipeline-journal.net/news/taliban-announces-readiness-begin-work-afghan-portion-tapi-gas-pipeline-project.

[22] Burna-Asefi, Sophia Nina. 2022. "India's Plan to Realize TAPI." *The Diplomat*, April 12, 2022. https://thediplomat.com/2022/04/indias-plan-to-realize-tapi/.

[23] Mohiuddin Alamgir, (March 3, 2005). "Report on the Economic Impact of Central-South Asian Road Corridors," Central and South Asia Transport and Trade Forum (CSATTF).

Source: Wikipedia

Indian interest in the CAS:

India has been making efforts to harness the potential of the central Asian states and gain access to Western Europe via the East-West corridor, which is part of the old Silk Road connecting Asia with Europe. India is involved in the International North-South Transport Corridor (INSTC) as well as other initiatives like the Transport Corridor Europe-Caucasus-Asia (TRACECA). To make use of the opportunities in landlocked countries, India is focusing on Iran and utilizing the Chabahar and Bandar Abbas ports. Through its 'Look West' and 'Look North' policies, India aims to connect with its neighboring countries with a primary focus on economic and energy diplomacy. India sees Iran as a gateway to access Central Asia. The Iranian Chabahar port, also known as the Golden Gate, is crucial for accessing landlocked countries. India has invested in Iranian land, sea, and rail links to strengthen its ties with Iran. In 2008, an agreement was signed by both Iran and Russia to create a new railway connection. India had intentions of investing in the Chabahar port to enhance regional trade and transit; however, these plans were impacted by Chinese investments in the port. India was also keen on contributing to the Chabahar container terminal project, the Chabahar-Faraj-Bam railway project, and expanding the port's capacity.[24]

In March 2021, China entered into a 25-year economic cooperation agreement with Iran, aiming to bolster Iran's economy and integrate it into China's Belt and Road Initiative with a $400 billion investment. As part of this cooperation, China plans to invest in 100 projects in Iran, spanning telecommunications, healthcare, ports, banking, railroads, and information technology.[25] This collaboration is also set to strengthen their military ties and intelligence sharing.[26] Wang Yi, the Foreign Minister of China, expressed China's steadfast commitment to developing its relations with Iran, regardless of global changes.[27] This move is poised to give China significant political and economic influence in the region, impacting the interests of India and the US. Despite facing sanctions from the United States, Iran has managed to significantly increase its crude oil exports to China, with a record high of 17.8 million tons in

[24] Meena Singh Roy, 2012. "Iran: India's Gateway to Central Asia." *Strategic Analysis/Strategic Analysis* 36 (6): 957–75. https://doi.org/10.1080/09700161.2012.728862.

[25] *Global Construction Review*. 2019. "China "Pledges $400bn" to Develop Iran's Energy, Transport and Manufacturing Sectors," September 6, 2019. https://www.globalconstructionreview.com/china-de5velop-arctic-silk-road/.

[26] Team, Wion Web. 2021. "What Is the Real Story Behind China's $400 Billion Deal With Iran?" *WION*, March 29, 2021. https://www.wionews.com/world/what-is-the-real-story-behind-chinas-400-billiondeal-with-iran-374134.

[27] Shannon Tiezzi, 2021. "What's in the China-Iran Strategic Cooperation Agreement?" *The Diplomat*, March 30, 2021. https://thediplomat.com/2021/03/whats-in-the-china-iran-strategic-cooperation-agreement/.

the past 14 months. China has been the leading global importer of oil since 2017, surpassing the United States in 2020.[28] In January 2021, Iran and Russia signed an agreement on cybersecurity, potentially paving the way for a new alliance. Furthermore, the China-Iran deal is strengthening relations between Iran and Pakistan, potentially leading to Iran's participation in the CPEC.[29] In May 2024, India inked a $370 million deal with Iran for a 10-year lease to operate one terminal of the two ports at the Chabahar port. The agreement stipulates that India will oversee and manage one terminal of the Shahid Beheshti port and invest $370 million in related projects and credit facilities.[30]

Chinese interest in Central Asia:

The Central Asian states are a part of the historic Silk Road, and the revival of this ancient trade route is a crucial component of the BRI Project, seeking to connect Asia and Europe. China has made significant investments in the Central Asian states, financing around 261 projects, a number that roughly equals the projects in all other areas combined.[31] The two main branches of the Silk Road Economic Belt pass through Central Asia: the New Eurasian Land Bridge (NELB) (connecting Asia with Europe) and the China-Central Asia-West Asia Economic Corridor (CCAWA) (linking China to the Mediterranean Sea through Central Asia, West Asia, and the Persian Gulf). The NELB provides a more direct trade route for China to Europe through Kazakhstan. Although the idea for this route was proposed in the mid-1990s, it gained momentum after 2011. Under the Belt and Road Initiative, the NELB connects 108 cities in 16 countries across Asia and Europe.[32] Due to the significant investment and the potential of natural resources in the Central Asian states, China has a strong interest in the region and aims to strengthen its relations with these states. Meanwhile, Pakistan, already involved in the Belt and Road Initiative through the CPEC, can integrate its system into the larger network of projects with China's support. The CPEC begins in Kashgar, in China's Xinjiang province. Tajikistan and Kyrgyzstan, rich in clean hydropower, share borders with China and have road access. The Irkeshtam Pass is the primary border crossing between Kyrgyzstan and China, and the Torugart Pass is another crossing between the two countries. [33] China also has border crossings with Tajikistan, including the Qolma Pass. [34]

Many attempts to connect Pakistan to the Central Asian states have failed due to insecurity and challenges in Afghanistan. However, an alternative approach could involve importing surplus electricity from Tajikistan and Kyrgyzstan through the CPEC, with the assistance of China.

Energy crisis in Pakistan:

Pakistan is facing a chronic energy crisis due to the unavailability of electricity and natural gas, leading to planned power outages in both urban and rural areas.[35] The energy crisis began in 2007 and reached its peak in 2018 when the electricity

[28] Eleanor Albert, 2021. "China Is Buying Record Amounts of Iranian Oil." *The Diplomat*, March 10, 2021. https://thediplomat.com/2021/03/china-is-buying-record-amounts-of-iranian-oil/.

[29] Mahima Duggal, 2021. "What the China-Iran Strategic Cooperation Pact Means for India." *The Diplomat*, April 9, 2021. https://thediplomat.com/2021/04/what-the-china-iran-strategic-cooperation-pact-means-for-india/.

[30] Shola Lawal, 2024. "Does India Risk US Sanctions Over Iran's Chabahar Port Deal?" *Al Jazeera*, May 17, 2024. https://www.aljazeera.com/news/2024/5/17/does-india-risk-us-sanctions-over-irans-chabahar-port-deal.

[31] Roman Vakulchuk, Indra Øverland, Farkhod Aminjonov, Alina Abylkasymova, Bahtiyor Eshchanov, and Daniyar Moldokanov. 2019. "BRI in Central Asia: Overview of Chinese Projects." *Social Science Research Network*, January. https://nupi.brage.unit.no/nupi-xmlui/handle/11250/2605068.

[32] Pradumna B. Rana, and Xianbai Ji. 2020. *China's Belt and Road Initiative: Impacts on Asia and Policy Agenda*. Palgrave Macmillan. https://doi.org/10.1007/978-981-15-5171-0.

[33] "Irkeshtam Pass: Osh-Kashgar." 2023. Caravanistan. June 30, 2023. https://caravanistan.com/border-crossings/kyrgyzstan/irkeshtam-pass/.

[34] "Qolma (Kulma) Pass." 2023. Caravanistan. February 28, 2023. https://caravanistan.com/border-crossings/tajikistan/qolma-pass/.

[35] Muhammad Yaseen, Farhat Abbas, Muhammad Bilal Shakoor, Aitazaz A. Farooque, and Muhammad Rizwan. 2020. "Biomass for Renewable Energy Production in Pakistan:

demand exceeded 9000 MW.[36] Load shedding has become a common occurrence to manage the growing energy needs. To meet the energy demand, Pakistan heavily relies on imported fossil fuels. During July-March FY 2019, the country spent 3.4 bn USD on oil imports, creating a substantial burden on the economy and increasing the cost of power generation.[37]

The rising energy costs have led to reduced energy consumption, which in turn has caused significant increases in capacity payment charges for the government to Independent Power Producers (IPPs). Energy inflation has risen from 40.6 percent in the first half of FY23 to 50.6 percent in the first half of FY24 due to the increase in domestic energy prices, subsequently leading to a surge in the country's circular debt. The circular debt in the country has been growing at an alarming rate, averaging an increase of Rs 68 billion per month. As of the end of January 2024, the circular debt has ballooned to 2.866 trillion, which accounts for approximately 2.7 percent of the Gross Domestic Product (GDP). This is a significant surge from the 2.39 trillion recorded in June 2023.[38] The power sector in Pakistan is facing several challenges stemming from structural issues, inadequate planning, and significant subsidies. These factors have led to inefficiencies that are negatively impacting the reliability of the power supply and contributing to substantial deficits. Of particular concern is the high level of subsidies provided to energy products in South Asia, with Pakistan currently allocating approximately 0.9 percent of its GDP (Rs976 billion) to these subsidies, two-thirds of which are directed towards electricity consumption. The distribution companies (Discos) in Pakistan also face inefficiencies, including outdated metering practices, low collection rates, high technical losses, and widespread theft. These factors have further exacerbated the challenges within the power sector. [39]

The transmission loss in 2018 was around 22%, while the distribution loss was approximately 50% of all generated electricity.[40] The ongoing power shortage is due to aging power facilities that are no longer efficient and effective at operating at their full capacity, as well as institutional inefficiencies.[41] According to the Pakistan economic survey, the majority of the country's energy is derived from hydrocarbons (58.5% from coal, LNG, and gas, and 30.9% from hydropower), with the remaining coming from nuclear and renewables. The government aims to increase the share of renewables to 13.5% by 2030.[42] Future renewable energy sources are expected to consist of wind power (6%), solar photovoltaic (4.5%), and other renewable energy resources (3.0%).[43]

Current State and Prospects." *Arabian Journal of Geosciences* 13 (2). https://doi.org/10.1007/s12517-019-5049-x.

[36] Dang Luo, Muffarah Ambreen, Assad Latif, and Xiaolei Wang. 2020. "Forecasting Pakistan's Electricity Based on Improved Discrete Grey Polynomial Model." *Grey Systems* 10 (2): 215–30. https://doi.org/10.1108/gs-12-2019-0060.

[37] Haseeb Yaqoob, Yew Heng Teoh, Talha S. Goraya, Farooq Sher, Muhammad Ahmad Jamil, Tazien Rashid, and Kashif Allah Yar. 2021. "Energy Evaluation and Environmental Impact Assessment of Transportation Fuels in Pakistan." *Case Studies in Chemical and Environmental Engineering* 3 (June): 100081. https://doi.org/10.1016/j.cscee.2021.100081.

[38] Khaleeq Kiani. 2024. "Energy Sector Circular Debt Surges to Rs5.5tr." *DAWN.COM*, April 4, 2024. https://www.dawn.com/news/1825571.

[39] Kiani, Energy Sector Circular Debt Surges.

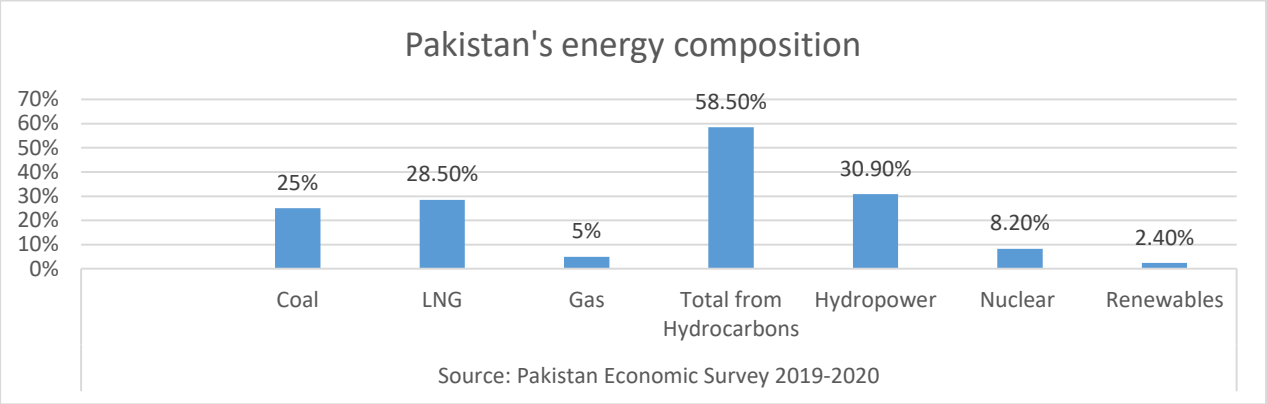
[40] Hosseini-Motlagh, Seyyed-Mahdi, Mohammad Reza Ghatreh Samani, and Vahid Shahbazbegian. 2020. "Innovative Strategy to Design a Mixed Resilient-sustainable Electricity Supply Chain Network Under Uncertainty." *Applied Energy* 280 (December): 115921. https://doi.org/10.1016/j.apenergy.2020.115921.

[41] Corbett A. Grainger, and Fan Zhang. 2019. "Electricity Shortages and Manufacturing Productivity in Pakistan." *Energy Policy* 132 (September): 1000–1008. https://doi.org/10.1016/j.enpol.2019.05.040.

[42] Muhammad Shahid, Kafait Ullah, Kashif Imran, Arshad Mahmood, and Maarten Arentsen. 2021. "LEAP Simulated Economic Evaluation of Sustainable Scenarios to Fulfill the Regional Electricity Demand in Pakistan." *Sustainable Energy Technologies and Assessments* 46 (August): 101292. https://doi.org/10.1016/j.seta.2021.101292.

[43] Tauseef Aized, Muhammad Shahid, Amanat Ali Bhatti, Muhammad Saleem, and Gabrial Anandarajah. 2018. "Energy Security and Renewable Energy Policy Analysis of Pakistan." *Renewable & Sustainable Energy*

Additionally, some outdated thermal power plants will not contribute electricity to the national grid in the future.[44] This situation has led to an increase in power tariffs, making electricity unaffordable for commercial, industrial, and domestic consumers over time.[45]



Conclusion:

The paper focuses on the significant potential of the Central Asian states (CAS) in addressing Pakistan's ongoing energy crisis. The CAS, rich in natural resources such as hydrocarbons and hydropower, can provide a viable solution to Pakistan's increasing energy demands. However, many initiatives like the TAPI and CASA-1000 projects were planned and started but faced challenges due to geopolitics, instability in Afghanistan, and sanctions on Iran. Despite these obstacles, the CPEC could offer a promising breakthrough. China could potentially connect the CPEC, starting from Kashgar in China's Xinjiang province, with the Central Asian states through the Qolma Pass and Irkeshtam Pass, bypassing Afghanistan and Iran.

The energy sources in the Central Asian states could help solve Pakistan's energy crisis. With electricity costs rising in Pakistan and limited renewable resources, cheap and sustainable energy from the Central Asian states holds promise. Tajikistan and Kyrgyzstan, with their surplus hydroelectricity, can play a crucial role in easing the crisis. In summer, they have the potential to export cheap electricity to Pakistan, meeting its peak energy demands. Importing clean and affordable electricity from Central Asian states can also reduce Pakistan's reliance on imported non-renewable and costly oil and gas, potentially alleviating its balance of payments crisis.

The paper concludes that despite challenges from Afghanistan's instability and sanctions on Iran, Pakistan can resolve its energy crisis by connecting the CPEC with the energy grid of Central Asian states with China's assistance. Importing clean and affordable electricity would help improve Pakistan's economy and energy situation.

Recommendations:

- Pakistan has been dealing with an energy crisis along with national and international debt challenges. To address these issues, Pakistan needs to explore new renewable energy sources, such as investing in its nuclear and hydro energy plants and importing clean and affordable energy from neighboring countries.
- Recognizing the immediate challenge of shifting directly to renewables, Pakistan should utilize the significant energy potential of the Central Asian states and connect the

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CPEC with the CAS through China's Xinjiang province. There is potential to connect Kashgar with Tajikistan through the Qolma pass and with Kyrgyzstan through the Irkeshtam and Torugart passes.

- In addition to importing cheap and affordable electricity from the Central Asian states, Pakistan can offer them access to the seas. The landlocked Central Asian states have untapped natural resources, and access to warm waters through Pakistan could significantly impact Pakistan's economy and energy sector, transforming its geostrategic importance to geoeconomics.
- Pakistan needs to accelerate the completion of CPEC projects and work with China to connect CPEC with Tajikistan and Kyrgyzstan.

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