

03 CORRIDORS, CULTURE & CONNECTIVITY

October, 2017

IMPACT OF CHINA-PAKISTAN ECONOMIC CORRIDOR (CPEC) ON THE ENERGY SECTOR OF PAKISTAN



Harris Azhar
Amna Syed



Pakistan-China Institute

Corridors, Culture & Connectivity

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Abbreviations

ADB	Asian Development Bank
AEDB	Alternative Energy Development Board
AJKHEB	Azad Jammu and Kashmir Hydel Electricity Board
AMRS	Automated Meter Reading System
BPC	Bulk Power Consumer
CPEC	China Pakistan Economic Corridor
CTG-	China three gorges
DISCO	Distribution Companies
EHP	Early Harvest Projects
EHV	Extra High Voltage
FDI	Foreign Direct Investment
GOP	Government of Pakistan GST General Sales Tax GTPS Gas Thermal Power Station
GWh	Giga Watt – hour
HESCO	Hyderabad Electric Supply Company Limited
HFO	Heavy Furnace Oil HPP Hydropower Project
HSD	High Speed Diesel
HSD:	High speed diesel RFO: Refined Fuel Oil
HVDC	High Voltage Direct Current
IA	Implementation Agreement
IAEA	International Atomic Energy Agency
ICB	International Competitive Bidding
IESCO	Islamabad Electric Supply Company Limited
IPP	Independent Power Producers
JPCL	Jamshoro Power Company Limited
NDRC	National Development and Reforms Commission of PRC
NEPRA	National Electric Power Regulatory Authority
NGC	National Grid Company
NGPS	Natural Gas Power Station
NPCC	National Power Control Centre
NPGCL	Northern Power Generation Company Limited
NTDC	National Transmission and Dispatch Company Limited
NTDCL	National Transmission and Dispatch Company Limited
O&M	Operation and Maintenance
OCPP	Open Cycle Power Plant
OGDCL	Oil and Gas Development Company Limited
PAEC	Pakistan Atomic Energy Commission
PASMIC	Pakistan Steel Mills Corporation

PEDO	Pakhtunkhwa Energy Development Organization
PEPCO	Pakistan Electric Power Company Limited
PESCO	Peshawar Electric Supply Company Limited
PNRA	Pakistan Nuclear Regulatory Authority
PPA	Power Purchase Agreement
PPDB	Punjab Power Development Board
PPIB	Private Power and Infrastructure Board
PPP	Power Purchase Price
PSDP	Public Sector Development Project
ROE	Return on Equity
SPP	Small Power Producer
SPS	Steam Power Station
STG	Secondary Transmission and Grid
ST	Steam Turbine
T&D	Transmission and Distribution
TCEB	Thar Coal and Energy Board
TCF-	Trillion Cubic Feet
TESCO	Tribal Area Electricity Supply Company Limited
WPPO	WAPDA Power Privatization Organization

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AUTHORS PROFILE

Harris Azhar has been working in the energy sector for the past two years, as an associate, with the Pakistan-China Institute. He has worked very closely both with the Chinese and the Pakistani governments and has had ample experience dealing with the private sector. Not only this, the author has been regularly interacting with the eminent local stakeholders involved in Pakistan's energy spectrum such as NTDC, NEPRA, AEDB, PPIB and provincial energy units. Moreover, he has been attending meetings of the parliamentary committee on CPEC. All this exposure, interactions and his own keenness to learn has placed him in a unique position to understand the underlying problems in Pakistan's energy ecosystem and more importantly analyzing them from an informed and methodical perspective.

Amna Syed has been working in the energy sector as an associate with the Pakistan-China Institute. She has worked closely with Chinese companies and the Pakistani government. She has worked as a coordinator for The International CPEC Conference 2017 and has been involved in consulting with the Chinese companies on various infrastructure and energy projects in Punjab and KPK, along with performing the role of a project coordinator. The author also has prior research experience with regards to the energy sector.

ABSTRACT

For more than a decade Pakistan has been facing a peak 8,500 MW of power shortage. This has had a detrimental effect on the economy, especially, since numerous industrial units have come to a standstill. The Government of Pakistan has resorted to supply-side measure to swiftly tackle the menace of load shedding. With the advent of the behemoth 62 billion USD China-Pakistan Economic Corridor (CPEC), the energy realm of the country has encountered a drastic paradigm shift. More than 50% of the total investment has been allocated for energy projects to alleviate the power crisis. This report will examine the energy ecosystem holistically - including but not limited to the detailed causes of the menace of load shedding, how CPEC will revamp the energy sphere, Chinese and local stakeholders involved and impediments faced by the Chinese enterprises. Conclusively, the paper provides policy recommendations, with a focus on how to attain long-term sustainability within the energy sector of Pakistan, will be prescribed.

FOREWORD

Pakistan-China Institute has undertaken a key analysis on the energy investments under CPEC and has broken down the different aspects and issues that constitute the discourse on energy in Pakistan in the context of CPEC. I am sure this research report will play an important role in addressing the misperceptions on energy projects as well as enable people to better understand and contextualize the nuances of CPEC energy projects

I am also grateful to KAS for continuing to support consequential discourse, research and dialogue in Pakistan, and being a formidable partner of the Pakistan-China Institute, with the common goal of achieving a peaceful, progressive and globally-integrated Pakistan.

Mustafa Hyder Sayed
Executive Director, Pakistan-China Institute

1. INTRODUCTION

Pakistan has been enduring a perpetual energy crisis for more than a decade now. The results have been devastating. It has rendered many businesses to shut down, which has resulted in unemployment in approximately 500000 households, across Pakistan. Around 140 million people have either no access to the national grid or suffer more than 12 hours of load shedding. Meanwhile, the household electricity demand is increasing at an annual rate of 10 percent, whilst, the investment in the power sector has dwindled from an overwhelming 1.5 pc in the 1990's to 0.7 pc, in the last ten years, or so. ¹

President Xi Jinping arrived in Pakistan in 2015 and announced the behemoth multi-billion-dollar China-Pakistan Economic Corridor - a pilot project of his grand 1.4 trillion USD Belt and Road scheme. The project started off from 46 billion USD and it has now reached 71 billion USD. Around 70-80 % of this total investment has been targeted towards the energy sector. While the rest of the amount is for other projects including but not restricted to, infrastructural projects. ²

The CPEC is only a short time supply-side solution to the detrimental energy crisis. To attain long term sustainability, the government and/or relevant authorities will have to focus on fixing the demand side loopholes in the power sector. According to a report by Dr. Ambrosini of the IFC, 17%³ of electricity consumed by Pakistanis could be saved through conservation and efficiency procedures. Energy efficient fans and lights could potentially condense the aggregate quantum of load shedding by 39 pc and 47 pc, respectively.

Unfortunately, limited literature exists on the Energy sector in Pakistan, especially, with reference to the emerging CPEC projects most of which are projects related to energy. Research for this particular sector was therefore, not easy, and intensive primary research plus rigorous data collection was required to ensure that a comprehensive and holistic picture of the Energy Sector in Pakistan could be presented. On the other hand, with growing number of CPEC projects in Energy, coupled with the fact that the energy sector plays a pivotal role in the development and growth of the country there was a dire need for such a report to be published. Literature of this sort is not only important for academic purposes but it also supports policy making endeavors.

This paper has been divided in three major components:

¹ Report "Energy Conservation: Avoid Wastages, Prevent Shortages"; Research and Advocacy for the Advancement of Allied Reforms (Raftaar), 2016.

² Report "How will CPEC boost Pakistan economy?" Deloitte, 2016.

³Sustainable Energy Finance International Experience in Support of Local Financial Institutions; Dr. Riccardo Ambrosini Senior SEF Specialist, IFC Karachi, June 9th, 2015.

- Pakistan's energy ecosystem - this section refers to the basic reasons why the energy crisis has been persistent for more than a decade, even though, Pakistan is blessed with a huge energy potential to be self-sustainable in terms of producing its own energy needs. It further touches upon the various advantages Pakistan has naturally which can support the country's increased demand for energy.
- Aftermath of CPEC - this section is focusing on the impact of the billion-dollar investment framework of CPEC on the energy economy; output in specific sectors has been thoroughly discussed and the impact on governmental bodies is also mentioned. This section largely talks about Coal and Hydro powered energy plants, both of which take center stage in the CPEC energy projects.
- The last section is targeted towards Challenges faced by the relevant stakeholders involved in the energy ecosystem of Pakistan. From an investor's point of view this is the most significant data, as it discusses the end-to-end project conception to execution in the power sector.

The paper finally proposes policy recommendations. These have been provided in consideration of the problems highlighted throughout the paper.

2. PAKISTAN'S ENERGY ECOSYSTEM

2.1. ENERGY RESOURCES:

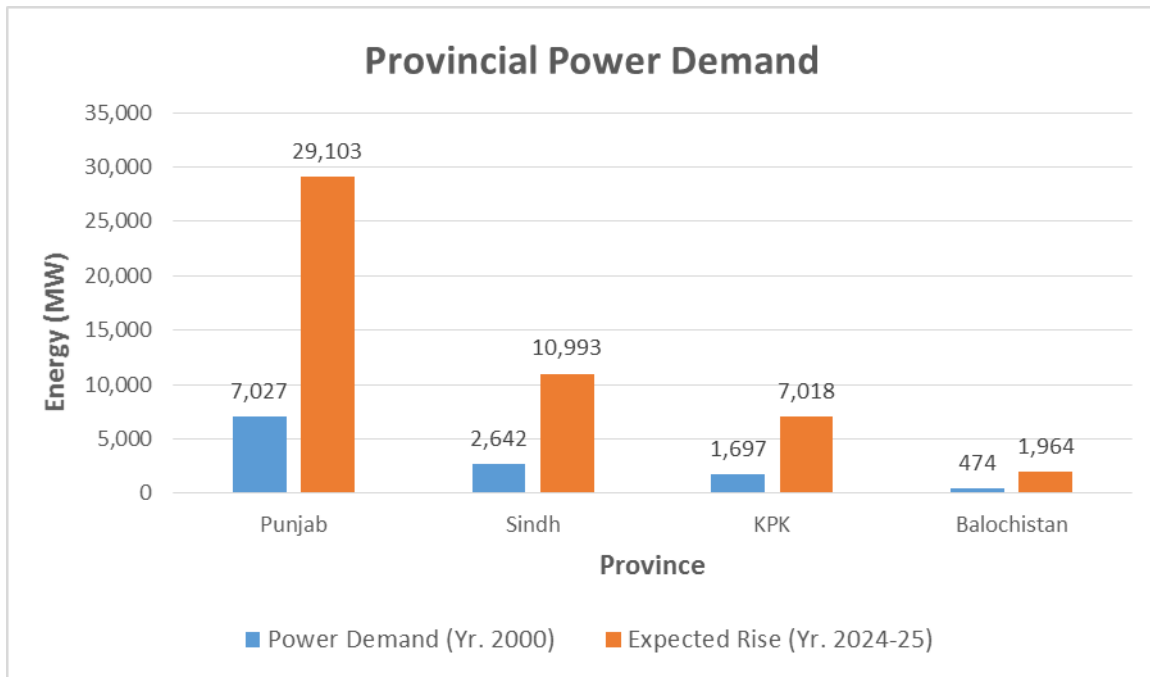
Resource	Potential (MW)	Current usage (MW)
Hydel	41000-45000	6555
Thermal	3-40000	8300
Wind Solar	10000-50000 100,000	600-800
Alternate Energy (Biomass, waste to energy)	10000	200-500

Source: Official websites of PPIB, Water & Power Ministry and NEPRA

Research shows that the potential of all types of energy fuel available is much higher than the

current usage of the same resources⁴. The table attached above shows the unofficial potential of hydro, thermal, renewable and alternate energy sectors in Pakistan. The difference between the potential and the current usage shows colossal differences. Therefore, it can be safely deduced that if we have the correct working machinery in the power sector, the potential resources could be utilized to generate ample electricity for Pakistan.

The following bar graph depicts the power demand of each province in the year 2000 and the expected rise in the years 2024-25. Increase in power demand is the highest in Punjab and is expected to rise at a rapid rate. In Punjab, at present, there is a demand-supply gap of about 4000 MW which is increasing at a rate of 6% per annum⁵. Baluchistan has the lowest level of increase in power demand. This is due to poor law and order situation, remoteness of the territory, insufficient communication and low level of profitability on investment. In all the provinces, the demand is increasing and it will continue to do so considering the increase in industry and population of the country.

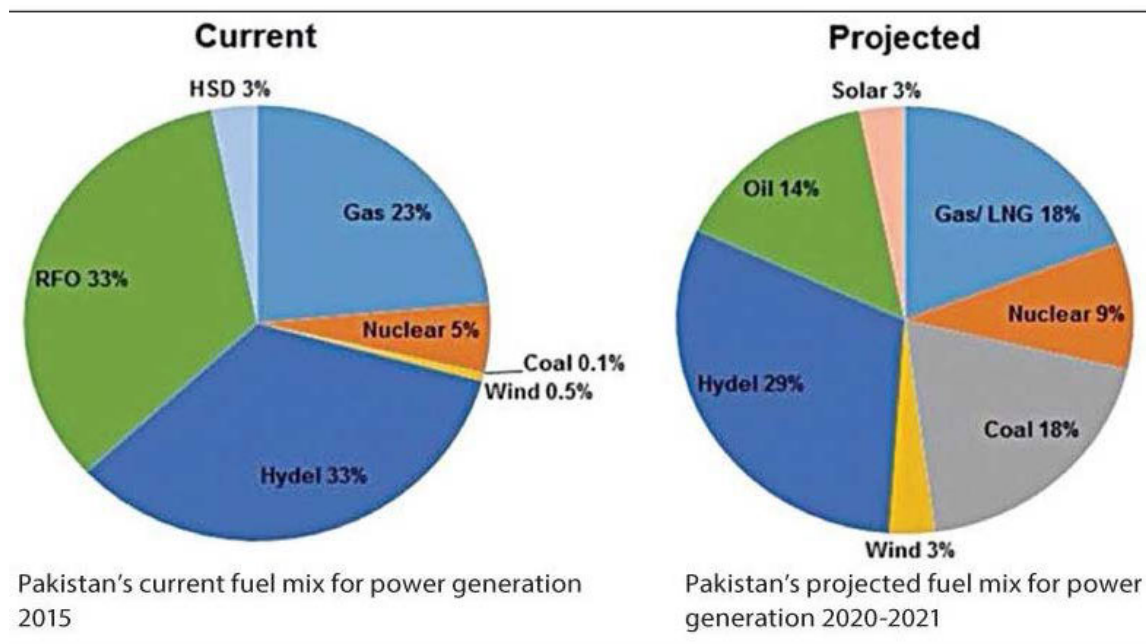


Source: Analysis of Pakistan’s Electric Power Supply; Blekinge Institute of Technology, Department of Electrical Engineering March 2015

⁴M. A. Maqbool and Dr. S. R. Malik, "Energy Potential of Pakistan", Journal of Engineering and Scientific Research."

⁵ NEPRA, State of Industry, 2015.

2.2. CURRENT AND PROSPECTIVE ENERGY MIX OF PAKISTAN



⁶ Source: "Power sector: winds of change"; Khalid Saeed; Ex Chairman NEPRA; November, 2016

The current Energy Mix of Pakistan is not at all in line with international best practices. All the sectors of the energy realm have been discussed below:

INCREASE IN OIL

Due to the CPEC, coal-based power plants have received a massive boom. The current share of coal-based power plants in the energy portfolio is mere 0.1 %. However, by 2021 this percentage will increase to 18 %, as predicted by the Ex-Chairman of NEPRA. This fundamental change is going to be driven by the three-major coal-fired projects that are under construction: 2x660MW Port Qasim Coal-fired Power Plant; 2x660MW Sahiwal Coal-Fired Power Plant; 4x330MW Engro Thar Coal-fired Power Plant and Surface Mine in Block II of Thar Coal Field.

The Port Qasim and Sahiwal coal power plants are both using imported coal from South

⁶ "Power sector: winds of change"; Khalid Saeed; Ex Chairman NEPRA; November, 2016.

Africa and Indonesia⁷. The general perception that exists is that the Government should strictly rely on indigenous coal sources to fuel the coal fired power plants. However, the current energy shortage situation in the country requires minimal time spent on extraction and acquiring of coal. The waiting period required in the extraction of indigenous coal is therefore not feasible.

Coal, is one of the cheapest form of energy that has been used by all the developed countries to generate their electricity from⁸. Coal power plants operating at high utilization levels will help in bringing down the cost of energy generation and will reduce the supply-demand gap between energy needed and generated. These imported coals fired power plants will be fully operational before 2018.



Sahiwal Coal fired power plant⁹

INDIGENOUS OR IMPORTED

On the other hand, the Thar Coal Project is using indigenous coal to generate power. The only evident issue linked to the indigenous-coal fired projects is the completion time. To set up a Coal Power Plant there are two primary steps involved: first, to extract coal and secondly, to use that coal to generate power. Once, the coal mines are sustainable there will come a time in Pakistan when there would not be any need for imported coal. The indigenous coal will consequently yield cheaper electricity.

DECREASE IN THERMAL (OIL AND GAS)

Pakistan has vast resources of indigenous gas reserves, especially in the areas of KPK and Baluchistan (explained in section 2.1). These resources need to be tapped effectively. To achieve this a cultural shift is needed in the rural areas (as explained in the policy briefs). The oil based power plant run on imported oil which is very costly. By 2020, the percentage of

⁷ Faisal Ali Ghumman, Sahiwal coal-fired power plant: Builders expect power generation before deadline, Dawn News, 2016.

⁸ Ibid.

⁹ <http://tweetcs.com/adnankhan452/>.

energy being produced by oil based plant will significantly reduce¹⁰. On the other hand, the share of gas fired power plants in the total energy mix shall also shrink - mainly because at this point in time the government is not adamant on exploration of the natural resources specifically gas reserves, instead they have resorted to supply side tools.

RENEWABLE ENERGY

Renewable energy has seen a positive shift in the country over the last few years. At least in theory, Pakistan is moving towards a more green and clean country. Many hydropower projects are under construction such as Nandipur 660 MW, Neelum Jhelum (969 MW). Karot and Kohala have reached their financial closure and the construction will begin soon.

On the other hand, solar and wind sectors have also picked up pace in Pakistan – together they contribute nearly 400 MW to the energy supply. The pertinent issue now is the transmission line availability. Due to a lack of comprehensive and well spread network of the transmission lines the increase in solar and wind energy is on a halt. Moreover, NEPRA, has recently issued a new tariff which is around 6 USD cents/KWh; this is still lucrative as the ROE is 17-18% on total equity per annum.¹¹ Effectively, soon, there will be increased focus on investing in solar and wind farms. An initial example is ADB's massive injection of 300 million USD in the solar sector in the KPK province.

INCREASE IN NUCLEAR

The current Prime Minister of Pakistan recently inaugurated the Chashma 3 Nuclear power plant in Mianwali district in Punjab. This project will add 330 MW of energy on the National Grid¹². The share from nuclear fuel to Pakistan's total energy mix is only about 4-5 % (World Nuclear Association). However, upon completion of k-2 and k-3 Nuclear power plants in Karachi by 2030, there would be a total of 8-10,000 MW of energy being produced by the aforesaid power plants alone. In the short run, this form of energy might not be that effective in curbing Pakistan's energy deficits. But, by 2020 there would be a 4-5% increase in the total energy portfolio for nuclear fuel based electricity.

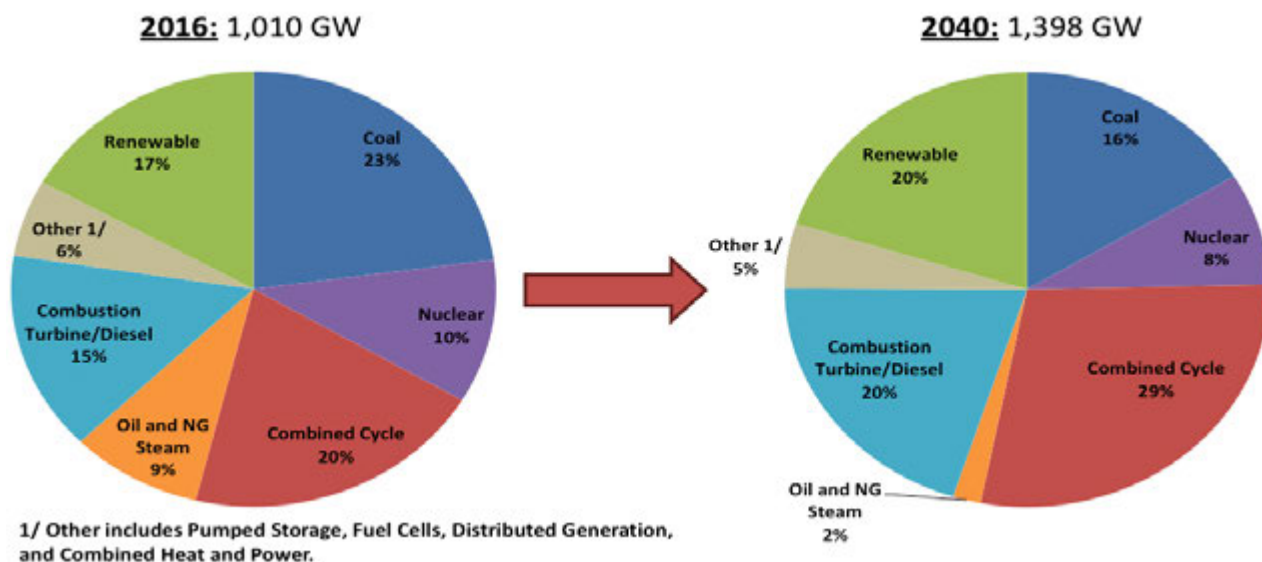
¹⁰ Jawwad Rizvi, Demystifying Pakistan's Energy Crisis, MIT Technology Review, 2016.

¹¹ NEPRA: <http://www.nepra.org.pk/Publications/Annual%20Reports/Annual%20Report%202015-2016.pdf>.

¹² Kugelman, Michael. "Pakistan's Interminable Energy Crisis: IS THERE ANY WAY OUT?" *Pakistan's Interminable Energy Crisis: IS THERE ANY WAY OUT?* 2015.

2.3. WORLD'S ENERGY MIX AND PAKISTAN'S ENERGY MIX

¹³Source: World Energy Resources; World Energy Council; 2016



The world's energy mix is moving towards renewable energy and the percentage share of coal in the total portfolio is therefore decreasing rapidly. China and the US are top two economies of the world and they have started cutting down the energy produced from coal fired power plants. In the case of Pakistan, the coal based energy was only 0.6% in 2016. After the addition of the new CPEC coal fired projects, this percentage will drastically increase. To meet the energy demands of the country, which is in line with International best practices, it is extremely important to define a 50-year energy portfolio, after consultation with International Organizations, such as the World Bank. There must be a definitive roadmap for the development of solar, wind and alternate energy resources, because coal is not a long-term solution. This is largely due to its detrimental effects on the environment, even if supercritical form of coal is used and all the environment degradation preventive measures are in place. The main task for the policy makers is to shift to renewable energy after a certain level of sustainability has been achieved in coal power generation. On other hand, Hydel energy cannot be depended upon as a constant form of energy - in winters there is less water which subsequently translates into lower yield in the output.

¹³ World Energy Resources; World Energy Council; 2016.

2.4 ENERGY SHORTFALL

The energy shortage started surfacing in the early 2000's. On average, Pakistan faces energy deficits of 4,500 to 5,000 MW. At the time of peak demands (summer season) this deficit has risen to 8500 MW, in the past. The impact of these deficits on the economy of the country is staggering 4% of the total Gross Domestic Product (GDP). The industrial sector has been shattered over the past few years and only in the industrial capital, Faisalabad, around 400 factories have been closed¹⁴.

In today's day and age, the aforementioned figures are shocking. More so since the oil prices are going down and the world is moving towards alternate forms of energy to see Pakistan still grappling with the energy crisis is unsettling. The factors contributing to this deficit are following:

1. EQUIPMENT IS OUTDATED

The equipment that is being used to transmit energy from power stations to the DISCOs and then to the end consumers are outdated. The ADB has approved funding to provide smart meter system, starting with the urban centers and then taking it to the rural areas as well. Due to the prevalent poor bureaucracy and structural issues this project is yet to be initiated.

2. POOR MAINTENANCE

The staff hired by the governmental bodies handling the power sector is not qualified enough to effectively maintain the transmission lines, transmitters and other related equipment. Power overloading on the transmission lines, improper cable earthlings at the remote side and lengthy single-phase lines are all incurring great losses¹⁵. Unless there are structural reforms introduced to increase the capacity building of the engineers and labors operating and running this equipment - these losses will continue to rise.

3. T&D LOSSES AND ENERGY THEFT

Current government has set a target of reducing the T&D losses to 16%, at the end of their tenure. However, up till now, the losses remain the same, as suggested by the energy experts in the country. NEPRA has allowed the T&D losses to occur at 12-13% which is very high rate compared to the 6-7% in developed countries. The T&D losses are considered technical in nature. Apart from this there is a huge problem of non-technical losses which are occurring due to energy theft, outdated equipment; and the persistence of these problems is due to a lack of political will to curb this problem.

One solution to this problem is that the local and lower level staff should be given training to

¹⁴ Ibid.

¹⁵ Ibid.

aply handle equipment. Moreover, they should be rewarded bonuses and other incentives, so that they can stop the corruption and not let it continue.

Washington Based Northeast Group LLC claims that power theft is a common problem in all the developing economies. The combined effect of these loses in the 50 emerging economies accounts to USD 58.7 billion.¹⁶ Pakistan is one of these 50 emerging economies. These energy thefts are executed by making fake bills, tampering with meters, stopping the rotating disk of the meters, destroying the meters.

4. OTHER REASONS

Lack of coherent and sustainable policies, unproductive bureaucracy, political squabbling and security concerns for potential investors have also attributed to the energy crisis. They have caused stagnation in Pakistan's energy sector a factor that has had a detrimental effect on the economy.

Commercial vs Non-commercial Energy:

Pakistan's policymakers focus heavily on commercial energy, a key ingredient of national growth. However, biomass—firewood, dung, and crop residues—constitute a significant proportion of total energy consumption in Pakistan, and is the chief household fuel in rural areas. In fact, noncommercial energy accounts for half of overall demand.¹⁷ Neglecting non-commercial energy consumers, constrains growth in the long term. Pakistan should incorporate noncommercial energy into plans and policies, and recruit more policymakers with expertise in this area. This can prove to be a major development in curbing the energy crisis.

Bureaucracy

The shortcomings in our government's will to pursue and complete projects, especially in reference to the bureaucratic system which has often caused many great projects to be abandoned has been a major problem. In 2005, Shenua, a Chinese energy company, offered to establish a coal power project in Thar for an attractive tariff of 5.7 cents per kilowatt (kw). Both the provincial government of Sindh and the federal government endorsed the project. However, the Water and Power Development Authority (WAPDA) because of a bureaucratic tussle rejected the offer since it thought Shenua's tariff offer was too high. This frustrated Shenua, which promptly abandoned the proposed project after having spent considerable human resource and time assessing Thar's coal resources and the project's feasibility. Ironically, today Pakistan is offering a tariff rate to initiate Thar coal power projects that is more than 50 percent higher than the 5.7 cent one proposed by Shenua back in 2005. This example clearly shows a lack of vision within our government which has been a major reason for Pakistan's energy crisis.

¹⁶ Northeast Group, LL; official website; 2014

¹⁷ Ibid.

Political Squabbling

The rift between the Federal and Provincial Governments has always derailed the development of many projects, in one way or another. One such example is the Kalabagh Dam situated in Punjab. The project was conceived 50 years ago. The provincial government of Sindh went at loggerheads with the federal government by claiming that the project will cause less water to be allocated to Sindh. The project viability and feasibility studies conducted shows that it will be highly beneficial for irrigation purposes for Punjab and KPK, and on top of that - it will reduce and effectively put an end to the annual flooding that destroys millions of USD worth of agricultural lands in Sindh and Punjab. However, political opposition to the plan made it extremely contentious resulting in caution being exercised by the federal and local government. A project approved in place of the KalaBagh Dam is the Diamer Basha Dam, the project which is of the same size, but three times more expensive.

Security Issues

For a long time now the security situation in the country has been less than satisfactory. Consequently, this has had an adverse effect on the country's development and especially the development in the energy sector. One failed energy project dates to late 1980s. At that point Exxon was one of the largest oil and gas companies of the world. They had secured the right to develop one of the gas block in Kohlu, Dera Bugti¹⁸. However, the fragile security situation was such that Exxon was unable to start any work on the ground. The Federal and the Baluchistan governments were unable to provide a safe and secure environment at Bugti for the largest company in the industry to execute a gas field project. Exxon exited after two years. In recent years, the security dynamics of Pakistan have altered resulting in an 80 KMs excess road made for Kohlu. Oil and Gas Company Limited (OGDCL) has started working for extraction of gas from this area. It is roughly estimated that about 15 trillion cubic feet (TCF) which would inadvertently increase 30% of gas reserves.

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3. THE AFTERMATH OF CPEC

3.1 INTRODUCTION

Ehsan Malik, who is the current chairman of the Pakistan Business Council has said "load shedding is a business's biggest difficulty right now". In the last decade or so, Pakistan has seen a drastic decrease in the FDI, it is only recently, with the advent of the great OBOR scheme of President Xi that there has been an increase.

¹⁸ IPRI. "Solution for Energy Crisis in Pakistan." Solution for Energy Crisis in Pakistan, 2017.

The driving force behind the China-Pakistan Economic Corridor is to curb the energy shortage crisis in the country. According to the forecast presented by the International Energy Agency the total energy demand would be 49 GW by 2025. In yearly terms this means 3,500MW per year would be required. In terms of power plants - six medium sized power plants with unit capacity of 600-660 MW would need to be installed per year.

To alleviate a developing country's economic crisis, the solution is simple: pump in private investments which would inadvertently appreciate the country's Foreign Direct Investment. CPEC has brought the very same phenomenon in Pakistan's energy realm. According to a figure shared by the official from the Trade and Commerce Ministry of PRC, until August 2016, PRC has injected 4.1 billion USD as investment in Pakistan¹⁹. This figure is subject to increase and hit the all-famous 55 billion USD figure soon.

3.2 COAL AND CPEC

Coal Fired Power Plants increased - Under CPEC, the present government resorted to the cheapest and quickest (in terms of construction and generation of electricity period) method of power production - coal power plants. With the eventual goal of relying completely on indigenous resources of coal, the current coal is dependent on imports from foreign countries. Ex VP of World Bank Mr. Shahid Burki has been reported to have said, "With greater reliance on coal, Pakistan should be able to reduce the cost of electricity for consumers."

The cost of a coal power plant is much less compared to hydro/solar/wind/thermal or any other form of energy. In the long term, the tariffs paid by the consumers are expected to directly reduce. Since the share of coal power production in current energy mix of Pakistan is minimal, the costs incurred by the consumers in Pakistan is one of the highest in Asia, at 0.13 USD per unit compared to 0.12 USD in India, 0.11 USD in China and 0.09 USD in Bangladesh.²⁰

Effectively, in the short-run, as a result of CPEC and the inclination towards coal based power plants has resulted in increased output of at least 3240 MW, by the end of 2018.²¹ This figure is more than half of the peak demand-supply shortfall. Resultantly, the supply side policy adopted by the energy specialists is expected to put an end to the acute load shedding - coal fired power plant playing a significant role in it.

In May 2017, the PPIB has awarded LOI for a 300 MW coal power project to CCCC. The Chief Representative of COPHC, sister company of CCCC reviewed the progress of Gwadar and CPEC in these words:

¹⁹ Deputy Director, Ministry of Trade (Address to SCO youth delegates in Beijing).

²⁰ Kiran Stacey and Henny Sender; Financial Times; Glimmer of light in Pakistan's blackout crisis.

²¹ Repeat 14.

“Port Rehabilitation and Phase I of Gwadar Free Zone invested by COPHC is progressing quite well. By Nov. 2017, 5 new port Cranes will be functioning in Gwadar Port and the port efficiency will be improved considerably. Construction of Phase I of Gwadar Free Zone will be completed by the end of this year. This is a very remarkable progress of CEPC. Due to the fact that there is no stable power supply in Gwadar, COPHC has invested for a capital power plants (7 generators in parallel). This will be completed by the end of this year and our investor will have non-stop power supply. Of course, this small power plant is only on temporary basis; the 300-mw power plant is expected to be in place soon - land acquisition, finance arrangement and implementation agreement are being finalized, as we speak. PPIB is offering assistance to them. I hope everything will be ok. Our major concern right now, however, is “security”. Unfortunately, terrorist activities keep on occurring in places that are near to the site of the power plant. This impedes the work being done and causes fear in the air. I hope Pakistani officials can solve this issue efficiently and quickly”²²

Other than COPHC which has recently stepped into the bandwagon of coal fired power development in Pakistan, Powerchina is one of the oldest player in the power sector. Under the umbrella of CPEC they are working on the 1320 Port Qasim imported coal fired project and Hydro China Dawood 50MW Wind Farm in Gharu, Thatta. Similarly, they are feverishly acquiring hydropower, wind and solar projects all around the country. PC also worked on Gomul Zan dam with the Frontier Works Organization (FWO) in the early 2000’s.

3.3 THAR COAL FIELD

INVESTMENT OPPORTUNITIES

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Thar Coal reserves have been calculated as 175 billion tonnes over an area of 9600 sq. meters. Thar humongous coal field has been distributed in 13 blocks. For any sponsor/company to participate in the Thar coal development - there are prospective opportunities for open-pit mining and subsequent power plant construction in block 4, 7, 8, 9,



Thar Coal Field, Sindh²³

²² Interview; Mr. Zhang; Chairman COPHC

10, 11, 12. Out of these 7 blocks, **block 4, 8, 9-12** have a very good stripping ratio (b/w 6-6.5:1) - which essentially means that for being able to mine 1 ton of coal 6-6.5 tonnes of waste rock will need to be dealt with. In block 7 the stripping ratio is much higher. ²⁴

How to Procure the Blocks?

- The Government does tendering of the blocks and the most qualified company is awarded the block.
- However, in case there is a company with extremely strong financials and working experience of the mining-pits and construction of coal based power plants - there can be a potential direct agreement with the Government of Sindh.

THAR-COAL PROJECTS

Table A²⁵ in the appendix illustrates all the projects (mining and power plants) that have been initiated in the Thar region in Sindh. The table clearly shows a comprehensive understanding of Coal Powered Energy Projects in Thar region of Sindh.

Table B²⁶ in the appendix lists down the mining project being undertaken in Thar.

Thar Block-by Block Analysis

At the moment there are 12 blocks divided by the government. Over the last decade or so efforts are being conducted on behalf of the provincial and federal government to lease out blocks for the development and eventual generation of electricity using indigenous coal reserves of Thar. The block-by-block analysis is mentioned below:

Block 1: Sino-Sindh Resources Limited (CMEC is the only Chinese company involved in mining and execution of the power plant) - *Project status mentioned in the table A in the Appendix*

Block 2: Leased to Sindh Engro Coal Mining Company- *Project status mentioned in the table A in the Appendix.*

Block 3: Leased out to a UK based company called Asia Power - Feasibility study has been submitted for approval.

²³ cpecinfo.com

²⁴ Interview; Mr. Khursheed Jamali; Chairman of Sindh Engro Coal Mining Company Limited and Engro Powered Thar (Private) Limited.

²⁵ Pakistan-China Institute Website – cpecinfo.com/energy.

²⁶ Planning Commission Website – cpec.gov.pk/energy.

Block 4 - Harbin relinquished this block, even though it has a very good stripping ratio - essentially, there is a potential vacuum.

Block 5 - Leased to Dr. Samar Mubarak for underground gasification. Feasibility studies has been submitted and a trial for 7-10 MW was conducted last year - waiting for approval from the Government to start the project on large scale.

Block 6 - Leased out to Oracle Coalfields PLC England. Working on financial close and is expected by end of 2017.

Block 7 - Consortium of American company and Fauji Fertilizer Corporation (FFC) was allotted - however, FFC backed out and there is a potential vacuum.

Block 8-12 - None of these blocks have been leased out to any company, so far.²⁷

The most involved Chinese company in the coal blocs is China Machinery Engineering Corporation (CMEC). They are working on diverse range of projects ranging from transmission lines, coal fired plants and industrial parks. They have the acquired the license from the concerned Ministry in Pakistan to develop and execute both mining and coal based power plants for block-2 in Thar, Sindh. Also, they have signed an exclusive MoU with the Government of Sindh to develop the Special Economic Zone in Sindh, which was shared by the Chief Minister Sindh, Mr. Murad Ali Shah, during the 6th JCC meeting in Beijing on the 27th of December 2016.

3.4 IMPROVING ECONOMIC INDICATORS (AFTER CPEC)

20

The Managing Director of the IMF, Mrs. Christine Legarde visited Pakistan at the end of 2016. After her brief yet thorough visit, she mentioned the progress of Pakistan in the following words: *“Just three years ago, the country was on the brink of an economic crisis. Today, and thanks to the authorities’ homegrown program of reforms that the IMF supported, the economy is on a much stronger footing”*

After the inauguration of CPEC the overall functioning of the government has amplified, as indicated by all the economic and fiscal indicators. Perhaps this had happened, due to a greater pressure exerted by the provinces/opposition parties or because of the prevalent threat of International alienation courtesy India’s lobbying, especially after recent skirmishes at Kashmir. In either case, Pakistan has managed to pull off an increasing growth rate, diminishing rate in increase of circular debt, reduction in load shedding and increasing taxation based revenue with respect to the GDP.²⁸

²⁷ Interview; Mr. Khursheed Jamali; Chairman of Sindh Engro Coal Mining Company Limited and Engro Powered Thar (Private) Limited

²⁸ Christine Lagarde, Managing Director, International Monetary Fund; Pakistan and Emerging Markets in the World Economy

The environment for business in Pakistan has also increased drastically, even though Pakistan has a very low ranking, 144 out of a total of 190 economies in terms of the “ease of doing business”. According to the “Doing Business 2017: Equal Opportunity for All” report published by the World Bank, Pakistan is one of the 10 improves.²⁹ Other positive economic indicators are mentioned below:

Growth Indicators

- **World Bank Report**
5.2% GDP growth prediction in FY16-17
- **MSCI Index**
Pakistan’s status improved from Frontier Market to Emerging Market
- **Cement Industry**
25% increase in annual demand from 44 million to 60 million tons
Industrial capacity enhancement by Cherat Cement, Arif Habib
- **Steel Industry**
30% increase in annual demand, expanding from 4 million to 6 million tons
- **E-Commerce Industry**
“Pakistan among fastest growing e-commerce platforms in the world” – CEO, eBay

Source: Pakistan - Positive Economic Factors³⁰

Provincially, what was once termed as a NO-GO area of the Khyber-Pakhtunkhwa province is seeing gigantic influx of Chinese and even other foreign nationalities. On the Panjkura River in Chitral, there are German, Austrian and Chinese firms operating and working for the development of small to medium scale hydropower projects. Similarly, the Chinese have shown tremendous interests to develop hydropower projects even in the insecure and far flung areas of FATA.

Similarly, the government of KPK, which was once inefficient and passive towards the behemoth CPEC investment, has taken a turn in their policy. Their ministers and bureaucrats have shown a profound interest in being part of the CPEC. As a result of which, the KPK government has hosted many road-shows in Beijing and there are many more to come in the near future. According to one of the senior Parliamentarians, Mr. Assad Omar:

“Prospects of Chinese investment coming in KPK and setting up industries look bright and for the first time ever KPK government has been able to project and present itself in front of the Chinese Investment companies.”

²⁹ Doing Business – World Bank (<http://www.doingbusiness.org/data/exploreconomies/pakistan>)

³⁰ Report: MSCI Pakistan Index, 2016

3.5 HYDROPOWER PROJECTS

Hydropower production under CPEC (energy) is the second major component. As per the figures mentioned in the table below, by 2022-23, 3.7 GW of energy will be added on the national grid by 2023 due to these large hydropower projects, namely: Karot, Kohala, Sukki Kinari and Neelum-Jhelum. Neelum-Jhelum, is not directly part of the CPEC, because the project started its construction in 2008 - but, the contractors and the sponsors of this project are Chinese. It is an indirect CPEC project. In addition to this the massive Diamer Basha Dam is still in the conception phase. According to Minister of Planning Development and Reform, the financing of this project is being secured from different International agencies; once that is taped up, the project is expected to be constructed by 2030-35. Table C in the appendix shows a list of currently under construction Hydro-power projects in Pakistan.



Neelum Jehlum Power Project 31

Few of the big Chinese companies that are working in the hydro sector China Three Gorges (CTG), China Ghezuba (CG) and Power China (PC). CTG is the largest hydropower company of China - by the end of January 2016, CTG's total controllable installed capacity amounted to 64540 MW globally, including nearly 6000 MW of wind and solar, added by 34580 MW of capacity under construction and 13600 MW attributable to its equity investment.³²

Some of the projects that CTG is working on are 99 MW wind farm in Jhimpir, 700 Karot and Kohala hydropower project. They are interested in developing the entire Indus cascade,

³¹ Official Planning Commission Website – cpec.gov.pk/energy

³² CTG's official website; 2016

as well, for which a MoU has been signed between CTG and concerned Pakistani departments. CG is working on extension of Mangla and Tarbella Dam and Sukki Kinari (CPEC project). Like CTG, CG wants to invest in other projects as well, however their financial muscle is limited as compared to CTG.

For the Karot hydropower project, **Silk Road Fund** has chipped in for the investment part. The Fund was established in Beijing on December 29, 2014, with \$40bn joint-investment from the State Administration of Foreign Exchange, China Investment Corporation, Export-Import Bank of China and China Development Bank

3.6 OTHER PROJECTS IN THE ENERGY SECTOR

RENEWABLE ENERGY AND CPEC

About 400 MW of renewable energy in the outlook of solar and wind has already been put up on the national grid, under the portfolio of EHP of CPEC. Due to the decreasing cost of solar, more and more Chinese investors are being lured to the lucrative Pakistani market. The recent tariff announced by the regulatory authority is around 6 USD cents/kwh, which is very less, compared to the initial tariff of around 14 USD cents/kwh offered to a Chinese sponsor for the Quaid-e- Azam Solar Farm.³³

As per the AEDB, there are more than 500 letter of intents (LOIs) issued to Chinese and other foreign and domestic investors who are interested to invest in the lucrative renewable sector of Pakistan. However, at this point in time the government is unable to consolidate a comprehensive and categorical policy for renewable energy.³⁴ The focus is on reaching commercial operation date for the large hydropower and coal fired projects so that the load shedding issue could be resolved, first, and then enhance the renewable capacity.

TRANSMISSION LINE AND CPEC

On the transmission side, China State Grid has been nominated from the Chinese side for the construction of the 660 KV transmission line from Matiari to Lahore and from Matiari to Faisalabad. These projects will carry 2000 MW of energy produced each. The commutative project cost is around 3 billion USD. These projects are Government to Government basis; therefore, the execution of these projects is taking a long time. The expected COD is in 2018/2019.³⁵

³³ Mr. HouPeng, Chief Rep, TBEA, 2016.

³⁴ Interview; AEDB Chairman, Mr. Amjad Awan.

³⁵ Official Planning Commission Website – cpec.gov.pk/energy.

3. 7 SHIFTS AND REFORMS IN THE GOVERNMENT TO CONSOLIDATE CPEC

Since the inception of CPEC the Government of Pakistan (federal and provincial), have found a new intent to work towards the development of the country. The Prime Minister of Pakistan chairs and monitors all the energy projects himself and summons the Cabinet Committee on Energy whenever he desires. This is the highest level of committee that exists and comprises of senior federal ministers and secretaries including but not limited to Federal Minister of Water & Power and Finance, Planning & Development. Due to the concerns raised by the provincial governments at that they are not being granted their due shares in the CPEC projects, the PM of Pakistan directed to formulate a CPEC- parliamentary committee, headed by Senator Mushahid Hussain Sayyed.

The role of this committee has been instrumental in terms of settling disputes and queries arising every other day regarding CPEC. Many organizations such as NTDCL, NEPRA, AEDB, representatives from federal ministries, provincial governments and the military have been summoned before the committee to brief on the progress of specific projects. The information imparted in these sessions is critical in eradicating the information gaps that exist even at the highest strata of the policy-makers of the country.

UNIFICATION AMONGST PROVINCES

On 27th December 2016, Mr. Ahsan Iqbal, Minister of Planning, Development and Reform headed a delegation comprising of Chief Ministers of all the four provinces to Beijing, to attend the 6th Joint Coordination Committee's meeting with the National Defense and Reform Commission of China (NDRC). The representation from Pakistan's all four provinces was unprecedented.

Chief Minister KPK also attended the meeting under the leadership of Federal Minister, Mr. Ahsan Iqbal. Even though the province of KPK and the Federal have differences, yet, for the greater good of the country, he had decided to participate in the all-important JCC meeting. Therefore, it can be safely concluded that CPEC has fostered a sense of unification amongst all provinces to take the development in Pakistan forward.

SPECIAL SECURITY DIVISION

CPEC has introduced more than 400 private and state-owned enterprises of China in Pakistan. ³⁶The Chinese are working all over Pakistan. Security was the number one concern of the Chinese after CPEC was initiated. Last year to address the issue the Government in

³⁶ Presentation by SSD management in front of the Parliamentary Committee on CPEC

consultation with the Pakistan Army announced the formation of the Special Security Division. The division, which comprises nine army battalions and six civil wings encompassing 13,700 personnel, has been tasked with securing CPEC projects and protecting Chinese nationals working on the projects. Currently, the Chinese have started working in Baluchistan and KPK provinces as well, where were once considered no go areas for any foreigners. This is the positive side of the picture and with the help of the security forces, the Chinese working in Pakistan will feel secure and safe.

4. CHALLENGES FACED WITHIN THE ENERGY SECTOR

4.1 ONE-WINDOW SOLUTION - A MYTH?

In the 1980s, the government of Pakistan decided to resort to private investments for producing energy. For this purpose, assistance of HUBCO (the first private sector power generation project) and another IPPs was sorted. This convinced the government to create an independent body with all the technical, financial and legal experts who can help investors land the right project and the help in developing it as well. Hence, PPIB was created, by the federal essentially a public body but with the requisite corporate outlook to attract and lure in investments.

The power policy of Pakistan dictates that an investor must go through many tedious steps to eventually reach the commercial operation date (COD) of the power plant. Following are the steps starting from pre-qualification till the COD of the project.

- Registration with concerned Federal entity (PPIB) or provincial (PEDO/EDP/EDS) by depositing a certain amount of fee along with a preliminary proposal;
- Examination of proposal and evaluation of credentials of the sponsors by the concerned authority;
- Submission of Performance Guarantee (PG) @US\$1000 per MW by Sponsors / Project Company to concerned agency for Issuance of Letter of Intent (LOI);
- Submission of Tariff Petition and Application for Generation License to NEPRA by the sponsors;
- Tariff Determination and issuance of Generation License by NEPRA & Submission of Performance Guarantee for LOS; Issuance of Letter of Support (LOS) by PPIB, after acceptance of PG by PPIB;
- Negotiations / Finalization of Project Agreements (IA, PPA, FSA/GSA);
- Achievement of Financial Close within nine (9) months from issuance of LOS;
- Commencement of construction activities;
- Achievement of Commercial Operation Date (COD) within the deadline stipulated in the LOS /IA /PPA.³⁷

³⁷ PPIB official website.

Since the inception of PPIB, provincial energy departments have also emerged, the description of each has been entailed in the section above. The primary goal of these bodies is to provide turn-key one window solution to the investors and expedite the processes starting from registration to achievement of the COD. Unfortunately, these departments have been unable provide the acclaimed solution. Numerous power projects have taken 3-5 times more time to reach COD then the expected time as per the guidelines of the one-window-solution provider.

These are structural inadequacies inherited in the system. PPIB cannot be effectively the one window solution provider because, to materialize a power project, the sponsor needs to go through NTDC, NEPRA, Ministry of Finance (MoF) and many other organizations for getting approvals and agreements. Realistically, PPIB is unable to provide any financial or legal help as per their mandate and all the Chinese companies have hired their own dedicated financial and legal teams to execute negotiations with the concerned departments.

Similarly, the provincial energy units can merely do anything other than the issuance of the Letter of Intent (LOI). Even this clause was added only recently as per the 18th Amendment which was approved by the parliament, after the issuance of the LOI, the sponsor needs to get other approvals and agreements signed with other federal authorities - which is a cumbersome and stagnant process.³⁸

4.2 COAL & ENVIRONMENTAL SUSTAINABILITY

SAHIWAL COAL POWER PLANT AND THARPARKAR

The coal being used for Sahiwal Coal-fired power plant is ultra-supercritical. Studies have shown that this type of coal runs the plant at a 45% efficient, as opposed to the conventional 32%. In one hour, a 1200 MW coal power plant would produce 1200 Kg of carbon dioxide, 9 kg of nitrous oxide and 5 kg of Sulphur dioxide. All these pollutants fall back on earth in the form of an acid rain. This disturbs the mercury level.³⁹

Coal emissions and ash increases the amount of arsenic and lead contents in the groundwater. Resultantly, this reduces the quality of drinkable water as well as water used for irrigation purposes. Sahiwal is a very fertile land and it used for agricultural purposes. The inception of a coal fired power plant would hamper the agricultural yield. Sahiwal and Okara districts are famous for prodding milk. Due to these emissions and deteriorating water levels, the milk production will be effected, as well. One of the very harmful emissions in PM10 – this gas enters the human and animal respiratory systems and causes diseases.⁴⁰

³⁸ Interview with Director Hydro, PPIB.

³⁹ The News, Article, March 2016; The-Sahiwal-power-plant.

⁴⁰ Environment Protection Agency (EPA) Report – Pakistan Today.

A 1200 coal power plant would require 10 million cubic foot of water every day. Considering, that there are is no sea near Sahiwal, this water will be supplied from the nearby canals. Approximately, this amount of water could provide livelihood for around 57,500 farmers. Moreover, 1400 tons of coal per day is the requirement for a gross production of 1200 MW of energy. This means that this amount of coal would need to be transported from Karachi to Sahiwal. The railway ministry had procured new locomotives for this specific exercise costing them at least 500 million USD.⁴¹

If there were any considerations to sustainability and long-term durability of the project – this project would not have been conceived. Tharparkar region, on the contrary, would have been a much better site for any coal power plant development in Pakistan, due to the following reasons:

1. Availability of water from the Arabian Sea.
2. Sporadically populated as opposed to Sahiwal or any other agricultural region in Punjab.
3. Imported coal transportation cost from Karachi to Tharparkar would be much cheaper than to Sahiwal.
4. Imported coal can be utilized until indigenous mines are excavated – for this, the boiler of the plant needs to be adjusted, accordingly.

4.3 CIRCULAR DEBTS

The term circular debt has three components to it: cash flows which are based on the performance of the distribution companies (DISCOs), subsidy payments by the government and tariff determined by the regulator, NEPRA and the behavior of the International power sector (price of oil). Dated 31st December 2016 the circular debt of the power sector has been recorded at 393 billion PKR. On 31st December 2014, the same debt was 298 billion PKR. The debt increased from 2014 to 2016, however, the rate of increase of the debt has been diminishing (decreasing).

The following factors have attributed to this positive indicator:

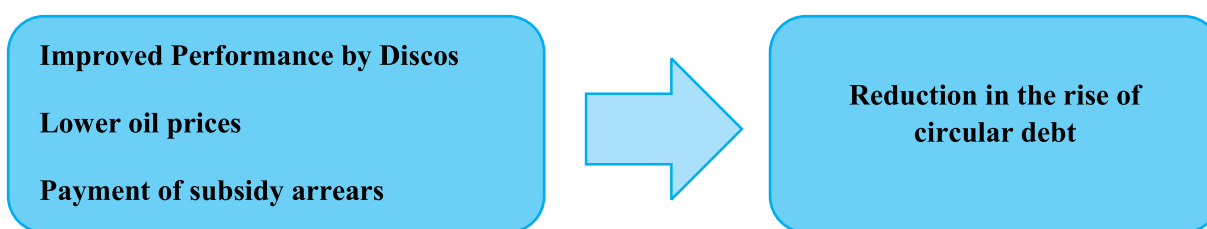
The DISCOs have been able to enhance the rate of recovery from 88% to 93%, in 2014 and 2016 respectively. Also, the T&D losses have decreased to an all-time low at 17.9% in 2016. Previously they were at 19%. This efficiency on part of the state-owned companies has added Rs 116 billion in the cash flow in the last two years - which is a great achievement on part of the government. Subsidy payments which were due were made by the government and the lower oil prices in the world economy have also resulted in the decrease in the circular debt.

⁴¹ The News, Article, March 2016, The-Sahiwal-power-plant

Following table illustrates the facts and figures from 2014-2016 pertaining to the circular debts:

Year	Assumed Recoveries	Assumed line-loss	Actual Recoveries	Actual line loss
2014	100%	15.3%	88.6%	19.1%
2015	100%	15.3%	93%	17.9%
2016	100%	15.3%	93%	17.9% ⁴²

⁴³ Line losses



4.4 SOVEREIGN GUARANTEES

What is Sovereign Guarantee?

To evaluate and understand the exact nature of the guarantees involved in the IPPs detailed categorical interviews were held with senior strata of PPIB and the Planning Commission.

According to a ruling passed by the Parliament, the Prime Minister of Pakistan has given the authority to PPIB for issuing the official sovereign guarantee to the sponsors of the IPPs. The sovereign guarantee ensures that if for any unforeseen circumstances the buyer of the electricity (the Government of Pakistan) is unable to pay the sponsor, the sponsor will get the requisite payment through the sovereign guarantee.

Another important thing to note is that this guarantee is a federal subject and not a provincial. The sovereignty is only entitled to the federal government and not to the provincial governments. In totality, there are following three major agreements covering majority of the risks of the investor:

- Implementation Agreement
- Power Purchase Agreement
- Fuel Supply Agreement

Similarly, the lender signs three simultaneous agreements with the sponsor. In totality, there are a total of 6 agreements which protect the interests of the lender and the sponsor. Over and

⁴² NTCL official website.

⁴³ NEPRA - State of Industry Report 2016.

above there is the sovereign guarantee which further sets in stone the repayment method for the sponsor. If the sovereign guarantee fails for some reason then the issue is resolved by the UNICTRL arbitration. The cost of handling the arbitration is much more than the payments that need to be made from the government to the sponsor.

HOW IS CPEC IPP DIFFERENT?

There are two distinctions in terms of the modality of the CPEC IPPs.

1. Sinasure: China Export & Credit Insurance Corporation (sinasure) charges 6% of the total project value to insure any CPEC project in Pakistan. This value is in addition to the regular insurance recommended from PPIB. The regular insurance is done in two parts: first component is from the time the equipment is transported from foreign country to Pakistan till the construction of the project; second component is the operation and maintenance phase of the project, post COD.
2. Buffer Budget: 22% of the total cost of the project must be kept in a bank account known as the buffer budge – this will ensure that if in case the government is unable to fulfill the terms and conditions stipulated even in the sovereign guarantee for whatever reason, this buffer budget will be utilized to pay the bills to the sponsor.

IMPLICATIONS

The guarantee is a mandatory and important part to lure and investment for a project, especially in the case of developing countries. The government of the host country is bound to provide sovereign guarantees to provide comfort zone and confidence for the investors. In Sweden, for instance, the government issued financial guarantees to promote energy projects, fishing, housing, agriculture and shipbuilding. In the 1990's the guarantees there were used in assuaging the Swedish banking crisis by injecting investment in infrastructure projects.⁴⁴

The government of Pakistan, on the other hand, is a very weak functioning body with bleak financial reserves. According to Dr. Salman Shah, former advisor to the PM on finance, the in 2016 sovereign guarantees have increased to 1.3 billion USD, while in 2012 the total amount was only 0.1 billion USD. In case of any adverse circumstances the government will have to pay the debts to the sponsors, which intrinsically shall increase the government deficit, thereby putting more burden on the public. Resultantly, the government resorts to increase in taxation, borrowing from International donors or imposition of new tax regime to pay for the debts.⁴⁵

⁴⁴ The Guardian Article, Sovereign Guarantees in Infrastructure Finance, 03 November 2015.

⁴⁵ Business Recorder, Article, CPEC Sovereign Guarantee, 26th January 2017.

4.5 PROVINCIAL & FEDERAL DICHOTOMY

According to the power policy of 1995 the provinces were allowed to issue LOIs for projects less than 20 MW and the federal government could proceed with projects greater than 20 MW. Then according to 2002 power policy, the provinces were allowed to process power projects less than 50 MW and the Federal had control over greater than 50 MW.⁴⁶

Affording to the 18th amendment made by the Parliament of Pakistan on in 2016, the provinces have finally given the complete authority to execute power project of any magnitude by themselves. There is a minor trick involved here – to realize the sovereign, guarantee the provinces must resort to the PPIB (federal government). So, in any case, the IPP must be conceived and administered in consultation with the Federal and provincial authorities. The provinces are not autonomous in nature and they are unqualified to issue such a guarantee. A provincial guarantee may be issued by the respective provincial banks; but, that does not placate the sponsors, in most of the cases.

In either case, if the province or federal develops power projects, the project falls back under the provincial domain after the BOT period of 30 years. Similarly, all the projects, irrespective of their federal or provincial outlook are bound to generate electricity on the National Grid. This illustrates that any IPP is undeniably for the development and progress of Pakistan and not specifically for any provincial unit. Conversely, in the short term, the provinces may use the project to accomplish some political benefit out of the classification of the project in the provincial or federal spheres

5. POLICY RECOMMENDATIONS

1. **Focus on demand side fixes for a long-term sustainable solution (Reduce T&D losses immediately):** The authorities and regulatory authorities in Pakistan need to focus on demand side faults and not just on supply side fixes. In the short run, indeed, the supply side fixes i.e. using more power plants to generate more electricity will curb the load shedding problem. Nevertheless, for the menace of load shedding to be eradicated perpetually the demand side fixes including but not limited to the T&D losses need to be dealt with accordingly.
2. **Follow best practice models set up by other developing countries:** In India for these demand side faults have been fixed by introducing anti-theft laws, introducing latest technologies such as smart distribution transformers and by exercising modern forms of management tools. One such precedence has been set by the Karachi Supply and Electric Company (KESC) in Pakistan as well. The DISCO was privatized, since then, they have used simple yet effective management techniques to solve the issue of power shortage in the economic hub of the country, Karachi. So far, they have been able to yield positive outcomes.

⁴⁶ Interview; Director Hydro PPIB, 2017

3. **Rely on Indigenous Resources:** Oil, gas and coal reserves of Pakistan have largely remained unexplored due to various reasons discussed in the report. According to Michael Kugelman of the Wilson Center of the US, less than 4% of the probable oil reserves, 19% of the oil reserves and just 1% of the coal deposits have been proven. There is a massive room for exploration and improvement in this field. For this, there is a dire need for a technological advancement as being applied by other fast-developing countries. These rich hydrocarbon areas happen to be the most insecure areas of Pakistan as well. The people of these areas often tend to believe that their resources are being exploited without the provision of their due shares. This traditional mindset needs to be addressed by the current governments, both federal and provincial - only then this issue could be resolved.
4. **Regulating the sovereign guarantees:** There should be an upper limit on the guarantees offered by the central government, per year, and the data should not be concealed from the public. According to the 18th amendment, provinces can individually execute a power project. They should also be allowed to execute provincial guarantees from their own budgets to lure in investors by themselves. This would considerably reduce pressure on the financial resources PPIB/central government.
5. **One Window Portal:** To actualize and realize the notion of one window solution, all the federal and provincial entities and organization involved in the energy sphere need to have a more coordinated approach towards implementing power plants. Vested interests should be kept aside and all the sponsors should be given equal and unified treatment. An effective mechanism would be to make an online portal which could be accessed by all the stakeholders alike. All the information required by the sponsor should be online on that portal, such as the appropriate tariffs, agreements' status, the time required and other associated data. Steps like these will consequence in ginormous interest of investors from all around the globe in Pakistan's profitable energy spectrum

Mr. Miftah Ismael, Chairman Board of Investment (BOI), mentioned at the 23rd Parliamentary Committee on CPEC - "all provincial entities, as well as Federation, needs to sit in one room to make things work in an effective manner" – there should be one supreme body.

6. **Lack of Coherent and Consistent Tariffs** - As mentioned in section 2's renewable and CPEC section that the tariffs have been drastically changed in renewable industry over the last couple of years. This shakes up investor's confidence. Therefore, the tariffs should remain same at least for a considerable (3-6 years) period so that investors could be lured in and absorbed.

6. CONCLUSION

The China-Pakistan Economic Corridor is considered a game changer for Pakistan. The majority share of this corridor is concentrated towards the energy sector: coal, hydro, renewable and thermal power plants have been conceived and are being implemented after the formal beginning of the CPEC.

Theoretically, within 4-5 years, Pakistan would become self-sufficient in terms of producing energy for both industrial and domestic purposes. However, the on-ground picture is not the same. To attain all-out utilization from the gigantic investment in the energy sector through the CPEC framework, the Government of Pakistan needs to revamp its energy-policy as well as the methodology and mechanisms through which an investor should go through.

As far as energy policy is concerned – self sustainability and sufficiency can only be attained if the emphasis is made towards fixing the demand-side issues. Even if more power plants are constructed and implemented, there cannot be a long-term solution to address the energy crisis, unless T&D losses are reduced, equipment is overhauled and indigenous resources are preferred as opposed to costly-imported sources of energy. On the other hand, the supply side needs to be made effectual and the red-tape needs to be cut. This can be achieved by introducing—an effective one-window portal for all the investors alike and by implementing consistent power policies, including but not limited to those related to tariffs and sovereign guarantees.

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Appendix

1. Table A (Projects initiated in the Thar)

Project/Category name	CPEC PROJECT - Engro 4x330 MW	CPEC PROJECT - 2x660 MW Mine Mouth Power Plant	330 MW Thar Coal based Power Project	330 MW Thar Coal based Power Project	1320 MW Thar Coal based Power Project	660 MW Thar Coal based Power Project near Port Qasim	330 MW Thar Coal based Power Project near Port Qasim	1320 MW Thar coal based Power Project
Primary Energy Input	Coal (Local)	Coal (Local)	Coal (Local)	Coal (local)	Coal Local	Coal - Local	Coal Local	Coal Local
Technology	Sub Critical	Sub Critical	Sub Critical	Sub critical	Sub Critical	Sub Critical	Sub Critical	Sub Critical
Installed Capacity (MW)	1320	1320	330	330	1320	660	330	1320
Location	Thar-Block-II-1.57 billion tonnes of coal	Block 1, Thar	Thar Block-II, Sindh	Thar block 2	Thar Block 1	Port Qasim	Thar	Thar Block VI,
Province	Sindh	Sindh	Sindh	Sindh	Sindh	Sindh	Sindh	Sindh
Cost (US \$ Million)	2,000	2000	500	500	2000	1000	500	2000
Executing Company	Engro Power Gen Thar Ltd. / China Machinery Engineering Corporation (CMEC)	Sino-Sindh Resources Limited	Hub Power Company Ltd	Thal Nova Power (Pvt) Ltd	Shanghai Electrics	Lucky Electric Power Company	Siddiqsons Limited	Oracle Coal Field PLC England
Financing	Independent Power Producer (IPP)	IPP	IPP	IPP	IPP	IPP	IPP	IPP
Coordinating Ministry	Ministry of Water and Power	Ministry of Water and Power	Ministry of Water and Power	Ministry of Water and Power	Ministry of Water and Power	Ministry of Water and Power	Ministry of Water and Power	Ministry of Water and Power
Supervising Agency	Private Power and Infrastructure Board	PPIB	Private Power and Infrastructure Board	PPIB	PPIB	PPIB	PPIB	PPIB

	(PPIB)		(PPIB)					
Status	By last quarter of 2018 - mining processes will be completed. Expected COD: December 2018 (First 660 MW) and June 2019 (for the Second 660 mw)	COD expected end of 2018/2019	LOS issues, FC in progress, COD expected end of 2019 as per PPIB	LOS issues, FC in progress, COD expected by end 2019 (as per PPIB)	LOS issued, FC in progress, COD expected: June 2020 (as per PPIB)	LOS issued, FC in progress, COD expected: December 2020 (as per PPIB)	LOS issued, FC in progress, COD expected: June 2020 (as per PPIB)	Project proposal YET to be submitted - NO FC/LOS - PPIB predicts that COD will be done by 2021 mid-year. Accd. to sources mining project will also be done by the same company .

2. Table B (Mining Coal Projects in Thar)

Project	Surface mine in Block II of Thar Coal field, 6.5 metric ton per annum (mtpa)	SSRL Thar Coal Block 1 - 6.5 metric ton per annum(mtpa)
Technology	Open Pit Mining	Open Pit Mining
Location	Block 2	Block 1
Estimated Cost (USD million)	1470	1300
Sponsors	China Machinery Engineering Corporation (CMEC) / Sindh Engro Coal Mining Company (SECMC)	Sino-Sindh Resources Limited (SSRL)
Supervising Agency	Thar Coal Energy Board (TCEB)	Thar Coal & Energy Board (TCEB)
Coordinating Ministry	Ministry of Water and Power / Ministry of Petroleum and Natural Resources	Ministry of Water and Power / Ministry of Petroleum and Natural Resources
Status	FC achieved, IA signed, COD expected 2018/2019	COD expected in 2018/2019

3. Table C (Hydel Power Projects)

Category/Project Name	Karot	Kohala	Sukki Kinari	Neelum-Jhelum
Primary Energy Input	Hydel	Hydel	Hydel	Hydel
Technology	Hydel	Hydel	Hydel	Hydel
Installed Capacity (MW)	720	1100	879	969
Location	AJK/Punjab	Jhelum River near Muzaffarabad	River Kunhar (Jhelum)	Jhelum River
Cost (USD)	1.42 billion	2.4 billion	1.802 billion	4.03 billion
Financing	Independent Power Producer (IPP)	Independent Power Producer (IPP)	Independent Power Producer (IPP)	Independent Power Producer (IPP)
Sponsor	China Three Gorges	CTG/CWEI (China Three Gorges)	China Gezhouba	CGGC-CMEC, Consortium of China
Project Progress	Financial close in 2017; construction in progress, COD expected in 2022	Financial close planned in December 2017; COD in 2023	Financial Close reached; construction about to start; COD in 2022	Dry test expected on Dec 2017; Full operation to commence on Feb 2018, as per WAPDA



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