



The Role of Logistics Infrastructure in China Pakistan Economic Corridor Energy Generation Development

Rao Qasim Idrees^{1,2*}, Rohimi Shapiee³, Haniff Ahamat⁴

¹National University of Malaysia, Malaysia, ²University of Gujrat, Pakistan, ³National University of Malaysia, Malaysia,

⁴National University of Malaysia, Malaysia. *Email: qasim.rao@uog.edu.pk

Received: 25 August 2018

Accepted: 26 November 2018

DOI: <https://doi.org/10.32479/ijeeep.7045>

ABSTRACT

Providing cheap and adequate supply of electricity is the backbone of the economy of country. It is recognised worldwide that key sectors of the country including trade, business, manufacturing, agriculture are heavily dependent on uninterrupted electricity supply. In addition, fast progress of the country and well being of the people is linked with strong and proper logistics management system. Pakistan has been encountering terrible energy shortage for almost last two decades. Considering such energy deficiency, this article provides broad information of the energy and logistics management in Pakistan and the problems it is dealing with. Furthermore this article provides the comprehensive frame work of China Pakistan Economic Corridor (CPEC) energy projects and analyse how logistics sector improvement can overcome energy deficit. In addition, this article examines the various factors which are responsible for the uneven power supply in the country. This article concludes that without upgrading logistics infrastructure the energy deficit would not be handled. Therefore, in such situation, as per CPEC logistics and infrastructure investment strategy, Pakistan can get consistent, excessive and cost effective power supply in order to streamline ever increasing energy needs and also ensures sustainable economic development of the country.

Keywords: China Pakistan Economic Corridor, Energy Generation, Logistics Infrastructure, Renewable Energy

JEL Classifications: Q40, Q41, Q47, Q48

1. INTRODUCTION

The objectives of this paper are to bring at front the current energy situation, analyse the basic issues and forthcoming challenges behind the unprecedented energy crisis in Pakistan.

Energy is considered as most significant reason for human wellness as well as economic development. Energy is also an indicator of economic and social improvement. In current situation around the globe, majority of the states use non renewable energy production methods which are not sustainable (Gabbasa et al., 2013). Pakistan has bestowed with best fertile land, suitable weather conditions and plenty of water resources by nature. However, this is pretty regrettable that regardless of occupying enormous energy resources particularly the coal minerals in area of Thar, a rich mineral district of Baluchistan, but the country is still facing horrible

energy shortages. The capacity of the country to generate enough electricity has been adversely affected because of poor organization and be deficient in effective rules and regulations. The numerous and long-standing electricity load shedding could direct to fall of economy of the country. According to recent statistics, more than 140 million people in the country have not been provided with proper electricity supply and consequently they are miserably facing frequent electricity outages which are >12 h out of 24 h. Furthermore this situation becomes a main reason for public strikes and held numerous protests against the authorities and public officials. Due to this situation, lowering of gross domestic product (GDP) growth rate and reduction in the industrial and commercial benefits can be visibly noticed (Kazmi, 2017).

China and Pakistan endeavours to tackle this severe crisis jointly and in November 2014 brought out several early harvest energy

producing projects in coal, solar, wind and hydel power sectors. The rationale for giving huge importance to energy producing plans with a total capacity of 10,400 MW is due to immediate and long lasting solution of this national substantial issue which hits badly every sector in Pakistan. China Pakistan Economic Corridor (CPEC) in current situation, deals 12 early harvest energy producing projects together with Sahiwal coal fired project, Port Qasim power plant and Karot Hydro power station. Moreover, with ongoing efforts, it can be perceived that such projects will be completed during current year (2018) and consequently will improve the energy production up to the mark. In addition, during first one belt one road (OBOR) summit last year hosted by China took further positive steps for Pakistan particularly in the energy production area together with other important infrastructural projects. Pakistan and China signed various agreements during that summit pertaining to CPEC energy production policies (Vats, 2016).

2. ENERGY SECTOR IN PAKISTAN

In Pakistan, among many others, electricity short fall is major threat to the struggling economy. While in international oil market where price and availability are better than before, Pakistan still encounters major energy shortages of 4,500–5,000 MW. It is pertinent to mention here that previously and currently, such power deficiencies have risen to 8,500 MW which is higher than 40% of national requirement. The developed areas as well as backward regions in the country frequently facing long hours of load shedding without any prior intimation or prescribed schedule. However, in certain areas people are fortunate to face minimum time as 4 to 5 hours each day. For the purpose of electricity generation, Pakistan is extensively consuming oil and gas and such mega use of indigenous energy sources can further lead to domestic scarcity in near future. Furthermore, Oil and Gas Development Company Limited already warns that if current situation persist, Pakistan's local oil reserves will be ended by 2025, and further Pakistan will totally lost indigenous reserves of natural gas by 2030 (Kugelmann, 2015).

On the other hand, Pakistan's energy troubles are also deeply linked with poor performance of authorities as well as supply issue. In addition, Pakistan electricity sector further affects from large number of discrepancies, like transmission and distribution (T and D) losses which are currently 20% and more along with heavy debt. Moreover, such losses are also due to faulty tools, weak maintenance and electricity unauthorized hidden supply. Non payments to the electricity distribution companies are further cause issues of cash flow and leads to the heavy circular debt. In this regard, electricity producers, dispensers, and providers are deficient in finance. This is owing to a defective pricing strategy in which the state receive high amount against electricity supply and therefore few number of people can afford to pay charges. In consequence, returns are insufficient, and the department failed to supply required electricity to the national grid. Pakistan's energy deficit has disturbing repercussions for the weak economy and unstable security conditions in the country. Due to prevailing circumstances, electricity short falls have charged the country about 4% of GDP. Furthermore, a large number of industrial units and plants have been forced to shut down in which most of these are situated in big industrial cities of the country. Not only

the domestic manufacturer companies are facing this miserable situation but multinational companies have also closed their plants in Pakistan (World Bank group, 2013).

In international scenario, the energy shortages of Pakistan has also discussed with concerns and worries. For example, Moody's a world class analyst institute predicted that electricity outages in Pakistan will place it in awkward monetary situation (2015, the Moody's ratings group). In the meantime, the electricity breakdown has caused protests which are more often brings violence and aggression among citizens. Demonstrators, furious due to spontaneous load shedding, have come out to the streets and roads and also physically harass the officers and political entities of the country.

The most alarming perspective of this situation is insurgents in Pakistan are active to get benefits of power shortages. For example, during the last 6 years, separatists in the province of Baluchistan have attacked about 100 gas supply lines. After these massive attacks, insurgents in province of Baluchistan attacked and damaged two major electricity polls adjacent to a main grid station, interrupting the national power supply and falling 80% of the country into black outs. Furthermore, in another insurgency incident in KPK province and this caused 25 million cubic feet gas supply reduction in the country. However, the insurgents from province of Baluchistan are not only involved in power infrastructure attacks but another Pakistani Taliban terrorist movement occasionally hit power supply infrastructure. In April 2013, this group attacked and destroyed the biggest grid station in KPK province in which Peshawar city also the provincial capital of KPK lost complete electricity for hours (Rafiq, 2017). Moreover, large numbers of sectors of the country are badly hit by electricity outages. Long hour load shedding not only avert citizens from doing their work, but also they are unable to cook at homes and more serious not getting appropriate medical treatment and facilities as several hospitals and medical care centers not equipped with required facilities due to electricity shortages. This critical situation points out the electricity shortages as Pakistan's top priority issue to deal with.

3. CURRENT ENERGY PRODUCTION

The following econometric model has shown the current and future estimated energy production in Pakistan (Figure 1). This model has been retrieved from trading economics forecast (Trading Economics, 2017). Electricity generation in Pakistan is predicted to be 13000.00 Gigawatt-hour at the end of this quarter, as per analysis of Trading Economics global macro models and analysts ideas. For prospective period, it is estimated that energy generation in Pakistan to further elevate up to 11304.04 in 1 year time period. In future for a long time period, the Pakistan electricity generation is expected to stand around 12300.00 Gigawatt-hour in 2020, as per this econometric model.

4. HOW PAKISTAN GENERATES ELECTRICITY

Renewable alternative energy sources are getting more attention to the depleting nature of non renewable fossil fuels. Increasing global

Figure 1: (Trading Economics, 2017)

warming, caused by the combustion of fossil fuels, triggered the research led aspects in finding out better energy options (Pudukudy et al., 2014). This part of research paper elaborates current sources of electricity production in Pakistan. The information for this purpose has been retrieved and based upon fact report prepared and issued by Islamabad Chamber of Commerce and Industry Islamabad in 2017 (ICCI, 2017). In this regard, energy produces in Pakistan through hydel, thermal, nuclear, wind, solar sources. Each has been discussed in further part.

4.1. Thermal

In Pakistan, the main source of electricity generation depends upon thermal power technology. In current situation, thermal power production provides 8,300 MW electricity in national grid, but such plants have low exchange efficiencies and are costly to uphold and functioning. A large number of thermal power plants are running and managed by independent power producers (IPPs), and they utilize furnace oil which is turn out to be extremely high-priced in recent years particularly in Pakistan. For this purpose, the furnace oil brings in to Pakistan and it extracts heavy amount from country's foreign reserves. However, a number of such energy producing plants utilizes natural gas to stimulate energy although Pakistan is also deficient of natural gas resources from recent period.

4.2. Hydro Power

Hydro power is considered as cheaper resource of generating electricity. In this process, electricity is generated with turbine system where water plays actual role. Nature bestowed Pakistan with plenty of water resources and they are in ideal situation for converting in to electricity. However, only 34 % of overall electricity generation is extracting from hydro power in the country. In current situation, Pakistan has the capacity to generate 41000–45000 MW of hydro power electricity but owing to lack of funds and transmission inefficiency only 6555 MW is generating for national grid.

4.3. Wind

Wind power systems installation has played an important role based on the fact that wind power systems are clean, environment friendly and secure energy source (Khatib, 2013). Wind power connects the movement of the wind to push the system of wind turbines. In the process of wind power electricity generation, turbines further rotates the magnets inside which consequently generates electricity. As per geography and weather situation in Pakistan, it has big capacity to generate electricity through wind power and it can be estimated from 10000 MW to 50000 MW. Wind electricity production is limited in Pakistan and government

is working to enhance its capacity through different projects. Currently 6 MW project is initiated in first phase in Jhampir which holds by a Turkish company and further 50 MW is in progress to be installed soon. In the same process further wind generation plants will be installed in Jhampir, Gharo, Ketu Bandar and Bin Qasim Karachi.

4.4. Solar

Pakistan as per its environmental conditions is in best situation to produce energy from solar plants in different areas of the country (Shah et al., 2013). Pakistan has capacity to get about 100,000 MW from solar energy. There is development work is going on in all the provinces of the country on solar energy plants. In addition, there are various commercial projects in markets of Pakistan for the promotion of solar energy equipments and best utilisation of this technology (Fudholi et al., 2014). For this purpose, private companies are importing and providing panels and solar water heaters to the consumers. The use of this renewable energy source is also promoted by Alternative Energy Development Board (AEDB) Pakistan and currently this institute is in process to provide 20,000 solar water heaters in remote areas of Gilgit Baltistan a mountainous region in the north of Pakistan.

4.5. Agricultural Biomass/Biodiesel

Biomass energy generation is also under consideration by Pakistani authorities. This is a popular system of generating energy through renewable sources like garbage, vegetables, sugarcane. This process involves decomposition of garbage which consequently produces methane gas and transmitted in to pipes for the production of energy. Moreover, fossil fuels technology which involves direct burning of wood and vegetation for producing energy is also under consideration for future plans. This technology gains popularity around the world as leading economies involve in this power generation source. For instance, Brazil and USA are at forefront by applying this renewable energy source through wide range of initiatives. In the same vein, 10 MW of electricity is planned to generate from garbage and domestic and commercial by AEDB of Pakistan (Shakeel et al., 2016). This experiment will be carried out in Karachi a coastal and biggest city of Pakistan at first stage and further initiated in other parts of the country.

4.6 Electricity Production from Nuclear

Energy generation through nuclear power plants is limited in Pakistan and it has only 425 MW installed capacity. Pakistan is in process to enhance this capacity by taking different initiatives in this regard. The big issue in the way is Pakistan still not a member of Nuclear Non-Proliferation Treaty, which excludes him from

any progress or advancement in civil nuclear technology and also barred any kind of trade involves nuclear plants and equipments. Figure 2 highlights the energy generation percentage through different sources in Pakistan.

5. WHY PAKISTAN ENCOUNTERS MEGA ENERGY OUTAGES

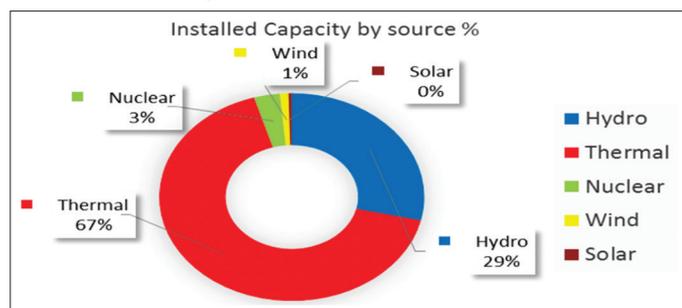
In previous part of this research paper, some basic factors relating to energy crisis have been discussed. In this part, authors provide detail analysis of electricity crisis in Pakistan. The information in this part attributes from Nargis Sethi research contribution for the purpose of finding electricity shortages reasons. The current emergency situation begins in 2006–2007, where an undesired difference between demand and supply of electricity get started. With passage of time and no further focus on this situation, such crisis has widened, and converted in to failure of electricity management and supply system. Furthermore, the electricity department of Pakistan has undergone a monetary catastrophe due to high fuel rates. Pakistan energy sector has also affected due to poor governance, political intrusion in policy making, unfavorable decisions of getting electricity from private investors like IPPs, disorganized power utility schemes, electricity unauthorized use by citizens, weak billing and recovery management, and defaulters of outstanding payments. In addition, the lack of efficient arrangements and a cost-effectively and fiscally feasible policy, as well as an ineligible supervisory body, have produced supply-demand issue.

The condition has been additionally deteriorated owing to main transmission and distribution losses, the growth and misuse of labor unions for supremacy, and decreasing payable amounts collections by the department. These flaws and irregularities in the system have brought to the constant addition of circular debt. Therefore, such situation compels the federal government to allocate huge amount of national budget for subsidies in order to avoid the fiscal constraints in the electricity department. However, such policy is not in favor of financial growth as well as become a source of addition in public debt (Sethi, 2015).

6. REASONS FOR ELECTRICITY BREAKDOWN

The electricity breakdown in Pakistan has not developed in a single day but it comes through a series of different factors which are responsible for this miserable situation. The authors attempt to

Figure 2: (Khan and Ashraf, 2015)



highlight these reasons with short briefing of each of them. The following information has been retrieved from business support organization forum (BSOF, 2014).

6.1. Institutional Drawbacks

Managerial and departmental flaws have escorted to ineffective administration, improper handling and preservation of equipments, malfunctioned and outdated technologies, bribery and dishonesty within institutions.

6.2. Demand and Supply Overlooked

From past years, electricity demand in Pakistan has mounting tremendously. It is believed that population expansion by itself necessitates thousands of megawatts each year to be added in national electricity transmission. Nevertheless, electricity production has not improved by the time which consequently led the people of Pakistan towards mega scarcity throughout the country.

6.3. Finance and Subsidies

In Pakistan, electricity department finance is highly relied on subsidies by the government. In this regard, such subsidies have put great pressure on national economy by costing 2% of GDP. Furthermore, these subsidies receiving 15–17% revenues from budget allocations each year. However, due to financial crisis in the country, these subsidies are no more available on power generation programs.

6.4. Circular Debt

The circular debt problem is considered as big hurdle in way of development of energy sector. It involves the poor financial situation of power sector as well as over dues of payments in oil and gas sectors. These circular debts are also responsible for low and irregular electricity production by the power producers.

6.5. Line Losses

Line losses is considered major factor responsible for the electricity outages in the country. Line losses deteriorate the functioning of the power sector and have caused major expense to the system. In current situation, approximately all distribution companies (DISCOs) occurring losses are elevated than the limit fixed by the supervisory body to these companies. This allows the system to cover the poor situation with generators, and also these line losses uplift the whole costs of the power generation system. In consequence, a large share of electricity is wasted and drops from the national transmission line.

6.6. Inefficient Power Transmission and Distribution System

Pakistan is using obsolete technology for electricity transmission and further distribution to the end consumers. This inefficiency considers a big problem for Pakistan and it further causes 23–25% department losses owing to weak infrastructure, professional negligence, and the stealing of electricity.

6.7. Poor Check and Balance System

Management and controlling matters have directly linked with the macroeconomic progress of sector in the country. A strong

check and balance system is also vital for sustainable economic development of the country. In Pakistan generally and in power sector particularly, such issues have hampered the growth and effectiveness of the department. Furthermore, these managerial and corporate issues led the power sector towards unproductive utility initiatives; electricity unauthorized use, meter altering, low billing and tariff revenue, defaulters of arrears, workers union monopoly, an increase of fiscal insolvency of electricity companies.

7. CURRENT IMPROVEMENTS THROUGH CPEC INVESTMENT

In 2013, CPEC launched with 59 billion USDs the first ever mega foreign investment by Chinese government in Pakistan and it has been abolishing all main economic constraints. The division of funds is distributed in Energy (\$33 billion), Infrastructure (\$12 billion), Gwadar port construction (\$14 billion) and Special Economic Zones (SEZ) and Industrial plants (\$10 billion).

This part of research paper focuses on CPEC energy generation and logistics infrastructure projects and their impacts on economic growth. The information and statistics in this part are well attributed from working paper “Challenges and solutions in building CPEC- A flagship of BRI” produced by Yasir Arrfat and published in Centre of Excellence Islamabad and acknowledged for the purpose of better understanding. CPEC is the central corridor among six corridors of Chinese unprecedented OBOR initiative. The CPEC has been introduced in 2013 and owing to fast progress and timely implementation; CPEC is at the moment greatly acknowledged as the most significant development project. In broad spectrum, CPEC development projects contain; improvement of Gwadar Port, road, rail and optical fiber between China and Pakistan, mega energy projects and SEZ progress for mutual interests to achieve comprehensive development and regional harmonization. Furthermore, the progress and development of Pakistan obstructs by two main issues which are electricity outages and obsolete infrastructure both locally and region wise. These mega issues have been tremendously addressed by CPEC very soon after its commencement. This paper explores the CPEC range as a most important project of Chinese OBOR initiative (Arrfat, 2017). The current study provides with the details and analysis of energy development projects in Pakistan, connectivity infrastructure investment plans, including Gwadar Port, Road, Rail, Optical Fiber, Energy and SEZ’s projects. This study also examines the relationship between improved connectivity infrastructures and Pakistan’s energy sector through CPEC investment.

To understand the immediate energy requirements of Pakistan and to deal with the severe electricity outages, maximum CPEC development finance is available for electricity generation. In addition, Chinese electricity investment covers all important aspects of this issue which includes energy mix, monetary funding, administrative systems, tariffs, revenue generation and operational tasks. CPEC electricity generation projects are very broad in terms of input production of power plants. Along with these projects, CPEC also covers two transmission line progress initiatives. CPEC does not only add more electricity but also

drops the per unit price meanwhile. CPEC energy projects have been exclusively mitigating the grave and chronic problems of Pakistan’s economy by way of injecting foreign investment in near future. It is pertinent to mention here that prior to the setting up of electricity schemes, cost is high per unit, however, in current situation it is anticipated to be dropped significantly by 2020 (Husain, 2017). The availability of enough electricity and economic growth has direct connection with financial and social progress including health division, education and high living standards. In previous time, Pakistan unfortunately lacks energy projects and advancement of its infrastructure.

In current situation, through CPEC about 10,000 MW electricity is expected to be included within a period of 3 years in national transmission line. Pakistan right from inception up to 2013, had managed the capability of only 16,000 MW electricity in to national grid. On the other side, in coming 3 years, Pakistan will be capable to add >10,000 MW electricity in which maximum portion is by the CPEC electricity plans. Pakistan has not received such kind of heavy foreign investment in energy sector in history. The CPEC investment plans are more concerned with electricity generation through coal and hydel system instead of thermal power. Pakistan having largest coal mines in the country which placed him among top coal reserve countries in the world. According to coal reserve statistics worldwide, Pakistan retains 186 billion tons coal volume (Imaduddin, 2013). Having big reserves of coal, Pakistan takes primary initiative to exploit this energy rich source for the production of electricity through CPEC schemes.

8. LOGISTICS INFRASTRUCTURE IN PAKISTAN

This part of research paper further elaborates the infrastructure development in Pakistan under CPEC projects and analyses a constructive relationship between road, rail, ports and energy development production in the country. However, owing to the existing position of linkages infrastructure, there are inadequacies and impediments which raise the cost of electricity generation and consequently the per unit price for consumers. Logistics concerns and supply chain issues those are common in Pakistan cause running business hard task and therefore providing weak business progress which directs to a short of foreign and domestic investment within variety of energy projects as well as other development schemes. For such issues, this paper discusses the logistics infrastructure growth under the CPEC and how it influences the electricity production in the country. The paper further provides the prospective benefits of strong and wide infrastructure connectivity arrangements on rising economy of Pakistan within CPEC investment plans. Moreover, through CPEC investment, the Chinese investors provide \$27 billion to update physical infrastructure. Energy projects in Pakistan are linked with improved and quality material roads and railway tracks. To carry and bring the machinery for the purpose of energy production, Pakistan needs advancement in regional and local roads network. Higher road density and railway double track remains a big challenge for Pakistan which consequently affects energy projects (Government of Pakistan, 2017). Both railway and road infrastructure development is vital for energy development

schemes, but with close analysis, railway use to carry equipments, oil transmission, concrete material shifting and machinery transfer is more economical and low in price as compare to use of road. For these purposes, up gradation of cargo railway is inevitable for the success and timely completion of CPEC energy schemes. However, there has been a regular decrease in the railway sector in support of road infrastructure in Pakistan since last several years. In Pakistan, a considerable value has been provided to road over rail even though the railway being the less expensive choice. Furthermore, for the period of the 2005 to 2010, the allocated budget expense for railway was significantly lesser than road budget. In such situation, Pakistan railway (PR) lost its competitiveness and mostly owing to a bigger preference made to the passenger side against the more beneficial freight sector (Road Freight Transport and Emerging Competitive Dynamics, 2016).

Trucking sector in Pakistan is the backbone of transportation area that is vital for the success of supply chain management. Trucking companies are responsible to carry and move the maximum cargo both in public and private sectors. Electricity department is also completely dependent on this sector to supply equipments, machinery, and oil to the rest of the country. In the same vein, railway sector of Pakistan is also involved many inefficiencies. With factors of outdated infrastructure, use of old technology and bogus equipments the railway transport causes long hour delays and poor safety measures (Sánchez-Triana et al., 2013). Unfortunately, such inadequacies have charged the economy about PKR 150 billion per annum. The sub standard functioning of transport sector has declined the Pakistan's regional position and efficiency. Presently in Pakistan, the railway tracks are obsolete and cargo trains cannot travel above to 65 km/h speed and which turns down the better margins.

Most importantly, this situation is going to be change as most advanced and efficient technology support progress of main line one through CPEC infrastructure projects. This improvement and advancement in PR particularly and logistics infrastructure generally has never seen previous to CPEC. The beginning of CPEC has dealt with foremost apprehensions of unproductive linkages arrangements and established finance for repairing and structuring of latest networks. Energy better production and development takes place in country with competitive area linkages and cheaper transportation expenses.

9. SUGGESTIONS AND RECOMMENDATIONS

Progress of logistics infrastructure declines the cost of energy production directly and indirectly. Furthermore, excluding CPEC logistics projects, the energy sector of Pakistan cannot be improved and work efficiently. This will result more obstructions and problems in the way of producing energy in the country. Such impediments comprise a short of consistent energy led services, long wait for machinery, low transmission of oil, accidents, poor handling of equipments owing to poor roads infrastructure, low road density to carry heavy electricity material, long journey time. Such factors not only raise the electricity price but also significantly reduce the interest of foreign investors and amount

of foreign investment for electricity generation in Pakistan. In pursuance of current logistics situation in Pakistan and deficiencies along, cargo transport consumes more time for electricity fundamental instruments and materials and that is three times behind as compare to China and US rail cargo transportation (Owais, 2014). Furthermore, leading economies such as USA, UK, Germany, and China are well ahead for establishing and maintaining high speed road and railway freight linkages.

At present electricity generation plants, dams for hydel power electricity generation are in construction phases throughout the Pakistan. The locations of such projects are spread over mountainous and remote areas. Therefore it requires good market access, low transportation costs, minimum delivery time of machinery and material related to energy production. Most of energy projects are located around CPEC trade route and construction work has already started on such route. The obsolete logistics network and high cost not only disallows future energy production investment in Pakistan but categorically reduces the margins of current electricity transmission. Cheap and rapid production of energy is vital to any economy as it strengthens the economy through improved imports and exports. These guided to industrial progress and development. One of the main objects of logistics infrastructure projects is to build a modern and fast linkages network to help the CPEC energy generation initiatives and supply sufficient and low-priced electricity to all parts of the country (Kiani, 2016). These logistics developments will have also direct and indirect effects on national and international economic growth, connectivity and trade.

10. CONCLUSION

The availability of appropriate physical logistics infrastructure linkages as discussed in this article through developed and short distance schemes consequently making financial benefits for the economy of the country. By means of improved roads and rails network, supply chain management would be enhanced and become more efficient. Logistics Infrastructure not only accelerates business growth straight away but also supports to decrease energy generation expenditures which will simply facilitate in industrial progress and development. CPEC has accurately dealt with the chief issues of Pakistan's struggling economy by way of its various financial projects together with connectivity infrastructure, energy generation, and industrial support.

CPEC's industrial advantages cannot be achieved without a sufficient and consistent energy supply. For the last several years, Pakistan has undergone from severe electricity outages, a costly electrical energy fuel mix, an unproductive and inefficient transmission arrangement, and lack of gas to run industry. In addition, sufficient, low price electricity and consistent fuel transmission are fundamentals for Pakistan's industrial and business growth. For such reasons, about 64% of CPEC's initial round funds will be allocated for electricity production and transmission schemes. Electricity schemes provide definite rates of return for IPPS companies and are good profits making investments. The majority of CPEC energy developments are coal fueled, by way of costs and electricity production. Coal is presently

a little part of Pakistan's fuel mix percentage. On the other hand, maximum portion of Pakistan's electricity generation is at this time produced by high-priced furnace oil and expensive high speed diesel, which are being substituted by regasified liquefied natural gas (LNG), which is further costly than furnace oil at existing market prices. However, liquefied natural gas is more efficient and comparatively stable in price changing. Pakistan's high dependence on furnace oil and diesel for generation of electricity takes the oil price very high and consequently reduces the economic growth significantly.

This paper concludes that CPEC electricity generation projects have been go down and receive delays for road and rail infrastructure grounds. It is further provided that electricity generation projects are in several situations far more difficult as compare to road and rail infrastructure schemes. Energy projects have need of getting a fuel supply, for instance imported coal or natural gas and the presence or development of a logistics infrastructure to move on the fuel supply through pipelines, long vehicles, port jetties, regasification terminals, and rail tracks. Electricity move also require a transmission line to attach an electricity generation source to the main power grid station. Moreover, coal projects generally are difficult to handle by means of logistics arrangements. For maximum of Punjab (Province of Pakistan) located coal power schemes, Pakistan requires to bring coal from Port Qasim which is far away from projects sites, and consequently the ability of PRs to transfer the required coal capacity to be analysed closely and considered for the electricity costs finally. However, it is well anticipated that CPEC would control energy catastrophe by 2018. Therefore, providing a sustainable energy overflow in Pakistan, CPEC energy generation projects will assist to achieve inclusive competitiveness. Current energy projects of about 10,000 MW would be supplemented in subsequent years, along with 1000 MW renewable energy based projects and around 16,000 MW by December 2020.

REFERENCES

- Arrfat, Y. (2017), Challenges and Solution in Building CPEC-A Flagship of BRI. Centre of Excellence. China Pakistan Economic Corridor. Working Paper No. 017/2017.
- Business Support Organization Forum. (2014), Causes of Energy Crisis. Recommendations for Short Term Solutions. Available from: <http://www.bsoforum.com/causes-energy-crisis-recommendations-short-term-solutions>. [Last accessed on 2018 Apr 09].
- Fudholi, A., Sopian, K., Othman, M.Y., Ruslan, M.H. (2014), Energy and exergy analyses of solar drying system of red seaweed. *Energy and Buildings*, 68, 121-129.
- Gabbasa, M., Sopian, K., Yaakob, Z., Zonooz, M.R.F., Fudholi, A., Asim, N. (2013), Review of energy supply status for sustainable development in the organization of Islamic conference. *Renewable and Sustainable Energy Reviews*, 28, 18-28.
- Government of Pakistan, Ministry of Planning, Development and Reform. (2017), Long Term Plan for China Pakistan Economic Corridor (2017-2030). Islamabad: Government of Pakistan, Ministry of Planning, Development and Reform.
- Husain, I. (2017), CPEC and Pakistani Economy: An Appraisal. Islamabad: Publication Paper. Centre of Excellence for CPEC.
- Imaduddin. (2013), Pakistan Ranked 7th in the World Having Coal Reserved. *Business Recorder*. Available from: <https://www.brecorder.com/2013/11/13/144400/pakistan-ranked-7th-in-world-having-coal-reserves>. [Last accessed on 2018 Jul 15].
- Islamabad Chamber of Commerce and Industry. (2017), An Overview of Electricity Sector in Pakistan. Available from: http://www.icci.com.pk/data/downloads/63/1293619048_1.pdf. [Last accessed on 2018 May 11].
- Kazmi, S. (2017), CPEC and the *Energy Crisis* in Pakistan *Foreign Policy News*.
- Khan, S., Ashraf, F. (2015), Analysis of Pakistan's Electric Power Sector. Pakistan: Blekinge Institute of Technology, Department of Electrical Engineering.
- Khatib, T., Sopian, K., Ibrahim, M.Z. (2013), Assessment of electricity generation by wind power in nine costal sites in Malaysia. *International Journal of Ambient Energy*, 34(3), 138-144.
- Kiani, K. (2016), Rs 8.12 Per Unit Tariff Approved for Hub Co's Power Project. *The Dawn*. Islamabad. Available from: <https://www.dawn.com/news/1239977>. [Last accessed on 2018 Jul 23].
- Kugelman, M. (2015), *Pakistan's Interminable Energy Crisis: Is there any Way Out?* Washington, DC: Wilson Centre.
- Owais, M. (2014), A Comparative Account on the Economic and Environmental Efficiency of the Road and Intermodal Freight Transport Networks. Islamabad, Pakistan: Pakistan Institute of Development Economics.
- Pudukudy, M., Yaakob, Z., Mohammad, M., Narayanan, B., Sopian, K. (2014), Renewable hydrogen economy in Asia-opportunities and challenges: An overview. *Renewable and Sustainable Energy Reviews*, 30, 743-757.
- Rafiq, A. (2017), *The China-Pakistan Economic Corridor: Barriers and Impact*. United States Institute of Peace. Washington, DC: Peace Works No. 135.
- Sánchez-Triana, E., Afzal, J., Biller, D., Malik, S. (2013), *Greening Growth in Pakistan through Transport Sector Reforms*. Washington, DC: World Bank.
- Sethi, N. (2015), *Power Sector Reforms: Pakistan's Energy Crisis and Ways Forward*. Asia Program. Washington, DC: Woodrow Wilson International Centre for Scholars.
- Shah, A.S., Omar, N.A., Ahmad, M.S., Siddiquei, H.R., Nor, S. (2013), Renewable energy in Malaysia: Strategies and development. *Environmental Management and Sustainable Development*, 2(1), 51-66.
- Shakeel, S., Takala, J., Shakeel, W. (2016), Renewable energy sources in power generation in Pakistan. *Journal of Renewable and Sustainable Energy Reviews*, 64, 421-434.
- Trade Related Technical Assistance (TRTA). (2016), *Road Freight Transport Sector and Emerging Competitive Dynamics*. TRATA. Available from: http://www.trtapakistan.org/wp-content/uploads/2016/01/Road-freight-transport-sector-and-emerging-competitive-dynamics_final.pdf. [Last accessed on 2018 Apr 12].
- Trading Economics. (2017), *Pakistan Electricity Production Forecast*. Available from: <https://www.tradingeconomics.com/pakistan/electricity-production/forecast?poll=2017-11-30>. [Last accessed on 2018 May 25].
- Vats, R. (2016), *China Pakistan Economic Corridor: Energy and Power play*. New Delhi: Research Intern, Institute of Chinese Studies.
- World Bank Group. (2013), *Toward a Sustainable Energy Future for All: Directions for the World Bank Group's Energy Sector*. Available from: http://www.wds.worldbank.org/external/default/WDSContentServer/WDSP/IB/2013/07/17/000456286_20130717103746/Rendered/PDF/795970SST0SecM00box377380B00PUBLIC0.pdf. [Last accessed on 2018 Apr 13].