



Pakistan-China Nuclear Energy Cooperation: Emerging Trends to Achieve Sustainable Development Goals

Dr. Allauddin

*Ph.D from School of International Relations and Public Affairs,
Shanghai International Studies University,
Shanghai China.*

allauddin_kakar@yahoo.com

Azeem Khalid

*Lecturer, COMSATS University, Islamabad
PhD Scholar, Jinan University
Department of International Relations
Guangzhou, China.*

Azeem.khalid@comsats.edu.pk

&

Malik Muhammad Ali

*PhD Scholar at Jinan University,
Department of International Relations
Guangzhou China*

Ali_ir152@yahoo.com

“Contracting parties shall actively develop and consolidate the bilateral strategic relationship of good-neighborly friendship and mutually beneficial cooperation....both the parties agreed to maintain a regular high-level strategic dialogue”. (People’s Daily Online News, 2019)

Abstract

This paper analyses the bilateral cooperation between China and Pakistan specifically in the arena of nuclear cooperation. While describing the



chronological civil nuclear collaboration between the two friendly nations it states that both countries cultivated a natural partnership with each other to further strengthen the bilateral ties. Historical cooperation between China and Pakistan in terms of Nuclear Technology was analyzed in the face of the opposition of international regimes critical to nuclear proliferation. To apply neo-realist paradigm, it is concluded that strategic cooperation in terms of nuclear technology is in the interest of both China and Pakistan for two reasons: First to balance their belligerent neighboring country India; second, countering the United States involvement in the region. To fulfill Pakistan's growing energy requirements, Pakistan, must continue its nuclear cooperation and extend it to the scientific research. This cooperation made Pakistan self-sufficient to meet the energy needs and opened new avenues of opportunities. This paper recommends that the strategic partnership between the two nations is inevitable for maintaining balance of power in the region. This research paper will highlight Sino-Pakistan nuclear cooperation in historical as well as in the context of emerging trends of strategic developments, such as the Indo-US nuclear agreement. The Sino-Pakistani nuclear deals aims to meet Pakistan's growing energy demand. In strategic context, the Sino-Pakistan cooperation aims to maintain balance of power in the region. Data collection will include both primary and secondary sources.

Key Words: Sino-Pak Relations, Strategic Tilt, Nuclear Cooperation

Brief History of Pakistan's Nuclear Program

Pakistan's nuclear program has been the most important national cause for every elected government and dictatorial regime. Every time they have functioned affectionately and considered it a significant element to fulfill the energy demands of Pakistan. A lot of factors involved that pushed them to start the civil nuclear program like it is cost-effective and clean source of energy and also contributes to achieve sustainable development goals. Toward that end, various energy experts in Pakistan consider it as imperative to reduce dependence on fossil fuels and exploit the potential of nuclear energy. In this vein, Pakistan's policymakers are tend to actively seek international cooperation in civilian nuclear power industry under the guidelines of non-proliferation norms. China's assistance in Pakistan's nuclear program, in terms of developing commercial nuclear power plants and



providing nuclear energy technology, is a landmark step to fulfill Islamabad's energy requirements. Presently, Pakistan-China civil nuclear cooperation is focused primarily on alleviating the gap between the production and consumption of energy; their cooperation in other areas, such as nuclear medicine, agriculture, pharmaceuticals, and education, has remained limited.

Civil Nuclear program of Pakistan was initiated with inspiration from atoms for peace program in 1956. Pakistan Atomic Energy Commission (PAEC) was established and Dr. Ishrat H Usmani was its pioneer chairman. Dr.H.Usmani's major achievement was the creation of the Pakistan Institute of Nuclear Science and Technology (PINSTECH) in Nilore. Under Pakistan Atomic Energy Commission in 1965. Pakistan Institute of Nuclear Science and Technology started a 5-MW type light water research reactor namely Pakistan Atomic Research Reactor 1 ((PARR-1) with help of the US. The main ambitions of Pakistan Institute of Nuclear Science and Technology were research development and capacity-building of the young scientists through training programs. Center for Nuclear Studies was established in 1976, and now it's a full-fledge university known as Pakistan's Institute of Engineering and Applied Sciences (PIEAS) (Khan, 2012). Separation of East Pakistan in 1971 with the support of India provided a significant push to Pakistan's nuclear ambitions. Zulfikar Ali Bhutto, the then prime minister, held a top-secret meeting in Multan on 24 January 1972. In that meeting, he encouraged the scientists for the projects of nuclear weapons. Pakistan's aspirations for its own nuclear program were discussed with the top-level nuclear scientists and engineers including Munir Ahmed Khan and Dr. Abduslam. Munir Ahmed Khan was designated as the third Chairman of PEAC in 1972.

On 05 January 1964, the first executive committee of the NEC (National Economic Council) approved the development of country's first Nuclear Power Plant at Karachi (KANUPP). The KANUPP was to be built by Canadian Deuterium CANDU 137 MW type reactor. The agreement was signed between Canadian general electric company and government of Pakistan on 24th of May 1965, also the nuclear reactor was under the IAEA safeguards (Siddiqui & Qureshi, 2005).

With the enforcement of NPT (Nuclear Nonproliferation Treaty) in 1970, the non-nuclear states aren't allowed to transfer or trade any type of nuclear material which



can be used for the productions and reprocessing of nuclear weapons. At that time Pakistan remained committed to acquire nuclear energy to fulfill its growing energy demands (Zhang, 2010). Therefore, KANUPP-I was inaugurated in November 1972, but due India's "peaceful nuclear explosion", the supply of nuclear facilities to Pakistan as well as India were refused by the Canadian firm in 1973. Though, Germany agreed to provide the heavy water production for KANUPP-I, but later stepped back. In 1973 Pakistan started a nuclear fuel cycle, completely an indigenous program (NTI, 2011).

Despite India's potential to use nuclear technology for the weapons' building and violation of global non-proliferation guidelines, Indian nuclear tests were declared as a peaceful nuclear explosion. At that time Pakistan was indigenously working on Karachi Nuclear Power Plant-I (KANUPP-I) on nuclear fuel fabrication. In March 1973 Pakistan signed an agreement for the new labs "Pilot Plant" in Rawalpindi at PINSTECH with the corporation of Saint-Gobain Techniques Nouvelles (SGN), a French company. In October 1974 the final design for the plant was completed and this power plant was not under the safeguards of IAEA (Khan, 1998). Though India's nuclear explosion badly impacted Pakistan's civil nuclear aspirations, yet, Beijing played a significant role in the development of Islamabad's nuclear energy technology, by assisting the latter in construction of nuclear power plants under IAEA guidelines. Pakistan and China signed a watershed agreement in the nuclear field on September 15, 1986. It followed the construction of commercial power plants at Chashma, situated in a city of Punjab, with China's cooperation. Commercial Power Plants are ones developed, owned and operated by private/government entities for commercial purposes. In 1991, China agreed to supply its indigenously developed 300 Megawatts electric (MWe) Qinshan-I nuclear power plant to Pakistan. Considering the Chashma, a sustainable site for a nuclear power plant, an agreement for the first power station Chashma-1 (C-1) was signed. And now Pakistan's civil nuclear program possess two nuclear complexes: First is Chashma Nuclear Power Plant (CHASNUPP) that is comprised of four operational unites (Chashma-I, Chashma -II, Chashma -3, and Chashma -IV) and a planned one (Chashma-5); three units, including (K-1, K-2, and K-3), lie at Karachi Nuclear Power Plant (KANUPP).

CHINA PAKISTAN NUCLEAR-ENERGY TRADE AND COOPERATION



Trends in Sino-Pakistan Bilateral Nuclear Cooperation: Addressing Pakistan's Fluctuating Nuclear Energy Demand

Peaceful nuclear technology has significant applications across multiple sectors, including agriculture, medical diagnostics, food irradiation, pharmaceuticals, scientific research and industry. The most common use of peaceful nuclear technology is in energy sector as an environment friendly, cost-efficient and clean source of energy. Toward that end, various energy experts in Pakistan consider it as imperative to reduce dependence on fossil fuels and exploit the potential of nuclear energy. In this vein, Pakistan's policymakers tend to actively seek international cooperation in civilian nuclear power industry under the guidelines of non-proliferation norms.

China's assistance in Pakistan's nuclear program, in terms of developing commercial nuclear power plants and providing nuclear energy technology, is a landmark step to fulfill Islamabad's energy requirements and bring advancement in various sectors, in particular pharmaceuticals and food processing. Presently, Pakistan-China civil nuclear cooperation is focused primarily on alleviating the supply and demand gap of energy; their cooperation in other areas, such as nuclear medicine, agriculture, pharmaceuticals, and education, has remained limited. China-Pakistan nuclear cooperation attests to both states' strong, progressive, and mutually beneficial relationship.

Despite the international anxieties, the process of China-Pakistan nuclear cooperation is irreversible for a number of reasons. First, both states share a strong history of strategic ties; two, at present, Pakistan is a linchpin partner of China's global strategy of "One Belt One Road"; third, Beijing is now largely integrated in global non-proliferation regime, and international community arguably considers China as a responsible nuclear weapon state; fourth, Islamabad is a member of various nuclear security regimes and other such arrangements and has been steadfast in improving its non-proliferation credentials; finally, commercial motives of Beijing as civil nuclear program between China and Pakistan will help the foreign markets to realize the commercial values and china's ability to supply



nuclear-related material and technology for peaceful purposes under IAEA guidelines.

A brief detail of Chashma Nuclear Power Complex (CHASHMA) and Karachi Nuclear Power Complex (KANUPP) is given below:

Chashma Nuclear Power Complex

i. CHASHMA-I

CHASHMA 1 is the 2nd unit constructed Pakistan with the assistance of China in 2000. This reactor yields almost 325 MW (300 MW net) and it is placed under the proper safeguard of IAEA. Shanghai Nuclear Engineering Research and Design Institute (SNERDI) designed the main part of the plant, based on Qinshin 1. The plant functionalized in mid-May 2000. The designed lifetime is almost 40 years. This, and three more units at the same site, was constructed using international design codes and standards (Pakistan Nuclear Regulatory Authority, 2010).

ii. CHASHMA-II

In December 2005 the CHASHMA power plant was enhanced with the extension named as CHASHMA 2 (CHASNUPP 2). The unit was reported to cost 51.46 billion PKR (490 million USD, **twenty** million USD of the amount was funded by China). In 2006 a safeguard agreement was signed with IAEA. Renovations have almost added 5 MW (to 330 MW gross) (Syed, 2014 January 2).

iii. CHASHMA – III and IV

The government announced the plans to build CHASHMA 3 and 4 units in June 2008, each unit will be able to produce 320 MW gross and largely financed by the Chinese government.

In March 2009 [SNERDI \(Shanghai Nuclear Engineering Research and Design Institute\)](#) announced that the institute was proceeding the design of CHASHMA unite 3 and 4. In April 2009, the [Shanghai Nuclear Engineering Research and Design Institute signed the contract design, at the cost of 2.37 billion USD, with 1.75 billion USD of this comprising “a foreign exchange component”](#). In March



2010, the Pakistani government agreed on all terms and conditions for CHASHMA unite 3 and 4, whereby the China would afford 82 per cent of the whole 1.921 billion USD. China will also provide fuel for the plants lifetime which is normally for forty years (Baqir, 2014, January 2).

These Units will have a forty years design lifetime and will be under the IAEA's safeguards. Both unit 3 and 4 constructions began at the end of May and December 2011 respectively. According to CZEC, the completion of unit 3 was in 2016 and unit 4 in 2017.

The Nuclear Suppliers Group (NSG) expressed reservations about the supply of China to CHASHMA 3 and 4. The Units I, II contract was signed in 1990 and 2000 respectively. These projects were agreed before China joining NSG back in 2004. China, with getting membership of NSG, has sustained restrictions on sales and transfer of nuclear technology to Pakistan. The Chinese government argued that unit III and unit IV are in the same way grandfathered, and arrangements are constant with those for unit I and unit II (IEA, 2017).

At the inauguration of CHASHMA unit IV, the then Prime Minister Yousuf Raza Gillani said that his government is seriously dedicated to reach its target of adding 8800 MW of electricity by 2030. This contains 2322 MW of Unit II-III under construction at Karachi (The News, 2011).

iv. CHASHMA-V

The PAEC (Pakistan Atomic Energy Commission) in February 2013 entered in an agreement with the CNNC (Chinese National Nuclear Corporation) in November 2010. According to this agreement the Chinese Government would take part to construct and developed the fifth power plant of CHASHMA nuclear complex. The power capability of this unit would be around 1000 MW. Surprisingly, the agreement didn't elaborate on that project and didn't clarify whether the plant is the fifth unit of the CHASHMA complex or it's a separate atomic power plant. The purpose of this project is still unclear although some analysts predict that it might be built in the commuter belt of the Multan city in the south-west of Punjab (Fox News, 2013).



KARACHI NUCLEAR POWER COMPLEX (KANUUP)

The Karachi Nuclear Power Complex (KANUUP) is located at the Paradise Point Karachi, Sindh province, Pakistan. It includes KANUPP and CIAL KARACHI. Another government power project "KANUPP-2", under construction, is also a part of this complex. KANUPP-1 and KANUPP-2 both are the civilian nuclear powers plants that produce 1,000 MW of electricity in Karachi, Sindh. This nuclear complex is under the protection and inspection of the IAEA. The construction plant was under the PAEC, and it was funded by the International Atomic Energy Agency, China National Nuclear Corporation, the China Atomic Energy Authority, and China's Guangdong Nuclear Power Group.

i. KANUPP -I

KANUPP-I is a CANDU power reactor from Canadian Government in 1972. It was inaugurated by the then president Zulfikar Ali Bhutto on 28th of November, 1972. This plant is a single CANDU-PHWR unit with an aggregate capacity of 137 Mega Watts. KANUPP-I will remain operational in the mid of May 2014, and it will be limited to 85 MW. KANUPP-I reactor, since its creation, has been subjected to checking by the IAEA (International Atomic Energy Agency) and its safeguards.

ii. KANUPP- II

On November 26, 2013, the then Prime Minister Nawaz Sharif officially opened KANUPP-2, a new project in Karachi nuclear complex Sindh province, which costs \$ 4.8 billion. KANUPP-II is also known as Hualong-I. This plant is based on Pressurized water and AP1000 Westinghouse Electric reactor. With respect to this project, Head of the PAEC (Pakistan Atomic Energy Commission) told that KANUPP-II will be operational by 2022.

iii. KANUPP -III

In November 2013, both China and Pakistan confirmed that KANUPP-III will be constructed in Karachi Sindh, and it will be operational by 2023. KANUPP-III will produce around 1,100 MW of energy.

iv. KANUPP -IV



Another commercial nuclear power plant KANUPP-IV is expected to be developed. It also includes a nuclear engineering school. The KANUPP Nuclear Engineering Institute (KINPOE) is organized by CEAP. It offers two years of master's in nuclear engineering and PDTP is credited by PIEAS.

Karachi Coastal Electricity Project

Planning Commission of Pakistan announced in June 2013 that Chinese government would provide Pakistan with two 1000 MW CNNC power reactors, used for both KANUPP II and KANUPP III. Planning Commission of Pakistan planned the construction of these two 1100 MW units, and two sites were considered for this purpose at coastal area of Karachi. In the same year, CNNC announced the signing of an arrangement with Pakistan for the provision of the ACP1000 (1100 MW) (Nelson, 2014). In August 2013, CEAP signed contracts with CNNC, China Zhongyuan Engineering Co. Ltd., China Nuclear Energy Institute, and East China Electrical Power Design Institute for the building of the power plant in coastal Karachi. The K-2 and K-3 power plants are almost complete and are to be operational in 2021 and 2022, respectively. Pakistan started the fuel loading of K-2 in December 2020 and expected to contribute in energy grid in April 2021.

China Nuclear Engineering & Construction Group Co. Ltd. was awarded the tender in April 2015, for construction and civil engineering works for the plant's conventional island, which would use the Hualong-I reactor. The China Zhongyuan Engineering Corporation was the general contractor of the project (Nelson, 2014). China has offered fuel supplies for the complete life cycle of a facility that is sixty years (International Atomic Energy Authority, 2015).

Planned and Under-construction Nuclear Power Units

Table 2

Reactor	Province	Type	MWe gross	Construction Start	Planned Commercial Operation
Chashma-IV	Punjab	CNP-300	340	Dec 2011	October 2017



Karachi – II (Coastal)	Sindh	Hualong One	1161	Aug 2015	late 2021
Karachi- III (Coastal)	Sindh	Hualong One	1161	Late 2016?	late 2022
Total (3)			1501 under construction		

The reactors operating in Pakistan

Reactor	Province	Type	MWe net	Construction Start	Commercial operation	Planned Close
Karachi – I	Sindh	PHWR	125	1966	December 1972	2019
Chashma – I	Punjab	PWR	300	1993	June 2000	2040
Chashma – II	Punjab	PWR	300	2005	May 2011	2051
Chashma – III	Punjab	PWE	315	May 2011	(grid conn October 2016)	2056
Total (4)			1040 operating			

Due to China's active promotion of the nuclear energy sector in Pakistan's economy, Pakistan has become the 1st Asian member of the European Organization for Nuclear Research, CERN (SAMA TV, 2015).

Interestingly, some Indian and US based experts assume that by the end of 2020 Pakistan can increase or acquire the capability of increasing its number of nuclear warheads up to 200. The Times of India reported that one of the American think



tanks estimates, "While many states are downsizing, Asia is accumulating. Pakistan has the fastest-growing nuclear program in the world..... And could have a supply of fissile material which, if armed, could produce up to 200 nuclear devices." (Times of India, 2014)

Furthermore, US experts Michael Krepon and Toby Dalton say that in next four to five years, Pakistan could become the 3rd most powerful nuclear country in the world in terms of the number of its accumulated nuclear weapons (Dalton & Krepon, 2015).

INDO-US NUCLEAR DEAL: A Strategic Assessment

United State of America and India entered into a nuclear agreement in 2008 which is famous with the name of Indo-US deal. India is not a signatory of NPT, but still, this deal happened to violate the NPT regime. There has been a lot of criticism regarding Sino-Pakistan nuclear deal although this is an extension of the old program, and it is not abiding by the terms and conditions of NSG. The critics of Sino-Pakistan deal argue that China has signed the NPT, and she is the member of Nuclear Supplier Group; still it conducted the deal with Pakistan. The supporters of Indo-US deal, while justifying the deal, argue that America has requested for the special wavier to India; and therefore, their deal is not violating the NSG. It is an obvious fact that Sino-Pakistan's nuclear cooperation started in 1986 at the time when neither Pakistan nor China was a member of NPT (Han, 2010). Although Pakistan even now is neither signatory on NPT nor NSG, yet both China and Pakistan continue their nuclear trade under IAEA's safeguards. Many analysts criticize Chinese nuclear assistance to Pakistan for the peaceful utilization of nuclear technology. The Chinese defend their act of providing nuclear assistance to (Pakistan) by invoking the grandfathered clause of international law. Moreover, China nuclear cooperation agreements with Pakistan were negotiated and entered into force prior to Beijing's joining of the Nuclear Supplier Group in 2004. Hence, NSG could not limit or thwart Sino-Pakistan Nuclear cooperation, legally.

The India-us deal is a clear contravention of Nonproliferation regime. India conducted its nuclear test as a peaceful nuclear explosion, but later India has used this technology for the weaponization which is nothing more than a violation of the treaty of nuclear nonproliferation. Besides, India has also refused to sign the



Comprehensive Test Ban Treaty (CTBT) in 1996. On one hand, United State criticizes Pakistan for having a bad record of non-proliferation; on the other hand, it did not even mention India for exploiting the Canadian assistance. United State not only granted India a special favor through NSG but also amended its domestic law. At the time of approval from the congress, America faced a large number of criticisms from the domestic lobbies, but for its own interest, United States not only changed its own domestic law “Hyde Act”, but also requested the members of the NSG to grant special favor to Indians (Anwar, 2005, October 21). It was the time when China did not use the option of veto. Following the goodwill gesture, the United State should also act positively towards the Sino-Pakistan nuclear agreement instead of blaming it. The fact is that this attitude of USA shows nothing more than a hegemonic nature of the USA. Here, it is worth to mention that the United State has no right to oppose China’s nuclear cooperation with Pakistan after the Indo-US deal.

The Pak-China deal has been criticized and it has been claimed that this deal is the reaction of Indo-US deal. Here, it is important to be noted that what is wrong if Pakistan and China entered into nuclear cooperation? If United State can finalize a deal by granting special favor for India in the NSG and even emending US domestic law, then why can’t China and Pakistan go for nuclear cooperation which is nothing, but the extension of the old agreements. All this reveals the United States’ hegemonic nature of interfering in the matters of other states. United State is not only intervening between Sino-Pakistan relations but also hindering the legal rights of the states to promote strategic relations with each other.

Sino-Pakistan nuclear trade has to meet the increasing energy demand of Pakistan. The country is facing energy crises, and this deal is basically a response to energy crises rather than a reaction to Indo-US deal. It can be one side of the deal that China and Pakistan tried to balance the power in the region, but it will be unjust and wrong if one says that the Sino-Pakistan nuclear cooperation is a direct response to Indo-US deal. It can be alternative view. Pakistan China nuclear deal roots back to 2003 agreement and 1991 CHASMA plant agreement while Indo-US deal was first announced in 2005, two years later, after the Sino-Pakistan nuclear agreements.



Therefore, stringent division has observed in narrative on India-US nuclear deal and Pakistan-China Civil Nuclear Cooperation that shows strong inclination in India-US nuclear cooperation favor over Pakistan-China's nuclear agreement. Nuclear cooperation between China and Pakistan is more centered to commercial or trade value to address energy crisis rather than traditional security dimension. On the other hand, Indo-US nuclear cooperation connected with strategic domain parallel with geo-political dimension has raised the concern of South Asian states regarding strategic stability of region. Critics are of the view that "policy of nuclear exceptionalism" allows India to import extensive fissile material for its civilian nuclear program that can used for military purpose. Thus, implications of granting NSG waiver supplemented by the Indo-US nuclear deal are very clear as transfer of sensitive military technologies contributes to military buildup, resulting imbalance that will trigger security dilemma and instigate the arms in the region. It would, therefore, destabilize strategic stability and security situation in South Asia.

INSTUTIONAL ARRANGEMENTS AND SINO-PAKISTAN NUCLEAR COOPERATION

A plethora of literature has been produced showing that Sino-Pakistan nuclear cooperation has violated the nuclear nonproliferation regime and propaganda, purely based on assumptions, has been created that Pakistan's civil nuclear Program may not be safe and secure. Besides, the country has faced many other issues and obstacles; one of such obstacles is, in fact, the international pro-American and Indian critics especially those who have tried their best to stop the nuclear cooperation between China and Pakistan. But in spite of the efforts of the opposing forces, the deal has been successfully signed and the construction of CHASHMA power plants (3and4) started. Although the critics such as Ashley j. Telis, Mark Hibbs and Toby Dalton, who are the supporters of the Indo-US deal, raised their concerns about the terrorist issues and the legality of the deal, somehow it is an undeniable fact that Pakistan's energy condition and economic crises all are the problems which will be sorted out due to Sino-Pakistan nuclear cooperation (Fitzpatrick, 2014).

Ashley J Telis, in his article, has told that China and Pakistan did not discuss the deal in front of the NSG, and neither had they taken the permission before signing



the deal just as the United States presented this concept in front of the Domestic Cabinet and NSG members before conducting the deal with India (Tellis, 2010). Ashley's argument is a baseless criticism, for China and Pakistan have not done anything which undermines the credibility of NSG and their domestic law. The United States presented the draft of the deal in the front of the congress since she was doing it against its domestic law. That is why the United States had faced lots of criticism from the domestic lobby while amending its domestic law.

India has neither signed the NPT nor is she the member of any export control regime; and it is, therefore, United State had to request the NSG members to grant a special wavier to her (India). According to the rule of NSG, any country which is not a member of the non-proliferation treaty is not capable to have nuclear trade with the other countries (Guidelines, 2019). This argument can be concluded with a fact that legality is not important for the United States. It was observed that the USA always wanted to make an illegal contract agreeable; and hence, before making any unlawful contract with India, she always tried to show the world that she had discussed all the pros and cons of the deal, and took the permission of the legal bodies before entering into an agreement with India.

China and Pakistan have not defied any rule, nor they have violated the terms and conditions of the NSG; that is the reason they took permission from the world and the USA? In fact, these nuclear projects are completely in accordance with the IAEA's safeguards and are the extensions of the old ones. Unlike USA, China and Pakistan have just signed the agreements without beating the drum that they are conducting a deal (Meier, 2011).

Toby Dolton, who was one of the critics of the Sino-Pakistan nuclear cooperation, has suggested Pakistan ratify the convention on nuclear safety and sign the FMCT. He further suggested that Pakistan should implement the IAEA recommendation for its power reactor etc.; (Lora & Toby, 2011) on the contrary, he has not given such suggestions to India. In other words, India was not being asked to sign the FMCT and CTBT while conducting the Indo-US nuclear deal. When Pakistan asked to create a nuclear weapon-free zone in the Asian region, there was no support for Pakistan from the west and international community. The fact is that



these are all pro-American efforts and lame arguments exercised to demoralize Sino-Pakistan strategic partnership and nuclear commitments.

Some of the critics have raised concerns about the designs of the power reactors and nuclear safety; their arguments put forth the claim that there is the risk of nuclear radiations, and these nuclear plants in Karachi might repeat the Fukushima incidents. Besides, there is another argument prevailing in the international community that Pakistan's entrance in the nuclear club and the increase in the Sino-Pakistan nuclear cooperation might add to the fear of nuclear proliferation. Additionally, there are large chances of potential risks to nuclear safety and security (Hyder, 2012).

The power reactors signed under the Sino-Pakistan nuclear operation are under proper safety mechanisms, and they are designed according to the international standard design codes. Moreover, it is worth to mention that up till now there has been no official proof of any nuclear accident that has occurred publically. These plants are in accordance with the IAEA's safeguards (Mehreen, 2013). Pakistan's participation in the nuclear security summits shows that Pakistan has been actively engaged in the efforts for the security and safety of its nuclear weapons and technology. The measures it has taken for the security and safety of nuclear technology are according to UN resolution 1540 (Zeb, 2014).

Pakistan's nuclear security regime provides a strong profound defense against any nuclear hazard including the cyber threats and nuclear terrorism. It has a logo of deter, detect, delay and then destroy. Pakistan's nuclear regulatory authority works under the guidelines of IAEA, and it takes cares of the physical protection of nuclear materials, nuclear trafficking inside and outside of the borders. Furthermore, Pakistan nuclear regulatory authority has taken proper measure to overcome any radiological accidents. Pakistan also had a wide-ranging export control regime compatible with the standards of IAEA, with the nuclear supplier group NSG, and with the Australia group. Apart from all these measures, Pakistan's international nuclear cooperation is according to the national policies and vital foreign policy objectives and the obligations of international standards. (Ministry of Foreign Affairs Pakistan, 2016)



Pakistan is not eligible for the membership of the NSG because there is a fear that Pakistan's nuclear weapons might be stolen by a terrorist. But this argument is totally invalid, for Pakistan, nuclear security regimen has taken strict measure for nuclear safety and security. Pakistan has proper command and control system which is responsible for the procurement and deployment of nuclear security. Moreover, it also has a proper check and balance on nuclear proliferation and WMD's terrorism.

Opposing the Sino-Pakistan nuclear cooperation, the opponents and the western scholars say that these nuclear power projects are unable to meet the energy requirements of Pakistan; even less than 20 per cent of the energy requirements will be fulfilled by these projects. Pakistan's stance is that CHASMA power plants will meet the energy demands of the country. According to the statements of the government official, it will produce 8,800 MW by 2030 (Joshi, 2011). When these energy requirements will be fulfilled, this will lead to the development of the country's economic situation. Resultantly, Pakistan would be capable to overcome the extremism which is prevalent in the country due to poverty and unemployment. A senior research fellow at the Asian Studies Center Lisa Curtis wrote, in her piece of work, that United State should condemn Sino-Pakistan nuclear cooperation, and she should make efforts to stop China from violating the NSG rules. China should be abided by these rules because if she had signed the NSG membership, this cooperation will disrupt the stability of the region (Lisa, 2013). The fact is that this Sino-Pakistan nuclear cooperation will balance power and stability. India and the United State have already misbalanced the stability by signing the Indi-US deal. The United States itself violated the NPT because India has not signed the NPT and still a special wavier has been given to India on America's request. Pakistan also requested for the NSG membership but was rejected. China has supported Pakistan's argument that if both South Asian neighbors are non-signatory of the NPT, then it is the right of Pakistan to have a special wavier of NSG. Depriving Pakistan of NSG membership is clearly a discriminatory act leading to create instability in the Asian region (Shahzadi, 2015). On several occasions, Pakistani and Chinese official stated that the Sino-Pakistan nuclear deal is for peaceful purpose, and it is in accordance with the IAEA's safeguards. The purpose of enhancing nuclear energy is to overcome the electricity crises and energy crises which are the major obstacles in the progress and development of Pakistan.



Conclusion

China and Pakistan have a long period of nuclear cooperation. China is assisting Pakistan in its energy sector. The nuclear cooperation under IAEA regulations aims at national development. Pakistan and China have always avoided race of nuclear weapons. Pakistan is seeking Chinese nuclear cooperation primarily for full filling its domestic energy demands. The nuclear cooperation between the two countries help bolstering Pakistan's energy sector and achieve sustainable development goals.

The on-going nuclear cooperation between China and Pakistan signify their contribution to the mutual development goals in Asian region under the IAEA safeguards as well as highlights that new narrative is emerging in Pakistan that peaceful use of nuclear energy is more important for national development than a race of nuclear weapons.

However, it has been witnessed that, India, however, has been mainstream in global nuclear order the Indo-US nuclear deal (2005) and NSG wavier. However, the doors of international nuclear energy market are unjustifiably closed on Pakistan, regardless the Pakistan's growing energy needs aimed energy crisis. Regarding the limitation on Pakistan-China civil nuclear cooperation especially regarding the NSG guidelines and discrimination against Pakistan to mainstream in global nuclear order, the way forward for Pakistan is to developed self-sufficiency in nuclear energy and expanding its civil cooperation with likeminded countries such as China under the non-proliferation guidelines to fulfil its energy needs. Moreover, the proceeding discussion manifests that Sino-Pakistan nuclear cooperation did not violate the nuclear nonproliferation regime norms. Although Sino-Pakistan nuclear cooperation is facing lots of criticism from Indian and western scholars, still this cooperation continues for the utility of nuclear technology for peaceful purpose. Pakistan and China have potential to cultivate their strategic ties to balance the power in the region but also it is a rational approach following the structural realist perspective. The strategic and nuclear cooperation between China and Pakistan not only accomplish the fulfilment of energy demands and the electricity crises faced by Pakistan but also provide opportunities to enhance trade with other countries to achieve sustainable development goals.



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