

TRACING THE DEVELOPMENT OF BANGLADESH'S CIVIL NUCLEAR POWER PROGRAMME

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INTRODUCTION

Bangladesh, which has been ardently pushing for a nuclear reactor since the 1960s, is finally set to launch its civil nuclear programme, with its first reactor scheduled to go critical by 2023. The country, home to 160 million people, has placed its expectations on nuclear power to generate about 9 per cent of its electricity by the next decade which would help in meeting its rising energy demands and boost its economy while also reducing levels of CO₂ emissions.¹ However, setting up a nuclear power programme is a complex and a long-drawn task which comes with several challenges. In this regard, the paper traces the development of Bangladesh's civil nuclear programme and its current status.

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1. Laura Gil, "Construction Progresses on Bangladesh's First Nuclear Power Plant", IAEA.org, January 31, 2019, at <https://www.iaea.org/newscenter/news/construction-progresses-on-bangladeshs-first-nuclear-power-plant>. Accessed on March 3, 2021.

UNDERSTANDING THE RATIONALE FOR DEVELOPING A CIVIL NUCLEAR PROGRAMME

Since the 1960s, Bangladesh has undertaken numerous feasibility studies to assess the scope of developing a nuclear power programme. Several factors have led the authorities to consider nuclear power in their energy basket. Some of these key factors are:

Energy Crisis

Bangladesh faces major energy deficit, with about 10 per cent of its population having no access to electricity,² either from grid or from local installations. Those who rely on the grid keep experiencing frequent power cuts. Although Bangladesh has come a long way with regard to increasing its power supply since it gained independence in 1971, a considerable demand for electricity still remains unmet. With the growing population, increasing urbanisation and rapid industrialisation in the country, the per capita energy consumption in Bangladesh has increased almost twice over to 222.22 kg (oil equivalent),³ making it challenging for the country to meet the rising demands. In 2013 for example, Bangladesh faced a peak electricity demand of 8,349 MW. However, the maximum production of electricity only reached 6,675 MW.⁴

As evident in Figure 1, Bangladesh depends heavily on fossil fuels to generate electricity, with natural gas contributing 64 per cent of the country's electricity generation. However, the increasing use of natural gas has led to the dwindling of the domestic reserves. Taking into account that Bangladesh uses about 57 per cent of the country's natural gas production, it is estimated that its reserve of natural gas will be depleted in the coming decade.⁵ Acknowledging this, Bangladesh began to ramp up its gas imports. This too is proving to be an unsustainable strategy as

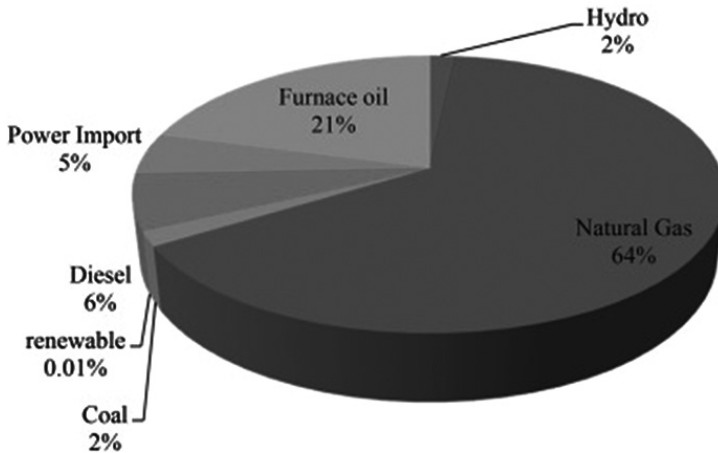
2. "Booming Energy Sector of Bangladesh: 90 Percent Have Access to the Electricity", BDnewsnet, July 12, 2018, at <https://bdnewsnet.com/bangladesh/economy/booming-energy-sector-of-bangladesh-90-percent-have-access-to-the-electricity/>. Accessed on February 28, 2021.

3. Asif Reza Chowdhury, Raihan Ul Islam Shezan and M. A. R. Sarkar, "The Prospects of Nuclear Power in the Bangladesh". Bangladesh Economic Association, at <https://bea-bd.org/site/images/pdf/041.pdf>. Accessed on March 1, 2021.

4. Ibid.

5. Ibid.

Figure 1: Energy Mix of Bangladesh
Primary Energy Mix Until August 2018



Source: N. K. Das, J. Chakrabartty, et al. "Present energy scenario and future energy mix of Bangladesh", *Energy Strategy Reviews*, vol. 32, 2020.

it would lead to import dependency. In this regard it is estimated that by 2030 Bangladesh will have over 90 per cent dependency on imported sources of energy.⁶ Bulk import of fuel won't only have a huge impact on government revenue but could also make the country vulnerable to price volatility and potential disruptions of power supply. Nuclear energy thus can play a significant role in the energy mix by minimising vulnerabilities and can go a long way in enhancing energy independence and steering the country into a sustainable course of development.

Furthermore, while the amount of coal used to generate electricity in Bangladesh isn't much currently, it is expected to rise as the authorities have been laying emphasis on coal exploration programmes around the country. The government has set up plans to establish a coal-based mega-power project which seeks to generate 19,200 MW by the year 2030.⁷ A boost in the coal energy sector

6. Badrul Imam, "The burden of imported energy", *The Daily Star*, December 13, 2018, at <https://www.thedailystar.net/opinion/perspective/the-burden-imported-energy-1504033>. Accessed on April 4, 2021.

7. N. K. Das, J. Chakrabartty, Mrinmoy Dey et al., "Present energy scenario and future energy mix of Bangladesh", *Energy Strategy Reviews*, v. 32, 2020.

would only worsen the problem of climate change further, to which Bangladesh is already highly susceptible. It is estimated that one in every 7 people in Bangladesh will be displaced by the year 2050 owing to the disastrous effects of climate change.⁸ Nuclear power in this regard has emerged as a favourable option considering its extremely low carbon footprint.

While renewable sources of power too have low carbon footprints, the expansion of the sector in Bangladesh has been limited. Among the renewables, hydropower is relatively more developed and currently contributes to about 2 per cent of the total electricity mix. However, it has the potential to further develop considering that Bangladesh has tapped into just 50 per cent of its hydropower capacity.⁹ The contribution of other renewable sources of energy is miniscule, since they haven't been adequately harnessed owing to political, economic and technological limitations. For example, despite having the potential to develop solar power in Bangladesh, there have been several impediments to doing so. This includes the requirement of substantial amount of land for the deployment of large-scale solar PV modules. Since Bangladesh is one of the world's most densely populated countries, availability of huge space is a challenge. Similarly, wind energy is assessed to have scope for development too; however, research on offshore wind speed, etc., have not yet been studied adequately in Bangladesh.

With the problem of energy crisis worsening, Bangladesh has been looking for alternative options to develop a sustainable energy policy. Nuclear Power in this regard emerged as one of the key energy options, considering the numerous benefits it offers, ranging from having a high capacity factor to extremely low carbon footprints.

To Fuel Economic Development

Energy security is a key factor to boost a country's economy. Especially in a country like Bangladesh, whose economy depends on industries,

83 "Climate Displacement in Bangladesh", *Environmental Justice Foundation*, at <https://ejfoundation.org/reports/climate-displacement-in-bangladesh#:~:text=Bangladesh%20is%20exceptionally%20vulnerable%20to%20climate%20change.&text=It%20has%20been%20estimated%20that,of%20sea%20level%20rise%20alone>. Accessed on March 3, 2021.

93 "Bangladesh—An economic behemoth in the making", *Andritz.com*, at <https://www.andritz.com/hydro-en/hydroneews/hydro-news-asia/bangladesh>. Accessed on April 4, 2021.

such as ready-made garments, agriculture and manufacturing sectors, keeping the power on has been critical for the country's economic development.¹⁰ As Bangladesh has been working to elevate its status to a middle-income country by 2021 and a developed country by 2041, it has been persistently looking at ways to achieve energy security. Towards this end, Rooppur Nuclear Power Plant Project Brochure states:

the availability of energy in a secured and affordable manner is the critical input parameters for materializing the country's vision 2021 and vision 2041 through socioeconomic development of all societies, improving quality of life of the population, proper urbanization and industrialisation. The indigenous resources of primary energy would be inadequate to meet the entire incremental demand on a sustainable and long-term perspective.¹¹

In this regard, considering Bangladesh's energy situation along with the experiences of other countries in their energy policies, the government of Bangladesh decided to pursue a nuclear energy programme to achieve these goals.

ASSESSING THE DEVELOPMENT OF NUCLEAR POWER AND TRACING ITS PROGRESS

The development of Bangladesh's nuclear power project can be studied under three phases based on the progress they've made.

Phase One: Pre-Project Planning

The inception of Bangladesh's civil nuclear programme can be traced back to the 1960s, when it was still East Pakistan. A proposal to build a nuclear power plant was raised in 1961 and since then several feasibility studies were undertaken, all of which concluded

103 Anand Kumar, "Bangladesh's Quest for Nuclear Energy", IDSA, October 17, 2007, at https://idsa.in/idsastrategiccomments/BangladeshsQuestforNuclearEnergy_AKumar_171007. Accessed on March 2, 2021.

113 Shakeel Ahmed Ibne Mahmood, "Air Pollution Kills 195,000 Bangladeshis Each Year". PATimes.org, at <https://patimes.org/air-pollution-kills-195000-bangladeshis-each-year/>. Accessed on March 2, 2021.

in favour of developing a nuclear power project.¹² The government gave formal approval for this project and the Rooppur site in Pabna district was selected. Shortly after Bangladesh gained independence, Bangabandhu Sheikh Mujibur Rahman, the father of the nation, decided to set up a nuclear power plant at Rooppur. Towards this end, the Bangladesh Atomic Energy Commission (BAEC) was established in 1973.

In 1986 BAEC started operating a 3 MW TRIGA-Mark-II research reactor. This was utilised to develop research and manpower training in the field of nuclear power.¹³ With energy demands increasing, the Bangladesh Nuclear Power Action Plan (BANPAP) was approved by the government and in 2001 it adopted the Nuclear Power Action Plan. Soon after, in 2007 BAEC proposed plans to build two 500 MWe reactors by 2015. Countries like China, Russia and South Korea expressed their interest in engaging in nuclear commerce with Bangladesh and offered technical and financial help to take the project ahead.

Phase Two: Decision Making

The second phase marks a period where important decisions regarding the nature of the civil nuclear programme were made. This includes the invitation for bids, consideration of proposals and signing of nuclear cooperation agreements, among others.

Bangladesh-Russia Nuclear Cooperation

In 2009 the Bangladesh government accepted a proposal by Russia to build a 1,000 MWe AES-92 nuclear plant at Rooppur. By mid-2009, a bilateral nuclear agreement was signed by both the countries and it was decided that the nuclear power plant will include two units, namely, Rooppur Unit-1 and Rooppur Unit-2. It was decided that these reactors would be designed to have a capacity of 1.2 GW each.¹⁴ It was also established that the project will be carried out by

12. M. M. Haque, M. S. Islam and M. A. Zulquarnain, "Challenges and Opportunities to Introduce the First Nuclear Power Plant in Bangladesh". IAEA.org, at https://www-pub.iaea.org/MTCD/Publications/PDF/P1500_CD_Web/htm/pdf/topic2/2S01_M.M.%20Haque.pdf. Accessed on March 1, 2021.

13. Ibid.

14. "Rooppur Nuclear Power Plant, Ishwardi". Power Technology.com, at <https://www.power-technology.com/projects/rooppur-nuclear-power-plant-ishwardi/>. Accessed on March 3, 2021.

the BAEC under the guidance of Science and Technology Ministry of the government of Bangladesh. The nuclear development project picked pace and in 2012 a nuclear energy bill was introduced in the parliament. This bill chartered the establishment of the Bangladesh Atomic Energy Regulatory Authority. The parliament was informed that the expansion of nuclear power was being considered, envisaging 5,000 MWe of nuclear power capacity by 2030. In 2013, funding and financing decisions were finalised and the Bangladesh government signed an intergovernmental agreement for a \$500-million Russian loan. This loan was taken to support the engineering surveys and training of the workforce, among other requirements. The repayment period for this loan was agreed for 12 years with an additional 5 years' grace period. In 2013, The Prime Minister of Bangladesh announced plans to construct a second nuclear power plant on an inland river island. For this purpose, the BAEC invited the Japan Atomic Energy Agency in 2014 to study the possibility of building a 2,000 MWe power plant. China's Dongfang Electric Corporation (DEC) too conveyed their interest in constructing the second power plant. Bangladesh, meanwhile, began to focus on developing the skills of its manpower. For this purpose, on May 2015, Bangladesh requested India's help in training its staff.

India-Bangladesh-Russia Tripartite Nuclear Cooperation

India began to play an important role in developing Bangladesh's civil nuclear programme after signing the 2014 *Strategic Vision for Strengthening Cooperation in Peaceful Uses of Atomic Energy* with Russia. Under this deal it was agreed that the "two sides will explore opportunities for sourcing materials, equipment and services from Indian industry for the construction of the Russian-designed nuclear power plants in third countries".¹⁵ Since India is not a member of the NSG, this arrangement with Russia provided it a platform to exhibit its capacity as a potential nuclear exporter. Towards this end in 2017, Sekhar Basu, chairman of the Atomic Energy Commission, announced India's decision to collaborate with Russia to build

15. "Strategic Vision for Strengthening Cooperation in Peaceful Uses of Atomic Energy Between the Republic of India and the Russian Federation", Ministry of External Affairs, Government of India, at https://mea.gov.in/bilateral-documents.htm?dtl/24487/Strategic_. Accessed on April 5, 2021.

the Rooppur nuclear power plant in Bangladesh.¹⁶ In 2017 India committed concessional financing of \$1.016 billion to Bangladesh under a line of credit worth \$4.5 billion. Kanwal Sibal, the former Foreign Secretary in this regard stated:

... Indian lines of credit create market openings for Indian companies. India is very well placed to provide such services as Russia is already building similar power plants for India at Koodankulam ... A joint venture between Russia, Bangladesh and India reduces costs for Russia and Bangladesh and provides commercial opportunities for Indian companies....¹⁷

In 2018 an MoU was signed by India's Department of Atomic Energy, Bangladesh's Ministry of Science and Technology and Russia's ROSATOM for the implementation of Rooppur Nuclear Power Plant. As per the agreement, Indian companies would be involved in the construction of non-critical infrastructure and installation work, in addition to supplying materials and equipment.¹⁸ The Hindustan Construction Company also entered into a joint venture with the Bangladesh-based MAX Group for this purpose. In addition, India has also been helping in the training of Bangladeshi nuclear scientists at the Kudankulam Nuclear Power Plant in Tamil Nadu, which too was built with Russian assistance. During Prime Minister Sheikh Hasina's visit to India, she signed three agreements, which included an agreement for exchange of technical information in regulation of nuclear safety and radiation protection. Another agreement was signed between the BAEC and India's Global Centre for Nuclear Energy Partnership (GCNEP),

16. "India, Russia to collaborate on Bangladesh nuclear plant, New Delhi's maiden atomic project abroad", *FirstPost*, September 20, 2017, at <https://www.firstpost.com/world/india-russia-to-collaborate-on-bangladesh-nuclear-plant-new-delhis-maiden-atomic-project-abroad-4063881.html>. Accessed on April 4, 2021.

17. Elizabeth Roche, "Indian firms to boost Bangla power infra", *Livemint*, April 2, 2021, at <https://www.livemint.com/companies/news/bangladesh-nuclear-power-project-1-t-others-awarded-construction-contract-11617271512562.html>. Accessed on April 5, 2021.

18. "Russia and India sign action plan on new projects", *World Nuclear News*, October 5, 2018, at <https://www.world-nuclear-news.org/Articles/Russia-and-India-sign-action-plan-on-new-projects>. Accessed on April 5, 2021.

appointing GCNEP as the consultant for the construction and operation of the Rooppur project. On March 2021, Harsh Vardhan Shringla, Foreign Secretary of India, announced that Indian companies will also be helping Bangladesh in the development of the transmission lines for the Rooppur Nuclear Power Plant in Bangladesh as part of its credit line. These transmission lines are valued at over US\$ 1 billion.¹⁹

Phase Three: Construction and Laying the Groundwork for the Operations

This period marks the preparations undertaken to get the reactors online. This includes the construction of the plant, training of personnel, etc. This period began in 2016 when the site work was 80 per cent completed and a site licence was issued by the Atomic Energy Regulatory Authority. In the following year, construction of the first unit began in November 2017, followed by the construction of the second unit in 2018, which is expected to go online by 2024. More agreements were signed with Russia in this period, such as the 2017 agreement on Spent Fuel Management. Soon after, in 2019 a nationwide policy on radioactive waste management was adopted by the cabinet. As it is a turnkey project, it was decided that ROSATOM will manage the power plant for the first years before handing it over to the BAEC. Meanwhile, BAEC has undertaken the task of training its manpower.

Phase Four: Operations

This phase is set to begin in the next few years when the reactors go online. This period will mark the testing, commissioning and operations of the two nuclear reactors. The first reactor is set to get operational in 2023 and the second by 2024.

19. "India's Credit Line for Bangladesh Covers Nuclear Projects, Rooppur Nuclear Power Plant: Foreign Secretary", NDTV.com, March 28, 2021, at <https://www.ndtv.com/india-news/indias-credit-line-for-bangladesh-covers-nuclear-projects-rooppur-nuclear-power-plant-foreign-secretary-2400332>. Accessed on April 5, 2021.

ASSESSING THE CRITICAL ASPECTS FOR NUCLEAR NEWCOMERS AND BANGLADESH'S PROGRESS IN THIS REGARD

Starting a civil nuclear project is a colossal task which requires in-depth planning and creative problem-solving techniques for critical issues. These include aspects such as ensuring nuclear safety, radioactive waste management, training a new generation of workforce, etc. The following section will assess these factors and analyse the potential challenges BAEC may face in this regard.

Nuclear Safety

Nuclear safety is a key concern that requires a comprehensive plan and infallible safety mechanisms. For this purpose, several institutions and mechanisms have been set up to ensure nuclear safety in Bangladesh. This includes the Nuclear Safety and Radiation Control Division (NSRC) established by the BAEC. This regulatory branch is responsible for matters regarding nuclear safety, such as careful use of radiation equipment, nuclear waste management, etc. The nuclear safety and radiation control division has been working in close cooperation with the IAEA, which guides on matters regarding radiation control. In addition, Bangladesh is also a signatory to several conventions and safeguard agreements.²⁰

However, several safety concerns have been raised considering that Bangladesh is susceptible to natural calamities, such as floods, earthquakes, cyclones and tsunamis. From 1980 to 2008, Bangladesh has witnessed over 200 natural disasters.²¹ Flooding, specifically, could pose a serious challenge, especially considering the 2020 floods which affected over 4 million people in Bangladesh. One of the areas that was massively affected was the Pabna district, where the Rooppur nuclear power plant is sited. Although a passive core flooding system was built for this purpose, it is unclear how successful it will be in evading any disaster. In addition to floods, earthquakes also pose a serious challenge since Bangladesh lies near 3 active fault

20. n. 12.

21. "Information on Disaster Risk Reduction of the Member Countries", ADRC Asia, at <https://www.adrc.asia/nationinformation.php?NationCode=50&Lang=en&NationNum=13#:~:text=Bangladesh%20suffers%20from%20floods%2C%20cyclones,136%2C000%2C%203%2C363%20and%20190%20respectively>. Accessed on March 4, 2021.

lines. The impact of an earthquake could be intensified considering that the plant is situated in a very densely populated area. Naiyyum Choudhury, Chairman of the Bangladesh Atomic Energy Regulatory Authority, clarified that these concerns were acknowledged and addressed before receiving the licences.²² Other project officials too have stated that a seismic monitoring station has already been set up to ensure constant monitoring of seismic activities.²³ However, despite the several safety mechanisms that have been adopted, there still isn't a comprehensive law to deal with matters of nuclear risks and possible liabilities.²⁴

Nuclear Waste Management

Nuclear waste management is a serious issue in the nuclear industry, requiring a highly safe system to store and dispose it. To manage nuclear waste, Bangladesh signed a "spent fuel sent back" agreement with Russia in 2017.²⁵ As per the agreement, Bangladesh will store the nuclear waste for a limited period of time, after which the waste will be sent back to Russia. According to the Science Secretary this provision was made considering that Bangladesh is a densely populated country, while Russia has large free spaces to treat and store the nuclear waste.²⁶ The Bangladesh cabinet has also approved the "National Policy on Radioactive Waste and Spent Nuclear Fuel Management—2019". As per this policy, the government will be creating a Radioactive Waste Management Company (RWMC). The RWMC will come under the BAEC and will be responsible for managing radioactive waste material in the country not only from

22. n. 3.

23. Rafiqul Islam, "Water shortages pose risks to Bangladesh's first nuclear plant", *The Third Pole*, at <https://www.thethirdpole.net/en/energy/water-shortages-pose-risks-to-bangladeshs-first-nuclear-plant/>. Accessed on March 4, 2021.

24. Dr. Md. Ershadul Karim and Ridoan Karim, "Future of Nuclear Energy in Bangladesh", *The Daily Star*, May 16, 2017, at <https://www.thedailystar.net/law-our-rights/rights-advocacy/future-nuclear-energy-bangladesh-1405837>. Accessed on March 4, 2021.

25. "Bangladesh signs uranium supply deal with Russia", *NewsOnAir.com*, August 6, 2019, at [http://www.newsOnAir.com/News?title=Bangladesh-signs-uranium-supply-deal-with-Russia&id=369741#:~:text=Bangladesh%20today%20signed%20a%20deal,Nuclear%20Power%20Plant%20\(RNPP\).&text=The%20two%20countries%20have%20also,Nuclear%20Power%20Plant%20\(RNPP\)](http://www.newsOnAir.com/News?title=Bangladesh-signs-uranium-supply-deal-with-Russia&id=369741#:~:text=Bangladesh%20today%20signed%20a%20deal,Nuclear%20Power%20Plant%20(RNPP).&text=The%20two%20countries%20have%20also,Nuclear%20Power%20Plant%20(RNPP)). Accessed on March 4, 2021.

26. "Bangladesh Govt approves Nuclear Waste Management Policy", *NuclearAsia.com*, October 23, 2019, at <https://www.nuclearasia.com/news/bangladesh-govt-approves-nuclear-waste-management-policy/3204/>. Accessed on March 4, 2021.

nuclear reactors but also from other sectors, such as the medical sector, industrial radiography practices, livestock research, etc.²⁷ A long-term strategy to deal with nuclear waste, however, does not appear to be formulated yet.

Public Acceptance

Public acceptance is a key factor in implementing the civil nuclear programme, especially in a democratic country. Understanding the importance of communicating with the public and creating awareness of its nuclear programme, the government of Bangladesh, along with Russia, has undertaken several steps to engage with the citizens. These public diplomacy initiatives include seminars and exhibitions to educate the citizens on the subject of nuclear power. To engage more effectively with the public the "Public Counselling Office" and a "Public Awareness Programme" too has been set up. To garner interest and create job opportunities, the government has made provisions for Bangladeshi students to study nuclear engineering in Russia. ROSATOM in this regard organises visits to the Novovoronezh Nuclear Power Plant and invites young Bangladeshi's to attend events such as Forsage 2017 International Forum for Young Power Engineers and Industrialists.²⁸

Nuclear Security

A critical infrastructure such as a nuclear power plant is vulnerable to attacks by violent organisations in order to make a statement or to steal nuclear materials. To ensure the safety of the plant, Bangladesh has a strong security plan in place. A composite response force led by the Bangladeshi Army is responsible for the physical security of nuclear infrastructure. In addition, the Bangladeshi authorities have signed a protocol with ROSATOM to form a Physical Protection System (PPS) of the nuclear power plant.²⁹ Speaking on matters of

27. Ibid.

28. Andrey Shevlyakov, "Changing perceptions on nuclear energy", *The Daily Star*, December 25, 2017, at <https://www.thedailystar.net/opinion/perspective/changing-perceptions-nuclear-energy-1509760>. Accessed on March 4, 2021.

29. Brigadier General Akhter Shahid, "Bangladesh's Experience in Nuclear Energy", Panel Discussion on Sustainable Use of Nuclear and Other Radioactive Materials, VCDNP.org, at <https://vcdnp.org/wp-content/uploads/2019/04/VCDNP-Panel-Talk-21-Mar.pdf>. Accessed on March 23, 2021.

nuclear safety, Prime Minister Sheikh Hasina mentioned that a unit of law enforcement, such as police, defence personnel, etc., has been formed to ensure security of the nuclear units.³⁰ The BAEC too has established a Nuclear Safeguards and Security Division to supervise matters regarding the accounting, control and security systems of nuclear materials.³¹

Legislative Framework

BAER Act-2012 is a wide-ranging legal framework that was established to regulate nuclear energy in Bangladesh. Supplanting the *Nuclear Safety and Radiation Control (NSRC) Act-1993*, its primary function is the safe operations of nuclear power plants. Its scope ranges across all nuclear issues from non-proliferation to environmental protection; from emergency preparedness to transport of nuclear materials; from nuclear liability to decommissioning of power plants. In addition to the BAER, other ministries also hold responsibility towards certain nuclear related matters. For example, the Ministry of Environment, Forest and Climate Change is responsible for public safety in case harmful radiation is leaked from nuclear facilities.³² There have also been plans to form an independent regulatory body. For matters of overall nuclear safety, the government emulates international legal safety mechanisms to meet international standards.³³

Development of Human Resources

Nuclear Power is a highly technical and specialised field which requires qualified and trained personnel for multilevel functioning of a nuclear power plant. With a dearth of human resources, the authorities have been focusing on upgrading the skill of their

30. "Necessary safety measures taken for nuclear power plant, says Hasina", Bdnews24.com, July 14, 2018, at <https://bdnews24.com/bangladesh/2018/07/14/necessary-safety-measures-taken-for-nuclear-power-plant-says-prime-minister>. Accessed on March 5, 2021.

31. n. 12.

32. Md. Shafiqul Islam, Shafiqul Islam Faisal and Sadia Khan, "Development and strengthening of the nuclear and radiation safety infrastructure for nuclear power program of Bangladesh", *Nuclear Engineering and Technology*, November 19, 2020, at <https://reader.elsevier.com/reader/sd/pii/S1738573320309359?token=5419FCBC1295B5B11110FAF23CF4EEF154766117A9E5CA99B5813649907BF4BB25F7507DD56869A5488B3B0C41DD8695>. Accessed on March 4, 2021.

33. n. 12.

manpower before the reactors go online. For this reason, BAEC has been organising workshops, symposiums and seminars.³⁴ BAEC has also established a training institute in the field of nuclear science which currently conducts fundamental courses on nuclear technology for young professionals.³⁵ Several universities in Bangladesh, such as the Bangladesh University of Engineering and Technology too have started courses on nuclear technology. In addition, agreements have been signed with other countries, which is helpful in providing training support from experienced players. This includes countries such as India, the United States, Belarus, Russia and Japan.³⁶

CONCLUSION

Bangladesh stands at the crossroads of a major transition from an underdeveloped economy to a rapidly developing one. Energy security is one of the primary factors that will facilitate this transition. Nuclear power will have an important role to play in managing the rising energy crisis in the country.

The overall future of nuclear power in Bangladesh so far appears to be optimistic. The BAEC is on track with most of the groundwork and it appears likely to be able to meet its timelines. Despite the COVID-19 pandemic, which stalled the progress of several developmental projects, such as the Padma Bridge and the Dhaka metro-rail in Bangladesh, the Rooppur project remains unaffected and is currently on schedule.³⁷ However, developing a civil nuclear project is a complex and enormous commitment, which requires a comprehensive plan of action. In this regard, authorities will need to be alert since there is a possibility of a myriad problems emerging at each stage.

Concerns of nuclear safety are already beginning to stir in Bangladesh especially after the Rooppur pillow scam which exposed

34. Ibid.

35. Md. Kabir Hossain, "Human Resources Development for Rooppur Nuclear Power Programme in Bangladesh." International Conference on Human Resource Development for Nuclear Power Programmes: Building and Sustaining Capacity, May 12-16, 2014, at <https://www-pub.iaea.org/iaeameetings/cn215p/Tuesday/IAPs/Morning/Hossain.pdf>. Accessed on March 6, 2021.

36. n. 30.

37. Reazul Bashar, "Rooppur nuclear power plant on 'fast track' despite pandemic", BDnews24.com, July 12, 2020, at <https://bdnews24.com/economy/2020/07/12/rooppur-nuclear-power-plant-on-fast-track-despite-pandemic>. Accessed on April 5, 2021.

several authorities embezzling funds. This has raised serious questions about the nature of the project.³⁸ As the case of South Korea's nuclear industry has proven, recklessness and venality by the authorities is sufficient to shut down even a well-established nuclear power programme. A more transparent nuclear programme with mechanisms to ensure credibility is imperative. Several other objections have been put forth by concerned citizens and activists that requires more clarity and communication from the authorities. This includes the apprehensions regarding the decreasing flow of water in Padma River³⁹ as it could pose a serious challenge to the nuclear power project since nuclear plants require huge amounts of water for cooling, the lack of which could lead to a nuclear catastrophe. In addition, considering the importance of grid reliance, there have been speculations that the current grid capacity is inadequate to introduce two new 12 MWe nuclear units. These concerns, and the ambiguities around them, need to be addressed by the authorities to clarify and quell public fear. The BAEC will also have to ensure that the development of legal and regulatory infrastructure matches the pace of the construction of the plant. This is important to ensure the safe functioning of nuclear power plants. The future of nuclear power in Bangladesh is thus likely to depend on the way the authorities ensure safety and manage the challenges that come their way.

38. "16 officials suspended in Rooppur Power Plant pillow scam", *Dhaka Tribune*, October 15, 2019, at <https://www.dhakatribune.com/bangladesh/court/2019/10/15/16-officials-suspended-in-rooppur-power-plant-pillow-scam>. Accessed on February 26, 2021.

39. n. 1.