Rooppur Nuclear Power Programme : Bangladesh's Nuclear Leap Forward

"The nuclear dream comes true"

In conversation with Yeafesh Osman, Minister, Ministry of Science and Technology

What is the present status of the Rooppur Nuclear Power Plant (RNPP) project?

I would like to begin by saying that Rooppur nuclear power programme is a long-cherished dream of the people of Bangladesh. The idea of building a nuclear power plant was first conceived in 1961. At that time, Rooppur area of Pabna was chosen as the project site. After years of procrastination, the then Pakistan government shifted the project to Karachi. This is another factor that contributed to a sense of deprivation among the Bengalee population.

After independence, Bangabandhu Sheikh Mujibur Rahman took up the project again and decided to set up a 200MW nuclear power plant at Rooppur. A feasibility study was conducted by the French company M/S Sofratome. After the brutal killing of Bangabandhu, the project faced a huge setback and until his daughter Sheikh Hasina came to power, it could not make much headway. Sheikh Hasina took up the project very seriously and asked me to contact Russia about the project since the country has vast experience in nuclear power programmes. There's also the fact that they played a key role in support of our Liberation War.

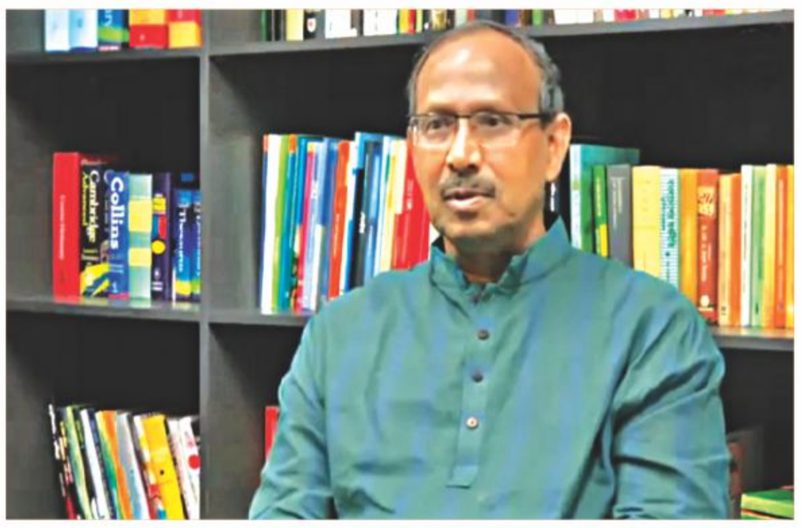
Long story short, on May 13, 2009 Bangladesh Atomic Energy Commission (BAEC) and Russian State Energy Commission, ROSATOM signed a MoU on cooperation in peaceful use of nuclear energy. After two years of groundwork, an inter-governmental agreement was signed between Bangladesh and Russia on November 2, 2011 to take forward the RNPP project and begin construction.

In all the discussions with Russia, we have always given the highest priority to the safety aspect of the project. Just to give an example, initially Russia put forward a proposal for a plant which, though technologically advanced, had not yet received international license. We did not go for it and chose the widely used VVER-1200 reactor technology.

There is also political commitment from the highest level in both Bangladesh and Russia to implement the project successfully. When our prime minister visited Russia, President Putin made a commitment to provide all kinds of support for the Rooppur project. This is a turn-key project which means that the contractor will complete the whole project and they will be liable for any problems that arise in the plant.

Our PM has a special interest in the project. She routinely inquires about the progress of the project. We also have full support from parliament which reflects public confidence in the Rooppur nuclear project.

We are closely working with International Atomic Energy Agency (IAEA). At every stage of construction of the nuclear plant, we adhere to IAEA's 'Milestones' approach to build a national infrastructure for nuclear power. This approach refers to 19 infrastructure issues that include nuclear safety, radiation protection, legislative framework, emergency planning, human resource development and so on.



We have hosted several missions from IAEA. Recently, the Director General of IAEA visited the Rooppur site. He expressed his satisfaction about the development of the project. He conveyed the message to our PM that he is fully convinced that the project will definitely be a safe and successful one. In the recently concluded IAEA Conference in Vienna, Bangladesh, for the first time, got a stall to showcase her nuclear programme. The DG of IAEA has also requested us to join the upcoming Abu Dhabi conference to present the Rooppur programme to a global audience.

Now coming to your question about the present status of the project, we have completed construction of the entire supporting infrastructure in the first phase. We are now preparing for the observation of the first "concrete-pouring day". Hopefully, it will happen by the end of October or mid-November this year, after which the main construction work will begin. We hope we will be able to start commercial production of electricity from the Rooppur Nuclear Power Plant in 2022.

The plant will be the cheapest source of electricity for the country. It is estimated that the electricity generated from the plant will cost Tk 4 per unit. This plant will be in operation for 80 to 100 years. Hopefully, within 20 years we will be able to get back the construction cost.

What would be India's involvement in the project?

India has implemented similar nuclear projects with Russian assistance. So we want to learn from their experience. They will not interfere in any way in the construction of the project. Their role will just be that of an adviser. It will definitely boost our confidence. The three parties, Bangladesh, India and Russia, are now working to find a modality of cooperation.

After the Fukushima accident in March 2011, the safety of nuclear plants has become ever more prominent. What safety measures have been taken for this project?

I visited Fukushima soon after the accident. Its radiation exposure was limited within a relatively short area. The Japanese government evacuated individuals who were living within a 20km radius around the nuclear plant. The accident was not a result of ineptitude but rather a deadly tsunami which knocked out the power supply and cooling system of the nuclear plant. The diesel generators that had been cooling the plant were waterlogged. It resulted in leakage of nuclear waste. Thanks to the location of the Rooppur plant, there is very little probability of such massive natural disasters ever occurring. However, we have taken the highest safety measures for all kinds of natural and human-induced external events such as earthquakes, floods, fires, etc., as well as to control the radiological impact on the population on the territory during normal and accidental conditions.

Another safety concern is the management of nuclear waste, particularly spent fuel of nuclear power plant. Ninety percent of the used fuel can be recycled. I went to France to get a clear idea about the storage process of nuclear waste. They keep it 1500ft under ground and keep it sealed in a steel structure. As Bangladesh is a densely populated country, we are not taking any risk with the spent fuel. Russia will take away the spent fuel. The government has recently signed an agreement with Russia in this regard.

We know a large number of skilled professionals are required for the implementation, operation and maintenance of a nuclear power programme. What is your plan in this regard?

We have a contract with a Russian organisation under which they will train 1600 people for the implementation, operation and maintenance of the project. We have already sent 47 students to Russia who will work at the top level. These students have been selected by BUET through intensive tests. We have even scrutinised their background since this is a very sensitive project. This year, we will send 50 more people to Russia. We have also arranged training programmes with India, and under this arrangement 100 Bangladeshis have already been trained on the fundamentals of a nuclear power project. Soon we will send 100 more for training.

I want to conclude by saying that I am a freedom fighter. I own this country. My interest in the project is to achieve a milestone for my country. Through the successful implementation of the project we aspire to enter the prestigious nuclear club.

State of nuclear safety education and research in Bangladesh

Dr Md Shafiqul Islam

After the independence of Bangladesh in 1971, the Father of the Nation Bangabandhu Sheikh Mujibur Rahman established Bangladesh Atomic Energy Commission (BAEC) by President's Order No. 15 of 1973 for the purpose of strengthening the peaceful use of atomic energy and establishing the Rooppur nuclear power plant. The primary work of the atomic energy commission was to establish larger research institutes like Pakistan Institute of Nuclear Science and Technology (PINSTECH) or UK's Atomic Energy Research Establishment (AERE) for the purpose of making breakthroughs by undertaking research and development work in different areas of nuclear science and technology. Then by the explicit involvement of the most prominent nuclear scientist Dr MA Wazed Miah, Bangabandhu Sheikh Mujibur Rahman sanctioned the BAEC 265-acre land at Ganakbari, Savar. As a result, BAEC's largest research institute, the Atomic Energy Research Establishment (AERE), was established in 1975. In this establishment, a 3 MWth TRIGA Mark-II research reactor was installed and commissioned in 1986.

From 1973 to date, despite noteworthy contributions by nuclear scientists, engineers and doctors in health, industry, agriculture, environment and human resource development areas, it was not possible to achieve the expected goal because of limited resources and infrastructural constraints.

Keeping in mind the need to overcome the country's fuel crisis and energy security issues and to meet the energy demands to become a middle income country by 2021 and a developed country by 2041, the government of Bangladesh with the help of Russia took up the decision of implementing the Rooppur nuclear power plant project in 2009. The construction of two units of the VVER-1200 nuclear reactor with a combined output of 2400 MWe is going on at present. It is estimated that one of the two units will go into operation by 2023 and the other by the following year. As Bangladesh is a newcomer in the nuclear power programme, national nuclear safety infrastructure must be developed in order to ensure the highest possible levels of safety throughout the entire lifetime of all nuclear facilities and activities. The prime responsibility lies with the government to establish an effective regulatory body with the necessary legal framework and other relevant national authorities in cooperation with international organisations in order to build and maintain a robust national nuclear safety infrastructure. On the other hand, ensuring safety—based on regulatory requirements and guidance set forth for the facilities and activities that give rise to radiation risks—is the responsibility of the operating organisation.

A nuclear power programme is highly infrastructure-dependent, sophisticated and technologically extensive. The success of a nuclear power programme of any country solely depends on how the safety aspects, particularly a safety culture, have been incorporated in its programme. TMI (1979), Chernobyl (1986) and Fukushima (2011) nuclear accidents occurred due to a weak safety culture. These accidents have resulted in negative growth of nuclear energy. There is much concern worldwide about the safety of nuclear technology.

With the purpose of creating knowledgeable manpower in nuclear technology and engineering and for the successful establishment and sustainable operation of a nuclear power programme, the University of Dhaka established the Nuclear Engineering Department for the first time in 2012. Academic activities began with the master's programme the same year and the honours programme the following year. In tandem with the University of Dhaka, MIST established its nuclear engineering department in 2014. In 2016, BUET founded an institute named Institute of Nuclear Power Engineering but its academic activities have not yet begun.

After getting involved in education and research activities in nuclear engineering, I noticed that there exists a lack of knowledgeable manpower in almost all areas of nuclear safety. Nuclear safety refers to the protection of people and the environment against radiation risks and the safety of facilities and activities that give rise to such risks. Nuclear safety disrupts when there are unintended conditions or events leading to radiological releases from authorised activities. It could happen in nuclear installations due to the lack of intelligent planning, proper design with conservative margins and backup systems, high-quality components and a well-developed safety culture during the management, site selection, design, construction, operation, maintenance, and decommissioning stages.

Safety has been an important consideration from the very beginning of the development of nuclear reactors when Enrico Fermi developed the first artificial nuclear reactor on December 2, 1942 where a nuclear chain reaction took place, controlled, and sustained. The term safety as used here includes the safety of nuclear facilities and the activities associated thereto. It does not cover non-radiation related safety.

With an aim of establishing a global safety regime, IAEA was created in 1957 to monitor and advocate the nuclear safety issues for countries embarking on a nuclear power programme and/or radiological activities for peaceful purposes. The first IAEA safety standard series focusing on how to handle safely the radionuclides evolved in 1958 in cooperation with a group of international experts. The IAEA safety standards consist of three pillars: safety fundamentals, safety requirements and safety guides.

Safety fundamentals establish the fundamental safety objective and principles of protection and safety and provide the basis for safety requirements. Safety requirements set out the requirements that must be met to ensure the protection of people and the environment for the present and the future. These requirements are governed by the objective and principles of the safety fundamentals. Safety guides provide recommendations and guidance on how to comply with the requirements.

The IAEA safety standard series is applicable for those countries that have nuclear facilities and activities or those going to develop a national nuclear infrastructure for the peaceful use of nuclear energy. It refers to competence, education, training, human resources, knowledge management and knowledge networks. It now has about 142 publications covering all areas of safety including management, site evaluation, design, construction, operation, maintenance regulatory control and function, nuclear and radiological waste, fuel cycles, transport and more.

In the context of safety education, research, and training activities, our academic curricula include safety analysis during design, siting, operation, safety regulation and control, nuclear accidents and safety issues. It also includes IAEA safety standards and safety culture. Since the academic programme is new, it is yet to set up thermohydraulic and fuel cycle safety laboratories. Limited safety related research is ongoing using codes and analytical methods. BAEC is doing limited safety research using codes such as RELAP, MCNP, etc. However, there is no such laboratory at BAEC or regulatory body.

For the successful and safe implementation of a nuclear power programme there should not be any scope of bureaucratic bottleneck, politics, and personal problems among each of the stakeholder organisations such as concerned ministries, regulatory bodies, operating organisations, educational institutes, and technical support organisations. All stakeholders need to work hand in hand. It is essential to develop a national strategic approach to education, research, and training in nuclear safety in line with the IAEA safety standards. It requires a high level of national commitment. Without a sustainable national nuclear safety infrastructure, it would be hard indeed to operate a nuclear power programme in a safe and sustainable manner. This is because safety comes first. It is worth mentioning that nuclear technology is ever-changing and evolving quite rapidly. The new generation of nuclear reactors is being developed with modern technology and enhanced safety features. There will be no such accidents like Chernobyl (1986) or Fukushima (2011) in the new generation of modern reactors like VVER-1200 generation III+ reactor which is selected for the Rooppur site. However, there is no other alternative except to develop a national nuclear safety infrastructure, competent human resources, and safety culture through proper policy, education, research, and training.

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