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The Political Economy of Rooppur Nuclear Power Plant in Bangladesh

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Abstract

Energy is essential for human survival. Its provision extends beyond access to social services; it is fundamentally a source of existence. Therefore, every government must ensure energy access at affordable rates. In this context, in 1960, the government of Bangladesh planned the construction of a nuclear power plant in Rooppur. Once operational, the plant will have a significant impact on the state, economy, and society. This study aims to explore the Political Economy of the Rooppur Nuclear Power Plant (NPP) by addressing key questions: How was it conceived and developed? What motivated the choice of nuclear power despite the well-known safety concerns of nuclear technology? What indicators influenced the vendor selection? Who are the state and non-state actors involved, and what are their interests? Due to the project's nature, the study adopts an alternative perspective based on the 3Cs theory of political economy: Collaboration, Conflict, and Cooperation. For developing countries, energy from fossil fuels is the most affordable option; therefore, it is commendable that the Bangladesh government has jettisoned coal-fired power and opted instead for the more sophisticated nuclear power option. The Rooppur NPP project, conceived in 1960, is now nearing completion, thanks to the effort and determination of the government of Bangladesh.

Keywords

Energy Access, Nuclear Power Plant, Political Economy, Collaboration, Conflict, Cooperation, Fossil Fuels, Coal-Fired Plant

1. Introduction

Energy is vital for human survival. Its supply goes beyond access to social services; it is fundamentally a prerequisite for existence. Therefore, every government must

ensure that energy is accessible at affordable rates. In this context, in 1960, the government of Bangladesh planned to build a nuclear power plant in Rooppur. Once operational, the plant will significantly impact the state, economy, and society. This study seeks to examine the political economy of the Rooppur Nuclear Power Plant by exploring key questions: How was it conceived and developed? What motivated the choice of nuclear power despite the well-known safety concerns of nuclear technology? What factors influenced the vendor selection? Who are the involved state and non-state actors, and what are their interests? Due to the project's nature, the study takes an alternative perspective based on the 3Cs of political economy: Collaboration, Conflict, and Cooperation.

1.1. Profile of Bangladesh

Bangladesh is a South Asian country situated at the confluence of three major river basins. A World Bank [1] report shows that Bangladesh had a population of 158 million in 2016 and a Gross Domestic Product (GDP) of $274 billion in 2018. Bangladesh has a high poverty rate, with the yearly per capita income ranging from $400 to $1700 [2]. Bangladesh has a high uranium deposit, and this radioactive mineral is the primary energy resource for Bangladesh's nuclear power. Ghose *et al.* [3] state that the riverine system of Bangladesh transports the most considerable amount of natural uranium sediments annually to the Bay of Bengal, which accounts for approximately 10 per cent of the estimated global supply of natural uranium to the oceans.

1.2. Electricity Profile [4]

Total generation: 73.2 TWh; Generation mix: natural gas (79%), oil (13.3%), coal (1%), and hydro (1%); Total consumption: 62 TWh; Per capita consumption: 350 kWh.

Bangladesh also has several off-grid energy sources from solar photovoltaic (PV) systems. As reported by [5], Bangladesh now has one of the fastest-growing solar home systems in the world, with a combined generating capacity of 220 MW. However, the price of solar electricity is four to six times higher than that of grid-connected electricity.

1.3. Energy Policy

Bangladesh is confronting twin energy crises: an urban crisis marked by persistent power outages and a rural crisis due to a shortage of traditional biomass. As an agricultural nation, the impact of biomass on rural energy consumption cannot be overlooked [6]. In 1996, the national government introduced a comprehensive energy policy in response to a growing population and rising energy demands. Its goals were to improve energy access, ensure energy security, and gradually shift from fossil fuels to renewable and sustainable energy sources. To commemorate Bangladesh's 50th anniversary in 2021, the government aimed to provide electricity to all by that year, with a target of generating 10 per cent of electricity from

renewable sources [5]. The prospective plan for 2010-2021 recommends using an energy mix to achieve 20,000 MW of generation by 2020, with nuclear power making up 10 per cent of the total energy production. According to the government's long-term policy projections, it is crucial to attain 4000 MW from nuclear power plants by 2030 [6].

2. Theoretical Framework

The theoretical framework serves as the fulcrum of an essay. Furthermore, a theoretical framework provides an approach to map how various institutions, ideas, and interests interact with each other in shaping a government's policy choices [7]. This study aims to analyse the process and implementation of Bangladesh's policy to construct a Nuclear Power Plant (NPP) in Rooppur, and to assess the motivations behind the project. Therefore, the political economy theoretical framework is the ideal choice to juxtapose the government's political considerations in its policy choices, the economic factors that necessitate such policies, and the interactions between different state and non-state actors. According to Gilpin [2], political economy, 'in its broadest sense, deals with how government, or the state, interacts with the private sector, or the market'. Due to its broadest, the political economy theory that underpins this study is the 3Cs: Collaboration, Conflict, and Cooperation.

3. The Political Economy of the Rooppur Nuclear Power Plant

3.1. Why Nuclear Power Plant (NPP)?

There is controversy over the advantages of nuclear power, and consequently, some countries, such as Germany, have now taken a stance against using nuclear energy [8]. The controversy represents a conflict that the government of Bangladesh needs to manage to achieve the aim of constructing the power plant. The Bangladesh government's decision to pursue nuclear power, given the substantial safety concerns surrounding NPPs, requires a thorough understanding and analysis. The Bangladesh government made it clear that the primary goal of the project is to provide its growing population with access to energy, using the country's abundant uranium resources. As Desai & Potter [9] state, 'good governance is defined as sound management of a country's economic and social resources for development'. Geert and Loorbach [10] further assert that access to energy is essential for human development. The first factor influencing Bangladesh's choice of nuclear power is energy reliability. An alternative energy source with a comparable energy density to that produced by an NPP would inevitably be derived from either fossil fuels or hydro energy. Fossil fuels include coal, oil, gas, and diesel. Nuclear energy has an advantage over hydroelectric power in terms of reliability, as seasonal water level variations significantly impact hydroelectric output. When comparing energy generated from NPPs with that from fossil-fuel power plants, Geert and Loorbach [10] highlighted the risk of dependence on fossil fuels, considering the imminent depletion of global mineral resources. Additionally, the

Bangladesh government considered solar PV as another potential energy source. However, solar PV requires large land areas to generate substantial power. It is not reliable for two main reasons: 'the solar home energy is not able to meet one of the most important energy demands, which is for cooking' and 'storage issues constrain how and for what solar electricity can be used' [5]. Consequently, based on the government's analysis, energy from NPPs was deemed the most reliable. Another factor in choosing nuclear power is its affordability. This refers to how reasonably priced the energy is for consumers in terms of tariffs. While domestic gas supply is limited, imported power lacks energy security, a point that will be discussed later. Comparing nuclear power with solar PV, Bridge *et al.* [5] noted that 'the price of solar electricity is still four to six times higher than grid-connected electricity'. This analysis indicates that energy from NPPs is more affordable. Environmental sustainability poses another challenge in ensuring energy access. The comparison here focuses on nuclear and fossil-fuel power, as both hydroelectric and solar PV power are environmentally friendly. Geert and Loorbach [10] highlight the heavy dependence of modern society's energy supply on oil and gas, as well as the extensive use of fossil fuels. They point out that severe air pollution in large cities results directly from coal burning. Besides air pollution, CO_2—a greenhouse gas produced by carbon emissions—significantly contributes to global warming. Nuclear power is environmentally friendly as it emits no air pollutants or carbon dioxide. Although radioactive waste from operating NPPs causes safety concerns, the Bangladesh government has considered this issue. Beyond reliability, affordability, and environmental sustainability, energy security is another crucial political factor influencing Bangladesh's energy choices. According to Bridge *et al.* [5], 'the oil shocks of the 1970s further consolidated interest in nuclear power, by elevating energy security as a policy concern'. Energy security relates to the resilience of an energy source against external pressures such as price fluctuation, supply disruptions, or conflicts (e.g., the Russia-Ukraine gas crisis of 2006-2009, which affected European gas supplies). The Rooppur NPP does not depend on imported primary energy sources or rely on political agreements with other countries. As a result, it provides a guarantee of Bangladesh's energy security. Natural disasters are also relevant factors to be considered—for instance, the 2011 earthquake destroyed the NPP in Fukushima, Japan—but these are beyond human control or contingency planning. Lastly, Bangladesh's energy policy framework, the National Energy Policy (NEP), supports the country's nuclear power plans. Nuclear power is expected to play a significant role in Bangladesh's energy mix from 2010 to 2030, supported by [6], which states that the NEP aims to ensure the proper exploration, production, distribution, and rational use of energy resources to meet growing energy demands. The details of the Rooppur NPP under construction are shown in **Table 1**, indicating the model, the size, construction, and operation targets. The government's plan and the above explanation provide the masses with an avenue to understand the NPP's choice, thereby avoiding conflicts with the masses.

Table 1. Details of the Rooppur NPP under construction [11].

Reactor	Model	Gross MWe	Construction Starts	Commercial Operation
Rooppur 1	VVER-1200/V-523	1200 MWe	November 2017	2023 or 2024
Rooppur 2	VVER-1200/V-523	1200 MWe	July 2018	2024 or 2025

3.2. The Choice of Russia as the Vendor

While the Government of Bangladesh collaborates with Russia on the construction, it is crucial to understand why. A project of this magnitude demands a thorough evaluation of bidders and proposals. The main criteria used by the Bangladesh government to select investors include technical proficiency, experience in similar projects, and financial capacity. An initial assessment suggests that the primary reasons for choosing Russia as an investment destination are expertise and financial resources. This is supported by Ashraf and Shafiqul [7], who mention three reasons for Bangladesh's decision to select Russia as the supplier.

1) In contrast to the Russian nuclear agency, companies in France, Japan, South Korea, and the United States do not have comparable experience in building and operating reactors abroad.

2) Nuclear Power Plant (NPP) projects are much more capital-intensive when compared to gas-based or coal-fired power plant projects. Hence, funding was a major driver behind the selection of the vendor country.

3) Although both China and South Korea expressed interest in the Rooppur NPP project, none of their financial proposals could match the one offered by Russia.

3.3. State and Non-State Actors

The government of Bangladesh is the leading actor in constructing the Rooppur NPP. It is responsible not only for selecting the vendor and appointing other key participants but also for establishing the proper government agency and creating an environment that enables the project's successful realisation. This includes ensuring collaboration with suitable countries, such as India, and promoting cooperation among all involved parties. Furthermore, the Prime Minister is tasked with lobbying Parliament to facilitate the smooth passage and enactment of relevant laws that will speed up the project's implementation.

Russia: This is another major actor in the implementation of the Rooppur NPP. In addition to finance, Russia handles the most complex aspect of the initiative: the design, engineering, procurement, and installation of the reactor under a turnkey contract format. A turnkey contract entails a build, test, operate, and transfer mode of operation.

India: The bilateral agreement between Bangladesh and India on the peaceful use of nuclear energy and technical support means India has a significant responsibility in terms of providing technical support and supplying manpower for the Rooppur NPP. Bangladesh is leveraging India's wealth of human resources.

Masses: Ordinarily, the masses would have played a more profound role if there had been opposition to the construction of the Rooppur NPP or its siting in Rooppur. Based on a preliminary study, there was a consensus among the population that the project is a means of better energy access and economic prosperity due to its propensity to provide employment opportunities and promote technology transfer. Nevertheless, Topychkanoc [12] deferred and argued that issues like water supply to the plant, safe disposal of spent nuclear fuel, terror threat, and security of the plant are of great concern that need to be addressed by the appropriate authority.

3.4. Government Institutions

The following institutions played key roles in the Rooppur NPP:

1) Bangladesh Atomic Energy Commission (BAEC): focused on the technical aspect of the reactor.

2) Ministry of Science and Technology (MOST): in charge of the legal and policy framework of the project.

3) Nuclear Power Company of Bangladesh Limited (NPCBL): ownership and operation of the NPP.

4) ROSATOM State Atomic Energy Corporation (ROSATOM): A Russian company in charge of the reactor.

5) International Atomic Energy Agency (IAEA): responsible for the global promotion of the peaceful use of nuclear energy.

3.5. Interests and Other Issues

1) The outbreak of the independence war with Pakistan delayed the take-off of the project.

2) The lack of political strength for the new country, Bangladesh, further delayed the take-off.

3) Lack of financing and initiatives stalled the implementation of the project.

4) Bangladesh later mustered the political strength for the execution of the project.

5) Regional cooperation from India (human resources) and foreign support from Russia (finances).

4. Benefits of the Rooppur Nuclear Power Plant (NPP)

4.1. Climate and Environment

Climate change is a global concern. Desai and Potter [9] assert that 'a major threat to the environment is posed by global climate change'. Nuclear power does not emit carbon into the atmosphere. The construction of the Rooppur NPP benefits the environment in two ways: it prevents greenhouse gas emissions and reduces environmental pollution. Therefore, it serves as an effective means of climate change mitigation and promotes a cleaner environment. Although Bangladesh contributes little to global greenhouse gas emissions, the Intergovernmental Panel on Climate

Change (IPCC) projection report predicts that Bangladesh will experience temperature increases of 1 to 3 degrees Celsius by 2050 [2]. In the environment, energy extraction and production often lead to pollution and land degradation. Desai and Potter [9] also recognise that activities related to energy supply cause various types of environmental damage. Consequently, the construction of an environmentally friendly NPP stands as a success story for the Bangladesh government.

4.2. Energy and Development

The importance of energy in every facet of human endeavour cannot be overemphasised. The United Nations (UN) Sustainable Development Goal (SDG) for ending poverty and ensuring prosperity identifies energy as central to nearly every major challenge and opportunity the world faces [13]. According to Bridge *et al.* [5], securing reliable, affordable, and environmentally sustainable energy is one of the grand challenges of the twenty-first century. Energy security provides valuable insights into Bangladesh's pursuit of nuclear power, which would make the country the only South Asian nation with the most significant proportion of nuclear energy connected to the national power grid [7].

5. Critique of the Rooppur Nuclear Power Plant

Safety concerns: since the NPP accidents at Three Mile Island in 1979, Chernobyl in 1986, and Fukushima in 2011 [7], there have been significant concerns about the safety of NPPs. NPP-related accidents are not only limited to the power plant or its immediate environment but also affect the entire surrounding area. This constitutes a significant shortcoming in the use of nuclear power. Nevertheless, countries such as France and the United Kingdom continue to incorporate nuclear power into their low-carbon energy solutions.

Environmental hazard: Radioactive waste generated during NPP operation, if not handled properly, can harm nearby plants and contribute to the loss of aquatic life. Ashraf and Shafiqul [7] reveal that the Russian nuclear agency has extensive experience in radioactive waste reprocessing capabilities. However, there is a compelling concern that the vendor (Russia) might fail to manage the radioactive waste effectively.

Bidding process: This study observed that the bidding process was shrouded in secrecy, and the total cost of the Rooppur NPP was not disclosed. Thus, Transparency International Bangladesh (TIB) called for full disclosure of information relating to the agreements concerning the Rooppur NPP between Bangladesh and Russia [7].

Choice of vendor: This study also observed that none of the Western countries, especially the United States, which is renowned for its nuclear power technology, showed interest in the bid.

Transparency: A study by Topychkanoc [12] on the potential risks associated with nuclear power, specifically focusing on the Rooppur NPP, highlighted trans-

parency issues, suggesting that the public may not have been fully informed about the project's details, including its potential risks.

6. Preliminary Findings

The Rooppur NPP project, conceived in 1960, is now nearing completion thanks to the effort and determination of the government of Bangladesh. For developing countries, energy from fossil fuels is the most affordable option; therefore, it is commendable that the Bangladesh government has abandoned coal-fired power and instead opted for the more advanced nuclear power alternative. In doing so, Bangladesh not only works towards fulfilling the National Energy Policy (NEP) on energy security but also advances two international treaties on universal access to modern energy: the Intergovernmental Panel on Climate Change (IPCC) on reducing global warming, and the United Nations (UN) Sustainable Development Goals (SDGs) on energy for all. It is crucial to examine the winners and losers connected to the Rooppur NPP project through the framework of political economy, the 3Cs theory of Collaboration, Conflict, and Cooperation. Bangladesh's effective collaboration with Russia and India accelerates the project's progress. There are no conflicts among the various branches of government, as the project's implementation has received support from legislative bodies. Moreover, the public also cooperates with the government in a mutually beneficial manner: the government pursues a national energy security policy, and society benefits from uninterrupted, affordable energy. Synergy exists among the different governmental institutions involved, such as the Bangladesh Atomic Energy Commission (BAEC) and the Ministry of Science and Technology (MOST). Likewise, these state institutions maintain working relationships with international agencies, such as ROSATOM and the IAEA. Landowners also cooperated with the government during land acquisition, creating another win-win situation because the project is both socially acceptable and environmentally sustainable.

Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

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