

Role of Nuclear Power in the Race to Net Zero Target: A Case Study of Bangladesh's Upcoming Rooppur Nuclear Power Plant

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This study explores the potential role of nuclear energy in supporting global efforts to reach net-zero carbon emissions, using Bangladesh's Rooppur Nuclear Power Plant (RNPP) as a case example. As international focus intensifies on sustainable energy solutions, nuclear power is increasingly recognized for its low greenhouse gas emissions and stable output compared to intermittent renewable sources. The paper begins by outlining the broader global context, emphasizing nuclear energy's advantages, including minimal lifecycle emissions and strong safety records. The RNPP, located in Pabna, Bangladesh, is the country's first nuclear energy facility, comprising two VVER-1200 reactors with a combined capacity of 2.4 gigawatts. It is expected to play a pivotal role in reducing reliance on fossil fuels and improving national energy security. The analysis compares projected emissions from RNPP to those of traditional fossil fuel-based plants such as coal, natural gas, HFO, and diesel. The findings reveal that RNPP's CO₂ emissions would be drastically lower by about 98% and emissions of SO₂ and NO_x would be nearly eliminated. Furthermore, the study uses international data to demonstrate that nations with a higher nuclear power share tend to have better air quality (lower AQI) and stronger environmental sustainability scores (higher EPI). It also highlights the spatial efficiency of nuclear facilities, showing that RNPP will require significantly less land per unit of energy compared to coal-based plants. In conclusion, the paper argues that nuclear energy, alongside renewables, can significantly contribute to cleaner air and reduced carbon output. The RNPP is presented as a model for how nuclear power can aid developing nations in meeting their climate goals while enhancing energy reliability. This case study reinforces the broader message that nuclear energy should be considered a key technology in the global transition to low-carbon energy systems.

Technical Track

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