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Oil, Gas and the Transition to Renewables 2024

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Bangladesh: Trends and Developments

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BANGLADESH

Trends and Developments

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Rahman's Chambers is a leading law firm specialising in the energy and construction sectors. With a strong focus on power generation, including coal, gas and renewable energy, as well as oil, gas and pipeline projects, the firm provides comprehensive legal services throughout the project life-cycle. Its expertise extends to complex construction projects, from procurement and bidding to dispute resolution. The firm

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Introduction

Bangladesh, a nation striving for rapid economic growth and development, finds itself at a critical juncture in its energy landscape. The country's energy mix, heavily reliant on fossil fuels, particularly natural gas, presents both opportunities and significant challenges.

As of July 2024, the Bangladesh Power Development Board has a total installed power generation capacity of 27,515 MW. The power generation mix is primarily composed of fossil fuels, with gas being the dominant source at 44.32%, followed by coal at 24% and HFO at 23.41%. Other sources include hydro (0.84%), imported electricity (4.22%), and renewable energy such as solar (1.94%) and wind (0.22%). The inclusion of imported electricity and the use of HSD for power generation highlight the complexities of Bangladesh's power sector.

Currently, natural gas dominates Bangladesh's power generation, contributing to nearly half of the total electricity produced. While this has fueled industrialisation and economic growth, the reserves are dwindling, leading to concerns about energy security. Coal, although a less preferred option due to its environmental impact, has also gained prominence in the power sector. However, the dependency on imported coal exacerbates the country's vulnerability to global price fluctuations. Renewable energy sources, such as solar, wind and hydro, while promising, currently constitute a small fraction of the overall energy mix.

The overreliance on fossil fuels has severe implications. Environmentally, the burning of these fuels contributes significantly to air pollution, climate change and water contamination. The country's low-lying coastal regions are particularly vulnerable to the impacts of climate change,

including rising sea levels and extreme weather events. Moreover, the import-heavy energy model puts immense pressure on the country's foreign exchange reserves.

To address these challenges and ensure a sustainable future, Bangladesh must accelerate its transition to a renewable energy-based economy. This shift is imperative for several reasons. First, it is crucial for ensuring energy security by reducing dependence on imported fossil fuels. Second, transitioning to renewable energy will help mitigate climate change impacts and protect vulnerable populations. Third, it presents a significant opportunity for economic growth and job creation in the renewable energy sector. Finally, it aligns with Bangladesh's international commitments to reduce greenhouse gas emissions and promote sustainable development.

The Role of Oil and Gas in Bangladesh's Development

Bangladesh has been known to have a considerable amount of gas reserves since the 1960s, when the international oil company Shell discovered five large gas fields in the country. In the 1970s and 1980s, exploration efforts gained momentum with the establishment of the state-owned Petrobangla, which became the central authority for managing and regulating the sector. The legal framework, encompassing the Petroleum Act, 2016, Petroleum Rules, 2018, Bangladesh Petroleum Act, 1974, Bangladesh Gas Act, 2010, and Speedy Supply of Power and Energy (Special Provision) Act, 2010, underscores the government's central role. However, exploration for gas has been very slow since then, with only 26 exploratory wells drilled since 2000, in spite of the country's immense demand for gas, which prompts import of liquefied natural gas (LNG) to meet the country's demands.

Bangladesh's offshore exploration commenced in 1974, with the discovery of a substantial gas reserve near Kutubdia. However, further exploration and extraction has been drawn out, and further slowed due to, among other reasons, maritime boundary disputes with Myanmar. After the settlement of the boundary dispute in 2012, Bangladesh now has 26 offshore blocks, of which 11 are shallow sea blocks and 15 are deep sea blocks. Of these, only three shallow sea and two deep sea blocks have been activated under a Production Sharing Contract (PSC) with international oil companies. Despite its rather lethargic past in exploring its natural reserves, Bangladesh has recently floated tenders to dozens of international companies on its offshore blocks, with new PSCs which offer better revenue-sharing models.

PSC 2019, which outlines terms for exploration, production and profit sharing, is now revised with PSC 2023, which aims to attract more foreign investment. It introduces a new pricing formula for domestically sold gas, linking it to Brent crude oil, potentially offering better returns for both the government and operators. This shift aligns with the government's strategy to enhance the sector's attractiveness to foreign investors.

The LNG sector has witnessed significant growth due to dwindling natural gas supplies. Bangladesh commenced the regasification of LNG in 2018 with its first floating storage and regasification unit (FSRU) off Moheshkhali. This was soon joined by a second FSRU in 2019, with each having a regasification capacity of 500 million standard cubic feet per day (MMscf/d) of natural gas. According to Petrobangla's data as of 13 December 2023, Bangladesh is currently producing around 2.45 billion cubic feet per day

of gas, of which 370 mmcf/d is from regasified imported LNG.

Despite the current volatile market for natural gas, the volume of imports has increased rapidly from 31.45 billion cubic feet (Bcf) of LNG 2018-2019 to 238.72 Bcf by 2023, which is more than seven times the 2018 figure. To avoid the market volatility and buy LNG at a lower cost, Bangladesh in 2023 entered into two long-term contracts of ten and 15 years each. Petrobangla expects that Bangladesh's LNG import from long-term suppliers will more than double in the near future.

Import and regasification of LNG-related activities have led to the implementation of several new regulations including fiscal benefits for terminal developers. Such fiscal incentives are similar to those provided to power plants in Bangladesh. These include exemption from payment of income taxes on income generated from the relevant LNG terminal, from payment of tax on capital gains derived from share transfer, tax on royalties, technical know-how fees and technical assistance fees, as well as from payment of interest on foreign loans. However, all such incentives are for a limited period only and may be extended by the relevant company.

The liquefied petroleum gas (LPG) industry in Bangladesh has navigated many ups and downs in the last decade and gradually positioned itself as an alternative to natural gas. The LPG market has been driven by factors such as increasing population, urbanisation, and government initiatives to promote clean cooking fuels. Despite significant private sector involvement in infrastructure development and LPG imports, recent government price controls have generated investor discontent. While the LPG Integrated Policy, 2021 aims to further expand the indus-

try, its implementation is hindered by conflicting existing policies and a lack of transparent pricing regulations by the Bangladesh Energy Regulatory Commission (BERC). This regulatory uncertainty, coupled with BERC's inconsistent pricing methodology, has raised concerns among investors, particularly smaller players.

Pipeline infrastructure is crucial for the sector's efficiency. The Gas Transmission Company Limited, a state-owned entity, primarily owns and operates gas pipelines. To expand capacity, the government is seeking private sector investment. Additionally, Bangladesh Petroleum Corporation is constructing oil pipelines to improve import efficiency. A cross-border pipeline with India enhances regional connectivity and reduces fuel import costs.

According to the data available (collected from SIRDA, 2022), Bangladesh's energy mix was dominated by fossil fuels. Natural gas contributed 46.0%, LNG contributed 13.0%, coal (imported) contributed 9.0%, LPG contributed 4.0%, electricity (imported) contributed 2.0%, coal (local) contributed 1.0%, RE (solar + wind) contributed 1.0%, and RE (hydro) contributed 0.0%.

The sector faces environmental challenges. Gas flaring and leaks contribute to pollution and greenhouse gas emissions, thereby necessitating the government to adopt sustainable practices.

The Renewable Energy Potential of Bangladesh

Bangladesh, blessed with abundant natural resources and a growing energy demand, presents a compelling case for a rapid transition to renewable energy. The country's geographic location, climatic conditions and diverse ecosys-

tems offer a rich tapestry of renewable energy potential.

As per information collected from SIRDA (2024), Bangladesh is transitioning towards a renewable energy future. Currently, there are a few operational solar power plants with a combined capacity of 537 MWp. While some plants are government-funded (8.6 MWp), the rest are funded by international financial institutions such as the World Bank and ADB (82.4 MWp) and by independent power producers (446 MWp). Several plants are presently under construction or under the approval process.

Solar energy dominates the renewable mix. Other sources include hydro (162 MW), wind (60 MW), biomass (400 kW) and biogas (1 MW). Government funding, international institutions and private investment local and foreign have contributed to this growth. There is also net metering for rooftop solar, but the contribution is small.

Solar energy

Bangladesh enjoys ample sunlight throughout the year, making solar energy a highly promising option. The country's vast rural areas, with millions lacking access to electricity, can significantly benefit from decentralised solar power systems. Moreover, rooftop solar installations can help meet the growing energy demands of urban households and businesses. While the government has introduced supportive policies and incentives, further investments in research and development, along with grid integration infrastructure, are essential to harness the full potential of solar energy.

A comprehensive assessment of a solar PV power plant's potential requires a detailed analysis and determines an annual energy output calcu-

lated in GWh. This should involve utilising data from multiple sources such as PVGIS, NASA Surface Meteorology and Solar Energy (SSE), NOAA Solar Radiation Data and local weather stations. Additionally, incorporating on-site solar resource measurements and detailed technical studies is crucial for accurately determining the site's solar yield and optimising system performance, including the potential for innovative technologies.

Several studies have been conducted on the feasibility of solar power projects in Bangladesh. Technical assessments of these projects have largely indicated viability. However, the successful implementation of such projects is contingent upon a complex interplay of factors, including economic, environmental and policy considerations.

Wind energy

Bangladesh, with its extensive coastline and favourable wind conditions in specific regions, presents significant opportunities for wind energy development. However, challenges such as inconsistent wind speeds and infrastructure limitations hinder progress. Several studies have explored this potential. The US Department of Energy's National Renewable Energy Laboratory estimated a wind energy potential of over 30,000 MW in Bangladesh. A local study by Islam et al. identified promising sites for different turbine sizes, including Chittagong, Jessore, Khepupara, Cox's Bazar and Hatiya.

Despite this potential, actual wind power generation remains limited. While projects such as the Chinese-funded US-DK Green Energy have already started generation, the sector faces hurdles. Conducting comprehensive wind resource assessments (EYAs) is crucial for identifying suitable sites and optimising turbine performance.

This involves meticulous data collection, analysis and modelling to accurately evaluate wind potential. While initial assessments using global wind models can provide preliminary insights, on-site measurements and detailed studies are essential for refining estimates and mitigating uncertainties associated with wind resource variability. Moreover, the economic viability of wind energy projects hinges on several factors, including turbine technology and size, project size and grid tariffs. Achieving competitive bids for turbines and securing favourable power purchase agreements are crucial for project profitability.

Hydropower

The majority of Bangladesh's current hydropower generation comes from the Kaptai Hydropower Station, located in the Kaptai Upazila of Rangamati district. This is the country's largest hydropower plant, with a capacity of 230 MW, playing a crucial role in meeting peak electricity demand.

Bangladesh's extensive river network presents a significant opportunity for hydropower generation. While large-scale projects like Kaptai have contributed to the country's electricity supply, there is untapped potential, especially in smaller, more environmentally friendly options like small-scale hydropower (SHP), as suggested by preliminary studies.

SHP offers several advantages, including minimal environmental impact and the potential for decentralised power supply. However, challenges such as infrastructure development, environmental assessment and seasonal water flow variability need careful consideration. Despite these obstacles, the government is committed to promoting renewable energy, including hydropower. To fully realise the potential of hydropower, fur-

ther research and development are essential to optimise SHP technology and identify suitable sites.

Biomass and biofuels

Bangladesh possesses a substantial biomass resource base, primarily comprising agricultural residues, animal waste and forest biomass. This untapped potential can be harnessed to generate clean energy and reduce reliance on fossil fuels. Studies, such as one by SREDA, indicate significant regional disparities in biomass availability. While some areas have surpluses, others face deficits.

This resource can be converted into biofuels or used for direct combustion to produce heat and electricity. The development of efficient bioconversion technologies and supportive policies can unlock the potential of biomass as a renewable energy source. However, careful consideration must be given to ensure sustainable biomass production and avoid deforestation.

To address this, strategies such as biogas production from livestock farms and exploring technologies such as gasification are being considered. Gasification, in particular, offers the potential to generate around 1,178 MWe of electricity from various biomass sources including rice husk, bagasse, wheat straw, jute stalks and forest residues.

However, sustainable biomass production and efficient conversion technologies are crucial for realising this potential. Careful planning and policy support are essential to avoid negative environmental impacts and ensure the long-term viability of biomass as a renewable energy source.

The Transition to Renewables: Challenges and Opportunities

The government has set ambitious targets, aiming to generate over 4,100 MW of electricity from renewable sources by 2030. The government also has an ambitious goal of becoming a net green energy exporter by 2041 and has spurred a shift towards renewable energy sources such as solar and wind power. However, challenges such as land acquisition, grid integration, social and environmental risks, legal risks and regulatory hurdles persist.

Grid infrastructure

The existing power grid infrastructure, primarily designed for conventional power sources, often lacks the flexibility and capacity to accommodate the intermittent nature of renewable energy, particularly solar and wind power. This necessitates substantial investments in grid reinforcement, including the construction of new transmission lines, substations and distribution networks.

Adherence to the country's grid code is crucial for ensuring the safe and reliable integration of renewable energy sources. However, the grid code may require modifications to accommodate the unique technical characteristics of these technologies. Moreover, the process of obtaining grid connection approvals can be time-consuming and bureaucratic, hindering project timelines.

Land acquisition

Land acquisition is a significant challenge for large-scale projects in Bangladesh. The process is often complex and time-consuming due to unclear land ownership, inadequate compensation and potential legal disputes. Converting agricultural or other land uses for industrial purposes requires specific government approvals,

further complicating matters. Resettlement and rehabilitation of affected communities also pose challenges, necessitating adherence to strict standards and potentially leading to delays and increased project costs.

Energy and power master plan

Bangladesh has unveiled its Integrated Energy and Power Master Plan (IEPMP) with the ambitious goal of transitioning to a clean energy future by 2050. This plan prioritises maximising green energy sources like solar and wind power while addressing challenges such as intermittency and land availability. Biogas production for both domestic use and potential grid integration is another focus area. The plan also explores opportunities for importing renewable energy from neighbouring countries and investigates the potential of emerging technologies such as hydrogen, expand nuclear capacity, turn coal-fired plants to ammonia co-firing ones, adopt carbon capture and storage technology, and minimise oil and captive power. Energy efficiency and conservation measures are integral to this strategy.

A primary concern is the plan's lack of transparency regarding its methodology and data sources for energy demand forecasting. The IEPMP places a disproportionate emphasis on emerging technologies such as hydrogen, ammonia, and carbon capture and storage, while underestimating the potential of proven renewables such as solar and wind. This approach raises concerns about the plan's feasibility and economic viability.

The country is currently constructing its first nuclear power plant, Rooppur, in collaboration with Russia's Rosatom. Bangladesh is also collaborating with Nepal, a water-rich nation, through a power purchase agreement contingent

on India's co-operation for electricity transmission. Nepal plans to ramp up hydropower generation and begin exporting electricity to Bangladesh from the next fiscal year starting July 2024. Bangladesh is heavily dependent on imported electricity, primarily from India.

Finance and assistance

Developing a robust renewable energy sector in Bangladesh requires a comprehensive assessment of project viability, including a detailed analysis of the Levelised Cost of Electricity (LCOE). To attract investments and ensure project sustainability, financial modelling and sensitivity analysis are crucial. International co-operation, including technology transfer, knowledge sharing and financial assistance, is essential to bridge the technology gap and reduce project costs. Additionally, leveraging climate finance and aligning with global sustainability standards can facilitate access to capital. Government support through financial incentives is vital for the successful integration of renewable energy into the national grid.

Bangladesh is actively seeking international co-operation and investment to support its energy goals. The nation is benefiting from increased climate finance, exemplified by the USD8 billion Bangladesh Climate and Development Platform. Aligning with global sustainability standards like IFRS S1, S2 and TCFD is crucial for attracting foreign investment. Refinance schemes offered by Bangladesh Bank aim to ease financial burdens for entrepreneurs.

The European Union Global Technical Assistance Facility for Sustainable Energy through Stantec, under the EU's GTAF, is involved in various renewable energy initiatives in Bangladesh. A few other countries are also showing interest.

Besides this, the World Bank, ADB and EIB are also active in the market.

Environmental and social

Renewable energy projects in Bangladesh, such as solar and wind power plants, require comprehensive Environmental and Social Impact Assessments (ESIAs) to ensure compliance with local regulations and international standards, particularly for projects involving foreign investment. Key challenges include potential impacts on air, water and noise pollution, waste management, biodiversity loss, and social issues such as land acquisition and community displacement. Given Bangladesh's vulnerability to climate change, including risks from flooding and cyclones, all projects must incorporate climate resilience measures. A thorough assessment of potential environmental and social risks is essential for sustainable development and to minimise negative impacts on local communities.

Legal risks

Renewable projects are inherently complex, often leading to contractual disputes arising from unclear terms and responsibilities. To mitigate these issues, it is crucial to incorporate robust dispute resolution mechanisms like mediation and arbitration into project contracts. Equally important is a thorough understanding of the project site through comprehensive assessments, including land ownership verification, land categorisation and potential dispute identification. Neglecting this due diligence can result in costly delays and conflicts. In essence, rigorous pre-bid or pre-proposal evaluation of overall contractual arrangements and allocation of risks is paramount for the overall success of such infrastructure projects.

Conclusion

Bangladesh must prioritise renewable energy to achieve sustainable development and energy security. Significant investment in research, development and the practical application of solar, wind and energy storage technologies is crucial. Strong collaboration among academia, industry and government is essential to drive innovation and reduce costs. Attracting domestic and foreign investment requires a favourable business environment, simplified processes and incentives for sustainable projects.

Balancing immediate energy needs with long-term climate goals is vital. Reducing reliance on fossil fuels through renewable energy expansion, energy efficiency and alternative fuels is essential for energy security and environmental sustainability. Maximising energy utilisation and minimising waste through energy-efficient practices is crucial.

While Bangladesh has significant renewable energy potential, challenges remain. A well-defined road map and strategic actions are necessary for a successful transition to a sustainable and secure energy future.

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