Energy Resources in Bangladesh

Sakib Bin Amin · Saanjaana Rahman

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Trends and Contemporary Issues

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Sakib Bin Amin
School of Business and Economics
North South University
Dhaka, Bangladesh

Saanjaana Rahman
School of Business and Economics
North South University
Dhaka, Bangladesh

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Preface

The idea of writing a book addressing the contemporary issues of Bangladesh energy scenario first brought to my mind in 2015 by my Ph.D. supervisors Dr. Thomas Renström and Dr. Laura Marsiliani. I received my Ph.D. in Economics from Durham University Business School (UK) where I researched the Macroeconomics of Energy Price Shocks and Electricity Market Reforms in Bangladesh. One of the chapters of my Ph.D. thesis focused on the overview of Bangladesh energy sector, and my supervisors always motivated me to update the chapter further as it can serve as a primer of the Energy sector in Bangladesh. Besides, at North South University (Bangladesh), I was fortunate to teach a course on Energy Economics and Policy at the undergraduate level, which provided me with an excellent opportunity to further enrich my knowledge on Bangladesh Energy sector. I also had the chance to supervise more than 40 students on energy-related research which further enhanced my understanding of the relevant energy issues. My students have also encouraged me to document my lecture notes, lecture-related write-ups, presentations, and hence, I got my ideas and preliminary works published in the country's leading newspapers with my students. When loving students push a teacher forward to publish a book, their fondness cannot get unnoticed. I felt excited and energetic too.

Moreover, being an active member of the International Association for Energy Economics (IAEE), I regularly participated and shared my research at different international conferences across the globe. My discussions with two former presidents of IAEE, Professor Ricardo Raineri and Gürkan Kumbaroğlu and the chairman of Bangladesh Energy Regulatory Commission (BERC), Mr. Monowar Islam in several occasions motivated me to address the energy-related challenges at different platforms. In collaboration with the IAEE, I took the lead to organise the first South Asia IAEE-NSU Energy Summit held on the 17 October 2017 at the campus of North South University, Dhaka, Bangladesh. The summit hosted high officials from the government sector, eminent academicians, and researchers, present and immediate past president of IAEE, donor agencies, and private sector energy experts. Helpful insight in dealing with the energy issues of Bangladesh was extracted from the discussions. It facilitated the incorporation of opinions and exchange of ideas from both local and foreign knowledgeable professionals, as well

as students who participated. Having discussed with all the participants, I understood the need for a balanced approach for a book on energy resources in Bangladesh. All these came handy while preparing for this book.

Bangladesh has made significant progress over last few years from socio-economic standpoint such as increased per capita income level, life expectancy, literacy rate, self-sufficiency in food production, poverty reduction, etc. and now known as the new "Asian Tiger" for its remarkable development. Bangladesh's economy grew by 7.1% in 2016, the fastest expansion in 30 years reducing poverty from 44.2% in 1991 to 13.8% in 2016–2017. From 2000, the economy is growing steadily at 6% on average every year, and that growth has elevated millions of people out of poverty. Based on these socio-economic indicators, recently, the World Bank has declared Bangladesh as a lower-middle-income country. With an aspiration to become an upper-middle-income country by 2021, a high-income country by 2041, and to end extreme poverty by 2030, Bangladesh now look forward for a sustained economic growth by creating more jobs, improving the quality of health and education, energy and transport infrastructure, and governance, including to reinforce anti-corruption measures.

Taking a glance back to this journey towards a middle-income nation, Bangladesh has taken many good initiatives, resulting in a landmark achievement in the energy sector, especially concerning increasing the country's generation capacity. For instance, there are currently 112 power plants as compared to 27 back in 2009. Net installed electricity generation capacity has increased from 5272 Megawatt (MW) in 2009 to 16,892 MW in 2018. Accessibility of electricity has also risen from 47% in 2009 to a whopping 90% in 2018. These achievements are in line with the government's commitment to ensuring access to affordable and reliable electricity for all citizens by 2021.

Despite the recent success in the electricity sector, Bangladesh is still heavily dependent on natural gas and imported fuels. Constraints of primary fuel cause inability to generate sufficient electricity to meet standards. The nation's huge dependence on imported fuel has also attributed to the fiscal burden, exerting multidimensional pressures on its economic development drives. It is a prime task for Bangladesh to tap all possible options that are optimal for future energy sector's development. For example, Bangladesh can look forward to replacing fossil fuel and non-renewable energy with the renewables to match the rural energy demand as a part of its fuel diversification drive and to ensure energy security.

With a focus on the Sustainable Development Goals (SDGs) criteria for sustainable, clean, and affordable energy, it should be ideal for Bangladesh to consider the environment-friendly energy usage would help to keep harmony with the ecosystem, reducing the rate of global environmental degradation. The dependency on natural gas has slowed down to a great extent in Bangladesh, and now, the government plans to minimise the uses of oil products in the electricity generation. The government aims to produce energy by the plethora of ways, including 35% by coal, 35% by natural gas, 10% by renewables, 11% by cross-border electricity trading, and 6% by nuclear power. However, to facilitate this transition, Bangladesh would require the government's stern involvement in the form of financing projects

to develop the energy infrastructure. If this can be ensured, then Bangladesh, by all means, can attain its dream of probing in the elite panel of upper-middle-income countries by 2021.

Grid extension is not possible and cost-effective in many countries like Bangladesh. Only 68.8% of the rural population in Bangladesh has access to electricity compared to 79% in South Asia and 75.7% in the lower-middle-income countries. The rural people, mainly the households and the small businesses, need to depend on the renewable energies to a great extent. As a tropical country with higher energy demand than non-tropical countries, Bangladesh can better make use of sunlight and develop solar energy generation further. Approximately, 6 million solar home systems (SHS) operate worldwide, and 4.5 million of them are in Bangladesh. Bangladesh government has taken many initiatives to utilise the renewable sources in the energy sector. However, to fully use the renewables, the country needs involvement from the local and international private investors to check up on the feasibility of the projects concerning what is workable here in Bangladesh. Bangladesh can also enhance bioenergy usage, an environment-friendly energy option, which can be exemplary in boosting its rural energy supply and relieving people from the burden of waste disposal and also resolve sanitation problems. Moreover, biogas produced from waste can be used to generate electricity that can be exhausted for off-grid rural electrification and can even be utilised to run waste management plants.

Bangladesh has 3 billion tonnes of underutilised coal resources. Therefore, one of the best options for Bangladesh to generate electricity is to shift its dependency to coal, at an affordable price. However, there is the argument about it being a dirty fuel. But due to technological advancement, the portrayal of coal has changed a lot. The adverse effects of burning coal can be minimised to a significant amount, if not completely cleansed. And on top of that, it is noteworthy to mention the coal in Bangladesh contains less amount of ash, when compared to other countries' coal. A big challenge is the lack of expertise in handling power generation from coals. Moreover, there are some institutional constraints Bangladesh which needs to be controlled to attract investments in energy projects. Bangladesh also wishes to see better human resources management on projects to promote efficiency.

The government has already opted for import-based solutions such as importing liquefied petroleum gas (LPG) or liquefied natural gas (LNG) which will ease pressure on oil-based power plants. It is a good idea to have an LNG terminal to complement local production with imports from abroad to increase energy security. We need to look towards international partners who have experience in this area. Regional cooperation will be helpful in overcoming energy challenges and ensuring energy security. Substantial energy resources exist in the South Asian region. In the case of Bhutan, large hydro resources are an excellent complement to the energy needs of Bangladesh. This implies crossing transmission lines through other countries. For this, Bangladesh needs projects that are well-structured in the sense that the country's investment and the dependency on this energy do not expose the country to geopolitical risks.

Bangladesh should also promote the practice of good governance more rigorously for future energy security by ensuring ensure effective exploration and utilisation of local energy resources and introducing coordinated energy policies to solve the prevailing energy crisis. Skill development is also crucial for Bangladesh energy sector because of the technological limitations of tapping the indigenous resources. A skilled labour force will drive implementation of energy projects across the sector through local value addition, manufacturing, assembling, project designing, operation and maintenance and vocational training.

Bangladesh should further improve the business environment for the energy investors. This implies more transparent process by the government, better access to finance, better management of construction permits, more clear rules in the labour market, the rule of law, among others. Ensuring competition is vital for the energy market in Bangladesh. In the presence of competition, investments will come from everywhere, and the market will choose the best projects under healthy competition. Having a master plan is also essential. It provides a sense of direction as to what kind of investment is needed shortly. So, investors require the proper signal to decide on the appropriate type of investment. The government has to create an atmosphere through which we can remove the barriers which will allow markets to participate. FDI and microenterprises can offer a new solution for helping to finance electricity devices.

Energy conservation is also significant from Bangladesh perspective. Energy conservation is sometimes known as energy sufficiency. It is evident that any energy conservation policy which could save energy not only ensures future energy supply but also accelerates the pace of the economic activities. Information and communication technology (ICT) can promote dematerialisation of billing processes and communication networks to connect all parts of the grid including operation, service providers, distribution, and transmission by aiding in communication between machines and humans. Through smart sensing and control, it can also allow energy conservation and energy efficiency. A prepaid metering system is also useful for the collection of bills in advance and limits the unauthorised electricity usage. In Bangladesh, women are mainly responsible for cooking and managing household tasks. Creating awareness among the women, Bangladesh can introduce sustainable energy projects and implement energy conservative and efficiency policies.

Rapid urbanisation and industrialisation increase energy usage by aggravating the demand for housing, land use, public utilities, food, electric appliances, and nonetheless transportation. So, Bangladesh can now look ahead to create a market-oriented environment for its future energy, where the energy sector will play a salient role underpinning the sustainable development. Energy is also key to achieve the goals related to gender equality, employment generation, poverty reduction, improvements in health and climate change. The development of power and energy sector will not only elevate the economy to a higher status but also upsurge productivity and efficiency that will boost the overall economic achievement of Bangladesh.

Energy-related issues are also highly interesting and diverse ranging from technical issues such as oil exploration, renewable energy technologies (RETs) to non-technical issues such as environmental degradation from energy usage and how the energy sector develops in harmony with local communities. This book aims to highlight the trends and contemporary issues of Bangladesh energy sector to address the existing challenges adequately for future energy solutions. I believe, this book will be a useful resource for the students, academicians, researchers, industries, investors, policymakers, and practitioners seeking a clearer understanding of contemporary energy issues, energy markets, and their sustainable development in Bangladesh. The coauthor of this book, Ms. Saanjaana Rahman, assisted me in preparing a few chapters and took the early initiatives with Springer to make it publishable. She is my former research student at North South University, Bangladesh.

Finally, I would like to thank the reviewers for their valuable comments towards improving the manuscript. My heartiest gratitude also goes to the friendly Springer team, in particular, Brian Halm and Amanda Quinn for their constant support and valuable advice in publishing this book.

Dhaka, Bangladesh

Sakib Bin Amin, Ph.D.
Commonwealth Rutherford Fellow
Durham University Business School, UK
Assistant Professor (Economics)
North South University
President, Bangladesh Association
for Energy Economics (BDAEE)

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Biographical Information of the Book

In 2017, United Nations declared Bangladesh as a lower-middle-income country for her significant progress in socio-economic development such as increased per capita income level, life expectancy, literacy rate, self-sufficiency in food production, poverty reduction, etc. Taking a glance back to this journey towards a middle-income nation, Bangladesh has taken many good initiatives, resulting in a landmark achievement in the energy sector, especially concerning increasing the country's generation capacity. Since the country aims to become an upper-middle-income country by 2021 and a high-income country by 2041, it is essential that Bangladesh should optimise her energy resources efficiently. The country needs coordinated energy policies for the future energy security. This book provides a detailed discussion of the energy-related issues in Bangladesh for policy analysis.

In-depth chapters address the diverse energy issues in Bangladesh for sustainable development. These include the importance of efficient use of available energy resources; fuel diversification strategies; environmental friendly use of energy; optimise applications of renewable energy resources, energy efficiency, and conservation measures, drivers of energy demand, integration of advanced technology in the energy system, practice of good governance in decision-making process, significance of skill development programme for better human resource management, benefits of energy trading for future energy solutions. Moreover, the role of energy in gender equality, employment generation, poverty reduction, improvements in health and climate change, tourism industry is also discussed in a few chapters. This book is useful to students, academicians, researchers, industries, investors, policymakers, and practitioners seeking a clearer understanding of contemporary energy issues, energy markets, and their sustainable development in Bangladesh. It presents thought-provoking ideas and strategies to help Bangladesh achieve Sustainable Development Goals (SDGs) and transition to an upper-middle-income country by 2021 and a high-income country by 2041, through the utilisation of efficient energy policies.

- The first book of its kind to be published in the context of the Bangladesh energy scenario;
- Discusses energy policies, energy practices, energy challenges, and presents thought-provoking solutions to energy-related issues in Bangladesh;
- Summarises strategies for developing and emerging countries facing similar energy and power related issues as Bangladesh.

Contents

About the Authors

Sakib Bin Amin is an Assistant Professor in the School of Business and Economics at North South University in Dhaka, Bangladesh, and a Visiting Commonwealth Research Fellow at Durham University Business School, UK. He holds a Ph.D. in Economics (University of Durham, UK) and a master's degree in International Economics (University of Essex, UK). His research mainly focuses on Energy Sector Reform and Energy Policy in developing countries. He is the President of the Bangladesh Association for Energy Economics (BDAEE), the Bangladeshi affiliates of the International Association for Energy Economics (IAEE).

Saanjaana Rahman holds Bachelors' in Economics from North South University, Dhaka, Bangladesh ('17). Her thesis paper was focused on the impact of urbanisation on energy demand in Bangladesh. Her research interests include energy, health economics, and development economics.

Abbreviations

A2i	Access To Information
BAPEX	Bangladesh Petroleum Exploration & Production Company Limited
BDT	Bangladesh Taka
BPC	Bangladesh Petroleum Corporation
BUET	Bangladesh University of Engineering and Technology
BWDB	Bangladesh Water Development Board
BAS	Building Automation Standards
BERC	Bangladesh Energy Regulatory Commission
BPDB	Bangladesh Power Development Board
BGFCL	Bangladesh Gas Fields Company Limited
BIFFL	Bangladesh Information Financing Fund Limited
CBET	Cross-border Electricity Trading
CNG	Compressed Natural Gas
CB	Circuit Breaker
CO_2	Carbon Dioxide
DESCO	Dhaka Electric Supply Company Limited
DPDC	Dhaka Power Distribution Company Limited
EE	Energy Efficiency
ESS	Energy System Services
ECNEC	Executive Committee of National Economic Council
ECDM	Electricity Conservation and Demand Management
FGD	Flue Gas Desulfurisation
FDI	Foreign Direct Investment
FDA	France Development Agency
FY	Fiscal Year
FO	Furnace Oil
FSRU	Floating Storage Regasification Unit
GCM	Global Coal Management
GW	Gigawatt
GOB	Government of Bangladesh

GHG	Greenhouse Gas
GDP	Gross Domestic Product
HVDC	High-voltage Direct Current
HSD	High-speed Diesel
IEA	International Energy Agency
IFRD	International Foundation for Research and Development
IDCOL	Infrastructure Development Company Limited
ICT	Information and Communication Technology
IOCs	International Oil Companies
IPP	Independent Power Producer
JNNSM	Jawaharlal Nehru National Solar Mission
JICA	Japan International Cooperation Agency
kWh	Kilowatt Hour
KV	Kilovolt
KM	Kilometre
KG	Kilogram
LNG	Liquefied Natural Gas
LPG	Liquefied Petroleum Gas
LED	Light Emitting Diode
MPEMR	Ministry of Power, Energy, and Mineral Resources
MW	Megawatt
MOU	Memorandum of Understanding
MWh	Megawatt Hour
MNCs	Multinational Companies
MMSCFD	Million Standard Cubic Feet Per Day
MSME	Micro, Small, and Medium Enterprises
NCP	National Committee for Protection
NEP	National Energy Policy
OECD	Organisation for Economic Cooperation and Development
PSMP	Power System Master Plan
PV	Photovoltaic
PGCB	Power Grid Company of Bangladesh
QR	Quick Rental
R&D	Research and Development
RMG	Ready-made Garments
RETs	Renewable Energy Technologies
REB	Rural Electrification Board
STEM	Science, Technology, Engineering, and Mathematics
SGT	Smart Grid Technology
SMEs	Small and Medium Enterprises
SHS	Solar Home Systems
SNG	Substitute Natural Gas
S&T	Science and Technology
SREDA	Sustainable and Renewable Energy Development Authority
SDGs	Sustainable Development Goals

SDG	Sustainable Development Goal
SWH	Solar Water Heating
SGFL	Sylhet Gas Fields Limited
TOE	Tonne of Oil Equivalent
Tcf	Trillion Cubic Feet
UCC	Unique Control Considerations
UNEP	United Nations Environment Programme
Wp	Watt Peak

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