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Technical Assistance Report

Project Number: 49102-001
Knowledge and Support Technical Assistance (KSTA)
November 2018

People's Republic of Bangladesh: Capacity Development for Renewable Energy Investment Programming and Implementation

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Asian Development Bank

CURRENCY EQUIVALENTS

(as of 10 October 2018)

Currency unit	–	taka (Tk)
Tk1.00	=	\$0.011933
\$1.00	=	Tk83.80

ABBREVIATIONS

ACEF	–	Asian Clean Energy Fund
ADB	–	Asian Development Bank
CTF	–	Clean Technology Fund
GDP	–	gross domestic product
MW	–	megawatt
TA	–	technical assistance

NOTES

- (i) The fiscal year (FY) of the Government of Bangladesh and its agencies ends on 30 June. "FY" before a calendar year denotes the year in which the fiscal year ends, e.g., FY2018 ends on 30 June 2018.
- (ii) In this report, "\$" refers to United States dollars.

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KNOWLEDGE AND SUPPORT TECHNICAL ASSISTANCE AT A GLANCE

1. Basic Data		Project Number: 49102-001
Project Name	Capacity Development for Renewable Energy Investment Programming and Implementation	Department/Division SARD/SAEN
Nature of Activity	Capacity Development, Research and Development	Executing Agency Power Div-Min of Power, Energy & Mineral Resources
Modality	Regular	
Country	Bangladesh	
2. Sector	Subsector(s)	ADB Financing (\$ million)
		Total 0.00
3. Strategic Agenda	Subcomponents	Climate Change Information
Inclusive economic growth (IEG) Environmentally sustainable growth (ESG)	Pillar 1: Economic opportunities, including jobs, created and expanded Urban environmental improvement	Climate Change impact on the Project Low
4. Drivers of Change	Components	Gender Equity and Mainstreaming
Governance and capacity development (GCD) Knowledge solutions (KNS) Partnerships (PAR) Private sector development (PSD)	Institutional development Application and use of new knowledge solutions in key operational areas Official cofinancing Private Sector Regional organizations Promotion of private sector investment	Some gender elements (SGE) ✓
5. Poverty and SDG Targeting		Location Impact
Geographic Targeting Household Targeting SDG Targeting SDG Goals	No No Yes SDG7, SDG13	Not Applicable
6. Risk Categorization	Low	
7. Safeguard Categorization	Safeguard Policy Statement does not apply	
8. Financing		
Modality and Sources		Amount (\$ million)
ADB		0.00
None		0.00
Cofinancing		1.90
Asian Clean Energy Fund under the Clean Energy Financing Partnership Facility (Full ADB Administration)		1.50
Clean Technology Fund (Full ADB Administration)		0.40
Counterpart		0.00
None		0.00
Total		1.90
Currency of ADB Financing: USD		

I. INTRODUCTION

1. The knowledge and support technical assistance (TA) to Bangladesh's energy agencies is envisaged to assess floating solar photovoltaic power potential, develop an investment plan covering solar PV, wind, biomass, and other renewable energy resources that complements both the government's climate change commitments and energy sector interventions by the Asian Development Bank (ADB).¹ Also, the TA intends to strengthen the capacity of the energy agencies and other stakeholders in large-scale renewable energy project planning and implementation. The TA is listed in the country operations business plan for Bangladesh, 2019–2021.²

II. ISSUES

2. Bangladesh has achieved sustained economic growth over the past decade. The gross domestic product (GDP) grew at an average of 6.3% during the Sixth Five-Year Plan period (2011–2015). The country's Seventh Five-Year Plan, 2016–2020 aims to achieve an average annual GDP growth of 7.4% and has achieved GDP growth of 7.3% in 2017. The power sector has made significant progress in sustaining the economic growth. As of June 2018, the country's installed power generation capacity stood at 18,753 megawatts (MW), compared with 4,942 MW in 2009.³ Bangladesh peak power demand exceeded 12,644 MW in 2017 from 11,405 MW in 2016, and is growing at a rate of 10.9% annually.⁴ As of July 2018, 90% of the population has access to electricity, compared with 60% in 2012. The government's Vision 2021 aims at "Electricity for All" and achieving an installed generation capacity of 20,000 MW by 2021.

3. As Bangladesh relies largely on indigenous natural gas to generate electricity, long-term energy security and the need to diversify its fuel mix are major challenges for the power sector. Currently, natural gas accounts for 62% of electricity generation, diesel and furnace oil for almost 30%, and renewable energy (including hydropower) for less than 3%. In the absence of major gas field discoveries, the country faces acute shortage of natural gas in the next 7–8 years. Natural gas supply constraints have already curtailed the operations of some power plants, increasing dependence on imported oil (mostly furnace oil and diesel). Hence, there is a pressing need to plan and diversify the fuel mix to minimize fossil fuel use for power generation.

4. Due to strong economic growth over the past few years, power demand continues to outpace supply and is expected to exceed 20,000 MW by 2025 and 45,000 MW by 2040. To meet the growing power demand sustainably, the revised 2016 Power System Master Plan set targets for a generation mix by 2041 of 35% gas, 35% coal, 15% cross-border imports (including renewable energy), 10% nuclear, and 5% oil. Due to depletion of domestic gas reserves, the future gas supply will depend on imported liquefied natural gas. Bangladesh has probable coal reserves of up to 3,300 million tons but has yet to make any strategic decision about using domestic coal resources, mainly due to environment and social concerns. Hence, future coal generation in Bangladesh will depend on imported coal. The country's first nuclear unit of 1,200 MW capacity is expected to start operating by 2024, while the second unit of 1,200 MW is to be commissioned in 2025.

¹ The renewable energy investment plan will include strategies and pipelines for deployment of solar, wind, and biomass energy resources.

² ADB. 2018. *Country Operations Business Plan: Bangladesh, 2019–2021*. Manila.

³ Bangladesh Power Development Board. Present Installed Generation Capacity (MW) as of 5 June 2018. http://www.bpdb.gov.bd/bpdb/index.php?option=com_content&view=article&id=5&Itemid=6.

⁴ Bangladesh Power Development Board. *Annual Report 2016-2017*. 17 August 2017. http://www.bpdb.gov.bd/bpdb_new/index.php/site/annual_reports

5. Bangladesh's renewable energy potential is estimated at 3,666 MW, including potential solar energy of 2,680 MW—1,400 MW from solar parks, 635 MW from solar rooftops, 100 MW from solar home systems, and 545 MW from solar photovoltaic pumping for irrigation—along with 637 MW from wind, 275 MW from biomass, 10 MW from biogas, 60 MW from small hydro, 3 MW from mini grid and micro grid, and 1 MW from waste to energy.⁵ Bangladesh has been slow in developing renewable energy, despite the country's 2008 Renewable Energy Policy, and Bangladesh Vision 2021's plan to generate up to 10% of its power from renewable energy by 2021, and the government's 500 MW Solar Power Initiative. Land acquisition has been a major hurdle in developing utility scale solar photovoltaic power plants, as existing land policy restricts the use of agricultural land for large solar power plants. The government has encouraged private sector participation in renewable energy development through competitive bidding and unsolicited proposals. Multiple expressions of interests from private sector developers to invest in solar power projects for generating approximately 900 MW have been signed, but only a few of the proposed solar power projects have advanced due to land constraints and inability to reach financial closure.

6. The Government of Bangladesh is committed to meeting its Nationally Determined Contributions under the Paris Climate Accord, which includes reducing greenhouse gas emissions by 5% by 2030 from the business-as-usual case. To meet this target, up to 1,000 MW of solar power installation is planned for medium-term development. However, given land constraints and the government's policy to retain as much land as possible for agriculture, utility scale solar photovoltaic power plants can be constructed only on marginal land, which poses big challenges for future scaling up. Floating solar photovoltaic power system is an ideal solution for Bangladesh as they do not compete with agricultural land, do not suffer from efficiency penalties caused by high ambient temperatures, and can be quickly deployed and built in stages.⁶ Bangladesh has large water reservoirs, but the potential of floating solar photovoltaic power has not yet been fully mapped. Some development partners are currently supporting wind and biomass resource mapping, while investment plans for strategic deployment of renewable resources are lacking.

III. THE TECHNICAL ASSISTANCE

A. Impact and Outcome

7. The TA is aligned with the following impact: share of renewable energy for sustainable power supply of Bangladesh increased.⁷ The TA will have the following outcome: capacity of government agencies and other stakeholders for large-scale renewable energy investment planning and implementation strengthened.⁸

B. Outputs, Methods, and Activities

8. **Output 1: Potential for floating solar photovoltaic power assessed.** The TA will assess the country's floating solar photovoltaic potential and identify candidate project sites that

⁵ Government of Bangladesh, Ministry of Power, Energy and Mineral Resources. 2016. *Power System Master Plan 2016*. Dhaka.

⁶ There are over 70 floating solar photovoltaic systems operating worldwide. The largest one, a 100 MW grid connected floating solar photovoltaic system, is in the People's Republic of China. Other floating solar photovoltaic plants range from 2.5 MW to 40 MW, located in Belgium, Japan, the Republic of Korea, and the United Kingdom. The Government of Singapore has tendered the construction of two floating solar photovoltaic plants on the Tengeh (50.0 MW) and Upper Pierce (6.7 MW) reservoirs.

⁷ Government of Bangladesh, Ministry of Planning. 2015. *Bangladesh Seventh Five-Year Plan, FY2016–FY2020*. Dhaka.

⁸ The design and monitoring framework is in Appendix 1.

are technically, economically, and financially viable for physical investments by public and private sectors.

9. Output 2: Projects for deployment of other renewable energy resources identified.

The TA will help identify suitable project sites for deployment of wind, biomass, and/or other renewable energy resources. It will also develop commercially viable business models that can be readily replicated and scaled up in the near term.

10. Output 3: Grid impact assessment completed. The TA will carry out a grid impact study to analyze the impact of variable renewable energy coming into the grid at the selected project sites and formulate appropriate mitigation measures to ensure efficient operation of the transmission grid. This exercise will be linked to output 5 as the TA will provide training to the Power Grid Corporation of Bangladesh to perform similar studies in the future, including software-based modeling and/or simulation of typical scenarios, as well as system operation training for more effective scheduling, forecasting, and planning.

11. Output 4: Updated grid code and operational guidelines proposed. The TA will update the existing grid code and operating guidelines to facilitate power system expansion using a variety of generation sources from renewable energy. Ensuring smooth operations will require the use of intelligent energy network technology including next-generation supervisory control and data acquisition systems, energy storage, and other high-level technology for renewable energy integration, optimization and control. This output will help address the necessary grid code updates, specifically automatic frequency control, voltage control, economic dispatching, cross-country interconnections, tariff structures to incentivize generators for grid frequency and power factor control, and demand forecasting and generation planning (including prescribing penalties for noncompliance).

12. Output 5: Institutional capacity strengthened. The TA will provide training to the energy agencies and other stakeholders to strengthen their knowledge and capacity in renewable energy investment planning and implementation. This includes, but is not limited to, orientation on (i) large-scale renewable energy development and associated environmental issues, (ii) integration of variable renewable energy into the grid, (iii) intelligent energy management systems (“smart grid”), (iv) floating solar power systems, (v) new business models for renewable energy development and innovative financing mechanisms, and (vi) renewable energy prospects for employing innovative technology.

C. Cost and Financing

13. The TA is estimated to cost \$2,337,000, of which \$1,500,000 will be financed on a grant basis by the Asian Clean Energy Fund under the Clean Energy Financing Partnership Facility (ACEF) and \$400,000 will be financed on a grant basis by the Clean Technology Fund (CTF), both administered by ADB.⁹ The key expenditure items are listed in Appendix 2.

14. ACEF resources will be earmarked for delivering outputs 1, 3, 4, and 5. The ineligible expenditures of ACEF funding include (i) purchase of vehicles, (ii) salaries for civil servants, (iii) foreign travel, (iv) scholarships or long internships, (v) detailed engineering design, (vi) civil works and other related expenses, and (vii) those under ADB’s List of Ineligible Items (or Negative List) and Prohibited Investment Activities List.

⁹ The Asian Clean Energy Fund was established by the Government of Japan.

15. CTF resources will be ringfenced for supporting output 2. The ineligible expenditures of CTF funding include (i) salaries for civil servants in recipient countries hired as consultants or otherwise, (ii) purchase of vehicles, (iii) foreign training and study tours, and (iv) salaries and travel of multilateral development banks staff and consultants.

16. The government will provide counterpart support in the form of data, counterpart staff, office space, and other in-kind contributions.

D. Implementation Arrangements

17. The Energy Division of ADB's South Asia Department will administer the TA. The implementation arrangements are summarized in the table below.

Implementation Arrangements			
Aspects	Arrangements		
Indicative implementation period	November 2018–December 2020		
Executing agency	Power Division, Ministry of Power, Energy and Mineral Resources		
Implementing agencies	(i) BPDB; (ii) SREDA; and (iii) PGCB BPDB will play the principal role in the implementation and supervision of the TA. ^a		
Consultants	To be selected and engaged by ADB		
	Consulting firms: Quality-based selection	3 contracts, international,	81 person-months
	Individual: individual selection	3 contracts, international,	13 person-months
Procurement ^b	To be procured by ADB in accordance with the ADB Procurement Policy (2017, as amended from time to time) and its associated project administration instructions and/or staff instructions		
	Procurement of design, supply, delivery and installation of four solar measurement masts (solar met-mast)	1 contract	\$135,000
	Procurement of design, supply, delivery and installation of two wind measurement meteorological masts (wind met-mast)	1 contract	\$60,000
	To be procured by consultants using RFQ method in accordance with the ADB Procurement Policy		
	Procurement of information technology software by RFQ method	3 contracts	\$15,000
	Advance contracting and retroactive financing		
Disbursement	Not applicable		
Disbursement	The TA resources will be disbursed following ADB's <i>Technical Assistance Disbursement Handbook</i> (2010, as amended from time to time). The TA is financed by the Asian Clean Energy Fund under the Clean Energy Financing Partnership Facility and the Clean Technology Fund. Disbursements under the TA will be made based on the distinct outputs supported by each resource as mentioned in paragraphs 14 and 15.		

Aspects	Arrangements
Asset turnover or disposal arrangement upon TA completion	Fixed assets and information technology software purchased from TA resources will be turned over to the executing agency and implementing agencies before or upon TA completion.

ADB = Asian Development Bank, BPDB = Bangladesh Power Development Board, PGCB = Power Grid Company of Bangladesh, RFQ = requests for quotation, SREDA = Sustainable and Renewable Energy Development Authority, TA = technical assistance.

^a BPDB is responsible for output 1 in association with SREDA; SREDA is responsible for output 2; and PGCB is responsible for output 3 and 4. The Power Division and all other stakeholders will be involved in output 5.

^b Procurement Plan (accessible from the list of linked documents in Appendix 3).

Source: Asian Development Bank.

18. **Consulting services.** ADB will engage consultants funded by ACEF following the ADB Procurement Policy (2017, as amended from time to time) and its associated project administration instructions and/or staff instructions.¹⁰ ADB will engage consultants funded by CTF following universal procurement policy. Individual consultants will be recruited through open competitive bidding process. Given that the envisaged assignments are highly specialized, consulting firms will be recruited following open competitive bidding procedures, guided by quality-based selection method.

19. **ADB's procurement.**¹¹ The Energy Division of ADB's South Asia Department will be responsible for procuring four solar measurement masts and two wind measurement meteorological masts for data collection. Procurement funded by ACEF will follow the ADB Procurement Policy and Procurement Regulations for ADB Borrowers (2017, as amended from time to time) and its associated project administration instructions. Procurement funded by CTF will follow universal procurement policy.

20. **Cofinancier requirements.** Consultants are responsible for the timely delivery of the envisaged outputs. The Energy Division of ADB's South Asia Department will update project records quarterly in eOperations on Project Performance Monitoring and conduct review missions every 6 months during implementation and report progress annually to ACEF and CTF fund manager respectively.

IV. THE PRESIDENT'S DECISION

21. The President, acting under the authority delegated by the Board, has approved (i) the Asian Development Bank (ADB) administering technical assistance not exceeding the equivalent of \$1,500,000 to be financed on a grant basis by the Asian Clean Energy Fund under the Clean Energy Financing Partnership Facility; and (ii) ADB administering technical assistance not exceeding the equivalent of \$400,000 to be financed on a grant basis by the Clean Technology Fund to the Government of Bangladesh for Capacity Development for Renewable Energy Investment Programming and Implementation, and hereby reports this action to the Board.

¹⁰ Outline Terms of Reference for Consultants (accessible from the list of linked documents in Appendix 3).

¹¹ Procurement Plan (accessible from the list of linked documents in Appendix 3).

Key Activities with Milestones

1. Potential for floating solar photovoltaic power assessed

- 1.1 Select consultants by Q4 2018.
- 1.2 Procure and install solar measurement masts by Q4 2018-Q1 2019.
- 1.3 Submit draft floating solar resource assessment report by Q2 2019.
- 1.4 Submit final floating solar resource assessment report by Q3 2019.
- 1.5 Submit draft investment plan covering ground-mounted and floating solar photovoltaic power systems by Q3 2019.
- 1.6 Submit final investment plan covering ground-mounted and floating solar photovoltaic power systems by Q4 2019.

2. Projects for deployment of other renewable energy resources identified

- 2.1 Procure and install wind measurement meteorological masts by Q4 2018-Q1 2019.
- 2.2 Review existing wind, biomass, and other renewable energy resource assessment reports by Q2 2019.
- 2.3 Submit draft investment plan covering wind, biomass, and other renewable energy resources by Q3 2019.
- 2.4 Submit final investment plan covering wind, biomass, and other renewable energy resources by Q1 2020.

3. Grid impact assessment completed

- 3.1 Select consultants by Q4 2018.
- 3.2 Procure information technology software for data collection by Q1 2019.
- 3.3 Submit draft grid impact study by Q2 2019.
- 3.4 Submit final grid impact study by Q3 2019.

4. Updated grid code and operational guidelines proposed

- 4.1 Select consultants by Q4 2018.
- 4.2 Review the existing grid code and operational guidelines by Q1 2019.
- 4.3 Submit draft proposal of updating grid code and operational guidelines by Q2 2019.
- 4.4 Submit final proposal of updating grid code and operational guidelines by Q3 2019.

5. Institutional capacity strengthened

- 5.1 Select consultants by Q4 2018.
- 5.2 Conduct training need assessment Q2 2019.
- 5.3 Submit draft training materials by Q4 2019.
- 5.4 Submit final training materials by Q4 2019.
- 5.5 Organize training, seminar, and workshops from Q1 to Q3 2020.

TA Management Activities

TA fact-finding mission in July 2018.
Review mission twice a year starting from Q1 2019 until TA completion.
TA completion report prepared by Q4 2021.

Inputs^c

Asian Clean Energy Fund under the Clean Energy Financing Partnership Facility: \$1,500,000

Clean Technology Fund: \$400,000

Note: The government will provide counterpart support in the form of data, counterpart staff, office space, and other in-kind contributions.

Assumptions for Partner Financing

Not applicable

BPDB = Bangladesh Power Development Board, MOPEMR = Ministry of Power, Energy and Mineral Resources, PGCB = Power Grid Company of Bangladesh, Q = quarter, SREDA = Sustainable and Renewable Energy Development Authority, TA = technical assistance.

^a Government of Bangladesh, Ministry of Planning. 2015. *Bangladesh Seventh Five-Year Plan, FY2016–FY2020*. Dhaka.

^b Other stakeholders will include other public power generation companies and private sector developers.

^c Outputs 1, 3, 4, and 5 will be financed by the Asian Clean Energy Fund; and output 2 will be financed by the Clean Technology Fund.

Source: Asian Development Bank.

COST ESTIMATES AND FINANCING PLAN
(\$'000)

Item	Amount
A. Asian Clean Energy Fund^a under the Clean Energy Financing Partnership Facility	
1. Consultants	
a. Remuneration and per diem	
i. International consultants	725.20
ii. National consultants	221.65
b. Out-of-pocket expenditures	
i. International and local travel	96.50
ii. Surveys	80.00
iii. Reports and communications	2.10
iv. Miscellaneous administration and support costs ^c	2.25
2. Goods (purchase)	145.00
3. Training, seminars, workshops, forum, and conferences	
a. Venue rental and related facilities	50.00
b. Participants	30.00
4. Contingencies	147.30
Subtotal (A)	1,500.00
B. Clean Technology Fund^b	
1. Consultants	
a. Remuneration and per diem	
i. International consultants	217.51
ii. National consultants	55.11
b. Out-of-pocket expenditures	
iii. International and local travel	27.30
iv. Reports and communications	0.30
v. Miscellaneous administration and support costs ^c	0.90
2. Goods (purchase)	65.00
3. Contingencies	33.88
Subtotal (B)	400.00
Total	1,900.00

Note: The technical assistance is estimated to cost \$2,337,000, including contributions from the Asian Clean Energy Fund under the Clean Energy Financing Partnership Facility and the Clean Technology Fund, which are presented in the table above. The government will provide counterpart support in the form of data, counterpart staff, office space, and other in-kind contributions. The value of government contribution is estimated to account for 19% of the total technical assistance cost.

^a Established by the Government of Japan and administered by the Asian Development Bank.

^b Administered by the Asian Development Bank.

^c This will cover passport and visa fees, medical costs, and other incidental travel expenses.

Source: Asian Development Bank estimates.

LIST OF LINKED DOCUMENTS

<http://www.adb.org/Documents/LinkedDocs/?id=49102-001-TARreport>

1. Terms of Reference for Consultants
2. Procurement Plan