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বিজ্ঞপ্তি

বিষয় : **"Bangladesh National Renewable Energy Roadmap 2026" খসড়া এর উপর সুধীজনের মতামত।**

উপর্যুক্ত বিষয়ে জানানো যাচ্ছে যে, নবায়নযোগ্য জ্বালানির দ্রুত প্রসার ও টেকসই উন্নয়ন নিশ্চিতকরণের লক্ষ্যে বিদ্যুৎ বিভাগ কর্তৃক ইতোমধ্যে 'জাতীয় নবায়নযোগ্য জ্বালানি উন্নয়ন কৌশল পত্র (২০২৬-২০৩০)' প্রণয়ন করা হয়েছে। উক্ত কৌশল পত্রের আলোকে টেকসই ও নবায়নযোগ্য জ্বালানি উন্নয়ন কর্তৃপক্ষ কর্তৃক "Bangladesh National Renewable Energy Roadmap 2026" এর খসড়া প্রস্তুত করা হয়েছে।

২। এমতাবস্থায়, "Bangladesh National Renewable Energy Roadmap 2026"-এর সংযুক্ত খসড়াটি পর্যালোচনা করে সংশ্লিষ্ট সকলের মূল্যবান মতামত, পর্যবেক্ষণ ও সুপারিশ লিখিতভাবে দ্রুত এ বিভাগে হার্ডকপি অথবা নিম্নোক্ত ই-মেইল ঠিকানায় প্রেরণের জন্য অনুরোধ করা হলো।

সংযুক্তি: "Bangladesh National Renewable Energy Roadmap 2026"-এর খসড়া

০৬/০৮/২৬

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Bangladesh
National Renewable Energy Roadmap 2026
(Draft)

Sustainable And Renewable Energy Development Authority (SREDA)

06 August 2026

ABBREVIATIONS AND ACRONYMS

ADB	Asian Development Bank	ADF	Asian Development Fund
ADMS	Advanced Distribution Management System	ADP	Annual Development Program
AF	Adaptation Fund	AGC	Automatic Generation Control
AI	Artificial Intelligence	AIIB	Asian Infrastructure Investment Bank
ASEAN+3	Association of Southeast Asian Nations Plus Three	BAB	Bangladesh Accreditation Board
BADC	Bangladesh Agricultural Development Corporation	BB	Bangladesh Bank
BDBL	Bangladesh Development Bank Limited	BDT	Bangladeshi Taka
BEPRC	Bangladesh Energy and Power Research Council	BEPZA	Bangladesh Export Processing Zones Authority
BERC	Bangladesh Energy Regulatory Commission	BESS	Battery Energy Storage System
BEZA	Bangladesh Economic Zones Authority	BGMEA	Bangladesh Garment Manufacturers and Exporters Association
BHTPA	Bangladesh Hi-Tech Park Authority	BIDA	Bangladesh Investment Development Authority
BIDF	Bangladesh Infrastructure Development Fund	BIPV	Building-Integrated Photovoltaics
BKMEA	Bangladesh Knitwear Manufacturers and Exporters Association	BMDA	Barind Multipurpose Development Authority
BMET	Bureau of Manpower, Employment and Training	BNBC	Bangladesh National Building Code
BOO	Build-Own-Operate	BOOT	Build-Own-Operate-Transfer
BPDB	Bangladesh Power Development Board	BPMI	Bangladesh Power Management Institute
BREB	Bangladesh Rural Electrification Board	BSEC	Bangladesh Securities and Exchange Commission
BSTI	Bangladesh Standards and Testing Institution	BTEB	Bangladesh Technical Education Board
BTRC	Bangladesh Telecommunication Regulatory Commission	BTS	Base Transceiver Station
BWDB	Bangladesh Water Development Board	CAD	Computer-Aided Design
CAPEX	Capital Expenditure	CDB	China Development Bank
CIF	Climate Investment Funds	CO2	Carbon Dioxide
CORSIA	Carbon Offsetting and Reduction Scheme for International Aviation	CSP	Concentrated Solar Power
CTCN	Climate Technology Centre and Network	DFC	U.S. International Development Finance Corporation
DFI	Development Finance Institution	DoE	Department of Environment
DSE	Dhaka Stock Exchange	DSM	Demand-Side Management
DTE	Directorate of Technical Education	EDCF	Economic Development Cooperation Fund

EEC	Energy Efficiency and Conservation
EMRD	Energy and Mineral Resources Division
EPC	Engineering, Procurement and Construction
ERD	Economic Relations Division
ESMAP	Energy Sector Management Assistance Program
ESS	Energy Storage System
EXIM	Export-Import Bank
FGD	Focus Group Discussion
FTE	Full-Time Equivalent
GCF	Green Climate Fund
GEF	Global Environment Facility
GoB	Government of the People's Republic of Bangladesh
GWh	Gigawatt-hour
HSC	Higher Secondary Certificate
IBRD	International Bank for Reconstruction and Development
ICT	Information and Communication Technology
IDCOL	Infrastructure Development Company Limited
IFAD	International Fund for Agricultural Development
IoT	Internet of Things
IRENA	International Renewable Energy Agency
ITMO	Internationally Transferred Mitigation Outcome
JV	Joint Venture
kgoe	Kilogram of Oil Equivalent
kWh	Kilowatt-hour
LC	Letter of Credit
LDC	Least Developed Country
LiDAR	Light Detection and Ranging
LPG	Liquefied Petroleum Gas
MDB	Multilateral Development Bank
MoFL	Ministry of Fisheries and Livestock
MoU	Memorandum of Understanding
MPP	Merchant Power Policy
MSW	Municipal Solid Waste
MTOE	Million Tonnes of Oil Equivalent
MWh	Megawatt-hour
EEZ	Exclusive Economic Zone
EMS	Energy Management System
EPZ	Export Processing Zone
ESIA	Environmental and Social Impact Assessment
ESMP	Environmental and Social Management Plan
EV	Electric Vehicle
FDI	Foreign Direct Investment
FGMO	Free Governor Mode of Operation
FY	Fiscal Year
GDP	Gross Domestic Product
GIS	Geographic Information System
GW	Gigawatt
HRD	Human Resource Development
HSE	Health, Safety and Environment
ICMA	International Capital Market Association
IDA	International Development Association
IEPMP	Integrated Energy and Power Master Plan
IMED	Implementation Monitoring and Evaluation Division
IPP	Independent Power Producer
IsDB	Islamic Development Bank
JICA	Japan International Cooperation Agency
KfW	KfW Development Bank
KII	Key Informant Interview
L&D	Loss and Damage
LCOS	Levelized Cost of Storage
LGD	Local Government Division
LNG	Liquefied Natural Gas
M&E	Monitoring and Evaluation
MoEFCC	Ministry of Environment, Forest and Climate Change
MoHPW	Ministry of Housing and Public Works
MoWR	Ministry of Water Resources
MRV	Measurement, Reporting and Verification
$MtCO_2e$	Million Tonnes of Carbon Dioxide Equivalent
MW	Megawatt
NBFI	Non-Bank Financial Institution

NBR	National Board of Revenue	NDB	New Development Bank
NDC	Nationally Determined Contribution	NEECMP	National Energy Efficiency and Conservation Master Plan
NGO	Non-Governmental Organization	NIE	National Implementing Entity
NREDS	National Renewable Energy Development Strategy (2026–2030)	NSC	National Savings Certificate
NSDA	National Skills Development Authority	O&M	Operation and Maintenance
ODA	Official Development Assistance	OPEX	Operating Expenditure
P2P	Peer-to-Peer	PD	Power Division
PGB	Power Grid Bangladesh PLC	PGII	Partnership for Global Infrastructure and Investment
PPA	Power Purchase Agreement	PPP	Public-Private Partnership
PPPA	Public-Private Partnership Authority	PRG	Partial Risk Guarantee
PV	Photovoltaic	R&D	Research and Development
RBCF	Results-Based Climate Finance	RDF	Refuse-Derived Fuel
RE	Renewable Energy	REC	Renewable Energy Certificate
REDD+	Reducing Emissions from Deforestation and Forest Degradation, plus related forest-carbon activities	RESCO	Renewable Energy Service Company
RPO	Renewable Power Obligation	RTHD	Road Transport and Highways Division
SCADA	Supervisory Control and Data Acquisition	SDG	Sustainable Development Goal
SEDF	Sustainable Energy Development Fund	SHS	Solar Home System
SIP	Solar Irrigation Pump	SLB	Sustainability-Linked Bond
SME	Small and Medium Enterprise	SOP	Standard Operating Procedure
SREDA	Sustainable and Renewable Energy Development Authority	SREP	Scaling Up Renewable Energy Program
SRF	Solid Recovered Fuel	SSC	Secondary School Certificate
TCAF	Transformative Carbon Asset Facility	TVET	Technical and Vocational Education and Training
UNEP	United Nations Environment Program	USAID	United States Agency for International Development
USD	United States Dollar	VCM	Voluntary Carbon Market
VGF	Viability Gap Funding	VRE	Variable Renewable Energy
W2E	Waste-to-Energy		

Contents

1.0 Background

Bangladesh's continued economic growth, industrialization, urbanization and improvement in living standards require a reliable, affordable, secure and sustainable electricity supply. Over the past two decades, the country has made substantial progress in expanding generation capacity and electricity access. However, the power sector remains highly exposed to imported fuel prices, global supply disruptions, pressure on foreign exchange reserves and the fiscal burden associated with electricity generation. Expanding domestic renewable energy, improving energy efficiency and conservation are therefore essential for strengthening long-term energy security and resilience in the energy sector.

The very first initiative to develop the renewable energy sector was taken by the Government of Bangladesh through the Renewable Energy Policy of Bangladesh in 2008. It was followed by several policies and programs such as the 500 MW Solar Program (2012-2016), Integrated Energy and Power Master Plan (IEPMP) 2023, National Rooftop Solar Program 2023, Power Sector Strategic Plan 2025, Net Metering Guideline 2025, Bangladesh's Third Nationally Determined Contribution targeting 2035 (NDC-3) and National Renewable Energy Policy 2025. These initiatives have supported the development of solar home systems, rooftop solar, solar irrigation, utility-scale solar, wind and other renewable energy applications.

As per the report of the Bangladesh Power Development Board (July 2026), Bangladesh has an installed electricity-generating capacity of nearly 29,500 MW, with summer peak demand exceeding 18,000 MW. According to data from the National Renewable Energy Database in July 2026, some 1,850 MW of off-grid and on-grid-connected renewable energy capacity has been developed, but it still accounts for a small share of the total generation mix. Moreover, according to the National Renewable Energy Development Strategy (NREDS) (2026-2030), future electricity demand is expected to grow at about 6% per year and the peak is expected to be around 24,000-25,000 MW by 2030. The annual electricity demand may be as high as about 135,000 GWh under the assumption of an average system load factor of 0.65. The Renewable Energy Policy 2025 aims to meet 20% of the projected annual electricity demand through renewable energy generation by 2030 and 30% by 2040. This would require approximately 27,000 GWh of renewable electricity in 2030.

The main contribution is expected from solar energy due to favorable weather and seasonal conditions, abundant sunlight, high population density and the suitability of solar technologies for both distributed and utility-scale applications in Bangladesh. NREDS aims for 5,500 MW of rooftop solar and 4,500 MW of ground or land-mounted solar by 2030. Wind, waste-to-energy, hydropower, floating solar, agrivoltaics and other renewable energy technologies are expected to add a further 450-500 MW. Rooftop solar is the topmost priority and ground-mounted PV projects will be developed with due consideration to agricultural land, food security, biodiversity, local livelihoods and environmental protection.

Higher renewable energy penetration will require corresponding improvements in power-system planning and operation. Renewable energy forecasting, grid modernization, smart-grid technologies, SCADA, system flexibility, demand-side management and battery energy storage systems (BESS) will be required to maintain reliability and grid stability. Energy efficiency is also an integral part of the development strategy, which aims to achieve at least 15% electricity savings through efficiency and conservation measures in industrial,

commercial and residential sectors, although the National Energy Efficiency and Conservation Master Plan (NEECMP) depicts 20% energy savings by 2030.

To implement it, the Power Division, SREDA, BPDB, Power Grid of Bangladesh, distribution utilities, BERC, concerned ministries, local government bodies, financial institutions, private sector, academia and development partners need to act in a coordinated manner. Public funding alone will never be sufficient; rather, domestic and foreign private investment, concessional finance, climate finance, green finance, public-private partnerships and carbon-finance mechanisms will therefore be key.

This Renewable Energy Roadmap replicates the message and ideology of both NREDS and The Renewable Energy Policy 2025 and elaborates on an implementation framework through 2040. It lays out actions, time frames, institutional responsibilities, financing approaches, risks and measurable indicators. The implementation will primarily focus on 2030 and afterward, pathways are designed for longer-term ambitious achievement of at least 30% RE integration by 2040.

The roadmap shall be treated as a living implementation policy document. Progress will be reviewed regularly and a formal mid-term review will be undertaken in July 2028 to assess implementation, identify delays and recommend corrective measures.

1.1 Executive Summary

Bangladesh is entering a crucial phase of its energy transition. Generally, electricity demand is propelled by economic growth, industrialization, urbanization and rising living standards. At the same time, dependence on imported fuels exposes the power sector to international price volatility, supply risks, pressure on foreign exchange reserves and higher costs of generating electricity. Therefore, renewable energy development, energy efficiency and grid modernization are critical to enhance energy security, ensure affordability and achieve sustainable economic growth.

This Renewable Energy Roadmap outlines a time-bound, staged implementation pathway up to 2040. It translates the essence of both NREDS and The Renewable Energy Policy 2025 by a series of coordinated actions, time frames, institutional responsibilities, financing approaches and measurable indicators of implementation. The roadmap has been developed through a structured process that includes reviewing primary and secondary information, data analysis and synthesis, drafting, stakeholder consultation, resource mobilization and validation. This approach is designed to ensure that the roadmap remains rooted in evidence, institutionally relevant and practically implementable.

Figure 1.1: Process followed for development and finalization of the Renewable Energy Roadmap

NREDS prioritizes generating 5,500 MW of rooftop solar and 4,500 MW of ground-mounted solar electricity. The remaining 450-500 MW is to be delivered by wind, waste-to-energy, hydropower, floating solar, agrivoltaics and other renewable energy technologies. The strategy also includes a year-wise allocation of renewable energy capacity additions for the period of 2026-2030. Capacity additions are fairly modest in 2026 and 2027 to allow time for policy and regulatory support, land identification, procurement, financing arrangements, grid studies, simplification of net-metering upgradation and investment preparation. Deployment is expected to pick up from 2028 onwards through private-sector investment, PPP and MPP models, rooftop RESCO/OPEX arrangements and improved grid readiness. The largest annual additions are expected in 2029 and 2030.

Rooftop solar will be given the highest priority, as it can be integrated into existing building water bodies and structures while releasing pressure from agricultural land. Grid-connected ground-mounted solar will also be implemented by considering the types of land where we are implementing the project, simultaneously keeping in mind our two or three times yearly cultivable agricultural land, food security, biodiversity, local livelihoods and environmental quality. Other renewable energy technologies will also be developed based on credible resource assessments, technical and financial feasibility, environmental safeguards and grid availability.

Higher penetration of renewable energy will require adequate advances in power system planning and operation. The roadmap includes renewable energy forecasting, grid modernization, smart grid systems, SCADA, system flexibility, demand-side management and battery energy storage systems (BESS). Storage requirements will be determined through project-specific technical assessments and system studies.

Energy efficiency and conservation are also an integral part of the RE map. The Strategy document calls for at least 15% in electricity savings through efficiency and conservation measures in industrial, commercial and residential applications. This target will be achieved through the implementation strategy of NEECMP. These measures will reduce the pressure on generation and network infrastructure and help achieve the renewable energy targets. Implementation requires coordinated public and private investment. The roadmap promotes both domestic and foreign private investment, concessional finance, climate finance, green finance, public-private partnerships and carbon-finance mechanisms. Transparent procurement, bankable contractual arrangements, payment security, quality standards and predictable regulatory procedures will be essential for mobilizing investment.

The Power Division would provide overall policy guidance while SREDA would help in coordination, data management, monitoring and review of implementation. BPDB, PGB PLC, distribution utilities, BERC, relevant ministries, local government institutions, financial institutions, the private sector, academia and development partners will play their respective roles in accordance with their assigned businesses and responsibilities.

The roadmap also addresses human resource development, research and innovation, local enterprise development, gender inclusion, environmental protection, social safeguards and a just and equitable transition. Renewable energy development will support employment, industrial competitiveness and improved electricity access in remote and climate-vulnerable areas. In the medium term, the focus will be on accelerating project delivery, grid and storage integration and financing. Longer-term actions will help support progress towards the projected target set by 2040.

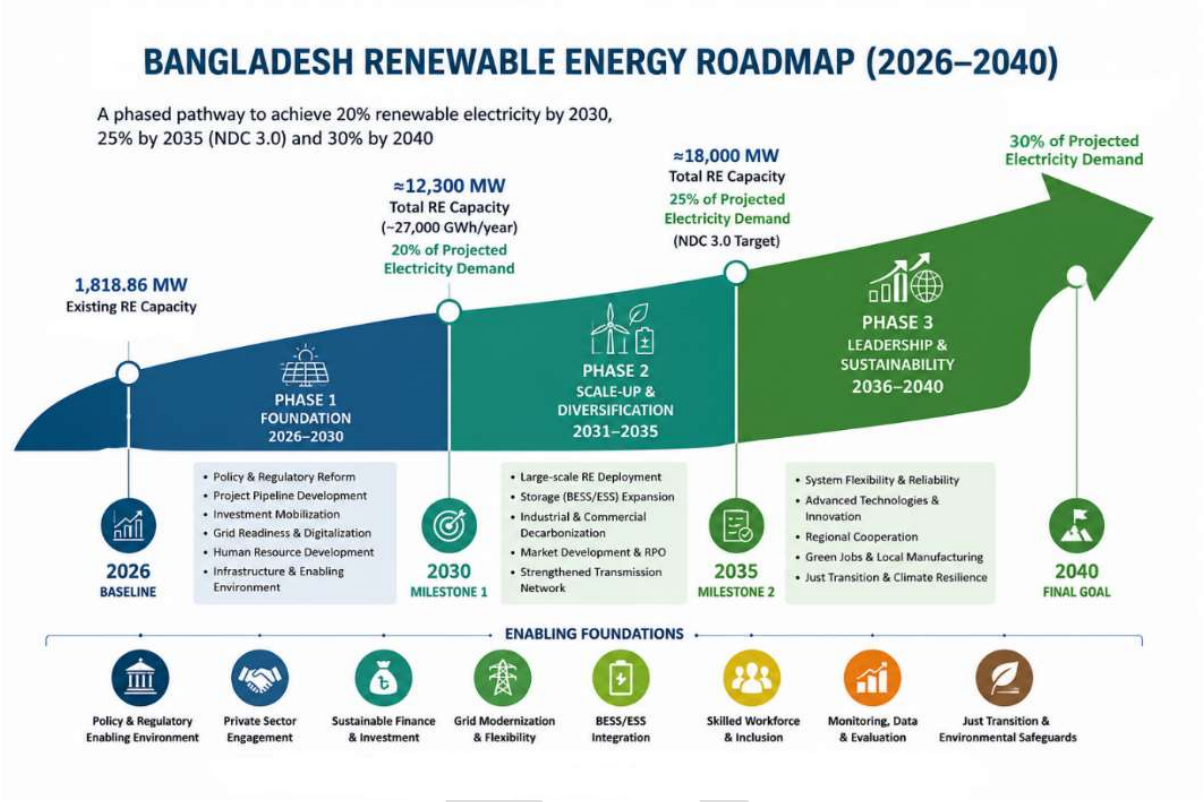


Figure 1.2: Visual presentation of the phased pathway to achieve the renewable energy targets (2030, 2040)

Progress will be tracked through quantifiable metrics on renewable electricity generation, installed capacity, project commissioning, energy conservation, investment, grid readiness, storage deployment, carbon emission cuts, job creation and gender engagement. In July 2028, a formal mid-term review will be conducted to assess implementation progress and propose corrective actions.

2.0 Vision, Mission, Aims, Targets and Objectives

2.1 Vision

To create a secure, affordable, sustainable and low-carbon energy system ensuring national energy security, economic growth, industrialization and climate-resilient development.

2.2. Mission

To accelerate the growth of renewable energy through competitive market mechanisms, technological innovation and private investment and to ensure public access to reliable and clean energy through better energy efficiency & conservation measures and smart grid technologies.

2.3 National Targets

The roadmap translates the goal set in the National Renewable Energy Development Strategy (NREDS) for 2030 into a series of coordinated, measurable implementation actions.

- Increase the share of renewable energy in electricity generation to 20% and 30% by 2030 and 2040, respectively and reduce dependence on imported primary energy;
- Introducing battery energy storage systems (**BESS)** and **smart-grid** systems to underpin national grid stability;
- Realize at least **15%** electricity savings through energy efficiency and conservation measures in the industrial, commercial and residential sectors;
- Develop required policies and **strengthen coordination between institutions on energy efficiency, demand management and effective monitoring**;
- Create an **investment-friendly environment** and promote **effective green financing**;
- **Promote the use of clean and efficient energy in all sectors, including export-oriented sectors;**
- Develop **skilled human resources** and foster local entrepreneurs and **domestic manufacturing;**
- **Reduce carbon emissions from the power sector** and develop projects and policies on carbon-credit mechanisms; and
- Formulate policy measures for **sustainable waste management** and the establishment of **a circular economy**.

2.4 Aims and Objectives

The Renewable Energy Roadmap will steer the joint action of government agencies, utilities, regulators, financial institutions, the private sector, academia and development partners. Specific aims and objectives of the roadmap are outlined below:

2.4.1 Implementation of Renewable Energy Programs and Projects

To develop implementation pathways for renewable energy programs and projects with clear responsibilities, time frames, outputs and performance indicators.

2.4.2 Policy, Regulatory and Budgetary Involvement

To enable implementation through the required policies, regulations, standards, institutional work plans, budgetary allocations and simplified approval and procurement procedures.

2.4.3 Renewable Energy, Energy Efficiency & Conservation and Climate Targets

To meet 20% of the expected annual electricity demand from renewable energy by 2030 and to help achieve the goal of 30% by 2040, align with **NREDS**. The roadmap will also support at least 15% electricity savings through energy efficiency and conservation, reduce carbon emissions and strengthen readiness for carbon credit mechanisms.

2.4.4 Investment, Industrial Competitiveness and Local Enterprise

To mobilize public finance, domestic and international private investment, concessional finance, climate finance, green finance and public-private partnerships. The roadmap will promote the use of renewable electricity in industry and will help improve export competitiveness and support local entrepreneurs, service providers and domestic manufacturing.

2.4.5 Sustainable Technology Development and Power-System Integration

To accelerate the environmentally and socially responsible deployment of rooftop solar, ground-mounted solar, wind, Waste-to-Energy (W2E), hydropower and other appropriate renewable energy technologies. The roadmap will also enable grid modernization, renewable energy forecasting, smart grid systems, demand-side management, battery energy storage (BESS) and circular-economy-based waste management.

2.4.6 Energy Justice, Capacity Building and Inclusive Growth

To improve reliable energy access in chars, islands, haor areas, hill districts and other difficult-to-reach locations. The roadmap shall strengthen technical and institutional capacity, research and innovation, public awareness, gender inclusion, youth participation and a just energy transition.

2.4.7 Institutional Coordination, Data and Accountability

The Power Division shall provide overall policy direction and oversight, while SREDA shall coordinate implementation, monitoring, data management, reporting and periodic review within its mandate. Relevant ministries, agencies, utilities, regulators and other stakeholders shall implement assigned actions according to their respective responsibilities. Progress shall be reviewed annually, with a formal mid-term review in July 2028.

3.0 Methodology for Roadmap Development

The Renewable Energy Roadmap would be developed through a structured and consultative process that combines policy review, quantitative and qualitative analysis, stakeholder engagement and implementation planning. The methodology is developed to ensure that the roadmap is technically robust, institutionally feasible and fully aligned with The Renewable Energy Policy 2025 and **NREDS**.

The strategy paper shall remain the governing reference for the 2026–2030 period. Where earlier studies, stakeholder proposals or previous roadmap assumptions differ from the strategy, the provisions and targets of the strategy shall prevail. The roadmap translates these provisions into implementable actions without changing their approved intent.

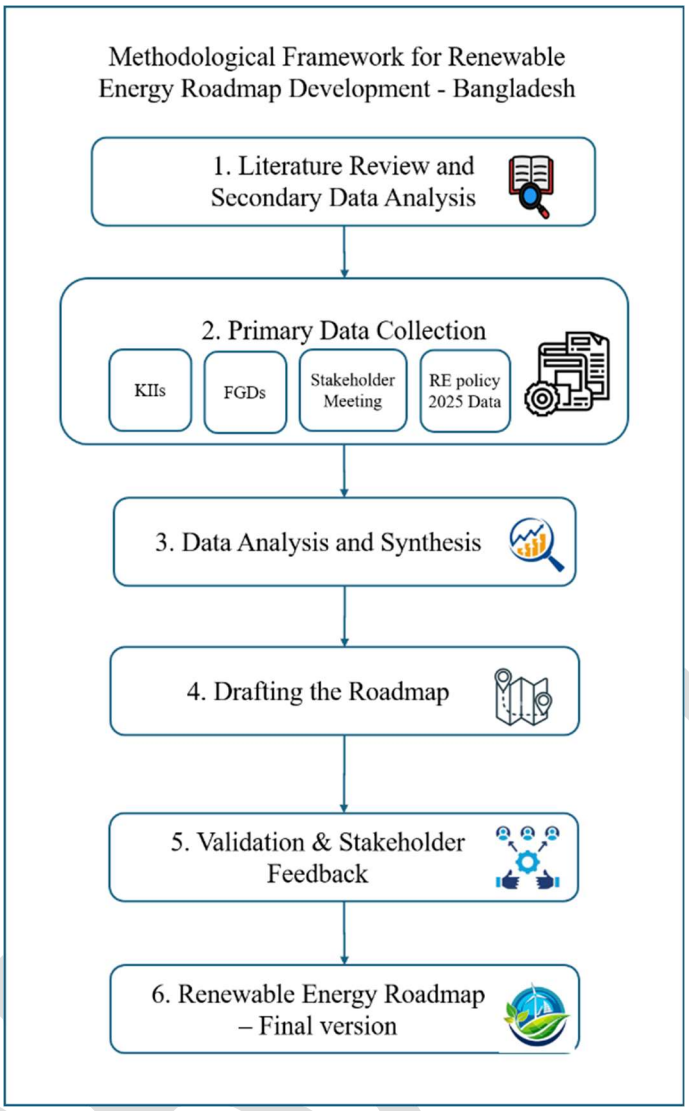


Figure 3.1: Steps for roadmap development

3.1 Literature Review and Secondary Data Analysis

A review of relevant national policies, strategies, guidelines, plans, legislation, institutional documents and sector data has been undertaken. The principal references include:

- National Renewable Energy Development Strategy **(NREDS)**, 2026–2030;
- Renewable Energy Policy, 2025;
- Net Metering Guideline, 2025;
- National Rooftop Solar Program, 2025;
- Integrated Energy and Power Master Plan (IEPMP), 2023;
- Energy Efficiency and Conservation Master Plan, 2030;
- Bangladesh's Nationally Determined Contributions (NDCs), National Adaptation Plan and other climate commitments; and
- Data and reports from SREDA, BPDB, Power Division, PGB PLC, distribution utilities, BERC, relevant ministries, financial institutions, international organizations (IRENA, World Bank, ADB, UNEP, KfW) and other development partners.

Regional (China, India, Pakistan, Nepal, Bhutan, Sri Lanka and Vietnam) and international experiences were reviewed, where relevant to Bangladesh, particularly in renewable energy procurement, rooftop solar, grid integration, battery storage, green finance, carbon markets, local manufacturing and institutional coordination.

The review identified gaps related to project implementation, regulation, financing, grid readiness, institutional capacity, human resources, environmental and social safeguards, gender inclusion and monitoring.

3.2 Primary Data Collection

Primary information was collected through consultations with public institutions, utilities, regulators, private developers, financial institutions, industry associations, academia, technical professionals, development partners and other relevant stakeholders. The methods included:

- **Key Informant Interviews:** To obtain strategic and institutional views on policy implementation, project development, financing, regulation and coordination.
- **Focus Group Discussions:** To examine operational constraints, skills requirements, gender and inclusion issues, local implementation challenges and stakeholder priorities.
- **Targeted Stakeholder Meetings:** To obtain institutional data, verify mandates, review ongoing and planned projects and discuss implementation responsibilities.
- **Structured Surveys:** To collect wider stakeholder feedback on investment barriers, technology readiness, financing requirements, institutional capacity and project-development challenges.
- **Policy and Consultation Records:** To incorporate relevant evidence, meeting records and lessons from the preparation of The Renewable Energy Policy 2025 and the National Renewable Energy Development Strategy (NREDS), 2026-2030.
- **Project and Case-Study Review:** To draw practical lessons from existing grid-connected and off-grid renewable energy projects in Bangladesh and relevant regional experience.

Table 3.1: Primary Data Collection Methods, Enhanced Summary

Method	Purpose	Main participants or sources	Data type	Application in the Roadmap
Key Informant Interviews (KIIs)	Capture high-level strategic & institutional insights	Policymakers, regulators, utilities, financiers and private-sector representatives	Qualitative	Institutional roles, policy gaps, investment barriers and enabling actions
Focus Group Discussions (FDGs)	Explore practical challenges, skills & inclusion issues	Practitioners, technicians, trainers, entrepreneurs, women and community representatives	Qualitative	Skills, inclusion, local constraints and implementation risks
Stakeholder Meetings	Obtain official data & institutional perspectives	Power Division, SREDA, BPDB, PGB PLC, distribution utilities and relevant agencies	Quantitative and qualitative	Project pipelines, grid readiness, institutional responsibilities and timelines
Structured Surveys	Gather broad quantitative feedback	Developers, industries, financiers, academia, NGOs and local institutions	Quantitative and qualitative	Market conditions, financing needs, technology readiness and stakeholder priorities

Policy and Consultation Records	Maintain continuity with existing government processes	Policy documents, meeting records, institutional submissions and consultation reports	Documentary and archival	Policy alignment, traceability and validation of recommendations
Project and Case-Study Review	Identify practical lessons and implementation risks	Existing renewable energy projects and relevant regional examples	Quantitative and qualitative	Technology performance, procurement, financing, safeguards and replication potential

Figure 3.2: Overview of Primary Data Collection Methods

3.3 Data Analysis and Synthesis:

The collected information has been analyzed and cross-verified to establish the sector baseline, identify gaps and develop practical recommendations. The analysis included:

- Review of consistency between the strategy, policy and existing roadmap provisions;
- Assessment of renewable electricity generation requirements in GWh and corresponding capacity requirements in MW;
- Technology-wise resource, feasibility and implementation assessment;
- Policy, regulatory, institutional and financing gap analysis;
- Grid integration, storage, energy efficiency and demand-management assessment;
- Environmental, social, gender and just-transition considerations;
- Risk, dependency and implementation-readiness assessment; and
- Cross-verification of findings against official data and stakeholder evidence.

3.4 Drafting the Roadmap

The findings are translated into a phased implementation framework covering renewable energy deployment and the related enabling environment. The roadmap addresses:

- Technology-specific programs and project pipelines;
- Policy, legal and regulatory measures;
- Grid modernization, forecasting, system flexibility and battery storage;
- Energy efficiency and demand-side management;
- Financing, private investment and industrial competitiveness;
- Institutional coordination and data management;
- Human resource development, research and innovation;
- Environmental and social safeguards, gender inclusion and energy justice; and
- Monitoring, evaluation and periodic review.

Actions are classified as immediate (0–2 years), medium-term (3–5 years) and long-term (post-2030 to 2040). Each major action identifies:

- The lead and supporting agencies;
- Implementation timeline and milestones;
- Expected outputs;
- Policy or regulatory requirements;
- Financing approach;
- Key dependencies and risks; and
- Measurable performance indicators.

The 2026–2030 actions shall directly support the targets and priorities of the National Renewable Energy Development Strategy. The post-2030 actions shall build on verified progress and support the achievement of the Renewable Energy Policy 2025 target for 2040.

3.5 Validation and Finalization

The draft roadmap shall be reviewed through technical and institutional consultations involving the principal implementing agencies and relevant stakeholders. Comments shall be assessed against the National Renewable Energy Roadmap 2025, the National Renewable Energy Development Strategy (2026-2030), official data, institutional mandates, technical feasibility and implementation readiness.

A comment-response matrix should be maintained to document major observations, decisions and revisions. Unresolved data gaps, assumptions and issues requiring further government decisions shall be clearly identified.

Following validation, the roadmap shall be revised and submitted to the competent authority for approval. Implementation progress shall subsequently be reviewed through annual reporting, periodic stakeholder consultation and the formal mid-term review scheduled for July 2028.

4.0 Sectoral Overview of the Renewable Energy Sector of Bangladesh

Bangladesh has made substantial progress in expanding electricity access and generation capacity. However, the power system remains largely dependent on natural gas, coal and petroleum products, including imported fuels. This dependence exposes the country to international fuel-price volatility, supply disruptions, pressure on foreign exchange reserves and rising electricity-generation costs. Expanding renewable energy is therefore important not only for environmental sustainability, but also for strengthening energy security, affordability and economic resilience.

Bangladesh is also highly vulnerable to climate-related hazards, including cyclones, floods, extreme temperatures and salinity intrusion. These risks affect power infrastructure and reinforce the need for a more diversified, resilient and decentralized electricity system. Renewable energy development, together with energy efficiency, grid modernization and storage, can support national climate commitments while improving the reliability and sustainability of electricity supply.

Renewable energy development in Bangladesh has so far been led by solar energy. Solar home systems (SHS: Bangladesh being the pioneer in the world in this sector), rooftop solar installations, solar irrigation pumps and grid-connected solar plants have demonstrated the technical applicability of solar technologies across residential, agricultural, commercial and industrial sectors. These applications have also supported rural livelihoods, irrigation, small businesses and access to electricity in remote and off-grid areas.

According to the latest data in the SREDA National Database of Renewable Energy, updated on 22 July 2026, Bangladesh's total installed renewable energy capacity stands at 1,818.86 MW, of which solar accounts for around 1,526 MW. Despite this progress, renewable energy still contributes only a limited share of total electricity generation (less than 6%). Major barriers include land scarcity, lengthy project-development and approval processes, limited grid-evacuation capacity, financing constraints, payment and foreign-exchange risks, gaps in resource data, shortages of specialized skills and weak coordination among implementing institutions.

NREDS therefore places strong emphasis on rapid expansion of rooftop and land-mounted solar, while also promoting wind, W2E, floating solar, agrivoltaics, solar irrigation, hydropower and other emerging technologies. Rooftop solar offers significant potential because it uses existing buildings and structures, while ground-mounted projects require careful consideration of agricultural land, biodiversity, local livelihoods and environmental safeguards. Wind, W2E and other technologies remain at earlier stages and will require reliable resource assessments, appropriate business models, technology standards and institutional support.

Future renewable energy growth will also depend on improvements in grid planning, forecasting, battery energy storage, smart-grid systems, demand-side management and transmission and distribution infrastructure. Greater private-sector participation, domestic and foreign investment, concessional finance, climate finance and public-private partnership models will be essential for scaling up project implementation. The sectoral overview indicates that Bangladesh has established a foundation for renewable energy development, but achieving

the national targets will require a coordinated transition from isolated projects to a structured program of investment, grid integration, institutional reform, skills development and performance monitoring. The roadmap provides the implementation framework for managing this transition up to 2040.

4.1 Current Status of Renewable Energy Installed Capacity

Based on the latest data in the SREDA National Database of Renewable Energy, updated on 22 July 2026, out of Bangladesh's total installed renewable energy capacity, 1,525.77 MW of capacity is coming from solar energy (including 377.47 MW off-grid and 1,148.30 MW on-grid); 230 MW from hydropower; 62 MW from wind power; 0.69 MW from biogas-to-electricity; and 0.40 MW from biomass-to-electricity technologies. Of the total capacity, 1,440.30 MW is connected to the grid and 378.56 MW is off-grid.

Table 4.1: Installed Renewable Energy Capacity by Technology (as of 22 July 2026)

Technology	Off-grid (MW)	On grid (MW)	Total (MW)	Share of RE (%)
Solar	377.47	1,148.3	**1,525.77**	83.9
Wind	0.00	62.00	**62.00**	3.4
Hydro	0.00	230.00	**230.00**	12.6
Biogas to Electricity	0.69	0.00	**0.69**	0.04
Biomass to Electricity	0.40	0.00	**0.40**	0.02
Total RE	**378.56**	**1,440.3**	**1,818.86**	**100**

Source: SREDA renewable energy database

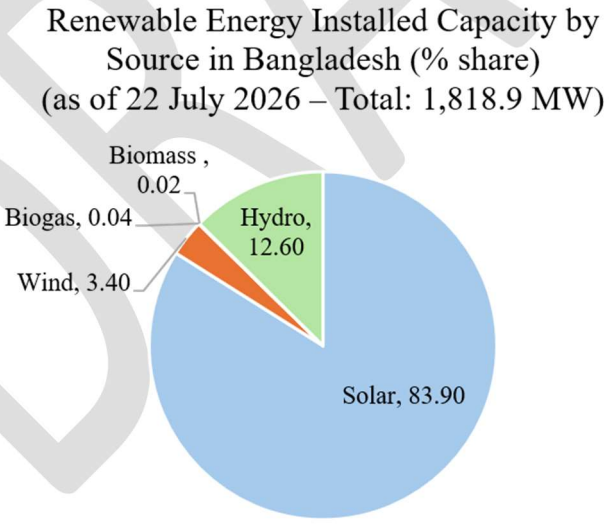


Figure 4.1: Renewable Energy Installed Capacity by Source in Bangladesh

Solar currently accounts for the large majority of installed renewable energy capacity. This provides a strong foundation for further deployment but also indicates limited technological diversity. The development strategy (2026-2030) paper, therefore, prioritizes rapid solar expansion while supporting wind, W2E, hydropower, floating solar, agrivoltaics and other technologies where technically, economically, environmentally and socially feasible.

Renewable energy development continues to face several constraints, including land limitations, lengthy project development and approval processes, insufficient grid evacuation capacity, financing and payment security concerns, foreign-exchange exposure, limited resource data, shortages of specialized skills, inconsistent quality assurance and weak coordination across implementing institutions. Climate risks, including cyclones, flooding, salinity and high temperatures, must also be incorporated into project design and operation. At the same time, Bangladesh has significant opportunities. Rooftop solar can use existing industrial, commercial, institutional and government structures without placing additional pressure on agricultural land. Ground-mounted solar can be developed through careful site selection and environmental safeguards. Solar irrigation, floating solar and agrivoltaics can provide productive and land-efficient applications, while wind and waste-to-energy can support technology diversification. Battery storage (BESS), renewable energy forecasting, smart-grid systems and demand-side management can facilitate higher renewable energy penetration. Table 4.2 provides a concise diagnosis of the renewable energy sector and explains what each issue means for the roadmap.

Table 4.2: Sector Status and Roadmap Implications

Area	Current sector condition	Implication for the Roadmap
Technology deployment	Solar dominates; most other renewable technologies remain limited or at the pilot stage	Prioritize the Strategy targets while applying feasibility-based sequencing for less mature technologies
Land and resource availability	High population density and limited non-agricultural land	Prioritize rooftop solar and require careful land, biodiversity and livelihood assessment for ground-mounted projects
Grid integration	Grid capability for variable renewable energy is still developing	Introduce forecasting, hosting-capacity assessments, SCADA, network reinforcement, storage and curtailment procedures
Investment and finance	High capital requirements, payment risk and foreign-exchange exposure	Improve procurement, contractual bankability, payment security, green finance and risk-mitigation instruments
Institutional coordination	Responsibilities are distributed across several ministries, agencies and utilities	Assign clear lead and supporting agencies, reporting timelines and escalation arrangements
Data and monitoring	Different datasets use different dates, boundaries and units	Establish a common data standard and a centralized renewable energy performance database
Skills and quality	Shortages exist in design, grid integration, finance, storage and quality control	Develop competency standards, certification, specialist training and stronger product-quality requirements
Inclusion, just transition and resilience	Remote and climate-vulnerable areas require tailored solutions	Include decentralized systems, energy justice, gender participation and climate-resilient technical standards

The sector overview demonstrates that achieving the renewable energy targets will require more than just adding generation capacity. It will require coordinated development of projects, grids, storage, financing, regulations, institutions, human resources, risk assessment, including adaptation and mitigation and monitoring systems.

5.0 Energy Consumption in Bangladesh

Bangladesh's energy consumption has increased with economic growth, industrialization, urbanization, electricity access and rising use of electrical appliances and productive equipment. The national energy system continues to depend substantially on natural gas, petroleum products and coal, including imported fuels. Renewable energy and energy efficiency are therefore important for reducing import exposure, improving affordability and supporting long-term energy security.

For clarity, this section distinguishes between:

1. Primary energy consumption, expressed in million tonnes of oil equivalent; and
2. Electricity demand and generation, expressed in GWh and MW.

The national target of meeting 20% and 30% of power demand from renewable energy by 2030 and 2040, respectively, applies to annual electricity demand, not to total primary energy consumption.

5.1 Primary Commercial Energy Consumption

In FY 2023-24, total primary energy supply (including commercial and non-commercial sources) reached approximately 58–60 MTOE. Commercial primary energy consumption stood at 44.94 MTOE. Per capita commercial energy consumption was around 297 kgoe, while per capita grid electricity consumption reached about 603 kWh. The estimated total primary energy for FY 2024-25 was approximately 60.36 MTOE; per capita commercial energy consumption was approximately 349 kgoe, while per capita electricity generation and consumption were approximately 661 kWh and 503 kWh, respectively. Bangladesh has successfully achieved near-universal electricity access (~100%), significantly boosting rural development, small businesses, digital connectivity and quality of life.

However, heavy dependence on imported fossil fuels, particularly LNG and oil, has exposed the economy to global price volatility and strained foreign exchange reserves. In response, the government is promoting energy efficiency (which delivered a 13.64% improvement between FY 2014–15 and FY 2023–24, avoiding ~7 MTOE of fossil fuel use in FY 2023–24 alone) and accelerating the integration of renewables, as outlined in The Renewable Energy Policy 2025.

Table 5.1 presents Bangladesh's primary commercial energy consumption by source in FY 2024–25. The table highlights the country's continued dependence on fossil fuels and imported energy, reinforcing the need to accelerate renewable energy deployment, improve energy efficiency and diversify the national energy mix.

5.2 Electricity Generation and Consumption Pattern

Bangladesh generated around 101,187 GWh of electricity in FY 2024-25. Natural gas was the largest contributor, accounting for 44% (44,613 GWh) of total generation. The second-largest energy source is coal, at 27,040 GWh (27%). The generation mix was heavily reliant on fossil fuels and imported electricity, showing the need for diversification and faster rollout of renewables to secure energy in the long term.

Table 5.1: Primary Commercial Energy Consumption by Source, FY 2024–25

Energy Source	Consumption MTOE
Oil (Crude + Refined)	6.86
LPG	1.57
Natural Gas	16.14
LNG	6.54
Coal (Imported)	11.55
Coal (Local)	0.63
RE (Hydro)	0.17
RE (Solar+ wind)	1.04
Electricity (Imported)	1.99
Biomass	13.88

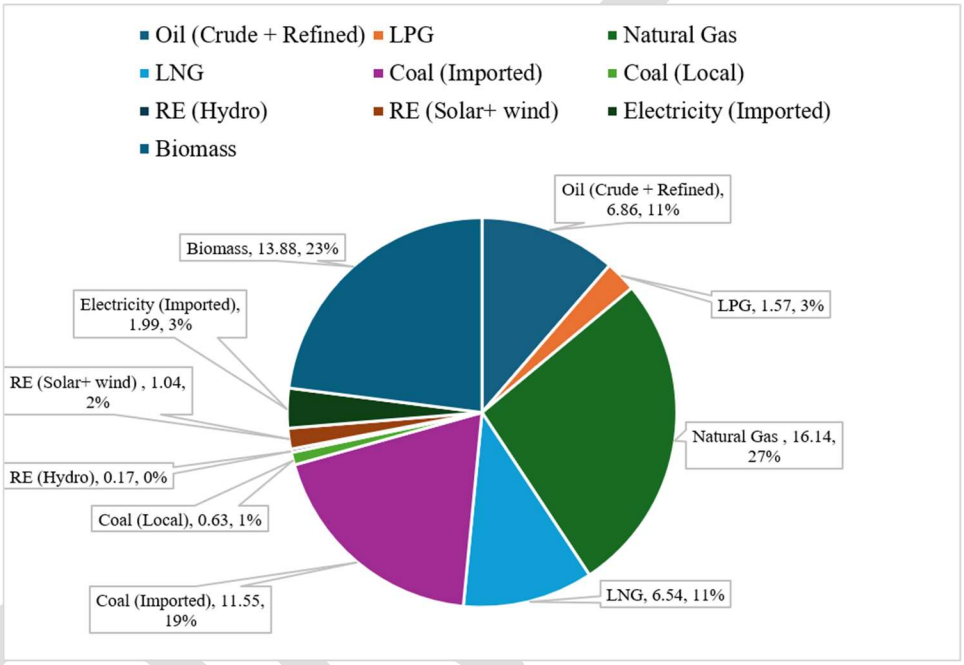


Figure 5.1: Primary Commercial Energy Mix by Share, FY 2024–25

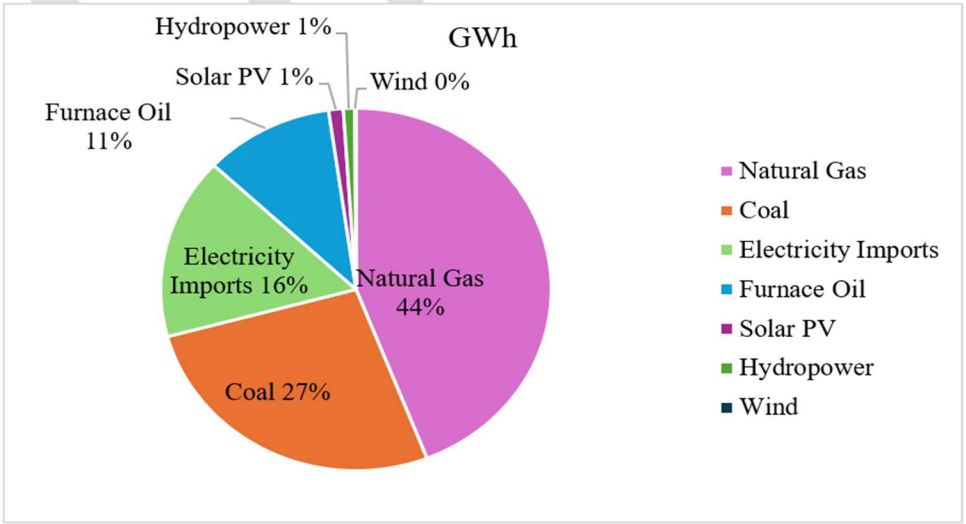


Figure 5.2: Electricity Generation Mix, FY 2024–25

Bangladesh's total electricity consumption in FY 2024-25 stood at 90,939 GWh, with the residential/domestic sector accounting for the largest share at 51,953 GWh (57%). The industrial sector is the second largest consumer, using 24,363 GWh (27%). Commercial activities account 11% of the total and other sectors, including agriculture and public services, account for around 5%.

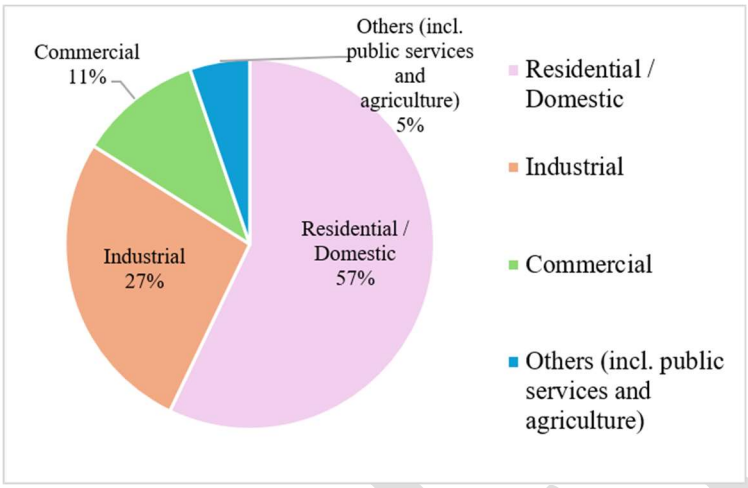


Figure 5.3: Sectoral Electricity Consumption Pattern, FY 2024–25

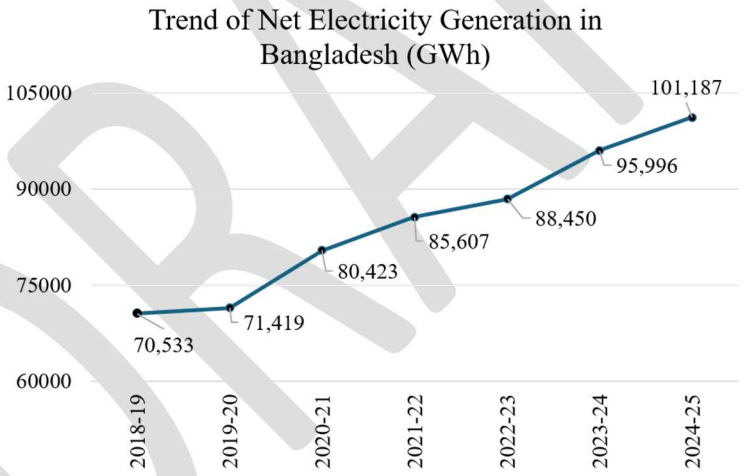


Figure 5.4: Trend of Net Electricity Generation in Bangladesh

Bangladesh's net electricity generation increased steadily from approximately 70,533 GWh in FY 2018–19 to 101,187 GWh in FY 2024–25, reflecting continued economic growth, industrialization, urbanization and rising electricity consumption. This trend indicates that future electricity demand will continue to place additional pressure on fuel supply, generation infrastructure and the national grid. Accordingly, renewable energy deployment must expand faster than overall electricity demand to achieve the national target of meeting 20% of projected annual electricity demand from renewable sources by 2030. The roadmap, therefore, prioritizes accelerated renewable energy projects, energy-efficiency measures, grid modernization, forecasting, battery energy storage and demand-side management to ensure that a growing share of future electricity demand is supplied from clean and domestic energy resources.

5.3 Electricity Demand and Renewable Energy Requirement for 2030 and 2040

Bangladesh's electricity demand is expected to continue increasing with economic growth, industrialization, urbanization and wider electrification of productive activities. NREDS assumes an average annual demand growth of approximately 6%, with peak electricity demand reaching around 24,000–25,000 MW in 2030. At an average system load factor of approximately 0.65, annual electricity demand is projected to reach about 135,000 GWh. The national target is to meet 20% of projected annual electricity demand through renewable energy generation by 2030. Achievement of this target would require approximately 27,000 GWh of renewable electricity generation in 2030. Based on the Strategy's planning assumptions, the corresponding total installed renewable energy capacity is estimated at approximately 12,000–14,000 MW.

The latest SREDA database records 1,818.86 MW of installed renewable energy capacity as of 22 July 2026. The Strategy's year-wise program proposes a further 10,450 MW of capacity additions during 2026–2030. If fully implemented and assuming no significant retirement or reclassification of existing capacity, this would increase total installed renewable energy capacity to approximately 12,268.86 MW by 2030, which falls within the Strategy's indicative range.

The Renewable Energy Policy 2025 sets a further target to meet 30% of projected annual electricity demand from renewable energy by 2040. The Strategy Paper does not necessarily provide a quantified 2040 electricity demand forecast, renewable generation requirement, or corresponding technology-specific capacity requirement. These values have hence been established through rigorous technical analysis employing various methods. An updated generation assessment following the 2030 review, rather than by carrying forward earlier capacity estimates based on different assumptions or the target in the Renewable Energy Policy 2025.

Table 5.2: Strategy-aligned Renewable Energy Planning Framework for 2030 and 2040

Planning parameter	2030	2040	Application in the Roadmap
Renewable energy target	20% of the projected annual electricity demand	30% of the projected annual electricity demand	Measured primarily on an annual energy basis
Projected peak demand	24,000–25,000 MW	To be updated	Used for system planning, not as the denominator of the renewable share
Projected annual electric energy demand	Approximately 135,000 GWh	To be updated	Denominator for measuring the renewable energy share
Required renewable electricity generation	Approximately 27,000 GWh	To be determined	Primary national outcome indicator
Renewable capacity baseline	1,818.86 MW as of 22 July 2026	2030 verified capacity to become the new baseline	Updated through the SREDA database
Planned capacity addition	10,450 MW during 2026–2030	To be updated	Technology- and year-specific implementation target

Indicative total installed renewable capacity	Approximately 12,000–14,000 MW	To be determined through generation modelling	Supporting capacity indicator; not a substitute for the GWh target
Main technology allocation	▪ 5,500 MW rooftop solar; ▪ 4,500 MW ground-mounted solar; ▪ 150 MW wind; ▪ 200 MW waste-to-energy; ▪ 100 MW other sources	Technology mix to be updated based on performance, resources and system requirements	Guides procurement, investment and institutional work plans
Review requirement	Mid-term review in July 2028 and comprehensive review in 2030	Periodic review up to 2040	Allows adjustment based on verified demand, generation and implementation data

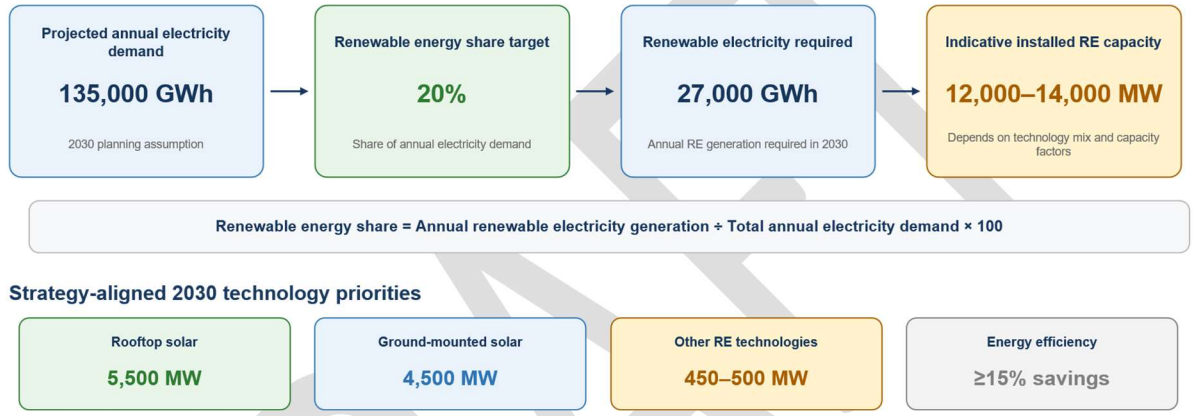


Figure 5.5: Translation of the 2030 Renewable Energy Target

5.4 Comparison with National Targets

The National Renewable Energy Development Strategy translates the 2030 target into quantified implementation requirements: approximately 27,000 GWh of renewable electricity, a total renewable capacity of approximately 12,000–14,000 MW and a year-wise program to add 10,450 MW during 2026–2030.

The roadmap, therefore, replaces earlier draft capacity projections that were derived from different demand assumptions or that treated the percentage target as a direct MW requirement. The 20% and 30% targets are energy-share targets, while the MW figures support implementation requirements.

Meeting the 2030 program would require renewable energy capacity to increase from 1,818.86 MW to approximately 12,268.86 MW, which is nearly 6.7 times the current installed capacity. The average annual addition required during 2026–2030 is approximately 2,090 MW, rising to 3,390 MW in 2030 under the Strategy's schedule.

The transition from a 20% renewable energy share in 2030 to 30% in 2040 will require more than a 50% increase in absolute terms in renewable electricity generation, as total electricity demand is also expected to grow. The 2040 requirement must therefore be based on an updated annual electricity-demand forecast, verified performance of the 2026–2030 program,

technology-specific generation data, grid capacity, storage requirements and the development of new renewable energy resources.

The 2030 data review and subsequent projection shall establish the confirmed baseline and technology pathways for 2031–2040, while maintaining the national objective of meeting 30% of annual electricity demand through renewable energy by 2040.

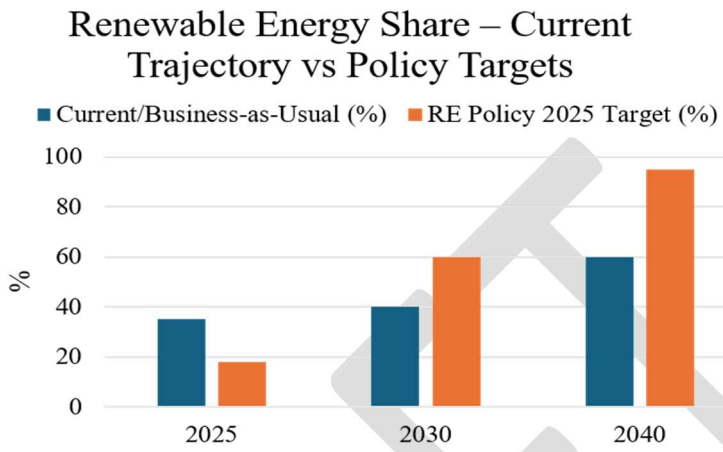


Figure 5.6: Renewable Energy Share: Current Trajectory vs Policy Targets

6.0 Implementation Strategy

The implementation of the Renewable Energy Roadmap will be gradual, coordinated and results-oriented. The first implementation period has been guided by the National Renewable Energy Development Strategy (2026–2030), while the Renewable Energy Policy 2025 provides longer-term guidance to meet the target of 30% of projected annual electricity demand from renewable energy sources by 2040.

The implementation plan focuses on renewable energy deployment and the enabling measures required to deliver it within the same time period. These include policy and regulatory reform, land and project preparation, grid modernization, battery energy storage (BESS), energy efficiency, financing, institutional coordination, human-resource development, environmental and social safeguards, research and performance monitoring.

6.1 Implementation Phases

Implementation will be phased in three stages:

Phase I: Fast Deployment and Strategy Execution, 2026–2030

During this phase, the technology-wise and year-wise targets of the National Renewable Energy Development Strategy will be implemented. It aims to add 10,450 MW of renewable power capacity, including:

- 5,500 MW of rooftop solar,
- 4,500 MW of ground-mounted solar,

- 150 MW of wind power,
- 200 MW of waste-to-energy and
- 100 MW from other renewable energy technologies.

During 2026-2027, the focus will be on policy and regulatory support, land and site identification, project preparation, grid studies, financing arrangements and procurement, as well as simplification of net-metering procedures and development of a bankable project pipeline. The implementation will be expedited by private investment, competitive bidding, public-private partnerships, the MPP and rooftop RESCO/OPEX models from 2028 onwards. This phase will also support at least 15% electricity savings through energy efficiency and conservation, together with grid modernization, renewable energy forecasting, smart-grid systems and appropriately designed Battery Energy Storage Systems.

Phase II: Consolidation and Diversification, 2031-2035

This phase will build on the progress verified by 2030. Focus will be on completing delayed projects, replicating successful business models, strengthening the transmission and distribution system and increasing the contribution of wind, waste-to-energy, floating solar, agrivoltaics, hydropower and other technically viable resources. Updated electricity-demand forecasts, resource assessments, generation data, grid studies and the comprehensive review undertaken at the end of 2030 will determine technology targets and capacity requirements for this period.

Phase III: Long-Term Scale-Up, 2036-2040

This phase will help achieve the Renewable Energy Policy 2025 target of meeting 30 percent of projected annual electricity demand with renewable energy by 2040. The emphasis will be placed on large-scale deployment of proven technologies, increased market participation, advanced storage, smart-grid operation, regional electricity cooperation, local production and long-term system flexibility.

6.2 Building Blocks for Implementation

The roadmap will be delivered via seven interdependent pillars.

Table 6.1: Implementation Pillars of the Renewable Energy Roadmap

Implementation Pillar	Primary Focus
1. Renewable energy deployment	Delivery of technology-wise programs, project pipelines and annual capacity targets
2. Policy and regulatory enablement	Timely preparation or revision of regulations, guidelines, standards, procurement documents and approval procedures
3. Grid, BESS storage and system readiness	Grid studies, evacuation infrastructure, forecasting, SCADA, operational flexibility, BESS and demand-side management
4. Investment and financing	Public and private investment by competitive bidding, green finance, concessional funding, PPP, MPP, RESCO/OPEX and risk-mitigation arrangements
5. Institutional and human capacity	Clear responsibilities, inter-agency coordination, dedicated renewable energy cells, professional training and local technical capacity
6. Sustainability and inclusion	Environmental and social safeguards, energy justice, gender inclusion, local employment, climate resilience and circular-economy measures

7. Monitoring and accountability	Verified data, annual reporting, performance indicators, online monitoring, periodic review and corrective action

6.3 Project Readiness and Delivery Framework

Each major renewable energy project will be supported by a clearly defined implementation package comprising:

- Technology and capacity target;
- Lead and supporting agencies;
- Implementation timeline and milestones;
- Land, site and resource requirements;
- Grid connection and power evacuation arrangements;
- Procurement and business model;
- Financing and risk allocation arrangements;
- Environmental and social safeguards; and
- Measurable performance indicators.

Projects will not be deemed ready for implementation until the necessary land, resource, grid, financing, approval and safeguard conditions have been satisfactorily addressed. Utility-scale projects will have to undergo grid-integration studies, transmission connectivity assessments, power-evacuation arrangements and system-impact assessments before they are approved. Priority will be given to projects that can deliver early and scalable outcomes, such as government, industrial and commercial rooftop solar, suitable ground-mounted solar, solar irrigation, energy efficiency, grid modernization and BESS storage. Less mature technologies for Bangladesh, such as floating solar, W2E, will require resource assessment, feasibility studies, pilot projects and performance evaluation prior to commercial scaling.

6.4 Assistance in Policy, Regulation and Markets

The implementation strategy needs to ensure that the policies, regulations, standards and guidelines required to deploy renewable energy are developed and revised in a timely manner. The priority areas are:

- Cost-effective and transparent project approvals;
- Standardized and bankable bidding and contractual documents;
- Better net-metering services;
- Technical and quality standards;
- Grid-connection and forecasting requirements;
- Battery-storage (BESS) guidelines;
- Environmental and social safeguards;
- Carbon-credit procedures; and
- Waste-management and circular-economy frameworks.

All regulatory and administrative measures will be aligned with the implementation timetable to avoid delays in enabling instruments that could delay project delivery.

6.5 Private Sector Involvement and Financing

The extent of renewable energy deployment will depend significantly on local and foreign private investment. Public resources may be used strategically to prepare projects, reduce risks, support enabling infrastructure and improve access, while commercially viable renewable energy projects will primarily be financed and delivered through private investment.

Projects can be executed through competitive bidding, PPP, MPP, RESCO/OPEX, independent power producer and such other arrangements. Financing will be mobilized through local financial institutions, development partners, concessional facilities, climate funds, green finance, capital markets and carbon-finance mechanisms.

Financial support will be tied to projects that are technically viable and investment ready. Priority measures will include concessional lending, refinancing, credit guarantees, payment security arrangements, appropriate fiscal support and financing facilities for SMEs, industries and underserved consumers.

6.6 Inter- Ministerial or Cross-Ministerial Coordination

The Power Division shall provide overall policy direction and strategic oversight. SREDA will coordinate technical monitoring and resource assessment, renewable energy data management, implementation reporting and periodic review within its mandate.

The concerned ministries, agencies, utilities, regulators and local government institutions shall carry out the activities assigned to them in accordance with their legal and institutional responsibilities. Each implementing agency shall designate a renewable energy focal point and develop a time-bound institutional action plan.

Inter-ministerial/Agency coordination will be supported through:

- Quarterly review meetings with the relevant ministries and agencies;
- Regular reporting against assigned milestones;
- Joint resolution of land, grid, finance and approval constraints; and
- Escalation of unresolved implementation issues to the appropriate government authority.

6.7 Performance Monitoring, Review and Corrective Action

The implementation performance will be tracked using a results-based framework. The main indicators will be:

- renewable energy commissioned capacity in MW;
- renewable electricity generated in GWh;
- annual share of renewable energy (%) with regard to annual demand;
- verified electricity savings in GWh;
- developed grid and storage capacity in MW and MWh;
- projects under feasibility, procurement, construction and commissioning stages;
- investment mobilized;
- project approval and implementation time;

- curtailment of renewable energy;
- carbon-emission reductions;
- employment and certified personnel; and
- participation of women and local communities.

Section 7.0 will elaborate this implementation strategy into sectoral action plans. The roadmap sets out the activities to be undertaken for each renewable energy technology and enabling area, the sequence in which they are to be done, the lead ministry, division or agency responsible, the supporting institutions and the expected delivery arrangements. The structure is designed to translate national targets into actions with clear assignments and accountability to specific institutions so that each institution knows its role in project preparation, approval, financing, grid integration, implementation, monitoring and corrective action.

7.0 Sectoral Activities and Technology-Based Implementation Work Plans

This section translates the National Renewable Energy Policy 2025 and the National Renewable Energy Development Strategy (2026-2030) into sector-specific activities to be implemented under the National Renewable Energy Roadmap, 2026. It includes rooftop solar, land-mounted solar, wind power, W2E, solar irrigation, floating solar, agrivoltaics, clean cooking, electric mobility (EV) and hydropower. The activities and institutional responsibilities are adapted from NREDS, while retaining its substantive intent.

The National Renewable Energy Development Strategy work plans specify the actions to be taken and the institutions to engage. The roadmap provides the implementation discipline needed to define when activities will be achieved, what outputs will be delivered, how projects will be funded, what dependencies will have to be addressed and how progress will be measured.

Where more than one institution is indicated against an activity, the Power Division shall verify the leading and supporting institutions through a detailed responsibility matrix. Each leading institution shall develop a time-bound work plan, budget and reporting arrangement within its mandate.

The following implementation and accounting principles shall be applied:

a. The technology-wise capacity additions for the period 2026–2030 shall follow the approved year-wise projection of the National Renewable Energy Development Strategy. Subject to satisfactory implementation progress, grid readiness, financing availability, environmental and social compliance and the findings of the mid-term and end-2030 reviews, renewable energy deployment shall continue during 2031–2040 under updated technology-wise and year-wise targets aligned with the national objective of meeting 30% of projected annual electricity demand from renewable energy by 2040.
b. All renewable energy capacity shall be counted only once in the national renewable energy database as a single entry and classified under a single official technology category.
c. The solar irrigation, floating solar and agrivoltaic capacity shall be registered under the respective solar category and shall not be counted again as a separate capacity.
d. Clean cooking, electric vehicles (EV) and demand-side measures shall be monitored separately from renewable generation capacity unless dedicated renewable generation systems are installed, commissioned and separately metered.

e. For existing hydropower modernization, a distinction should be made between restoration of existing capacity and genuine addition of capacity.
f. EEC will be measured by a different registry managed by SREDA.

Table 7.1 summarizes the translation of the technology-specific targets of the National Renewable Energy Development Strategy into sectoral implementation programs under the roadmap, until 2030. It also sets out how each technology or application is recorded for the purposes of target accounting, so that capacity additions are reported consistently in MW and no project is counted more than once. The table thus provides a common reference point for implementation planning, institutional responsibility, monitoring and progress reporting up to 2030 and, at the same time, points the way to the preparation of updated targets for the period 2031–2040.

Table 7.1: Sectoral Implementation and Target-Accounting Framework (2026-2030)

Sector or Program	Strategy Position for 2030	Roadmap Treatment
Rooftop solar	5,500 MW	Priority deployment program covering public, industrial, commercial, institutional and residential rooftops
Ground-mounted solar	4,500 MW	Utility-scale deployment through competitive bidding, PPP, MPP and other approved models
Wind power	150 MW	Resource measurement and guideline development, followed by commercially viable projects
Waste-to-energy	200 MW	Integrated waste-management projects supported by viable feedstock, RDF/SRF, tipping fees, environmental and financing arrangements
Other renewable technologies	100 MW	Floating solar, agrivoltaics, hydropower additions and other approved technologies, without double-counting
Solar irrigation	Included within solar capacity	Pump-replacement program monitored by pumps installed, MW, electricity generated and diesel displaced
Clean cooking	No generation-capacity target	Demand-side, emissions-reduction and energy-access program
EVs, electric vessels and charging	No separate generation-capacity target	Transport-electrification program linked with dedicated solar generation, storage and managed charging
Energy efficiency	At least 15% electricity savings	Monitored through a defined baseline and verified electricity savings in GWh

7.1 Rooftop Solar Power

Bangladesh has scarcity of non-agricultural land, high population density and a large stock of industrial, commercial, public and institutional buildings, so rooftop solar would be given the highest priority. The 5,500 MW target will require a program-based approach rather than implementation through disjointed customer applications.

The first deployment will be targeting government buildings, power sector facilities, industries, export processing zones, economic zones, commercial buildings, educational institutions, hospitals and other consumers with suitable roofs with significant daytime demand. Residential deployment will expand progressively, driven by simplified net metering, standardized systems, consumer financing and qualified service providers.

The suitability of a roof will be determined by structural assessment, measurement of the usable area, assessment of shading, analysis of electrical load and review of the hosting capacity of the distribution network. Private investment through CAPEX/RESCO/OPEX, lease, third-party ownership and other approved arrangements shall be preferred where such arrangements reduce the need for upfront public expenditure.

Table 7.2: Rooftop Solar Power Implementation Workplan

No.	Activity	Implementing Ministry/Division/Agency
1	All ministries, divisions and agencies shall determine the area of suitable rooftops in their own buildings and facilities and install rooftop solar through private investment selected by tender. Preliminary estimates may be obtained through the "Rooftop Solar Calculator" available on the Power Division website. SREDA shall collect and maintain relevant data.	All ministries/divisions/ agencies; SREDA
2	Update the prices and standard specifications of solar-system equipment and materials, including panels, inverters, meters and storage devices (BESS/ESS), in the Rooftop Solar Calculator every six months and publish the updated information on the website.	SREDA; Distribution utilities; NBR; BPDB
3	Where a consumer generates electricity from rooftop solar through net metering, provide an incentive in the consumer's electricity bill based on the amount of electricity generated.	Power Division; BERC; BIDA; electricity distribution utilities
4	Include provisions in the Bangladesh National Building Code requiring the use of 30–70% of suitable rooftop area, depending on consumer category, to ensure rooftop solar installation in residential, commercial and industrial establishments.	Ministry of Housing and Public Works; Ministry of Commerce; LGD; BEPZA; BEZA; Hi-Tech Park Authority
5	All agencies under the Power Division shall install rooftop solar in accordance with the National Rooftop Solar Program Guideline.	All agencies under the Power Division
6	In accordance with the Net Metering Guideline, 2025, determine a uniform benchmark tariff for all prosumers through public hearing and amend the Guideline as necessary. Any aggrieved consumer may lodge specific complaint to BERC.	Power Division; SREDA; BERC
7	Make solar-power systems mandatory in buildings, garages, bridges and other suitable infrastructure under all ongoing and future development projects and amend the Development Project Proposal guidelines accordingly.	Planning Commission; IMED; ERD; All ministries
8	Simplify existing policies, guidelines, agreements and tender documents to facilitate participation in competitive bidding.	Power Division; BPDB
9	From 2028, increase the holding tax for relevant categories of consumers who fail to install rooftop solar PV in accordance with the Bangladesh National Building Code and the circular issued by the Power Division.	Local Government Division; all electricity distribution utilities

To implement this work plan, a national rooftop inventory shall be prepared by consumer category, utility service area and district. It shall identify the usable roof area, indicative capacity, sanctioned load, structural suitability, ownership status and the relevant distribution feeder.

Public and institutional buildings shall have standard tender documents, CAPEX/OPEX agreements, performance guarantees, operation and maintenance requirements and insurance provisions. Distribution utilities should maintain an online application and tracking system with established service timelines.

The key indicators shall include rooftop capacity commissioned in MW, electricity generated in GWh, number of buildings and industries solarized, private investment mobilized, average net-metering approval time, system availability and number of installations verified against applicable standards.

Case Study: Australia – Utility-Led Rooftop Solar Scale-Up and Lessons for Bangladesh

International experience shows that meeting a large rooftop solar target requires more than financial incentives or net metering arrangements. It requires active participation of distribution utilities, appropriate technical standards, transparent connection procedures, grid-hosting assessment and progressively flexible system operation. In this regard, Bangladesh can take a good example from Australia.

Australia's rooftop solar expansion was not achieved through a single subsidy or a single central program. It came out of a coordinated system of national incentives, state-level implementation, electricity market regulation, distribution utility connection rules, technical standards, transparent monitoring and, increasingly, battery storage (BESS) and flexible exports. By November 2024, Australia had more than 4 million rooftop PV installations, with one in three homes equipped with rooftop solar and about 300,000 new systems being installed each year. By May 2024, the National Consumer Energy Resources Roadmap had 22.6 GW of rooftop solar. The key lesson for Bangladesh, which is aiming for 5,500 MW of rooftop solar by 2030 under NREDS, is thus institutional: rapid deployment requires utilities, regulators and policymakers to jointly develop a predictable pathway from application to connection, export, monitoring and system integration.

The Small-scale Renewable Energy Scheme (SRES), administered by the Clean Energy Regulator, reduces the upfront cost of eligible rooftop systems by providing Small-scale Technology Certificates (STCs) at the national level. Consumers typically receive a discount up front for selling these certificates to an approved agent or retailer. The Australian Government expressed that this mechanism reduced the standard upfront costs of a solar system by approximately 30% and an average rooftop solar household could reduce electricity bills by more than A$1,500 annually. The same policy architecture has now been applied to household batteries through the Cheaper Home Batteries Program, showing how a mature rooftop solar program can progressively evolve from PV-only deployment toward solar-plus-storage.

The governance system is decentralized. National energy ministers set the overall policy direction, market rules are developed by the Australian Energy Market Commission (AEMC), network revenues, tariffs and export-service performance are regulated by the Australian Energy Regulator (AER), the power system is managed and planned by Australian Energy Market Operator (AEMO), state governments adopt local incentives and export arrangements and Distribution Network Service Providers (DNSPs) assess connections, local hosting capability and export limits. This division of responsibilities is essential for Bangladesh. The governing authority does not need to do all the operational work itself, but it must set the rules, service standards, reporting obligations and accountability framework under which utilities will operate rooftop solar.

Regarding the feed-in tariff (FiT) and net metering mechanisms, Australia does not have a nationally consistent FiT mechanism; it has state-wise mechanisms. New South Wales, for example, uses an independent benchmark range rather than a mandated single tariff and Western Australia uses time-of-export buyback rates that reward electricity exported later in

the day, thereby incentivizing self-consumption and batteries. Smart inverters can be flexible, exporting more when there is capacity in the local network and reducing exports only when there are constraints, rather than setting a fixed, low export cap for every customer. By June 2025, over 88% of eligible customers were opting for the flexible-export option. This is particularly relevant for Bangladesh, where a standard static export rule could become more restrictive as rooftop penetration increases.

Australia regards rooftop solar as part of the power system and not an individual consumer technology. Distribution utilities evaluate local network conditions, connection applications and export capability. AS/NZS 4777 - Smart-inverter requirements, DNSP-specific connection rules and internationally recognized PV product standards such as IEC 61215 and IEC 61730, enable safe and predictable grid interaction. The Flexible Exports architecture also uses CSIP-AUS, based on IEEE 2030.5, to communicate with capable inverters. In areas of high penetration, remote management and emergency backstop provisions are in place as system security measures. Separately, the AER also publishes annual network export-service performance information, so regulators and consumers can see connection performance, export capability and network expenditure.

Bangladesh does not need to replicate Australia's institutional structure, but can replicate the functions that enabled continued rooftop solar growth. The Government can implement the national rooftop registry, common technical standards, utility service timelines, hosting-capacity methodology and select pilot feeders for smart-inverter and flexible-export arrangements in 2026-2027. Successful pilots could be scaled across distribution utilities during 2028–2030. BERC could periodically review export-value mechanisms and consumer protection. Rooftop programs for industrial zones, public buildings and commercial consumers can be the first large-scale implementation platforms since these consumers typically have stronger daytime demand and can more readily absorb solar generation behind the meter.

Government policy can create the investment signal, but it is the utilities that decide if rooftop projects can connect quickly and continue to export safely as penetration increases. A successful Bangladesh model should therefore track not only installed MW, but also approval time, generated GWh, feeder hosting capability, export constraints, consumer savings, storage deployment and network performance. Australia’s experience shows the importance of this form of institutional and technical coordination in enabling rooftop solar to continue expanding in high-penetration scenarios and reducing the risk that grid constraints become a barrier to the 5,500 MW target and the longer-term 2040 transition.

Table 7.3: Key Lessons from Australia’s Rooftop Solar Experience and Recommended Adaptations for Bangladesh

Australian Lesson	Recommended Adaptation for Bangladesh
Hosting-capacity management	Start feeder- and substation-level hosting-capacity assessments in high-potential industrial, commercial and urban zones. Publish simplified hosting information for developers and consumers.
Smart inverter/export rules	Introduce nationally consistent smart-inverter and grid-support requirements, while allowing utilities to apply location-specific export settings. Pilot dynamic/flexible exports before imposing blanket restrictions.

FiT/export valuation	Periodically review the value of exported electricity. As penetration grows, test time-of-use or time-of-export signals that encourage daytime self-consumption, BESS and evening export.
Solar + BESS	Make new rooftop programs progressively BESS-ready. Use pilots in congested feeders, industrial clusters and critical public facilities before wider deployment.
Standards and quality	Enforce relevant international and/or equivalent national standards for modules, inverters, protection, communications, installation and storage safety; link incentive eligibility to compliance.
Monitoring and accountability	Create a national rooftop-solar registry linking SREDA and utilities and report MW commissioned, GWh generated, application time, rejected/limited connections, export constraints, consumer savings and BESS deployment annually.

7.2 Ground/Land-Mounted Solar Power Plants

Ground-mounted solar will be a big part of the 2030 renewable energy program. However, careful consideration must be given to agricultural land, food security, biodiversity, water flow, local livelihoods and displacement risks during site selection.

A national land and project-siting inventory shall identify unused or low-conflict government land, degraded land, suitable chars and other technical and environmentally acceptable locations. The inclusion of land in the inventory does not automatically mean that the project is approved. Each project will require site-specific resources, land, grid, environmental, social and financial assessments.

Projects shall be procured through transparent competitive bidding, PPP, MPP or any other approved arrangements. Payment-security support will be provided on a project-by-project basis, taking into account fiscal implications and bankability assessments and will not be provided automatically for every project.

Table 7.4: Implementation Plan for Large Ground-Mounted Solar Power Plants

No.	Activity	Implementing Ministry/Division/Agency
1	Where applicable, provide a Payment Guarantee to encourage investors and reduce investment risk.	Power Division; Finance Division
2	Relax the requirement for institutions interested in large land-mounted solar power projects to submit a Letter of Commitment from a bank or financial institution with their application and introduce a Preliminary Letter of Support or Comfort Letter.	Power Division; Bangladesh Bank
3	Simplify existing contracts and tender documents for competitive bidding and publish templates on the website.	Power Division
4	Prepare a list of unused land under all ministries and divisions, considering its suitability for renewable energy projects to be implemented through the PPP process.	PPP Authority
5	At an appropriate level, ensure the implementation of Battery Energy Storage System (BESS) for a portion of the generation from ground-mounted solar projects (where study shows the use of BESS as a defined service and supports the least-cost benefit, with MW and usable MWh specified).	Power Division; BPDB
6	Ensure protection of the environmental and biodiversity balance when using unused land in tea gardens and haor areas for solar power projects.	Ministry of Land; Ministry of Commerce; Ministry of Water

		Resources; Ministry of Environment, Forest and Climate Change

Before tendering, each utility-scale project needs: a confirmed grid-connection point, a system-impact assessment, a power-evacuation arrangement, a land-access pathway and an environmental and social screening. The BESS requirements will be identified through grid and project studies and will include power capacity (MW) and energy capacity (MWh).

The key performance indicators shall include land screened and confirmed, MW bid, MW financial close, MW under construction, MW commissioned, annual generation in GWh, evacuation facilities completed, project-development time and compliance with environmental and social commitments.

7.3 Wind Power:

The Strategy seeks to achieve 150 MW of wind power by 2030. Implementation will rely on bankable, site-specific wind data rather than broad estimates of national potential. Opportunities may exist in coastal, offshore and hilly areas, but commercial development requires long-term measurement, cyclone-resilient engineering, corrosion protection, environmental review and grid-access assessment.

The first implementation priority will be the production of onshore and offshore guidelines, followed by a 12-24-month period of Met-Mast or LiDAR measurements at shortlisted locations. An operational-performance assessment shall be undertaken on the existing utility-scale wind installation to examine capacity factors, availability, wake effects, corrosion, cyclone resilience, grid behavior and operation and maintenance experience.

Table 7.5: Wind-Power Implementation Plan

No.	Activity	Implementing Ministry/Division/Agency
1	Prepare guidelines for onshore wind installation.	SREDA
2	Prepare guidelines for offshore wind installation.	SREDA
3	Prepare environmental guidelines for wind-turbine installation.	Ministry of Environment, Forest and Climate Change& SREDA
4	Select potential sites for wind-power generation, collect data and conduct studies.	Power Division; SREDA; BPDB
5	Supervise the activities of organizations conducting wind studies.	SREDA
6	Establish a simulation laboratory for reviewing wind data.	Power Division; SREDA
7	Select potential sites and collect data through 12–24 months of Met-Mast/LiDAR-based wind measurement in coastal and hilly areas and conduct the required studies.	SREDA

The wind-resource database shall include measurement height, duration, data recovery rate, seasonal variation, turbulence, extreme wind conditions and uncertainty. Sites should go to procurement only when data supports a credible energy yield assessment and grid connection plan. The main indicators shall be guidelines approved, measurement stations installed, bankable datasets completed, viable sites identified, MW tendered and commissioned, annual wind generation, plant availability and performance during severe weather.

The projection and generation by 2030-40 will be based on wind resource assessment, as per technology adaptation, technical studies, data collection and validation by SREDA.

7.4 Waste-to-Energy (W2E), Biogas and Waste-Derived Energy

W2E should be seen primarily as a combined waste management and public health intervention with the ability to produce electricity, gas, fertilizer and other useful products. Electricity Generation alone may not generate enough revenue to make projects financially viable.

Projects shall therefore be developed on the basis of verified waste quantity and composition, source segregation, calorific value upgrading, moisture reduction, collection reliability, land availability, tipping-fee arrangements, by-product markets, emissions control, residue disposal and long-term O &M responsibility.

The Local Government Division should spearhead municipal waste initiatives. Procurement of electricity, grid connection, environmental regulation and project financing shall be coordinated with the relevant institutions. Biogas from livestock will be developed through a separate farm, side-by-side project, or cluster-based approach.

Table 7.6: W2E Implementation Strategy

No.	Activity	Implementing Ministry/Division/Agency
1	For selecting land for electricity generation from waste under a PPP model: (a) the Local Government Division may treat its administrative units as clusters and select one site for one or more districts; or (b) each city corporation, municipality, pouroshova or union parishad may identify a site within its jurisdiction.	Local Government Division; Ministry of Land; district/upazila administration
2	After finalizing the list of land, undertake waste-to-electricity projects with private investors in compliance with prevailing rules and regulations and with support from the PPP Authority.	Local Government Division; PPP Authority
3	Under the supervision of the Cabinet Division, the Local Government Division shall formulate technology-specific business models for affordable electricity generation from waste with participation from the relevant ministries.	Cabinet Division
4	Establish standards under the Solid Waste Management Policy for incineration and other technologies, including pyrolysis and anaerobic digestion.	Ministry of Environment, Forest and Climate Change
5	Engage local entrepreneurs in livestock-rich areas to establish biogas plants for generating gas and electricity.	Ministry of Fisheries and Livestock; Power Division; Energy and Mineral Resources Division

Before procurement, each municipal project must have a binding feedstock-supply arrangement, a waste-characterization study, an environmental clearance, an emissions-control plan, an ash or dig-estate management plan, a tipping-fee mechanism and a bankable revenue structure.

The key indicators will include waste-processing capacity in tonnes per day, renewable capacity commissioned in MW, generated electricity in GWh, waste diverted from uncontrolled disposal, availability of tipping fees, making a viable business model, free of

wheeling charge, compliance with emission requirements, by-products recovered and avoided methane emissions.

7.5 Solar Irrigation Pumps

Solar irrigation will increase access to reliable irrigation and reduce reliance on diesel imports and grid electricity. The program shall prioritize replacing operating diesel- and electricity-driven pumps over installing additional pumps.

Implementation will be based on an upazila or union -level inventory of pump type, capacity, operating hours, water source, command area, farmer organization, electricity or diesel consumption and suitability for solar conversion. Where technically and environmentally appropriate, surface water use should be prioritized.

Net metering, productive loads, cold storage, agro-processing, or local mini-grid arrangements shall be used to improve off-season electricity use where feasible.

Table 7.7: Implementation Plan for Expansion of Solar Irrigation Pumps

No.	Activity	Implementing Ministry/Division/Agency
1	Identify replaceable irrigation pumps and irrigation cooperatives in each upazila, prepare a list and set measurable annual targets for replacement with solar irrigation pumps.	Ministry of Agriculture; BADC/BMDA
2	Set annual targets and coordinate implementation for the phased replacement of diesel- and electricity-powered pumps.	Ministry of Agriculture; BADC/BMDA
3	Arrange easy loans for farmers through different financial institutions to replace existing pumps with solar irrigation pumps.	Ministry of Agriculture, Bangladesh Bank and other financial institutions, NGO Affairs Bureau
4	Raise awareness among farmers on converting diesel- and electricity-powered pumps to solar irrigation pumps.	Ministry of Agriculture; district and upazila administration
5	Install solar irrigation pumps in coordination with government canal-excavation programs to encourage the use of surface water.	Ministry of Agriculture; Local Government Division; Ministry of Disaster Management and Relief; Bangladesh Water Development Board; BMDA
6	Form an inter-ministerial committee led by the Ministry of Agriculture to coordinate overall activities.	Ministry of Agriculture

The principal indicators shall include pumps replaced or solar-powered, installed solar capacity, irrigated areas, diesel consumption avoided, grid electricity saved, irrigation cost per unit of land, surface-water utilization and off-season renewable electricity used or exported.

Solar irrigation capacity shall be counted in the official solar total and shall not be recorded in a separate capacity category.

7.6 Floating Solar

Floating solar could ease pressure on land, but development needs to protect fisheries, water quality, navigation, irrigation, biodiversity and the existing economic uses of water bodies.

Deployment will be initiated by national screening and selected demonstration projects. A GIS-based or other applicable assessment will identify potentially suitable government-controlled water bodies with information on ownership, water use, depth, seasonal variation, fisheries, ecological sensitivity, access and nearby grid infrastructure.

Table 7.8: Strategy for Expanding Floating Solar

No.	Activity	Implementing Ministry/Division/Agency
1	Install floating solar systems in government water bodies, ponds, canals, wetlands, lakes and other water bodies through PPP models and private investment.	Ministry of Land; Ministry of Water Resources; Ministry of Shipping; Power Division; PPP Authority
2	Establish the required standards and prepare guidelines for installing floating solar systems.	Ministry of Fisheries and Livestock; Ministry of Environment, Forest and Climate Change; Power Division; Ministry of Water Resources; SREDA

The standards shall cover water body coverage, anchoring and mooring, electrical safety, corrosion, cyclone and flood resilience, fisheries protection, water-quality monitoring, navigation clearance and decommissioning. The main indicators will include water bodies screened, priority sites identified, guidelines issued, pilot capacity commissioned, electricity generated and power evacuation, water-quality compliance, fisheries impacts and project availability.

7.7 Agrivoltaics

Agrivoltaics will be promoted as a viable dual-use system in which agricultural production and solar power generation occur on the same land. A traditional ground-mounted solar project shall not qualify as agrivoltaics unless there is demonstrated and monitored ongoing agricultural, fisheries or livestock use.

The pilot projects will measure crop yield, water usage, land productivity, farmer income, solar efficiency and operational arrangements against appropriate control conditions. The results will be used to develop national guidelines for design and crop selection.

Table 7.9: Strategy for Expanding Agrivoltaics

No.	Activity	Implementing Ministry/Division/Agency
1	Encourage agricultural production at existing and future ground-mounted solar power plants.	Power Division; Ministry of Agriculture; BPDB
2	Where applicable, conduct integrated research on agricultural production, aquaculture and livestock farming at ground-mounted solar power plants.	Ministry of Agriculture; Ministry of Fisheries and Livestock; SREDA
3	Establish environmental standards and prepare guidelines for agrivoltaic installations.	Ministry of Agriculture; Ministry of Environment, Forest and Climate Change; SREDA
4	Prepare and disseminate promotional videos on successful existing projects, including the 75 MW Sonagazi project, to popularize the concept of agrivoltaic projects.	Power Division

Any project intended to serve as a national agrivoltaic reference shall first be verified against the approved definition and performance criteria. The key indicators will be demonstration

area, solar capacity, crop or fisheries output, land equivalent ratio, water consumption, farmer participation, farmer income and number of validated models for replication.

7.8 Clean Cooking

Clean cooking is a demand-side program for household energy, health and emission reduction. Unless dedicated renewable power systems are installed and recorded separately, it will not be directly counted in the renewable generation-capacity target. Implementation shall be based on technically suitable solar-based cooking applications, consumer affordability, reliability, user acceptance and eligibility for carbon-credit. Before the widespread implementation of induction cooking, the potential impact on the grid must be assessed.

Table 7.10: Strategy for Expanding Clean Cooking

No.	Activity	Implementing Ministry/Division/Agency
1	Encourage users of electric, gas and other stoves to adopt solar-powered clean-cooking technologies and conduct extensive awareness campaigns.	Power Division; SREDA; NGO Affairs Bureau
2	Determine a mechanism through which the Government may obtain carbon credits by introducing clean-cooking systems.	Power Division
3	Conduct research to assess the impact on the national grid of widespread use of induction cookers and similar technologies drawing electricity from the grid.	Power Division; SREDA; Power Grid
4	Set measurable year-wise targets for the introduction of clean cooking systems.	SREDA

Targets shall be year-wise, specifying the number of households or institutions covered, the type of technology, fuel or electricity savings, emissions reduction and financing arrangement. The key indicators will be deployed clean-cooking systems, served users, displaced conventional fuels, impact on demand for electricity, verified emissions reductions, female participation and carbon revenue generated.

7.9 Electric Vehicles, Electric Vessels and Solar-Based Charging Stations

If charging is uncontrolled, electric mobility will increase electricity demand and put additional pressure on distribution networks. Charging infrastructure shall therefore be developed in a coordinated manner through transport, power, industry, land-use and tariff planning. The design of solar-based charging stations shall be based on the expected vehicle demand, the available solar resource, the connection capacity, the charging speed and the BESS needs. The sites along national highways will be selected through a transparent network plan and not through isolated proposals. Pilot feasibility studies will be carried out to assess electric-vessel charging requirements at selected ferry terminals, river ports and other suitable locations.

Table 7.11: Strategy for Developing Electric Vehicles and Solar-Based Charging Stations

No.	Activity	Implementing Ministry/Division/Agency
1	Identify sites for EV charging stations at specified intervals along all national highways and establish solar-based charging stations through private investment under PPP models.	Road Transport and Highways Division; Ministry of Industries
2	Gradually convert a portion of public transport to electric vehicles and provide tax and duty benefits, financial incentives and necessary policy support.	Road Transport and Highways Division; NBR
3	Identify unauthorized charging stations and convert them to solar-based charging stations to ensure the security of the national grid.	All electricity distribution utilities
4	Determine electricity tariffs for all types of charging stations.	BERC
5	Create opportunities for new service sectors, employment and entrepreneurship through battery-swapping systems.	Ministry of Commerce

Technical standards will be developed for electrical safety, metering, connector compatibility, battery swapping, fire protection, BESS, power quality and managed charging. Distribution utilities shall incorporate demand charging into feeder and substation planning. The major indicators are authorized charging stations, solar capacity installed, BESS capacity in MW and MWh, renewable electricity supplied to vehicles, unauthorized facilities regularized, public vehicles converted and charging-related feeder violations.

7.10 Hydropower

Hydropower Development and Modernization

Hydropower accounts for a substantial share of Bangladesh's installed renewable energy capacity, primarily through the 230 MW Kaptai Hydroelectric Power Plant. But the mostly flat landscape, seasonal rivers, high sediment load and densely populated land conditions restrict the possibilities for conventional large-scale hydropower development in the country. Thus, domestic hydropower expansion will focus on modernizing the existing Kaptai facility and systematically assessing the technical, economic, environmental and social suitability of sites.

The first priority shall be to study the modernization, rehabilitation, efficiency improvement and possible capacity enhancement of the Kaptai Hydroelectric Power Plant. The assessment will include the state of the generating units, turbines, generators, control and protection systems, reservoir operation, sedimentation, dam safety, climate resilience, plant availability and grid-support capability. The restoration of unavailable or degraded capacity shall be reported separately from any verified addition to installed capacity. The Government may undertake a national assessment of potential hydropower resources beyond Kaptai. The assessment shall cover small, mini, micro and run-of-river applications, especially in hilly and remote areas where there may be adequate water flow and elevation differences. Head-based conventional hydropower is not feasible and in-stream or hydrokinetic systems may also be considered at the research or pilot stage.

Projects will be developed on a feasibility-first basis. No specific site or capacity will be included in the confirmed implementation pipeline until the required hydrological, geotechnical, environmental, social, financial and grid studies have been completed.

Table 7.12: Strategy for Expanding Hydropower

No.	Activity	Implementing Ministry/Division/Agency
1	Modernize the Kaptai Hydroelectric Power Plant and increase its capacity.	Power Division
2	Identify potential hydropower sites throughout the country, collect data and conduct studies.	Power Division; SREDA

For Roadmap implementation, the above strategy activities shall be supported by the following specific actions:

Table 7.12A: Hydropower Implementation Actions

Activity	Required Output	Lead and Supporting Institutions	Timeframe
Conduct a comprehensive technical assessment of the Kaptai Hydroelectric Power Plant	Modernization and capacity-enhancement plan identifying rehabilitation needs, verified additional MW, cost and implementation schedule	Power Division; BPDB	2026–2027
Review dam safety, reservoir operation, sedimentation and climate resilience	Updated dam-safety and reservoir-management assessment	Power Division; BPDB; relevant water-resource and disaster-management institutions	2026–2027
Prepare a national inventory of potential hydropower sites	GIS-based site inventory covering flow, head, accessibility, land, environmental sensitivity and nearby electricity demand or grid facilities	Power Division; SREDA; BPDB; relevant water-resource agencies	2026–2028
Conduct prefeasibility studies for shortlisted sites	Shortlist of technically and financially viable small, mini, micro and run-of-river projects	Power Division; SREDA; BPDB	2027–2029
Conduct environmental and social screening	Identification of effects on environmental flows, fisheries, biodiversity, land, livelihoods and local communities	Relevant implementing agency; Ministry of Environment, Forest and Climate Change	Before project approval
Develop pilot projects for remote locations where feasible	Operational pilot systems with verified generation, cost and community benefits	SREDA; BPDB; local institutions; private or development partners	2028–2030
Assess pumped-storage hydropower potential	Technical screening of potential storage sites and their role in solar and wind integration	Power Division; PGB; BPDB; SREDA	2027–2030

Technical Evaluation Parameters

All potential projects shall be judged by the following minimum criteria:

a. Availability of long-term and seasonal river flow;
b. Available hydraulic head and expected power output;
c. Sedimentation, erosion and flood risks;
d. Dam safety, seismic and geotechnical conditions, where applicable;
e. Environmental-flow and fisheries requirements;
f. Impacts on land, livelihoods, cultural resources and local communities;
g. Grid connection or suitability for an isolated or mini-grid system;

h. Estimated capital cost, operating cost and electricity-generation cost;
i. Climate-change effects on future water availability; and
j. Institutional ownership, financing and operation and maintenance arrangements.

Pumped-Storage Hydroelectric Power

Pumped-storage hydropower shall be considered separately from conventional renewable generation. It does not create a new primary renewable energy source. Rather, it stores electricity by pumping water up to an upper reservoir and generating electricity when needed. Its potential role will thus be evaluated in terms of grid flexibility, evening peak management, renewable energy curtailment and system-storage needs.

Performance Indicators
Progress shall be monitored by:

- Verified additional hydropower capacity, in MW;
- Existing capacity restored through rehabilitation, in MW;
- Plant availability and efficiency improvement at Kaptai;
- Number of potential sites inventoried; number of prefeasibility and feasibility studies completed;
- Number and capacity of pilot projects commissioned;
- Environmental and social compliance and financing mobilized for approved projects.

Any post-2030 hydropower capacity figure, including the earlier proposal of 100 MW, shall remain indicative until supported by completed studies and formally approved as part of the 2030 roadmap review.

7.11 Cutting Edge Renewable Energy Technologies

The existing Roadmap sets out the proposed capacity figures for tidal energy, wave energy, river-current systems, geothermal energy, green hydrogen and other emerging technologies. These figures are not part of the National Renewable Energy Development Strategy, which approved technology-specific targets;

Accordingly, these technologies will remain in the research, resource assessment, feasibility and pilot development stages until their technical, economic, environmental and grid suitability is established. Without government approval, no commercial-scale capacity will be recognized as a binding target under the roadmap.

Table 7.13: Implementation Pathway for Emerging Renewable Energy Technologies

Activity	Timeline	Lead and Supporting Institutions	Expected Output
Prepare an initial national screening of tidal, wave, river-current, geothermal, green hydrogen and other emerging resources	2026–2027	SREDA; Power Division; BPDB; BEPRC; universities and relevant resource agencies	National screening report identifying technologies and locations suitable for further study
Develop technology-specific feasibility and pilot-selection criteria	2027	SREDA; Power Division; BSTI; relevant ministries	Approved criteria covering resource quality, technology readiness, cost, grid connection,

			safeguards and local value creation
Select a limited number of research or demonstration projects	2027–2029	Power Division; SREDA; BPDB; research institutions; development partners	Pilot projects with defined technical objectives and monitoring plans
Evaluate pilot performance before commercial scale-up	2029–2030	SREDA; BPDB; independent technical reviewers	Verified data on generation, cost, availability, environmental performance and replication potential
Decide post-2030 technology priorities	2030 review	Power Division and relevant ministries	Approved 2031–2040 research or deployment pathway

Pilot projects under this section shall be reported separately from the commercial renewable energy pipeline. Any capacity included in the Strategy under the category "Other" shall be clearly identified and shall not exceed the approved allocation without formal revision.

7.12 Source- and Year-Wise Renewable Energy Projection

The Strategy envisions a year-wise capacity addition program of 10,450 MW during 2026-2030. We have 10,000 megawatts of solar on rooftops and on the ground and 450 megawatts of wind, waste-to-energy and other technologies. The lower additions in 2026 and 2027 are due to the time required for policy support, land selection, tendering, financing, grid studies, simplification of net metering and preparation for investment. The program picks up momentum from 2028 as projects enter the procurement, financial close, construction and commissioning phases.

Table 7.14: Source- and Year-Wise Renewable Energy Projection

Technology/Source	2026 (MW)	2027 (MW)	2028 (MW)	2029 (MW)	2030 (MW)	Total (MW)
Rooftop solar	400	1,000	1,200	1,500	1,400	**5,500**
Ground-mounted solar	20	400	1,100	1,200	1,780	**4,500**
Wind power	0	0	30	50	70	**150**
Waste-to-energy	0	0	40	60	100	**200**
Other	0	0	20	40	40	**100**
Total						**10,450**

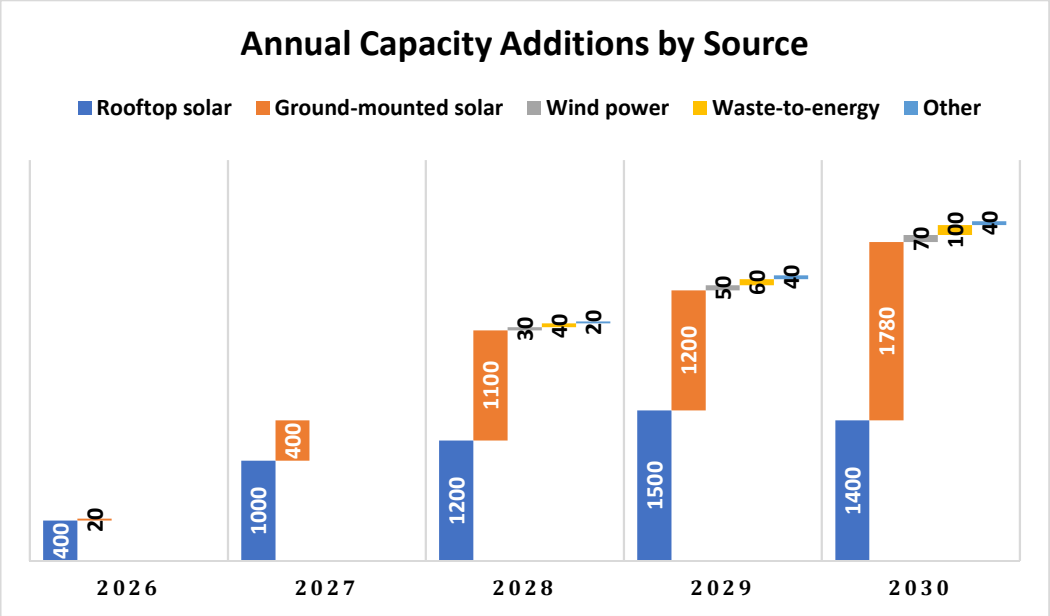


Figure 7.1: Year-Wise Renewable Energy Capacity Additions by Technology, 2026–2030

Table 7.15: Annual and Cumulative Capacity-Addition Milestones

Year	Annual Addition (MW)	Cumulative Addition (MW)	Share of Five-Year Program	Main Delivery Condition
2026	420	420	4.0%	Policy actions, rooftop inventory, standard documents, initial procurement and project identification
2027	1,400	1,820	17.4%	Land and roof pipelines, financing, bidding, grid studies and contracted projects
2028	2,390	4,210	40.3%	Accelerated construction and commissioning supported by the grid and investment readiness
2029	2,850	7,060	67.6%	Large-scale rooftop and ground-mounted project delivery
2030	3,390	10,450	100%	Completion of the remaining pipeline and verification of the 20% renewable-generation outcome

At the end of each reporting year, the project pipeline at tendering, financial close and construction stages will be sufficient to support the combined commissioning targets for the next two years. This is an important requirement, as 82.6% of the five-year capacity program is scheduled for the 2028-2030 period.

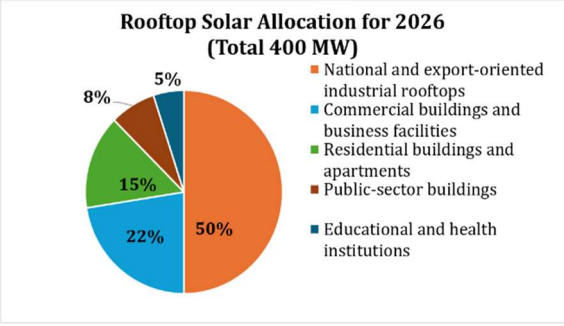
SREDA, BPDB, PGB and the distribution utilities shall also prepare annual generation projections in GWh on a technology-wise basis. The projection shall be based on approved assumptions for capacity factors, availability, degradation, system losses and curtailment. This will enable the Government to assess whether the MW program remains fit for purpose in delivering approximately 27,000 GWh of renewable electricity in 2030.

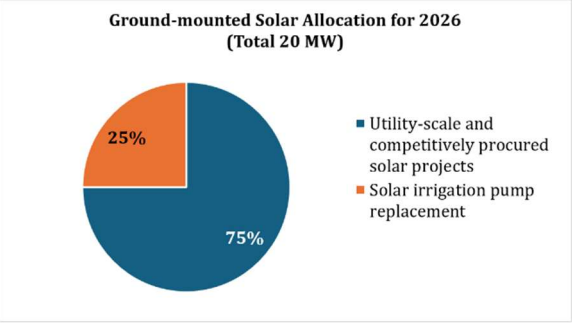
Table 7.14A-7.14E presents the allocation of renewable energy capacity additions on a sector and year basis for 2026–2030. It translates the broad technology targets of the National Renewable Energy Development Strategy into practical implementation areas, including

industrial rooftops, public buildings, residential and commercial facilities, utility-scale solar, solar irrigation, wind, waste-to-energy and emerging technologies. This table is a unique and critical feature of the roadmap, showing how the total capacity target can be distributed without double-counting and where implementation should start immediately and where research, feasibility, policy support and project preparation must start in advance to enable commissioning in later years.

Table 7.16A: Proposed Renewable Energy Capacity Allocation for 2026

No.	Technology/ Source	Sector/Area	Allocation for 2026 (MW)	Implementing Agency	Supportive Agencies
1	Rooftop solar	National and export-oriented industrial rooftops	200	Ministry of Industries	PD, SREDA, distribution utilities
		Commercial buildings and business facilities	90	LGD; MoHPW	PD, SREDA, distribution utilities
		Residential buildings and apartments	60	LGD; MoHPW	PD, SREDA, distribution utilities
		Public-sector buildings	30	Respective Ministry/Division	PD, SREDA, distribution utilities
		Educational and health institutions	20	Respective Ministry/Division	PD, SREDA, distribution utilities
Subtotal:			400		
2	Ground-mounted solar	Utility-scale and competitively procured solar projects	15	BPDB	PD, SREDA, PGB
		Solar irrigation pump replacement	5	Ministry of Agriculture	BADC, BMDA, PD, SREDA, distribution utilities
Subtotal:			20		
3	Wind, W2E, hydro, floating solar and SIP	Technical and feasibility studies, resource assessment and project preparation		Respective lead agencies	SREDA, BEPRC, BPDB, PGB PLC, universities and others
Total			420		





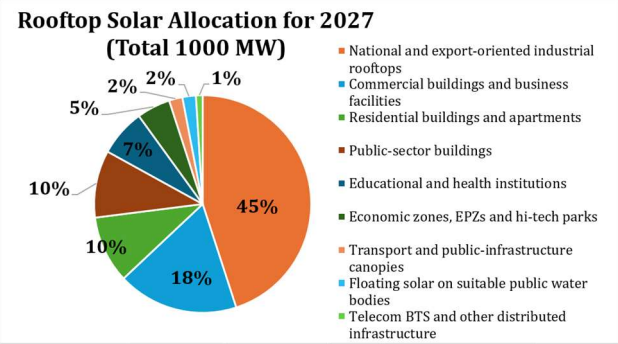
Preparatory activities during 2026:

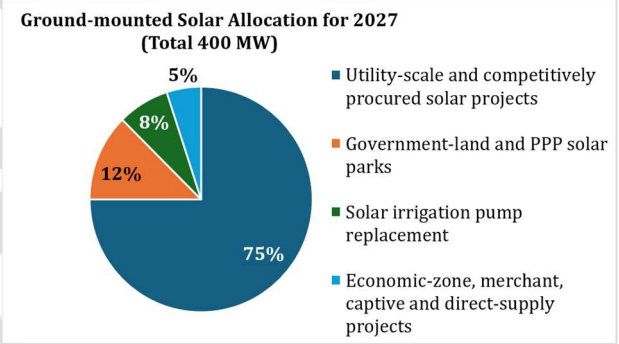
Technology or Program	Main Preparatory Activity
Rooftop solar	Prepare national rooftop inventory; standardize RESCO/OPEX agreements, tenders and net-metering procedures
Ground-mounted solar	Establish land and grid-connected project pipelines; identify near-ready projects and prepare standard bidding documents
Solar irrigation	Prepare upazila-wise inventory of replaceable pumps and suitable financing arrangements
Floating solar	Screen suitable water bodies and begin preparation of technical and environmental guidelines
Wind power	Prepare onshore and offshore guidelines; select sites and begin met-mast/LiDAR measurements
Waste-to-energy	Conduct waste-characterization studies, identify sites and prepare technology-specific business models
Hydropower	Start Kaptai modernization assessment and national hydropower site inventory
Agrivoltaics	Define qualification criteria, identify pilot sites and establish research arrangements
Emerging technologies	Begin national resource screening, research partnerships and pilot-selection criteria
Grid and BESS	Initiate system studies, grid-integration requirements and BESS guideline/roadmap

Table 7.16B: Proposed Renewable Energy Capacity Allocation for 2027

No.	Technology / Source	Sector/Area	Allocation for 2027 (MW)	Implementing Agency	Supportive Agencies
1	Rooftop solar	National and export-oriented industrial rooftops	450	Ministry of Industries	PD, SREDA, distribution utilities
		Commercial buildings and business facilities	180	LGD; MoHPW	PD, SREDA, distribution utilities
		Residential buildings and apartments	100	LGD; MoHPW	PD, SREDA, distribution utilities
		Public-sector buildings	100	Respective Ministry/Division	PD, SREDA, distribution utilities
		Educational and health institutions	70	Respective Ministry/Division	PD, SREDA, distribution utilities
		Economic zones, EPZs and hi-tech parks	50	BEZA; BEPZA; BHTPA	PD, SREDA, distribution utilities
		Transport and public infrastructure canopies	20	RTHD; Ministry of Railways; Ministry of Shipping	LGD, PD, SREDA, distribution utilities
		Floating solar on suitable public water bodies	20	MoWR; Ministry of Land	MoFL, MoEFCC, PD, SREDA, PPP Authority
		Telecom BTS and other distributed infrastructure	10	Posts and Telecommunications Division; BTRC	SREDA, distribution utilities, private operators

Subtotal:			1000		
2	Ground-mounted solar	Utility-scale and competitively procured solar projects	300	BPDB	PD, SREDA, PGB
		Government-land and PPP solar parks	50	PPP Authority	Ministry of Land, PD, BPDB, PGB
		Solar irrigation pump replacement	30	Ministry of Agriculture	BADC, BMDA, PD, SREDA, distribution utilities, financial institutions
		Economic zone, merchant, captive and direct supply projects	20	BEZA; BEPZA; Ministry of Industries	PD, BERC, SREDA, distribution utilities
Subtotal:			400		
3	Wind, W2E, hydro and other emerging technologies	Complete technical studies, guidelines, site preparation, procurement and financing arrangements		Respective lead agencies	SREDA, BEPRC, BPDB, PGB PLC, PPP Authority, universities and others
Total			1400		





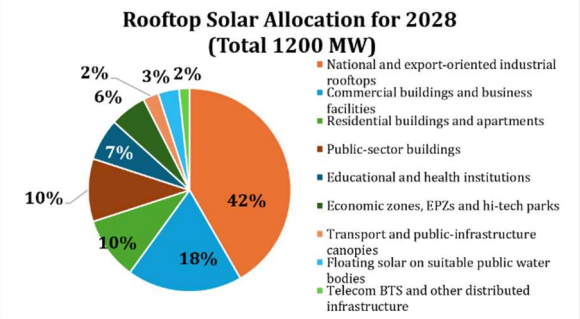
Preparatory activities during 2027

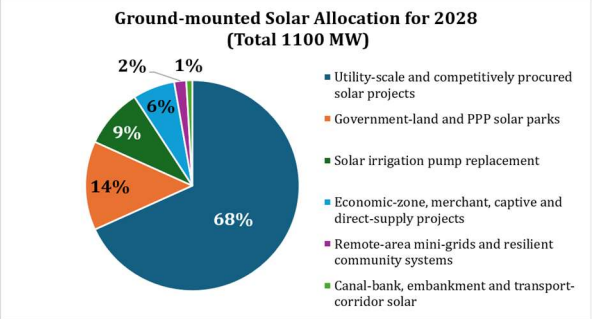
Technology or Program	Main Preparatory Activity
Rooftop solar	Scale public, industrial and commercial procurements; establish digital approval and monitoring systems
Ground-mounted solar	Complete land due diligence, grid studies, tendering, financing and power-evacuation planning
Wind power	Continue 12–24-month measurements; complete feasibility, environmental and grid studies
Waste-to-energy	Complete feedstock agreements, tipping-fee arrangements, technology standards and PPP preparation
Floating solar	Approve implementation guidelines and undertake first pilot procurement
Agrivoltaics	Develop pilot projects and begin collection of agricultural, water-use and energy baseline data
Hydropower	Continue Kaptai studies and complete prefeasibility screening of shortlisted sites
EV charging	Prepare charging-station siting plans, tariff arrangements and technical standards
Emerging technologies	Complete resource studies and select limited research or demonstration projects
Grid and BESS	Complete grid-code amendments, forecasting arrangements, BESS procurement frameworks and start deploying project-specific BESS

Table 7.16C: Proposed Renewable Energy Capacity Allocation for 2028

No.	Technology/ Source	Sector/Area	Allocation for 2028 (MW)	Implementing Agency	Supportive Agencies
1	Rooftop solar	National and export-oriented industrial rooftops	500	Ministry of Industries	PD, SREDA, distribution utilities
		Commercial buildings and business facilities	220	LGD; MoHPW	PD, SREDA, distribution utilities
		Residential buildings and apartments	120	LGD; MoHPW	PD, SREDA, distribution utilities
		Public-sector buildings	120	Respective Ministry/Division	PD, SREDA, distribution utilities
		Educational and health institutions	80	Respective Ministry/Division	PD, SREDA, distribution utilities
		Economic zones, EPZs and hi-tech parks	70	BEZA; BEPZA; BHTPA	PD, SREDA, distribution utilities
		Transport and public infrastructure canopies	30	RTHD; Ministry of Railways; Ministry of Shipping	LGD, PD, SREDA, distribution utilities
		Floating solar on suitable public water bodies	40	MoWR; Ministry of Land	MoFL, MoEFCC, PD, SREDA, PPP Authority
		Telecom BTS and other distributed infrastructure	20	Posts and Telecommunications Division; BTRC	SREDA, distribution utilities, private operators
Subtotal:			1200		
2	Ground-mounted solar	Utility-scale and competitively procured solar projects	750	BPDB	PD, SREDA, PGB
		Government-land and PPP solar parks	150	PPP Authority	Ministry of Land, PD, BPDB, PGB
		Solar irrigation pump replacement	100	Ministry of Agriculture	BADC, BMDA, PD, SREDA, distribution utilities, financial institutions
		Economic-zone, merchant, captive and direct supply projects	70	BEZA; BEPZA; Ministry of Industries	PD, BERC, SREDA, distribution utilities
		Remote-area mini-grids and resilient community systems	20	SREDA; BREB	PD, IDCOL, LGD, local institutions
		Canal-bank, embankment and transport-corridor solar	10	MoWR; RTHD; Ministry of Railways	PD, SREDA, distribution utilities
Subtotal:			1100		
3	Wind power	Coastal onshore utility-scale wind	25	BPDB; SREDA	PD, PGB PLC, MoEFCC
		Island and remote-area wind-solar hybrid systems	3	SREDA; BREB	PD, IDCOL, local government, private operators

		Industrial and coastal captive wind-solar hybrids	2	Ministry of Industries; SREDA	PD, distribution utilities, private developers
Subtotal:			30		
4	Waste-to-energy	Municipal solid-waste-to-electricity projects	25	LGD	City corporations/municipalities, PPP Authority, BPDB, MoEFCC
		Industrial organic waste and effluent-based biogas/electricity through anaerobic digestion	8	Ministry of Industries	SREDA, DoE, PD, private industries
		Livestock and poultry waste biogas-to-electricity through anaerobic digestion	5	Ministry of Fisheries and Livestock	PD, EMRD, SREDA, local entrepreneurs
		Agricultural residue and biomass-to-electricity	2	Ministry of Agriculture	PD, SREDA, MoEFCC, private developers
Subtotal:			40		
5	Other renewable technologies	Agrivoltaic demonstration and commercial projects	10	Ministry of Agriculture	PD, BPDB, MoFL, MoEFCC, SREDA
		Small, mini and micro hydropower and verified Kaptai capacity addition	5	PD; BPDB	SREDA, MoWR
		Tidal, river-current and wave-energy pilots	2	SREDA; BPDB	PD, Ministry of Shipping, MoEFCC, BEPRC
		Geothermal and other emerging renewable pilots	1	EMRD; Geological Survey of Bangladesh	PD, SREDA, BEPRC
		Hybrid renewable mini-grids and multi-source pilots	2	SREDA; BREB	PD, IDCOL, LGD, private operators
Subtotal:			20		
Total			2390		





Preparatory and scale-up activities during 2028

Technology or Program	Main Preparatory or Implementation Activity

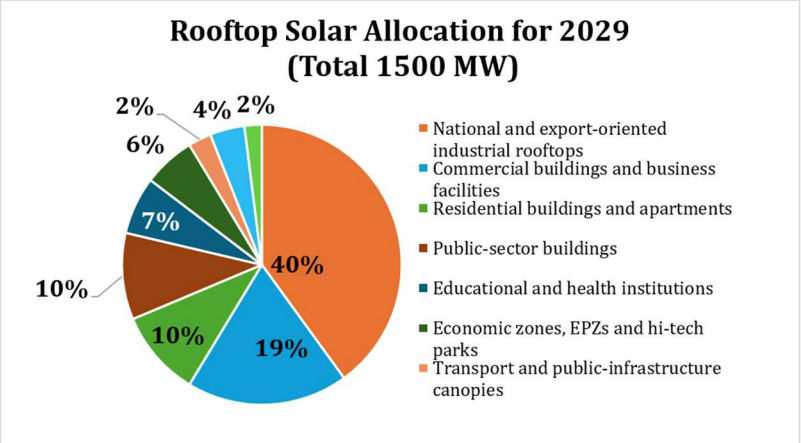
Rooftop solar	Accelerate national deployment and verify technical quality and system performance
Ground-mounted solar	Begin large-scale commissioning and ensure completion of grid-evacuation facilities
Wind power	Commission first bankable projects and monitor cyclone resilience, availability and grid performance
Waste-to-energy	Commission first projects with verified feedstock, emissions control and revenue arrangements
Agrivoltaics	Commission demonstration projects and monitor agricultural output, farmer income and energy generation
Hydropower	Implement approved pilot and modernization activities where feasibility has been established
Emerging technologies	Commission limited pilot projects and establish performance-monitoring arrangements
Grid	Strengthen forecasting, SCADA and system flexibility
Monitoring	Conduct formal mid-term review in July 2028 and adopt corrective actions where targets are at risk

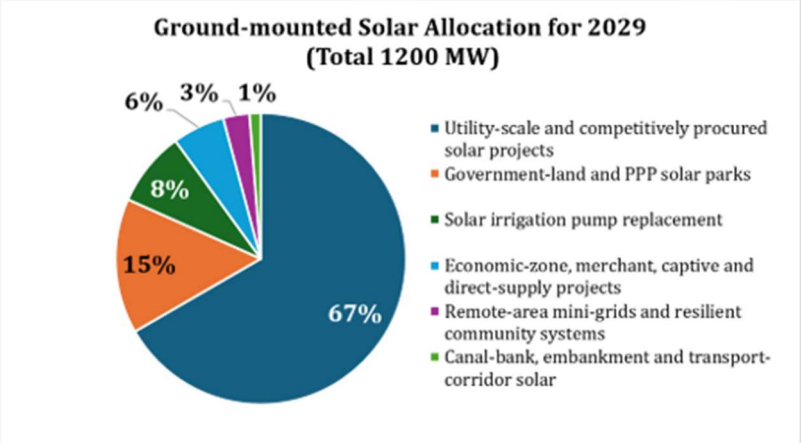
Table 7.16D: Proposed Renewable Energy Capacity Allocation for 2029

No.	Technology/ Source	Sector/Area	Allocation for 2029 (MW)	Implementing Agency	Supportive Agencies
1	Rooftop solar	National and export-oriented industrial rooftops	600	Ministry of Industries	PD, SREDA, distribution utilities
		Commercial buildings and business facilities	280	LGD; MoHPW	PD, SREDA, distribution utilities
		Residential buildings and apartments	150	LGD; MoHPW	PD, SREDA, distribution utilities
		Public-sector buildings	150	Respective Ministry/Division	PD, SREDA, distribution utilities
		Educational and health institutions	100	Respective Ministry/Division	PD, SREDA, distribution utilities
		Economic zones, EPZs and hi-tech parks	90	BEZA; BEPZA; BHTPA	PD, SREDA, distribution utilities
		Transport and public infrastructure canopies	40	RTHD; Ministry of Railways; Ministry of Shipping	LGD, PD, SREDA, distribution utilities
		Floating solar on suitable public water bodies	60	MoWR; Ministry of Land	MoFL, MoEFCC, PD, SREDA, PPP Authority
		Telecom BTS and other distributed infrastructure	30	Posts and Telecommunications Division; BTRC	SREDA, distribution utilities, private operators
Subtotal:			1500		
2	Ground-mounted solar	Utility-scale and competitively procured solar projects	800	BPDB	PD, SREDA, PGB

		Government-land and PPP solar parks	180	PPP Authority	Ministry of Land, PD, BPDB, PGB
		Solar irrigation pump replacement	100	Ministry of Agriculture	BADC, BMDA, PD, SREDA, distribution utilities, financial institutions
		Economic zone, merchant, captive and direct supply projects	70	BEZA; BEPZA; Ministry of Industries	PD, BERC, SREDA, distribution utilities
		Remote-area mini-grids and resilient community systems	35	SREDA; BREB	PD, IDCOL, LGD, local institutions
		Canal-bank, embankment and transport-corridor solar	15	MoWR; RTHD; Ministry of Railways	PD, SREDA, distribution utilities
Subtotal:			1200		
3	Wind power	Coastal onshore utility-scale wind	40	BPDB; SREDA	PD, PGB PLC, MoEFCC
		Island and remote-area wind-solar hybrid systems	5	SREDA; BREB	PD, IDCOL, local government, private operators
		Industrial and coastal captive wind-solar hybrids	5	Ministry of Industries; SREDA	PD, distribution utilities, private developers
Subtotal:			50		
4	Waste-to-energy	Municipal solid-waste-to-electricity projects	35	LGD	City corporations/municipalities, PPP Authority, BPDB, MoEFCC
		Industrial organic waste and effluent-based biogas/electricity through anaerobic digestion	10	Ministry of Industries	SREDA, DoE, PD, private industries
		Livestock and poultry waste biogas-to-electricity through anaerobic digestion	10	Ministry of Fisheries and Livestock	PD, EMRD, SREDA, local entrepreneurs
		Agricultural-residue and biomass-to-electricity	5	Ministry of Agriculture	PD, SREDA, MoEFCC, private developers
Subtotal:			60		
5	Other renewable technologies	Agrivoltaic demonstration and commercial projects	15	Ministry of Agriculture	PD, BPDB, MoFL, MoEFCC, SREDA
		Small, mini and micro hydropower and verified Kaptai capacity addition	10	PD; BPDB	SREDA, MoWR
		Tidal, river-current and wave-energy pilots	5	SREDA; BPDB	PD, Ministry of Shipping, MoEFCC, BEPRC
		Geothermal and other emerging renewable pilots	3	EMRD; Geological Survey of Bangladesh	PD, SREDA, BEPRC

		Hybrid renewable mini-grids and multi-source pilots	7	SREDA; BREB	PD, IDCOL, LGD, private operators
Subtotal:			40		
Total			2850		





Preparatory and scale-up activities during 2029

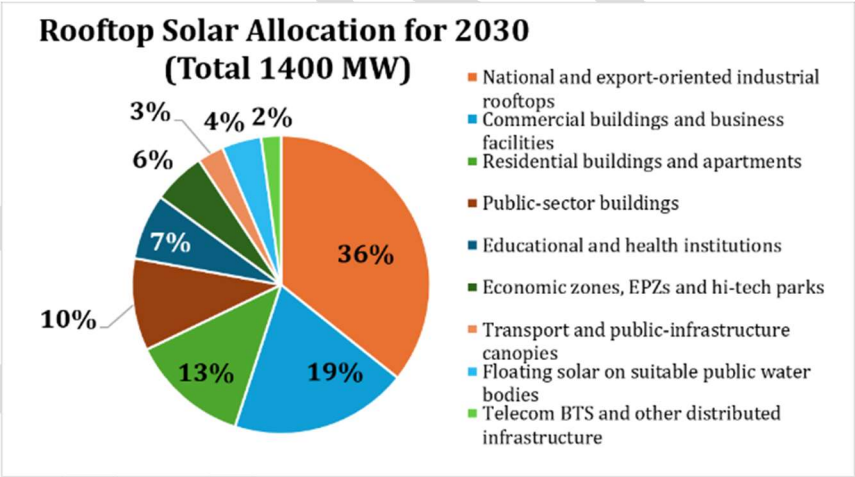
Technology or Program	Main Preparatory or Implementation Activity
Rooftop solar	Expand aggregated procurement and strengthen inspection, O&M and compliance arrangements
Ground-mounted solar	Accelerate the construction and commissioning of competitively procured and PPP projects
Wind power	Scale technically successful projects and update resource and operational data
Waste-to-energy	Replicate viable municipal, industrial and farm-cluster business models
Floating solar	Expand only at water bodies where pilot performance and environmental monitoring are satisfactory
Agrivoltaics	Replicate technically and agriculturally successful models
Hydropower	Implement verified modernization and small-hydropower projects
Emerging technologies	Continue, modify or discontinue pilots based on verified technical and economic evidence
Grid and BESS	Expand transmission, distribution, storage and flexibility facilities required for the 2030 additions
Project pipeline	Ensure that the remaining projects required for the 2030 target have reached financial close and the construction stage

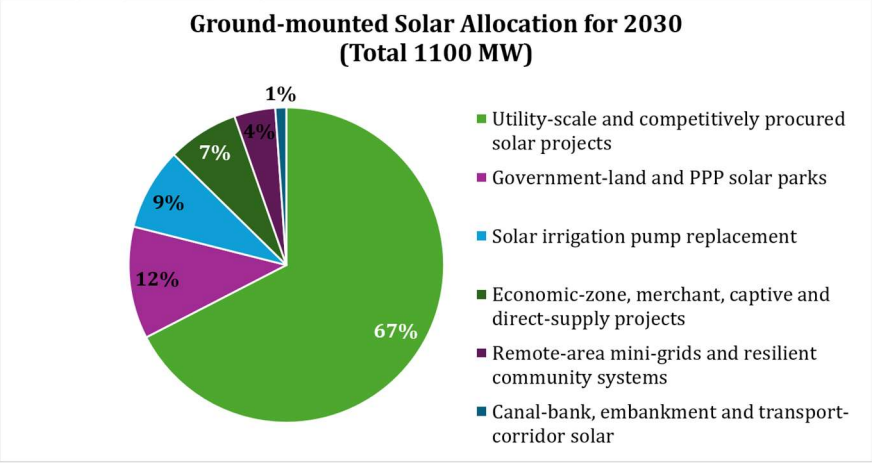
Table 7.16E: Proposed Renewable Energy Capacity Allocation for 2030

No.	Technology / Source	Sector/Area	Allocation for 2030 (MW)	Implementing Agency	Supportive Agencies
1	Rooftop solar	National and export-oriented industrial rooftops	500	Ministry of Industries	PD, SREDA, distribution utilities
		Commercial buildings and business facilities	270	LGD; MoHPW	PD, SREDA, distribution utilities
		Residential buildings and apartments	180	LGD; MoHPW	PD, SREDA, distribution utilities
		Public-sector buildings	140	Respective Ministry/Division	PD, SREDA, distribution utilities
		Educational and health institutions	100	Respective Ministry/Division	PD, SREDA, distribution utilities
		Economic zones, EPZs and hi-tech parks	80	BEZA; BEPZA; BHTPA	PD, SREDA, distribution utilities
		Transport and public infrastructure canopies	40	RTHD; Ministry of Railways; Ministry of Shipping	LGD, PD, SREDA, distribution utilities
		Floating solar on suitable public water bodies	60	MoWR; Ministry of Land	MoFL, MoEFCC, PD, SREDA, PPP Authority
		Telecom BTS and other distributed infrastructure	30	Posts and Telecommunications Division; BTRC	SREDA, distribution utilities, private operators
Subtotal:			1400		
2	Ground-mounted solar	Utility-scale and competitively procured solar projects	1200	BPDB	PD, SREDA, PGB
		Government-land and PPP solar parks	205	PPP Authority	Ministry of Land, PD, BPDB, PGB
		Solar irrigation pump replacement	150	Ministry of Agriculture	BADC, BMDA, PD, SREDA, distribution utilities, financial institutions
		Economic-zone, merchant, captive and	130	BEZA; BEPZA; Ministry of Industries	PD, BERC, SREDA, distribution utilities

		direct-supply projects			
		Remote-area mini-grids and resilient community systems	75	SREDA; BREB	PD, IDCOL, LGD, local institutions
		Canal-bank, embankment and transport-corridor solar	20	MoWR; RTHD; Ministry of Railways	PD, SREDA, distribution utilities
Subtotal:			1780		
3	Wind power	Coastal onshore utility-scale wind	55	BPDB; SREDA	PD, PGB PLC, MoEFCC
		Island and remote-area wind-solar hybrid systems	5	SREDA; BREB	PD, IDCOL, local government, private operators
		Industrial and coastal captive wind-solar hybrids	5	Ministry of Industries; SREDA	PD, distribution utilities, private developers
		Offshore wind demonstration	5	PD; BPDB	SREDA, Ministry of Shipping, MoEFCC, PGB
Subtotal:			70		
4	Waste-to-energy	Municipal solid-waste-to-electricity projects	60	LGD	City corporations/municipalities, PPP Authority, BPDB, MoEFCC
		Industrial organic waste and effluent-based biogas/electricity through anaerobic digestion	15	Ministry of Industries	SREDA, DoE, PD, private industries
		Livestock and poultry waste biogas-to-electricity through anaerobic digestion	15	Ministry of Fisheries and Livestock	PD, EMRD, SREDA, local entrepreneurs
		Agricultural-residue and biomass-to-electricity	10	Ministry of Agriculture	PD, SREDA, MoEFCC, private developers
Subtotal:			100		
5	Other renewable technologies	Agrivoltaic demonstration and	15	Ministry of Agriculture	PD, BPDB, MoFL, MoEFCC, SREDA

		commercial projects			
		Small, mini and micro hydropower and verified Kaptai capacity addition	10	PD; BPDB	SREDA, MoWR
		Tidal, river-current and wave-energy pilots	5	SREDA; BPDB	PD, Ministry of Shipping, MoEFCC, BEPRC
		Geothermal and other emerging renewable pilots	5	EMRD; Geological Survey of Bangladesh	PD, SREDA, BEPRC
		Hybrid renewable mini-grids and multi-source pilots	5	SREDA; BREB	PD, IDCOL, LGD, private operators
Subtotal:			40		
Total			3390		





Preparatory and scale-up activities during 2030

Technology Or Program	Main Completion or Review Activity
Rooftop solar	Complete the five-year target and verify installations through utility and SREDA databases
Ground-mounted solar	Complete major utility, PPP, MPP, merchant and irrigation programs
Wind power	Complete the approved 150 MW program and assess the pathway for further scale-up
Waste-to-energy	Complete the 200 MW program and evaluate feedstock, environmental and financial performance
Other technologies	Verify commissioned capacity and determine which technologies should continue after 2030
Grid and BESS	Confirm that the grid, transmission, distribution, forecasting and storage systems can safely accommodate the installed capacity
Investment	Reconcile committed and disbursed investment and identify remaining financing constraints
Monitoring	Verify project commissioning, operational status and avoidance of double counting
Post-2030 planning	Prepare updated technology-wise and year-wise targets for 2031–2040 based on the comprehensive review

8.0 Policy, Regulatory and Technical Instruments for Roadmap Implementation

The renewable energy targets and sectoral work plans presented in Sections 6 and 7 cannot be implemented only through project announcements. The implementation of their use will require suitable policies, regulations, guidelines, standards, specifications, administrative instructions, model contracts, approval procedures and institutional agreements.

The Renewable Energy Policy 2025 has brought in several new market and implementation mechanisms, such as Renewable Power Obligation (RPO), Renewable Energy Certificates (REC), open access, peer-to-peer (P2P) electricity trading, third party sales, BESS/ESS services, renewable energy hubs, local manufacturing, quality assurance and the Sustainable Energy Development Fund. NREDS also needs enabling instruments for rooftop solar, ground-mounted solar, wind, W2E, floating solar, agrivoltaics, clean cooking, electric mobility, grid modernization, financing, carbon credits, energy efficiency and institutional coordination.

8.1 Objectives of the Legal and Regulatory Roadmap

The objectives of this section are:

a. Identify the policies, regulations, guidelines, standards and administrative instruments necessary for implementation of the roadmap;
b. Ensure that the necessary instruments are in place before the relevant capacity additions and projects reach procurement or construction;
c. Clarify responsibility for drafting, consultation, technical review, approval, publication and implementation;
d. Reduce time delays in project development by standardizing approval processes, contracts, technical specifications and institutional responsibilities;
e. Provide predictable and transparent rules to investors, utilities, consumers and financial institutions;

f. Protect the national grid, consumers, public resources, land, water bodies, biodiversity and local communities;
g. Introducing new market mechanisms in a phased and controlled manner; and
h. Establish a process for periodic review and amendment in the light of experience gained in implementation and technological development.

8.2 Guiding Principles

The following principles shall apply to the preparation of instruments under this roadmap:

8.2.1 Review before creating a new instrument

First, existing acts, rules, policies, regulations and guidelines shall be reviewed. A new instrument shall be prepared only where the implementation requirement cannot be adequately met by an existing instrument. Where possible, existing guidelines or regulations should be amended rather than creating a parallel framework.

8.2.2 Use of the appropriate instrument

Not every act requires a new law or regulation. The instrument shall be chosen in accordance with the purpose and legal authority of the issuing institution.

Table 8.1: Types of Instruments its Application

Type of Instrument	Main Application
Act, rule or regulation	Statutory obligations, licensing, tariff regulation, penalties and enforceable market requirements
Policy or guideline	Implementation procedures, eligibility, responsibilities, application processes and operational requirements
Standard or specification	Product quality, design, testing, installation, safety and performance requirements
Circular, notification or office order	Administrative instruction, institutional assignment, reporting requirement or compliance direction
Model contract or standard bidding document	Procurement, PPA, lease, RESCO/OPEX, PPP, MPP and risk-allocation arrangements
MoU or inter-agency protocol	Data sharing, coordinated approval, joint inspection, research collaboration and institutional cooperation
Operational Manual or SOP	Day-to-day implementation, verification, monitoring, payment, registration and complaint handling

8.2.3 Mandate of the Institution

The institution having the relevant legal mandate shall prepare and issue each instrument. Power Division and SREDA may provide technical coordination and necessary support, but regulatory, tariff, fiscal, environmental, construction, land and financial instruments must be approved by the competent authority concerned.

8.2.4 Timing Depending on Implementation

Priority will be given to instruments that directly support the 2026-2030 capacity-addition program. Before the tendering or approval of the related projects, the instruments for procurement, grid connection, financing, access to land and private investment shall be finalized.

8.2.5. Transparency and Consultation

Concerns of the concerned ministries, regulators, utilities, private developers, financial institutions, industry associations, technical experts, research institutions, consumer representatives etc. and other affected stakeholders should be taken into consideration while reviewing draft instruments.

8.2.6 Bankability: Technical and Financial

The guidelines and model documents shall clearly allocate land, grid, payment, foreign exchange, construction, performance, curtailment, environmental and force-majeure risks. Technical requirements shall be measurable and conform to recognized standards.

8.2.7 Periodic Review

Each major instrument shall specify a review period or a review trigger. Instruments affected by technology cost, market development, grid conditions or fiscal policy may require more frequent updates.

8.3 Instrument Drafting, Consultation and Approval Process

The following procedure shall be followed normally:

a. **Gap identification**: The lead institution shall identify the implementation problem, the existing legal position and the need for a new or amended instrument.
b. **Classification of instruments**: The lead institution shall determine whether the output shall be a regulation, guideline, standard, circular, model contract, MoU or operational procedure.
c. **Draft arrangement**: A technical working group shall be established. Where the subject matter requires legal, financial, market, grid, environmental or technology expertise, specialized consultants may be engaged.
d. **Technical and institutional review**: The draft shall be reviewed by all institutions whose mandate, expenditure, operations or regulatory responsibilities could be affected.
e. **Stakeholder consultation:** Drafts with market, consumer, environmental or investment implications shall be published for stakeholder consultation for an appropriate period, subject to any applicable government procedures.
f. **Approval and publication:** The instrument shall be approved, notified, gazetted or published as prescribed by its legal status. Both Bangla and English versions should be provided and uploaded on the websites, where appropriate.
g. **Operationalization:** Post approval circulars, standard forms, online systems, institutional training, budget allocation and communication to the public.
h. **Review and amendment:** The performance of the instrument shall be reviewed after implementation and, if the evidence shows that the instrument is ineffective, unclear or inconsistent with changing conditions, the instrument shall be amended.

8.4 Priority Instruments for 2026–2030

Table 8.1 presents the principal legal, regulatory, technical and administrative instruments required to implement the Renewable Energy Policy 2025, the National Renewable Energy Development Strategy and the sectoral workplans contained in Section 7.

Table 8.2: Roadmap for Preparation and Operationalization of Priority Instruments

Sl No.	Activity	Time-line	Agency	Action	Finance
1.	Review of the Net Metering Guideline 2025	2026-27	SREDA, Power Division	Amendment	Outsource/Self
2.	Drafting a guideline for Peer-to-Peer (P2P) Trading for Rooftop Solar PV systems.	2028	SREDA, PD	Drafting and publications	Outsource/Self
3.	Drafting a guideline for Floating Solar Project Implementation (ensuring protection of water bodies, fish habitats, biodiversity, etc.).	2027	SREDA, PD	Drafting and publications	Outsource/Self
4.	BESS/ESS guideline for utility, captive and third-party applications and National Battery Roadmap and end-of-life framework	2026-27	SREDA, PD	Drafting and publications	Outsource/Self
5.	Formulation of an Incentive Guideline for a grid-tied renewable energy project	2027	SREDA, PD	Drafting and publications	Outsource/Self
6.	Development of a regulatory mechanism for Renewable Power Obligation (RPO), Renewable Energy Certificate (REC) and Carbon Market	2027	SREDA, PD	Drafting and publications	Outsource/Self
7.	Maintaining an inventory of RE projects that will participate in the Global Carbon Markets. Carbon-credit revenue-sharing framework.	2027	SREDA, PD	Drafting and publications	Outsource/Self
8.	Open-access and third-party renewable electricity sale framework	2026-27	SREDA, PD	Drafting and publications	Outsource/Self
9.	Administering and initiating the Sustainable Energy Development Fund (SEDF) for R&D and HRD activities.	2027	SREDA, PD	Drafting and publications	Outsource/Self
10.	Support mechanism for local manufacturing of RE equipment and to facilitate their product certification.	2027	SREDA, PD	Drafting and publications	Outsource/Self
11.	Strengthening quality control, certification and testing infrastructure for renewable energy technologies.	2027	SREDA, PD	Drafting and publications	Outsource/Self
12.	Facilitate R&D initiatives on renewable energy equipment and emerging technologies.	2027	SREDA, PD	Drafting and publications	Outsource/Self
13.	Recommend national standards and specifications for renewable energy equipment in consultation relevant agencies. Maintain a list of accredited	2027	SREDA, PD	Drafting and publications	Outsource/Self

	testing laboratories (in collaboration with BAB)				
14.	Rooftop solar requirements under BNBC and development-project procedures	2027-28	Ministry of Housing, SREDA	Drafting and publications	Outsource/Self
15.	Grid Code amendment for inverter-based renewable energy resources	2026	Power Division, PGB PLC, BERC	Drafting and publications	Outsource/Self
16.	Distribution-network RE hosting-capacity assessment study	2027	Distribution -Utility, SREDA, Power Division	Drafting and publications	Outsource/Self
17.	Agrivoltaics guideline and performance standard	2027	SREDA, PD	Drafting and publications	Outsource/Self
18.	Amendment of the existing EV, electric-vessel and renewable charging framework	2027	SREDA, BERC, Power Division	Drafting and publications	Outsource/Self
19.	Drafting a guideline for Waste to Energy (W2E) project.	2027	SREDA, PD	Drafting and publications	Outsource/Self
20.	Drafting a guideline for bio-slurry management in consultation with the Ministry of Agriculture, the Ministry of Fisheries and Livestock and MoEFCC.	2027	SREDA, PD	Drafting and publications	Outsource/Self
21.	SREDA shall develop the RE Roadmap/Implementation plan within a time frame based on this policy	2026	SREDA, PD	Drafting and publications	Self
22.	A business model for operating solar irrigation pumps to utilize their capacity beyond the irrigation seasons	2027	SREDA, PD	Drafting and publications	Outsource/Self
23.	Biomass being a major source of energy in rural areas, a comprehensive plan for the development of biomass energy shall be developed on biomass resource mapping	2027	SREDA, PD	Drafting and publications	Outsource/Self
24.	Preparation of guidelines for the maintenance of Solar Panels, Inverters and associated equipment of solar energy plants. Similarly, the guidelines for the maintenance of wind energy plants and biogas plants will be prepared by SREDA	2027	SREDA, PD	Drafting and publications	Outsource/Self
25.	Green-finance, refinancing and credit-guarantee arrangements	2026-28	Bangladesh Bank, IDCOL	Drafting and publications	Outsource/Self

The Renewable Energy Development Fund and the Sustainable Energy Development Fund (SEDF) are not to be regarded as one and the same tool. The former is proposed in the Strategy as a wider project-financing mechanism involving ERD, Bangladesh Bank, financial institutions and development partners. The SEDF is established under The Renewable Energy Policy 2025, mainly to promote renewable energy research, innovation and human-resource development and will be maintained and managed by SREDA. The two funds should therefore have separate operational rules, governance and accounting arrangements.

The second group will support scale-up and diversification from 2028. This includes P2P trading pilots, agrivoltaics, bio-slurry management, EV charging, energy-efficiency compliance, local manufacturing, battery recycling, carbon-revenue sharing and technology-specific O&M requirements.

After the necessary grid studies, pilot experience and institutional readiness are in place, regional electricity trade, wider market integration and commercial frameworks for emerging technologies will be established. No capacity target should be delayed because the required enabling instrument was initiated only after project procurement. The lead institution shall therefore work backward from the scheduled commissioning year and ensure completion of the legal and regulatory requirements prior to tendering, financial close, or construction.

Where an instrument impacts tariffs, licensing, regulated charges, consumer obligations or market compliance, BERC will be involved from the start of the drafting process. Where there are fiscal incentives, government guarantees or public financial liabilities, prior review shall be done by the Finance Division, Internal Resources Division, NBR and other concerned authorities.

Technology standards shall be developed with BSTI and, where appropriate, conform to recognized international standards. Testing and certification shall be carried out by competent and accredited laboratories. Environmental instruments shall be developed in consultation with the Ministry of Environment, Forest and Climate Change and relevant sectoral ministries.

New market mechanisms such as open access, P2P trading, ancillary services and others may be introduced initially through controlled pilots or regulatory-sandbox mechanisms. Pilot rules should specify their term, eligible participants, consumer protection, data, settlement arrangements and conditions for continuation or expansion.

8.5 Monitoring and Corrective Action

Progress under this section shall be monitored through the following indicators:

- Number and percentage of priority instruments completed within the approved timeline;
- Average time from initiation to approval;
- Number of instruments supported by public consultation;
- Number of stakeholder comments received and addressed;
- Number of model contracts and standard procedures being used by implementing agencies;
- Reduction in renewable energy project approval time;
- Number of projects processed under standardized procurement and grid-connection arrangements;
- RPO compliance and REC issuance after commencement of the mechanism;

- Number of open-access and P2P pilot participants;
- Number of products and laboratories certified under approved standards; and
- Number of instruments reviewed or amended based on implementation evidence.

The quarterly roadmap scorecard will provide the status of priority instruments. If an instrument is delayed, the institution responsible must submit a corrective action plan outlining the cause, decisions needed, updated timeline and authority responsible for resolving the delay.

The legal and regulatory program will be formally reviewed as part of the mid-term review in July 2028. The review will examine whether the approved instruments have helped to reduce project delays, improve investment conditions, protect consumers and support the planned additions to renewable energy capacity. Instruments not having given the expected result shall be reviewed, consolidated or replaced.

Implementation of this section will create the policy and regulatory basis for the institutional, human-resource, financing, storage and monitoring measures outlined in the following sections of the roadmap.

9.0 Mapping and Development of Technical Human Resources for Roadmap Implementation

Implementation of the renewable energy capacity program discussed in Section 7 will require more than general engineering manpower. Bangladesh will require the right mix of policymakers, planners, project developers, financiers, designers, installers, technicians, grid specialists, storage experts, quality inspectors, researchers and operation and maintenance personnel. These resources will be needed in government institutions, utilities, financial institutions, universities, training organizations and private companies.

Hence, the roadmap also includes a preliminary year-by-year simulation of the direct employment, workforce-development needs and training investment for the 2026-2030 capacity program. The simulation provides a preliminary basis for planning and should not be taken as a fixed government recruitment quota. The assumptions and results will be validated through the National Renewable Energy Skills and Institutional Capacity Assessment, the July 2028 mid-term review and the comprehensive 2030 review.

9.1 Priority Tasks, Professional Profiles and Competency Requirements

SREDA, with the help of the National Skills Development Authority (NSDA) and the Bangladesh Power Management Institute (BPMI) under the policy guidance of the Power Division, shall coordinate a National Renewable Energy Skills and Institutional Capacity Assessment during 2026-27 (further details in the subsequent sections). The assessment will identify existing personnel, vacancies, competency gaps, training capacity, geographical shortages and the expected demand arising from projects at feasibility, procurement, construction, commissioning and operation stages.

The assessment shall identify separately:

- Requirements of public sector and utilities for policy, regulation, planning, procurement, grid operation, data management and monitoring;
- Requirements of the private sector for project development, engineering, construction, financing, commissioning and operation and maintenance;
- Requirements of technicians and installers at district and local levels;
- Requirements of specialists for grid integration, forecasting, SCADA, BESS, wind, waste-to-energy, hydropower, environmental safeguards and carbon finance;
- Training, laboratory and certification capacity within universities, polytechnics, technical training centers and professional institutions; and
- Opportunities for women, youth, local entrepreneurs and workers from climate-vulnerable and difficult-to-reach areas.

The assessment shall confirm the employment factors used in the preliminary simulation, establish the renewable energy workforce baseline, identify the extent to which existing personnel can be re-skilled and validate the unit costs of training, certification, laboratory development and practical assessment.

9.2 Indicative Qualification and Capacity-Development Pathways

The professional titles in Table 9.1 represent indicative functional profiles, not fixed recruitment quotas or a requirement to create a separate post for each function. Each implementing institution shall determine existing competencies, personnel requiring special training, the positions to be hired and the services to be provided by consultants, accredited laboratories, universities or private technical organizations. The numerical requirements will be formalized through the National Renewable Energy Skills and Institutional Capacity Assessment.

Table 9.1: Priority Tasks, Professional Profiles and Competency Requirements for Roadmap Implementation

Main Task Area	Professionals To Be Engaged	Principal Responsibilities and Required Competencies	Main Institutions for Engagement and Capacity Development
Policy, regulation and institutional coordination	Renewable Energy Policy Specialist; Energy Regulatory Specialist; Energy Lawyer/Legal Drafting Specialist; Tariff and Market Specialist; Institutional Coordination Officer; Carbon-Market and MRV Specialist	Draft and review policies, regulations and guidelines; support RPO, REC, open access, net metering and tariff mechanisms; clarify institutional mandates; coordinate approvals; support carbon-market participation and compliance	Power Division; SREDA; BERC; Law and Justice Division; MoEFCC; relevant ministries
Project development, feasibility and procurement	Renewable Energy Project Development Engineer; Project Manager; Feasibility-Study Specialist; Procurement Specialist; PPP/Transaction Adviser; PPA and Contract	Conduct resource, technical and financial feasibility studies; establish project readiness; assess land, rooftops and grid access; prepare tender documents; manage	SREDA; BPDB; PPP Authority; utilities; relevant ministries; private developers

	Specialist; Land and Site-Development Specialist	procurement, PPA, PPP and contractual processes	
Environmental and social safeguards	Environmental Specialist; Social Safeguards Specialist; ESIA Expert; Biodiversity Specialist; Occupational Health and Safety Specialist; Community-Engagement Specialist	Undertake environmental and social screening; prepare ESIA and management plans; assess biodiversity, livelihoods, land acquisition, resettlement and climate risks; conduct consultation and monitor compliance	MoEFCC; DoE; implementing agencies; SREDA; local government institutions; consulting organizations
Solar engineering, design and construction	PV System Design Engineer; Electrical Design Engineer; Structural/Civil Engineer; CAD and PV-Modelling Specialist; EPC Project Engineer; Site Engineer; Solar Installer; Electrical Wiring Technician; Commissioning Engineer	Design rooftop and ground-mounted systems; conduct structural assessment; prepare layouts and electrical designs; undertake installation, protection, earthing, testing, commissioning, net-metering compliance and construction supervision	SREDA; BPDB; distribution utilities; universities; polytechnics; EPC and RESCO companies; professional institutions
Operation, maintenance and quality assurance	Solar O&M Engineer; O&M Supervisor; Performance Analyst; Quality-Control Inspector; Testing and Calibration Engineer; Thermography Technician; Safety Officer; Warranty and Spare-Parts Coordinator	Conduct preventive and corrective maintenance; monitor plant performance; undertake inspection, testing, thermography and fault diagnosis; manage warranties, spare parts, safety and equipment quality	SREDA; utilities; BSTI; BAB; accredited laboratories; asset owners; O&M service providers
Grid planning, integration and system operation	Power-System Planning Engineer; Grid-Integration Specialist; Load-Flow and Stability Analyst; Protection Engineer; Renewable-Energy Forecasting and Scheduling Analyst; SCADA/EMS/AGC Engineer; System Operator; Cybersecurity Specialist	Conduct hosting-capacity, load-flow and stability studies; develop interconnection and protection arrangements; support forecasting, scheduling, SCADA, dispatch, power quality, system flexibility and cybersecurity	PGB; BPDB; distribution utilities; BERC; BPMI; universities
BESS/ESS development and life cycle management	BESS Design Engineer; Battery-System Engineer; Power Conversion System Engineer; Energy-Management-System Specialist; Fire-Safety Engineer; BESS Commissioning Engineer; BESS O&M Technician; Battery Recycling and Environmental Specialist	Determine storage requirements in MW and MWh; design and integrate BESS; establish EMS and protection; manage fire and electrical safety, performance testing, degradation, warranty, repurposing, recycling and disposal	Power Division; SREDA; PGB; BPDB; distribution utilities; BSTI; Fire Service and Civil Defence; DoE; private suppliers
Wind and hydropower development	Wind Resource Analyst; Wind-Turbine Engineer; Coastal/Offshore Engineer; Met-Mast and LiDAR Technician; Hydrologist; Hydropower Engineer; Mechanical Engineer; Dam-Safety and Geotechnical Specialist	Conduct wind and hydrological resource measurements; assess energy yield; design and supervise projects; address cyclone, corrosion, sedimentation and dam-safety risks; support operation and maintenance	SREDA; BPDB; PGB; Ministry of Water Resources; BWDB; Ministry of Shipping; universities and research institutions
Waste-to-energy, biogas and biomass	Waste-Management Engineer; Process/Chemical Engineer; Anaerobic-Digestion and Biogas Specialist; Biomass and Feedstock Specialist; Environmental and Emissions-Control Specialist; Digestate and	Characterize waste and feedstock; select appropriate conversion technologies; design and operate incineration, anaerobic digestion, biogas and biomass systems; control	Local Government Division; MoEFCC; Ministry of Industries; Ministry of Agriculture;

	Bio-slurry Specialist; Plant O&M Technician	emissions; manage ash, digestate and by-products	Ministry of Fisheries and Livestock; SREDA; local government bodies
Floating solar, agrivoltaics and emerging technologies	Floating-Solar Engineer; Marine/Mooring Engineer; Agrivoltaic System Designer; Agricultural Scientist; Fisheries Specialist; Research Scientist; Technology-Assessment Specialist; Pilot Project Manager	Undertake resource screening and pilot design; address waterbody, crop, livestock and fisheries requirements; monitor pilot performance; assess technology readiness, commercial viability and opportunities for scale-up	SREDA; BEPRC; Ministry of Agriculture; Ministry of Fisheries and Livestock; Ministry of Water Resources; universities; development partners
Finance, investment and commercial development	Renewable-Energy Project Finance Analyst; Green-Finance Specialist; Financial Modeler; Credit and Risk Officer; Investment Specialist; PPP Finance Adviser; Carbon-Finance Specialist; Insurance Specialist	Prepare financial models; assess project bankability; structure debt, equity, guarantees and concessional finance; manage foreign-exchange, payment and credit risks; support green bonds, Sukuk, climate finance and carbon revenue	Bangladesh Bank; ERD; Finance Division; BSEC; IDCOL; commercial banks; finance companies; development partners
Manufacturing, supply chain and product quality	Renewable-Energy Manufacturing Engineer; Supply-Chain and Logistics Manager; Import and Customs Specialist; Product-Certification Specialist; Factory Quality-Control Engineer; Recycling Specialist	Support local assembly and manufacturing; manage importation, logistics and inventory; establish product standards and certification; inspect manufacturing quality; develop recycling and circular-economy arrangements	Ministry of Industries; NBR; Ministry of Commerce; BSTI; BAB; BIDA; private manufacturers and suppliers
Data, GIS, research and monitoring	GIS and Resource-Mapping Analyst; Renewable-Energy Data Analyst; Database Manager; Energy Modeler; Monitoring and Evaluation Specialist; Research Engineer; AI/IoT Specialist; Gender and Social-Inclusion Specialist	Maintain the national renewable energy database; prepare resource maps and dashboards; verify capacity and generation; undertake modelling and research; monitor investment, employment, gender, safeguards and Roadmap performance	SREDA; Power Division; utilities; ICT Division; BEPRC; universities and research institutions
Local implementation and energy services	Certified Solar Technician; Licensed Electrician; Solar-Irrigation Technician; Mini-grid Technician; EV-Charging Technician; Clean-Cooking Technician; Community Energy Adviser; Local Renewable-Energy Entrepreneur	Install, repair and maintain distributed systems; provide customer support and after-sales service; operate irrigation, mini-grid, charging and clean-cooking systems; support local awareness and entrepreneurship	NSDA; BMET; BTEB; technical training centers; utilities; local government institutions; NGOs; private service providers

Table 9.2: Indicative Qualification and Capacity-Development Pathways

Professional Level	Illustrative Positions	Normal Entry Qualification	Required Capacity-Development Pathway
Policy and senior specialist	RE Policy Specialist; Regulatory Specialist; Energy Lawyer; Energy Economist; Carbon-Market Specialist	Relevant postgraduate degree or substantial professional experience	Specialized policy, regulation, market-design and government-procedure training

Professional engineer and project specialist	PV Design Engineer; Grid-Integration Engineer; BESS Engineer; Project Manager; Wind or Hydropower Engineer	Relevant bachelor's degree; postgraduate qualification where required	Technology-specific design, software, standards, project management and practical training
Technical supervisor and inspector	O&M Supervisor; Quality Inspector; Commissioning Supervisor; Safety Supervisor	Engineering degree or diploma with relevant experience	Inspection, testing, commissioning, safety and competency-assessment training
Certified technician	Solar Installer; Electrician; BESS Technician; EV-Charging Technician; Mini-grid Technician	SSC/HSC, vocational or diploma background appropriate to the occupation	Competency-based theoretical and practical training followed by assessment
Finance and commercial professional	Project Finance Analyst; Green-Finance Specialist; Credit and Risk Officer	Finance, economics, business or engineering background	Renewable energy financial modelling, risk, appraisal and green-finance training
Data and digital specialist	GIS Analyst; SCADA Technician; Data Analyst; IoT Specialist	Engineering, ICT, geography, statistics or related qualification	Technology-specific software, data management, cybersecurity and field application training
Local entrepreneur and service provider	Local RE Entrepreneur; Community Energy Adviser; After-sales Service Provider	No single prescribed qualification	Business development, consumer protection, system basics, safety and referral-based technical training

The qualifications and training routes are indicative. The approved national competency standards and employer validation will detail the entry requirements, course duration and assessment arrangements. Where appropriate, prior learning and relevant professional experience should be taken into account.

9.3 Institutional Roles for Renewable Energy Skills Development

Human resource development must build on and make use of existing institutions and not create parallel structures without a demonstrated need. Training shall be competency-based and include practical work, assessment and workplace exposure.

Table 9.3: Institutional Roles for Renewable Energy Skills Development

Institutional Group	Main Role in Human Resource Development
Power Division and SREDA	Policy oversight; national skills assessment; competency priorities; coordination; national register and monitoring, Training module development, Training showcasing
BPMI and utility training centers	Training for officials, utility engineers, system operators, procurement personnel and renewable energy cells
National Skills Development Authority, BTEB and BMET	Occupational standards; competency-based curricula; assessor and trainer development; certification of technicians
Universities and research institutions	Advanced engineering, planning, finance, research, postgraduate study and specialist laboratory training
Polytechnics and technical training centers	Installer, electrician, O&M, BESS, EV charging, safety and field-technician programs
BSTI, BAB and accredited laboratories	Testing, quality assurance, laboratory competency and product-certification support
Utilities, developers, EPC, RESCO and O&M companies	Apprenticeships, internships, practical assessment, workplace training and employment

Professional institutions and industry associations	Continuing professional development, codes of practice, employer validation and dissemination

SREDA shall gradually keep a national register of qualified designers, installers, inspectors, maintenance service providers, trainers and assessors. Registration shall be linked to approved competency standards, experience, continuing professional development and compliance history.

9.4 Human Resource Development Roadmap, 2026–2030

Table 9.4: Human Resource Development Roadmap, 2026-2030

Period	Priority Action	Expected Output	Lead/ Supporting Agencies
2026	Complete national skills and institutional capacity assessment; map existing training programs, personnel and vacancies; identify urgent gaps for the 2026-2027 project pipeline	Verified baseline and priority occupation list	Power Division; SREDA; NSDA; BPMI; utilities
2026-2027	Develop or revise occupational standards, curricula, training manuals, practical assessment tools and trainer programs; establish or strengthen renewable energy cells in relevant utilities and agencies	Approved training packages, trainers and institutional work plans	SREDA; BPMI; BTEB; BMET; universities; utilities
2026-2028	Deliver priority training for rooftop and utility solar, grid integration, BESS, project finance, procurement, quality assurance and environmental safeguards; introduce apprenticeships	Certified personnel available for early scale-up	Training institutions; utilities; private employers; professional bodies
July 2028	Review workforce supply against project delivery, vacancies, safety, quality and regional requirements	Corrective training and recruitment plan	Power Division; SREDA; implementing agencies
2028-2030	Scale training and recruitment in line with annual technology targets; expand district-level technicians and specialist programs for wind, W2E, hydropower and emerging technologies	Workforce deployed for accelerated commissioning and O&M	Relevant ministries; SREDA; utilities; private sector
2030 review	Establish verified workforce requirements and training priorities for 2031-2040 based on the confirmed technology pathway	Post-2030 human resource plan	Power Division; SREDA; NSDA; relevant institutions

9.5 Inclusion and Financing of Human Resource Development

Training and jobs will help ensure a just and inclusive energy transition. Relevant training programs shall be pursued with at least 30% participation by women, with appropriate measures to include transgender and other gender-diverse persons. Youth, people from climate-vulnerable districts, local communities around project sites and existing power sector workers needing re-skilling shall be included as per program needs and applicable Government provisions.

Development of the human resource base can be financed through institutional budgets, project development costs, employer contributions, the Sustainable Energy Development Fund for eligible R&D and HRD activities, development-partner technical assistance, scholarships, training-service contracts and private co-financing. Every major public procurement or development-partner-supported renewable energy program should have an appropriate budget for practical training, technology transfer, apprenticeships and local O&M capacity. Uncommitted fixed funding commitments or compulsory levies shall not be included without formal Government approval.

9.6 Preliminary Quantitative Human Resource and Employment Simulation

The renewable energy capacity additions presented in section 7 are expected to create significant employment in project planning, engineering, construction, installation, grid connection, commissioning, operation and maintenance. The employment requirement will increase, particularly from 2028, when annual renewable energy additions increase significantly.

In clarity, this simulation distinguishes between:

- Construction and installation job-years: one full-time equivalent person employed for one year in the development, construction, installation or commissioning of projects;
- Operation and maintenance jobs: recurrent full-time equivalent positions needed to operate and maintain commissioned facilities;
- Cross-cutting professional jobs: personnel involved in regulation, finance, procurement, grid studies, quality assurance, environmental and social safeguards, data management, training and institutional coordination; and
- Training places: people undergoing new occupational training, specialized upskilling, competency assessment or certification.

Ten (10) persons working for six (06) months are therefore equivalent to five (05) job-years. A training place shall not automatically be reported as a new job, because some participants may already be employed and may only require upskilling or certification.

International employment factors are useful reference points but cannot be applied mechanically for this roadmap. International Renewable Energy Agency (IRENA) estimates that a typical 50 MW solar PV plant requires about 41,500 person-days to plan, install and connect and annual O&M requires about 13,560 person-days. Planning and installation for a 50 MW onshore wind project takes around 37,060 person-days and annual O&M takes around 2,665 person-days. Distributed solar systems are often more labour-intensive per MW than utility-scale projects.

Table 9.5: Employment Factors Used for the Preliminary Simulation (Source: IRENA)

Technology or Program	**Project Development, Construction and Installation**	**Recurring O&M Employment** (FTE: Full-Time Equivalent)	**Basis and Treatment**
Rooftop solar	4.50 job-years/MW	1.23 FTE/MW	Solar benchmark adjusted upward because rooftop and distributed

			installations require more site-level design, installation and coordination
Ground-mounted solar	3.80 job-years/MW	1.23 FTE/MW	Closely follows the IRENA utility-scale solar planning, installation and O&M benchmark
Wind power	3.40 job-years/MW	0.24 FTE/MW	Based on IRENA's onshore wind planning, installation and O&M estimate
Waste-to-energy, biogas and biomass	5.00 job-years/MW	4.00 FTE/MW	Provisional composite factor reflecting plant operation, waste/feedstock handling, emissions control and residue management
Other renewable technologies	4.00 job-years/MW	0.50 FTE/MW	Preliminary factor for agrivoltaics, hydropower additions, hybrid systems and demonstration projects
Cross-cutting enabling functions	—	5% of technology-related employment	Covers policy, finance, procurement, grid, safeguards, quality, data, training and institutional functions

These factors are used solely for a preliminary Roadmap simulation. They do not include induced employment and most upstream manufacturing employment unless the activities are carried out in Bangladesh. The factors will be replaced or refined when Bangladesh-specific project and workforce data become available.

Using the approved annual capacity additions of 420 MW, 1,400 MW, 2,390 MW, 2,850 MW and 3,390 MW, the following base-case simulation is obtained.

Table 9.6: Preliminary Year-Wise Direct Employment and Training Requirement, 2026–2030

Year	Renewable Capacity Addition	Construction and Installation Employment	Cumulative O&M Employment	Cross-Cutting Professional Employment	Total Direct Employment Supported During the Year	New or Substantially Upskilled Persons Required
2026	420 MW	1,876 job-years	517 FTE	120 FTE	2,512	1,758
2027	1,400 MW	6,020 job-years	2,239 FTE	413 FTE	8,672	4,400
2028	2,390 MW	9,961 job-years	5,245 FTE	760 FTE	15,966	5,410
2029	2,850 MW	11,939 job-years	8,838 FTE	1,039 FTE	21,815	4,653
2030	3,390 MW	13,960 job-years	13,186 FTE	1,357 FTE	28,504	5,446
2026–2030	10,450 MW	Approx. 43,756 job-years	Approx. 13,186 continuing O&M jobs by 2030	—	—	Approx. 21,667 training places

The simulation indicates that the 10,450 MW program would generate around 43,756 direct construction and installation job-years in 2026-2030. As many as 13,186 recurring operation and maintenance jobs may be needed by the end of 2030. The simulation indicates that approximately 28,500 direct jobs and job-equivalent positions may be supported during 2030,

including construction, installation, recurring O&M and cross-cutting professional functions. This figure does not represent 28,500 entirely new permanent employees.

Preliminary planning estimates that some 70% of the required workforce will need formal renewable energy training, specialized upskilling or competency certification. The remaining workforce may be drawn from existing occupations such as civil construction, transport, administration and general electrical services and may only need project-specific induction or safety training. The simulation also assumes that about 95% of trained personnel are available from one year to the next, allowing trained workers to move from project to project while allowing for limited attrition and replacement.

A preliminary employment simulation, presented in Table 9.7, provides an indicative range of trained and qualified personnel required to support the 10,450 MW renewable energy capacity addition program by 2030. The ranges are for personnel to be available across project development, construction, installation, commissioning, operation and maintenance. These are planning estimates, not fixed recruitment quotas and will be validated through the National Renewable Energy Skills and Institutional Capacity Assessment.

Table 9.7: Indicative Professional and Technical Workforce Required by 2030

Rooftop and Distributed Renewable Energy Workforce	Indicative Personnel Required By 2030	Utility-Scale Grid-Connected and Enabling-System Workforce	Indicative Personnel Required By 2030
Certified solar PV installers and licensed electricians	3,200–3,600	EPC construction personnel, site engineers and supervisors	1,500–1,800
Solar technicians	1,800–2,100	Utility-scale project engineers, designers and project managers	600–750
Solar O&M technicians	1,600–1,900	Plant O&M engineers, operators and technicians	1,800–2,200
Solar PV system designers and modelling specialists	600–750	VRE, grid-integration, protection and SCADA specialists	450–600
Maintenance engineers and O&M supervisors	350–450	Wind, W2E, hydropower and resource-assessment specialists	300–450
Rooftop EPC project engineers, site engineers and supervisors	500–650	Utility-scale BESS/ESS engineers and technicians	350–500
Quality-control, testing and commissioning technicians	300–400	Quality-control, testing, commissioning and independent inspection personnel	300–400
Sub-assistant engineers and diploma engineers	700–850	Sub-assistant engineers and diploma engineers	600–750
Graduate engineer trainees and assistant engineers	450–550	Graduate engineer trainees and assistant engineers	450–550
Procurement, import, customs and logistics specialists	200–250	Procurement, PPA, contract and commercial specialists	150–200
Manufacturing, assembly and equipment-service personnel	500–650	Finance, investment, credit and risk specialists	150–200

Rooftop BESS and EV-charging engineers and technicians	300–400	EV-charging network and high-power charging specialists	100–150
RESCO/OPEX, consumer-finance and customer-service specialists	200–250	Environmental, social, occupational-safety and fire-safety specialists	250–350
Net-metering, metering and distribution-interface personnel	200–300	Forecasting, scheduling, GIS, data and monitoring specialists	200–300
—	—	Heavy-equipment import, transport and logistics specialists	100–150
Indicative subtotal	Approximately 10,900–13,050	Indicative subtotal	Approximately 7,300–9,350

The occupational ranges are not designed for independent addition without adjustment, because some personnel may perform more than one related function. A diploma engineer could be a solar technician, a commissioning technician or an O&M supervisor, while a graduate engineer can later become a designer, a project engineer or a grid specialist. The consolidated national range is therefore a refined and de-duplicated estimate. EPC contractors, importers and manufacturers are organizations, not occupations. Their needs for labour have therefore been articulated through the engineers, the managers, the technicians, the procurement staff, the logistics specialists, the assembly workers and the quality-control staff of those organizations.

9.7 Indicative Investment Requirement for Human Resource Development

The cost of human resource development per year will depend on the duration of the course, use of laboratories, requirements of trainers, equipment, consumables, certification and workplace training.

For initial simulation:

- A lower cost case of BDT 60,000 per training place;
- A base case of BDT 80,000 per training place;
- A higher cost case of BDT 100,000 per training place

have been in constant 2026 prices.

The base case is a weighted average. Short technician courses might be less expensive but advanced BESS, grid, wind, W2E, finance and specialist courses might be considerably higher. Bangladesh's skills programs already have competency-based curricula, practical or simulated workplace activities and formal assessment, which should also be followed for renewable energy training. The simulation also takes into account some limited institutional costs for curriculum development, training of trainers, assessment systems, practical equipment, laboratory improvement and the national skills register.

Table 9.8: Preliminary Year-Wise Renewable Energy Training Investment

Year	New or Substantially Upskilled Persons (Approx.)	Institutional and Training-System Development	Low-Cost Estimate (Approx.)	Base-Case Estimate (Approx.)	Higher-Cost Estimate (Approx.)
2026	1,758	BDT 20 crore	BDT 30.5 crore	BDT 34.1 crore	BDT 37.6 crore
2027	4,400	BDT 15 crore	BDT 41.4 crore	BDT 50.2 crore	BDT 59.0 crore
2028	5,410	BDT 10 crore	BDT 42.5 crore	BDT 53.3 crore	BDT 64.1 crore
2029	4,653	BDT 5 crore	BDT 32.9 crore	BDT 42.2 crore	BDT 51.5 crore
2030	5,446	BDT 5 crore	BDT 37.7 crore	BDT 48.6 crore	BDT 59.5 crore
Total	21,667	BDT 55 crore	BDT 185.0 crore	BDT 228.4 crore	BDT 271.7 crore

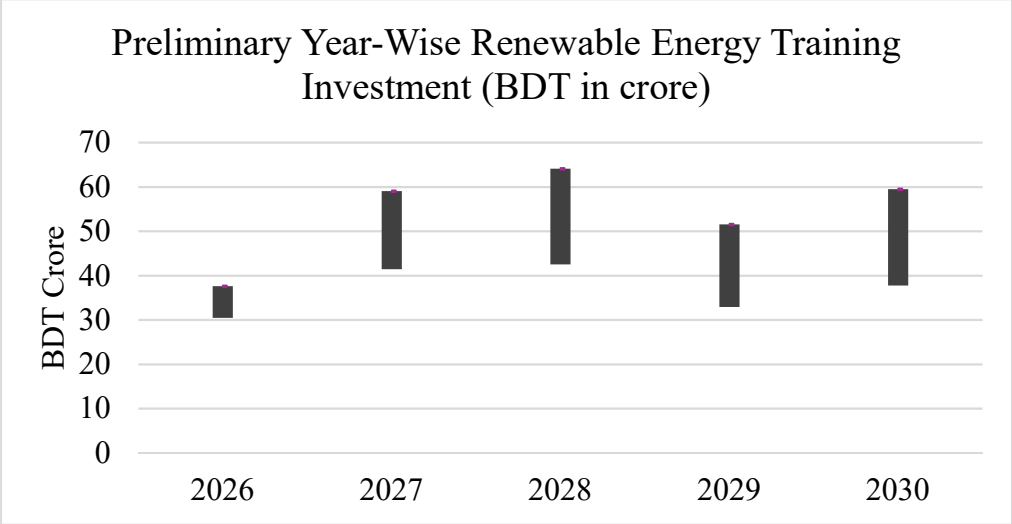


Figure 9.1: Preliminary year-wise RE training investment financial target plan

The preliminary simulation indicates that the base-case human resource development requirement for 2026–2030 is about BDT 228 crore at constant 2026 prices. This is a planning estimate and not a confirmed Government budget.

9.8 Monitoring and Updating of the Human Resource Simulation

SREDA, NSDA and BPMI will update the simulation every year with data from commissioned projects, EPC contractors, utilities, training institutions, professional bodies and employers. The update will compare forecast employment with actual job-years, permanent employment, certified personnel, vacancies, placement rates, regional shortages and training expenditure.

10.0 Financial Investment Planning

Substantial investments will be needed in generation projects and the enabling systems required to operationalize them to reach the 10,450 MW renewable energy capacity target in 2026-2030. These include project preparation, land and roof development, grid connection and evacuation, forecasting, SCADA, BESS/ESS, environmental and social safeguards, quality assurance, human resources and long-term operation & maintenance.

10.1 Financing Objectives and Principles

The investment and financing plan shall follow the following principles:

a. Commercially viable renewable energy projects shall primarily be financed and implemented through local and foreign private investment;
b. Public and concessional resources shall be used strategically for project preparation, grid and common infrastructure, access for underserved consumers, research, pilots, risk reduction and other public-interest requirements;
c. Financing instruments shall be matched with the risk, cash-flow profile and useful life of each project;
d. Government guarantees and contingent liabilities shall be used selectively, transparently and only after bankability and fiscal-risk assessment;
e. Investment commitments, financial close, disbursement and commissioning shall be reported separately;
f. Environmental, social, climate-resilience, gender and lifecycle costs shall be included from the beginning; and
g. Investment planning for 2031-2040 shall be finalized after the 2030 review confirms the updated demand, technology and grid pathway.

10.2 Investment Planning and Costing Method

Table 10.1: Renewable Energy Investment-Costing Framework

Investment Component	Items To Be Included	Costing Basis
Project preparation	Resource measurement, feasibility, land/roof due diligence, grid studies, Environmental and Social Impact Assessment (ESIA), legal and transaction advisory	Project or program-specific estimate
Generation facility	Modules/turbines/conversion equipment, civil works, structures, electrical system, controls, testing and commissioning	Technology-specific CAPEX based on current market and tender data
Grid connection and evacuation	Interconnection, substation, feeder, transmission, protection, metering, SCADA and communication	Utility-approved connection and system-impact plan
BESS/ESS and flexibility	Power capacity, energy capacity, duration, power conversion system, Energy Management System (EMS), safety systems and integration	Service- and location-specific sizing in MW and MWh
Environmental and social measures	Land and livelihood measures, biodiversity protection, community engagement, waste and emissions control	Approved Environmental and Social Impact Assessment (ESIA)/ Environmental and Social Management Plan (ESMP) and safeguard instruments
Financing and risk costs	Interest during construction, fees, insurance, hedging, guarantees, reserves and transaction costs	Financing term sheet and risk allocation
Operation and maintenance	Staffing, spares, warranties, monitoring, scheduled replacement and service contracts	Lifecycle O&M plan

End-of-life obligations	Decommissioning, site restoration, recycling and disposal of panels, batteries and other equipment	Funded or secured lifecycle plan

10.3 Financing Architecture

Table 10.2: Renewable Energy Financing Architecture

Financing Source/Instrument	Possible Mechanism	Priority Application
Private equity and commercial debt	IPP, PPP, MPP, merchant, captive, third-party, RESCO/OPEX and corporate investment	Commercial generation and customer-side projects with predictable cash flow
Renewable Energy Development Fund	Long-term or concessional lending, project preparation, risk-sharing and approved investment support	Renewable energy project financing and investment facilitation
Bangladesh Bank green and sustainable finance	Refinancing, eligible green lending, credit support and guidance to banks and finance companies	Rooftop, SME, industrial, agricultural and other eligible renewable energy investments
Multilateral and bilateral development finance	Concessional loans, grants, guarantees, transaction support and technical assistance	Grid, storage, utility-scale projects, climate-resilient systems and market development
Climate finance	GCF, GEF, CIF, national climate funds and other eligible facilities	Incremental climate benefit, resilience, access, innovation and emissions reduction
Government budget and ADP	Project preparation, public facilities, common grid infrastructure, data, standards, access and public-interest activities	Activities with clear public value or limited commercial revenue
PPP, MPP and competitive procurement	Private financing supported by transparent contracts, tariff or market arrangements and defined risk allocation	Utility-scale solar, W2E, floating solar, charging and shared infrastructure where suitable
Capital markets	Green bonds, sustainability bonds, project bonds, infrastructure funds and Sukuk under applicable regulations	Mature project portfolios and refinancing after construction risk is reduced
Guarantee and payment-security instruments	Escrow, revolving LC, partial credit/risk guarantee, insurance and other approved instruments	Specific payment, credit, political or construction risks
REC, RPO and carbon finance	Supplementary revenue linked with verified renewable attributes and emission reductions	Improvement of project viability; not a substitute for sound project fundamentals
Microfinance and consumer finance	Small loans, lease, pay-as-you-go and community financing	Households, small enterprises, clean cooking and decentralized energy access

10.4 Total Investment Requirement by Phase & Technology

Using the benchmark rate of around US$ 1 billion per 1,000 MW for solar PV (DC current basis), US$ 2.5 billion per 1,000 MW for offshore wind (US$ 1.5B for onshore wind) and US$ 2 billion per 1,000 MW for waste-to-energy, the total investment requirement across three phases is estimated at approximately US$ 40.6 billion, as shown in Table 10.3 below.

Table 10.3: Total Investment Requirement by Phase & Technology plan

Technology	Phase 1 2026–2030 (US$ B) (approx.)	Phase 2 2031–2035 (US$ B) (approx.)	Phase 3 2036–2040 (US$ B) (approx.)	Total Investment (US$ B) (approx.)
Solar PV (All Types)	8.18	9.01	9.35	26.54
Onshore Wind	0.45	1.05	1.50	3.00
Offshore Wind	0.00	0.75	1.25	2.50
Waste-To-Energy (MSW + Biomass)	0.60	1.20	2.00	3.80
Grid Infrastructure & Storage (BESS)	1.00	1.50	2.28	4.78
Total Investment Required	10.73	13.51	16.38	40.62

Note: *The investment requirements presented in this table are preliminary and indicative planning estimates based on initial technology cost benchmarks and roadmap assumptions. They do not represent approved budgets as of now, fixed investment requirements or confirmed financing commitments. Actual investment requirements may vary significantly with technology costs, project design and location, exchange rates, financing costs, grid and BESS requirements, procurement outcomes, environmental and social requirements and prevailing domestic and international market conditions. Estimates for the post-2030 period shall be reviewed and updated following the comprehensive review of the 2030 roadmap.*

10.5 Financial Sources, A Comprehensive Framework

Mobilizing US$ 40.6 billion over 15 years requires a carefully structured blend of public, private, domestic and international finance. No single source can cover this requirement. The strategy is built on four pillars: (i) concessional international finance from multilateral and bilateral sources, (ii) climate-dedicated finance from global funds, (iii) private capital mobilized through de-risking instruments and (iv) domestic resource mobilization.

10.6 Multilateral Development Banks (MDBs), US$ 7.60-8.95 Billion approx. (22%)

MDBs are the backbone of the financing strategy, offering long-tenor concessional loans (20–30 years), technical assistance and guarantee instruments that crowd in private capital.

Table 10.4: MDB Financing: Key Institutions, Instruments & Indicative Targets

Institution	Instrument	Focus Area	Indicative Allocation (US$ B) (Approx.)
Asian Development Bank (ADB)	ADF Concessional Loans, Guarantees, Equity	Grid-Scale Solar, Grid Modernization	2.50-3.00
World Bank / IDA	IDA Credits, IBRD Loans, PRG	Rooftop Solar, Rural RE, W2E	2.20-2.50
Islamic Development Bank (IsDB)	Murabaha, Istisna'a Financing	Solar, Wind, Islamic Finance Window	1.30-1.50
Asian Infrastructure Investment Bank (AIIB)	Project Finance, Co-financing	Large Grid Solar, Infrastructure	1.00-1.20

New Development Bank (NDB)	Project Loans	W2E, Biomass, Grid Storage	0.60-0.75
Total MDB financing			7.60-8.95

Note: *The institutions, financing instruments, indicative terms and allocations presented in this table are included for preliminary financing-planning purposes only and do not constitute confirmed commitments. Actual access, financing volume, pricing, tenor and instrument will depend on project eligibility, country and institutional programming, due diligence, negotiations, applicable financing policies and approval by the respective institutions and the Government of Bangladesh.*

10.7 Climate Funds: US$ 4.50-4.88 Billion approx. (12%)

Bangladesh, as a Least Developed Country (LDC) and climate-vulnerable nation, has preferential access to global climate finance mechanisms. These funds provide grants and highly concessional finance, effectively reducing the cost of capital for RE projects.

a. Green Climate Fund (GCF): Bangladesh can access GCF resources through accredited entities, including Infrastructure Development Company Limited (IDCOL), Bangladesh's first GCF Direct Access Accredited Entity. GCF can finance up to 50% of project costs as grants or concessional loans. Target: US$ 1.90-2.00B (approx.) across phases 1–3.
b. Climate Investment Funds (CIF): Scaling Up Renewable Energy Program (SREP): Dedicated instrument for grid-connected RE in LDCs. Provides first-loss guarantees and concessional co-financing. Target: US$ 1.10-1.20B (approx.).
c. Adaptation Fund (AF): Supports climate-resilient RE infrastructure, particularly off-grid solar for climate-vulnerable coastal and char areas. Target: US$ 0.45-0.50B (approx.).
d. Global Environment Facility (GEF): Co-financing for technical assistance, capacity building and grid integration studies. Target: US$ 0.45-0.50B (approx.).
e. CTCN / UNEP Green Finance: Technical grants for feasibility studies, policy reform support and blended finance structuring. Target: US$ 0.32-0.38B (approx.).
f. Loss & Damage Fund (COP28): Bangladesh is eligible for L&D fund support for extreme weather resilient RE infrastructure. Target: US$ 0.28-0.30B (approx.).

10.8 Bilateral Concessional Loans: US$ 5.40-6.10 Billion approx. (15%)

Bangladesh has strong bilateral relationships with major development finance providers. Bilateral Official Development Assistance (ODA) loans typically carry interest rates of 0.01–2% with 30–40-year tenors, making them extremely attractive for capital-intensive RE infrastructure.

Table 10.5: Key Bilateral Financing Partners

Country / Agency	Instrument	Priority Technology	Target (US$ B) (approx.)
Japan (JICA)	ODA Yen Loans	Grid Solar, Smart Grid, BESS, Offshore Wind	1.75-1.80
Germany (KfW)	Development Loans & Grants	Rooftop Solar, Energy Efficiency, W2E	0.90-1.00
China (Exim / CDB)	Preferential Buyer's Credit	Large Solar Plants, W2E, Grid Infrastructure	1.00-1.20

South Korea (EDCF)	EDCF Concessional Loans	Industrial Solar, Smart Meters, Grid	0.60-0.70
India (EXIM India)	Line of Credit	Solar components, mini-grids, shared grid	0.35-0.40
USA (DFC / USAID)	DFC Loans, Grants, PGII	Offshore Wind, BESS, Clean Energy R&D	0.40-0.50
Netherlands / Denmark	Bilateral Grants + Loans	Offshore Wind, Blue Economy RE	0.40-0.50
Total Amount			5.40-6.10

Note: *The bilateral partners, financing instruments, indicative terms and potential financing volumes presented in this table are illustrative planning references based on available information and initial assessment. They should not be interpreted as offers, negotiated terms, Government-to-Government agreements or financing commitments by the institutions or countries identified. Actual financing opportunities and terms shall be determined through formal engagement, project preparation, bilateral consultation, due diligence and the applicable approval processes of the Government of Bangladesh and the respective development partners.*

10.9 Private Sector & Foreign Direct Investment (FDI): US$ 7.00-7.32 Billion approx. (18%)

Private capital is essential to achieving Bangladesh's RE targets at scale. The Government must create an enabling environment through stable policy, transparent offtake agreements (Power Purchase Agreements, PPAs) and effective risk mitigation instruments to attract international and domestic private investors.

Table 10.6: Private Sector Finance Instruments & Mechanisms

Instrument	Description & Mechanism	Suitable Technology	Indicative Volume (US$ B) (approx.)
Independent Power Producers (IPP)	Long-term PPAs (20–25 yr) with BPDB/government offtake guarantee; BOOT/BOO models with transparent competitive tendering (reverse auction)	Large grid solar, wind, W2E	2.80-3.00
Build-Own-Operate (BOO) Private Projects	Merchant power, industrial self-supply, direct wheeling to industry; BGMEA/BKMEA factory solar	Industrial & commercial rooftop	1.45-1.50
Foreign Direct Investment JV with GoB	Joint ventures where a private foreign developer holds 49–74% equity with BPDB or state entities; risk shared	Offshore wind, large solar parks	1.45-1.50
Domestic Private Sector Investment	Local banks, NBFIs and private developers financing rooftop and small-scale solar under SREDA licensing	Rooftop, agrivoltaics, mini-grids	1.30-1.32
Total private sector investment			7.00-7.32

Note: *The private-sector financing mechanisms and indicative volumes presented in this table are preliminary planning assumptions and do not represent committed private investment or predetermined project structures. Actual investment volumes and financing arrangements will depend on project bankability, market conditions, investor interest, applicable laws and regulations, procurement outcomes, tariff and offtake arrangements, foreign-exchange conditions, risk allocation and access to debt and equity finance.*

10.10 Green Bonds & Sustainable Finance: US$ 3.00-3.26 Billion approx. (8%)

a. Sovereign Green Bond: Bangladesh should issue its inaugural sovereign green bond (targeting US$ 500M–US$ 1B per issuance) for RE and climate resilience. Sri Lanka and India have successfully issued sovereign green bonds; Bangladesh's LDC status and strong environmental credentials make it well-positioned.
b. Corporate Green Bonds: BPDB, IDCOL and leading private utilities can issue corporate green bonds on domestic and international markets (Eurobond format), with proceeds ring-fenced for RE projects verified under ICMA Green Bond Principles.
c. Bangladesh Securities and Exchange Commission (BSEC) RE Bond Framework: Develop a domestic regulatory framework permitting listed RE-specific bonds on the Dhaka Stock Exchange (DSE), enabling domestic institutional investors (insurance companies, pension funds, mutual funds) to participate.
d. Sustainability-Linked Bonds (SLBs): Structure bonds with interest rate step-up/step-down provisions tied to renewable capacity milestones, incentivizing implementation performance.

10.11 Carbon Credits, Article 6: US$ 1.22 Billion approx. (3%)

a. Paris Agreement Article 6.2 Bilateral Carbon Trading: Bangladesh can enter bilateral ITMOs (Internationally Transferred Mitigation Outcomes) agreements with Japan, South Korea, Switzerland and Singapore — these countries are actively purchasing carbon credits to meet NDC targets. Each 1,000 MW of solar displaces ~1.1-1.2 million tons of CO_2/year in Bangladesh; at US$ 15–US$ 50/ton, this generates US$ 16–US$ 60M/year per GW.
b. CORSIA (Carbon Offsetting for Aviation): RE projects qualifying under CORSIA provide revenue from airline carbon offsetting purchases.
c. Voluntary Carbon Markets (VCM): Gold Standard and Verra-verified RE credits from Bangladesh (off-grid solar, mini-grids, SHS) attract premium prices of US$ 5–US$ 20/tons in voluntary markets.
d. Results-Based Climate Finance (RBCF): World Bank's TCAF and ADB's Energy Transition Mechanism pay per ton of CO_2 reduced post-verification.

10.12 Government Budget & Domestic Sovereign Bonds: US$ 4.07 Billion approx. (10%)

a. Annual Development Program (ADP): Increase dedicated RE allocation in ADP from current ~0.5% to at least 2–3% of total ADP by 2027.
b. Bangladesh Infrastructure Development Fund (BIDF): Create a dedicated RE Infrastructure Fund under the Finance Ministry, capitalized at BDT 5,000 crore initially, drawing from energy subsidy savings as fossil fuel use declines.
c. National Savings Certificates (NSC): Offer RE-dedicated NSCs at competitive rates to retail investors — tapping Bangladesh's large household savings (gross savings rate ~29% of GDP).
d. Energy Subsidy Reallocation: As fossil fuel subsidies are phased down, redirect a proportion of fiscal savings directly to RE infrastructure grants and viability gap funding (VGF) for less commercially attractive technologies (offshore wind, W2E).

10.13 IDCOL, Local DFIs & PPP: US$ 2.85 Billion approx. (7%)

a. IDCOL (Infrastructure Development Company Ltd): Bangladesh's most successful RE financier — US$ 780M+ disbursed for 6M+ Solar Home Systems. Expand IDCOL's mandate and capital base to finance grid-connected solar, floating solar and agrivoltaics. ADB, World Bank and KfW are existing IDCOL co-financers.
b. Bangladesh Development Bank Ltd (BDBL) & Sonali Bank: Establish dedicated Green Finance windows with Bangladesh Bank guidance; mobilize domestic bank lending to RE projects at concessional rates.
c. PPP Authority (PPPA): Structure RE projects under the PPP Act 2015, enabling government Viability Gap Funding (VGF) of up to 30% of project cost for commercially marginal technologies, reducing private sector risk.
d. Bangladesh Bank Green Refinancing Scheme: Expand the existing BB green refinance scheme (currently BDT 200 crore) to BDT 5,000 crore to enable commercial banks to on-lend at reduced rates for RE projects.

10.14 Master Financing Plan, Phase-wise Source Allocation

Table 10.7 presents the comprehensive phase-by-phase allocation across all identified financing sources, ensuring the total investment of approximately US$ 40.62 billion is fully covered.

Table 10.7: Master Financing Plan, Source Allocation by Phase (US$ Billion) approx.

Financing Source	Share % (approx.)	Phase 1 2025–30 (US$ B) (approx.)	Phase 2 2031–35 (US$ B) (approx.)	Phase 3 2036–40 (US$ B) (approx.)	Total (US$ B) (approx.)
Multilateral Development Banks (ADB, World Bank, IDB)	22%	1.98	2.33	4.64	8.95
Green Climate Fund (GCF) & Climate Investment Funds (CIF)	12%	1.08	1.27	2.53	4.88
Bilateral Concessional Loans (Japan JICA, China CDB, KfW Germany)	15%	1.35	1.59	3.16	6.10
Private Sector / Foreign Direct Investment (FDI)	18%	1.62	1.91	3.79	7.32
Government Budget & Sovereign Bonds	10%	0.90	1.06	2.11	4.07
Green Bonds (Domestic & International)	8%	0.72	0.85	1.69	3.26
Islamic Finance / Sukuk Bonds	5%	0.45	0.53	1.06	2.04
Carbon Credits & REDD+ Mechanisms	3%	0.27	0.32	0.63	1.22
IDCOL & Local Development Finance Institutions	4%	0.36	0.42	0.85	1.63
Public-Private Partnership (PPP) Equity	3%	0.27	0.32	0.63	1.22

Grand Total	100%	10.73	13.51	16.38	40.62

Note: *Key financing principle: Concessional international finance (MDBs + Climate Funds + Bilateral) covers 49% (US$ 19.93B), the largest share given Bangladesh's LDC status and strong eligibility. The private sector provides 25% (US$ 10.17B) through a mix of IPP, FDI and domestic investment. The remaining 26% comes from domestic sources, including green bonds, Islamic finance, government budget, carbon credits and DFIs.*

10.15 Technology-Specific Financing Strategies

10.15.1 Solar Energy: US$ 26.54 Billion

Solar PV is the dominant technology and the most mature financing market. Three sub-strategies are recommended:

Table 10.8: Solar Sub-Sector Financing Strategy

Solar Sub-Sector	Primary Finance Source	Secondary Sources	Finance Model	Investment (US$ B) approx.
Grid-Scale MW Solar Parks	ADB, World Bank, JICA ODA Loans	GCF, KfW, Private IPP, Green Bonds	BOOT / IPP with PPA	8.90-9.00
Industrial Rooftop (BGMEA/BKMEA)	Private Banks, CAPEX/OPEX PPAs	BB Green Refinance, DFC, domestic bonds	OPEX Model (Zero CAPEX)	2.80-3.00
Govt / Institutional Rooftop	Government ADP, Sovereign Green Bond	ADB, World Bank, JICA	Govt Capital Expenditure	9.00-10.00
Floating Solar	ADB, GCF, AIIB, Private JV	JICA, bilateral grants	JV BOO model	0.50-0.60
Agrivoltaics & Irrigation Solar	IsDB, World Bank, IFAD	GCF, Adaptation Fund, Agri Ministry	Subsidized lending, NGO-led	1.00-1.20
SHS, Mini-Grids & Off-Grid Solar	IDCOL, GCF, ADB (Rural Energy)	NGOs, microfinance, carbon credits	Microcredit / Results-based	1.50-1.66
R&D Solar (BIPV, CSP, etc.)	Government R&D Budget, GEF, CTCN	Academic partnerships, bilateral grants	Grant + Equity	1.00-1.08

Note: *The financing sources, models and investment ranges presented in this table are preliminary and indicative planning estimates intended to illustrate potential financing pathways for the respective solar sub-sectors. They do not represent approved Government allocations, confirmed financing commitments, agreed financing structures or assured availability of funds from any institution identified. Actual financing requirements and arrangements shall be determined through detailed feasibility studies, project structuring, procurement, financing negotiations and applicable Government and institutional approval processes, and may vary with technology costs, project scale, market conditions, financing terms and other prevailing circumstances.*

10.15.2 Wind Energy: US$ 5.50 Billion

Bangladesh has significant untapped wind potential, particularly offshore in the Bay of Bengal and coastal zones (Cox's Bazar (including Chakaria and Inani), Kuakata (Patuakhali), Kutubdia Island, Sandwip and the coastal belt of Khulna). Wind energy requires specialized financing due to its higher upfront costs and technological complexity.

a. Onshore Wind (3,000 MW by 2040, US$ 3.0B approx.): Bankable onshore sites exist at Kutubdia, Feni and coastal chars. Primary financing: JICA ODA loans, ADB, private IPP under 20-yr PPAs. Key challenge: grid connectivity and land acquisition.

b. Offshore Wind (1,000 MW by 2040, US$ 2.5B approx.): Bangladesh's exclusive economic zone (EEZ) offers excellent offshore wind resources (Class 4–5 wind speeds). Requires specialized DFI support, ADB's Offshore Wind Development Fund, World Bank ESMAP and partnership with Danish/Dutch offshore wind developers.
c. Wind-Solar Hybrid (R&D Phase → Scale): Hybrid sites reduce grid integration challenges and optimize land use. GCF and SREP are suitable co-financers for pilot projects.
d. National Wind Resource Atlas: SREDA should commission a comprehensive offshore wind resource assessment (LIDAR measurement campaign) funded by JICA, World Bank, or bilateral grants; estimated cost US$ 10M approx., as a prerequisite for attracting private developers.

10.15.3 Waste-to-Energy: US$ 3.80 Billion approx.

Bangladesh generates approximately 13,000 tons of municipal solid waste (MSW) daily, with this figure set to double by 2040. W2E plants convert this waste stream into electricity while reducing landfill pressure, methane emissions and urban pollution, offering triple environmental co-benefits.

10.16 Financial Implementation Roadmap

Table 10.9: Key Actions for Financial Mobilization, Phase-wise Milestones

Phase	Timeline	Key Financial Mobilization Actions	Target Finance to Mobilize (approx.)
Phase 1 Foundation	2025–2030	(1) Issue Bangladesh's inaugural Sovereign Green Bond (US$ 500M). (2) Sign ADB RE Framework Financing Agreement (US$ 1.5B). (3) Register the first GCF-accredited program (US$ 500M). (4) Launch Offshore Wind Resource Assessment. (5) Establish BB Green Refinance Scheme expansion to BDT 5,000 crore. (6) Launch first competitive solar auction (reverse tender) 500 MW. (7) Negotiate first Article 6.2 ITMOs agreement with Japan.	US$ 10.73 Billion
Phase 2 Scale-Up	2031–2035	(1) Issue second sovereign green bond (US$ 1B). (2) Launch Bangladesh Green Sukuk (US$ 500M). (3) First offshore wind IPP tender (200 MW pilot). (4) GCF Phase 2 program (W2E and industrial solar, US$ 1B). (5) IDCOL capitalization increases to US$ 2B. (6) DSE green bond listing framework operational. (7) Bangladesh joins the ASEAN+3 green finance network.	US$ 13.51 Billion
Phase 3 Transition Complete	2036–2040	(1) Full offshore wind scale-up (US$ 1.25B ADB/JICA/Private). (2) Issue Bangladesh's third green bond series (US$ 1.5B). (3) Carbon credit revenue fully operational (US$ 200M+ annually). (4) Domestic RE financing self-reliance through mature local capital markets. (5) Bangladesh transitions from ODA recipient to emerging market RE finance model.	US$ 16.38 Billion

Note: *The milestones, financing actions and amounts presented in this table constitute an indicative financial-mobilization scenario for roadmap planning purposes and shall not be interpreted as already approved committed financing, agreed borrowing programs, confirmed bond issuances or commitments by any development partner, financial institution or private investor. Implementation of each action will be subject to detailed assessment, Government policy and fiscal decisions, project readiness, market conditions, financing negotiations, applicable regulatory requirements and approval by the competent authorities. The timing, sequencing, financing instruments and amounts may therefore be revised during periodic roadmap reviews in response to evolving domestic and international circumstances.*

11.0 Inclusion of BESS/ESS in Renewable Energy Mapping

BESS/ESS should be considered as a key enabling infrastructure for the implementation of the Renewable Energy Roadmap of Bangladesh, particularly for integrating large-scale solar generation, supporting evening peak demand, improving power-system flexibility and increasing the reliability of transmission and distribution networks. Storage capacity shall be separately quantified in MW and usable MWh and shall not be added to renewable-generation capacity. The last BESS requirement needs to be determined based on power system studies and techno-economic evaluations for the specific project. However, to ensure that storage is evaluated systematically rather than only considered at a later stage, techno-economic feasibility studies for large-scale solar projects shall also evaluate, at a minimum, a BESS configuration with a power rating equivalent to 10% of the solar system's DC capacity. The total BESS power capacity, usable energy capacity, storage duration and operating strategy will be determined by the required grid or consumer service and economic viability.

11.1 Strategic Rationale and Role of BESS/ESS

Bangladesh's 2026-2030 renewable energy program has 5,500 MW of rooftop solar and 4,500 MW of ground-mounted solar. As the solar generation is planned to grow faster than ever before in Bangladesh in the coming days, the power system requires more flexibility to manage mismatches in the timing of renewable generation and electricity demand, local network constraints, forecast errors, reserve requirements and system contingencies. BESS should progressively accompany utility-scale solar, large industrial/commercial rooftop systems and grid-constrained locations where studies demonstrate system value. However, storage capacity and quality shall be assessed together with grid reinforcement, renewable-energy forecasting, demand response, flexible generation, smart-grid operation and regional electricity cooperation.

11.2 Bangladesh Power-System Context

The electricity demand profile of Bangladesh typically shows a pronounced evening peak after solar generation declines. An increase in solar capacity means an increased demand for demand management, energy shifting, flexible generation and other system-balancing resources. Higher daytime solar injections may also be associated with local reverse power flow, voltage variation, feeder or substation congestion and renewable-energy curtailment where there is insufficient network capacity, system operation or demand. These impacts will not be uniform across the country and therefore shall be evaluated in feeder, substation, project and system

level studies. The surplus or curtailed energy coming from solar thus needs to be managed by energy storage technologies.

11.2.1 The Evening Peak Problem

Bangladesh shows a typical dual-peak pattern of electricity demand. **BPDB and PGB PLC consistently show that evening demand is much higher than daytime demand. For example, Bangladesh's highest peak demand in 2023 was 15,648 MW at 9 pm on 19 April 2023**. The evening peak hours are approximately between 6 pm and 9 pm, which is also the period of zero solar generation. This structural mismatch means that solar power alone, without storage, is not a solution to the country's most severe supply problem: reliably and affordably meeting evening demand. Integration of BESS and ESS at suitable nodes of the power system would ease the sharp rise in peak demand, which the grid now meets by utilizing gas-, oil- and imported power, which are expensive, face import constraints and also fuel BPDB's chronic revenue deficit.

11.2.2 Daytime Off-Peak Surplus and Curtailment Risk

Bangladesh's demand is relatively low during the daytime, which is considered off-peak time. As solar capacity scales towards the 10,000 MW target for 2030, the national grid will have to contend with a significant **midday surplus**. This problem is already emerging, with a possible 15-20% curtailment of solar during midday peaks in the northern divisions of Bangladesh, largely due to gaps in substation upgrades. The Power Grid Bangladesh PLC has allocated US$1.2 billion for grid expansion through 2028, but near-term gaps are leaving completed solar projects to absorb off-take risk. BESS can be deployed alongside these installations to capture and dispatch stranded generation during peak hours.

11.3 Bangladesh BESS Reference Assessment and Indicative Range

A World Bank-supported assessment for Bangladesh found that rooftop solar and BESS can reduce transformer and feeder loading, improve voltage, support peak management, defer selected investments and improve supply to essential loads during outages. The same assessment showed that BESS could be competitive with diesel for back-up for shorter durations, though the optimal configuration varied significantly with battery cost, duration of outage and the assumed value of unserved energy. The study revealed different values optimized for storage, assuming battery cost and reliability. Modeled configurations spanned a wide range, from roughly 476 MW to 2,342 MW, with energy capacities of 1,876 MWh to 4,466 MWh. The results indicate that storage needs are very sensitive to the assumptions made. BESS should be used where analysis indicates a clear technical requirement and economic benefit. It will not be used as a substitute for all required investments in transmission and distribution.

Table 11.1: Bangladesh BESS Reference Scenarios from Existing Technical Assessment

Assessment Result	Indicative Range Identified	Roadmap Interpretation
BESS power capacity	Approximately 476–2,342 MW	Preliminary reference range only

BESS energy capacity	Approximately 1,876–4,466 MWh	Preliminary reference range only
Main variables affecting the result	Battery cost, outage conditions, value of unserved energy and alternative diesel capacity	Values cannot be transferred directly into a national target
Roadmap treatment	Complete updated national and project-specific studies	Establish confirmed MW, MWh, duration, location and service requirements

These figures, presented in Table 11.1, are not adopted as national targets because the assessment underlying these was mainly focused on distribution-system reliability and backup applications and did not model the full 10,450 MW roadmap program. These references provided a Bangladesh-specific reference and demonstrated the need for an updated national assessment of flexibility and storage.

11.4 Linkage with Renewable Energy Roadmap Targets

A review of the Renewable Energy Roadmap tables reveals that BESS is already referenced as a required operational mode for several target categories:

Table 11.2: Renewable Energy Roadmap Applications Referencing BESS/ESS

Roadmap Target	Mode	Est. Target 2030 (MW)	Est. Target 2040 (MW)
Grid-Connected Industrial Rooftop Solar	On-grid / BESS	1,000	2,000
Solar EV Charging Stations	Off/On-grid / BESS	50	200
PV-Based Pumped Hydro Storage	Off/On-grid / BESS	2 (R&D)	20
MW-Scale Grid Solar Plants	On-grid (BESS implied)	2,000	6,000
Rooftop Solar — Govt. Offices/Academic Institutes/Hospitals etc.	On-grid / Net Metered	1500	6,500

Industrial rooftop solar (1,000 MW by 2030, led by BGMEA and BKMEA in the garments sector) is explicitly listed as 'On grid/BESS' mode. The garment industry is Bangladesh's economic backbone, contributing over 10% of GDP and 80% of total exports and requires reliable, 24/7 power. Without BESS, rooftop solar serves the factory only during working hours; with BESS, factories can reduce grid dependence during peak evening shifts and actively manage their energy costs.

BESS should be viewed as a critical enabling infrastructure for higher renewable energy penetration, not an optional add-on to individual projects. Its implementation should be incrementally phased into utility-scale solar, large industrial and commercial rooftop systems, renewable energy charging facilities and other places where storage can deliver demonstrable system value. Priority applications may include evening peak support, renewable energy shifting, local network congestion reduction, renewable energy curtailment mitigation, frequency and voltage support, backup capability for critical loads and power quality improvement.

The need for BESS should be determined by techno-economic studies specific to the system and project and not by applying a fixed percentage of renewable energy capacity. However, for the purpose of techno-economic feasibility assessment, BESS sizing for solar power projects can initially be assessed from a minimum benchmark equivalent to 10% of the DC capacity of

the solar system and the final capacity will be determined based on target requirements, operating objectives, storage duration and economic viability. Grid-connected projects should therefore consider the appropriate BESS power rating (MW), usable energy capacity (MWh), duration, operating strategy and point of connection during the project preparation.

The demonstration and early commercial deployment of BESS at selected utility-scale renewable-energy projects, industrial rooftop clusters, substations and grid-constrained locations needs to be prioritized in 2026–2030. There should be systematic monitoring of the operational results of these projects, including peak reduction, renewable-energy utilization, curtailment avoided, response time, system availability, battery degradation and economic performance. The findings can then be used to inform the development of additional technical requirements, procurement arrangements, tariff treatment and future scale-up toward 2040.

PGB PLC, BPDB and the distribution utilities should progressively integrate storage assessment into renewable-energy planning, grid-connection studies and network-development plans, with SREDA and BERC supporting the relevant technical, monitoring and regulatory framework.

11.5 BESS/ESS Mapping and Sizing Methodology

BESS shall be mapped by location, connection level, ownership and service. Every proposed installation shall state both its power capacity in MW and its usable energy capacity in MWh. A storage proposal expressed only in MW shall not be considered adequate for planning or procurement.

Table 11.3: Minimum BESS/ESS Mapping Requirements

Parameter	Required information
Storage technology	Battery chemistry or other storage technology
Power capacity	MW
Usable energy capacity	MWh
Discharge duration	Hours at rated output
Installation arrangement	Co-located, stand-alone, behind-the-meter, shared or mini-grid
Connection level	Transmission, distribution or consumer premises
Primary service	Energy shifting, fast frequency response, voltage support, congestion relief, backup or multiple services
Charging source	Renewable electricity, grid electricity or mixed source
Location and grid node	Project site, feeder, substation or load centre
Performance	Round-trip efficiency, response time, availability, cycle life and degradation
Operating strategy	Charging and discharging schedule, reserve level and dispatch authority
Commercial model	Developer-owned, utility-owned, storage-as-a-service or consumer-owned
Lifecycle treatment	Warranty, augmentation, repurposing, recycling and final disposal
Project status	Study, procurement, construction, commissioning or operation

11.6 Economic and Commercial Assessment

If BESS is not included exclusively in the new RE capacity addition stages, the 10,000 MW of solar capacity, including that from prosumers benefiting from the net-metering facility, cannot be reliably dispatched. No fixed national BESS capacity has been adopted at this stage. The

required storage capacity, duration, location and services shall be determined by the assessment of national flexibility and storage needs. The 10% solar-DC benchmark defined in this roadmap is intended as a minimum techno-economic assessment case and should not be taken as a predetermined national BESS capacity target.

11.6.1 Global BESS Cost Trajectory: A Paradigm Shift

The cost of global battery energy storage has fallen dramatically; however, various sources quote different prices depending on whether they are discussing battery packs, complete storage systems, or fully installed projects. These values should not be seen as interchangeable.

The global weighted-average installed cost of utility-scale battery storage declined from about US$ 2,571/kWh in 2010 to US$ 192/kWh in 2024, according to IRENA. This implies a major long-term cost reduction. However, actual costs in Bangladesh are subject to import duties, taxes, financing, transport, land, civil works, grid connection, fire protection, control systems, warranty, degradation, augmentation and recycling obligations. Therefore, project decisions in Bangladesh should be based on competitive tender results and project-specific life-cycle analyses rather than on a single global price forecast.

11.6.2 Comparative Cost: BESS vs. Oil-Fired Peaking Plants

The economic value of BESS shall be compared against the realistic alternatives for the same service. For evening energy shifting, the alternatives may include flexible thermal generation, demand response, regional imports and other storage technologies. For short-duration outage support, the alternative may be diesel generation, feeder reinforcement or an alternative supply connection. A Bangladesh assessment, supported by the World Bank, found that BESS could be cost-competitive with diesel for shorter outages, while combined BESS and diesel arrangements could be more economical for longer outages. The result still hinged on the cost of batteries and the value of unserved electricity. Therefore, the economic assessment shall consider the full lifecycle cost and value of each service rather than comparing only the capital cost of BESS with the fuel cost of a peaking plant.

Currently, Bangladesh relies heavily on oil-fired power plants to meet peak evening demand, which are among the costliest sources of generation worldwide and a major cause of financial losses for BPDB. The Government's own acknowledgment of considering coal plants to replace oil peakers highlights how urgently cheaper peak power is needed.

BESS charged from cheap daytime solar offers a real alternative to oil-fired peaking. In comparable markets such as India, BESS auctions have cleared at around US$12/kWh/year (with capital subsidies) and Saudi Arabia has set a record capex of US$73–75/kWh. On a Levelized Cost of Storage (LCOS) basis, BESS is already cheaper than gas and oil peaker plants in several global markets and is the preferred choice for new peaking capacity. Given the high peaker costs in Bangladesh, BESS economics are likely to stack up favorably even without subsidies, especially as solar costs continue to fall.

11.6.3 Solar Curtailment Avoided Cost

Solar curtailment is an economic loss. BESS co-located with solar plants can absorb any surplus solar generation rather than waste it, either due to curtailment or to generation exceeding requirements. For example, a 100 MW solar plant curtailed by 15%, resulting in a significant loss of dispatchable MWh during peak curtailment hours. This is millions of BDT of stranded revenue per plant, annually at the grid tariff rates in Bangladesh. BESS turns this

stranded energy into peak power in the evenings, improving the economics of solar investments across the entire solar target 2030 pipeline.

11.6.4 Avoided Transmission Infrastructure Costs

PGB PLC has committed significant investment through 2028 to transmission upgrades to accommodate the integration of renewables. Strategic deployment of BESS, especially at the distribution level at rooftop solar and industrial sites, can defer or reduce transmission investment by balancing local generation and demand. Every BDT transmission cost avoided by deploying storage improves the economics of the solar program itself.

11.6.5 Quantitative benefit summary

The following table summarizes the primary economic and operational benefits of BESS deployment in support of Bangladesh's Renewable Energy Roadmap:

Table 11.4: BESS/ESS Economic and Operational Assessment Framework

Benefit Category	Quantification Basis	Estimated Impact
Evening energy shifting	1,800 MW BESS x 4 hrs. = 7,200 MWh/day shifted from oil peakers	US$ 200–400M/year in fuel cost avoidance
Solar curtailment recovery	15–20% curtailment on ~1,000 MW = 150–200 MW recovered	BDT 500–1,000 crore annual revenue recovery
Transmission cost deferral	Distributed BESS reduces upgrade requirements	Partial offset of PGB 's US$ 1.2B expansion plan
Industrial reliability premium	Garments sector exports US$ 40B+/year; power reliability critical	Avoidance of production losses from outages
Grid stability services	Frequency regulation and voltage support reduce system operating cost	US$ 10–30M/year in ancillary service value
Carbon finance	Displacement of oil-fired peaking enables carbon credit generation	US$ 5–20M/year at current carbon prices

Battery Energy Storage Systems are not peripheral to Bangladesh's Renewable Energy Roadmap; they are load-bearing infrastructure for it. The solar generation profile (daytime-only) is naturally out of phase with Bangladesh’s demand profile (evening peak). To scale solar to 10,000 MW by 2030 without storage will mean midday surpluses, curtailment and transmission stress and leave the evening peak reliant on expensive oil-fired generation. BESS addresses this mismatch by shifting low-cost solar energy to when the grid demands it most.

The economic case has transformed. Global BESS costs declined by 31% over one year to US$117/kWh in 2025, with further reductions expected. Solar-charged BESS already rivals and, in many markets, undercuts the cost of oil- and gas-fired peaker plants when measured on a levelized cost-of-storage basis. Bangladesh, too, is on a knife-edge, with its crippling dependence on oil imports and the BPDB revenue crisis.

11.7 Key Risks and Mitigation Measures

Table 11.5: Key Risks Associated with BESS/ESS Deployment and Recommended Mitigation Measures

Risk	Recommended mitigation
High upfront cost	Competitive procurement, phased deployment, concessional finance and service-based ownership models
Unclear revenue model	Define contracted service, payment responsibility, performance requirement and settlement procedure
Incorrect sizing or location	Require grid, load, renewable-generation and economic studies before procurement
Regulatory gap	Develop BESS/ESS guideline, grid-connection procedures, metering rules and tariff treatment through Power Division, SREDA, BERC, PGB PLC, BPDB and distribution utilities
Battery degradation	Specify usable capacity, efficiency, state of health, augmentation and end-of-warranty requirements
Fire and electrical risk	Apply recognized safety standards, site-specific hazard assessment, separation, ventilation, detection, suppression and emergency-response requirements
Limited technical capacity	Include training, technology transfer, local O&M and supervised commissioning in contracts
Import and supply-chain risk	Apply technical prequalification, supplier due diligence, warranty security and spare-parts requirements
Recycling and disposal	Require the producer or supplier to take back, authorized transport, repurposing, recycling and environmentally sound disposal
Cybersecurity risk	Apply secure communication, access control, software updates, event-logging and incident-response requirements
Climate and site risk	Design for flooding, high temperature, humidity, salinity, cyclone exposure and drainage conditions
Double counting of energy	Maintain separate metering for renewable generation, charging, losses and BESS discharge

11.8 Technical Standards, Safety and Lifecycle Management

All BESS projects shall consider electrical protection, fire and thermal safety, emergency response, flood and cyclone resilience, control-system security, performance testing, degradation, augmentation, transportation, second-life use, recycling, decommissioning and site restoration.

Procurement documents shall contain guarantees for usable MWh, power output, round-trip efficiency, availability, response time, degradation, warranty period and safety performance. Suppliers must submit an emergency-response plan and an end-of-life management plan prior to commissioning.

The NREDS has mentioned the requirement of preparation of a National Battery Roadmap covering production, use, recycling, repurposing and environmentally sound disposal. Agencies, such as BSTI, SREDA, utilities and the fire services, need to establish a national BESS technical and safety framework that references relevant international standards.

11.9 BESS/ESS Implementation Roadmap

Bangladesh has a limited but growing opportunity to develop BESS infrastructure in parallel with its solar expansion, rather than as an afterthought. Costs are coming down; financing is

available and the underlying grid economics are solid. The decisions we make now will dictate whether the 2030 and 2040 solar generation targets provide reliable, affordable and resilient power or merely contribute to daytime generation while the country continues to depend on expensive imported fuel to satisfy the evening demand peak.

Table 11.6: BESS/ESS Implementation Actions, 2026–2030

Period	Priority Action	Expected Output	Lead and Supporting Agencies
2026–2027	Complete a national power-system flexibility and storage-needs assessment, covering generation, transmission, distribution and major demand centres.	Bangladesh-specific assessment identifying priority BESS locations, required services, indicative MW/MWh, storage duration, grid level and implementation sequence.	Power Division; PGB PLC; BPDB; SREDA; distribution utilities
2026–2027	Require BESS assessment within techno-economic feasibility studies for solar projects. At minimum, the feasibility study shall evaluate a BESS power-rating case equivalent to 10% of the solar system DC capacity, while final MW, MWh and duration shall be determined by technical and economic assessment.	Standardized BESS feasibility-assessment requirement incorporated into project preparation, feasibility studies and relevant tender documents.	Power Division; SREDA; BPDB; PGB PLC; distribution utilities
2026–2027	Finalize a National BESS/ESS Guideline covering planning, ownership, grid connection, metering, charging, dispatch, operation, tariff treatment, performance, safety and lifecycle management.	Approved national regulatory and technical framework for grid-connected, behind-the-meter and stand-alone BESS/ESS.	Power Division; SREDA; BERC; PGB PLC; BPDB; distribution utilities
2026–2027	Develop and adopt technical, electrical, fire-safety, cybersecurity, performance-testing and environmental requirements for BESS installations, drawing on applicable international standards and Bangladesh conditions.	Minimum national BESS standards covering protection, fire and thermal safety, flood/cyclone resilience, communications, testing, emergency response and end-of-life management.	BSTI; SREDA; Fire Service and Civil Defence; DoE; PGB PLC; BPDB; distribution utilities
2026–2027	Implement 3–5 priority BESS demonstration projects representing different applications, such as utility-scale solar, industrial rooftop clusters, grid-constrained substations/feeders and critical loads.	Bangladesh-specific evidence on cost, performance, safety, degradation, energy shifting, peak reduction, grid services and commercial arrangements.	BPDB; PGB PLC; distribution utilities; BREB; private developers/industries, with coordination by Power Division and SREDA
2026–2027	Develop standard procurement, contractual and commercial models for utility-owned, developer-owned, consumer-owned and storage-as-a-service projects.	Standard bidding documents, performance guarantees, payment arrangements, dispatch responsibilities and risk-allocation mechanisms.	Power Division; BPDB; PGB PLC; BERC; PPP Authority; SREDA
2026–2028	Establish a national BESS registry and monitoring framework, with storage recorded separately from renewable generation capacity in both MW and usable MWh.	Centralized database containing location, technology, MW, MWh, duration, service, ownership, commissioning	SREDA; PGB PLC; BPDB; distribution utilities

		status, performance and safety information.	
July 2028	Conduct a formal review of national studies, pilot projects and early commercial installations as part of the Roadmap mid-term review.	Confirmed priority BESS applications, revised technical and commercial requirements and an evidence-based scale-up plan for 2028–2030.	Power Division; SREDA; PGB PLC; BPDB; BERC; distribution utilities
2028–2030	Progressively procure and deploy BESS at technically and economically justified locations, including selected utility-scale renewable projects, industrial/commercial rooftop clusters, substations, high-renewable feeders, critical infrastructure and EV-charging hubs.	Commercial-scale BESS deployment reported in MW and MWh and linked to clearly defined grid or consumer services.	BPDB; PGB PLC; distribution utilities; renewable-energy developers; industries and other project owners
2027–2030	Develop appropriate tariff, cost-recovery and service-remuneration arrangements for BESS, including energy shifting, peak reduction, congestion relief, voltage/frequency support and other verified grid services.	Clear regulatory basis for BESS revenue, cost recovery, settlement and avoidance of double compensation.	BERC; Power Division; BPDB; PGB PLC; distribution utilities
2026–2030	Establish battery take-back, repurposing, recycling and environmentally sound disposal arrangements, aligned with the proposed National Battery Roadmap.	Approved lifecycle-management framework including producer/supplier responsibility, authorized transport, second-life use, recycling and final disposal.	MoEFCC; DoE; Ministry of Industries; BSTI; SREDA
2030 Review	Undertake a comprehensive national BESS requirement assessment for 2031–2040, based on actual renewable deployment, demand growth, grid constraints, pilot/commercial performance, technology cost and system-flexibility requirements.	Updated national storage pathway for 2031–2040 with indicative requirements expressed separately in MW and MWh, differentiated by application, duration and location.	Power Division; PGB PLC; BPDB; SREDA; BERC; distribution utilities

11.9.1 Priority Policy, Regulatory and Investment Actions

BESS should be progressively integrated into renewable-energy and power-system planning as an important source of flexibility, reliability and grid support. Accordingly, techno-economic feasibility studies for relevant solar power projects shall consider at least a BESS configuration having a power rating equal to 10% of the DC capacity of the solar system. This benchmark is intended to promote systematic consideration of storage in project preparation and is not intended to be a uniform, mandatory installed storage ratio. The final BESS power capacity (MW), usable energy capacity (MWh), storage duration, operating strategy and point of connection shall be determined by project-specific and system-level technical and economic studies.

BESS requirements for new utility-scale solar projects, especially large projects and projects connected at grid-constrained locations, shall be studied as part of the grid-integration, system-impact and power-evacuation studies prior to procurement. Where such studies show a clear technical requirement and economic benefit, appropriately sized BESS may be included in the

tender and contractual requirements. Large industrial and commercial rooftop-solar clusters, renewable-energy charging facilities, critical infrastructure, substations and distribution feeders with high renewable-energy penetration should be subject to similar assessments.

Power Division, SREDA, BERC, PGB PLC, BPDB and the distribution utilities will provide the enabling environment for BESS deployment within their respective mandates. Priority actions shall include BESS-specific grid connection requirements, metering and accounting rules, dispatch arrangements, tariff and cost recovery mechanisms, technical and safety standards, performance requirements, cybersecurity provisions and lifecycle management obligations. Appropriate commercial arrangements should be developed for developer-owned, utility-owned, consumer-owned, shared-storage and storage-as-a-service models. Regulatory structures should also enable BESS to provide multiple technically verified services.

The initial implementation period should focus on 3-5 demonstration and early-commercial BESS projects across a range of applications and grid conditions, including utility-scale Solar-BESS, industrial or commercial rooftop clusters, transmission/distribution substations and critical-load applications. These projects will be used to develop Bangladesh-specific evidence on system performance, cost, safety, degradation, renewable-energy utilization, peak reduction, operational flexibility and commercial viability. Results will be systematically tracked and fed into the Roadmap review in July 2028 to inform the next steps for commercial scale-up.

Competitive procurement, domestic and foreign private investment, concessional finance, climate and green finance, PPP arrangements and other suitable risk mitigation mechanisms will need to be used to encourage investments in BESS. Early projects may be supported through concessional financing, technical assistance, project preparation and risk-sharing instruments from multilateral and bilateral development partners. Any fiscal incentives, viability-gap support or capital assistance targeted at early deployment of BESS will be based on demonstrated economic need, transparent eligibility criteria and formal Government approval and not on a pre-determined general subsidy.

BESS should remain a distinct infrastructure category in the national renewable-energy and power-system database. Installed BESS capacity shall be reported separately in MW and usable MWh, including storage duration, location, ownership, principal service, performance and project status. SREDA will be the national coordinator of the BESS performance database, while PGB PLC, BPDB and the distribution utilities will progressively incorporate storage requirements into generation planning, grid development plans, hosting-capacity assessments and connection studies.

BESS will be a critical enabler for Bangladesh to transition to a larger share of renewable electricity. Its role should therefore evolve from selected pilots to systematic integration into the planning of renewable energy, transmission and distribution. The immediate priority is to establish the technical, regulatory and commercial framework, build Bangladesh-specific operational evidence and deploy storage where it adds measurable value to the system and consumers. With this evidence-based approach, BESS has the potential to increase the uptake of renewable energy, relieve pressure during peak periods, improve grid reliability and provide the flexibility required to meet the national renewable energy ambitions for 2030 and 2040.

12.0 Grid Modernization and Power-System Flexibility

The 2026-2030 renewable energy program intends to add 10,450 MW capacity, of which 10,000 MW is expected to be from rooftop and ground-mounted solar. This amount of variable renewable energy (VRE) cannot be treated as a collection of discrete generation projects. The transmission system, distribution networks, system operation, forecasting, protection, metering, communication and operating procedures must work together to enable the integration, dispatch and use of high levels of renewable electricity with high reliability.

The National Renewable Energy Development Strategy (2026-2030) states about the generation forecasting and scheduling, Free Governor Mode of Operation (FGMO) and Automatic Generation Control (AGC) implementation, a detailed grid-integration study and project-specific grid integration, transmission connectivity, power evacuation and system impact assessments. This section retains these requirements and translates them into a brief implementation framework for the roadmap.

Grid modernization under this Roadmap does not mean revising or replacing the entire national grid. It involves identifying the specific studies, operational capabilities, digital systems, standards and network investments required to accommodate increasing VRE in a planned and least cost way. Details on BESS/ESS requirements are in Section 11.

12.1 Power-System Features Required for GW-Range Renewable Energy Addition

A power system can integrate increasing renewable energy when it can see the generation, forecast it, plan for uncertainty, control voltage and frequency, move power through the network and respond when actual conditions differ from the schedule.

Table 12.1: Power-System Features Required for GW-Scale VRE Integration

Required Feature	What Is Required	Primary Purpose
System visibility and data	Real-time or near-real-time information on renewable generation, plant availability, network status, weather and demand.	Accurate system operation, event analysis and planning.
Forecasting and scheduling	Day-ahead and intraday renewable-generation forecasts, schedules and updates from relevant plants or aggregators.	Improved unit commitment, reserve planning and economic dispatch.
Grid-connection standards	Clear requirements for voltage and frequency tolerance, reactive-power capability, fault ride-through, protection, metering, telemetry and remote control where applicable.	Secure connection of inverter-based renewable energy resources.
Network capacity and evacuation	Transmission- and distribution-level hosting-capacity studies, connection points, substation capacity and power-evacuation plans.	Reduced congestion, delayed connections and avoidable network reinforcement.
Operational flexibility	Verified ramp rates, minimum stable generation, start-up time, reserve capability and dispatch limitations of the generation fleet.	Ability to balance changes in solar and wind output and manage evening ramps.
Frequency, voltage and power-quality support	Capability-based implementation of FGMO, AGC, reactive-power support, voltage control and appropriate system-support functions.	Maintenance of system frequency, voltage and power quality.

Curtailment and congestion management	Transparent operating rules, metering, cause classification, reporting and treatment of renewable-energy curtailment.	Fair and secure management of temporary system constraints.
Resilience and cybersecurity	Climate-resilient network design, secure communication, access control, event logging, backup arrangements and recovery procedures.	Reliable operation of an increasingly digital and climate-exposed power system.

12.2 Bangladesh's Transmission and Distribution Readiness

Bangladesh has an interconnected national transmission network, a central system-operation structure, an updated Electricity Grid Code, utility planning institutions and ongoing transmission and distribution expansion. These form an important basis for integrating renewable energy. SCADA/ADMS, advanced metering, substation automation and digital reliability monitoring are also being implemented in some areas as part of distribution-modernization programs.

However, the level of readiness is different across the transmission and distribution systems. A planned acceleration from 2028 will require a shift from predominantly project-by-project connections towards coordinated system-wide planning, regular hosting-capacity assessment, broader operational visibility, standardized forecasting, capability-based flexibility and transparent handling of network constraints. This preliminary assessment will be confirmed in the comprehensive grid integration study.

Table 12.2: Preliminary Overview of Grid Readiness for Higher Renewable Energy Penetration

Area	Existing foundation	Requirement for the Roadmap	Preliminary status
Legal and technical framework	BERC Electricity Grid Code Regulations, 2023 and existing connection procedures provide a regulatory base.	Review and progressively update provisions relevant to inverter-based resources, forecasting, telemetry, system support and data exchange.	Developing
Transmission planning and operation	National transmission planning, high-voltage infrastructure and central dispatch arrangements are established.	Integrate the 2026–2030 renewable project pipeline into transmission planning, connection queues and evacuation schedules.	Foundation exists
Distribution-network readiness	Distribution utilities have extensive networks and some modernization, automation and advanced-metering initiatives.	Undertake feeder- and substation-level hosting-capacity assessments and expand digital visibility in priority rooftop-solar areas.	Uneven / priority action
Renewable forecasting and scheduling	The National RE Development Strategy (2026-2030) requires forecasting and scheduling arrangements.	Establish common forecasting responsibilities, data formats, update intervals, approved error metrics and treatment of deviations.	Priority gap
SCADA, EMS and ADMS coverage	Transmission-level control and selected distribution digitalization provide an initial platform.	Connect priority renewable plants and substations to appropriate monitoring and control systems and improve data exchange among institutions.	Developing

Generation flexibility and reserves	FGMO and AGC are recognized requirements.	Test actual plant capabilities and apply differentiated requirements according to technology, ramping capability and system need.	Step-by-step system upgradation ongoing
RE Curtailment and congestion procedures	Project and system operators can take the necessary security actions within their existing responsibilities.	Develop transparent recording, cause classification, reporting and operational procedures for renewable curtailment.	Priority gap
Storage and demand-side flexibility	BESS pilots, advanced metering and demand-management initiatives are emerging.	Scale only where studies establish service, location, duration, operating responsibility and economic value.	Addressed through Sections 11 and 13

12.3 Renewable Energy Hosting-Capacity Assessment

Hosting capacity is an additional amount of renewable generation a network location can accommodate without violating approved limits for voltage, thermal loading, protection, power quality, stability or operational security. It is not a permanent national figure for all time. It depends on location, demand, network configuration, generation profile, operating rules, available flexibility and planned reinforcement.

Assessments are therefore required in the roadmap at the national, transmission, distribution and project levels. The results should be retained as planning information and updated as network, project pipeline and operating conditions change. Publication of simplified capacity maps or connection guidance may help developers identify suitable areas, but such information shall not replace the detailed studies required for project approval.

Table 12.3: Minimum Levels of Renewable Energy Hosting-Capacity Assessment

Assessment level	Principal question	Expected output	Main responsibility
National power system	How much renewable energy can be integrated during 2026–2030 under different demand, generation, outage and weather conditions?	System-wide VRE scenarios; flexibility requirement; priority grid investments; operating strategy.	Power Division; PGB; BPDB
Transmission corridor and substation	Can the proposed capacity be evacuated under normal and credible contingency conditions?	Connection capacity, reinforcement requirement, phasing, protection and evacuation plan.	PGB; BPDB; relevant generating utilities
Distribution feeder and substation	How much rooftop and distributed generation can be accommodated without unacceptable voltage, loading, protection or reverse-flow impacts?	Feeder/substation hosting capacity; upgrade options; application limits; monitoring requirements.	Distribution utilities; SREDA for data coordination
Individual project	Can the project connect safely at the proposed point and comply with the Grid Code and utility requirements?	Grid Integration Study; Transmission Connectivity Assessment; Power Evacuation Facility Assessment; System Impact Assessment.	BPDB; PGB; relevant distribution utility; project developer

Each assessment shall specify the data used, the year of study, the demand and generation assumptions, credible contingencies, technical limits, the proposed corrective measures and validity period. Where hosting capacity is limited, there should be a comparison of alternatives, such as network reinforcement, revised project phasing, operational controls, reactive power support and BESS/ESS, under Section 11.

12.4 Supporting System Addition Requirements

The primary system capabilities that have to be accompanied with higher VRE penetration are summarized in the following requirements. These are described as actions and study areas in the roadmap and not as detailed engineering specifications. The Grid Code, system studies, utility standards and project connection agreements shall be used by the responsible agencies to establish technical settings and procurement specifications;

Table 12.4: Supporting System Requirements for Higher VRE Penetration

System requirement	Roadmap treatment	Implementation consideration
Renewable forecasting and scheduling	Develop plant-, portfolio- and system-level forecasting using weather, satellite and operational data. Begin with utility-scale solar and wind and progressively include aggregated distributed solar.	Define data submission, schedule-update intervals, forecast-error metrics and proportionate treatment of deviations.
SCADA, EMS, ADMS and smart-grid functions	Expand visibility of renewable plants, substations, feeder loading, voltage and switching status. Integrate priority assets with dispatch and utility control systems.	Adopt common data standards, reliable communication, time synchronization, cybersecurity and backup arrangements.
FGMO, AGC and frequency control	Implement and periodically test primary and secondary frequency-control capability according to plant type and actual technical performance.	Avoid uniform assumptions across gas, hydro, coal, nuclear, storage and inverter-based resources; assign response according to capability and system need.
Protection, voltage control and power quality	Review connection requirements for fault ride-through, active and reactive power, voltage regulation, frequency response, harmonics, islanding and protection coordination.	Update relevant codes and specifications progressively as inverter-based resources increase.
Flexible generation and minimum-load operation	Assess ramp rates, minimum stable generation, start-up times, reserve capability and cycling limits of existing and planned plants.	Prepare operating strategies for midday solar output, evening ramps, planned outages and periods of low demand.
Demand response and load management	Use advanced metering, tariff signals, industrial load management, managed EV charging and automated demand response where feasible.	Detailed energy-efficiency and DSM measures are addressed in Section 13.
Ancillary and system-support services	Determine requirements for frequency response, operating reserve, reactive power, voltage support, ramping and restoration services.	Identify technically capable providers and develop procurement, dispatch, measurement and settlement arrangements where approved.
Renewable-energy curtailment management	Develop an operating procedure defining authority, sequence, communication, metering, cause codes and reporting.	Curtailment shall be used only when required for system security or for approved network management and shall be recorded transparently.

Regional and interconnection support	Assess the operational value of existing and future cross-border links for balancing, reserve sharing and renewable-energy trade.	Any arrangement shall remain subject to Government policy, technical capability, commercial agreements and regional coordination.

12.5 Grid-Modernization Implementation Plan, 2026–2030

The grid modernization plan and actions for 2026-2030, supported by the National RE Development Strategy (2026-2030), are presented in Table 12.5. This plan considers issues regarding generation forecasting and scheduling; FGMO and AGC; a comprehensive study of renewable integration and system flexibility; and mandatory project-specific grid studies. The roadmap builds upon these requirements by identifying the minimum supporting activities needed to operationalize them in advance of the larger annual additions expected starting in 2028.

Table 12.5: Grid-Modernization and Power-System Flexibility Implementation Plan, 2026–2030

Period	Priority action	Expected output	Lead and supporting agencies
2026–2027	Review the 2026–2030 renewable energy project pipeline and complete the necessary national and project-level grid-integration assessments.	Priority connection points, grid constraints and required actions identified.	Power Division; PGB; BPDB; distribution utilities; SREDA
2026–2028	Progressively introduce renewable-energy forecasting and scheduling and strengthen FGMO/AGC arrangements according to verified system and plant capabilities.	Improved scheduling, frequency control and operational readiness.	PGB; BPDB; generation utilities; project developers
2027–2029	Assess priority transmission substations and distribution feeders and implement essential network, protection, metering, communication and control improvements where required.	Improved hosting capacity and visibility at priority renewable-energy locations.	PGB; distribution utilities; BPDB
2027–2029	Review and update the necessary grid-connection and operating procedures for inverter-based renewable energy, system flexibility and renewable-energy curtailment.	Clear and practical technical and operating requirements.	BERC; PGB; BPDB; distribution utilities; Power Division
July 2028	Review grid readiness against project progress and identify the corrective measures needed to accelerate the 2028–2030 program.	Agreed corrective grid-readiness actions for 2028–2030.	Power Division; PGB; BPDB; SREDA; BERC; distribution utilities
2028–2030	Implement priority grid and operational measures in line with the approved renewable-energy commissioning schedule and prepare the post-2030 system-integration pathway.	Grid support for the 2030 program and an updated pathway for 2031–2040.	PGB; BPDB; distribution utilities; Power Division; SREDA

The implementation sequence shall continue to be coordinated with the annual technology targets in Section 7, the human-resource requirements in Section 9, the financing plan in Section 10 and the BESS/ESS actions in Section 11.

12.6 Monitoring Indicators

Monitoring shall focus on whether the grid-enabling actions are completed before they become constraints to renewable-energy commissioning. Baselines and annual targets shall be confirmed through the Comprehensive Grid Integration Study, utility workplans and the July 2028 review.

Table 12.6: Grid-Modernization and VRE-Integration Monitoring Indicators

Indicator	Measurement and definition	Source and frequency	Main responsibility
Comprehensive Grid Integration Study	Study approved and recommendations incorporated into agency workplans.	Study report and approved action plan; annual	Power Division; PGB; BPDB
Project-specific grid studies	Percentage of utility-scale RE projects completing all required connection, evacuation and system-impact studies before approval.	Project approval and study records; quarterly	BPDB; PGB; relevant utility
Hosting-capacity assessment coverage	Number of transmission substations and priority distribution feeders/substations assessed and updated.	Utility study register and maps; six-monthly	PGB; distribution utilities
Forecasting and scheduling coverage	Percentage of applicable utility-scale VRE capacity submitting approved forecasts and schedules.	Dispatch and plant records; monthly	PGB; BPDB
Forecasting performance	Forecast error measured using an approved and consistently applied metric, with separate reporting by technology and forecast horizon.	Forecasting platform and dispatch data; monthly	PGB; BPDB; plant operators
Real-time visibility	MW of renewable capacity and number of priority substations providing required telemetry to the relevant control center.	SCADA/EMS/ADMS records; quarterly	PGB; distribution utilities
FGMO/AGC capability	Number and MW of relevant generating units tested, available and compliant according to verified capability.	Test reports and operating records; six-monthly	PGB; BPDB; generating utilities
Grid-connection delivery	Average time from complete grid application to connection approval and energization, reported by project category.	Utility connection registers; quarterly	PGB; distribution utilities; BPDB
Renewable curtailment	Curtailed renewable energy in MWh and percentage of available renewable generation, classified by cause and location.	Metering and dispatch records; monthly	PGB; BPDB; distribution utilities
Network and digital upgrades	Priority transmission, substation, SCADA/EMS/ADMS, communication and protection actions completed against the approved plan.	Project and utility progress reports; quarterly	PGB; distribution utilities
Ancillary service and reserve capability	Available MW by service and verified provider, where such arrangements have been approved.	System-operation records; monthly	PGB; BPDB; BERC

The monitoring results shall be included in the roadmap scorecard quarterly and in the annual implementation report. In the event of a delay in a required grid study, connection facility, digital system or operating procedure, the responsible institution shall identify the reason, the required decision, the corrective action and the revised completion date. Material delays in the 2028–30 renewable energy program will be escalated through the institutional coordination arrangements in Section 14 and reviewed under the consolidated monitoring framework in Section 15.

13.0 Consolidated Risk Matrix and Mitigation

This section concentrates on risks that may affect the roadmap as a whole or require coordinated Government action. Each implementing institution will continue to manage its project- and sector-specific risks through its normal planning, procurement, safeguard, safety and operational procedures.

13.1 Risk Rating Approach

Ratings for Impact, Probability, Inherent Risk and Residual Risk use a standard three-level scale (High/Medium/Low) commonly applied in project risk management:

a. Impact: Potential effect on RE targets, timelines, investment, or overall roadmap success.
b. Probability: Likelihood based on current Bangladesh context (e.g., historical delays, governance fragmentation, financing gaps).
c. Inherent Risk: Pre-mitigation risk level (typically High if both Impact and Probability are High/Medium-High).
d. Mitigation: Practical, actionable measures tailored to Bangladesh's RE ecosystem (drawing from SREDA, national policies and common challenges like land, grid and bureaucracy).
e. Residual Risk: Post-mitigation level (assuming effective implementation).

In cases where more than one institution is listed, the institution with the legal or operational mandate should take the lead in the response. SREDA will consolidate the risk status for roadmap reporting and the Power Division will assist with decision making and escalation on cross-agency or high-impact issues.

13.2 Consolidated Risk Matrix in Roadmap

Table 13.1: Consolidated Risk Matrix for Renewable Energy Roadmap Implementation

Code	Risk Description	Impact	Probability	Inherent Risk	Mitigation and Corrective Action	Lead and Supporting Institutions	Residual Risk
R1	Insufficient or delayed finance, payment-security constraints or slow administrative approval	High	High	High	Prepare financing and approval requirements during project preparation; distinguish commitments, financial close and disbursement; use suitable public, private, concessional, green-finance and de-risking instruments subject to approval; track delayed decisions and payment constraints through the quarterly Roadmap process.	Power Division; Finance Division; ERD; BPDB; Bangladesh Bank; IDCOL; implementing agencies	Medium
R2	Change, delay or inconsistency in policies, regulations, tariffs, procurement rules or incentives	High	Medium	High	Prioritize the instruments in Section 8; undertake consultation and legal review; publish clear transitional arrangements; avoid retrospective changes where possible; review ineffective or delayed instruments during the July 2028 review.	Power Division; SREDA; BERC; competent ministries and authorities	Medium
R3	Weak coordination, unclear responsibility or delayed decisions among ministries, agencies, utilities and regulators	High	High	High	Use institutional focal points, time-bound workplans, quarterly coordination, a common action tracker and clear escalation of unresolved land, grid, finance, approval and safeguard issues, as provided in Section 14.	Power Division; SREDA; all lead implementing institutions	Medium
R4	Low participation or limited capacity of financial institutions	High	High	High	Engage financial institutions in the project pipeline; strengthen renewable-energy project appraisal; use standard project information and financing documents; improve access to eligible refinancing, credit-enhancement and green-	Finance Division; Bangladesh Bank; IDCOL; commercial financial institutions; SREDA	Medium

					finance facilities; document reasons for rejected or delayed finance.		
R5	Low participation of private developers, industries or generation, transmission and distribution utilities	High	High	High	Improve project preparation, procurement transparency, contractual clarity, grid-connection arrangements and payment discipline; use competitive, PPP, merchant-power, RESCO/OPEX and corporate procurement approaches where approved; include assigned actions in utility workplans.	Power Division; BPDB; Power Grid Company of Bangladesh (PGB); distribution utilities; BERC; PPP Authority; SREDA	Medium
R6	Slower-than-planned project preparation, construction or commissioning and failure to meet annual capacity milestones	High	High	High	Maintain a rolling pipeline by project stage; prioritise near-term rooftop and investment-ready projects; identify critical dependencies before procurement; prepare recovery plans for delayed annual milestones; revise targets only through the formal review process.	Power Division; SREDA; BPDB; relevant utilities and implementing agencies	Medium
R7	Weak renewable resource, project pipeline, or performance data and delayed feasibility studies	Medium	High	High	Apply common data definitions; complete priority resource and site assessments; maintain a verified national project register; require essential feasibility, grid and safeguard studies before approval; clearly mark provisional data and avoid treating unverified capacity as a confirmed target.	SREDA; BPDB; PGB; distribution utilities; relevant resource and technical agencies	Low
R8	Grid, forecasting, system flexibility, or justified BESS/ESS actions are not ready when renewable projects are commissioned	High	Medium	High	Align the renewable project pipeline with PGB PLC and distribution planning; complete priority grid and hosting-capacity assessments; progressively introduce forecasting and operating procedures; determine BESS/ESS from defined services and studies; adopt a corrective grid-readiness plan at the July 2028 review.	Power Division; PGB; BPDB; distribution utilities; SREDA; BERC	Medium
R9	Land conflict, environmental and	High	Medium	High	Use early site screening and consultation; avoid productive agricultural land and sensitive areas	Implementing agencies; project developers;	Medium

	social impacts, community opposition or climate and disaster damage				where feasible; complete applicable environmental and social assessments; maintain grievance arrangements; apply climate-resilient design, emergency planning and site-restoration requirements.	MoEFCC; DoE; relevant land, local-government and disaster-management authorities	
R10	Poor technology quality, inadequate skills, unsafe implementation or weak end-of-life management	Medium	Medium	Medium	Apply approved standards and accredited testing; use competent designers, installers and operators; include HSE, performance, warranty, O&M and data requirements in contracts; strengthen training and certification; include take-back, reuse, recycling and disposal provisions for panels, batteries and related equipment.	SREDA; BSTI; BAB; NSDA; BTEB; BMET; DoE; implementing agencies and project owners	Low

13.3 Corrective Action, Escalation and Review

The risk matrix shall be reviewed with the quarterly roadmap scorecard. Each material risk shall have an owner, current rating, mitigation action, due date and status. A corrective-action plan shall be prepared when a risk increases, a mitigation measure is delayed, or an annual roadmap milestone is likely to be missed.

Table 13.2: Meaning and Responses in Risks

Current Risk Level	Meaning	Required Response
Low	Risk is controlled or unlikely to materially affect the roadmap.	Continue routine monitoring and maintain existing controls.
Medium	Risk may affect a milestone, cost, quality or institutional decision if not managed.	Update the mitigation action, responsible institution and completion date; review through the quarterly scorecard.
High	Risk may cause major target slippage, system-security concern, financial exposure, non-compliance or material public impact.	Prepare immediate corrective action and decision note; escalate cross-agency constraints to the Power Division; monitor until the rating is reduced.

The corrective action record shall include the cause of the problem, immediate containment measure, the policy or management decision needed, the responsible authority, the resources required, the revised date of completion and the expected residual risk.

The consolidated risk matrix shall be reviewed annually during the roadmap implementation period. Particular emphasis will be placed on the first implementation phase (2026–2030), including the formal mid-term review in July 2028 and the comprehensive review in 2030. The results of the 2030 review will be used to update the risk matrix, implementation priorities and mitigation measures for the next implementation period with a view to achieving the objectives of the 2040 roadmap. New risks may be added where there is evidence of implementation to support them. Risks that become project-specific or are no longer material may be transferred to the relevant institutional risk registers of the responsible implementing agencies.

14.0 Just Transition and Strategic Institutional Coordination

The Renewable Energy Roadmap will create new opportunities for investment, employment, skills and local enterprise when implemented. At the same time, renewable energy projects may affect land, livelihoods, working conditions, local environments and the responsibilities of a variety of public institutions. Therefore, the transition must be implemented in an inclusive, safe and environmentally responsible manner, supported by clear institutional coordination.

For the purposes of this roadmap, a just transition is defined as the expansion of renewable energy contributing to energy security and emission reduction and supporting employment, skills development, social inclusion, gender equality, environmental protection and local economic development. Implementation should not disproportionately affect any community, worker or region. This section is aligned to the National Renewable Energy Development

Strategy (2026–2030) and does not create a stand-alone compensation, social-protection or fossil-asset retirement program outside the Government framework in place.

Strategic institutional coordination means that each activity is implemented through the ministry, division, agency, regulator or utility with the appropriate mandate. Use existing Government structures wherever possible. Introduction of further committees, units, staffing or budget provisions should be made only in the light of a demonstrated requirement for implementation and the approval of the competent authority.

14.1 Principles of a Just Energy Transition in Bangladesh

For Bangladesh, a just energy transition means expanding renewable energy without imposing excessive hardship on workers, landowners, farmers, fishers, or local communities. Therefore, utility-scale solar and wind projects should focus on suitable non-agricultural or low-conflict land, minimize impacts on livelihoods and biodiversity and ensure consultation and grievance redress arrangements before construction. Rooftop solar, solar irrigation, mini-grids and other distributed systems should be developed to create opportunities for local technicians, women, youth and small enterprises, especially in industrial areas, chars, islands, haor areas, coastal zones and other hard-to-reach locations. Renewable energy projects should also make sure that workers are safe and treated fairly and that solar panels, batteries and other equipment are managed environmentally soundly at the end of their life. These principles will be implemented through existing Government laws, safeguards and institutional mandates and will not involve unsupported compensation, employment quotas or new social protection commitments.

Table 14.1: Just Energy Transition Strategy

No.	Activity	Implementing Ministry/Division/Agency
1	Give priority to employing local communities in renewable energy projects.	Power Division
2	Avoid adverse impacts on the land, agriculture, fisheries and livelihoods of local communities arising from project implementation.	Power Division
3	Provide targeted social protection for workers and communities affected by the transition from fossil-fuel-dependent sectors.	Ministry of Labour and Employment; Ministry of Social Welfare
4	Ensure consultation and grievance-redress mechanisms for local communities, landowners, farmers, fishers, women, youth, small ethnic groups and persons with disabilities in project areas.	All agencies under the Power Division
5	Increase women's participation, skills development, entrepreneurship and representation in decision-making in the renewable energy sector.	Ministry of Women and Children Affairs; Power Division
6	Ensure occupational health and safety, a fair working environment and compliance with international labour standards.	Ministry of Labour and Employment; Power Division
7	Ensure protection of biodiversity, agricultural land, wetlands, forest land and coastal areas in renewable energy projects.	Ministry of Environment, Forest and Climate Change
8	Ensure take-back schemes, recycling and safe e-waste management for solar panels, batteries, inverters and other equipment.	Ministry of Environment, Forest and Climate Change

14.2 Strategic Institutional Coordination

The National RE Development Strategy requires specific responsibilities, lead and support agencies, time-bound work plans, periodic review of progress and a results-based monitoring system. This direction is implemented in the roadmap through a simple coordination structure based on existing mandates.

The Power Division will provide policy direction and strategic oversight. SREDA shall coordinate technical monitoring, renewable energy data, implementation reporting and periodic review within its mandate. Implementation of activities assigned to BPDB, Power Grid Bangladesh (PGB PLC), distribution utilities, BERC and the relevant ministries and agencies.

Table 14.2: Strategic Institutional Coordination Framework

No.	Strategy requirement	Roadmap treatment	Lead and supporting institutions
1	Designate renewable-energy focal-point officials and prepare time-bound institutional workplans.	Each relevant ministry, division, agency and utility should identify a focal point and translate assigned Roadmap actions into its regular workplan, budget proposal and reporting arrangement.	All relevant ministries, divisions, agencies and utilities
2	Hold regular inter-ministerial coordination meetings.	Quarterly operational meetings of focal points may be chaired by the Secretary, Power Division, or an authorized senior representative, to review progress and resolve implementation constraints.	Power Division
3	Arrange apex-level policy review.	Major policy issues and annual progress may be presented to the appropriate apex Government forum. The Strategy's proposed National Policy Council may be activated subject to a formal Government decision.	Power Division; Cabinet Division
4	Operate a results-based monitoring framework and online dashboard.	Use the common indicator, reporting and corrective-action structure established in Section 16 and avoid creation of parallel monitoring systems.	Power Division; SREDA
5	Maintain a verified national renewable-energy database.	Collect and verify information from utilities, project owners and relevant programs, including grid-connected, off-grid and industrial rooftop systems, using common definitions and preventing double-counting.	SREDA; BPDB; PGB PLC; distribution utilities
6	Maintain quality and compliance information on renewable-energy organizations and products.	Strengthen registration or listing arrangements and, following due process under the applicable authority, suspend or delist organizations with substantiated quality or compliance failures.	SREDA; BSTI; BAB; NBR; utilities; competent authorities
7	Provide accessible public and investor information.	Strengthen existing SREDA information and help-desk arrangements and publish updated frequently asked questions, procedures, standards and contact points rather than creating unnecessary parallel services.	SREDA; distribution utilities; BPDB

8	Set deadlines, accountability and corrective actions.	Each workplan should state responsible authority, timeline and output. Delayed actions should be accompanied by a cause analysis, required decision and revised completion date. Reporting will follow Section 16.	All implementing ministries, divisions and agencies
9	Assess staffing and budget requirements.	Review whether the Power Division, SREDA and other implementing institutions have adequate staff and resources. Additional provisions shall remain subject to workload assessment and formal approval.	Finance Division; Ministry of Public Administration, Power Division; concerned institutions
10	Use thematic technical working arrangements where required.	For cross-cutting matters such as grid integration, BESS, energy efficiency, standards, research and innovation, use time-bound technical working arrangements drawing on the relevant agencies, universities, industry and development partners.	Power Division; SREDA; relevant ministries, utilities and technical institutions

The coordination framework should not overlap in authority. Decisions on regulatory, tariff, fiscal, land, environmental, labour and construction issues shall fall within the competence of the legally competent institutions. The Power Division and SREDA shall coordinate and facilitate and shall not supersede the statutory mandate of any other authority.

Any issues that cannot be resolved through normal agency coordination should be documented and escalated, clearly stating the decision required. Operational constraints should be addressed in quarterly meetings and major policy, budgetary and inter-ministerial issues in the annual strategic review.

14.3 Monitoring Indicators

Monitoring shall be limited to indicators that show whether inclusive implementation and institutional coordination are working.

Table 14.3: Transition and Institutional Coordination Monitoring Indicators

Indicator	Measurement	Source and frequency	Main responsibility
Local employment and skills	Number and share of local personnel engaged or trained in applicable projects, reported without treating this as a mandatory quota.	Project and training records; six-monthly	Implementing agencies, project developers, SREDA
Women's participation	Participation of women in training, employment, entrepreneurship and relevant consultation, with progress against the Section 9 training objective.	Training, employer and program records; six-monthly	SREDA; NSDA; implementing agencies
Consultation and grievance redress	Projects with consultation and grievance arrangements; grievances received, resolved and outstanding.	Project safeguard reports; quarterly	Implementing agencies; project developers
Land and livelihood safeguards	Projects completing required screening and assessment; material livelihood impacts and agreed mitigation actions.	Environmental and social documents; quarterly	Implementing agencies: Department of Environment, relevant authorities

Occupational health and safety	Safety training coverage, major incidents, corrective actions and compliance status.	Employer and inspection records; quarterly	Employers, implementing agencies, Ministry of Labour and Employment
Lifecycle and e-waste arrangements	Projects or procurements containing take-back, recycling and disposal provisions; materials collected or processed where data are available.	Procurement, supplier and environmental records; annual	SREDA; Department of Environment; implementing agencies
Energy-justice implementation	Number of renewable-energy access interventions and beneficiaries in difficult-to-reach or climate-vulnerable areas.	Program and utility records; annual	SREDA; utilities; relevant programs
Institutional focal points and work plans	Relevant institutions with designated focal points and approved time-bound workplans.	Power Division coordination register; annual	Power Division; all relevant institutions
Coordination and decision follow-up	Quarterly meetings held, decisions recorded and percentage of agreed actions completed within the approved timeline.	Meeting records and action tracker; quarterly	Power Division
Roadmap reporting and data completeness	Institutions submitting complete and timely data under the common reporting framework.	Institutional reporting system; quarterly	SREDA; Power Division
Delayed actions and corrective plans	Number of delayed actions, causes identified, corrective plans issued and matters escalated.	Roadmap scorecard; quarterly	Power Division; responsible institutions
Institutional capacity response	Priority staffing, budget, training or technical-support gaps identified and addressed through approved arrangements.	Institutional reports and budget records; annual	Concerned institutions: Finance Division, Ministry of Public Administration

Where relevant and practicable, indicators relating to employment, training, consultation and beneficiaries should be disaggregated by sex and location. The 2030 review will assess whether the roadmap is creating inclusive opportunities, protecting the communities that are impacted and obtaining sufficient institutional backing. Any necessary corrections shall be included in the implementation plan for 2030-2040.

15.0 Project Implementation, Monitoring and Evaluation Framework

The Project Implementation, Monitoring and Evaluation Framework provides a common structure for tracking the implementation of the National Renewable Energy Roadmap through 2040. The first phase of implementation is scheduled for 2026–2030 and is based on the National Renewable Energy Development Strategy (2026–2030). The result of this phase will determine the validated baseline and implementation pathway for 2031–2040.

This framework associates national goals with concrete activities, indicators, evidence, institutional responsibilities and review periods. It will be implemented through existing

Government, regulatory, utility and project-reporting arrangements to the extent possible, without establishing unnecessary parallel reporting arrangements.

Power Division will provide overall policy direction and oversight. SREDA will coordinate Roadmap monitoring, maintain the consolidated renewable energy database, compile progress reports and support periodic reviews. Relevant ministries, agencies, utilities, regulators, financial institutions, project owners, training institutions and other stakeholders will report on progress within their respective mandates.

15.1 Structure of the Framework

The framework is structured around six interconnected areas:

1. *Strategic and operational objectives*: the national result to be achieved and the intervention area;
2. *Activities*: actions required to achieve the operational objective;
3. *Key Performance Indicators*: measurable evidence of progress, including applicable baseline, target, unit and method of calculation;
4. *Means of verification*: official documents, databases, meters, reports, or other evidence used to verify results;
5. *Responsible Institutes/Agencies*: the lead and supporting institutions responsible for implementation and reporting; and
6. *Frequency*: timing of implementation, reporting, verification and review.

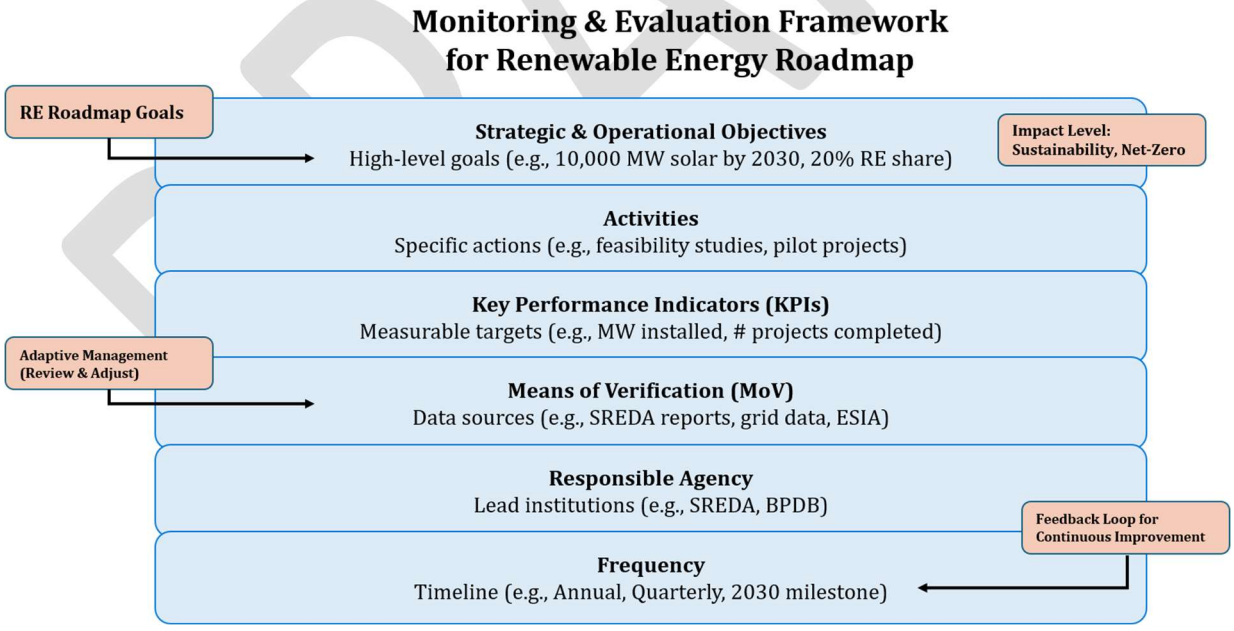


Figure 15.1: Graphical presentation of the Monitoring and Evaluation Framework

15.2 Strategic Objectives

The roadmap will be monitored through the following five broad strategic objectives.

Table 15.1: Strategic objectives of the roadmap

Strategic Objectives	Intended Results
Strategic Objective 1 (SO-1): Sustainable Renewable Energy Deployment, Grid Integration and Energy Efficiency	Deliver the approved renewable energy program, improve grid and system readiness, expand BESS/ESS and demand-side flexibility where justified, achieve verified electricity savings and support the national renewable electricity targets for 2030 and 2040.
Strategic Objective 2 (SO-2): Policy, Regulatory, Institutional and Budgetary Enablement	Complete and operationalize the required policies, regulations, guidelines, standards, institutional workplans, budgetary provisions and coordination arrangements necessary for timely Roadmap implementation.
Strategic Objective 3 (SO-3): Finance, Private Investment, Industrial Competitiveness and Local Market Development	Mobilize public, private, concessional, climate and green finance; improve project bankability; expand renewable electricity use in productive sectors; and support capable local enterprises, service providers and manufacturers.
Strategic Objective 4 (SO-4): Human Resources, Research, Innovation, Quality and Inclusive Participation	Develop the technical, managerial and financial skills required by the sector; strengthen resource assessment, research, innovation, standards and quality assurance; and improve participation by women, youth and people in underserved areas.
Strategic Objective 5 (SO-5): Data, Monitoring, Risk Management and Adaptive Review	Establish reliable data collection and reporting, monitor implementation and risks, undertake periodic reviews, obtain stakeholder feedback and apply corrective actions throughout the roadmap period up to 2040.

15.3 Consolidated Logical Framework

Table 15.2: Consolidated Project Implementation and M&E Framework

Strategic Objective	Operational Objective	Priority Activities	Key Performance Indicators	Means of Verification	Lead and Supporting Agencies	Frequency
SO-1: Sustainable Renewable Energy Deployment, Grid Integration and Energy Efficiency	1.1 Implement the approved renewable energy deployment program for 2026–2030 and prepare the subsequent pathway to 2040.	Maintain a technology- and stage-based project pipeline; complete approvals, procurement, financing, construction, grid connection and commissioning; separately monitor renewable electricity generation.	Annual commissioned additions of 420 MW in 2026, 1,400 MW in 2027, 2,390 MW in 2028, 2,850 MW in 2029 and 3,390 MW in 2030; cumulative addition of 10,450 MW by 2030; installed capacity and renewable generation in GWh; renewable share of annual electricity demand.	SREDA renewable energy database; commissioning certificates; utility-metering records; BPDB, PGB and distribution-utility reports; approved project documents.	Power Division; SREDA; BPDB; PGB; distribution utilities; relevant implementing agencies and project owners.	Monthly project data, quarterly monitoring and annual verification.
	1.2 Improve grid readiness, system flexibility, BESS/ESS implementation, energy efficiency and DSM.	Undertake priority grid and hosting-capacity assessments; introduce forecasting, visibility and operating measures; implement justified grid and BESS/ESS projects; promote energy audits, efficient equipment, conservation and selected DSM measures.	Priority studies and upgrades completed; renewable capacity covered by forecasting and monitoring; curtailment in MWh and percentage; BESS/ESS reported in MW and usable MWh; progress towards at least 15% verified electricity savings; peak reduction and demand shifted in MW/MWh.	PGB, BPDB and distribution-utility records; SCADA, EMS, ADMS and meter data; BESS/ESS commissioning and performance records; energy-audit and measurement-and-verification reports.	Power Division; PGB; BPDB; distribution utilities; SREDA; BERC; project owners and participating consumers.	Operational or monthly reporting; quarterly consolidation; annual verification.
SO-2: Policy, Regulatory,	2.1 Prepare, consult, approve	Prepare and review the instruments identified in	Number and percentage of due instruments drafted,	Official submissions; consultation records;	Competent issuing authorities, Power	According to the approved

Institutional and Budgetary Enablement	and operationalize the priority legal and regulatory instruments.	Section 8, including applicable provisions for procurement, grid connection, RPO, REC, open access, P2P trading, BESS/ESS, quality standards and other approved market arrangements; undertake stakeholder consultation and legal review.	consulted upon, submitted, approved and operationalized; time taken from drafting to approval; implementation issues identified after notification.	Government notifications; gazettes; BERC orders; approved guidelines and website publications.	Division, SREDA, BERC, BSTI, BPDB, PGB PLC, distribution utilities and other relevant institutions.	implementation schedule, quarterly progress reporting and annual review.
	2.2 Strengthen institutional responsibility, coordination, budgeting and accountability.	Assign institutional focal points; prepare time-bound workplans; incorporate Roadmap actions into institutional plans and budgets; conduct periodic coordination meetings; track decisions, approvals, delays and corrective actions.	Institutions with designated focal points and approved workplans; assigned actions completed on time; budgetary provisions made; average approval time; quarterly decisions implemented; unresolved matters escalated.	Institutional workplans and budgets; meeting minutes; approval records; action tracker; annual performance reports.	Power Division; SREDA; relevant ministries, agencies, utilities, regulators and local government institutions.	Quarterly coordination; annual performance review; July 2028 and 2030 reviews.
SO-3: Finance, Private Investment, Industrial Competitiveness and Local Market Development	3.1 Mobilise appropriate financing and improve project bankability.	Prepare bankable projects; engage with financial institutions during project preparation; structure approved public, private, concessional, climate, green finance and PPP arrangements; address payment, foreign exchange and other financing constraints through suitable instruments.	Finance committed, financial close, disbursement and expenditure reported separately; private investment mobilised; projects reaching financial close; projects delayed or rejected because of financing constraints; average financing-processing period.	Financing agreements; Government approvals; lender and project records; audited financial statements; Bangladesh Bank, IDCOL and financial institution reports.	Finance Division; ERD; Bangladesh Bank; IDCOL; commercial financial institutions; Power Division; SREDA; BPDB; BIDA; PPP Authority and project developers.	Quarterly progress reporting; annual consolidation.
	3.2 Increase renewable electricity use in	Promote industrial and commercial rooftop solar, RESCO/OPEX models,	Industrial and commercial renewable energy installations; factories and	Utility and SREDA records; industry reports; project	Power Division; SREDA; distribution	Quarterly project reporting; annual market review.

	industries and support qualified local market participation.	corporate procurement and other approved arrangements; support capable local developers, EPC firms, service providers and manufacturers; apply approved technical and product-quality requirements.	other productive facilities using renewable electricity; commissioned MW and generated GWh; qualified local service providers; compliant locally supplied or manufactured products; reported project-performance and quality issues.	contracts; commissioning records; BSTI standards and certification records; BAB accreditation records.	utilities; BIDA; BEZA; BEPZA; BSTI; BAB; industry associations; project owners and private service providers.	
SO-4: Human Resources, Research, Innovation, Quality and Inclusive Participation	4.1 Develop the technical, managerial and financial workforce required for Roadmap delivery.	Update competency standards and relevant curricula; strengthen training for project preparation, installation, grid integration, BESS/ESS, O&M, finance, safeguards and quality assurance; improve training access in remote and underserved areas; engage employers in program design and assessment.	Persons trained and certified; training programs updated; placement or sector-engagement rate; temporary job-years and continuing O&M jobs reported separately; participation of women, youth and underserved groups; training provided outside major urban centers.	NSDA, BPMI, BTEB, BMET, DTE and training-provider records; employer reports; certification records; tracer studies and participant data.	Power Division; SREDA; NSDA; BPMI; BTEB; BMET; DTE; universities; TVET institutions; employers and industry associations.	Six-monthly program reporting; annual workforce review.
	4.2 Strengthen research, resource assessment, innovation and quality capability.	Undertake priority solar, wind, biomass, waste, hydropower and other resource assessments; implement justified pilots; support applied research and technology adaptation; prepare labour-market and sector-skills information; strengthen standards, testing, certification and accreditation.	Priority resource assessments and feasibility studies completed; pilot projects evaluated; research outputs adopted or used in planning; sector-skills reports produced; technical standards updated; laboratories and certification arrangements strengthened.	SREDA and BEPRC reports; university and research publications; feasibility studies; pilot evaluations; NSDA labour-market information; BSTI and BAB records.	SREDA; BEPRC; NSDA; BSTI; BAB; BPDB; PGB; relevant resource agencies; universities and private-sector partners.	Annual reporting; major assessments according to approved workplans; July 2028 review.

SO-5: Data, Monitoring, Risk Management and Adaptive Review	5.1 Establish an integrated monitoring, reporting and risk-management system.	Maintain a national renewable energy database and digital monitoring arrangement; define common indicators and reporting templates; collect quantitative and qualitative information; maintain the consolidated risk and corrective-action registers.	Core indicators with approved definitions, baselines and targets; reporting institutions submitting complete data on time; commissioned projects recorded in the national database; digital dashboard operational; risks and overdue corrective actions reported by status.	SREDA database and dashboard; institutional submissions; utility records; risk register; corrective-action records; verification and data-quality reports.	SREDA as coordinator; Power Division; BPDB; PGB; distribution utilities; BERC; implementing agencies; financial, skills, quality and safeguard institutions.	Continuous or monthly data collection; quarterly scorecard; annual verification.
	5.2 Conduct periodic reviews, stakeholder feedback and adaptive updating up to 2040.	Prepare annual progress reports; undertake the formal July 2028 review and comprehensive 2030 review; update the implementation pathway for 2031–2040; conduct periodic post-2030 reviews and the final 2040 evaluation; obtain feedback from consumers, workers, communities, investors, employers, training providers and other stakeholders.	Annual progress reports issued; July 2028 and 2030 reviews completed; corrective and reprioritization decisions implemented; post-2030 targets and indicators updated; stakeholder issues recorded and addressed; final 2040 review completed.	Annual reports; review and evaluation reports; meeting decisions; stakeholder consultations; surveys; grievance records; tracer studies and corrective-action registers.	Power Division, SREDA, relevant implementing institutions and independent reviewers were formally engaged.	Annual; July 2028; comprehensive review in 2030; periodic review during 2031–2040; final review in 2040.

15.4 Annual Capacity-Addition Scorecard

The annual scorecard shall identify projects under study, approval, procurement, financing, construction, testing and commercial operation. Annual and cumulative capacity targets shall only consider commissioned capacity.

The annual capacity additions will be tracked against the technology allocation of 5,500 MW of rooftop solar, 4,500 MW of ground-mounted solar, 150 MW of wind, 200 MW of waste-to-energy (W2E) and 100 MW from other renewable energy sources during 2026–2030. The mix of technologies post 2030 will be determined by the comprehensive 2030 review, considering the proven electricity demand, renewable generation, resource availability, project performance, grid readiness, storage needs, cost, environmental and social considerations and market development.

15.5 Data Collection and Reporting

SREDA will coordinate the national roadmap reporting system linking, where practicable, the existing databases and records of BPDB, PGB PLC, distribution utilities, BERC, implementing agencies, financial institutions, skills institutions, quality bodies, project owners and other responsible organizations.

The reporting system will capture both quantitative and qualitative information. Quantitative information will include installed capacity, electricity generated, project stage, financing, grid connection, curtailment, BESS/ESS capacity, employment, training, investment, emissions reduction, safeguard compliance and other approved indicators. Qualitative information will include reasons for delays in projects, institutional constraints, investor and consumer experience, feedback from employers, community concerns, quality issues and lessons learned from pilot projects.

The digital monitoring set-up can be scaled up gradually to include project mapping, geotagged data, data visualization, automated alerts and analytics. However, the initial implementation will concentrate on accurate definitions, comprehensive reporting and institutional ownership and verification of the core data.

Table 15.3: Reporting Structure

Reporting Level	Main Purpose	Frequency	Principal Output
Project and operational reporting	Monitor construction, commissioning, generation, grid, BESS/ESS, quality, safety and safeguard performance.	Continuous, monthly or project-specific	Validated project and operational data.
Institutional reporting	Report assigned actions, approvals, finance, training, compliance, risks and corrective measures.	Quarterly or six-monthly, as applicable	Institutional progress submission and updated action register.
National Roadmap reporting	Consolidate progress against the five strategic objectives and national targets.	Quarterly scorecard and annual report	National Roadmap scorecard and annual progress report.
Independent verification and evaluation	Verify selected indicators, data quality and implementation effectiveness.	As approved, particularly in July 2028, 2030 and 2040	Verification or evaluation report.

Stakeholder feedback	Identify implementation barriers and lessons from consumers, communities, workers, investors, employers and service providers.	Ongoing; consolidated annually	Stakeholder issue log and recommended corrective actions.

15.6 Performance Assessment and Corrective Action

The quarterly scorecard will use a simple performance rating:

- Green: The activity or milestone is going well with no critical unresolved issues;
- Amber: If corrective action is not taken, delay or underperformance may impact the annual milestone;
- Red: significant delay, non-compliance or critical financial, grid, institutional, safety, quality or safeguard issue requires senior-level intervention; and Not Rated: adequate baseline, target or verified evidence not yet available.

If an Amber or Red rating is given, the cause of the problem, the immediate response, the required policy or management decision, the responsible authority, the required resources, the revised completion date and the expected residual risk shall be identified. In case of cross-agency issues that cannot be resolved through normal coordination, the same may be escalated to the Power Division.

15.7 Monitoring and Review Calendar

Table 15.4: Monitoring, Reporting and Review Calendar

Review Mechanism	Timing	Main Purpose
Operational monitoring	Continuous or monthly	Monitor project implementation, generation, grid performance, storage, quality, safety and safeguards.
Quarterly Roadmap scorecard	Quarterly	Review milestones, institutional actions, risks, dependencies and corrective measures.
Annual progress report	Every year	Consolidate annual and cumulative results, identify barriers and approve time-bound corrective actions.
Formal mid-term review	July 2028	Assess delivery of the 2026–2030 program and determine corrective and reprioritization measures for the remaining period.
Comprehensive first-phase review	2030	Verify the results of the first implementation phase and establish the updated baseline, targets, technology pathway and supporting measures for 2031–2040.
Post-2030 periodic reviews	During 2031–2040	Review progress towards meeting the 30% of projected annual electricity demand from renewable energy by 2040 and adjust implementation measures based on verified evidence.
Final Roadmap review	2040	Evaluate overall results, sustainability and the future direction of Bangladesh's renewable energy transition.
Continuous stakeholder feedback	Ongoing	Capture implementation experience and respond to changing technology, labour market, investment and community requirements.

15.8 Data Quality and Target-Accounting Rules

The following minimum rules apply:

- Renewable energy capacity should be counted only after commissioning and should be registered only once under one official technology category.
- Capacity under study, procurement, financing, construction or testing should be reported separately from commissioned capacity.
- Renewable electricity generation shall be reported in GWh based on verified metering or a method of estimation approved by the Authority.
- BESS/ESS shall be reported separately in MW, usable MWh, duration and primary service and shall not be combined with renewable generation capacity.
- Solar irrigation, floating solar and agrivoltaics should be counted in the relevant solar capacity and should not be counted as separate national capacity twice.
- Clean cooking, electric vehicles, electric vessels and other demand-side interventions shall not be counted as renewable generation, unless dedicated renewable generation is commissioned and separately metered.
- True additional capacity should be distinguished from the restoration of existing generating capacity.
- The investment commitment, financial close, disbursement and expenditure shall be reported separately.
- Employment reporting should differentiate between temporary job-years, continuing employment, persons trained and persons certified.
- Disaggregation by gender, location, consumer category, ownership and project stage, as appropriate and feasible.
- Estimates, provisional information and data gaps will be identified clearly and will be updated as verified information becomes available.

SREDA shall, in consultation with the reporting institutions, maintain an indicator register, in which the definition, unit, baseline, target, calculation method, data source, frequency of reporting and the institution responsible and required disaggregation are specified for each national indicator.

This framework will allow the roadmap to serve as a practical and flexible implementation tool through periodic monitoring, institutional accountability, stakeholder feedback, risk management and evidence-based revision until 2040.

16.0 Summary and Conclusion

16.1 Consolidated Findings

Bangladesh has established a clear policy and strategic foundation for accelerating renewable energy with the National Renewable Energy Policy 2025, the National Renewable Energy Development Strategy (2026–2030) and related national plans and guidelines. The primary challenge is not the lack of policy guidance or renewable energy potential, but the timely conversion of national targets, identified resources and project proposals into investment-ready, grid-compatible and operational projects. The primary constraints identified in this roadmap include delays in the availability of land and sites, lack of a sufficiently bankable pipeline of projects, risks to financing and payment security, incomplete enabling instruments, uneven grid readiness, shortage of specialized human resources, fragmented institutional coordination and limitations in verified data and performance monitoring.

The National Renewable Energy Development Strategy (2026–2030) sets the main implementation target for installed capacity: 10,450 MW. The proposed addition reads:

- Rooftop Solar: 5,500 MW
- Ground Mounted Solar: 4,500 MW
- Wind Power: 150 MW
- Waste to Energy: 200 MW
- Other Renewable Energy Sources: 100 MW

If the program is added to the recorded renewable energy capacity of 1,818.86 MW as of 22 July 2026, Bangladesh's total installed renewable energy capacity would increase to about 12,268.86 MW by 2030, depending on project commissioning and retirement and reclassification of existing capacity. This is within the indicative requirement of the Strategy of around 12,000-14,000 MW of total installed renewable energy capacity.

This installed capacity, depending on the final technology mix, capacity factors, plant availability, grid conditions and curtailment, is expected to support approximately 27,000 GWh of renewable electricity generation annually, corresponding to the national objective of meeting approximately 20% of projected annual electricity demand from renewable energy by 2030.

Solar energy is expected to remain the dominant source of renewable electricity in Bangladesh in the short term. The country is densely populated, has limited non-agricultural land, large daytime electricity demand in industry and commercial establishments and a large stock of public, industrial, institutional and commercial buildings. Thus, rooftop solar has been given the highest priority. Ground-mounted solar will remain necessary for large-scale capacity addition, but must be developed with careful land selection, grid-evacuation planning and appropriate protection of agricultural production, food security, wetlands, biodiversity, local livelihoods and environmental quality.

Wind, waste-to-energy, biogas, biomass, floating solar, agrivoltaics, hydropower and emerging renewable technologies have large diversification potential. However, the commercial expansion of these technologies will have to be based on credible resource measurements, technical and financial feasibility, environmental and social safeguards, appropriate business models and verified operating performance. Solar irrigation, renewable energy-based electric

vehicle charging, decentralized systems and productive-energy applications also present great opportunities for reducing fuel use, supporting agriculture and local enterprise and improving energy services in chars, islands, haor areas, coastal regions and other hard-to-reach places.

The roadmap further confirms that renewable energy targets cannot be achieved through generation projects alone. Grid modernization, energy forecasting and scheduling, transmission and distribution hosting-capacity assessments, Supervisory Control and Data Acquisition (SCADA) and digital visibility, system flexibility, transparent curtailment procedures and technically justified Battery Energy Storage System (BESS) or Energy Storage System (ESS) deployment will be essential to maintain system stability and reliability with the growth of variable renewable energy resources. BESS/ESS should be planned and reported separately in MW and usable MWh and should not be counted as renewable generation capacity. Financing, regulatory enablement, technical standards, skilled personnel, institutional coordination, environmental and social safeguards, occupational safety, product quality, recycling and end-of-life management must proceed in parallel with project deployment.

16.2 Immediate Priorities and Expected Outcomes, 2026–2030

The immediate national implementation priority is the 2026–2030 period. The responsible ministries, divisions, agencies, utilities, regulators and other stakeholders shall focus on the following actions:

a. ***Build an investment-ready project pipeline:*** Develop and continuously maintain technology and stage-based project pipelines that include resource assessment, site or rooftop identification, feasibility, approval, financing, procurement, construction, grid connection and commissioning. Commissioned capacity shall be reported separately from projects under development.
b. ***Finalize the enabling instruments***: Finalize and operationalize the priority policies, regulations, guidelines, standards, model contracts, bidding documents and administrative procedures related to net metering, competitive procurement, open access, Renewable Power Obligation (RPO), Renewable Energy Certificates (REC), BESS/ESS, grid connection, product quality, local market participation, carbon finance and other approved mechanisms.
c. ***Ensure grid and system readiness***: Complete the required national and project-specific grid integration studies, transmission connectivity studies, power evacuation plans and system impact assessments. Improvements in renewable energy forecasting, scheduling, monitoring, Free Governor Mode Operation (FGMO), Automatic Generation Control (AGC), protection, communication and priority transmission and distribution will be progressively implemented before they become constraints for project commissioning.
d. ***Mobilize appropriate finance and private investment***: Enhance project bankability, contractual clarity, risk allocation and payment security and mobilize domestic and foreign private investment, concessional finance, climate finance, green finance, public-private partnerships, capital-market instruments and other approved sources. Investment commitments, financial close, disbursements and actual expenditure shall be reported separately.
e. ***Strengthen implementation capability and quality assurance***: Develop the technical, managerial, regulatory and financial skills required for project preparation, engineering, procurement, grid integration, BESS/ESS, environmental safeguards, commissioning,

operation and maintenance. Approved standards, accredited testing, certification, occupational health and safety requirements, warranties and lifecycle obligations shall be integrated into project delivery.

f. ***Enhance institutional accountability***: The Power Division shall provide overall policy direction and strategic oversight, while SREDA shall coordinate monitoring, renewable energy data management, implementation reporting and periodic review within its mandate. Each responsible institution shall maintain an approved work plan, reporting arrangement, responsible focal point and time-bound corrective-action process.

g. ***Operate a results-based monitoring system***: The monitoring framework shall track commissioned capacity in MW, renewable electricity generation in GWh, the renewable share of annual electricity demand, project stages, investment mobilized, grid readiness, curtailment, BESS/ESS in MW and MWh, emissions reduction, employment, certified personnel, environmental and social compliance, local participation and other approved indicators.

The formal mid-term review in July 2028 shall evaluate whether project preparation, finance, regulatory instruments, grid readiness, institutional performance and other enabling measures are proceeding at the pace required for the larger capacity additions planned during 2028–2030. The review shall identify delayed actions, responsible institutions, decisions required, revised completion dates and corrective actions. The full review in 2030 will confirm the results of the first implementation phase and establish the new baseline and implementation parameters for 2031–2040.

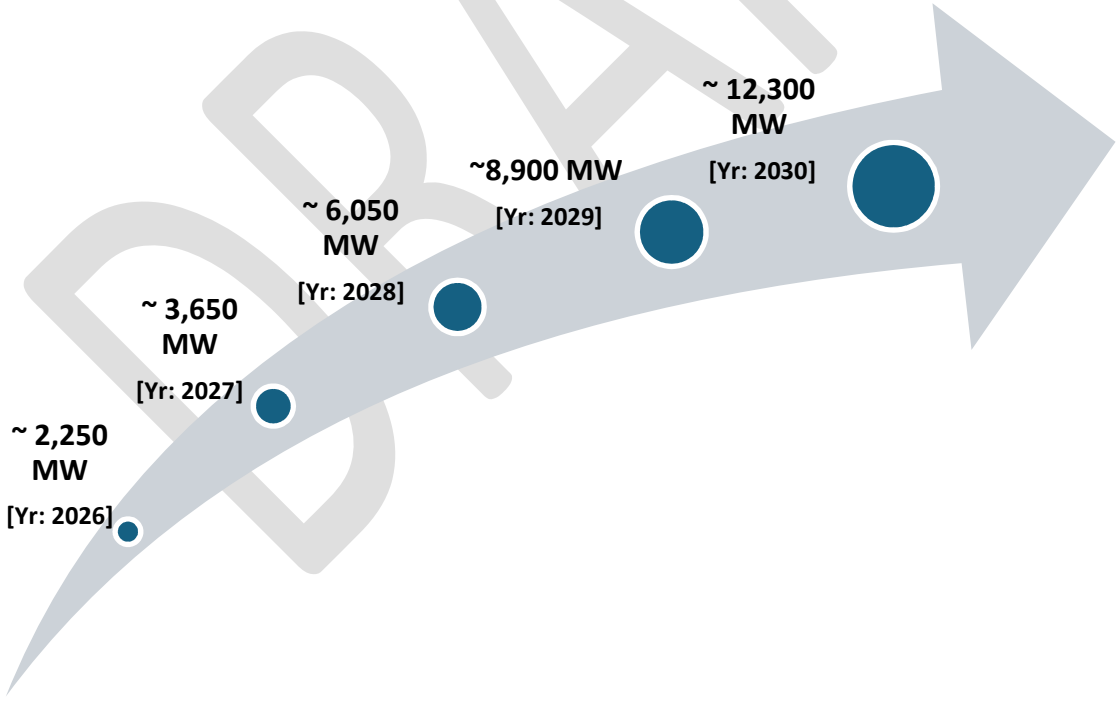


Figure 16.1: Cumulative Renewable Energy Capacity 2026-2030

16.3 National and Global Alignment and Pathway to 2040

This developed roadmap acts as an implementation bridge to The Renewable Energy Policy 2025, the National Renewable Energy Development Strategy (2026–2030), the Integrated

Energy and Power Master Plan (IEPMP), Bangladesh's Third Nationally Determined Contribution (NDC) and the country's obligations under the Paris Agreement.

The NDC 3.0 of Bangladesh sets an economy-wide target to reduce emissions by 84.97 $MtCO_2e$, or 20.31%, below the business-as-usual level by 2035. It also has a renewable energy target to meet 25% of total electricity demand by 2035, with 40% of the renewable energy target identified as unconditional and 60% conditional on adequate international finance, technology transfer and capacity-building support. The NDC lists rooftop solar, solar parks, solar irrigation, floating solar, agrivoltaics, wind, biomass, storage, reduced transmission and distribution losses and cleaner alternatives to liquid-fuel-based peaking generation among the priority power-sector actions.

The roadmap therefore provides a coherent national path from 20% renewable electricity by 2030, through the NDC 3.0 milestone of 25% by 2035, to 30% of projected annual electricity demand by 2040. The 2030 review will establish the revised demand forecast, renewable generation requirement, technology mix, grid-expansion requirements, BESS/ESS requirements, investment requirement and institutional priorities for the subsequent period. No unverified technology-specific capacity figure for the period beyond 2030 shall be considered binding until this review has been completed.

Priority in 2031–2035 shall be given to completing delayed projects, expanding successful rooftop and utility-scale delivery models, strengthening transmission and distribution systems and increasing the contribution of technically proven wind, waste-to-energy, floating solar, agrivoltaics, hydropower and other resources. During 2036-2040, the focus will shift toward larger-scale deployment of proven technologies, advanced power-system operation, greater market participation, regional electricity cooperation, domestic technical services and manufacturing, circular-economy arrangements and long-term flexibility.

The roadmap is also aligned with the orientation of the first Global Stocktake under the Paris Agreement, including the global call to triple renewable energy capacity by 2030 and to pursue the transition away from fossil fuels in a just, orderly and equitable manner, taking account of different national circumstances.

Implementation will directly contribute to SDG 7 on Affordable and Clean Energy; SDG 8 on Decent Work and Economic Growth; SDG 9 on Resilient Infrastructure and Innovation; SDG 11 on Sustainable Cities and Communities; SDG 12 on Responsible Consumption and Production; SDG 13 on Climate Action; and SDG 17 on Partnerships. Renewable electricity generation avoided emissions and carbon-market activities should be supported by credible measurement, reporting and verification. Participation in Article 6 mechanisms will be subject to national authorization, corresponding adjustments, avoidance of double counting and protection of Bangladesh's domestic NDC requirements.

16.4 Conclusion and Way Forward

The National Renewable Energy Roadmap 2026 offers Bangladesh a practical framework to convert national commitments into quantifiable projects, institutional responsibilities and verifiable results. It recognizes the country's particular opportunities: large-scale rooftop availability, significant industrial and commercial electricity demand, potential for solar irrigation and productive-energy applications, opportunities for renewable electricity in export-

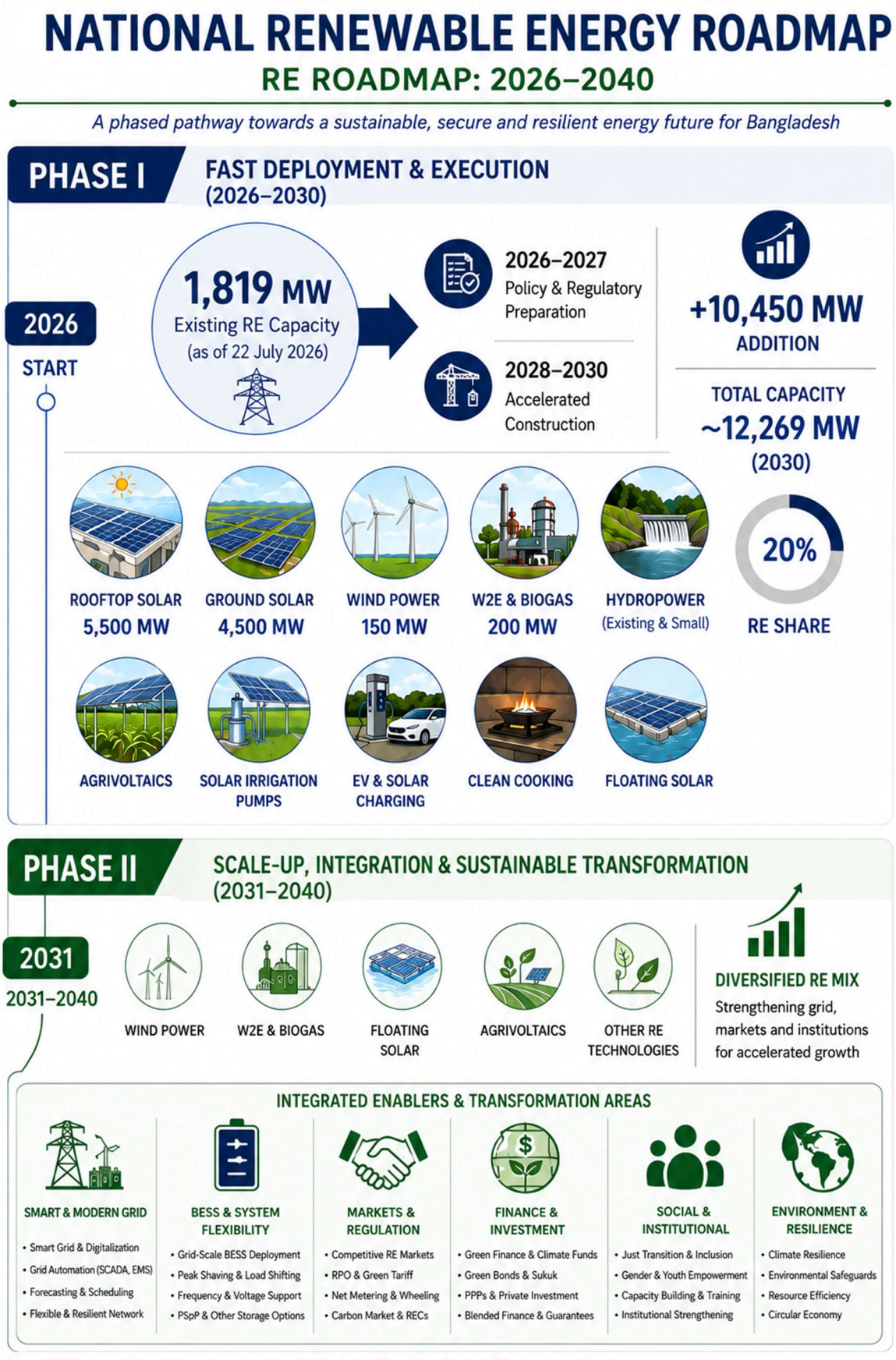


Figure 16.2: Phased Implementation Pathway for the Renewable Energy Roadmap of Bangladesh, 2026–2040

oriented industries, scope for decentralized systems in climate-vulnerable areas and the potential for local technical services, skills development and manufacturing.

The roadmap also recognizes the limitations and risks for Bangladesh, including land scarcity, grid constraints, risks of financing and foreign-exchange exposure, payment-security issues, lack of availability of resource data, institutional fragmentation, climate hazards and the nascent stage of some renewable technologies. These constraints call for disciplined project preparation, realistic sequencing of technologies, clear allocation of risks, capable institutions and evidence-based decision-making rather than unverified targets or isolated project announcements.

Successful implementation will improve national energy security by reducing dependence on imported LNG, oil and coal, reducing pressure on foreign exchange resources, increasing resilience to international fuel-price volatility and helping ensure the long-term affordability and reliability of electricity. It can also support industrial decarbonization, protect the competitiveness of Bangladesh's export-oriented industries, create skilled employment, strengthen local enterprises and expand reliable energy services in underserved and climate-vulnerable areas.

The decisive requirement is coordinated and accountable implementation. Bangladesh's ability to build the technical, financial, regulatory and institutional foundation required to achieve the 2040 objective will depend on the timely delivery of the 10,450 MW program and its enabling measures by 2026–2030. The roadmap shall therefore be implemented as a living Government instrument, supported by quarterly monitoring, annual reporting, the formal July 2028 mid-term review, the comprehensive 2030 review and evidence-based updating through 2040.

With sustained political commitment, institutional coordination, credible private sector engagement, international cooperation and transparent performance monitoring, Bangladesh can move from a largely project-based renewable energy approach to a structured national program that can deliver a more secure, competitive, inclusive and climate-resilient power system.

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