CPD Briefing on

National Rooftop Solar Programme

Proposals on the design, implementation, and monitoring and evaluation

27 July 2025

Study Team

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1.Introduction

1. Introduction

- The interim government has announced an initiative on 3 July 2025 titled National Rooftop Solar Programme
- The target of this initiative is to add 3000 MW of electricity from solar rooftops to be set on the government buildings, schools and hospitals
- The newly launched project is aimed at achieving the target of meeting 20% of the total electricity demand from renewable sources by 2030 and 30% by 2040
- CPD appreciates such initiatives, as it will help will Bangladesh achieve the renewable energy goals
- However, a proper pre-planning and effective implementation guidelines are essential for the successful implementation of the program
- Without such planning and preparation, like the previous initiative, this program is likely to turn into another failure (Net Metering Rooftop Solar Program)
- In the prevailing context, CPD Power and Energy Studies has taken this study titled *National Rooftop Solar Energy Programme: Proposals on Design, Implementation, Monitoring and Evaluation*
- The main objective of this event is to present a design for the proposed National Rooftop Solar Program and outline its possible monitoring and evaluation framework

2. Detailed Overview

2.1 Government Circular

গণপ্রজাতন্ত্রী বাংলাদেশ সরকার
বিদ্যুৎ, জ্বালানি ও খনিজ সম্পদ মন্ত্রণালয়
বিদ্যুৎ বিভাগ
নবায়নযোগ্য জ্বালানি-২ শাখা
www.powerdivision.gov.bd

নম্বর: ২৭.০০.০০০০.০০০.০৯৬.২২.০০০২.২৫.১০১

তারিখ: ১৯ আষাঢ় ১৪৩২ বঙ্গাব্দ
০৩ জুলাই ২০২৫ খ্রিস্টাব্দ

পরিপত্র

বিষয়: জাতীয় রুফটপ সোলার কর্মসূচি

বাংলাদেশ নবায়নযোগ্য জ্বালানি নীতিমালা ২০২৫ অনুযায়ী সরকার ২০৩০ সালের মধ্যে মোট বিদ্যুৎ চাহিদার ২০% এবং ২০৪০ সালের মধ্যে ৩০% নবায়নযোগ্য উৎস থেকে পূরণের লক্ষ্যমাত্রা নির্ধারণ করেছে। বর্তমানে মোট উৎপাদিত বিদ্যুতের মাত্র ৫.৬% (১,৫৬৩.৭ মেগাওয়াট) সৌর বিদ্যুৎ থেকে উৎপাদিত হচ্ছে, যা প্রতিবেশী দেশগুলোর তুলনায় উল্লেখযোগ্যভাবে কম [ভারত (২৪%), পাকিস্তান (১৭.১৬%) ও শ্রীলঙ্কা (৩৯.৭%)]। দেশের ৫৬% বিদ্যুৎ আসে প্রাকৃতিক গ্যাস থেকে, যার মজুদ দ্রুত ফুরিয়ে যাচ্ছে। এ পরিস্থিতিতে জ্বালানি নিরাপত্তা নিশ্চিত ও নবায়নযোগ্য জ্বালানিকে অগ্রাধিকার দেওয়ার লক্ষ্যে বিদ্যুৎ বিভাগ **'জাতীয় রুফটপ সোলার কর্মসূচি'** প্রণয়ন করেছে।

২.০ কর্মসূচির কৌশলগত দিক

- **উদ্যোগ ক (সরকারি অফিস):** সকল সরকারি প্রতিষ্ঠানের নিজস্ব ভবনের ছাদে (ভাড়া করা স্থাপনা ব্যতিত) সোলার প্যানেল স্থাপন। ইতোমধ্যে এ বিষয়ক একটি ওয়েবভিত্তিক অ্যাপ্লিকেশন চালু হয়েছে, যা বিদ্যুৎ বিভাগের ওয়েবসাইটে সন্নিবেশ করা হয়েছে (https://powerdivision.gov.bd/)। এই অ্যাপ্লিকেশনের মাধ্যমে ছাদের আয়তন বিবেচনায় বিদ্যুৎ উৎপাদন ক্ষমতা, প্রয়োজনীয় যন্ত্রপাতির বিবরণ ও প্রাক্কলিত ব্যয় জানা যাবে। এই প্রক্রিয়ায় নেট মিটারিং পদ্ধতিতে বিদ্যুৎ বিল সমন্বয় করা হবে।
- **উদ্যোগ খ (শিক্ষা প্রতিষ্ঠান ও স্বাস্থ্য স্থাপনা):** স্কুল, কলেজ, মাদ্রাসা ও হাসপাতালে ওপেক্স মডেলে বিনিয়োগ, যেখানে প্রতিষ্ঠানগুলোর কোনো ব্যয় বহন করতে হবে না। ফলশ্রুতিতে, প্রতিষ্ঠানগুলোর বিদ্যুৎ বিল সাশ্রয় হবে।

৩.০ বাস্তবায়ন প্রক্রিয়া

- **সরকারি অফিস:** সংশ্লিষ্ট মন্ত্রণালয়ের মাধ্যমে বরাদ্দ প্রাপ্তির পর পিপিআর-২০০৮ অনুযায়ী দরপত্র আহ্বানের মাধ্যমে CAPEX মডেলে বাস্তবায়ন করবে।
- **শিক্ষা/স্বাস্থ্য প্রতিষ্ঠান:** বিদ্যুৎ বিতরণ কোম্পানি/সংস্থা, এনজিও বা বেসরকারি সরবরাহকারী প্রতিষ্ঠান দ্বারা পিপিআর-২০০৮ অনুযায়ী দরপত্র আহ্বানের মাধ্যমে OPEX মডেলে বাস্তবায়ন করবে।
- উভয় ক্ষেত্রেই একাধিক অফিস/প্রতিষ্ঠান গুচ্ছাকারে (bundling) ক্রয় প্রক্রিয়া সম্পন্ন করতে পারবে।
- সৌরবিদ্যুৎ সিস্টেমগুলো ব্যাটারিবিহীন ও গ্রীডে সংযুক্ত হবে। তবে চাহিদার ভিত্তিতে কোন কোন শিক্ষা প্রতিষ্ঠান ও স্বাস্থ্য স্থাপনায় ব্যাটারি যুক্ত হতে পারে।
- নেট মিটারিং পদ্ধতিতে সিস্টেমগুলো পরিচালিত হবে। প্রতি তিন মাস অন্তর গ্রিডে সরবরাহকৃত বিদ্যুৎ এবং গ্রীড থেকে ব্যবহৃত বিদ্যুৎ সমন্বয় করে গ্রাহককে বিল প্রদান করা হবে।
- ছাদের আয়তনভেদে সৌরবিদ্যুৎ সিস্টেমগুলো ১০ কিলো-ওয়াট থেকে কয়েক মেগাওয়াট হবে।

৪.০ বাস্তবায়ন প্রক্রিয়ার ধাপসমূহ

- ছাদের পরিমাপের ভিত্তিতে ভবনে উৎপাদনযোগ্য সৌরবিদ্যুতের পরিমাণ নির্ধারণ
- সংশ্লিষ্ট বিদ্যুৎ বিতরণ কোম্পানি/সংস্থার নিকট অনলাইনে নেট মিটারিং এর জন্য আবেদন দাখিল (https://nem.powerdivision.gov.bd/)
- নেট মিটারিং আবেদন অনুমোদনের পর প্রয়োজনীয় অর্থের চাহিদা মন্ত্রণালয়ে/বিভাগে প্রেরণ (CAPEX মডেলের ক্ষেত্রে)
- প্রতিটি মন্ত্রণালয়/বিভাগের অর্থ বিভাগ থেকে বরাদ্দ গ্রহণ
- অর্থ বরাদ্দের পর দরপত্র আহ্বান
- দরপত্র মূল্যায়ন সমাপ্ত করে কার্যাদেশ প্রদান

এ প্রক্রিয়াটি ৩-৬ মাসের মধ্যে সম্পন্ন করতে হবে।

৫.০ প্রত্যাশিত ফলাফল:

জাতীয় রুফটপ সোলার কর্মসূচির আওতায় সরকারি অফিস, শিক্ষা প্রতিষ্ঠান ও স্বাস্থ্য স্থাপনার ছাদে সোলার সিস্টেম স্থাপনের মাধ্যমে আগামী ডিসেম্বর ২০২৫ সালের মধ্যে দেশের জাতীয় গ্রিডে প্রায় ৩,০০০ মেগাওয়াট বিদ্যুৎ সংযুক্ত করার লক্ষ্য নির্ধারণ করা হয়েছে। এ উদ্যোগের ফলে শুধু বিদ্যুতের সরবরাহই বাড়বে না, পাশাপাশি দেশের অর্থনীতি ও পরিবেশের ওপরও ইতিবাচক প্রভাব পড়বে। উল্লেখ্য, ২০২৫-২৬ বাজেটে সোলার প্যানেল, ইনভার্টার ও ব্যাটারির কর হ্রাস করে ১% করা হয়েছে। এছাড়াও, সোলার থেকে উৎপাদিত বিদ্যুৎ উৎপাদনকারী প্রতিষ্ঠানের জন্য ১০ বছরের আয়কর অব্যাহতি প্রদান করা হয়েছে।

এ কর্মসূচির মাধ্যমে দেশে বার্ষিক প্রায় ৪,২০০ কোটি টাকা অর্থসাশ্রয় হবে। উৎপাদিত বিদ্যুতের আর্থিক মূল্য দাঁড়াবে প্রায় ২৫,২০০ কোটি টাকা। এছাড়া, জীবাশ্ম জ্বালানির ব্যবহার কমবে বছরে প্রায় ১৮ লক্ষ টন। যার ফলে বিদ্যুৎ উৎপাদনে আমদানিকৃত জ্বালানির ওপর নির্ভরতা অনেকাংশে হ্রাস পাবে। এই উদ্যোগের ফলে কার্বন-ডাই-অক্সাইডের নিঃসরণ বছরে প্রায় ২৫ লক্ষ টন হ্রাস পাবে; যা জলবায়ু পরিবর্তন মোকাবিলায় বাংলাদেশের অবস্থানকে আরও সংহত করবে। এছাড়াও, কার্বন ক্রেডিট বিক্রির মাধ্যমে বছরে প্রায় ২০ মিলিয়ন মার্কিন ডলার বৈদেশিক মুদ্রা অর্জন করা সম্ভব হবে।

জাতীয় রুফটপ সোলার কর্মসূচির বাস্তবায়নে প্রায় নতুন ১,০০,০০০ কর্মসংস্থান এবং উদ্যোক্তা সৃষ্টি হবে। এই কর্মসূচি নতুন বাজার সৃষ্টি করবে, দেশের তরুণ ও দক্ষ জনশক্তির জন্য নতুন দিগন্ত উন্মোচন করবে এবং জাতীয় আয় বৃদ্ধিতে গুরুত্বপূর্ণ ভূমিকা রাখবে।

সামগ্রিকভাবে, এ কর্মসূচি বিদ্যুৎ খাতে গতি আনবে, দেশের জ্বালানি নিরাপত্তা নিশ্চিত করবে, জীবাশ্ম জ্বালানির ওপর নির্ভরতা কমাবে, পরিবেশ রক্ষা ও অর্থনৈতিক উন্নয়নের ক্ষেত্রে এক যুগান্তকারী ভূমিকা পালন করবে। বিশেষত, নবায়নযোগ্য জ্বালানির লক্ষ্যমাত্রা দ্রুততম সময়ে অর্জনের ক্ষেত্রে এই কর্মসূচি মাইলফলক হিসেবে বিবেচিত হতে পারে।

এ কর্মসূচি সংশ্লিষ্ট কোন তথ্যের জন্য নিম্নে বর্ণিত নাম্বারসমূহে যোগাযোগ করা যেতে পারে। সোলার হেল্প ডেস্ক -০১৫৫০৭৭৭৭৭৭, বিদ্যুৎ বিভাগ - ১৬৯৯৯, বিপিডিবি - ১৬২০০, পবিবো - ১৬৮৯৯, ডিপিডিসি - ১৬১১৬, ডেসকো - ১৬১২০, ওজোপাডিকো - ১৬১১৭, এবং নেসকো - ১৬৬০৩।

৬.০ সরকারি প্রতিষ্ঠানসমূহে জাতীয় রুফটপ সোলার কর্মসূচি বাস্তবায়নে সকলের প্রত্যক্ষ সহযোগিতা প্রয়োজন। বিদ্যুৎ বিতরণ সংস্থা সোলার সিস্টেম স্থাপনে সরকারি প্রতিষ্ঠানের সঙ্গে যোগাযোগ ও সিস্টেম স্থাপনে কারিগরি ও আর্থিক বিষয়গুলো সমাধান করবে। উদ্যোগ **'ক'** এবং **'খ'** সুষ্ঠুভাবে বাস্তবায়নের লক্ষ্যে বিদ্যুৎ বিভাগ এবং সকল ইউটিলিটি থেকে একজন করে ফোকাল পয়েন্ট থাকবেন, যিনি এসকল বিষয়ে প্রয়োজনীয় পরামর্শ দিয়ে সহযোগিতা করবেন।

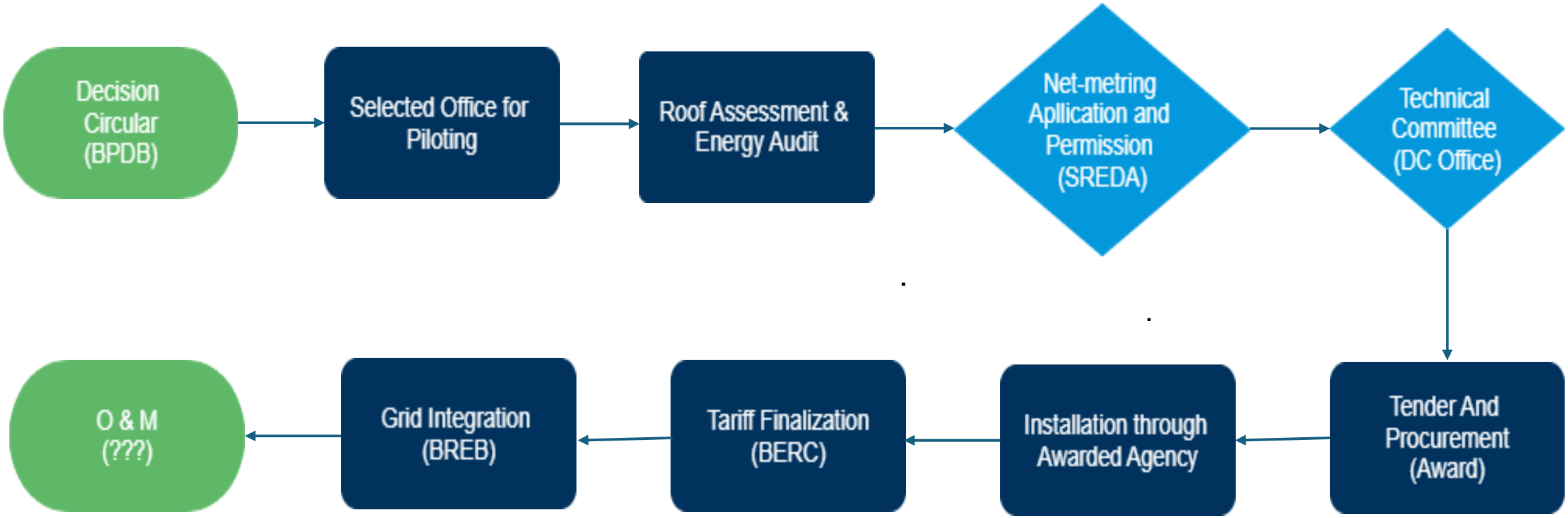
৭.০ এটি অবিলম্বে কার্যকর হবে।

০৩-০৭-২০২৫
তাহমিদুর রহমান
সিনিয়র সহকারী সচিব
re-2@pd.gov.bd

2.2 Detailed Overview: Policy and Guidelines

- The announced programme state that the full scheme will be designed and implemented based on the Net Metering Guidelines (2018)
- The NEM guidelines have been revised and released during the same time line of the national solar roof top circular
    - The new revised version made some revisions compared to the Net Metering Guidelines 2018
- The guideline lays out the process of setting up solar rooftops in the residential, commercial and industrial buildings
- For the procurement purposes the rooftop programme will follow the Public Procurement Rules (PPR) 2008
    - Both in case of CAPEX and OPEX model, the firm or the company for the installation process to be procured through the PPR 2008

Figure 1: Complete flowchart of the pre, during and post implementation process



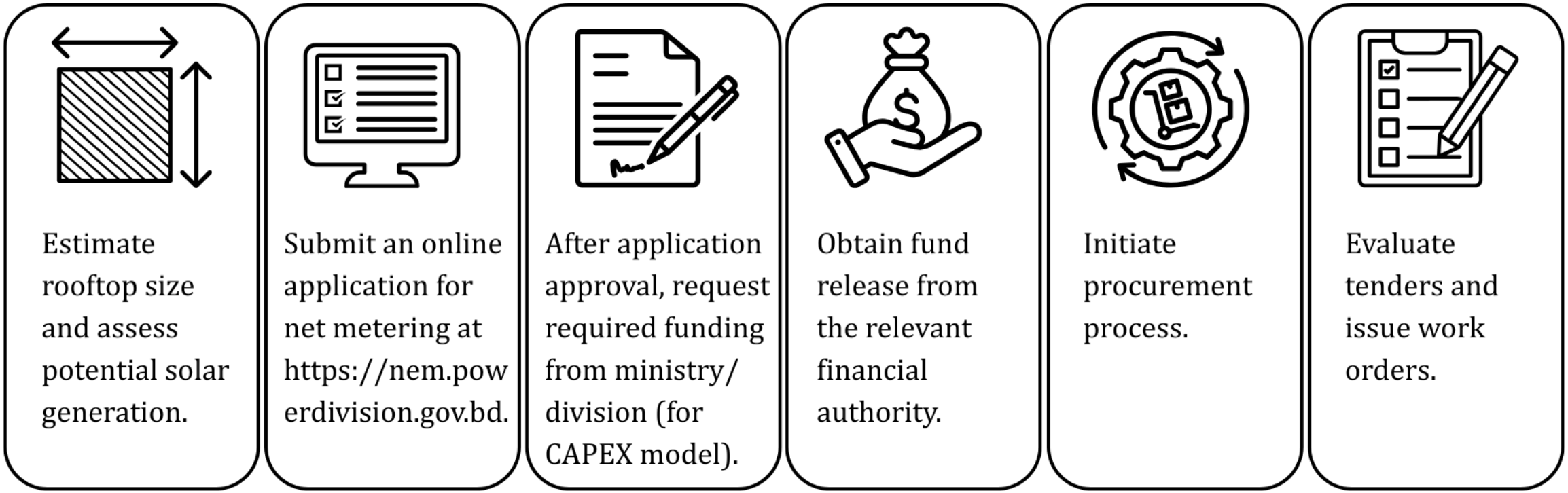
Source: Authors' Illustration

Table 1: Strategic Aspects of the Program

Initiative A (Government Offices)	Initiative B (Educational and Health Institutions)
▪ Installation of solar panels on the rooftops of all government-owned buildings (excluding rented ones) ▪ Government will fund the whole project ▪ A web-based application system has already been launched and is accessible via the Power Division website (https://powerdivision.gov.bd/) ▪ This application will help determine electricity generation capacity based on rooftop area, required equipment, and estimated cost ▪ A **net metering system** will also be in place to manage billing	▪ Solar installation in schools, colleges, madrasas, and hospitals through private investment ▪ **With no cost to the institutions** ▪ As a result, these institutions will benefit from reduced electricity bills ▪ A web-based application system has already been launched and is accessible via the Power Division website (https://powerdivision.gov.bd/) ▪ This application will help determine electricity generation capacity based on rooftop area, required equipment, and estimated cost ▪ A **net metering system** will also be in place to manage billing

Source: NEM Guidelines 2018

Figure 2: Implementation Steps



This process should be completed within 3–6 months.

2.2 Detailed Overview: Procurement Process

- The full procurement process set to be initiated by the district commissioner of the local government and a technical committee will be formed to implement the procurement process
- BPDB aspires to only procure the top tier equipment from the Bloomberg list
- However, SREDA already has a specification list for all the equipment (table 2)

Table 2: Technical Specifications and Requirements for Rooftop Solar System Components

	Component	Specification / Standard
1	Module Capacity	• Between 10 kWp and 50 kWp
2	PV Module	• Single glass: 230V (±15%) • Double glass: 400V (±15%)
3	Mounting Structure	• Single or double rail system
4	Battery (if any)	• Lead-acid: 700–3500 Ah
5	PV Module Brand	• Tier-1 brand (e.g., JA, Jinko, Longi, Trina, Risen, REC, Canadian Solar, Astronergy, etc.) • Efficiency: Minimum 10 years warranty and 25 years power output warranty (at least 80% output)
6	Inverter	• Reputed brand (e.g., Solis, Growatt, Sungrow, Huawei, SMA, Fronius, Fimer, etc.) • Minimum efficiency warranty: 10 years- Minimum product warranty: 5 years
7	Monitoring System	• Remote monitoring system (RMS) must be included
8	PV Module Technology	• Mono PERC or advanced equivalent • Minimum product warranty: 20 years

Source: SREDA Website

Table 2: Technical Specifications and Requirements for Rooftop Solar System Components (cont.)

	Component	Specification / Standard
9	AC Cable	• UV Protected type • Minimum product warranty: 20 years • Minimum service warranty: 5 years
10	DC Cable	• Locally reputed brand (e.g., BRB, BBS, Partex, RR, Bizli, etc.) • Minimum product warranty: 20 years • Minimum service warranty: 2 years
11	Energy Meter	• Must comply with national standards • All meters must be calibrated and certified • Must include RF/PLC-based communication option • Minimum service warranty: 3 years
12	Combiner Box & Junction Box	• Must be of reputed brand • Must comply with BSTI/IEC/IEEE standards • Minimum warranty: 1 year
13	Operation & Maintenance	• Comprehensive O&M manual must be provided

Source: SREDA Website

Table 3: Proposed Financing models

Government Offices:	Educational and Health Institutions:
▪ Implementation will follow **CAPEX model** (capital expenditure) through procurement as per **PPR-2008** via respective ministries ▪ The government will allocate budget for the national solar rooftop programme	▪ Implementation will follow **OPEX model** (operational expenditure) through electricity distribution companies, NGOs, or private service providers as per **PPR-2008**

Source: National Solar Rooftop Circular

- In both cases, multiple offices/institutions may be **bundled** together for procurement.
  All solar systems will be **battery-less and grid-connected**, although some institutions may require batteries based on their needs.
- **Net metering** will be used to manage the billing. Customers will receive bills every three months based on the power supplied to and drawn from the grid.
- Depending on rooftop size, solar systems will range from **10 kW to several megawatts**.

2.2 Detailed Overview: Operation and Maintenance

- The circular **does not provide specific guidelines** on Operation and Maintenance (O&M), even though it is crucial for ensuring the long-term performance and safety of rooftop solar systems
- Current responsibility is **vaguely assigned to rooftop owners or third-party contractors**

- Pre- installation- More clear guideline regarding the pre- installation requirements are needed
  - No mechanism regarding the testing and evaluation of the equipment before and after installment is mentioned
- Installation- the mechanism of the installation of NEM system under the national solar rooftop for both cases are
  - The standards and sub- standards regarding the provision seems okay if maintained religiously
- Post- installation- the entire programme doesn't mention any specific mechanism for the operation and maintenance
  - There is no specific framework or mechanism to ensure the NEM systems are fully operational
  - Financing and budget for operation and maintenance of the NEM under CAPEX model has not been mentioned anywhere in the circular
  - It is not clear who will bear the cost of the operation and maintenance of the NEM under CAPEX
  - In case of OPEX it is clear

3. Lessons Learned from Rooftop Solar Programme in Residential Buildings

3. Lessons Learned from Rooftop Solar Programme in Residential Buildings

Table 4: Reasons behind the failure of rooftop solar policy implemented in Dhaka around **2010–2012**

	Problem Area	Details
Pre- installation	**Lack of Industry Standards**	• Users ignored **regular maintenance** (e.g., cleaning panels, checking inverters) • Dust accumulation drastically reduced performance
	Misaligned Policy Objectives	• Blanket mandate ignored **practical feasibility**, especially in urban apartments or shaded roofs
	High Upfront Costs	• Cost of installation (Tk3.5–36 lakh) was **too high** for many households and small businesses
	Battery-Dependent Design	• Early policy pushed for **battery-backed systems**, which increased cost, complexity, and maintenance needs
Installation	**Misuse of Policy (Tick-box Installation)**	• Many installed panels **only to get electricity connections**, not to use solar power • Once connected, they abandoned the systems
	Poor Quality of Equipment	• Many panels were **low-grade** and failed within 3–5 years, far short of their expected 20-year lifespan • Inverters and batteries also often failed early
	Weak Implementation of Net Energy Metering	• Net metering was introduced in 2018 but lacked **clarity**, **support**, and **working meters** • Even **vendors** couldn't explain it well
Post- installation	**Lack of Awareness and Training**	• Owners lacked **basic knowledge** about how solar panels work • They were unaware of **simple upkeep practices**
	No Centralized Oversight or Monitoring	• No systematic tracking of whether systems remained functional • No **incentives or penalties** for keeping systems active
	Lack of Maintenance	• Users ignored **regular maintenance** (e.g., cleaning panels, checking inverters) • Dust accumulation drastically reduced performance

Source: EU paper titled “Barriers and Opportunities for Scaling Up Rooftop Solar PV Systems in Bangladesh”

Lesson Learned

- The panels, inverters and batteries need to be of high grade so that these don't fail or expire before the lifetime of 20 years
- Regular maintenance and care (e.g., cleaning panels, checking inverters) can not be ignored
- The NEM system can not be a show piece solar project without any electricity connections, and abandoned the systems
- Owners can not be uninformed regarding the basic functionality of the solar panels and maintenance
- The NEM tariff can not be more than the grid electricity tariff from the utilities
- There shouldn't be absence of a tracking system to ensure the functionality of the NEM system
- No such policy to adapt for battery-backed systems, which increased cost, complexity, and maintenance needs should be obligated in the consumers

4. Critical Analysis of the Programme: Policy Related Issues

4.1 Observation

- As the new rooftop solar circular did mention in the Net Energy Metering Guidelines 2018 (Second Revission) for the implementation of the National Solar Rooftop Programme
- The national solar rooftop programme is said to kickstart together in all the 495 upazilas in Bangladesh
- Doing so might cause a major fallback in the programme given the not so successful experience in the

Table 5: Observations regarding the provisions in the NEM Guideline 2018

Issues	Provisions	Observation
Rooftop space utilisation	The prosumer can generate equivalent to their total electricity demand	The limit should be withdrawn enabling the full utilization of the rooftop
Export limit	The export of the electricity is optional	Will complement
NEM capacity	In case of medium and high voltage NEM capacity can not exit 80% of the cumulative capacity of the parallel transformers	Will complement
Settlement period	The prosumer will be paid in every three months against their cumulative credit	Will complement
Tariff structure	Tariff will be determined according to the tariff circular of BERC	Separate tariff structure for these two NEM schemes by BERC might be required

Source: Authors Observation

4.2 Lack of coordination among the public authorities

- The three government bodies who are the key stakeholders of the National Solar Rooftop Programme- (a) Bangladesh Power Development Board (BPDB), (b)Sustainable and Renewable Energy Development Authority (SREDA) and (c) Bangladesh Rural Electrification Board (BREB)
- However, coordination among these authorities have been majorly absent

Table 6: Coordination mismatch among the government authorities

Issues	BPDB	SREDA	REB
Statement regarding the pilot	The project will be commissioned in all the 495 upazilas at the same time	Some of the Upazilas will be selected for the piloting before going in with full scale	Some of the Upazilas will be selected for the piloting before going in with full scale
Policy guidelines and business model	SREDA is drafting a policy guideline along with a business model	SREDA is not informed regarding the policy guidelines	SREDA is drafting a policy guideline along with a business model
NEM Model	CAPEX- Government office Building OPEX- Schools/hospitals	OPEX/ CAPEX- Both are fine for Government office Building OPEX- Schools/hospitals	OPEX- Government office Building OPEX- Schools/hospitals
NEM System Capacity	100% of the building electricity demand (may not utilize the full roof capacity)	Full utilization of the building roof	100% of the building electricity demand (may not utilize the full roof capacity)

Source: Authors Observation from KIIs

4.3 CPD's Recommendations on Policy Related Issues

❑ Shifting from Compliance-Oriented to Performance-Oriented Procurement

- Many residential systems were installed as a formality to access grid connections or subsidies, not to actually generate solar power.
  - This "tick-box" culture must be prevented in public buildings by designing policies that tie **budget disbursement to actual energy generation**, not installation.
  - Contracts should link milestone payments to post-installation **energy output over 12–24 months**, and not just physical completion.
  - This requires installing **smart meters** and integrating building load data to measure actual solar contribution to power consumption.

❑ Building Capacity of Facility Managers and Government Operators

- A core challenge in the residential sector was the lack of user awareness
- In public buildings, although direct users are not householders, the building managers (utility officers or facility engineers) often lack basic knowledge of how solar PV works.
  - It is essential to conduct **mandatory capacity-building workshops** during the commissioning phase for designated government staff.
  - Training must include **hands-on maintenance, basic troubleshooting, and interpretation of performance dashboards**, as public buildings will increasingly host these systems across ministries.

5. Critical Analysis of the Programme: Design Related Issues

5.1 Context

- **From a design standpoint, the successful deployment of rooftop solar PV systems on government buildings requires careful alignment with national technical guidelines and site-specific variables**
- As per the circular, all systems must strictly adhere to the **technical standards and installation protocols approved by SREDA**
- These standards should ensure safety, performance efficiency, structural compatibility, and long-term sustainability of the systems

Key parameters in the system design include:

- **Load Demand & Rooftop Assessment:** Systems should be sized based on actual electricity needs and available, structurally sound rooftop space.
- **Solar Resource & System Orientation:** Proper tilt, orientation, and shading analysis are essential to maximize generation.
- **Grid Integration:** Use of bi-directional meters and compliant inverters is mandatory under the Net Metering Policy for seamless grid export.
- **Financing Models:** Both CAPEX (agency-funded) and OPEX (third-party-funded) models are allowed, based on financial and operational capacity.
- **Monitoring & Maintenance:** Designs must include monitoring systems and maintenance plans, with regular reporting of generation and grid export data.

5.2 Observation

- The success of rooftop solar installations on government buildings relies on a **well-planned and practical system design that considers technical standards, building conditions, and grid integration**
- While the recent government circular addresses some of these aspects, there are important areas that need further clarity and detail

Strengths in Design Reflected in the Circular:

- **Standards Alignment:** The circular mandates compliance with SREDA's approved technical standards, ensuring baseline quality and safety.
- **Grid Integration:** Emphasis on using bi-directional energy meters and Net Metering Policy enables monitoring and export to the national grid.
- **Design Flexibility:** Encouragement of both CAPEX and OPEX models allows institutions to choose financing based on technical and financial capacity.
- **Site-Specific Planning:** Recognizes the need to assess rooftop area, load demand, and structural safety for customized system sizing.
- **Maintenance Provisions:** Circular requires post-installation monitoring and regular reporting which is an essential element for sustained performance.

5.2 Observation

Design Gaps & Areas for Strengthening:

- **Lack of Standardized Sizing Guidelines:** No clear method for calculating optimal system size based on demand profiles and usable roof area.
- **Absence of Technical Templates:** The circular lacks standard design templates for components like PV modules, inverters, mounting systems, etc.
- **No Mandatory Energy Audits:** Pre-installation load analysis or energy audits are not emphasized, which can lead to suboptimal system planning.
- **Limited Structural Assessment Guidance:** There is no requirement for structural feasibility or wind-load assessment, crucial for rooftop safety.
- **Insufficient O&M Planning:** Long-term design considerations for operation and maintenance (like inverter replacement, cleaning access, etc.) are not detailed.
- **Uniform Design Approach:** The circular does not differentiate between building types (urban multi-storey vs. rural single-storey), despite differing design needs.

5.3 Global Rooftop Solar Programmes Example

Several countries have implemented diverse rooftop solar programmes ranging from **incentive-driven residential adoption** to utility-integrated digital monitoring systems offering valuable design, financing, and regulatory insights for Bangladesh.

Table 7: Comparative analysis of the rooftop solar programmes

Country	Programme Name / Policy	Key Implementing Agencies	Deployment Model	Key Features
India	National Solar Rooftop Programme (MNRE)	Ministry of New and Renewable Energy (MNRE), DISCOMs	CAPEX and RESCO	• Central portal (solarrooftop.gov.in) for application, subsidy, and tracking • Standardized tools for quality control • Key schemes: PM-KUSUM, SRISTI
Sri Lanka	Soorya Bala Sangramaya ("Battle for Solar Energy")	Sri Lanka Sustainable Energy Authority (SLSEA), Utilities (CEB, LECO)	CAPEX (self/loan-financed)	• Target to solarize all state buildings by 2025 • Compliance ensured for net metering, safety- Utilities provide bi-directional metering support
Pakistan	Rooftop Solar via PakSEP and AEDB guidelines	Alternative Energy Development Board (AEDB), World Bank	Donor-funded CAPEX; pilot RESCO/ESCO models	• Pilots supported by World Bank under PakSEP • Technical guidelines by AEDB • Digital monitoring platform under development
Germany	EEG (Renewable Energy Sources Act), Mieterstrom (Tenant Solar)	German Federal Network Agency, Utilities	Feed-in Tariff (FiT)	• Guaranteed returns for exports • Strong safety, performance, and certification frameworks- Mandatory smart meters
Australia	Small-scale Renewable Energy Scheme (SRES)	Clean Energy Regulator, State Govts, Utilities	Primarily Residential (rebate backed)	• Accredited installer network • Real-time digital monitoring • Pre-installation technical audits by gov't tools • Transparent comparison portals

Source: Collected from various secondary literatures

5.4 CPD's Recommendations on Design Related Issues

- **Strategic Siting for Rooftop Solar in Bangladesh: Aligning Government Infrastructure with Solar Potential**
  - To maximize the effectiveness of the National Rooftop Solar Programme, site selection must be driven by **solar radiation potential and the geographic distribution of government offices**.
  - A tailored, **location-specific approach is essential** to ensure technical and financial feasibility across diverse regions of Bangladesh.
  - A total of **46,654 government offices have been identified nationwide**, with the majority located at **Upazila and Union levels**, indicating a significant potential for **decentralized solar installations across rural and semi-urban areas.**
  - Operation and Maintenance **(O&M) in remote Upazila and Union areas poses greater challenges compared to urban centers**, highlighting the **need for a dedicated institutional framework and strong regulatory mechanism** to ensure long-term functionality and service delivery.

Table 8: Number of Government Offices (From Ministry to Union Level)

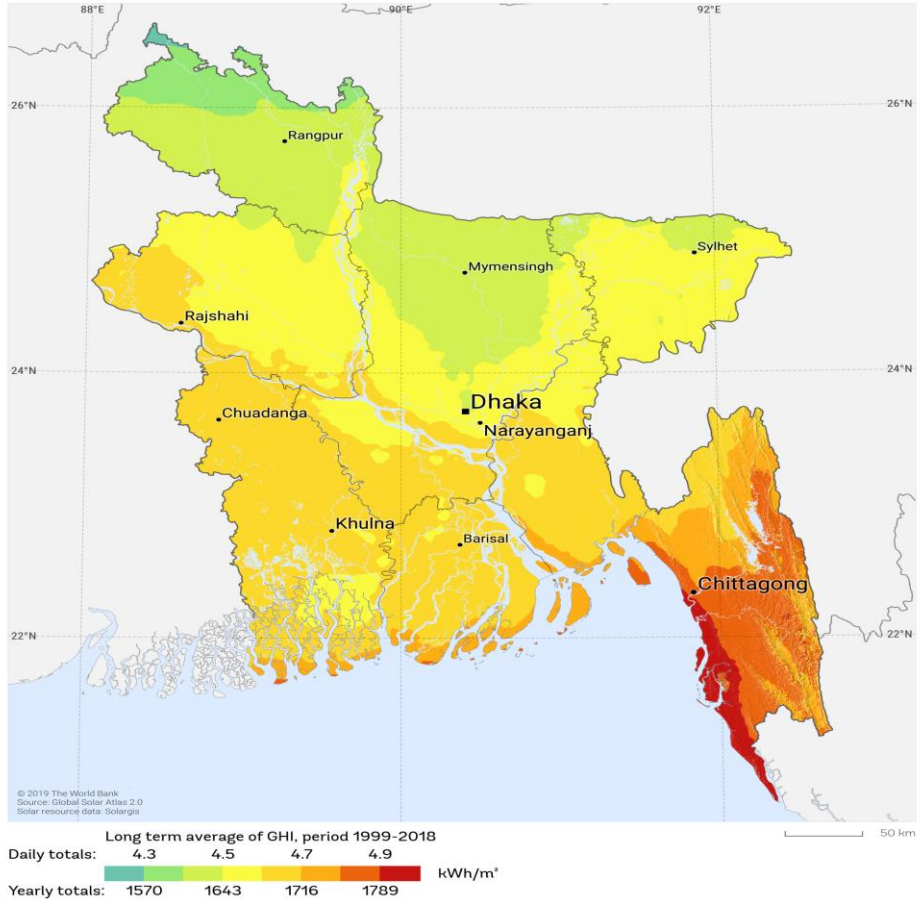
Level	Description	Number of Offices/Websites
Ministry/Division	Total Ministries/Divisions	70
Directorates/Departments	Directorates and Departments	351
Divisional Level	Total Divisions – 8	8
	Divisional Level Offices (8 × 52)	416
District Level	Total Districts – 64	64
	District-Level Offices (64 × 68)	4,352
Upazila Level	Total Upazilas – 491	491
	Upazila-Level Offices (491 × 37)	18,167
Union Level	Total Unions – 4,554	4,554
	Union-Level Offices (4,554 × 4)	18,216
Total	**From Ministry to Union Level**	**46,654**

Source: Public Works Department

5.4 CPD's Recommendations on Design Related Issues

- **Geographic Prioritization Based on Solar Resource**: Division-wise solar radiation data reveals **higher solar irradiance in the Southern and South-Western regions of Bangladesh**
  - therefore, these areas should be **prioritized for implementation** during the initial phases of the national rooftop solar programme for maximum efficiency and return
- **Equipment Standards and Financing Mechanism**: All installations must adhere to **national (BSTI) and international (IEC) equipment standards**
  - A **structured financing model** should be developed for both CAPEX (government or donor-funded) and OPEX (vendor or PPP-based) to ensure financial sustainability
- **O&M Strategy and Financial Support**: Long-term success depends on a robust **Operation & Maintenance (O&M) framework**

Figure 3: Division-wise Solar Radiation : A Prerequisite for Design



Bangladesh Photovoltaic Potential: Solar Resource Map

- Roles must be clearly defined: **For CAPEX**: Include mandatory multi-year O&M in EPC contracts
- **For OPEX**: Vendors should commit to **generation-linked performance guarantees**
- A **central O&M fund or revolving maintenance facility** should be created to support routine servicing and issue resolution, especially in public institutions.

5.4 CPD's Recommendations on Design Related Issues

- **Utility Readiness and Integration**: The programme's success requires **active involvement of utilities (e.g., DESCO, BPDB, BREB)**
  - To Strengthen **net metering implementation** and grid responsiveness, support **digital monitoring infrastructure** (e.g., real-time metering, rooftop dashboards).
  - Coordinate with **SREDA and Power Division** on interconnection guidelines, safety protocols, and local grid capacity assessments.

- **Mandate Rooftop Feasibility and Flexible Siting Options: Require feasibility assessments for all public buildings** and allow rooftop leasing from nearby structures; when **onsite conditions** (shade, orientation, etc.) are unsuitable, using sunlight hours and orientation as eligibility criteria

- **Create Differentiated Design Frameworks for Key Sectors:** Introduce **separate technical design and approval frameworks** for government offices, educational/health institutions, and industrial/commercial zones under SREDA or Power Division oversight

- **Ensure Future-Readiness Through Digital Integration: Mandate smart meter interoperability and real-time monitoring** (IoT/data logging) to support performance tracking, billing integration, and lifecycle cost analysis.

6. Critical Analysis of the Programme: Implementation Related Issues

6.1 Context

- The circular outlines key technical and administrative provisions, its implementation on the ground reveals a range of practical challenges
  - A range of critical issues has emerged at the implementation level include institutional capacity constraints, inadequate technical audits, fragmented coordination among executing agencies
  - such as the Power Division, SREDA, distribution utilities, and EPC contractors, and delays in procurement and approvals

6.2 Observation

Who will ensure the feasibility of rooftop installation?

- According to the relevant purchase agreement, the **power producer (RESCO) and the purchaser shall analyze the structural stability** of the roof(s) of the proposed site
  - Also, power producer (RESCO) may construct a smaller or larger size of Solar Energy System for any material technical reason, as mutually agreed between the Parties (Producer and Purchaser)
- **There is no independent third party who will ensure where the feasibility results are right**
  - This can create problem when there will be less generation as over-feasibility were showed and solar were installed more than needed

Grid Readiness

- When solar energy is generated and used on-site, any extra electricity goes back into the national grid through net metering
- This brings some technical challenges:
    1. **Power Factor Correction**: The grid expects energy to flow in a certain pattern. Solar can disturb that, making it less efficient unless corrected
    2. **Reverse Power Flow**: Solar sometimes pushes unused power back into the grid. If the grid is not prepared, this can cause voltage problems or damage
    3. **Grid Stability**: Too many solar systems operating without coordination can cause imbalances; like fluctuating voltage or frequency, that affect the reliability of the overall power supply
- If these aren't handled well, solar systems may underperform, be shut down, or even cause blackouts
- So utility companies (like REB, DPDC) must upgrade their systems and adopt clear net metering policies
- According to the **experts in REB**, power grid is ready to take more power to the grid
- But whether the mentioned issues where considered should be **clarified**
- This will help encourage and provide confidence to investors and the public to focus more on rooftop solar

6.2 Observation

Concerns may rise due to the faulty pricing system under NEM

- Different interpretation of the same net metering policy by different power sector agencies was found to be an issue for other rooftop solar projects
- In this initiative (though government-led) uniform interpretation is needed before going forward
- The estimated power generation cost is Tk 40/**Wp (Tk 4 crore/ MW)**
- The NEM tariff for the government office buildings will not exceed over Tk 5.50/ MW

Table 9: Comparative analysis of three major solar power pricing mechanisms FiT vs NEM vs Merchant Tariff

Feature	Feed-in Tariff (FiT)	Net Metering	Merchant Tariff
Definition	Sell all energy at fixed rate	Use solar first, export excess to grid	Sell to market at real-time prices
Customer Type	IPPs, large commercial	Residential, public buildings, SMEs	Large grid-connected generators
System Size	Medium to large (>1 MW)	Small to medium (1 kW – 1 MW)	Large-scale only (>5 MW)
Use of Power	100% sold to grid	Self-consumption + grid export	100% sold to grid
Tariff Rate	Fixed (e.g., Tk 10/kWh)	Variable credit (bulk/retail rate)	Market-based (varies hourly/daily)
Revenue Mechanism	Direct revenue from energy sale	Bill savings via credit	Revenue based on market spot price
Tariff Security	Very high (long-term PPA)	Medium (depends on policy stability)	Low (market-dependent, volatile)
Grid Dependency	Fully grid dependent	Partially grid dependent	Fully grid dependent
Risk Level	Low (guaranteed tariff)	Medium (tariff adjustments possible)	High (price fluctuations and no long-term PPA)
Common in	Feed-in based RE programs (e.g., Vietnam)	Rooftop solar policies (e.g., India, BD)	Deregulated electricity markets (e.g., USA)

Source: Authors' Assessment

6.3 CPD's Recommendations on Implementation Related Issues

- To ensure the success of Bangladesh's National Rooftop Solar Programme, each installation **must undergo a comprehensive feasibility study covering rooftop and structural assessment with shadow analysis, solar irradiation and tilt optimization, and site-specific equipment selection**.
- **Ensure Independent Feasibility Verification**
  - Introduce third-party technical auditing to validate rooftop structural and solar potential assessments.
  - Prevent over/under-design of systems that lead to generation inefficiencies.
- **Strengthen Grid Readiness and Utility Coordination**
  - Mandate readiness assessments by utilities (REB, DPDC, etc.) before approval.
  - Upgrade local grids to handle power factor correction, frequency fluctuations, and voltage s.
  - Align all distribution utilities under a uniform net metering interpretation.
- **Standardize Tariff Interpretation under Net Metering**
  - Develop unified guidelines for interpreting NEM to prevent agency-level discrepancies.
  - Address tariff volatility by clarifying credit rates and revenue models for government-led projects.
- **Institutionalize Comprehensive Feasibility Studies**
  - Require detailed rooftop analysis: shadow study, irradiation data, and structural viability.
  - Use standard design templates with real-world cost benchmarks (e.g., BARD case) for transparency.

7. Critical Analysis of the Programme: Procurement Related Issues

7.1 Observation

How to ensure fairness and transparency in the procurement process for solar instruments and equipment?

- BPDB aspires to include the Bloomberg top tier equipment's, panels, inverters and battery, which may be more on the costly side (table 10)
  - However, there may be resistance regarding the usage of more costly equipment resulting in opting more cheaper and lower grade equipment
- There is no clear monitoring mechanism to ensure whether the specification and the standard process is getting followed
- Energy auditors trained by SREDA could be involved in the process.
  - Whether BERC or SREDA be the regulatory and monitory authority of the full installation and operation process, it is not clarified in the relevant documents

Table 10: BloombergNEF Tier 1 Solar Panel Ranking

Manufacturer / Brand	Annual Capacity (MW/h)	Manufacturer / Brand	Annual Capacity (MW/h)	Manufacturer / Brand	Annual Capacity (MW/h)
Longi	120,000	ZNShine Solar	10,000	First Solar	15,200
Jinko Solar	120,000	Jollywood	10,000	Seraphim	13,000
JA Solar	100,000	Eging	10,000	Talesun / Taekmo	13,000
Trina	100,000	Solarsapce	10,000	Waaree	12,000
Tongwei / TW Solar	85,000	OSDA / Austa	6,560	Qcells / Hanwha Qcells	11,200
Canadian Solar	61,000	Renew Photovoltaics	6,400	ET Solar Inc / Elite Solar	3,000
Chint / Astronergy	56,000	HT-SAAE / HT-Solar	5,000	Sumec / Phono Solar	4,000
Risen Energy	48,000	Hanersun	5,000	BYD	4,000
DAS Solar	31,000	Renesola	5,000	Vikram Solar	3,500
DMEGC (Hengdian Magnetics)	21,000	Haitai Solar	5,000	Fellow Energy	3,000
Yingli	19,200	Adani / Mundra	4,000	YH Sunpro Power	3,000

Source: BloombergNEF Q2, 2025

7.2 CPD's Recommendations on Procurement Related Issues

❑ Enforcing Industry Standards through Vendor Accreditation

- Many installation failures stemmed from poor workmanship, lack of standards, and subpar components
  - To ensure quality in public buildings, only **pre-qualified, accredited vendors** should be allowed to bid
  - SREDA and BSTI should jointly enforce **installation guidelines**, and all vendors must provide **as-built documentation**, **system testing reports**, and **project commissioning certificates**
  - Importantly, **penalties** for performance failures and **blacklisting** of vendors who fail quality checks must be enforced
  - All the service providers must hold the membership of Bangladesh Sustainable and Renewable Energy Association (BSREA)

❑ Ensuring High-Quality Equipment through Procurement Standards

- To avoid premature system failure, common in past residential installations due to substandard panels and inverters, the National Program must adopt strict **technical specifications** in line with SREDA guidelines, embedded within the tendering and procurement process.
  - Since public buildings operate under government CAPEX budgets, all suppliers should be required to meet **international IEC/ISO certifications** and offer a **minimum years of performance warranties**.
  - Quality compliance should not be just a checklist, **independent third-party quality audits** should be mandatory before and after installation
  - **Different renowned labs in the country** should be entrusted with the testing of the equipments before and after installation

8. Critical Analysis of the Programme: Financing Related Issues

Table 11: Detailed CAPEX vs OPEX in Rooftop Solar Projects

Aspect	**OPEX Model** (Pay-as-you-use)	**CAPEX Model** (Own the asset)
Capital Investment	**No upfront investment** is required from the institution. The entire cost is borne by the developer or EPC firm.	Requires full upfront investment from the institution (government or agency). Entire system cost is paid in advance.
Ownership	The **EPC/developer** retains ownership of the system throughout the contract period.	The system is fully **owned by the institution** from the beginning.
Operation & Maintenance (O&M)	All O&M responsibilities are handled by the **EPC/developer**. This includes cleaning, monitoring, repairs, and replacements.	The **institution is responsible** for managing and financing regular O&M activities, either internally or via outsourcing.
Performance Risk	The performance risk lies with **the EPC/developer**. If the system underperforms, the institution pays only for the actual electricity generated.	**The institution** bears full risk. Any underperformance or technical fault directly affects savings.
Payment Mechanism	The institution **pays a fixed tariff** (per unit of electricity) under a long-term Power Purchase Agreement (PPA).	**No per-unit payment required**. After installation, the electricity generated leads to direct savings over the system's lifetime.
Savings	Provides moderate, **predictable savings** on electricity bills without asset ownership.	Enables higher long-term savings after recovery of initial investment, as the **power generated is effectively free**.
Replacement and Repairs	**Covered by the developer** during the warranty and PPA period.	To be arranged and **financed by the institution** once the warranty expires.
Tenure	Typically **10 to 25 years** under contract terms.	Long-term utility (**20–25 years**), depending on maintenance quality and system design.

Source: Secondary Sources

Table 12: CAPEX or OPEX, which is the appropriate for the programme?

User Type	Best Suited Model	Why?
Large Corporates	CAPEX / OPEX Hybrid	Have capital, want tax benefits but may outsource O&M
SMEs / MSMEs	OPEX (RESCO)	Avoids upfront burden, ensures performance
Government Buildings	**Should be open for both CAPEX and OPEX**	**Long-term savings, public infrastructure benefit, ownership of the programme**
Residential Consumers	CAPEX (with subsidy)	Investment with long-term ROI, net metering
NGOs / Educational/ Hospitals	**OPEX or Donor-driven**	**Limited capital, predictable costs**

Source: Authors' Observation

8.2 Observation

The government's estimation might over or under estimate the actual cost of rooftop solar NEM System

- ❑ A fixed cost allocation for rooftop solar installations is impractical, as project costs can significantly vary depending on building type, roof size, structural conditions, and geographic location.
- ❑ A flexible, site-specific budgeting approach is essential to ensure effective and efficient implementation across diverse settings

OPEX Models for Government Projects Need Bank Guarantees or Sovereign Backing

- ❑ For private companies, this is a risky investment. What if the government delays payments or changes policies midway?
  - Unlike private clients, government institutions may not always have enforceable contracts due to bureaucracy or changing administrations.
- ❑ A Bank Guarantee (BG) or sovereign assurance acts like a security deposit or insurance.
  - It gives the private company confidence that: payments will be made on time, the project won't be cancelled midway, investors' money is protected.
- ❑ Therefore, more companies will be willing to finance OPEX projects for government buildings, knowing their investment is safe. It also helps in getting better interest rates from banks.
- ❑ Another issue is the payment period, local banks are not ready to lend funds for longer period. They usually lend funds for 5 to 7 years.

8.3 Global Rooftop Solar Programmes Example

- Around the world, in an OPEX (Operating Expenditure) model,
  - A private company (often called the EPC or Energy Service Company) invests upfront to install a rooftop solar system on a government building.
  - The government institution then pays back gradually; either through monthly payments or savings-sharing; over 10–15 years.
- Savings-sharing is a payment model used in OPEX-based rooftop solar projects,
  - In this model the consumer (e.g., a government building) doesn't pay upfront for the solar system.
  - Instead, they agree to share a portion of the money saved on electricity bills with the solar service provider (EPC/OPEX investor).

❑ Establish a Bangladesh Bank Refinance Scheme or Dedicated Rooftop Solar Fund

To ease liquidity constraints and encourage long-term lending for rooftop solar projects, especially under the OPEX model, Bangladesh Bank should introduce a refinance scheme or a dedicated green energy fund targeting rooftop solar on public buildings.

- This fund can offer **concessional refinance** lines to commercial banks and NBFIs, enabling them to lend at lower interest rates and for longer tenures (10–15 years).
- A **dedicated window** within the existing Green Fund or a **new instrument** under BB's Sustainable Finance Department can accelerate adoption by reducing the financing cost for EPCs and investors.

❑ Introduce Sovereign Guarantees or Bank Guarantees for OPEX Projects

To attract private sector investment in OPEX-based rooftop solar projects on government buildings, a sovereign guarantee or bank guarantee mechanism should be institutionalized.

- Private companies currently perceive high risk due to uncertainty in payment timelines and potential changes in policy or administrative leadership.
- A sovereign guarantee, issued by the Ministry of Finance or a central authority, would provide assurance of timely payments and contract enforcement
    - This would significantly reduce the perceived credit risk

❑ Enable Savings-Sharing Models through Circulars and Guidelines

Savings-sharing models, where the institution pays a percentage of monthly electricity bill savings instead of a fixed tariff, can be highly attractive for cash-strapped government bodies

- The Ministry of Finance and Sustainable and Renewable Energy Development Authority (SREDA) should issue circulars or administrative guidelines allowing public entities to enter such contracts, ensuring these payments are treated as operational expenses in annual budgeting

❑ Extend Tenure of Renewable Energy Loans through Public-Private Financing Instruments

A major barrier is the short tenure of local loans, usually limited to 5–7 years, while OPEX business models require repayment structures spanning 10–15 years

- To overcome this mismatch, the government may collaborate with development partners and multilateral banks to **create blended finance** instruments or risk-sharing facilities that allow local financial institutions to lend at longer tenures and lower interest rates
- Green banks or climate finance facilities under Bangladesh Bank or **IDCOL could play a pivotal** role in operationalizing such a window

9. Critical Analysis of the Programme: Operation and Maintenance Related Issues

9.1 Context

- Operation and Maintenance (O&M) is a critical component for ensuring the **long-term sustainability, efficiency, and safety of rooftop solar systems**
- Without proper O&M practices such as regular cleaning, fault detection, and system performance checks, the energy yield and financial viability of installations can decline significantly over time.

- In the context of scaling up rooftop solar across diverse building types and institutions, a lack of structured guidance on O&M creates **risks of system degradation, safety hazards, and user dissatisfaction**
- Therefore, a deeper examination of O&M-related gaps in the programme is necessary to strengthen long-term performance and trust in rooftop solar adoption
- Power Division has been considering a few possible solutions to the O&M of the solar panels
  - Hiring a third party/
  - Training their own manpower/
  - REB to do the maintenance in return of financial benefit

Association of the ministry and divisions to monitor repair and maintenance issues after the installation

- Regular maintenance is one of the key challenge that can **dictate the success or failure** of these type of public projects as there can be absence of instructions that declare specific responsibilities to specific authority

Table 13: Proposed O&M Activities Under the Circular	
Activity	**Frequency**
Panel cleaning	At least once every 7 days
Visual inspection	Every 3 months
Electrical system testing	Every 1 month
Mounting structure inspection	Every 6 months
Inverter inspection	At least once a year

Source: National Solar Rooftop Programme

- As per the purchase agreement: **The Power Producer will be responsible for running and maintaining the solar power plant**
- They will do this in coordination with any contractors they hire, making sure the plant runs efficiently
- In CAPEX model power producer is the owner of the rooftop solar, that is the building authority.
- The policy and further instructions should also clarify, for running and maintenance will there be any system in place to incorporate **REB** in the process?

9.3 Global Rooftop Solar Programmes Example

Table 14: Global Comparative Analysis of O&M the rooftop Solar Systems

Country	Programme Name	Operation & Maintenance (O&M) Approach	Key O&M Practices
India	National Solar Rooftop Programme (Ministry of New and Renewable Energy – MNRE)	O&M is mandatory under Engineering, Procurement and Construction (EPC) contracts for 5 years (extendable to 10 years in some states)	• Remote data monitoring via Solar Monitoring System (by MNRE) for institutional/government systems • Third-party performance audits in states like Gujarat and Rajasthan • Smart meter integration by State Distribution Companies (DISCOMs)
Sri Lanka	Soorya Bala Sangramaya (Battle for Solar Energy)	O&M responsibility lies with system owners; technical support by Sri Lanka Sustainable Energy Authority (SLSEA)	• Net-metered systems monitored by utilities like Ceylon Electricity Board (CEB) and Lanka Electricity Company (LECO), though real-time digital tools are limited • SLSEA is piloting local technician training at community level
Pakistan	Net Metering Policy and Alternative Energy Development Board (AEDB) Guidelines	O&M is generally left to consumers; absence of formalised frameworks is a concern	• AEDB mandates the use of licensed installers • Inverter failures and poor service due to weak follow-up systems • Ongoing discussions to include warranty-backed O&M in new rooftop policies
Australia	Small-scale Renewable Energy Scheme (SRES)	O&M performed by Clean Energy Council (CEC)-accredited professionals	• Regular inspections, inverter checks, and panel cleaning promoted • Long-term O&M (10–25 years) through lease or Power Purchase Agreement (PPA) models (e.g., Sunwiz, Origin Energy) • Consumer-oriented O&M guidelines by government agencies
Germany	Renewable Energy Act (Erneuerbare-Energien-Gesetz – EEG) and Mieterstrom (Tenant Solar) Models	Professional and regulated O&M services are standard	• Routine inspection of inverter performance, panel degradation, and grid compliance • Tenant solar includes bundled O&M for operators or landlords • Mandatory use of data loggers and smart meters for performance tracking

Source: Collected from various secondary literatures.

9.4 CPD's Recommendations on O&M Related Issues

❑ Independent Monitoring and Reporting Mechanisms

Given transparency issues in public procurement and infrastructure, it is critical to introduce third-party monitoring and verification (M&V) mechanisms.

- Independent institutions such as BUET, SREDA-approved technical inspectors, **Energy auditors**, or certified engineering firms should be tasked with conducting annual **performance audits.**
- Their reports must be submitted to the implementing agency **on a quarterly basis** and made publicly available.
- This system of external validation will foster accountability and help detect faults or fraud early, while also building trust among stakeholders and development partners

❑ Transparent Metering and Real-Time Monitoring

In the purchase agreement The Power Producer is responsible to develop an Online Monitoring System for remote monitoring

Both CAPEX and OPEX models benefit from the integration of digital monitoring systems

- It is appreciable that all rooftop solar systems are required to be equipped with **remote monitoring platforms** that display generation data in real time.
- This data should be made **accessible to relevant agencies** such as SREDA or the Power Division to track plant health and output. A centralized digital portal, like a **national solar dashboard**, can increase transparency and provide evidence for payments under the OPEX model or performance audits in CAPEX.
- This is particularly important in Bangladesh where verification and reporting are often manipulated in the absence of transparent data.

❑ Strengthening O&M Under the CAPEX Model

In a CAPEX model, where the government owns the rooftop solar system after installation, O&M responsibilities often become neglected due to weak accountability and budgetary limitations. To address this, it is crucial to embed O&M obligations directly into the EPC contract.

- A **5–10 year O&M clause** should be mandatory, where the **contractor is responsible** for scheduled maintenance, system monitoring, and fault resolution.
- **Payments to EPC** providers can be staggered and tied to **long-term system performance metrics** such as annual energy yield, ensuring that vendors remain engaged even after commissioning.
- This is essential in the Bangladeshi context where once-off infrastructure projects are frequently left without sustained care.

❑ Establishing a Dedicated Guarantee Fund for Repair and Maintenance

- **A government-backed Guarantee Fund** should be introduced to support **urgent repairs and critical maintenance of rooftop solar systems**, particularly in **public institutions under the CAPEX model**, where **annual maintenance budgets are insufficient or absent**.
- The fund should be **administered by SREDA or the Power Division**, with **disbursement linked to third-party audit verification**, ensuring **timely system restoration** and uninterrupted solar generation without bureaucratic delays.

❑ **Institutional Accountability Within Public Buildings (an alternative)**

Public institutions in Bangladesh often face bureaucratic ambiguity regarding who is responsible for post-installation maintenance.

- To overcome this, the government must assign a **dedicated office or official within each institution**, such as an engineering unit or facility manager, to act as the primary custodian of the rooftop solar system.
- This person should be **responsible** for maintaining a **solar logbook, coordinating with vendors, and overseeing routine system checks.**

❑ **Introducing Centralized Monitoring and Accountability Frameworks**

A major failure in past programs was the lack of centralized monitoring—once installed, no one tracked system health or generation.

- For public buildings, a **central digital monitoring platform** must be established under SREDA, linking all installed systems through IoT-based monitoring tools. These dashboards should track live generation, uptime, inverter status, and fault alerts.
- Ministries should appoint **Energy Focal Points** to be accountable for ensuring that rooftop systems are functional and optimized

10. CPD's Recommendation on Design, Implementation, Monitoring and Evaluation

10. CPD's Recommendation on Design, Implementation, Monitoring and Evaluation

Recommendations on the overall programme

- The programme should kick start with the piloting of the selected areas instead of going full swing (table 15)
- The piloting sample should be selected based on the following criteria
    - Radiation impact, available finances in different divissions, grid readiness, major load shedding areas, presence of REB Somities
- Before even starting the piloting, the relevant stakeholders must decide among themselves to finalise their roles as there is a major lack of coordination among the three key stakeholders
- The new programme must learn from the failure of the previous programme and must not repeat the similar ones

Recommendations on the policy

- The policy must prevent from becoming a "tick-box" culture in public buildings by designing policies that tie budget disbursement to actual energy generation, not installation
- There should be a policy guideline for the successful implementation of the programme
- All sorts of customs duty, import duty, VAT and Tax should be exempted from solar panels, battery and inverters

Table 15: Piloting Sample for the Programme

Location	Govt. office buildings	Educational Institutions	Hospitals
Union	57 ministries/ divisions	• 5 primary schools • 5 secondary schools • 5 colleges • 5 universities • 5 madrassas	• 30 hospitals
Upazila	57 ministries/ divisions	• 5 primary schools • 5 secondary schools • 5 colleges • 5 universities • 5 madrassas	• 30 hospitals
District	57 ministries/ divisions	• 5 primary schools • 5 secondary schools • 5 colleges • 5 universities • 5 madrassas	• 30 hospitals
Division	57 ministries/ divisions	• 5 primary schools • 5 secondary schools • 5 colleges • 5 universities • 5 madrassas	• 30 hospitals
Sub- Total	228	100	120
Total Piloting	448		

10. CPD's Recommendation on Design, Implementation, Monitoring and Evaluation

Recommendations on the Design Related Issues

- To maximize the effectiveness of the National Rooftop Solar Programme, site selection must be driven by solar radiation potential and the geographic distribution of government offices.
- A tailored, location-specific approach is essential to ensure technical and financial feasibility across diverse regions of Bangladesh

Recommendations on the Implementation Related Issues

- To ensure the success of Bangladesh's National Rooftop Solar Programme, each installation must undergo a comprehensive feasibility study covering rooftop and structural assessment with shadow analysis, solar irradiation and tilt optimization, and site-specific equipment selection.
- During the grid implementation process, the NEM tariff should be discussed and finalised with utility providers

Recommendations on the Procurement Related Issues

- As the full procurement process is highly technical, there must be a technical committee to facilitate the process
- To ensure quality in public buildings, only pre-qualified, accredited vendors, BSREA members should be allowed to be selected in the bid
- Since public buildings operate under government CAPEX budgets, all suppliers should be required to meet international IEC/ISO certifications and offer a minimum years of performance warranties
- Different renowned labs in the country should be entrusted with the testing of the equipment before and after installation

10. CPD's Recommendation on Design, Implementation, Monitoring and Evaluation

Recommendations on the Financing Related Issues

- Bangladesh Bank should introduce a refinance scheme or a dedicated green energy fund targeting rooftop solar on public buildings
- In both CAPEX and OPEX-based rooftop solar projects on government buildings, a sovereign guarantee or bank guarantee mechanism should be institutionalized
    - A sovereign guarantee, issued by the Ministry of Finance or a central authority, would provide assurance of timely payments and contract enforcement

Recommendations on the Operation and Maintenance Related Issues

- Given transparency issues in public procurement and infrastructure, it is critical to introduce third-party monitoring and verification (M&V) mechanisms
    - The third party will submit a quarterly report to the responsible DC office and the report to be publicly available at their website
- A **5–10 year O&M clause** should be mandatory, where the **contractor is responsible** for scheduled maintenance, system monitoring, and fault resolution
- A government-backed Guarantee Fund should be introduced to support urgent repairs and critical maintenance of rooftop solar systems, particularly in public institutions under the CAPEX model, where annual maintenance budgets are insufficient or absent

Thank You!