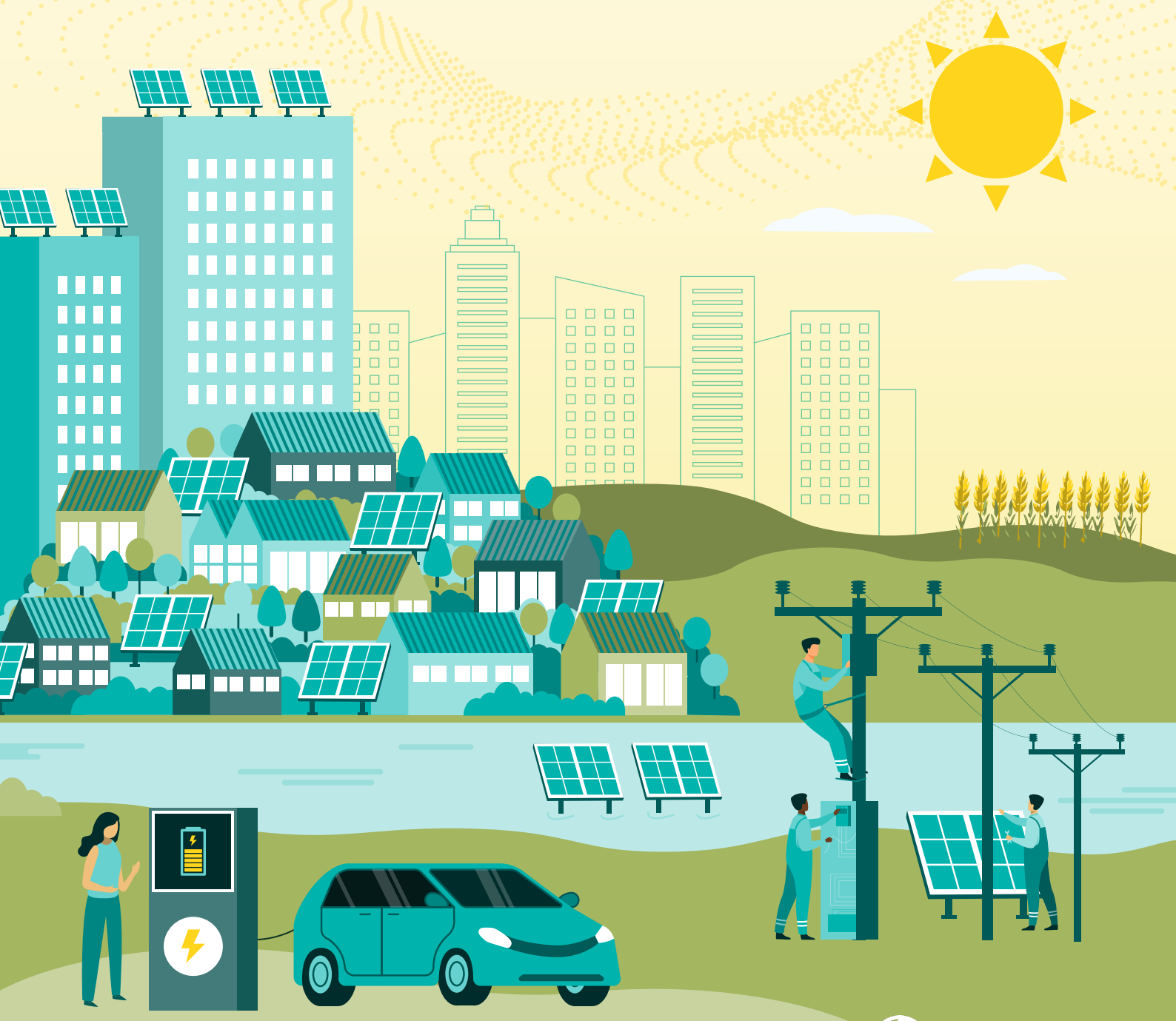
Global Gateway

EUROPEAN UNION

Boosting Solar in Bangladesh

Stocktaking of global solar solutions and complementarity of Bangladeshi and European solar industries



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TAF team:

Key experts

- Nicola Bugatti
- Nijaz Dizdarevic
- Georges Kamar

Non-key experts

- Máté Heisz
- Benjamin Clarke
- Shadekul Talukder

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ABBREVIATIONS

Agri-PV	Agrivoltaics
BERC	Bangladesh Energy Regulatory Commission
BESS	Battery Energy Storage System
BOO	Build-Own-Operate
BOOT	Build-Own-Operate-Transfer
BPDB	Bangladesh Power Development Board
CAR	Contractor's All Risk
EPR	Extended Producer Responsibility
EPC	Engineering, Procurement, and Construction
ESG	Environmental, Social, and Governance
EU	European Union
GTAF	Global Technical Assistance Facility
HVDC	High Voltage Direct Current
IDA	International Development Association
IPP	Independent Power Producer
LCC	Lifecycle Cost
LD	Liquidated Damages
LFP	Lithium Iron Phosphate
MEAT	Most Economically Advantageous Tender
NMC	Nickel Manganese Cobalt
O&M	Operation and Maintenance
PDU	Project Development Unit
PGCB	Power Grid Company of Bangladesh
PPA	Power Purchase Agreement
PPP	Public-Private Partnership
PV	Photovoltaic
SHJ	Silicon Heterojunction
SPP	Sustainable Public Procurement
SREDA	Sustainable and Renewable Energy Development Authority
TOPCon	Tunnel Oxide Passivated Contact
WEEE	Waste Electrical and Electronic Equipment

1. EXECUTIVE SUMMARY

This report was commissioned by the European Union Delegation to Bangladesh under the EU Global Technical Assistance Facility (GTAF) for Sustainable Energy, to support the Government of Bangladesh in increasing the share of local renewable energy sources, in line with the country's Nationally Determined Contributions (NDCs) and long-term energy security objectives. The study's overarching aim is to provide a comprehensive understanding of the on-grid solar utility sector in Bangladesh and to identify practical ways to leverage European technologies, competitive advantages, and best practices in collaboration with the local private sector. The findings are intended to inform the European Investment Bank (EIB), the EU Delegation, and other stakeholders, and to feed into the design of subsequent programmes, including BREF. The report synthesises three core analyses:

- A stocktaking of technologies, business models, and market trends in Bangladesh and globally;
- A mapping and characterisation of European and other companies relevant for solar projects in Bangladesh, including their added value;
- An assessment of how Engineering, Procurement, and Construction (EPC) procurement and contracts can enhance project implementation and sustainability, with a focus on value-based procurement.

1.1. SUMMARY OF TECHNOLOGIES AND SERVICE/BUSINESS MODELS, AND MARKET ANALYSIS IN BANGLADESH AND IN THE REGION

1.1.1. Overview of technical and business model advancements in the solar sector

1.1.1.1. Global stocktaking of solar technologies and services

The global solar industry is advancing rapidly, with high-efficiency n-type photovoltaic (PV) cells such as Tunnel Oxide Passivated Contact (TOPCon) and Silicon Heterojunction (SHJ) now consistently achieving efficiencies above 22%, surpassing older Passivated Emitter and Rear Cell (PERC) technology. Inverter technology has also evolved, with a shift towards 1500V and 2000V string inverter architectures, and the emergence of grid-forming inverters capable of providing synthetic inertia and fast frequency response. Battery Energy Storage Systems (BESS), particularly those using Lithium Iron Phosphate (LFP) chemistry, are increasingly integrated to enhance grid flexibility and project bankability.

Key recommendations:

- Prioritise procurement of advanced n-type PV modules (e.g. TOPCon) for higher energy yield at similar costs.
- Adopt advanced inverters with grid-forming capability and integrate BESS where feasible to support grid integration and ancillary services.

1.1.1.2. Business model evolution

Innovative business models are diversifying project development and financing. Alongside traditional Independent Power Producer (IPP) models, new approaches such as merchant solar, hybrid merchant plus PPA arrangements, corporate PPAs, and various Public-Private Partnerships (PPP) are emerging. Bangladesh's Merchant Power Plant Policy 2025 opens the market to direct private-to-private electricity sales.

Key recommendations:

- Issue clear guidelines and standardised contracts for merchant and corporate PPA projects.
- Develop transparent PPA templates and competitive bidding processes to ensure project bankability.

1.1.1.3. Sustainability and circularity

There is a growing emphasis on sustainability, end-of-life management, and cybersecurity. Circular economy practices are being promoted, including extended producer responsibility (EPR) schemes and advanced recycling processes for PV modules and batteries.

Key recommendations:

- Establish EPR schemes for collection and recycling of decommissioned solar equipment.
- Mandate compliance with international cybersecurity standards (e.g. ISO/IEC 27001, IEC 62443) for solar plant operators.

1.1.1.4. Innovative applications: Agrivoltaics and floating solar

To address land scarcity, innovative applications such as agrivoltaics (Agri-PV) and floating solar are being piloted. These approaches allow dual use of land and water bodies, increasing land-use efficiency and reducing competition with agriculture.

Key recommendations:

- Develop guidelines for agrivoltaic system design tailored to local crops and farming practices.
- Formulate technical standards and environmental safeguards for floating PV and incorporate these into national renewable energy plans.

1.1.2. Identification of the specificities of solar project implementation in Bangladesh

1.1.1.5. Land availability and suitability

Securing land for solar farms is a major challenge due to high population density and agricultural land protection laws. Land records are fragmented, and acquisition is administratively complex.

Key recommendations:

- Establish a digital land suitability map or land bank for renewable energy, categorising available tracts and their ownership status.
- Streamline land acquisition processes and promote dual-use approaches such as agrivoltaics and floating PV.

1.1.1.6. Climate and environmental considerations

Bangladesh's tropical monsoon climate and extreme weather events pose significant risks to solar infrastructure. Projects must be designed to withstand flooding, cyclones, extreme heat, and humidity.

Key recommendations:

- Mandate climate-resilient design standards, including elevated structures, reinforced foundations, and equipment rated for local climate stresses.
- Update building and equipment codes to require these adaptations, referencing international standards.

1.1.1.7. Grid integration and stability

Integrating variable solar generation is challenging due to limited reserve margins and aging transmission infrastructure.

Key recommendations:

- Prioritise grid upgrades in regions slated for large solar additions.
- Deploy BESS and synchronous condensers for voltage support and frequency regulation.
- Update the national Grid Code to accommodate high shares of renewables and include provisions for ancillary services.

1.1.3. Performance reviews: case studies of Bangladeshi solar plants

1.1.1.8. Sirajganj 7.6 MW solar plant

This plant demonstrates stable technical performance and significant CO_2 emissions avoidance but faces financial viability challenges due to high capital costs and lack of low-cost financing.

Key recommendations:

- Reduce financing costs through concessional loans or blended finance.
- Incorporate project structures such as joint ventures or PPPs to spread risk.
- Budget adequately for O&M and consider performance-based O&M contracts.

1.1.1.9. Sonagazi 75 MW solar plant

This project showcases international best practices, with high performance ratios, low module degradation, and strong stakeholder engagement. The financial model, supported by concessional loans, enabled rapid profitability.

Key recommendations:

- Apply high standards and secure soft financing for future projects.
- Ensure early and continuous stakeholder engagement and robust O&M procedures.
- Build capacity in O&M through training or contracting experienced firms.

1.1.4. Review of standards and regulatory frameworks

1.1.1.10. Technical standards

Bangladesh's solar equipment standards are partly based on international norms but require some critical tests and recent amendments.

Key recommendations:

- Update BDS standards for solar components to fully align with current IEC/ISO benchmarks.
- Institute regular review cycles for standards and establish a standing committee with industry experts.

1.1.1.11. Regulatory and policy framework

Recent policies aim to liberalise the market, but many require detailed implementation guidelines and regulatory adjustments.

Key recommendations:

- Translate new policies into actionable regulations, including standardised PPA and tariff guidelines.
- Establish a digital one-stop permitting portal to streamline approvals.
- Empower the Bangladesh Energy Regulatory Commission (BERC) with greater autonomy and resources.

1.1.5. Elaboration of a manual on implementation procedures

A comprehensive manual has been developed to guide stakeholders through each phase of utility-scale solar project development, delineating roles, timelines, and best practices.

Key recommendations:

- Adopt the manual's checklists as a baseline for all involved agencies to ensure consistency and transparency.
- Establish a central Project Development Unit (PDU) to coordinate project approvals and maintain a one-stop portal for permits.

- Use umbrella agreements for split-contract structures and integrate schedule management tools.

1.1.6. Capacity needs assessment of utilities

A structured assessment of the capacity of major public utilities revealed solid experience in conventional power projects but identified gaps in specialised expertise for solar PV.

Key recommendations:

- Implement a phased training and development programme for utility staff, starting with foundational training and advancing to specialised courses.
- Establish a national solar knowledge hub for sharing data, best practices, and case studies.
- Enhance planning and oversight capacity within utilities, focusing on project management, O&M, and data monitoring.

1.1.7. Conclusions and recommendations

Utility-scale solar PV in Bangladesh demonstrates strong viability and transformative potential, especially with EU-supported initiatives like BREF. The following strategic actions are recommended:

Key recommendations:

- Adopt global best practices in technology and sustainability, including high-efficiency PV modules, advanced inverters, robust BESS, and circular economy requirements.
- Incorporate climate-resilient and innovative project design, updating standards and piloting agrivoltaics and floating solar.
- Modernise procurement and contracting frameworks, adopting value-based approaches and standardising contracts.
- Strengthen standards and regulatory enforcement, updating national standards and operationalising new policies.
- Improve implementation processes and institutional capacity, establishing a central PDU and investing in continuous capacity building.
- Mobilise finance and partnerships, leveraging blended finance facilities and encouraging joint ventures between European and Bangladeshi companies.

1.2. SUMMARY OF MAPPING AND CHARACTERISATION OF THE EUROPEAN COMPANIES RELEVANT FOR SOLAR PROJECTS IN BANGLADESH, INCLUDING THOSE ALREADY WORKING IN THE REGION

1.2.1. Mapping of the European companies relevant for solar projects in Bangladesh

The study provides a comprehensive mapping of European companies that are active or have the potential to be active in Bangladesh's solar sector. European companies are categorised into three main groups: developers or Independent Power Producers (IPPs), technical advisors or software providers, and manufacturers of solar components. The mapping includes companies already present in Bangladesh, those active in comparable Asian markets such as India and Vietnam, and other notable European firms whose expertise could address Bangladesh's specific challenges, including climate resilience, land scarcity, and grid limitations.

Key European companies currently or formerly active in Bangladesh include ib vogt (Germany), which developed a 50 MW grid-tied solar plant in Chattogram, TÜV SÜD (Germany) and Fichtner (Germany) as technical advisors and owner's engineers, and REC Solar (Norway) as a panel manufacturer for the rooftop and commercial/industrial market. The withdrawal of TotalEnergies (France) and Scatec (Norway) due to regulatory uncertainty highlights the importance of a stable investment climate.

European companies active in India and Vietnam, such as 3E (Belgium), ABB (Switzerland/Sweden), Ciel & Terre (France), EDF Renewables (France), EDP Renewables (Portugal), Enel Green Power (Italy), Engie (France), Enerparc (Germany), Fortum (Finland), Fronius (Austria), juwi (Germany), SMA Solar Technology (Germany), and TŰV Nord (Germany), have demonstrated expertise in project development, technical advisory, manufacturing, and innovative applications such as floating solar and agrivoltaics. Their experience in similar climates and regulatory environments positions them as valuable partners for Bangladesh.

Key recommendations:

- Proactively engage European companies with proven expertise in climate-resilient engineering, advanced technology, and project management.
- Facilitate the entry of European firms by providing a stable and transparent regulatory environment, clear procurement pipelines, and opportunities for joint ventures with local partners.
- Leverage the experience of European companies in India and Vietnam to address Bangladesh's unique challenges, particularly in land use, grid integration, and climate adaptation.

1.2.2. Mapping and characterisation of other key global/regional and Bangladeshi companies active in the national market

The study maps the landscape of non-European companies and Bangladeshi firms active in the solar sector. Bangladeshi EPC companies such as Rahimafrooz Renewable Energy Ltd., Energypac, Confidence Group, AG Agro Industries, ACME Group, East Coast Group, FBBC, G-Tech, and Engreen Engineering have demonstrated local project execution capabilities, particularly in small to medium-scale projects. However, for large utility-scale projects, local firms often rely on joint ventures with international partners for technical expertise, financial strength, and procurement leverage.

International companies from China, India, Southeast Asia, and the Middle East have played significant roles in Bangladesh's solar development, often providing EPC services, technical advisory, and financing. Chinese state-owned enterprises, Indian EPC firms, and Southeast Asian developers have contributed to the implementation of large-scale projects, frequently in partnership with local companies.

Key recommendations:

- Strengthen the capacity of Bangladeshi EPC companies through targeted training, exposure to international best practices, and participation in joint ventures with experienced foreign partners.
- Encourage knowledge transfer and local capacity building by structuring contracts and partnerships to include training, technology transfer, and local content requirements.
- Promote the development of local manufacturing and supply chains to reduce reliance on imports and enhance project sustainability.

1.2.3. Added value of European companies and the benefits they can bring to the Bangladeshi solar sector

European companies offer significant added value to Bangladesh's solar sector, distinguished by their rigorous climate-resilient engineering, high quality standards, technology and innovation transfer, financial strength, and enhanced environmental, social, and governance (ESG) performance:

- **Climate-Resilient Engineering and Best Practices:** European firms integrate climate adaptation features from the outset, such as elevated structures for flood protection, cyclone-resistant mounting, corrosion-resistant materials, and robust lightning protection. These measures ensure that solar projects can withstand Bangladesh's extreme weather conditions and maintain long-term performance.
- **High Quality Standards and Compliance:** European companies are renowned for stringent quality assurance and compliance with international standards (e.g., IEC, ISO). Their involvement ensures that projects are built to high technical, safety, and environmental standards, reducing the risk of underperformance and increasing bankability.

- **Technology and Innovation Transfer:** European firms introduce advanced technologies such as bifacial PV modules, single-axis trackers, floating solar, agrivoltaics, battery storage integration, and advanced monitoring and control systems. They also invest in training local staff, facilitating knowledge transfer and capacity building.
- **Financial Strength and Risk Management:** European developers and IPPs bring strong balance sheets, access to concessional finance, and experience in risk mitigation strategies, including comprehensive insurance, robust contract guarantees, and blended finance models. Their involvement enhances project bankability and attracts international lenders.
- **Enhanced ESG Performance:** European companies prioritise thorough environmental and social impact assessments, community engagement, labour and safety standards, benefit-sharing, and transparency. Their projects often include community benefit programmes, grievance redress mechanisms, and adherence to international human rights standards.
- **Circular Economy and End-of-Life Management:** European firms plan for recycling and waste handling, efficient resource use, upgradability, and decommissioning, ensuring that solar projects are sustainable throughout their lifecycle.

Key recommendations:

- Prioritise the involvement of European companies in projects where climate resilience, quality, and sustainability are critical.
- Structure procurement and contracting processes to reward quality, innovation, and ESG performance, rather than lowest cost alone.
- Facilitate technology and knowledge transfer through joint ventures, training programmes, and long-term O&M partnerships.
- Leverage the financial strength and risk management expertise of European firms to improve project bankability and attract international finance.
- Incorporate circular economy principles and end-of-life management requirements into project planning and contracts.

1.2.4. Main barriers for European companies in the Bangladesh market

European companies exploring opportunities in Bangladesh's solar sector encounter a rapidly evolving environment in response to national renewable energy ambitions. The market presents a range of considerations that shape the strategies and engagement of different types of European actors, including EPC contractors, developers and IPPs, technical advisors, and manufacturers.

For EPC contractors, the need for a structured and predictable project pipeline is an important factor in market entry decisions. As procurement frameworks continue to evolve, there is increasing scope for value-driven approaches that recognise long-term quality and resilience. The growing emphasis on partnerships and local presence supports knowledge exchange and capacity building, which are mutually beneficial for both European and Bangladeshi firms.

Recent policy reforms are aimed establishing a more transparent and competitive environment. The transition towards regular competitive tendering and the introduction of new business models, such as merchant power and corporate PPAs, are opening new avenues for investment. However, action is needed to operationalise these policies and to increase the regulatory stability and certainty for developers and IPPs looking to make long-term investments. Continued progress in streamlining land acquisition, grid connection, and project approval processes will further enhance the attractiveness of the market for international developers.

Technical advisors and service providers are well positioned to contribute as the market expands and the demand for independent engineering, due diligence, and performance analysis grows. Collaborative approaches that combine global expertise with local knowledge are increasingly valued, and the ongoing professionalisation of the sector is expected to create more opportunities for high-value advisory services. This can be further supported through dedicated skill development programmes for Bangladeshi's entering the solar industry.

Manufacturers of solar equipment are observing positive trends as procurement practices begin to incorporate quality and lifecycle considerations. Work should continue to institutionalise value-based procurement that would bring high quality equipment to Bangladesh and create opportunities for European manufacturers. The development of local distribution networks and after-sales support, together with the strengthening of local supply chains, will further facilitate the entry and sustained presence of European manufacturers.

Key recommendations:

- Continue to support the operationalisation of new policies and the development of detailed implementation guidelines, which will provide clarity and predictability for all market participants.
- Maintain momentum in publishing multi-year project pipelines and facilitating access to information on upcoming opportunities.
- Encourage ongoing improvements in land acquisition and grid connection processes and provide targeted support for international investors navigating local requirements.
- Advance procurement reforms that reward quality, sustainability, and partnership, ensuring that value-based criteria are embedded in project selection.
- Foster the development of local service and support networks and promote collaborative models that facilitate knowledge transfer and capacity building.

1.2.5. Opportunities for collaboration with local private sector

There are significant opportunities for collaboration between European companies and the Bangladeshi private sector, leveraging complementary strengths. Recent developments include the launch of approximately 2.6 GW of utility-scale solar projects and a national rooftop solar programme targeting 3 GW by December 2025.

Collaboration models include joint ventures, EPC consortia or split contracts, O&M partnerships, technical advisory roles, technology licensing and local assembly, and co-development of innovative pilot projects. These models facilitate knowledge transfer, capacity building, and the delivery of high-quality, sustainable projects. Of these collaboration opportunities, there have already been joint ventures between European and Bangladeshi companies, with ib vogt & AG Agro forming one for a 50 MW solar project. The same applies to technical advisory, with European firms, such as TÜV SUD and Fichtner, already established in the market. Notably, European development partners are already supporting the development of innovative pilot projects in partnership with the Government of Bangladesh. GIZ's partnership with Power Division on the country's first agrivoltaics pilot project is a good example of this and further opportunities could be leveraged. Moreover, split EPC models and O&M partnerships could be operationalised in the short term, provided there is a sufficient project pipeline. Technology licensing and local assembly is a collaboration prospect that can be achieved once the Bangladeshi market has matured further

Key recommendations:

- Promote joint ventures and consortia between European and Bangladeshi companies, particularly for large-scale and innovative projects.
- Establish matchmaking platforms, networking events, and online portals to facilitate partnerships.
- Encourage development finance institutions to support collaborative projects through dedicated credit lines, guarantees, and training programmes.
- Incorporate requirements for local content, training, and technology transfer into procurement and contracting processes.

1.2.6. Conclusions and recommendations

European companies, though currently modestly present in Bangladesh's solar sector, have the potential to become key contributors to the country's renewable energy goals. Their expertise in engineering quality, climate resilience, advanced technology, and sustainability standards can address critical gaps

in the current market. However, regulatory uncertainty, procurement practices, and financial risks remain significant barriers.

Key recommendations:

- Strengthen policy and regulatory frameworks, focusing on the full operationalisation of new policies and regulatory clarity.
- Improve market access and project bankability through standardised contracts, payment security, and risk mitigation instruments.
- Incentivise quality, innovation, and local partnerships through procurement reform and targeted support.
- Facilitate matchmaking and capacity building to foster collaboration and knowledge transfer.
- Enhance after-sales support, O&M, and circularity by incorporating these requirements into project planning and contracts.

1.3. SUMMARY OF IDENTIFICATION OF HOW EPC PROCUREMENT AND CONTRACTS CAN CONTIRBUTE TO ENHINACING PROJECT IMPLEMENTATION AND SUSTAINABILITY BY LEVERAGING INTERNATIONAL STANDARDS, TECHNOLOGIES AND BEST PRACTICES, INCLUDING FROM EUROPE

1.3.1. Procurement frameworks of Bangladesh and the EIB

The study provides a detailed analysis of the evolution of procurement frameworks in Bangladesh, with a focus on the transition from a lowest-cost approach to a value-based procurement paradigm. The Public Procurement Act 2006 and its subsequent amendments, the Public Procurement Rules 2025, the Sustainable Public Procurement Policy 2023, and the Sustainable Procurement Practitioner's Guide 2024 collectively establish the legal and procedural foundation for integrating quality, sustainability, and lifecycle considerations into public procurement. The creation of the Bangladesh Public Procurement Authority (BPPA) further strengthens institutional oversight and capacity building.

The report benchmarks these frameworks against the European Investment Bank (EIB) and international best practices, noting that Bangladesh's reforms are closing the gap with global standards. The alignment with the Most Economically Advantageous Tender (MEAT) approach and the inclusion of environmental and social criteria are particularly significant.

Key recommendations:

- Continue to operationalise the new procurement frameworks by updating standard bidding documents and providing targeted training for procurement officials.
- Ensure that all evaluation criteria, including technical quality, sustainability, and lifecycle cost, are transparently disclosed and consistently applied.
- Leverage the BPPA's authority to clarify and standardise procurement practices across government entities.

1.3.2. Integration of value-based criteria

The study examines the practical integration of value-based criteria into bid evaluation, drawing on global best practices and EIB standards. The report highlights the shift towards multi-criteria evaluation, where contracts are awarded based on a balanced assessment of price, technical quality, sustainability, and social value. The use of weighted scoring systems, two-envelope bidding, and minimum technical thresholds is encouraged to ensure that quality is given due weight.

The study also identifies areas where further procedural or legal changes may be required, such as the formalisation of supply chain resilience, corporate social responsibility, and past performance as evaluation criteria. The importance of piloting these criteria in donor-funded projects and updating standard bidding documents is emphasised.

The advantages of value-based procurement are improved project quality and durability, long-term cost efficiency, sustainability, resilience to local challenges, skills development, social and economic benefits, transparency, and enhanced market participation. The recommended procurement approaches include multi-criteria evaluation, technical quality assessment, lifecycle costing, O&M integration, performance guarantees, environmental and social criteria, CSR/local development, supply chain resilience, and data security.

Key recommendations:

- Adopt multi-criteria evaluation frameworks that balance price with technical, environmental, and social factors.
- Pilot advanced evaluation criteria, such as supply chain resilience and CSR, in upcoming tenders and donor-funded projects.
- Update standard bidding documents to institutionalise value-based procurement practices.
- Provide ongoing training and support to procurement officials and evaluation committees to build confidence and expertise in applying these methods.

1.3.3. Global examples of value-based procurement

The study presents international case studies illustrating the successful implementation of value-based procurement in renewable energy and infrastructure projects. Examples from Denmark, India, the United States, South Africa, Ghana, and the European Commission demonstrate the effectiveness of multi-criteria evaluation, minimum technical thresholds, and the integration of sustainability and social value into procurement decisions.

The study notes that these global experiences provide practical models for Bangladesh to adapt, particularly in the context of solar EPC procurement. The emphasis on quality, innovation, and long-term value is shown to result in better project outcomes, higher performance, and greater stakeholder satisfaction.

Key recommendations:

- Draw on international best practices to customise value-based procurement approaches for the Bangladeshi context.
- Incorporate lessons learned from global case studies into the design of evaluation frameworks and tender documents.
- Engage with development partners and international experts to support the adaptation and implementation of these practices.

1.3.4. Guidelines for value-based procurement in Bangladesh

The study provides detailed guidelines for incorporating value-based criteria into EPC procurement for solar projects in Bangladesh. The report recommends the immediate adoption of criteria such as climate and environmental resilience, land-use efficiency, and lifecycle cost in tender evaluations. It also outlines additional criteria that may require procedural or legal changes, including supply chain resilience, local industry development, CSR, and past performance.

The guidelines emphasise the importance of transparency, consistency, and enforceability in the application of these criteria. The use of standard templates, scoring matrices, and clear documentation is encouraged to ensure fairness and accountability.

Key recommendations:

- Introduce evaluation sub-criteria for climate resilience, land-use efficiency, and lifecycle cost in all upcoming solar EPC tenders.
- Pilot social and supply chain resilience criteria in donor-funded projects and prepare for their broader adoption.
- Issue updated standard bidding documents and templates that embed value-based criteria and scoring methods.

- Institutionalise regular review and refinement of evaluation frameworks based on feedback and project outcomes.

1.3.5. Benchmarking and guidelines for EPC contracting

The study benchmarks typical Bangladeshi EPC contracts against international best practice, including FIDIC-based contracts and those used in EU-funded projects. The report identifies nine key elements for enhancement: scope of work and technical specifications, performance guarantees and KPIs, warranty and defects liability, O&M obligations, sustainability and environmental compliance, corporate social responsibility, climate and disaster resilience measures, insurance requirements, and liability and liquidated damages.

The guidelines recommend the explicit inclusion of climate-resilient features, robust performance guarantees, extended warranty periods, bundled O&M services, ESG compliance, local benefit clauses, disaster management plans, comprehensive insurance, and clear allocation of liabilities.

Key recommendations:

- Update EPC contracts to include detailed technical specifications referencing international standards and climate resilience requirements.
- Set robust performance guarantees and enforce liquidated damages for underperformance or delays.
- Extend warranty and defects liability periods to cover critical operational phases.
- Bundle O&M services with EPC contracts to ensure knowledge transfer and reliable operation.
- Mandate compliance with ESG standards and include local benefit and CSR clauses.
- Require comprehensive insurance coverage and clearly allocate liabilities and remedies in contracts.

1.3.6. Recommendations for reform and implementation

The study synthesises the key recommendations for embedding value-based procurement and robust contracting in Bangladesh's renewable energy projects. The report calls for the revision of procurement regulations and documents, capacity building for officials, enhancement of bid evaluation processes, implementation of lifecycle costing tools, strengthening of contract enforcement and quality assurance, promotion of transparency and accountability, and alignment of grid codes and policy frameworks.

The recommendations are designed to ensure that solar projects are awarded to the best candidates and implemented to high standards, delivering reliability, resilience, and sustainable benefits.

Key recommendations:

- Revise procurement regulations and standard documents to mandate value-based evaluation and robust contract terms.
- Build the capacity of procurement officials and evaluation committees through targeted training and expert support.
- Enhance the rigour and transparency of bid evaluation and contract management processes.
- Institutionalise lifecycle costing and performance monitoring tools.
- Align grid codes and policy frameworks to support the integration of advanced technologies and services.
- Promote continuous stakeholder engagement and feedback to refine procurement and contracting practices.

2. STOCKTAKING OF TECHNOLOGIES AND SERVICE/BUSINESS MODELS, AND MARKET ANALYSIS IN BANGLADESH AND IN THE REGION

2.1. OVERVIEW OF TECHNICAL AND BUSINESS MODEL ADVANCEMENTS IN THE SOLAR SECTOR

2.1.1. Global stocktaking of solar technologies and services

The global solar industry is advancing rapidly, setting benchmarks that Bangladesh can leverage. High-efficiency n-type PV cells such as Tunnel Oxide Passivated Contact (TOPCon) and Silicon Heterojunction (SHJ) now consistently achieve >22% efficiency, overtaking older PERC (Passivated Emitter Rear Contact) cells.

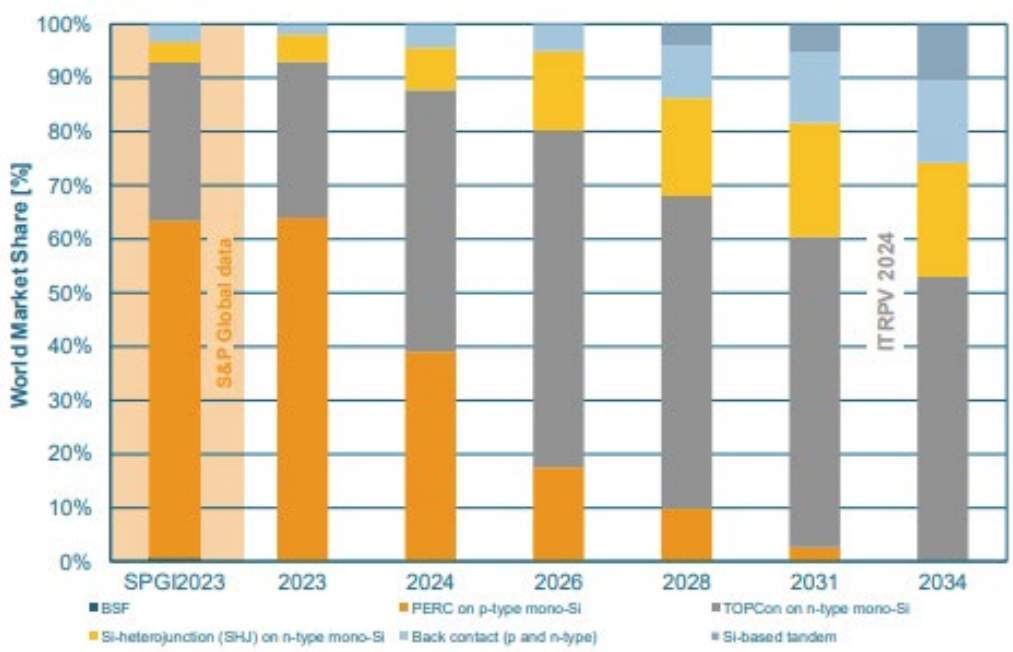

Figure 1 - Different cell technologies (VDMA, 2024)

Recommended action: Prioritise modern PV modules – future projects could consider procuring advanced n-type modules (e.g. TOPCon) which offer greater energy yield for nearly the same cost as older p-type PERC technology.

Table 1 - Comparison of cell technology efficiency and price (Author's own design, data from VDMA, 2024)

Cell technology	Efficiency (2023)	Global average price[1]
PERC p-type	21.4%	US$ 0.117/Wp
TOPcon n-type	22.5%	US$ 0.120/Wp
Silicon Heterojunction (SHJ) n-type		

[1] Taken from Chinese, American and European inputs.

Inverter technology has likewise progressed. Utility-scale systems are moving from traditional central inverters toward 1500V (and even 2000V) string inverter architectures that bring higher modularity and easier maintenance. Grid-forming inverters have emerged as an essential innovation, capable of establishing voltage/frequency and providing synthetic inertia and fast frequency response – critical features for stable operation with high renewable penetration.

Table 2 - Overview of specificities *and differences between central and string inverters. (Author's own design, data from SolarPower Europe, 2024a)*

Type	Capacity	Characteristics	Advantages	Disadvantages
Central inverters	500 kW AC – 5 MW AC	Centralise electricity from several PV arrays. Housed in free standing electrical enclosures.	Simple design and connection processes. Low operating costs. Lower capital expenditures (CAPEX) per kW than string inverters.	Inverter failure can lead to the shutdown of a significant portion of a power plant as several arrays will be connected to it. Higher Operating Expenses (OPEX) per kW as they are complex to repair.
String inverters	A few kW AC – over 380 kW AC	String inverters collect electricity from one or several strings (depending on capacity) of PV modules connected in series. They tend to be mounted on walls, ceilings, or racks.	Modularity. More efficient MPPTs. Easy to repair and replace without a huge impact on generation. Lower OPEX per kW than central inverters.	Higher AC cabling requirements leading to greater losses than power plants using central inverters. Higher CAPEX per kW than central inverters.

Recommended action: Adopt advanced inverters and storage: to aid with grid integration of increasing amounts of variable renewable energy, new solar projects could consider deploying inverters with grid-forming capability and integrate Battery Energy Storage Systems (BESS) where feasible. This could help avoid problems with curtailment, or, in the case of BESS, avoid negative pricing scenarios. Lithium Iron Phosphate (LFP) batteries, in particular, have become the preferred BESS chemistry globally due to their safety, thermal stability and cost-effectiveness. While adding storage increases upfront cost, it enhances grid flexibility and opens revenue streams through ancillary services (e.g. frequency regulation), improving overall project bankability.

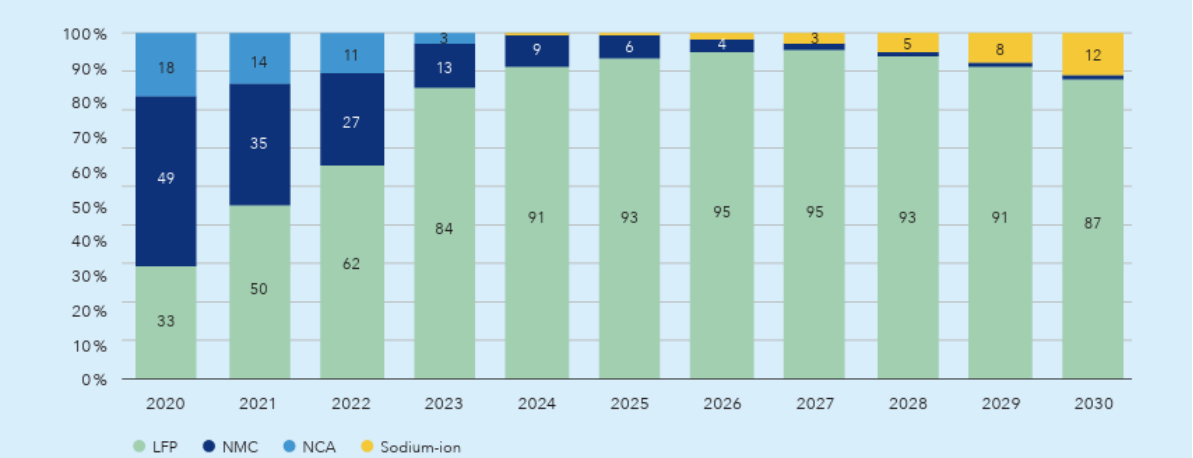

Figure 2 - Forecast (2020-2030) of the market shares of different battery chemistries (Aquila Capital, 2024)

2.1.2. Business model evolution

Innovative business models are diversifying how solar projects are developed and financed worldwide. Alongside the traditional Independent Power Producer (IPP) model (Build-Own-Operate or Build-Own-Operate-Transfer with long-term PPAs), new models include merchant solar (selling directly into spot markets), hybrid merchant + PPA arrangements, corporate PPAs (direct power sales to commercial consumers), and various Public-Private Partnerships (PPP). These models can offer higher returns or risk-sharing but demand robust market mechanisms and regulatory clarity. Bangladesh has taken a major step by introducing the Merchant Power Plant Policy 2025, which opens the market to direct private-to-private electricity sales.

Recommended action: Enable new financing models: To broaden the availability of financing models to the industry, authorities could consider issuing clear guidelines and standardised contracts for merchant and corporate PPA projects, capitalising on the Merchant Plant Policy. In particular, developing transparent PPA templates and competitive bidding processes will give investors confidence and ensure project bankability under these new models. Likewise, ongoing Renewable Energy Policy 2025 reforms must be operationalised with detailed rules so that IPPs and PPPs can flourish under a predictable policy framework.

2.1.3. Sustainability and circularity

As the solar sector scales up, emphasis on sustainability, end-of-life management, and cyber-security is increasing. Globally, there is a push for circular economy practices: PV modules and batteries retaining ~80% capacity at end-of-life can be repurposed for secondary uses, and advanced recycling processes are being developed to recover materials.

Recommended action: Implement Extended Producer Responsibility (EPR): To deal with an increasing volume of PV and electronic waste streams as a result of increased deployment, Bangladesh could consider establishing EPR schemes (with Producer Responsibility Organisations) to ensure collection and recycling of decommissioned solar equipment. Adopting the EU's Waste Electrical and Electronic Equipment (WEEE) Directive principles in national policy would incentivise manufacturers and project developers to plan for recycling and disposal from the outset. In the interim, encouraging second-life applications for used panels and batteries can reduce waste and extend value.

Moreover, as solar farms become increasingly digital (remote monitoring, smart inverters, SCADA systems), cybersecurity has emerged as a critical concern.

Recommended action: Enforce cyber-security standards: To ensure robust cyber-security, Bangladeshi authorities could consider mandating compliance with international standards like ISO/IEC 27001 (information security management) and IEC 62443 (industrial control system security) for solar plant operators. Aligning with the EU Cyber Resilience Act and related best practices will help safeguard critical energy infrastructure from cyber threats.

Table 3 - Key Data Security Standards for Solar PV Inverters and Systems (Source: SolarPower Europe, 2025; ENTSO-E, 2025)

Standard/regulation	Scope	Key Requirements	Applicability to Solar PV
ISO 27001 (ISMS)	Information security management systems	Risk assessments, access controls, encryption, and continuous audits. Certification verifies secure data handling.	Mandatory for EU manufacturers; e.g., Fronius and SMA certified, ensuring encrypted communications and EU-based data storage. Adds ~2-3% to costs but reduces breach risks by 40%.
IEC 62443 (Industrial Automation Security)	Cybersecurity for operational technology (OT) in energy systems.	Network segmentation, secure boot, and firmware integrity checks.	Applies to inverters and SCADA; CRA requires compliance for connected devices >1 kW, targeting 100% EU market coverage by 2027.
EU CRA (Regulation 2024/2847)	Horizontal cybersecurity for products with digital elements.	Vulnerability disclosure, secure updates, and bans on default credentials. Early certifications (e.g., SolarEdge, 2024) for wireless PV systems.	Covers inverters/BESS; fines up to €15M for non-compliance. Focuses on distributed energy resources (DERs) to prevent grid attacks.
NIS2 Directive	Critical infrastructure resilience.	Incident response plans and supply chain due diligence.	Classifies large solar farms (>50 MW) as "essential"; mandates EU servers for data to avoid foreign jurisdiction risks.
ENTSO-E Grid Code	Grid integration security.	Secure remote access and anomaly detection for VREs	Ensures grid-forming inverters (e.g., SMA's) resist frequency manipulation; pilots in 2025 for 3 GW of secure solar.

2.1.4. Innovative applications: Agrivoltaics and floating solar

To address land scarcity and other local challenges, innovative solar applications are being piloted globally and in Bangladesh. Agrivoltaics (Agri-PV) – the dual use of land for agriculture and PV energy – has shown positive results in various countries, using designs like elevated panels or solar greenhouses to allow farming underneath. Bangladesh has begun exploring Agri-PV through pilot projects, indicating potential to increase land-use efficiency and farmer acceptance of solar installations.

Recommended action: Scale up agrivoltaics pilots: The Bangladeshi authorities could develop guidelines for agrivoltaic system design tailored to Bangladesh's crops and farming practices and include this modality in renewable energy tenders to encourage private investment in dual-use projects.

Figure 3 - Interspace Crop-PV installation (SUN'AGRI in SolarPower Europe, 2024b)

Similarly, floating solar installations on water bodies offer a promising solution in a country with abundant ponds, lakes, and reservoirs. Floating PV can reduce land acquisition needs, lower panel temperatures (boosting efficiency), and cut reservoir evaporation. Bangladesh's first commercial floating solar plant is already in operation, and more are in planning.

Recommended action: Leverage water bodies for PV: To encourage this, Bangladeshi authorities could consider formulating and adopting technical standards and environmental safeguards for floating PV (anchoring, mooring, water quality protection) and incorporating these into the national renewable energy plans. By building on successful pilots in agrivoltaics and floating PV, Bangladesh could unlock new sites for solar development while also deriving co-benefits (agricultural output, water conservation), which is especially valuable given the country's land constraints.

Figure 4 - Malaysia First Large Scale Floating Solar COD in LSS2 Scheme (Source: PV Magazine)

2.2. IDENTIFICATION OF THE SPECIFICITIES OF SOLAR PROJECT IMPLEMENTATION IN BANGLADESH

2.2.1. Land availability and suitability

Securing land for solar farms is a prime challenge. Bangladesh's high population density and agricultural land protection laws severely limit the land available for non-agricultural uses. The Agricultural Land Protection Act and the Wetland Conservation Policy restrict conversion of cultivable land and water bodies, so developers must target marginal, fallow, or government-owned lands. However, land records are fragmented, and acquisition is administratively complex.

Recommended action: Improve land identification and access: To ease land identification bottlenecks, Bangladesh could establish a digital land suitability map or land bank for renewable energy, categorising available tracts of land (e.g. fallow, industrial wasteland, saline areas) and their ownership status. This platform, could be managed by SREDA or the land ministry, and could incorporate data from agencies like the Bangladesh Bureau of Statistics and reflect legal constraints (e.g. marking areas restricted by wetland or agriculture laws). Streamlining land acquisition through clearer government processes or land leasing frameworks (especially for government-owned land) will reduce project delays. Furthermore, to increase the adoption of innovative applications, the Government of Bangladesh could promote dual-use approaches. For example, agrivoltaics on farmland and floating PV on reservoirs that could help to mitigate land competition while still advancing solar capacity.

2.2.2. Climate and environmental considerations

Bangladesh's tropical monsoon climate and extreme weather events pose significant risks to solar infrastructure. Projects must contend with flooding, cyclones, extreme heat and humidity, and hailstorms. Without adaptation, these hazards can reduce plant performance by 10–15% or more over a project's life.

Recommended action: Mandate climate-resilient design standards: The Government of Bangladesh could consider mandating that all new solar projects should incorporate engineering measures to withstand local climate stresses. This includes elevating PV structures above historic flood levels, using reinforced foundations and waterproof equipment enclosures in flood-prone zones; specifying mounting systems rated for cyclonic wind speeds (including deep piles and storm tie-downs) in coastal areas; ensuring adequate drainage and stormwater management on site; and opting for equipment that can tolerate high temperature and humidity (e.g. inverters with enhanced cooling, PV modules with PID-resistant encapsulants and UV-resistant backsheets). Hail protection is crucial as well – Bangladesh is not traditionally known for large hail, but as storms intensify, modules should at minimum meet IEC 61215 standard hail tests (25 mm ice ball at 23 m/s) and preferably an enhanced hail rating (up to 35–50 mm at 30–40 m/s) for extra robustness. Upfront investments in these resilient features (estimated +3–6% in CAPEX) are justified by reduced downtime and maintenance costs over the plant's lifetime. The government could also update relevant building and equipment codes to require these adaptations, drawing on international standards (e.g. IEC TS 62898 series for grid resilience, IEC 61215-2:2021 for extended climate testing of modules) to guide local specifications.

2.2.3. Grid integration and stability

Integrating variable solar generation into Bangladesh's grid is challenging given limited reserve margins and aging transmission infrastructure. Although nationwide electrification is achieved, many grid segments are weak – transmission losses are high, and the system has little flexibility to absorb sudden solar output fluctuations.

Recommended action: Upgrade grid infrastructure and rules: In order to carry this out efficiently, the Government of Bangladesh could seek to prioritise grid upgrades (transformers, lines, substations) in regions slated for large solar additions to increase hosting capacity. Moreover, they may wish to consider deploying Battery Energy Storage and synchronous condensers at strategic locations to provide voltage support and frequency regulation. In new solar projects, they could encourage the use of grid-

forming inverters and require fault ride-through and fast frequency response capabilities, helping the fleet of solar plants support grid stability rather than hinder it.

On the regulatory side, updating the national Grid Code to accommodate high shares of renewables: Through the inclusion of clearer procedures for solar farm interconnection, standards for ancillary services (so solar or storage can be paid to provide grid support), and provisions for emerging solutions like hybrid plants and virtual power plants, the Government of Bangladesh could support the integration of greater shares of renewable energy into the grid. Improved coordination among SREDA, BPDB (Bangladesh Power Development Board), and PGCB (Power Grid Company of Bangladesh) is crucial – for example, integrating solar deployment plans into the power expansion master plan and using modern forecasting tools for solar output to inform dispatch decisions.

Recommended action: Plan for flexibility: Bangladesh could consider incorporating storage requirements or demand response programs in its renewable energy planning. For instance, solar parks could be coupled with a certain percentage of storage, or large industrial consumers could be incentivised to shift loads to sunny periods. By proactively strengthening grid infrastructure and updating grid management policies, the country can accommodate a higher share of solar PV without compromising reliability.

2.3. PERFORMANCE REVIEWS: CASE STUDIES OF BANGLADESHI SOLAR PLANTS

In-depth case studies of the Sirajganj 7.6 MW and Sonagazi 75 MW grid-tied solar plants provide valuable operational insights.

2.3.1. Sirajganj 7.6 MW solar plant

This smaller-scale plant has demonstrated stable technical performance. It annually generates around 8–9 GWh, corresponding to a capacity factor near 14%, and maintains high availability (minimal downtime). The performance ratio, while slightly below global best-in-class, is reasonable given local conditions. Environmental benefits are clear – the project makes efficient use of land and achieves significant CO_2 emissions avoidance. However, financial viability has been challenging. The project faced high capital costs (relative to its size) and lacked access to low-cost financing, resulting in a long payback period. In response, the operator has sought alternative revenue, such as carbon credits, to improve returns. Key lessons: Reduce financing costs and improve O&M. Future small and medium solar projects in Bangladesh should aim to tap concessional loans or blended finance (combining grants or soft loans with private investment) to lower the weighted cost of capital. Incorporating project structures like joint ventures or PPPs can also spread risk and attract different sources of funds. On the operational side, Sirajganj underscores the importance of preventive maintenance and rapid fault response – the plant's strong uptime is attributed to an active O&M regime and having spare parts readily available. All projects should budget adequately for O&M and possibly include performance-based O&M contracts where the contractor's compensation is tied to plant availability. Climate resilience is another lesson: despite being a landlocked site, Sirajganj still had to manage issues like monsoonal flooding. Designing with elevated module structures and robust drainage from the outset proved essential and should be standard practice in similar settings.

2.3.2. Sonagazi 75 MW solar plant

This utility-scale project in Feni district showcases international best practices adapted to Bangladesh. It achieved a high performance ratio and strong annual output, comparable to well-run plants globally. Notably, module degradation has been low, and the plant was engineered to withstand coastal conditions (e.g. high salinity air, cyclones) – features including corrosion-resistant coating and a compact layout helped maintain performance. The financial model for Sonagazi is a highlight: with a competitively low Levelised Cost of Electricity (LCOE) and a concessional IDA loan from development partners, the project reached profitability quickly. Strong stakeholder engagement from the planning phase (community consultations, biodiversity assessments) contributed to smooth implementation. Key lessons: Apply high standards and secure soft financing. Sonagazi demonstrates that insisting on quality components

and resilient design pays off. The plant used Tier-1 equipment (e.g. high-efficiency bifacial panels, durable infrastructure) and benefited from third-party technical advisors to ensure construction met international standards – this should be emulated in future large projects to maximise longevity and output. Early and continuous engagement with local communities and authorities can pre-empt social or environmental issues; such practices (including proper Environmental and Social Impact Assessments per IFC/WB standards) should be non-negotiable for big projects. Securing low-cost financing (from sources like the World Bank, ADB, or climate funds) is crucial to keep tariffs affordable – government and developers should actively seek these credit lines or guarantees for solar ventures. Finally, having an experienced O&M team with robust procedures (e.g. regular automated module cleaning, inverter thermal management) has kept Sonagazi performing optimally. This emphasises the need for capacity building in O&M (either via training local teams or contracting experienced firms) for all utility-scale plants.

Both Sirajganj and Sonagazi underline a set of best practices: (1) Mobilise blended finance to reduce project cost of capital – for example, combine public loans, climate finance, and private equity to bring down tariffs. (2) Incorporate climate resilience in design – e.g. elevated structures, cyclone-resistant mounting, high IP67/68 rated equipment – to avoid output losses from Bangladesh's harsh weather. (3) Enforce rigorous O&M and monitoring – use performance guarantees, remote monitoring systems, and incentivise the O&M contractor to exceed performance benchmarks. (4) Streamline contracts and approvals – both projects would have benefited from faster land acquisition and permitting; thus, standardised PPA clauses, clear risk allocation, and a single-window permitting process can significantly speed up future projects. By learning from existing plants, Bangladesh can refine its approach to new solar investments, avoiding past pitfalls and replicating successes.

2.4. REVIEW OF STANDARDS AND REGULATORY FRAMEWORKS

A thorough comparison of Bangladesh's technical standards and regulatory policies with international best practices reveals several gaps and opportunities for reform.

2.4.1. Technical standards

Bangladesh's solar equipment standards (BDS standards) are partly based on international norms, but they are not fully up to date. For instance, the national standards for PV modules draw from IEC 61215 (design qualification for crystalline silicon modules) and IEC 61730 (safety), yet certain critical tests and latest amendments are missing. Issue: Testing gaps – Current local standards could include provisions for intensive stress tests such as extended thermal cycling, damp heat, and ammonia corrosion that are present in modern IEC protocols. This means modules could be certified for use in Bangladesh without undergoing all the durability tests needed for the country's environment (e.g. resistance to humidity ingress or agricultural ammonia). Likewise, standards for inverters and BESS do not yet reflect newer requirements like grid support functions (LVRT, frequency response) or advanced battery safety (thermal runaway prevention).

Recommended action: Align with IEC and ISO standards: The government (through BSTI, SREDA and BERC) could consider updating the BDS standards for solar components to fully align with current IEC/ISO benchmarks. For example, including IEC 61215-2:2021 test sequences for PV modules would ensure products are qualified against condensation and temperature fluctuation effects – conditions very relevant to Bangladesh. Similarly, adopting standards like IEC 61701 for salt mist corrosion (for coastal areas) and IEC 62716 for ammonia resistance (for installations near farms) will address climate-specific degradation. In the inverter domain, international codes such as IEEE 1547 or IEC 62116 (anti-islanding) and IEC 62443 (cybersecurity for power systems) should be referenced in Bangladesh's grid code and equipment standards so that inverters and control systems meet modern grid interoperability and security requirements. Regular review cycles (e.g. every 2–3 years) could be instituted so that standards can keep pace with technological advances; a standing committee with industry experts could be set up for this purpose. Up-to-date standards will not only improve quality and safety but also make Bangladeshi projects more bankable to international financiers who often require compliance with IEC/ISO norms.

2.4.2. Regulatory and policy framework

The policy landscape for renewable energy in Bangladesh is evolving, marked by several recent policies that aim to liberalise the market. The Private Sector Power Generation Policy (PSPGP) established the initial framework for IPP investments. Building on that, the Renewable Energy Policy 2025 (an updated national policy for renewables) and the Merchant Power Plant Policy 2025 have been introduced to encourage more private sector participation and new business models. These policies allow for direct sales of power outside traditional single-buyer arrangements and endorse competitive procurement for renewables. In addition, the existing PPP Act provides a basis for public-private partnerships in infrastructure, and efforts are underway to harmonise it with energy sector needs. However, many of these progressive policies are yet to be backed by detailed implementation guidelines and regulatory adjustments. Investors still face uncertainty about how, for example, a merchant plant would obtain grid access or how tariff setting will work without long-term PPAs.

Recommended action: Operationalise new policies with clear rules: In order for these new, progressive policies to fully take effect, the Government would ideally continue its work to translate the Renewable Energy Policy 2025 and Merchant Plant Policy into actionable regulations. This could include issuing standardised PPA and tariff guidelines for different models (IPP, merchant, corporate PPA) and setting up a regulatory approval process for private power sales. A digital one-stop permitting portal could also be established (ideally under SREDA's leadership) to streamline the myriad approvals (land use, environment, grid connection, etc.) required for solar projects. This would significantly reduce red tape by allowing developers to apply and track multiple clearances in one place, increasing transparency and speed.

Institutional roles also need clarification and strengthening. For example, the Bangladesh Energy Regulatory Commission (BERC) should be empowered with greater autonomy, resources, and enforcement authority to oversee compliance, set tariffs, and adjudicate disputes. At present, BERC would benefit from independent funding and legislative support to act decisively in regulating the evolving power market.

Recommended action: Strengthen governance and planning: An important step that the Government of Bangladesh could take is to harmonise the PPP procurement process with power sector requirements. Energy projects have unique risk profiles, so the general PPP framework may need amendments (for instance, predefined risk-sharing mechanisms or government support measures for land and transmission). The Government might also consider establishing a dedicated energy project dispute resolution mechanism, possibly under BERC or a special tribunal, to handle any conflicts (contractual or regulatory) swiftly and fairly – this will boost investor confidence. Through expanding and updating the Grid Code to incorporate provisions for high renewable penetration, such as including technical standards for solar plant connectivity, energy storage integration, and new services like demand response or virtual power plants, the Government of Bangladesh could lay a key role in supporting solar deployment. Importantly, making national renewable energy targets legally binding and linking them to procurement schedules and licensing would be another consideration for the Government. For example, if the target is 40% renewables by 2040, ensure that competitive auctions or solicitations are planned on a timeline to achieve that, and empower BERC to enforce obligations on utilities to contract the required capacity. In summary, Bangladesh has commendable policies in place; the focus now should be on detailed rulemaking, capacity-building of institutions, and inter-agency coordination to implement those policies effectively.

Table 4 - Overview of the electricity sector framework in Bangladesh (Author's own elaboration, 2025)

Building block	Fulfilled KPIs	Gaps identified
Competition and openness of the sector to private investors	IPP authorisation; incentives for private sector participation; foreign investor eligibility	Non-binding procurement mandates; need for clearer guidelines on how provisions in the Renewable Energy Policy (2025) and Merchant Power Plant Policy (2025) will actually be implemented.
Licensing & contractualisation	Publicly available licensing framework; clear environmental clearance processes; one-stop agency for all permitting	Need for clearer guidelines on how provisions in the Renewable Energy Policy (2025) and Merchant Power Plant Policy (2025) will actually be implemented.
Unbundling of power sector	Legal separation of PGCB (TSO) from BPDB	Absence of functional, operational and financial independence for PGCB from BPDB; lack of transparency in grid access; no access register; no performance-based incentive mechanism for PGCB
Tariffs	Clear cost-plus tariff regulations; public consultation procedures	Political interference; inconsistent application of tariff escalation clauses; market-distorting subsidies
Complementarity between PPP laws and sector-specific laws	PPP Act with defined procurement and viability funding procedures	Absence of legal coordination with BERC; dual and conflicting project vetting regimes
Complaints & Dispute Settlement frameworks	BERC hearings; arbitration mechanisms under the PPP Act	Lack of specialised energy arbitration panel; reliance on litigation via an over-burdened, non-expert judiciary
Grid code	Revised grid code with renewable energy interconnection provisions	No provisions for storage, VPPs or ancillary services; forecasting not legally binding
Regulatory authority	Statutory establishment of BERC with legal mandate	Contingent funding; weak enforcement mechanisms; limited stakeholder consultation influence
Long-term energy planning	IEPMP and updated Renewable Energy Policy (2025) set targets; SREDA, BPDB, and PGCB coordinate on planning; periodic announcements of required renewable capacities.	Targets are non-binding; need for more clarity on enforcement mechanisms; and explanation of the review and update procedure for the policy.

2.5. ELABORATION OF A MANUAL ON IMPLEMENTATION PROCEDURES

This manual of procedures at different project lifecycle stages intended to guide stakeholders through each phase of developing a utility-scale solar project in Bangladesh. This manual serves as a step-by-step playbook, delineating roles, timelines, and best practices from project inception to operation.

2.5.1. Project lifecycle stages

The manual breaks down the project development process into clear stages – site identification, feasibility study, financial structuring, environmental and social impact assessment (ESIA), tender preparation, bid evaluation (if applicable), contract negotiation (PPA, Implementation Agreement, EPC contract), financial close, construction, commissioning, and finally O&M handover. For each stage, it defines the responsible party (e.g. government ministry, utility, developer, contractor) and outlines the necessary approvals or documents.

Recommended action: Adopt standardised checklists: All involved agencies (Power Division, SREDA, BPDB, DoE, etc.) could consider using the manual's checklists as a baseline to ensure no critical step is overlooked. This will introduce consistency and transparency in how projects are handled, regardless of the sponsoring entity.

2.5.2. Roles and coordination

A recurring recommendation is to improve coordination among the many actors in project development.

Recommended action: Establish a Project Development Unit (PDU): The manual strongly advises creating a central one-stop unit within the government to coordinate across ministries and departments. This PDU would act as a single interface for the project developer, streamlining communication with land authorities, environment regulators, grid companies, and finance ministries. By having a dedicated team shepherding projects through the bureaucracy, approval times can be reduced and accountability improved. The PDU can also maintain the above-mentioned one-stop portal for permits. In the interim (until a PDU is formally set up), an inter-agency task force or steering committee for each large project could replicate this coordination function.

2.5.3. Procurement and contracting best practices

The manual differentiates between various project models – IPP, EPC-only, PPP, Merchant – and notes that each may require a tailored approach in contracts and risk allocation. However, some universal best practices apply.

Recommended action: Use umbrella agreements for split-contract structures: If a project is delivered via multiple contracts (e.g. separate contracts for different lots, or an EPC plus a separate O&M contract), the manual suggests using an Umbrella Agreement that ties all parties together under common terms and timelines. This ensures that even if there are distinct contractors, they are contractually obligated to coordinate and there is a clear hierarchy for decision-making and liability. Additionally, integrate schedule management tools – a unified project timeline with milestones and checkpoints (drawing from the manual's templates) should be agreed by all stakeholders to monitor progress and flag delays early. Another recommended practice is to include robust risk management clauses in contracts: e.g. clearly specify force majeure events, define liquidated damages for delay, require contractors to have adequate insurance (CAR – Contractors' All Risk insurance – and similar), and include warranty and performance guarantee provisions to cover at least 1–2 years of operation post-commissioning.

2.5.4. Risk management and quality assurance

The manual emphasises proactive risk mitigation at each stage. For example, during feasibility and design, conduct thorough climate risk assessments (flood, cyclone, etc.) and geotechnical studies; during procurement, vet suppliers for quality (perhaps requiring IEC certifications and factory audits); during construction, enforce strict supervision (owner's engineers, independent inspectors like TÜV) to

ensure standards are met; before commissioning, complete all testing and obtain necessary certifications (grid compliance tests, safety certifications).

Recommended action: Institutionalise these practices: Government bodies should consider establishing a requirement that any project benefiting from public support (land, tariff, subsidies) follows the manual's guidelines. For private projects, it is in the off-taker's interest (e.g. BPDB as power purchaser) to demand adherence to these procedures to reduce failure risk. Over time, these procedures could be refined into official Standard Operating Procedures (SOPs) or incorporated into the terms of reference for future projects under the Bangladesh Renewable Energy Facility (BREF).

In summary, the Manual on Implementation Procedures is a critical tool for de-risking project execution. By following its structured approach – one-stop coordination, clear stage-wise processes, and emphasis on quality & risk management – Bangladesh can significantly improve the efficiency and success rate of solar project development, ensuring projects are delivered on time, within budget, and to the desired standards.

2.6. CAPACITY NEEDS ASSESSMENT OF UTILITIES

A structured assessment of the capacity of Bangladesh's major public utilities - BPDB, EGCB, NWPGCL, and RPCL - to develop and operate utility-scale solar projects draws on a comprehensive questionnaire covering financial planning, regulatory knowledge, risk management, engineering and procurement, health and safety compliance, personnel development, and operation and maintenance practices.

2.6.1. Current strengths

The utilities generally have solid experience in conventional power project development and operations. They understand project finance basics, standard regulatory compliance processes, and have managed large generation projects (mainly fossil fuel-based) through Engineering, Procurement, and Construction (EPC) contracts. There is also a baseline familiarity with procurement regulations and some exposure to renewable projects (e.g. BPDB has handled several solar IPP tenders). These are encouraging foundations on which to build.

2.6.2. Identified gaps

Utility staff often require more specialised expertise needed for scaling up solar PV and integrating new technologies. For example, PPP structuring and dealing with independent power producers is relatively new – skills in negotiating Implementation Agreements, managing tender evaluations on quality (not just cost), or structuring guarantees and risk-sharing with private partners need enhancement. Technical knowledge gaps were noted in areas like advanced grid integration of solar (forecasting, dispatch management, storage integration), contract negotiation for renewables (e.g. understanding bankability concerns in PPAs), and predictive O&M (using data analytics for maintenance). Utilities also show room for improvement in health, safety, and environmental (HSE) practices specific to solar farms (e.g. managing battery safety, PV recycling plans) and in project management during the construction phase (overseeing contractors, QA/QC, and progress tracking). Additionally, there tends to be reliance on external consultants for studies and design; building in-house capacity would be more sustainable.

2.6.3. Recommendations for capacity building

To address these gaps, a phased training and development programme for the utilities could be considered.

Recommended action: Government could consider implementing a Solar Capacity Development Roadmap: Start with foundational training on solar PV technology and economics for a broad base of staff (Phase 1), then provide targeted advanced courses (Phase 2) for smaller groups on topics like grid integration techniques (e.g. forecasting, use of SCADA/EMS systems), detailed PPA and EPC contract

management, energy storage and hybrid systems, and project finance modelling for renewables. Collaborating with international partners can be invaluable – for instance, twinning programs with experienced utilities or developers abroad (perhaps through EU partners or development banks) can offer Bangladeshi utility engineers real-world insights and even short-term secondments to solar projects overseas. Certification programs (like those for project management, or specialised ones like ISPQ for solar professionals) and involvement in global networks (APVIA, IRENA initiatives) will also help professionalise the workforce.

Another recommendation is that Government could consider establishing a national solar knowledge hub – a repository and community of practice for sharing data, best practices, and case studies among all stakeholders. This could be managed by SREDA or a university centre of excellence, and host everything from performance benchmarking data of local plants to a library of standard documents and contracts.

Recommended action: Strengthen planning and oversight capacity: The utilities should also consider enhancing sections or teams dedicated to renewable project development. Lastly, on the operations side, improving capabilities such as spare parts management (maintaining inventories for critical components like inverter parts or transformer spares), data monitoring (ability to analyse performance data from plants and respond to issues), and transitioning projects from development to long-term O&M smoothly could be considered. By investing in human capital now, Bangladesh will ensure that its institutions can not only initiate solar projects but also effectively deliver and sustain them over decades.

2.7. CONCLUSIONS AND RECOMMENDATIONS

Utility-scale solar PV in Bangladesh demonstrates strong viability and transformative potential, especially with EU-supported initiatives like BREF. Adopting global best practices in technology and business models, incorporating climate-resilient design features, enhancing operation and maintenance, strengthening standards and regulatory frameworks, improving implementation processes and institutional coordination, building capacity across institutions and stakeholders, and deploying cost-effective technical solutions and financing models could all drive sector advancement.

Adopt global best practices in technology and sustainability: Embracing state-of-the-art solutions could be considered. Using high-efficiency n-type PV modules, advanced inverters with grid support features, and robust BESS for new projects could help to ensure longevity and efficiency from the start. Simultaneously, incorporating sustainability principles such as circular economy requirements, like introducing extended producer responsibility for solar hardware (so vendors plan for end-of-life retrieval/recycling) and mandating that project bids include end-of-life management plans in line with EU WEEE standards could support this. Strengthening cyber-security for critical solar infrastructure by requiring compliance with ISO 27001 and related standards would be an important pillar of a robust industry. These measures will align Bangladesh's solar sector with international quality, safety, and environmental norms, making it more resilient and attractive to top-tier investors.

Incorporate climate-resilient and innovative project design: Best practice suggests that all solar developments should be treated as climate-critical infrastructure. This means updating design standards and practices now – e.g. elevated and flood-proof structures, cyclone-proof mounting, and high-temperature-rated equipment are to become the norm, not the exception. The government could consider developing and introducing guidelines or building codes for solar farms that address local climate threats (potentially an amendment or adjunct to the National Building Code). Pilot projects in agrivoltaics and floating solar could be accelerated into larger demonstration projects, with lessons disseminated and fed into policy. By diversifying into these innovative applications, Bangladesh can expand solar capacity despite land scarcity and generate valuable knowledge for scaling up. Development partners (like the EU Delegation) can support these pilots with technical assistance or grant funding, given their potential for replication.

Modernise procurement and contracting frameworks: Consider adopting a value-based procurement approach. Whenever public tenders are issued (through BPDB or others), Most Economically Advantageous Tender (MEAT) criteria could be used that reward not only price but also technical quality, durability, O&M support, local co-benefits, etc. This could be achieved by assigning significant

weight to technical scores and long-term performance in evaluations. Contracts could be standardised through updating PPA templates to balance risks fairly and include provisions for new models (e.g. termination clauses suitable for merchant projects, tariff indexation for inflation/currency risk, etc.). Consider introducing climate resilience and circularity clauses into EPC and O&M contracts (for example, requiring that equipment meets certain IEC standards for extreme weather, and that bidders demonstrate end-of-life recycling plans). Consider embedding performance warranties and guarantees into contracts so that contractors are accountable for output and availability over a defined period. These contracting improvements, many of which align with international best practices, will lead to higher-quality assets and more bankable projects.

Strengthen standards and regulatory enforcement: Consider updating Bangladesh's national standards (BDS) urgently to reflect relevant IEC and ISO standards across the board – from modules (IEC 61215 series) and inverters to storage and plant performance. Consider institutionalising a process for continual revision of standards with stakeholder input. At a policy level, consider focusing on implementing the progressive policies already introduced: operationalise the Renewable Energy Policy 2025 and Merchant Power Plant Policy 2025 by issuing the necessary rules, guidelines, and institutional arrangements without delay. Consider making renewable targets actionable by embedding them in the planning and auctioning process and holding agencies accountable to meet them. Consider empowering BERC with clear authority to approve renewable projects and tariffs efficiently, monitor compliance (e.g. ensure licensees meet grid code and standards requirements), and enforce penalties when needed. This can be achieved through providing BERC with the financial and human resources to carry out these duties independently. Enhance inter-agency coordination: for example, consider formalising cooperation between SREDA and the Power Division to jointly oversee BREF initiatives, ensuring that policy targets translate into on-ground projects. Also, consider streamlining the PPP approval process for energy projects by developing energy-specific PPP guidelines or fast-track provisions. In summary, consider updating the institutional apparatus to fully realise the promise of the new policy framework.

Improve implementation processes and institutional capacity: As recommended, consider establishing a central Project Development Unit (PDU) or an empowered task force to act as a one-stop shop for project facilitation. This will dramatically reduce bureaucratic delays and signal to investors that Bangladesh is serious about ease of doing business in renewables. Coupled with the one-stop digital portal for permits, the PDU can help projects navigate land leases, licensing, and grid interconnection more smoothly. Additionally, pursue capacity building as a continuous effort – consider implementing a training roadmap for utilities and relevant government staff, possibly with international donor support to fund workshops and exchange programs. This could include the aim to certify a new cohort of solar project managers/engineers within the public sector each year who are proficient in project appraisal, financial modelling, and technical due diligence. Knowledge sharing should be intensified: consider establishing regular forums or roundtables (e.g. quarterly) under SREDA where recent project developers (local and foreign) can share their experiences and obstacles faced, enabling a feedback loop to policymakers. By boosting the capabilities of institutions and processes, Bangladesh will not only implement projects faster but also ensure quality control and sustainability are upheld at each step.

Mobilise finance and partnerships: Lastly, address the financial and partnership aspects to support the above measures. Consider working with international partners (EU, World Bank, ADB, etc.) to create blended financing facilities under BREF – for instance, an EU-supported guarantee fund or a soft loan facility that can de-risk projects adhering to higher standards. Such instruments can buy down the cost of capital for projects that incorporate climate resilience or European technology, making quality more affordable. Consider encouraging joint ventures and consortia between European and Bangladeshi companies, leveraging each side's strengths. This can be done by matchmaking events, and by structuring tenders that require or incentivise consortium bids (e.g. giving credit in bid evaluations for partnerships with experienced firms). European developers and EPC contractors bring expertise in engineering and ESG, while local firms understand the terrain – together they can deliver superior outcomes. The EU Delegation and platforms like Eurocham can facilitate these by providing forums for dialogue and networking.

By implementing these recommendations – modernising technology and standards, climate-proofing projects, reforming procurement, enforcing robust policies, building institutional know-how, and lever-

aging innovative financing and partnerships – Bangladesh can create an enabling environment for sustainable solar expansion. This will pave the way for significant investments into the sector, improved project performance, and the achievement of national renewable energy targets. Ultimately, such actions will ensure that the growth of Bangladesh's solar energy is not only rapid but also resilient, delivering lasting economic, environmental, and social benefits in line with both national interests and international best practices.

3. MAPPING AND CHARACTERISATION OF THE EUROPEAN COMPANIES RELEVANT FOR SOLAR PROJECTS IN BANGLADESH, INCLUDING THOSE ALREADY WORKING IN THE REGION

3.1. MAPPING OF THE EUROPEAN COMPANIES RELEVANT FOR SOLAR PROJECTS IN BANGLADESH

European solar photovoltaic companies operate in emerging markets under various roles. Typically, their involvement falls into three broad categories: (1) Developers or Independent Power Producers (IPPs) – companies that invest in, own, and operate solar projects; (2) Technical advisors or software providers – firms offering expert services in engineering design, quality assurance, certification, or digital monitoring solutions; and (3) Manufacturers – suppliers of high-quality solar components and equipment (such as PV modules, inverters, mounting systems, and related technology). This section provides an overview of European companies globally active in solar energy and then narrows in on those particularly relevant to Bangladesh's context. It profiles the European firms already active in Bangladesh, those active in comparable Asian markets (India and Vietnam) whose experiences may provide insight for Bangladesh, and other notable European solar companies not yet present in the region but whose capabilities could address Bangladesh's specific challenges (for example, coping with extreme weather, land scarcity, or grid limitations). Each profile highlights the company's background, track record in Asia, and the potential value it could bring to Bangladesh's solar ambitions.

3.1.1. European companies active or formerly active in Bangladesh

Only a handful of European companies have established a direct presence in Bangladesh's solar power market to date. These include one major developer/IPP and a few technical advisory/service firms, as well as a specialised rooftop module manufacturer. Two European solar developers had also pursued Bangladeshi projects but withdrew following complications with their planned projects. Below, we summarise the roles and contributions of each relevant company:

- **ib vogt (Germany)** – Developer and EPC Manager: ib vogt GmbH is an international solar project developer with EPC and asset management capabilities. It has developed over 2 GW of solar PV worldwide across Europe, Asia, the Middle East and Africa. In Bangladesh, ib vogt became the first European developer to win a utility-scale solar tender. In 2019, a consortium of ib vogt and local partner AG Agro Industries was awarded a contract by the Bangladesh Power Development Board (BPDB) to develop a 50 MW_{ac} (approximately 68 MW_p) grid-tied solar plant in Chattogram District. After overcoming lengthy land acquisition hurdles, ib vogt signed a 20-year power purchase agreement in 2024 for this project at a tariff of USD 0.1094 per kWh. The relatively high tariff reflects Bangladesh's challenging project costs (land acquisition, financing risk, infrastructure) and the lack of intense tariff competition. The plant, expected online in 2025, is being built to international standards under ib vogt's management. Notably, ib vogt insisted on technical quality: they selected a reputable Malaysian firm as the EPC contractor after finding no local contractor could yet meet their standards. The project will feature advanced design choices such as high-efficiency bifacial solar modules (which capture sunlight on both sides) and robust fixed-tilt mounting structures suitable for local conditions. Ib vogt has also implemented rigorous environmental and social safeguards – including biodiversity assessments and community consultations – ensuring the project does not adversely impact local wildlife or residents. By choosing a site that is non-agricultural and less prone to flooding, and by upholding strong construction quality and safety measures, ib vogt's involvement demonstrates the added value European developers can bring, particularly in addressing Bangladesh's land scarcity and climate vulnerability challenges. This project serves as a proof of concept that European investment and know-how can successfully overcome local hurdles and deliver a viable solar plant.

- **TÜV SÜD (Germany)** – Technical Advisor / Quality Assurance: TÜV SÜD is a globally renowned engineering firm specialising in testing, certification, and technical advisory services. In the energy sector, it often acts as an owner's engineer or independent technical advisor, providing quality assurance and oversight on projects. TÜV SÜD has had a presence in Asia for decades, including offices across India and Southeast Asia, and has advised on numerous solar farms in the region. In Bangladesh, TÜV SÜD has been engaged to ensure that projects meet international standards and run reliably. For instance, it served as independent engineer (Owner's Engineer) for the 75 MW Sonagazi solar power plant developed by the Electricity Generation Company of Bangladesh (EGCB) and financed by the World Bank. In this role, TÜV SÜD oversaw the project's design and construction on behalf of the owner and lenders, verifying that engineering practices and equipment quality met the required benchmarks. The value TÜV SÜD provides to Bangladesh lies in its rigorous approach to design review and quality control. Its experts recommend climate-resilient engineering solutions – for example, specifying equipment rated for high ambient temperatures and humidity, designing array layouts and mounting systems to withstand cyclone-level winds, and ensuring proper lightning protection and grounding given frequent thunderstorms. TÜV SÜD also conducts thorough testing and certification of components (modules, inverters, etc.) to ensure they can handle Bangladesh's conditions (such as potential-induced degradation from heat and moisture). Having a respected firm like TÜV SÜD involved gives Bangladeshi projects third-party validation and risk mitigation, which boosts investor confidence. Their presence essentially guarantees that a project is built as promised and will operate reliably despite environmental stresses, bridging the gap where local quality standards or enforcement might be weaker.
- **Fichtner (Germany)** – Owner's Engineer / Technical Consultant: Fichtner GmbH & Co. KG is Germany's largest independent engineering consultancy, offering services in energy and infrastructure projects worldwide. Active in Bangladesh for over 50 years, Fichtner even established a permanent office in Dhaka in 2018, reflecting its long-term engagement. In Bangladesh's solar sector, Fichtner has acted as Owner's Engineer on innovative projects – for example, a 2.2 MW_p solar-diesel hybrid power system with a 5 MWh battery for BPDB, where Fichtner handled the conceptual design, tender preparation, contractor negotiations, construction supervision and performance testing. Fichtner's relevance lies in ensuring international engineering and quality standards are met in local projects. Its expertise in integrating solar with storage and diesel (as in the hybrid project) also brings know-how valuable for Bangladesh, where grid stability and off-grid solutions are important. By having a continuous local presence, Fichtner can support multiple projects and help build local capacity, acting as a conduit for European engineering excellence and mentoring Bangladeshi engineers in the process.
- **REC Solar (Norway)** – Solar Panel Manufacturer: REC Group, originally Norwegian (now headquartered in Singapore), is a leading global manufacturer of high-efficiency solar panels. It is known for innovative technologies like HJT (heterojunction) cells that offer high energy yield and durability. REC has supplied over 10 GW of solar modules worldwide. In Bangladesh, REC has entered the market via a local distributor (Engreen Engineering Ltd.) to supply panels for rooftop and commercial/industrial solar installations. Their panels are increasingly used by factories and businesses that prioritise performance and long-term reliability. REC's high-efficiency, premium modules are well-suited to Bangladesh's needs: they generate more power from limited roof space (important in space-constrained urban areas), and they are designed to resist degradation even in high heat and humidity, ensuring output remains high over the years. With strong warranties and after-sales support, REC's presence is raising quality benchmarks in the local rooftop segment. By proving the value of better technology (even if initially costlier), REC is helping Bangladesh transition to more reliable, low-carbon power in the commercial sector and is supporting the emergence of a quality-conscious solar market segment.

In addition to these active examples, it is notable that two prominent European solar developers entered and then exited the Bangladesh market due to policy and regulatory challenges:

- **TotalEnergies (France)** – Through its renewables arm (formerly Total Eren), this major French energy company had pursued large solar IPP projects in Bangladesh and even secured provisional agreements. However, as part of a shift toward competitive bidding, the government cancelled several unsolicited solar project deals in 2024, including those involving TotalEnergies. Faced with these reversals, TotalEnergies withdrew its involvement. (Regionally, TotalEnergies has extensive solar investments in India, such as a strategic joint venture with the Adani group, indicating it has the capacity and interest to invest at scale if conditions are right. Its withdrawal underscores how past inconsistencies in Bangladesh's project approval process deterred even well-capitalised European players.)
- **Scatec (Norway)** – A Norwegian IPP known for developing and operating renewable projects globally, Scatec similarly had a Bangladesh project (around 50 MW) in partnership with a local firm (Rahimafrooz). This installation was also halted by the cancellation of unsolicited projects, and Scatec pulled out of Bangladesh in 2024. Scatec's experience illustrates the difficulty foreign IPPs faced with land acquisition and regulatory reversals. The company remains active in other Asian markets (e.g. a partnership for a 900 MW solar project in India, which was paused due to external factors, and previously owning a wind farm in Vietnam) and could reconsider Bangladesh if competitive conditions improve.

These cases of withdrawal highlight that even major European companies will hesitate to engage without a predictable policy framework. However, their underlying interest suggests they might return if Bangladesh stabilises its tendering and approval processes. For example, if future procurements ensure transparent competition and contract certainty, firms like TotalEnergies – with significant financial resources and technical expertise – could be attracted back, bringing considerable benefits in terms of investment and technology.

3.1.2. European companies active in India and Vietnam

Both India and Vietnam have experienced rapid growth in their solar markets, making them instructive case studies for attracting foreign investment including European involvement. India's growth was driven by clear policies (the National Solar Mission), regular competitive auctions via the Solar Energy Corporation of India (SECI), and strong payment security mechanisms. This resulted in mega-projects like the Pavagada and Rewa solar parks and steadily falling tariffs due to competitive bidding. Vietnam's solar boom, by contrast, was triggered by an extremely generous feed-in tariff (9.35 US¢/kWh) in 2018-2020, which led to a rush of installations (over 4.5 GW in 18 months). However, Vietnam then faced challenges: the state utility EVN imposed curtailments and retroactively hesitated on tariff commitments, undermining investor confidence and stranding some investments. Thus, while both countries attracted significant foreign and domestic investment thanks to strong initial incentives and economic growth, India provided a more stable long-term environment, whereas Vietnam illustrated the risks of sudden policy shifts and inadequate grid integration.

A number of European companies built strong track records in India and/or Vietnam. Their success in those markets indicates their capabilities and potential relevance to Bangladesh, since they have dealt with similar climates, regulatory issues, and grid conditions. These firms span developers, service providers and manufacturers. Key examples include:

- **3E (Belgium)** – *Technical Advisor and Software Provider*: 3E is a Belgian renewable energy consultancy and software developer, known for its solar and wind performance analytics platform. In India, 3E has provided services like solar resource assessments, energy yield predictions, and independent performance audits for many projects, leveraging an office in India. It has also deployed its SynaptiQ software in both India and Vietnam, enabling operators to perform real-time monitoring and data analysis across solar farms. For Bangladesh, 3E's expertise is directly applicable to the need to maximise energy output under challenging conditions. By using high-resolution climate modelling and considering local factors (e.g. monsoon cloud cover patterns, dust and haze that can reduce output), 3E can improve yield forecasting accuracy, helping investors better predict returns. Its monitoring tools can quickly detect issues like performance drops due to panel soiling (after floods) or degradation from heat/humidity, enabling timely maintenance to keep plants running optimally. Additionally, as a technical advisor, 3E

could guide on design adaptations specific to Bangladesh – for instance, recommending which module technology performs best in high humidity, or optimising site layout to reduce shading on smaller land parcels. Having worked in Vietnam's monsoon climate and India's hot environments, 3E is well qualified to advise on adaptation measures such as improved site drainage, or anti-reflective coatings and cleaning schedules to deal with frequent rain and dust. Importantly, 3E emphasises knowledge transfer, meaning it would train local Bangladeshi engineers in advanced analytics and predictive maintenance. This builds local capacity in data-driven plant management, enhancing the long-term productivity of Bangladesh's solar assets.

- **ABB (Switzerland/Sweden)** – *Technology Supplier and EPC Contractor*: ABB is a multinational technology company specialised in electrification and automation. Although ABB exited the standalone solar inverter manufacturing business in 2019, it remains a major supplier of electrical infrastructure for solar projects – including transformers, switchgear, control systems (SCADA), and grid integration equipment. (Notably, ABB's power grid division has since been taken over by Hitachi Energy, which continues to provide high-voltage solutions relevant for grid connection of renewable plants.) In India, ABB had been a key provider of inverters and substation equipment for many solar farms during the early boom and continues to supply transformers and automation for new projects. In Vietnam's solar boom, ABB also supplied inverters and control systems to utility-scale projects, enhancing their grid compatibility. For Bangladesh, ABB's products and expertise are highly relevant because one of the country's biggest challenges in scaling solar is maintaining grid stability and reliability. ABB can provide advanced solutions to ensure that solar plants connect safely to the grid and operate smoothly. This includes designing systems resilient to Bangladesh's climate (for instance, corrosion-resistant components for humid, coastal areas and equipment enclosures with high IP ratings to protect against monsoon rain). ABB's automation and control systems enable real-time performance monitoring and grid support, which can help optimise output and reduce downtime – crucial in Bangladesh's variable weather and weaker grid environment. In partnership with Hitachi Energy, ABB can also deliver the necessary transmission infrastructure (like substations and high-voltage transformers) to integrate new solar capacity, something developers in Bangladesh currently struggle with. By combining ABB's and Hitachi's offerings, Bangladesh could reinforce its grid to handle more solar power, benefiting from European know-how in managing grid integration and reliability.
- **Ciel & Terre (France)** – Developer/IPP (Floating Solar specialist): Ciel & Terre is a French company that has become a global leader in floating solar PV (FPV) installations – solar arrays deployed on water bodies. It has a presence in 30+ countries with over 320 projects (~3.2 GW) of FPV, including some of the world's largest floating solar arrays. In India, Ciel & Terre has executed significant FPV projects, the largest being a 120 MW_p floating solar farm on the Omkareshwar reservoir in Madhya Pradesh, using its proprietary Hydrelio floating platform technology. It has also done FPV projects in West Bengal and Tamil Nadu (cumulatively over 425 MW_p in India) and explored projects in Vietnam. Relevance to Bangladesh: Bangladesh, being land-scarce but having many bodies of water, is an excellent candidate for FPV solutions. Ciel & Terre's expertise and technologies directly address this scenario – they provide a way to generate solar power without consuming valuable land. Their Hydrelio floats and anchoring systems are proven for durability and have been tailored even for challenging conditions (such as strong currents or varying water levels). The company's experience with special anchoring methods (e.g. rock bolt anchors used in India) shows they can adapt to complex hydro-geological conditions. By leveraging Ciel & Terre's know-how, Bangladesh could pursue large FPV projects on reservoirs, ponds, or even flooded quarries, thus bypassing land acquisition issues. These floating plants could supply power without taking farmland, and they have side benefits like reducing water evaporation. Ciel & Terre's involvement would bring international-standard design and safety to such projects, positioning Bangladesh as a regional leader in innovative solar deployment.
- **EDF Renewables (France)** – Developer/IPP: EDF Renewables is the renewable energy subsidiary of France's state-owned EDF Group. With over 16 GW of installed renewable capacity

globally, EDF Renewables invests in, develops, and operates large wind and solar projects around the world. In India, EDF Renewables has pursued projects via joint ventures such as a partnership with the Sitac Group, resulting in several hundred megawatts of wind and solar capacity. In Vietnam, EDF Renewables helped develop a portfolio of solar and wind projects, including a 49.5 MW solar farm in Binh Thuan that became operational in 2020, acting as an equity investor and providing technical oversight. Relevance to Bangladesh: EDF Renewables combines a strong financial standing (backed by a major European utility) with deep technical expertise in utility-scale projects. Its public-sector backing can make it a trusted partner for governments and public utilities – crucial in a market like Bangladesh where the main off-taker is government-owned. EDF could bring to Bangladesh the ability to invest at scale and to ensure projects are engineered for reliability and safety. With experience operating in Asian climates and navigating emerging market regulations, EDF Renewables would be capable of tackling challenges like flood-prone sites or weaker grid areas by employing robust design measures and working closely with authorities on grid integration. EDF's involvement would likely ensure high technical standards and could also attract co-financing from institutions due to EDF's credibility. In short, EDF Renewables could help Bangladesh by deploying capital at scale, delivering resilient project design, and setting a benchmark for performance and safety.

- **EDP Renewables (Portugal)** – Developer/IPP: EDP Renewables (EDPR) is the renewables arm of Energias de Portugal, with over 15 GW of renewable capacity globally. EDPR focuses on developing, building, and operating wind and solar projects, including hybrids with storage. In Vietnam, EDPR recently made an entry by acquiring a controlling stake in Sunseap, a large solar developer in Southeast Asia, through which EDPR now has a significant portfolio of commercial rooftop and small utility-scale projects in Vietnam. Relevance to Bangladesh: EDPR's move into Southeast Asia shows its adaptability to tropical, fast-growing energy markets. Its expertise in distributed solar (rooftop) via Sunseap could be particularly useful to Bangladesh, given the country's huge untapped rooftop potential and the government's push for rooftop solar. EDPR also brings knowledge in hybrid systems and smart grid integration – aligning with Bangladesh's need for innovative solutions to manage grid constraints and maximise generation in limited space. As a financially strong developer, EDPR could contribute to Bangladeshi projects by mobilising investment and introducing advanced operational practices (like digital asset management) that ensure longevity and efficiency.
- **Enel Green Power (Italy)** – Developer and IPP: Enel Green Power (EGP) is the renewable energy division of Italy's Enel Group, one of the world's largest utilities, managing over 60 GW of renewable capacity worldwide. EGP develops and operates solar, wind, geothermal, and hydro projects and often provides integrated EPC and O&M services using its in-house teams. In India, EGP has developed over 300 MW of solar projects and has been participating in new hybrid and storage-backed renewable tenders; it also maintains a pipeline of several gigawatts across Asia, including Vietnam (~6 GW of projects under consideration). Relevance to Bangladesh: EGP's model of combining development and EPC under one roof means it can directly ensure project quality from construction onwards. Backed by a major utility, it has the financial strength and long-term outlook to undertake large projects responsibly. EGP is known for implementing sustainable construction practices and often goes beyond minimum requirements by integrating biodiversity measures or community initiatives. For Bangladesh, Enel Green Power could deliver high-quality solar parks and is particularly skilled in managing construction in remote or challenging environments – which would help in areas with difficult access or harsh weather. EGP's emphasis on things like biodiversity offsets or reusing materials would also introduce more sustainable practices in Bangladesh's market. In essence, they could ensure any project they do in Bangladesh is built robustly (to handle floods, storms, etc.) and operated efficiently, setting an example for future projects.
- **Engie (France)** – Developer & IPP: Engie is a French multinational energy company and one of the world's largest independent power producers, with a diversified portfolio over 38 GW of renewable capacity. Engie develops, finances, builds, and operates projects, and is notable for its focus on long-term sustainability and innovative energy transition solutions (including energy

storage and efficiency services). In India, Engie has developed more than 1.5 GW of renewable projects, including large solar parks (like a 200 MW solar farm in Gujarat) and also runs programs for commercial solar and energy efficiency. In Vietnam, Engie operates commercial-scale distributed solar systems (e.g. on factories) and provides energy services to industrial clients. Relevance to Bangladesh: Engie's broad expertise across generation, grid services, and energy storage makes it a valuable potential partner. Its experience with hybrid projects and corporate PPAs could help Bangladesh diversify beyond the traditional single-buyer model. For example, Engie could explore supplying solar power directly to industrial zones or developing solar-plus-storage solutions to provide reliable power and grid support. Given its engineering depth, Engie would also uphold high environmental and safety standards on any project, and its strong commitment to ESG aligns well with raising standards in Bangladesh. Engie's presence could thus help introduce more advanced business models (like private-sector power sales or mini-grids) and enhance the quality and reliability of delivered projects.

- **Enerparc (Germany)** – Developer and EPC Contractor: Enerparc is a German solar developer and EPC contractor with a global footprint. In India, Enerparc has been active for over a decade, establishing an Indian subsidiary and delivering numerous mid-sized solar farms and commercial rooftop projects (totalling tens of megawatts). It even completed a novel project installing solar panels on port cranes in Mumbai. In Vietnam, Enerparc provided technical partnership on some solar farms during the 2019 FiT-driven expansion, lending engineering support to local developers. Relevance to Bangladesh: As an integrated developer-EPC, Enerparc can offer end-to-end project execution experience with European quality. The company prides itself on efficient construction and project optimisation while maintaining high standards. Its experience in tropical climates (like southern India) means it knows how to design systems for extreme heat – e.g., ensuring inverters have adequate cooling and mounting structures allow airflow to prevent overheating. If Enerparc were to enter Bangladesh, it could bring reliable EPC services, likely in partnership with local contractors. It is skilled at keeping costs controlled by leveraging Asian supply chains without compromising on critical components, and it often uses its own monitoring software to keep plant performance high. All these capabilities would be advantageous in Bangladesh, where cost control and maintaining performance in harsh conditions are both vital.
- **Fortum (Finland)** – Developer/IPP: Fortum is a Finnish energy company that made a substantial foray into India's solar market in the 2010s, becoming a significant foreign solar IPP in India. It developed and operated around 700 MW of solar parks in India – including a 250 MW solar plant in Rajasthan (which it won in 2019 at a competitive auction) and several 50–100 MW projects in other states. These projects were notable for achieving very low tariffs at the time. Fortum later sold many of these assets to global investors after successfully commissioning them, showing that it could build bankable projects and then recycle capital. In Vietnam, Fortum has not directly built solar projects, but as a regional player it has explored various opportunities in Southeast Asia's renewables sector. Relevance to Bangladesh: Fortum's success in India demonstrates its ability to navigate land acquisition, grid connection, and PPA arrangements in a challenging emerging market environment. This directly translates to Bangladesh's context. Because Fortum deployed top-quality equipment and O&M practices to keep its Indian plants running optimally despite dust and extreme heat, it would likely apply similar strategies in Bangladesh (such as durable mounting structures, stringent O&M schedules to counter dirt and humidity). Fortum also experimented with innovative business models in India, such as participating in projects with utility tie-ins and possibly exploring corporate PPAs – experience which could be valuable if Bangladesh opens up to merchant projects or private PPAs. If Fortum engaged in Bangladesh, it could bring not only capital and execution know-how but also a mindset of finding pragmatic partnerships – in India, Fortum often collaborated with local engineering teams and contractors, which is a model that could help build Bangladeshi capacity if replicated.
- **Fronius (Austria)** – Manufacturer (Inverters and Systems): Fronius is an Austrian company known for its high-quality solar inverters and system components. It has been a family-owned

business since 1945 and expanded into solar in the 1990s. With a presence in over 60 countries, Fronius inverters are respected for their reliability in harsh conditions. In India and Vietnam, Fronius inverters have been widely used in both utility-scale and commercial projects, appreciated for their ability to maintain performance in hot, humid climates and for good after-sales support. For instance, Fronius has supplied inverters to a range of Indian solar installations where high temperatures and monsoons test equipment durability. Relevance to Bangladesh: Inverters are critical to solar farm uptime, and Bangladesh's environment (extreme heat, heavy monsoons, dust) can be tough on electronics. Fronius designs its inverters with features suited for these conditions: high ingress protection (IP65/IP66) to resist dust and water, active cooling systems to prevent overheating in ~40°C ambient temperatures, and built-in voltage regulation features to cope with grid fluctuations. By using Fronius or similar European inverters, Bangladeshi solar projects can achieve better long-term reliability compared to cheaper models – meaning fewer failures and replacements over the plant's life. Fronius also offers strong technical support and remote monitoring tools; it often establishes local service partnerships or centres in the markets it serves (it has done so in India). For Bangladesh, having access to such support means any technical issues with inverters can be addressed swiftly, minimising downtime. In summary, if developers in Bangladesh choose European inverters like Fronius, they invest in durability and performance that can save money over time via higher energy yields and reduced maintenance hassles, which is a compelling argument as the market matures and focuses on life-cycle quality.

- **juwi (Germany)** – Developer and EPC Contractor: juwi is a German renewable energy company that develops and builds solar and wind projects worldwide. In India, juwi entered in the 2010s and successfully built projects such as a 135 MW solar PV plant in Karnataka as an EPC contractor for an Indian IPP, among other projects. In Vietnam, juwi secured at least one utility-scale EPC contract during the FiT rush and has executed off-grid solar-plus-battery projects in remote parts of Asia. Relevance to Bangladesh: juwi's projects are known for incorporating advanced engineering solutions like single-axis trackers, which can significantly increase energy yield on a limited land area – an attractive proposition for Bangladesh's land-constrained context. If land is scarce, getting more output per acre through tracking systems (which tilt panels to follow the sun) can be a game-changer. Juwi's experience would ensure that such technology, if used, is properly adapted (for example, ensuring trackers can withstand local wind loads and the soil conditions). As an EPC, juwi is also skilled in managing complex logistics – shipping thousands of panels and equipment, dealing with customs, and organising large local labour forces – which would be beneficial in Bangladesh where transportation and site management can be tricky, especially in remote or flood-prone areas. By partnering with local construction contractors, juwi could bring global best practices in project management, health and safety, and quality control. This includes strict HSE (Health, Safety, Environment) standards on construction sites and rigorous commissioning tests to verify performance. The net effect would be solar plants built on schedule and to a high standard, and also a transfer of project management know-how to Bangladeshi firms working alongside juwi.
- **SMA Solar Technology (Germany)** – Manufacturer (Inverters): SMA is a German company and one of the world's leading manufacturers of solar inverters and related energy management systems. In the early years of India's solar boom, SMA inverters were widely used (SMA exceeded 3 GW of inverter sales in India by 2017) as they were considered highly reliable. In Vietnam too, SMA supplied central inverter stations for several large solar farms commissioned around 2019, helping those projects achieve high availability despite grid issues. Relevance to Bangladesh: SMA inverters are engineered for robust performance in challenging conditions – many models have advanced cooling and can handle high temperatures without derating (loss of output). They also carry high enclosure ratings (dust- and waterproof), making them suitable for Bangladesh's dusty dry seasons and wet monsoons. Using SMA or similar quality inverters can reduce the risk of failures from overheating or moisture ingress, which are common failure modes in tough climates. Furthermore, SMA offers a strong warranty and sets up service centres in key markets; if they or their partners provide local service in Bangladesh, plant operators would have faster access to spare parts and technical support, which is critical when every day

of downtime affects revenues. Another advantage is that SMA's latest inverter systems often support battery storage and grid support features. As Bangladesh's grid takes on more solar, having inverters that can perform grid stabilisation (voltage/frequency control) is beneficial. Although cheaper Chinese or local inverters might suffice initially, the life-cycle performance and support from European inverters like SMA could lead to better overall economics – an important consideration for IPPs and lenders thinking long-term.

- **TÜV Nord (Germany)** – Technical Advisor / Certification Agency: TÜV Nord is another German engineering and certification organisation similar to TÜV SÜD. It provides inspection, testing, and consulting services. In India, TÜV Nord has been active in certifying solar projects (for example, providing technical consulting on 300 MW of ISTS-connected solar projects and offering aerial inspection services via drones). It also has a presence in Bangladesh for industrial inspection services, though not yet prominently in solar. Potential value for Bangladesh: TÜV Nord could become a key technical advisor or certifier for future solar projects, given its background in ensuring compliance with international standards (IEC, etc.). They can help local developers adapt designs to local hazards, much like TÜV SÜD does – for instance, advising to elevate electrical equipment in flood zones, or use corrosion-resistant materials in coastal installations. TÜV Nord can also train local engineers on operations and maintenance best practices to deal with issues like high humidity and dust (ensuring proper cleaning schedules, ventilation for equipment, etc.). Essentially, TÜV Nord's involvement would further elevate quality and safety in the industry, giving confidence to investors and authorities that projects meet global benchmarks. As Bangladesh's market grows, having multiple reputable certifiers (TÜV SÜD, TÜV Nord, DNV, etc.) ensures healthy competition and ample capacity for necessary inspections and due diligence, which will become increasingly important, especially for projects seeking international financing.

This overview shows that European companies are already participating in regional solar markets in diverse roles – from building some of the largest solar plants to supplying critical technology and ensuring quality. These successes in India and Vietnam demonstrate a pool of expertise that Bangladesh can tap into. European players have learned to navigate Asian market conditions, deal with extreme weather, integrate projects into evolving grids, and deliver top-notch quality often under cost pressures. As Bangladesh expands its solar capacity, engaging these experienced companies – through proper incentives and partnerships – can help leapfrog challenges and ensure the solar rollout is efficient, resilient, and aligned with international best practices. The following sections will delve into how other global players are active in Bangladesh, what unique benefits European companies offer (especially compared to current players), the barriers they face in Bangladesh specifically, and how targeted cooperation could increase European involvement to Bangladesh's advantage.

3.2. MAPPING AND CHARACTERISATION OF OTHER KEY GLOBAL/REGIONAL AND BANGLADESHI COMPANIES ACTIVE IN THE NATIONAL MARKET

While European participation in Bangladesh's solar EPC sector is currently limited, a number of Asian regional companies have taken leading roles in implementing Bangladesh's solar projects. Simultaneously, several Bangladeshi companies have emerged as local EPC contractors or developers, often in collaboration with foreign firms. This section maps out these non-European players and describes the key Bangladeshi firms active in the country's solar market, to provide context on the existing industry landscape.

3.2.1. Bangladeshi EPC companies

Bangladesh's domestic solar EPC landscape consists of a small but growing group of companies that contribute to project development, construction, and O&M at both large and small scales. Some of the most prominent local actors include Rahimafrooz Renewable Energy Ltd., Energypac, Confidence Group, AG Agro Industries, ACME Group, East Coast Group (through subsidiaries like Radiant Alliance

and Omera), FBBC, and several others like G-Tech, Engreen Engineering and Muspana. Their roles and capacities vary:

- **Rahimafrooz Renewable Energy Ltd.** – A pioneer in Bangladesh's renewable sector, Rahimafrooz built its reputation on solar home systems (SHS) during the rural electrification programs financed by IDCOL (Infrastructure Development Company Limited). Having supplied countless small off-grid systems in rural areas, Rahimafrooz later expanded into on-grid solar. It has acted as an EPC contractor for numerous small-to-medium grid-tied solar projects (from sub-megawatt up to a few MW in size). This makes Rahimafrooz one of the more experienced local firms, bridging both off-grid and on-grid domains, and giving it a versatile profile in the solar industry.
- **Energypac** – A large Bangladeshi engineering conglomerate known for power and industrial equipment, Energypac has recently ventured into solar EPC services. With its strong background in electrical engineering and project execution (for conventional power and infrastructure), Energypac has begun taking on engineering, procurement, and construction roles for solar projects. So far, its solar portfolio is in early stages – handling components of solar installations and smaller projects – but it is actively positioning itself to win roles in larger utility-scale projects. Energypac's broad engineering experience suggests it has the potential to scale up in the solar field once it secures opportunities.
- **Confidence Group** – Another diversified Bangladeshi conglomerate, Confidence Group has also expanded into renewables. It has been involved in several medium-sized solar development initiatives, likely providing EPC or co-development services. As a local EPC aspirant, Confidence is building capabilities to handle larger solar builds, although it has not yet singularly delivered a major project by itself. Its interest and investments indicate that local industrial groups see solar as a growth area.
- **AG Agro Industries** – This firm, part of a local industrial group, gained prominence through its partnership with ib vogt on the landmark 50 MW project in Chattogram. AG Agro's role in that consortium was key: it handled local coordination, land procurement assistance, and on-the-ground execution aspects for the project. Essentially, AG Agro provided the local knowledge and connections (for regulatory approvals and landowner negotiations) that complemented ib vogt's technical and financial strength. The success of that joint venture highlighted that Bangladeshi companies, when teamed with experienced foreign developers, can partake in delivering large projects and learn along the way. AG Agro's involvement in this flagship project effectively elevated its profile and experience in the renewable sector.
- **ACME Group (Bangladesh)** – (Not to be confused with India's ACME Solar) A local conglomerate with interests across multiple sectors, ACME Group in Bangladesh has engaged in renewable project development including participating in public-private partnership (PPP) initiatives. It has taken on some early-stage solar project development and EPC activities, though details are limited. ACME's approach shows how local groups are trying various modes – from PPPs to direct EPC contracting – to make inroads into the solar sector.
- **East Coast Group (ECG)** – A notable development from Bangladesh's private sector is East Coast Group's increasing role in renewables. Through subsidiaries like Radiant Alliance Limited (branded Omera Solar) and Omera Renewable Energy Ltd., ECG has achieved a couple of milestones: Radiant Alliance recently became the first Bangladeshi exporter of solar PV modules. In June 2025, it shipped an inaugural batch of locally made 100 W_p and 200 W_p solar panels to a US buyer, from its new 600 MW/year manufacturing plant in Ashulia. This is a major step for Bangladesh's industry, indicating a move towards local manufacturing capacity. Meanwhile, Omera Renewable Energy has provided EPC services for rooftop solar installations, reportedly delivering over 75 MW of rooftop systems across Bangladesh – including a large 22.7 MW_p industrial rooftop installation for the Meghna Group. These achievements suggest that East Coast Group is aggressively expanding in the renewable value chain: manufacturing panels, executing projects, and capitalising on both domestic demand and export potential.

- **FBBC** – This entity (which likely stands for a local business consortium) has been involved as a facilitator and junior partner in utility-scale solar projects. FBBC often does not act as the main EPC itself but rather provides critical enabling support – such as assisting with land acquisition, obtaining local permits, and liaising with authorities. By partnering in consortia, FBBC plays a bridging role to ensure a project can move forward within local contexts, contributing to deals and partnerships that deliver large projects. While not an EPC contractor per se, its role is important in smoothing the path for project implementation.

Collectively, these domestic companies form the emerging backbone of Bangladesh's solar EPC ecosystem. Most of them are still developing their technical and financial capacity to handle large (50+ MW) projects independently. So far, the trend has been that they either concentrate on smaller projects (e.g., 1–10 MW or rooftop installations) or they join forces with foreign companies to tackle larger ones. The presence of even a nascent module manufacturing facility (Radiant/Omera) and significant rooftop installations indicates local industry is gradually maturing. However, for big utility-scale projects, local firms still rely on international support – whether in engineering design, financial guarantees, or procurement of critical equipment. Over time, as they gain experience from these partnerships, Bangladeshi EPC companies are expected to shoulder more responsibility and deliver greater portions of projects on their own, which is key to localising the renewable energy sector benefits.

3.2.2. International companies present in Bangladesh

Given the current gaps in experience and capacity among local firms described above, Bangladesh's utility-scale solar projects to date have often required the involvement of foreign EPC contractors and developers – predominantly from Asia. These international companies fill the technical and financial roles that local companies alone might struggle with. Typically, they enter either through joint ventures with local partners or as subcontractors to local developers. Key categories and examples include:

- **Chinese state-owned enterprises (SOEs)**: Chinese engineering and construction firms have become major players in Bangladesh's solar development. Leveraging China's global dominance in solar manufacturing and its ability to offer competitive financing, companies like PowerChina and China Energy Engineering Group have pursued projects in Bangladesh (often sized 50–100 MW). These firms commonly engage via government-to-government deals or partnerships with local companies. For example, the 73 MW_p (50 MW_{ac}) Feni Solar Plant commissioned in 2019 was financed by the IFC (International Finance Corporation) and reportedly built by a Chinese contractor (likely Sinohydro, a large Chinese SOE) under a turnkey arrangement. Chinese companies bring the advantage of low-cost, rapid construction – they can mobilise large teams and use economies of scale to drive down costs, often bundling cheap Chinese-made PV modules, inverters, and equipment as part of the EPC package. They sometimes accompany this with concessional loans or supplier credits, making their offers attractive. While Chinese contractors can certainly meet required technical standards, their approach may prioritise cost and speed. In Bangladesh, Chinese-built projects have been instrumental in jump-starting capacity, though they may not always incorporate the highest level of international best practices unless such standards are stipulated by financiers like the World Bank/IFC.
- **Indian EPC companies**: India's large solar EPC firms have also looked beyond their borders to markets like Bangladesh. Sterling & Wilson (India) – one of the world's top-ranked solar EPCs with over 11 GW built globally – has expressed interest in Bangladesh's market. Indian players bring experience from a very similar climate and a familiarity with South Asian operating environments. Tata Power Solar (India) is another example of a major Indian solar EPC with regional ambitions. Indian companies have already been involved: Bangladesh's first significant solar park, the 20 MW (28 MW_{dc}) Teknaf Solar Park commissioned in 2018, was developed by local company Joules Power but with Indian technical input and using India-made solar panels. Typically, Indian EPCs operate in consortium with Bangladeshi partners, where the Indian firm provides design expertise, key equipment procurement and project management, while the local partner secures land and handles local clearances. Since Indian firms are used to working in similar high-heat, high-moisture conditions and sometimes constrained grid scenarios, they can adapt easily to Bangladesh. They also share cultural and business similarities (language,

negotiation style), which can smooth collaboration. Indian involvement is increasing as Bangladesh starts tendering new projects – recent BPDB auctions have seen bidding interest from Indian firms. With their strong project management and track record, Indian EPCs often serve as a middle ground option: potentially higher quality than purely local efforts, but at costs more competitive than European offerings.

- **Southeast Asian developers/EPCs**: Regional players from Southeast Asia – including companies from Malaysia, Singapore, Thailand, and Vietnam – have targeted opportunities in Bangladesh's renewable sector. Examples include B.Grimm Power (Thailand), which through a joint venture secured a contract for around a 30 MW solar project in northern Bangladesh, and interest shown by BCPG (Thailand) and Sembcorp (Singapore) in various projects. Singapore's Sunseap, now part of EDPR as mentioned earlier, also explored Bangladeshi projects (Sunseap has particular expertise in tropical solar and floating PV). These Southeast Asian firms often have access to regional investment funds and are comfortable with monsoonal climates. They may also see Bangladesh as part of a broader regional portfolio strategy. Japanese companies like Marubeni and JGC (known for high-quality engineering) have evaluated Bangladesh's solar tenders too, though Japanese firms have thus far been more active in conventional power and Hitachi's grid business rather than solar EPC in Bangladesh. Middle Eastern interest has also emerged, notably ACWA Power (Saudi Arabia) signing MOUs for large projects (including a proposed 100 MW solar plant), and Masdar (UAE) exploring renewable opportunities. These companies usually come more as developers/investors rather than pure contractors and would likely engage international EPC firms as needed for execution. Middle Eastern developers bring strong financing and experience in partnering with governments on big projects, although they tend to rely on either Chinese, European, or their own in-house teams for actual construction work.

Almost all utility-scale solar capacity installed in Bangladesh so far has involved international expertise in some form. Chinese firms have constructed the majority of capacity installed to date, given their head start and competitive edge in price. Indian-led initiatives have contributed as well, particularly in early projects and upcoming tenders. Southeast Asian and other foreign developers are positioning themselves but often still depend on either Chinese or Indian EPC capabilities (or potentially European, if the project demands higher standards or if financed by development banks). The reliance on these international players underscores that Bangladesh presently lacks a fully self-sufficient utility-scale solar EPC capability. However, it also means that Bangladesh can draw on a diverse pool of global expertise. The downside is that projects built by certain foreign contractors might not focus on capacity building or knowledge transfer to locals. They may import equipment and labour, finish the project, and leave, without significantly upskilling local industry or ensuring long-term maintenance capacity. This is precisely an area where European companies, though fewer in number in Bangladesh, have a chance to differentiate themselves – by emphasising quality, resilience, and local capacity development. The next section will highlight these comparative advantages.

3.3. ADDED VALUE OF EUROPEAN COMPANIES AND THE BENEFITS THEY CAN BRING TO THE BANGLADESHI SOLAR SECTOR

European companies can provide significant added value to Bangladesh's solar power sector in ways that distinguish them from many other international or local players. Based on the mapping above and their global track record, the key strengths of European firms include:

3.3.1. Rigorous climate-resilient engineering and best practices

European developers and EPC contractors have extensive experience designing projects in challenging environments worldwide and usually implement stringent, context-specific resilience measures. In Bangladesh – faced with cyclones, floods, extreme heat, and lightning – this expertise is invaluable. European firms tend to integrate climate adaptation features from the outset of design. For example, in flood-prone areas they will design PV array structures to be elevated on higher foundations or stilts so that critical electrical components (inverters, combiner boxes, etc.) remain above likely flood levels. All

outdoor electrical equipment (cables, connectors, switchgear) will typically be specified to high ingress protection ratings (IP65/IP66 or above) with waterproofing and proper sealing, to prevent monsoon rain damage or moisture build-up. In coastal or cyclone-prone sites, European engineers will increase wind load design margins – using stronger mounting frames, additional bracing, and fastening systems rated for winds over 200 km/h – to ensure arrays can withstand severe storms without catastrophic damage. Lightning protection and earthing are given special attention, since Bangladesh has frequent thunderstorms; European best practice includes installing sufficient lightning arrestors and grounding all equipment adequately to protect against surges. Materials are also carefully chosen: corrosion-resistant materials (galvanised steel, aluminium alloy, stainless steel, special coatings) are used for structures and bolts to handle high humidity and salinity (in coastal air) and to maximise the plant's lifespan. While some international competitors might cut costs by using generic designs, European firms typically err on the side of safety and durability, often learning from their global experience (for instance, drawing from designing hurricane-resistant solar farms in the Caribbean or flood-adapted installations in the Netherlands). The result is that projects built or guided by European companies can better withstand Bangladesh's climate extremes, suffering less damage and downtime over their lifetime. Although initial costs may be slightly higher, this resilience means fewer repairs and interruptions, ultimately saving money and ensuring more consistent power generation. For Bangladesh, which cannot afford solar farms being knocked out by the first cyclone or heavy flood they encounter, this level of robustness is a crucial long-term benefit.

3.3.2. High quality standards and compliance

European companies are renowned for their commitment to stringent quality assurance (QA) and quality control (QC) processes as well as compliance with international standards. In practice, this means that when European EPCs or manufacturers are involved, every stage of the project undergoes rigorous checks. During construction, European contractors implement systematic QA/QC protocols: every weld, cable connection, structure alignment, etc., is inspected and tested – often using detailed checklists and independent inspectors – to catch and fix issues early. European-supplied components (like modules, inverters, transformers) are usually certified to international standards (IEC, UL) and often go through more extensive reliability testing than the minimum required. For example, solar panels from a European source might have been tested for extended periods in climate chambers (thermal cycling, damp heat tests, mechanical load tests) and carry certifications from bodies like TÜV, ensuring they can endure stresses without premature failure (meaning less risk of power loss from PID, micro-cracks, or encapsulant discoloration under Bangladesh's hot sun). Similarly, European inverters might be designed for higher MTBF (mean time between failures) and include self-protection features that prolong their life under an unstable grid. The net effect of this quality focus is higher performance and reliability over the project's 20–25 year life: modules degrade slower, wiring faults or inverter breakdowns are less frequent, and the plant maintains a higher output. Moreover, European developers often follow international environmental and social (E&S) standards (e.g. IFC Performance Standards, Equator Principles) even if not explicitly required by local regulations. This means thorough environmental impact assessments are done, and mitigation plans (for managing impacts on land, water, local communities) are implemented to global standards. They will engage with local communities to manage expectations and grievances, incorporate health and safety plans for workers that meet OSHA/ILO guidelines, and ensure no exploitative labour practices on site. For instance, ib vogt's 50 MW project includes a comprehensive Environmental and Social Management System to mitigate any negative effects on communities and the ecosystem. By doing so, European-led projects often create fewer local conflicts, face fewer delays related to social issues, and set a positive example of sustainable development. Another aspect is transparency and integrity: European companies typically maintain high ethical standards, reducing risks of corruption or malpractice during project execution. This can lead to smoother execution and fairer dealings with subcontractors and workers. Overall, the presence of European players tends to raise the bar in terms of construction quality, safety, and sustainability – benefits which, once demonstrated, can influence the wider industry in Bangladesh to adopt better standards.

3.3.3. Technology and innovation transfer

European firms are frequently at the forefront of renewable energy innovation. Their involvement can introduce new technologies and modern techniques to Bangladesh's solar sector earlier than would otherwise happen. Examples of such innovations include:

- **Bifacial PV modules:** which produce more energy by capturing reflected light – European projects have deployed these to boost energy yield per area, directly addressing Bangladesh's land constraints.
- **Single-axis trackers:** which rotate panels to follow the sun, common in European-run projects in sunny regions, increasing output significantly on limited land.
- **Floating solar (FPV) and agrivoltaics (Agri-PV):** European companies like Ciel & Terre are pioneers in FPV, and others have trialled Agri-PV (using land for both solar and agriculture). By bringing these concepts, they can help Bangladesh utilise ponds, reservoirs, and dual-purpose land, mitigating the land scarcity issue.
- **Battery storage integration:** Several European developers and electrical firms have experience pairing solar with battery energy storage to provide stable power and ancillary services. They can introduce viable storage solutions and advise on market mechanisms needed for these to work financially.
- **Advanced monitoring and control systems:** European technical firms and utilities often use sophisticated SCADA systems and even AI-driven analytics for predictive maintenance. By implementing these, they ensure plants in Bangladesh can be monitored in real time with automatic alerts and performance optimisations. Issues like strings going offline or panels getting dirty can be detected remotely and promptly fixed, keeping performance high.
- **Digital design tools and software:** European consultants (e.g. 3E, DNV) bring cutting-edge modelling software for precise energy yield forecasting and layout optimisation, improving project design accuracy.
- **Grid management solutions:** European companies have developed smart inverters and grid-support functions to help maintain grid stability (voltage regulation, frequency response). As Bangladesh's solar penetration grows, such solutions will be needed to avoid disruptions; European firms can supply and configure them.
- **Construction methods:** Techniques like efficient pile-driving machines, modular wiring harnesses, or prefabricated electrical skids are often introduced by European EPCs to speed up construction with quality.
- **Training and capacity building:** Crucially, European firms don't just bring hardware but also invest in training local staff. For example, if a European O&M provider manages a plant, they may train Bangladeshi technicians in preventative maintenance procedures, or a European manufacturer might train local partners on product installation and troubleshooting.

This knowledge transfer element means that even after a project is done, Bangladeshi professionals and companies are left with improved skills and familiarity with advanced solutions, which they can then replicate or adapt. Over time, this contributes to the self-reliance of Bangladesh's renewable sector – local teams become capable of implementing high-tech solutions independently. The introduction of global best practices in areas like grid studies (for instance, European utilities can share how they handle high solar penetration via improved forecasting and grid code enforcement) or innovative business models (like corporate PPAs or net metering improvements from European markets) can help Bangladesh modernise its policy and operational frameworks. In summary, European involvement accelerates the learning curve for Bangladesh by several years, injecting innovation and expertise that might otherwise arrive only after long delays. This jump-start in technology adoption not only increases efficiency and output in current projects but also builds a foundation for Bangladesh to incorporate emerging renewable technologies (like next-generation solar panels or hydrogen-ready plants) in the future.

3.3.4. Financial strength and risk management

Many European developers and IPPs come with strong balance sheets or partnerships with development finance institutions (DFIs) that give them access to lower-cost capital. Their presence can significantly improve a project's bankability and financing terms. For instance, a project sponsored by a well-known European company often finds it easier to attract international lenders because that sponsor's track record reduces perceived execution and operational risks. Lenders trust that a company like EDF Renewables or Enel will build the plant properly and run it successfully, thus loans are more likely and possibly at better interest rates. Some European firms also have lower return on investment expectations if they are partially publicly owned or have strategic mandates (e.g., a European utility might accept a modest return in exchange for long-term stable revenue, compared to a private investor requiring high returns). This means they could bid lower tariffs, making solar power more affordable for Bangladesh, without cutting corners on quality. Moreover, European companies are experienced in complex risk mitigation strategies:

- They often insure projects comprehensively (construction all-risk insurance, political risk insurance if needed, etc.), protecting against unforeseen events.
- They structure EPC and O&M contracts with strong guarantees – for example, a European EPC might guarantee a certain performance ratio for the plant and accept penalties if not met, which assures investors of performance.
- They might secure export credit agency (ECA) guarantees from agencies in their home countries when exporting equipment (for example, a German module maker can get Euler Hermes cover), which reduces default risks on payments.
- They are familiar with using blended finance – mixing concessional loans or grants (perhaps via EU funding mechanisms) with commercial funds to improve project viability. For example, a European developer might bring along a soft loan from a European development bank to complement its equity, thus lowering the overall cost of capital.
- European IPPs typically negotiate robust contracts; they will push for terms like foreign currency indexation in PPAs (to guard against Taka depreciation) or sovereign guarantees for payment, thereby enhancing revenue security. Their experience in worldwide negotiations means they are skilled at achieving these risk mitigants.
- If currency volatility is a risk, European companies have access to hedge instruments or financing in local currency via development banks, managing the currency risk better.

With these approaches, European involvement can make a marginal project bankable or reduce the tariff needed because the risk premium comes down. Additionally, in a context like Bangladesh where obtaining financing can be a challenge partly due to perceived country risk, the credibility of a European sponsor can reassure not just banks but also other partners (like EPC contractors or equipment suppliers) to offer better terms – for instance, suppliers might extend longer credit for equipment if the buyer is a reputable European firm. Another financial aspect is that European utilities or IPPs often have diversified portfolios and can absorb country risk more easily; for example, a company operating in many countries can invest in Bangladesh as a small part of its portfolio, using corporate finance, which might allow it to accept some risks that a smaller investor would not. European companies also usually have strong internal risk management procedures, meaning they will carefully assess and mitigate project-specific risks (like geotechnical surveys to avoid land risks, thorough due diligence on local partners to avoid defaults, etc.). Summing up, the financial heft and disciplined risk approach of European firms can bring more secure and potentially cheaper financing, reduce the likelihood of project distress, and lead to more competitive yet realistic tariff bids – benefiting Bangladesh with both lower costs in the long run and more reliable project execution.

3.3.5. Enhanced environmental, social, and governance (ESG) performance

European involvement tends to ensure that ESG considerations are prioritised in project development and execution. In tangible terms, this manifests as:

- **Thorough Environmental Impact Assessments (EIA) and management plans:** European

developers will study impacts on local flora, fauna, water flows, etc. If a site has ecological sensitivity (e.g., near wetlands), they will incorporate measures such as wildlife corridors, re-planting trees elsewhere, or adjusting the layout to avoid critical habitats.

- **Community engagement:** They will actively consult local communities, both to inform them about the project and to incorporate feedback or address concerns. For example, if a project requires using land that locals graze cattle on, a European company might develop a plan to provide alternative grazing areas or compensation.
- **Labour and safety standards:** European contractors apply stringent labour standards on site – ensuring no child labour, providing appropriate wages and benefits, safety training, and personal protective equipment to all workers. They implement international HSE protocols to prevent accidents (toolbox talks, safety drills, first aid stations on site, etc.), which not only protect workers but also create a safer and more disciplined working environment that can improve construction efficiency.
- **Benefit-sharing:** Often European-led projects include community benefit programs – such as setting up a community trust fund from a portion of project revenues to invest in local schools, clinics, or infrastructure; or running training programs for locals so they can be employed in the project (e.g., training young people as solar technicians or security staff).
- **Grievance redressal:** An accessible system for local people to voice complaints (e.g., about construction noise or land issues) and get them resolved is typically established.
- **Transparency:** European investors are accustomed to public reporting on project impacts and progress, which means they maintain documentation and share information openly with stakeholders – fostering trust.
- **Governance (anti-corruption):** They follow strict governance norms, which means procurement for subcontractors and materials is done ethically (reducing the likelihood of local elite capture or bribes), and project decisions are made on merit and sustainability, not short-term expediency.
- **Reputation effect:** When European projects set a high ESG benchmark, Bangladeshi officials and communities start expecting that level of performance from all projects. This can encourage even non-European developers to improve their practices to avoid community pushback or to meet the standards set in tenders.

The benefit of all this to Bangladesh is multi-fold: projects face fewer delays or conflicts due to social issues (land disputes, protests) because these are proactively managed. There's less likelihood of negative incidents (like a safety accident or environmental damage) that could halt a project or mar public perception of solar energy. The local community often ends up supporting the project because they see tangible benefits – which is critical for the sustainability of solar expansion, especially if many projects are to be rolled out. In addition, these high standards help Bangladesh meet international expectations, which is important if the country seeks climate finance or wants to attract more foreign investors who require ESG compliance. In the long term, integrating ESG deeply also means Bangladesh's solar growth will be sustainable and equitable – not causing unintended harm but instead contributing positively to local development and the environment, aligning with the broader Sustainable Development Goals (SDGs).

3.3.6. Circular economy and End-of-Life management

European companies are increasingly pioneering circular economy approaches in the solar industry, focusing on what happens at the end of a project's life and minimising waste. They bring this perspective to the projects they develop:

- **Recycling and waste handling:** They plan for recycling of solar panels and batteries once those components wear out. European firms might initiate partnerships with recycling companies or propose take-back programs where, after 20–25 years, panels are collected and recycled (recovering silicon, glass, metals) instead of simply being dumped. This forward-thinking approach addresses a future challenge (solar waste) early on and prevents environmental problems down the line.

- **Efficient resource use:** During construction, they try to reduce waste – for example, optimising panel layout to minimise land use, reusing packaging materials, or sourcing some materials locally (like using locally available sand or cement where possible to reduce transport emissions).
- **Upgradability:** European technology providers sometimes design systems for upgradability – inverters that can be reprogrammed for future grid needs or mounting structures that can accommodate new panel models – which means the project can integrate improvements over time rather than become obsolete.
- **Decommissioning plans:** They include decommissioning and site restoration in project planning, ensuring that at end-of-life, the site can be restored (panels removed, land maybe returned to original use or prepared for new systems). This is particularly important for Bangladesh's land usage – a solar farm should not permanently degrade land if it can be avoided.
- **Training in circular practices:** European experts can train local staff on maintenance practices that prolong equipment life (thus delaying waste). They may also work with Bangladeshi regulators to introduce guidelines for solar waste management in the future, drawing from their home countries' evolving regulations.

For Bangladesh, which is at the beginning of its solar journey, adopting a circular approach from now means avoiding a large solar waste problem in a couple of decades. European involvement ensures these long-term environmental considerations are not overlooked amidst the push for capacity addition. It aligns solar expansion with sustainability principles, reinforcing the environmental benefits of renewables by handling their full lifecycle responsibly. For example, if Bangladesh installs thousands of MW of solar by 2040, having frameworks to recycle or locally process expired panels (perhaps using technology or partnerships introduced by Europeans) will prevent pollution and create new green job streams in recycling industries. In short, European companies help embed a culture of sustainability beyond just building solar farms – encompassing how those farms are built, operated, and retired in an environmentally conscious manner.

By leveraging these strengths – from engineering rigor and innovation to finance and sustainability – European companies offer a holistic enhancement to Bangladesh's solar sector development. They can fill critical gaps (quality, reliability, advanced tech, training, financing) in the current market and ensure that as Bangladesh boosts solar capacity, it does so in a way that is efficient, durable, and socially responsible. It should be noted, though, that whilst European companies excel particularly in circularity, sustainability and cybersecurity, international firms can also provide high-quality services that incorporate best practices and innovative technologies. A key challenge for European companies is navigating a set of barriers that currently limit their engagement in Bangladesh. The next section analyses those barriers in detail, by type of company, to understand why European participation remains limited and what issues need to be addressed to tap into the full range of these benefits.

3.4. MAIN BARRIERS FOR EUROPEAN COMPANIES IN BANGLADESH MARKET

European companies considering entry or expansion in Bangladesh's solar sector encounter a range of challenges that are shaped by their specific roles within the market. They can be categorised according to four principal types of actors: pure EPC contractors and O&M service providers, developers and independent power producers, technical advisors and software providers, and equipment manufacturers. Each category faces distinct market conditions, but common themes include regulatory procedures, procurement practices, financial arrangements, and operational complexities. The evolving policy framework and the growing emphasis on renewable energy present a strong basis for future engagement and ensuring the smooth and successful operationalisation of this would enable the sector to realise its full potential.

3.4.1. Challenges for EPC contractors

For EPC-only firms, the principal determinant of market entry is continuity and predictability of the utility scale tender pipeline. Building capacity through local presence and collaboration is feasible and constructive, but it requires time, investment and careful partnership selection to navigate permits, customs, workforce mobilisation and site logistics. Procedural requirements for documentation and approvals are routine within the national context and can be planned for, although proposals that reflect higher quality standards may be disadvantaged in strictly price driven evaluations. Payment schedules, letters of credit, currency exposure and repatriation processes must be structured to ensure timely milestones and risk mitigation. Competition from regional EPCs that offer lower prices is significant, yet European firms can differentiate through engineering quality, safety and sustainability that reduce lifecycle risks for owners. As procurement frameworks evolve to weigh long term value and project resilience alongside price, Bangladesh will become more attractive for EPC-focused European participation.

European EPC-only contractors, who focus exclusively on engineering, procurement, and construction without holding equity in projects, are influenced by several structural and operational factors. The visibility and consistency of the utility-scale solar project pipeline is a key consideration. Bangladesh's tendering activity has undergone significant reform and a clear model and timeline for procurement of utility-scale solar is still under development. Establishing a clear auction timeline and tender requirements will enable EPC firms to better assess whether or not to establish a local presence. The prospect of multiple opportunities across several tenders would certainly improve the feasibility of market entry for these firms. As Bangladesh continues to expand its renewable energy ambitions and develop its procurement practices, the resultant structured and transparent project pipeline would enhance the market's appeal.

Establishing a local presence or forming partnerships with Bangladeshi firms is often a practical requirement for effective project delivery. EPC execution in Bangladesh involves engaging with local supply chains and labour, managing site-specific logistics, and navigating administrative and regulatory processes. These partnerships can support long-term engagement and facilitate knowledge exchange, although they require time and investment to develop. European firms accustomed to operating with established networks may initially approach such arrangements with caution, but successful examples of international-local collaboration in other sectors suggest that these partnerships can be constructive and mutually beneficial.

From a regulatory and contractual standpoint, international EPC contractors may encounter procedural requirements that differ from those in their home markets. These can include documentation for work permits, customs clearance for imported equipment, and construction-related approvals. While these processes are standard within the local context, they may require adaptation and planning for firms unfamiliar with the regulatory environment. Additionally, procurement evaluations in Bangladesh have traditionally prioritised cost competitiveness, which can present challenges for companies whose proposals reflect higher quality standards and associated costs. As the market evolves, there may be opportunities for procurement frameworks to incorporate broader evaluation criteria that balance cost with long-term value, quality, and sustainability.

Financial and contractual arrangements are also important considerations. EPC contracts typically involve milestone-based payments, and firms must ensure that payment schedules are reliable and that financial flows are managed efficiently. While Bangladesh has experience engaging with international partners, firms may seek additional assurances, such as letters of credit or guarantees, particularly when working with newer or less-established developers. Currency management is another area of focus, as contracts denominated in Bangladeshi Taka may be subject to exchange rate fluctuations. The country's foreign exchange policies are generally supportive, but occasional delays in repatriating funds can occur. These are common considerations in emerging markets and can often be addressed through appropriate financial structuring and risk mitigation strategies.

European EPC firms operate in a competitive environment that includes international companies. These firms often benefit from lower cost structures and established supply chains in the region, enabling them to offer competitive pricing. While European contractors may incur higher costs due to their emphasis on quality, safety, and compliance with international standards, these attributes can contribute to long-

term performance benefits for project owners. As the Bangladeshi market continues to develop, there may be increasing recognition of the value of such attributes, particularly in projects financed by international institutions or those with specific quality and environmental requirements.

Overall, while EPC-only European companies currently approach the Bangladeshi market with measured consideration, the evolving policy landscape and growing emphasis on renewable energy present a positive outlook. The example of ib vogt, which has successfully engaged in Bangladesh through a development-led approach, illustrates how European firms can adapt their strategies to align with local conditions. As the market continues to mature and procurement processes evolve to incorporate broader evaluation criteria, there is potential for greater participation by EPC-focused European firms. With the right partnerships, enhanced regulatory clarity, and project pipeline visibility, Bangladesh could become an increasingly attractive destination for international EPC expertise.

3.4.2. Challenges for developers and IPPs

European developers and independent power producers seeking to develop, own, and operate solar projects in Bangladesh encounter challenges across the project lifecycle. One significant challenge relates to long-term regulatory stability.

The Government on Bangladesh's most recent reforms on renewable energy and public procurement have established a more transparent legal framework and development work on the accompanying guidelines for implementation will be crucial in establishing a long-term and stable regulatory base. The approach to project development has shifted, with the government transitioning towards transparent and competitive tendering. Whilst this is an encouraging move for the long-term health of the sector, the cancellation of some previously agreed projects as part of that shift has had an adverse effect on the perceived risk in the market for European IPPs and developers. This heightened risk perception on the part of European companies might make it difficult to commit development capital initially.

Furthermore, several detailed regulations necessary for smooth project development are still evolving. Clear guidelines on processes such as land acquisition for private power projects, standards for grid interconnection, and transparent utility procurement procedures are in development, and where rules are not yet fully defined, developers may encounter ambiguity or a need for case-by-case approvals. The timeline and transparency of approvals can be protracted and non-transparent, adding to costs and uncertainty.

Securing a suitable site for a solar farm in Bangladesh is widely regarded as one of the most demanding aspects of project development. Bangladesh is densely populated and much of its terrain is either fertile agricultural land or otherwise occupied, leaving limited tracts available for large-scale solar installations. The government generally does not allocate prime agricultural land for solar projects, which narrows the options for developers. Consequently, project proponents frequently have to seek out land that is unused or fallow, often leading to consideration of low-lying areas or remote char islands, which come with engineering and accessibility challenges. The process of acquiring land involves negotiations with multiple local stakeholders, alignment with community interests, and approvals at several levels of government. Costs associated with land can escalate quickly, and there are often ancillary costs and complexities, such as informal payments or the need to address grievances from local residents, that can arise during land transactions. Bangladesh also imposes certain fees that developers must bear if land is not provided by the government, including charges for converting land use and for registering the land for power project purposes. These can encompass high stamp duties and registration fees, which add a financial burden to the project.

Grid connection and infrastructure requirements for new solar plants are another major consideration. In Bangladesh, the responsibility for connecting a power plant to the national grid, including the construction of necessary transmission lines, typically falls to the project developer or IPP. This introduces additional tasks and risks, as the developer must secure rights-of-way for the transmission corridor and negotiate compensation for any landowners or communities along the route. Managing the construction of transmission infrastructure requires technical expertise and coordination with the national grid authorities. These extra infrastructure costs must be budgeted for, and the associated permitting must be navigated. Another layer of complexity is the capacity of the grid itself, as the nearest substation or the

regional grid might not have sufficient capacity to absorb the new power unless it is upgraded. Developers often need to conduct detailed grid impact studies to assess whether the network can accommodate their project's output and to identify any necessary grid reinforcements.

The bankability of power purchase agreements and the creditworthiness of the off-taker form another crucial challenge. Utility-scale solar projects typically sell electricity to a public utility under a long-term PPA, and the specific terms of these PPAs greatly influence a project's appeal to investors and lenders. Developers scrutinise these contracts closely to ensure that revenue streams will be secure over the life of the project. Aspects such as currency denomination, payment mechanisms, and safeguards are examined. Developers generally prefer tariffs pegged to a stable currency, and look for payment security provisions, such as government guarantees or escrow accounts. The government of Bangladesh has traditionally extended sovereign guarantees for large power projects, which is a positive signal, but it has not always been explicit whether every solar PPA benefits from such backing automatically. Any uncertainty in this area can make lenders uneasy. Tariff levels are a point of negotiation, and low tariffs may challenge the economics for international developers, especially if project risks are perceived to be high. Without measures to mitigate or compensate for risks such as currency fluctuation or potential payment delays, a project's PPA might not be deemed bankable by international standards.

Fiscal and financial regulations also affect project viability. Foreign developers examine the tax and investment framework to understand how it will impact project costs and profits. Bangladesh has at times provided incentives for renewable energy, such as exemptions from import duties and value-added tax, but these incentives have not always been consistently applied. Developers look for corporate income tax holidays, reduced VAT rates, and customs or duty waivers for importing components. The administrative process to obtain these incentives can be involved, and profit repatriation is regulated by the central bank. The possibility of future foreign exchange controls introduces risk, and changes in fiscal policy, such as new taxes or surcharges, can affect ongoing projects.

Another structural factor is the limited alternative routes to market for electricity in Bangladesh. The power market has traditionally been organised around a single buyer model, with few alternatives for developers if a government-backed PPA is not secured. The Merchant Power Policy (2025) aims to open the market to direct sales, but practical implementation is still underway. In summary, European developers and IPPs find the Bangladeshi solar market to be both promising and challenging. The hurdles described above have so far led to cautious involvement by European firms, but the growing energy needs and renewable energy targets suggest ample opportunity for those who can navigate the market. With continued progress on consistency of policies, streamlined approvals, and clearer safeguards, European developers will be able to commit capital at greater scale and pace.

3.4.3. Challenges for technical advisors and service providers

European technical advisory firms, engineering consultancies, and software solution providers face a distinct set of challenges in the Bangladeshi solar market. The limited scale of the market to date has meant that demand for their services has been relatively low. Only a small number of utility-scale solar projects in Bangladesh have reached construction or operation, which directly translates into fewer opportunities for roles such as independent engineering, technical due diligence, or performance analysis. Many firms engage with Bangladeshi assignments on a project-by-project basis, rather than establishing a permanent local branch, which makes it difficult to build long-term relationships with local stakeholders or to maintain continuous involvement in the market's development.

The cost-sensitive nature of the market and a preference for local consultants present further difficulties. Consulting budgets for energy projects in Bangladesh are often tight, and contracts for technical advice or studies tend to be awarded to the lowest bidder or to local firms that charge less. European consultancies, due to their international experience and overheads, typically charge higher fees than local firms, which can make it challenging to convince Bangladeshi clients to incur these higher costs. Local consultants bring language skills and cultural familiarity, which can be important in stakeholder meetings and navigating local bureaucratic processes. The value proposition offered by European technical advisors, such as highly precise energy yield forecasts and robust safety and quality assessments, is not always fully leveraged by cost-conscious project owners or lenders in an early-stage market.

Logistical challenges also factor in the decisions of international advisors. Working in Bangladesh can involve demanding on-site conditions, such as installing meteorological equipment in remote areas or carrying out detailed site inspections in regions with limited infrastructure. International firms typically need to subcontract parts of their work to Bangladeshi companies or hire local engineers for assistance. Identifying capable and trustworthy local collaborators can be a learning process, and managing their work from afar adds complexity. Project delays can disrupt the schedule of an advisory engagement, tying up resources longer than anticipated.

Intellectual property and data-related concerns are also relevant. Companies offering specialised software tools or analytical services are often protective of their intellectual property, and entering a nascent market can raise worries about how well that IP will be safeguarded. Enforcement of software licences and protection against piracy can be challenging, and connectivity constraints can limit the benefits of digital solutions. These considerations add another layer of consideration for firms that are otherwise eager to introduce modern software and analytical techniques to Bangladesh.

Despite these present challenges, the situation is evolving, and there are reasons for optimism. As Bangladesh pursues its renewable energy targets and more projects enter the pipeline, the need for independent technical advice is likely to increase. European technical advisors are well-placed to meet this demand when it emerges, particularly through collaborative approaches that pair global expertise with local knowledge. Building such partnerships requires finding the right local counterparts and investing in their training, but these efforts lay the groundwork for stronger local relationships and a potential future upswing in demand.

3.4.4. Challenges for manufacturers

European manufacturers of solar equipment, such as photovoltaic modules, inverters, battery storage systems, and mounting structures, face several hurdles in entering the Bangladeshi market. The market is dominated by low-cost imports from international companies, which creates intense price competition. European products, which are often higher priced due to quality and production standards, may struggle to compete in a cost-driven market where procurement decisions have been previously influenced by on upfront cost. Whilst the new procurement framework in Bangladesh seeks to change this approach by incorporating higher quality standards and lifecycle costing, this has yet to be fully operationalised. This means that companies with pre-existing and extensive marketing operations and support networks in Bangladesh are likely to continue dominating the market until the new Public Procurement Rules (2025) are fully operationalised.

Shipping equipment from Europe involves longer transit times and higher freight costs, which can erode some of the competitive edge of European products. Establishing a local distribution network is necessary but requires time and investment. Developers may prefer suppliers with readily available stock or a local presence to reduce the risk of delays. Once equipment arrives at Bangladeshi ports, customs clearance and local distribution must be managed, and without a well-organised local logistics and support chain, European manufacturers may find that potential customers perceive ordering from them as more complicated or time-consuming.

After-sales service and maintenance support are critical concerns for equipment manufacturers. Developers consider after-sales service and maintenance support essential, and European manufacturers must provide local service arrangements and guarantee response times. Without such support, their products may be seen as riskier choices, as operators could worry about delays in obtaining technical assistance or replacement parts.

Financing terms and payment flexibility also influence procurement decisions. Asian suppliers may offer attractive credit terms, such as deferred payment plans or vendor financing options, which are appealing in a capital-constrained market. European manufacturers often require conventional payment security, such as upfront deposits or letters of credit, and currency exchange considerations further complicate transactions.

Given these conditions, European solar equipment has only a limited footprint in Bangladesh's utility-scale projects so far. Opportunities may increase where projects are financed with quality and resilience criteria, and where manufacturers invest in a stronger local presence, partnerships, and training. Over

time, as procurement frameworks recognise lifecycle outcomes and reliability, and as service infrastructure strengthens in country, higher quality equipment will be better positioned to support Bangladesh's solar ambitions.

3.5. OPPORTUNITIES FOR COLLABORATION WITH THE LOCAL PRIVATE SECTOR

Despite the challenges outlined, there are significant opportunities for collaboration between European companies and the local Bangladeshi private sector that can help accelerate solar deployment while benefiting both sides. Recent developments underscore the scale of these opportunities: BPDB has launched approximately 2.6 GW of utility-scale solar projects ranging from 105 MW to 250 MW, located near substations in regions such as Mymensingh, Chattogram, Gopalganj, and Jashore. This is part of a project pipeline of 5.2 GW that is due to be part of subsequent procurement rounds. To complement this, in July 2025, the Government of Bangladesh announced an ambitious National Rooftop Solar Programme, targeting 3 GW of rooftop solar by December 2025. This would be primarily on government offices, hospitals, educational institutes, and commercial buildings.

European and Bangladeshi firms have complementary strengths: local companies offer on-ground knowledge, networks, and manpower, whereas European companies bring technical expertise, advanced technology, and often easier access to finance. By leveraging these complementary attributes, various partnership models can overcome individual limitations and meet Bangladesh's renewable energy needs. This section characterises Bangladesh's existing local EPC and service provider landscape in the solar sector (to understand what local players can contribute) and then identifies promising forms of collaboration and ways to facilitate effective matchmaking between European and Bangladeshi companies.

3.5.1. Characterisation of Bangladeshi EPC companies and service providers already active in the solar sector

Bangladeshi EPC firms have started to play roles in implementing utility-scale solar projects, but their experience and capacity vary widely. For projects above ~20 MW, only a few local companies have taken lead roles, often in partnership with foreign firms. Key observations about their current status:

- **Demonstrated local project execution:** A handful of large projects have been executed primarily by local companies. For instance, the 100 MW Mongla solar park (by Orion Group's Energon) and the 20 MW Teknaf solar park (by Joules Power) were largely managed by Bangladeshi teams. These instances show that domestic companies, when backed by sufficient financing and perhaps some external technical inputs, can deliver sizable projects. They provide proof that local capacity exists – at least among top-tier conglomerates – to handle major construction tasks and coordinate project development.
- **Reliance on joint ventures for most large projects:** The majority of large-scale solar installations in Bangladesh to date have been delivered through **joint ventures or consortia** with significant foreign involvement. Typically, local companies cover land, permits, civil works, and labour, while the foreign partner covers design, critical equipment, and sometimes part of financing. This model, seen in projects like ib vogt/AG Agro's 50 MW and others, highlights that local firms are integral but not yet fully independent for complex projects.
- **Technical experience gap:** Utility-scale (50+ MW) solar farms are very new in Bangladesh. Local contractors have limited experience in specialised areas of large solar projects, such as advanced power system design (for grid interconnection studies, protection systems coordination) and sophisticated solar engineering optimisation. While Bangladeshi engineers are skilled, they have not had many opportunities to manage entire large projects end-to-end. For critical design areas (like tracking system integration or dealing with high DC capacities), they usually rely on guidance from foreign engineers. Thus, local EPCs still benefit from international expertise to meet lender requirements for plant performance and safety. They also might not have

prior exposure to niche engineering tasks like wind tunnel testing of structures or flood risk assessment – areas where European firms have know-how.

- **Financial strength constraints:** Building a 50–100 MW solar farm involves tens of millions of dollars. EPC contractors often need to provide performance guarantees or bonds worth a portion of the project value and have the liquidity to handle large procurement orders. Bangladeshi companies typically have much smaller balance sheets compared to global EPCs. Most could not take on full project liability alone – they would not be able to compensate for big delays or failures. Nor can they easily obtain large bank guarantees without tying up their capital or if banks doubt their ability to perform. In contrast, international EPCs or developers often have corporate financial backing to issue such guarantees. This means local firms usually cannot act as sole contractor on a large project if international lenders are involved, because they would not meet the financial criteria on their own. Joint ventures mitigate this, as the foreign partner shares liability or provides the required guarantees.
- **Supply chain limitations:** A significant part of a utility-scale EPC job is procurement of thousands of components (modules, inverters, transformers, cables, structures). Local companies lack global procurement leverage – they buy at market price and often through traders. They cannot get the volume discounts or priority supply that a large international EPC might. Also, Bangladeshi firms are still familiarising themselves with international quality standards for equipment. They might not know the nuances between Tier 1 vs Tier 2 panels, or the importance of certified mounting hardware, etc., to the same extent (though this is improving fast as they do more projects). The supply chain in Bangladesh relies on imports; local manufacturing of panels is just starting (600 MW plant by Radiant Alliance) and covers smaller panels mostly, so big projects still import nearly everything. Local EPCs thus have to manage international logistics (shipping, customs) which they are learning. A foreign partner can streamline this with established supplier relationships.
- **Project management capacity:** Managing a large solar site with hundreds of workers and subcontractors, within tight deadlines, requires robust project management systems – planning, scheduling, HSE management, quality control. Many local firms are still building this capacity. They may excel in the core construction (e.g., Bangladeshi labour is adept at civil work and electrical installation), but scaling up to a 50 MW site introduces challenges in coordination (ensuring all piles are driven correctly, running multiple work fronts, etc.). Weather disruptions (e.g., heavy monsoon rains) can cause delays if not anticipated. International partners often bring best practices in project management (like advanced scheduling software use, risk management plans, etc.). Without such, local-led projects can suffer delays which might breach deadlines or budgets. So far, those local large projects that succeeded likely did so because of meticulous planning or simpler circumstances (like Teknaf 20 MW – still large, but perhaps more manageable with external advice).
- **Credibility and bankability:** From an investor or lender standpoint, a purely local EPC with no track record on big projects is a risk. They prefer seeing a known name involved. The local market being nascent means no Bangladeshi EPC has a deep track record of multiple 50+ MW successes yet (they may have one or two at best). Over time, as joint ventures deliver projects, these local players will accumulate experience and credibility. But at present, for new big projects, lenders typically insist on a strong EPC contractor – which often means either an international firm or at least a JV where someone with a track record is accountable. This creates a chicken and egg situation: local firms need big project experience to be credible, but cannot get that experience unless they are allowed on big projects (which they only are via partnerships currently). The JV approach is breaking that cycle gradually, letting local firms build their resumes.

In conclusion, Bangladeshi companies are keen and increasingly capable participants, but they still require technical and financial bolstering to take on large-scale solar projects confidently. They provide critical local knowledge: navigating the permitting maze, handling community relations and landowner dealings, and mobilising local labour effectively. They also often contribute equity or local financing connections and drive the development from within the country. But they still need international support

to meet high technical standards, secure affordable quality equipment, guarantee performance, and manage complex aspects like grid connection and large-scale project integration.

This context underscores the rationale for collaborative models: by pairing local and European strengths, projects can be delivered more effectively than either could alone. Local firms get access to technology, quality assurance, and perhaps capital; European firms get a trusted local partner to handle ground realities, share risk and ensure compliance with local requirements.

3.5.2. Identification of opportunities for collaboration between European and local private sector and possible ways to facilitate matchmaking

Given the complementarity of European and Bangladeshi companies, several collaboration models emerge as win-win pathways. Some can be implemented immediately under current conditions, while others might become viable as the market matures. Key collaboration vectors include:

- **Joint ventures (JVs)**: In a JV, a European company and a Bangladeshi company form a new project company and both invest equity and share responsibilities in developing a solar project. This arrangement blends local and international strengths:
    - The local partner handles permitting, land acquisition, and engagement with government agencies and communities, leveraging its understanding of local processes and culture. It also contributes local market knowledge and can often move faster in initial development stages because of existing relationships.
    - The European partner brings in technical expertise in design and execution, ensures international best practices are followed, and often provides a chunk of the equity capital (or arranges debt from foreign banks by boosting credibility). It might also secure or guarantee performance on the EPC and O&M.
    - Both share the risks and rewards proportionally. For example, in ib vogt & AG Agro's JV for a 50 MW project: AG Agro secured the land and local approvals, while ib vogt provided technical leadership and financial strength; together they won the tender and are building the project. This JV meant ib vogt did not have to navigate Bangladesh's bureaucracy alone, and AG Agro got to participate in a large project beyond its solo capacity.
    - JVs effectively make projects bankable that might not be otherwise. The European firm's involvement gives lenders confidence, while the local firm's involvement helps clear practical hurdles and ensure local acceptance.
    - As more JVs succeed, trust builds and processes refine, potentially leading to repeat collaborations. Over time, local partners gain enough experience that they can take larger roles or even lead smaller projects on their own with minimal support.
- **EPC consortia or split EPC contracts**: Here, a European and a Bangladeshi firm team up specifically to execute the Engineering, Procurement, and Construction of a project, often with a deliberate split of scope:
    - The European firm focuses on the design engineering and equipment procurement. They would produce detailed designs, specify the technical solutions, and use their global supply chain to source key components (solar modules, inverters, switchgear, etc.) at good quality and price. They ensure the plant design meets international standards and is optimised for performance.
    - The Bangladeshi firm executes the on-site construction and installation work. They handle civil works (land preparation, foundations), structure assembly, panel installation, wiring, and build the transmission line and grid connection under guidance. They supply local construction materials (cement, sand) and labour.
    - Responsibility is divided but coordinated. For example, contracts can be structured such that the European EPC partner is prime contractor for design & procurement, and

subcontracts construction to the local firm, or both sign a consortium agreement and jointly guarantee the EPC delivery, each for their part.

- This split EPC model plays to each side's efficiency: the project benefits from European quality in design and tech, and from local cost advantages for construction and manpower. It can reduce overall cost compared to a purely European EPC doing everything (since local labour and certain works are cheaper) yet maintain high quality.
- Such arrangements are absolutely feasible under current rules – tenders allow consortia. They just need to clearly delineate roles in contracts (especially for liability). But given that many Bangladeshi and European companies already talk informally about working together, formalising into consortia and bidding as a team is a natural step.
- This also acts as capacity building: local firms learn advanced installation techniques and project management from close collaboration, so next projects they do are upskilled. Meanwhile, European firms learn how to better manage and utilise local resources to reduce costs in Bangladesh specifically.

- **Operations & Maintenance (O&M) partnerships**: After a solar farm is built, it requires 20+ years of operation and maintenance. European companies that specialise in O&M or provide advanced asset management can partner with local service providers to jointly maintain plants:
  - The European partner could supply monitoring technology (SCADA systems, analysis software) and remote expert oversight. They might set up the maintenance protocols, provide training, and handle performance analysis.
  - The Bangladeshi partner supplies the on-site workforce for daily operations – cleaning panels, preventive maintenance rounds, minor repairs – and can respond quickly physically to issues.
  - For example, a European O&M firm might remotely track a plant's output and detect an underperforming string. They then alert the local O&M team, who go check and fix (maybe a fuse blown or panel fault) according to the procedures the European firm recommended.
  - This arrangement ensures plants benefit from world-class asset management (keeping performance high and spotting issues early with techniques like infrared drone scans if available), while keeping the on-site cost low through local labour. And knowledge is shared continuously (the local team becomes more proficient in advanced O&M, the European firm learns local environmental issues like monsoon cleaning needs).
  - Given Bangladesh's climate (dust, heavy rain, potential vegetation growth, etc.), good O&M is crucial for longevity. European methods can increase yield (e.g., optimal cleaning schedules) and thus revenue for project owners, which can justify any higher cost compared to a purely local O&M that might be cheaper but less effective.
  - Already we see an example: TÜV SÜD acting as owner's engineer implies an ongoing oversight role. Extending that into long-term O&M partnerships with local subcontractors would be relatively straightforward.
- **Technical advisory and owner's engineering roles**: European technical firms can embed as owner's engineers or independent engineers on projects while partnering with local engineers:
  - They serve the project owner or lenders by overseeing construction and commissioning, verifying quality and performance. A local engineering consulting firm can supply field personnel to work under the European expert team's guidance to do daily inspections.
  - This way, the project benefits from international quality assurance, and local engineers learn those high standards in practice. For instance, Fichtner with a local team ensured international quality in a hybrid project; similar setups can be done for solar.

  - This model does not require shareholding or consortia for bidding; it is a service partnership often mandated by financiers or chosen by quality-conscious developers. It ensures projects are built right, while building up local consultant capacity.
  - The immediate benefit is risk reduction: if European advisors catch issues early, they can be fixed cheaply, preventing long-term problems. For Bangladesh, having experienced eyes on projects helps avoid negative experiences that could tarnish the solar programme (like a plant failing prematurely).
  - Over time, local consultants can adopt the protocols of these European advisors, eventually being able to replicate some services on their own – essentially increasing Bangladesh's internal capacity to manage quality as more projects roll out.

- **Technology licensing and local assembly (longer-term)**: A forward-looking collaboration could involve European manufacturers partnering with local companies to do local assembly or manufacturing of solar components:
  - For example, a European inverter company might license its designs to a Bangladeshi electronics firm to assemble or manufacture certain inverter models domestically, or a European mounting structure company might tie up with a Bangladeshi metal fabricator to produce racking systems locally under license and supervision.
  - This model is likely a bit beyond the immediate horizon because currently demand is not huge, but as Bangladesh's annual solar installation grows, local assembly of panels or other parts might become economical (as seen, Radiant Alliance has begun module assembly with foreign equipment). European equipment makers could seize this to get into the market with a local footprint, capturing some cost savings and fulfilling any local content preferences.
  - The benefit to Bangladesh is technology transfer and job creation – building some of the supply chain domestically (like assembling panels, which Radiant already does with presumably some European equipment like laminators from Italy – e.g., Ecoprogetti was mentioned as an Italian module equipment supplier).
  - European firms could gain market access by being seen as supporting Bangladesh's industrial development goals. They provide the know-how and maybe specialised components, local firm provides labour and market distribution. This can also reduce import costs (duties, freight) and possibly beat Chinese pricing if scaled up, plus ensure quality because European design and QC is involved.
  - However, this is considered a long-term option because it requires stable, larger volume market or strong policy incentives like local content requirement to justify setting up assembly lines for, say, inverters or trackers in Bangladesh.

- **Co-development of innovative pilot projects:** Another collaboration avenue is for European and Bangladeshi firms to jointly develop smaller innovative projects that test new ideas (with perhaps donor support):
  - Examples: Floating solar pilot on a lake, Agri-PV pilot where crops and solar share land, or a solar-plus-storage microgrid demonstration.
  - A Bangladeshi company provides the site or relationships (like access to a reservoir or farm cooperation) and local execution, while a European company brings the specialist technology or design for these innovative setups.
  - These pilots, possibly under a PPP or donor funding, allow testing viability in Bangladesh's context and showcasing success. If proven, they create new business lines that both can jointly scale – being first movers gives a head start.
  - For instance, a European FPV specialist like Ciel & Terre could partner with a local firm to install a 1 MW floating plant on a particular pond, funded by a grant or a utility's pilot program. The local firm learns FPV construction, the European firm shows its tech works in BD conditions, and together they can then bid for larger FPV opportunities when the govt issues them.

  - Similarly, an agri-PV trial with European adjustable mounting and local farming expertise could help convince authorities to allow dual land use top viability, unlocking potentially significant land area for solar if proven.
  - This approach often needs donor or government support because initial economics of pilots can be challenging, but the EU and other development partners can indeed spur such pilots as part of technical assistance (they like funding innovation pilots).
  - Success of these can encourage policy change (like feed-in tariffs for floating PV or support for solar with crops), which then opens a new market segment where those collaborators can shine.

To facilitate all these forms of collaboration, match-making mechanisms are crucial. European and Bangladeshi firms need platforms to find each other, build trust, and negotiate deals. Some recommended facilitation methods include:

- **Networking and investment forums:** Organise regular events such as an annual "EU-Bangladesh Sustainable Energy Business Forum. These can be spearheaded by the EU Delegation and EUROCHAM (European Chamber in Bangladesh), in coordination with local bodies like SREDA or BSREA. The idea is to bring together European renewables companies and Bangladeshi companies to discuss opportunities, present upcoming projects, and hold B2B matchmaking sessions. If held around times when government announces new tenders or initiatives, it can spark partnership discussions targeting those.
- **Online matchmaking portal:** Develop an online platform perhaps under BSREA or an EU-funded initiative, where Bangladeshi companies can list their profiles, interests, and needs, while European firms can also list what they offer and seek local partners for. It could have features like search filters for looking for EPC partner, looking for technical consultant, etc., and contact facilitation. This lowers initial communication barriers and can be a continuously accessible resource rather than one-off events.
- **Pre-tender market sounding events:** When big tenders (like the BPDB 300+ MW solar tender) are planned, hold sessions where Bangladesh authorities share draft terms to international and local companies together, and they can find potential partners to bid jointly. So foreign companies who attend and see, for example, that they need local insight might meet Bangladeshi bidders looking for a technical partner. Government itself can encourage joint bids by clarifying consortia are welcome, etc.
- **Project incubation hubs:** Possibly set up under a donor program, a hub where European experts and local firms come together to design demonstration projects (like the pilots above). For example, an incubator could solicit proposals for innovative solar applications in Bangladesh, pair a local firm that submitted an idea with a relevant European firm to jointly refine it, then help find funding. Academic partnerships (with BUET, etc.) could also be involved. This incubator approach fosters collaboration at early conceptual stages without immediate commercial pressure.
- **Embedded experts programmes:** The EU or bilateral programs could fund a scheme where European technical experts (in solar engineering, grid integration, etc.) are seconded into Bangladeshi companies or vice versa (Bangladeshi engineers placed in European firms for a few months). These exchanges build personal relationships and understanding, often leading to formal partnerships later when an opportunity arises. For instance, if a Bangladeshi engineer trains at a European solar EPC, that company might later partner with his/her home company on a project because they have a champion inside who knows both contexts.
- **Development finance support for partnerships:** Encourage multilateral banks (World Bank, ADB, etc.) to structure tenders or programs in ways that require or favour partnerships. For example, a World Bank tender for a solar park could mandate international and local joint venture proposals to ensure capacity building. Or they could provide *partial risk guarantees* specifically if a European and local consortium is implementing, to sweeten such collaborations.

- **Industry associations linkages:** Forge direct links between associations like SolarPower Europe (the European solar industry association) and BSREA (Bangladesh's renewable association). They can sign MOUs to promote member interactions, do study tours (bring Bangladeshi company reps to Europe to meet solar firms and vice versa). Building these institutional ties often catalyses business relationships.

Using a combination of these tools (events, digital platforms, donor initiatives), the aim is to reduce the transaction costs and uncertainty of finding good partners. Many European SMEs might not know whom to trust in Bangladesh, and many Bangladeshi firms might be unsure how to approach European companies. Match-making solves that by providing vetted venues to meet and frameworks to collaborate (like standardised NDA or MOUs they can use to start discussions, etc.).

In conclusion, there is a strong strategic rationale for fostering European-Bangladeshi private sector collaborations: Europe's technology and quality can combine with Bangladesh's local savvy and cost base to deliver better solar projects faster. This can accelerate the renewable energy goals while developing Bangladesh's own industry capacity. The government and development partners have a role in catalysing these partnerships, after which market forces and mutual interest should sustain them. With structured matchmaking and support, we can expect to see more joint ventures, consortia, and cooperative endeavours turning Bangladesh's solar ambitions into reality, thereby leveraging the best of both worlds.

3.6. CONCLUSION AND RECOMMENDATIONS

European companies, though currently modestly present in Bangladesh's solar sector, have the potential to become key contributors to the country's renewable energy goals. European firms can inject much-needed expertise in engineering quality, climate resilience, advanced technology, and sustainability standards – areas where Bangladesh's nascent sector will benefit greatly. However, it also highlights the array of obstacles holding back greater European participation: regulatory uncertainty and slow implementation of policies, an unpredictable project pipeline, land acquisition and grid integration challenges, procurement practices that favour lowest cost over best value, and various financial risks. The government's recent reforms, notably the Renewable Energy Policy 2025 and Merchant Power Policy 2025, are positive steps towards addressing these issues. They signal commitment to higher renewable targets, promise faster approval timelines, and open new market avenues (like private power sales) – all of which have been welcomed by investors. Crucially, though, these policies must be fully put into practice to realise their impact. As of late 2025, supporting regulations (e.g. wheeling charge guidelines, standard PPA templates for merchant projects) are still in draft, and until they are finalised the uncertainty remains. European companies will respond not just to policy announcements, but to tangible improvements in the ease and predictability of doing business.

To unlock the engagement of European firms and thereby strengthen Bangladesh's solar program, comprehensive and actionable measures are recommended. Below is a summary of key recommendations:

- **Strengthen policy and regulatory frameworks:** Focus on the full operationalisation of new policies and overall regulatory clarity. This includes issuing the detailed rules and procedures to implement the Renewable Energy Policy 2025 and Merchant Power Policy 2025 without delay. For example, define wheeling tariffs and grid access rights for private solar producers, and establish clear criteria/timelines for approving renewable projects (so that the time-bound approvals commitment is met). Additionally, streamline and digitalise administrative procedures for project development – a one-stop online portal for permits and licenses (covering land use clearance, environmental clearance, BERC generation license, etc.) would greatly reduce bureaucratic friction. Institutional coordination should be improved (e.g. regular inter-agency meetings via the proposed Project Development Unit) so that developers are not caught between departments. Finally, provide pipeline visibility: publish a multi-year tender or project calendar (with expected capacities and timelines) to allow companies to plan and invest for the long term. By strengthening the overall regulatory environment – making it transparent, efficient, and forward-looking – Bangladesh will reduce the perceived risk and attract sustained interest

from European and other international players.

- **Improve market access and project bankability:** Take measures to make projects more bankable for foreign investors and contractors. One priority is to standardise and enhance PPA terms: develop bankable Power Purchase Agreement (PPA) templates that include robust payment security (e.g. escrow accounts or sovereign guarantees for public offtakers) and protections against curtailment or change-in-law. For instance, clauses ensuring that if power cannot be evacuated due to grid issues, the IPP still gets capacity payments, will reduce revenue uncertainty. Relatedly, mitigate currency risk by indexing tariffs partly to USD or EUR or providing a reliable mechanism for forex conversion; European financiers often insist on this. Another important step is to facilitate land access for projects: the government could create a framework for allocating state-owned land (where available) or assisting in land acquisition for high-priority renewable projects. This might involve identifying a land parcel and doing initial due diligence (so the developer does not start from scratch on every project) or at least reducing fees/taxes on land purchase for solar use. By lowering the uncertainty and cost around land and interconnection (e.g. perhaps the government can take on building common transmission upgrades for solar zones), projects become more bankable. Engaging multilateral institutions to offer partial risk guarantees or insurance for renewable projects can also directly address European investors' concerns about payment default and political risk. In summary, de-risk the project environment through better contracts and supportive government actions, thereby improving the risk-reward balance that European companies evaluate when considering Bangladesh.
- **Incentivise quality, innovation, and local partnerships:** Shift the market dynamics to reward the value that European and other high-quality players bring. Procurement processes should be reformed to include non-price criteria in bid evaluation – moving towards a Most Economically Advantageous Tender (MEAT) approach. This means tenders for solar projects or EPC should explicitly score factors such as technical robustness, bidder experience, O&M plans, environmental impact, and local content, instead of 100% weight on price. For example, a bid that offers a higher capacity factor via better technology or a longer warranty period could score higher, even if its upfront cost is higher. This encourages international firms who emphasise quality to participate, as they have a fair chance rather than almost certain defeat on price alone. Alongside this, the government can launch pilot projects or innovation lots that specifically seek advanced solutions (like a tender lot for a battery-integrated solar plant, or an agri-voltaics pilot) to attract companies with those capabilities. Providing incentives for technology transfer is also key: tenders or policies could give preference or additional points to bids that include plans for local manufacturing, training programs, or joint ventures with local firms. For instance, if a European bidder partners with a Bangladeshi EPC and commits to a skill development program as part of project execution, that bid should be seen as more favourable. Promoting joint ventures can also be done through softer means – e.g. government and development partners hosting matchmaking as discussed, or even requiring international bidders to have a local partner (as some countries do) for projects above a certain size. The overall intent is to ensure that value (quality, sustainability, local economic benefits) is properly factored into awards, thereby encouraging companies that deliver such value – which often includes European firms – to participate and invest in Bangladesh.
- **Facilitate matchmaking and capacity building:** As detailed in section 2.2.5, proactively facilitating collaborations between European and Bangladeshi companies is one of the most immediate steps that can be taken. It is recommended to establish a dedicated platform or forum for EU-Bangladesh clean energy cooperation. The EU Delegation, leveraging the Team Europe Initiative, can spearhead this by bringing together European renewable energy businesses and local companies/authorities regularly. Specific actions include: hosting annual investment and networking events (to coincide with energy summits or as standalone matchmaking conferences); creating an online matchmaking portal accessible to stakeholders from both sides; and organising trade missions and site visits for European firms to meet local partners and inspect potential project sites. In parallel, development finance institutions (DFIs) should align their support to encourage European-Bangladeshi partnerships: for instance, the European Investment Bank (EIB) and others could offer dedicated credit lines or guarantee facilities for joint venture

projects. Donor programmes can also incorporate training courses and secondment opportunities, essentially building a pipeline of local engineers and managers who have experience with European standards. Over time, these efforts will create a network of relationships and shared understanding, reducing the entry costs for European companies (since finding a trustworthy local partner will be easier and faster). Additionally, a focus on capacity building ensures that Bangladesh maximises the knowledge transfer from collaborations: this can be done by funding expert exchange programmes (European experts embedded in BPDB or local firms, and vice versa), and by supporting universities or centres of excellence to partner with European institutions (for curriculum development, research on solar tech, etc.). All these initiatives can be coordinated under the umbrella of the Bangladesh Renewable Energy Facility or a similar program to avoid fragmentation. The outcome sought is a vibrant ecosystem of partnerships where European know-how and Bangladeshi talent work hand-in-hand, both in individual projects and in shaping the sector's evolution.

- **Enhance after-sales support, O&M, and circularity:** As the solar sector grows, it is important not just to build projects but to keep them performing optimally. European companies excel in providing long-term support – for instance, through comprehensive operations & maintenance (O&M) contracts, training local operators, and planning for eventual equipment replacement and recycling. Bangladesh should take advantage of this by encouraging arrangements where European firms continue to engage post-construction. One recommendation is for procurement to include multi-year O&M obligations or partnerships with the EPC contractor or a European service provider. This ensures that the high performance standards at commissioning are sustained throughout the plant's early life (and knowledge is transferred in the process). Another recommendation is to incorporate circular economy principles from now: require bidders to outline end-of-life plans for panels and batteries, and perhaps provide an option for buy-back or recycling services at end of project life. European experience under the WEEE Directive can guide these plans. By making after-sales service and environmental stewardship part of project contracts, Bangladesh can benefit from the full lifecycle expertise of European firms, rather than a build-and-depart model. Finally, establish a mechanism for continuous stakeholder dialogue and feedback – for example, an annual review workshop under SREDA where foreign and local companies discuss issues they faced in projects and suggest improvements. This kind of open feedback loop, ideally with participation from European stakeholders, will help Bangladeshi regulators fine-tune processes (such as simplifying customs for renewable equipment, or adjusting contract terms in future tenders to make them more bankable). Regular engagement will signal to European players that Bangladesh is a responsive and learning-oriented market, further bolstering confidence.

By implementing the above recommendations – operationalising policies, improving project bankability, shifting to value-based procurement, fostering partnerships, and focusing on long-term sustainability – Bangladesh can create a much more inviting landscape for European involvement. It will align the market more with international best practices and reduce the entry barriers that currently exist. In turn, this should catalyse significant European investment, technology, and expertise into Bangladesh's solar sector, accelerating progress toward the country's renewable energy targets. The European Union and its Member States, through initiatives like the Global Gateway and TAF, are well-placed to support these actions, working closely with Bangladeshi authorities to ensure they materialise.

Ultimately, the greater participation of European companies is not an end in itself, but a means to help Bangladesh build a resilient, high-quality, and sustainable solar energy industry. It offers Bangladesh access to world-class technology and project management, helps instil higher safety and environmental standards, and mobilises additional sources of finance – all of which will be crucial for meeting Bangladesh's renewable energy ambitions in the coming years. With the right enabling measures in place, what is now a limited engagement can grow into a robust partnership, delivering clean power and shared prosperity for both Bangladesh and its European partners.

4. IDENTIFICATION OF HOW EPC PROCUREMENT AND CONTRACTS CAN CONTRIBUTE TO ENHANCING PROJECT IMPLEMENTATION AND SUSTAINABILITY, BY LEVERAGING INTERNATIONAL STANDARDS, TECHNOLOGIES AND BEST PRACTICES, INCLUDING FROM EUROPE.

4.1. PROCUREMENT FRAMEWORKS OF BANGLADESH AND THE EIB

Bangladesh's public procurement system has traditionally emphasised cost over quality, but it is now undergoing reforms to incorporate value-based criteria. A review of the current Bangladeshi procurement laws and policies, alongside the European Investment Bank's requirements, reveals how the landscape is shifting:

4.1.1. Public Procurement Act (2006)

The Public Procurement Act 2006 (PPA 2006) has been the cornerstone of Bangladesh's procurement legislation. Under PPA 2006, the guiding principle was to award contracts to the lowest evaluated responsive tender. In practice, this meant that once a bid met the minimum technical specifications, the contract had to be awarded to the bidder offering the lowest price. The intent was laudable – ensure efficient use of public funds and treat bidders equally – but it left almost no room to consider differences in quality or long-term value. For example, if one bidder offered a more durable solution or faster completion but at a slightly higher price, the law offered little flexibility to choose that bid unless exceptional justification could be given. Section 16 of the Act essentially mandated accepting the lowest price except in extraordinary cases (such as an emergency requiring faster delivery), and even then, detailed justification was needed to deviate from the lowest-cost rule. This rigid lowest-price mandate often led to unfortunate outcomes: contracts were awarded cheaply but without regard to life-cycle costs, maintainability, or performance, sometimes resulting in higher expenses down the line due to rework or early failures.

Recognising these limitations, the government has moved to amend the PPA to explicitly allow a best-value approach. By 2025, amendments to the Act were being finalised to introduce the concept of Most Economically Advantageous Tender (MEAT) into Bangladeshi law. The revised Act will empower procuring entities to consider factors beyond just upfront price – such as technical merit, long-term operating costs, and social/environmental benefits – when evaluating bids. In essence, the legal strictures that forced decisions purely on lowest initial cost are being relaxed. The PPA amendment is expected to clearly state that award decisions can be based on a combination of price and other criteria that yield the best overall economic result for the country. This provides a much-needed legal basis for multi-criteria decision-making, aligning Bangladesh's law with international best practices (for instance, EU procurement directives that require value-for-money over the project life). Once enacted, this change will give confidence to procurement officials that selecting a higher-quality bid (even if not the absolute cheapest) is not only allowed but encouraged, provided it is properly justified as the most advantageous economically.

4.1.2. Public Procurement Rules 2025

The Public Procurement Rules 2025 (PPR 2025) are a comprehensive update of the detailed regulations that implement the PPA. These rules translate the Act's principles into practical procedures for tendering. The new PPR 2025 – replacing the older 2008 rules – explicitly broadens the bid evaluation methods to accommodate the value-based approach envisioned by the amended Act and the SPP Policy. Under PPR 2025, the default method is still open competitive tendering, but bid evaluation is no longer confined to price alone. The rules permit procuring entities to assign weighted points to qualitative aspects of bids. In effect, a tender can now specify an evaluation formula where, for example, price counts for, say, 70% of the score and technical quality 30%, or any such combination, as relevant. The rules also introduce the option of a two-envelope system for complex procurements: bidders submit

technical and financial offers separately, the technical offers are evaluated and scored first without seeing prices, and only technically strong proposals have their financial offers opened. This prevents price from unduly biasing the evaluation of quality, a practice the EIB and multilateral development banks strongly encourage for complex projects.

Another significant inclusion in PPR 2025 is the integration of sustainability criteria into procurement. The rules, for the first time, reference environmental and social considerations. Procuring entities are now empowered to include requirements and evaluation factors related to environmental impact, social inclusion, and life-cycle costing (LCC) in their tenders. For example, a tender document under PPR 2025 might state that X points will be awarded for a bidder's environmental management plan or that bids will be compared on the basis of total cost of ownership (including operating expenses and disposal costs). Previously, the Bangladeshi procurement rules were essentially silent on these aspects – agencies were unsure if they could factor in, say, a product's energy efficiency or a contractor's safety record. The 2025 rules explicitly legitimise doing so. They also ensure transparency: if any non-price criteria are used, they must be clearly stated in the tender notice and documents, along with their weighting. This mirrors international standards (the EIB, for example, requires all evaluation criteria and their weights to be disclosed upfront to bidders).

The PPR 2025 was developed with input from development partners and is intended to closely mirror international best practices. As a result, it removes the prior fear among officials that using anything other than lowest price could be challenged as a violation of the rules. Now, selecting a higher-price, higher-quality bid is perfectly in line with the regulations, provided the procedure (weights disclosed, proper scoring, etc.) is followed. To ensure these new provisions are actually used (since changing ingrained habits is hard), the government and BPPA are conducting trainings and pilot tenders illustrating the MEAT approach. The expectation is that over time, as agencies gain comfort, Bangladesh's everyday procurement will routinely consider quality, sustainability, and long-term cost – much like EIB's own procurement policies, which rarely rely on price alone for important contracts.

4.1.3. Sustainable Public Procurement Policy 2023

The Sustainable Public Procurement (SPP) Policy 2023 is a major policy initiative signalling Bangladesh's commitment to value-for-money and sustainability in government spending. Approved in early 2023, it sets out a vision to leverage the roughly 40–45% of the national budget spent via procurement to achieve broader economic, social, and environmental goals. In essence, the SPP Policy declares that procurement should not just buy goods and works cheaply but also support sustainable development objectives.

Under this policy, procuring entities are encouraged – and in stages will be required – to consider three pillars of sustainability in their decisions: economic efficiency, environmental protection, and social development. It introduces terminology new to Bangladesh's public sector, like MEAT (most economically advantageous tender) and life-cycle costing, and makes clear that the lowest price may not always mean the best value. For example, the policy explicitly states that a higher-priced bid might be chosen if it offers superior quality or lower total cost over the asset's life. It also urges that externalities (like greenhouse gas emissions) be factored into decisions where feasible, effectively putting a cost on negative environmental impacts. This is a significant departure from past practice and aligns closely with European Union procurement philosophies which mandate considering sustainability and quality.

Crucially, the SPP Policy comes with an action plan and timeline. It called for pilot sustainable procurement projects in 2024, capacity building for officials, and legal reforms by 2025 to embed these concepts in law (hence the aforementioned PPA/PPR updates). It established an inter-ministerial Sustainable Procurement Steering Committee to oversee the changes. While the policy itself is not a law, it represents high-level government commitment and gave agencies like the Implementation Monitoring and Evaluation Division (IMED) and BPPA the mandate to start issuing guidelines in line with the policy. In short, the SPP Policy 2023 provides the political and strategic backing for value-based procurement, making it clear that Bangladesh intends to make its procurement practices more like those of leading economies and lenders (the EU, EIB, World Bank, etc.), where procurement is a tool for achieving sustainable development outcomes.

4.1.4. Sustainable Procurement Guidelines 2024

To translate the lofty goals of the SPP Policy into day-to-day practice, Bangladesh introduced the Sustainable Procurement Practitioner's Guide 2024. Published in late 2024 by BPPA, this guide is essentially a manual for procurement officers on how to implement sustainability and value-based criteria under current law. It was initially applied to pilot ministries but recommended for use by all.

The SPP Guide 2024 provides step-by-step instructions and templates. It covers everything from planning a procurement with sustainability in mind, to drafting tender specifications that include green and social requirements, to evaluating bids with a scoring system. Some key aspects include:

- **How to write technical specifications for sustainability:** e.g. requiring equipment to meet certain energy efficiency standards, or materials to have recycled content, without unduly narrowing competition.
- **How to conduct MEAT evaluations:** The guide offers sample evaluation criteria and scoring methods. It might suggest, for instance, a 70/30 weighting between price and quality, with quality further broken down into sub-criteria (technical solution, O&M plan, environmental impact mitigation, etc.). It even provides an example scoring sheet so that evaluators can uniformly judge technical proposals. Importantly, it advocates setting minimum technical score thresholds so that quality below a certain level is disqualifying.
- **Life-cycle costing methodologies:** It teaches procurers to compute total ownership cost, giving examples like adding the cost of fuel or electricity a machine will use over its life to the purchase price for evaluation purposes, or monetising maintenance costs and end-of-life disposal. By practicing with these methods, officials learn how a cheaper item can be more expensive in the long run.
- **Social and environmental safeguards:** The guide includes clauses and requirements to ensure compliance with labour laws (no child or forced labour, fair wages), safety standards, and environmental regulations. It suggests making contractors submit environmental and social management plans and gives evaluators guidance on awarding points for robust plans (for instance, if a bidder proposes a strong waste management and site safety plan, that bid could score higher).
- **Adjusting Standard Bidding Documents (SBDs):** Recognising that the official SBDs did not originally contain sections for these new criteria, the guide points out where procurers can insert additional clauses or criteria. For example, it provides language to add in the Special Conditions of contracts about contractor obligations for waste disposal or penalties for not meeting fuel efficiency targets.

The SPP Guide 2024 is effectively enabling procurement officials to start using value-based practices immediately, even before all laws are amended. It stays within the bounds of the existing PPA 2006 (so nothing in it violates current law), but it exploits the flexibility that does exist – for instance, the law allows setting qualification requirements and determining "responsive bids, so the guide suggests using those stages to filter based on quality and sustainability. Some pilot tenders in late 2024 followed the guide's approach – for example, a solar EPC tender that used a weighted scoring model from the guide ended up awarding the contract to a bidder that was not the cheapest but had the best output guarantee and maintenance plan. This early success demonstrated the practicality of the MEAT approach in Bangladesh.

In summary, the Sustainable Procurement Guide 2024 serves as a practical toolkit bridging policy and practice. It incorporates many concepts from EU procurement directives and multilateral bank guidelines, essentially localising them for Bangladeshi context. Its existence means procurement officers do not have to invent new methods; they have a ready manual to follow, which greatly increases the odds that the SPP Policy gets implemented on the ground.

4.1.5. Bangladesh Public Procurement Authority Act 2023

Alongside policy and rule changes, Bangladesh undertook institutional reform by enacting the Bangladesh Public Procurement Authority Act 2023. This law transformed the government's Central Procurement Technical Unit (CPTU) into a full-fledged Bangladesh Public Procurement Authority (BPPA). The BPPA is now the autonomous agency responsible for regulating and overseeing public procurement nationwide.

The creation of BPPA is a critical enabler for value-based procurement. Under the new Act, BPPA has the authority to issue procurement regulations, standard documents, and official interpretations of procurement rules. It effectively centralises expertise and ensures consistent application of procurement policies across government. For example, BPPA prepared the SPP Guide 2024 and is updating all Standard Tender Documents to include sustainability clauses as mandated by the SPP Policy. It also provides capacity building – training procurement professionals – and monitors compliance.

Notably, the Act empowers BPPA to clarify any procurement issue in writing with legal authority. If a procurement officer is unsure whether a certain sustainability criterion is allowed, BPPA can issue a formal clarification, preventing disputes and giving confidence. This power addresses a common constraint: without authoritative guidance, officials might err on the side of caution (i.e. not using new criteria for fear of challenge). Now, BPPA's word is law in this realm, which greatly helps in implementing new practices like value-based evaluations.

The BPPA Act also established a high-level Sustainable Procurement Steering Committee (SPPSC) to guide SPP implementation across ministries, reflecting a coordinated approach. By having a dedicated body championing procurement reform, Bangladesh ensures the initiatives like the SPP Policy do not languish but are actively driven forward.

Internationally, having a strong central procurement authority is regarded as best practice – many countries have one (e.g. UK's Crown Commercial Service, Indonesia's LKPP). It professionalises procurement and provides a focal point for donor engagement. For EIB and other donors, the presence of BPPA is positive as it means there is a counterpart agency to ensure that their funded projects follow agreed standards and that national systems are being strengthened to match international norms.

In short, the BPPA Act 2023 institutionalises procurement reform. It creates a guardian of procurement quality and integrity that will outlast individual projects and ensure continuous improvement. For the shift to value-based procurement, this means there is now an institution with the mandate and clout to roll out training, enforce the new rules, and address any confusion among practitioners, which significantly increases the likelihood of success of these reforms.

4.1.6. Comparison with EIB and international best practice

How do Bangladesh's updated procurement frameworks compare with EIB guidelines and global best practices? In many respects, the gap is closing:

- **Legal and Institutional Setup:** Bangladesh now has an autonomous procurement authority (BPPA) and updated laws permitting best-value tendering, akin to EU countries governed by EU Procurement Directives and independent oversight bodies. This is consistent with best practices which emphasise a strong legal framework and central oversight to implement value-based procurement.
- **Evaluation Criteria (Price vs Value):** Historically Bangladesh was price-focused, but now the law endorses MEAT, and the rules allow weighted scoring of quality. The EIB and EU *require* MEAT for complex procurements, discouraging purely price-based awards. Bangladesh's new system mirrors this: tenders can weigh technical quality, and all criteria/weights must be disclosed (transparency principle). This alignment means Bangladeshi procuring entities can now, like their European counterparts, choose a bid that might not be lowest in price but offers superior quality or lower life-cycle cost, all within the rules.
- **Inclusion of Sustainability:** With the SPP Policy and Guide, Bangladesh is integrating environmental and social criteria into procurement. For instance, a bidder's plan for waste management or local community engagement can be part of the evaluation. The EIB similarly mandates

environmental and social standards in projects and encourages using procurement to drive positive outcomes (e.g., awarding contracts with better ESG profiles). Bangladesh's embrace of these criteria (still at early stages) is directly in line with what institutions like the EIB expect – that procurement contributes to sustainable development goals. A practical example is life-cycle costing: now permitted in Bangladesh, it is a standard requirement internationally to account for long-term costs like energy efficiency.

- **Life-Cycle Costing (LCC):** PPR 2025 lets entities consider operating and maintenance costs and not just initial price. The EIB and OECD procurement guidelines emphasise LCC to ensure value for money. By adopting LCC, Bangladesh can avoid cheap but energy-guzzling equipment, for example, aligning with EIB's focus on long-term cost-effectiveness.
- **Standard Documents and Transparency:** Bangladesh's use of e-GP (electronic procurement) and standardised documents promotes open competition and transparency. With upcoming updates to include sustainability terms, its documents will start to resemble those used in donor-funded tenders, which always include E&S clauses. International best practice requires that all criteria are published in the tender and evaluation is documented against those criteria – Bangladesh's rules now stipulate the same. Award notices will similarly reflect value-based justifications. In essence, on procedural transparency, Bangladesh already was strong and remains so while adding complexity in criteria.
- **Capacity and Oversight:** A challenge is that Bangladeshi procurement professionals are new to multi-criteria evaluation. The BPPA and training programs are addressing this, and early tenders are being closely watched. Internationally, when new practices are introduced, a period of capacity building and perhaps external oversight (like donor supervision) is normal. Bangladesh is following that trajectory: initial pilots with support (some with donor involvement) and gradually scaling up. The presence of BPPA to monitor tenders and an appeals mechanism for bidders means that as value-based awards happen, any disputes can be resolved in a structured way, ensuring credibility.

Overall, Bangladesh's procurement reforms of 2023–2025 mark a pivotal shift from a purely cost-driven approach to a holistic value-driven approach in line with international standards. The legal permission, policy encouragement, and institutional support for MEAT and sustainability are now largely in place. The key remaining work is implementation – training people and adjusting habits – but the essential tools and framework have been established. This creates a conducive environment for applying value-based procurement in sectors like renewable energy, which is precisely what the next parts of this report will address in detail for solar EPC projects.

4.2. INTEGRATION OF VALUE-BASED CRITERIA

One of the core differences between Bangladesh's traditional procurement and international best practice lies in how non-price criteria are integrated into bid evaluation. Globally, especially in the EU and among development banks, the trend has long been toward a best-value paradigm where contracts are awarded on a balanced assessment of price and quality (the MEAT approach) rather than solely on lowest price. Bangladesh is now attempting to make this shift. This section examines the integration of value-based criteria in practice – what global standards entail, how Bangladesh is moving in that direction, and what gaps remain between policy and implementation on the ground.

4.2.1. Global best practices and EIB standards

In the European Union, the use of weighted scoring systems for public tenders is commonplace and codified in law (e.g. EU Directive 2014/24/EU). Public procuring entities set out a combination of criteria – typically including price, technical quality, possibly project methodology, environmental impact, delivery time, and more – each with a specified weight in the evaluation. For a complex contract, price might be, say, 60% of the score and other factors 40%, or an even split, depending on priorities. Importantly,

two-envelope bidding is widely used: technical proposals are evaluated without reference to price, ensuring an unbiased quality assessment. Only after scoring quality does the evaluation committee open the financial proposals and combine the scores.

The EIB, which finances projects globally, essentially mandates such approaches. The EIB's procurement framework insists that if quality matters (as it almost always does in infrastructure projects), it must be quantified and factored into the award decision. All evaluation criteria and their weights are published in the tender documents for transparency. An EIB-funded tender for an EPC contract would typically work like this: Bidders submit detailed technical offers and separate price offers. The evaluation team, possibly including independent experts, scores each technical offer on predefined criteria (like understanding of project, technical soundness, experience of key staff, proposed equipment quality, etc.). Only bids that achieve a certain minimum technical score (to weed out subpar ones) proceed. Then those bids' price envelopes are opened and scored (the lowest price gets full points; others get proportionally fewer). Finally, technical and price scores are combined according to the weights (for example, out of 100 total points, 70 might be from technical score + 30 from price score). The highest total score wins. This way, a bidder that is moderately priced but excellent technically can beat a bidder that is slightly cheaper but technically mediocre – reflecting true best value.

Beyond scoring, EIB and other MDBs also integrate sustainability at the qualification stage. For instance, bidders often must commit to an Environmental and Social Covenant (especially outside the EU) – effectively promising to adhere to certain environmental, labour, and human rights standards if awarded the contract. This is a pass/fail prerequisite rather than a scored criterion, but it ensures all bidders meet a baseline of E&S responsibility. Some procurements also include explicit social value criteria (like the UK's system which might allocate points for local job creation or apprenticeships offered).

In summary, global best practice entails a rigorous, transparent methodology: all key factors are quantified, and bidders know in advance how their proposals will be judged. Quality is given due weight so that procurers can legitimately choose a proposal that delivers more value over time, even if initial costs are higher. This approach tends to result in better performing projects, fewer disputes, and more innovation, since bidders compete on technical merits as well as price.

4.2.2. Bangladesh's shift toward value-based procurement

Bangladesh has clearly recognised the need to evolve toward this best-value approach. The policy and regulatory reforms discussed (SPP Policy 2023, PPR 2025, etc.) have created a formal allowance – even encouragement – for using non-price criteria. The SPP Policy explicitly states procurement should achieve value for money on a whole-life basis and urges adoption of MEAT evaluations. Following this, the BPPA's SPP Guide 2024 provides the how-to, strongly advocating moving away from evaluated lowest cost to most advantageous offer. Concurrently, the new PPR 2025 legally permits these methods (multi-criteria, two-envelope, etc.) that were previously not in use.

Early signs of change have appeared. Some procuring entities in Bangladesh, especially those working with international funding or advice, have started to pilot multi-factor evaluations. For instance, when tendering consultancy services or complex works (like large solar plants), they might use a Quality-and-Cost Based Selection (QCBS) approach, which is already practiced for hiring consultants (e.g., owner's engineers are often selected 80% on technical merit, 20% on cost in QCBS). Extending that mindset to EPC works is new but conceptually similar.

The Public Procurement Rules 2025 cement this shift by specifying how multi-criteria evaluation can be done transparently. They require that if such criteria are used, they must be mentioned in tender documents, and the weighting method must be clear. In effect, as of 2025, Bangladesh's legal framework no longer stands in the way of value-based procurement; instead, it supports it.

Additionally, Bangladesh's procurement authorities are aware of international examples and are keen to learn from them. The Central Procurement Technical Unit (now BPPA) has collaborated with programs like the U.S. Trade and Development Agency's Global Procurement Initiative (GPI). The GPI, for instance, has been training Bangladeshi officials on how to incorporate life-cycle cost and best-value

considerations into tendering. This exposure helps justify the changes and build a coalition of practitioners who understand the benefits.

4.2.3. Bridging policy to practice – current status and gaps

While the policy and legal framework is much improved, there is still often a lag between paper reforms and practice. Bangladesh is currently in a transition: the rules allow value-based procurement, but many in the procurement community are still adapting to this new paradigm. Several gaps and challenges are evident:

- **Mindset and training**: Procurement professionals used to decades of lowest-price awards need to develop the skill and confidence to assess qualitative factors. Scoring a technical proposal requires judgment and technical knowledge, which can feel subjective. There is a learning curve to ensure evaluation committees can do this rigorously and defend their decisions. Without robust training and perhaps technical expert support, there is a risk some entities might default to more familiar evaluation criteria, based on compliance with baseline technical standards and price, despite the new rules, simply because it is simpler.
- **Consistency and standardisation**: Initially, each agency might try different approaches to multi-criteria evaluation. Some may set criteria or scoring methods that are not optimal (too complicated, or conversely too superficial). BPPA's guide is addressing this by offering templates, but uptake will vary. Ensuring consistency in how criteria like technical quality or environmental impact are defined and measured is crucial for fairness and clarity. Over time, Bangladesh will develop precedents and perhaps sector-specific standard evaluation frameworks (for example, a model scoring system for solar projects), but these are nascent.
- **Risk aversion and oversight**: Previously, choosing anyone but the lowest price could invite scrutiny from auditors or anti-corruption watchdogs, because it might look like favouritism. Now that multi-criteria choice is allowed, oversight bodies themselves need to understand it and accept it. The Auditor General's office and the Anti-Corruption Commission will need to update their audit guidelines to align with the new procurement rules, so that a well-documented decision for a higher-priced bid is not mistakenly flagged as an irregularity. Until there is a clear framework for performing multi-criteria and weighted evaluations, there may be resistance to fully adopting it for fear of non-compliance with auditing and anti-corruption regulations.
- **Supplier adaptation**: Bidders also need to adapt to the new system. Companies will now have to pay more attention to the quality of their proposals – e.g., staffing plans, methodologies, warranties offered, etc. Initially, some might not understand how to compete in this new way, which could lead to inconsistent bid quality. International or higher-quality firms, on the other hand, might become more interested once they see tenders genuinely consider quality. During the transition, there could be a mix of bids with very different approaches, and evaluation committees will have to handle that.
- **Enforcement of new criteria**: Including criteria in tenders is one thing; actually enforcing them through contract execution is another. The credibility of value-based procurement will be reinforced if, for example, a contractor who pledged a great environmental plan actually implements it and is monitored on it. If contractors realise that winning with a good proposal is only the start and they must deliver on those promises (or face penalties), then the benefits will materialise. This means project supervision post-award should also align with the value-based approach (ensuring performance guarantees are met, etc.).

In summary, Bangladesh has made commendable progress on paper. The challenge now is ensuring these reforms take root in everyday procurement. It requires a culture change, capacity building, and vigilant oversight to ensure that lowest-price habits give way to thoughtful, quality-conscious decision-making. The government is actively working on this through training programs and early pilot tenders. Over the next few years, one can expect a gradual but steady increase in the use of multi-criteria tenders, especially in sectors where the benefits are obvious (like solar energy, where cheaply built plants could become liabilities). Each successful case – where a project awarded on a MEAT basis performs well – will build confidence and demand for the approach.

As Bangladesh bridges this gap, it will align more closely with the procurement practices of its development partners. This alignment not only improves project outcomes but also means donor-funded projects can more easily use Bangladesh's own procurement system (when it meets their standards), which is a long-term development goal (use of country systems). Already, EIB specialists have noted Bangladesh's progress and are likely supportive of the direction, possibly offering technical assistance to ensure the reforms are fully implemented in the energy sector.

In conclusion, the structures for integrating value-based criteria are largely in place; the focus shifts to implementation. The rest of this report will assume that Bangladesh is moving in this direction and will explore the specifics of how to do so effectively in solar EPC procurement and contracting, which is our main subject.

4.3. GLOBAL EXAMPLES OF VALUE-BASED PROCUREMENT

Many countries' experiences illustrate how moving to value-based procurement can lead to better project outcomes. A few notable global examples demonstrate different ways quality and sustainability have been embedded in EPC tendering:

4.3.1. Denmark

In Denmark's renewable energy tenders, the government often includes evaluation criteria beyond price, such as the projected carbon footprint of the project or the innovativeness of the design. For example, a solar or wind project bid might receive additional points if it proposes novel solutions to reduce environmental impact or uses cutting-edge technology that promises better long-term efficiency. This approach encourages bidders to bring forward their best ideas, not just the cheapest compliance with basic specs.

4.3.2. India

While much of India's solar capacity has been built through lowest-tariff auctions (particularly for large Independent Power Producer projects), there are instances where quality plays a role. Government-owned entities and some state-level tenders have required bidders to meet rigorous technical pre-qualifications – for example, demonstrating experience in similar projects and robust O&M capabilities – before even considering their prices. In some cases, especially for EPC contracts for public-sector projects, a combined scoring is used where technical proposals (covering project design, equipment quality, and O&M plans) are scored alongside price. This ensures that inexperienced or low-quality players are filtered out despite potentially lower bids.

4.3.3. United States of America

U.S. federal procurement uses what is called the Best Value Tradeoff method in many cases. This allows an agency to accept a higher-priced offer if it provides greater benefits. For instance, the U.S. Department of Defense, when contracting for construction of facilities (including energy projects on bases), routinely evaluates the contractor's past performance and project management approach as key criteria. A contractor with an excellent track record and a strong technical plan can win even if not the lowest bidder, provided the difference in price is justified by the lower risk of delays or failures. This emphasises that reliability and quality (especially important in defence projects) are worth a premium.

4.3.4. South Africa

South Africa's public procurement rules include a functionality evaluation before price. In an EPC tender, functionality refers to quality aspects – e.g. technical merit, qualifications, methodology – which are scored out of 100. Only bids scoring above a certain threshold (say 70 points out of 100 in functionality) are deemed responsive and proceed to the price evaluation stage. Price is then considered, often with a formula that also takes into account socioeconomic goals (South Africa also gives some preference

to bids benefiting previously disadvantaged groups). This two-step approach ensures no contract is awarded solely on a cheap price if the quality is below par.

4.3.5. Ghana

Ghana's Public Procurement Authority has developed standard tender documents that allow a combined technical and financial evaluation for works. They often use a prequalification stage to shortlist capable contractors. In major infrastructure projects in Ghana, including energy projects, it's common to require that bidders meet certain minimum technical criteria (like having completed projects of similar size, having certain certifications, etc.). Then among those qualified, a weighted scoring might be applied. This ensures capacity and track record are given importance. Ghana, like Bangladesh, has been influenced by development partners to adopt more of these best-value practices.

4.3.6. European Commission (EU procurement)

Also within the EU institutions themselves, tenders (which must follow EU directives) often explicitly allocate points for sustainability. For example, a tender to construct an EU-funded facility might award part of the score for the contractor's environmental management measures or social inclusion plans (like how they will involve local workforce or SMEs). This means bidders include comprehensive sustainability sections in their proposals, knowing it will help their evaluation – effectively mainstreaming CSR (Corporate Social Responsibility) concerns in technical scoring.

These examples underscore a common lesson: when quality or broader impacts are formally evaluated in tenders, bidders respond by offering better solutions, not just cheaper ones. Projects procured this way tend to face fewer issues in execution and yield greater satisfaction to the client in the long run. Bangladesh's reforms draw on such global experiences – for instance, the idea of a minimum technical score threshold (like South Africa's) or weighted criteria akin to EU practices is reflected in the SPP Guide 2024. There are several studies that quantify how and increased focus on quality and value-based procurement can have a positive effect on the LCOE of solar projects2, 3, 4.

One emerging consideration relevant for Bangladesh, given discussion of attracting European participation, is European preference criteria. In 2025, the EU signalled moves to prioritise Made in Europe solutions in strategic sectors even in external funding. For instance, the new EU Ukraine reconstruction facility has procurement rules favouring EU and partner countries' firms and goods (within WTO-compliant limits). In practical terms, this could translate to criteria that reward bidders sourcing certain components from diversified (non-monopolistic) supply chains or upholding EU-level ESG standards. While Bangladesh cannot outright discriminate by nationality in procurement (due to international trade agreements and to ensure competition), it can indirectly encourage high-standard suppliers (which often includes European ones) by using qualitative criteria such as supply chain resilience, adherence to international standards, and robust ESG performance. This ensures that, say, a bidder who plans to use high-quality solar panels from a reputable, sustainability-audited manufacturer (which could be European or similarly vetted) might score better than one using unknown or lower-grade sources – not because of origin per se, but because of quality and reliability proxies.

In summary, Bangladesh can take confidence from global examples that value-based procurement is workable and beneficial. The challenge is to customise those approaches to the local context. The next chapter will outline exactly how Bangladesh can incorporate specific value-based criteria in solar EPC

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[2] **International Renewable Energy Agency (IRENA)**. (2017) *Boosting solar PV markets: The role of quality infrastructure*. Available at: https://www.irena.org/publications/2017/Sep/Boosting-solar-PV-markets-The-role-of-quality-infrastructure

[3] **Alafnan, H. (2024)** *The Impact of PV Panel Degradation Rate, Initial System Efficiency, and Interest Rate on the Levelised Cost of Energy for PV Projects: Saudi Arabia as a Benchmark*. 16 November 2024, Sustainability 16(22). Available at: https://www.mdpi.com/2071-1050/16/22/10012

[4] **Fraunhofer Institute for Solar Energy Systems ISE**. (2024) *Levelized Cost of Electricity: Renewable Energy Technologies*. Available at: https://www.ise.fraunhofer.de/en/publications/studies/cost-of-electricity.html

procurement, ensuring that the bids are evaluated not just on Who is cheapest today? but on Who will deliver the greatest overall value throughout the project's life? – which is the essence of the shift that all these examples, and Bangladesh's policies, are aiming for.

4.4. GUIDELINES FOR VALUE-BASED EPC PROCUREMENT IN BANGLADESH

4.4.1. Incorporating new criteria under existing laws

An analysis of Bangladesh's procurement regulations and the recent SPP Policy shows that many valuable criteria *can be adopted immediately* without awaiting legal changes. For example, tenders can explicitly require bidders to address *climatic and environmental resilience* in their proposals. Given Bangladesh's exposure to floods, cyclones, and extreme humidity, procuring entities should demand that EPC bidders outline specific design features to handle these stresses – e.g. elevated foundations for flood protection, cyclone-rated mounting structures, or corrosion-proof hardware. This can be scored under a Technical approach criterion. Likewise, *land-use efficiency* should be a criterion: because land is scarce, bids that make creative use of limited space (through higher efficiency panels, bifacial modules, or agrivoltaics integration) can be given extra points. Another readily usable criterion is *Lifecycle Cost (LCC)*. Evaluators can calculate the 20-25 year net present cost of each proposal (including O&M and expected energy output) rather than just the upfront EPC price. This incentivises offers that might have slightly higher capex but significantly lower operating costs or higher energy yields. Notably, the draft SPP Policy calls for LCC or total cost of ownership to guide awards, aligning with this approach.

Recommended action: Use climate, land, and LCC criteria now - for upcoming solar PV tenders, agencies should introduce evaluation sub-criteria like Robustness of climatic design (10 points), Efficiency of land use (5 points), and Lowest 20-year LCC (15 points). These do not conflict with current procurement rules – they simply need to be transparently stated in bidding documents. By doing so, Bangladesh can start obtaining offers optimised for local conditions and long-term performance, without waiting for any new legislation.

4.4.2. Criteria requiring procedural or legal changes

Some other high-impact criteria may require updates to procurement regulations or practices before they can be applied. One is *supply chain resilience* and local industry development. For instance, giving preference to bidders who source critical components from diversified or local suppliers (to reduce over-reliance on any single country) or who commit to some local manufacturing/content could strengthen Bangladesh's solar supply chain. While permissible under EIB guidelines in certain cases, Bangladesh's PPR might need tweaking to formalise such preferences. Similarly, evaluating *Corporate Social Responsibility (CSR) and local development contributions* – e.g. a bidder's plan for local job creation, training programmes, or community investment – is a qualitative measure that goes beyond the traditional scope. The SPP Policy 2023 encourages considering social criteria (like SME participation and support for disadvantaged groups), but an official scoring method for CSR efforts may require new detailed guidance or even an amendment to the PPR to explicitly list social value as an evaluation factor.

Recommended action: Pilot social and resilience criteria - even before formal rule changes, pilot tenders (especially those under donor-funded programs like BREF) can include soft criteria such as a *CSR plan* or *supply chain plan*, making it clear these will be qualitatively judged (e.g. acceptable/not acceptable) rather than heavily weighted. This signals to bidders the importance of these aspects and collects experience for scaling up. In parallel, the government can prepare amendments to the PPR to explicitly allow scoring of CSR, past performance, and supply-chain robustness in works procurements – mirrored on how QCBS is allowed for services. Additionally, *bidder experience and past performance* as weighted criteria (beyond basic qualification) would reward companies with proven track records of delivering quality projects. Introducing a formal performance score (perhaps based on past project references and client feedback) might require a policy change or at least a standard formula issued by CPTU. Over time, incorporating these advanced criteria will further align Bangladesh's procurement

with international standards, but they should be introduced carefully to maintain fairness and competition.

4.4.3. Legal basis and support for changes

Crucially, none of the above recommendations conflict with Bangladesh's obligations – they are in fact supported by recent policy and would be backed by international lenders. The SPP Policy (draft approved in 2025) explicitly endorses MEAT and sustainability factors, giving local procuring entities confidence (and a mandate) to use them. Meanwhile, EIB and other development partners' procurement frameworks effectively *require* such value-based approaches on co-financed projects. This means for any solar projects receiving donor funding, Bangladesh can and should include these criteria to comply with donor standards.

Recommended action: Issue new guidelines and SBDs - as an immediate next step, the Bangladesh Public Procurement Authority (BPPA) should publish updated *Standard Bidding Documents (SBDs)* for EPC contracts in the energy sector that embed these value-based criteria. For example, the SBD could contain a template Section for Bid Evaluation Criteria listing technical, environmental, and social points with suggested weights, and a template Schedule where bidders must detail their climate resilience measures, O&M plans, etc. By institutionalising these in standard documents, every agency will have a ready-made tool to move towards best-value procurement. Additionally, any needed amendments to the Public Procurement Rules (such as explicitly allowing weighted scoring in works tenders) should be drafted and approved – however, it is important to note that *existing laws already provide a great deal of flexibility* when interpreted in light of the SPP policy. In summary, Bangladesh should seize the opportunity to modernise EPC procurement now, using the legal reforms and policy guidance at hand, to ensure upcoming solar investments are judged not just on cost but on their quality, longevity, and contribution to sustainable development.

4.5. BENCHMARKING AND GUIDELINES FOR EPC CONTRACTING

A comparison of typical Bangladeshi EPC contracts to international best practice (including FIDIC-based contracts and those used in EU-funded projects) highlights several areas for enhancement. Nine key elements have been identified where stronger clauses can greatly improve project outcomes:

4.5.1. Scope of work and technical specifications

Contracts should define the scope comprehensively, with detailed technical specifications that reference international standards. For example, require that all PV modules meet IEC 61215 and IEC 61730 (quality and safety) and inverters comply with IEC 62109 (safety) and national grid code requirements. Each contract should mandate thorough site investigations by the contractor (geotechnical surveys, flood risk assessment) and include any site-specific design criteria – e.g. plant must be designed to withstand wind speeds of X km/h (equivalent to a Super Cyclone). It is advisable to make the contractor's design subject to approval by an independent engineer or Owner's Engineer to ensure it meets these specs. Guideline: Embed climate and grid requirements: In the technical scope, explicitly require climate-resilient features (like minimum elevation of electrical equipment, corrosion protection per IEC 61701 salt-mist standards in coastal areas, and compliance with IEC 62716 ammonia tests if near farms). Also include grid-integration obligations: e.g. the plant must be equipped with fault ride-through and comply with Bangladesh's grid code (or IEEE 1547) – this ensures the EPC contractor accounts for necessary equipment from the get-go.

4.5.2. Performance guarantees and KPIs

Internationally, EPC contracts include robust performance guarantees – Bangladesh should do the same to hold contractors accountable for output. A primary KPI is the Performance Ratio (PR) of the plant, which measures actual vs. theoretical output. Contracts should set a minimum PR (adjusted for local climate) that the contractor must achieve in final tests, often around ~78–80% for fixed-tilt or ~80–82% for tracking systems in Bangladesh's irradiance conditions. Also consider guaranteed energy yield

(kWh/year) in the first year. If the contractor fails to meet these, impose proportionate Liquidated Damages (LDs) – e.g. an LD equal to 1% of contract value for each percentage point PR shortfall, or monetary compensation per kWh underperformance. Availability (uptime) during initial operation can be another KPI. Guideline: Define PR test clearly: Use IEC 61724 monitoring standards for PR calculations and conduct a performance test (of say, 7 days continuous operation) upon commissioning. If results are below the guarantee, enforce LDs as pre-agreed in the contract. This pushes contractors to optimise design and installation quality to avoid penalties. Conversely, some contracts abroad even offer a bonus for exceeding guarantees, which Bangladesh might consider to incentivise exceptional performance.

4.5.3. Warranty and defects liability

Strengthen warranty periods to ensure long-term support. The typical Defects Liability Period (DLP) in local contracts might be 12 months; raising this to 24 months will cover two monsoon cycles, exposing any latent defects. Key components should have even longer warranties: require PV module performance warranties of at least 10–12 years against defects (plus 25-year output warranty from the manufacturer) and 5–10 years on inverters and transformers. The EPC contractor should facilitate these OEM warranties and be liable to replace components that fail prematurely. Importantly, include clauses that make the contractor responsible for failures due to environmental conditions that a prudent design should have handled – e.g. if an inverter fails due to overheating, it is on them, not excused as climate. Guideline: Enforce extended defect coverage: In contracts, explicitly state that any defect or underperformance attributable to design, materials, or workmanship within two years must be rectified at the contractor's cost. For modules, include an acceptance criterion that module degradation after one year should not exceed e.g. 2% (ensuring high-quality modules were used). These measures compel contractors to source reliable equipment and construct diligently.

4.5.4. O&M obligations

Rather than ending obligations at commissioning, best practice is to include a period of post-commissioning O&M by the EPC contractor (or an affiliate) to ensure knowledge transfer and accountability. Bangladesh should require that the EPC contractor provide 2–5 years of O&M services (often called an O&M wrap) after plant COD. During this period, the contractor can train the owner's staff and fine-tune the plant. The contract should detail O&M expectations: regular cleaning schedule, vegetation control, preventive maintenance routines, spare parts inventory, etc. To keep the contractor incentivised, tie a portion of their payment or a bonus/penalty to performance during the O&M term (e.g. if availability falls below 98% or PR drops, penalties apply). Guideline: Bundle O&M with EPC: Include a contract annex that outlines the O&M scope and perhaps retain 5-10% of the EPC sum to be paid out over the O&M period subject to performance KPIs. This ensures the contractor's responsibilities do not end the day the last cable is connected – they remain on the hook to deliver a smoothly running plant and to fix any teething issues.

4.5.5. Sustainability and environmental compliance

Align contracts with international E&S standards to avoid negative impacts and ensure lender compliance. This means writing in obligations to follow the project's Environmental and Social Management Plan (ESMP) and any Environmental Impact Assessment recommendations. For example, if the ESMP requires managing run-off water to prevent local flooding or implementing dust control during construction, the contract's technical conditions must state the contractor will do so. Include clauses on proper waste disposal (per local law and possibly referencing EU WEEE principles for solar panel/battery recycling), prohibiting dumping or open burning of waste. Guideline: Mandate ESG plans: The contract should annex the ESMP and require the contractor to designate an EHS manager to implement it. Noncompliance with environmental or social requirements should be treated as a breach of contract. This is often reinforced by requiring the contractor to obtain an ISO 14001 (environmental management) certification or equivalent – though not mandatory, it sets an expectation. By building these duties into the agreement, Bangladesh ensures solar projects are executed responsibly, with respect for communities and nature.

4.5.6. Corporate social responsibility and social impact

Pioneering contracts go beyond doing no harm and encourage positive local impact. Bangladesh can incorporate such provisions by requiring the contractor to execute a CSR plan during the project. This might involve commitments like employing a certain percentage of local labour, providing on-site skills training for Bangladeshi workers, or investing in a community benefit (e.g. improving a local school or clinic infrastructure). Contracts should also enforce core labour standards: no child or forced labour, fair wages (potentially referencing local labour law or international ILO standards), and safe working conditions. A grievance redress mechanism for local community complaints during construction should be required. Guideline: Include local benefit clauses: For example, stipulate that at least 30% of unskilled labour and 10% of skilled positions be filled by local residents (with training as needed), and require the contractor to submit monthly manpower reports to verify this. Also, add a clause that the contractor must follow international human rights due diligence in their supply chain (aligning with emerging EU regulations on forced labour) – practically, this can mean declaring the sources of modules and providing Tier-1 supplier audits if requested. By embedding social responsibility, projects are more likely to have community support and leave a positive legacy, which in turn reduces risks of disruption or protest.

4.5.7. Climate and disaster resilience measures

Given Bangladesh's climate risks, contracts need to ensure the design is hardened against disasters. While part of this is covered in specifications, it is worth isolating a section in the contract that explicitly addresses climate/disaster resilience obligations. For example: "Contractor shall design all structures to withstand a 1-in-50-year flood and a 1-in-25-year storm wind and provide certification by a qualified structural engineer." In addition, require the contractor to prepare a Disaster Management Plan for the construction and initial operation (covering procedures for cyclones, lightning strikes, etc.). On the contractual side, review the force majeure definition: ensure that it excludes events that are reasonably foreseeable and should be mitigated by good design. Guideline: Assign climate risk clearly: If a cyclone below a certain severity (say Category 1–2) hits and causes damage, the contractor should not be off the hook under force majeure – it should be seen as a design shortfall. Only truly extraordinary events (beyond design spec, e.g. a once-in-a-century flood) would be force majeure. Additionally, to cover both parties, require robust insurance (see next point) so that if extreme events occur, funds are available to rebuild.

4.5.8. Insurance requirements

Best practice contracts mandate comprehensive insurance coverage during construction and a handover of operational insurance at commissioning. In Bangladesh, EPC contractors should carry Contractor's All Risk (CAR) insurance covering loss or damage to works (from causes like accidents, natural disasters, theft, etc.) up to the full replacement cost of the project. They should also have third-party liability insurance to protect against claims for injury or property damage to others (e.g. if a construction accident affects a neighbouring property). Furthermore, require evidence of Worker Compensation insurance for their labour force as per law. The contract must state the minimum coverages and that the Employer (project owner) is co-insured or at least notified in the policy. Guideline: No work without insurance: Make it a condition precedent that the contractor submits certificates of all required insurance before starting on-site work. Maintain the requirement that insurance be kept until final acceptance (with some policies, like latent defect insurance, extending even beyond). This transfer of risk is crucial – if something goes wrong, the insurance, not the project or taxpayers, should pay for it. Also, consider requiring the contractor to insure against environmental liability (pollution, site contamination) if available in the market, given the sensitive sites some projects may inhabit.

4.5.9. Liability and liquidated damages

Finally, the contract should clearly allocate liabilities and set appropriate LDs for delays and underperformance. Many Bangladeshi contracts have LD clauses but sometimes they are too lenient to be effective. The guideline is to set LDs for delay at a level that meaningfully incentivises timely completion without being viewed as a penalty (commonly 0.05% to 0.1% of contract price per day of delay, capped

at, say, 5–10% of contract value). For performance shortfalls (as discussed, LDs per unit under PR guarantee or per kWh shortfall can be applied). Additionally, include an aggregate liability cap for the contractor, often equal to 100% of the contract price or more (since if major rework is needed, it could cost as much). This cap typically excludes certain things like wilful misconduct or certain environmental liabilities which might be unlimited. Guideline: Tighten the remedies: Ensure the contract specifies that if delays exceed a certain threshold (e.g. 180 days delay, or reaching the LD cap), the Employer can terminate the contract and draw on performance securities. Also, maintain a performance security (bank guarantee) of perhaps 10% of contract value that the Employer can call in case the contractor defaults – this is standard in Bangladesh and should continue, as it underpins the LDs and any other recoverable damages.

In implementing these contract enhancements, Bangladesh can refer to international model contracts (such as FIDIC Silver Book for EPC turnkey projects) and the practices of experienced renewable energy developers. For example, FIDIC-based contracts widely used in the Middle East require contractors to rectify defects at their cost for two years and include strict LDs for delay. Many solar IPP deals backed by development banks also include long-term performance guarantees and often an O&M obligation from the EPC for several years to ensure a smooth ramp-up. By benchmarking against these, the above guidelines were tailored to fit Bangladesh's context of climate risk, land scarcity, and grid challenges. Implementing them will result in contracts that deliver higher quality assets: plants that meet output expectations, withstand the elements, and are constructed with regard for people and the environment.

4.6. RECOMMENDATIONS FOR REFORM AND IMPLEMENTATION

To transition from theory to practice, a series of concrete reforms and actions is necessary. These recommendations will help embed value-based procurement and robust contracting in Bangladesh's renewable energy projects, ensuring that the policies and guidelines are actually executed on the ground:

- **Update procurement regulations and documents:** The Government of Bangladesh could consider revising the Public Procurement Rules and associated guidelines to explicitly endorse multi-criteria evaluation for complex infrastructure tenders. The government could issue a formal amendment or a policy directive under the SPP Policy that for renewable energy projects, factors like quality, sustainability, and lifecycle cost must be considered in addition to price. Alongside, the Standard Bidding Documents (SBDs) for solar EPC should be overhauled to include sections for technical scoring, ESG requirements, and detailed contract terms as outlined above. This provides procuring entities with a ready template aligned to new practices.
- **Capacity building for officials:** Strengthen the capacity of tendering authorities and evaluation committees through targeted training programs. Workshops and toolkits could be developed on how to draft value-based criteria, how to evaluate bids with scoring matrices, and how to manage the procurement process fairly when multiple factors are in play. Donor support (from the likes of the EU, World Bank, ADB) can be leveraged to organise these trainings, possibly under the umbrella of the Bangladesh Renewable Energy Facility. The goal is to ensure the people implementing procurement reforms fully understand them and have the skills to apply them.
- **Enhance bid evaluation process:** Consider including independent experts on bid evaluation committees for solar projects. For example, an experienced solar engineer or an environmental specialist (from SREDA or a partner institution) could join the committee to provide technical insight when scoring qualitative criteria. Their presence can improve the rigor of evaluations and lend credibility to the outcomes. Also, introduce the two-envelope system formally for EPC bids to ensure unbiased technical scoring as recommended earlier.
- **Implement lifecycle costing tools:** Develop and adopt standard methodologies for life-cycle cost analysis in bid comparisons. The government can publish a formula or require bidders to fill a spreadsheet that calculates the 20-year cost per kWh of their solution, factoring in O&M

and degradation. By institutionalising LCC, evaluators can quantitatively see long-term differences between bids. Providing a simple software or template for this purpose (perhaps via CPTU's e-GP portal) would facilitate its consistent use.

- **Strengthen contract enforcement and quality assurance:** Once contracts are awarded, ensure that the promised value materialises during execution. This calls for robust contract management and quality assurance measures. Appoint or train project managers within BPDB or relevant utilities to actively oversee EPC contractors' work, verifying compliance with specs and ESMP commitments. Use independent engineers for milestone inspections (design review, equipment factory acceptance tests, commissioning tests). Tie contractor payments to meeting the specified KPIs and ask for periodic reports. Essentially, the culture should shift to managing for performance rather than just checking boxes. If a contractor fails to deliver based upon their bid (e.g. the final PR is lower than they guaranteed), enforce the LDs rigorously – this signals that the new system is robust.
- **Promote transparency and accountability:** To build trust in the new procurement approach, increase transparency at key steps. For each major tender, publish an evaluation report (at least a summary) explaining how scores were assigned and why the winner was chosen. This practice, in line with EIB guidelines, deters any perception of arbitrariness and helps losing bidders learn how to improve. Also, consider third-party monitoring or audits of the procurement process by institutions like the BPPA or civil society observers, to assure that value-based criteria are not misused to favour anyone unfairly. Over time, consistent fairness combined with better project outcomes will win stakeholder buy-in.
- **Grid code and policy alignment:** Outside the procurement rules, complementary reforms are needed to maximise project value. In particular, update the Grid Code and interconnection regulations to enable new technologies and services from solar plants. For instance, allow (and require) large solar projects to provide ancillary services like reactive power support or frequency response, and compensate them for it. This way, when EPC contractors design plants, they will include capabilities (like advanced inverters or storage) that improve grid stability. It creates a virtuous loop: procurement demands grid-friendly features, and the grid code recognises and rewards them. Similarly, continued implementation of the Renewable Energy Policy 2025 and Merchant Power Policy 2025 is crucial – their provisions (e.g. timely approvals, wheeling for private sales) will underpin investor confidence and ensure that the procured projects can actually be executed and integrated.

In conclusion, by carrying out these recommendations – revising the rules and documents, building human capacity, enforcing contracts strictly, and refining the surrounding regulatory environment – Bangladesh can transform its EPC procurement and contracting landscape. The result will be solar projects that are awarded to the best candidates and implemented to high standards, delivering not only megawatts but also reliability, resilience, and sustainable benefits. Such a market will be attractive to experienced international companies (including European firms) and top-tier local companies alike, creating healthy competition that drives quality up and costs down over the long run. These reforms, supported by the EU and other partners, place Bangladesh on a path to procure and build its renewable energy infrastructure in line with global best practices, ultimately ensuring the country's solar ambitions are met with successful, lasting projects.

5. CONCLUSIONS AND WAY FORWARD

5.1. SUMMARY OF KEY INSIGHTS

Bangladesh's solar energy ambitions can be realised by coupling global best practices with targeted local reforms. The analysis highlighted three overarching insights:

- **Advanced technologies & resilient implementation:** Cutting-edge solar technologies and business models now common worldwide can significantly boost Bangladesh's solar outcomes. High-efficiency PV modules (e.g. TOPCon, SHJ) and modern inverters (1500V, grid-forming capability) promise greater energy yields and grid stability. Likewise, innovative models – such as merchant power plants and corporate PPAs – could unlock new investments. However, to harness these gains, Bangladesh must tackle its local implementation challenges. Land scarcity, a vulnerable electricity grid, and climate risks (floods, cyclones) are constraining projects. The takeaway is that importing global innovation is not enough: projects must be adapted with climate-resilient designs, efficient land use solutions, and grid upgrades. By doing so, Bangladesh can maximise the impact of advanced technology under its unique conditions.

- **European engagement & investment climate:** European companies offer distinct value – from engineering excellence and stronger environmental standards to lower-cost financing – that can greatly benefit Bangladesh's solar sector. At present, European participation is limited due to a challenging investment climate. Policy uncertainty, ad hoc project opportunities, difficult land acquisition, and price-focused procurement have signalled high risk for international investors. A key insight is that improving the enabling environment will attract more world-class developers (including European firms), bringing in capital and expertise that elevate quality. Stable renewable energy policies, transparent procurement, and risk mitigation instruments are thus not only bureaucratic improvements; they are strategic steps to engage partners who can deliver durable, high-performance solar infrastructure.

- **Procurement & contracting as levers for quality:** How Bangladesh tenders and contracts solar projects emerged as a critical determinant of project success. Currently, lowest-price bidding and basic contract terms often undervalue quality, resulting in shortfalls in performance and longevity. International experience shows that value-based procurement – evaluating bids on technical strength, lifecycle cost, and safety/environmental factors – leads to more reliable and sustainable projects. Strengthening EPC contracts with robust performance guarantees, longer defect liability, and clear maintenance obligations ensures contractors deliver on promises. In short, by modernising procurement and contracting practices, Bangladesh can secure solar projects that may cost slightly more upfront but will generate significantly greater value over their lifetime.

Taken together, these insights present a coherent message: Bangladesh can achieve a step-change in solar deployment by marrying innovation with institution-building. Embracing new technologies and models will raise what is possible; simultaneously, improving policies, partnerships, and processes will ensure those possibilities are fully realised on the ground. This twin-track approach – innovation and reform – underpins the report's recommendations.

5.2. STRATEGIC RECOMMENDATIONS

In light of the above findings, several strategic recommendations have been formulated. These recommendations are mutually reinforcing and designed to remove barriers while accelerating investment in sustainable solar projects:

- **Implement policy reforms and provide clarity:** Rapidly operationalise the Renewable Energy Policy 2025 and Merchant Power Policy 2025. This means issuing the detailed rules, tariff guidelines, and grid codes needed to translate these policies into action. Investors should see clear pathways for merchant projects (e.g. defined wheeling charges and standard contract

terms for direct power sales) and streamlined approval processes for all solar projects. A priority is to set up a one-stop coordination mechanism – for example, a dedicated Renewable Energy facilitation unit or Project Development Unit – to guide developers through land leases, licenses, and grid interconnection swiftly. Providing this regulatory clarity and administrative support will greatly reduce perceived risk.

- **Strengthen the investment framework:** Proactively de-risk solar investments to attract both domestic and foreign capital. Concretely, standardise bankable PPA contracts with strong payment security (escrow accounts or guarantees) and clauses that protect producers against curtailment or unforeseen policy changes. Collaborate with international partners (such as the European Investment Bank and other DFIs) to offer partial risk guarantees, political risk insurance, or foreign exchange liquidity facilities. These measures will reassure investors about off-taker reliability and currency convertibility. In parallel, develop a pipeline of projects and announce regular tender rounds or auctions aligned with national targets – giving investors a forward view of opportunities. Consistency and transparency in the market pipeline are crucial: a rolling multi-year auction schedule would signal that Bangladesh is a stable, long-term market worth investing in.
- **Mandate quality and resilience in procurement:** Pivot procurement rules towards a most economically advantageous approach. Update public tender documents to award solar projects based on technical quality, lifetime performance, and compliance with international standards – not just lowest upfront price. Immediately apply the 2023 Sustainable Public Procurement guidelines: for example, include weighted criteria for plant design durability (withstanding floods/cyclones), equipment efficiency, O&M plans, and social impact. Require a minimum technical score for bids to be considered. This shift will encourage reputable firms (who might be slightly costlier but far superior in quality) to participate and will discourage under-priced bids that could compromise performance. To support this, train evaluation committees in using multi-criteria scoring, and consider involving independent technical experts in the evaluation of large projects to ensure objectivity.
- **Enhance EPC contract standards:** Adopt robust contracting practices that hold contractors accountable for delivering high-quality, sustainable projects. As a norm, all utility-scale solar EPC contracts should include: minimum performance guarantees (e.g. a threshold for first-year output or performance ratio, with financial penalties if not met); an extended defects liability period of at least 2 years (so contractors remain responsible for resolving issues beyond the first monsoon); and requirements for contractors to provide operations & maintenance support for an initial period (e.g. 2 years) to ensure knowledge transfer and reliable operation. Embed environmental and social safeguards in contracts – for instance, adherence to an Environmental Management Plan, worker safety standards, and end-of-life equipment recycling provisions (aligning with international best practices such as IEC standards and the WEEE Directive). Enforcing these contract standards will result in solar plants that perform as intended and uphold sustainability commitments.
- **Leverage European partnerships and local capacity:** Facilitate partnerships between experienced European firms and Bangladeshi companies to blend international expertise with local know-how. Government and industry bodies should actively connect potential partners – for example, through an EU–Bangladesh renewable energy business forum or matchmaking platform. In upcoming tenders, incentivise joint ventures or consortia (for instance, by giving additional credit in bid evaluations to teams that include qualified local and foreign firms together). This will speed up technology transfer – allowing Bangladeshi engineers to learn cutting-edge practices and European firms to navigate local procedures more easily. At the same time, invest in capacity-building programmes: provide specialised training for utility and ministry staff on solar project finance, grid integration, and contract management; organise exchange programmes and secondments with European utilities or developers; and strengthen institutions like SREDA and BERC with the skills and resources to enforce the new standards. Building human capacity and fostering collaboration are long-term investments that will enable Bangladesh to sustain and scale up its solar sector well into the future.

These strategic recommendations form a comprehensive package. Crucially, they should be pursued in parallel – progress on one front will reinforce success on others. For example, improving procurement standards will be far more effective when paired with policy clarity and risk mitigation that draw more capable bidders to the table, including European partners. By addressing technical, financial, and institutional aspects together, Bangladesh can create an ecosystem in which solar projects are bankable, well-built, and impactful.

5.3. THE WAY FORWARD

Moving from recommendations to results will require coordinated action and continued commitment from Bangladesh and its international partners. The following sequenced steps outline a clear path forward:

- **In the next 6–12 months:** Focus on foundational policy and process changes. The government should finalise the outstanding regulations under the Renewable Energy Policy 2025 and Merchant Power Policy 2025 – for example, publish the wheeling charge guidelines, standard PPA templates, and grid interconnection procedures for private solar producers. Simultaneously, establish the proposed one-stop Renewable Energy facilitation unit (or empower SREDA accordingly) to streamline project clearances. This period should also be used to revise standard bidding documents and PPA contracts in line with the new value-based procurement and contracting standards. Capacity-building initiatives can start immediately: organise workshops for procurement officials on MEAT evaluation, and for utility engineers on new technical standards and grid integration techniques. Early action on these fronts will lay the groundwork for better projects and send a strong positive signal to investors.
- **In the short to medium term (1–2 Years):** Launch and deliver a first wave of solar projects that embody the reformed approach. This could include a pilot tender under the Bangladesh Renewable Energy Facility (BREF) where bids are evaluated on quality and innovation as well as cost – perhaps for a flagship 50–100 MW solar park with battery storage or agrivoltaics elements. Ensuring a successful, transparent tender and achieving financial close on these initial projects (potentially with EIB or other development bank support) is critical to build confidence. During this time, implement the new EPC contract provisions on projects already in the pipeline – for instance, any upcoming project should incorporate the enhanced performance guarantees and O&M agreements. It will also be important to roll out risk mitigation instruments: operationalise any guarantee fund or credit support mechanism in partnership with development partners so that investors see concrete reductions in risk. Meanwhile, deepen the Europe–Bangladesh partnerships: facilitate matchmaking events, and consider twinning a Bangladeshi public utility with a European counterpart to mentor through the first projects developed under the new framework. By the end of this period, Bangladesh should have a few exemplary solar projects either commissioned or under construction, delivered through improved processes – serving as proof of concept for the new way of doing business.
- **Longer term (3–5 Years):** Institutionalise the reforms and scale up investment. With initial successes demonstrating the viability of quality-focused, resilient solar development, Bangladesh can embed these practices into all renewable energy procurements and sector plans. This means routinely updating technical standards to keep pace with technology (institutionalising a review committee for standards and grid codes), maintaining a predictable schedule of auctions or solicitations to reach medium-term targets (e.g. X MW of solar added per year), and continually strengthening capacity (perhaps by establishing a renewable energy training centre or certification programme in collaboration with international experts). On the finance side, efforts in the short term to improve bankability should translate into more local banks and investors engaging in solar deals, reducing reliance on concessional finance over time. European involvement should ideally grow from a few pilot projects to a portfolio of partnerships – European developers, suppliers, and O&M providers working alongside Bangladeshi firms in multiple projects, contributing know-how and capital. To support this, Bangladesh and the EU/EIB can ex-

plore forming a dedicated investment platform under BREF that blends public and private finance for a pipeline of projects, thereby institutionalising collaboration. Throughout, the government must remain vigilant in monitoring outcomes and gathering feedback – for example, convene an annual stakeholder forum to review what is working and where policies might need adjustment – ensuring continuous improvement of the enabling environment.

Conclusion: Bangladesh stands at an important inflection point. The analyses of technology options, market players, and procurement methods all point to the same overarching conclusion: by embracing change now, Bangladesh can unlock a virtuous cycle of investment and innovation in solar energy. The nation has set ambitious renewable energy targets and identified what needs to be done to reach them. The task ahead is to implement these recommendations swiftly and resolutely. For Bangladeshi policymakers, this will mean enacting and enforcing new rules, coordinating across agencies, and committing resources to build capacity. For international partners like the EIB and the EU, it means continuing to provide technical assistance, risk mitigation, and financing aligned with these reforms – effectively backing Bangladesh's vision of a modernised solar sector.

If these steps are carried out, the payoff will be considerable. In a few years, we can expect a larger pipeline of bankable solar projects in Bangladesh, built to high standards, delivering affordable clean electricity, and resilient to climate impacts. The local workforce will have greater expertise, domestic companies will have grown in capability (often through partnerships), and international investors will view Bangladesh as a credible destination for climate-friendly infrastructure investment. Such outcomes directly support Bangladesh's sustainable development and energy security goals, while also contributing to global climate mitigation efforts. The way forward, therefore, is one of action and partnership – implementing policy reforms decisively at home and working closely with international allies – to turn the promise of Bangladesh's solar potential into a reality on the ground.

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