

# Towards a Rooftop Solar Transition in Bangladesh

The transition would be beneficial but perceived risks, import duties, tight fiscal conditions and lack of awareness remain major hurdles

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## Key Findings

**Upscaling the rooftop solar sector requires risk-mitigation instruments, business models for utilities, waiver of import duties on solar accessories and easing the letter of credit opening process.**

**While the economic benefits of rooftop solar are clear, its slow progress shows the sector is held back by lack of awareness, low confidence, perceived risks, high import duties, and tight fiscal conditions.**

**New rooftop solar capacity of 2,000MW could save the Bangladesh Power Development Board between Tk52.3billion (US\$476 million) and Tk110.32 billion (US\$1 billion) a year.**

**Awareness raising, capacity development of stakeholders and quality assurance of accessories will help build trust in rooftop solar.**



## Executive Summary

**Rooftop solar capacity added in Bangladesh from 2012 to 2022 was paltry, with a lack of monitoring and quality control of solar equipment installed as part of obtaining new grid connections damaging confidence in the sector. Installations surged in 2023, momentum that needs to be accelerated through incentives for lenders, utilities and investors to support the sector. We estimate that rooftop solar expansion of just 2,000 megawatts (MW) capacity could save the Bangladesh Power Development Board up to US\$1 billion a year by reducing generation and purchase of costly fossil fuel-based power. Yet the unlevel playing field created by import tariffs on rooftop solar equipment and perceived risks of lenders are major obstacles to the sector's expansion. This is despite new tariffs on offer making a strong economic case and being more attractive than those that sparked the rooftop solar explosion in Vietnam in 2020. However, many in Bangladesh remain unaware of the benefits and savings rooftop solar offers. A cohesive business model, risk mitigation instruments and capacity development can benefit stakeholders, consumers and the economy.**

The limited rooftop solar capacity of 160.63 megawatts (MW), installed under net-metered and non-net-metered systems until 10 October 2023 in Bangladesh, has proved grossly inadequate.<sup>1,2</sup> As frequent load-shedding and energy supply disruption stifle industrial production and economic activity, adding 2,000MW of rooftop solar can provide some relief to the country.

A similar capacity addition in rooftop solar can also help the Bangladesh Power Development Board (BPDB). BPDB has a high revenue deficit each year owing to expensive power generation and purchases from furnace oil- and diesel-fired plants. We estimate that adding 2,000MW of rooftop solar capacity could help the BPDB save between Tk52.3 billion (US\$476 million) and Tk110.32 billion (US\$1 billion) a year by reducing generation and purchase of costly power.

There have been some encouraging signs recently. The capacity addition of 42.04MW – net-metered and non-net-metered rooftop solar systems combined – in 2023 was the highest in a year since the first rooftop system was installed in 2012.<sup>3</sup> The government introduced regulation changes in August 2023, making rooftop solar a prerequisite for grid connection for different establishments. It also floated an international tender for deploying rooftop solar in jute mills. Some universities are prioritising rooftop solar.

<sup>1</sup> Sustainable and Renewable Energy Development Authority (SREDA). [Statistics of Installed Net Metering System](#). 31 October 2023.

<sup>2</sup> SREDA. [Rooftop Solar Except Net Metering](#). 31 October 2023.

<sup>3</sup> Ibid.

Rooftop solar also appears to make more financial sense for industrial and commercial consumers. The levelised cost of energy (LCOE) from rooftop solar stands at Bangladeshi Taka (Tk) 5/kilowatt hour (kWh) (US\$0.046/kWh) against the electricity tariffs of Tk9.9/kWh (US\$0.09/kWh) and Tk10.55 (US\$0.096/kWh) for industrial and commercial buildings, respectively.<sup>4</sup> These tariffs are not only attractive to industrial and commercial buildings to install rooftop solar systems but also better than the rates that triggered 9 gigawatts (GW) of such capacity addition in Vietnam in 2020. Yet, the sector's slow progress shows industry and building owners' interest in taking up rooftop solar is scattershot.

## Barriers to the Rooftop Solar Sector

Building on available information and interviews with stakeholders from seven major groups, this study identifies barriers to the sector's progress. These barriers include the awareness level of consumers, the presence of high import duties on equipment, the cap on rooftop solar system capacity, financiers' risk averseness, service providers' risks, lack of business models for utilities, fiscal conditions, capacity level of major stakeholders.

People are gravitating towards rooftop solar, albeit slowly, due to a lack of awareness and trust in its benefits. Low-quality rooftop solar installations while obtaining new grid connections in the past negatively affected the confidence of building owners. Most stakeholders do not see the upfront cost of rooftop solar as a significant obstacle since the system cost continues to fall. However, high import duties disproportionately affect rooftop solar as opposed to utility-scale solar projects. Such duties make rooftop solar costly in Bangladesh. The cap on installation capacity of up to 70% of the sanctioned load prevents some industries or commercial buildings from enjoying more benefits.



**Rooftop solar is disproportionately affected by high import duties as opposed to utility-scale solar projects.**

The available financing vehicles for rooftop solar are lucrative but not without problems. Most financial institutions, excluding Infrastructure Development Company Limited (IDCOL), do not prioritise rooftop solar projects due to small financing opportunities. Stakeholders shared that most financial institutions are not accustomed to assessing the feasibility of rooftop solar projects. Investors are also reluctant to spend on high-quality feasibility studies. IDCOL has substantial experience assessing rooftop solar projects and a dedicated financing facility for them. Still, it can only meet a small fraction of the overall demand for finance in the foreseeable future. The green refinancing scheme of the Bangladesh Bank is limited and has a lengthy process.

All financial institutions demand high collateral, such as land, bank and personal guarantees, to minimise their risk exposure, which affects project implementation. Likewise, they are less willing to

<sup>4</sup> Industries and commercial buildings having sanctioned loads from 50 kilowatts (KW) to 5MW enjoy the mentioned flat tariff rates.

extend loans to Engineering, Procurement and Construction (EPC) companies for projects under the operational expenditure (OPEX) model, which can swiftly increase rooftop solar uptake.<sup>5</sup> EPC companies foresee the risks of payment delay/default from building owners (offtakers’).

While utilities can accelerate rooftop solar deployment, without any incentive, they do not have a motivation to front-load efforts.

The Tk depreciated by 28.8% against the US\$ between December 2021 and September 2023. The depletion of foreign currency reserves sparked government intervention to restrict imports of luxury goods. However, the initiative ended up being counterproductive for rooftop solar. Without a tag of essential goods, there were delays in the opening of the letter of credit (LC) for the import of rooftop solar accessories, affecting project implementation.

Notably, working in tandem with policymakers and relevant stakeholders, associations create an enabling environment for clean energy. However, the Bangladesh Solar and Renewable Energy Association (BSREA) has its own operational challenges, which limit its effectiveness in the sector.

An analysis of different stakeholders of the rooftop solar sector demonstrates that only the nodal agency of the clean energy sector, the Sustainable and Renewable Energy Development Authority (SREDA) and EPC companies exhibit more than average capacity to spearhead a change from the status quo. The rest have less than average capacity.

## Key Levers to Upscale Rooftop Solar in Bangladesh

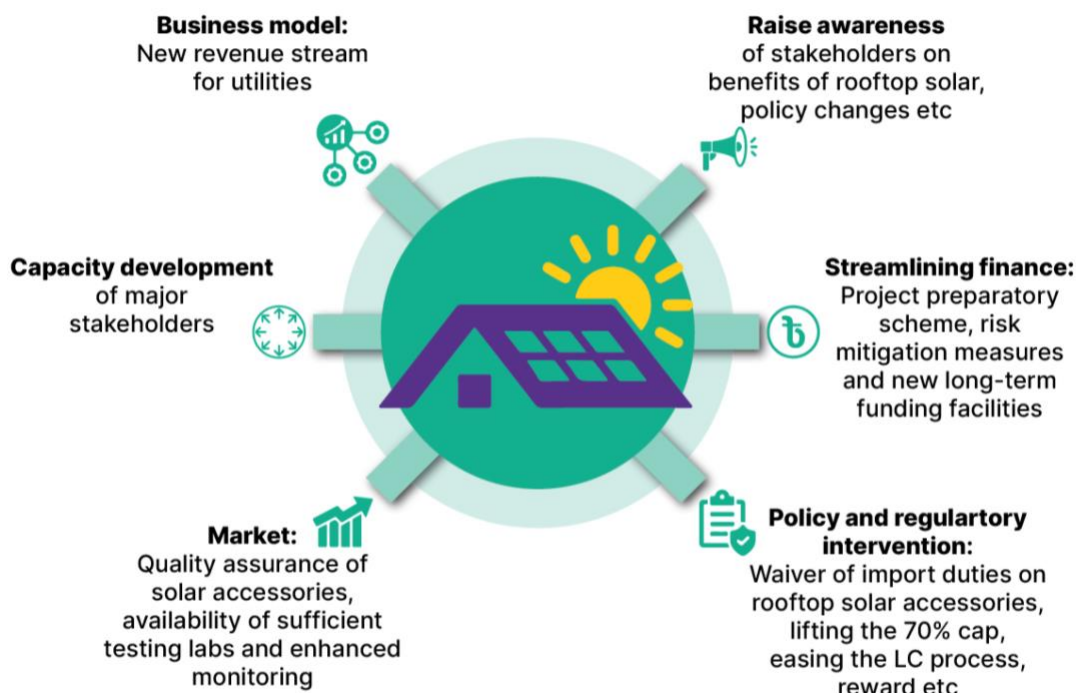
The study recommends six key levers to upscale the rooftop solar sector quickly and effectively. These are raising awareness, streamlining finance, policy and regulatory intervention, quality assurance, business models for utilities and capacity development of key stakeholders (Figure 1).

While investors want to quickly assimilate information on interest rates, net metering guidelines and policy changes, there is information asymmetry within the sector. Moreover, the government recently changed net-metered rooftop solar targets for new grid connections and interest rates of the low-cost refinancing scheme. Therefore, raising awareness of the rooftop solar segment is indispensable. The solar helpdesk, hosted by SREDA, shares information on request, but stakeholders feel a performance assessment of the desk is essential to upgrade services based on need and relevance.

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<sup>5</sup> EPC companies invest in OPEX model as opposed to the capital expenditure (CAPEX) model where building owners such as industries invest.

Figure 1: Key Levers to Accelerate Rooftop Solar



Source: IEEFA analysis

A credit risk guarantee scheme can minimise the perceived risks of financial institutions and smoothen fund flows to projects under the capital expenditure (CAPEX) and OPEX model, thereby reducing the demand for high collateral. A first-loss guarantee can address EPC companies' challenges linked to repayment from offtakers. A project preparatory scheme will ensure high-quality feasibility studies of rooftop solar projects, boosting the confidence of financial institutions. While Bangladesh Bank's green refinancing scheme is the least-cost financing vehicle, all eligible rooftop solar projects will not receive the refinance due to its limited funds of Tk4 billion (US\$36.4 million) and the competition with 69 other environment-friendly projects. Stakeholders further claim that the refinancing process is time-consuming. Therefore, Bangladesh Bank may pre-approve financing for rooftop solar based on an assessment at the initial stage to eliminate any uncertainty about availing of the low-cost scheme.

IDCOL's financing scheme is also appealing, but increasing rooftop solar use in the country will require additional financing. This will make it necessary for local financial institutions to explore sources, including multilateral agencies, international climate finance and the local bond market, in the foreseeable future.

Our study substantiates the need for a waiver on prevailing import duties on solar panels and four accessories, ranging from 11.2% to 58.6%, at least for a limited period. Since utility-scale solar



projects enjoy a complete duty waiver, the government should treat rooftop solar equally. We recommend fixing the rooftop solar installation capacity to 100% of the sanctioned load to make it more attractive.

As rooftop solar accessories are usually imported, the Bangladesh Bank and the National Board of Revenue (NBR) should declare rooftop solar a top priority and ease its LC opening process.

For a rapid expansion, the Bangladesh Bank may give financial institutions an annual disbursement target on renewable energy, including rooftop solar.

Most stakeholders note that rooftop solar already has a compelling economic case and do not suggest providing financial incentives as the country's fiscal burdens continue to mount amid depreciating foreign currency. However, they feel that along with a duty waiver of rooftop solar accessories, awards and recognition could motivate industry and building owners to pursue rooftop solar. The government may recognise the contribution of the best-performing rooftop solar projects in the National Environment Award ceremony or introduce a National Clean Energy Award.

Utilities specialising in power generation, transmission and distribution could spur rooftop solar expansion in the country. But they need a revenue stream for their intrinsic motivation. Both the utility- and third-party-owned business models can serve this purpose.

Moreover, unless the quality of accessories is maintained, rooftop solar expansion will not really be hitting the target. Setting up enough testing labs and increasing market monitoring by the Bangladesh Standards and Testing Institute (BSTI) could address quality concerns around accessories. Stakeholders said that SREDA can include a consumer feedback mechanism for EPC companies and solar equipment suppliers to ensure quality project implementation and initiate certification for service providers.

SREDA should design and conduct targeted capacity development and awareness programmes, as well as exposure visits to successful projects for stakeholders. However, SREDA should increase its workforce to fulfil its responsibilities, from policy formulation to sector coordination and capacity development. Likewise, utilities require additional staff to manage the increasing volume of applications for net-metered rooftop solar and adopt new business models for upscaling.

Bangladesh does not need to start afresh and reinvent the wheel. It should enhance the effectiveness of existing measures, such as raising awareness and capacity building, making policy conducive by addressing barriers and adopting a credit risk guarantee scheme and successful business models for utilities implemented elsewhere.

The country must tap the low-hanging fruit of rooftop solar to stave off the energy sector challenges and reduce colossal imports of fossil fuels. The delay in steering the sector in the right direction could result in a missed opportunity. Finally, this evidence-based assessment of the rooftop solar sector would provide a solid empirical base for future studies.

## Background

The slow progress of cost-competitive renewable energy in Bangladesh amid its high reliance on volatile, imported fossil fuels indicates a missed opportunity. The simplistic hypothesis that the country's economic growth and financial capacity will ensure the uninterrupted supply of imported fossil fuels is no longer tenable. Instead, the status quo surrounding renewable energy, including rooftop solar, could prove costly for the country. Energy supply shortages, led by tight fiscal conditions, stifle industrial production and the economy.<sup>6</sup>

While utility-scale renewable energy projects face hurdles, such as acquiring large quantities of land and obtaining numerous government approvals, rooftop solar is low-hanging fruit for Bangladesh.<sup>7,8</sup> The financial equation of installing rooftop solar is entirely different today as industry and building owners can reduce electricity bills even more today compared with several years ago. The trajectory of falling rooftop solar costs, as opposed to rising grid electricity prices, will likely make the former even more appealing in the foreseeable future.

Interest in rooftop solar is growing among industries as electricity prices soar.<sup>9</sup> Additionally, realising the need for a regulatory push to advance rooftop solar, the government floated an international tender in July 2023 to lease rooftop spaces of 13 jute mills for an estimated solar capacity of 90MW.<sup>10</sup> Universities also plan to opt for rooftop solar.<sup>11</sup>

However, the installed net-metered rooftop solar capacity stood at a paltry 84.59 megawatts (MW) until 10 October 2023.<sup>12</sup> Likewise, non-net-metered rooftop solar systems have a combined capacity of only 76.04MW.<sup>13</sup>

Although the renewed interest in setting up rooftop solar is a positive development, the sector lacks traction. A report published in February 2023 shows that inadequate finance schemes, quality of accessories, and insufficient installation and maintenance services hamper the rooftop solar sector.<sup>14</sup>

This study delves into Bangladesh's rooftop solar sector, identifies the key barriers that affect its progress and recommends measures that could speed up the implementation of rooftop solar projects in the country. First, this study reviews the existing regulatory framework and status of the sector (see methodology in Figure 2). It then selects seven major areas of the sector for a comprehensive assessment. It further determines sectoral experts for interviews based on criteria such as their involvement in the sector (see Annexure 1 for the selection of major areas and

<sup>6</sup> IEEFA. [Bangladesh Must Revamp its Power System Model by Keeping Space for Renewables](#). 31 January 2023.

<sup>7</sup> IEEFA. [Charting an Electricity Sector Transition Pathway for Bangladesh](#). 5 April 2023.

<sup>8</sup> IEEFA. [Moving Towards a Green Garment Sector in Bangladesh](#). 30 August 2023.

<sup>9</sup> The Business Standard. [A Green shift: Why Industries are Loving Rooftop Solar Solution](#). 4 September 2023.

<sup>10</sup> The Business Standard. [Bid for Renewable Boost Thru Rooftop Solar in Jute Mills](#). 17 July 2023.

<sup>11</sup> Bangladesh Post. [BUET Picks Genex Infrastructure for Rooftop Solar Installations](#). 7 November 2023.

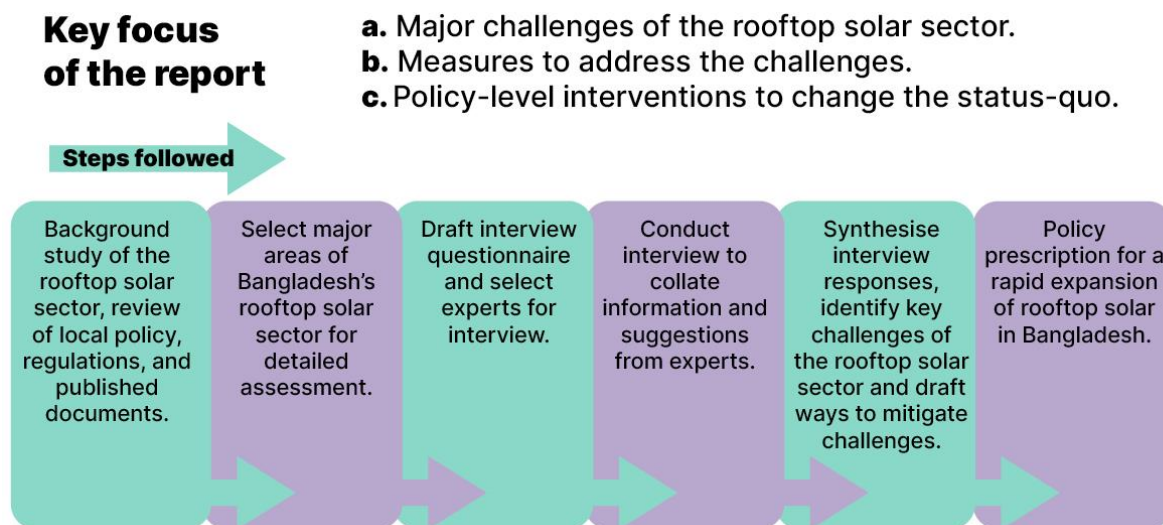
<sup>12</sup> SREDA. [Statistics of Installed Net Metering System](#). 31 October 2023.

<sup>13</sup> SREDA. [Rooftop Solar Except Net Metering](#). 31 October 2023.

<sup>14</sup> Tetra Tech ES, Inc. [Renewable Energy Policy in Bangladesh: Recommendations for Achieving Vision 2041](#). February 2023.

interviewees). Synthesising experts' responses against a semi-structured questionnaire, the study crafts solutions and policy recommendations to dispel the sector's concerns and remove barriers to create a better ecosystem for investors considering rooftop solar (See Annexure 2 for the questionnaire).

**Figure 2: Methodology**

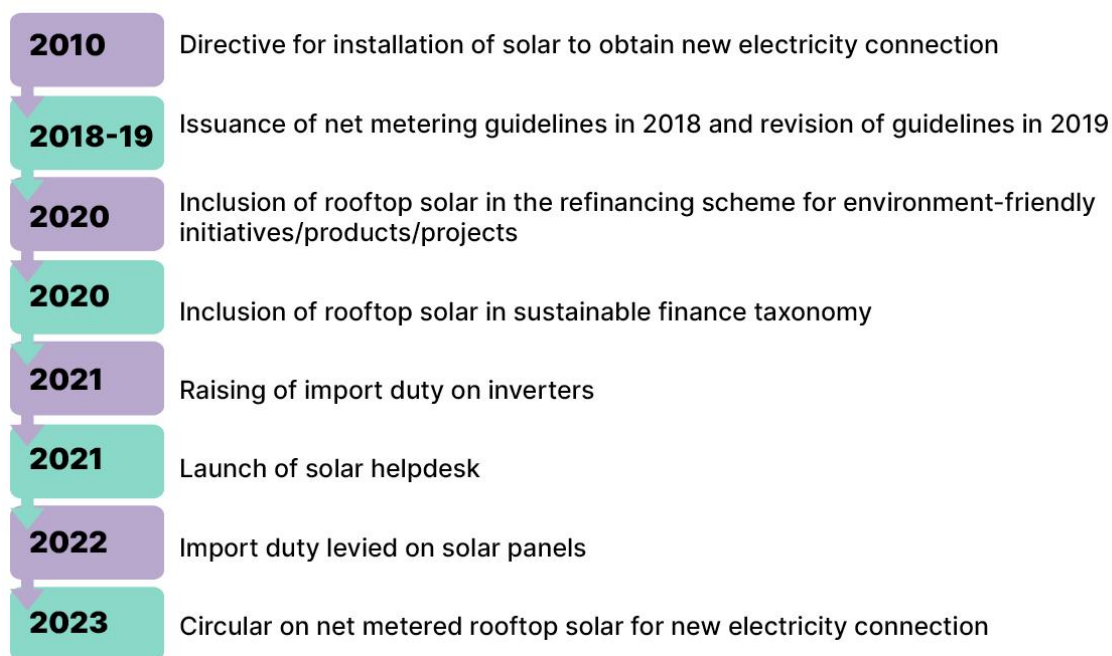


## Bangladesh's Rooftop Solar Sector

### Existing Framework

To increase solar energy capacity in the country amid a large supply-demand electricity deficit, the government issued its first directive on rooftop solar installation in 2010.<sup>15</sup> It mandated that new buildings and industries install rooftop solar systems to obtain grid connection. New households in urban areas would require setting up rooftop solar capacity of at least 3% of their sanctioned loads. Similarly, commercial buildings in urban areas and industries with more than 50 kilowatts (kW) sanctioned loads would need to install rooftop solar systems of 10% of their sanctioned loads.

<sup>15</sup> The Business Standard. [Rooftop Solar Panels are Now Junks](#). 24 December 2020.

**Figure 3: Rooftop Solar Policies, Regulations and Support**

Sources: *The Business Standard*; SREDA; Bangladesh Bank; *The National Bureau of Asian Research*; Ministry of Finance; Power Division.

Almost a decade later, the government formulated net metering guidelines in 2018 and revised them in 2019 to allow industries and buildings with three-phase connections to install rooftop solar, connecting to the grid via two-way meters. The regulation made the selected category of buildings eligible to install solar capacity of up to 70% of their sanctioned loads, helping reduce electricity bills. Among other things, the guidelines define the billing process, solar equipment standards and preconditions for net-metering connections.<sup>16</sup>

In April 2020, the Bangladesh Bank added rooftop solar with net metering in its green refinancing scheme, under which owners of industries and selected categories of buildings qualify for low-cost funds.<sup>17</sup> Additionally, the Bangladesh Bank included rooftop solar in the sustainable finance taxonomy to encourage financial institutions to extend loans to boost the sector.<sup>18</sup>

However, the government raised the overall import duty on solar inverters from 11% to 37% in 2021.<sup>19</sup> Furthermore, to incentivise local manufacturers, the government imposed a 1% duty on

<sup>16</sup> SREDA. [Net Metering Guidelines-2018](#). Revised on 14 November 2019.

<sup>17</sup> Sustainable Finance Department, Bangladesh Bank. [SFD Circular No. 02. Poribeshbandhob Ponno/Udyog/Prokolper jonno Punoh Orthayon Scheme](#) [Refinance Scheme for Environment-friendly Products/Projects/Initiatives]. 30 April 2020.

<sup>18</sup> Sustainable Finance Department, Bangladesh Bank. [Sustainable Finance Policy for Banks and Financial Institutions](#). 30 December 2020.

<sup>19</sup> The National Bureau of Asian Research. [Building Renewable Energy in Bangladesh](#). 6 March 2023.

imported solar panels in June 2022.<sup>20</sup> Although the plan to levy import duty on solar panels and increase it for inverters was to support local manufacturing and substitute imported solar accessories, few companies in Bangladesh assemble solar modules. Inverters produced in the country are of inferior quality.<sup>21</sup>

In the meantime, the national agency responsible for spearheading clean energy, the Sustainable and Renewable Energy Development Authority (SREDA), launched a solar help desk to make relevant information available to entrepreneurs, financial institutions and agencies interested in solar projects.<sup>22</sup> SREDA further provides information relevant to policy updates and statistics through its website.<sup>23</sup>

In August 2023, the Power Division of the Ministry of Power, Energy and Mineral Resources released a circular, widening the scope of the net metering guidelines. Buildings with single-phase connections are now eligible for rooftop solar project implementation under net metering.<sup>24</sup> The circular further stipulates minimum targets for rooftop solar systems at different establishments seeking new grid connections (Table 1).

**Table 1: Directives on Net-metered Rooftop Solar for New Electricity Connection**

Types of Establishments	Directives
<b>Residential buildings with 1,000 square feet roof space</b>	Single-phase connection: minimum solar system capacity is 1kW.
	Three-phase connection: minimum solar system capacity is 3kW.
<b>Industrial and commercial buildings</b>	Up to 80kW sanctioned load: minimum solar system capacity is 15% of the sanctioned load.
	More than 80kW and up to 500kW sanctioned load: minimum solar system capacity is 12% of the sanctioned load. Net metering guidelines 2018 (revised in 2019) should be followed.
	More than 500kW sanctioned load: minimum solar system capacity is 10% of the sanctioned load. Net metering guidelines 2018 (revised in 2019) should be followed.
<b>Educational institutes, hospitals and charitable organisations</b>	Single-phase connection: minimum solar system capacity is 1kW.
	Three-phase connection: minimum solar system capacity is 3kW.
* If there is a lack of rooftop space, the relevant agency will form a three-member team to fix the implementable solar system capacity based on site visits.	
** Establishments that already have grid connections but want to increase the sanctioned load should install solar capacity for the additional load based on the rate mentioned above. <sup>25</sup>	

Source: Power Division

<sup>20</sup> Ministry of Finance, Government of the People's Republic of Bangladesh. [National Budget Speech 2022-23](#). 9 June 2022.

<sup>21</sup> The Financial Express. [Prohibitive Taxing Stymies Green Power Expansion](#). 12 March 2022.

<sup>22</sup> The Financial Express. [SREDA Launches Help Desk to Provide One-stop Service on Rooftop solar](#). 20 August 2021.

<sup>23</sup> SREDA. [E-Service Desk for Solar](#). 1 December 2023.

<sup>24</sup> Power Division, Ministry of Power, Energy and Mineral Resources. [Circular on Installation of Net-metered Rooftop Solar for New Electricity Connection](#). 23 August 2023.

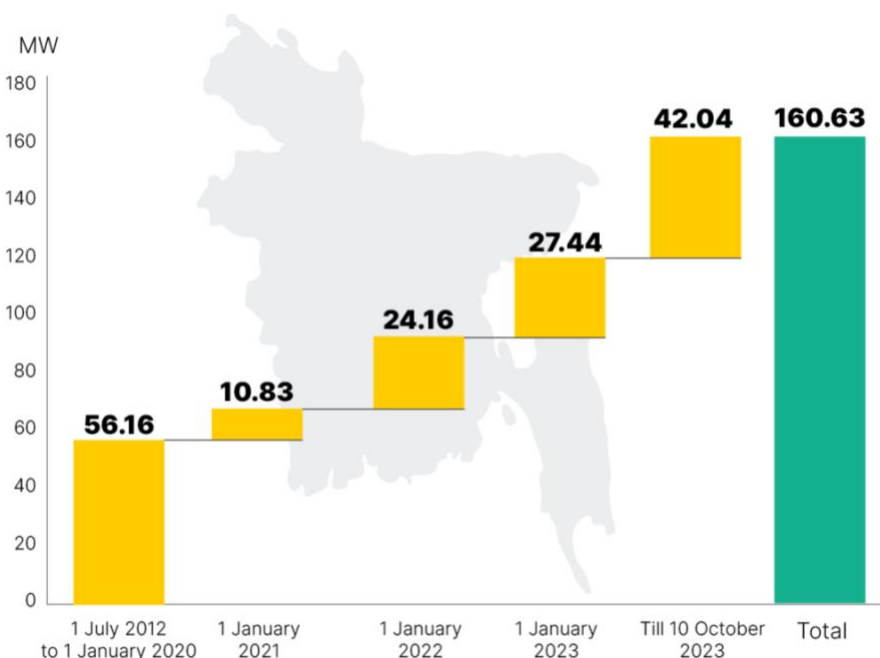
<sup>25</sup> The threshold for installing rooftop solar system is up to 70% of the sanctioned load as per net metering guidelines.

## Status of Rooftop Solar in Bangladesh

The rooftop solar segment is yet to peak in Bangladesh. The frequent load-shedding and steep electricity bills have only created scattershot interest among industries and building owners.

As of 10 October 2023, the country had a combined rooftop solar capacity of only 160.63MW, including net-metered and non-net-metered systems (Figure 4).<sup>26,27</sup> Analysis of the sector shows that Bangladesh registered this meagre rooftop solar capacity addition over a period of more than 11 years with the first system installed on 1 July 2012 without the net metering. However, there has been a positive trend lately, with the sector adding 42.04MW capacity in the first three quarters of 2023. Of this 42.04MW, rooftop solar under net metering made up 31.21MW.<sup>28</sup>

**Figure 4: Rooftop Solar Installation by Year**



Sources: SREDA; IEEFA analysis (including net-metered and non-net-metered systems)

Despite an uptick in 2023, the contribution of rooftop solar in Bangladesh is limited compared with other countries. For instance, India added a rooftop solar capacity of 2 gigawatts (GW) from April to July 2023.<sup>29</sup> Vietnam smashed records by installing a massive 9GW of rooftop solar capacity in 2020 alone.<sup>30</sup> Although there is no proper assessment of the full rooftop solar potential in Bangladesh,

<sup>26</sup> SREDA. [Statistics of Installed Net Metering System](#). 31 October 2023

<sup>27</sup> SREDA. [Rooftop Solar Except Net Metering](#). 31 October 2023.

<sup>28</sup> Ibid.

<sup>29</sup> IEEFA and JMK Research. [The Rooftop Solar Commercial & Industrial Market in India](#). 1 September 2023.

<sup>30</sup> IEEFA. [Charting an Electricity Sector Transition Pathway for Bangladesh](#). 5 April 2023.

several thousand garment industries, public and commercial buildings, universities and planned economic zones can harness this energy, significantly enhancing national renewable energy capacity.

## Economic Rationale for Rooftop Solar

Pursuing rooftop solar makes economic sense, as the government raised the price of grid electricity three times in quick succession during the first quarter of 2023.<sup>31,32,33</sup> and<sup>34</sup> For industries with a sanctioned load ranging from 50kW to 5MW, the flat electricity tariff is Bangladeshi Taka (Tk) 9.90/kilowatt-hour (kWh) (US\$0.09/kWh).<sup>35</sup> The flat electricity tariff for commercial buildings within the same bracket of the sanctioned load is Tk10.55/kWh (US\$0.096/kWh) (Figure 5). Tariffs are slightly lower for industries and commercial buildings with sanctioned loads of more than 5MW.<sup>36</sup>

**Figure 5: Rising Trend of Electricity Tariffs**



Sources: BERC & Power Division; IEEFA analysis

As the power sector grapples with a hefty revenue shortfall, consumer electricity tariffs will likely increase after the general election in 2024. Notably, existing tariffs in the country are better than the feed-in tariff of US\$0.0838/kWh, which triggered massive rooftop solar capacity addition in Vietnam in 2020.<sup>37</sup> A comparative analysis shows that industries and commercial buildings for sanctioned loads of up to 5MW in Bangladesh pay 7.4% and 14.56% more, respectively, than Vietnam's feed-in tariff of 2020. While these tariffs are favourable for industries and commercial buildings to install rooftop solar systems, another round of adjustment in tariffs will make rooftop solar even more attractive, both for industries and commercial buildings.

<sup>31</sup> Bangladesh Energy Regulatory Commission (BERC). [Order on Retail Tariffs for Bangladesh Power Development Board](#). 27 February 2020.

<sup>32</sup> Power Division. [Gazette on Retail Tariffs for Electricity](#). 12 January 2023.

<sup>33</sup> Power Division. [Gazette on Retail Tariffs for Electricity](#). 30 January 2023.

<sup>34</sup> Power Division. [Gazette on Retail Tariffs for Electricity](#). 28 February 2023.

<sup>35</sup> Tk to US\$ conversion rate: Tk1 = US\$0.0091

<sup>36</sup> Ibid.

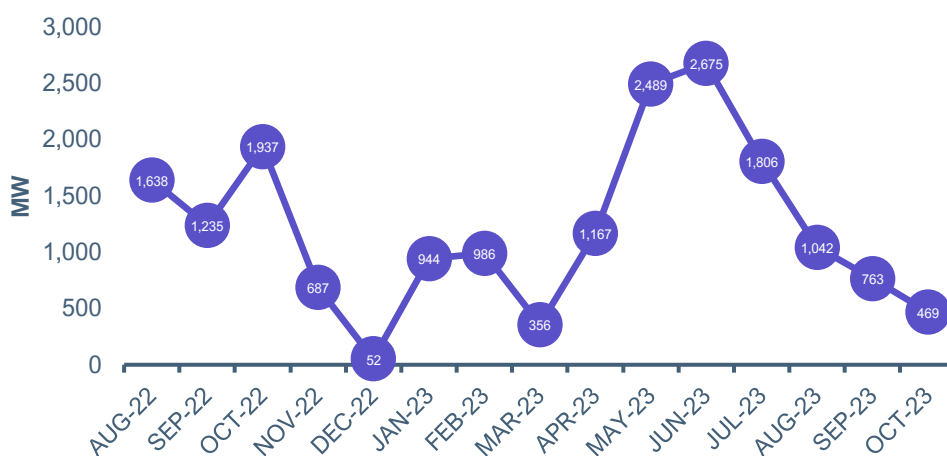
<sup>37</sup> IEEFA. [Charting an Electricity Sector Transition Pathway for Bangladesh](#). 5 April 2023.

Notably, industries historically enjoyed highly subsidised gas to generate low-cost electricity. But, they are no longer entitled to cheap gas following record price adjustments in January 2023.<sup>38</sup> Uninterrupted gas supply is also not guaranteed due to local gas shortages and difficulty importing Liquefied Natural Gas (LNG). Instead, using rooftop solar during the peak hours of the day would be more beneficial for industries.

An assessment of a 1MW rooftop solar system without a battery storage facility shows that the levelised cost of energy (LCOE) is Tk5/kWh (US\$0.046/kWh).<sup>39</sup> The LCOE confirms that industries and commercial buildings can drastically reduce electricity bills when the sun shines.

On the other hand, Bangladesh experienced more than 1,000MW day-peak load-shedding in eight of the 15 months, from August 2022 to October 2023 (Figure 6).<sup>40</sup> A rooftop solar capacity of 2,000MW could have helped utilities reduce load-shedding or fossil fuel-based power generation, contributing to the economy from different angles, such as supporting industrial production or cutting down fossil fuel imports and taking some pressure off foreign currency reserves.

**Figure 6: Maximum Load-shedding during Day Peak**



Sources: PGCB; IEEFA analysis

A sizeable rooftop solar capacity can improve the financial health of the Bangladesh Power Development Board (BPDB), which continues to experience a yearly revenue deficit. The enormous gap between the cost of power generation, including purchase from public and private power plants, and the selling price of power to different utilities and consumers causes this shortfall. Notably, the power generation cost was more than three times BPDB's weighted average bulk electricity tariff of Tk6.2/kWh (US\$0.056/kWh) in several public and private power plants during the fiscal year (FY)

<sup>38</sup> IEEFA. [Ramping up Clean Energy will Help Bangladesh Reduce its Reliance on Imported Fossil Fuels](#). 16 February 2023.

<sup>39</sup> See Annexure 4 for Assumptions.

<sup>40</sup> Power Grid Company of Bangladesh (PGCB). [Monthly Operational Reports](#). 1 December 2023.



2021-22.<sup>41,42</sup> Since raising electricity tariffs will add to consumers' woes, BPDB needs to find ways to minimise generation and purchase costs. Rooftop solar is a way BPDB can reduce expensive electricity production or purchase, partly containing the revenue deficit.

For instance, the average cost of power generation from selected public and private furnace oil-based plants in FY2021-22 was Tk18.68/kWh (US\$0.17/kWh). Similarly, the average power generation cost from selected diesel-fired plants in FY2021-22 was Tk39.4/kWh (US\$0.358/kWh).<sup>43</sup>

Additional rooftop solar capacity of 2,000MW, if installed by building owners, would help BPDB minimise the operation of costly plants and reduce the need to purchase expensive electricity from private and public plants. This could help BPDB reduce the annual revenue shortfall between Tk52.3 billion (US\$476 million) and Tk110.32 billion (US\$1 billion) without leveraging its resources.<sup>44</sup>

## Factors Holding Back Rooftop Solar

Despite the increasing competitiveness, several factors hamper the expansion of rooftop solar in Bangladesh.

High import duties on rooftop solar accessories increase overall project costs. Since the Tk also depreciated against the US\$ by 28.8% between December 2021 and September 2023 (Figure 7), a stable local currency could have made rooftop solar more profitable.<sup>45</sup> Notably, there is no fiscal incentive or reward from the government to implement rooftop solar projects.

The quality of solar accessories also deters the uptake of rooftop solar projects. For instance, solar home systems implemented during 2003-18 helped transform the lives of 20 million off-grid people, spurring economic activity in rural areas. However, of late, cheap and poor-quality accessories available in the market have affected the performance of solar home systems.<sup>46,47 and 48</sup>

Moreover, as part of obtaining new grid connections under the 2010 directive, many building owners installed rooftop solar systems, which are now stranded assets and generate little or no energy due

<sup>41</sup> Bangladesh Power Development Board (BPDB). [Annual Report 2021-22](#). 27 November 2022.

<sup>42</sup> BERC. [Bulk Electricity Tariffs, 2022](#). 21 November 2022.

<sup>43</sup> See Annexure 5 for Calculation.

<sup>44</sup> Assuming 4 hours of operation for 350 days a year, total energy generation from 2,000MW rooftop solar will be =  $(2,000 \times 1,000 \times 4 \times 350) / 1,000,000 = 2,800$  million kWh/annum.

Taking Tk18.68/kWh for energy generated from selected furnace oil-based plants, annual savings from 2,000MW rooftop solar will be =  $2,800 \times 18.68 = \text{Tk}52,304$  million/annum = Tk52.3 billion/annum.

Taking Tk39.4/kWh for energy generated from diesel-run plants, annual savings from 2,000MW rooftop solar will be =  $2,800 \times 39.4 = \text{Tk}110,320$  million/annum = Tk110.32 billion/annum

<sup>45</sup> Bangladesh Bank. [Exchange Rate of Taka](#). 13 October 2023.

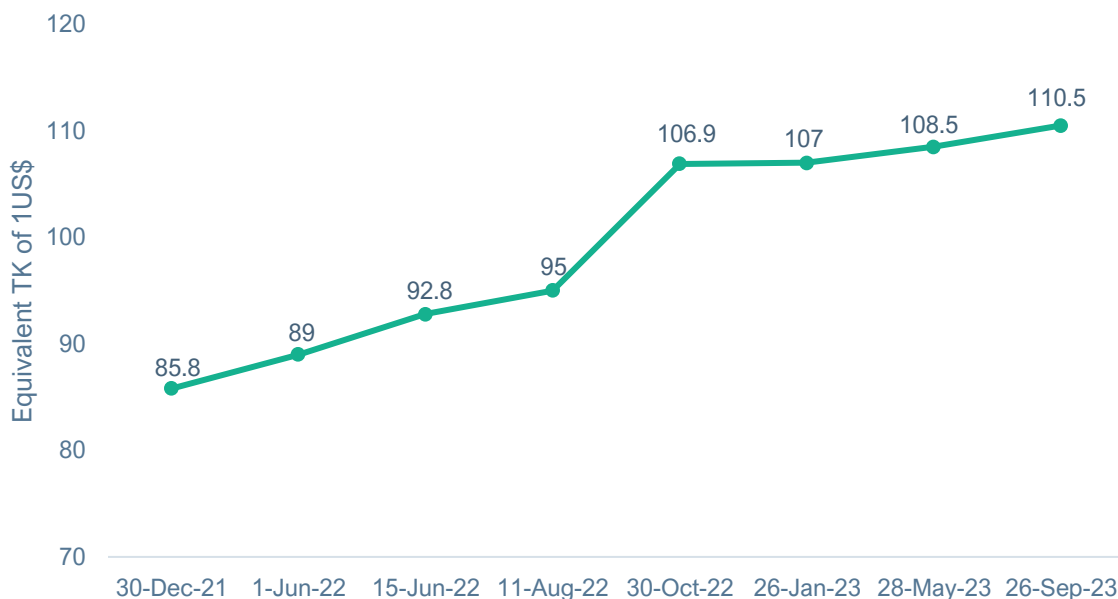
<sup>46</sup> Cabraal et al. [Living in the Light: The Bangladesh Solar Home Systems Story](#). 24 March 2021.

<sup>47</sup> Wimmer. [100% Electrification but What Comes Next for Bangladesh? Lessons from Insiders](#). In: Groh, S., Barner, L., Heinemann, G., von Hirschhausen, C. (eds) *Electricity Access, Decarbonization, and Integration of Renewables*. *Energiopolitik und Klimaschutz*. Energy Policy and Climate Protection. Springer VS, Wiesbaden. 3 November 2022.

<sup>48</sup> The Business Standard. [Why Home Solar Scheme Did Not Light Up](#). 16 July 2023.

to inadequate monitoring and quality control.<sup>49</sup> This led to a negative impression of rooftop solar among investors in the country.

**Figure 7: Devaluation of Bangladeshi Taka against US Dollar**



Sources: Bangladesh Bank; IEEFA analysis

Additionally, industry and building owners face challenges securing loans for rooftop solar projects.<sup>50</sup> The portfolio guarantee scheme, available in India, and the credit risk guarantee scheme, expected to be launched by the World Bank in India, can reduce financial institutions' risk exposure.<sup>51</sup> The absence of such schemes in Bangladesh impedes risk-averse financial institutions from extending loans for rooftop solar projects.

## Analysis of Interview Responses

### The Role of Rooftop Solar and its Potential

The benefits of rooftop solar are wide-ranging. It reduces energy costs, helps meet peak energy demand and offers other benefits such as environmental. Therefore, the question of the role of rooftop solar in Bangladesh evokes different reactions from respondents. Many share that rooftop

<sup>49</sup> World Bank. [Combined Project Information Documents / Integrated Safeguards Datasheet \(PID/ISDS\) - Bangladesh Scaling-up Renewable Energy Project \(P161869\)](#). 10 October 2018.

<sup>50</sup> The National Bureau of Asian Research. [Building Renewable Energy in Bangladesh](#). 6 March 2023.

<sup>51</sup> IEEFA and JMK Research. [The Rooftop Solar Commercial & Industrial Market in India](#). 1 September 2023.

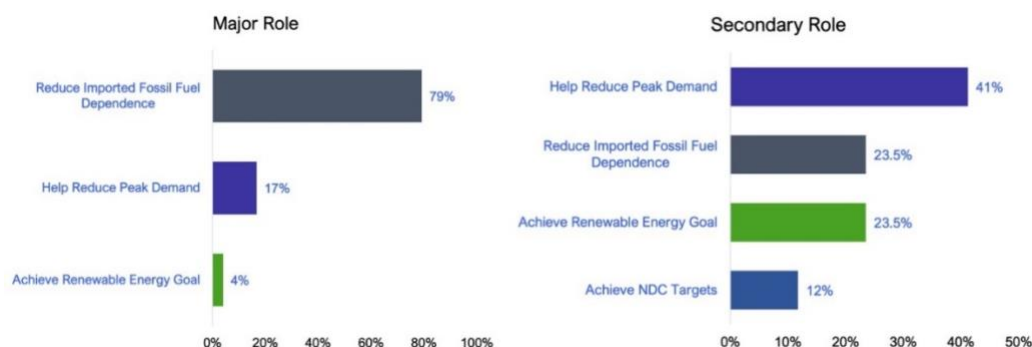
solar can support in multiple ways. Based on preference, we recorded multiple responses from the interviewees as major and secondary roles of rooftop solar. As such, an interviewee's response recorded as a primary role can be someone else's secondary choice.

For multiple responses, we assigned a score of two against the first preference and one against the second preference (see Annexure 3 for the interview and result interpretation process). The scoring exercise shows that the major contribution of rooftop solar is reducing imported fossil fuel dependence (score: 42), which is well ahead of managing peak demand (15) in Bangladesh.<sup>52</sup> A detailed analysis of recorded responses can explain this.

For instance, more than three-quarters of the stakeholders said that reducing the country's imported fossil fuel dependence is the major role of rooftop solar. One-sixth of interviewees believe the major role of rooftop solar is to help manage peak demand. The remaining respondents think the rooftop solar will contribute to the national renewable energy goal.

On the other hand, more than 40% of respondents consider the secondary role of rooftop solar is reducing peak demand. About one-quarter believes rooftop solar has the potential to reduce fossil fuel import dependence, while another quarter perceives it will help achieve the national renewable energy goal (Figure 8).

**Figure 8: Role of Rooftop Solar**



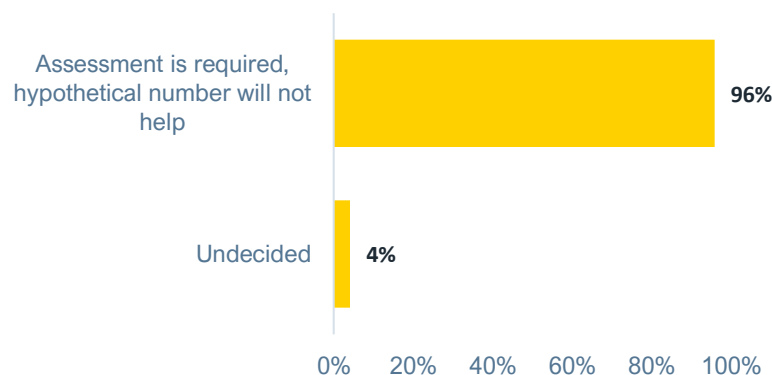
## Potential of Rooftop Solar

Land constraint poses a significant challenge to large-scale renewable energy expansion in densely populated and agriculture-dependent Bangladesh. Rooftop surfaces can, therefore, help utilise solar energy without disrupting agricultural production.

<sup>52</sup> Score of the response "Reducing fossil fuel dependence" = 19X2 + 4X1 = 42; Score of the response "Help reduce peak demand" = 4X2 + 7X1 = 15 [Note: 17 respondents chose both major and secondary roles, but seven respondents chose only major role]

Often, it is claimed that rooftops of existing industries can unlock 5,000MW of solar capacity.<sup>53</sup> The aggregate rooftop solar potential is substantial, combining public, residential and commercial buildings, universities, and other establishments. However, most stakeholders cannot grasp the full potential of rooftop solar without verified data.

**Figure 9: Potential of Rooftop Solar**



An assessment of rooftop surfaces is needed to establish the full capacity of solar that can be mounted on existing buildings. This is because old buildings may not have the load-bearing capacity to hold rooftop solar systems, and high-rise buildings can obstruct sunlight from reaching solar panels on adjacent buildings. Similarly, factories near cement manufacturing units will experience dust problems affecting their solar systems. Additionally, building owners may have plans to expand the existing buildings, limiting the scope of installing solar in the foreseeable future.

A proper assessment in lieu of assumption-based numbers could help the government visualise rooftop solar's full, untapped contribution to the national power system while highlighting the potential market for Engineering, Procurement and Construction (EPC) companies. It can also signal to financial institutions the aggregate investment required.

## Priority and Motivation

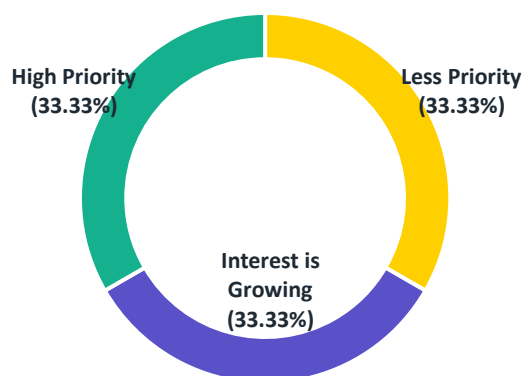
The stakeholders agreed that rooftop solar is not yet a high priority for all industries, but interest is growing (Figure 10).

The energy price spikes and supply disruptions since July 2022, following Russia's invasion of Ukraine, are a cautionary tale for industries to pursue alternative energy and enhance energy independence. Yet, only a third of the respondents believe rooftop solar is a high priority. Of the remaining two-thirds, half agree interest in rooftop solar is growing, while the other half thinks rooftop

<sup>53</sup> The Business Standard. [5,000MW Solar Power Achievable from Industrial Rooftops](#). 24 October 2020.

solar is not a priority. However, interest among stakeholders is growing due to increasing energy tariffs in the country.

**Figure 10: Rooftop Solar Priority Level**



Despite higher tariffs, interviewees say commercial building owners are least concerned about rooftop solar projects.

Although the government formulated the net metering guidelines in 2018 and conducts events to raise awareness, the priority level in rooftop solar is primarily due to the lack of awareness (Figure 11). As interviewees again shared multiple responses, we recorded the first preference as the primary reason and the other as secondary. We assigned a score of two and one for primary and secondary reasons, respectively (see Annexure 3 for the interview and result interpretation process). The scoring exercise confirms that awareness-related factors, like doubts over benefits or lack of trust and difficulty in accessing finance, influence people's priority of rooftop solar.<sup>54</sup>

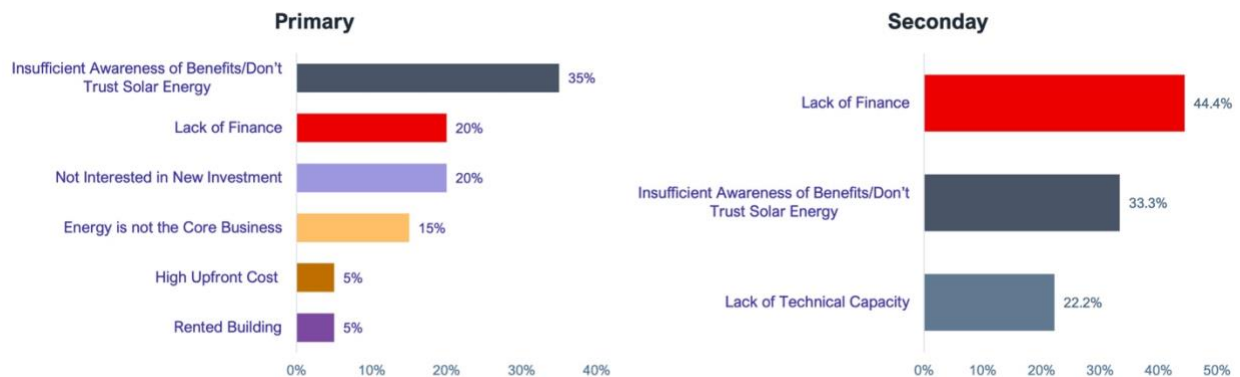
A careful assessment of interview responses shows that one in three stakeholders primarily believed that “people are unaware of the benefits of rooftop solar or hold doubts about the rooftop solar’s viability due to negative experiences”. Previously, owners of newly constructed households in urban areas installed rooftop systems of up to 3% of their sanctioned loads to obtain a grid connection. Still, a lack of monitoring and quality assurance left many rooftop solar systems stranded.

Other primary reasons for the priority level include lack of finance and lack of interest in making new investments. Some stakeholders feel that energy is not the core business of industry and building

<sup>54</sup> Score of the response “Lack of awareness of the benefits/trust” =  $7 \times 2 + 3 \times 1 = 17$ ; Lack of finance =  $4 \times 2 + 4 \times 1 = 12$  [Note: While 20 interviewees shared the primary reason, nine of them also shared secondary reasons]

owners. However, only 5% of respondents said high upfront costs negatively influence industry and building owners pursuing a rooftop solar system.

**Figure 11: Factors Affecting Rooftop Solar Priority**

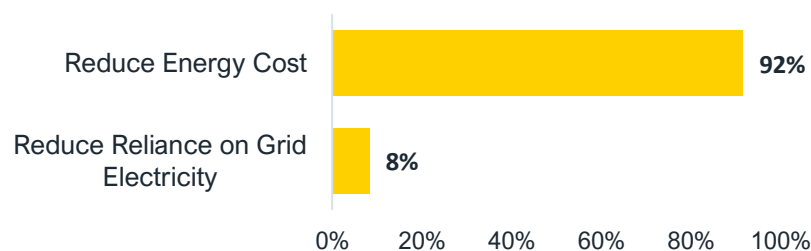


Almost half the stakeholders note a lack of finance, but one-third consider insufficient awareness as the secondary reason people do not prioritise rooftop solar.

## What Motivates Building Owners to Install Rooftop Solar?

The vast majority of respondents (92%) said reducing energy costs motivates industries to install rooftop solar systems (Figure 12). The remaining respondents believe that industry and building owners want to minimise reliance on the national grid as they continue to experience load-shedding. However, most commercial building owners are reluctant to invest in rooftop solar.

**Figure 12: Motivation to Install Rooftop Solar**



All interviewees point out that the readymade garment (RMG) industry is motivated to install rooftop solar to increase the contribution of clean energy as it needs to meet buyers' compliance. The RMG industry is committed to reducing greenhouse gas emissions by 30% by 2030 after joining the

Fashion Industry Charter for Climate Action, convened by the United Nations Framework Convention on Climate Change in 2019.<sup>55</sup>

## Finance and Associated Challenges

This section assesses the financial institutions' motivation to extend loans for rooftop solar projects, collateral sought by financial institutions from investors in the sector, and the popularity of models based on whether building owners or EPC companies invest.

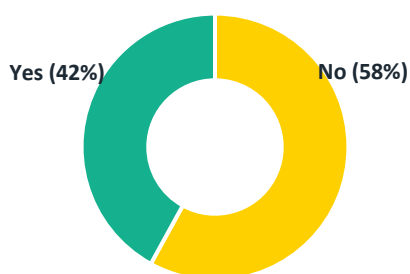
Additionally, this section includes the financing vehicles available in the country and a de-risking mechanism to manage the challenges of the rooftop solar sector.

### Financial Institutions have Little Motivation

There is a deeply ingrained assumption that the market will drive the shift to rooftop solar, a cheaper electricity source than fossil fuels. As identified in the previous section, availability and accessibility of finance for rooftop solar is the second-most dominant factor for industry and building owners. The low motivation of financial institutions to extend loans for rooftop solar projects underpins this problem.

While Infrastructure Development Company Limited (IDCOL), a specialised non-banking financial institution, considers rooftop solar a priority, other financial institutions do not. IDCOL alone can meet only a fraction of the funding needs of the rooftop solar sector. Significantly, more than half of respondents highlighted financial institutions do not have enough motivation to provide loans for rooftop solar projects (Figure 13).

**Figure 13: Willingness of Financial Institutions to Lend for Rooftop Solar**



The question “Why financial institutions are less interested in rooftop solar?”, elicited multiple responses from the interviewees. As such, we use a scoring. The scoring indicates that “small

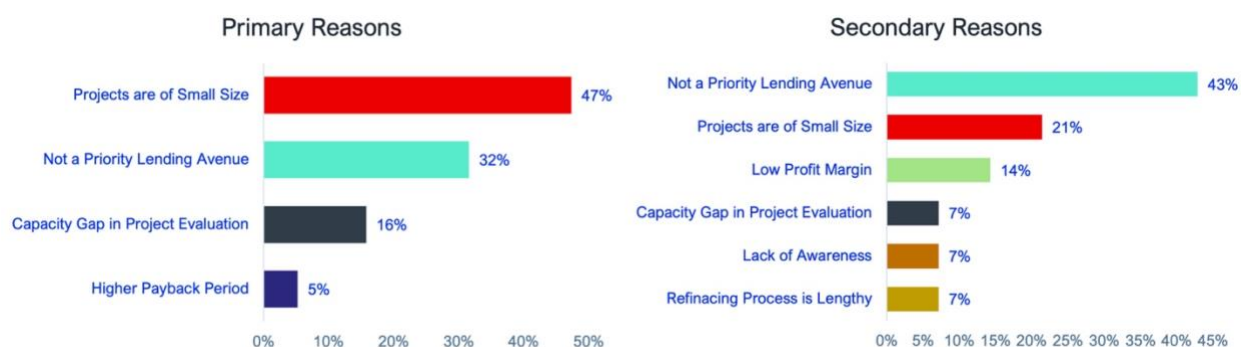
<sup>55</sup> Apparel Insider. [BGMEA Joins UN Climate Charter](#). 8 July 2019.

project size” and “not being a priority” affect financial institutions’ motivation to lend for rooftop solar projects.<sup>56</sup> Low profit margins and bankers’ capacity gap in project evaluation also impact their decisions on loans for rooftop solar. Further evaluation illustrates that these factors are linked to the perceived risks of financial institutions.

Individual responses exhibit that almost half of the stakeholders believe the small scale of rooftop solar projects is a deterrent for lenders (Figure 14). Nearly one in three say that rooftop solar does not feature in the priority lending list of financial institutions.

The secondary reasons reinforce the notion that project size, lending priorities and low profit margins make bankers indifferent to rooftop solar.

**Figure 14: Why Financial Institutions are Less Interested in Rooftop Solar**



## Collateral

The collateral requested by financial institutions in Bangladesh demonstrates their perceived risks in lending to rooftop solar systems. Financial institutions prefer fresh security since existing industries are already mortgaged to other lenders against their previous loans. For instance, to make the loan fully secured, bank guarantees, personal guarantees and/or assets, such as land, are sought. Stakeholders find the cost of the collaterals too high, which eventually dissuades investors from taking loans for rooftop solar projects.

## Existing Business Models

Companies with capital constraints and no intention to invest in non-core operations prefer the OPEX model to the CAPEX model.<sup>57</sup> However, most rooftop solar projects in Bangladesh are implemented under the CAPEX model. According to the stakeholders, EPC companies want to free their resources

<sup>56</sup> Score of major responses: Projects are of small size =  $9 \times 2 + 3 \times 1 = 21$ ; Not a priority lending avenue =  $6 \times 2 + 6 \times 1 = 18$ ; Capacity gap in project evaluation =  $3 \times 2 + 1 \times 1 = 7$ .

<sup>57</sup> EPC companies invest in OPEX model as opposed to the capital expenditure (CAPEX) model where building owners such as industries invest.



quickly and are more inclined towards the CAPEX model. Similarly, perceived risks linked to offtakers' (building owners') payment delays or defaults against their solar energy consumption hinder rooftop solar projects under the OPEX model.

Interviewees say the OPEX model is gaining popularity, albeit slowly. As demand for the opex model increases in the foreseeable future, sufficient creditworthiness of EPC companies and their equity commitment would be important preconditions for securing enough loans from financial institutions to simultaneously implement projects.

Stakeholders further agree that the significant uptake of the lease model will hinge on the success of the tender floated by the government in July 2023 to implement rooftop solar systems in 13 jute mills.

### Green Refinance Scheme

Bangladesh's central bank made net-metered rooftop solar eligible for refinancing of up to Tk10 crore (US\$0.91 million).<sup>58</sup> Stakeholders have reservations about the refinance process. They say it is lengthy, and the scheme limits financial institutions' interest rate margin to 3%, making such loans less profitable.

However, in August 2023, the central bank raised financial institutions' interest rate margin limit to 4%, making the refinancing scheme more profitable for them. As the central bank will charge only 1% interest against the refinancing amount, the cost of borrowing will not exceed 5%.<sup>59</sup> Such a timely change will garner interest in rooftop solar, both among financial institutions and building owners.

Yet, sectoral experts and bankers point out a major drawback of the refinancing scheme. A financial institution first conducts due diligence and then approves and disburses a loan at a prevailing market rate. It then applies to the central bank for low-cost refinancing. Since the refinancing scheme covers environment-friendly projects across 70 categories, including rooftop solar, the competition for a refinance facility of Tk4 billion (US\$36.4 million) appears too high.<sup>60</sup>

### De-risking Rooftop Solar Projects

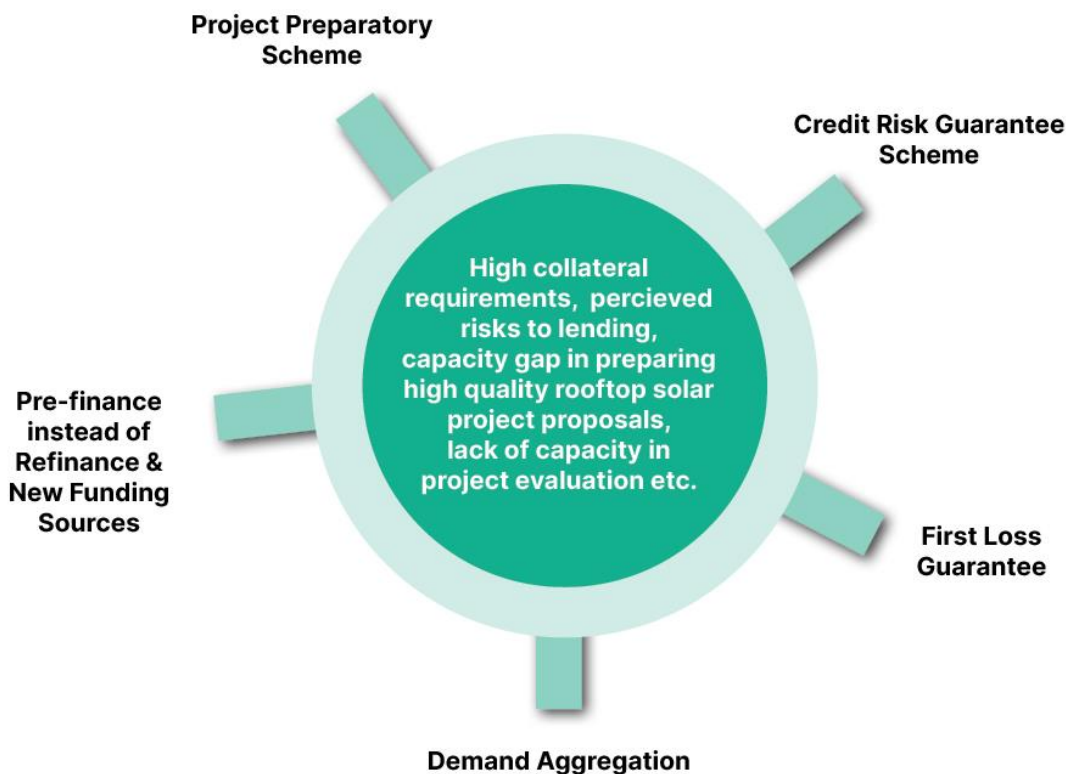
Unless the perceived risks attached to the payment delay/default of consumers, including offtakers or EPC companies, are addressed, the flow of debt financing to the rooftop solar sector is unlikely to surge. This section proposes a de-risking mechanism for rooftop solar projects based on the interview results.

<sup>58</sup> Sustainable Finance Department, Bangladesh Bank. [SFD Circular No. 02. Poribeshbandhob Ponno/Udyog/Prokolper jonno Punoh Orthayon Scheme](#) [Refinance Scheme for Environment-friendly Products/Projects/Initiatives]. 30 April 2020.

<sup>59</sup> Sustainable Finance Department, Bangladesh Bank. [SFD Circular No. 02. Poribeshbandhob Ponno/Udyog/Prokolper jonno Punoh Orthayon Scheme](#) [Refinance Scheme for Environment-friendly Products/Projects/Initiatives]. 30 August 2023.

<sup>60</sup> Ibid.

Figure 15: De-risking Mechanism for Rooftop Solar



Source: IEEFA Analysis

The first step in the lending process for a financial institution is to analyse a project proposal with feasibility and measures to mitigate risks. Since most industry and building owners do not want to invest in feasibility studies, and all financial institutions do not have sufficient capacity to evaluate a rooftop solar project, developing a project preparatory scheme within the framework of technical assistance from a multilateral agency could address this challenge. Supported by the project preparatory scheme, bankers will receive investment-ready proposals.

Introducing a credit risk guarantee scheme will help financial institutions mitigate their exposure to risks that emerge if a borrower, be it a building owner or an EPC company, defaults on the loan or falls behind on payments. A credit risk guarantee scheme would also reduce borrowers' demand for high collateral. This instrument can potentially increase funding to EPC companies to accelerate projects under the OPEX model.

The OPEX model is pivotal for rapidly upscaling rooftop solar in Bangladesh. However, EPC companies are exposed to the risk of offtakers (building owners) defaulting. A first-loss guarantee scheme could minimise the risks of EPC companies and thus accelerate the implementation of rooftop solar projects under the OPEX model.

On the other hand, stakeholders suggest a pre-financing mechanism to avoid the uncertainty financiers and investors experience with the refinancing scheme. A financial institution first disburses a loan to an investor at the prevailing market rate and claims the low-cost refinance afterwards. Instead, the central bank could review the rooftop solar project proposal at an early stage when a financial institution evaluates the same. Once convinced, the central bank may channel low-cost finance following the approved loan by a financial institution. This will signal at the beginning whether the project will receive low-cost funding.

Rooftop solar is still at a nascent stage in Bangladesh and has a long way to go. The available refinance scheme of Tk4 billion (US\$36.4 million) and the finance facility of IDCOL are not enough for a rapid expansion of the sector. A new combined capacity of 1,000MW rooftop systems presents a debt financing opportunity of about Tk56 billion (US\$510 million).<sup>61</sup> Therefore, the country's financial sector should explore international low-cost finance options to meet the demand for the rooftop solar sector. One insurance company has already invested in a sustainability-linked bond, fully guaranteed by GuarantCo, in the project of a local automobile company that envisions producing environment-friendly mobility solutions. A similar bond could help finance Bangladesh's rooftop solar sector.<sup>62</sup> Since the central bank prepared a policy for green bond financing in 2022, financial institutions can issue bonds to stimulate sustainable investment in rooftop solar.<sup>63</sup> The low-cost funding channel of multilateral development banks (MDBs) could also help manage the growing funding need for the sector. IDCOL and other financial institutions have experience utilising MDBs' funds for different environment-friendly projects. Additionally, Bangladesh could design projects to facilitate international climate finance.

Small-scale rooftop solar projects do not attract financial institutions due to transaction costs. A demand aggregation, leading to a sizeable volume combining several industries or buildings, could encourage financial institutions to leverage loans. We further discuss demand aggregation in the section Business Models and Revenue Streams for Utilities.

Although the five approaches will help de-risk rooftop solar projects, targeted events should be organised by SREDA to inform major stakeholders of the changes in relevant policies. For instance, industries, commercial buildings and EPC companies are not aware of the recent reduction in interest rates for the refinancing scheme of environment-friendly projects.

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<sup>61</sup> Stakeholders share that investment for a 1MW rooftop system varies from Tk65 million to 75 million. Taking an average of the two figures, investment need for rooftop solar systems of 1,000MW capacity will be  $= 1,000 \times 70 = \text{Tk}70,000 \text{ million} = \text{Tk}70 \text{ billion}$ . Assuming a debt-equity ratio of 80:20, the demand for debt finance for rooftop solar systems of 1,000MW capacity will be  $= 70 \times .8 = \text{Tk}56 \text{ billion}$ .

<sup>62</sup> Prothom-Alo. [MetLife Invests nearly Tk 2.6 billion in Bangladesh's First-ever Internationally Certified Sustainability Bond](#). 8 August 2023.

<sup>63</sup> Sustainable Finance Department, Bangladesh Bank. [SFD Circular No. 05, Policy on Green Bond Financing for Banks and Financial Institutions \(FIs\)](#). 18 September 2022.

## Market and Quality Assurance

Rooftop solar may help industrial consumers address two problems – interruption in power supply during the day and soaring power bills.<sup>64</sup> According to the interviewees, more industries are now inclined to rooftop solar due to energy price shocks and supply disruptions during 2022-23. EPC companies are still concerned about the rooftop solar business. Despite receiving increasing requests for rooftop solar project proposals, EPC companies have downgraded their expectations as many investors are dilly-dallying in making the final decision on rooftop solar implementation. The delay in issuing letters of credit (LCs) to import rooftop solar accessories also affects project implementation.

Although the installed rooftop solar capacity under net metering is the highest in 2023 since the approval of the net metering guidelines in 2018, market demand is yet to surge to a level that could result in a modest 2,000MW capacity over the next two to three years.

Moreover, stakeholders warn that the big EPC companies may have work orders, but smaller companies experience significant uncertainties in the rooftop solar business.

### Service Quality of EPC Companies

Most stakeholders believe that some big EPC companies can deliver quality installation and post-implementation operation and maintenance services, but small companies do not have sufficient capacity. As highlighted by interviewees, some small companies make aggressive offers to tempt industries to take up rooftop solar projects. These companies cannot maintain the desired quality, setting a bad precedent for others.

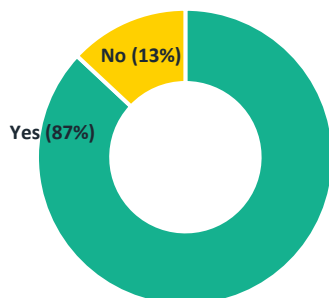
While the existing solar companies can manage the current level of work orders, a sudden surge in demand for rooftop solar will test their overall capacity to manage a high volume of projects simultaneously.

### Quality of Rooftop Solar Accessories

Stakeholders almost unequivocally agree that the quality of accessories affects the upscaling of rooftop solar in Bangladesh.

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<sup>64</sup> The Business Standard. [A Green shift: Why Industries are Loving Rooftop Solar Solution](#). 4 September 2023.

**Figure 16: Does Quality of Accessories Impact Rooftop Solar Sector?**

Interviewees say that small companies often compromise on quality in small-scale projects. However, the chance of selling substandard accessories is slim in larger projects and those implemented under the OPEX model.

### Measures to Address Market and Quality Issues

Since the delay in LC processing affects the growth of rooftop solar, regulatory directives must send the right signal to banks issuing an LC. Although the devaluation of local currency and tight fiscal conditions have prompted the government to reduce LCs for luxury goods, solar accessories should automatically fit within the bracket of essential goods for several reasons. First, rooftop solar will help limit imported fossil fuel consumption and reduce pressure on waning foreign currency reserves. Secondly, by removing barriers related to LCs, Bangladesh could utilise the motivation boost for rooftop solar projects as the country struggles to ramp up renewable energy capacity.

The National Board of Revenue (NBR) could declare solar accessories “essential goods” entirely based on public interest and the net positive role of rooftop solar on the economy. Furthermore, the central bank could direct banks to swiftly open LCs for solar accessories to help solvent clients advance their projects.

On the other hand, the precondition for quality assurance is to weed out substandard accessories from the market for which sufficient sample testing is essential. Given there are only a few labs available for quality checks of solar accessories in the country, the number of facilities should be increased for quality assurance and to boost investors’ confidence. Increasing the number of testing labs is relevant as the recent change in regulation requires new buildings to install rooftop solar for

securing grid connections. Notably, there was a discussion on establishing 69 testing labs, but no progress has been made to date.<sup>65</sup>

The presence of quality EPC companies, service providers and traders in the local market can ensure standards for solar accessories, which SREDA fixes. While SREDA has a list of EPC companies, service providers and traders of solar accessories on its webpage, there is no screening mechanism to choose quality EPC companies or service providers. As such, SREDA could introduce a feedback mechanism, seeking industry and building owners' views on the quality of service and accessories they receive from EPC companies and service providers. Based on performance records, future investors may select their preferred EPC companies and service providers from SREDA's list.

Moreover, the Bangladesh Standards and Testing Institute (BSTI) should monitor the market and enforce standards for solar accessories.

## Perspectives of Utilities

### Utilities – Enablers or Deterrents?

Rooftop solar is the wave of Bangladesh's present and foreseeable future as industries plan to go green, and new buildings need to set up solar systems for their grid connections. Here is an apparent conflict when the role of utilities is to earn revenue from selling electricity to the consumers; their revenue may fall as the number of rooftop solar systems increases. Nevertheless, interviewees, including respondents from utilities, feel that the business risk from rooftop solar is minimal. As power demand will continue to soar in the future, and uninterrupted electricity supply remains a major concern, rooftop solar is important.

Utilities have been accustomed to sending electricity in one direction from their centralised power plants through their transmission and distribution channels against payments from customers of different tariff categories. Now that they allow electricity flow to their network from decentralised systems, they should incorporate favourable business models to enable them to earn revenues. With growing rooftop solar systems, utilities will lose revenue from high-paying industrial and commercial consumers, affecting their business. Although utilities in Bangladesh are not profit-driven, revenue from rooftop solar will motivate them and ensure their long-term sustainability.

### Business Models and Revenue Stream for Utilities

Utilities need a comprehensive plan to operate sustainably in the rooftop solar sector. This is due to the regulation changes that require new buildings to install a minimum quantity of rooftop solar systems to secure grid connections. Similarly, scaling up rooftop solar in the country depends on the

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<sup>65</sup> The Business Standard. [Experts Emphasise Quality Management of Rooftop Solar Equipment](#). 14 February 2022.

engagement of utilities as financial institutions are reluctant to extend debt finance to small rooftop systems.

The demand aggregation, combining a sizeable capacity from industries of specific distribution areas, could help utilities earn revenue and rapidly expand rooftop solar in the country. Financial institutions may reduce transaction costs in lending if demand is aggregated compared with financing small-scale projects separately.

For demand aggregation, Bangladesh may choose from different business models based on relevance and ease of deployment. A consumer, a third party or a utility may own such models.<sup>66</sup> The utility is a demand aggregator and a facilitator in all models. It also invests in the utility-owned model.

As EPC companies and consumers/building owners have difficulty obtaining loans, the utility-owned business model appears suitable for Bangladesh. Within this framework, a utility aggregates demand for rooftop solar from selected building facilities, takes debt finance, selects an EPC company for installation and maintenance service and facilitates the inflow of solar energy to the network (Figure 17). Consumers pay for solar energy at an agreed price under a power purchase agreement (PPA) with a utility but for grid energy consumption at prevailing tariff rates. The revenue prospects of this model could motivate utilities to intensify their efforts to upscale rooftop solar.

Utilities may explore low-cost financing avenues of multilateral agencies. Bangladeshi utilities already have experience working with multilateral agencies such as the Asian Development Bank (ADB) and the World Bank.

The third-party-owned model could also catalyse the expansion of rooftop solar systems (Figure 18). Utilities would aggregate demand and select EPC companies for implementing and operating solar systems through a competitive process. This model requires EPC companies to invest through a tripartite power purchase agreement (PPA), under which the utility must acquire power produced from a rooftop solar system. While utilities charge a facilitation fee and margin from trading electricity generated from rooftop solar, the consumer pays a negotiated price for the quantity of electricity generated from the solar system under a power supply agreement. For the remainder of the energy, the consumer follows the prevailing tariffs.

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<sup>66</sup> Asian Development Bank (ADB). [Guidebook for Demand Aggregation: Way Forward for Rooftop Solar in India](#). December 2022.

Figure 17: Utility-owned Business Model

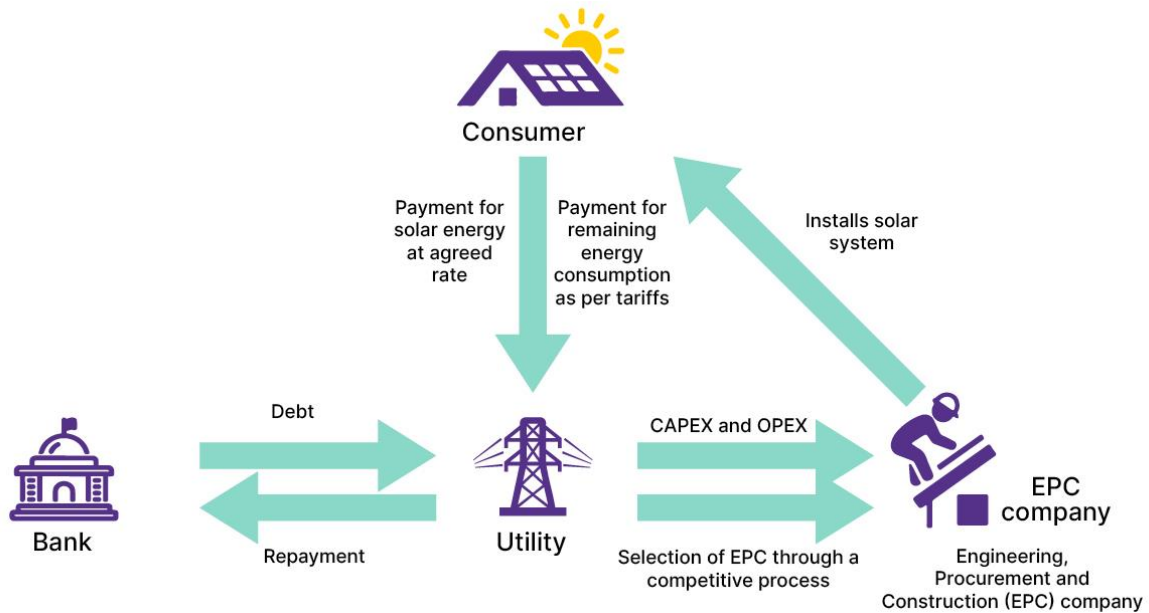
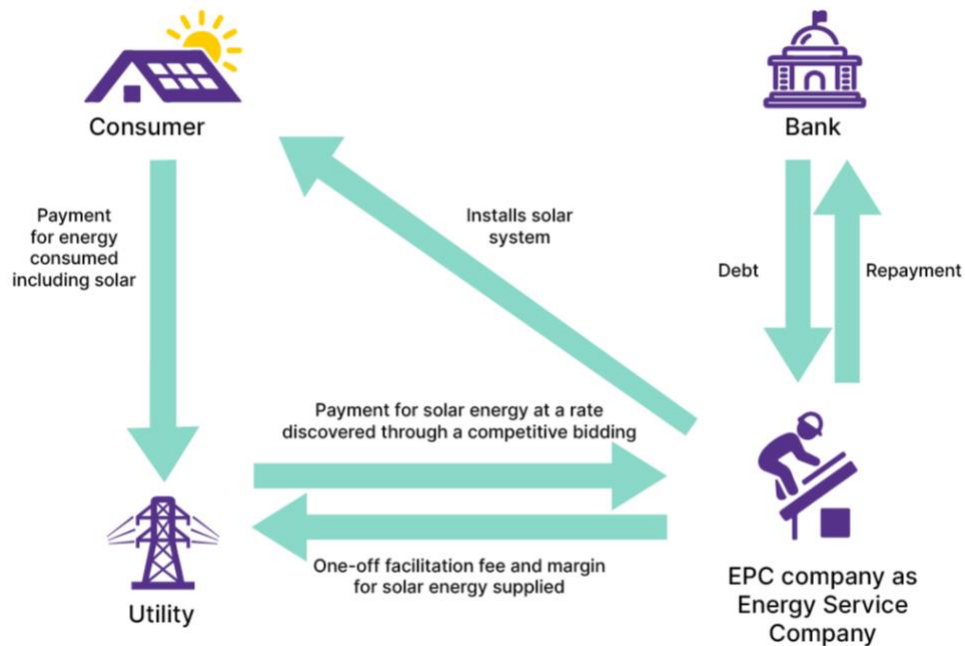


Figure 18: Third-party-owned Business Model



Source: Adapted from ADB Report<sup>67</sup>

<sup>67</sup> Asian Development Bank (ADB). *Guidebook for Demand Aggregation: Way Forward for Rooftop Solar in India*. December 2022.



## Regulatory Support, Policy, and Incentive

### Renewable Energy Web Portal and Solar Helpdesk

SREDA's physical solar helpdesk and web portal for renewable energy with essential features, such as policies, standards and a list of solar EPC companies, are fundamental tenets for expanding renewable energy, including rooftop solar, in the country. However, many stakeholders raise that rooftop solar investors and bankers are oblivious to the services SREDA offers. They suggest the solar helpdesk should go beyond providing only information for solar projects. It should pursue follow-up activities to determine how many interested investors have implemented rooftop solar, what holds back the remainder of the investors from their rooftop solar projects, and how the solar helpdesk could assist them.

Since SREDA launched the solar helpdesk in August 2021, stakeholders feel it is time to assess the helpdesk to gauge how well it has performed, what has not worked and what SREDA needs to improve or incorporate into the service. Moreover, SREDA should craft a long-term plan for the sustainability of the solar helpdesk as demand for information will likely increase.

### Incentivise Rooftop Solar

The high import duties on rooftop solar accessories do not create a level playing field, as utility-scale solar projects are exempt. Stakeholders note that total tax incidences of 1% customs duty on imported solar panels eventually become 11.2%. This is because additional taxes are applicable on 1% customs duty. Likewise, fibre-reinforced polymer (FRP) walkways, imported inverters, mounting structures and direct current (DC) cables are subject to import duties ranging from 15.25% to 58.6%.<sup>68</sup>

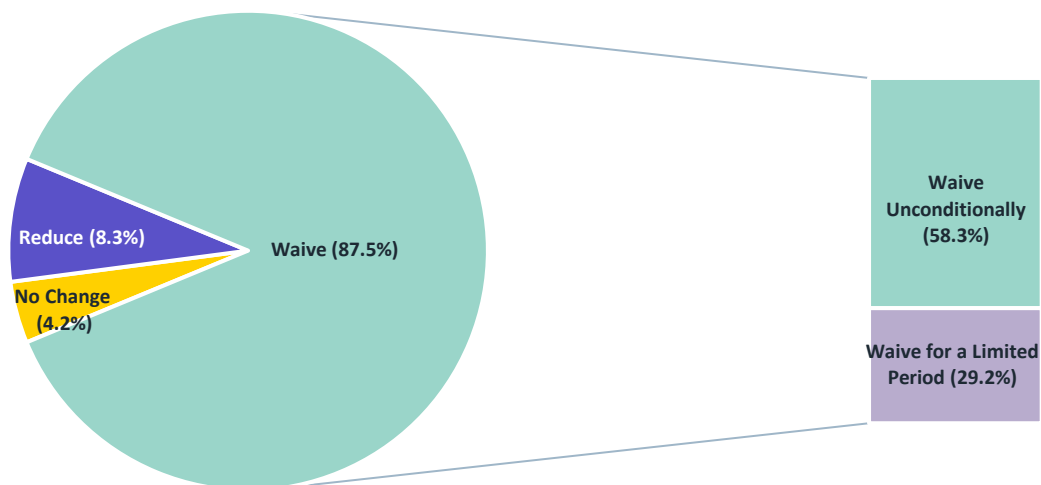
If the government waives these disproportionate duties on rooftop solar, it will be a deeper motivator for the industries and other building owners.

The vast majority of respondents argue that the high import duties on rooftop solar accessories are of significant concern and the government should waive them for rooftop solar projects (Figure 19). This will level the playing field for rooftop solar with utility-scale solar projects.

Notably, most stakeholders feel that the duty waiver should be unconditional, but one-third of them support a conditional waiver for a specific time of a year or two to assess the impacts.

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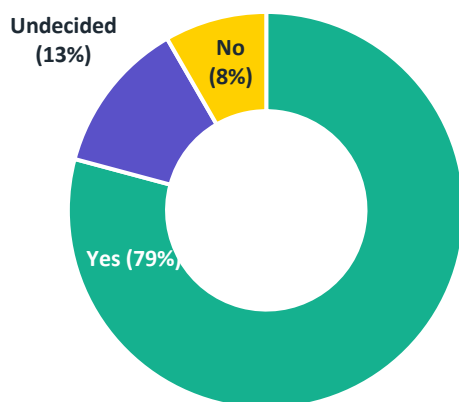
<sup>68</sup> IEEFA. [Charting an Electricity Sector Transition Pathway for Bangladesh](#). 5 April 2023.

**Figure 19: Should Import Duties on Rooftop Solar Accessories be Waived?**

In addition to the duty waiver, reward and recognition would inherently motivate industries and building owners to pursue rooftop solar. Since rooftop solar is considerably cheaper than grid electricity and drastically reduces energy bills when the sun is available, most stakeholders do not see the need to provide financial incentives to building owners amid the country's tight fiscal conditions. Instead, annual recognition of the best rooftop solar projects in events like the National Environment Award could encourage others to install rooftop solar projects. Bangladesh may introduce the National Clean Energy Award and provide a certificate of annual clean energy generation and emission reductions to eligible industries and building owners through a competitive process.

## The Need to Change Regulations

Regulations limit the maximum installed capacity of a rooftop solar system to 70% of the sanctioned load of a building, say industry. Although many industries, commercial buildings or relevant establishments cannot even fulfil the 70% cap, some buildings have more capacity to install. A total of 79% of the stakeholders suggest that the government should lift this cap on installed and increase it to 100% of the sanctioned load.

**Figure 20: Views on Lifting the Cap on Rooftop Solar Capacity**

While the government sticks to the 70% cap to ensure that no building becomes a net electricity exporter to the grid, even with a rooftop solar system capacity equalling the sanctioned load, different buildings will not become net exporters. For instance, an average generation of four to five hours a day will not lead to a surplus generation for an industry that normally operates longer hours. In the unlikely event that an industry remains closed for a prolonged period, it can be a net exporter. Such cases will be few and far between. Rather, stakeholders maintain that lifting the cap on rooftop solar installation capacity will be a pragmatic decision considering the government's enhanced goal for renewable energy and the prevailing energy sector challenges.

## Changing the Status Quo

### Present Scenario – Stakeholders' Overall Interest in Rooftop Solar and Capacity

This section examines the interest and capacity of seven important stakeholders, namely SREDA, EPCs, the Bangladesh Solar and Renewable Energy Association (BSREA), industries, commercial buildings, financial institutions, and utilities.<sup>69</sup>

Based on the stakeholders' responses on their interest and capacity on a scale of four, it appears that EPC companies and SREDA are highly interested in the rooftop solar sector (Figure 21).<sup>70</sup> While the BSREA and industries have received higher-than-average scores in the interest category, utilities and financial institutions have lower-than-average scores. Commercial building owners have very low interest in rooftop solar.

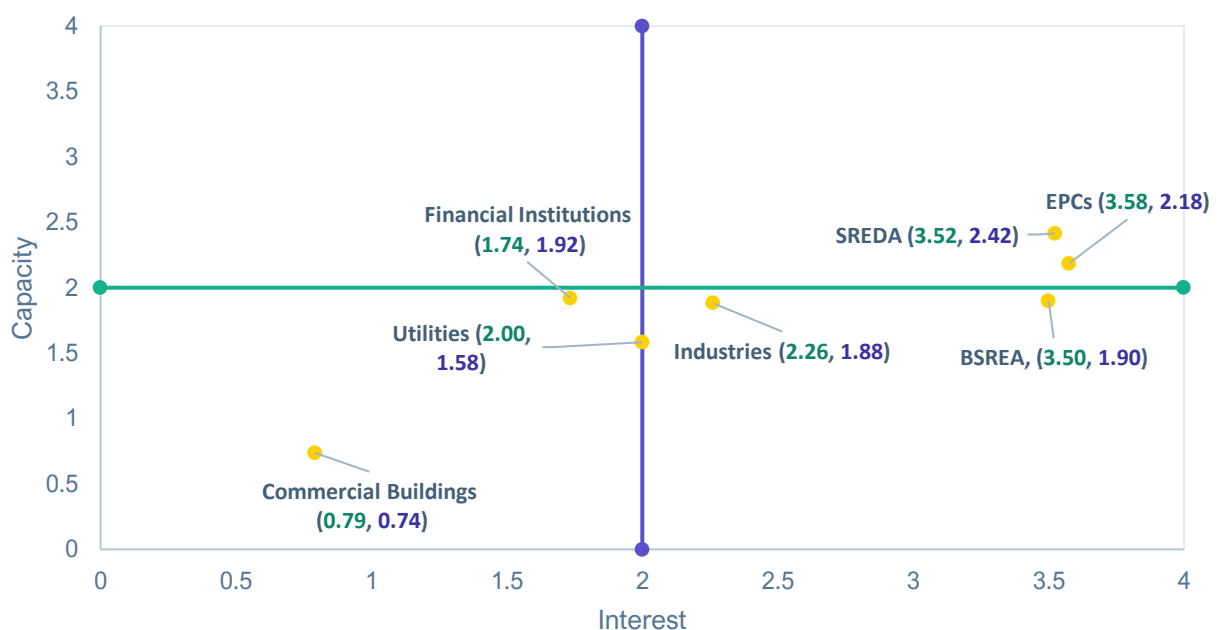
<sup>69</sup> Academic Institutions are excluded.

<sup>70</sup> Score 0 = no interest, 2 = average interest and 4 = maximum interest; Similar scoring is used for the assessment of capacity.

On the other hand, SREDA has scored more than average on the capacity to formulate policy/regulation and coordinate and monitor the rooftop solar sector. This includes SREDA's ability to conduct awareness-raising and capacity-development training for stakeholders.

EPC companies have an above-average score, meaning they need capacity development support for quality project implementation and post-implementation services. This score reflects that although some good EPCs operate in Bangladesh, most small service providers cannot adhere to quality.

**Figure 21: Comparative Scoring of Stakeholders**



According to the sectoral experts, financial institutions, the BSREA, industries and utilities have less than average capacity in their respective areas of rooftop solar projects.

Finally, commercial building owners have low capacity, matching their low interest in rooftop solar projects.

### Role of Stakeholders: How SREDA Should Evolve for the Big Jump

As energy sector challenges have intensified, expectations from SREDA have increased, be they on conducive policy formulation, capacity development of stakeholders, or removing market barriers. Stakeholders envisage SREDA, the nodal agency for clean energy promotion, to instil leadership and help accelerate change in the rooftop sector, restrained by its slow progress.

At the micro level, SREDA should focus more on awareness-raising and training programs to enhance motivation and develop the capacity of stakeholders. Such events are highly expedient

amid the capacity gaps among almost all major stakeholders (Figure 21). A plethora of changes, including net-metered rooftop solar targets for new grid connections and the reduced interest rate of the refinancing scheme for environment-friendly projects, highlight the need for greater information dissemination and awareness raising events.

Stakeholders expect technical assistance from SREDA for the scale-up of rooftop solar in addition to the information it offers through the solar helpdesk and web portal. Since a development agency supports the helpdesk, stakeholders agree that SREDA should prepare a plan for ownership and long-term sustainability of the help desk.

According to sectoral experts, SREDA should take measures to substantiate that rooftop solar should be a priority for the government. To put utility-scale and rooftop solar on an equal footing, SREDA needs to coordinate with the Ministry of Power, Energy and Mineral Resources and the NBR to waive import duties based on an assessment of the net benefits. This should include a comparative analysis of the one-off import duties from rooftop solar accessories against the clean energy benefits of rooftop solar throughout its lifecycle.

SREDA should eliminate the 70% cap on the total installed capacity of rooftop solar projects, increasing it to 100%. This will not make a building owner a net energy exporter, barring the unlikely event that an industry is closed for an extended period.

Since Bangladesh imports solar panels and accessories, such as inverters, walkways, DC cables and mounting structures, expediting the LC opening process for rooftop solar is urgently needed. SREDA should collaborate with the NBR and central bank to speed up the LC opening process for rooftop solar accessories as essential goods.

Due to project quality issues, stakeholders suggest SREDA initiate professional certification for solar service providers. As new buildings, even with single-phase connections, must now install rooftop solar to obtain grid connections, demand for small-capacity systems will soar. Unless properly monitored, this may again result in poor-quality solar installations that generate little or no energy. Although the BSTI conducts periodic market monitoring for quality assurance, a broader collaboration with SREDA is imperative.

Moreover, SREDA could forward a proposal to increase the number of testing labs in the country, comprising the rationale and potential funding sources, to the Power Division of the Ministry of Power, Energy and Mineral Resources.

To help drive the transformation to rooftop solar, SREDA itself needs to grow. The interviewees believed SREDA has resource constraints and should recruit more professionals, including engineers, financial analysts and economists.

### How the BSREA can be More Effective

An association helps its members flourish in business and provides support during exigency. It also negotiates with the government on relevant policies and regulations of national and sectoral interest to make them more conducive.

However, stakeholders reveal that the BSREA has yet to meet the expectations of the renewable energy sector, including rooftop solar. They feel it should advocate for the government to waive the import duty on rooftop solar accessories, engage more with the policymakers and provide input to the national energy policy formulation process.

The BSREA may work on developing the capacity of stakeholders, such as EPC companies and financial institutions, on a fee basis to generate revenue for its sustainability. This posits the need for the BSREA's capacity enhancement, such as recruiting full-time technical staff.

Furthermore, the BSREA should increase its membership base to represent all renewable energy companies in the country.

### Other Major Stakeholders Should Step Up

Although the popularity of rooftop solar is increasing gradually, capital scarcity remains one of the major inhibitors to its growth in Bangladesh. With IDCOL's capacity constraint to finance rooftop solar up to 300MW by 2025, other financial institutions should come forward.<sup>71</sup> The rooftop solar sector could be a significant part of their portfolios. As the refinancing scheme is limited to Tk4 billion (US\$36.4 million) for environment-friendly projects of 70 types, and there is a large shortage of available capital, they need to look at new avenues of finance. More importantly, all financial institutions could develop a dedicated renewable energy finance wing to better understand the ecosystem and its risks and craft solutions. The central bank may provide annual renewable energy financing targets to financial institutions.

The EPC companies and service providers, especially smaller ones, should work on maintaining quality and retaining staff. On the other hand, the utilities are likely to remain constrained without additional staff. As new buildings with single-phase connections are compelled to set up rooftop solar, applications for net metering will increase drastically. Therefore, utilities will require more human resources to meet this demand.

Lastly, building owners, including industries and commercial buildings, could draw lessons from successful rooftop solar projects. Periodic events conducted by SREDA could help raise awareness of building owners and remove information asymmetry on the cost of refinancing and net-metering regulation.

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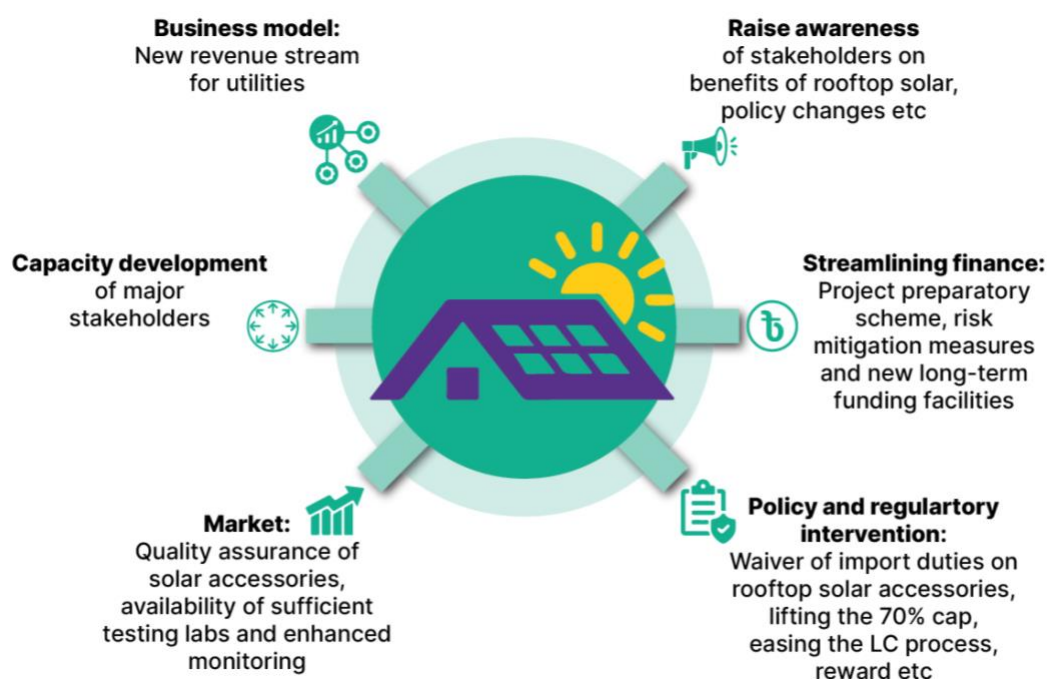
<sup>71</sup> The Daily Star. [IDCOL to Finance 300MW Solar Projects by 2025](#). 10 March 2023.

## Recommendations and Way Forward

Bangladesh needs to design a market that incentivises and de-risks investments in rooftop solar to promote it at a faster pace and scale. The policy and regulatory measures put in place will set the course of rooftop solar for years to come.

The study identifies six key levers to address the hurdles facing rooftop solar in Bangladesh quickly and effectively. These are raising awareness, streamlining finance, policy and regulatory intervention, quality assurance, a business model for utilities and capacity development of major stakeholders.

Figure 22: Key Levers to Accelerate Rooftop Solar



### Raising Awareness

Awareness and complete, up-to-date information are not evenly distributed among the stakeholders of the rooftop solar sector. Ideally, stakeholders, such as building owners and EPC companies, can swiftly assimilate information on the benefits of rooftop solar, changes in regulations and interest rates, and make prudent investment decisions.

Tellingly, many stakeholders are unaware of the government changes to net metering and interest rates of the refinancing scheme in late 2023. They have the impression that the cost of refinancing is still high when it is the lowest-cost financing avenue for green projects available locally. Likewise,

some stakeholders are still not fully convinced about the benefits of rooftop solar, mostly due to systems that were installed to secure grid connections but are no longer functional.

Periodic events and exposure visits to successful projects, supported by SREDA, could raise awareness and remove information asymmetry on rooftop solar, the cost of refinancing and net-metering regulations.

## Streamlining Finance

The slow progress of the rooftop solar sector is, in part, due to the crippling challenges of accessing capital. Financial institutions see far greater risk in Bangladesh, demanding high collateral from industry and building owners in the capex model and thus penalising them heavily. Therefore, building owners with capital constraints prefer the OPEX model, where EPC companies take care of loans. Financial institutions feel the same risks in the OPEX model, too.

Although the number of projects under the OPEX model is increasing, EPC companies want to free up resources in favour of the CAPEX model. The risks of offtakers' repayment delay or loan default epitomise the reluctance of EPC companies to undertake projects under the OPEX model.

A project preparatory scheme would help develop high-quality feasibility studies of rooftop solar projects, giving confidence to financial institutions. This could be done within the framework of technical assistance from multilateral agencies. Moreover, a credit risk guarantee scheme would minimise the risks of financial institutions lending for projects under both CAPEX and OPEX models. A first-loss guarantee scheme could reduce the risks of EPC companies, and thus accelerate the implementation of rooftop solar projects under the OPEX model.

While the central bank's green refinancing scheme is the cheapest source of debt finance available in Bangladesh, banks disburse loans at prevailing rates before they can apply for refinancing. As 70 green sectors compete for the same limited funding of Tk4 billion (US\$36.4 million), all rooftop solar projects with investment-grade credit ratings are unlikely to receive low-cost financing. To dispel this uncertainty, the central bank could pre-approve finance based on a detailed evaluation of projects at the application stage.

IDCOL's rooftop solar facility is also lucrative. Yet, along with the refinancing scheme, its facility will be grossly insufficient to expand rooftop solar in the country. Financial institutions should be equipped to meet the demand for incremental investment in the sector. They should explore funding sources, including multilateral agencies, international climate finance and the local bond market.

## Policy and Regulatory Traction

Of the various options analysed, this study substantiates that rooftop and utility-scale solar should have a level playing field. Waiving import duties on rooftop solar accessories, ranging from 11.2% to 58.6%, at least for a limited period, would make it compatible with utility-scale solar. Increasing the



threshold for rooftop solar installation to 100% of the sanctioned load would provide a major boost in the sector.

The restriction on imports of luxury goods due to the foreign currency shortage has proved counterproductive for rooftop solar accessories. As rooftop solar does not fall under the essential goods category, the opening of LCs for rooftop solar projects is delayed, like luxury goods. The banking sector regulator and the NBR should take steps to minimise this delay by declaring rooftop solar essential.

To accelerate the pace of implementation, the Bangladesh Bank may set up financial institutions with an annual disbursement target on renewable energy, including rooftop solar.

Moreover, awards and recognition would motivate industry and building owners to pursue rooftop solar. With rooftop solar considerably cheaper than grid electricity and tariffs better than those rates that spurred the massive expansion of rooftop solar in Vietnam, most stakeholders don't feel the urgency to provide financial incentives to building owners amid the tight fiscal conditions of Bangladesh. Instead, an annual recognition of the best rooftop solar projects at the National Environment Award ceremony could encourage installation. Bangladesh could introduce the National Clean Energy Awards and provide a certificate of annual clean energy generation and emission reductions to eligible industries and building owners through a competitive process.

## Quality Assurance

Both market monitoring and testing of rooftop solar accessories are key to ensuring quality. As changes in regulations compel new buildings to install rooftop solar to secure grid connection, the number of small rooftop solar units will rise sharply, creating concern about poor-quality installations. Without consistent monitoring and quality checks, small units may only be used to obtain grid connections and become stranded assets that generate little, if any, energy. This is similar to how the lack of monitoring left rooftop solar units stranded following the previous directive for newly constructed urban houses to harness at least 3% energy from renewables to obtain new grid connections.

As the country has insufficient testing labs, they should be increased for quality assurance and to boost investor confidence. SREDA could introduce a feedback mechanism, seeking building owners' views on the quality of service and accessories they have received from EPC companies and service providers. Based on performance records, future investors can select their preferred EPC companies and service providers from SREDA's list. SREDA should also initiate a certification for service providers.

Additionally, the BSTI should monitor the market and enforce standards set for solar accessories.

## Business Model for Utilities

Utilities – with their specialisation in power generation, transmission, and distribution – have a big role in the paradigm shift towards rooftop solar systems. The discussions with stakeholders show that utilities are unfazed about the prospect of rooftop solar, but they are not moving fast. Utilities have little or no motivation to accelerate rooftop solar projects without business models that reward. Both the utility- and third-party-owned business models can be a source of revenue for utilities, incentivising them to multiply their efforts in the rooftop solar sector.

With many building owners expected to install small rooftop units to comply with minimum solar targets for new grid connections, demand aggregation will be even more important for viability and quality assurance, and utilities will be an integral part of this.

Different utilities can also combine the rooftop solar potential of respective zones and thus conclude on the national rooftop solar market size, providing the signal to financial institutions on aggregate investment the sector will require. EPC companies and service providers can also prepare with certainty.

## Capacity Development of Stakeholders

The study concludes that major stakeholders of the rooftop solar sector lack capacity in terms of personnel, quality assurance or project appraisal.

Overall, the EPC companies and service providers, especially smaller ones, should work on maintaining quality in project implementation and post-implementation services. Financial institutions need to enhance capacity on rooftop solar project evaluation and could develop a renewable energy wing to address their challenges. Likewise, utilities need additional staff to manage the volume of net-metered connections applications and accelerate the sector's transformation with new business models.

SREDA should design and conduct targeted programs for the capacity development of different stakeholders. However, SREDA has resource constraints and should recruit more professionals, including engineers, financial analysts, and economists, and build on a pool of permanent staff to influence the clean energy sector, including rooftop solar.

These six levers will help create a framework that will result in faster deployment of rooftop solar and deliver benefits to energy consumers, service providers, utilities and the government.

Notably, import dependence has caused serious upheavals in Bangladesh's energy sector, leading to price hikes during 2022-23 and forcing industries to operate at lower capacities. Speeding up the transition to rooftop solar will help strengthen the power sector's resilience, reduce import dependence, and give consumers some energy independence.

However, piecemeal approaches to fixing the persisting gaps will be an opportunity missed for Bangladesh.

Finally, this report's neutral and evidence-based assessment of Bangladesh's rooftop solar sector provides a solid empirical base for future study.

## Annexure 1: Questionnaire Design and Selection of Interviewees

### Questionnaire Design

Reviewing Bangladesh's rooftop solar sector and the existing regulatory framework, this study identifies seven thematic areas with key points for a detailed assessment (Table 2).

**Table 2: Thematic Areas for Questionnaire**

Thematic Area	Key Points
√ <i>Role of rooftop solar in Bangladesh</i>	Probable role of rooftop solar in Bangladesh's energy sector and the true potential of rooftop solar in the country.
√ <i>Motivation of building owners</i>	What motivates building owners to install a rooftop solar system? Is the intervention a priority for them?
√ <i>Finance</i>	Challenges in obtaining loans from financial institutions. Capacity gaps of financial institutions, de-risking mechanisms to expedite loans, business models, etc.
√ <i>Perspective of utilities</i>	Risk factors for utilities in pursuing rooftop solar and the way out.
√ <i>Quality assurance</i>	Capacity of available solar EPC companies, quality of solar accessories and measures to ensure quality.
√ <i>Policy, regulation and reward</i>	Is it necessary to change policy or regulation and introduce a reward mechanism to incentivise the sector?
√ <i>Change the status quo</i>	Ways to help spur rooftop solar projects in Bangladesh. What roles can relevant organisations play in the transformation of the sector?

Based on seven thematic areas and key points, we prepared a questionnaire to grasp the perception of major stakeholders on rooftop solar. The full questionnaire is in [Annexure 2](#).

## Selection of Interviewees

The successful uptake of rooftop solar systems involves multiple stakeholders, spanning policy, finance, technology, market and quality assurance. To synthesise the views of major stakeholders, this study set nine criteria for selecting interviewees with sufficient experience in the sector.

**Table 3: Criteria for Selecting Stakeholder Groups**

Selection Criteria : Stakeholder Group	
√ <i>Involved in developing policy and regulation.</i>	
√ <i>Entrusted with responsibilities to steer and coordinate clean energy development in Bangladesh.</i>	: Participants from the relevant ministry, regulatory agency and utilities.
√ <i>Facilitates net metering connections, etc.</i>	
√ <i>Sales, installation and provision of after-sales service</i>	: Solar EPC companies.
√ <i>Extends debt finance</i>	: Banks and non-bank financial institutions.
√ <i>Relevant establishments</i>	: Managers of industries and commercial buildings.
√ <i>Sectoral expertise</i>	: Experts from the private sector and participants from development agencies.
√ <i>Policy, technology and market research</i>	: Academic institutions.
√ <i>Business body</i>	: Related association.

## Annexure 2: Questionnaire

### Role of Rooftop Solar and Potential in Bangladesh

1. According to you, what role rooftop solar could play in Bangladesh?
  - i. Achieve renewable energy goal
  - ii. Achieve Nationally Determined Contributions (NDCs)
  - iii. Reduce the average power generation cost of the Bangladesh Power Development Board (BPDB)
  - iv. Reduce fossil fuel imports
  - v. Others, if any .....
2. We often come across data that four to five thousand MW of rooftop solar capacity could be installed in the existing industries. What is your impression?
  - i. True potential on the existing buildings may be less
  - ii. Exact assessment of potential is needed
  - iii. Others, if any: .....

Reasons behind your response above:

- i. Roofs of many existing industries can't bear the load
- ii. Others, if any: .....

### Priority and Motivation

3. What is (should be) the main motivation for (industry/commercial building owners) to install rooftop solar?
  - i. Reduce energy cost
  - ii. Meet buyer's GHG mitigation compliance at a lower cost
  - iii. Achieve LEED-certified green factory status
  - iv. Help government meet renewable energy goal
  - v. Others, if any .....
4. Do you think industries/building owners consider rooftop solar a less priority?
  - i. Yes
  - ii. No

If yes, why?

- i. The business case is not strong
- ii. Energy is just a small fraction of the operating cost
- iii. Lack of finance
- iv. Higher interest rate
- v. Lack of technical capacity
- vi. Don't have trust in solar energy
- vii. Others .....

## Finance

5. Do the financial institutions (banks and non-bank financial institutions) lack the motivation to finance rooftop solar projects?
  - i. Yes
  - ii. No

If yes, why?

  - i. Capacity gap in understanding rooftop solar
  - ii. Rooftop solar projects are of small volume
  - iii. Others, if any: .....
6. a. Which business model is currently preferred for rooftop solar?
  - i. Capex model<sup>72</sup>
  - ii. Opex model<sup>73</sup>
  - iii. Lease Finance<sup>74</sup>
  - iv. Other, if any: .....

b. What are the reasons behind your response above?

.....
7. a. What are the collateral financial institutions ask against the loan for rooftop solar?
 

.....

b. Does collateral affect the loan approval process for rooftop solar? Please explain

.....
8. Is introducing a project preparatory scheme for project-specific feasibility a good idea? How this could encourage banks to extend loans to rooftop solar projects?
 

.....
9. Which instrument can minimise rooftop solar project risks?
  - i. Credit risk guarantee fund<sup>75</sup>
  - ii. Others .....
10. Can demand aggregation models<sup>76</sup> help upscale rooftop solar? How?
 

.....
11. In addition to green refinance schemes, which financing sources should be considered?
  - i. Multilateral Development Banks
  - ii. Climate Funds
  - iii. Others: .....

<sup>72</sup> Industry/building owner invests in rooftop solar.

<sup>73</sup> EPC company invests in rooftop solar and collects payments to cover investment and interest, and to make profits as per the power purchase agreement (PPA); EPC company will ensure the satisfactory operation of the rooftop solar system.

<sup>74</sup> EPC company will install rooftop solar system and take rentals on a monthly basis as per the agreement with the industry/building owner. The industry/building owner will ensure satisfactory operation of the rooftop system.

<sup>75</sup> Provides guarantees on loans to borrowers by covering a share of the default risk of the loan. ([Vienna Initiative Working on Credit Guarantee Schemes](#))

<sup>76</sup> Bringing together several colocated potential rooftop solar consumers, and the aggregated demand is presented as a single project to an installer or investor; This can provide economies of scale. ([Shakti Foundation](#))

### Market and Quality

12. a. Do you think Bangladesh has a sufficient number of solar EPC companies that would be able to install several thousand MW of rooftop solar capacity in the next several years (ensuring quality)?

i. Yes ii. No

If not, what should be done? .....

- b. What are the approaches that could assure quality installation and post-implementation service by solar companies? .....

13. Do you see any uncertainty in relation to rooftop solar projects? .....

14. There are concerns over the quality of solar accessories. According to your opinion, is the quality of solar accessories affecting the expansion of rooftop solar in the country?

i. Yes ii. No

If yes, how the sales and installation of only high-quality rooftop solar accessories could be ensured?

- i. Enhanced monitoring  
ii. Increase the number of testing labs  
iii. Others, if any: .....

15. Which entity should play the major role in the quality assurance of solar accessories?

i. SREDA  
ii. BSTI

### Perspectives of Utilities

16. In your opinion, do the utilities feel the risks of increasing rooftop solar capacity?

i. Yes ii. No

If yes, why?

- i. Business risk  
ii. Volume of works in giving net metering connections to small units of rooftop solar projects  
iii. Others, if any: .....

17. What measures could help address the perceived risks of utilities? .....



### Policy, Regulation and Reward

18. SREDA has a web portal and a help desk for solar energy. How effective have they been so far? What should be done in view of the need for ramping up rooftop solar capacity? .....
19. Can the enlistment of quality EPC companies be effective to build trust among the investors interested to install rooftop solar systems? How .....
20. Do you think the 70% cap on rooftop solar installation concerning the sanctioned load should be waived and why?.....
21. According to your opinion, is it a good idea to waive the existing import duties (15.25% to 58.6%) on rooftop solar accessories and why.....
22. Given that rooftop solar is already attractive, what kind of reward mechanism could help expedite rooftop solar in the country?
  - i. Annual recognition through events
  - ii. Publicising contributions of industries or commercial buildings through media
 Others, if any: .....

### Change the Status Quo

23. What measures SREDA, being the nodal agency for clean energy promotion in Bangladesh, could undertake to change the status quo in the rooftop solar sector?
 

Hints: Training, monitoring of progress, annual action plan, organising sessions with industries, banks and other stakeholders to reduce information asymmetry, improvement of SREDA online solar platform, visit to the best practice cases .....
24. What role Bangladesh Solar and Renewable Energy Association (BSREA) can play for the success of rooftop solar in Bangladesh? .....
25. How do you see the overall interest and capacity of the organisations involved in the rooftop solar systems?
 

*Interest* (on a scale of 4)<sup>77</sup>:

  - i. Industries
  - ii. Commercial Buildings
  - iii. EPC companies
  - iv. Financial Institutions
  - v. SREDA
  - vi. Utilities
  - vii. BSREA

*Capacity* (on a scale of 4)<sup>78</sup>:

  - i. Industries
  - ii. Commercial Buildings
  - iii. EPC companies
  - iv. Financial Institutions
  - v. SREDA
  - vi. Utilities
  - vii. BSREA

<sup>77</sup> 4 means maximum interest, 2 means average interest and 0 means no interest.

<sup>78</sup> 4 means maximum capacity, 2 means average capacity and 0 means no capacity.

## Annexure 3: Interview and Result Interpretation Process

The study incorporates the views of 24 stakeholders based on one-on-one discussions held from 29 May 2023 to 18 September 2023. The questionnaire comprises 25 questions. For some questions, stakeholders can choose from multiple options and include additional views. Stakeholders needed to share their direct answers to the remaining questions. The questions further provide respondents with opportunities to explain their stance.

Any view that receives the maximum number of responses is considered the best cause or explainer of a specific question. However, in the case of multiple responses from individuals against a question, we gave more weight to the first preference and assigned a score of two. The second preference receives 1. For instance, a respondent may select option (i) as the first preference but option (iii) as second, and another respondent may choose option (ii) as the first preference but option (i) as second against a specific question. In such a case, the first preference of a respondent earns a score of two, while the second preference receives one. Therefore, option (i) receives “ $2 + 1 = 3$ ”, option (ii) receives “ $0 + 2 = 2$ ”, and option (iii) receives “ $1 + 0 = 1$ ”. Therefore, option (i) is appropriate for this specific context.

## Annexure 4: Assumptions for LCOE Calculations

Rooftop Solar System Cost: Tk70 million/MW (US\$0.635 million/MW)<sup>79</sup>

Debt-equity Ratio: 80:20

Cost of Debt: 5% a year

Cost of Equity: 12% a year

Project Life: 20 years

Inverter Replacement: after 10 years

Rate of Panel Degradation: 1% after the first year and 0.8% from year two onwards

Annual Costs Considered: Maintenance, insurance and bank guarantee

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<sup>79</sup> Stakeholders report the cost of a rooftop solar projects ranges from Tk65 million/MW to TK75 million/MW. Therefore, an average of the two values is taken.

## Annexure 5: Cost of Energy Generation from Randomly Selected Power Plants

### Power Generation Cost from Selected Public and Private Furnace Oil-run Plants:<sup>80</sup>

- Sample 1: Tk15.58/kWh
- Sample 2: Tk15.55/kWh
- Sample 3: Tk16.96/kWh
- Sample 4: Tk16.83/kWh
- Sample 5: Tk17.58/kWh
- Sample 6: Tk19.58/kWh
- Sample 7: Tk36.85/kWh
- Sample 8: Tk28.45/kWh
- Sample 9: Tk19.21/kWh
- Sample 10: Tk19.91/kWh
- Sample 11: Tk15.76/kWh
- Sample 12: Tk15.18/kWh
- Sample 13: Tk14.03/kWh
- Sample 14: Tk13.5/kWh
- Sample 15: 15.28/kWh

The arithmetic mean of generation costs shows that the average cost of energy from 15 furnace oil-based power plants was Tk18.68/kWh in FY2021-22.

### Power Generation Cost from Selected Public and Private Diesel-fired Plants:<sup>81</sup>

- Sample 1: Tk42.33/kWh
- Sample 2: Tk36.28/kWh
- Sample 3: Tk33.58/kWh
- Sample 4: Tk55.39/kWh
- Sample 5: Tk51.05/kWh
- Sample 6: Tk32.4/kWh
- Sample 7: Tk24.77/kWh

The arithmetic mean of generation costs shows that the average cost of energy from seven diesel-run power plants was Tk39.4/kWh in FY 2021-22.

<sup>80</sup> BPDB. [Annual Report 2021-22](#). 27 November 2022.

<sup>81</sup> Ibid.

## About IEEFA

The Institute for Energy Economics and Financial Analysis (IEEFA) examines issues related to energy markets, trends and policies. The Institute's mission is to accelerate the transition to a diverse, sustainable and profitable energy economy. [www.ieefa.org](http://www.ieefa.org)

## About the Author

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