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Collusive Pricing in Solar Power in Bangladesh: Mapping Informal Processes and Corruption Risks

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Acknowledgments

This study titled **'Collusive Pricing in Solar Power in Bangladesh: Mapping Informal Processes and Corruption Risks'** is part of an extensive investigation into the dynamics of the power sector within the context of Bangladesh's energy landscape. This research has been enabled through the collaborative efforts of esteemed institutions and dedicated individuals who have provided their invaluable expertise and insights.

This study has been enriched by the diverse perspectives and collective wisdom of all key informants, as well Sabrin Sultana and other researchers at the Change Initiative. It is our hope that the findings and insights garnered through this collaborative endeavour will contribute significantly to the discourse on corruption and collusion in the energy sector and help pave the way for more equitable and sustainable energy practices in Bangladesh and elsewhere.

Contents

Executive summary

We map the formal and informal processes involved in contracting for solar power projects in Bangladesh. The governance of these processes has been poor, and Bangladesh has been contracting solar power at prices that are often more than twice as high as in comparable neighbouring countries. Even allowing for higher land prices and transmission costs, the prices awarded are excessive, and high electricity prices are making Bangladeshi businesses uncompetitive relative to competitor countries. The governance failures here can be traced to several factors. The most obvious is the prevalence of unsolicited bids and the absence of competition in the bidding process. A deeper problem is that capable investors without strong political connections are likely to find this investment environment too risky, particularly in the absence of financing instruments or co-investments that reduce their risks. These investors stay away and do not submit unsolicited bids of their own. In their absence, the formal governance structure based on vertical checking fails to work.

Formal governance is a system of vertical checking, but it is only effective if there are strong horizontal checks from other actors. These demands and pressures are necessary to force the formal system to work as it should, particularly in contexts where the rule of law is weak. In the Bangladeshi solar power sector, horizontal checks have virtually disappeared because of the emergence of a collusive approvals process. Based on our observations of business practices, and key informant interviews with critical insiders, we show how investors must strike collusive deals with key officials in multiple departments involved in approving projects. The coordination of deals across these officials is usually carried out by trusted intermediaries or consultants who organise a package deal for investors in exchange for significant upfront payments. We describe this hidden coalition of colluding officials as a ‘syndicate’. The implications of the syndicate are far reaching. The high risks facing unconnected investors keeps them out, but their absence means there are no effective horizontal checks on regulators and officials to enforce the rules. As a result, the politically connected investors who do bid not only receive approval for their projects but can also raise contracted prices to the highest level they can negotiate. These governance failures have clearly been very damaging for Bangladeshi taxpayers and electricity consumers.

The emergence of a syndicate means that a horizontal actor who may want to check a particular violation must take on the syndicate. They are unlikely on their own to have the power to be able to do so, or to construct a sufficiently powerful alternative coalition. A feasible strategy is only likely to emerge if new actors can be brought in who may have a different relationship with the vertical actors responsible for governance. One possibility is suggested by the evidence of lower prices achieved in other parts of the power sector in Bangladesh: to look for strategies that can attract a broader range of investors to bid on specific projects. Some forms of preferential financing can attract new investors to bid, if this reduces investor exposure to high

interest payments in a context where their own payments may not be made on a timely basis. In turn, if capable and unconnected investors are attracted to bid on projects, this can enhance horizontal checks and create pressures for the enforcement of governance rules at least for these projects. If more contracts go to capable companies at competitive prices, this can begin to change the distribution of power and interests in a sector that now appears to be dominated by collusive interests.

Acronyms

BDT	Bangladeshi taka
BERC	Bangladesh Energy Regulatory Commission
BPDB	Bangladesh Power Development Board
BUET	Bangladesh University of Engineering Technology
CSO	Civil society organisation
DFI	Development finance institution
EPC	Engineering, procurement and construction
FDI	Foreign direct investment
GW	Gigawatt
IDCOL	Infrastructure Development Company Limited
IPP	Independent power producer
KII	Key informant interview
kWh	Kilowatt-hour
LCoE	Levelised cost of electricity
LCoET	Levelised cost of electricity transmission
LOI	Letter of intent
MoPEMR	Ministry of Power, Energy and Mineral Resources
PGCB	Power Grid Company of Bangladesh
PPA	Power purchase agreement
SREDA	Sustainable Renewable Energy Development Authority
US	United States

1. Introduction

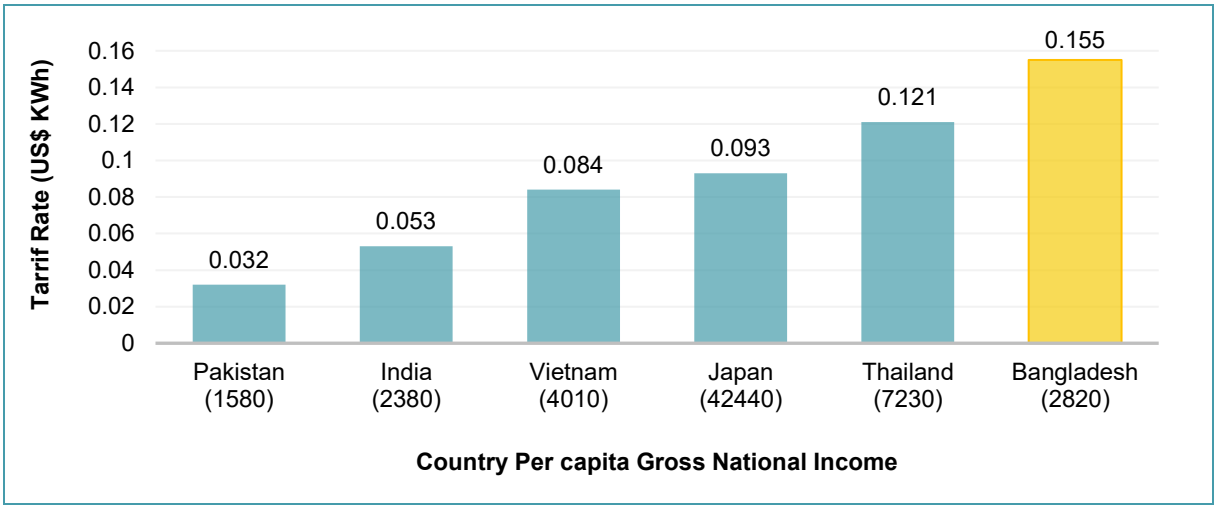
Bangladesh is actively transitioning towards renewable sources of energy to fulfil its commitment to the Climate Vulnerable Forum. The nation aims to generate 40 GW (40% of its electricity capacity) from renewables by 2041, with an interim target of 16 GW (30% of capacity) by 2031 (Lightcastle, 2023). However, the current contribution of renewables to the total energy mix remains low at 3.7%, with solar energy accounting for the majority (approximately 2.8% of the total mix) (Kaisar and Ali, 2023). This shift towards renewables necessitates increased private sector involvement.

The private sector plays a critical role, owning 59% of planned renewable energy projects and contributing 62% of the total investment. Public investment makes up 23%, while joint ventures contribute 15% of the identified investment for renewable energy generation in Bangladesh (Change Initiative, 2023). This trend aligns with the global strategy that has been observed in developing countries over the past decades, where power purchase agreements (PPAs) with private providers have become increasingly popular tools to meet growing energy demands (Khan et al., 2022). The World Bank (2020) reports that private investments in developing-country energy projects have reached a staggering $867 billion across 4,900 projects since 2000. This private participation has demonstrably propelled many countries to successfully expand their generation capacity and extend electricity access to millions of people.

The Government of Bangladesh encourages foreign direct investment (FDI) in the renewable energy sector through supportive policies. According to Mahbub et. al. (2022), reform of key policies includes tax breaks such as a 15-year income tax exemption for the entrepreneurs, duty-free import of equipment and accessories, and the ability to repatriate profits. Additionally, the government has established the Sustainable Renewable Energy Development Authority (SREDA) as an independent regulatory body to streamline investment processes in the sector (Mahbub et al., 2022). Moreover, FDI in Bangladesh's power sector has grown significantly, from $30 million (4% of total FDI) in 2004/05 to $520 million (22% of total FDI) in 2019/20, surpassing other major sectors. This surge reflects growing investor confidence in the country's renewable energy potential (Bangladesh Bank, 2020).

Despite the growing trend of funding and projects in renewable energy in Bangladesh, the tariff rates remain elevated. Despite its lower gross national income (GNI) ranking (142nd), Bangladesh pays more for renewable energy than its regional neighbours and developed nations with higher GNI, as shown in Figure 1 (Change Initiative, 2023). Additionally, the average tariff ($0.155/kWh for projects starting operation in 2022/23) is more than double that of India and Pakistan. Private solar independent power producers (IPPs) are the key rent-seekers that are charging $0.13/kWh to sell, whereas it is slightly lower for generation from public plants ($0.10/kWh).

Figure 1 Average tariff of solar IPP plants that started operation in 2022/23 in selected countries



Source: Change Initiative (2023)

In Bangladesh, a significant challenge persists in the determination of tariff rates and their alignment with transparent policies. The Bangladesh Power Development Board (BPDB), the Power Grid Company of Bangladesh (PGCB) and the Power Division bear primary responsibility for setting these rates, yet they lack transparency in their processes and do not adhere to established policies. This lack of clarity allows significantly different prices to emerge across IPPs with similar characteristics. According to Donastorg et al. (2017), one of the foremost hurdles in renewable energy financing within developing countries is the perceived risk stemming from inaccurate and sometimes misleading understandings regarding costs and power generation capabilities of renewable energy sources.

There are several reasons for the higher tariff rates, especially the cost of financing. Despite the increasing importance of renewable energy worldwide and its role in addressing climate change and promoting energy security, the deployment of renewable energy projects is often hindered by a lack of access to financing. Even though there is potential for FDI, as well as grant allocations, Bangladesh is falling behind in accessing them. According to a Change Initiative (2023) study, limited access to foreign capital and investor concerns regarding risk (currency fluctuations, permitting delays, financing difficulties and power market instability) hinder solar IPP financing in Bangladesh. SREDA, a Bangladeshi government agency, is mandated to increase renewable energy production and act as the regulatory body for the sustainable energy industry, but its effectiveness in attracting investment is unclear. Years of resource limitations and a lack of Clean Development Mechanism implementation raise concerns about SREDA's commitment to advancing renewables (Hashim, 2022). In fact, a SREDA official mentioned that the organisation's finance department is lacking and is currently not making any significant contribution (Khan et al., 2023). Compounding the financing challenge, a recent EY report (2023) highlights the weakening creditworthiness of the BPDB, the primary electricity buyer. This has led international commercial lenders to halt

massive private investment in renewable energy. As a result, investors are turning to development finance institutions (DFIs) for financing, but these options come at a higher interest cost due to perceived macroeconomic risks. While international commercial banks are beginning to consider financing Bangladeshi renewable energy projects, the credit and political risk premiums make them a more expensive option compared to financing led by Multilateral Development Banks or DFI (EY, 2023). Apart from financing, land acquisition, a lack of coordination and collaboration among government authorities, and administrative procedures turn out to be the key weaknesses to consider while investing in this sector (Khan et al., 2023).

One of the major underlying reasons underpinning these risk perceptions is the corruption and collusive practices in this sector that justifiably create doubts about contract enforcement, transparency, and the future viability of long-term investments in the solar power sector. Biswajit et al. (2018) asserted that the average capital cost of a power plant in Bangladesh was double the global average. This study examined the capital costs of 61 operational and planned power plants in Bangladesh. Statistical analysis of selected power plants unveiled a correlation between corruption levels and power plant costs, suggesting that heightened corruption is associated with increased capital expenditures. Furthermore, according to Transparency International Bangladesh (2020), an estimated $8 million was misappropriated from initiatives targeting reforestation and the advancement of renewable energy between 2018 and 2020. Politically affiliated companies engaged in collusive agreements have exacerbated sectoral corruption. This includes instances of higher-cost plants in Bangladesh receiving despatch orders ahead of lower-cost counterparts, preferential fuel supply, and biased contract renewals (Nikolakakis et al., 2017; Zhang, 2019). As a result of these collusive agreements, private power plants in Bangladesh generate expensive electricity, resulting in approximately $1 billion in annual subsidies borne by taxpayers (Khan et al., 2022).

Ineffective anti-corruption efforts have created scope for rent-seeking in Bangladesh, and anti-corruption efforts have been weakened by politicised enforcement and subversion of the judicial process. The Anti-Corruption Commission is ineffective and subject to overt political interference. Media outlets and civil society face restrictions and are less able to expose government corruption (Freedom House, 2023). Corruption not only directly affects investments in renewable energy; it also deters new firms from entering the market. Entry barriers are created by high costs of doing business (Djankov et al., 2002) and affect firms' performance (Freund and Bolaky, 2008). The anti-competition effect of corruption is much more significant than the direct costs of corruption in raising the price of power.

In Bangladesh, renewable power projects are seldom subjected to competitive bidding or formal tendering processes because there is very limited interest in this market among investors who do not have political connections or can otherwise navigate a highly corrupt environment. As a result, there are few bidders, and contracts are predominantly awarded through direct negotiations, creating significant additional opportunities for corruption. Many projects are granted without adequate

scrutiny of technical, commercial and financial aspects necessary for project approval. Corruption can raise costs of doing business even for politically connected investors. The lack of due diligence often results in delays in project completion and difficulties in securing financing during implementation, and can ultimately lead to project failure (Mahbub et al., 2022). Karim et al. (2020) identify a lack of coordination among government agencies, cumbersome administrative procedures and corruption as major weaknesses because corruption causes added costs and ambiguity for investors, leading to a reduction in FDI (Cuervo-Cazurra et al., 2019). In essence, corruption acts as an additional tax that deters investment, as evidenced by studies from Shleifer and Vishny (1993) and Li and Zhang (2021).

While corruption directly raises costs for all investors, its most damaging effect is that by driving out competition, the final contracted prices reflect not just the corruption costs incurred by the investor but also additional unconstrained profit mark-ups that can be agreed and shared because of collusion between the investor and public officials. This is why politically connected investors do not complain about the cost of corruption: they benefit much more than their investments in bribes. The price is paid by taxpayers and consumers of power. The solar power contracts awarded in Bangladesh are significantly overpriced, even compared to neighbouring countries. A particularly serious consequence is that overpriced power is making Bangladeshi industry and export sectors uncompetitive relative to regional competitors, with potentially catastrophic future effects on job creation and economic development. Khan et al. (2022) show how a vicious cycle can emerge in the governance of the power sector. Politically unconnected investors face high investment risks and stay away from the sector; as a result, there is an absence of checks on collusion between the remaining investors and public officials, and this results in high prices that threaten the financial viability of the power sector, which further increases risks for unconnected investors and so on. This study finds evidence of similar collusion and overpricing emerging in the renewables sector. An understanding of these processes will help identify the most promising entry points for incremental governance reforms that can improve developmental outcomes (Khan and Roy, 2022).

This study identifies the various points in the contracting process in Bangladesh and the flows of resources that are most affected by corruption in the renewable energy sector, and specifically solar IPPs. The remainder of this paper is structured as follows. Section 2 discusses the design of the study. Section 3 describes the structure of a solar IPP company. Section 4 presents the existing policies and policy gaps regarding the Bangladeshi power sector which affect the renewable energy sector. Section 5 depicts how a company obtains approval from the relevant ministry and acquires a contract. Section 6 discusses concessional and contestable financing, and how they affect business risks and the competitiveness of the solar power market. Section 7 shows the cost structure of solar power and opportunities for manipulation. Section 8 discusses the learning outcomes and future scopes. The final section concludes.

2. Design of the study

This research employs an observational approach to identify and describe the informal processes through which power sector investors access public officials and pursue power supply contracts. This approach can be described as a variant of an economic anthropological approach to sheds light on the informal processes and transactions that are collectively described as corruption. Our focus here is to describe the formal and informal processes involved in seeking out investment opportunities obtaining a formal contract in Bangladesh's renewable energy sector, specifically focusing on solar IPP projects. While our aim is ultimately to identify feasible policy interventions that are testable and plausible in terms of an institutional economics analysis, we begin with an unconstrained description of the formal and informal behaviour of different stakeholders and actors, which we loosely describe as economic anthropology (Torsello and Venard, 2016). This includes observing and recording behaviour that may otherwise be described as cultural and social, and not just driven by institutional or economic factors. This study therefore looks beyond behaviour guided by formal regulations and procedures, to describe informal practices and dynamics that may be much more important in facilitating the search for projects and the deals leading to the granting of contracts in the solar IPP sector.

The study team began with an extensive literature review, gathering and examining secondary data related to renewable energy policies, infrastructure and projects in Bangladesh and similar developing countries. This review sourced information from academic articles, government reports, international organisation publications and industry analyses to construct a detailed picture by creating a comprehensive database on the current renewable energy sector in Bangladesh, including challenges and opportunities – especially regarding financing and tariff issues.

The core method relied on the close participation of our partner Change Initiative with the private sector community engaged in solar power, and its observations of business practices over a long period from its action research in the sector (see Khan et al., 2023). Observational and participatory insights based on these engagements with policy-makers, public officials and businesses were then validated through semi-structured key informant interviews (KIIs) with a diverse range of stakeholders. These interviews included representatives from private companies developing solar projects, civil society organisations (CSOs) working on transparency and accountability in the energy sector, relevant government officials involved in the renewable energy permitting process, and independent consultants with expertise in Bangladesh's solar energy landscape. This multi-stakeholder approach ensured a comprehensive understanding of the challenges and opportunities related to corruption within the sector. Details of the KIIs are shown in Table 1.

The research used formally acquired data and insights from a highly informed internal source and many other key informants, and triangulates these different stakeholder

perspectives to construct a detailed 'approval process map' for solar IPPs. This map describes both the formal procedural stages and the points in the procedural chain that are particularly susceptible to informal pressures and corrupt practices, based on identifying recurring patterns in several different types of projects.

This research design acknowledges the limitations inherent in studying a sensitive topic such as corruption. KIIs may be subject to social desirability bias, where informants may be hesitant to disclose sensitive information or processes. To mitigate this problem, we developed trust with a small number of very important informants and used this understanding of informal processes to guide questions to others. By demonstrating that we already knew how some of these processes worked, we were able to gain the confidence of other informants to reveal other related processes. We ensured that all respondents were confident that we would maintain confidentiality, and used a flexible interview approach that allowed for follow-up questions and probing, and often also follow-up meetings. Additionally, corroborating interview data with existing research and reports from credible institutions enhanced the robustness of our findings.

Table 1 Details of key informant interviews

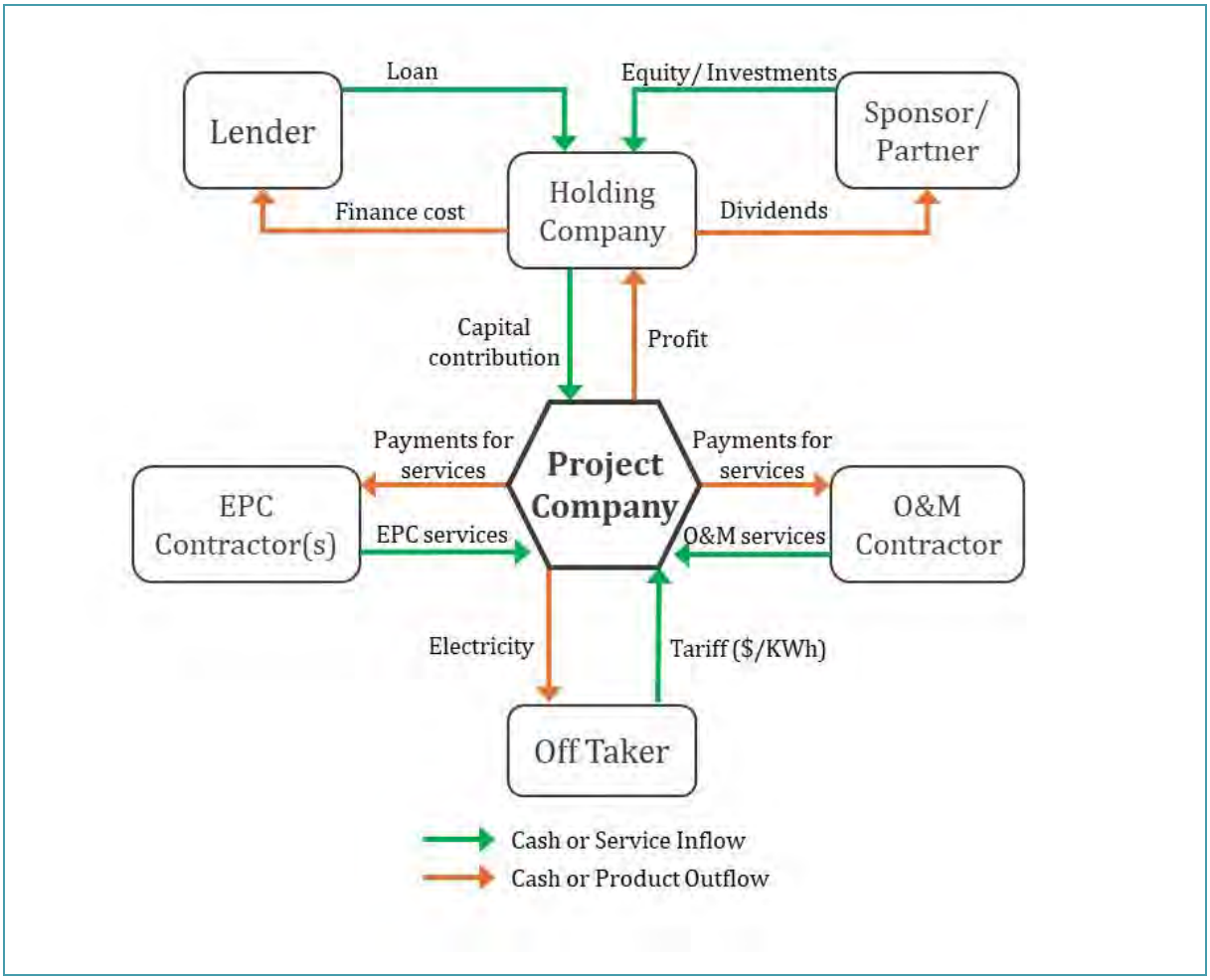
Background of the informant	Informant	Designation	Capacity	Interview date
Company	A	Manager & Deputy Manager	100 MW & 50 MW	17 January 2024
	B	Head of Sales	20 MW	22 January 2024
	C	Former Country Manager	10 MW	1 February 2024
	D	Assistant Vice-President	100 MW	14 February 2024
	E	Chief Engineer, System Operations	100 MW & 50 MW	25 February 2024
	F	Chairman & Managing Director	N/A	28 February 2024
	G	Senior Analyst	50 MW & 20 MW	29 February 2024
	H	Executive Engineer	100 MW	3 March 2024
Government officials	I	Executive Engineer, System Planning	N/A	6 March 2024
	J	Deputy Director	N/A	2 February 2024
	K	Deputy Director (Executive Engineer)	N/A	30 January 2024
	L	Former Additional Director at Sustainable Development	N/A	9 March 2024
NGO/CSO officials	M	Chief Executive	N/A	2 February 2024
	O	Lead Analyst	N/A	8 February 2024
Independent consultant	P	Director	N/A	14 February 2024

3. Solar IPP firm structure

Understanding the structure of solar IPP firms is essential in renewable energy corruption mapping to identify potential vulnerabilities and points of intervention within their operations. The solar IPP projects involve several types of companies collaborating in the project. There is usually an engineering, procurement and construction (EPC) company that constructs and makes the plant operational, and a financial partner or 'developer' that acts as the holding company that raises the money through loans or equity and is the ultimate owner of the assets. The project company agrees a contract with and delivers the power to the electricity purchaser, the off-taker.

Raikar and Adamson (2020) created a general structure which is modified in the Bangladeshi context, shown in Figure 2, and of course subject to variations based on company ownership and other characteristics.

Figure 2 General structure of a solar IPP project



Source: Authors.

Note: EPC = Engineering, procurement and construction; O&M = Operations and maintenance

At the apex of the structure sits the holding company, essentially the primary owner or developer of the entity with the majority equity stake. The project may be financed by this company alone or in conjunction with a sponsor or partner through equity investments, with the latter receiving dividends from profits. This partner could be a governmental body or private entity. In cases where the sponsor or partner is public and the holding company private, a joint venture agreement is typically drawn up to form a project company, which is then tasked with owning and operating the project. This entity serves as the legal contract holder for all operations, frequently via subsidiaries strategically registered in jurisdictions favourable to lawful ownership and operational activities.

The project company is capitalised through contributions from the holding company, lenders and sponsors, and it dispenses profits accordingly. Should the project company lack implementation and operational expertise, it may engage EPC and Operations and Maintenance (O&M) contractors. The EPC contractor is mandated to design and construct the project to meet the specifications outlined by the off-take agreement, and according to government regulations and the sponsor's criteria. The contract specifies construction milestones, payment schedules, and sanctions for failure to meet deadlines or performance benchmarks. Concurrently, the O&M contractor is responsible for providing continuous operational and maintenance services to ensure the project's ongoing functionality.

Alternatively, one or more financial institutions can finance the project as lenders. The financial institutions, which can be local or foreign or both, collect interest on their loans to the holding company. Lastly, the off-taker is the party that is obliged to purchase the electricity generated from the project through a long-term contract in US$/kilowatt-hour (kWh) units. For power projects, such contracts are often in the form of a PPA. In Bangladesh, the Bangladesh Power Development Board (BPDB) is the sole buyer, and the tariff is set based on a 'no power, no payment' policy (see Business Insider Bangladesh, 2021).

The levelised cost of energy (LCoE) is a term which describes the cost of the power produced by solar over a period, typically the warranted life of the system.

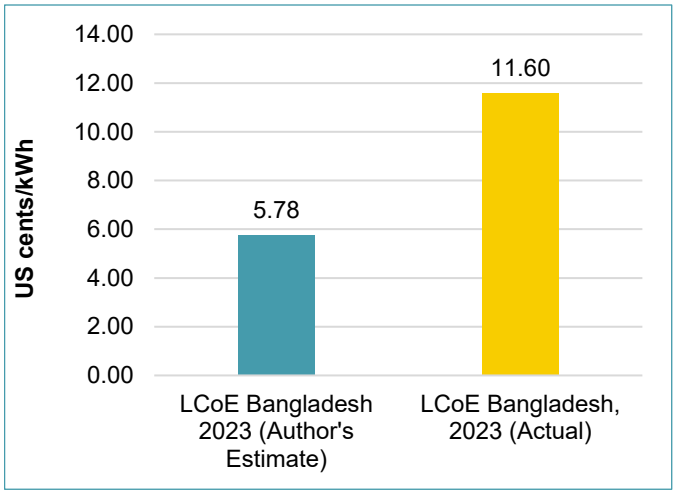
$$LCoE = \frac{Total\ system\ cost\ (US\$)}{Total\ electricity\ generation\ (kWh)}$$

According to IEA (2020), the total system cost is a function of the cost of the machineries and equipment, the cost of balance of systems, the cost of construction and installation, the cost of funding (debt interest and other fees), available resources (irradiance, etc.), the O&M cost, the cost of land and land development, the cost of evacuation line and substation construction, the cost of organising permits, the cost of insurance, the return on equity or margin of the IPP, and depreciation.

Furthermore, the LCoE methodology discounts the time series of expenditures and incomes to their present values in a specific base year. It provides the costs per unit of electricity generated (performance degradation incorporated), which are the ratios of total lifetime expenses (net present value) versus total expected electricity generation, the latter also expressed in terms of net present value.

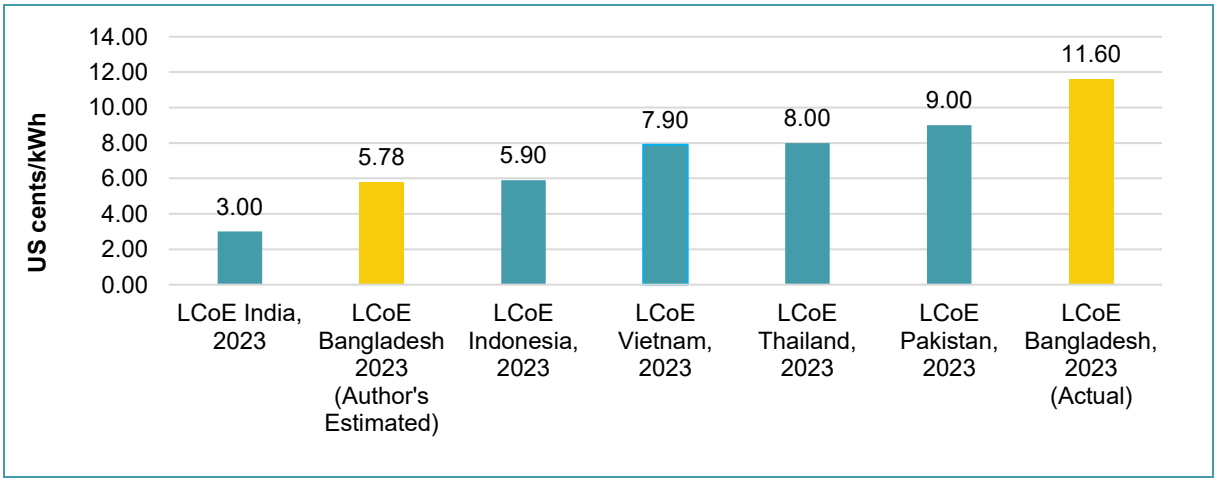
According to our calculations based on our KIIs and secondary source data, for a 100 MW power plant with a 20-year lifespan, financed by a 5% concessional loan, the total system cost should be within $208 million and generate 3.58481 billion kWh of electricity over 20 years, and the LCoE should be around 5.78 cents/kWh.[6] See details in Appendix 1.

Figure 2 Differences in LCoE between author's calculation and Bloomberg report



However, the actual average LCoE of renewable energy observed in Bangladesh, as reported by Bloomberg, is nearly double this estimate (Figure 3). Moreover, it is higher than in neighbouring countries that are economically similar to Bangladesh. Figure 4 shows that the actual average LCoE of solar power projects of Bangladesh is 3.87 times higher than that of India and 1.47 times higher than Vietnam, one of Bangladesh's export competitors.

Figure 3 Comparing LCoE of Bangladesh with neighbouring countries of similar socioeconomic structure



Source: Authors' calculation and Bloomberg reports (2023).

6 The sum of $208 million ÷ 3.58481 billion kWh.

4. Policy capture and emergence of uncompetitive solar projects

In Bangladesh, collusion and corruption within the private power sector have significantly affected energy prices and governance, especially in relation to the Quick Enhancement of Electricity and Energy Supply (Special Provision) Act 2010. This legislation, ostensibly aimed at resolving energy shortages, has facilitated high-cost energy procurement processes that, in practice, have created fertile ground for corruption and collusion, particularly between politically connected firms and government officials. The Act enables unsolicited bids and direct negotiations without competitive tendering, which has elevated contracted electricity prices, imposing a substantial burden on taxpayers and electricity consumers.

The collusion problem emerged because the government addressed the unwillingness of investors to invest in the high-risk power sector by negotiating high prices with individual investors. As the agreed risk premium emerged out of negotiations between public officials and connected investors, the profit mark-ups were much higher than may have emerged from a competitive bidding process that could attract unconnected investors to determine the minimum risk premium in a competitive way (Khan et al., 2022). The study by Khan et al. (2022) argued that a strategy of offering higher prices to attract investors in a high-risk environment (where some of the risks were themselves created by corruption) allowed more corruption and raised risks for future investors even further. They describe this unattractive risk reduction strategy as a ‘targeted risk mitigation’ strategy, which involves high mark-ups being collusively negotiated with connected investors. This contributed to the escalation of energy prices and limited the participation of unconnected and potentially more efficient energy suppliers. This inefficient strategy is now being replicated in renewable energy contracts. What is required instead is a ‘competitive risk mitigation’ strategy where policy feasibly reduces risks for many potential investors, enhancing potential competition in these bids and helping the discovery of the minimum risk premium.

In addition, the bilateral nature of contracts under the Act has weakened regulatory agencies, notably the ability of the Bangladesh Energy Regulatory Commission (BERC) to enforce energy pricing policies and competition laws. Bilateral agreements, by circumventing competitive bidding processes, not only undermine market competition but also open the door to potential collusion and corruption. This has significant implications for governance within the renewable energy sector, as it constrains the regulatory body’s capacity to maintain low energy prices for consumers and ensure a competitive market environment conducive to the transition towards sustainable energy sources.

Addressing these governance challenges requires a multipronged approach that includes improving the regulatory framework in ways that can be enforced given the power, capabilities and interests of competing stakeholders, and promoting competitive bidding processes by discovering and implementing strategies that can attract politically unconnected investors to explore the market and bid. These two planks are closely connected, because success in attracting a broader range of actors into the power generation market will create effective demand from significant competing investors for more effective regulation and enforcement of competitive conditions. Strengthening the role and capacity of regulatory bodies, such as the BERC, to enforce regulations and of other agencies such as the BPDB to oversee transparent and competitive procurement processes is also crucial and again dependent on success in attracting a broad base of investors.

The interdependence between the number and types of investors (their power, capabilities and interests), on the one hand, and the effective implementation of regulations or competitive procurement process, on the other, is often not understood. Without a good enough regulatory structure and competitive procurement processes, high-capability competitive investors are not likely to want to bid, but if a larger number of competitive and politically unconnected investors do not want to bid, the pressures and demands that improve regulatory effectiveness and competitive procurements will also not emerge. To trigger a virtuous cycle in a context where a vicious cycle has been operating, we have to identify the most feasible entry points where small feasible interventions can trigger incremental changes that can begin to tip a complex collusive process towards a competitive one. This is why it is insufficient to simply identify a set of formal guidelines for project selection, procurement processes or regulation, without asking who has the power and interest to effectively demand the enforcement of these rules. If the only investors are politically connected ones, who are making big profits through collusion, the demand for effective enforcement of regulations or competitive procurement processes is unlikely to materialise. Change is likely to be driven by feasible strategies that can attract more capable investors that can deliver more competitive pricing in a sequence of projects that gradually begin to change the configuration of the sector. A better understanding of the informal processes and the different types of actors involved is the first step in identifying feasible entry points and the incremental policy changes that may be potentially feasible and that can then be tested in practice.

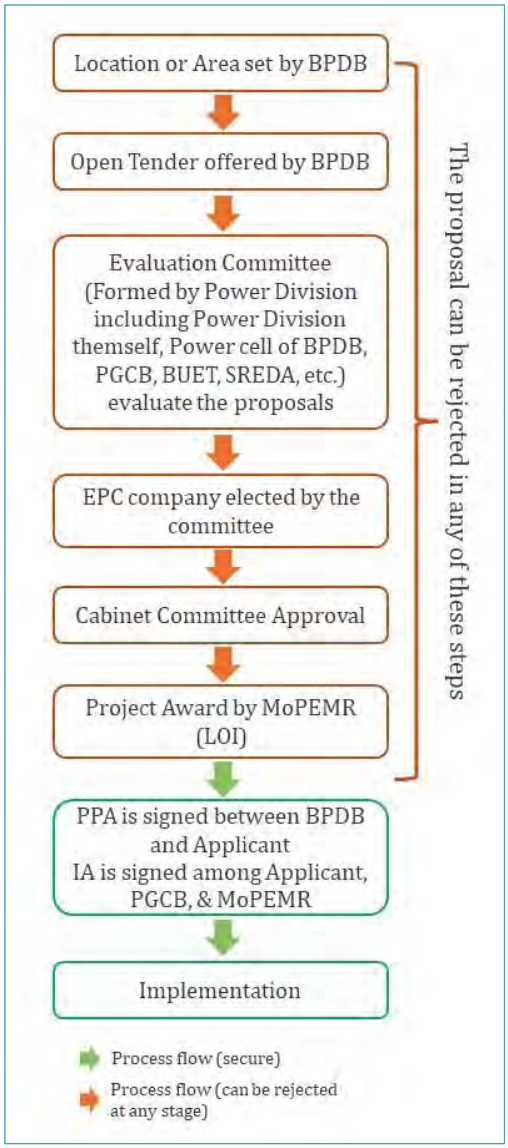
5. Mapping the project approval process

In Bangladesh's renewable energy sector, projects have predominantly been initiated as unsolicited bids since 2010, with private entities proposing solar projects for government approval, bearing full responsibility for land acquisition and obtaining the requisite permissions. Conversely, a minority of projects are solicited, where the government off-taker initiates the project development and orchestrates the funding and planning. The solicited process invites bids from private EPC firms, where they can be either an implementing entity or a stakeholder in a joint venture or even the sole owner. Out of the 60 solar power plants with a letter of intent (LOI) issued to date, only 2 are solicited, with a combined capacity of 100 MW, while the remaining 58 unsolicited projects account for 3,798.79 MW of capacity.

5.1. Solicited bids: Process mapping

Bangladesh rarely uses solicited IPP initiatives for solar projects. As illustrated in Figure 5, the formal approval process begins with the government identifying a suitable area, considering factors such as land availability and solar irradiance. An open tendering process then follows, inviting bids from potential EPC firms. An evaluation committee, comprising representatives from various government bodies such as the BPDB, Power Cell, the PGCB, the Bangladesh University of Engineering Technology (BUET) and SREDA, scrutinises the tender submissions against technical, financial and environmental criteria.

Figure 4 Formal process map for solicited solar IPP projects



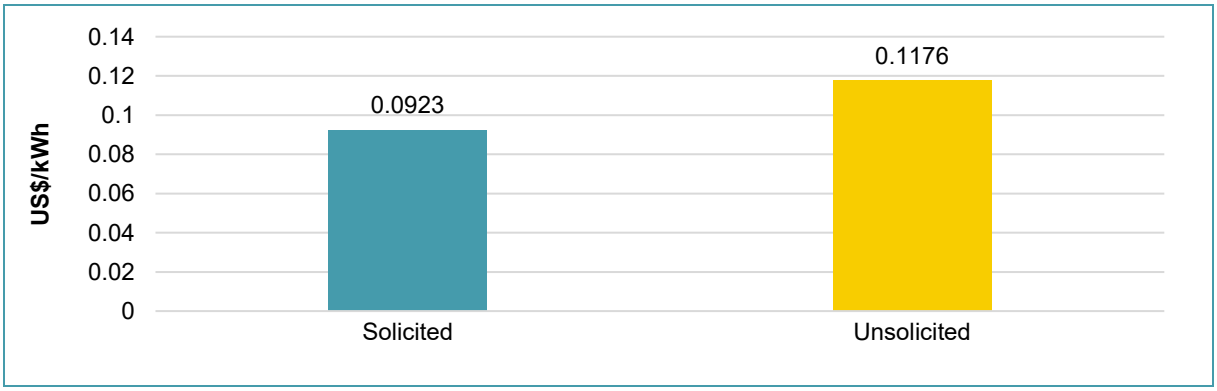
Note: BPDB = Bangladesh Power Development Board
PGCB = Power Grid Company of Bangladesh
BUET = Bangladesh University of Engineering and Technology
SREDA = Sustainable and Renewable Energy Development Authority
EPC = Engineering, procurement and construction
LOI = Letter of intent
MoPEMR = Ministry of Power, Energy and Mineral Resources
PPA = Power purchase agreement
IA = Implementation agreement

Post-evaluation, the proposal of the selected company is presented to the government's cabinet committee, often referred to as the purchase committee, led by the Ministry of Finance, for final approval. After governmental sanctioning, the Ministry of Power, Energy and Mineral Resources (MoPEMR) issues an LOI to the winning private company. It is noteworthy that projects may be retracted prior to LOI issuance due to any 'identified' defects or regulatory issues.

Finalisation of the project occurs through the execution of a PPA and an implementation agreement, establishing formal contractual relationships between the applicant, the BPDB, the PGCB and the MoPEMR. With these agreements in place, the company advances to the development and execution phase, adhering to the stipulated timelines, quality standards and regulatory mandates, ensuring efficient project management and successful solar energy generation.

Solicited bidding processes are uncommon in Bangladesh's renewable energy sector. The government's preference for unsolicited proposals might be due to the perceived complexity and time-consuming nature of approvals involving multiple agencies. According to the KII informant, the Chairman of the BPDB has not championed the tender process, favouring unsolicited methods, despite the evidence (shown in Figure 6) showing that prices contracted through solicited bids are lower than those in unsolicited ones. Up until the time of writing this article, only two solar IPP projects have been approved through a solicited process. The first one received the LOI in 2019, and the second one is currently awaiting approval of the PPA.

Figure 5 Average tariff rate of solicited and unsolicited approval projects



Source: Authors' calculation.

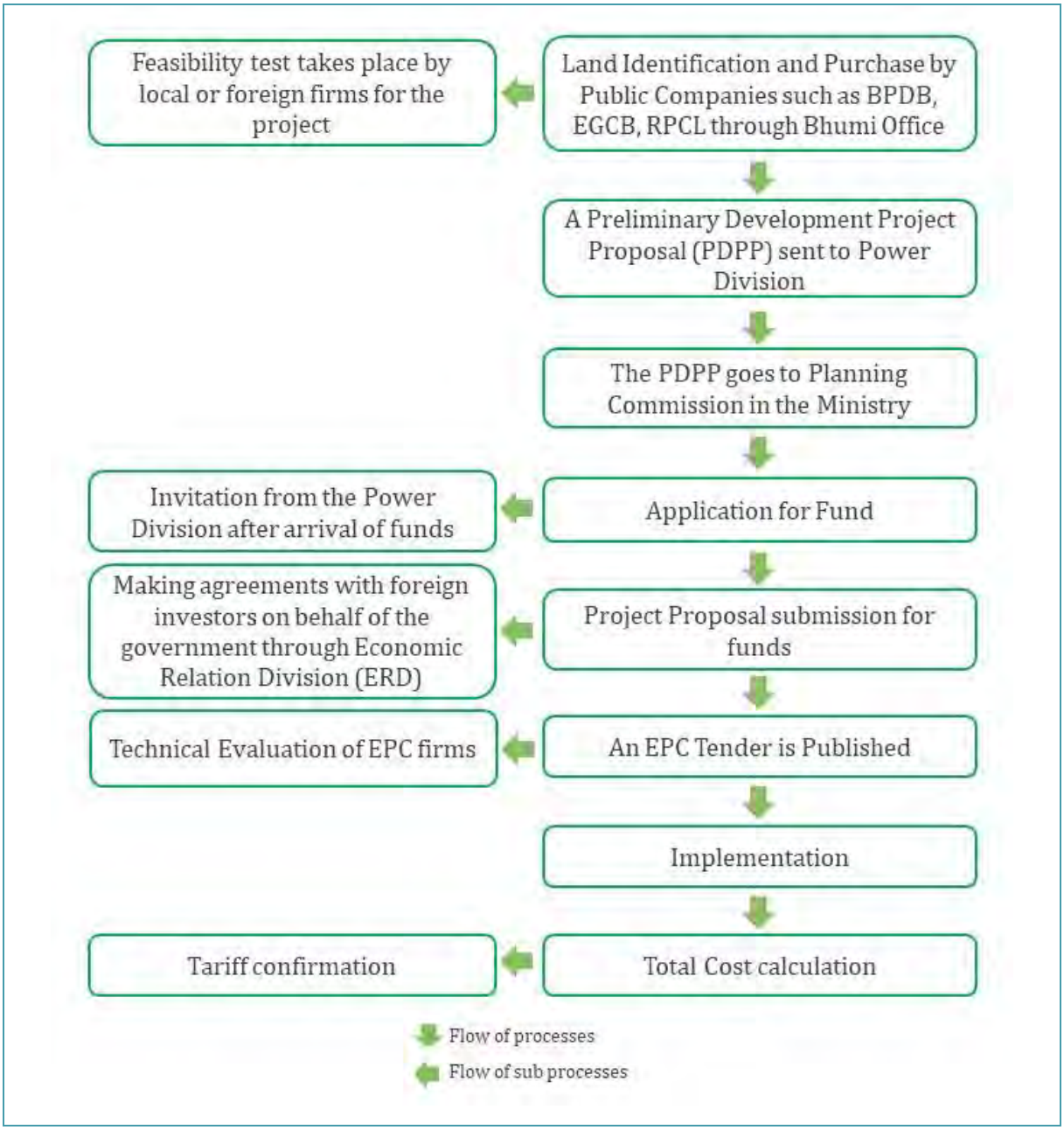
5.2. Unsolicited bids: Process mapping

As the majority of the solar IPP plants are approved through unsolicited processes, this paper will focus on this mechanism. Both public and private companies are obtaining approval through this mechanism. From a KII with a Chief Engineer, System Operations of a public company, we have mapped the steps involved in a public company obtaining approval. First, for public companies such as the Rural Power Company Limited, the Bangladesh Power Development Board (BPDB), the North-West Power Generation Company Limited (NWPGCL) and the Electricity

Generation Company of Bangladesh Limited (EGCB), the solar projects are owned by them. The process (as shown in Figure 7) begins with the identification and acquisition of land, a foundational step that sets the stage for what is to come. This land is leased or procured through the local *Bhumi* (Land) Office. Once the land is secured, a feasibility test is conducted to determine whether the proposed project is viable and sustainable.

The preliminary development project proposal is then crafted and submitted to the power division under the MoPEMR. This proposal outlines the project's scope, objectives and expected outcomes. It is a comprehensive document that provides a road map for the project's development. The proposal then makes its way to the Planning Commission within the ministry.

Figure 6 Unsolicited approval process for a public company



Here, it undergoes a rigorous evaluation that scrutinises every aspect of the project. Upon receiving approval from the Planning Commission, an application is submitted to the Power Division for project funds. The government works to arrange these funds, both local and foreign, ensuring that the project has the financial backing it needs to succeed. A project proposal is submitted to the Power Division. It outlines the project's financial needs and justifies why additional funds are necessary. To secure foreign investment, agreements are made through the Economic Relations Division. These agreements are made on behalf of the government, ensuring that the project has the necessary international support. Loans are then secured, both from foreign investors and the Government of Bangladesh, providing the project with its financing.

With the financial groundwork laid, a tender is published for the selection of an EPC firm. A technical evaluation committee is formed to assess the technical qualifications of the firms, ensuring that only the most qualified are selected. Of the selected firms, the one that offers the lowest price is awarded the project. Once an EPC firm is chosen, an EPC contract is awarded, and the project's implementation begins. Finally, the price at which power is to be delivered to the off-taker is calculated. This is a complex process, and the total cost of the project is considered, as well as the forecast energy production each year. A contracted tariff is fixed, ensuring that the project remains financially sustainable.

According to a government official, many public companies operate with a cost-based contracted price, which does not include a profit or any other risk premiums. This reflects the fact that the public organisation does not have to make a profit from the investment; as a government body, it does not have its own investment risk. However, another official working with a different public company disagreed and argued that profits are incorporated into the price set for public companies too.

This disparity highlights a broader issue of transparency within the public companies, as evidenced by a case study of a public sector solar power project. Despite advancing to the stage of EPC firm selection in May 2023, the contracted price for power has not yet been declared 10 months after the selection of the EPC firm, according to its Chief Engineer, System Operations.

Box 1 Subsidised financing in unsolicited projects does not necessarily reduce power prices

Theoretically, an increase in either subsidies or in levels of competition may result in a decrease in the contracted price of power. In the renewable energy sector, especially in solar power plants, competitive tendering of solicited projects may increase competition between EPC firms and result in lower contracted prices. Subsidised finance (concessional loans at lower than market interest rates) may also help a project reduce its financial cost and result in lower contracted prices if these savings are passed on.

A public sector company has been planning to implement a 100 MW solar power plant and has a loan of BDT11.15 billion ($101.365 million) at 6% interest approved by the Exim Bank of India (line of credit 3). The Government of Bangladesh is also to invest BDT3.19 billion ($29.001 million) with a 60:40 equity–loan ratio, and the public sector company is also to invest BDT760 million ($6.94 million). Moreover, BDT10 million ($90,000) of the amount is collected as a grant, which results in a total of BDT15.11 billion ($137.365 million) of finance.

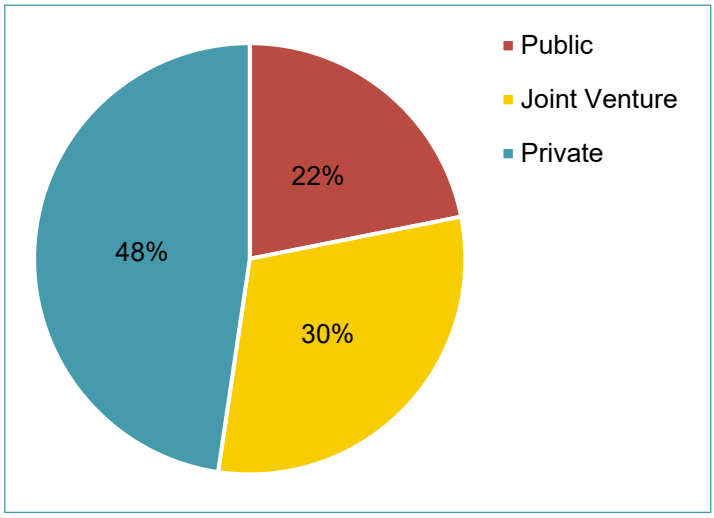
Generally, lower interest rates on a substantial portion of the project cost should lower the cost of production and lead to lower contracted prices. However, in the absence of competition, there is no necessity for the cost saving to be passed on to consumers and taxpayers. Instead, the saving could leak out to insiders in other ways. In this project, the finance is not as concessional as it appears because it comes with the condition that 60–70% of the components of the solar plant must be imported from India. This means that only around a third of the components, mainly used for land and infrastructure development, will be sourced from the local market or the cheapest sources. Therefore, the subsidised or lower cost of finance in this case is an export guarantee scheme. In addition, another hidden condition is that an Indian EPC firm can be contracted for implementation of the project. This forces the public company to publish the EPC tender, but only for Indian firms. According to Exim Bank, lines of credit are extended to support many Indian companies operating as project management consultants, EPC contractors or consortium members in export markets. Far from reducing costs, this type of subsidised finance creates entry barriers and allows much higher prices to be contracted.

The Exim Bank of India nominated seven Indian EPC companies, of which only four responded to the tender. From our KIIs we found that the EPC cost for a solar IPP of this size ranges from BDT7 billion to BDT7.5 billion ($63.8 million to 68.4 million at 1 US$ = 110 BDT). But in this case the EPC contractor charged nearly $130 million (approximately BDT14.24 billion), approximately double the market rate. Furthermore, the construction of a transmission line to the grid, one of the major costs for EPC firms, was excluded from the contract. Another EPC firm was hired to install the transmission line for BDT830 million ($7.6 million).

This example shows that subsidised finance does not necessarily result in lower contracted prices. It only has that effect if the subsidised finance serves to reduce risks sufficiently for a broader range of high-capability bidders to compete in the bid, and only if that happens will the competition effect (which may be even larger than the direct cost-reducing effect of the preferential interest rates) serve to reduce contracted prices (Khan et al., 2022).

Figure 8 shows that nearly half of the total solar generation capacity is owned by private companies. We conducted KIIs with several informants in private solar power plants to map the approval and contracting processes. The Assistant Vice-President of Project Management of a prominent private company outlined the approval process, shown in Figure 9. The process begins with the acquisition or leasing of land by the private company. This precedes the formal proposal submission to the MoPEMR and the BPDB, which is then assessed by these bodies. If the project passes this step, a land visit committee is convened to evaluate the proposed site. Then, a technical review committee, constituted by the Power Division under the MoPEMR and comprising seven to eight members from the Power Division, the BPDB, the PGCB, the BUET and the SREDA, among others, is set up for additional scrutiny. Following this committee's approval, the proposal advances to a BPDB board meeting for a concluding evaluation before being escalated to the MoPEMR for final approval. Given that the Prime Minister serves as the minister for the MoPEMR, the proposal is ultimately submitted to the Prime Minister's Office for final endorsement.

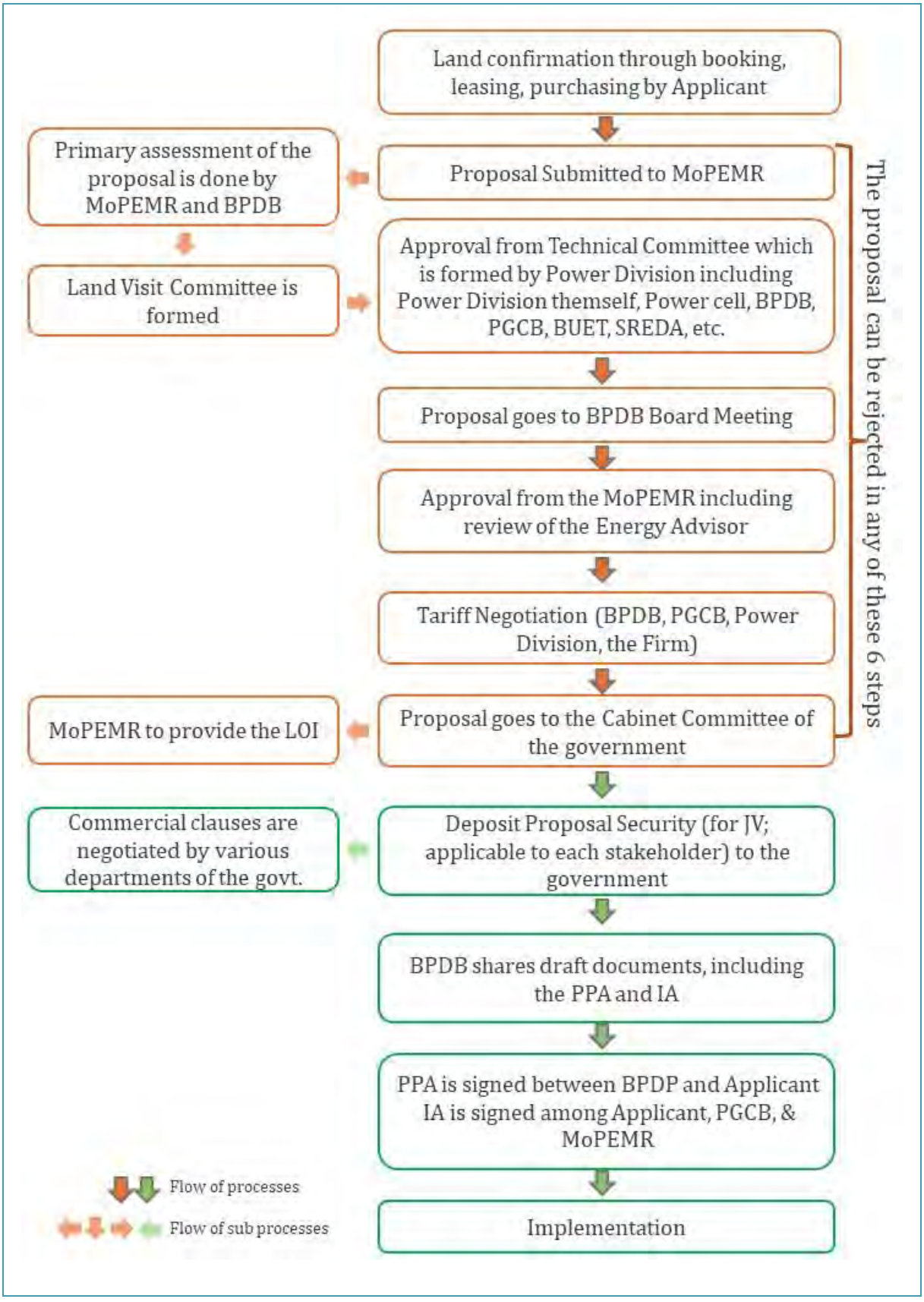
Figure 7 Percentage of solar electricity generation by ownership



Source: Authors' calculation.

A critical stage in this process is the negotiation of the contracted prices, where project rates are determined through discussions with stakeholders, including the BPDB, the PGCB, the Power Division and the private company. The proposal with the agreed price is then presented to the government's cabinet committee for sanction. Finally, the MoPEMR issues the LOI to the applicant, marking the formal approval or award of the project.

Figure 8 Approval process for an unsolicited bid by a private company



Subsequently, the project developer is required to submit a proposal security to the MoPEMR. The BPDB then produces the contract documents, including the PPA and the implementation agreement as drafts. These documents go through further negotiations, particularly concerning commercial clauses, and involve interactions with several public departments and offices such as the Department of Environment, the Land Office, the Local District Commissioner's Office, the Sub-Registrar's Office, the Ministry of Law, the Ministry of Finance and the Economic Relations Division, among others.

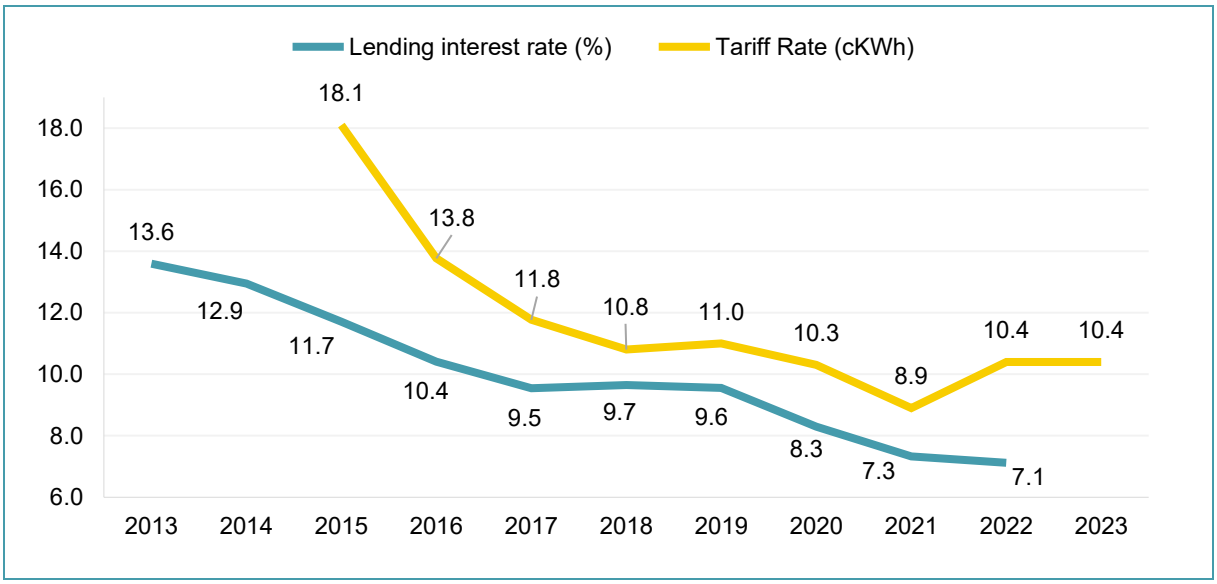
After agreeing on the terms, the agreements are executed: the PPA between the BPDB and the applicant, and the implementation agreement among the applicant, the PGCB and the MoPEMR. The execution date is designated as the zero-date of the project, initiating a stipulated implementation period of 18–24 months, which may be adjusted for smaller-scale projects. Progress of the project may be terminated at any stage prior to the issuance of the LOI, and non-compliance with the established timeline for implementation may incur penalties for the company.

The mapping of the complex approval process for private sector-led unsolicited bids is particularly important for us. Most solar power projects in Bangladesh have emerged through this process. A striking feature here is the huge number of approvals and processes that are involved. Government bureaucracies in developing countries such as Bangladesh are typically characterised by delays, and deliberate blocking actions if informal deals and payments are not made. Given the large number of government departments, agencies and committees involved, such an approval process is unlikely to be completed without the involvement of fixers who can make joined-up deals with all the key individuals in critical positions in this decision-making chain. Our KIIs confirmed the existence of such 'syndicates' and well-known 'consultants'. For a price, these facilitators carry out the behind-the-scenes negotiations to facilitate the approval of a project.

The effect of such a collusive approval process is not just that the informal payments are inevitably going to be built into the contracted price, resulting in higher contracted prices. The effect is likely to be worse, because once connected businesses have worked out how to deal with the syndicate and pay for the approval, there is nothing to stop them setting prices that not only recover the money they spent in informal payments but achieve additional profits on top of it. This double effect of a collusive approval processes – the direct cost, and the additional escalation as a result of the creation of barriers to entry and lower competition – is similar to the effects of 'targeted' or collusive risk mitigation strategies discussed earlier. In the latter, the government sits with an individual investor to agree on the risk premium that would induce the investor to invest, but as a result of the collusion and kickbacks that are likely to emerge between the two sides in the absence of competition, the mark-up agreed is likely to be much higher than the risk premium that would have been necessary in a competitive context (Khan et al., 2022). Not surprisingly, in a context of rapidly decreasing global prices for solar power, the decrease in contracted prices in Bangladesh has been slow, and in some years prices have even *increased.*

As Figure 10 shows, there were *increases* in average contracted prices or tariffs in 2019, 2022 and 2023.

Figure 9 Trend of average tariff rate and lending interest rate in Bangladesh, 2013–2023



Source: Authors' calculation and World Bank Data.

6. The governance of unsolicited bids: Vertical versus horizontal checks

A project approval process requires a robust system of governance to ensure that outcomes are aligned with the public interest. In mapping the formal and informal activities that affect the governance of resource allocation decisions in developing countries where the rule of law is weak, we use the power–capabilities–interests (PCI) approach to identify the different actors that support or obstruct the application and enforcement of formal processes (Khan and Roy, 2022). The formal aspects of governance typically create an accountable actor (the principal) whose job is to monitor the allocation and use of public resources by other actors (the agents). For instance, the regulatory authority, the BERC, is supposed to monitor the contracted prices agreed between the BPDB and the private company, and take action to stop contracting at prices that are excessive or are suspected of being collusive. We term these lines of formal monitoring and holding to account 'vertical checking'. In countries where the rule of law is strong, the detection by the principal of violations by agents results in corrective actions being taken through established accountability mechanisms.

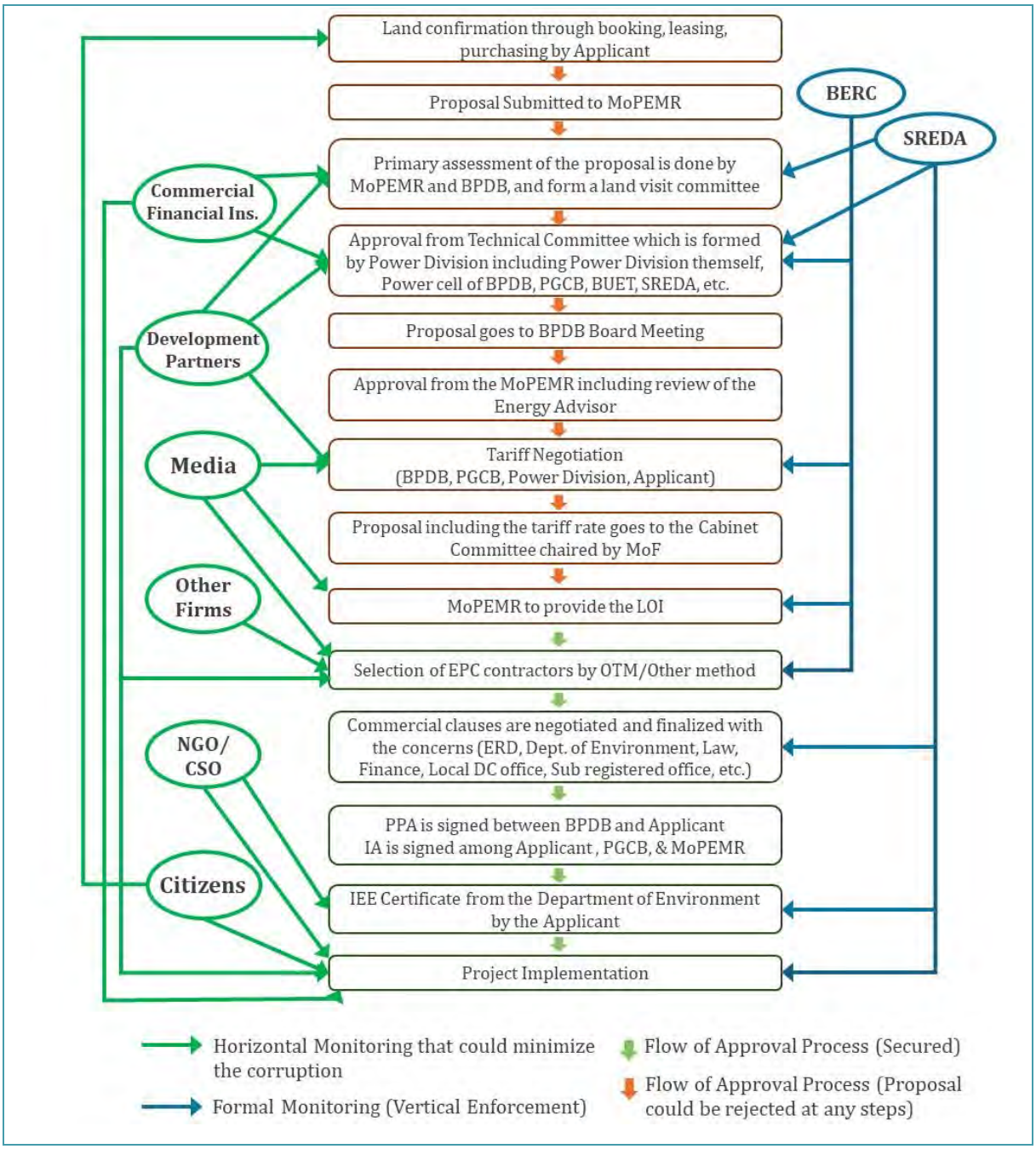
However, in countries where the rule of law is weak, corrective action often does not follow even after the rule violation is revealed, because the principal often does not have enough support to carry out the action, while the agents may have strong network support to resist enforcement. This leads to principals agreeing to collude with agents, as these individually attractive 'rent-sharing' deals are unlikely to be stopped by other coalitions of actors. In these contexts, the emergence of rule-following behaviour often depends on other actors, beyond the directly involved principals and agents, taking self-interested actions to demand the enforcement of some of the relevant rules. The outcomes depend on the power and interests of these additional actors, which we define as 'horizontal actors' and their activities in trying to demand the implementation of formal rules as 'horizontal checking activities'. The evidence from developing countries suggests that vertical checking is more likely to be effective when horizontal checking supplements and supports the vertical checking, which usually fails otherwise. For instance, when effective risk reduction strategies attract multiple investors of sufficient power and capabilities to bid in a tender, the horizontal checking of the bidding process by multiple bidders can ensure that the vertical enforcement by the formal principals is effective in these cases (Khan et al., 2022).

By looking at the contract approval process through the lens of both horizontal and vertical monitoring mechanisms, we can explain why, given the power and interests of the different actors, the enforcement of the formal rules does not happen despite the presence of many horizontal actors attempting to check the processes, and of course formal vertical checking and accountability mechanisms. Figure 11 maps this formal approval process, showing both the vertical and horizontal actors and their monitoring activities. This process predominantly describes unsolicited bids, but open tendering can also be incorporated in the diagram if at the point of appointing the EPCs there is open competitive tendering to select the lowest priced provider.

Two pivotal organisations, the BERC and the SREDA, marked out in blue circles, are tasked with formal oversight that we describe as vertical checking. Under the SREDA Act (2012), the SREDA's responsibilities include the designation and verification of suitable geographical locations, imposition of fines for non-compliant actions, and the facilitation and coordination of implementation and development endeavours across semi-government and autonomous bodies. Consequently, the SREDA is empowered to oversee the land visit and technical committees, expedite negotiations on commercial clauses, ensure adherence to environmental standards, and oversee the certification of Initial Environmental Examinations by the Department of Environment.

Under the BERC Act (2003), this body sets out the methodology for determining contract prices, considering consumer welfare among other factors. The BERC also has the authority to issue licences to private firms and to scrutinise their financial health. A further mandate of the BERC is to foster increased market competition. Consequently, its involvement includes oversight of the technical committee, tariff negotiations and the issuance of the LOI, as indicated by blue lines. To promote market competition, the BERC could advocate open tendering processes. However, the enactment of the Quick Enhancement of Electricity and Energy Supply Act 2010 rendered the BERC's mandates obsolete.

Figure 10 Generalised formal approval process map, including vertical and horizontal checking



Beyond formal monitoring mechanisms, other entities (shown in green circles) have the potential to monitor and check the approval process to ensure its efficiency based on their respective duties and self-interest. Commercial financial institutions, providing loans and financial assistance to private firms, can check the progress of their supported proposals and oversee the implementation of projects they finance. Similarly, development partners such as Multilateral Development Banks or other DFIs offering concessional loans for sustainable renewable energy projects could assess the progress of evaluations, the technical reviews, and of course the implementation of projects they finance.

The media has played an important role in Bangladesh in monitoring the approval processes and querying the contracted prices that are announced. They have often uncovered and publicised collusive and corrupt practices or questionable processes and outcomes, particularly regarding tariff negotiations, the awarding of the LOI, and tendering mechanisms. The media's scrutiny can extend to comparisons of the contract price with other projects and the quality of the EPC agreement. Additionally, an important set of horizontal checks can come from firms in solicited bids where, having participated in the tender, firms that have been unfairly excluded can challenge specific processes.

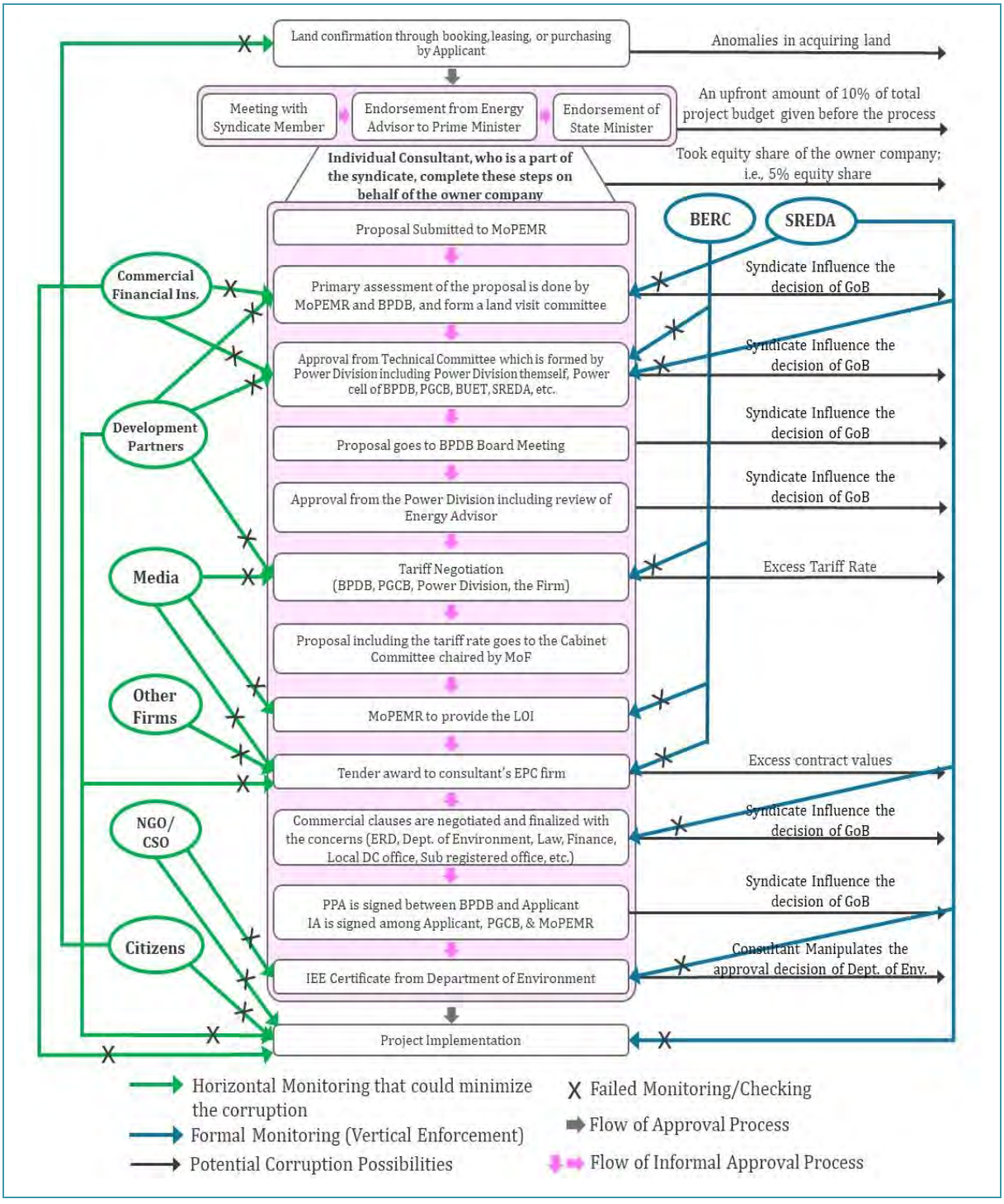
CSOs, especially rights and climate activists, also play a role in Bangladesh in providing external (horizontal) scrutiny of project approvals and contracts. Their involvement typically commences after the issuance of the LOI, when they evaluate the project's social benefits, focusing on the impact on end users and consumers. These organisations can also assess the validity of the Initial Environmental Examination certificates and the project's environmental cost and benefit.

Citizen engagements also provide other forms of horizontal checks, particularly by local citizens in land acquisition disputes. Questions about environmental impacts and social disruptions also result in citizen engagement in formal processes as they voice their grievances, seek legal recourse, and build coalitions with other horizontal actors with shared interests.

However, neither the vertical nor the horizontal checks work too well in practice in the solar power contracting process. According to our KIIs and a key informant with inside knowledge of the processes, the renewable energy approval process is organised as a syndicate. This is not surprising given its complexity, which precludes any possibility of working through such an intricate set of steps without a significant role for informal fixers. Figure 12 shows how fixers operate the syndicate, and describes the key individuals operating behind the scenes, whose collective approval is required for the project to go ahead. As soon as approval is fixed with informal deals and payments to all the key nodal actors, the leakages of resources through overpricing and other processes can no longer be stopped by the 'principals' and may indeed be exacerbated by collusive price-setting by the principals and agents acting together.

According to our insider informant, after an unsolicited bidder procures the land for the project, the applicant needs to have an informal meeting with a syndicate member. According to the key informant, the syndicate consists of policy-makers, several government officials, individual consultants, and some journalists who are directly connected to decision-makers. Based on this meeting, the syndicate member arranges consent from the energy advisor and the state minister responsible. Meanwhile, an advance bribe of 10% of the total project budget is typically handed over as an upfront amount, even before beginning the formal approval process. The upfront amount varies depending on how close the applicant is to the syndicate members, with closer applicants having to pay a smaller upfront bribe, which eventually impacts on the tariff rate they negotiate later.

Figure 11 Informal (syndicated) approval process map



After that, a 'consultant' who is connected to the insider decision-makers is hired to negotiate the endorsement of the technical committee by negotiating an appropriate deal with the concerned parties. The consultant is usually assigned the task of delivering the entire 'package' from developing the project proposal to completing all the approval steps, including navigating the technical committee's approval process, and negotiating the contracted price at which the project sells power to the off-taker.

An energy expert we interviewed told us the consultant also arranges the Initial Environmental Examination certificate from the Department of Environment.

These insider accounts triangulated across several KIIs show that consultants have come to play a pivotal role, not only as facilitators but also as gatekeepers for the syndicate. In addition to organising the contracting, regulatory and pricing permissions, they advise the investor on procurement sources for solar systems and international joint venture partnerships, charging consultancy fees amounting to 5% of the company's shares. Investors with sufficiently large sums of money to invest upfront and without powerful political enemies use this process. Investors with money and powerful political connections of their own can bypass the consultant, making deals directly with the syndicate through alternative connections and their intermediaries.

The emergence of such a syndicate has important implications for the vertical and horizontal checks that are necessary for the governance of the contracting process. Resource leakages of different sorts that can be described as corruption are depicted by the horizontal black arrows leaving Figure 12 at different points of the decision-making process, each recording separate opportunities for organising the long-term resource leakage through overpricing of the power contract, or implicit resource losses for society through regulatory violations that carry out incomplete or fake environmental impact studies or alter the pricing or the process of land acquisition that extracts value from affected citizens. As the syndicate is essentially a collusive coalition of all the significant stakeholders on the government side, overcoming the syndicate's resistance to the effective implementation of vertical governance rules is very difficult. Taking on the syndicate would require the construction and mobilisation of a horizontal coalition of actors with sufficient collective power and interest to check the collective action of the syndicate and force it to apply and implement the existing formal rules. As this is unlikely, we will later discuss the types of incremental changes that may begin to make a difference.

Vertical oversight mechanisms have been ineffective in curbing these issues. In addition, the Quick Enhancement of Electricity and Energy Supply Act 2010 has further weakened aspects of vertical checking. It effectively nullified the BERC's monitoring role, particularly regarding technical approvals, tariff negotiations, LOI issuance and tender advocacy. By allowing individual investors to negotiate their 'risk premiums', specific technology and land costs on a case-by-case basis and without any competitive validation at different nodal points in the approval chain, it has become virtually impossible for any single agency to validate the acceptability of these prices.

Furthermore, the SREDA has turned out to be a weak government organisation. Even SREDA officials acknowledge their activities are ineffective for supporting their renewable energy mandates (Khan et al., 2023). The SREDA's role in monitoring the land visit committee, the technical committee, the negotiations of commercial clauses with different departments, and the approval of the Initial Environmental Examination

certificate from the Department of Environment are all recognised as ineffective. The organisation has persistently failed to intervene in various committee deliberations or in the endorsement of environmental certifications (Khan et al., 2023), making its regulatory role of limited consequence. Insiders say that the SREDA has been relegated to having a say only in very small projects, up to 10 MW. We see this as evidence of the very limited power of individual agencies such as the BERC and the SREDA relative to the collective power of the syndicate.

> *"The SREDA is authorised to assess every energy project, but the SREDA has been effectively limited to assessing small projects up to 10 MW only."*
>
> Energy expert

Our observations of actor behaviour and their checking activities suggest that horizontal checks from other formal actors – including commercial banks, development partners and the media – are also largely ineffective in influencing key aspects of projects such as technical reviews, land inspections, power price negotiations and tendering processes. Even relatively powerful excluded firms appear to be reluctant to challenge the tendering process as single entities, possibly fearing repercussions for future opportunities. This inactivity by a variety of stakeholders whose self-interest should have made them interested in checking some of these activities suggests that they have assessed their power as individual actors to be entirely insufficient to take on the 'system' (i.e. the syndicate). At the same time, constructing a coalition for collective action of all the stakeholders that may be interested in checking the activities of the syndicate faces the usual collective action problems of individual risk and free-riding opportunities. Individual actors that 'defect' from this coalition and obtain contracts, lending opportunities or kickbacks can start making large profits, and the possibility of future entry militates against raising one's voice in advance.

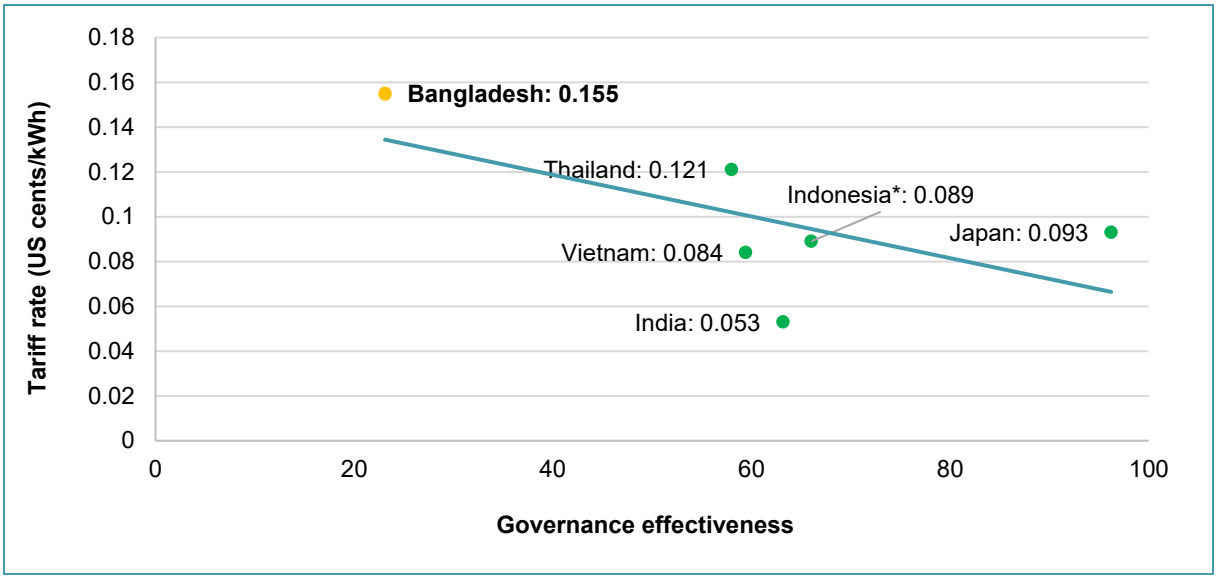
Many CSOs are engaged in reporting anomalies and extractive practices at other points in the system, but given their limited economic, organisational and political power relative to the coalition that constitutes the syndicate, their impact has been understandably limited. Individual citizens may also be affected by the implementation of the project in their localities or during the land acquisition process. There are many reports of significant grievances, especially when land previously used for agriculture and grazing is requisitioned or acquired by intimidation or pressure. These concerns highlight systemic flaws in the land procurement process in general, which goes beyond land acquisition for solar power projects. This is also shown as a black arrow during the land acquisition phase in Figure 12. By underpaying landowners, or misreporting the current uses of the land, value can be extracted from less powerful actors.

> *"In many cases, lands have been acquired forcefully… Some people may not have received the rightful value for their land, while others may have received less or more than the actual value in comparison to others."*
>
> Local citizen

Figure 12 summarises our investigations of actor behaviours. The black crosses on all the formal (vertical) checks, as well as on all the horizontal checks by other affected actors (the horizontal actors), show that the governance of the contracting process is largely unconstrained by any formal or informal activities outside the syndicate. The only limits to what can be done in terms of the prices agreed in individual contracts, the authorisations of where the project can be set up, who the implementing parties are and so on appear to depend only on what syndicate insiders think they can get away with. We cannot directly interrogate all the insiders on how these informal limits on prices and so on emerge. It may well be that these are not coordinated decisions but emerge out of deals made by consultants with multiple power centres within the syndicate. This is consistent with the observation of widely diverging prices that are agreed for different projects. It is likely that project sponsors and their consultants and facilitators make the deals depending on the demands of different insiders, and the latter make political assessments of what they can each demand in the project. The evidence suggests that national economic feasibility is not an important constraint coordinating the decisions of insiders within the syndicate. This is because the continuing practice of approving solar projects at around twice the unit price of Bangladesh's nearest competitors is very likely to make large swathes of Bangladeshi industries uncompetitive.

The overpricing of solar contracts is therefore closely related to the governance of the contracting process. Our mapping of the organisation of the informal syndicate and how it distorts both formal vertical governance and all potential horizontal checks is in this case consistent with aggregate observations of government effectiveness across comparator countries. Figure 13 shows the correlation between aggregate indicators of government effectiveness in 2023 and the average contracted price of completed solar power projects in 2022/23. This figure should not be seen as an 'explanation' of contracted solar prices in terms of government effectiveness, as there are clearly multiple determinants of pricing. However, our analysis of the high level of collusion that has emerged in the governance of solar power contracting in Bangladesh is robust enough to indicate that governance is an important contributor to the emergence of these price differences. The aggregate governance effectiveness indicators are likely to pick up some aspects of the sectoral governance problems that we describe here in detail (for more detail, see Appendix 2).

Figure 12 Relationship between tariff rates of projects completed in 2022/23 and governance effectiveness in 2023

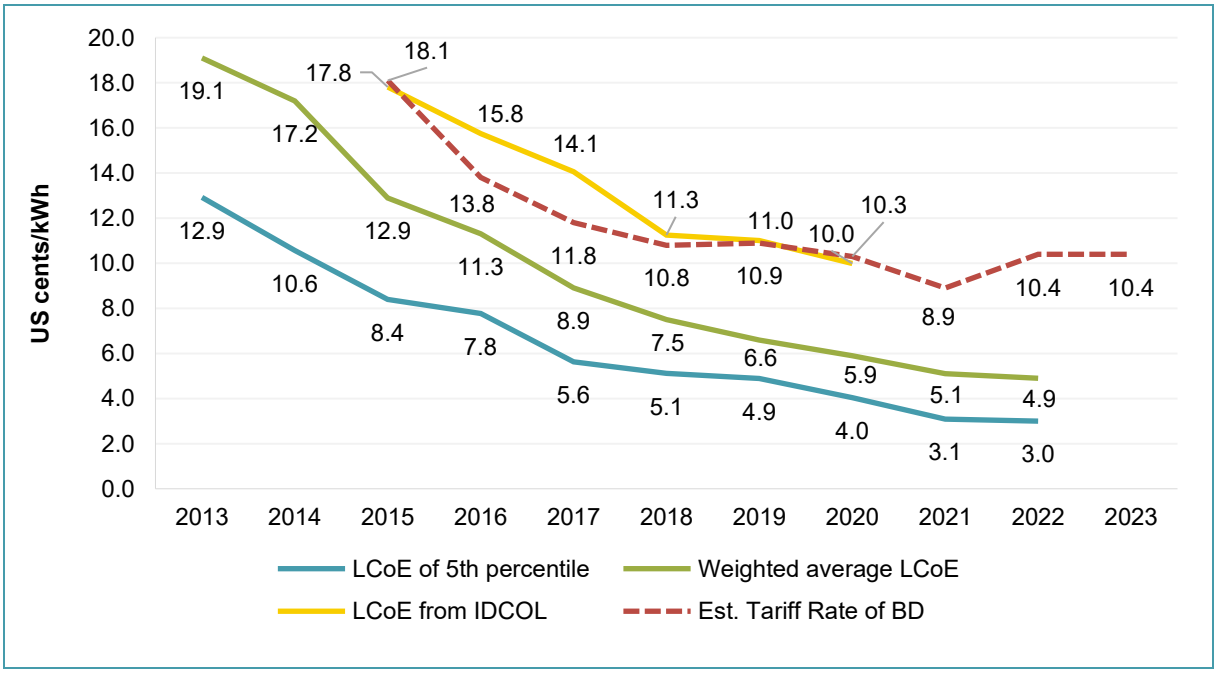


Source: Change Initiative (2023); Silalahi et al. (2023); and World Bank (2023).

Note: Due to data unavailability, estimated data are used for Indonesia's tariff rate.

Figure 14 shows the trend of the average levelised cost of solar-efficient countries that are in the top five percentiles, the average levelised cost of all countries together, the average levelised cost as estimated by the Infrastructure Development Company Limited (IDCOL) for Bangladesh, and our own estimated average contracted price for solar power in Bangladesh. It appears that the LCoE of solar power at the global level has been decreasing over the last decade, even during the COVID-19 pandemic, but not so in Bangladesh. Here, the LCoE has been relatively flat since 2018.

Figure 13 Trend comparison between global LCoE and Bangladeshi tariff rates



The gap between the prices that could and should have been achieved in Bangladesh and the actual contracted prices has been noted in other studies. An IEPMP (2023) report shows that solar power is now *potentially* the most economical way of generating electricity in Bangladesh, at approximately $0.04/kWh (4 cents) as of 2020, with projections indicating further reductions ahead, while the actual contracted prices are on average higher than $0.1/kWh (10 cents).

7. The role of preferential financing in improving governance

Our corruption mapping of the approval and contracting processes in solar power projects demonstrates the challenge of attempting to improve the governance of this process through improvements in transparency and accountability. These approaches focus on the formal or vertical checking mechanisms. The assumption is that better information about violations (transparency) and improved methods of holding violators to account (accountability) will help the enforcement of rules that protect the public interest. But we have shown, in line with our broader analysis of governance challenges in developing countries (Khan and Roy, 2022), that violations happen despite regulators and other principals knowing about the violations and despite the existence of formal accountability systems. Moreover, the many powerful horizontal actors that could have put pressure on formal principals at many different points of the policy process are also found to remain entirely silent or ineffective. We explain this as reflecting the emergence of an informal syndicate where powerful decision-makers within the system are engaged in a coordinated process of approving projects based on deal-making by trusted intermediaries and 'consultants'. This makes the collective power of the colluding coalition too great for individual horizontal actors to check. Nor is it simple to apply concerted pressure on the insiders by organising a counteraction involving all these disparate horizontal actors.

In such a context, we must consider new ways of attracting a broader spectrum of high-capability investors that are currently dissuaded from participating in solicited or unsolicited bidding processes. The demand for the enforcement of governance rules is only effective when there are many different types of investors bidding, and their interests are too diverse to allow collusion. Our process mapping suggests why high-capability investors stay away from the bidding process. Both solicited and unsolicited bids systematically attract investors that are politically connected in different ways and can access the intermediaries who can progress their project through the syndicated system. The first reason is that paradoxically the politically connected investors have lower risks of investing in such a system. This is not only because they can navigate the approvals process; the more important reason is that they can reduce their risk by overpricing the power in their projects and thereby collect the return on their investment very rapidly. This overpricing requires collusion and plausibly some sharing of the excess profits. This is the disadvantage of the less connected investors. Only if some other way can be found to reduce their risks are they likely to be interested in bidding. And if they are interested in bidding, that is a precondition for effective horizontal checks emerging in the bidding process that can begin to control some of the open violations that are taking place. The financing available for a power project can be used as an instrument for reducing the risks of

investors with lower political connections and attracting a broader range of investors, provided the financing is well designed to reduce investor risks, and is accessible to a broad range of potential investors. Khan et al. (2022) describe competitive risk reduction strategies in conventional power plants in Bangladesh that were based on the availability of preferential finance (financing offered at rates below market levels), and partial risk guarantees (that safeguard investors from non-commercial risks such as contract breaches, regulatory shifts and political unrest) when these opportunities were potentially available to a number of bidders in a tendered project. The relatively small implicit subsidies in these mechanisms served to reduce investors' exposure to future payment uncertainties. By attracting their interest in these projects, the instruments were doubly effective in also encouraging greater potential participation in the bids, thereby making the bids competitive. This success hinged on the condition that the financing was not tailored to a particular investor – a concept the authors describe as the financing subsidy being contestable.

The Khan et al. (2022) paper shows that projects that had financing with characteristics of small contestable subsidies from DFIs – namely financing that was a few percentage points cheaper than the market rate and potentially accessible to any investor that met the technical and commercial conditions for that project – resulted in contracted prices in those projects dropping by 26% compared to identical projects without such risk reduction instruments, controlling for factors such as plant capacity, size and fuel type. This massive reduction in contracted prices cannot be explained by the direct effect of the lower-cost financing, which would have an effect of 2–5% at most on the contracted unit price. The bulk of the price reduction was due to a competition effect because the risk reduction ensured the potential interest of investors that would otherwise not have been interested in bidding or observing the progress of the tendering. This risk reduction works by attracting 'horizontal checks' from other potential investors with the power, capability and interest to monitor and assess the governance of these tenders, because given the risk reduction, they are bidding or may have bid in these projects themselves. These potential bidders cannot be ignored (even if they do not actually bid), because they have the power and interest and therefore the credibility to monitor the progress of these large tenders out of self-interest, even if only to assess whether they should bid in the next tender.

As soon as significant potential investors become interested because the risk profile of a project is now something they could accept, their monitoring and interest becomes noticed by other actors, including formal monitors such as the DFIs funding part of the project, or government agencies. If potential or actual investors with the technical capabilities to do the costing and the power to make their objections known begin to suspect that formal monitors are accepting significant overpricing in the project, their objections will become known. This type of horizontal checking and pressure from other actors not directly connected with the project is very effective in these contexts in constraining contracted prices. Formal monitoring and accountability mechanisms in contexts where the rule of law is weak only begin to work when there are horizontal actors with the power and interest to put pressure on formal monitors and regulators to do their monitoring and due diligence properly.

Moreover, even politically connected bidders in these projects quietly reduce their demands for high contracted prices, as they know there is greater competitive scrutiny in these tenders. Clearly, even at prices 26% lower, these investors are making lucrative returns on their investments. This is why prices drop when risk is reduced sufficiently to attract competitive interest in a project and set up effective horizontal checking (Khan et al., 2022; Khan and Roy, 2022).

Risk reduction may be a feasible way of enhancing competition and blocking some types of collusion and corruption in power projects in contexts where the formal governance structures appear not to be working even in the presence of transparent evidence of overpricing and political connections. Eberhard et al. (2017) acknowledge that DFIs play an important role in mitigating risk and bringing in private financiers. Christianson et al. (2017) concur that ensuring optimal financing conditions for investments will be crucial in realising a low-carbon future. This may entail experimenting with different financial designs that reduce risk in competitive ways, to enhance competition and potentially reduce contracted prices. Financing instruments that reduce risk do not necessarily have to be exclusively provided by DFIs. Local financing can also have the same effect, provided at least one of the actors involved in the project has the self-interest to want to pursue a competitive outcome and has the power to impose costs on other stakeholders if this does not happen. Whether overseas investors and multinational corporations bring in competitive or collusive pressures on regulators may depend on the corporation's home jurisdiction, whether it is subject to monitoring and rule of law constraints in its home jurisdiction, and whether government-to-government linkages between the corporation's home country and Bangladesh allow these foreign investors to engage in collusive overpricing.

A policy strategy to reintroduce preferential financing as an instrument to reduce the risks of large numbers of infrastructure investors is likely to require the assistance of DFIs and development partners. The justification of such an initiative would be to create the conditions for effective horizontal checks on the governance of infrastructure contracts, without which it is unlikely that effective governance will improve. Local financial organisations have played a positive role in the past, but a reset is again required. Bangladesh has a long history of local non-bank financial institutions such as IDCOL that have been involved in financing power projects, and recently solar power projects. IDCOL is a non-bank financial institution and the most active public financial lender in the solar IPP sector. Development partners and international financial institutions grant IDCOL loans at a reduced rate, which are then on-lent to power sector investors. IDCOL can provide loans at 6–8%, compared to interest rates at least 3–4 percentage points higher in commercial banks now that rates have reached double digits across the financial institutions. In its early days, IDCOL played a very important role in reducing risks in major power projects and was involved in some of the early IPPs that were very competitively priced (Khan et al., 2022).

Initially, IDCOL had a reputation for sound entrepreneurial lending and was behind some of the early independent power projects in Bangladesh. Unfortunately, the governance of organisations in developing countries often depends on the characteristics and interests of a few leading individuals and is also affected by changes in the configuration of power and interests outside the organisation. IDCOL as an organisation has not been immune to the effects of the syndicate that has developed in solar power contracts.

This is unfortunate because IDCOL has access to funds from various sources, including the Global Climate Fund and the Global Environment Facility. The Global Environment Facility has allocated $160 million in grants and secured $1.037 billion in co-financing for 43 projects in the country (Khan et al., 2023). According to these authors, the Green Climate Fund has awarded Bangladesh $441.2 million across nine projects, and IDCOL is the major recipient of those amounts for energy efficiency in the private sector. Additionally, the Climate Investment Funds have contributed $110 million in grants and low-cost financing to enhance the livelihoods of 10 coastal towns in Bangladesh. Furthermore, bilateral and multilateral channels such as the World Bank, the Asian Development Bank and the United Nations Development Programme (UNDP) have also directed climate-related funds to Bangladesh. According to EY (2023), State-owned non-banking financing institutions such as the Bangladesh Infrastructure Finance Fund Limited (BIFFL) and IDCOL are frequently recognised for their robust management of non-recourse financing, a form of commercial lending where repayment is contingent upon project profits and the lender's ability to seize only specified collateral outlined in the loan agreement, even if its value falls short of covering the total debt. They offer funds in various currencies, including Bangladeshi taka, US dollars and euros, with credit lines sourced from DFIs.

However, in 2018, the Anti-Corruption Commission investigated IDCOL for irregularities and corruption in the implementation of a solar panel project (Bangla News 24, 2018). Earlier, in 2016, the Solar Association of Bangladesh claimed that IDCOL was involved in corruption involving 90% of the allocated funds for solar energy projects (Jugantor, 2016). In addition, more recently, in 2021, it was alleged that IDCOL's partner organisation had participated in a BDT1.49 billion ($13.546 million) loan default case by knowingly allowing the implementation of cheap and faulty solar systems. This type of allegation has been directed at more than one IDCOL partner organisation. According to the Anti-Corruption Commission, IDCOL's employees were involved in this scheme (Daily Inqilab, 2021). Our access to key insiders in the solar power industry and our KIIs with multiple insiders tell a more worrying story. There are plausible accounts from our insiders of key individuals within IDCOL participating in the negotiations and deals with the syndicate through consultants, making the organisation compromised in terms of immediately exercising any effective horizontal checks on the granting of contracts (see Box 2).

Box 2 IDCOL's role: Horizontal checks or collusion with the syndicate?

In our KIIs we came across trusted insiders who provided evidence of emerging practices in IDCOL that are consistent with some key individuals within IDCOL engaging in informal transactions and deal-making with the syndicate. One of our key informants is an official of an EPC company known for its own better-than-usual corporate governance and transparent dealings. This company was one of IDCOL's biggest partner organisations. Yet after doing above-board business with IDCOL worth hundreds of millions of takas, it found that obtaining contracts in new projects involved informal practices that it could not participate in. IDCOL's role is not limited only to providing finance to investors, but also in sharing information about how to do business, gain approvals and identify the recommended EPCs investors should work with to implement the project. What is an above-board formal business support approach can easily morph into under-the-table informal deal-making in a context of widespread informality, weak horizontal checks by other actors, and the growing power of the external syndicate. This key informant explained that informal networks and exchanges with IDCOL officials were now critically important for the selection of EPCs in projects and for organising kickbacks. This EPC company could no longer work with IDCOL, and the latter does not put it forward for any upcoming projects.

> *"As one of the oldest and most reputable players in this business, we should have been supported by IDCOL in new projects. But like many other established businesses, we do not get IDCOL recommendations for projects anymore, and many organisations like ours do not want to work with them either. On the other hand, some connected companies want to work with IDCOL and are supported by them."*
>
> EPC official

According to another private EPC company official, IDCOL has become part of the 'syndicate' and can also play a negotiating role in facilitating the progress of approvals. This also means that involved IDCOL officials are now part of the coalition sharing the benefits of new loans and projects, with the EPC becoming an important partner in the implementation of the project. As a result, the selection of trusted EPCs has become important for IDCOL. It supports lending to projects which engage its preferred EPCs. Moreover, the official added that, as a result, IDCOL now prefers to work with several specific EPCs and often suggests that investors should work with these selected EPCs, which is clearly going beyond their business support remit.

Nevertheless, despite this landscape of widespread and growing corruption, Bangladesh does need to support more infrastructure development, including solar power. Moreover, any ruling coalition in Bangladesh also has an interest in ensuring that the price of power does not cripple the country's export sectors and export earnings. These factors mean that if development partners and international financial institutions offer preferential financing for solar power (or other critical infrastructure sectors) that is available to any investor that meets technical and commercial requirements set by the DFIs and finance providers, it is unlikely that the syndicate will be able to mobilise to block such an offer. Indeed, such types of financing arrangements have played a role in conventional power generation in Bangladesh in the past. If, as a result, competent solar power investors begin to bid lower prices by factoring in their lower risk because of access to this preferential finance, it will be difficult for the syndicate to block these projects for very long. These investors are likely to have the power and capabilities to put pressure on regulators, DFIs, development partners and ministers and government officials who are not directly beneficiaries of the solar power syndicate and may want to see lower-priced power projects for their own interests. The development of these horizontal pressures may

allow a few cheaper and technologically superior solar projects to be approved, opening the doors to incrementally stronger horizontal checks on the regulatory management of the sector.

These incremental shifts are aligned with Bangladesh Bank's new green refinancing scheme. Central to this scheme is a cap on interest rates, ensuring that customers, in this case a private company, do not pay rates exceeding 5% for refinancing purposes. More precisely, the refinancing mechanism involves a commercial bank to finance private project first, and then Bangladesh Bank will provide the funds to the private company through the commercial bank. According to Bangladesh Bank (2023), the private firm has to pay interest of 4% to the commercial bank and of 1% to Bangladesh Bank. Additionally, the financing mandates a 70:30 loan–equity ratio, so the customer must invest at least 30% in the project. Khan et al. (2023) surveyed 30 industry leaders in renewable energy and found that nearly 8.3% of photovoltaic assembly and manufacturing (EPC) firms and 11.1% of power plant producers received green financing support from Bangladesh Bank.

The process of refinancing involves an application that must be submitted by the private company to Bangladesh Bank within 90 days of disbursement. However, in cases where financed projects encounter operational challenges, the application window extends to 180 days. Bangladesh Bank channels the funds directly to the participating financial institutions, rather than to the customers, ensuring proper oversight and compliance. However, this scheme is not yet widely known, even in the power sector. The banking sector has been facing severe liquidity crises in raising deposits, so Bangladesh Bank has created sustainable funding sources exclusively for green investments, including renewable energy options. However, delivery is still low due to the complexity of the sector and limited interest among banks to deal with this portfolio due to a lack of focus on climate resilience.

According to a Bangladesh Bank official, the bank collaborates closely with the SREDA. A committee comprising representatives from Bangladesh Bank, public sector banks and major private sector banks has been established to drive efforts towards increasing renewable energy adoption and energy efficiency. This collaborative approach underscores an official commitment to create a financial ecosystem aligned with environmental sustainability goals and to improve the performance of monitoring agencies such as the SREDA. The emergence of a broader range of horizontal checks along the lines we propose can only assist this process.

8. The cost structure of solar power and opportunities for manipulation

Private power company officials uniformly point out the high land prices in Bangladesh in overall project expenses. Solar power requires relatively large areas of land on which to locate panels, and land is scarce in Bangladesh. Despite a global reduction in other costs related to solar power, the higher costs in Bangladesh may be due in part to higher prices of land acquisition. Owners of solar power companies assert that the high cost of land increases the total expenditure of solar IPP projects. This is an issue, but our KIIs and investigations also revealed that some of these high prices are deliberately overstated to enable overpricing of power contracts.

Box 3 Land acquisition costs: Reality versus reported

The generation of solar power is land-intensive. The land market in Bangladesh is subject to well-known market failures. Usually, barren non-agricultural lands are cheaper and are used to build solar farms. But in Bangladesh it is hard to find large areas of contiguous land for sale. Solar power developers say that to acquire 200 acres of land, you may have to deal with 150–200 landowners, compared to 10–20 owners in other jurisdictions. Developers also report that local landowners increase land prices when they know a large area is to be acquired. This has made land a large cost item for project developers. An alternative is to use leased government land. However, entrepreneurs cite legal challenges that may limit step-in rights for developers and their ability to take full control of the project.

A privately owned 100 MW solar power plant situated in the southern region involved the acquisition of **280** acres of land a decade ago for the solar modules. A total of **350** acres were acquired, including land for additional infrastructure and operations. Normally land for solar power is leased, but this land was bought. The plant manager claimed that the cost was around **BDT7 billion to BDT8 billion** ($63.85 million to $73 million).

However, most of this land was cheaper land of high salinity, and used for shrimp cultivation. Locals told us that the current price of this land is around BDT2 million to BDT2.5 million per Bigha (a third of an acre). Adjusting for inflation, this suggests that the land acquisition should have cost BDT1.2 billion to BDT1.3 billion ($10.95 million to $11.95 million). A similar 100 MW solar plant later constructed on a 326-acre site paid BDT330 million to BDT340 million ($3 million to $3.1 million) for a lease.

Thus, while land prices are a significant part of the LCoE, reported land acquisition prices are often unrealistically high compared to the market and to leasing opportunities. Clearly investors have an incentive to overstate their land costs when they bilaterally negotiate contracted prices with the power purchaser. Without an effective formula for land pricing, overpriced projects are likely to be approved. A competitive determination of contract prices must be the way forward.

To assess the land acquisition costs for solar IPP plants in Bangladesh, a study encompassing the regions of Madarganj, Mongla, Bagerhat, Gajaria in Munshiganj, Shonagaji, Bera in Pabna, Muktagaccha in Mymensingh, Dimla in Nilphamari, Barisal

Sadar and Gowainghat in Sylhet was conducted. These areas collectively represent over half of the nation's solar power plant installations. According to the criteria for 'non-arable land', the average cost for acquiring 225 acres for a 50 MW solar plant is approximately BDT960 million ($8.8 million), whereas a 100 MW facility requiring 350 acres required expenditure of about BDT1.5 billion ($13.7 million), but, depending on the location, this figure could vary between BDT500 million ($4.56 million) and BDT3.7 billion ($34 million). This variation is huge and offers scope for exaggerated estimation of the contacted tariff; only a competitive bidding process can determine the most cost-effective locations for solar power plants.

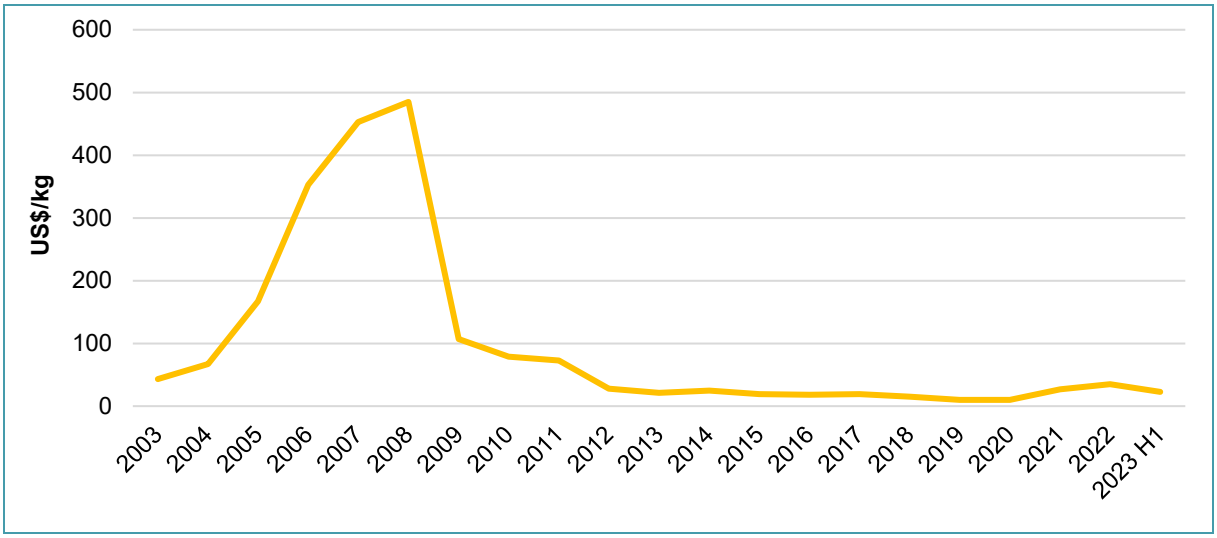
Under the Immovable Asset Acquisition and Requisition Act 2017, land acquired for government projects requires compensation 200% above market rates, and 300% above market rates for land acquired by non-governmental organisations. This provision is also discriminatory, as the final tariff rate for consumers is uniform, and the difference in compensation is not reflected. Hence, the land acquisition cost for a 100 MW solar power plant, estimated at 350 acres, is up to a maximum of BDT3.75 billion ($34.2 million), with an average cost of around BDT1.5 billion ($13.7 million). Yet many projects declare land acquisition costs much higher than this (see Box 3).

Bangladesh's flat geography makes it vulnerable to flooding, and most of the land that would be ideal for the installation of solar power projects is located along riverbanks. Consequently, backfilling is required on most of the land that is available for solar power projects, adding to the project's cost. The land fill cost, as specified in the Local Government Engineering Department's Schedule of Rates 2022, is BDT283.13 per cubic metre. Based on an average filling depth of 2.2 metres for 350 acres, the estimated cost is around BDT625 million. Factoring in an additional BDT1 billion for land development and civil construction, the comprehensive land development expense should not surpass BDT2.5 billion.

8.1. Estimated costs of solar panels

The price of polysilicon, a key raw material in solar panel production, has decreased significantly over the last decade. In 2008, the price was around $485/kg, but by 2023 it had plummeted to $23/kg, representing a 95% decrease over 15 years (see Figure 15). This price reduction can be attributed to factors such as improvements in production methods and the establishment of excess manufacturing capacity, particularly in China, which now dominates the global polysilicon market with an 80% share.

Figure 14 Polysilicon price trend 2003–2023



Source: IRENA data, accessed 10 March 2024.

The cost reductions extend beyond polysilicon. There was a 34–61% drop in prices of solar photovoltaic modules between 2013 and 2018, depending on the market. From 2018 to 2022, in the South Asian region the price of modules and inverters fell from $411/kWh to $226/kWh. On average there was an 80% price reduction in installation costs between 2010 and 2022 (for more information, see Appendix 1). Furthermore, China and India are currently the leading countries for exporting solar IPP equipment. In 2023, the installation cost in India was $640.5/kW, whereas in China it was $715.2/kW. That means a 100 MW solar park should have an installation cost of $64.05 million to $71.52 million depending on the country. Currently, Regulatory Code 155 provides import duty exemptions for solar cells, modules and lanterns. There is 1% custom duty on solar panels, and 37% on solar inverters. In 2023, the inverter installation costs in India and China were $28.8/kW and $40/kW, respectively. So duty tax for inverters should be $10.60–14.80/kW. On this basis, the installation cost of a 100 MW power plant should not exceed **$65 million to $75 million**.

Looking ahead, the trend of declining equipment costs is expected to continue. With advancements in technology, further optimisations of the supply chain, and the growth of new manufacturing in regions such as Southeast Asia, the cost of solar photovoltaic equipment is likely to decrease further. This trend, coupled with supportive policies and increasing energy security concerns, will undoubtedly propel the adoption of solar power as a leading source of clean energy. The global decline in the cost of solar photovoltaic equipment presents an opportunity for Bangladesh to achieve reductions in contracted prices for electricity. However, corruption in the contracting process is preventing this from happening. Finding feasible strategies for improving the governance of contract allocation is important if Bangladesh is not to lose out in the global transition to green energy.

8.2. Transmission infrastructure for competitive solar power

The PGCB, a subsidiary of the Power Development Board, is the only firm that has been transmitting electricity throughout Bangladesh since its foundation in 1996. It is financed mostly by the government and a few private organisations, including foreign ones. Before then, the BPDB had the sole authority to generate, transmit and distribute power. Although the PGCB formally comes under the authority of the BPDB, it is currently functioning independently.

When a proposal for a solar power plant is submitted, the PGCB assesses whether power can be distributed from that project through existing transmission lines or whether it will be possible in the future. Based on this feedback, the project developer decides on its course of action. The power plants are primarily controlled by the BPDB. The PGCB does not have a direct role in the approval of solar projects. However, indirectly, its opinion is important, and based on this, the BPDB and the Power Division provide approval. The PGCB does not construct any transmission lines to meet the needs of a new project. If a new transmission line is needed for a solar IPP project, the investors have to construct it themselves.

8.3. Estimation of transmission cost

The levelised cost of electricity transmission (LCoET) refers to the cost of moving the electricity from its generation source to end users. It does not include the cost of generating the electricity, but rather the cost of the associated infrastructure and processes involved in delivering it. The LCoET can be combined with the LCoE on the generation side to provide a single figure for the cost of delivering the electricity to final consumers.

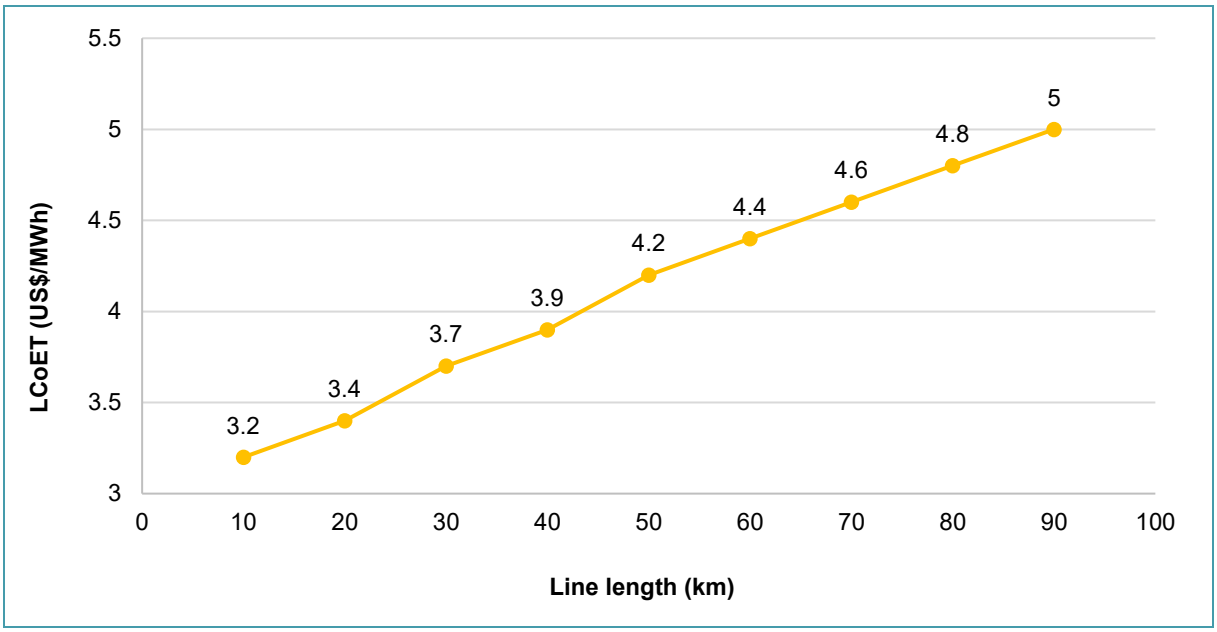
Several factors influence the cost of electricity transmission. Significant capital expenditures are required to build, maintain and upgrade transmission infrastructure. Longer transmission distances and difficult terrains elevate the costs due to the need for more extensive or expensive infrastructure and technology. Both over- and under-utilisation of capacity can lead to increased costs, either through the need for additional infrastructure or higher unit costs in infrastructure use. Compliance with safety, environmental and industry regulations may require further infrastructure modifications, and higher costs. The need for regular maintenance and the age of infrastructure determines operational expenses. Extreme weather conditions can damage infrastructure, necessitating costly repairs and upgrades.

The transmission of electricity requires a variety of equipment, including transformers, switchgear, circuit breakers, relays, isolators and conductors. The costs associated with these instruments and the overall transmission infrastructure are substantial. For instance, the construction of transmission lines in Bangladesh has been reported to cost approximately BDT30 million to BDT40 million ($270,000–

360,000) per kilometre for a 132 kV line. This figure varies depending on the terrain, with costs escalating in hilly or densely populated urban areas. Moreover, the price of key components such as transformers and switchgear depends on global commodity prices, technological advancements and local installation costs.

Using publicly available cost figures, we estimate that for a **60 km line**, the transmission cost for a 100 MW solar plant with a 20-year lifespan should be around BDT173 million or $1.6 million (see Appendix 5 for more details), which is far less than the price quoted in an EPC contract we have seen of BDT830 million ($7.57 million) for a similar transmission line constructed for a public company, and far less than the BDT1.4 billion BDT ($12.77 million) estimate of the PGCB.

Figure 15 Levelised cost of energy transmission vs. line length



Source: US Energy Information Administration (2022).

9. Lessons learned and further scope for in-depth research

During our analysis of corruption in renewable energy projects, several key insights have emerged, shedding light on the informal mechanisms prevalent in the approval and implementation processes, particularly concerning solar IPP projects. First, we have discerned an informal pathway through which solar IPP projects secure approval. This pathway often circumvents formal channels and relies heavily on personal connections and political affiliations. Additionally, our investigation has unearthed instances of budget leakage during the project execution phase, indicating systemic vulnerabilities in financial oversight mechanisms. Moreover, it has become evident that the entire implementation of solar IPP initiatives is subject to control by a syndicate, further complicating transparency and accountability measures. A deep dive is required to reveal the patterns across the project's ownership, size, and source of and access to funding.

Looking ahead, there exists a pressing need for in-depth research to deepen our understanding of these illicit practices and their broader implications. One area ripe for exploration is the identification and analysis of the various informal avenues used to obtain project approval. For instance, further investigation may reveal the intricate network of relationships between private company owners, political figures and syndicate members, demonstrating how these connections facilitate the evasion of standard procedural checks. Moreover, delving into the specifics of insider knowledge and its role in project advancement could provide valuable insights into the extent of information asymmetry and its impact on equitable resource allocation.

Furthermore, future research should prioritise unravelling the intricate dynamics of budgetary leakage in renewable energy projects. By scrutinising the mechanisms through which funds are siphoned off, and examining the complicity of key stakeholders, such studies can contribute to the development of robust safeguards against financial malfeasance. Additionally, an exploration of the overarching influence wielded by syndicates in the implementation phase of solar IPP ventures is imperative. Understanding the power structures at play and their interplay with regulatory frameworks is essential for devising effective strategies to combat systemic corruption.

10. Conclusion

Our mapping of the formal and informal processes involved in contracting for solar power projects in Bangladesh explains why the governance of these processes has become so poor. Bangladesh has been contracting solar power at prices that are often more than twice as high as in comparable neighbouring or competing countries. Even allowing for land prices and transmission costs, our estimates suggest that the prices awarded are excessive, and that high electricity prices are making Bangladeshi businesses uncompetitive relative to competitor countries. The governance failures here have several dimensions. The most obvious is the prevalence of unsolicited bids and the absence of competition in the bidding process. A deeper problem is that capable investors without strong political connections are likely to find this investment environment too risky, particularly in the absence of financing instruments or co-investments that reduce their risks. These investors stay away and do not submit unsolicited bids of their own. In their absence, the formal governance structure based on vertical checking fails to work.

In our framing, the vertical checking on which formal governance is based requires effective horizontal checks from other actors. These horizontal demands and pressures are necessary to force the formal system to work as it should, particularly in contexts where the rule of law is weak. In the Bangladesh solar power sector, these horizontal checks have effectively disappeared because of the emergence of a collusive approval process. Based on our knowledge of the practices of stakeholders in this sector, and KIIs with critical insiders, we build up a picture of how investors strike collusive deals with key officials in multiple departments involved in approving projects. The coordination of deals with all these officials is usually carried out by trusted intermediaries or consultants who organise a package deal for investors in exchange for significant upfront payments. We describe this hidden coalition of colluding officials as a ‘syndicate’. The implications of the syndicate are far-reaching. The high risks facing unconnected investors keep them out of the sector, but their absence means there are no effective horizontal checks on regulators and officials to enforce the rules. As a result, politically connected investors not only get their projects approved regardless of their qualifications, but also raise contracted prices to the highest level they can negotiate. These governance failures have clearly been very damaging for Bangladeshi taxpayers and electricity consumers.

The emergence of a syndicate means that a horizontal actor that may want to check a particular violation currently has to take on the syndicate. They are unlikely to have the power on their own to be able to do so, or to construct a sufficiently powerful alternative coalition. A feasible strategy is only likely to emerge if new actors can be brought in with a different relationship with the vertical governance actors. One possibility is suggested by the evidence of lower prices achieved in other parts of the power sector in Bangladesh. The solution may be to look for strategies that can attract a broader range of investors to bid on specific projects. Some forms of

preferential financing can attract new investors to bid, as this can reduce investor exposure to high interest payments in a context where their own payments may not be received on a timely basis. If capable and unconnected investors are attracted to bid on projects, this can enhance the horizontal checks and pressures on formal (vertical) enforcement actors and improve formal governance at least in these projects. If more contracts are awarded to capable companies at competitive prices, this can begin to change the distribution of power and interests in a sector that now appears to be dominated by collusive interests.

Land acquisition is another area where feasible improvements can be made to improve the viability of solar power. Leaving private investors to acquire land creates adverse incentives. Powerful politically connected investors can take this opportunity to acquire additional land by cheating small landowners and overstating land acquisition prices when negotiating contracted prices for solar power. As solar power is land-intensive, it makes sense to insist that solar projects should only be constructed on land that can be leased from the government. This can help bring down unit costs of solar power, though without a strategy of attracting new investors and feasibly enhancing competition and effective horizontal checks, any savings in land acquisition costs are unlikely to be passed on as reductions in the contracted price of power.

The research in this study justifies a deeper investigation into the risk appetite of potential investors in the renewable power sector in Bangladesh. What are the types of preferential finance that may induce them to be interested in submitting unsolicited bids or to participate in solicited tenders? An estimate of the extent of preferential financing that can attract a wider range of bidders could justify small-scale trials by DFIs and development partners. Experiments with different designs of financial instruments can help assess the most effective instruments that can attract investor interest and enhance horizontal checks during the bidding process. If this can be achieved, this would be an effective way of improving governance to achieve better developmental outcomes in terms of lower contracted prices in these power projects.

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Appendix 1: Calculation of LCoE

Financing

For a 100 MW power plant			
	BDT (millions)	**Nature**	**$ (millions)**
Foreign loan	11,157.9	100% loan	102.0664
Government	3,190	60% equity, 40% loan	29.18039
Implementing entity	770	100% equity	7.043542
Total	15,117.9		138.2903
		1 $ = 109.82 BDT	

Financing assumptions

Tenor (from financial close)	**12**	**Years**	**Financing fees**	**2.00%**	**one time**
Grace period	1.5	Years	Swap rate	2.50%	
Tenor (from payment date)	10.5	Years	Interest rate (fixed)	6%	
Number of repayments	4	Annually	US inflation	2023	3.40%
Total number of repayments	42	Quarterly	Bangladeshi inflation	2023	9.41%

Total system cost

Parameters	**Cost ($)**	**Remarks**
Solar EPC	129,932,228.00	
Evacuation and transmission line EPC	7,557,821.89	Considering 47 km transmission line
Land lease	3,187,033.33	30 years
Fixed operations and maintenance	8,800,000.00	
Salary and allowances	2,261,883.08	
Total	151,738,966.30	$
	151.7389663	$ millions

Considering compound interest of 8.12% on the loan, the total system cost is BDT265,661,339.98 or roughly **$265.66134** million.

Technical assumptions

Category	Value	Unit/Remarks
Specific yield	1450	kWh/kWp
Daily operation hour (average)	6	hours/day
Installed capacity	110	MWp
Supply to grid (targeted)	100	MWp
Performance ratio	84%	
Availability loss	1.00%	From EPC guaranteed yield
Distribution loss	0.05%	Substation and other losses
Grid maintenance loss	2.50%	Due to 10 days maintenance right of BPDC
First-year degradation	2.00%	
Guaranteed degradation/year	0.70%	/year
Cumulative performance ratio	87.8%	
Alternating current capacity utilisation factor	16.01%	
Direct current capacity utilisation factor	11.93%	
Average radiation	800	W/m2
Plant availability	100%	

So yearly net electricity generation is:

Year	Yearly degradation incorporated (kWh)	Year	Yearly degradation incorporated (kWh)	Year	Yearly degradation incorporated (kWh)	Year	Yearly degradation incorporated (kWh)
1	191,452,980	6	184,845,283.3	11	178,465,640.8	16	172,306,181.5
2	190,112,809.2	7	183,551,366.3	12	177,216,381.3	17	171,100,038.2
3	188,782,019.5	8	182,266,506.7	13	175,975,866.6	18	169,902,338
4	187,460,545.4	9	180,990,641.2	14	174,744,035.5	19	168,713,021.6
5	186,148,321.5	10	179,723,706.7	15	173,520,827.3	20	167,532,030.4

The net electricity generation over 20 years is **3,584,810,541.03 kWh**.

Levelised cost of energy

The levelised cost of energy (LCoE) is a term which describes the cost of the power produced by solar over a period, typically the warranted life of the system.

$$LCoE = \frac{Total\ system\ cost\ (US\$)}{Total\ electricity\ generation\ (kWh)}$$

So, the LCoE is ($265,661,339.98 ÷ 3,584,810,541.03 kWh) = $0.074107/kWh

But our KII gives a different outline, as follows:

	Category	Cost (BDT)	Cost ($)	Debt amount (70%) ($)	Equity amount (30%) ($)
Fixed cost	Solar EPC	7,500,000,000	68,293,571.30	47,805,499.91	20,488,071.39
	Transmission cost	200,000,000	1,821,161.90	1,274,813.33	546,348.57
	Land lease	350,000,000	3,187,033.33	2,230,923.33	956,110.00
	Land fill (2.2 m)	625,000,000	5,691,130.94	3,983,791.66	1,707,339.28
Total fixed cost		8,675,000,000	78,992,897.47	55,295,028.23	23,697,869.24
Interest tenor	10.5 years	Interest rate	5%		
Debt service		4,063,233,048	36,999,026.12		
Variable cost	Operations and maintenance	1,328,000,000	12,092,515.02		
Total cost		22,741,233,048	207,077,336.08		
Total electricity generation	kWh		3,584,810,541.03		
Flat LCoE (total cost/ total electricity generation)			0.057765211		

Source of the decline in the global weighted average LCOE of utility-scale solar photovoltaic power plants in two periods, 2010–2016 and 2016–2022

					TIC			***Finance***	***OPEX***	***Performance***	
	2010	Module	Other soft cost	Installation/ EPC/ devt.	Inverter	Racking and mounting	Other BoS hardware	WACC	All-in operations and maintenance	Capacity factor	2016
US$/kWh	0.445	-0.153	-0.040	-0.037	-0.031	-0.019	0.009	-0.021	-0.009	-0.030	0.113
Share of decline (2010–2016)		46%	12%	11%	9%	6%	-3%	6%	3%	9%	

					TIC			***Finance***	***OPEX***	***Performance***	
	2016	Module	Other soft cost	Installation/ EPC/ devt.	Inverter	Racking and mounting	Other BoS hardware	WACC	All-in operations and maintenance	Capacity factor	2022
	2016										**2022**
US$/kWh	0.113	-0.017	-0.01	-0.007	-0.003	-0.005	-0.013	-0.008	-0.001	-0.001	0.049
Share of decline (2016–2022)		27%	15%	11%	4%	7%	20%	13%	2%	1%	

Appendix 2: Relationship between governance effectiveness and tariff rate of completed projects

Country	Governance effectiveness	Tariff rate of completed project
Bangladesh	23.11321	0.155
Sri Lanka	35.85000	0.072*
India	63.20755	0.053
Vietnam	59.43396	0.084
Thailand	58.01887	0.121
Japan	96.22642	0.093
Indonesia	66.04000	0.099*

Note: *Due to unavailability of data, a proxy tariff rate is used.

Appendix 3: EPC cost estimation, imported from two different destinations, 2023 ($)

Category	China	India	Import duty	EPC cost (China – assigned)	EPC cost (India – assigned)
Modules	257.7	196.8	1%	260.277	198.768
Inverters	40	28.8	37%	54.8	39.456
Racking and mounting	14.3	52.4	1%	14.443	52.924
Grid connection	68.1	34.6	0%	68.1	34.6
Cabling/wiring	20	34.9	0%	20	34.9
Safety and security	11.9	22.2	0%	11.9	22.2
Monitoring and control	2.5	6.5	0%	2.5	6.5
Mechanical installation	67.8	46	1%	68.478	46.46
Electrical installation	47.8	32.8	1%	48.278	33.128
Inspection	10.4	7.2	1%	10.504	7.272
Margin	74.8	50.9	1%	75.548	51.409
Financing costs	53.2	79.4	1%	53.732	80.194
System design	4.3	17.5	1%	4.343	17.675
Permitting	15.2	15.9	1%	15.352	16.059
Incentive application	19.2	8.2	1%	19.392	8.282
Customer acquisition	8	6.4	1%	8.08	6.464
Total	715.2	640.5		735.727	656.291

Appendix 4: Land cost estimation

Division	Area	Mouja rate (for 1 decimal) – BDT	Land area (50 MW) (acres)	Land area (100 MW) (acres)	50 MW land acq. cost (BDT)	100 MW land acq. cost (BDT)
Mymenshingh	Madarganj	30,000	225	350	675,062,612.8	1,050,097,398
Khulna	Mongla	46,346	225	350	1,042,881,728	1,622,260,467
Khulna	Bagerhat	77,866	225	350	1,752,147,514	2,725,562,799
Dhaka	Gajaria, munshiganj	105,982	225	350	2,384,816,194	3,709,714,080
Chitagong	Shonagaji	32,000	225	350	720,066,787	1,120,103,891
Rajhshahi	Bera, Pabna	40,277	225	350	906,316,561.9	1,409,825,763
Mymenshingh	Mymensingh, Muktagacha	33,333	225	350	750,062,069.1	1,166,763,219
Rongpur	Dimla, Nilfamari	16,316	225	350	367,144,053	571,112,971.4
Barishal	Barisal Sadar	29,850	225	350	671,687,299.8	1,044,846,911
Sylhet	Gowainghat, Sylhet	15,333	225	350	345,024,501.4	536,704,780
Average		42,730.3		Average	961,520,932.2	1,495,699,227.83
				Max.	2,384,816,194	3,709,714,080
				Min.	345,024,501.4	536,704,780

Appendix 5: Transmission cost

Distance (km)	LCoET (US$/MWh)	LCoET (US$/kWh)	Plant lifespan	Total energy production (kWh)	Transmission cost (US$)	Transmission cost (BDT)
47	4.4	0.0044	20 years	3,584,810,541.03	15,773,166.38	1,727,477,182

Note: For reference, see Figure 16.

ACE SOAS Consortium **Anti-Corruption Evidence**
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