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BANGLADESH'S RENEWABLE ENERGY SUPPLY CHAIN: GAPS, BARRIERS & THE PATH FORWARD

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Powering Bangladesh's Future: Why the Renewable Energy Supply Chain Must Be Built at Home

Selim Raihan

Bangladesh can no longer afford to think of renewable energy only as a power generation issue. It is now a question of economic strategy, industrial policy, energy security, and national resilience. For too long, the discussion has focused mainly on megawatts: how much solar or wind capacity the country can install, how quickly projects can be approved, and whether renewable energy can help reduce pressure on imported fuel. Those are important concerns, of course. But they are only part of the story. The deeper issue is this: Bangladesh needs to build and strengthen the full renewable energy supply chain, from equipment sourcing and local assembly to financing, logistics, standards, maintenance, storage, and grid integration. Without that broader shift, the country may expand renewable energy use, yet still remain dependent, vulnerable, and structurally unprepared for the next phase of energy transition. Recent official data show Bangladesh's renewable energy installed capacity at around 1,696.9 MW as of 1 April 2026, while the government's draft Renewable Energy Policy 2025 explicitly highlights local manufacturing of solar equipment, inverters, mounting structures, cables, batteries, and energy storage systems as a policy priority.

This matters because Bangladesh's energy challenge is no longer just about supply shortages. It is also about the cost and fragility of import dependence. A country exposed to volatile global fuel prices, foreign exchange stress, and external supply disruptions cannot build a secure energy future by relying on imported fossil fuels on the one hand and imported clean-energy equipment on the other. That would simply replace one dependence with another. Renewable energy must therefore be seen not only as clean power, but as an opportunity to create domestic value addition. Solar panels, inverters, battery systems, smart meters, cables, control systems, mounting structures, and technical services all form part of a wider ecosystem. If Bangladesh remains merely anend-user market, it will lose the chance to generate jobs, build technical capability, and reduce long-term costs. The country's own policy direction increasingly recognizes this. The draft Renewable Energy Policy 2025 calls for promoting domestic manufacturing, and recent discussions around scaling renewables have also pointed to the need for streamlined institutional support and a stronger project ecosystem.

The case for strengthening the supply chain is especially strong in the solar segment. Bangladesh has already seen that rooftop solar, utility-scale solar parks, and distributed systems can play an important role. In 2025, the government moved to expand rooftop solar on public buildings such as schools, colleges, and hospitals, partly to reduce dependence on costly fuel imports and to use idle rooftop space more productively. Many of the larger land-based solar projects may take years to come online, making rooftop solutions a faster and more practical option in the near term. That logic is sound. But rooftop expansion also exposes the weakness of Bangladesh's current supply chain. Developers face difficulties in accessing equipment at competitive cost, financing remains cumbersome, technical approvals are often slow, and there is still insufficient domestic capacity in installation, after-sales servicing, and system integration. In other words, renewable energy deployment is being slowed not only by policy barriers but by a thin industrial base around it.

Therefore, what should Bangladesh do? First, it needs a clear industrial strategy for renewable energy components and services. This does not mean trying to manufacture everything immediately. That would be unrealistic. Instead, the country should identify priority segments where local capability can emerge relatively quickly. Mounting structures, cables, switchgear, control panels, solar module assembly, battery pack assembly, and inverter-related components are natural starting points. Bangladesh already has some experience in light manufacturing, electrical goods, and industrial assembly. Those capabilities can be extended. The goal should be gradual deepening: begin with assembly and balance-of-system components, move toward higher-value manufacturing where feasible, and integrate domestic firms into regional and global supply chains. The draft policy's reference to production-linked incentives is therefore important, but incentives alone will not be enough. They must be linked with performance, technology transfer, standards compliance, and export potential.

Second, financing has to be redesigned around the needs of the supply chain, not just the final project. In Bangladesh, energy financing has often been imagined in project terms: a power plant, a rooftop installation, a donor-supported programme. But supply chains require working capital, warehouse finance, credit guarantees, longer-term industrial loans, and support for SMEs that operate in fabrication, installation, repair, logistics, and electrical engineering. Domestic firms need easier access to capital if they are to become credible participants in the renewable economy.

Third, Bangladesh must invest in standards, testing, certification, and skills. A renewable supply chain cannot thrive in a low-trust environment where poor-quality equipment enters the market, installations vary widely in quality, and buyers have limited confidence in performance. This is where public institutions become crucial. Technical standards for panels, inverters, batteries, and grid-connected systems have to be clear and enforced. Testing facilities and certification mechanisms must be strengthened. At the same time, vocational and engineering training need to catch up with the market. Thousands of technicians, electricians, engineers, data specialists, and maintenance workers will be required if renewable energy is to expand at scale. This is not just about climate policy. It is also about workforce transformation.

Fourth, the grid and logistics systems must be treated as part of the supply chain. Renewable energy is often discussed as if generation alone were enough. It is not. Solar and wind require transmission readiness, storage options, smart dispatch systems, forecasting tools, and better coordination between generation sites and demand centers. Delays at ports, customs bottlenecks, transport inefficiencies, and poor coordination among

agencies can raise the cost of renewable deployment just as surely as bad tariffs can. A genuine supply-chain strategy would therefore connect energy policy with trade facilitation, customs modernization, industrial land policy, and transport planning.

Finally, Bangladesh should think beyond import substitution and toward strategic positioning. The country has a chance to become more than a passive consumer of renewable technologies. With the right policy mix, it can build a competitive domestic base in selected components and services, support a vibrant rooftop and distributed solar market, and eventually serve parts of the wider regional market. That would make renewable energy not merely an environmental obligation, but a pillar of structural transformation.

The real test is whether policymakers can move past a narrow, project-centric mindset. Bangladesh does not simply need more solar panels. It needs an ecosystem that can finance them, move them, assemble them, certify them, install them, maintain them, and integrate them into a smarter energy system. That is what a real renewable transition looks like. And that is where the future lies. If Bangladesh gets the supply chain right, renewable energy will do more than keep the lights on. It will strengthen industry, create jobs, conserve foreign exchange, and build a more resilient economy. That is the opportunity now in front of us. The question is whether we are ready to build it.

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How Import Duties and Taxes are Shaping Bangladesh's Solar Energy Future

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While Bangladesh is in the middle of the transition phase towards renewable energy, solar power has become one of the key alternatives to fossil fuels. In the past 10 years, this country has added nearly 1,500 megawatts of solar, a gradual transition of energy consumption from urban industrial hubs to rural homes. Yet, the readiness or realization of the country's full solar potential seems to be limited more by systematic and structural challenges in the ecosystem of the overall solar supply chain. According to insights acquired from recent conversations with domestic solar companies, it indicates that a multi-layered, disjointed scheme of import duties and taxes works as a primary and significant constraint. Even though the global price of solar components is experiencing a downward growth, industry stakeholders note that Bangladesh has been unable to take complete advantage of the trend, primarily because local policies make going green more expensive and local businesses less competitive.

For enabling fiscal policies to have any meaningful impact on the solar industry, the long-time structural dynamics of the country's solar supply chain has to be examined first. As of now, Bangladesh is heavily depended on imports with local enterprises suggesting that nearly 90 to 95 percent of total solar equipment imported from China. Everything from solar panels to inverters, inverters, structural components, networking equipment, controllers, DC cables, and batteries make up this imported inventory. As the market insight shows, China is dominating the global solar industry due to large economies of scale, which enable manufacturers to provide high-worth components at a much lower cost that would be very difficult to replicate in Europe or North America. Thus, local solar companies are running more in an import-driven model than a manufacturing model.

Significant structural barriers are prevalent to localizing the supply chain of solar market in Bangladesh. Local sector representatives indicate that the domestic manufacture is virtually confined to assembly activities that provide a low-value-add of around 10 to 15 percent. Furthermore, Bangladesh does not have the necessary raw materials, including solar cells and tempered solar glass, needed for full-scale production. In addition, expensive international certifications, which run from $20,000 to $30,000 per model, coupled with the lack of a gigawatt scale domestic market make large research and development investments financially unfeasible for local firms. As a result, the country is still very much intertwined with the world import market and thus, national tariff policies are, by far, the most important factor driving the course of solar adoption.

Policymakers claim that there are incentives which are designed to bolster the sector, like 1 per cent import duty on solar panels. Nonetheless, practitioners within the industry state that the overall taxation regime is fraught with procedural complexities that further raise the cost of importing. One of the main difficulties pointed out by local companies relates to the way the customs authorities value imported panels. In recent times, global solar panel prices have declined, and, at times, revenue collection assessments were made based on weight elements instead of real market price indicators. As solar panels are inherently heavy, this weight-based tariff system can indirectly make the assessed import cost increase, offsetting the economic merits of plunging worldwide costs. According to local importers, the effective tax burden is effectively three times as high as it is when valuation is by weight, because of the fact that in practice the tax burden on solar panels could reach approximately 3%.

Also, while there are tax exemptions on solar panels themself, a full-fledged solar ecosystem needs an entire set of peripherals like inverters, structural components, networking equipment, controllers, DC cables, and batteries that face significantly higher duties. The Total Tax Incidence rises dramatically when considering Advance Tax, Value Added Rub, and Advance Income Tax. For example, inverters have official import duty of 10%, while the effective tax rate can be as high as 27% approximately. Aggregate duties for structural components and DC cables are often around 58 to 60 percent, leading to an even more severe fiscal impact. Even the cumulative duties on batteries are up to 62%. Though these batteries are not the batteries used for the Energy Storage System, these are extremely important for the current supply chain as a part of the whole process. Addressing the challenges regarding the import duties for different kinds of equipment will be helpful for inaugurating Energy Storage System for realizing the potential of storing day-time production to use in peak hours.

Sometimes, the tax structure is not consistently applied and varies with the classification of the project, as per the industry source. A uniform 1 percent duty is generally charged on all components of equipment imported under a particular Hybrid Power Plant Project. But the same equipment is taxed at the higher aggregated rates when imported for the conversion into ordinary rooftops or for normal Engineering, Procurement, and Construction projects. And even training-related equipment imported may carry a further 10 percent duty. To lower these costs, occasionally manufacturers try to import panels and inverters at the same time in a master Letter of Credit subject to a single 1 percent duty rate. However, this administrative workaround usually involves the mediation of third parties, drawing extra charges and resulting in more outflows of foreign currency. In comparison, local stakeholders tend to cite regional examples such as Malaysia, which over the years have slashed tariffs on solar equipment to speed up green energy transitions.

Local firms face a range of operational difficulties due to the regime of tariffs that exists and makes it difficult for them to compete with foreign contractors. Local businesses claim foreign firms generally get project funding from their countries of origin at very low interest rates. On the other hand, local players incur huge capital expenses simply to obtain Bank Guarantees, since blocking big money for tender security deposits affects local company's operational cash flow. Furthermore, local firms strictly follow the formal VAT and corporate tax regimes, which create an inherent operational baseline. This structural imbalance usually leads to foreign companies continuing to be dominant in mile-sized, grid-scale solar projects while domestic firms focus on much smaller scale projects, often in the form of rooftop systems. Many local enterprises also consider institutional financing portals, like the ones accessible via IDCOL, as having tough collateral conditions that can be proven difficult for nascent firms to negotiate.

The supply chain is also clogged by a dearth of testing and certification infrastructure. As the Bangladesh Standards and Testing Institution lacks thorough and modern testing facilities they have to depend on document verification only. In a situation where physical screening is necessary, samples should be shipped to Dhaka. If a company imports 2,000 panels and submits three for testing, the whole shipment can be detained at the port for three to four months. This delay constrains the significant size of capital, causing setbacks to the progress of the projects and increasing the overall cost. Creating testing centers at the district-level, or even at ports, would considerably mitigate these delays.

Ultimately, it seems the future of Bangladesh's solar power market is intricately linked with the progress in fiscal and regulatory policies in the country. A uniform, flat import duty on all solar components could help, according to academic and industry consensus. Categorical discrepancies, absence of level playing field for the domestic investors in comparison with foreign investors should be worked on. Fair tender policies, simplified financing mechanisms, and decentralized port-based testing are imperative to develop a sustainable solar future. To build resilience and to drive the national renewable energy ambition forward, Bangladesh could better position its local industries along with incentivizing the foreign companies.

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Bangladesh's Renewable Energy Transition: A Missing Link in Quality Assurance

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Geopolitical crises have always exposed Bangladesh's over-dependency on imported fossil fuels. Ongoing tensions involving the United States and Iran have already contributed to rising inflationary pressures. Energy shortages are reducing industrial output, increasing transportation costs, disrupting fertilizer production due to gas shortages, and posing serious risks to future food security. Nationwide load shedding has intensified, while rising subsidies on imported fossil fuels are likely to further deplete foreign reserves and put additional pressure on the domestic currency. Current Middle East conflicts have further exposed this structural weakness. Energy is widely recognized as one of the most critical resources in the global economy and is likely to become a defining factor in the coming years. To overcome these geopolitical conflicts, Bangladesh needs to expand the available domestic renewable energy sources urgently. However, a critical question arises: to what extent does the government show a genuine commitment to the renewable energy transition in Bangladesh? If such intent exists, are the current policies and strategies being implemented effectively to deliver meaningful progress? The evidence suggests that, despite policy attention and strategic declarations, implementation gaps remain substantial and persistent.

While financing constraints, taxation structures, and investment gaps are the primary obstacles to the renewable energy transition in Bangladesh, another equally important yet underexplored issue is the absence of a robust quality assurance and certification ecosystem for imported renewable energy components. This institutional gap significantly undermines efficiency, reliability, and long-term sustainability in the sector.

Renewable energy systems depend heavily on high quality components to ensure efficient, stable, and long-lasting performance, particularly in challenging environmental conditions such as high humidity, heat, and dust exposure, which are common in Bangladesh. In global practice, the quality assurance process involves several stages. First, manufacturers subject components such as solar panels and inverters to laboratory testing to assess their electrical performance, durability, and safety under simulated environmental conditions, including high temperature, humidity, and mechanical stress. These tests are conducted in accordance with internationally recognized standards such as those developed by the International Electrotechnical Commission (IEC) and other national regulatory frameworks. Following successful testing, accredited certification bodies verify compliance and issue certificates that allow products to enter international markets. Upon import, national authorities are expected to re-validate these certifications or conduct additional conformity assessments to ensure compliance with domestic requirements. Proper implementation of this process ensures optimal energy conversion and storage, enhances system efficiency, reduces the risk of component failure, and ultimately safeguards the return on investment for end users.

A dedicated renewable energy component testing institute would play a critical role in supporting Bangladesh's renewable energy transition by ensuring the quality, reliability, and safety of imported technologies. Without such an institution, the country remains heavily dependent on foreign certification, which can create information asymmetries, increase the risk of substandard components entering the market, and delay project implementation. In addition, the absence of domestic

testing capacity limits the government's ability to enforce standards effectively and undermines consumer confidence in renewable energy systems. The countries that are currently leading in renewable energy transition in the world such as Germany, Italy, the USA, China, and India all have their own multiple specialized testing institute for renewable energy components. These institutions not only ensure technical compliance but also support innovation, product development, and industrial competitiveness. Even though Pakistan has recently been significantly successful in the renewable energy transition, and more than 46 percent of its electricity generation capacity comes from renewable energy as of September 2025, the PAK-KOREA Testing Laboratory for PV Modules and Allied Equipment lab was established in December 2025. On the contrary, there is no single dedicated renewable energy components testing institute in Bangladesh.

According to the data from the power division, of the total renewable energy capacity, approximately 78 percent comes from solar power in Bangladesh. Despite this heavy reliance on solar energy, Bangladesh does not have its own comprehensive solar components testing institute. The Bangladesh Standards and Testing Institution (BSTI) has performed a limited role in this area, as its technical and institutional capacity remains significantly constrained. Although BSTI provides some testing facilities for solar panels, its capabilities for testing solar inverters are negligible, and it does not offer testing services for other solar components.

In practice, solar panels are certified based on internationally recognized standards, which are enforced by national testing authorities. Unfortunately, Bangladesh has not developed its own certification framework for solar panels, but rather it is just adapting different international standards such as International Organization for Standardization (ISO), International Electrotechnical Commission (IEC), Bureau of Indian Standards (BIS), and Conformité Européenne (CE).

However, the BSTI testing system is mainly documentation-based rather than based on direct comprehensive physical testing. Usually, a company imports solar components and submits the certificates to BSTI, and then BSTI reviews them to determine compliance with the required standards. If approved, the product is listed in BSTI's database. Once a specific model is listed, subsequent imports of the same model do not require further testing. BSTI does not have enough modern and advanced testing equipment to test solar panels and solar inverters. Without proper testing infrastructures, imported solar panels and inverters often fail to meet their claimed quality and performance standards. For example, a solar panel advertised as having a capacity of 500 watts, but it delivers only 300 watts. In addition, most of the low-cost solar components in the market do not meet established quality standards. This system, while administratively convenient, raises serious concerns regarding quality assurance and technical reliability.

Furthermore, the bureaucratic delays further complicate the process. Sometimes, even after obtaining BSTI certifications, the Sustainable and Renewable Energy Development Authority (SREDA) checks unnecessary documents for a long time, sometimes taking three to four months. As a result, importing companies cannot install solar panels for the customers on time, escalating project costs and diminishing efficiency.

If Bangladesh is economically capable of it, the current government should urgently build up a separate testing institute just for renewable energy components. If not, then it is very necessary to further strengthen, modernize, and upgrade the existing capacities of BSTI. BSTI must be needed to introduce direct physical testing-based methods for all renewable energy components, rather than a purely documentation-based system. Another solution could be to establish port-based testing facilities that could significantly decrease delays by enabling rapid testing of imported products upon arrival. If there is a testing institute at each port in Bangladesh, it will be possible to test the imported renewable energy components quickly after they arrive at the port. Otherwise, several months are wasted in bringing these components to Dhaka and travelling around, because there are few testing labs in Dhaka. As technology is changing rapidly around the world, BSTI's testing equipment needs to be updated and modernized in line with that. In addition, the government should encourage the establishment of testing laboratories in the private sector to enhance capacity and competition.

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War, Energy, and Bangladesh's Missing Solar Workforce

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Due to price volatility in international energy markets, Bangladesh's economy remains highly vulnerable. A recent example was the Russia-Ukraine war. However, there remains a question of what the country learned from the crisis and whether its lessons were properly internalised. Bangladesh now faces another energy shock following the outbreak of the Iran war in March 2026. Because of the conflict, LNG prices rise quickly, forcing the country to seek costlier spot cargoes. This event exposes how quickly a distant war can travel through the Strait of Hormuz into domestic power shortages, industrial anxiety, and fiscal pressure. Imported LNG accounts for more than 25% of the national total gas consumption, and about 42% of total gas consumption goes to the power sector. This is not a fact of energy; this is a national vulnerability.

This is why solar must be treated as an energy security strategy, not merely a climate aspiration. The recent national energy policy of Bangladesh is the Renewable Energy Policy (REP) 2025, and it recognises the country's dependence on natural gas and other fossil fuels. Most of the fuels are imported, and Bangladesh needs a diversified energy mix to strengthen energy security. The REP 2025 vision also goes beyond installing more renewable projects. It connects renewable expansion with local manufacturing capability, cost competitiveness, and human resource development. The diagnosis is correct, but it is not delivered.

There is no lack of ambition when it comes to increasing renewable energy capacity. Current SREDA dashboards on renewables show that Bangladesh has about 1.69 GW of installed renewable capacity, accounting for about 5.24% of total installed energy generation capacity. 1.40 GW of that capacity is represented by solar, consisting of solar parks, rooftop net metering, and solar home systems (SHS). Apart from solar installations, there are initiatives in solar panel exports and foreign investment in solar. In June 2025, Radiant Alliance, a Bangladesh-based company, exported solar panels to the US market for the first time. In March 2025, Chinese solar manufacturer Longi revealed plans to invest in solar panel manufacturing in Bangladesh.

The government has also pushed some big rollouts on solar expansion. In December 2025, the erstwhile interim government approved 12 new private solar plants with a combined capacity of 918 MW and an investment value of BDT 39,862 crore. As part of the National Rooftop Solar Program 2025, the government aims to install 3,000 MW equivalent of solar panels on state-owned buildings, alongside net metering reforms that now allow systems up to 100% of sanctioned load. This is the sort of scaling Bangladesh needs, but that's only on paper. In practice, there is an uncomfortable question: who will build, install, test, service, and maintain all this capacity?

This is where the bottleneck begins. Bangladesh may be announcing a solar manufacturing and deployment push, but its training pipeline is not ready for it yet. A 2024 future-skills study on TVET in Bangladesh finds a serious shortage of skilled workers than jobs. It finds a continuous mismatch between what graduates learn and what employers need. It also finds that around 60% of respondents said their technical skills needed more development for employment.

The quality problem inside the training system makes that mismatch worse. The same study reports that

the National Technical and Vocational Qualifications Framework is not implemented in reality. The student enrollment exceeds the capacity of buildings, tools, and equipment. According to respondents, students do not benefit from learning to operate old and obsolete machines when companies recruit for newer technologies. The country cannot prepare a modern solar energy workforce when the teaching tools are obsolete, and the qualification systems are half-implemented.

There is also a disconnect between the institution and industry. The 2024 study reveals that 68% of the TVET students believe there is no linkage between their institute and industry. The graduates ultimately struggle in the labour market because of a lack of coordination between training institutions and employers. This matters a lot for solar, as the sector does not reward only theoretical knowledge. It depends on practical competence in installation, electrical integration, quality control, troubleshooting, and routine maintenance. Without structured industrial attachment, apprenticeship, and assessment, "trained" becomes only a label, not a capability.

The political temptation of confusing manufacturing announcements with readiness exists as well. Renewable Energy Policy 2025 includes the right signals of promoting the production of solar cells, panels, inverters, and peripheral components by the government. It also opens doors to production-based incentives, tax exemptions, and duty or VAT cuts on certain solar components. These measures can help local industries grow, but they do not run on policy clauses alone. They run on technicians, supervisors, quality inspectors, electricians, operators, trainers, and after-sales service teams. Solar localisation without skills localization will achieve nothing.

Meanwhile, implementation problems are already visible in reality. There are debates over rooftop solar costs, import duties on accessories, and whether the policy mix is helping adoption fast enough. Apparel sector entrepreneurs argue that import taxes increase system costs just when rooftop solar could decrease both energy vulnerability and carbon emissions. At the same time, the government wants to protect and nurture local manufacturing. This is a real policy dilemma, but it should not overlook the larger issue. Even if tariffs are perfectly balanced, Bangladesh will still struggle unless it produces enough competent workers for a growing solar ecosystem.

The good news is that the REP 2025 already has a practical opening. It directs SREDA to support training and research, encourage renewable energy curriculum from the school level to university, and maintain a national database on designers, installers, maintenance professionals, suppliers, importers, manufacturers, and EPC companies. The database could become the backbone of certification, accountability, and labour market visibility. Bangladesh needs recognised training pathways, credible standards, and industry-linked certification before the next wave of solar projects outstrips the workforce meant to sustain it.

The Iran war may end. Shipping routes may return to normal. Spot LNG prices may stabilise. But Bangladesh's skills gap will remain unless the country treats it as seriously as it treats capacity targets. A panel on a rooftop cannot secure a factory, a school, or a grid if no one is there to install it properly, certify it credibly, or repair it when it breaks down. Bangladesh needs more solar, but it needs a workforce for it even more. Energy security will not come from solar panels alone. It will come from the skilled hands that make them work.

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