Policy Paper

Bangladesh Industrial Energy Efficiency Policy

A Draft for Sustainable Progress

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Contents

List of Tables

Acronyms and Abbreviations

ACEEE	American Council for an Energy-Efficient Economy
ADB	Asian Development Bank
BAPEX	Bangladesh Petroleum Exploration and Production Company Limited
BGMEA	Bangladesh Garment Manufacturers and Exporters Association
BKMEA	Bangladesh Knitwear Manufacturers and Exporters Association
BMS	Battery Management System
BPDB	Bangladesh Power Development Board
BREB	Bangladesh Rural Electrification Board
BERC	Bangladesh Energy Regulatory Commission
BSTI	Bangladesh Standards and Testing Institution
BLDC	Brushless Direct Current
CCA	Climate Change Agreements
CEA	Certified Energy Auditor
DCCI	Dhaka Chamber of Commerce & Industry
DESCO	Dhaka Electric Supply Company
DPDC	Dhaka Power Distribution Company
DSM	Demand Side Management
EECMP	Energy Efficiency and Conservation Master Plan
EECPFP	Energy Efficiency & Conservation Financing Project
EDMS	Energy Data Management System
EE	Energy Efficiency
EE&C	Energy Efficiency & Conservation
EIB	European Investment Bank
EMS	Energy Management System
EPC	Energy Performance Contracting
EPZ	Export Processing Zone
ESCO	Energy Service Company
ETI	Energy Transition Index
EV	Electric Vehicle
FGD	Focused Group Discussion
GCF	Green Climate Fund
GIS	Geographic Information System
GRI	Global Reporting Initiative
GRS	Green Refinancing Scheme
GTF	Green Transformation Fund
GWp	Gigawatt Peak
HVAC	Heating, Ventilation, and Air Conditioning
IETF	Industrial Energy Transformation Fund
IEEFA	Institute for Energy Economics and Financial Analysis
IE3	International Efficiency 3
IE4	International Efficiency 4
IDCOL	Infrastructure Development Company Limited
IEPMP	Integrated Energy & Power Master Plan

IFC	International Finance Corporation
KII	Key Informant Interview
KPI	Key Performance Indicator
LC	Letter of Credit
LED	Light Emitting Diode
LNG	Liquefied Natural Gas
MoPEMR	Ministry of Power, Energy & Mineral Resources
MoC	Ministry of Commerce
MoI	Ministry of Industries
MoF	Ministry of Finance
MoEFCC	Ministry of Environment, Forests & Climate Change
MoHPW	Ministry of Housing and Public Works
MRV	Measurement, Reporting and Verification
MW	Megawatt
MWh	Megawatt Hour
NBR	National Board of Revenue
NBFI	Non-Banking Financial Institution
NEECP	National Energy Efficiency Compliance Portal
NGO	Non-Governmental Organization
O&M	Operations and Maintenance
OSH	Occupational Safety and Health
PAT	Perform, Achieve, and Trade
PMO	Prime Minister's Office
PRS	Periodical Energy Consumption Reporting System
PRSF	Partial Risk Sharing Facility
PWD	Public Works Department
R&D	Research and Development
RMG	Readymade Garments
ROI	Return on Investment
SCADA	Supervisory Control and Data Acquisition
SEETRUM	Southeast Asia Energy Transition Partnership
SIP	Solar Irrigation Pumps
SME	Small and Medium Enterprise
SRO	Statutory Regulatory Order
SREDA	Sustainable and Renewable Energy Development Authority
TA	Technical Assistance
TARA	Technology and Action for Rural Advancement
TBS	The Business Standard
UK PACT	United Kingdom Partnerships for Action on Green Economy
UNDP	United Nations Development Programme
VAT	Value Added Tax
VFD	Variable Frequency Drive
VRM	Vertical Roller Mill
WEF	World Economic Forum

Executive Summary

The industrial sector of Bangladesh consumes approximately 50% of total energy consumption while experiencing severe climate change challenges, increasing energy demand, and very large energy inefficiency in use. This reality threatens the economy of the country, affecting the competitiveness of the industries globally in the long run. There are ambitious master plans for energy, i.e., Energy Efficiency and Conservation Master Plan (EECMP) 2016 and Integrated Energy and Power Master Plan (IEPMP) 2023, and other rules and regulations. However, the lack of implementation at the operational level of government and the lack of prioritizing the energy efficiency of the private sector have impeded the master plans from being utilized properly. This policy paper aims to mitigate this gap through a comprehensive consultation procedure with the public and private stakeholders and proposes a framework with interconnected policy domains, so that the present industrial energy use can be transformed into catalysts of economic and environmental performance.

Key Policy Areas

(i) Energy Efficiency Awareness

Ignorance is the biggest behavioral barrier for industrialists and entrepreneurs to identify energy efficiency opportunities and utilize incentives provided by the Government. There are many industrial sectors, and each sector has its own set of barriers and thus requires it to be addressed through a sector-specific awareness campaign. Awareness campaigns for energy efficiency should include providing practical training to the operators of industries, incorporating energy efficiency in the academic curriculum of schools and colleges, promoting technology development through local production incentives, promoting ISO 50001, developing and implementing a smart monitoring system, and establishing a national energy data platform to facilitate energy management.

(ii) Energy Auditing and Monitoring

Though energy auditing identified 18-21% potential efficiency improvement opportunities, only 16 audits out of the 189 required for large consumers have been conducted so far. The main policy-practice gap is the lack of institutional capability to conduct quality audits and the lack of effective regulatory enforcement. While the export-oriented Garment sector conducts energy audits as part of the services offered to its foreign buyers, energy-intensive sectors such as the steel and cement industries have no systematic energy auditing practices in place.

Instead of relying on a voluntary approach to energy audits, they should be made mandatory and phased with certain consumption benchmarks for different sectors of industry. To enable monitoring and review of consumption on a continuous basis, an Energy Data Management System (EDMS) and a Periodical Energy Consumption Reporting System (PRS) need to be developed and linked with financial incentives such as concessional loans and green finance to make the energy audit a tool for improvement.

(iii) Financing and Incentives

There are some domestic initiatives and international investments for green financing in Bangladesh, but huge gaps remain to be addressed to facilitate access of SMEs to green

financing. The complex and time-consuming process of approval for concessional credit, in addition to the absence of de-risking facilities, ESCO contracts, and capital-market instruments, creates huge hurdles for entrepreneurs to pursue green financing. At the same time, commercial banks of the country are charging exorbitant interest rates to make green financing attractive to cost-conscious entrepreneurs and thus remain out of their reach. The projected industrial efficiency financing demand far exceeds the available amount of concessional capital. To address this financing gap, setting up 'one-stop' green finance desk(s) to be disbursed through an online platform with standardized terms & conditions is an immediate requirement. Pilot carbon credit programs can be developed. Import duty on efficient components can be equalized to zero. Cluster-level metering can be installed. In the long run, setting up green credit guarantee facilities is required.

(iv) Energy Conservation

There is systemic inertia among the operators of industries. The owners of industrial units are slow to identify potential for energy efficiency and slow to seize an opportunity when it is identified. While the industry owners can save almost 20% of their operational cost by energy conservation, they are responding as per the current reality of subsidized energy prices. Lack of a functional market of ESCO and the inability of commercial banks to finance energy efficiency projects are causing inertia regarding conservation. Establishing an Institute of Energy Conservation, appointing a dedicated energy officer in each industry, and supporting ESCO model establishment can incentivize the conservation process.

(v) Stakeholder Collaboration

Bangladesh will require, to some extent, a process of collaboration between government, industry, and academia, based on shared risk and shared innovation. There are a large number of stakeholders from government, industry, and academic institutions, but most of their priorities are divergent. Even within and across ministries, and between and within industry and other private sector organizations, there is a great deal of fragmentation. In general, there is a lack of adequate coordination between stakeholders. In order to ensure effective implementation of all prior steps of this study, a high-level National Energy-Efficiency Stakeholder Council should be established with the end objective of developing energy efficiency policy and of implementing these policies through the coordinated actions of government, industry, and academia.

(vi) Infrastructure and Grid Modernization

Energy policy in Bangladesh has moved on from demand management to focus on transmission and distribution infrastructure development through the IEPMP 2023. However, land acquisition, lack of integrated planning, and most importantly, lack of finance continue to impede the modernization of the distribution network. As a result, industries are forced to set up inefficient captive power generation spread all over the country, creating a near-catastrophic national inefficiency. For creating competitive industrial bases, it is very important to invest in distribution networks of clusters of industries in Dhaka, Gazipur, and Narayanganj. New industries should be set up in Economic Zones and linked to high-voltage supply lines on a shared basis. Natural gas policy should prioritize supplying gas to the most

efficient power plants in the country and allow industrial users to access green concessional finance.

(vii) Enforcement and Communication

The inability of the current system to implement decisions made for the energy plan is mainly due to the inability of the current system to enforce its decisions. The rules and ways of implementation of the current system are scattered amongst various institutions. To change the behavior of industries through rules, it is necessary to bring all fragmented rules in place currently under implementation by various entities under one umbrella, and that can be done by establishing an Enforcement Regulation under SREDA. Also, a National Energy Efficiency Compliance Portal needs to be established to prevent the entry of the least efficient product/ technology in the market in the country and to implement energy efficiency programs through a "carrot and stick" approach.

Sector-Wise Energy Efficiency Study and Action Prioritization:

(i) Readymade Garments (RMG) Industry

The readymade garments (RMG) industry is contributing about 30-40% to the country's electricity consumption in the industrial sector. Unpredictable and persistent power cuts force several industries to use captive gas generators for power generation, which incur huge costs. RMG industries are spread across the country in chaotic zoning and are operating in the neighborhoods of large steel and other industries, which cause serious grid frequency instabilities and affect the quality of production. Shifting existing RMG units to economic zones having suitable zones for industries and providing them with stable 11/33 KV power supply lines through cheap and firm power can improve the situation. This will enable the RMG units to do away with the expensive captive gas generators.

(ii) Cement Industry

The cement sector of the country is importing about 95% of raw materials, and in the case of local sources, the materials are only being used for grinding and packaging in various units across the country, and thus, these are very power-intensive. The overcapacity in the cement sector of the country and price war among the manufacturers are causing great obstruction in implementing energy efficiency measures in the sector. Energy audits are recommended to be conducted for the medium and large cement plants; however, due to the absence of such practices in the country and the high cost of their implementation, especially in the case of Vertical Roller Mills (VRMs), these have not yet been addressed. The high logistics cost in the cement sector is another challenge, and this is due to various reasons, including inefficient movement of materials through the river and the road. Mandatory auditing, financial incentives to import energy-efficient technology (such as VRM), careful assessment of approving new firms, and improving transportation are the suggested policy initiatives.

(iii) Steel Sector

The steel sector is also quite vulnerable to load shedding due to reliance upon electricity-intensive induction furnaces, which are largely dependent on imported scrap. A massive drop in furnace temperature caused by a single power outage results in millions of dollars in losses.

Many barriers in the steel industry, like weak energy auditing practices, long supply chains, and congestion in ports, exist and pose big problems, which are increasing costs in the industry and impeding the practices of energy-efficient production in the steel sector. Recommended policy reforms include guaranteeing firm power supply for melting operations, aggregating new investments in economic zones with shared utilities, ensuring mandatory energy audits with incentives, and streamlining shipbreaking processes to ensure a stable scrap supply.

(iv) Commercial Sector

The commercial sector in Dhaka is responsible for 70% of the power consumption in the city. This is largely due to extended shopping and dining hours. The large glass facade found on the exterior of most shopping malls and restaurants allows a lot of heat to penetrate the air-conditioned interior. This, in turn, requires the air conditioning system to use even more power to cool to maintain a comfortable temperature. Limiting operating hours, restricting full-glass exterior, and incorporating climate-sensitive design elements into buildings would help to conserve energy.

Conclusion

Industrial energy efficiency in Bangladesh should move on from mere compliance to energy management and improve the global competitiveness of the industries. Number of policy interventions will be required for this purpose, including creation of awareness, mandatory energy audit, financing ecosystem building, connected public and private stakeholders through enhanced engagement, power grid modernization, and timely enforcement of rules and regulations. Sector-specific attention is also necessary to meet the unique reality of each sector. Along with all the policy challenges and ways to address those, a paradigm shift in viewing energy efficiency through reconceptualizing the idea from a compliance burden for industry to a very effective internal tool to make industry competitive, to bring down cost, to improve quality, and thereby increasing market share for products is urgent.

1 Introduction

Bangladesh has a significant energy efficiency performance gap, which is observed (and measured) with international benchmarks and indicators. The country ranks 83 out of 126 countries on the Energy Trilemma Index of the World Energy Council, a composite index based on performance in three dimensions: energy security, energy equity, and environmental sustainability. Additionally, the World Economic Forum (WEF) has recently evaluated 120 countries across the world on decarbonization efforts and placed them in its Energy Transition Index (ETI), where Bangladesh stood at 109th place. Bangladesh's weak performance in such global indices is indicative of long-prevailing weaknesses in energy efficiency, comprising high system losses, outdated infrastructure, and continuation of reliance on inefficient fossil-fuel burning power generation. Due to this, the country has difficulty gaining similarly proportional economic and social return on its energy investment and is falling farther below internationally accepted benchmarks of energy productivity and achievement.

This background of sluggish energy efficiency and sustainability is compounded by the country's vulnerability to climate change. Bangladesh is one of the most susceptible countries to natural hazards as a consequence of climate change. According to the Global Climate Risk Index 2021 published by Germanwatch, Bangladesh is ranked 7th among the countries affected most in 2000-2019 due to climate change (Department of Environment, 2024). The geographic location and topography are the primary reasons for this vulnerability. However, the journey as a developing country is causing the country to undergo expanded economic activities. The demand for energy has been rising, consequently. The government of Bangladesh, both in the previous regime and in the current regime, has been struggling to balance the energy demand with reliable but sustainable sources. Often, environmental compatibility was compromised due to immediate need, for example, during the COVID-19 pandemic, the global energy crisis in 2022, etc. These decisions kept Bangladesh far away from the international commitments, such as the Paris Agreement.

Although energy efficiency has been conceptualized in national initiatives, like the Energy Efficiency and Conservation Master Plan (EECMP) 2016 and the Integrated Energy & Power Master Plan (IEPMP) 2023, Bangladesh remains without a well-defined stand-alone policy for industrial sector energy efficiency. Master plans have been produced, but those could not be actionable plans. Laws and regulations, including the Regulatory Energy Audit of Generation Facilities Regulations, 2017, for instance, under the Bangladesh Energy Regulatory Commission, have been established, although their enforcement has not been adequate. Also, there is no consistent and common definition of what energy efficiency would be for an industry purpose, and industries do not have the same incentives to invest in being exercised on their own roads.

In this situation, the industrial sector, as the highest energy consumer, holds substantial significance. Optimal energy use, i.e., achieving higher energy efficiency in industries, is one of the most important energy sector targets for both economic development and climate concern. This policy draft will encompass rules, regulations, technological adaptation, and financial incentives that will minimize energy use for each unit of industrial output.

Bangladesh's industrial energy efficiency landscape requires a three-dimensional approach:

1. Mitigating regulatory gaps and institutional challenges

2. Following regional best practices from South and Southeast Asia or peer countries.

3. Assessing sector-specific energy efficiency requirements for practical policy design.

According to these dimensions, this policy draft will include sector analysis and policy recommendations. The study team has analyzed steel, cement, ready-made garments, and commercial sectors based on relevant government documents, literature, and information accessibility and availability. The necessary structural reforms will be suggested in this policy draft along with realistic financial incentives, adaptable energy-efficient technologies, and necessary rules and regulations for energy audit.

2 Policy Objective

By December 2025, the government, in association with the private sector organizations such as the Dhaka Chamber of Commerce & Industry (DCCI), will agree in principle to formulate an industrial sector energy efficiency policy [with specific rules and regulations] based on the Energy Efficiency and Conservation Master Plan up to 2030 to increase energy efficiency in the industrial sector.

Specific objectives:

1. Mapping policy, plan, and regulations gap in improving energy.
2. Analyze the implementation level of EECMP targets.
3. Identify the most potential sectors for energy efficiency optimization.
4. Innovate public-private-academics collaboration ways to enhance energy efficiency.
5. Stakeholder consultation by group and by individual, to understand the situation, needs, and way forward.
6. Develop comprehensive rules, incentives, and monitor frameworks.

3 Key Policy Areas

3.1 Energy Efficiency Awareness

Bangladesh's industrial sector is the largest consumer of energy, accounting for approximately 50% of the country's total energy consumption (SREDA, 2016). Despite the potential benefits of energy efficiency, lower costs of energy, reduced energy consumption, and reduced environmental impact, the adoption is limited. The lack of awareness is one of the primary barriers to EE technologies; many industrialists are unaware of the current government incentives and benefits. Research shows that awareness building through training is notably neglected in the industries of Bangladesh. Adopting new technologies, increasing awareness through training, and improving responsibility can significantly enrich consumption behavior, whereas ignorance of technology adoption makes consumption behavior worse (Islam et al., 2022). The lack of awareness is most influential in the early stages of the decision-making process, such as recognizing energy efficiency needs and opportunities. (Trianni et al., 2016) The insufficient information regarding energy service companies (ESCOs) and the shortage of trained professionals in energy management seem to be the reasons behind high energy prices, and the gap in energy management constitutes energy efficiency measures. Almost 4% energy efficiency improvements can be gained through energy management practices in industries. (Hasan et al., 2019)

A number of driving forces can also accelerate the acceptance of energy efficiency practices, such as the demands from the owner, subsidies, and lower cost-benefit ratio (Hasan et al., 2019). To overcome challenges, different sectors of rather closed communities have established their own tacit knowledge, perceived technology, and routines concerning energy efficiency measures. Actors in different industrial sectors highlight different barriers to energy efficiency where cost-effective energy efficiency measures are not being implemented. The identified barriers can be problematized in relation to the social context, understanding their existence and awareness build up to resolve them. (Palm & Thollander, 2010).

Policy recommendations

(a) Building awareness and training stakeholders

Introducing Certification and Training Program under National Curriculum: Currently, SREDA runs a standardized and accredited program for certifying energy auditors and managers. However, there is a lack of public knowledge on the necessity and scope of energy auditing as well as energy efficiency. Energy efficiency and conservation concepts should be included in secondary and tertiary education, nurturing an energy-conscious generation. Short-term trainees are insufficient; auditors should be university-trained professionals with practical exposure. Therefore, the introduction of diploma or certification programs in universities and technical institutes will not only produce skilled energy auditors and energy managers but also enrich public knowledge on this issue.

Training for Energy Managers & Plant Heads: SREDA and Industry associations can offer certified, practical training focused on technology, managing human factors, monitoring systems, and fostering an efficiency culture on the factory floor.

Training for operators: To introduce training for operators and tying EE with OSH *(Occupational Safety and Health, e.g., lighting/ventilation)* for co-benefits. Identify no-cost/low-cost measures to protect SME cash flow.

Preparing and Popularizing Sector-specific Training Module: Prepare Bangla playbooks/checklists on EE process. *(e.g. Boilers, compressed air, HVAC- (Heating, Ventilation, and Air Conditioning), motors, lighting).*

Launch a National Industrial Energy Productivity Campaign: Government-led campaign *(e.g., "Efficient Industries, Competitive Bangladesh")* using case studies, workshops, and media to showcase successful local factories. This should highlight cost savings and climate benefits through mass media, social networks, and industrial fairs. This will be supportive to reduce perceived risk and demonstrate tangible ROI (Return on Investment) from behavioral and operational changes.

Collaboration with Industry Associations: Collaboration with major industry participants (e.g., DCCI, BGMEA, BKMEA) to spread information, conduct workshops, and encourage the use of energy-saving measures. Such associations can be a reliable channel of knowledge. should lead peer-learning sessions, publish best-practice guides, and facilitate workshops

(b) Promotion of Technology and Innovation

Encourage the Adoption of ISO 50001: Encourage and ensure industries to apply the ISO 50001 Energy Management System. This may assist in inculcating a culture of everlasting energy enhancement in industrial practices.

Introduce Utility-run DSM (Demand Side Management) and automated "efficient" settings through auto-shutdown, optimal temperature/pressure, ensure motor rewind standards, fixing compressed-air pressure caps, and using Leak-fix blitzes, etc.

Support for Research and Development (R&D): Foster the idea of the private sector and academia's development of R&D related to energy-saving technologies specific to the industrial environment of Bangladesh. Grant money or a tax break to those companies that invest in developing or adopting such technologies. Modify BSTI requirements on IE3/IE4 motors, high efficiency boilers, VFDs (Variable Frequency Drive), and non-efficient equipment.

Incentivizing Local Production

Domestic production of energy-efficient machinery and components such as motors, boilers, and lighting through fiscal benefits and public–private innovation funds.

Support ESCO (Energy Service Company) Models: Encourage private ESCO participation by creating a standard performance-contract template and allowing project financing through local banks. This model can deliver guaranteed savings without upfront capital.

Technology Benchmarking and Testing Infrastructure: Develop national EE testing laboratories in collaboration with universities and BSTI, establishing standardized efficiency metrics for industrial appliances.

Digitalization and Smart Monitoring: Introduce digital dashboards, smart meters, and real-time energy tracking in industrial zones. Linking these systems with green-certification programs will encourage continuous improvement

(c) Promote Transparency & Data-Driven Management and Behavioral Nudges

Establish a National Data Platform: Establish a central data repository system that is publicly accessible under SREDA to collate and disseminate information on industry energy use and effective efficiency initiatives. Not only would this platform assist in establishing realistic goals, but also demonstrate case studies and best practices, which would contribute to a peer-to-peer learning setting.

Sub- Metering Incentives: Grant incentives or tax relief to install sub-metering in high consumption buildings (e.g., compressors, dyeing units). Live information plays a vital role in the decision-making of operational behaviors and waste.

Standardization of Reporting: create an easy Key Performance Indicator (KPI) of energy productivity (e.g., kWh/kg of product) to promote internal performance reporting and benchmarking.

3.2 Mandatory Energy Auditing & Monitoring

Energy auditing and monitoring are the backbones of reaching industrial energy efficiency. Globally, mandatory energy audits have been shown to reduce waste, optimize processes, and

establish baselines for benchmarking. The Energy Efficiency and Conservation Master Plan (EECMP) 2016 has strong evidence of energy audits already holding major savings potential. Through actual on-site auditing, the plan estimated that industrial sub-sectors contained a 21% efficiency and conservation potential. The Integrated Energy and Power Master Plan (IEPMP 2023) updated this picture, reporting that 18 personnel, including SREDA members, are now formally certified as energy auditors (currently 42 energy auditors).

While the EECMP 2016 introduced the concept of Designated Consumers, the implementation was inadequate. Only about 16 audits have been completed by BERC so far, and SREDA has identified nearly 189 large consumers that should be under mandatory audit obligations. This mismatch shows a significant policy-to-practice gap that weakens national efficiency targets. IEPMP 2023 made some improvements in this method. It emphasized audits as essential for industrial efficiency and proposed a "Periodical Energy Consumption Reporting System" to strengthen monitoring.

Both master plans lay out detailed requirements for how audits are conducted. Energy audits are identified as a mandatory element of the Energy Management System (EMS) for Designated Consumers. They involve data collection, calculation of energy intensity, equipment efficiency measurement, and process review. The EECMP requires DCs to submit regular audit reports to SREDA, while the IEPMP introduces a Periodical Energy Consumption Reporting System (PRS) to enable continuous oversight and benchmarking. In addition, the documents establish the framework for certifying personnel. SREDA is mandated to run a national certification system for Certified Energy Auditors (CEAs) and Accredited Energy Auditors (ACEAs), with training, exams, and capacity-building programs. CEAs are allowed to perform audits for energy consumers, while ACEAs must carry out mandatory audits for large Designated Consumers. To strengthen technical depth, the IEPMP recommends diagnosis projects conducted jointly by CEAs and international experts, creating a database of case studies and benchmarks for sectors such as steel and chemicals

These master documents prove that while auditing is recognized as a tool for identifying efficiency gains, the scale of coverage remains far too limited. At the same time, both plans emphasize that Designated Consumers are to be placed under mandatory audit obligations, with energy managers expected to conduct in-house audits and accredited auditors responsible for larger facilities. EECMP also proposed the public disclosure of audit results, which will enable transparency and accountability. The master plans stressed that audits must be tied to robust monitoring. SREDA has been tasked with nationwide data collection through the PRS, feeding into an Energy Data Management System (EDMS) that supports benchmarking and evaluation. Indicators such as the number of DCs, CEAs, ACEAs, and energy managers, along with sectoral consumption and efficiency improvements, are to be tracked annually. Despite these provisions, the findings from key informant interviews showed that auditing is exclusively treated as an external obligation. Energy auditing is triggered by donor projects or export requirements, instead of being part of day-to-day operations.

Audit Culture and Industry Practices

There is a serious lack of audit culture in the industrial sector of Bangladesh. In the focused group discussions (FGDs), business leaders admitted that auditing is not seen as a serious

priority, and many factories never assess how energy is being used. One of the stakeholders even said his factories lost 20% of energy in the distribution system until small investments were made after an audit showed them the problem. The situation is worse in sectors like cement and steel, where auditing is fully absent. These comments show a very weak auditing culture at the firm level, even though some garment factories do audits because foreign buyers demand proof of compliance.

There has also been a contrast between sectors that were found in interviews and FGDs. Export-oriented garment factories often perform audits to satisfy buyer requirements, sometimes adopting energy-saving measures like efficient boilers or rooftop solar. In contrast, energy-intensive sectors such as steel and cement rarely conduct audits, even though their potential savings are substantial. One of the industry stakeholders pointed out that audits are almost non-existent in the steel sector, even though scrap quality and load shedding make efficiency a crucial issue. Another stakeholder confirmed that cement industries have no energy audit culture despite being highly electricity dependent. Both sectors indicated that cost and weak financing options remain barriers.

Regulatory and Institutional Context

The official regulatory picture does not look impressive. Energy auditors are tasked with supporting industries in establishing baseline consumption and preparing compliance reports. Yet, capacity remains low when compared to the scale of the industrial sector. One of the public stakeholders pointed out that industries could save a significant amount of energy if boilers and other machinery were maintained according to audit recommendations. But the number of completed audits is inadequate, which means these opportunities are underutilized. So, the issue is not only regulatory weakness but also institutional under-capacity to deliver regular, sector-wide assessments. In the FGD, one of the private stakeholders noted that even small behavioral changes in lighting or fan use could save 5-7% of energy, but without a system of audits to institutionalize such measures, industries do not treat them seriously. EECMP 2016 and IEPMP 2023 mention energy audits. They do not contain enforceable policies or proper definitions, resulting in industries lacking clarity on how to comply. Both the EECMP 2016 and IEPMP 2023 urged the need for regulatory frameworks that make audits mandatory for large energy consumers. Although there are decent policy mechanisms, FGD with relevant stakeholders revealed that they remain largely on paper. Key informants argued that uncoordinated institutional responsibilities slow enforcement.

Financial and enforcement constraints

Finance is a major issue as well. Many industries, especially SMEs, cannot afford audits or the efficiency investments that come after them. One of the public sector stakeholders stressed that subsidized energy prices reduce incentives for industries to adopt efficiency, since the savings from audits appear less profitable than continuing with existing practices. Commercial banks also hesitate to lend for energy-efficient projects, as highlighted by one of the private sector stakeholders, who explained that lenders often lack the technical knowledge to assess audit reports. Without access to affordable credit, firms cannot translate audit recommendations into practice.

Government officials admitted that enforcement has been minimal so far. One of them in the FGD stated that while auditor numbers have grown and notices are being sent to non-compliant

factories, the present approach is mostly based on the carrot method. Industries are encouraged to comply through incentives or support rather than punishments. He added that eventually stricter enforcement will be necessary, including penalties and even shutdowns for factories that refuse to adopt cogeneration or efficient boilers. Another government official has also supported this by pointing out that rising energy costs have already forced many industries to upgrade to European-standard boilers, showing that financial pressure itself can drive compliance (European Union, 2023).

Experts argued that mandatory audits should be institutionalized alongside financial audits to hold large energy users responsible. FGD participants also noted that industries often ignore audit recommendations until crises such as tariff hikes or supply shortages force action.

Policy Recommendations

(a) Establishing a culture of energy auditing in the industry through sustained efforts

Energy auditing is a gratifying concept that has not yet reached the industrial sector of Bangladesh with a top-level urgency that could lead to improved energy efficiency. Apart from a few large firms, this is not on the priority list of most of the firms. A few stakeholders opined that just by standardization through audit frameworks, even very small behavioral changes are enough to save huge amounts of energy, which is not happening due to a lack of awareness. However, without formal structures and incentives, these practices are likely to be scattered, and this shows the gap between policy and industry culture. Continued efforts to establish the importance of energy efficiency should be the primary policy approach.

(b) Towards a Phased Strategy

Despite the success of voluntary audits, stakeholders across the government, industry, and academia cited their limitations, arguing that voluntary auditing does not suffice for industrial transformation. One of the public stakeholders pointed out that incentives are needed in the near term, but that more punitive means should be phased in, especially for large energy consumers. This incremental approach would be like practices in India and China, where mandating consumers have binding targets and compliance is tied to market-based or regulatory penalties. Bangladesh should establish an obligatory regime for all Designated Consumers with timelines and sector-specific benchmarks.

Mandatory energy audits and monitoring are rather effective policy tools that produce fairly widespread outcomes. If enforced vigorously, supplemented with financial incentives, investments in professional capacity training, and monitored digitally, Bangladesh can transform audits from mere compliance tick marks to an effective driver of industrial efficiency. This will reduce the reliance on imported LNG, reduce the production cost, and increase export competitiveness. Without it, the country could fall even further behind its regional rivals, who already conduct compulsory audits.

(c) Institutional coordination through digitization

An important cross-cutting theme emerging from KIIs and the FGD was the absence of institutional coordination. Governing responsibilities are divided between SREDA, BERC, Petro Bangla, and the distribution companies. One of the government officials who spoke with the media said it lacks a coherent long-run strategy and policymaking and is lagging on what is usually short-term or reactive. There is no system in place to really get the actual consumption reality, he stressed, explaining that these industries need to be tracked on a centralized database. Even with two master plans, there is no clear matrix for the implementation of audits for efficiency.

(d) Linking Energy Audit with Incentives and Financing:

Audit requirements became detached from business realities without the connection to punitive financial or market-based motivators. Some stakeholders recommended that, rather than just mandating audits, regulations also link the audits to (a) providing access to concessional loans, (b) access to green funds, and/or (c) recognition schemes attaching to a green label. That would embed auditing in industrial decision-making and solve the enforcement deficit.

(e) Partnership and collaboration

Partnerships with development agencies may help from both ends: bringing international standards into the workplace and ensuring credible audits for export markets. If not implemented, audits may be nothing but simple checkbox monitoring or compliance exercises instead of a mechanism for change.

3.3 Financing & Incentives for Energy-Efficient Technology Adoption

The path to clean energy financing in Bangladesh did not start with one, all-encompassing plan, but rather a number of building block activities and the fostering of international alliances that slowly gained steam. Sustainable and Renewable Energy Development Authority (SREDA) has established a basic goal as energy intensity improvement of 20% with respect to FY 2013-142 by 2030 in its recently published "Energy Efficiency & Conservation (EE&C) Master Plan up to 2030" (SREDA, 2016). In support of this, the Japanese Government supplied a soft loan of around USD 100 million in 2016 for the Energy Efficiency & Conservation Financing Project (EECPFP), which established a two-step loan facility aimed at incentivising industries to adopt energy-efficient equipment (SREDA, 2016). Until 2023, the Bangladesh Bank's green refinancing scheme and IDCOL programs are major domestic financing vehicles (SREDA, 2024). The green refinancing scheme, which has now reached the size of Tk 1000 crore (The Daily Star, 2025), was amended in Jul 2022 to provide low-cost credit for the rooftop solar and solar park projects (SREDA, 2024).

Following these pioneering programmes, finance mechanisms have evolved to incorporate new models and dedicated funds. One remarkable intervention from the private sector has been the issuance of a 30 billion BDT green sukuk by Beximco to raise funds for a 230 MW solar project, which sets a precedent for a new alternative financing model (Beximco Green Sukuk Trust, 2021; Alam, 2023). The Asian Development Bank (ADB) in 2023 suggested setting up a dedicated Solar Irrigation Pumps (SIP) Fund with an initial size of at least USD 250 million and

an additional USD 800 million in loans and grants to retire diesel pumps (Asian Development Bank, 2023). IDCOL is a key player, having already financed more than 650 MW of renewable capacity in the country with a projection to finance an additional 6 GWp. SREDA also received technical assistance from the Green Climate Fund to identify and address systemic challenges in clean energy financing in 2023 (Energy & Power, 2020).

More recently, international financial bodies have pledged hundreds of millions of dollars to help Bangladesh's transition to a greener economy. In addition, in May 2025, the EIB approved a €350 million framework loan, including a €45 million EU grant, for the deployment of renewable energy projects in the country (TBS, 2025), representing the EIB's overall investment in approximately six projects valued at a total of €635 million in total by May 2025 (TBS, 2025). In June 2025, the World Bank approved a $640 million financing package in a landmark decision. In this regard, $290 million is allocated to Bangladesh Clean Air Project that will deploy 400 zero-emission electric buses, a clear action on cleaner urban infrastructure, next to $350 million intended to ensure gas supply for transitional energy (World Bank, 2025) The large scale of these recent investments highlights the momentum which has begun to emerge in the US to close the considerable funding gap necessary to reach the US long-term renewable energy targets.

However, the FGDs revealed persistent bottlenecks: industrial associations and financiers noted that access to concessional credit remains uneven, and approval procedures are complex, particularly for SMEs. While multiple funds exist, there is a lack of rich industrial insights in energy research. There is a need for evidence-based mapping of which sectors, technologies, and firm sizes benefit most. Stakeholders emphasized that financing must be linked with technical support. Programs combining concessional loans with technical-assistance (TA) grants, performance verification, and auditor guidance could increase uptake.

When assessed in comparative perspective, Bangladesh’s green financing ecosystem expose fragmented and less comprehensive compared to mature policy frameworks in countries like the UK and India. The UK’s Industrial Energy Transformation Fund (IETF) declares direct grants for feasibility and implementation of energy-saving projects, while Climate Change Agreements (CCAs) reveal long-term levy discounts tied to emissions targets—mechanisms that combine both financial incentives and strong compliance signals (Department for Energy Security and Net Zero, 2020, 2023). India, on the other hand, mixed concessional loans with risk-sharing mechanisms such as the Partial Risk Sharing Facility (PRSF), which diverts and reduces private sector investment. Its Perform, Achieve, and Trade (PAT) scheme also represents an innovative market-based approach, enabling industries to trade excess energy savings certificates. In contrast, Bangladesh’s policies are broadly refinancing-driven and compliance-focused, with limited de-risking instruments, weak implementations, and modest incentives for technological innovation beyond concessional loans.

The SANEM–TARA Investment Estimation Study further underlines the financing gap. Considering the report for financing and incentive practices, projected industrial EE demand exceeds available concessional funding by factors like interest-rate spreads, short tenor, and lack of credit guarantees, which discourage large-scale retrofits and technology substitution. The study recommends creating a Green Industrial Credit Guarantee Facility and energy-performance contracting standards to crowd-in private ESCOs and institutional investors.

This comparison exposes the policy gap in Bangladesh. While the country has established a foundation of green finance and audit regulations, it lacks the synergy approach seen elsewhere that combines financial incentives, risk-sharing mechanisms, and robust compliance structures.

Policy Recommendations

(a) Short Run

- **Carbon Credit:** Offer carbon credits to homeowners and industry owners for adopting energy-efficient systems; pilot a verified, small-ticket scheme for LEDs/BLDC fans, efficient motors/boilers, and rooftop solar with simple MRV and bank redemption.
- **Awareness Program:** Implement year-round awareness campaigns and vocational green training programs; add factory-level "energy officer" trainings and quick-win playbooks (lighting, VFDs, boiler O&M), and run association-led clinics
- **Product Ownership:** Ensure SME-accessible registration/subsidy systems and guarantee proper product ownership; publish model contracts for ESCO/EPC projects to reduce disputes and clarify asset ownership in retrofits.
- **One-Stop Green Finance Desks**: Create a single window for GTF/GRS/IDCOL lines with standard term sheets, pre-finance for SMEs, and on-site technical advisory; address LC bottlenecks and interest-rate spreads between BB refinance and commercial on-lending.
- **Duty/VAT Fixes via SRO:** Zero-rate critical RE/EE parts (cells, BMS, pack materials, high-efficiency inverters/motors) and remove contradictory charges that push effective tax to 28–74% despite "1%" policy; publish the HS-code list.
- **Cluster Data & Power-Quality Fixes:** Begin zone/cluster-level metering dashboards in major hubs to manage outages/voltage issues and target savings coherently.
- **Recognition & Buyer Signaling:** Publish annual league tables/awards for top improvers and enable export-linked "green-MWh/wheeling" compliance pathways now in drafting aligns with buyer demands and nudges action.

(b) Long Run Policy Recommendations

- Develop a National Energy Innovation Strategy linking R&D, testing laboratories, and carbon-credit readiness.
- Accelerate Energy-Efficiency Mandates and introduce verified carbon-credit and trading mechanisms.
- Reform Tier-Based Import Pricing and strengthen institutional, legal, and investment frameworks.
- Promote Integrated Energy and Industrial Planning through coordination among SREDA, BERC, and BIDA.
- Establish a Green Credit-Guarantee and Risk-Sharing Facility to de-risk loans and attract private capital.
- Create a "Super ESCO" or Aggregator Platform to standardize energy-performance contracts and pool financing for retrofits.

- Launch a National Industrial Energy-Data Center for transparent tracking of audits, compliance, and savings.
- Rationalize Tax and VAT Policies for certified EE and RE components while tightening import-quality control.
- Accelerate Domestic Manufacturing of Clean-Energy Technologies under BSTI/SREDA certification schemes.
- Issue Sovereign and Corporate Green Bonds or Sukuk to finance large-scale industrial energy projects.
- Set Sector-Specific Energy-Efficiency Benchmarks (steel, cement, RMG) linked to financing incentives and recognition programs.

Bangladesh's industrial growth depends on the resilience and sustainability of its energy sector. A coordinated policy shift toward energy efficiency, innovation, and inclusive investment is imperative. The government must act decisively to mobilize institutions, incentivize private actors, and modernize infrastructure to secure the nation's energy future.

3.4 Sector-Specific Energy Efficiency Standards & Regulations

3.4.1 Readymade Garments (RMG) Industry

The Readymade Garments sector is one of the biggest electricity consumers in the country, occupying almost 30 - 40 % of total energy provision. Because the government had failed to supply a quality and uninterrupted power supply, as reflected by the seven-to-eight-hour load shedding, the sector had to rely on captive generation. The dependence on this reliance has resulted in tremendous inefficiency in the use of national gas. Now these captive generators consume about 900 mmcf of gas to produce just 3000 MW of power. This same amount of gas can represent 5700 to 5800 MW of output from high-energy efficient combined cycle power plants, which can raise total national output of gas up to 10, 000 MW instead of the current production of 8000 MW in combination. This has been coupled with the chaotic zoning of factories in residential areas, including Gazipur, Savar, and Narayanganj, where existing infrastructure is ill-equipped to develop industrial-specific lines. Also, the steel industry shares the same grid and is a major disruptor of the quality of production in this sector. Electric furnaces in the steel industry induce significant load changes (the load varies from 0 to 200 MW), which leads to frequency instability, causing harm to RMG machines. Such instability leads to certain production defects like thread spins and a lack of consistency in the dyeing of fabrics, which in turn require a perfectly stable power frequency to meet export quality norms.

Policy Recommendations

(i) Industrial zoning: The government should be serious about relocating the RMG factories to dedicated industrial zones or EPZs where dedicated 11 KV or 33 KV lines can be established with firm power free from interference from loads of residential or other industrial nature.

(ii) Incentivizing Grid Dependency: Policy must incentivize the shift from inefficient captive generators to grid electricity, coupled with grid stability, with guaranteed supply, which will free up huge amounts of natural gas from the grid for higher efficiency national generation.

(iii) Grid replanning for assurance of quality: Regulatory authorities need to isolate or at least regulate heavy polluters of the grid, such as steel furnaces, to avoid frequency fluctuation that deteriorates the quality of RMG product.

3.4.2 Cement Industry

Bangladesh's cement industry is unique because it does not produce clinker; rather, it imports almost 95% of raw material for the production of cement. As a result, electricity is the most essential input for this industry. As unloading, conveyors, grinding, and packaging all require power, supply disruptions stop production. A number of companies set up gas- based captive power, but its availability gets squeezed due to a lack of gas supplies. Energy audits are not conducted in the sector, and almost all factories run on aged equipment, consuming excessive energy. While vertical roller mills (VRMs) save energy, they are costly to install, accommodated by only a few firms like Premier, Crown, etc. (Shah Cement). Renewable energy adoption in the cement sector is almost non-existent. Even when organizations like GIZ tried to showcase international practices, there was no follow-up. Green finance is not readily available (Premier Cement may be an exception). The industry is over-capacity, producing 50% more than domestic demand. There is a price war in this sector, and prices have been fluctuating, which affects profitability.

River and road transportation are being used for cement distribution in Bangladesh, resulting in higher costs. Profiteering and exorbitant transportation costs only compound the weight of these import duties. A better, more effective transportation system should be achievable once transport reforms are made, although difficulties such as the width of roads are a factor that could not allow for utilizing bulk concrete carriers. Heavy industries such as cement, which must be sited on rivers for logistical reasons, cannot cluster as per the stakeholders. Instead, efficiency gains would rely on technology upgrades and a consistent electricity supply. He also mentioned that CO2 emissions for Bangladesh's cement industry are so low compared to clinker-producing countries, as the energy-intensive burning is done abroad.

Policy recommendations

(i) Energy Audits: Mandate and incentivize energy audits for medium and large grinding plants, tie audit results to technical support or eligibility for industry assistance.

(ii) Facilitate the Adoption of VRMs: Incentivize or support in some other way to ensure that there are no initial cost barriers for installing vertical roller mills, which are much more energy efficient and yet under-utilized at present.

(iii) Enhance Power Supply and Gas Supply Quality: Ensure uninterrupted power and gas supply for grinding plants and make viable use of guest captive power, in such cases where gas-related constraints can be removed.

(iv) Awareness and Technical Forums: Establish permanent awareness development programs in collaboration with NGOs, development orgs, and SMEs to showcase business models and financing plans where clear cost savings are demonstrated.

(v) Logistics Enhancement: Reduce delivery costs through better riverine handling/infrastructure and easier transport processes, and address road limitations that prevent the use of bulk carriers, where possible.

(vi) Control Overcapacity: Reconsider the approval of new grinding capacity until utilization increases to stop price wars and ensure profitability.

3.4.3 Steel Industry

The steel sector in Bangladesh mainly consists of small and medium-scale rod and rebar production, where an estimated 90% of rod production is produced from induction furnaces, and a minor share (e.g., Abul Khayer, GPH Ispat) utilizes electric arc furnaces. The domestic or otherwise home-headquartered industry is a grinding-and-melting supply chain heavily reliant on imported scrap (15–20% from shipbreaking; imports of scrap have fallen steeply from 3,000 million tons pre-pandemic to 900–1,000 million tons), sourcing no more than 10–15% of its scrap requirements domestically. The installed capacity greatly outstrips demand, and planned expansions risk pushing capacity up to 15 million tons by 2026, intensifying overcapacity and price pressure. Electricity is the single most important input: melting operations are electricity-intensive and sensitive to load shedding (a single power loss during melting can reduce furnace temperature from 1700°C to 500–600°C within an hour and add BDT 300,000–400,000 in cost for a 20-ton furnace). Energy audits and systematic practices for efficiency are uncommon; financing for energy-efficient investments continues to be constrained through excessive interest rates, foreign exchange depreciation, and vulnerable demand, and the sector lacks a common voice for advocacy or a survey-based planning approach. Logistics and trade limitations prevail, for example, deep-sea port inaccessibility, higher container prices, and protracted turnarounds, etc., which elevate import expenses and decrease competitiveness. While agglomeration in economic zones is perceived as potentially beneficial, it is constrained by location and current investment patterns. Projects at various stages are also subjected to 20% renewable power sourcing obligation, which encourages energy efficiency enhancement. In general, new plants are less polluting than old ones. However, over the last three years, the sector has still had limited product diversification and is dominated by the domestic market.

Policy recommendations

(i) Stabilize power for melting operations: Focus on supply reliability and quick setup of furnace backup to prevent dips in temperature and expensive reheats and back captive power where it is made firm.

(ii) Require and finance minimum energy assessments: Make basic energy audits mandatory for large plants and subsidize follow-up quick wins (process controls, motor management, oxygen optimization) so that audits become measurably savings.

(iii) Secure scrap supply and strengthen shipbreaking links: Make shipbreaking processes and trade passages smoother to bring back scrap volumes, and ensure a levelled quality of scrap flowing into the industry.

(iv) Short-term logistics relief measures: Rectify the immediate transport cost drivers, specifically truck permit holding, river/road coordination, and turnaround times to lower import and distribution costs and increase competitiveness.

(v) Promote aggregation and pooling of utilities in economic zones: Centralize new steel investments in economic zones where utilities, logistics, and pollution treatment can be shared to improve efficiency and reduce unit costs.

(vi) Establish sectoral advocacy and coordination mechanisms: Facilitate development of a common industry platform above and among large companies, pooling best practices, aligning training efforts, and advocating collectively with government and finance.

(vii) Enhance competitiveness through diversification and trade facilitation: Stimulate product diversification beyond rebar, lower penalties for import costs (deep-sea port and turnaround constraints), and complement focused export efforts with market studies to increase demand from abroad.

3.4.4 Commercial sector

This sector is a huge burden for the PowerGrid, as in Dhaka City, it is nearly 70 percent in the area of DESCO and DPDC. The first half of this consumption is largely temperature dependent (with a summer and winter load curves showing a 6000 to 7000 MW divergence). But big shopping centers like Bashundhara City and Jamuna Future Park take as much as 20 MW each, which is comparable to powering up a whole village because of unduly excessive lighting and long durations of operation. While in foreign countries, commercial places close at 7:00 PM or earlier, Bangladeshi malls and restaurants open until late at night; just regulating it could save nearly 2000 MW. It is worth noting that the temptation of glass-walled buildings, which has caught on in high-end neighborhoods like Gulshan as a badge of elite honor, has been a disaster for energy efficiency in a hot climate. They trap heat and compel central air conditioning systems to run continuously at low temperatures to keep the interiors comfortable, leading to a surge in ambient temperatures by as much as 5 degrees Celsius in these neighborhoods.

Policy Recommendations

(i) Regulate Working Hours: The government should impose stringent closure timings for malls and restaurants, as these can save a lot of electricity at peak hours.

(ii) Climate Adaptive Building Standards: Enforce building codes that prohibit full glass facades or require that the design is congruent with the local climate – i.e., concrete insulation and shading to reduce cooling loads.

(iii) Institutional Monitoring and Smart Technology: City corporations should create special teams to check commercial buildings and legally require the installation of sensors to control lighting and temperature, and also charge higher rates on firms failing to comply.

3.5 Energy conservation

Energy conservation can be simply defined as eliminating waste by preventing energy consumption from exceeding real operational needs. Energy usage in an average factory is uniquely divided into auxiliary loads, including lighting, fans, and air conditioning, which account for about 20 to 35 percent of consumption, and production loads such as motors,

boilers, and heavy equipment, which consume the rest. However, to optimize this consumption, the industry has been implementing measures like declaring certain parts of the production areas as "active" production zones and the other parts as "passive" non-production areas to control lighting and airflow strictly, along with deploying energy-efficient technologies like soft starters, VFDs for motors, and tubular boilers that automatically vary according to steam demand. Energy represents 30 to 40 percent of total operating costs and as much as 60 percent in energy-intensive industries such as steel. However, there is a striking lack of awareness and urgency to make significant strides. These savings can be at least 20 percent when executed effectively, but many businesses ignore this completely as they remain profitable, despite the inefficiencies. A key structural bottleneck is the missing Energy Service Company (ESCO) model in the country, combined with the unwillingness of commercial banks to finance efficiency projects. In addition, many industries, such as paper, still use obsolete machinery, so domestic sector competitiveness only applies to quotas, while in other countries (for example, Vietnam), modern and optimized equipment are common.

Policy Recommendations

(i) National Energy Audits Should be Mandatorily Implemented: Make energy audits compulsory in all factories and institutionalize the position of an Energy Officer in every industry for constant monitoring and accountability.

(ii) Professionalize Auditors: Audit policy should be based on a workforce of accredited university-trained energy auditors in diploma courses so that audits are conducted by qualified professionals and not by short-term trainees.

(iii) Institute of Energy Conservation: Considering the huge national outlay on electricity, there ought to be a dedicated high-level authority to drive energy conservation and energy efficiency to ensure compliance and create awareness amongst the citizens.

(iv) Creating an Enabling Environment for ESCOs: ESCOs need both formal recognition and some degree of institutional support, such as giving directions to commercial banks and other lending institutions to support efficiency projects on the basis of feasibility studies and projected savings.

(v) National Policy on Advanced Technologies: Advanced technologies like comprehensive electric vehicles (EVs), lithium-ion batteries, etc., policies can be approved, and local assembly incentives must be included to improve efficiency.

3.6 Stakeholder Collaboration to Build Energy-Efficient Ecosystem

The world is moving toward sustainable development, and energy efficiency is now a key part of efforts to fight climate change, improve competitiveness, and support people's well-being. It's not just about technology; it's a shared effort that requires cooperation between governments, businesses, universities, and communities. This teamwork is often described as the "triple helix," where governments set rules and policies, businesses lead in using new technologies and changing markets, and universities create knowledge, innovations, and skills.

Around the world, it's clear that working together makes projects more accepted, fair, and long-lasting. Trust is strengthened, risks are reduced, and energy projects can better meet people's needs when multiple groups collaborate (AWorld, 2022). Platforms like Indonesia's Ecoxyztem

and SEETRUM demonstrate how they can facilitate the sharing of information, training, and professional connections. Including these kinds of partnerships in global plans is important for making progress. Moreover, ISO 26000, GRI, and equity-centered approaches (e.g., Equity Advisory Groups) ensure marginalized communities also shape decision-making. One finding, according to a case study on Greece's clean energy transition (Karakosta & Papathanasiou, 2024), suggests that public authorities (30%), financial institutions (24%), and technical providers (19%) are critical stakeholders for energy efficiency initiatives, and they require more than 70% engagement to drive the effort.

For Bangladesh, this means setting up inclusive co-design forums and digital platforms to bring together policymakers, industries, academia, and end users to work together in developing energy benchmarks, standards, and solutions. Working with multiple stakeholders has its advantages, but it also has disadvantages. For example,

- Different priorities among stakeholders, like focusing on compliance versus profitability.
- Funding issues because of high initial costs and uncertain returns, which need blended financing solutions.
- The regulators' and industries' limited capacity to monitor and adopt new technologies A lack of understanding among all stakeholders regarding energy efficiency and the identification of fundamental issues and obstacles.
- Complexity in managing multi-stakeholders and identifying responsibility and accountability, as well as establishing trust.

Key Stakeholders in Bangladesh's Energy Sector

- **Government Ministries & Agencies**: Ministry of Power, Energy & Mineral Resources (MoPEMR), Ministry of Finance, Ministry of Industries, Ministry of Environment, Forests & Climate Change (MoEFCC), Ministry of Housing and Public Works (MoHPW)
- **Regulatory & Standards Bodies:** Sustainable and Renewable Energy Development Authority (SREDA), Bangladesh Energy Regulatory Commission (BERC), Bangladesh Standards and Testing Institution (BSTI), National Board of Revenue (NBR)
- **State-Owned Enterprises (SOEs):** Bangladesh Rural Electrification Board (BREB), Bangladesh Petroleum Exploration and Production Company Limited (BAPEX), Petrobangla, Bangladesh Power Development Board (BPDB)
- **Public Institutions:** Public Works Department (PWD), Department of Architecture
- **Professional Bodies:** Institute of Architects Bangladesh (IAB), Institution of Engineers Bangladesh (IEB)
- **International Development Partners:** World Bank, International Finance Corporation (IFC), United Nations Development Programme (UNDP), Asian Development Bank (ADB)
- **Private Sector & Finance:** Private developers, Real estate investors, Industries, trade bodies and associations, Bangladesh Bank, NBFIs.
- **Civil Society & Academia:** NGOs, Civil society groups, Academic institutions.

Global Experiences & Lessons

Evidence shows that equity-centered engagement, co-creation, capacity building, early participation, and accountability frameworks are central to successful energy-efficiency transitions.

- **Equity & Inclusion**: Bangladesh can institutionalize **community-led councils under the Sustainable and Renewable Energy Development Authority (SREDA) and the Ministry of Power, Energy, and Mineral Resources (MPEMR),** similar to the American Council for an Energy-Efficient Economy (ACEEE, 2022) approach to empowering marginalized communities through advisory groups.
- **Capacity Building**: Platforms like Indonesia's **Southeast Asia Energy Transition Partnership initiative, "SEETRUM,"** highlight the importance of training and networking; Bangladesh could establish a **Platform** to certify **auditors and train energy** managers.
- **Accountability**: Using well-established global standards like **ISO 26000** and the **Global Reporting Initiative (GRI)** can help build more trust and openness in programs such as Bangladesh's **Energy Efficiency and Conservation Master Plan (EECMP) 2030**.

Policy Recommendations for Bangladesh: Building a Sustainable Energy-Efficient Ecosystem:

To strengthen stakeholder collaboration and foster an inclusive, sustainable, energy-efficient ecosystem, Bangladesh should adopt the following measures:

- Create a **National Energy-Efficiency Stakeholder Council** that includes government ministries like MoPEMR, MoC, MoI, MoF, PMO/CAO, along with regulators (Bangladesh Bank, NBR), trade bodies, industry associations, academia, and civil society to coordinate policies, settle disagreements, and ensure inclusive decision-making.
- Set up **Community-Led Energy Councils** under SREDA/MPEMR to involve citizens, SMEs, women-led enterprises, and rural communities in planning energy-efficiency initiatives through participatory workshops, discussions, and feedback loops (Sustainability Directory, 2023).
- Introduce a **Digital Engagement Platform**, modeled after Indonesia's SEETRUM (UK PACT, 2022), to bring together practitioners, policymakers, and communities; include knowledge sharing, virtual training, certification programs for energy auditors, discussion forums, and track progress through dashboards.

- Initiate **Capacity-Building Programs for Stakeholder Participation** to train government regulators, industry professionals, community representatives, and academic staff in how to work with others, negotiate, and use energy-saving technologies. Training can include certifications, online sessions, and mentorship.
- Implement **accountability and reporting systems** based on ISO 26000 and GRI standards to monitor how stakeholders are involved, how much they influence decisions, and how their feedback is used in programs like the Energy Efficiency and Conservation Master Plan (EECMP) 2030.

3.7 Infrastructure & Grid Modernization

Policy Evolution and Focus

The modernization of Bangladesh's energy infrastructure has been a core theme of several major policy documents. The Energy Efficiency and Conservation Master Plan (EECMP 2016) focused heavily on demand-side interventions and much less on transmission and distribution, whereas the Integrated Energy and Power Master Plan (IEPMP 2023) focuses on grid modernization with a particular appetite for high voltage transmission, smart grids, and interconnectivity with regions. However, implementation has been patchy, held back by land scarcity, right-of-way tussles, and unaligned planning.

Grid Weaknesses and Industrial Impact

When generation capacity is quite good, these persistent power cuts, voltage instabilities, and transmission losses damage industrial competitiveness through grid weaknesses. Unreliable grid supply has forced industries, especially steel & garments, to resort to expensive and inefficient captive diesel generation. This creates grid instability, amplifying another problem: the haphazard clustering of industries in residential areas such as Dhaka, Gazipur, and Narayanganj, and served by distribution systems that were simply not designed to withstand heavy demand. To give another example, the erratic load of steel plants varies in frequency, leading to quality defects in Garment manufacturing focused on exports.

Technological Modernization Challenges

While plans exist to introduce SCADA, GIS, and smart meters to improve reliability and integrate renewables, challenges such as cybersecurity risks and human resource limitations persist. The absence of standardized distribution codes further delays the integration of technologies like rooftop solar and energy storage. Furthermore, the lack of domestic manufacturing for critical infrastructure components forces reliance on expensive imports, slowing modernization efforts.

Fossil Fuel-Based Infrastructure

Fossil fuel infrastructure remains dominant in national development planning, with commitments for Liquefied Natural Gas (LNG) terminals, oil refineries, and coal ports in Bangladesh. Such dependence ties the economy to fickle global markets and mixed currency pressure. It has been argued by the stakeholders that high-carbon infrastructure "lock-in"; it is a drain on funding that should go into renewables instead. On the flip side, captive generation precludes more efficient use of gas as captive generators consume gas at much lower efficiency than would a combined cycle power plant.

Capital Cost Constraints

KIIs and the FGD highlighted that challenges in financing were also experienced. They mentioned that multilateral funds like the Green Climate Fund or concessional windows from ADB and JICA were available, but commercial banks in Bangladesh were charging high interest, which sent international lenders looking in other directions. Some stakeholders also said planned industrial clusters and special economic zones could attract more targeted finance as they enable collective investment in substations, storage, and renewable integration. It was also

pointed out by a public stakeholder that long-term green loans are indeed on offer, but bureaucratic obstacles still prevent access, and Letters of Credit to import energy-efficient machines do not help either. Without access to funding, this leads to slow-moving solutions becoming reliant on unreliable grid supply and more expensive diesel generators, thus widening the gap towards energy efficiency.

Policy Recommendations

(i) Enhancing Grid Reliability in Prioritized Clusters: Focus on the improvement of transmission and distribution networks in the core (Dhaka, Gazipur, Narayanganj) industrial clusters to reduce the outages and voltage instability detrimental to export competitiveness.

(ii) Match Infrastructure to Industrial Geography: Require regrouping of fragmented industries into purpose-built economic zones in order to offset system inefficiencies and costs through shared high-voltage infrastructure and cogeneration.

(iii) Fossil Fuel Usage Rationalization: Inferior captive power generation needs to be penalized and redirected to natural gas supply to maximize natural gas energy through a high-efficiency combined-cycle power plant.

(iv) Green Financing Mechanisms: Step-up concessional credit aimed at modernization to provide easy access to the funds for SMEs and industries by simplifying bureaucratic processes.

(v) Incorporate Modern Grid and Distribution Codes: Update and strictly enforce regulatory codes to enable seamless integration of renewable energy, storage, and smart grid technologies while ensuring cybersecurity.

3.8 Enforcement and Communication

Bangladesh must effectively coordinate the enforcement, which should play a pivotal role in its energy paradigm, patching the borders between the energy efficiency and conservation master plan (EECMP) and the integrated energy and power master plan (IEPMP) 2023 goals. Although the SREDA Act, 2012, provided the institutional framework, and the Energy Efficiency and Conservation Rules, 2016, provided for audits and labelling, enforcement remains disparate. While recent legislative updates, including the Electricity Act 2018 (which imposes penalties for energy wastage) and the energy audit regulations (EAR), issued in 2018 and revised in 2024, have provided necessary legal layers, they lack a cohesive operational engine (SREDA, 2025). Eventually, to ensure compliance rather than adoption, these different rules must be harmonized into a single "Enforcement Regulation" under SREDA, with unambiguous inspection procedures, fines structures, and grievance processes.

Digital Governance and Transparency

The National Energy Efficiency Compliance Portal (NEECP) needs to be established to operationalize compliance and enforcement. It would inject transparency into the system by effectively tethering required energy audits, real-time monitoring data, and compliance certifications to business licenses and utility connections. That would be very much in line with the IEPMP's attention on digitization and smart grid technologies (IEPMP, 2023). MRV (measurement, reporting, and verification), backed by third-party verification and rotating

auditors, while establishing a systematic model allowing verification gaps to be filled and fraud to be curtailed.

Targeted Institutional Coordination and Regulatory Alignment

Good enforcement will require breaking institutional rigidities. This requires a collaborative approach among SREDA, the Bangladesh Standards and Testing Institution (BSTI), customs authorities, and the Bangladesh Energy Regulatory Commission (BERC). Customs and the Bangladesh Standards and Testing Institution (BSTI) both need to work together to stop low-end appliances (e.g., inefficient motors, fans, and lighting) that do not meet the new Energy Efficiency and Conservation Rules from getting into the country. Only valid efficiency certificates should enable utility connections, and BERC should be empowered to levy a penal tariff on inefficient industries and structural efficiency-linked tariff regimes.

Lessons from global best practices

India's PAT Scheme: Bangladesh may adopt sector-specific energy consumption norms based on 10 schemes developed by India in the Perform, Achieve and Trade (PAT). Such a mechanism allows the energy-intensive industries to create a market-based mechanism to trade energy-saving certificates, which leads to making compliance an asset rather than a liability (Bureau of Energy Efficiency, 2022).

Japan Top Runner Program: A Top Runner approach for appliance standards is one that obtains the best available on the market locally (Ministry of Economy, Trade and Industry,2015) and uses changes in this best product to drive innovation in local manufacturing.

Incentives and Infrastructure Prerequisites: Punitive measures must be paired with infrastructure assistance. There must be capability before enforcement; industries need dependable quality of power supply and permanent technology alternatives before compromising based on harsher punishments. Periodic regulatory changes according to IEPMP 2023 will keep the standards in sync with technology development. Finally, a carrot and stick approach is suggested: Put severe penalties on those who repeatedly fail, while providing fiscal carrots, for example, grants, tax breaks, or low-interest financing through IDCOL to top achievers.

4 Implementation Roadmap

1.1 Structural Strategy

Table 1: Implementation Roadmap of Structural Strategy

Issue/Focus	Actions	Responsible Agency	Timeline
Aging Infrastructure & Pipeline Leakages	Repair/replace pipelines, eliminate illegal gas connections	Petrobangla, Titas Gas, GTCL, LGED; Pipeline contractors	**Short (2025–27)**
	Upgrade gas networks & digital monitoring		**Mid (2027–30)**

Issue/Focus	Actions	Responsible Agency	Timeline
	Nationwide smart gas grid with predictive maintenance		**Long (post-2030)**
Refinery Limitation	Optimize refinery output & imports	Eastern Refinery Ltd., BPC, MPEMR, PPP investors	**Short (2025–27)**
	Expand refinery capacity		**Mid (2027–30)**
	Build new large-scale refineries		**Long (post-2030)**
Insufficient Storage	Use private storage & inventory management.	BPC, MPEMR, Private operators	**Short (2025–27)**
	Build storage tanks (2–3 months)		**Mid (2027–30)**
	Develop strategic reserves (3 months)		**Long (post-2030)**
Transmission Capacity	Temporary load management	PGCB, BEZA, BSCIC, Petrobangla	**Short (2025–27)**
	Develop zones with pipelines		**Mid (2027–30)**
	Modernize transmission.		**Long (post-2030)**
System Loss	Repair leakages, illegal use	Petrobangla, GTCL, ICT Division	**Short (2025–27)**
	Install metering & monitoring		**Mid (2027–30)**
	Achieve near-zero via automation		**Long (post-2030)**

1.2 Supply-side strategy

Table 2: Implementation Roadmap of Supply-side Strategy

Issue/Focus	Actions	Responsible Agency	Timeline
Fossil Fuel Dependence	Ration fuel to industries	MPEMR, Petrobangla, SREDA, IPPs, MDBs	**Short (2025–27)**
	Expand LNG terminals/diversify		**Mid (2027–30)**
	Scale renewables & smart grids		**Long (post-2030)**
Gas Supply–Demand Gap	Ration supply, dual-fuel	Petrobangla, Summit, PGCB	**Short (2025–27)**
	Expand LNG & diversify		**Mid (2027–30)**
	Balance via RE, EE, smart grid		**Long (post-2030)**
Domestic Reserves	Maximize recovery, LNG imports	BAPEX, Petrobangla, IOCs	**Short (2025–27)**
	Accelerate exploration, upgrade BAPEX		**Mid (2027–30)**
	Offshore fields & Bhola LNG conversion		**Long (post-2030)**

Issue/Focus	Actions	Responsible Agency	Timeline
Industrial Production Loss	Emergency allocation to energy-intensive industries	BEZA, IDCOL, DCCI, BGMEA, BKMEA & other Trade bodies	**Short (2025–27)**
	Dedicated pipelines & EE system development		**Mid (2027–30)**
	Sector-wide EE adoption		**Long (post-2030)**
Import Dependency	Optimize LNG imports	BPC, BAPEX, IPPs, IDCOL, PPPA, Trade bodies	**Short (2025–27)**
	Increase domestic exploration		**Mid (2027–30)**
	Diversify with renewables/hydrogen		**Long (post-2030)**
Matarbari Hub	Complete LNG/LPG terminals	CPGCBL, JICA, SREDA, IPPs	**Short (2025–27)**
	Integrate renewables & power trade		**Mid (2027–30)**
	Transition to renewables & H_2		**Long (post-2030)**

1.3 Policy & Regulatory strategy

Table 3: Implementation Roadmap of Policy & Regulatory Strategy

Issue/Focus	Actions	Responsible Agency	Timeline
Price Hike	Stabilize tariffs, subsidies	BERC, Finance Div., MPEMR	**Short (2025–27)**
	Transparent pricing		**Mid (2027–30)**
	Independent regulator		**Long (post-2030)**
Predictable Pricing Formula	Standardize formulas	BPC, BERC, Finance Div.	**Short (2025–27)**
	Link pricing with EE incentives		**Mid (2027–30)**
	Market-linked pricing		**Long (post-2030)**
Automated Fuel Pricing	Hedging/import planning	BPC, Bangladesh Bank, ICT division, and Trade bodies	**Short (2025–27)**
	Improve storage & planning		**Mid (2027–30)**
	Real-time global price integration		**Long (post-2030)**
Institutional Capacity	Provide fiscal and non-fiscal support	BAPEX, Energy Div., NSDA, SREDA, PPP Authority, and Energy related gov. agencies	**Short (2025–27)**
	Modernize exploration (PPP)		**Mid (2027–30)**
	Self-sufficient exploration		**Long (post-2030)**
Policy Instability in Renewables	Stabilize projects, incentives	SREDA, Power Cell, MDBs	**Short (2025–27)**
	Clear framework		**Mid (2027–30)**

Issue/Focus	Actions	Responsible Agency	Timeline
	Predictable long-term RE policy		**Long (post-2030)**
Industrial Clusters & Zoning	Energy audits	BEZA, BEPZA, BSCIC, MoI, BIDA, BGMEA, BKMEA, DCCI, and other trade bodies	**Short (2025–27)**
	Relocate industries		**Mid (2027–30)**
	EE/ESG-linked zoning		**Long (post-2030)**
EE Policy Framework	Sector EE targets	BERC, MPEMR, SREDA, BSTI, MoI, MoF, BB, Planning Commission, Trade bodies	**Short (2025–27)**
	Mandatory audits/reporting		**Mid (2027–30)**
	Industry-wide EE framework		**Long (post-2030)**
Financing EE Tech	Expand green refinancing	MoF, Bangladesh Bank, IDA, IDCOL, MDBs	**Short (2025–27)**
	Scale concessional MDB loans		**Mid (2027–30)**
	Establish GCF window		**Long (post-2030)**

5 Conclusion

Bangladesh is at a unique crossroads where climate vulnerability, rapid industrialization, and increasing economic ambitions are meeting to call for a new direction towards energy. The new policy framework for industrial energy efficiency is more than just a regulatory document; it is about the nation's securing of its sustainable future. The industrial sector consumes almost half of the country's energy, and the inefficiencies in practice, from captive generators to the lack of auditing cultures, will threaten national energy security and economic competitiveness. These practices endanger national economic competitiveness and energy security, resulting from the inherent inefficiency entailed by such practices.

This policy draft proposes the path forward: a comprehensive transformation from piecemeal programs to a systemic, institutionalized process. Ensure that the scale-up of ambitious master plans such as the EECMP and IEPMP is matched by the enforcement, institutional coordination, and financial resources needed to bridge the gap between ambitious plans and implementation on the ground. The limited success of the voluntary measures makes it clear that a shift to a mandatory regime for energy audits and a strong "Enforcement Regulation" is a must. Integral to this transition must be the digital infrastructure of a National Energy Efficiency Compliance Portal that conveys transparency, audit trails, and accountability.

At the heart of this transition is financing. This disconnect suggests a structural failure, which must be tackled via simplified credit mechanisms, risk-sharing facilities, and focusing on the building capacity of ESCOs in order to make the green fund accessible for SMEs; And without budget-friendly capital, the technology upgrades needed for efficiency, whether on replacing inefficient boilers or smart grid technologies, will remain off-limits for most sectors. In addition, tax structures need to be rationalized to avoid conflicting duties on energy-efficient parts in other regions if green technology must make economic sense.

Sector-specific approaches show that a uniform model does not work. The varying nature of RMG, steel, cement, and commercial markets requires specific interventions, ranging from industrial zoning and dependable grid supply to building codes enforcement and operation hour compliance. At the same time, they need to modernize the national grid to cater to these industries. Without overcommitting to fossil-fuel infrastructure that would lock the economy into a high-carbon future, regional interconnectivity and renewable integration must be pursued aggressively.

Ultimately, the "triple helix" of government, industry, and academia to act collaboratively to raise awareness, create local capacity, and stimulate innovation could only bring success to our energy efficiency journey. Bangladesh can learn from experiences abroad, and by adopting global best practices, including India's PAT scheme or Japan's Top Runner program, adapt them to the Bangladesh context to transform energy efficiency into a competitiveness driver.

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