



Bangladesh

Terminal Evaluation

Atlas Project ID: 00059348; PIMS: 3327



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ACRONYMS AND ABBREVIATIONS

AC	Air Conditioner
APR	Annual Project Review
AWP	Annual Work Plan
APLF	Annual Plant Load Factor
BAB	Bangladesh Accreditation Board
BAU	Business as Usual
BBS	Bangladesh Bureau of Statistics
BDS	Bangladesh Standard
BERC	Bangladesh Energy Regulatory Commission
BPDB	Bangladesh Power Development Board
BRESL	Barrier Removal for Energy Efficiency Standards and Labeling
BSTI	Bangladesh Standardization and Testing Institute
BUET	Bangladesh University of Engineering and Technology
CC	Climate Change
CDM	Clean Development Mechanism
CFL	Compact Fluorescent Lamp
CoP	Co-efficient of Performance
EB	Electronic Ballast
EC	Energy Conservation
EE	Energy Efficiency
ES&L	Energy Standard and Labeling
ERD	Economic Research Division
ESCO	Energy Service Company
FIT	Feed-in Tariff
FY	Fiscal Year [mention date/month]
GEF	Global Environment Facility
GHG	Green House Gases
GiZ	German International Development Corporation
GoB	Government of Bangladesh
GW	Gigawatt
IDCOL	Infrastructure Development Company Limited
IEC	International Electrotechnical Commission
IMED	Impact Monitoring and Evaluation Division
IPP	Independent Power Producer
ISO	International Organization for Standardization
kWh	Kilowatt hour
MEPS	Minimum Energy Performance Standard
M&E	Monitoring and Evaluation
MoF	Ministry of Finance

Mol	Ministry of Industry
MoPEMR	Ministry of Power, Energy and Mineral Resources
MTE	Mid Term Evaluation
MWh	Megawatt hour
NEP	National Energy Policy
NGO	Non-Government Organization
PD	Power Division
PDF	Project Development Facility
PGF	Project Guarantee Facility
PIMS	Project Information Management System (UNDP GEF)
PIR	Project Implementation Review
PM	Project Manager
PMU	Project Management Unit
PPP	Public private partnership
PV	Photo voltaic
RE	Renewable Energy
REB	Rural Electrification Board
REP	Renewable Energy Policy
SHS	Solar Home System
SREDA	Sustainable and Renewable Energy Development Authority
TA	Technical Assistance
ToE	Ton of Oil Equivalent
Wp	Watt peak
UNDP	United Nations Development Programme
UNFCCC	United Nation Framework Convention
WB	World Bank

PROJECT DETAILS

UNDP/GEF Project Title:	Barrier Removal to Cost Effective Development and Implementation of Energy Efficiency Standards and Labeling (BRESL)
GEF Project ID No:	Atlas Project ID: 00059348
UNDP Project ID No:	00074185, (PIMS: 3327)
Evaluation Time Frame:	20 May – 20 June 2015
Date of Evaluation Report:	20 June 2015
Region and Countries included in the Project:	Asia and the Pacific Bangladesh, China, Indonesia, Pakistan, Thailand, Vietnam
Implementing Agency	UNDP Bangladesh
Executing Agency:	BSTI
Project Partners:	BSTI, Manufacturers, Distributors, Retailers, Association and MoI, MoF, IMED, ERD
Evaluation Team Members:	Sattya Ranjan Bhattacharjee

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EXECUTIVE SUMMARY

Project Summary Table				
Project Title: Barrier Removal to the Cost-Effective Development and Implementation of Energy Efficiency Standards and Labeling (BRESL)				
GEF Project ID:	Atlas Project ID: 00058669		<i>at endorsement (US\$)</i>	<i>at completion (Million US\$)</i>
UNDP Project ID:	PIMS:3327	GEF financing:	6,50,000.00	6,50,000.00
Country:	Bangladesh	IA/EA own:	11,428.00	8,814.26
Region:	Asia and the Pacific	Government:	2,000,000	2,000,000.00
Focal Area:	ES&L	Other:		
Operational Program:		Total co-financing:	2,011,428.00	2,008,814.26
Executing Agency:	BSTI	Total Project Cost:	2,661,428	2,658,814.26
Other Partners involved:	Manufacturers, Distributors, Retailers, Association and MoI, MoF, IMED, ERD	Prodoc Signature (date project began):	01 June 2009	
		(Operational) Closing Date:	Proposed 30 June 2014	Actual: 30 June 2015

The terminal evaluation has been performed on a request of the UNDP country office in Bangladesh, as a standard mandatory requirement of all UNDP/GEF projects. The terminal evaluation mission took place in May-June 2015, ten days before the final completion of the project which is scheduled to finish at the end of June 2015. The objective of this evaluation is to assess the achievement of project's objective, the affecting factors, the broader project impact and the contribution to the general goal/strategy, and the project partnership strategy. The terminal evaluation focuses specifically also on recommendations and lessons learned that could be utilized in similar projects in other countries of UNDP/GEF operation.

Terminal evaluations have four complementary purposes:

- To promote accountability and transparency, and to assess and disclose levels of project accomplishments.

- To capture and synthesize lessons that may help improve the selection, design and implementation of future GEF activities, as well as to suggest recommendations of replication of project successes.
- To provide feedback on issues that are recurrent across the portfolio and need attention, and on improvements regarding previously identified issues.
- To contribute to the GEF Evaluation Office databases for aggregation, analysis and reporting on effectiveness of GEF operations in achieving global environmental benefits and on the quality of monitoring and evaluation across the GEF system.

To this end, the terminal evaluation is intended to:

- enhance organizational and development learning;
- enable informed decision-making; and
- create the basis for replication of successful project outcomes
- recommend the future actions from the lesson learned
- identify and include new appliance for the next steps.

The structure of this Terminal Evaluation report follows the latest UNDP guidance for terminal evaluation of GEF-Financed Projects and follows Annex F of the UNDP template for *Terminal Evaluation Terms of Reference*. This first introductory chapter describes the purpose of evaluation and methods used. Chapter 2 describes the Project and its objectives, within the development context of Bangladesh. Findings from the evaluation are presented in Chapter 3, focusing in turn on the formulation, implementation and results (outputs, outcomes and impacts) of the Project. Aspects of each of these three components of the project cycle were assessed using the rating systems outlined above in Table 1.1. Conclusions are drawn in Chapter 4, highlighting the strengths, weaknesses and outcomes of the Project. Lessons learned from the experience are identified, along with practical, feasible recommendations that build on the Project's interventions.

This report summarizes the findings of the Final Evaluation Mission conducted during May-June 2015 implemented by the BSTI under UNDP and with financing support provided by the GEF. The GEF project budget of USD 7 million was designed to be supplemented by 6 countries of which USD 1 million allocated for Bangladesh, 65% of the budget was carried out for national level activities, while 35% was used for Bangladesh related regional level activities operated by the Regional Project Centre (RPC) in Beijing. Contribution of Bangladesh Government to co-financing was USD 2 million (in kind) and USD 11,428 (in Cash).

The project development objective was defined to reduce Bangladesh's greenhouse gas emissions by accelerating the adoptions and implementation of energy standards and labels of the targeted energy consuming appliances, equipments and lighting products and achieving the removal of barriers to the development and effective implementation of energy efficiency standards and labelling programs in the region. The overall objective of BRESL project as defined in the project documents to achieve the objective set out in GEF Operational Programme is to Removal of barriers to the successful implementation of energy standards and labeling policies and programs in Asia. In order to achieve the project Objective, the project consists of five outcomes, which is mutually supportive from each other.

Outcome 1: Establishment of legal and regulatory basis for removing lowest technologies from the market and promoting high-efficiency technologies.

Outcome 2: Building of institutional and individual capacity to secure on-the-ground implementation of regulatory frameworks, as well as actual standards and labeling programs.

Outcome 3: Provision of information and technical assistance to manufacturers of covered products

Outcome 4: Regional cooperation and information sharing on-going and helps to maximize impacts

Outcome 5: Demonstration of various aspects of the development and implementation of ES&L programs

The project activities focused on 6 products namely Compact Fluorescent Lamp, ballast for fluorescent tubes, electric fan, electric motors, room air conditioner and refrigerator for developing the ESL. Though energy standards programs for residential fans, fluorescent tube lights, refrigerators, and compact fluorescent lamps were being developed in Bangladesh in some extent, but there were no policy to use efficient products to reduce energy consumption. BSTI is the only institute to authorize for issuance of licences and permission of marketing any electrical products.

With the assistance of BRESL project, BSTI has already set the energy efficiency standards of the appliances which are graded by STAR marks. BSTI developed the lab facility for ES&L of CFL, fan and electronic ballast and submitted a DPP for AC, fridge and motor components in the planning ministry for setting up the lab in BSTI with a budget of USD 1.78 million which is approved on 26 May 2015. Under this project BSTI has completed the required standards of as below:

- **CFL= BDS-IEC 1734,1735 & 1761.**
- **EB = BDS-IEC 60921 & BDS-1724**
- **Refrigerator/Freezer =BDS 1849 : 2011 (Performance standards)**
- **Refrigerator/Freezer =BDS-1850 : 2011 (Energy Efficiency rating)**
- **Air-Conditioners=BDS-1852 : 2012 (Energy Labeling)**
- **Air-Conditioners=BDS-1853 : 2012 (Energy Performance)**
- **3-Phase Motor (Test methods) =BDS-IEC 60034-2 : 2009**
- **3-Phase Motor (Efficiency Class) =BDS-EN 60034-30 : 2012**

The main stakeholders of the Project are as follows:

- Government professional like ERD, IMED, Mol, MoF, MoPEMR,
- Manufacturers of 6 appliances
- Distributors of 6 appliances
- Retailers of 6 appliances
- Consumers of 6 appliances
- Importers of 6 appliances
- Civil society and NGO like Consumers Association of Bangladesh
- Environmental stakeholders
- Gender Stakeholderds (core Technician)
- The client, BSTI, whose capacity in coordinating the planning and management of ES&L has been strengthened and developed;
- Local universities like BUET, UAP and technical professionals who have developed their capacities and expertise through consulting opportunities provide by the Project.
- Donor organization like GiZ who assisted to establish Lab in BSTI for CFL and EB.

Summary of the results of BRESL project are given below:

- Total 15 Manufactures were given Star label for CFL, Fan and Ballast. 9 of them are Compact Fluorescent Lamp, 2 of them are Electronic Ballast and 4 are Electric Fan manufacturer.
- According to the Mid Year Review of BRESL project total energy saved 751.84mW upto May 2015.
- During Jan 2013 –May 2015, 4 companies sold 2,50,000 pcs Electric fan. Each STAR label fan consume around 60W, whereas locally available fan in the market consume more than 120W. Total electricity saved from these Star Labeled Electric Fans was 15 mW. Present CO2 emission from grid electricity is 0.67kg-CO2/kWh and expected CO2

emission in 2030 is 0.79kg-CO₂/kWh. This emission rate increase will be caused by the change of generation mix, due to the increase in thermal combustion.

- During April 2013 to May 2015, 9 CFL manufacturers sold around 9.8 million CFL. Each STAR label CFL of 25W save around 75w electricity from the incandescent lamp of 100W and thus 736.54 mW electricity was saved.
- During May 2014 to May 2015 around 25,000 ballast were sold. Star Label Ballast save 12W electricity and hence around 0.3mW electricity were saved from this appliance.
- Total 751.84mW of electricity were saved from the using of CFL, fan and ballast. Installation of 1 mW power plant need around USD 1million and hence Government could save USD 751.84 million from these options.
- Under the media coverage program, a TV commercial of 30 seconds has been produced and broadcasting in 8 TV channels (Mass awareness quota) for national awareness campaign (from May 27, 2015).
- 122 core technicians of above 3 products for newly star label awarded manufacturers were trained (7th March & 9th April 2015) to produce Energy Efficient products by designed training module.

Monitoring and evaluation: Standards of BRESL products were done by BSTI in a manner that voluntary products should come first and then mandatory standard followed the sequence. Star label fixation was going on to mark the grading of Energy Efficiency of 3 products-CFL, EB & Electric Fan. Air-conditioner, Refrigerator & Electric Motor will be done in next steps as Govt approved the DPP recently for lab equipment for these appliances. For continuous monitoring,

BSTI visited the market and factory frequently to find out the available standard products certified by BSTI. BSTI connected with SREDA for new strategy of M&E for Energy Labeling Master Plan that will be implemented from 2016 as Regulations.

After completion the project in June 2015, UN activity tracking will continue by BSTI through Energy Efficiency Cell as a part of sustainability. Result monitoring will be done by M&E unit through reporting and surveillance by BSTI. Adoption of international standards (continuous process) from IEC, ISO, ANZ, SL and IS for reference, comparison, evaluation and formulation of BDS (Bangladesh Standards) through Feasibility Study (FS) already reported by National Experts as a part of Harmonization with other 5 participating countries. In future BSTI may revise the BDS with SREDA and technical experts of the country.

Based on the all outcomes of the project, the evaluator marked the project as following:

Outcomes, Effectiveness, Efficiency, M&E, I&E Execution	Sustainability	Relevance
5. Satisfactory (S): minor shortcomings	3. Moderately Likely (ML): moderate risks	2. Relevant (R)
		Impact
		3. Significant (S)

The Project objective and outcomes were rated according to their respective outputs, based on evidence provided by THE PROJECT MANAGER and assessed by the evaluators, and by means of performance indicators using the 6-point satisfaction scale. Other aspects of performance were assessed using the full range of set of ratings shown in Table in chapter 2.

CONCLUSIONS, RECOMMENDATIONS AND LESSONS LEARNED

The project has delivered remarkable result. It introduced and established the star labelling of the appliances and in future, SREDA can make a mandatory policy to use the star label products in the residential, commercial and industrial sector. It was also learnt that SREDA will make a mandatory rules from Dec 2016 for these appliances. It is a practical tool for effective housekeeping in the private sector as well as public sector in the country, including the Upazilla, district and division level, as well as ministries and departments. During project implementation and based on results in pilot products like CFL, Electronic ballast and household fan, the project has attracted exceptionally high to the other donor organizations like JICA.

The project has not only changed the perception and the business-as-usual practice concerning energy consumption but it also changed the awareness and attitude towards energy efficiency in the some part of the society by its information campaigns, outreach activities and free energy efficiency advisory services, targeting primarily the commercial and residential sector. More than 500 technicians, engineers, entrepreneurs, manufacturers, supplier, distributors, dealers and even end users, energy experts, including auditors, have been trained in the training programs for energy efficient products. The results achieved and the impact the project had delivered are evaluated more than satisfactory.

These results would not materialize without the strong leadership and drive of the National Project Director who has a long time working experience with BSTI combined international best-practice experience with a detailed knowledge of the local market. It was the newly appointed Project Director who focused on all the activities of BRESL project in his Inception Report. With their hard job they could establish testing CFL, electronic ballast and household fan and in BSTI, technician, engineers are able to test these products. They also appointed

an Assistant Director for monitoring the testing. According to BSTI, they have received all these equipments in Dec 2010 and they had previous experience to test with these types of equipments. Due to unavailability of equipments for testing the Air conditioner, refrigerator and electric motor, it was not possible for them to check and standardize the products for labeling.

In the local market in Bangladesh there is no monitoring system and market control from the government. In most of the cases end user became sufferer though they pay the products even in some cases more than the international standard prices. Long time ago government introduced PSI system and it could not help about the quality. PSI companies tested only the quantity, not the quality and even sometimes not the products.

Some of the manufacturers who got the star label for their products like SEC Fan wants financial incentives from Government or make the access to finance easy for those types of manufacturers from Government Green Climate Fund. Company like Transtec and Walton, who have their own R&D division with lab facility wants government monitoring policy should be strong enough to stop the import of less quality products and seeking a business opportunity in other countries who implemented the BRESL. They are not sure yet whether BRESL star label is sufficient to export the products in the BRESL countries. If BRESL ensure that if the manufacturers got star label they can export to other BRESL implementing countries, it will be another success story for BRESL and more entrepreneur will come forward to get the certificate from BSTI.

Bangladesh is a densely populated country with about 161 million people living in 147,570 square kilometers of land. In order to maintain a sustainable GDP growth of 7%/year up to 2020 and beyond, the Government of Bangladesh (GOB) needs to meet the essential energy needs of the people and industries. For this purpose, demand-side energy management is just as important as supply-side infrastructure development. A rapidly growing country like our country needs a huge amount of energy to feed its large growth appetite. In the past decade, primary energy consumption increased over 100% and this trend will sure to be continued. We have no room for wasting energy. Besides the latest sector-wise energy consumption (industrial, residential, transport, agriculture and commercial) is shown in Figure 1-1: industry has the biggest share at 47.8%, followed by residence and transportation at 30.5% and 11.5%, respectively.

By achieving the target of 20% improvement of primary energy consumption per GDP, a total of approx. 66 Mtoe (or 78 billion m³ of gas equivalent) is expected to be saved within the 15

years between 2016 and 2030. The total energy savings in monetary terms will amount to approx. Tk 530 billion in the period or an annual average of Tk 35 billion, at the current weighted average natural gas price¹. The energy intensity in 2030 will be improved by 20% compared to the 2013 level and the energy consumption in 2030 will be reduced by 17% (or by 12 Mtoe) compared with the BAU case.

ES&L will give impact on foreign manufacturers, because most of these 6 products are imported either in complete set or in SKD mode depends on the structure of duty which change year to year are sold in Bangladesh market. All manufacturers import all the components instead of complete set to avoid the duty as according to the SRO, less duty will be paid for parts. Some of the manufacturers make most of the products in Bangladesh except some electronic components and they have their own lab for testing. This program may identify a Non Tariff Barrier between the countries implementing BRESL program. In that case voluntary participation will be increased and will not depend when the rules will be mandatory. Committees and/or WGs on the program should be held fairly and often not only gathering governmental officers, but also inviting many stakeholders including foreign manufacturers.

As residential sector consume more than 40% of total electricity consumption and energy consumption is rapidly increasing in this sector, it is needed to implement an effective counter measures to mitigate energy consumption in this sector. New Version of Bangladesh National Building Code is going to be published by Ministry of Housing and Public Works (HOHPW), taking into consideration energy consumption in building as well. Since BNBC [Revised] is the core program for promoting EE buildings, it is focused in the Project. In parallel, for not only energy efficiency and conservation but also reduction of overall environmental impact and betterment of indoor air environment in buildings, MOHPW is developing Green Building Guideline (GBG). Since green building program is important as one of international movements, GBG is also discussed in the Project.

Bangladesh Standardization and Testing Institute (BSTI) has been engaged as a leader in BRESL Project in Bangladesh. BSTI has issued BDSs on EE measurement methods, but couldn't issue regulation, and the initial EE Labeling Program didn't work well under the project. SREDA has been newly established with an objective to promote, coordinate and assist Renewable Energy and Energy Efficiency activities in the country. SREDA's most important role is to issue regulations and fully manage the program. Without mandatory

¹ Based on the recent gas tariff proposal, weighted average tariff is calculated as 195BDT/MCF, raised from the current 140.6BDT/MCF. 195BDT/MCF is equal to 6.8BDT/m³ (1MCF = 28.3m³)

regulations from SREDA it will be difficult to count the success of the project as SREDA is a authority whether BSTI can test and label the products only.

BSTI will concentrate on standardization (issue of BDSs) and conduction of EE measurement tests. Bangladesh Accreditation Board (BAB) will join in the program for maintaining laboratories' test reliability by issuing accreditation. It has received international recognition for laboratory accreditation (APLAC).

Usually, there are two types of labeling procedure, one is that manufacturers can affix EE label on their products by themselves, referring to their in-house laboratories' EE measurement test data like Transtec, Walton. The other is that the manufacturers must get label certification, which is given by the authority, referring to 3rd party laboratories' EE test like BSTI. BSTI prefer second one and due to this they submitted a DPP to ministry to get the fund for lab equipments so that they can test and certify all the components under BRESL program.

The "Framework of EE Labeling Program" under Power Division was drafted. This Framework instructed mainly technical issues of CFL, refrigerator, AC, TV, electric fan, electronic ballast and induction motor. The regulation can give administrative power on the relevant Bangladesh Standards (BDSs) by means of introducing BDSs, in which EE measurement methods are fully stated. Star rating criteria will be directly shown in the regulation, and will not be issued as BDSs, because star rating criteria must be designed considering social and economic viewpoints, besides BDSs mainly stipulates technical issues.

According to the Power Division, it was found that SREDA will start EE Labeling Program as a voluntary basis and shift to mandatory, in order to spread the program through all parties. In case of the mandatory program, the Government must provide EE testing service for the all manufacturers and importers, which want to get EE data on their products. Therefore, governmental testing agencies, including BSTI have to develop EE test capacity urgently.

Recommendations:

1. Update the electricity prices: Government provides subsidy to the energy sector. Low price of the energy bill is a barrier of energy efficient products as payback period of the products become longer period and consumers usually not interested for longer time return.

2. Saving should always be shown in economic term instead of technical or environmental term as end user understand how much they can save instead of how much electricity or Carbon will be saved.
3. Develop business plan of the ES&L products: BSTI in consultation with SREDA and international technical assistance, should develop a business plan how the ES&L will be sustained financially and operationally. BSTI should nominate entities, assigning responsibilities for the next phase. The plan includes:

- Description of activities from the technical point of view
- Strategy definition
- Intervention areas and identification of instrumental and operational partners (public/private), including project implementation and process management
- Identification of costs and financing sources, economical and financial viability
- Sensitivity analysis (one variable- electricity price)
- Monitoring and evaluation of framework of next ES&L program
- Definition of a methodology for evaluation of the energy savings associated with ES&L program

4. Develop a comprehensive incentives program that supports the ES&L program to effectively transform market. BSTI in consultation with SREDA and other technical experts will research on the appropriate and possible bundle of incentives that could be given, upstream, midstream and downstream the appliances value chain, to foster the penetration of high efficient equipment in the local market
5. Capacity development of BSTI: Staffs in charge of the EE&C programs are expected to have enough competencies and have a overall capacity to

- communicate with stakeholders
- Energy data collection and analysis
- Communication with industrial sector and associations
- Basic knowledge in S/L (Standards and Labeling)
- Label certification / Laboratory accreditation system
- Standardization of EE measurement method and Star Label Rating criteria
- Star Label Standardization (Unification)
- Participation of manufactures, importers and retail shops (mandatory/voluntary)
- MEPS (Minimum Energy Performance Standard)
- Basic EE technology on home appliances

- Present market condition- Communication with manufacturers and dealers
- EE&C financing -Available financing source for EE&C
- Communication with financial institutions
- Harmonization with International and/or Regional EE Labeling Programs
- IT Skill to operate IT
- Communication with Ministry of Education and schools/universities
- Economic analysis (Economy on energy)
- Outline of EE&C programs and technology
- Climate change Knowledge on global warming, Kyoto mechanism, CDM, etc.

6. Sustainable participation of the testing facilities must be accompanied with periodical maintenance, calibration, skilled personnel and demand of EE tests. Capacity development for skilled personnel needs long time and experiences, especially in case of refrigerator and AC. BSTI will develop its testing ability. On the other hand, BAB must issue accreditation for the eligible laboratories by accessing laboratories' test facility, staffs and quality. Therefore, BAB must be knowledgeable about testing procedures
7. Nationwide network on EE&C implementation including international donors, related associations and the academy should be formulated and BSTI will coordinate for testing. National capacity building should be achieved through the network by means of information exchange and technology transfer. SREDA will operate as authority
8. In order to make the establishments to take voluntary actions on EE&C implementation, BSTI with SREDA should notice possibility of energy supply shortage and energy price increase in near future to the industrial, commercial and residential sectors. Provision of knowledge and conscious on energy and EE&C to students will influence their family through EE&C action at home, and, finally, cause awareness rising in the society. BSTI with SREDA will conduct EE&C school program, which will be a joint program with Ministry of Education.
9. BSTI should implement EE&C campaign through media such as televisions, newspapers and advertising boards, discussions, billboard, school campaigns, competitions with prizes, etc. In cooperation with related governmental and/or private organizations and program.
10. BSTI will concentrate standardization (issue of BDSs) and conduction of EE measurement tests. BAB (Bangladesh Accreditation Board) will join in the program for maintaining laboratories' test reliability by issuing accreditation. BSTI should get accreditations by BAB. Key players/ stakeholders on the program are manufactures and importers. They are expected to join in the program voluntarily complying with the

labeling rules. Also, they are expected to join in stakeholder meetings for developing and/or improving the program elements such as EE measurement method and star rating criteria, based in their technical expertise and information about market condition.

11. Assurance of EE label's reliability (establishment of verification system): Verification system including EE measurement procedures may select from the two verification types given below and assuring EE label's reliability.

Procedure 1:

- Manufacturers/importers get EE test on their products at accredited laboratories.
- Label certification body evaluates the EE test report and issue label certificate on the product with star rating, and issue it to the manufacturer/importer
- Manufacturers/importers affix the label on the products or their packages, and deliver to the markets.
- Label certification body carries out EE check test for the products sold in the markets, picking up samples, in order to maintain credit of labels.
- Label certification body should have a magistracy capacity to fine the manufacturers/importers if they find the products delivered in the local market are below standards. They should visit and select products randomly from the market.

Procedure 2:

- Manufacturers/importers get EE test on their products and make EE label with star rating in accordance with the specified standards and criteria.
- The labels are registered at the authority
- Manufacturers/importers affix the label on the products or their packages, and deliver to the markets.
- The authority carries out EE test for the products sold in the markets picking up sample, or being asked for "challenge test" by somebody who wants the test for verification.
- Penalty will be imposed to the manufacturers/importers, if they affix illegal labels.

12. LED products are already in the market since 2011 and CFL will be gradually discontinued as it has got mercury and Bangladesh is a signatory of Minamata convention on mercury under UNEP who are committed to discontinue mercury use. Many imported products are sold in Bangladeshi market. How to verify foreign manufacturers EE test data is the discussion point at EE Labeling Committees and WGs.

Issue of BDSs on EE measurement method. BSTI should develop BDS for LED used for DC and AC system for the next project.

13. BDS for other products like TV should be developed in the next phase as consumption of TV is increasing due to economic development and the size of the TV also changing from low wattage 26 inch to high wattage LED 42 inch or more. Though LED TV is efficient but due to bigger sizes, it consume more electricity.
14. BSTI may also think to develop BDS for Battery, Solar panel, solar charge controller as renewable energy plays a key role in rural areas and end user becoming sufferer from this products. 20% of the total energy will be generated from Renewable energy (particularly solar, as other options are not so feasible in Bangladesh context) by 2020 and it will right time if BSTI can do this in the next phase.
15. Some of the manufacturers have their own R&D and lab facility for their products testing in their own lab. For example, WALTON has five sets of testing facilities (climate chambers), and has conducted tests according to BDS1850 (EE measurement method). However, these test facilities have not yet acquired BAB accreditation.
16. SREDA intends to start mandatory program from FY 2016-17 in Phase 1 in order to facilitate the nationwide application of the program. In case the program becomes mandatory, laboratory's EE testing capacity becomes a critical problem. This is because The Government must provide full-fledged EE testing (measurement) services, which satisfy manufacturers and importers requests for label application. Therefore, the time line for the capacity building of BSTI's testing facilities and the timing of the shift from voluntary to mandatory implementation should be well coordinated between SREDA and BSTI.
17. BSTI in consultation with SREDA and other technical experts should revised the BDSs for 6 products in the next phase.
18. Some companies have testing facilities in the neighboring countries such as India, and are already participating in other labeling programs abroad. BSTI should consider the possibility of utilizing the facilities and experiences of these companies and other reputed international companies, mobilizing their participation in the labeling program. In this way BSTI could do this system for motor, fridge and AC in the 1st phase.
19. It is recommendable to visit to neighbouring countries such as India, Sri Lanka, Thailand, Malaysia, etc. where EE labeling program has been applied, to grasp present situation, issues and impact of the program. Not only BSTI, but also local manufacturers and BAB are expected to join in the mission. In the foreign countries, interview to the authorities,

survey in the appliance market and observation of laboratories testing equipment should be scheduled. The mission should be arranged and conducted by BSTI.

20. It is recommendable to make a business policy to export the star products within BRESL implementing countries and BSTI should cooperate to the manufacturers in this case with SREDA. If this Star level allows the manufacturer to export easily without needed any further certificate for BRESL countries, more manufacturers will join volunteer to export eh products.

21. UNDP, BSTI, SREDA together motivate National Board of Revenue (NBR) to develop a tariff value of all each electrical and electronics products. At present there is a duty system against each HS Code. If import value is fixed for each imported item, importer will stop to import less quality products when tariff is same for same products.

Lessons Learned

- As big manufacturers involved with BRESL project to produce EE products, have experienced that ES&L can provide opportunities to increase market share & profitability with their business
- Technical training by National Experts & CPE of BRESL for core technicians is a very good support for EE products.
- Government support for regulations of Voluntary & Mandatory through SREDA for the formulated BRESL Product is essential, otherwise non-EE products will be inundated in the market.
- At the beginning of assigning EE Star Label unwillingness was observed from small manufacturer's side to produce energy efficient (EE) products because of high initial investment and fear of loosing market but now it is changing.
- Mass Awareness Campaign (through print & electronic media) up to the grass-root level among the end users (consumers) students, traders, dealers & relevant stakeholders is very much effective to highlight the benefits of using energy efficient (EE) product.
- Maximum percentage of manufacturers involved with project to produce BRESL products has agreed that ES&L can provide opportunities to increase profitability with their business.
- Technical support by National Expert of BRESL for core technicians can enhance manufacturer's production of EE products.
- Government support for legislation (Voluntary & Mandatory steps) and implementation for the formulated BRESL Product is very much essential.

1. INTRODUCTION

This report summarizes the findings of the Final Evaluation Mission conducted during May-June 2015 implemented by the BSTI under UNDP and with financing support provided by the GEF. The Project Document (Prodoc) provides details to remove the key barriers to energy conservation and energy efficiency for 6 electrical compliances mostly used in residential, commercial and industrial sector.

The GEF project budget of USD 7 million was designed to be supplemented by 6 countries of which USD 1 million allocated for Bangladesh, 65% of the budget was carried out for national level activities, while 35% was used for Bangladesh related regional level activities operated by the Regional Project Centre (RPC) in Beijing. Contribution of Bangladesh Government to co-financing was USD 2 million (in kind) and USD 11,428 (in Cash).

The project development objective was defined to reduce Bangladesh's greenhouse gas emissions by accelerating the adoptions and implementation of energy standards and labels of the targeted energy consuming appliances, equipments and lighting products and achieving the removal of barriers to the development and effective implementation of energy efficiency standards and labelling programs in the region. The project immediate objectives were defined to capacity building and assisting government, manufacturing, distributing, retail, consumers, environmental stakeholders throughout the country to implement the most cost-effective energy efficiency measures available and to help foster the process for developing ES&L program.

The project activities focused 6 products namely Compact Fluorescent Lamp, ballast for fluorescent tubes, electric fan, electric motors, room air conditioner and refrigerator for developing the ESL Though energy standards programs for residential fans, fluorescent tube lights, refrigerators, and compact fluorescent lamps were being developed in Bangladesh in some extent, but there were no policy to use efficient products to reduce energy consumption. BSTI is the only institute to authorize for issuance of licences and permission of marketing any electrical products.

With the assistance of BRESL project, BSTI has already set the energy efficiency standards of the appliances which are graded by STAR marks. Appliances labelled with more STAR marks are more energy efficient. Implementation of BRESL project allowed BSTI to develop the lab facility for ES&L of CFL, fan and electronic ballast and submitted a DPP for AC, fridge and motor components in the planning ministry for setting up the lab in BSTI which is approved on 26 May 2015 USD 1.78 million.

BRESL provided massive technical assistance to Bangladesh in carrying out ground works for preparing a market ready for the star labelled appliances. BSTI under supervision of the Ministry of Industries was the executing agency of this project. Along with the legal framework and government policies, scope of BRESL project in broader way includes- capacity building of concern government organs, guidelines to the manufacturers of energy appliances, increase of stakeholders participation, arrangements of technical and demonstration support on modern testing equipments and technology transfer, sharing knowledge of experienced academicians and practitioners, facilitating the manufacturers with market development tools.

The project closely worked with demand from residential and commercial consumers of energy appliances in market with an awareness program for pilot basis installations of the star labelled appliances at consumer's places, market promotions at the residential, commercial and industrial sectors and setting out media coverage of advertisements in TV channels was also a part of this project.

1.1 Purpose of evaluation

The terminal evaluation has been performed on a request of the UNDP country office in Bangladesh, as a standard mandatory requirement of all UNDP/GEF projects. The terminal evaluation mission took place in May-June 2015, ten days before the final completion of the project which is scheduled to finish at the end of June 2015.

The objective of this evaluation is to assess the achievement of project's objective, the affecting factors, the broader project impact and the contribution to the general goal/strategy, and the project partnership strategy. The terminal evaluation focuses specifically also on recommendations and lessons learned that could be utilized in similar projects in other countries of UNDP/GEF operation.

Purposes of evaluation include understanding why and the extent to which intended and unintended results are achieved, and their impact on stakeholders. Evaluation is an important source of evidence of the achievement of results and institutional performance, and contributes to knowledge and organizational learning. Monitoring and evaluation policy² in the Global Environment Facility (GEF) have the following overarching objectives: to promote accountability for the achievement of GEF objectives through the assessment of results, effectiveness, processes and performance of the partners involved in GEF activities. GEF results will be monitored and evaluated for their contribution to global environmental benefits; and to promote learning, feedback, and knowledge sharing on results and lessons

² *The GEF Monitoring and Evaluation Policy 2010*, Evaluation Document November 2010, No. 4. Page 1.

learned among the GEF and its partners, as a basis for decision making on policies, strategies, program management, projects, and programs and to improve performance.

Terminal evaluation is an integral part of the UNDP/GEF project cycle. Its purpose is to provide a comprehensive and systematic account of the performance of the completed project by assessing its design, process of implementation, achievements (outputs, outcomes, impacts and their sustainability) against project objectives endorsed by the GEF (including any agreed changes in the objectives during project implementation) and any other results.

Terminal evaluations have four complementary purposes:

- To promote accountability and transparency, and to assess and disclose levels of project accomplishments.
- To capture and synthesize lessons that may help improve the selection, design and implementation of future GEF activities, as well as to suggest recommendations of replication of project successes.
- To provide feedback on issues that are recurrent across the portfolio and need attention, and on improvements regarding previously identified issues.
- To contribute to the GEF Evaluation Office databases for aggregation, analysis and reporting on effectiveness of GEF operations in achieving global environmental benefits and on the quality of monitoring and evaluation across the GEF system.

To this end, the terminal evaluation is intended to:

- enhance organizational and development learning;
- enable informed decision-making; and
- create the basis for replication of successful project outcomes
- recommend the future actions from the lesson learned
- identify and include new appliance for the next steps.

1.1.1 Project specific aspects of this evaluation

The Terms of Reference (ToR) for this Terminal Evaluation of the BRESL project include a number of specific provisions, notably to identify the energy savings and GHG emission reduction of the project and to recommend the next steps of the project. There is no option but to ensure supplying energy efficient appliances at affordable price, increasing tariff on energy inefficient appliances through imposing addition tax and duty and gradually phasing them out. Standards for essential energy using appliances must be finalized and adopted first for achieving success in energy efficiency and energy conservations. All the local products must be tax free. On the other hand, there should be nominal tax and duty for the

import of these. But at the same through effective monitoring it must be ensured that nonstandard appliances must not find market access. Low interest bank loan should be ensured for facilitating energy efficiency. Simultaneously fiscal incentives should be provided. Finally product labeling needs to be ensured.

1.2 Scope and methodology of the evaluation

This Terminal Evaluation follows the aforementioned GEF monitoring and evaluation policy and the new *Guidance for Conducting Terminal Evaluations of UNDP-supported, GEF-Financed Projects* (UNDP Evaluation Office, 2012). More specifically, details of the scope and deliverables of this Terminal Evaluation are given in the ToR.

The evaluation process is independent of GEF, UNDP, BSTI and other partners. The opinions and recommendations in this Terminal Evaluation are from national consultant, and do not necessarily reflect the position of GEF, UNDP, BSTI or any other Project stakeholders. Once accepted, the Terminal Evaluation becomes a recognised and publicly accessible component of the Project's documentation.

The Terminal Evaluation has been undertaken in line with GEF principles concerning independence, credibility, utility, impartiality, transparency, disclosure, ethical, participation, competencies and capacities.

Terminal evaluation is an evidence-based assessment of the Project concept and design, its implementation and its outputs, outcomes and impacts as documented in the Annual Progress Reviews (APRs), Project Implementation Reports (PIRs) and Logical Framework Matrix (LFM), which provides indicators and targets for measuring success in implementation. Evaluators relied more on the APRs/PIRs and the extensive feedback on outputs helpfully provided by the Project Manager.

The Evaluation was carried out in May - June 2015. The field mission comprised: 7 days in-country (24 May to 7 June inclusive) meeting and interviewing partners and other stakeholders in Dhaka and in the field at four of the Project sites (Transtec, SEC, BSTI Lab, Walton). Details of the in-country itinerary, including field visits, and stakeholders met are provided in **Annex 1**. The approach was based on the Terms of Reference includes desk review of project documents and relevant related literature (**Annex 2**) like project document, project reports – including Annual APR/PIR, project budget revisions, midterm review, progress reports, and GEF focal area tracking tools, project files, national strategic and legal documents, and any other materials that the evaluator considers useful for this evidence-based assessment. This TE will review project objectives and activities which is consists of the five outcomes of the project between 1st July 2010 to 20 June 2015 and will focus on

- The context of the ES&L implementation

- Extent of realizing outcomes of the project
- Asses the soundness of the methodologies developed for ‘S&L’
- Asses the relevance of the Energy Efficiency and Conservation (EE&C) Laws and Acts
- Activities of the project contributing to capacity development for S&L
- Recommendations for the future

National Consultant visited several factories particularly who got the star label from this program and took an interview with major stakeholders, including BSTI, Manufacturers, Distributors, Academicians, etc. The evaluation was undertaken in as participatory manner as possible in order to build consensus on achievements, short-comings and lessons learnt. Interviews focused on the strengths and weaknesses of the Project and future opportunities for energy efficiency related programs and projects, Energy efficiency and conservation rules and regulation made by SREDA which is supposed to be start implementing from 2016 in Bangladesh. Opportunities were taken to acknowledge, challenge and encourage Project partners in an open, objective manner on the basis of preliminary findings from Project reports and interviews, before committing these to paper. Initial findings were shared with the Executing Agency (BSTI).

Table 1.1 Ratings and their scales for different evaluation criteria³

Outcomes, Effectiveness, Efficiency, M&E, I&E Execution	Sustainability	Relevance
6. Highly Satisfactory (HS): no shortcomings 5. Satisfactory (S): minor shortcomings 4 Moderately Satisfactory (MS): moderate shortcomings 3. Moderately Unsatisfactory (MU): significant shortcomings 2. Unsatisfactory (U): major shortcomings 1. Highly Unsatisfactory (HU): severe shortcomings	4. Likely (L): negligible risks to sustainability 3. Moderately Likely (ML): moderate risks 2. Moderately Unlikely (MU): significant risks 1. Unlikely (U): severe risks	2. Relevant (R) 1. Not relevant (NR)
	Additional ratings if relevant	Impact
	Not Applicable (N/A)	3. Significant (S)
	Unable to Assess (U/A)	2. Minimal (M) 1. Negligible (N)

In addition to a descriptive assessment, Project achievements (outputs and outcomes), sustainability of outcomes, monitoring and evaluation system (design and application), were rated with respect to either the level of satisfaction achieved or the likelihood of various dimensions of the outcomes being sustainable at Project termination. Also, three criteria

³ *Guidance for Conducting Terminal Evaluations of UNDP-supported, GEF-Financed Projects*, UNDP Evaluation Office, 2012

(relevance, effectiveness and efficiency) were used, as appropriate, to evaluate the levels of achievement attained with respect to the Project objective and outcomes in accordance with GEF requirements. The different scales for rating various criteria are shown in Table 1.1, and further defined in Table 1.2 (level of satisfaction scale) and Table 1.3 (likelihood of sustainability scale).

Table 1.2 Definitions of ratings of levels of satisfaction (Guidelines for GEF Agencies in Conducting Terminal Evaluations, 2008)

Rating	Definition
Highly Satisfactory (HS)	The project had no shortcomings in the achievement of its objectives in terms of relevance, effectiveness, or efficiency.
Satisfactory (S)	The project had minor shortcomings in the achievement of its objectives in terms of relevance, effectiveness, or efficiency.
Moderately Satisfactory (MS)	The project had moderate shortcomings in the achievement of its objectives in terms of relevance, effectiveness, or efficiency.
Moderately Unsatisfactory (MU)	The project had significant shortcomings in the achievement of its objectives in terms of relevance, effectiveness, or efficiency.
Unsatisfactory (U)	The project had major shortcomings in the achievement of its objectives in terms of relevance, effectiveness, or efficiency.
Highly Unsatisfactory (U)	The project had severe shortcomings in the achievement of its objectives in terms of relevance, effectiveness, or efficiency.

Table 1.3 Definitions of levels of risk to sustainability of Project outcomes (*UNDP Evaluation Guidance for GEF-Financed Projects*, 2012)

Rating	Definition
Likely (L)	Negligible risks to sustainability, with key outcomes expected to continue into the foreseeable future.
Moderately Likely (ML)	Moderate risks , but expectations that at least some outcomes will be sustained.
Moderately Unlikely (MU)	Substantial risk that key outcomes will not carry on after project closure, although some outputs and activities should carry on.
Unlikely (U)	Severe risk that project outcomes as well as key outputs will not be sustained.

The Project objective and outcomes were rated according to their respective outputs, based on evidence provided by THE PROJECT MANAGER and assessed by the evaluators, and by means of performance indicators using the 6-point satisfaction scale. Other aspects of performance were assessed using the full range of set of ratings shown in Table.

1.3 Structure of the evaluation report

This evaluation is also to help UNDP/GEF identify any problem in project design, implementation, achievements and take into account and take in to account the lessons learnt and recommendations for future programming purposes. The Goal of the project is the reduction of Greenhouse Gas (GHG) emission from the thermal power generation in Bangladesh. The project mainly focused on capacity building and assisted the stakeholders like government agencies, private manufacturers, distributors, retailer, end users throughout Bangladesh to implement the most cost effective energy efficiency products through:

- Increased capacity to develop and implement ES&L program
- Enhanced awareness on ES&L programs and use of EE products
- Facilitation of the development and implementation of of ES&L program with the participation of the relative government agencies, manufacturers/suppliers, retailers, and consumers
- Increased financing and access to financing for ES&L initiatives
- Establishment of regional network of standards and labeling activities that will facilitate harmonization of the standards, and
- Successful demonstration of the design, development, financing, institutional, implementation of ES&L program and the resulting benefits from such programs

The structure of this Terminal Evaluation report follows the latest UNDP guidance for terminal evaluation of GEF-Financed Projects and follows Annex F of the UNDP template for *Terminal Evaluation Terms of Reference*. This first introductory chapter describes the purpose of evaluation and methods used. Chapter 2 describes the Project and its objectives, within the development context of Bangladesh. Findings from the evaluation are presented in Chapter 3, focusing in turn on the formulation, implementation and results (outputs, outcomes and impacts) of the Project. Aspects of each of these three components of the project cycle were assessed using the rating systems outlined above in Table 1.1. Conclusions are drawn in Chapter 4, highlighting the strengths, weaknesses and outcomes of the Project. Lessons learned from the experience are identified, along with practical, feasible recommendations that build on the Project's interventions.

2. THE PROJECT DESCRIPTION AND ITS DEVELOPMENT CONTEXT

2.1 Project start and duration

This project has been developed by the joint collaboration between Government of Bangladesh and Global Environment Facility to establish a sustainable energy standard and labeling programs for 6 electrical appliances mostly consumed electricity in Bangladesh. The project is titled as 'Barrier Removal to the cost-effective development and implementation of energy efficiency standards and labeling project (BRESL, PIMS # 3327 and is a component of the approved UNDP-GEF funded regional project with participation of 6 countries – Bangladesh, China, Indonesia, Pakistan, Thailand and Vietnam. All of the above countries participated in the formulation of the regional project document. Bangladesh Standards & Testing Institute (BSTI) participated in the development of the Regional Project document at the invitation of GEF. The GEF Council approved the project in June 2007 and the GEF CEO endorsed the Prodoc on 27 May 2008. Following that all countries have signed the Regional Prodoc for implementation.

The regional project started on 3rd February 2009 with a regional Inception Workshop (2-5 Feb 2009) in Bangkok, Thailand. Bangladesh Government approved BRESL on 1st June 2009 and hence it had a late start. The Ministry of Industries/BSTI nominated National Project Director on 26 July 2009 and developed the PIP. Bangladesh submitted draft inception report to RPSC meeting in 6th August 2009 together with other countries. National Project Manager and other members of the project started work from 1st July 2010 and it will continue until 30 June 2015.

2.2 Problems that the project seek to address

According to the Prodoc4 of BRESL, in Asia, the demand for energy consumption is growing and it will continue due to rapid economic growth. Appliances used for energy consumption primarily rely on fossil fuel based power generation, which is one of the major sources of greenhouse gas (GHG) emissions. It is estimated that, over the next decade, GHG emissions in the region will increase adequately with economic growth. Without focused efforts to better utilize energy efficient technology and reduce energy consumption by household, office appliances and equipment, energy demand throughout Asia will continue to outstrip supply. The goal of the project was the reduction in the annual growth rate of greenhouse gas (GHG) emissions from thermal power generation in selected Asian countries. The objective of the project was the removal of barriers to the development and effective implementation of energy efficiency standards and labeling (ES&L) programs, thereby facilitating the transformation of the regional product markets of targeted energy

consuming appliances, equipment and lighting products. This project facilitates harmonization of test procedures, standards and labels among developing countries throughout Asia.

Based on a survey of participating countries carried out during May 2006, the project focused on six products: (1) refrigerators; (2) room air conditioners; (3) electric motors; (4) ballasts for fluorescent tubes; (5) electric fans; and (6) compact fluorescent lamps. These appliances and equipment account for the majority of electricity consumption in the residential, commercial and industrial sectors. There is little or no ES&L activity in most of the target countries and target of BRESL project was to achieve the objective set out in GEF Operational Programme 5, to remove barriers to energy efficiency and energy conservation. Details of the barriers are described in the UNDP Project Document for BRESL.

2.3 Immediate and development objectives of the project

Experience in Asia, as well as in many other countries in the world, is that ES&L programs and policies are one of the most effective ways to improve energy efficiency, and energy efficiency is one of the most effective ways to reduce emissions of greenhouse gases. The overall objective⁵ of BRESL project as defined in the project documents to achieve the objective set out in GEF Operational Programme is to Removal of barriers to the successful implementation of energy standards and labeling policies and programs in Asia. In order to achieve the project Objective, the project consists of five outcomes, which is mutually supportive from each other.

Outcome 1: Establishment of legal and regulatory basis for removing lowest technologies from the market and promoting high-efficiency technologies.

Outcome 2: Building of institutional and individual capacity to secure on-the-ground implementation of regulatory frameworks, as well as actual standards and labeling programs.

Outcome 3: Provision of information and technical assistance to manufacturers of covered products

Outcome 4: Regional cooperation and information sharing on-going and helps to maximize impacts

Outcome 5: Demonstration of various aspects of the development and implementation of ES&L programs

In order to achieve these outcomes, this project arranged combination of training and capacity-building, assessing and transmitting lessons learned, learning by doing, sharing

⁵ Terms of Reference, National Consultant

work among countries to reduce the effort needed from each country, and technical assistance.

A set of inter-related and mutually supportive outputs and activities are specified in the Project Document to deliver these outcomes, all of which were subsequently reviewed during the implementation phase of the Project, and shown in **Table 2.1**.

Table 2.1 Project objectives and their respective outputs and activities, as specified in the Project Document

Outcome	Activity
Outcome 1: Establishment of legal and regulatory basis for removing lowest technologies from the market and promoting high-efficiency technologies.	Activity 1.1: Strengthening of Policy Context for ES&L
	Activity 1.2: Adoption and Implementation of ES&L Regulations
Outcome 2: Building of institutional and individual capacity to secure on-the-ground implementation of regulatory frameworks, as well as actual standards and labeling programs.	Activity 2.1: Training to Strengthen and Enable Public Institutions to Support Development and Implementation of ES&L Programmes
	Activity 2.2: Capacity Development and Implementation of ES&L for 6 Target Products
	Activity 2.3: Strengthening National and Regional Testing and Certification Infrastructure
	Activity 2.4: Strengthening of Data Collection and Reporting Procedures on Equipment Availability and Sales by Efficiency Level
Outcome 3: Provision of information and technical assistance to manufacturers of covered products	Activity 3.1: Product Technical Analysis and Reports
	Activity 3.2: Educational Workshops for Manufacturers/ Retailers on Impacts of Standards and Ways to Work with Standards to Increase Profitability
Outcome 4: Regional cooperation and information sharing on-going and helps to maximize impacts	Activity 4.1: Development of Project Website
	Activity 4.2: Lessons Learned Report
	Activity 4.3: Regional Energy Efficiency and Labeling Network
	Activity 4.4: Regional ES&L Harmonization Initiative
	Activity 4.5: Preparation of a Plan for Regional Activities and Coordination of GEF Funded Project Ends
Outcome 5: Demonstration of various aspects of the development and implementation of ES&L programs	Activity 5.1: Government Procurement
	Activity 5.2: Database (and Website) of Energy Efficient Equipment
	Activity 5.3: Development of Consumer Education Schemes
	Activity 5.4: ES&L Initiatives Financing
	Activity 5.5: Regional Harmonization Promotion

2.4 Baseline indicators established

Government made an action plan on energy efficiency and conservation with a target of 10%, 15% and 20% energy conservation has been estimated by 2015, 2020 and 2030 respectively. On the other hand government's sixth five year plan includes a target for achieving 10% energy efficiency by 2016. Renewable energy policy has a target of achieving 5% (about 800 MW) by 2015 and 10% (2,000 MW) contribution from renewable energy by 2020. Though the above targets are ambitious enough to achieve during the indicated time but it is good enough that government is aware to save energy.

Bangladesh in its sustainable development plan is also attaching due importance to energy efficiency and energy conservation alongside to renewable energy expansion. It created a world record in installing highest numbers of CFL bulbs free of cost. Though there was criticism about quality of these bulbs yet it made significant impacts in load management.

In 2014, average power demand was 6,870⁶ MW and about 2,640 MW power could be conserved through ensuring efficiency in six sectors of end users. Total lighting load of the country is 1,700 MW and 1,020MW can be saved by using CFL and LED lamp. In RMG, lighting load is 120MW and electronic ballast can save 30MW. Electrical fan consume 1,300MW which can be reduced to 520MW by efficient electrical fan. For commercial and industrial sector electrical motor consume 1,800MW and efficient motors can save 360MW. Refrigerator and freezer use 350MW power and can be saved 70MW through using efficient one. Air conditioners consume 1,600MW and about 640MW can be saved using efficient AC.

The analysis evidenced that USD 6 billion investment is required for setting up of plants for generating 2,640 MW power. Additional USD 140 million will be required for annual maintenance and operation. If the energy efficiency can be ensured, it can save 140 BCF of natural gas. The government has taken up initiative for energy efficiency taking all these into account.

Bangladesh's economy has demonstrated steady growth since the 1990s with an average GDP growth of 6.13% for between 2009- 2014⁷. In 1971, a mere 3% of the population of Bangladesh had access to grid electricity, but by year 2014, this figure had risen to over 70%. Despite intensive efforts to increase coverage, government statistics indicate that per-capita electricity consumption was 248.89 kWh and 232.68 kWh respectively in FY 2013.

⁶ Fortnightly magazine "Energy & Power"- www.ep-bd.com , volume 12, issue 22, May 1-15

⁷ National Budget 2015-16, Table 5, page 7

The country is yet unable to meet current demands for electricity. With growing consumption, the demand-supply gap is most likely to widen further. In principle, the present installed generation capacity of the country should meet even the peak demand for electricity, but gas supply shortages cause nearly 700-800 MW to remain idle.

In Bangladesh, power generation capacity has been increased to 13,675 MW in May 2015 from 4,942 MW in Dec 2009. The Peak Demand⁸ in FY 2010 was 6,454 MW whereas in FY 2014 it rose to around 9,268 MW. The average year on year (YoY) growth rate for peak demand works out to 8.88%. The total generation also increased from 26,339 Million kWh in FY 2009 to 42,196 Million kWh in FY 2014 implying average YoY growth rate of 9.90%. The deficit in overall generation works out to around 28% each year from FY 2009 to FY 2014. In FY 2014 the energy billed to customers was 36,233 Million kWh with the total losses being 5,963 Million kWh; whereas in FY 2009 the energy billed to customers was 21,910 Million kWh and the total losses were 4,437 Million Units.

Grid-based power consumption is heavily subsidized through direct and indirect subsidies for power delivered by the national grid. As in most developing countries, electric power is a political good, and tariffs to consumers are kept artificially low, insufficient to cover generation, transmission and distribution costs. During the 2012 financial year the total subsidy for electricity and petroleum products was \$1.93 Billion; Bangladesh Petroleum Corporation and Bangladesh Power Development Board received \$1.04 and \$.89 Billion respectively.

It is very important to understand the category wise consumption in order to initiate any energy efficiency projects. In FY 2014, domestic consumption contributed almost 50.44% of total consumption with CAGR of 1.96% from FY 2010 to FY 2014. In FY 2014, industrial sector contributed around 34% and commercial sector contributed 9.15%. The energy efficiency projects and demand side management projects can target reducing the energy consumption in domestic, industrial and commercial sectors respectively i.e. promoting use of CFL, electronic ballast for tube light, encouraging use of efficient fans, efficient motor, refrigerator/freezer, Air conditioner (AC) in residential, commercial and industrial buildings.

For Commercial sector, the overall electricity consumption CAGR from 2010 till 2014 is 10.02% per annum, the commercial consumers have increased by 4.08% per annum and the consumption per consumer has increased by 5.70% per annum. REB has highest number of commercial consumers, followed by BPDP, DPDC and DESCO. However the per capita

⁸ The Peak demand is based on the Master Plan prepared in 2010

(consumer) consumption is highest in DPDC and DESCO followed by BPDP and lastly by REB. The consumption per consumer is highest in DESCO at around 8,340 kWh/consumer and it is lowest in REB with per capita consumption being 1,417 kWh/consumer.

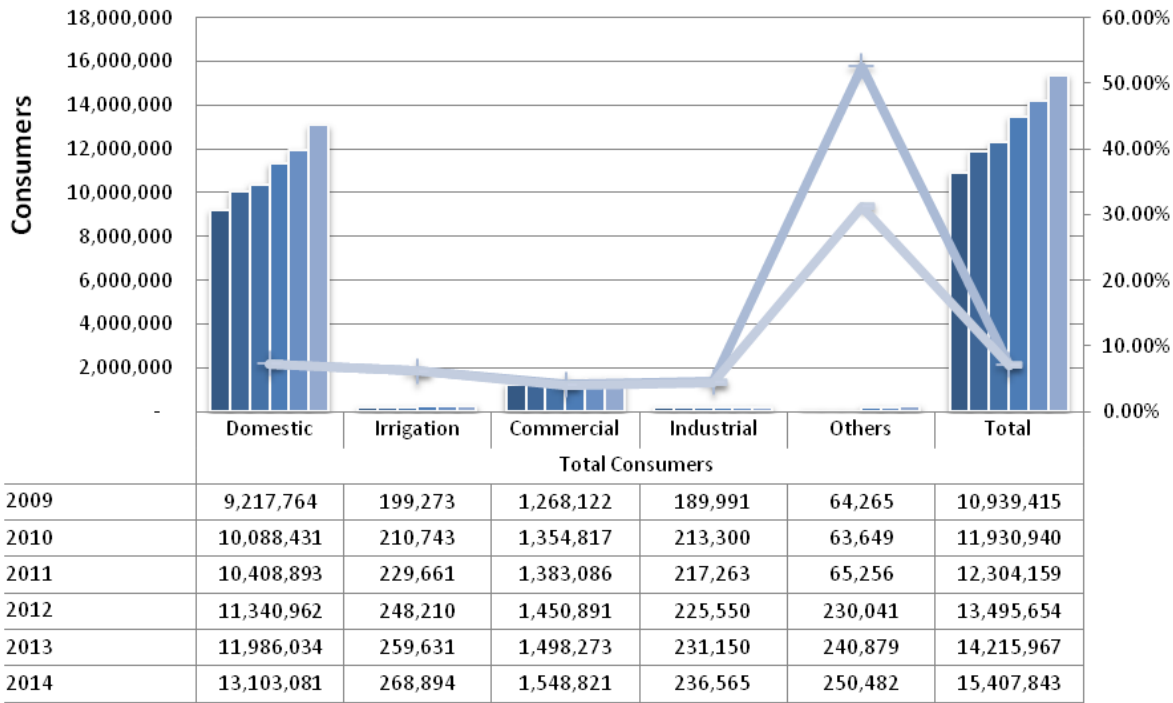


Fig 2.1: Sector wise Consumers in Bangladesh for electricity

Source: Bangladesh Power Development Board

For Industrial sector, the overall electricity consumption CAGR from 2009 till 2014 is 7.97% per annum, the industrial consumers have increased by 4.48% per annum and the consumption per consumer has increased by 3.34% per annum. REB has highest number of industrial consumers, followed by BPDP, DPDC and DESCO. However the per capita (consumer) consumption is highest in DPDC and DESCO followed by BPDP and lastly by REB. The consumption per consumer is highest in DESCO of 212,925 kWh/consumer and it is lowest in REB with per capita consumption being 29,352 kWh/consumer. In 2014, the average consumption for a) Domestic sector was 1,394 kWh/consumer, b) commercial sector was 2,139 kWh/consumer; d) industrial sector was 51,963 kWh/consumer.

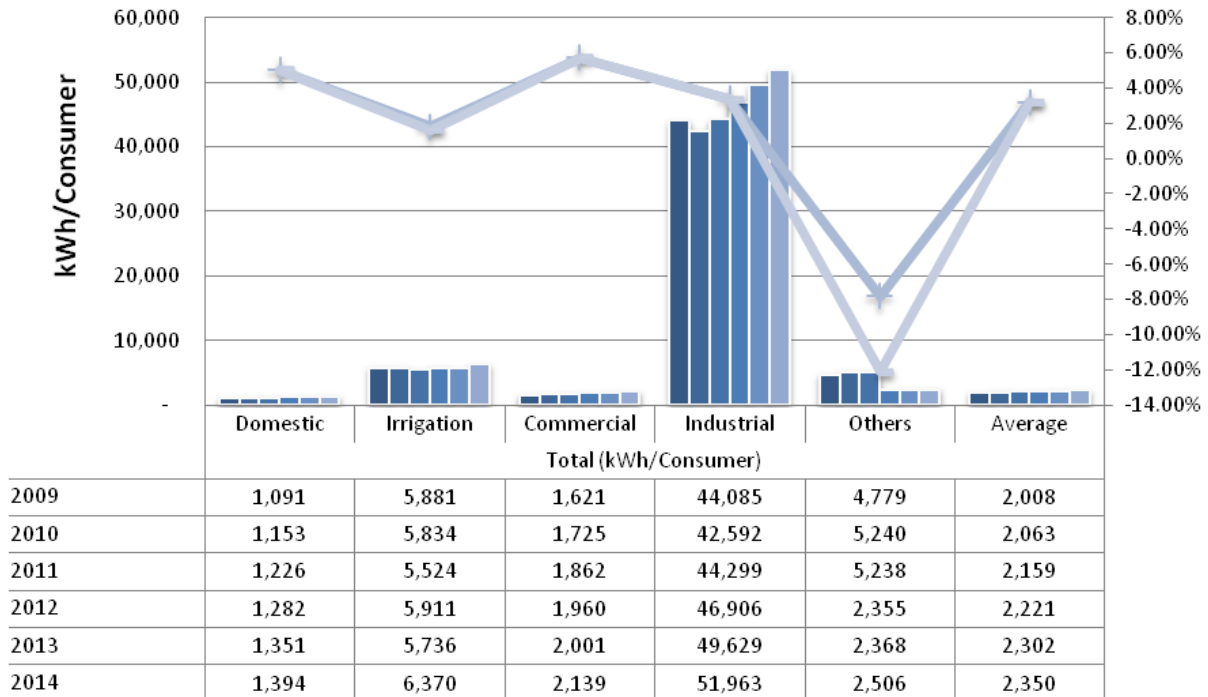


Fig 2.2: Sector wise Electricity Consumption by Consumers in Bangladesh

Source: Bangladesh Power Development Board

Considering all of the statistics above, BRESL’s plans to initiate energy labeling activities for six products and initiate tangible programmes on labeling and Minimum Energy Performance Standards (MEPS) nationally and benefit from regional cooperation as well with Global Environment Facility (GEF) technical assistance both regionally and nationally, is in proper time.

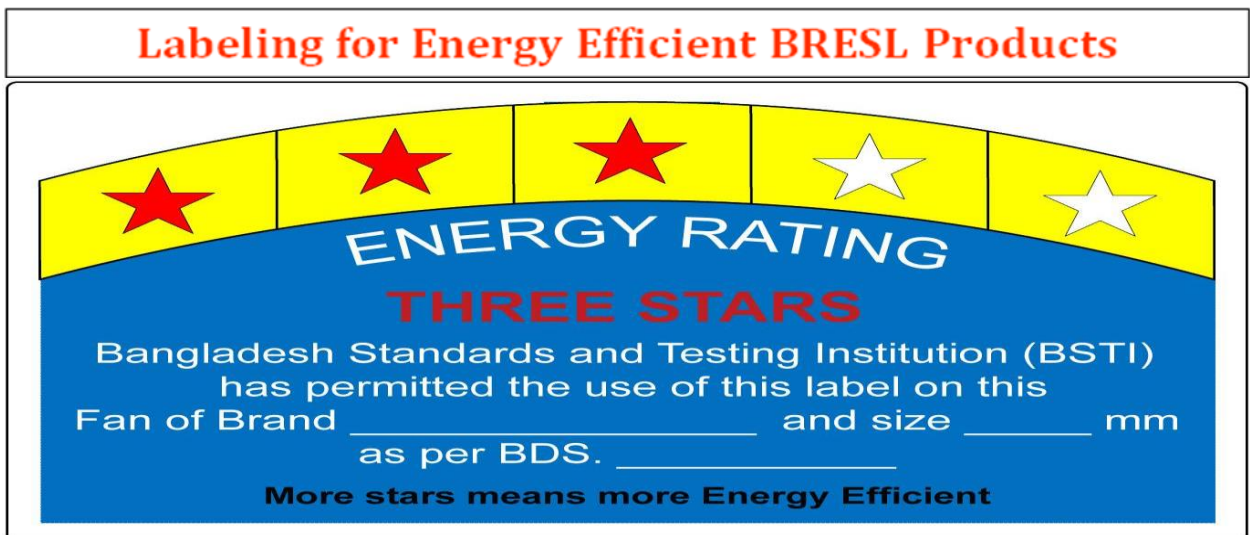


Fig 2.3; Average Power Saving in % calculation by BRESL project

According to BSTI BRESL, a table was made how much electricity will be saved from the 6 appliances when using different STAR level. This savings is indicated in the % and presented in Table 2.2.

Table 2.2: STAR wise energy save in percentage

Star #	A/C	Refrigerator	E. Motor	E. Fan	CFL	Ballast
*	4%	8%	3.5%	5%	13%	3%
**	7%	16%	7%	13%	29%	6%
***	11%	24%	10%	23%	45%	8.5%
****	15%	32%	14%	32%	61%	11%
*****	18%	40%	17%	40%	77%	15%

Under this project BSTI has completed the required standards of as below:

- CFL= BDS-IEC 1734,1735 & 1761.
- EB = BDS-IEC 60921 & BDS-1724
- Refrigerator/Freezer =BDS 1849 : 2011 (Performance standards)
- Refrigerator/Freezer =BDS-1850 : 2011 (Energy Efficiency rating)
- Air-Conditioners=BDS-1852 : 2012 (Energy Labeling)
- Air-Conditioners=BDS-1853 : 2012 (Energy Performance)
- 3-Phase Motor (Test methods) =BDS-IEC 60034-2 : 2009
- 3-Phase Motor (Efficiency Class) =BDS-EN 60034-30 : 2012

Until May 2015, BSTI provided Star Label of 15 companies of which 9 from CFL, 4 from fan companies, 2 from Electronic Ballast companies. The name and brand name of these companies are given below:

Table 2.2. Energy Star Label Awarded Manufacturers List (Evidence)

SI No.	Name of the Manufacturer	Brand Name
CFL Manufacturer		
01	Energypac Electronics Ltd, Gazipur	ENERGYPAC
02	Superstar Electronics Ltd, Narayangonj	SUPER STAR
03	Bangladesh Lamps Ltd, Dhaka	TRANSTEC

SI No.	Name of the Manufacturer	Brand Name
04	Energy+ Electric & Electronics Pvt. Ltd ,Dhaka	ENERGY+
05	Macro Febricators Ltd , Gazipur	DELTA MFL
06	China Bangladesh Electronics Pvt. Ltd, Dhaka	CBE
07	M.H.L. Dhaka	DELTA MACRO
08	Khwaja Energy Company, Chittagong	OPPLE
09	SQ Lighting	S.Q.
E. Fan Manufacturers		
01	S.E.C Fan, Gazipur	S.E.C Diamond, S.E.C Gold & S.E.C Silver
02	General Fan Company Ltd, Gazipur	Shuvo
03	Chisty AG Manufacturing Company Ltd, Dhaka	AG
04	Superstar Electronics Ltd, Narayangonj	SUPER STAR
E. Ballast Manufacturers		
01	Energypac Electronics Ltd, Gazipur	ENERGYPAC
02	Superstar Electronics Ltd, Narayangonj	Super Star

For Refrigerator, Motor and Air Conditioner, BSTI prepared a DPP of about USD 1.78 million and has been approved on 26th May 2015 by Planning Minister for Lab Facilities. According to the consultant report it was found that energy saved 751.84 MW after implementing this project from 3 components. BRESL project also making campaign in the media like TV commercial of 30 seconds has been produced and broadcasting in 8 TV channels (Mass awareness quota) for national awareness campaign (from May 27, 2015). 122 core technicians of above 3 products for newly star label awarded manufacturers were trained (7th March & 9th April 2015) to produce Energy Efficient products by designed training module.

2.5 Analysis of Logical Framework

In recent years, Bangladesh has demonstrated increasing determination and commitment to address the challenges of ensuring sustainable use of efficient CFL lamps instead of incandescent lamps. A major challenge has been to ensure the effective implementation of the National Energy Policy 1996 (revised in 2010) with broad powers to Power Division that it determines to be energy conservation and saving energy as a fifth fuel of the country. In the

context of implementing the Project Investment Funding (PRIF) for this Project, BSTI took the crucial step of nominating the 6 appliances under this project.

The overall objective of this Project was to establish and demonstrate an innovative system for managing ES&L program in Bangladesh that will have a significant and positive impact on the long-term viability of the country's important energy saving and reducing green house gas emission. Thus, the Project was designed to support BSTI efforts to operationalise the ES&L concept in 6 main products consumed mostly in residential, commercial and industrial sectors in Bangladesh. The intention, using a combination of GEF incremental cost financing and baseline and co-financing, was to demonstrate conservation and sustainable use of 6 products, thereby creating important opportunities for replication in other products throughout the country.

Project based on a participatory Logical Framework approach involving government institutions, policy makers, local manufacturers, dealers, academicians, environmental stakeholders, etc in a series of workshops, training program. This provided the basis for development of manufacturing and sales-level conservation planning matrices. Representatives from various sectors were engaged in the preliminary identification of boundaries.

The overall design of the Project is simple and straightforward, saving energy system through five inter-related objectives, focused on. The Evaluator was advised that the Development Objective tab in the APR/PIR has provided the basis for monitoring progress towards meeting the Development Objective. This monitoring framework is very elementary and the selected indicators are neither comprehensive with respect the range of outputs deliverable under each objective (outcome) nor are they very SMART⁹.

2.6 Assumptions and risks

The Project was considered to be a bold venture. The crux of the challenge concerns BSTI's ability to assert its mandate and fulfil its responsibilities as defined under the project document. The overriding assumption, as indicated in the Project Document, is that this mandate is appropriate for a Government agency whose responsibilities, in addition to safeguarding products, are to coordinate the interventions of other Ministries. The Project provided a major opportunity for BSTI to demonstrate its credibility with respect to Energy labelling and management and, thereby, raise its profile.

BSTI has gained valuable experience on ES&L management over the years through various efforts. BSTI plays key role in planning, reviewing and monitoring ES&L initiatives and in

⁹ Specific, Measurable, Achievable, Relevant and Time-bound (UNDP-GEF 2012, *Guidance for Conducting Terminal Evaluations of UNDP-supported, GEF-Financed Projects*)

ensuring that energy saving labelling concerns are properly integrated into the national development process. SREDA, a one stop mall, was designed as an authority with a number of other projects very much in mind like energy efficiency and renewable energy related project.

To make standard and labelling program in a country like Bangladesh requires a huge amount of money and time for identifying EE&C potential and need practical approach to gradually realize it in a phased manner. With the suitable nationwide mandatory program for ES&L issue, primary energy consumption per GDP can be reduced below 2010 level (project started). Main risk is in import stage as most of the products are imported in Bangladesh particularly from China and need a policy to maintain the quality in this stage. According to the Master Plan 15% reduction will be done by 2021 and 20% energy reduction by 2030 compare to the energy used in 2013 with due consideration of the EE&C potential and current energy consumption status: low electrification ratio, industries' insufficient environmental protection measures, improvement in work conditions and modernization of life styles, etc. The final goal of ES&L policies is to realize a self-reliant cycle in which people proactively and voluntarily save energy, rather than through compulsory EE&C activities.

2.7 Linkages between project and other interventions within the sector

In Bangladesh, there are several donor agencies which are actively supporting demand side management for promoting EE&C, such as GIZ, UNDP, World Bank, ADB, USAID, etc. They are trying to reduce energy consumption by providing energy efficient equipment and conducting capacity development for energy regulatory body to strengthen their operation. BSTI with support from SREDA will have to coordinate with donors and government-related organizations to avoid duplication of the support from donors and to make effective implementation of ES&L activities by clarifying roles and responsibilities among government related organizations. For Energy efficiency following plans and regulations issued by MoPEMR and other ministries:

- Sustainable and Renewable Energy Development Authority Act, 01
- Energy Efficiency and Conservation Rules -
- Interim Action Plan for Improvement of Energy Efficiency & Conservation (2012-2016)
- Action Plan for Energy Efficiency and Conservation Power Division, MPEMR,
- The Electricity Act 1910 (under revision)
- The National Energy Policy 1996 (revised in 2010 and in process again for revision)
- Policy Guidelines for the Enhancement of Private Participation in the Power Sector 2008
- Renewable Energy Policy of Bangladesh 2008 (under revision)
- Power System Master plan-2010

- Gas Act 2010
- Environment Conservation Rules (ECR) 1997
- Bangladesh Energy Regulatory Commission Act 2003
- Bangladesh Climate Change Strategy and Action Plan 2009
- Sixth Five-year Plan (2011-15) 2010
- BSTI Ordinance
- GHG emission, 1st and 2nd National Communication for UNFCCC by DoE, MOEF
- National Building Code MOHPW

2.8 Expected results

According to the Project Document, the following results are expected by the end of the Project:

- Legal and regulatory basis for removing lowest EE technologies from the market and promoting high-efficiency technologies for air conditioners, refrigerators, fluorescent ballasts, motors, CFL and Fan are established
- Standards and labeling scheme for above 6 items are implemented and ES&L capacity building program for institutional and individual level are strengthened by providing training and improving testing procedures
- Technical support to ES&L manufacturers provided, disseminated prepared technical report for each product to the manufacturers
- Assessment report of local manufacturer's capacity to produce EE products are developed
- TA program for financial institutions to finance manufacturing plant upgrades to produce more efficient products is designed
- Lessons learned reports, website and action plan for post BRESL activities in Bangladesh were prepared
- Various aspects of the development and implementation of ES&L programs are demonstrated for pilot projects and developed an on-line database of efficient equipments

3. Project Findings

3.1 Project formulation

In recent years, Bangladesh has demonstrated increasing determination to address the challenges of reducing Greenhouse gas emission from the power generation as energy is an obligatory effort for economic growth and human development which leads a strong both-way correlation between economic development and energy utilization. To attain sustainable GDP growth 6% and above till 2030 & beyond, it is of deem necessary to meet the essential energy needs. Demand for power is increasing day by day. Moving towards energy sustainability will require development not only in the way energy is supplied, but in the way it

is used as well. Reducing the amount of energy required to deliver various goods or services is also essential in this regard. Energy efficiency and renewable energy are said to be the twin pillars for sustainable energy. The improvement of energy efficiency will be having primarily two-fold impact: (i) improvement of energy security, (ii) efficient environmental management. The government has taken a number of initiatives for efficient energy use and reduced consumption of energy. Government started encourage to use CFL/LED bulb and T5 tube light in all entities; replace conventional street lights with LED and solar lights, gradual discontinuation of incandescent bulb, limiting the use of air conditioners, or keeping temperature 25 degrees C and above, introduction of energy Star Labeling Program in the electrical appliances through BSTI;

A major challenge has been to ensure the effective implementation of the BRESL project BSTI took the crucial step of nominating the first 6 appliances mostly consumed electricity in the country. .

While all efforts are made to ensure the effective design and implementation of the project activities, there are some risks that have to be addressed to ensure success of the project. The Project Planning Matrix (Sec II, Part II) shows a detailed overview of the project's risk and assumptions. The principal risks, which can potentially hinder the successful project implementation and/or reduce project effectiveness, relate to: (a) the sustainability of the support by key stakeholders in the participating countries; (b) lack of, or fading, interest of the private sector (particularly appliance/equipment manufacturers and suppliers); (c) ineffective project coordination at the national and/or regional levels; (d) failure of EE products to perform as claimed by manufacturers resulting to customer dissatisfaction; (e) unabated proliferation of illegally traded and unreliable EE equipment/appliances; and, (f) unwillingness of consumers to buy EE products due to bad experiences in the past and high initial cost may lead to failure of the project to induce increased sales and widespread use of EE equipment and appliances.

To address these risks, the project has to establish effective means to monitor and to the extent possible mitigate these risks. Mitigation measures include a strong emphasis on hands-on project management and participation of each country, mobilizing private sector participation and a continuous dialogue between the project's donors, implementing Partner, executing agency, regional organizations and national governments. The different risks that were identified during the BRESL project formulation exercise and the recommended mitigation measures are described details in Project document

3.2 Planned stakeholder participation

The main stakeholders are identified in the Prodoc. They were involved throughout the design and development of the Project, using a participatory Logical Framework approach as mentioned above. The preparatory phase of ES&L followed the spirit and methods of the process developed by Government to prepare its National Energy Policy (NEP) in 1996, i.e. fifth fuel of the country is energy efficiency. There are a wide range of stakeholders having interests vested in the Project. They include the intended beneficiaries of the Project, specified in the Project Document as follows:

- Government professional like ERD, IMED, Mol, MoF, MoPEMR,
- Manufacturers of 6 appliances
- Distributors of 6 appliances
- Retailers of 6 appliances
- Consumers of 6 appliances
- Importers of 6 appliances
- Civil society and NGO like Consumers Association of Bangladesh
- Environmental stakeholders
- Gender Stakeholderds (core Technician)
- The client, BSTI, whose capacity in coordinating the planning and management of ES&L has been strengthened and developed;
- Local universities like BUET, UAP and technical professionals who have developed their capacities and expertise through consulting opportunities provide by the Project.
- Donor organization like GiZ who assisted to establish Lab in BSTI for CFL and EB.

3.3 Replication approach

The Project has been designed with replication of the ES&L concept and its application very much in mind. The Project provides a first opportunity for BSTI to fulfil its legal mandate with respect to coordinating the protection and management of ES&L. During the life of the Project, some more appliances like LED light, TV and Solar Panel were discussed with continuing of AC, fridge and motor. Lessons learned from the present Project will be extremely valuable in informing the planning and management of next phase.

3.4 UNDP comparative advantage

The comparative advantage of UNDP is justified in the Project Document and the reasons for its assistance are founded on a request for assistance from the Government of Bangladesh to devise strategies to develop and sustainably use the country's energy resources. This is in line with priorities established under the EE&C Rules of SREDA also.

UNDP has been successful in securing co-financing for this Project that, additionally, supports many of the manufacturers efficient technology development concerns, including energy savings, environment, and sustainable development.

3.5 Management arrangements

Financial incentives are monetary rewards which can provide economic benefits for implementation of S&L projects through changes in people's behavior. Mainly, there are three types of financial incentives which are considered as the most effective financial measures to promote S&L: subsidies, preferential taxation and low-interest loans. Investment subsidies are what the government or government-related organization pays to companies and/or individuals in order to reduce their investment costs. Rebate program and buy-down grants (investment subsidies for loans) are examples of the subsidies. It is effective to stimulate economic effects because beneficiaries can purchase goods with lower prices when they receive subsidies.

However, to implement the measure, it requires high administrative and transaction costs, which means it is necessary to establish an organization to manage funding source for subsidies and to create application processes and procedures for receiving money. Preferential taxation includes tax reduction and exemption, and accelerated depreciation. This measure applies to anyone who makes investments according to the criteria. It is easy to implement because there is no need to add special procedure on the normal taxation process. However, the economic impacts of tax measures such as accelerated depreciation and tax reductions on EE&C are hard measure as they are accounting procedure to reduce taxable income.

Thus, the government also needs to consider how to cover its income when reducing such tax collection. As for low-interest loans, financial institutions will provide loans to their customers with lower interest rate than the market rate. The government and/or international donor agencies will provide concessional funds to financial institutions in order to promote specific policies, which make financial institutions capable of providing loans with low interest. On the other hand, disadvantage of this measure is that beneficiaries are limited: the borrowers are to be screened by the eligibility criteria. The bottlenecks of EE&C promotion in Bangladesh are considered below:

- Lack of urgency of energy saving among individuals and companies: The Government highly subsidizes energy and power sector to lower the costs of fuel and electricity for the household and industries
- Tight budget constrains: The Government does not have enough budget to implement subsidies or tax incentive measures

The Project was implemented by UNDP Bangladesh Country Office and nationally executed (NEX)¹⁰ by BSTI under MoI, with support provided by the UN Offices for Project Services (UNOPS) for recruiting consultants as required. It was designed to be operational at BSTI which supported manufacturers, distributors, retailers, etc.

- Government Partnership has been established for creating testing laboratory of 3 products (AC, Refrigerator & E. Motor) at BSTI through DPP of about 1.78million USD which was approved on 26th May 2015 by Planning Minister.
- At the beginning of the Project GIZ funded to establish Testing laboratory of CFL & Electronic Ballast in BSTI.
- Partnership is continuing with more than 50 Manufacturer of 6 BRESL Products for their capacity building and policy making opinions.
- Partnership is continuing with Associations like BEMMA, BEA, CAB for market share surveillance, data collection and consumer awareness.
- Built partnership with relevant Ministries as MoI, MoEPMR, MoEF, ERD, IMED, Planning Commission for Policy making regarding Standards, Star Label grading, Physical structure (Lab Facility) setting & relocation etc.

3.6 Project implementation

At the inception stage of BRESL the project risks and assumptions were reviewed by BSTI and project management team UNDP. In general, the Project established some strong and productive partnerships, with evidence of congenial and close collaboration with manufacturers of six appliances. Initially, however, as reported in the APR, the Project got off to a slow start and Project Manager and other staffs started the project from 1st July 2010.

BRESL project in Bangladesh mainly focused on the implementation of the activities defined under the country budget. The identified national level activities implemented by the Project Team consisting of BSTI and UNDP. These activities addressed specific barriers to ES&L at the national level, delivering on the ground activities including appliance and/or equipment testing utilizing local experts and involving entities working on ES&L, as well as those that will contribute to the regional ES&L harmonization efforts. It also gave country's ownership of the project, maximum local participation, particularly of the private sector, local authorities, and more importantly consumers. The project used regional /international and national experts where and when necessary under this program. Government professionals and other

¹⁰ The Project followed the ERD/UNDP NEX Manual which covers operational and management procedures, including financial and accounting arrangements.

relevant national stakeholders from the private sector and civil society participated in the activities conducted by project as required.

Since this project was highly technical and aim to build BSTI’s capacity substantially under the project in this new area of energy standards and labeling in Bangladesh, UNDP implemented all national activities under the project, on behalf of and in support to BSTI.

UNDP worked closely with BSTI counterparts and NPMU staff to help develop the work plan and budget and provide direct support for procurement, recruitment and implementation of all activities under the various components of BRESL. UNDP’s DCOS to the project ensured that the expected outputs are delivered using the most efficient and cost effective management strategies in order to synchronize all national level activities with those of the other 5 countries as well as with the regional level activities of the RPMU.

The purpose of EE Labeling Program is to promote sales of high efficiency products in the market. The program is applied mainly on home appliances, such as ACs, refrigerators, TVs, lightings, and fans. Due to the rapid economic growth, the number of home appliances, which will be purchased by the people, will expand remarkably in the coming years.

Penetration of high efficiency appliances contributes not only to the reduction of energy consumption (kWh), but also to the reduction of electricity demand (i.e., peak load demand in kW). Table 3.2 shows energy efficiency improvement rates of the latest EE&C technology on home appliances/equipment compared with the conventional technology.

Table 3.1: EE&C Technology of Home Appliances/Equipment

Appliance	EE&C technology	Improvement of efficiency
Lighting fixture	CFL, LED, T-8, FL	Electricity consumption Incandescent: CFL = 4:1
3 phase induction motor	High efficiency motor	Efficiency gain: 10-50%
TV	LCD, LED back light, standby mode	Electricity consumption CRT/ LCD = 2/1
Refrigerator and freezer	high efficiency compressor, High performance heat insulation,	Annual electricity consumption, comparing similar type 10 year old: 1/3
Room Air Conditioner	Large evaporation coil Inverter drive COP: more than 4.0 Efficient at partial load	Example: COP; 2.5 - 4.0

3.7 Implementing activities under this project:

- Capacity assessment for ESL development, implementation and enforcement.
- Design training materials based on needs assessment, ESL regulations, policies, programmes and case studies.

- Assign 6 experts as national trainers for the 6 selected ESL products.
- Join Technical Working Groups (TWGs) at the regional level for the 6 ESL products. Each TWG conducted feasibility studies and develop harmonized testing procedures, specifications and labeling scheme.

Program operation procedure is as following:

- Manufacturers/importers get EE test on their products at accredited laboratories.
- Accredited laboratories should have been accredited by BAB through ISO17025, etc.
- Manufacturers/importers which have in-house laboratories can get EE test at their laboratories, provided laboratories are accredited by BAB
- Label certification body evaluates the EE test report and issue label certificate on the product with star rating, and delivers it to the manufacturer/importer
- Manufacturers/importers affix the label on the products or their packages, and deliver them to the markets.
- Label certification body carry out EE check test for the products sold in the market collecting samples at random, in order to maintain labels reliability.
- Anybody can claim challenge test to the label certification body, provided the test cost is backed by him/her.

3.8 Budget:

The Bangladesh co-financing budget was US\$ 2.0 million in kind and USD 11,428 in cash for this project. This includes budget for national and international experts from current and ongoing programmes related to ES&L. This fund comes from a number of sources, including development agencies, but the cost share is shown in the budget as a Bangladeshi government contribution. The total cost of the project was estimated at USD 2,660,714.00 (Tk. 186.25 million) of which the UNDP contribution is US\$ 6,50,000 (Tk 45.50 million). BSTI on behalf of GoB supported the project in kind as office space, conference hall, gas, electricity, fax, designated staff (NPD and National Counterparts), laboratory facilities and other logistics support for 05 years. A lot of training/Seminar conducted at BSTI premises under the said project period. 3/4 BSTI officers worked with project personnel during entire project period. BSTI laboratory, equipment was used for BRESL product testing and BSTI made the payment against utilities charges. Yearwise budget including cash and in-kind is presented in Table 3.1 and Component wise progress is in Table 3.2.

Table 3.2 Annual budgets, including cash and in-kind co-financing

Source of Financing	Total Actual Budget during 2010-2015 USD	Year-wise Breakdown of Actual Cost				
		USD				
		FY 2010-11	2011-12	2012-13	2013-14	2014-15
GEF Contribution	6,50,000	1,19,571.27	1,02,702.74	1,07,925.47	1,30,647.67	1,89,152.86
In-kind Co-financing, GoB	2,000,000	400,000	400,000	40,0000	40,0000	40,0000
In Cash financing, GoB	11,428*	3,214.28	1,371.42	1,385.71	1,814.28	1,028.57

*Though budget was USD 11,428 but actual expenditure was USD 8,814.26 and PMU returned rest to GoB account. It was due to procurement through tender and vendor was selected by QCBS system

Table 3.3 Component-wise Progress (As per approved PP)

Items of Work (as per PP)	Target (As Per PP) Tk (in Lac*)	Actual Progress upto June 2015 Tk (in Lac)
GoB		
Office Equipment	2.50	1.78
Furniture	1.00	0.47
Stationery	2.50	2.50
Miscellaneous	2.00	1.43
PA		
Travel Cost	47.60	47.60
Utilities	7.28	7.28
Seminar/Conference	61.12	61.12
Management Charge	156.00	156.00
Consultancy		
International Consultant	38.00	38.00
Local Consultant	41.00	41.00
Miscellaneous	22.00	22.00
Sub-Contract	68.00	68.00
Office Equipment	10.00	10.00
Furniture	4.00	4.00
Total	463.00	461.18

* Lac= 1,00,000.00

3.9 Project Results upto May 2015

Summary of the results of BRESL project are given below:

- BSTI submitted a DPP of about USD 1.78 million to Planning Ministry and it has been approved on 26th May 2015 by Planning Minister for Lab Facilities in BSTI.
- Total 15 Manufactures were given Star label for CFL, Fan and Ballast. 9 of them are Compact Fluorescent Lamp, 2 of them are Electronic Ballast and 4 are Electric Fan manufacturer.
- During Jan 2013 –May 2015, 4 companies sold 2,50,000 pcs Electric fan. Each STAR label fan consume around 60W, whereas locally available fan in the market consume more than 120W. Total electricity saved from these Star Labeled Electric Fans was 15 mW. Present CO₂ emission from grid electricity is 0.67kg-CO₂/kWh and expected CO₂ emission in 2030 is 0.79kg-CO₂/kWh. This emission rate increase will be caused by the change of generation mix, due to the increase in thermal combustion.
- During April 2013 to May 2015, 9 CFL manufacturers sold around 9.8 million CFL. Each STAR label CFL of 25W save around 75w electricity from the incandescent lamp of 100W and thus 735.54 mW electricity was saved. A few years back, Power Division took step to replace the conventional incandescent bulbs with CFL. Under the move, about 20 million bulbs were replaced in two phases across the country with financial support from the World Bank while the country's total bulbs in use are around 50 million.
- During May 2014 to May 2015 around 25,000 ballast were sold. Star Label Ballast save 12W electricity and hence around 0.3mW electricity were saved from this appliance.
- Total 751.84mW of electricity were saved from the using of CFL, fan and ballast. Installation of 1 mW power plant need around USD 1million and hence Government could save USD 751.84 million from these options.
- Under the media coverage program, a TV commercial of 30 seconds has been produced and broadcasting in 8 TV channels (Mass awareness quota) for national awareness campaign (from May 27, 2015).
- 122 core technicians of above 3 products for newly star label awarded manufacturers were trained (7th March & 9th April/2015) to produce Energy Efficient products by designed training module.
- Activities wise result of the project is presented in Table 3.4

Table 3.4: Activity-wise results of the project

Activity (Based on Approved National ProDoc)	Status of Implementation (as of May 2015)
<p>Component 1: ES&L Policy-Making Program. Establishment of legal and regulatory basis for removing lowest EE technologies from the market and promoting high-efficiency technologies.</p>	
<p>Activity 1.1: Strengthening of policy context for ES&L actions Supporting Activities</p>	<p>MEPS of A/C, Refrigerator & Motor done. HEPS will be implemented from the Year 2016 onward by SREDA as Mandatory Regulation. International Consultant completed the ES&L policy and feasibility studies and country situation at the very beginning of the project activities. Through several Sectional & Divisional Committee, the Standard Formulation of 6 BRESL products were completed duly as:</p> <ul style="list-style-type: none"> ○ Refrigerator/Freezer =BDS 1849 : 2011 (Performance standards) - No Star assigned ○ Refrigerator/Freezer =BDS-1850 : 2011 (Energy Efficiency rating) - No Star assigned ○ Air-Conditioners=BDS-1852 : 2012 (Energy Labeling) - No Star assigned ○ Air-Conditioners=BDS-1853 : 2012 (Energy Performance) - No Star assigned ○ 3-Phase Motor (Test methods) = BDS-IEC 60034-2 : 2009 - would be assigned 4 Star ○ 3-Phase Motor (Efficiency Class) =BDS-EN 60034-30 : 2012 - would be assigned 4 Star. <p>A genuine shortfall is prevailing due to lack of Testing Lab facilities in BSTI for 3 BRESL products as, Air-Conditioner, Refrigerator & Electric Motor for which assignment of Star Label Grading could not be executed.</p>
<p>Activity 1.2: Adoption and implementation of ES&L regulations Supporting Activities</p>	<p>Completed the Regulatory & Legal framework for Minimum Energy Performance Standards (MEPS) & Labeling of 3 BRESL products as Compact Fluorescent Lamp (CFL), Electronic Ballast (EB) & Electric Fan but not yet declared the mandatory Policy of any products which will be declared in 2016 by SREDA. For adoption & comparing International</p>

Activity (Based on Approved National ProDoc)	Status of Implementation (as of May 2015)
	<p>Standards, BSTI referred ISO, ANZ, IS & SL for technical assistance. Moreover BSTI considered the Energy Rating Label of 3 (three) main features:</p> <ul style="list-style-type: none"> ○ The star rating gives a quick comparative assessment of the model's energy efficiency ○ The comparative energy consumption (usually kilowatt hours/year) provides an estimate of the annual energy consumption of the appliance based on the tested energy consumption and information about the typical use of the appliance at home. Air-conditioners show the power consumption of the appliance (kWh/year). ○ The Star Rating of an appliance is determined from the energy consumption and size of the product.
Component 2: ES&L Capacity-Building Program	
<p>Activity 2.1: Training to strengthen and enable public institutions to support development and implementation of EE standards and labeling</p>	<p>Some Govt. officials as CPE of BSTI, MoI, IMED BUET got training inside and outside the country during Jan 2011 to Dec 2012.</p> <p>Local Consultant conducted gap analysis and capacity needs assessment on ES&L development, implementation, and enforcement.</p>
<p>Activity 2.2: Capacity enhancement in the development and implementation of standards and labeling for the six targeted products</p>	<p>Standards of 6 products & Star Label for CFL completed by BSTI during Jan 2011 to Dec 2012.</p> <p>One International Consultant designed training materials based on capacity needs assessment and impacts on training courses.</p> <ul style="list-style-type: none"> ○ Established 6 technical workgroups, one for each BRESL product ○ Development of model test procedures, standards, and labeling by each respective technical working group by 6 Counter Part Experts(CPE)

Activity (Based on Approved National ProDoc)	Status of Implementation (as of May 2015)
Activity 2.3: Strengthening of national and regional testing and certification infrastructure	<p>Yes for CFL & EB only during Jan 2010 to Dec 2012. For rest of the products mobilization completed with a new donor partner (giz) for creating test facility.</p> <p>Through 5 TWG meeting arranged by RPMU, National Experts prepared Feasibility Study Report to Identify the gaps, and subsequent development and implementation to fill gaps by reviewing existing ES&L technical capacity, and capacity needs assessment for appliance and testing equipment getting inputs from other countries which is termed as Regional Harmonization.</p> <p>Conducted Round Robin Test with Electric Fan as a part of Technical assistance.</p> <p>Documented and disseminated the results from Round Robin Testing to RPMU for circulating the Results to other participating Countries.</p>
Activity 2.4: Strengthening of data collection and reporting procedures on equipment availability and sales by efficiency level in participating countries	<p>Process is continuing by BSTI & PMU through National Consultant & CSC during Jan 2012 to Dec 2012.</p> <p>Evaluated the applicability of model data collected from different Reports by National & International Consultants for planning and establishing the harmonization requirements in the country those were suggested by the consolidated FS reports.</p>
Component 3: ES&L Manufacturer Support Program	
Activity 3.2: Educational workshops for manufacturers on impacts of standards on manufacturers and ways to work with standards to increase profitability.	<p>Several workshops conducted during Aug 2010 to Dec 2014. More than 6,000 participants covered from different stakeholders brought under training (core technicians and other experts of the production section), workshop, idea exchange meeting and through print media (poster, festoon, stickers, diary, calendar etc).</p> <p>Reviewed Energy Performance and other requirements of existing 6 BRESL products and then gave certificate to the Manufacturers.</p>

Activity (Based on Approved National ProDoc)	Status of Implementation (as of May 2015)
	<p>Designed and formulated Star Label Grading and awarded only 3 products as CFL, FAN & EB by regular strategy set by CM wing of BSTI.</p> <p>By visiting to manufacturing plants to assess the designs those were given by BSTI and then published consolidated formulation of BDS on 6 BRESL products.</p>
<p>Activity 3.3: Limited technical assistance that addresses technical and marketing/financial barriers to increasing EE in the manufacturing of equipment and appliances for local manufacturers on techniques for increasing efficiency of their products.</p>	<p>Star Labeling process for CFL (watt wise) & FAN (Air delivery & watt consumption wise) & started marketing with Star Label Stickers to the container & to the body of products done during Aug 2010 to Dec 2012. Several times visited factory by national/international and local consultant with CPE and national Expert supported production and R&D section of each manufacturer for producing energy efficient products.</p>
<p>Component 4: ES&L Regional Cooperation Program. <i>Regional cooperation and information sharing on-going and helps to maximize impacts</i></p>	
<p>Activity 4.1: Project web site with regional information developed and maintained; provides umbrella for websites referenced in other components.</p>	<p>Development of Project Website (www.breslbd.org) during Dec 2011 and Updating is continuing</p>
<p>Activity 4.2: Lessons learned are assessed, documented and disseminated.</p>	<p>From June 2011, Maximum manufacturers those are involved with this project do agree that ES&L can provide opportunities to increase profitability with their business.</p> <p>Technical support as Hands-on-Training for core technicians of each product by National and International Expert of BRESL Project could enhance manufacturer's production more.</p> <p>Strict market surveillance is required in favor of EE products</p>

Activity (Based on Approved National ProDoc)	Status of Implementation (as of May 2015)
	<p>by Authorized Institutions (BSTI CAB, FBCCI, BEA etc.) against sub- standard (non-EE) products without star label.</p> <p>Intervention of Pilot project and it's replication to different area could provoke Mass Awareness Campaign and at the same time Evaluation of Impact of EE concept</p>
Activity 4.3: Regional work group on labeling and standards (cutting across products)	One Round Robin Test of EE Fan completed during Nov-Dec 2012
Activity 4.4 Regional ES&L Harmonization Initiative.	
Activity 4.5: Preparation of a plan for regional activities and coordination after the GEF-funded project ends.	Under process for 2 nd phase of BRESL. Resolution made for the purpose in the 5 th RPSC meeting.
COMPONENT 5: ES&L Pilot projects – <i>Demonstration of various aspects of the development and implementation of ES&L programs</i>	
Activity 5.1: Government procurement	Proposed for purchasing of CFL & EE Fan from local manufacturers since Oct 2012. Process is under way through SREDA by MoPEMR.
Activity 5.2: On-line databases of efficient equipment	Browsing website and others countries as well started since Jan 2012.
Activity 5.3: Consumer education	Started & process is continuing from very beginning of 2011 and with Training Module developed by Contractual Service Company (CSC). Training for different types of Technicians for each product has been done by local and International trainer as a TOT. This TOT was implemented with Training module developed by CSC.

3.10 Monitoring and evaluation

Standards of BRESL products were done by BSTI in a manner that voluntary products should come first and then mandatory standard followed the sequence. Star label fixation was going on to mark the grading of Energy Efficiency of 3 products-CFL, EB & Electric Fan. Air-conditioner, Refrigerator & Electric Motor will be done in next steps as Govt approved the DPP recently for lab equipment for these appliances. For continuous monitoring, BSTI visited the market and factory frequently to find out the available standard products certified by BSTI. BSTI connected with SREDA for new strategy of M&E for Energy Labeling Master Plan that will be implemented from 2016 as Regulations. After completion the project in June 2015, UN activity tracking will continue by BSTI through Energy Efficiency Cell as a part of sustainability. Result monitoring will be done by M&E unit through reporting and surveillance by BSTI. Adoption of international standards (continuous process) from IEC, ISO, ANZ, SL and IS for reference, comparison, evaluation and formulation of BDS (Bangladesh Standards) through Feasibility Study (FS) already reported by National Experts as a part of Harmonization with other 5 participating countries. In future BSTI may revise the BDS with SREDA and technical experts of the country.

Based on the all outcomes of the project, the evaluator marked the project as following:

Outcomes, Effectiveness, Efficiency, M&E, I&E Execution	Sustainability	Relevance
5. Satisfactory (S): minor shortcomings	3. Moderately Likely (ML): moderate risks	2. Relevant (R)
		Impact
		3. Significant (S)

The Project objective and outcomes were rated according to their respective outputs, based on evidence provided by THE PROJECT MANAGER and assessed by the evaluators, and by means of performance indicators using the 6-point satisfaction scale. Other aspects of performance were assessed using the full range of set of ratings shown in Table in chapter 2.

4. CONCLUSIONS, RECOMMENDATIONS AND LESSONS LEARNED

The project has delivered remarkable result. It introduced and established the star labelling of the appliances and in future, SREDA can make a mandatory policy to use the star label products in the residential, commercial and industrial sector. It was also learnt that SREDA will make a mandatory rules from Dec 2016 for these appliances. It is a practical tool for effective housekeeping in the private sector as well as public sector in the country, including

the Upazilla, district and division level, as well as ministries and departments. During project implementation and based on results in pilot products like CFL, Electronic ballast and household fan, the project has attracted exceptionally high to the other donor organizations like JICA.

The project has not only changed the perception and the business-as-usual practice concerning energy consumption but it also changed the awareness and attitude towards energy efficiency in the some part of the society by its information campaigns, outreach activities and free energy efficiency advisory services, targeting primarily the commercial and residential sector. More than 500 technicians, engineers, entrepreneurs, manufacturers, supplier, distributors, dealers and even end users, energy experts, including auditors, have been trained in the training programs for energy efficient products. The results achieved and the impact the project had delivered are evaluated more than satisfactory.

These results would not materialize without the strong leadership and drive of the National Project Director who has a long time working experience with BSTI combined international best-practice experience with a detailed knowledge of the local market. It was the newly appointed Project Director who focused on all the activities of BRESL project in his Inception Report. With their hard job they could establish testing CFL, electronic ballast and household fan and in BSTI, technician, engineers are able to test these products. They also appointed an Assistant Director for monitoring the testing. According to BSTI, they have received all these equipments in Dec 2010 and they had previous experience to test with these types of equipments. Due to unavailability of equipments for testing the Air conditioner, refrigerator and electric motor, it was not possible for them to check and standardize the products for labeling.

In the local market in Bangladesh there is no monitoring system and market control from the government. In most of the cases end user became sufferer though they pay the products even in some cases more than the international standard prices. Long time ago government introduced PSI system and it could not help about the quality. PSI companies tested only the quantity, not the quality and even sometimes not the products.

Some of the manufacturers who got the star label for their products like SEC Fan wants financial incentives from Government or make the access to finance easy for those types of manufacturers from Government Green Climate Fund. Company like Transtec and Walton, who have their own R&D division with lab facility wants government monitoring policy should be strong enough to stop the import of less quality products and seeking a business opportunity in other countries who implemented the BRESL. They are not sure yet whether BRESL star label is sufficient to export the products in the BRESL countries. If BRESL

ensure that if the manufacturers got star label they can export to other BRESL implementing countries, it will be another success story for BRESL and more entrepreneur will come forward to get the certificate from BSTI.

Bangladesh is a densely populated country with about 161 million people living in 147,570 square kilometers of land. In order to maintain a sustainable GDP growth of 7%/year up to 2020 and beyond, the Government of Bangladesh (GOB) needs to meet the essential energy needs of the people and industries. For this purpose, demand-side energy management is just as important as supply-side infrastructure development. A rapidly growing country like our country needs a huge amount of energy to feed its large growth appetite. In the past decade, primary energy consumption increased over 100% and this trend will sure to be continued. We have no room for wasting energy. Besides the latest sector-wise energy consumption (industrial, residential, transport, agriculture and commercial) is shown in Figure 1-1: industry has the biggest share at 47.8%, followed by residence and transportation at 30.5% and 11.5%, respectively.

By achieving the target of 20% improvement of primary energy consumption per GDP, a total of approx. 66 Mtoe (or 78 billion m³ of gas equivalent) is expected to be saved within the 15 years between 2016 and 2030. The total energy savings in monetary terms will amount to approx. Tk 530 billion in the period or an annual average of Tk 35 billion, at the current weighted average natural gas price¹¹. The energy intensity in 2030 will be improved by 20% compared to the 2013 level and the energy consumption in 2030 will be reduced by 17% (or by 12 Mtoe) compared with the BAU case.

ES&L will give impact on foreign manufacturers, because most of these 6 products are imported either in complete set or in SKD mode depends on the structure of duty which change year to year are sold in Bangladesh market. All manufacturers import all the components instead of complete set to avoid the duty as according to the SRO, less duty will be paid for parts. Some of the manufacturers make most of the products in Bangladesh except some electronic components and they have their own lab for testing. This program may identify a Non Tariff Barrier between the countries implementing BRESL program. In that case voluntary participation will be increased and will not depend when the rules will be mandatory. Committees and/or WGs on the program should be held fairly and often not only gathering governmental officers, but also inviting many stakeholders including foreign manufacturers.

Bangladesh Standardization and Testing Institute has been engaged as a leader in BRESL Project in Bangladesh. BSTI has issued BDSs on EE measurement methods, but couldn't

¹¹ Based on the recent gas tariff proposal, weighted average tariff is calculated as 195BDT/MCF, raised from the current 140.6BDT/MCF. 195BDT/MCF is equal to 6.8BDT/m³ (1MCF = 28.3m³)

issue regulation, and the initial EE Labeling Program didn't work well under the project. SREDA has been newly established with an objective to promote, coordinate and assist Renewable Energy and Energy Efficiency activities in the country. SREDA's most important role is to issue regulations and fully manage the program. Without mandatory regulations from SREDA it will be difficult to count the success of the project as SREDA is a authority whether BSTI can test and label the products only.

BSTI will concentrate on standardization (issue of BDSs) and conduction of EE measurement tests. Bangladesh Accreditation Board (BAB) will join in the program for maintaining laboratories' test reliability by issuing accreditation. It has received international recognition for laboratory accreditation (APLAC).

Usually, there are two types of labeling procedure, one is that manufacturers can affix EE label on their products by themselves, referring to their in-house laboratories' EE measurement test data like Transtec, Walton. The other is that the manufacturers must get label certification, which is given by the authority, referring to 3rd party laboratories' EE test like BSTI. BSTI prefer second one and due to this they submitted a DPP to ministry to get the fund for lab equipments so that they can test and certify all the components under BRESL program.

The "Framework of EE Labeling Program" under Power Division was drafted. This Framework instructed mainly technical issues of CFL, refrigerator, AC, TV, electric fan, electronic ballast and induction motor. The regulation can give administrative power on the relevant Bangladesh Standards (BDSs) by means of introducing BDSs, in which EE measurement methods are fully stated. Star rating criteria will be directly shown in the regulation, and will not be issued as BDSs, because star rating criteria must be designed considering social and economic viewpoints, besides BDSs mainly stipulates technical issues.

According to the Power Division, it was found that SREDA will start EE Labeling Program as a voluntary basis and shift to mandatory, in order to spread the program through all parties. In case of the mandatory program, the Government must provide EE testing service for the all manufacturers and importers, which want to get EE data on their products. Therefore, governmental testing agencies, including BSTI have to develop EE test capacity urgently.

Recommendations:

1. Update the electricity prices: Government provides subsidy to the energy sector. Low price of the energy bill is a barrier of energy efficient products as payback period of the

products become longer period and consumers usually not interested for longer time return.

2. Saving should always be shown in economic term instead of technical or environmental term as end user understand how much they can save instead of how much electricity or Carbon will be saved.
3. Develop business plan of the ES&L products: BSTI in consultation with SREDA and international technical assistance, should develop a business plan how the ES&L will be sustained financially and operationally. BSTI should nominate entities, assigning responsibilities for the next phase. The plan includes:
 - Description of activities from the technical point of view
 - Strategy definition
 - Intervention areas and identification of instrumental and operational partners (public/private), including project implementation and process management
 - Identification of costs and financing sources, economical and financial viability
 - Sensitivity analysis (one variable- electricity price)
 - Monitoring and evaluation of framework of next ES&L program
 - Definition of a methodology for evaluation of the energy savings associated with ES&L program
4. Develop a comprehensive incentives program that supports the ES&L program to effectively transform market. BSTI in consultation with SREDA and other technical experts will research on the appropriate and possible bundle of incentives that could be given, upstream, midstream and downstream the appliances value chain, to foster the penetration of high efficient equipment in the local market
5. Capacity development of BSTI: Staffs in charge of the EE&C programs are expected to have enough competencies and have a overall capacity to
 - communicate with stakeholders
 - Energy data collection and analysis
 - Communication with industrial sector and associations
 - Basic knowledge in S/L (Standards and Labeling)
 - Label certification / Laboratory accreditation system
 - Standardization of EE measurement method and Star Label Rating criteria
 - Star Label Standardization (Unification)
 - Participation of manufactures, importers and retail shops (mandatory/voluntary)
 - MEPS (Minimum Energy Performance Standard)
 - Basic EE technology on home appliances
 - Present market condition- Communication with manufacturers and dealers
 - EE&C financing -Available financing source for EE&C
 - Communication with financial institutions
 - Harmonization with International and/or Regional EE Labeling Programs
 - IT Skill to operate IT

- Communication with Ministry of Education and schools/universities
 - Economic analysis (Economy on energy)
 - Outline of EE&C programs and technology
 - Climate change Knowledge on global warming, Kyoto mechanism, CDM, etc.
6. Sustainable participation of the testing facilities must be accompanied with periodical maintenance, calibration, skilled personnel and demand of EE tests. Capacity development for skilled personnel needs long time and experiences, especially in case of refrigerator and AC. BSTI will develop its testing ability. On the other hand, BAB must issue accreditation for the eligible laboratories by accessing laboratories' test facility, staffs and quality. Therefore, BAB must be knowledgeable about testing procedures
 7. Nationwide network on EE&C implementation including international donors, related associations and the academy should be formulated and BSTI will coordinate for testing. National capacity building should be achieved through the network by means of information exchange and technology transfer. SREDA will operate as authority
 8. In order to make the establishments to take voluntary actions on EE&C implementation, BSTI with SREDA should notice possibility of energy supply shortage and energy price increase in near future to the industrial, commercial and residential sectors. Provision of knowledge and conscious on energy and EE&C to students will influence their family through EE&C action at home, and, finally, cause awareness rising in the society. BSTI with SREDA will conduct EE&C school program, which will be a joint program with Ministry of Education.
 9. BSTI should implement EE&C campaign through media such as televisions, newspapers and advertising boards, discussions, billboard, school campaigns, competitions with prizes, etc. In cooperation with related governmental and/or private organizations and program.
 10. BSTI will concentrate standardization (issue of BDSs) and conduction of EE measurement tests. BAB (Bangladesh Accreditation Board) will join in the program for maintaining laboratories' test reliability by issuing accreditation. BSTI should get accreditations by BAB. Key players/ stakeholders on the program are manufactures and importers. They are expected to join in the program voluntarily complying with the labeling rules. Also, they are expected to join in stakeholder meetings for developing and/or improving the program elements such as EE measurement method and star rating criteria, based in their technical expertise and information about market condition.

11. Assurance of EE label's reliability (establishment of verification system): Verification system including EE measurement procedures may select from the two verification types given below and assuring EE label's reliability.

Procedure 1:

- Manufacturers/importers get EE test on their products at accredited laboratories.
- Label certification body evaluates the EE test report and issue label certificate on the product with star rating, and issue it to the manufacturer/importer
- Manufacturers/importers affix the label on the products or their packages, and deliver to the markets.
- Label certification body carries out EE check test for the products sold in the markets, picking up samples, in order to maintain credit of labels.
- Label certification body should have a magistracy capacity to fine the manufacturers/importers if they find the products delivered in the local market are below standards. They should visit and select products randomly from the market.

Procedure 2:

- Manufacturers/importers get EE test on their products and make EE label with star rating in accordance with the specified standards and criteria.
- The labels are registered at the authority
- Manufacturers/importers affix the label on the products or their packages, and deliver to the markets.
- The authority carries out EE test for the products sold in the markets picking up sample, or being asked for "challenge test" by somebody who wants the test for verification.
- Penalty will be imposed to the manufacturers/importers, if they affix illegal labels.

12. LED products are already in the market since 2011 and CFL will be gradually discontinued as it has got mercury and Bangladesh is a signatory of Minamata convention on mercury under UNEP who are committed to discontinue mercury use. Many imported products are sold in Bangladeshi market. How to verify foreign manufacturers EE test data is the discussion point at EE Labeling Committees and WGs. Issue of BDSs on EE measurement method. BSTI should develop BDS for LED used for DC and AC system for the next project.

13. BDS for other products like TV should be developed in the next phase as consumption of TV is increasing due to economic development and the size of the TV also changing from low wattage 26 inch to high wattage LED 42 inch or more. Though LED TV is efficient but due to bigger sizes, it consume more electricity.

14. BSTI may also think to develop BDS for battery, Solar panel, solar charge controller as renewable energy plays a key role in rural areas and end user becoming sufferer from

this products. 20% of the total energy will be generated from Renewable energy (particularly solar, as other options are not so feasible in Bangladesh context) by 2020 and it will right time if BSTI can do this in the next phase.

15. Some of the manufacturers have their own R&D and lab facility for their products testing in their own lab. For example, WALTON has five sets of testing facilities (climate chambers), and has conducted tests according to BDS1850 (EE measurement method). However, these test facilities have not yet acquired BAB accreditation.
16. SREDA intends to start mandatory program from FY 2016-17 in Phase 1 in order to facilitate the nationwide application of the program. In case the program becomes mandatory, laboratory's EE testing capacity becomes a critical problem. This is because The Government must provide full-fledged EE testing (measurement) services, which satisfy manufacturers and importers requests for label application. Therefore, the time line for the capacity building of BSTI's testing facilities and the timing of the shift from voluntary to mandatory implementation should be well coordinated between SREDA and BSTI.
17. BSTI in consultation with SREDA and other technical experts should revised the BDSs for 6 products in the next phase.
18. Some companies have testing facilities in the neighboring countries such as India, and are already participating in other labeling programs abroad. BSTI should consider the possibility of utilizing the facilities and experiences of these companies and other reputed international companies, mobilizing their participation in the labeling program. In this way BSTI could do this system for motor, fridge and AC in the 1st phase.
19. It is recommendable to visit to neighbouring countries such as India, Sri Lanka, Thailand, Malaysia, etc. where EE labeling program has been applied, to grasp present situation, issues and impact of the program. Not only BSTI, but also local manufacturers and BAB are expected to join in the mission. In the foreign countries, interview to the authorities (the label certification body), survey in the appliance market and observation of laboratories testing equipment should be scheduled. The mission should be arranged and conducted by BSTI.
20. It is recommendable to make a business policy to export the star products within BRESL implementing countries and BSTI should cooperate to the manufacturers in this case with SREDA. If this Star level allows the manufacturer to export easily without needed any further certificate for BRESL countries, more manufacturers will join volunteer to export the products.

21. UNDP, BSTI, SREDA together motivate National Board of Revenue (NBR) to develop a tariff value of all each electrical and electronics products. At present there is a duty system against each HS Code. If import value is fixed for each imported item, importer will stop to import less quality products when tariff is same for same products.

Lessons Learned

- As big manufacturers involved with BRESL project to produce EE products have experienced that ES&L can provide opportunities to increase market share & profitability with their business
- Technical training by National Experts & CPE of BRESL for core technicians is a very good support for EE products.
- Government support for regulations of Voluntary & Mandatory through SREDA for the formulated BRESL Product is essential, otherwise non-EE products will be inundated in the market.
- At the beginning of assigning EE Star Label unwillingness was observed from small manufacturer's side to produce energy efficient (EE) products because of high initial investment and fear of loosing market share of traditional appliances (sub-standard products) but now it is changing.
- Mass Awareness Campaign (through print & electronic media) up to the grass-root level among the end users (consumers) students, traders, dealers & relevant stakeholders is very much effective to highlight the benefits of using energy efficient (EE) product.
- Maximum percentage of manufacturers involved with project to produce BRESL products has agreed that ES&L can provide opportunities to increase profitability with their business.

NEXT STEPS FOR REGIONAL ES&L COOPERATION

- BRESL will give priority to the following products for the next round of regional cooperation and harmonization: air conditioner, motor, washing machine, LED lights, TV, electric iron, microwave oven, distribution transformers, refrigerators, ballast, battery, solar panel, solar charge controller, and others that may be further identified.
- BRESL will give priority to the following activity areas for the next round of regional cooperation and harmonization: laboratory comparison test, acceptable testing tolerance for energy efficiency, compliance of ES&L, networking, public awareness campaign, training and capacity building, incentive policy in promotion of EE products, impact evaluation protocol for ES&L program, information dissemination, new EE technologies and other areas that may be further identified.

Annex 1: Itinerary and Persons Interviewed

No.	Name of the event	Date and time	Types of information gathered
1.	Meeting/orientation session with UNDP project officials, <ul style="list-style-type: none"> • Alamgir Hossain, Programme Analyst, UNDP 	20 May 2015	- Get oriented about the task and receive instructions/guidance and related information
2.	Meeting with BSTI project officials <ul style="list-style-type: none"> • Mr Md Abdul Matin National Project Director and Director Technical, BSTI 	21 May 2015	- The NPD informed me the government position about BRESL project
3.	Meeting with and Team of BRESL Project <ul style="list-style-type: none"> • Mr Shahjahan Chowdhury Project Manager BRESL Project 	21 May 2015	- Receive a detailed overview about the project components, time of implementation, areas covered.
4.	Meeting with Bangladesh Lamps Limited <ul style="list-style-type: none"> • Engr Md Habibur Rahman Plant Manager 	24 May 2015	- Receive a detailed overview about the AC CFL production, sells and other information in the market
5.	Meeting with Walton Hi-Tech Industries Ltd <ul style="list-style-type: none"> • Engr Md. Moeenul Haque Executive Director • Engr Tapash Kumer Majumder First Sr. Additional Director • Engr Al Imran First Sr. Additional Director 	6 June 2015	- Receive a detailed overview about the domestic refrigerator production, sells and other information in the market
6.	Meeting with SEC Fan <ul style="list-style-type: none"> • Mr Syed Mosarraf Hoosain Managing Director • Mr Md Sazzad Akram Production Manager 	6 June 2015	- Receive a detailed overview about the electrical fan production, sells and other information in the market
7	Meeting with MK Electronics	6 June 2015	Receive a detailed overview about the electrical product, sells
8	Meeting with Distributors in Nawabpur Market, Dhaka	7 June 2015	
9	Meeting with Townhall Market, Mohammadpur, Dhaka	7 June 2015	

Annex 2: List of Documents Reviewed

1. Technical Assistance Project Proposal (TPP) on Barrier Removal to the Cost Effective Development and Implementation of Energy Efficiency Standards and Labeling Project (BRESL), GoB, Ministry of Industries, July 2010
2. The Project for Development of Energy Efficiency and Conservation Master Plan in Bangladesh, Final Report, JICA, March 2015
3. Energy Efficiency and Conservation Master Plan up to 2030, JICA, SREDA, March 2015
4. BBS 2013: Statistical Yearbook of Bangladesh
5. 6th Five Year Plan, GoB, Productivity Improvement in Industry through Energy Efficiency Programs, CES, BUET 2006
6. Energy Efficiency Guidelines for Asian Industries, UNEP 2006
7. Bangladesh Roadmap for Energy Efficiency Improvements and Demand Side Management, World Bank and GiZ, Sep 2009
8. Strategic Programme Framework 2006-2010, Energy and climate change, UNDP
9. Energy Access, Efficiency, and Poverty, How Many Households Are Energy Poor in Bangladesh? World Bank, June 2010
10. Report on Greenhouse Gas Emission Calculation, e.gen Consultants Ltd, July 2014
11. Selection and Implementation of Pilot Project for 3 BRESL Products under BRESL Project, e-gen Consultants Ltd, Dec 2014
12. Report on Factory Visits, e.gen Consultants Ltd, May 2014
13. Situation Analysis: BRESL Project-Bangladesh, Final Report, Dr Shahab Qureshi, June 2011
14. Capacity Needs Assessment on ES&L program in Bangladesh, B.D Rahmatullah, National Consultant, BRESL, UNDP, August 2012
15. Annual Report, BPDB 2013-14
16. SREDA Act 2012
17. Power System Master Plan, Bangladesh 2010
18. National Energy Policy 2008 (edited)
19. National Renewable Energy Policy 2010
20. Report on Barriers Faced during Execution Period and how those barriers have been Overcome at Pilot Project. e.gen Consultants Ltd, June 2014
21. Report on Marketing and Advertising Strategy for Manufacturers, e.gen Consultants Ltd, May 2014
22. Training Materials for the ES&L Practitioners, e-gen Consultants Ltd, Feb 2014
23. Proposed Action Plan for the Next 2-3 Years of EES&L, e.gen Consultants Ltd, May 2014