ACTION PLAN FOR ENERGY EFFICIENCY & CONSERVATION

Power Division
Ministry of Power Energy & Mineral Resources
Government of the People's Republic of Bangladesh

Action Plan for Energy Efficiency & Conservation

September, 2013

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State Minister
Ministry of Power, Energy & Mineral Resources
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Message

Energy efficiency and conservation are the techniques for energy reduction and in achieving the same result with less energy. Efficient use of energy directly contributes to security of energy supply, sustainable transport, affordable energy, competitiveness and environmental sustainability. Improving energy efficiency is widely recognized as the easiest and most cost-effective means of reducing carbon emissions. Being more energy efficient offers tremendous financial benefits - industry and society can achieve more with less energy, public services are delivered at lower cost, and fuel poverty is reduced. Reducing demand also put less pressure on energy supplies. However, this can only be achieved with significant changes to the behavior of individuals, communities, businesses and the public sector.

This Action Plan for Energy Efficiency and Conservation reaffirms the government's commitment on efficient use of energy. The plan sets a framework for energy efficiency and conservation that furthers the government climate change, economic and social agendas. It sets a target of energy saving and identify some actions to meet the target.

Energy efficiency is the first and foremost a matter of controlling and reducing energy demand, and targeted actions are required for both energy consumption and energy supply. Some targeted sectoral measures are identified in this plan with its implementers along with time-frame. As the energy efficiency and conservation is a cross-cutting issue and different government agencies are involved in its implementation, so its success to meet the target will depend on cooperation and proper coordination with the implementers.

I wish to appreciate the team for preparing this action plan.

Mohammad Enamul Huq, MP

Secretary
Power Division
Ministry of Power, Energy & Mineral Resources

Foreward

The Action Plan for Energy Efficiency & Conservation has been prepared by Power Division, Ministry of Power, Energy and Mineral Resources to set a logical vision, mission, targets, objectives and required actions in the backdrop of the current energy scenario (primary and secondary) of Bangladesh. This plan will be elaborated during preparation of the Energy Efficiency & Conservation Master Plan in the near future.

The plan briefly describes the functionality and mandates of the Sustainable and Renewable Energy Development Authority (SREDA) to regulate and oversee the Energy Efficiency initiatives in the Demand Side Management (DMS) . Number of areas are identified in this plan, where large amount of energy could be saved, and agencies are identified with a given time line. This would be considered as a handy tools to monitor the progress of different activities under energy efficiency program.

This action plan has been prepared by a team of officials from Power Division and is the product of an intensive collaboration with governmental and non-governmental agencies. Lot of consultations have been made to finalize this document. I wish to acknowledge their contributions.

This is the first endeavor of the government in preparing such a national document on energy efficiency and conservation. I am most grateful to the Hon'ble State Minister of MOPEMR and Hon'ble Adviser to Prime Minister, for their continued guidance, encouragement and support in preparing such document.

I gratefully acknowledge the encouragement of Honorable Prime Minister and finally approved this plan.

Thanks are also due to my colleagues in the Division who worked hard to make the document available in time.

Monowar Islam, ndc

Content

Acronyms

AC	Air Conditioner
ADB	Asian Development Bank
BERC	Bangladesh Energy Regulatory Commission
BPC	Bangladesh Petroleum Corporation
BPDB	Bangladesh Power Development Board
BRESL	Barrier Removal for Energy Standards and Labeling
BSTI	Bangladesh Standardization and Testing Institute
CBM	Condition Based Maintenance
CFL	Compact Fluorescent Lamp
CNG	Compressed Natural Gas
CSR	Corporate Social Responsibility
DoE	Department of Environment
DSM	Demand Side Management
EE	Energy Efficiency
EC	Energy Conservation
ECR	Environment Conservation Rules
ERD	Economic Relation Division
FL	Fluorescent Lamp
FY	Financial Year
GEF	Global Environment Facility
GIZ	German Technical Cooperation
GoB	Government of Bangladesh
HR	Human Resource
HV	High Voltage
IAP	Interim Action Plan
ICS	Improved Cooking Stove
ICT	Information and Communications Technology
IPP	Independent Power Producer
JICA	Japan International Cooperation Agency
Kgoe	Kilograms of Oil Equivalent
KPI	Key Performance Indicators
ktoe	Kilo Ton Oil Equivalent
KVA	Kilo Volt Ampere
KW	Kilo Watt
LDC	Least Developed Country
LNG	Liquefied Natural Gas
LPG	Liquefied Petroleum Gas
MDG	Millennium Development Goal
MGI	McKinsey Global Institute
MIC	Middle Income Country
MPEMR	Ministry of Power, Energy and Mineral Resources
MW	Mega Watt
NCTB	The National Curriculum and Text Book Board
NGO	Non Government Orga ization

PF	Plant Factor
PSCDP	Power Sector Capacity Development Program
PGCB	Power Grid Company of Bangladesh
PWD	Public Works Department
RE	Renewable Energy
SCADA	Supervisory Control And Data Acquisition
SDG	Sustainable Development Goal
S&D	Sales and Distribution
SED	Sustainable Energy Development
SHS	Solar Home Systems
SREDA	Sustainable and Renewable Energy Development Authority
SWH	Solar Water Heater
TPP	Technical Project Proposal
TBM	Time Based Maintenance
TOU	Time of Use
UNDP	United Nations Development Program

Executive Summary

Our expanding economy, growing population, and rising standard of living all depends on energy services. Current projections anticipated that our electricity demands alone rising nearly five times by 2030. At work and at home, we are continue to rely on more and more energy-consuming devices. At the same time, Bangladesh is facing an unprecedented energy challenges resulting from increase import dependency, limited supply of natural gas and other fuels.

The direct cost of our inability to use energy efficiently amounts to more than billions of dollar annually. Realizing our savings potential in a sustainable manner is a key element in our National Energy Policy. It is by far the most effective way concurrently to improve security of energy supply, reduce carbon emissions, foster competitiveness and stimulate the development of a large leading-edge market for energy efficient technologies and products. A paradigm shift is required to change the behavioral patterns of our societies, so that we use less energy while enjoying the same quality of life. Producers will have to be encouraged to develop more energy-efficient technologies and products and consumers will need stronger incentives to buy such products and use them rationally. Using best available technology will be the key importance. While the objective of this Action Plan can be achieved using existing technology, it is however evident that the uptake of innovative technologies emerging during the life time of the Action Plan should equally be encouraged.

This Action Plan for Energy Efficiency & Conservation has been prepared to set a logical vision, mission, objectives, institutional and legal framework and actions to be undertaken in the backdrop of the current energy scenario (Primary and Secondary). Government has adopted this action plan to consolidate efforts and coordinate different EE & EC programs and measures towards achieving a set of national targets under a single government umbrella through establishment of the Sustainable and Renewable Energy Development Authority (SREDA). The Action Plan will also recognize EE & EC measures and programs associated with sectoral and national interests, putting emphasis on government priorities. It is also expected that those intervention will be further accelerated by both government and non-government stakeholders through various possible ways.

The plan also briefly describes the functionality and mandates of SREDA as a national nodal organization to regulate and oversee the Energy Efficiency initiatives in the Demand Side Management (DMS) in Bangladesh. EE & EC is a cross-cutting issue and many government agencies are involved in its implementation. In continuation of this Action Plan, a comprehensive study on sectoral energy efficiency status will be conducted for preparation of a Master Plan on Efficient Energy Management with a view to exploring the prospective areas for energy savings in different tiers, which will be commencing subsequently, to meet the specific needs.

This plan envisages efficient use of energy at all level including generation, transmission, distribution in the supply side and introduction of energy efficient household appliances; energy efficient equipment in the industries and offices; etc. in demand side. Consideration has bee given to the u er consuming much energy and

n s

also to the sector, where initial investment is less to achieve the target.The major source of primary energy in Bangladesh is natural gas and 80% of the total power generation comes from gas, so by introduction of energy efficient electricity generation to improving efficiency in transmission and distribution including Demand Side Management (DSM) can save substantial amount of electricity leading to save the gas. Including awareness building and capacity development there are number of areas where, through appropriate interventions, a good amount of energy could be saved nationally. It is suggested to capacitate SREDA, so as to provide a common platform for both public and private sector.

In the management of public sector power generation, many power plants are old, its capacities are de-rating and subjected to be retired. So far there is no law or regulation for regular inspections in public power units. In order to ensure the concept of "preventive maintenance" instead of the current "repair after breakdown" it is suggested for implementation of regular inspection of power plants. Introduction of automated controls system can also enhance the efficiency of the generation stations. Timely procurement of spare parts and follow the maintenance schedule of power plants is important for keeping the plant operational at standard level. Rehabilitation, replacement or repowering of the old and inefficient power plants, introduction of energy auditing in power station for prevention of the misuse of energy will bring significant positive result. Online Interface meters are to set up at the energy dispatch point from the power station to the grid to monitor the energy generation. Importance will be given for in-house capacity building and proper training of the operation and maintenance people of the power plants as per standard practice.

From the power stations heat sheat is being released in the air as waste. The waste heat could be used for generating further electricity. BPDB and other generation utilities have undertaken plans for adding combined cycle in the existing power plants. BPDB is also making a study for efficiency improvement and repowering of existing power plants. All the new coal based power plants are to be designed with supercritical boilers.

This Action Plan put due importance to system improvement and set the targets to reduce transmission and distribution losses. Introduction of voltage regulation to improve the line losses, prevention of forced outage, upgradation of line and transformer capacity and incorporation of automatic generation control, smart grids and system metering are recommended. Efficiency gains in the distribution systems will be done through upgrading of overloaded components and subsequent reduction of theft. Apart from those, up-gradation of distribution lines and substations, power factor improvement, introduction of modern metering and standard service drop practices and prevention of pilferage and in-house capacity building activities are identified as important interventions.

Around two-thirds of the energy is lost while converting primary, secondary, and final energy into useful energy services. Improving the energy efficiency of end-use applications would further reduce the energy intensity of the economy. So far this has primarily been the function of market forces, assisted in some cases by the formulation of standard by the appropriate authority, in this ca e SREDA. However, the Bangladesh

consumer market is extremely price-sensitive, hence consumers prefer initial lower cost outlay to optimization of lifecycle costs. Strong policy and regulatory framework with explicit incentive mechanism is necessary to address this issue. Energy Star Leveling, Bench Marking of energy uses in industrial process and in equipments, awareness building campaign is marked as important interventions to ensure energy efficiency in end users level.

Large energy consumers will be audited by the Accredited Energy Auditor and designate or appoint an Energy Manager. SREDA will carry out the Certification of Energy Managers & Energy Auditors in order to create a cadre of professionally qualified energy managers with expertise in energy management, project management, financing and implementation of energy efficiency projects and policy analysis. To conduct these activities the necessary regulations and documents will be prepared.

Introduction of Improved Cook Stove (ICS) as one of the household level interventions will increase the fuel efficiency in rural cooking system, save nearly 50% of energy, reduce health hazard, bring environmental benefit and keep the kitchen smoke free. Improved Rice Parboiling System (IRPS) will bring similar energy, health and environmental benefit which has been targeted to replace within 2021. Energy efficient brick kiln in brick industries would be used in order to reduce production cost, improved product quality, lower local pollution and reduced greenhouse gas emissions. Solar Water Heaters (SWHs) will be introduced to replace gas and electric heater. Very old Urea fertilizer plants will be replaced by new ones and retrofit the other plants where possible.

Boiler and furnaces are the gas burning technology extensively used in industries and steel & re-rolling mills. In most of the cases boilers used in Bangladesh are operating at around 70% efficiency. Whereas, the international norm for efficiency is at least 85%. Efficiency improvement of boiler and furnaces is therefore identified as an attractive and cost-effective option. Energy Division will take necessary actions to gradually phase out all inefficient gas burners through all gas distribution companies by 2015. Gas burners will be brought under meters in order to avoid misuse of gases.
Cogeneration is a thermodynamically efficient use of fuel. In Bangladesh cogeneration has huge prospects, because more than 2000 MW of captive generation is there in the industry sector, where waste heat is not tapped. This waste heat can be used for chilling, drying or any other suitable purposes. Power Division will identify suitable industries and implement demo-projects by 2015 to popularize it.

Energy Efficiency reduces the level of per capita energy consumption, thus decreasing the vulnerability of the economy and individual consumer to energy price disruptions due to supply shortage. Adoption and diffusion of energy efficiency and conservation culture in Bangladesh may be a long-term approach, but henceforth it needs to be implemented through a nationally integrated strategy before being too late for the next generation. EE & EC should form an integral part of the country's strategy for achieving energy security. The targets for EE & EC should be implemented through very specified time frame using different approache having a mix of policies, rules &

regulations, incentives to industries and people to use less energy. Demonstration of EE technologies and equipment, research & development (R&D), targeted awareness raising in schools, mass awareness raising and information dissemination, and other options covering urban to rural areas are equally important. However, by and large, action oriented national commitment from all stakeholders, regulatory bodies and support from the development partners are the key to the success for achieving energy efficiency targets by 2015 and beyond.

Chapter — 1

Introduction

Chapter i

INTRODUCTION

1.Background

Bangladesh is one of the most densely populated countries in the world with about 161 million people living in 147,570 sq. kilometers of land. It is also mostly agrarian, about 79% of its population live in rural areas. It is generally recognized that energy is the most essential factor for economic growth and human development in the modern world. There is a very strong correlation between economic development and energy utilization which are directly proportional to each other. The per capita annual consumption of 292kWh makes Bangladesh one of the lowest energy consuming countries in the world.

Bangladesh's economy is growing rapidly over the past decades and has been at an average of 6% annually since 2008 despite the global financial crisis and severe recession in the global economy in the last 3-4 years yet it remains in LDC. Bangladesh is striving to achieve a Middle Income Country (MIC) status by 2021. It can do so if it is able to push the economic growth to an average of 7% and above. In that case the energy growth needs to be doubled.

The country has made significant strides in the MDG goals and is set to exceed the targets in many areas of the social well-being by more than half. It has already made significant improvements in reducing infant and maternal mortality rates, improving school drop-out rates, attendance and enrollment of girl child, etc. However, the country needs to invest in energy significantly and improve its power generation capacity in order to achieve all the goals under social, economic and environmental aspects of sustainable development including achievement of the MDG goals.

To attain a sustainable GDP growth of 6% and above by 2020 and beyond, it deems necessary to meet the essential energy needs of the people. In this regard, the GoB needs, at the very least, to increase its primary energy supply by 3-4 times and its electricity generation capacity by approximately 6 times.

The demand for energy is increasing day by day due to accelerated industrialization, rapid urbanization, infrastructure development and an emerging consumer society.The nation as a whole is trying to catch up with ICT. The "Digital Bangladesh" agenda of the government is focused on fast-forwarding ICT capacities at all levels - grassroots, sub-national and national-to leap-frog the country into the 21st Century.The prime mover of this agenda and the demands mentioned above will be the power supply. Therefore, the government has a declared vision of "Electricity for all by 2021".

In the conventional power generation sector, the country has been able to somewhat reduce the gap between the current demand and supply, through the setting up some

plants in public and private sectors that have produced the additional power. However, as the population grows and the economic activities gear up with rapid urbanization and industrialization, the demand for energy will far outstrip the production as it is expected.

Subsidy provided to the entire power sector has become unsustainable over the years and the government has initiated withdrawal of subsidy in phases by increasing the price of electricity, which is unpopular but necessary. A direct impact on the common people of such action is the rise in living cost as cost of transport fares go up and as a result the prices of essentials and other food and non-food items rises.

Till date, gas has remained the major source of primary energy in the country. Coal would be a much cheaper source of energy for the country with new reserves found recently which are promising. The government is also considering having electricity from a nuclear power plant, as well as exploring other options like regional power sharing.

In recognition of the need to promote sustainable energy in the country, encompassing renewable energy, energy efficiency and energy conservation, the government has enacted the Sustainable & Renewable Energy Development Authority (SREDA) as a national nodal organization for promoting such energies in the country.

With a view to promoting sustainable energy in the country, the Renewable Energy Policy envisages to generate 5% electricity from renewable resources by 2015 and increase it to 10% by 2020. The focus of renewable energies will be on off-grid and remote areas to provide energy services to the poor as well as urban areas where street lights can be solar powered and high rise buildings are already mandated to include 15% solar energy.

As part of its sustainable energy agenda, the government is actively striving to promote Energy Efficiency (EE) and Energy Conservation (EC). These are two areas, which are mutually complementary, where significant amount of power/energy can be saved and redirected for other economic use in the country.

Outdated boilers, inefficient motors and use of old technologies are costing heavily through inefficient energy use. Bangladesh needs to opt for low consumption and low cost smart technologies by bringing policy changes in its import and production of technologies that use energy. At the same time leakage, pilferage and waste of energy at all levels needs to be brought under control through effective means.

Some initiatives have already been taken up by the government in this regard, but more needs to be done. For example, use of gas meters in households in some areas has yielded positive results. It needs to be extended to other commercial consumers like hotels, restaurants, shops using gas burners, etc. and expanded in all areas for households. That will bring about a good reduction in the wastage in gas by the domestic and commercial users.

Efficient energy use at every level including generation, transmission, distribution in

the supply side and in demand side; introduction of energy efficient household appliances; energy efficient equipment in the industries; CFL bulbs and energy efficient electric fans in households, offices and industries; etc. can bring about a significant saving in energy through increased efficiency.

Introduction of green building technology, energy efficient bricks, smart technologies that cut or reduce power supply when equipment are not in use or rooms are not occupied can save energy through conservation.

As the economic growth increases, the share of energy from commercially available sources (coal, gas etc.) will increase. Also rural consumers will move away from bio-mass, which is now a primary source of energy in the rural areas, thereby increasing the demand on energy. In order to balance the energy need between supply and demand, energy efficiency across all sectors of the economy is a critical component in the growth strategy being pursued by the government.

The improvement of energy efficiency and conservation in the country will have primarily a three-fold impact: (i) improvement of energy security of the country, (ii) meeting the MDG targets on time, and (iii) efficient environmental management, thus laying the ground for achieving sustainable development. Through this EE & EC campaign, Bangladesh can set a low carbon footprint by lowering carbon emissions through efficient utilization of primary energy and thus contribute to offsetting the negative impacts of climate change at the global level.

1.1 Objectives of EE Action Plan

Government of Bangladesh has adopted this Action Plan to consolidate efforts and coordinate different EE & EC programs and measures towards achieving a set of national targets under a single government umbrella through establishment of SREDA. The Action Plan will also recognize EE & EC measures and programs associated with sectoral and national interests, putting emphasis on government priorities. It is also expected that those intervention will be further accelerated by both government and non-government stakeholders through a variety of possible ways.

In continuation of this Action Plan, comprehensive study on sectoral energy efficiency status will be conducted for preparation of a Master Plan on Efficient Energy Management with a view to exploring the prospective areas of energy savings in different tiers, which will be commencing subsequently, to meet the specific needs.

1.2 Vision

Government has a stated vision of improving the primary and secondary energy saving level for sustainable energy security including low carbon emission.

1.3 Mission

In line with its vision statement, the government has set the following targets to ensure sustainable energy security:

- 10% of primary and secondary energy saving by 2015
- 15% by the 2021 and
- 20% by 2030

Different energy saving initiatives will be undertaken and the government will promote energy efficiency measures to meet the targets.

Energy conservation and energy efficiency is a multi-sectoral issue and different stakeholders within the government, non-government and private sectors must play an active role in reducing their energy consumption through efficient management of energy while increasing the energy efficiency at the same time through a mix of measures and modern technologies. To achieve that set targets, active cooperation, coordination and monitoring mechanism in a coordinated way is indispensable. Through proper and apposite sectoral programs, the EE &EC agenda will be promoted in the country in future.

Chapter – 2

Overview of Energy Sector

Chapter ii

OVERVIEW OF ENERGY SECTOR

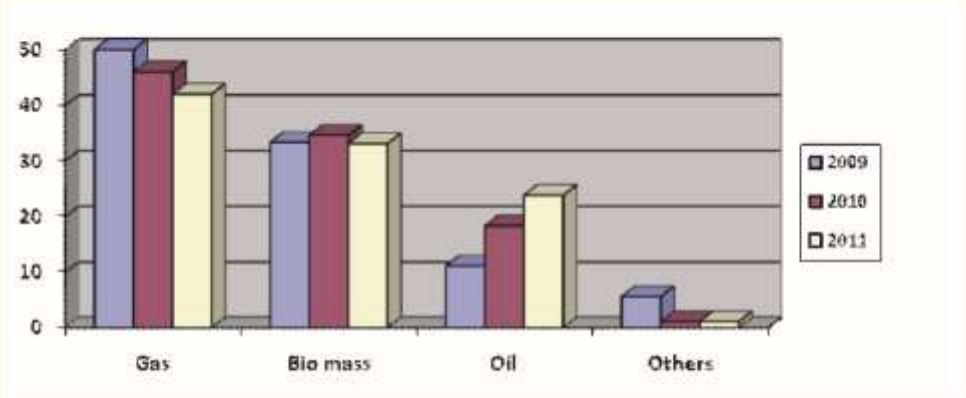
2. Present Energy Scenario in brief

Primary energy consumption in Bangladesh is one of the lowest in the world. In 2008, the country's per capita annual energy consumption was about 182 kgoe and per capita electricity generation at 292 kWh including captive generation in FY 2012 until recent years. Despite intensive efforts to increase coverage, 60 percent (including Renewable Energy) of its population has now access to electricity with per capita electricity generation (including captive) of 292 kWh. In FY 2012 average power generation was 5500-6000 MW in Bangladesh.

At present, both renewable and non-renewable sources contribute to total energy consumption. Currently about 80% of power generation is based on natural gas. About 55% of the country's energy supply is based on traditional fuels (crop residues, animal dung and fuel wood), 24% on natural gas, 19% on imported oil and coal and the remaining 2% is hydroelectricity.

The use of oil as an energy source in the corresponding period has shown increasing trends: in 2009, oil represented 11.1% of total energy supply and in 2010 18.3% and 23.8% in 2011. The consumption changes and trends described above can be seen from the figures below:

Figure: 1 Consumption patterns (2009-2011)

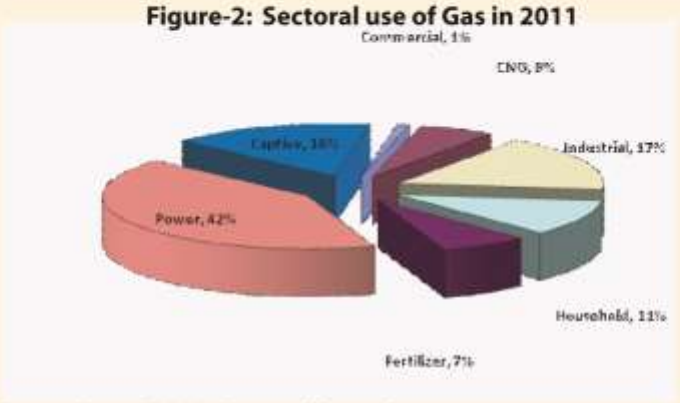


Source : Finance Division, Power and Energy Sector Road map: Second Update, 2012 data

2.1 Sectoral use of Primary Energy:

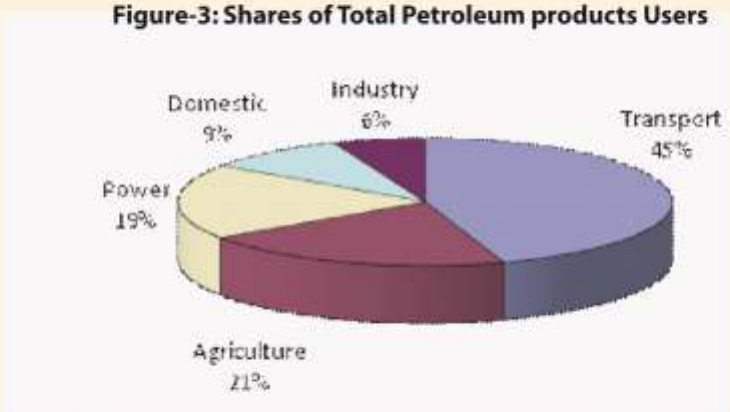
Gas and Petroleum are the main source of primary energy to meet our energy demand. Power sector is the most dominant user of gas(58% ,including captive power) and industry is the next to it (17%), but household and fertilizer are also have a considerable use, which are 11% and 7% respectively. Considering the use of petroleum, transport sector is the biggest consumer (45%) and agriculture is the next to it (21%) which is used up for irrigation purpose but 9% of petroleum product (in the form of kerosene oil) are used up for domestic purpose. Though the use of petroleum oil in power sector is 19%, but its use will be increased gradually in near future. So,to prepare an energy efficiency action plan, consideration should be given to the user consuming much energy and also to the sector, where less monitory involvement is required to achieve the target.

Figure-2: Sectoral use of Gas in 2011



Source : Finance Division, Power and Energy Sector Road map: Second Update, 2012 data

Figure-3: Shares of Total Petroleum products Users

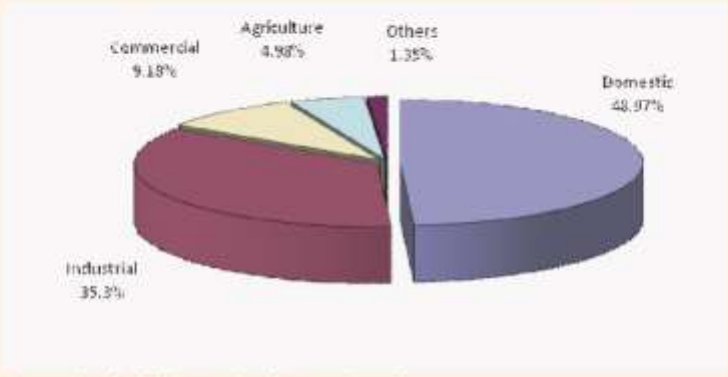


Source : BPC, Irrigation- Petroleum Product distribution and Activities 2010-2011

2.2 Consumption Pattern of Electricity

The major source of primary energy in Bangladesh is natural gas and 80% of the total power generation comes from gas, so saving of electricity through electric energy efficiency and Demand Side Management (DSM) measures would be a direct saving of gas supplies. The total installed power generating capacity of the country stood at 8,100 MW at the end of the first quarter of 2012. This included 4,329 MW in the public sector and 3,771 MW in private sector. If we look into the consumption pattern of electricity use, it will be seen that nearly half of its generation (48.97%) used for domestic purposes and industrial sector uses 35.3% of the total generation. Commercial use is the next to it (9.18%) and agriculture uses some amount of electricity which is 4.98%. This consumption pattern suggests that domestic and industrial sectors need much attention for saving of electricity. The consumption pattern of the electricity consumer is as follows;

Figure-4: Consumption pattern of electricity



Source : Bangladesh Power Development Board

With the growth of economy, the demand of electricity increases to a great extent. Government has prepared a Power System Master Plan 2010 (PSMP) to deliver stable and high quality electricity to the people of Bangladesh via the creation of a power network that will help realize comfortable and affluent lifestyles for all and to support GDP growth in the 7 to 8 percent range. Given such a GDP growth scenario, the added demand for electricity both grid and captive is expected to be as follows:

Table-1: Electricity demand added

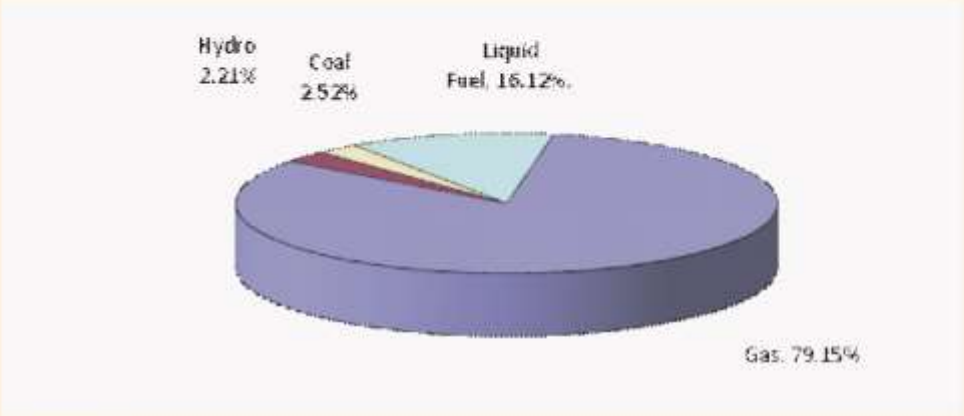
Year	Demand in MW
2015	11,618
2021	20,488
2030	36,659

Source: PSMP 2010

To meet the demand with reasonable reliability, installed generation capacity must be increased to 24,000 MW and 39,000 MW by 2021 and 2030. In line with this master plan, government has already taken short, mid and long term generation, transmission and distribution programs, which are at various stages of planning and implementation. According to the existing (2012) generation expansion program, total 12,000 MW of new generation will be added to the national grid within FY 2016.

Of the total net generation of 35,118 Million-kilowatt hour (MkWh) in 2011-2011, 43% was generated by the public sector and 57% by the private sector. The share of gas, hydro, coal and oil based power generation were 79.15%, 2.21%, 2.52 % and 11.86% respectively.

Figure-5: Percentage of Electricity generation by fuel



Source: BPDB

Although the situation of power generation has changed dramatically from 2009, actual demand could not be met during the last few years because of supply shortages caused by limited generation capacity. The situation was further exacerbated because of shortage of gas supplies to the power plants. On the other hand the quality of life appears to have improved in the past few years. The overall housing condition has improved in 2010 relative to 2005. Real income grew by 15 percent at the national level; as a result demand for energy is increasing manifolds.

Chapter — 3

Legal and Institutional Framework

Chapter iii

LEGAL & INSTITUTIONAL FRAMEWORK

3. Legal Frameworks

The legal framework for a dedicated central agency named as Sustainable and Renewable Energy Development Authority (SREDA) has been enacted. Government is taking steps to set up the authority and to make it functional. The SREDA will be the national nodal agency to promote and develop renewable energy and energy efficiency activities in public and private sectors. Until the SREDA is made functional, the Power Division is carrying forward its activities through a cell.

SREDA will broadly regulate and oversee the energy efficiency and conservation activities in industrial, agriculture,commercial and residential sectors.

In order to integrate energy efficiency in the development agenda, the GOB has put in place a legal, regulatory and policy framework to promote market based energy efficiency in the national economy, these include:

i The Electricity Act,1910 (under revision)
ii The National Energy Policy, 1996 (under revision)
iii Environment Conservation Rules (ECR) 1997
iv Bangladesh Energy Regulatory Commission Act 2003
v Policy Guidelines for the Enhancement of Private Participation in the Power Sector 2008
vi Renewable Energy Policy of Bangladesh, 2008 (under revision)
vii Bangladesh Climate Change Strategy and Action Plan 2009
viii Six Five year Plan (2011-15)
ix Power System Master plan-2010
x Gas Act 2010
xi Distribution Code
xii Grid Code
xiii Building Code
xiv BSTI Ordinance
xv Gas sector Master Plan
xvi Sustainable and Renewable Energy Development Authority (SREDA)Act 2012
xvii Energy Efficiency and Conservation Rules 2013 (under process)

3.1 Institutional Frameworks

Ministry of Power, Energy and Mineral Resources (MPEMR), is responsible for the overall planning and development of the power and energy sector. The ministry has two separate divisions namely- (i) Power Division and (ii) Energy Division and, each division is headed by a Secretary.

The Power Division has the overall authority for the electricity sector including implementation of energy efficiency and renewable energy programs. Until enactment of SREDA, a cell is working on energy efficiency activities and Power Cell is also supporting the activities. Different utilities in power sectors also have separate units to deal with energy efficiency issues in their respective organization.The Energy Division is responsible for exploration and management of natural gas and mineral resources.

The Bangladesh Energy Regulatory Commission (BERC) was created under an Act of Parliament in March 2003 with the mandate to regulate the electricity, gas and petroleum sectors. Apart from other activities, BERC is also empowered to ensure energy efficiency in generation, exploration, production, transmission and distribution levels of the related sectors.

3.2 Sustainable & Renewable Energy Development Authority (SREDA)

The Sustainable & Renewable Energy Development Authority (SREDA) has been enacted through Parliament, which has fulfilled a long felt demand of setting up a dedicated national organization to promote renewable energy use, energy efficiency and energy conservation in the country. SREDA's mandate is to promote renewable energy (RE), energy efficiency (EE) and energy conservation (EC). The activities of SREDA are focused on the following:

- Assisting the MPEMR to formulate appropriate policies on RE, EE and EC.
- Conducting studies, research, action research and pilot demonstrations for all stakeholders
- Provide training for capacity building at institutional levels.
- Providing advisory services to the private sector corporate bodies and government and non-government agencies/organizations.
- Promote regional and international experience sharing in the field of RE, EE &EC for capacity building.
- Manage an Energy Fund to promote innovative pilot projects in the country to enhance RE, EE & EC coverage in the country.
- Advocacy and awareness raising
- Documentation and dissemination of results and information

3.3 Role of SREDA for EE & EC

This Action Plan will particularly focus only on the EE & EC activities of SREDA and elaborate on them. To oversee and regulate the energy efficiency and conservation, the formulation of Energy Conservation and Efficiency Rules under the SREDA Act is at final stage, through which the following quasi-regulatory, promotional, developmental and facilitational roles will be played at different levels:

I. Quasi Regulatory Role

SREDA will aid and advise the concerned government monitoring and accreditation bodies e.g. BSTI, PWD and other related organizations, which will be delineated by their specific needs, through the following specific roles:

i. Prescribing minimum energy performance standards and informative labels for end use equipment and appliances.
ii. Assisting the government in the development and implementation of Energy Conservation Building Codes.
iii. Enhancing energy efficiency of high energy using sectors defined as designated consumers by-

- developing specific energy consumption norms
- certifying Energy Managers and Energy Auditors
- accreditation of Energy Auditors
- defining the manner and periodicity of mandatory energy audits
- developing reporting formats on energy consumption and action taken on the recommendations of the energy auditors.

II. Promotional Role

The SREDA Act provides the following promotional activities that need to be performed in order to mainstream energy efficiency:

i. Creating awareness and disseminating information on energy efficiency and its conservation.
ii. Strengthening consultancy services to the entrepreneur in the field of energy conservation.
iii. Promotion of research and development.
iv. Formulation of pilot projects and demonstration projects.
v. Facilitation of implementation of pilot/ demonstration projects.
vi. Promoting use of energy efficient processes, equipment, devices and systems.
vii. Encouraging preferential treatment for use of energy efficient equipment and appliances.
viii. Promoting innovative financing of energy efficiency projects.
ix. Creating provision for incentives of energy efficiency projects.
x. Implementing international co-operation programs relating to efficient use of energy and its conservation.
xi. Encouraging the use of energy efficient equipment and appliances.
xii. Encouraging consumers to use energy star labeled equipment and appliances.

III. Development and Facilitation

SREDA will aid and advise the concerned government monitoring and accreditation bodies e.g. BSTI, PWD and other related organizations, which will be delineated by their specific needs, through the following specific roles:

i. Maintenance of list of certified energy managers and energy auditors.
ii. Maintenance of list of designated consumers and their energy consumptions.
iii. Promotion of capacity building/training activities.
iv. Preparation and implementation of energy efficiency roadmap for utilities.
v. Development of testing and certification procedures and promoting testing facilities.
vi. Inclusion of CDM activities for prospective new and existing industries.
vii. Coordination among different ministries, departments, divisions and GoB agencies for adhering to a sustainable energy regime.
viii. Promoting innovative financing of energy efficiency projects.
ix. Evolving instruments and delivery mechanisms for implementing energy efficiency projects.
x. Promoting private-public partnership in efficient use of energy.

3.4 Over view of key steps leading to establishment of SREDA

The MPEMR, with initial technical assistance from UNDP, conceptualized SREDA and its roles, responsibilities, structure and framework of actions. Subsequently, with technical support from GIZ, the MPEMR prepared a draft Operational Plan of SREDA which outlines the mandate of the Authority; its various divisions, sections and units; and their functions, operational areas of engagement, and management structures. The Plan also has an organogram for SREDA and elaborates on it by defining the individual roles and responsibilities of all the organs of SREDA as well as the duties and responsibilities of officials and staff, at the individual level, who will serve SREDA. The Plan is supplemented by well-defined roles and responsibilities under the individual Terms of References (TORs) for the officials of SREDA.

After the enactment of SREDA, the following actions/activities will be required for SREDA operationalization:

a) Framing of Rules under this Act : RE Rules, EE & EC Rules, which are the elaboration of the Act and laid down procedures of operation for these.

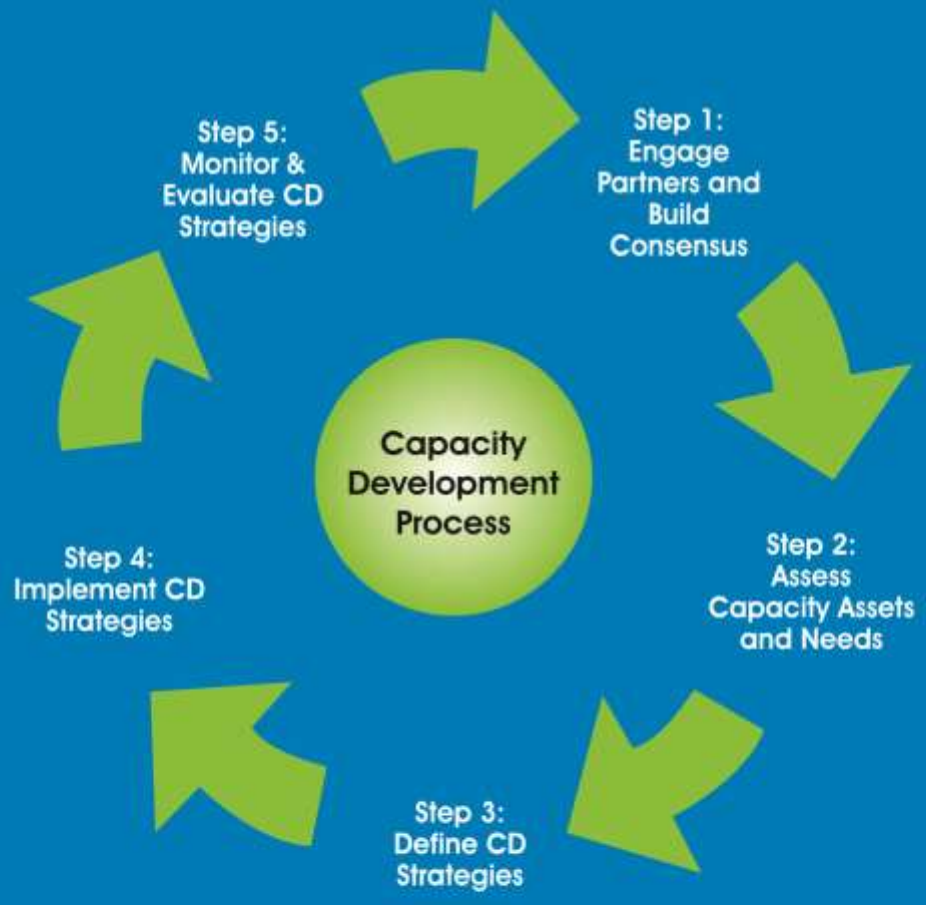
b) Preparation of Organogram, job allocation, creation of new post etc. as per requirement of Ministry of Public Administration(MoPA) and Ministry of Finance (MoF).

c) Preparation of Service Rules etc.

d) Recruitment /posting of personnel.

Chapter — 4

Capacity Development



Chapter iv

CAPACITY DEVELOPMENT

4. Human Resource Development in Energy Management

In energy management the human resource is the key issue to carry forward the energy efficiency and conservation programs. The status of human resource in energy management is at initial stage. Due to government's recent attachment of attention on energy efficiency issues, numbers of initiatives have been taken up in public and private sectors that require number of professional man power. But there exist a scarcity of man power working in this area, and this may be a challenge to move ahead with the energy efficient program in Bangladesh.

The officers of SREDA would require extensive training to improve their performance and understanding of the critical need and role of EE & EC in national economy and energy management and strengthen their technical and professional capacities to provide a common platform of assistance to other organization, both public and private. Their training may be conducted through the PSCDP project under the Power Division. Other upcoming training projects will also be supportive for the proposed SREDA personnel.

The ultimate aim of SREDA is to create a network through formation of energy efficiency units at different relevant GoB organizations with a linkage created with SREDA for their guidance and advice in promoting EE & EC. Thus there is no need for a huge set of manpower, rather the existing manpower in various organizations will form part of the national EE & EC network.

SREDA will work closely with the already existing energy efficiency managers at power plants and the various utilities to guide them. SREDA will also establish close cooperation with the private sector by creating linkages with appropriate personnel in different companies. Inter-ministerial focal points for EE & EC will be sought for coordination with SREDA so that the EE & EC Agenda can be taken full steam across sectors.

Chapter — 5

Action Plan for Energy Efficiency and Conservation

Chapter V

ACTION PLAN FOR ENERGY EFFICIENCY AND CONSERVATION

5. Energy Efficiency Action Plan

Research conducted by the McKinsey Global Institute (MGI), which finds that by adopting existing energy-efficient technologies that pay for them in future energy savings, developing countries could reduce their energy demand growth by more than half-from 3.4 to 1.4% annually in the next 12 years and reduce their energy consumption in 2020 by 22% from the projected levels. Thus, energy efficiency should have a higher priority than generation addition.

The generation is gradually increasing but there is a gap between demand and generation and there are still scopes to reduce the demand through energy efficiency activities. As a result of the use of energy efficiency management, the power demand growth may be reduced to 7% per year with comparison to earlier demand growth.

5.1 Overview ongoing Energy Efficiency Activities:

The summary of ongoing activities are as follows:

(1) Steps have been taken to introduce energy efficiency building concept in the National Building Code (revision). In addition to that energy efficiency measures, alternative and renewable energy subjects have been introduced in the national Text Book Curriculum of schools, madrasas and colleges.

(2) Installation of solar panels for solar power production in all the government, non-government and autonomous institutions are going on.

(3) Installation of energy saving CFL, T- 5 tube light instead of incandescent bulb and replacement of electronic ballast by magnetic ballast activities are going on.

(4) Free CFL distribution program (replacement of incandescent bulb with CFL bulb) has been conducted to demonstrate the energy saving and cost saving benefits of CFL and to encourage its use by consumers.

(5) Energy Star Labeling Program has been started to motivate the users to use energy efficient appliances. BSTI has star marked six appliances (fan, air conditioner, refrigerator, CFL bulb, Ballast and electric motors) so far.

(6) Efficient Rice Husk Parboiling Program has been initiated for replacement of 50 (fifty) thousand inefficient boilers with efficient ones, which will save about half of the rice husk for other uses.

(7) Improved Cook Stove Program is going on to replace the inefficient cook stoves in urban and rural areas to save the primary energy resource- biomass.

(8) Improving Kiln Efficiency in the brick manufacturing industry is going on which will save half of the fuel cost, while reducing carbon emissions by half.

(9) Electricity Week program has already been launched since 2010 with a view to promote energy saving campaigns at consumer and school levels. In this program, prizes were also awarded to the champions related to electricity saving at their level. Essay competitions on energy saving topics were conducted in the schools/madrasas and the successful children were awarded nationally to encourage them on energy saving issues. This program is nationally observed on 7th December each year.

(10) Some energy audits are being conducted in limited scale through Energy Audit Cell under Electrical Advisor and Chief Electrical Inspector.

Chapter — 6

Energy Efficiency in Power Generation

Chapter vi

ENERGY EFFICIENCY IN POWER GENERATION

6.Generation

In the management of public sector power generation, in addition to the effective loss of energy of the generators, caused by the need to correct low power factors in the distribution system, there are a number of major issues which have impacted on the ability of generator's output. Amongst the major issues is shortage of primary fuel. The program for fuel diversification is under process for the power sector with a view to shifting the total dependency from single fuel i.e. natural gas to multiple fuels. Recently the low pressure and shortage of gas supply and lack of proper future projection of gas reserves have been restraining the sustainable generation supply growth. The demand of electricity is increasing to a faster rate. Many power plants are old, its capacities are de-rating and subjected to be retired. Considering all other constraints, Government has prepared its generation plan. According to this plan the shortfall of power will gradually be overcome in 2015 (Table 4). The PSMP 2010 suggested gradual reduction on gas dependency and emphasized the use of coal in power generation.The following table shows the forecasted demand supply scenario:

Table 4: Capacity vs. Demand

Year	2010	2011	2012	2013	2014	2015	2016
				MW			
Max.Demand with DSM (PSMP 2010)	6454	6765	7518	8349	9268	10283	11405
Gen addition - Public Sector	255	800	632	737	2426	934	700
Gen. addition - Private Sector	520	963	344	1413	892	1707	2135
Regional Power Imp	Nil	Nil	Nil	500	Nil	Nil	Nil
Capacity Retired	Nil	Nil	40	344	649	462	632
Gross Gen. Capacity	5850	7613	8549	10855	13524	15703	17906
Net Gen. Capacity	5616	7308	8207	10475	13051	15153	17279
Dependable Capacity	4268	5628	6401	8485	10571	12274	13996
Max Surplus/ Shortfall	-2186	-1137	-1117	136	1303	1991	2591
	-34%	-17%	-15%	2%	14%	19%	23%

Source: BPDB

6.1 Operation and Maintenance (De-rating Issues)

There are two major causes of de-rating which are as follows :

(i) The lack of adequate supply in the electricity system which causes extreme pressure on supply line and thus scheduled maintenance is usually taken off.

(ii) The natural capacity decline over a typical 4-5 year "Wash Cycle", and unless units undergo the manufacturer's maintenance schedule there is a possibility of dropping the rating further in addition to the previous one. Under these circumstances, a number of generation units using the high-pressure boilers are needed for maximum performance.

Following table showing the de-rated capacities of the existing power plants in terms of fuel:

Table 5 : Power plants and their capacities

Power Plants	Installed Capacity (MW)	De-rated Capacity (MW)
Hydro	230	220
Natural Gas	5862	5417
Furnace Oil	1841	1752
Diesel	533	511
Coal	250	200
Total	**8716**	**8100**

Source : System Planning Directorate, BPDB

So far there is no law or regulation for regular inspections in public power units, so that each generator unit independently carries out its own inspection, based on its own judgment. In reality, it is difficult to shut down the plant due to a tight supply-demand situation for electricity and/or lack of inspection funds. This creates a situation of non-stop operations until the equipment breaks down, which has a tendency to lead to more severe damage and longer repair periods - a classic case of "break-down maintenance."

In order to ensure the implementation of regular inspections, the Power System Master Plan -2010 recommends the revision of existing rules and regulations, which enables the maintenance scheme to shift over from break-down maintenance to time-based or condition-based maintenance to maintain the plant at an effective level all throughout.

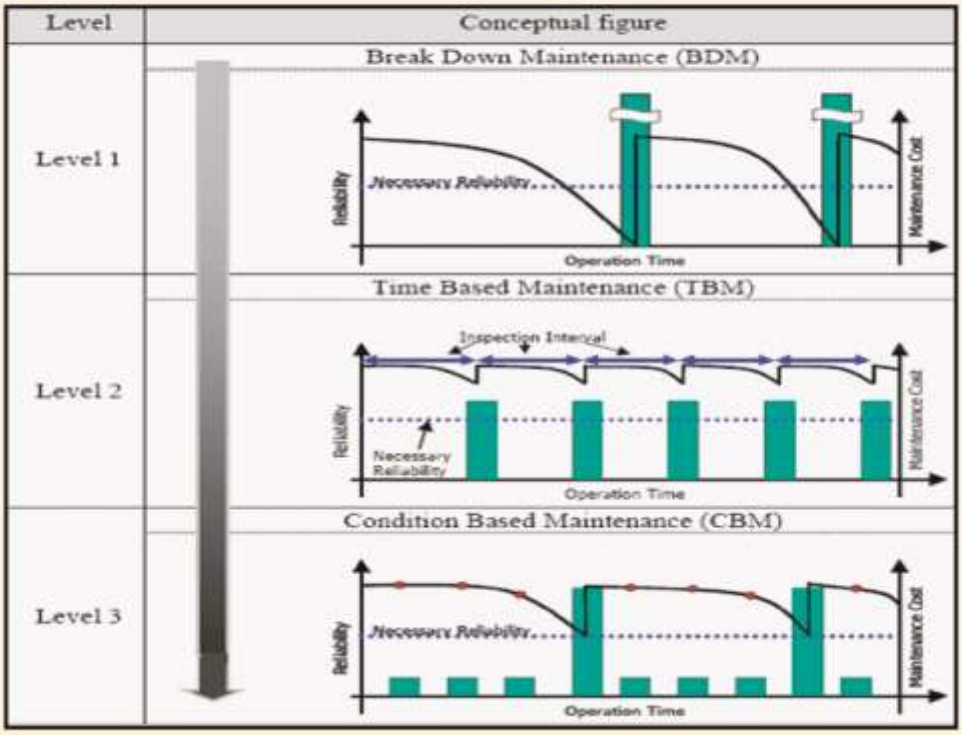


Figure 6 : Modern Maintenance System

So far, Power sector has fallen into a vicious circle where the power shortage has lasted for a long time due to multiple factors, such as lack of primary energy resources like domestic natural gas, decrepit power stations, imperfect maintenance and lack of funding. To solve these issues, the power division focuses on more short-term measurements rather than long-term ones.

Majority of the plants are incapable of reaching designated performance levels of capacity and efficiency. The main reason is that these maintenance activities are more restorative than preventive, which means most repairs take place after something breaks down. To meet the stable power demand, it is important to change over to the concept of "take care before breakdown" instead of the current "repair after breakdown". Power Division has given directives to proceed with regular inspection regardless of whether something is broken or not, such as (Time Based Maintenance (TBM))" or heeding to equipment predictors during monitoring (Condition Based Maintenance (CBM)".

6.2 Fuel Efficiency Issues

The average fuel efficiency in the public owned generation is 30.4% gross or 28.5% in terms of net generation. Steam plants and gas turbines have net outputs of 28.4% and 26.1% respectively.

The factors which contribute to the loss of efficiency of the units include the following:

i. Lack of regular maintenance.

ii. Insufficient fuel so that units operates below their optimum efficiency bands. For instance at 80% load, a steam turbine will operate at least at 15% net efficiency of the system.

iii. Lack of automated controls. In particular there are no flue gas analyzers installed in the public-sector owned units, this can add at least 1.5% net efficiency to the system.

iv. In-house use is high for many units, particularly the steam units. This is largely due to an unacceptably high forced rate where the plant continues to use high levels of power for in-house use.

To improve and set the targets for auxiliary consumption and for increasing the net efficiency of individual generation units, Key Performance Indicators (KPI) has already been set up by the Power Division. Achievement or failure of the targets of KPI will lead to financial incentives or punishments. This will improve the net efficiency and reduce auxiliary consumption. Importance has been given to conduct Fuel/Gas Supply Agreement with Petrobangla and BPC to ensure required fuel supply to the new energy efficient power generating units.

6.3 Availability

Average plant availability in the past 10 years in the public sector was 67% which is reported to be very low.The average forced outages and maintenance were 23.4% and 9.6% respectively. The availability of high efficiency plant affects the amount of running time that will be required by less efficient plant, and thus has direct impact on total system fuel cost. Secondly, every time a unit is switched off due to a forced outage, other units incur start-up costs which burn fuel and do not deliver energy to the system.

The total system plant load factor in Bangladesh is 58%, and without the seasonally constrained Hydro, the load factor is only 59.4%. This is dedicative of under-loaded base load plants and the frequent intermittent use of small peaking plants, given that the annual load factor is approximately 75%. Fuel shortages are to blame in part, but maintenance of the base load units, in particular, remains inadequate.

6.4 Combined Cycle Power Plants

Power sector is the biggest consumer of primary energy. Huge amount of gas and oil are required to generate electricity and for simple cycle gas turbine a huge amount of heat is being released in the air as waste. The waste heat could be used for generating further electricity. By thumb rule, about 50MW of electricity could be generated from waste heat of 100MW power plant. BPDB and other generation utilities have undertaken plans for adding combined cycle in the existing power plants. BPDB is also making a study for efficiency improvement and repowering of existing power plants.

Table 6 : Plan for converting to Combined Cycle up to 2016

Sl.	Description	Capacity Addition (MW)	Owner-ship	Fuel	Expected COD	Present Status
1.	Conversion of Sylhet 150 MW to 225 MW CC: HRSG and ST	75	BPDB	Gas/ HFO	2014	DPP has been sent to Planning Commission for approval
2.	Shahjibazar(2x 35): HRSG and ST	35	BPDB	Gas	2014	DPP has been sent to Planning Commission for approval
3.	Baghabari (100): HRSG and ST	50	BPDB	Gas	2014	Recasted DPP has been sent to ministry
4.	Sirajganj 150 MW Peaking	75	NWPGC	Gas	2013	Land development and pile work is going on
5.	Ghorasal Repowering of 3rd unit from Simple Cycle to Combined Cycle.	±400	BPDB	Gas	2015	Retender will be invited soon
6.	Khulna 150 MW Peaking	75	NWPGC	Gas/ HFO	2013	
	Total:	**710MW**				

Source : BPDB

6.5 Key Issues Affecting Power Generation

- **Low efficiency :** Some of the old power stations are running beyond economic life cycle so they are running at higher heat rate or lower efficiency. Proper maintenance is not regularly implemented for various reasons.
- **Low plant factor :** This steam from capacity de-rating, higher forced outage of power plants and shortage of fuel.
- **Lack of maintenance practice :** This result from lack of timely overhauling and maintenance, lack of spare parts and lack of decentralized authority to carry out decisions at the plant level.
- **Lack of Expertise :** to operate and maintain the plants as per standard practice.

6.6 Energy Efficiency Improvement Intervention in the Power Generation Sector

- ✓ Rehabilitation of the old and inefficient power plants as per the Policy Guidelines for Enhancement of Private Participation in the Power Sector.
- ✓ Replacement or repowering of some of the power plants that are still running at very low efficiency and their availability beyond their economic life time.
- ✓ To take possible energy efficiency measures, each power plant must have a responsible technical person who will identify the possible energy loss, and take measures for prevention of the same in the power station and assist the energy audit system in the power sector. This person should be trained and strengthen to perform the job responsibly.
- ✓ Timely procurement of spare parts and adhering to the maintenance schedule must be followed by all the power plants for keeping the plant operational at standard level.
- ✓ In-house capacity building and proper training of the operation and maintenance people of the power plants as per standard practice.
- ✓ Online Interface meters are to set up at the energy dispatch point from the power station to the grid to monitor the energy generation.
- ✓ All the new coal based power plants are to be designed with supercritical boilers and gas based simple cycle base load power stations as combined cycle ones for higher energy output.
- ✓ The peaking power plants will not be allowed to run in base load to avoid unscheduled heat loss.

Chapter — 7

Energy Efficiency in Power Transmission

Chapter vii

ENERGY EFFICIENCY IN POWER TRANSMISSION

7. Transmission Sector

The losses in transmission, whilst not high and are mostly at the level of international standards for a highly concentrated system. The network operation has suffered problems with insufficient capacity and the prevailing need to correct voltage drops, which leads to less efficient dispatch. The following table sets out systems operations for the past 8 years:

Table 7 : HV Transmission Losses Bangladesh

Year	GWh Net Generated	GWh Transmitted	Losses (GWh)	Losses (%)
2004-05	21408	20430	723	3.42
2005-06	22978	21955	783	3.44
2006-07	23267	22053	718	3.15
2007-08	24946	23962	984	4.06
2008-09	26533	25584	949	3.80
2009-10	29247	28344	903	3.42
2010-11	31355	30442	913	3.31
2011-12	35118	34100	1018	3.22

Source : PGCB

There are currently two voltage regulation projects underway which will rapidly improve the line losses, these will add approximately 950MVar of capacitor banks and reduce line losses by 128GWh per year.

There is a lack of coordinated System Planning causing both congestion (increasing losses) and System Stability issues. Transmission planning is a response to new generating plants, and is not well coordinated, least cost approach. This has resulted in very large concentration of power(e.g. 1000MW at Haripur), which in turn lowers transmission efficiency and requires upgrading of lines to reduce losses whilst at the same time leaving other areas underutilized. This suggests that there is much greater flexibility in generation locations than is currently used.

To improve and set the targets to reduce transmission system loss of Power Grid Company of Bangladesh, Key Performance Indicators (KPI) has already been set up by Power Division to 2.62% by FY 2013. Achievement or failure of targets of KPI will lead to financial incentives or punishments. This will improve the transmission system loss of the grid system. Economic merit order dispatch are being followed in load dispatch center and distributed power generation from coal power plants planned in the power system master plan will help to reduce the transmission system loss.

7.1 Key Issues in Transmission sector

The key issues in the transmission system concerning energy efficiency can be summarized as:

- o Higher system loss and voltage drop
- o Low power factor
- o Insufficient transmission capacity in certain areas
- o Overloaded transformer in certain areas

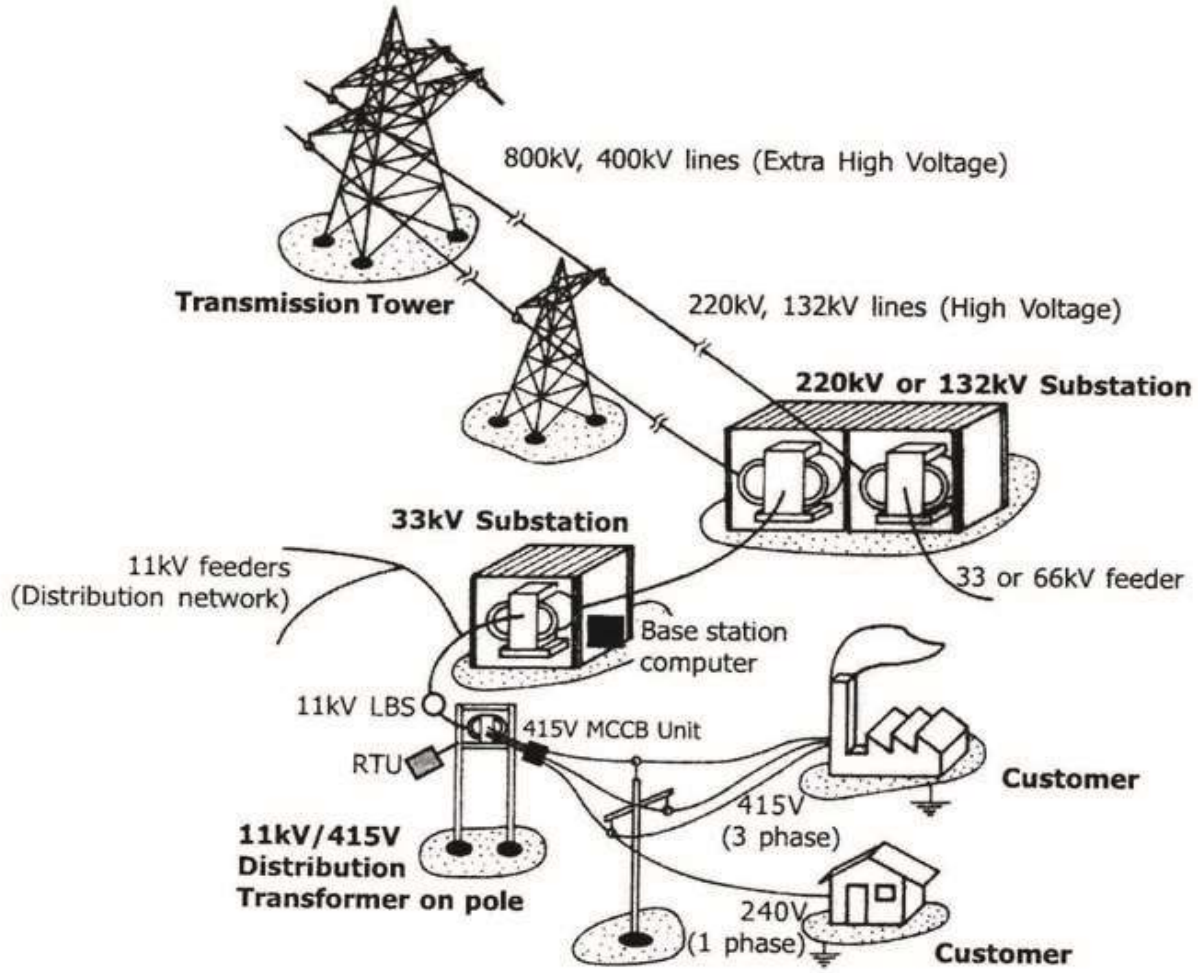
7.2 Action for Transmission Network Management of Long Distance Gridline

Energy efficiency improvement interventions in the power transmission sector are as follows:

- ✓ Power factor and voltage drop : There are currently two voltage regulation projects underway which will rapidly improve the line losses. These will add approximately 950MVar of capacitor banks and reduce line losses by 128GWh per year.
- ✓ Prevention of Forced outage, blackout and synchronization mismatch : There are some mismatches in the current level of fault setting of the large substations around Dhaka. This could lead to system intervention and blackout. Power Grid Company of Bangladesh (PGCB) should identify the substations and take necessary correction and replacement of undersized protective devices for smooth operation.
- ✓ Upgradation of line and transformer capacity : PGCB should identify the lower loaded transformer and transmission line considering future demand -generation growth.
- ✓ Automatic Generation Control, Smart grids and System Metering : PGCB should regularly evaluate the economic load dispatch merit order, current load dispatch system as well as identify the proposed measures to be adopted to enhance energy efficiency. This will include automatic generation control in SCADA (Supervisory Control and Data Acquisition) system, smart grids, proper system metering etc.
- ✓ In-house Capacity building and HR Strengthening measures : PGCB will identify possible training programs to promote in-house measures in transmission network operation and maintenance.
- ✓ Islanding the grid connectivity : for managing long distance grid lines for efficient management of the grid loss.

Chapter – 8

Energy Efficiency in Power Distribution



Chapter viii

ENERGY EFFICIENCY IN POWER DISTRIBUTION

8. Distribution Network

Efficiency gains in the metropolitan distribution systems have rapidly increased over the past 9 years. Total losses in the system were 14.72% at the end of 2007-08 and are expected to drop in single digit within a few years. Two major contributing factors have been identified: (i) upgrading of overloaded components and (ii) subsequent reduction of theft. Whilst the overall Dhaka system still has a low power factor(PF), averaging 0.85, the introduction of KVA tariff approved by BERC, is compensating for some of the losses; and at the same time providing a signal to the consumers for up-gradation of their equipment or changing the procedures to reduce PF.

The lack of financial viability of most of the PBSs in the REB, and in several of the urban utilities, poses a major constraint for internal funding of the necessary infrastructure to alleviate overloaded and aging systems.

Long distribution lines (33 KV and 11KV), over loading of distribution transformers, hooking of distribution line from another distribution line result in huge voltage drop and energy loss especially in REB distribution lines. Steps are being taken to solve them and these technical issues will be solved in phases.

Table 8 : Efficiency Improvement Trend of Transmission and Distribution lines

Item	FY 2000 -2001	FY 2005 -2006	FY 2007 -2008	FY 2008 -2009	FY 2009 -2010	FY 2010 -2011	FY 2011 -2012
Transmission Line (230 &132kV)(Ckt. Km.)	3738	6844	7848	8330	8465	8616	8949
Distribution Line (KM)	176179	264891	256143	259963	269877	274347	281123
Distribution Loss (%)			14.72	14.57	13.49	12.66	12.10
System Loss (Tr.&Dist.) (%)	28.43	21.30	18.16	17.25	15.90	15.21	14.50

Source : Power Cell

8.1 Key issues related to Energy Efficiency in the Power Distribution Sector

The key issues related to system loss in distribution sectors are-

- long distance distribution lines and feeders as well as overloaded distribution substations.
- Low power factor.
- Insufficient metering system and proper billing and lack of standardized service drop practice.
- Pilferage of energy.

To improve and set the targets to reduce distribution system loss of power distribution utilities of Bangladesh, Key Performance Indicators (KPI) has already been set up by Power Division. Achievement or failure of targets of KPI will lead to financial incentives or punishments.

8.2 Energy Efficiency Interventions in the Power Distribution Sector

- ✓ Upgradation of distribution lines and substations : Distribution utilities will identify the areas with lines and substations overloading and issues concerning load distribution and feeder lines and prepare a priority list for replacement and financing. Load balancing in the distribution areas should be followed.
- ✓ Power Factor Improvement : Power distribution utilities will assess the current distribution power factors as well as prepare action plan and take necessary measures to address this issue.
- ✓ Modern Metering and service drop : Distribution utilities will adopt standard service drop practices and proper metering system. Each power connection should have proper metering (preferably Pre-paid meters for Low Tension consumers and remote metering for High Tension consumers) and billing system.
- ✓ Prevention of pilferage and in-house Capacity building : distribution utilities will identify possible pilferage prevention measures and proper training to enrich in-house capacity building of the personnel serving in the sector.

Chapter — 9

Initiatives for Demand Side Energy Efficiency

Chapter ix

INITIATIVES FOR DEMAND SIDE ENERGY EFFICIENCY

9. Current Country Context of Demand Side Management (DSM)

In Bangladesh, there is a widespread prevalence of low cost, less efficient, high energy consuming equipment which do not take into account the life cycle costs, particularly where the energy cost component is very low and subsidized. Often in buildings, where insulation and energy saving measures are overlooked deliberately to save costs by the developers, the end user unknowingly suffers from higher energy costs over the time.

9.1 Demand Side Management through Metering

Introduction of meters in various spheres can effectively add to DSM of power consumption and contribute to saving a good deal of power in many ways. This additional power can be used for peak time compensation or for diverting to industries.

a) Time of Use (TOU) metering

Time of use meters (peak and off peak) are under rollout for all commercial and Industrial users in the Dhaka Metropolitan region. Over 41,000 meters were installed in 2009 and the consumers' response by shifting load to off peak has increased the system load factor by nearly 3%. There is still scope to increase this further to about 7% with greater awareness and an increased delta between the peak and off peak tariff.

b) Prepaid Metering

To minimize technical and non-technical losses, BPDB has undertaken a pilot project in Chittagong for pre-paid meter installation. The distribution areas in Chittagong were chosen as the pilot project area, where 12,000 single-phase meters, 1000 three-phase meters, 150 check meters were installed in the 11 KV feeder areas of Stadium and Khulshi along with insulated steel-reinforced aerial concentric conductor cables. DESCO has a pilot prepaid metering project in Uttara and the BPDB is implementing several additional pilot projects in Agrabad under Chittagong district, Syllhet, Bogra and Sirajganj district. Result from the latter pilots demonstrated an almost 10-20% reduction in unusual consumption, which inspired other utilities to install Unified Advance Pre-paid Meter all over the country. Inthe first phase, 35,000 pre-paid meters will be installed and 2 million meters will be installed in subsequent phases.

9.2 Identification of Energy Inefficient Equipment and Appliances

By taking appropriate steps through imposing restrictions the production, importation and identification of energy inefficient equipment and appliances will be phased-out from the market gradually. This will contribute significantly to energy conservation in the country. BSTI is now working on standardize 6 products for making them energy efficient through its Standards & Labeling project. However, more number of equipment and appliances need to be brought under proper standards and labeling program in the country. Also, there needs to be sound monitoring of the import of electrical appliances to ensure that no old energy inefficient technologies are brought into the country

9.3 Demand Savings Program

More recently the Government has taken initiatives to control consumption of electricity in the public and private sectors. The Government estimates that a saving of around 350MW of electricity has been achieved by undertaking actions like keeping the urban shopping malls and shopping centers closed after 8 p.m. Consumers are encouraged to keep the temperature of air-conditioners at 25° Celsius or higher and are prohibited to use air conditioner in the evening peak hours. Staggered working hours and holidays have also been introduced to reduce peak demand. In addition, the following interventions may be imposed namely:

(i) Introducing master meter in market place
(ii) Discouraging unnecessary lighting and illumination in community centres, shops and market places, commercial residential buildings and filling stations. In particular saree shops, auto showrooms and small shops are using way too many lights including high power fluorescent bulbs and yellow sodium lights. Steps should be taken banning such lights and restricting the shops to use a certain number of CFLs based on a fixed square feet of space.

These initiatives will be continued as a part of awareness generation program.

9.4 Energy Efficiency in the Construction Sector

The New Building Code is under preparation which would address the EE issues and practices in buildings. The Code includes a set of minimum standards for electrical and electronic engineering installations covering all building types: residential, apartments, commercial, office buildings and warehouses etc. Several international and regional documents, codes and regulations have been used as references in developing this Building Code.

The EE and Sustainability Section of Building Code is aimed at enhancing the design and construction of buildings through the use of concepts having positive environmental impact; sustainable construction practices involving energy efficient bricks; encouraging efficiency and conservation of energy, water and building materials; and promoting resource efficiency. It proposes both mandatory and voluntary measures for "green buildings".

In future, SREDA in consultation with the relevant organizations will identify the possible areas of incentives and provide certification for green buildings.

9.5 CFL Distribution Program

Government has already launched CFL distribution program all over the country with the support of World Bank. A total of 18 million CFL will be distributed free of cost to the consumers in two phases. 10.5 million CFL have been distributed in 2011 and the rest of 7.5 million CFL will be distributed within December 2013. Nearly, 400 MW power is expected to be saved through this program. In the meantime, LED is considered to be more energy efficient and already in the market. Power Division/SREDA will consider to undertake similar program to promote LED in the country. Awareness raising program will be continued for the use of energy saving bulbs (i.e. CFL, LED etc.).

9.6 Street Light Program

The government is considering the replacement of street lights by LED. Already a few streets in Dhaka have been converted to solar street lights for show-casing the effect through public-private partnership. Conventional street lights will be replaced subsequently by LED or solar lamps in phases. The government also has a plan to discontinue the production of incandescent bulb in near future to support the above program.

9.7 LED Security Lighting in Urban Areas

To reduce the large peak demand for lighting in the night time, LED security lighting will be introduced in urban areas. Power utilities will conduct public awareness program to install solar/LED security lighting system in industrial, commercial and large housing areas preferably powered by solar system.

9.8 Commercial and Industrial FL Re-lamping Program

Replacement of magnetic ballast set of T8 4-ft fluorescent light (FL) with latest generation electronic ballast energy saving type T5 18mm 4-ft FL set can save an average of 11 W per lamp and also give relatively more light output. Replacement of magnetic ballast with latest generation electronic ballast can also save an average of 7 W per lamp. The replacement program is already going on in large industries and domestic complexes. Commercial and industrial FL Re-lamping program will be more effective by using good quality of EBs & T5 lamps.

Chapter — 10

Energy Efficiency and Conservation in Key Program Areas

Chapter X

ENERGY EFFICIENCY & CONSERVATION IN KEY PROGRAM AREAS

10. EE in the Industrial Sector

Power and industrial sectors are the main consumers of primary energy. Due to inefficient and old boilers, furnaces and motors used in the industries, a huge amount of energy is being wasted.

As per provisions of SREDA Act, government should notify the sectors as Designated Consumers in order to bring them under EE compliance. For that to happen, firstly there is a need to conduct a bench mark survey in the industries to identify and prioritize the sub-sectors considering the amount of use of energy by them and its wastage. Based on the survey report, the government can go for the following actions :

- Policy decision on how to obligate the sector to reduce their energy consumption.
- Creating enabling situations for their capacity building as may be necessary with the support of SREDA.

10.1 Energy Audit Program

As per provision of SREDA Act it is mandatory for all the designated energy consumers to get energy audit conducted by Accredited Energy Auditors and to designate or appoint an Energy Manager.

The SREDA Act has mandated the Authority to look after the Energy Auditing activities. SREDA will carryout the Certification of Energy Managers & Energy Auditors in order to create a cadre of professionally qualified energy managers with expertise in energy management, project management, financing and implementation of energy efficiency projects and policy analysis. To conduct these activities the necessary regulations and documents will be prepared.

10.2 Improved Cook Stove Program

Cooking is the other area where a large amount of primary energy is required. Basically firewoods are the most widely used form of biomass for cooking around the country, particularly in rural areas which bears the larger segment of population. About 82.6% of the people are using firewood and agricultural residuals for cooking purpose. An amount of 8 million cft of wood are used annually of which, 63% is for cooking and 37% is for industrial and commercial purposes. This is leading to rapid deforestation in the country and reducing natural forests which are carbon sinks and thus acts against global warming. Improved cook stove (ICS) is the suitable alternative for increasing fuel efficiency in rural cooking system, which brings the following benefits:

- The introduction of Improved Cook Stove (ICS) can save nearly 50% of energy and keep the kitchen smoke free.
- Bring major health benefits as the design draws off smoke and toxic gases, reducing the high prevalence of asthma of mother and child in the country from indoor air pollution.
- Each ICS can save 1.7 tons of CO2 per year thus making a net contribution to global emissions reduction for reducing the effects of climate change.

SED project of GIZ has developed a business model to make the ICS program in a sustainable manner. Up to now 0.4 million of ICS has already been distributed through their partner organizations under this project. It is targeted 100% coverage of ICS within 2030. Awareness generation will be required to popularize this stove and an integrated and coordinated effort will be needed to reach the target. A separate action plan will be developed to disseminate this program in larger scale to cover 30 million households by 2030.

10.3 Rice Husk Parboiling Program

In Bangladesh about 90% of all harvested rice is parboiled and most of them in conventional boilers. There are nearly 50,000 rice husking[1] mills around the country which produce about 28 million tons of rice a year. The husking mills are usually operated by traditional technology using rice husk as fuel. This system is not safe and energy efficient and produce smokes that pollute the environment and create health hazard.

Improved Rice Husk Parboiling System (IRPS) developed by the Sustainable Energy for Development (SED) project of GIZ has demonstrated a saving of up to 50% energy used for parboiling. These systems are smoke free and reduce the threat of possible boiler explosions.

SED project is providing technology and sensitizing the mill owners to popularize this technology. Besides, commercial banks are being mobilized to provide credit support to replace these boilers. As of now 40 IRPS husking mills have replaced the traditional system.

The SED initiative may save up to 2-4 million tons of rice husk, which can be used to generate electricity (> 100 MW)[2]. To replace the total traditional system in the country, a massive program needs to be initiated by involving Bangladesh Bank and other commercial banks. A steering committee will be formed to coordinate the program and annual target will be fixed to replace all boilers within 2021.

10.4 Improved Brick Kiln Program

In the last 15 years, Bangladesh has enjoyed consistent economic growth of five to six percent annually. Rapid urbanization in the country has created a booming construction industry and spurred the production of 8.6 billion bricks each year, with demand for the bricks rising at an annual rate of about 5.28 percent[3].

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[1] *Source: http://www.teriin.org/technology/rice-husk-fired.php*
[2] *Adapted from http://www.ap-net.org/documents/seminar/21st/15_Mirza_Bangladesh.pdf*
[3] *Source: http://chimalaya.org/2011/06/24/energy-efficient-brick-technology-in-bangladesh/*

Yet, the brick-making industry remains largely unregulated. About 4000 brick kilns are listed in Bangladesh (actual data would be much higher it is anticipated as more number of kilns are growing by the day) and most of them are energy inefficient and highly polluting to the environment. The industry emits around 6 million tones of CO2 annually, making it one of the largest sources of greenhouse gas emissions in the country.

The United Nations Development Program (UNDP) and the Global Environment Facility (GEF) have introduced energy efficient, smokeless brick-making technology to curb greenhouse gas emissions in Bangladesh through a project titled "Improving Kiln Efficiency in the Brick Making Industry". For the energy efficient kilns, the new device known as the Hybrid Hoffman Kiln (HKK), originally developed in Germany, was used to replace the older, highly pollutant brick-making technology. It was later modified in China and remodeled to accommodate the specific needs of Bangladesh's brick-making industry. As a result, the new brick-making technology is now maximally efficient, eco-friendly and cost-effective.

Following successful demonstration of the energy efficiency kiln in Phase-I, 15 additional demonstration projects have been undertaken in Phase-II. The World Bank has adopted the UNDP model to undertake a program for replacing another 14 brick kilns. With the newly introduced smokeless technologies, the industry will operate under higher efficiency, better energy control capabilities, higher rates of production and processing, all of which could bring about reduced production cost, improved product quality, lower local pollution and reduced greenhouse gas emissions. Demonstrations show about 50% or so reduction in CO2 emissions. It is targeted to replace all traditional brick kiln by the energy efficient brick kiln by 2021.

10.5 Introduction of Solar Water Heater

Solar Water Heaters (SWHs) are replacing gas and electric heaters in urban areas to reduce energy consumption in many countries. This is now widespread in many developing cities and has become a standard practice in Nepal and most of India as well. The market for solarwater heater and its manufacturers are well established in the region. Several companies in Bangladesh are also selling solar water heaters. Introduction of SWH to replace gas and electric heater will be introduced in the new Building Code Updates.

A pilot project has been implemented in the tanneries and significant improvement in energy use was noted, which created lot of interest in that sector for SWH. Therefore, it needs further scaling up in other leather industries and expansion into other industries and service sectors with special focus on dyeing, textile, hospitals and hotels in Bangladesh.

All rest houses belonging to the government and semi-government organizations will be brought under solar water heating system. Government will take action to promote solar water heating technology in industrial, commercial and residential sectors as well through SREDA.

10.6 Retrofitting Urea Fertilizer Plants for Improving Energy Use

Seven Ammonia-Urea complexes (six public and one international/private) have been built since 1961. The total installed capacities of these plants are 2.9 Million Tons of urea and 1.9 Million Tons of ammonia per year. Almost all the plants are more than twenty years old. The specific energy consumption (SEC- the natural gas in MCF consumed to produce a ton of urea) of those plants are more than double (46 MCF/Ton urea) that of state-of-the art urea plant (22 MCF/ Ton urea). Therefore, the best option is to replace the very old plants by new ones and retrofit the other plants where possible. Power Division/SREDA will take up the issue with the Ministry of Industry for rehabilitation and modernization of the urea fertilizer plants to make them energy efficient.

10.7 Steel Mill Furnace Rehabilitation for Energy Efficiency

The steel re-rolling mills process steel ingots into iron rods and flat bars. The total annual production of all mills in Bangladesh is about 2.5 million tons. The process used in Bangladesh is fairly crude and energy inefficient. Out of 250 mills, 225 are not using modern technologies. The Specific Energy Consumption (SEC) of different mills are relatively high at about 75-90 cubic meters of gas per ton of steel compared to a modern mill of energy consumption with about 30 - 40 cubic meter of gas per ton of steel.

Titas Gas Transmission & Distribution Company along with other gas distribution companies will conduct the motivational campaign among the mill owners and the industry entrepreneurs to improve the efficiency of the industry's boilers and furnaces. The Titas employees will receive special training very soon to conduct the energy audit of the industry's boilers and furnaces.

10.8 Energy Efficiency of Gas Burners

The traditional gas burner wastes huge amount of natural gas in the domestic sector. The majority of cook stoves are made locally and are not efficient. These are fitted with inefficient burners and low quality regulators. They do not have any built-in ignition system. Lighting these stoves are cumbersome and also hazardous due to which many users keep the burners on and idle, rather than repeating the exercise of putting them off and on frequently. So there is a need to standardize the gas burners and to make it compulsory in marketing this product.

a) Improved Natural Gas Stove

Introduction of improved natural gas stove has the potential to replace over 4 million stoves and save 4 billion cubic feet of natural gas per year. The Titas Gas Distribution Company will standardize the improved gas burner and subsequently the Energy Division will take necessary actions to gradually phase out all inefficient gas burners through all gas distribution companies by 2015.

b) Introduction of Gas Meters

The government charges for gas use goes by fixed monthly rates for domestic and industrial consumption rather than on the amount of gas consumed. This encourages the users to keep the burners on and burning the gas as they pay the same at the end of the month. This can only be stopped by installing gas meters. Some piloting in urban areas has provided good results. The efforts need to be expanded to cover the whole country as soon as possible.

10.9 Utilization of Exhaust Heat/steam

A large number of industries and power plants are producing heat and steam as by-products or waste. The waste heat of industries/power plants could be used as a source of energy for cogeneration in other industries such as for chilling, drying or any other suitable purposes. With this technology the optimal energy may be used by an industry while leading to diversification and expansion. The cogeneration technology, though common in the region, would require some demonstration in Bangladesh. Power Divisions will identify suitable industries and implement demo-projects by 2015 to popularize it. Besides, a study will be conducted in captive power generation to explore the possibilities of cogeneration in this sector and scale up the good practices that have made by some industries.

10.10 Cogeneration of Energy from Sugar Cane Bagasse

Bangladesh, having about 15 cane sugar mills, annually produces around 8,750,000 million tons of bagasse which is sufficient to produce power with minimum investment. In the north-western region, which is starved for energy, the sugar cane bagasse will be a great energy resource for cogeneration. This is also an advantage as all the sugar-producing units were installed in the same region. A feasibility study will be conducted to assess the cost effectiveness of setting up sugar bagasse based power plants in this region.

10.11 Energy Star Labeling Program

A legal instrument will be necessary to launch the Energy Star Labeling program. SREDA Act and EE&EC Rule will provide legal support to start this program. A regulation will be formulated for proper implementation of this program.

Awareness generation will be needed for the industries/importers/other stakeholders to embrace this program. Hence, number of seminars will be arranged involving different stakeholders .

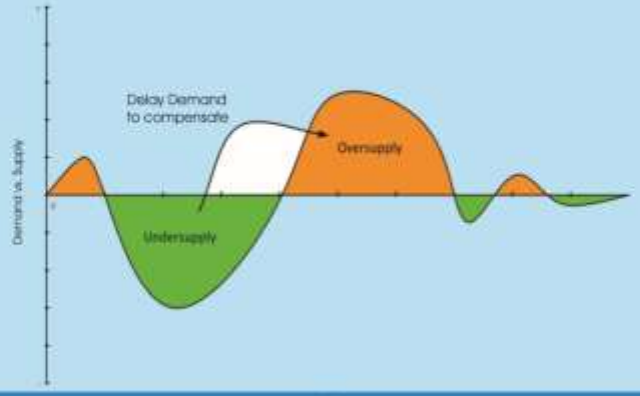
BRESL project is assisting the BSTI to develop energy standards and leveling with improve mitigation technology for six common electrical appliances e.g., (i) air-conditioners, (ii) refrigerators, (iii) electric fan, (iv) electric motors, (v) electronic ballasts for fluorescent tubes and (vi) CFL. This will help to promote energy efficient equipment to the end users at domestic and commercial sectors. In this regard, establishment of full-fledged testing laboratory in BSTI is also under process. SREDA will prepare a regulation on Energy Star Labeling program to bring it under legal coverage.

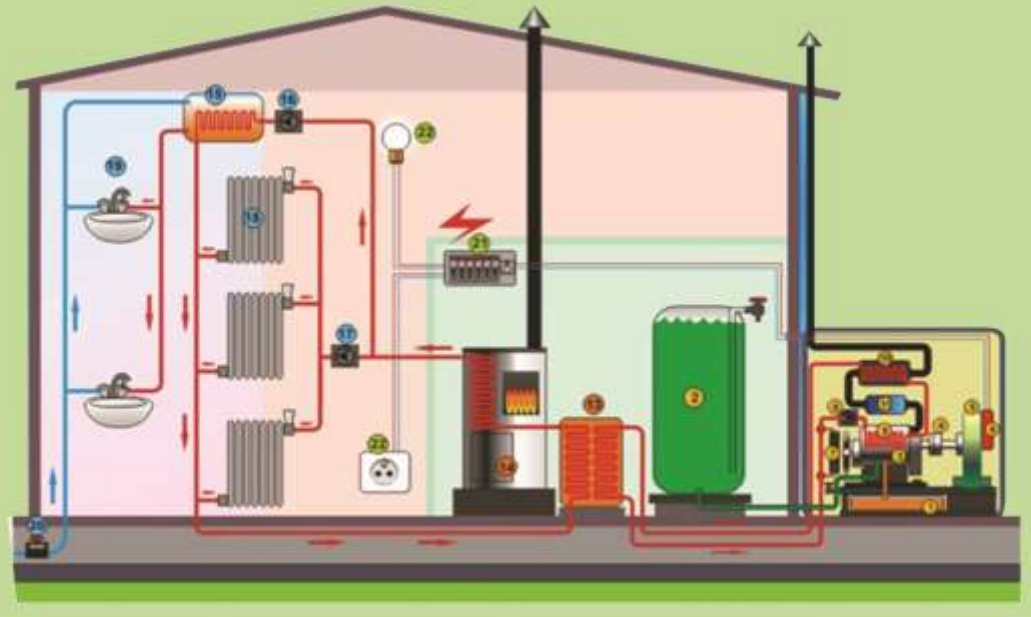
10.12 Energy Efficiency of Boilers :

Most of the industries are running with inefficient boilers. Air-fuel ratio regulators are also not available in most of the industries such as power plants, fertilizer industries, paper industries etc., which causes wastage of huge quantity of fuel. Gas utilities will identify the industries running with inefficient boiler and will keep pressure to these industries to improve their boiler efficiency and to ensure the air-fuel ratio regulator .

Chapter — 11

Other Important EE and EC Interventions





Chapter xi

OTHER IMPORTANT EE & EC INTERVENTIONS

11. EE & EC Support Activities

In addition to the targeted program interventions mentioned above, there needs to other very important interventions related to policies, incentives, capacity building and studies, R & D and awareness raising to make the approach to EE & EC holistic. Without the support activities mentioned below, the programmatic interventions will not be very successful as stand-alone efforts. The support activities will provide the guidance and encouragement to adopt to energy efficient practices and build national capacity for it.

11.1. Policy and Regulation

To deal with EE and EC issues, separate rules will be formulated under the SREDA Act. This will be the elaboration of the SREDA Act and will support and regulate the energy efficiency and conservation issues in the country. This set of rules will be treated as an instrument for dealing with the EE & EC issues and a number of regulations will be prepared to deal with tasks specified for follow-up of the rules. Preparation of both the rules and regulation are underway and is expected to be completed by June December 2013.

The following Regulation, not limited to the SREDA rules only, will be required for the successful implementation of energy efficiency program by SREDA:

1. Regulation for Energy Star Labeling Program
2. Regulation for Energy Audit Program
3. Regulation for Incentive to Encourage Energy Efficiency and Conservation in Industries

11.2 Creating Incentives for EE & EC

Best results can be achieved by providing concrete incentives at all levels - individual, corporate, industrial - for energy saving. For example, in other countries, a certain percentage of an individual's household electric bill is reduced if he/she is able to reduce consumption of electricity to a certain extent than the previous bills. Similarly, industries are provided concessions in certain ways if they are able to reduce energy use by adopting newer technologies, equipment and appliances. SREDA is expected to come up with appropriate rules to this effect. But until SREDA comes into being, the Power Division may initiate some rules in this regard to test the ground.

11.3 Institutional Strengthening & Capacity Building

To Ensure EE & EC agenda of the government, emerge upgradation of the professional efficiency of the utility employees and placement of right person in the right position is deemed necessary along with regular relevant training programs at home and abroad. In this regard, the following programs/activities may be adopted:

- Human Resources Development of SREDA
- Capacity development of the officers of concerned utilities
- Capacity development of manufacturers
- Capacity development of importers
- Capacity development of Customs and Excise officials
- Training to the different stakeholders
- Laboratory capacity building of key institutions like SREDA, BSTI, BUET, BCSIR, etc.

11.4 Benchmark Study for Energy Sector (equipment, appliances and sectoral)

The benchmark survey is essential to get a clear picture about the energy reserves, consumptions by different sectors including power generation. The benchmark survey is essential for forecasting future energy needs, planning for national energy security of the country and management of the energy sector in the long run.

11.5 Research and Development Activities

Plan is underway to technically and financially capacitate Research Organizations in demand based EE & EC research work. Existing research institutes and research wing of different academic institutions will be facilitated with modern equipment for action based research in EE & EC development activities.

11.6 Awareness Campaign Program

The following energy saving and energy conservation related issues are currently being used for general public awareness-

i. Not to use AC, electrical iron, water pump during peak hour.
ii. To avoid unnecessary electrification in the shopping malls, commercial or residential places.
iii. To motivate the people to finish their regular work by using daylight.
iv. To use standard auto gas burners for cooking purposes for efficient use of gas.
v. To maintain the temperature of AC not below 25° C in the government and semi-government offices to set an example for the private and other sectors.
vi. To motivate the people to use energy saving bulbs instead of incandescent bulbs.
vii. To motivate the people to use energy efficient electrical appliances.

Different approaches and programs will be designed to generate awareness to mass people. In this regard TV spots, discussions, street campaigns, school campaigns, competitions with prizes, etc. will be taken into consideration. The strategies for such awareness campaigns will be needed to be formulated.

11.7 Inclusion of EE & EC in Primary, Secondary, Higher Secondary Schools and the Madrasah Curricula

It is recognized that awareness raising on EE & EC has to start from the roots of the nation for making it sustainable in the long run. To grow awareness on energy efficiency and conservation issues among the young generation, The School Text Book Board will review the curricula at primary, secondary and higher secondary levels and incorporate the necessary messages for EE & EC. As such, a committee will be formed by the government to review the existing curricula and incorporate the necessary topics in the text books at all levels for the students.

11.8 EE & EC School Program for "Switch off"

Energy saving has turned into a social demand around the globe in the face of acute energy scarcity globally and the concerns for protection and preserving the environment which is directly affect by energy consumption. Therefore, the awareness campaigns are focusing on changing the perceptions of consumers and their energy use habits in order to reduce their energy saving effectively.

The EE & EC School Program initiative will focus on children as they are the most conscientious individuals in society. Once they become dedicated advocates for EE & EC, they can motivate their families to change their energy use practices to minimize the use, conserve energy and use energy efficient appliances. Incorporation of EE & EC messages in the school curriculum at all levels (mentioned above) will be one approach. The other approach will be through launching of direct program to disseminate EE & EC information through the following :

- Showing of video clips and documentaries on energy efficiency and conservation practices and their benefits.
- Organizing spot quiz.
- Introducing appropriate posters in schools.
- Organizing thematic art competition.
- Motivational talks by experts or professionals

The government will pass orders to the primary, secondary schools and madrasas all over the country to this effect. The students will be encouraged to take an active part in School Energy Saving Program avowing to switch off the electric bulbs /appliances when not of use, using more daylight for work and conserving gas and other energy resources. This program is expected to be initiated soon in the country and will be continued round the year.

11.9 Electricity Week program

The government has been dedicating a week in the year as Electricity Week for mass awareness on EE & EC. This program has already been launched since 2010 as an energy saving campaign at the consumer and school levels. In this program, prizes are awarded to the champions who contributed to maximum electricity saving at their levels. Essay competitions on energy saving topics in the schools/madrasahs were conducted and the succeeded children were awarded nationally to encourage energy savings. This program is nationally observed from 7th December each year.

Chapter — 12

Coordination and Implementation Mechanism of The Plan

Chapter xii

COORDINATION & IMPLEMENTATION MECHANISM OF THE PLAN

Energy Efficiency and Conservation is a cross-cutting issue and many government agencies are involved in its implementation. So, to carry forward this plan, supports from all stakeholders are very much needed. The role of government organizations /agencies in implementing specific program are mentioned in the action matrix. A national level committee will be formed to oversee the progress of implementation. In power sector the generation, transmission and distribution entities will detail up their respective actions and implement these actions through their concerned units. The progress of the actions will be monitored regularly by the competent authority. A standard format will be developed for reporting to the national committee. Other government organizations/agencies will also detail up their program separately and report the status of implementation to the national committee periodically following the same reporting format.

The National Committee will review the consolidated progress and submit a comprehensive report to the Minister of Power, Energy & Mineral Resources Ministry. Implementation progress of the action plan will be reviewed half-yearly basis in a meeting under the chairmanship of the Minister. For quick reporting and for better management a web based software may be developed, so that all stakeholders could have access and submit their reports at their end.

Chapter — 13

Way Forward

Chapter xiii

WAY FORWARD

Adoption and diffusion of energy efficiency and conservation culture in Bangladesh may be a long-term approach, but henceforth it needs to be implemented through a nationally integrated strategy before being too late for the next generation. This would involve setting of mandatory targets for achieving efficient use of energy in every sector of economic, social and environmental development of Bangladesh so that EE & EC becomes a part of the nation's Sustainable Development Agenda. Energy as a prerequisite for achievement of the MDGs will be carried over to the Sustainable Development Goals (SDGs) beyond 2015.

EE & EC should form an integral part of the country's strategy for achieving energy security. For this reason the draft National Energy Policy specifies EE & EC as the fourth fuel in addition to gas, coal and liquid fuel, since a large amount of energy is tied to it which, if saved, can be utilized for industrial development and other essential sectors like agriculture where it is required for irrigation.

The targets for EE & EC should be implemented through very specified time frame using different approaches having a mix of policies, rules & regulations, incentives to industries and people to use less energy, piloting of EE technologies and equipment, research & development (R&D), targeted awareness raising in schools, mass awareness raising and information dissemination, and other options covering urban to rural areas.

The government alone cannot provide all the remedies for EE & EC. Its promotion will require concrete commitments from the private sector, corporate bodies, banks and other institutions. The private sector and corporate bodies can influence promotion of EE & EC through its CSR funds by bringing the practice in-house and then spreading it to targeted communities. The financial institutions can provide requisite loans to the industries to convert to energy efficient technologies and also provide CSR funds for community interventions. Universities and other institutions can promote information dissemination and awareness raising programs.

The country will also require support from the international community to address its EE & EC agenda since it is directly linked to reduction of carbon emissions globally. Although Bangladesh is one of the least emitting countries, it is however the most vulnerable country to the effects of climate change. Hence Bangladesh expects support from the developed countries for its climate adaptation and mitigation actions. The actions related to EE & EC would fall under climate mitigation efforts and hence deserve support from the development partners.

However, by and large, action oriented national commitment from all stakeholders, regulatory bodies and support from the development partners are the key to the success for achieving energy efficiency targets by 2015 and beyond.

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Annex-1

Action Plan Matrix

			Responsible organization and timeline to conduct the task	*Remarks*
Energy efficiency in the generation sector		1. Rehabilitation of the old and inefficient power plants to be made . 2. Replacement or repowering of the power plants to be made that are still running at very low efficiency and their availability beyond their economic life time. a)To take possible energy efficiency measures, have a responsible technical person to be appointed to each power plant who will identify the possible energy loss, and take measures for prevention of the same in the power station and assist the energy audit system in the power sector. b) This person will be trained and strengthen to perform the job responsibly. 3. Timely procurement of spare parts and adhering to the maintenance schedule to be followed by all the power plants and keeping the plant operational at standard level. 4. In-house capacity building and proper training of the O&M personnel of the power plants as per standard practice. 5. Online Interface meters are to set up at the energy dispatch point from the power station to the grid to monitor the energy generation. 6. All the new coal based power plants are to be	Power Division and all generation utilities By 2015 and beyond	Development Partners support is required for feasibility study of inefficient power plant and for investment project

Chapter	*Section*	*Description of Actions*	*Responsible organization and timeline to conduct the task*	*Remarks*
		designed with supercritical boilers and gas based base load power. 7. The peaking power plant should be restricted to run only in peaking hour, to make this utility efficient. The peaking power plant should not be allowed to run in base load to avoid unscheduled heat loss. 8. A committee under the leadership of Power Division will be formed to monitor the implementation of the above activities.		
	Combined Cycle Power Plants	1. A good number of Power Plants to be converted to combined cycle to make these plant energy efficient. 2. Number of plants to be identified and feasibility study to be done. 3. Funding to be secured 4. Implementation and follow-up	Power Division and all generation utilities By 2015 and beyond	Development Partners support required for feasibility study and in investment project
Energy efficiency in the power transmission		1. <u>Power factor and voltage drop:</u> Two projects under implementation to be monitored for its timely completion. 2. <u>Prevention of Forced outage, blackout and synchronization mismatch:</u> Power Grid Company of Bangladesh (PGCB) will identify the substations and take necessary correction and replacement of undersized protective devices for smooth operation. 3. <u>Upgradation of line and transformer capacity:</u> PGCB will identify the lower loaded transformer and transmission line	Power Division and PGCB By 2015	PGCB will identify whether they need any financing support to address these issues.

Chapter	Section	Description of Actions	Responsible organization and timeline to conduct the task	Remarks
		considering future demand – generation growth. 4. Automatic Generation Control, Smart grids and System Metering: PGCB to evaluate the economic load dispatch merit order regularly, current load dispatch system as well as identify the proposed measures to be adopted to enhance energy efficiency. This will include automatic generation control in SCADA (Supervisory Control and Data Acquisition) system, smart grids, proper system metering etc. 5. In-house Capacity building and HR Strengthening measures: PGCB will identify possible training programs to promote in-house measures in transmission network operation and maintenance. 6. A committee to be formed in PGCB to oversee the above mentioned issues and report to Power Division regularly.		
Energy efficiency in power distribution		1. *Upgradation of distribution lines and substations:* Distribution utilities will identify the areas with lines and substations overloading and issues concerning load distribution and feeder lines and prepare a priority list for replacement and financing. Load balancing in the distribution areas should be followed. 2. *Power Factor Improvement:* Power distribution utilities will	Power Division and Distribution utilities By 2015	Distribution utilities will identify, whether they have any need for financing support to address these issues.

Chapter	Section	Description of Actions	Responsible organization and timeline to conduct the task	Remarks
		assess the current distribution power factors as well as prepare action plan and take necessary measures to address this issue. 3. *Modern Metering and service drop:* Distribution utilities will adopt standard service drop practices and proper metering system. Each power connection should have proper metering (preferably Pre-paid meters for Low Tension consumers and remote metering for High Tension consumers) and billing system. 4. *Prevention of pilferage and in-house Capacity building:* Distribution utilities will identify possible pilferage prevention measures and proper training to enrich in house capacity building of the personnel serving in the sector. 5. A committee will be formed in each distribution utility and report to Power Division regularly.		
Demand side initiatives for energy efficiency	Demand Side Management through Metering	**a) Time of Use (TOU) metering** The use of Time of use (TOU) meters will be increased to cover all commercial and industrial users by 2015. **b) Prepaid Metering** 1. 35,000 prepaid meter will be installed within 2013-14. 2. 2 million meter will be installed within 2016.	All distribution utilities a) By 2014 b) 1st piloting will be done by 2014and rest will be done within 2016.	Development Partner's support will be required to install pre-paid metering system.
	Demand saving program	Already initiated awareness generation program to be continued.	Power Division/Power Cell/SREDA	

Chapter	Section	Description of Actions	Responsible organization and timeline to conduct the task	Remarks
	Energy Efficiency in the Construction Sector	1. New building code incorporating EE and RE issues will be developed and will be implemented by the concerned government agencies. 2. Concept of 'Green Buildings' will be developed and will be disseminated to embrace the concept by the people.	M/O Housing & Public Works/RAJUK By 2014 and to be continued Power Division/SREDA By 2014	TA support will be required to develop 'Green Building' concept in Bangladesh.
	Street Light program	For gradual phase out of the conventional street lights by LED, Power Division/SREDA has initiated a demo project. The following action will be needed to complete this project: 1. Project consultant to be engaged , 2. Bidding doc. to be prepared and related works to be done. 3. Procurement to be completed. 4. Implementation and follow up.	Power Division BPDB and City corporation By 2014	Fund is assured
	CFL distribution program	For the 2nd phase distribution program the following actions to be required: 1. DPP for the 2nd phase to be revised, and other project related activities to be done 2. Bidding documents to be reviewed by engaging consultant, Tender will be floated. 3. Implementation to be follow up	Power Division and REB with all other distribution utilities By 2013	Fund is assured
	LED Security lighting in urban areas	1. Power utility will take administrative and public awareness generating activities to use the LED security lighting. 2. Preference to be given to use solar power.	Power Distribution utilities By 2013 and to be continued	

Chapter	*Section*	*Description of Actions*	*Responsible organization and timeline to conduct the task*	*Remarks*
	Commercial and Industrial FL Re-lamping Program	1. The T8 4-ft fluorescent light and magnetic ballast will be replaced by T5 4-ft FL set and electronic ballast. 2. Power Division will take up this issue to Ministry of Industry and Ministry of Commerce to phase out this lamp.	Power Division/SREDA M/O Industries /Commerce By 2013	
Increasing energy efficiency & conservation In key program areas	Energy Audit Program	To introduce this program , the following actions will be needed to be undertaken: 1. A Regulation to be prepared to guide on how the program will be implemented , qualification of Energy Manager/Energy Auditors, on how to conduct the examination, procedures for constitution of Accreditation Advisory committee. 2. Preparation of Action Plan of implementing the Energy Audit Program 3. Syllabus to be prepared for Energy Audit and Energy Manager Certificate Examination 4. Preparation of manual and code for standardizing the process of energy audit to support the energy manager and energy auditors. 5. Seminar to be arranged to sensitize the industry owners. 6. Capacity Building of the industry people as well as the SREDA staffs	Power Division/SREDA By 2013 and to be continued	TA support will be required to prepare the documents
	Improved Cook Stove Program	To take it up as a National Program, different stakeholders to be involved. For that the following tasks to be undertaken - 1. Forming National	Power Division/SREDA and IDCOL ,other organizations involve in this program. 100% coverage by 2030	Development partner's support will be needed to scale up these initiatives.

Chapter	Section	Description of Actions	Responsible organization and timeline to conduct the task	Remarks
		Alliance 2. Forming Working Group 3. Prepare Country Action Plan 4. Stakeholder Consultation 5. Finalization of Country Action Plan 6. Prepare Roadmap 7. Coordinate DP funding and technical support and follow-up implementation by sector partners		
	Rice Husk Parboiling Program	To scale up the program that SED already been developed, the following actions to be undertaken- 1. Prepare Awareness building strategy 2. National Committee will be formed to coordinate this program involving Bangladesh Bank and other Commercial Banks	Power Division/SREDA Bangladesh Bank & Commercial Bank, SED project 100% coverage by 2021	
	Improved Brick Kiln Program	Department of Environment is assigned to implement this program. SREDA will provide support to promote this program for scaling it up all over the country. The following actions to be undertaken- 1. Forming National Committee to coordinate and scale it up all over the countries. 2. Identify Awareness generation strategy 3. Bangladesh Bank and Commercial Bank to be involved for financing this program. 4. Follow up implementation	Power Division/SREDA and M/O Environment &Forest /Department of Environment and Bangladesh Bank/Commercial Banks 100% coverage by 2021	Development Partner's support will be required
	Introduction of Solar Water Heater	A small effort has already been made in tannery sector. This effort to be consolidated and needs to scale up	Power Division/SREDA and M/O Environment &Forest	Support from Climate Trust Fund will be required to

Chapter	Section	Description of Actions	Responsible organization and timeline to conduct the task	Remarks
		especially to industry sector. For this the following actions will be undertaken: 1. Incorporating solar water heater in the new building code to be monitored of its implementation; 2. Directives to be given to concerned govt. agencies to bring out the govt./semi-govt./corporation owned rest house under solar water heating system. 3. New project to be initiated to expand the areas of implementation of solar water heating in industrial sector.	By 2015 the project to be finished	initiate a project in industry sector
	Steel Mill Furnace Rehabilitation for Energy Efficiency	1. Titas Gas Transmission & Distribution Company along with other gas distribution companies will conduct the motivational campaign among the mill owners and the industry entrepreneurs to improve the efficiency of the industry's boilers and furnaces. 2. The Titas employees will receive special training very soon to conduct the energy audit of the industry's boilers and furnaces.	Energy Division and Gas distribution utilities By 2015 the project to be finished	Titas may initiate a project for its campaign and implementation
	Energy Efficiency of Gas Burners	A. <u>Improved natural gas stove</u> 1. The Titas Gas Distribution Company will standardize the improved gas burner. 2. The Energy Division will take necessary actions to gradually phase out all inefficient gas burners through all gas distribution companies by 2015 B. <u>Introduction of Gas Meters</u> 1. Installation of gas	Energy Division and Titas and other gas distribution utilities 100% coverage by 2014	Development Partners support may be required for the installation of Gas meters.

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		meters to be expanded to cover the whole country.		
	Utilization of Exhaust Heat/steam	1. Power Division/SREDA will identify suitable industries and implement demo-projects of cogeneration technology by 2014 to popularize it. 2. A study will be conducted to asses the Possibilities of utilizing exharst heat/steem in the industry 3. Financial Institution will be identify to come up with financing this types of projects.	Power Division/SREDA and IDCOL By 2014	Financing support will be required to initiate this project
	Cogeneration of Energy from Sugar Bagasse	1. A feasibility study to be conducted to assess the cost effectiveness of setting up sugar bagasse based power plants in the northern region.	Power Division/SREDA and Sugar Mills Corporation/Power Cell By 2014 the study to be completed	TA support will be required
	Energy Star Labeling Program	1. Regulation to be prepared and made final 2. Implementation methodology to be identified 3. Capacity enhancement of Implementation wing 4. Labeling logo to be prepared and made it final 5. Arranging Seminar with industry owner/ importers and other stakeholders for awareness generation 6. Follow-up workshop and evaluation 7. Standardization of selected appliances will be made final. 8. Testing lab to be accredited or assist to set up testing lab.	Power Division/SREDA and BSTI By 2013 and to be continued	A project to be initiated to implement this program and to provide support of setting up testing lab. Development partners support will be required
Other important EE & EC intervention	Policy and Regulation	The following Rules/ Regulation/Policies, will be required for the successful implementation of energy efficiency program by SREDA:	Power Division/SREDA By 2013-14	TA support will be required

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		1. Regulation for Energy Star Labeling Program; 2. Regulation for Energy Audit Program; 3. Regulation for Incentive to encourage Energy Efficiency and Conservation in Industries; 4. Service Regulation of SREDA; 5. Organogram and job allocation; 6. Revised Renewable Energy Policy; 7. Road map for RE; 8. Guideline for 500 MW solar program; Many other policy / regulation documents may be required time to time during the operational phase.		
	Institutional Strengthening & Capacity Building	1. Preparation of Service Regulation, Organogram, Job allocation, new post creation related document of SREDA 2. Get approval from M/O PA &Finance Division 3. Recruitment of personnel 4. SREDA office accommodation and logistic arrangement 5. Training of the Power sector officials specially working in SREDA Cell 6. Consultative support agreement for SREDA 7. Training Need Assessment of SREDA Staffs and other government/semi-government and private sectors	Power Division/SREDA By 2013 and to be continued up to 2015	TA support will be required

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		officials. 8. Devising integrated Training Program and Funding arrangement 9. Launching Training Program		
	Benchmark Study for Energy Sector (equipment, appliances and sectoral)	To understand the energy reserves, consumptions by different sectors including power generation a benchmark survey to be conducted for forecasting future energy needs, planning for national energy security of the country and management of the energy sector in the long run.	Power Division/SREDA/Power Cell By 2013	TA support will be required
	Awareness Campaign Program	a) Strategy for Awareness Generating Campaign: 1. Consulting firm will be engaged to develop awareness generation campaign strategy. 2. Campaign program will be launched as per strategy **b)** EE & EC School Program for "Switch off" 1. Program to be designed to campaign energy efficiency issue to the school children. Boy Scouts and Girl Guides will be involved in this program. 2. Promotional materials to be developed and distributed amongst the children. 3. Fund to be mobilized to run this program c) Inclusion of EE & EC in Primary, Secondary, Higher Secondary Schools and the Madrasah Curricula 1. A committee to be formed to review the	Power Division/SREDA/Power Cell By 2013 and to be continued	Development partners support will be required for awareness generation program.

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		existing curricula and incorporate the necessary topics in the text books at all levels for the students. d) Electricity Week Program 1. Different activities have already been designed, Different committees have been formed to implement this program. This program will be continued.		