SAARC Action Plan on Energy Conservation

SAARC Energy Centre, Islamabad

FOREWORD

SAARC Energy Centre (SEC) is mandated to initiate, coordinate and facilitate regional Cooperation in energy sector in South Asia. It provides relevant information, updates on technology, and necessary expertise to Member States to promote the integration of energy strategies within the region.

Import dependence for energy supplies in SAARC Member States varies between 25% in case of Bhutan to 100% in case of Maldives. With accelerated economic development, the energy consumption is increasing rapidly with resultant increase in import dependence. Inefficient use of energy to support such economic growth further compounds the rate of growth in energy use with consequent environment degradation. Member States, therefore, need to become energy efficient to become competitive in the global market besides getting environmental dividend.

The Sixteenth SAARC Summit (Silver Jubilee Summit) held in Thimphu, 28-29 April 2010, placed utmost importance on energy, especially energy conservation in the region. The Silver Jubilee SAARC Declaration, titled “Towards a Green and Happy South Asia”, states:“The Leaders agreed that an Action Plan on Energy Conservation would be prepared by the SAARC Energy Centre with inputs from the Member States and submit its recommend ations to the inter-governmental mechanism for consideration”.

The draft SAARC Action Plan on Energy Conservation was accordingly prepared by SEC. The Plan also included the elements of SAARC Road Map on Energy Efficiency & Energy Conservation, recommendations of SAARC Working Group on Energy and various other valid suggestions made at several energy fora held in the region.

The first draft of the Action Plan was placed before the 6th Meeting of SAARC Working Group on Energy held in August 2011 in Islamabad. The Working Group recommended that the draft be sent to the Member States for comments and the final version should be developed incorporating those comments. Accordingly, the draft was circulated among Member States, and the comments received from them have been incorporated in the revised draft.

The revised draft was subjected to extensive external and internal peer review and is being submitted to the 7th Meeting of the Governing Board of SAARC Energy Centre to be held on 18-19 September 2012 in Islamabad for approval and onward submission to SAARC Secretariat for consideration of the SAARC inter-governmental mechanism for consideration.

This Action Plan has no binding obligations. It provides useful guidelines and the actions required for energy conservation. The Member States may adopt this Action Plan according to their needs and priorities and may wish to alter the suggested targets and goals to suit the prevailing ground situation.

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ABBREVIATIONS AND ACRONYMS

AC	Air conditioner/ Alternative Current
Bcum	Billion Cubic Meters
BEE	Bureau of Energy Efficiency, INDIA
BMS	Building Management System
BSC	Balanced Score Card
CDM	Clean Development Mechanism
CFL	Compact Fluorescent Lamp
CNG	Compressed Natural Gas
DC	Direct Current
DSM	Demand Side Management
EA	Energy Auditing/ Energy Auditor
EC	Energy Conservation
EEBC	Energy Efficiency Building Code
EEI	Energy Efficiency Improvement
EEI&C	Energy Efficiency Improvement & Conservation
EES	Energy Efficiency Services
EM	Energy Management/ Energy Manager
ENERCON	National Energy Conservation Centre, Pakistan
ESCO	Energy Services Company
ESDP	Energy Services Delivery Project
GDP	Gross Domestic Product
GHG	Green House Gas
GWh	Giga Watt-Hour
ICS	Improved Cooking Stove

IFL	Incandescent Filament Lamp
kgOE	Kilogram Oil Equivalent
Km	Kilo Meter
kVA	Kilo Volt-Ampere
kWh	Kilo Watt-Hour
LED	Light Emitting Diode
LNG	Liquefied Natural Gas
Min	Ministry of
M&V	Monitoring & Verification
Mln	Million
MRT	Mass Rapid Transport
mT	Million Tonne
mTOE	Million Tonne of Oil Equivalent
N/A	Not Available/ Not Applicable
OECD	Organization for Economic Cooperation and Development
OTEC	Ocean Thermal Energy Conversion
RE	Renewable Energy
R&D	Research & Development
SAARC	South Asian Association for Regional Cooperation
SEA	Sustainable Energy Authority, Sri Lanka
SEC	SAARC Energy Centre
SMART	Specific, Measurable, Attainable, Realistic, and Timely(in relation to Goals)
SWOT	Strengths, Weaknesses, Opportunities, and Threats
TV	Television
VSD	Variable Speed Drive

INTRODUCTION TO THE ACTION PLAN

It is imperative to consider integrated aspects when Energy conservation is evaluated in the SAARC region. It should be done hand in hand with introduction of alternative fuels, new and alternative energy strategies, and necessary capacity buildings towards efficient use of energy. This approach will help to achieve energy conservation which is an integral part of energy security. Hence a total and comprehensive scenario analysis was undertaken in the development of the Action Plan. Understanding the importance of minimizing losses of this valuable commodity, i.e., Energy, wherever possible, an entire Supply Chain Management approach was employed, from the place of harnessing the energy to the end-user level. The Supply Chain Management approach that weigh-up the total path is very important.

If only supply chain management is considered, other factors that affect the use and production of Energy & Energy Resources might be overlooked. Accordingly introduction of necessary legislations, and building codes along with introduction of new and alternative fuels to the national energy mix has also been discussed. The analysis of Strengths, Weaknesses, Opportunities, and Threats (SWOT) and SMART goal settings based on the analysis are the basic tool used in the development of the Action Plan. SWOT analysis helps to evaluate the present situation, and to identify measures that evidence futuristic approach to achieve EE & EC. Emphasis was given to manage the anticipated threats well in advance and address weaknesses to minimize possible impacts. The Strengths need to be enhanced along with Opportunities to gain the momentum.

Any good action plan should set out time bound targets with well defined milestones and an evaluation strategy; without which the Action Plan losses its value. It is in this context that time bound targets and evaluation mile stones have been incorporated in the SAARC Action Plan on Energy Conservation. The executing agency should be in a position to evaluate the progress of the implementation of the Action Plan on a continuous basis to identify the reasons for non-adherence to the plans, and also to take remedial actions. For the evaluation purpose, it is proposed to employ Balanced Score Card (BSC) mechanism that pin-points the issues. As the BSC is needed to be prepared according to the Member State specific requirements, it is not appropriate to develop a sample of BSC for proposed actions. Nevertheless, a draft of BSC has been developed for the action “Analyse whether there is room for use of wasted-heat for any valuable applications” in Goal “Energy Conservation at Source: Power Generation (Fossil fuel based)”. This is given in Annexure III. This may be used to develop other BSCs where applicable.

However, due to national situations the Member States may alter BSCs or consider this action plan as base to develop their own action plan, if need arises. As the Action Plan is developed to suit most of the Member States, there would definitely be targets and areas that are not relevant or applicable to some of Member States. The Member States may adopt this action plan to suit ground realities and change targets accordingly. In this dynamic plan there may be rooms for further improvements based on different levels of Member State initiatives and plans for energy conservation.

Inputs received from Member States (India, Nepal, Pakistan and Sri Lanka) are gratefully acknowledged. Editorial support of Dr Muhamed Pervaz, Programme Leader (Technology Transfer) at the SEC, and Mr. Arshad M. Sheikh (Former Deputy Director, SEC) were immense to the Researcher. Peer review done by Dr Arshad Mohammed Khan (Executive Director, Global Climate Change Impact Study Centre, Islamabad, Pakistan), and Dr. P. N. Fernando (Former Manager, Energy Division (East), Asian Development Bank, Manila) has been invaluable.

The development of this Action Plan has been materialized thanks to the direction, support, guidance and advice of Mr. Hilal A. Raza, Director SAARC Energy Centre.

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Chapter 1 SITUATION ANALYSIS

1.1 Preamble

The Sixteenth SAARC Summit held in Thimphu, 28-29 April 2010, placed utmost importance on energy especially the energy conservation in the region. The Silver Jubilee Declaration "Towards a Green and Happy South Asia" in Para 32 states: "The Leaders agreed that an Action Plan on Energy Conservation would be prepared by the SAARC Energy Centre (SEC), Islamabad with inputs from the Member States and submitted to the inter-governmental mechanism for consideration. They called for the creation of a web portal on Energy Conservation for exchange of information and sharing of best practices among SAARC Member States."

The SEC prepared the format for collecting inputs from the Member States, and it was circulated to the Member States through the SAARC Secretariat. The SEC acknowledges Governments of India, Nepal, Pakistan, and Sri Lanka for responding positively. Further, the SAARC Energy Centre incorporated inputs of the study on implementation of the SAARC Road Map for Energy Efficiency and Energy Conservation (EE&EC) conducted by the SEC. The preparation of this Action Plan was facilitated by the information collected by the SEC through web searches and knowledge and experience of the Researcher.

1.2 Background Information

The brief energy scenario of the Member States was analyzed to understand the energy consumption and supply pattern in the Region. The consumption pattern in the Member States varies depending on population size, climatic conditions, living habits, status of development of the industry and so on. Most of the Member States except Maldives are blessed with cheap hydropower, while some have fossil fuel resources. Nuclear power is used to generate electricity only in two Member States. Despite large renewable sources; wind and solar have yet to be exploited by the Member States in a significant manner, so as to reflect their presence in a big way in their energy mix. , Besides, it is essential to mention that about one half of the total energy requirements of the entire Region are met by biomass.

1.3 Action Plan Development Mechanism

1.3.1 Methodology

Data were collected and information gathered about the Energy production, transportation, and consumption along with information on other parameters that affect Energy Conservation in the region. Analysis of collected Data led us to identify five key areas which have direct impact on Energy Conservation. Therefore, The Action Plan for Energy Conservation in the SAARC Region seeks conservation of energy by exploring the identified five different levels:(i)

production level, (ii) transportation level, (iii) end-use level, (iv) introducing Renewable (home grown resources) or Alternatives to the national grid, and (v) by introducing necessary legislations and initiating required capacity building pertaining to EC.

In the identified five areas, key stakeholders have been identified to address the Energy Conservation issues. Areas such as marine transport, use of animal power, and utilization of nuclear power were not taken in to account due to their specific nature. However, the identified key areas are not common for all the Member States as these depend on geography, development status and social aspects of Member States.

Energy consumption and Energy resources data with information on Transmission losses was evaluated to assess the current situation. Further, information on Policy related issues that might have an impact on Energy Conservation were also considered.

The Action Plan noted that planned gas pipelines such as Iran-Pakistan-India and Turkmenistan-Afghanistan-Pakistan-India will bring natural gas from vast gas fields of Iran and Central Asia to the SAARC Region. There is a possibility that the projects will be extended to cover Bangladesh, Bhutan, Nepal and Sri Lanka too. Further, Myanmar is exploringits gas fields and has good gas reserves. In that case, a gas pipeline connecting Myanmar and Bangladesh will also be possible. The earlier mentioned two pipelines are expected to be in operation by 2017. However, energy conservation will remain a very important aspect in all the SAARC Member States to achieve sustainable development.

In each of identified areas that may have impact on energy conservation, a SWOT Analysis was conducted to identify the current status. Based on the SWOT analysis SMART Goals were set for the sectors to achieve. These SMART Goals have led to define evaluation milestones for each of sub-activity that contributes to the overall energy conservation. Evaluation mile stones may be further expanded to have a detailed investigation of successes and failures. The Balanced Score Card (BSC) mechanism is recommended to be utilized to analyze the failures.

1.4 Main Focused Areas for Energy Conservation

In order to achieve Energy Conservation at the maximum possible level it is prudent to investigate the entire supply chain of Energy; i.e., being supplied, being lost, and being consumed. Furthermore, it is imperative to assess non-technical approaches also that help to conserve energy. In this context a comprehensive approach for Energy Conservation is proposed.

Table I: Identification of Sector-wise Potential Contributors to Energy Conservation

Main focused area for Energy Conservation	Key Players in identified area
1. Energy Production Level	a) Power Generation (Hydro or Fossil fuel based)
	b) Fossil fuel mining sites
2. Energy Transportation Level	a) Electricity transmission
	b) Fossil fuel transportation
3. Energy End-use Level	a) Transport sector
	b) Household sector
	c) Industry sector (including Agriculture)
	d) Large Commercial and Service sector
4. Introduction of Renewable and Alternative Energy Resources	a) Renewable Energy
	b) Bio-Fuels
5. Introduction of Legislations and Capacity Building	a) Introduction and Implementation of enabling Legal frameworks
	b) Introduction and Implementation of Capacity building activities

Initially the energy consumption pattern and the energy supply pattern were identified in the region. The supply was categorized as Biomass, Electricity, Fossil Fuels and Others. The consumers were categorized as Household, Industry (inclusive of Agriculture), Transport, and Large Commercial and Service Sector. Attempts were made to assess what type of energy is being used for a particular activity. This was done so as to obtain a comprehensive picture about the room available for energy conservation. A SWOT analysis was performed on the identified key players with a view to embark on Energy Conservation. The "identified Key stakeholders" in the "Main focus areas for Energy Conservation" were evaluated by introducing sub-sections to examine the feasibility of introducing Energy Conservation approach. Then, based on the SWOT analysis, Action Plans were developed for the same.

The following are the five Main focus areas for Energy Conservation:

1. Energy Harnessing (mining) or Generation
2. Transmission and Transportation
3. End-use level
4. Introduction of Alternative Energy (Renewable +)
5. Introduction of Legislations and Capacity Building.

By studying these areas and their sub-sections, it became possible to understand the energy conservation potential and make recommendations for overall improvement of aggregate energy conservation.

1.5 SWOT Analysis and SMART Goal Settings

Before embarking on development of Action Plan, it is essential to make an environmental scanning (or situation analysis) of Main focus areas and their corresponding Key players which make an impact on the Main focus areas. The environmental scanning led to a vital element; namely the SWOT analysis. The SWOT analysis scans Strengths, Weaknesses, Opportunities, and Threats. In this analysis, Strengths and Weaknesses are internal factors while Opportunities and Threats have both internal and external components. The SWOT analysis was developed in 1960s at the Stanford University Mainly for Business Entities. Later it has spread in many more areas where the initial planning was vital for the process. In the present case the SWOT analysis was focused on the Key players that have impact on the identified Main focus areas. An in-depth analysis was done on the Key players' Strengths, Weaknesses, Opportunities, and Threats in relation to energy conservation. A careful exposition of the findings of the SWOT analysis helped in setting the Goals and formulating the Action Plan for achieving the targets.

Proper attention was paid to set SMART goals due to the uneven stage of development amongst the Member States. The Specific, Measurable, Attainable, Realistic, and Timely goals were set up with an option to adopt and change them depending on the Member State's development level.

Strengths (Positive attributes to succeed)

- Availability of Resources
- Level and support enjoyed
- Tacit Knowledge
- Funds available
- Established system

Weaknesses (Factors within that hamper the progress)

- Lack of expertise
- Inadequate funding
- Lack of skills or technology
- Poor infrastructure
- Negative attitude

Opportunities (Potential that we can realize to maximum)

- Potential for growth
- Changing life style in SAARC Region
- Encouraging perception from people in the Region

Threats (Factors beyond control that might affect the proposed change)

- Need to identify them to have contingency plan
- *Examples:* price increase for commodities; Economic downturns; negative lobbying by NGOs or Media; WTO regulations

The SMART goal settings were focused on further strengthening the Strengths, addressing the identified Weaknesses, capitalizing on Opportunities, and possible elimination of Threats. An attempt was made to give a cap in goal setting to suit all the Member States. Following the goal settings an action plan is proposed to achieve the goals, hence achieving energy conservation.

Beside the SWOT analysis findings, all other available information was considered when quantifying the Goals.

1.5.1 The Balanced Score Card Approach

Evaluation of progress is proposed to be carried out by identifying milestones while using simplified version of the Balanced Score Card (BSC) approach as it will highlight the success as well as illustrate the negative impacts that caused delays. The SEC has not developed specific BSCs for all the elements of the Action Plan. They can be developed by Member States taking into account country-specific attributes. However, a sample BSC is developed for the activity of “whether there is room for use of wasted-heat for any valuable applications” under “Energy Conservation at Source.

1.6 Outcome and Way Forward

During the development of the Action Plan we have examined all the possible ways to conserve the Energy in Direct and Indirect ways. In addition to that, we have considered the ways to achieve Energy Security of the region as we feel it as a vital component in the current context. As entire Energy supply chain management was considered in this exercise, we did not separate Energy conservation and Energy Security. The implementation of Energy Conservation Plan will make significant contributions towards achieving Energy Security in South Asia.

It is expected that after adopting the proposed actions, the Member States will continue in the same path beyond 2021 to achieve energy conservation as well as energy security in a sustainable manner.

Chapter 2 ENERGY CONSERVATION AT SUPPLY SIDE (FOSSIL FUELS PRODUCTION AND POWER GENERATION)

Historically no adequate attention was paid to conserve the energy at the source of mining or power generation as all the conservation activities were focused towards the end-users. Nevertheless, conservation of energy at the source is very much important. It is estimated that out of 100 units of energy from mined coal at a mining site, only 2 units of energy is delivered as an output for lighting when incandescent bulbs are used at the end-use level. That forces us to consider options for conservation (waste eradication) at sites. Hydro power stations are running at almost 97% efficiency. If additional 1% increase in efficiency is achieved, it will bring huge impact, considering the share of Hydro power in national energy mix.

2.1 Conservation of Energy during Power Generation (Hydro or Fossil Fuels based)

The power stations are designed to generate power at their maximum efficient level such as about 97% for hydro and about 34% for thermal. Technological development leading to increase of efficiency has stagnated and very few options are available. However, proper housekeeping and adoption of some innovative ideas may yield increase of overall efficiency of power generation thus helping to generate more power for the same input.

A SWOT analysis was done to evaluate possible options for increase of efficiency with respect to fossil fuel based power generation and hydro power generation.

Strengths

- Member States' Leadership commitment on EE & EC
- Government ownership of power stations (in most cases -easy to make orders)
- Environmental lobby
- Policies towards energy security

Weaknesses

- High cost of new technologies
- Lack of motivation as payback period is high in certain cases
- Inadequately availability of expertise

Opportunities

- Possibility of CDM claim
- Possibility of cost cutting
- Possible technology break-through development
- Potential for Fuel Saving

Threats

- Discovery of a new fuel type or discoveries of vast deposits of fossil fuels, which may lead to drop in the fuel prices, thus energy conservation may lose focus
- Accelerated development rate in the region may result in forgoing energy conservation

Goal Setting

Recent studies in technologically advanced countries have shown that there is a potential to increase the overall efficiency of existing coal based thermal power plants to the level 32.5% to 35.8% and even work is going on to increase the overall efficiency up to 45%. Whereas Gas turbine have shown the overall efficiency increase potential up to 60.75%.

These studies have been carried out in more technically advanced countries where power plants may already run at the design efficiencies, i.e., 26%-28%. However, in the SAARC Region the plants normally do not run at even designed efficiencies due to various reasons. The SWOT analysis indicates that there is a room for improvements. These studies also point out that simple and proper housekeeping may also help to increase the efficiency. Considering the prevailing economic situation in the region, non-availability of state of the art technologies, and inadequate knowledge base in our region against new technological developments that are taken place in more technological advanced countries, it is proposed to set a moderate target to increase the overall efficiency of existing fossil fuel fired power plants by minimum 2%. Individual Member States may embark on activities that may eventually overshadow the achievements of the advanced nations of the world.

GOAL: To increase overall efficiency of the existing fossil fuel based Power Plants minimum by 2% by the Year 2021.

As the Hydro Power Plants already operates at more than 90% efficiency there seems to be little scope for improvement. However, continuous research and development is needed to be supported in hydro power as well.

The following Action Plan with its components and time frame was defined to achieve the set Goal:

Action Plan for Energy Conservation at Source: Power Generation (Fossil fuels based)

GOAL: To increase the overall efficiency of the existing fossil fuels based Power Plants minimum by 2% by the Year 2021.

Proposed Action Plan to achieve the set Goal	**Anticipated Contribution to Efficiency Improvement by (%)**	**Component Weightage**
a) Analyze whether there is room for use of wasted-heat for any valuable applications	Intangible contribution	Proper housekeeping is the least cost method to increase efficiency. Plant modification component has greater impact to the overall efficiency crease in coal based Power Generation. Gas Turbines also have a huge potential to improve the efficiency. **[Techno-economic evaluation of Plant modification should be conducted where applicable.]**
b) Analyze whether proper housekeeping is in place and act accordingly	25	
c) Explore possibility of adopting Coal Gas Firing in place of Direct Coal Burningfor Steam	30	
d) Explore possibility of adopting Super Critical Live Stream in Coal Based Plants	5	
e) Introduction of Combined Cycles to Gas based Power Plants where possible	30	
f) Explore possibility to improve efficiency in Oil based power plants	10	

Time frame for Implementation:
Year 1= 2013 ; Year 2 = 2014; Year 3 = 2015; Year 4 = 2016; Year 5 = 2017; Year 6 = 2018; Year 7 = 2019; Year 8 = 2020; Year 9 = 2021

a) Analyze whether there is room for use ofwasted-heat for any valuable applications

Main Components	Detailed Actions	Scheduled Target	Resource/ Funding	Responsibility	Evaluation Milestones (listed in the parenthesis is the Year that is targeted to complete a particular activity)
Harnessing of wasted-heat	Explore feasibility to utilize excessive heat to dry Coal	Year 1-Year 2	Member State/ Min Power	Min Power	i) Moisture percentage of coal from different suppliers measured (Year 1) ii) Coal Storage-industry best practices identified (Year 1) iii) Potential to apply best practices evaluated (Year 1) iv) Implement (Year 2) Manage hurdles in implementing (Year 2) v) Throughout Monitoring (Year 1- Year 9)
	If feasible, utilize it to maxi-mum extent	Year 3	Min Power	Min Power	
	Based on the Success develop local benchmarking and improve it in constantly base	Year 4-9	Min Power	Min Power	

b) Analyze whether proper housekeeping is in place					
House keeping	Cleaning boiler tubes; apply proper sealing; Turbine blade cleaning; explore possibilities of introduction of VSDs;	Year 1-Year 3	Min Power	Utility/Min Power	As these activities need shut-down of the Power Plant, it is anticipated that they will be taken up during routine maintenance. Hence time targets cannot be proposed.
	If feasible, incorporate in routine maintenance	Year 3-Year 9	Min Power	Utility/Min Power	
c) Explore possibility of adopting Coal Gas Firing in place of Direct Coal Burningfor Steam Generation					
Main Components	**Detailed Actions**	**Scheduled Target**	**Resource/ Funding**	**Responsibility**	**Evaluation Milestones, (listed in the parenthesis is the Year that is targeted to complete a particular activity)**
Adoption of Coal Gas Firing	Undertake feasibility study	Year 1-Year3	Min Power	Utility	Study and measure Power Plant design (Coal based) i) parameters and current operating parameters (Year 1) ii) Identify disparities if there are any and reasons (Year 1) iii) Complete the undertaken laboratory scale experimental study (Year 1) iv) Undertake and complete Plant Modification feasibility Study (Year 2), Complete techno-economic study (Year 3), Implement (Year 3) v) Continue with new technology and analyze the results annually for further improvements (Year 3- Year 9)
	Do it on a lab. scale	Year 3-Year 5	Min Power	Utility	
	Explore possibilities of applying in Power Stations	Year 6-Year 9	Min Power	Utility	

d) Explore possibility of adopting Super Critical Live Stream in Coal Based Plants

Main Components	Detailed Actions	Scheduled Target	Resource/ Funding	Responsibility	Evaluation Milestones, (listed in the parenthesis is the Year that is targeted to complete a particular activity)
Adoption of Super Critical Live stream in Coal Power Plants	Undertake feasibility study	Year 1-Year3	Min Power	Utility	i) Study and measure Power Plant design parameters and current operating parameters (Year 1), Identify disparities if there are any and reasons (Year 1) ii) Complete Undertaken laboratory scale experimental study (Year 2) or seek technology transfer from an advanced Country iii) Undertake feasibility study in introducing novel methodology (Year 2), conduct techno-economic analysis (Year 3), Implement (Year 4) iv) Continue with new technology and analyze the results annually for further improvements (Year 3-Year 9)
	Do it on a lab. scale	Year 3-Year 5	Min Power	Utility	
	Explore possibilities of applying in Power Stations	Year 6-Year 9	Min Power	Utility	

e) Introduction of Combined Cycles to Gas based Power Plants

Main Components	Detailed Actions	Scheduled Target	Resource/ Funding	Responsibility	Evaluation Milestones (listed in the parenthesis is the Year that is targeted to complete a particular activity)
Combine Cycle introduction	Undertake feasibility study	Year 1-Year3	Min Power	Utility	i) Study and measure Power Plant design parameters and current operating parameters (Year 1), Identify disparities if there are any and reasons (Year 1) ii) Undertake feasibility study in introducing novel methodology (Year 2), conduct techno-economic analysis (Year 3), Implement (Year 4) iii) If not succeed seek assistance from advanced country in the region or SEC iv) Continue with new technology and analyze the results annually for further improvements (Year 3- Year 9)
	Do it on a lab. scale	Year 3-Year 5	Min Power	Utility	
	Explore possibilities of applying in Power Stations	Year 6-Year 9	Min Power	Utility	

2.2 Conservation of Energy at Fossil Fuels Production Sites and Oil Refineries

Taking measures to minimize waste is very important whether it is a Coal mine, Gas or Oil well, or an Oil refinery. The Member States may still be exploiting outdated technologies in Coal mining or in tapping Oil and Gas. There is a chance that some of the Oil refineries and Oil and Gas wells just flare excess gas due to absence of any value added application. Hot steam injection and CO2 injection in to the oil wells to tap oil second and third time may or may not be taking place in our region. Due to lack of valid data, a Generalized SWOT is proposed.

The SWOT analysis was done to introduce fuel conservation at Fossil fuel mining sites and Oil refineries

Strengths

- Member States' Leadership commitment
- In most cases ownership is with the Government (easy to implement orders)
- Environmental lobby
- Low intensive technology

Weaknesses

- High cost of new technologies
- Payback period is high for certain new technologies
- Lack of awareness on new technologies

Opportunities

- Possibility of cost cutting
- Help to secure energy independence
- New job opportunities

Threats

- Discovery of a new fuel type or discoveries of vast deposits of fossil fuels may lead to drop in the fuel prices, thus conservation may not be very attractive and/or cheap option.

Goal Setting

The SWOT analysis has shown that there are avenues for energy conservation and efficiency improvement at the mining sites but very little at the refineries. However, the literature indicates that there are limited possibilities even at the refineries. Considering all the above, a Goal was set to reduce waste in, both, mining and refineries.

Goal: To reduce the waste in Fossil fuels mining and in Oil refineries by 25% of the present level by the Year 2021, while other affecting factors remain as of now.

The following Action Plan has been developed to achieve the set Goal:

Action Plan for Energy Conservation at Source: Fossil Fuel Mining Sites					
GOAL: To reduce the waste in Fossil fuel mining by 25% (of the present level provided other components remain same) by the Year 2021.					
Proposed Action Plan to Achieve the Set Goal (Though there are many options to improve the overall productivity of mining at this stage we are considering only waste minimization)				**Anticipated Contribution to Efficiency Improvement by (%)**	**Component Weightage**
a) Minimize the current wastages				75	Major savings can be achieved through the deployment of latest technologies in Oil and Gas sector. However, the development or acquiring of the same could be costly.
b) Explore new mining techniques with Minimum waste and employ them				25	
Time frame for Implementation: Year 1= 2013 ; Year 2 = 2014; Year 3 = 2015; Year 4 = 2016; Year 5 = 2017; Year 6 = 2018; Year 7 = 2019; Year 8 = 2020; Year 9 = 2021					
a) Minimize the current wastes					
Main Components	Detailed Actions	Scheduled Target	Resource/ Funding	Responsibility	Evaluation Milestones (listed in the parenthesis is the Year that is targeted to complete a particular activity)
Minimizing overall waste in the current mining practices	Calculate the wastes	Year 1-Year 2	Min Mining, Petroleum	Min Mining	i) Undertake a site survey to measure the wastages (Year 1) ii) Identify methods to minimize it (Year 2) iii) Check with international standards iv) benchmarking for comparison (Year 2) v) Undertake techno-economic feasibility study (Year 3) vi) Implement the findings (Year 4)
	Compute the wastages percentage relative to production	Year3	Min Mining, Petroleum	Min Mining	
	Take measures to minimize wastes in mining fields	Year 4	Min Mining, Petroleum	Min Mining	

b) Explore new mining techniques					
Main Components	Detailed Actions	Scheduled Target	Resource/ Funding	Responsibility	Evaluation Milestones, (listed in the parenthesis is the Year that is targeted to complete a particular activity)
New techniques	Search for new mining and production techniques that are already developed	Year 1	Min. Mining, Petroleum	Min Mining	i) Undertake a study on employed mining techniques for saving wastages (Year 1) ii) Identify methods to improve (Year 2) iii) Undertake benchmarking study for industry best practices (Year 3) iv) Undertake techno-economic analysis in adopting new mining techniques (Year 4) v) Implement (Year 4) vi) Continue with new methodologies and improve it (Year 5- Year 9)
	Undertake feasibility to adopt those techniques	Year 1-Year 3	Min Mining	Min Mining	
	Adopt them	Year 4	Min Mining	Min Mining	
	Employ R&D departments to investigate new mining techniques so that wastageis minimized	Year 1-Year 9	Min Mining, Petroleum	Min Mining	

Chapter 3 ENERGY CONSERVATION DURING POWER TRANSMISSION AND TRANSPORTATION

Any form of energy whether fossil fuel or electricity has to be brought to the point of use. The delivery path has its losses, some of which are unavoidable but steps could be taken to minimize them. Whether electricity is transmitted using overhead lines or fossil fuel is transported by pipelines, trucks or railways; minimization of losses needs to be given due importance. In this Action Plan Electricity distribution losses such as theft, are not considered due to their specific nature and need to be eliminated through requisite administrative and legal mechanisms.

3.1 Electricity Transmission

Electricity that is normally generated between 11 kV and 33 kV by Generator sets cannot be efficiently transmitted to long distances. As such stepping-up transformers are used at the power stations to increase the voltage in the range 132 kV to 400 kV generally in the SAARC region, except for India which is having A/C transmissions systems at 765kV, and major DC systems as well. The high voltage overhead lines (usually double circuit on pylons or towers) connect the generating stations with the grid substations where stepping-down of the voltage takes place in order to make the electricity usable in most of the equipment. In the technically advanced countries average technical losses in the transmission of electricity are around 5%.

A SWOT analysis was conducted to examine the current situation and for exploring the possibilities for promoting energy efficiency of transmission lines.

Strengths

- High cost of new technologies
- Government owned transmission lines (easy to address changes)
- Political leadership
- Good knowledge base in the region
- Availability of reliable Data

Weaknesses

- Lack of funds for major changes/augmentation of systems
- Lack of new skills and technology in some of the Member Countries, but available in the region
- High stake of System stability of the power system on Economy

Opportunities

- Potential for heavy savings
- Possible technology break-through
- Potential for new knowledge development

Threats

- Any decrease of fossil fuels prices may hamper the efforts.
- Problems in Technology Transfer

Goal Setting

The SWOT analysis indicates more difficulties than possibilities. Considering all available information about the potential of energy savings during power transmission and the SWOT findings, it is proposed that steps be taken to reduce transmission losses by 1/5th of the existing levels by the Year 2021.

Goal: To reduce technical losses in power transmission by 1/5th in comparison with today's relative losses by the Year 2021

The following Action Plan has been developed to accomplish the Goal:

Action Plan for Energy Conservation during Transmission and Transportation: Electricity Transmission					
GOAL: Reduction of Power transmission losses by 1/5th from existing relative losses (provided other factors remain same) bythe Year 2021					
Proposed Action Plan to Achieve the Set Goal (It is understood that here we are considering only technical losses)				**Anticipated Contribution to Efficiency Improvement by (%)**	**Component Weightage**
a)	Asses the current power losses in Transmission lines, take remedial steps to reduce it			20	Further minimizing of line losses from current 5% -6 % is very difficult task as the losses mainly depends on resistance of the conductor. Major contributor to the expected reduction would be from new lines construction and introduction of stepping-up transformers where applicable. However, not overloading the existing conductors will have to be maintained.
b)	Explore stepping-up of Voltage, where possible, to reduce the losses			30	
c)	In new constructions, pay due attention to Conductor capacity increase, High Voltage and New Generation of Transformers			50	
Time frame for Implementation: Year 1= 2013 ; Year 2 = 2014; Year 3 = 2015; Year 4 = 2016; Year 5 = 2017; Year 6 = 2018; Year 7 = 2019; Year 8 = 2020; Year 9 = 2021					
a) Asses the current power losses in transmission lines					
Main Components	**Detailed Actions**	**Scheduled Target**	**Resource/ Funding**	**Responsibility**	**Evaluation Milestones (listed in the parenthesis is the Year that is targeted to complete a particular activity)**
Line losses	Assess line losses	Year 1	Min Power	Min Power	i) Study the line rating losses (Year 1) ii) Measure actual losses (Year 1) iii) Identify the cause for excessive losses (Year 2) iv) Check international benchmarking (Year 2) v) Propose remedial measures (Year 2) vi) Implement (Year 3)
	Evaluate the losses against international norms	Year 1	Min Power	Min Power	
	Take actions to reduce line losses	Year 3	Min Power	Min Power	

b) Explore stepping-up of Transmitting Voltage, where possible, to reduce the losses					
Voltage Step-up	Evaluate the need and technical feasibility	Year 1-Year 3	Member State/ Min Power	Utility	i) The line load is measured to determine losses (Year 1) ii) Losses are compared with international benchmarks (Year 1) iii) If losses are well above the benchmarked losses, explore technical feasibility of Stepping up the Voltage (Whether existing Towers, Conductors and other Eq could support Augmentation) (Year 1) iv) Undertake techno-economic evaluation (Year 2/ Year 3) v) Implement (Year 4)
	Calculate Cost-economics	Year 3	Min Power	Utility	
	Make a proposal and Implement	Year 4	Min Power	Utility	
C) In new constructions pay due attention to Conductor capacity increase, High Voltage and New Generation of Transformers					
Main Components	**Detailed Actions**	**Scheduled Target**	**Resource/ Funding**	**Responsibility**	**Evaluation Milestones (listed in the parenthesis is the Year that is targeted to complete a particular activity)**
Introduction of New Generation of Transformers, etc.	Calculate Cost-economics	Year 1-Year 3	Min Power	Min Power	i) Undertake studies on new generation of Transformers where Cu-losses are further minimized (Year 1) ii) Carry-out technical feasibility study of introducing them to the system (Year 1) iii) Undertake a techno-economic evaluation of the proposed idea (Year 2) iv) Implement (Year 4- Year 9)
	Consider the above with new generation of Transformers etc.	Year 4	Member State/ Min Power	Min Power	
	Evaluate the feasibility	Year 4	Min Power	Min Power	
	Make a proposal and try to implement	Year 4-Year 9	Min Power	Min Power	

3.2 Fossil Fuels Transportation and Distribution

Coal is transported to the end user from mine by railways or road transport. Oil is initially transported to the refineries either through pipelines or in containers, and from there it is transported to the end user in containers. Gas is also taken to the end user mostly through pipelines but also in containers in liquid form (LPG). Though the issue has not been addressed adequately, losses do exist in transportation and distribution of fossil fuels. As the stakes are high, it is essential to explore the possibilities for reducing the losses.

A SWOT analysis was undertaken to assess the situation.

Strengths

- High stakes involved facilitates promotion of energy conservation
- Policy making level support may be enjoyed
- Easy to calculate losses
- Mainly government controlled fleet (easy to enforce)

Weaknesses

- Poor funding situation
- Lack of expertise in gas pipelines
- Mainly government controlled fleet (lack of incentives for affecting savings)

Opportunities

- Huge potential for savings
- Immediate cash recovery
- Modest level technology requirement

Threats

- Sudden drop of fossil fuels price may cause a negative impact
- Accelerated economic growth in Member States may force to forgo conservation
- Shifting to a new fuel will threaten conservation

Goal Setting

The SWOT analysis indicates the possibilities of getting support from the concerned authorities but funding is not expected. Considering the importance of the sector being assessed and all available information about the potential of energy savings in this sector, it is proposed to reduce energy losses in fossil fuels transportation and distribution by a half. Accordingly a Goal is set.

Goal: To reduce Energy losses incurred during fossil fuels transportation and distribution by a half from today's losses by the Year 2021 for the same amount transported while other affecting factors remaining unchanged.

The following Action Plan has been developed to accomplish the set Goal:

Action Plan for Energy Conservation during Transmission and Transportation: Fossil Fuel Transportation					
GOAL: Reduction of Fossil fuels transportation and distribution losses by a half by the Year 2021 for the same amount transported while other affecting factors remaining unchanged					
Proposed Action Plan to achieve the Goal				**Anticipated Contribution to Efficiency Improvement by (%)**	**Component Weightage**
a) Asses current losses in fossil fuels transportation				Intangible impact	Identify ways to minimize losses and assessment of current losses is the key to improve the fossil fuel transportation. New technologies always reduce losses however it depends on the Cost.
b) Identify ways to minimize losses and Implement				50	
c) Adopt new technologies to minimize losses				50	
Time frame for Implementation: Year 1= 2013 ; Year 2 = 2014; Year 3 = 2015; Year 4 = 2016; Year 5 = 2017; Year 6 = 2018; Year 7 = 2019; Year 8 = 2020; Year 9 = 2021					
a) Asses the current losses in Fossil fuels transportation					
Main Components	**Detailed Actions**	**Scheduled Target**	**Resource/ Funding**	**Responsibility**	**Evaluation Milestones (listed in the parenthesis is the Year that is targeted to complete a particular activity)**
Evaluation of losses	Identify means of transport that deliver fuel to the end user according to the capacity (Pipeline, Rail, Truck, other)	Year 1-Year 2	Min Petroleum	Min Petroleum	v) Analyze the transportation of fuel from the point of mining to end user or from the point of delivery to the country to end user (Year 2)
	Losses are measured to determine the proportion against means of the transport	Year 2- Year 3	Min Petroleum	Min Petroleum	vi) Identify the major contributing means of transport that incur higher losses (Year 2)

b) Identify ways to minimize losses occurred in fossil fuel transportation and Implement remedial actions					
Main Components	**Detailed Actions**	**Scheduled Target**	**Resource/ Funding**	**Responsibility**	**Evaluation Milestones (listed in the parenthesis is the Year that is targeted to complete a particular activity)**
How to minimize losses	Develop models to identify causes for losses	Year 3	Min Petroleum/ Science & Technology	Min Petroleum/ Science & Technology	i) Identify the causes for losses (Year 3) ii) Screen global best practices to reduce losses (Year 3) iii) Evaluate remedial measures for techno-cost effectiveness (Year 4) iv) implement measures(Year 4- Year 9)
	Identify causes for losses	Year 1-Year 3	Min Petroleum	Min Petroleum	
	Undertake Technology Watch to determine Global remedial measures	Year 3	Min Petroleum	Min Petroleum/ Science and Technology	
	Calculate Cost-economics and Implement if feasible	Year 4- Year 9	Min Petroleum	Min Petroleum	
c) Adopt new technologies to minimize losses					
Implementation of new technologies	Undertake Technology Watch	Year 1-Year 3	Min Petroleum	Min Petroleum	i) Losses are graded according to mean of the transport (Year 1) ii) Undertake Technology Watch to determine new methodologies developed (Year 2) iii) Take Cost benefit analysis of new technologies with comparison to the amount of losses (Year 3) iv) Apply appropriate new technologies (Year 4)
	Evaluate new technologies	Year 4	Min Petroleum	Min Petroleum	
	Undertake techno-economic evaluation	Year 4	Min Petroleum	Min Petroleum	
	If feasible Consider introduction	Year 4	Min Petroleum	Min Petroleum	

Chapter 4 ENERGY CONSERVATION AT THE END-USE LEVEL

Energy consumption data of the Member States were analyzed to explore the possibility of Energy Conservation at the end-use level. For that purpose, four categories of energy end-users have been identified, which are Transport sector, Household sector, Industry sector (including Agriculture), and Large Commercial & Service sector. Contribution by Agriculture harvesting combines has been taken as negligible. These sectors were identified in order to have a common platform for all the SAARC Member States.

4.1 Conservation of Energy in Transport Sector

The Transport sector in the SAARC region is dominated by motorized road transport followed by railways. Contribution of river / marine based transport is minimal in comparison with the other two. Poor road conditions and over worn vehicular fleet lead to more energy consumption and heavy pollution. Recent reports indicate that in OECD countries the transport sector contributes 27% to their total CO2 emissions. Considering the poor vehicle fleet that are on the roads in the SAARC region and the current development stage of the SAARC countries, it is understood that the CO2 emissions from road transport sector in the SAARC countries will definitely be more than 27% of their total emissions. Therefore, Conservation of Energy in the road transport sector will have a substantial impact on the overall fuel consumption of these countries as well as reduction of their GHG emissions. The number of private vehicles per unit of population is very low compared to that in the developed countries, while the public transport systems are widely used in the SAARC Region. Development of Bio-fuels for use in transport sector is still in the R&D stage. Once achieved, it will be beneficial at least for a fraction of the vehicular fleet.

The SWOT analysis for conserving energy in the Transport sector has been very helpful in formulating the Action Plan for this sector.

Strengths

- Commitment of the Member States' leadership
- Fewer numbers of private vehicles per unit of population in comparison with the developed world
- Easy to train workmanship
- Well distributed road network in the Member States
- Growth of income facilitates shifting to more fuel economical modes of transport (from private motor bicycles to cars; from old, inefficient vehicles to new, more efficient vehicles)
- Cost effectiveness is visible

Weaknesses

- Vehicular engines and locomotives are made outside the SAARC Region, so no chance for influencing their design
- Lack of expertise to increase efficiency of the engines and locomotives
- Railway transport is not evenly developed among Member States
- Poor public transport schemes force people to use inefficient private means of transportation
- Inadequate funding for development of Mass Rapid Transport schemes
- Highly urbanized economies attract traffic and people to cities

Opportunities

- Huge potential of users for more efficient vehicular engines, if developed
- A good potential of users for more efficient public transport system
- Potential for induction of Solar powered/ Battery powered motor vehicles in the region with the maturing of thee technologies.

Threats

- Un-announced sudden change of policies in the Member States will have adverse impacts
- If the fuel prices fall drastically then no one will be interested in energy conservation
- Improved income of the people leads to purchase of private and more comfortable means of transport instead of using public transport services

Goal Setting

The SWOT analysis indicates that there is ample room to conserve energy in the Transport sector. Various studies suggest that the SAARC Member Studies can reduce the consumption of energy to meet their transport demand by a quarter, if the issue is properly addressed. However, poor funding and inadequate deployment of sophisticated technologies can reduce it to a moderate targets. Thus, an appropriate specific target would be to reduce the fuel consumption in the Transport sector by10% from the current consumption level and achieve it by the Year 2021. This is attainable considering the strengths we do posses and realistic with the possible technology development and awareness creation. So the timely target is to conserve Energy use in the Transport sector so that by 2021 fossil fuel requirement is reduced by 10% for a unit of commodity transported (Ex: per passenger km or per ton of goods transported per km) in comparison to 2012 figures.

Goal: 10% reduction in Fuel used in Transport sector in SAARC Member States by 2021 for a unit of transported while other affecting factors remain as of today.

To accomplish the set goal, the following Action Plan is developed comprising various components:

Action Plan for Energy Conservation at End-Use Level: Transport Sector

GOAL: To improve Energy Conservation in the Transport sector by 2021 per passenger-km and per unit of ton-km; so that per unit of passenger-km and per ton of good-km transported, fossil fuel consumption is reduced by 10% (in comparison with 2012 figures).

Proposed Action Plan to Achieve the set Goal	Anticipated Contribution to Energy Conservation by (%)	Component Weightage
a) Introduction of Mass Rapid Transport schemes in large cities	5	Energy conservation in the Transport sector may be achieved by more Efficient ways of utilization of transport or use of Alternative method of transportation. In SAARC Countries we will have to pay more attention to encourage to use Bicycles, and to undertake development of Rail network
b) Encourage shifting to more fuel efficient means of transport by providing appropriate incentives (e.g. bring in your fuel inefficient car and give incentives in the shape of tax breaks for purchasing a new fuel efficient vehicles)	20	
c) Encourage use of Bicycles for short distances (so that people travel less by Cars)	30	
d) Undertake Road network developments	15	
e) Encourage development of Bio-fuels for Transport	Intangible impact	
f) Undertake Railway network developments	30	

Time frame for Implementation:
Year 1= 2013 ; Year 2 = 2014; Year 3 = 2015; Year 4 = 2016; Year 5 = 2017; Year 6 = 2018; Year 7 = 2019; Year 8 = 2020; Year 9 = 2021

a) Introduction of Mass Rapid Transport schemes for large cities

Main Components	Detailed Actions	Scheduled Target	Resource/ Funding	Responsibility	Component Weightage
Identifying city limits MRT starting points.	Identify main junctions/ suburbs	Year 1	Local Autho in outer city limits (listed in the parenthesis is the Year that is targeted to complete a particular activity)	Transport Ministry	i) Undertake survey to identify key points at the city entry points and main suburbs ii) where passengers disembark from Busses/ Rail for further travelling (Year 1) iii) Expand the survey to identify main attractions/ frequent visiting places (Year 3)
	Undertake survey of commuters passing those points in the peak hours	Year 3	Local Authority	Transport Ministry	

Undertake feasibility studies and secure funding	Make recommendations for MRT points	Year 2	Local Authority	Transport Ministry	i) Hiring Consultants (Year 1) ii) Feasibility Study(Year 2) iii) Bidding for BOO/ BOOT (Year 3) iv) Negotiation and Award of the Contracts (Year 4)
	Hire local institution or secure assistance for preparation of MRT feasibility study	Year 2	Member State	Transport Ministry	
	Introduction of Zonal entry tax system within the city limits	Year 3	Member State	Transport Ministry	
	If Rail based MRT is feasible, either secure own funding or arrange BOO/ BOOT mechanism to secure the operation	Year 4-Year 6	Member State or Lending Organization	Finance Ministry/ Transport Ministry	
Introduction of MRT (Tube trains or "point-to-point" Luxury/ Normal Busses)	Negotiations, hiring consultants, EIA, project finalizing	Year 4	Member State	Transport Ministry	i) Based on initial surveys and reports, consultants are hired to prepare funding proposals and other reports (EIA , etc) (Year 3) ii) Secure funding, sign contracts (Year 6) iii) Start construction (Year 7) iv) Expand facilities based on success (Year 9)
	Start construction of MRTs or Start Bus service	Year 2 (Bus)-Year 5 (construction of MRTs)	Local Authority/ Member State	Finance, Ministry/ Transport Ministry/ Environment Ministry	
	Introduction of MRTs	Year 9	Member State or Lending Organization	Transport Ministry/ Environment Ministry	
Implement the Zonal taxes scheme for private vehicles	Introduce legislations	Year1	Member State/ SEC	Member State/ Transport Ministry/ AG Office	i) Introduction of Point to Point Busses at Identified locations (Year 2) ii) Evaluation (Year 3) iii) Introduction of Tax System in the Restricted Area (Year 4)
	Empower local authorities for tax collection	Year 2*	Member State	Local Authority/ Environment Ministry	
	Implement	Year 2-Year 5*	Local Authority	Local Authority	
		after arranging that If alternative transports are provided with			

b) Encourage shifting to more fuel efficient means of transport by providing appropriate incentives					
Main Components	**Detailed Actions**	**Scheduled Target**	**Resource/ Funding**	**Responsibility**	**Evaluation Milestones (listed in the parenthesis is the Year that is targeted to complete a particular activity)**
Introduction of laws to regulate fuel inefficient vehicles	Assess existing laws	Year 1	Member State		i) Study the existing transport laws (Year 1) ii) Undertake Drafting new laws to bridge the gaps (Year 3) iii) Undertake Opinion view (Year 4) iv) Get the law approved (Year 5)
	Draft new legislations if the existing laws are not adequate (Leading Countries in the region may help.)	Year 2 SEC	Member State/	Transport Ministry/ AG Office	
	Enforce the Laws Transport Ministry/ AG Office	Year 5	Member State	Member State/	
c) Encourage commuters to get off from cars and use peddled bicycles					
Make roads safer for Cyclists and Pedestrians(e.g. build cycling paths)	Undertake a feasibility study	Year 1	Local Authority	Member State/ Transport Ministry/ Local Authority	i) Award the feasibility study to local University (Year 1) ii) Evaluate the results (Year 3) iii) Mark Cycle lanes on the Roads or Build separately (Year 3) iv) Evaluate for effectiveness (Year 4)
	If feasible, secure funding	Year 2	Local Authority	Member State/ Transport Ministry/ Local Authority	
	Build Cycling paths	Year 4	Local Authority	Local Authority	

Main Components	Detailed Actions	Scheduled Target	Resource/ Funding	Responsibility	Evaluation Milestones (listed in the parenthesis is the Year that is targeted to complete a particular activity)
Develop more efficient Bicycle Rickshaws	Study the ways through which improvements may be achieved	Year 1	Member State	Designated SAARC Laboratory	i) Hire consultant to study feasibility (Year 1) ii) Hire consultant for ToR preparation (Year 2) iii) Call for competitive R&D projects (Year 2) iv) Award Auto-Rickshaw Modification grants (Year 2) v) Obtain research results (Year 5) vi) Evaluate results (Year 5) vii) Start mass production based on scaling-up (Year 6) viii) Re-visit the R&D for further improvement (Year 9)
	Award R&D Programme	Year 2	Member State/ SDF/ SEC	Member State	
	Scale-up the R&D Results	Year 3-Year 5	Member State/ SDF	Member State	
Arrange necessary publicity	Request Media Institutions' support	Year 3	Member State	Member State/ Mass Media Ministry	i) Arrange a wide Media Campaign (Year 1) ii) Make Media as partners for this Programme (Year 2) iii) Arrange Annual Gala Media Event to cover this activity (Year 2- Year 8)
	Invite Media to cover the Events	Year 3-Year 8	Member State	Member State/ Mass Media Ministry	
d) Undertake road network developments					
Main Components	**Detailed Actions**	**Scheduled Target**	**Resource/ Funding**	**Responsibility**	**Evaluation Milestones (listed in the parenthesis is the Year that is targeted to complete a particular activity)**
Identify heavily used roads	Undertake a survey using actual data	Year 1- Year 2	Member State/ Lending Organization	Member State/ Transport Ministry	i) Award the study to a local University (Year 1) ii) Evaluate the Report (Year 2) iii) Amend the report and publish it (Year 3) iv) Make recommendations to improve the conditions (Year 4)
	Map heavily congested roads	Year 3	Transport Ministry/ Survey Ministry	Transport Ministry	
	Undertake road expansions or develop alternative roads	Year 4	Member State/ Lending Organization	Member State/ Transport Ministry	

e) Encourage development of Bio-fuels for transport					
Assess the feasibility	Undertake stocktaking of all manufacturing plants	Year 1-Year 2	Ministry of Petroleum	Member State/ Ministry of Agriculture, Forestry	i) Undertake a Nationwide stock taking of current Bio-Fuel Production and Institutional Capacity (Year 1) ii) Undertake a feasibility study of production with seasonal variations (Year 2) iii) Study current and feasible end users (Year 3) iv) Study available and feasible Distribution networks (Year 3)
	Assess seasonal variations of production	Year 1-Year 2	Ministry of Agriculture/ Petroleum	Ministry of Agriculture	
	Study distribution networks	Year 2 –Year 3	Ministry of Petroleum	Ministry of Petroleum	
Main Components	**Detailed Actions**	**Scheduled Target**	**Resource/ Funding**	**Responsibility**	**Evaluation Milestones (listed in the parenthesis is the Year that is targeted to complete a particular activity)**
Undertake Bio-fuel promotion programmes	Introduce various tax benefits and other benefits for Bio-fuels production	Year 1	Member State	Member State	i) Introduce legislations to support Bio-Fuels programme with guaranteed minimal purchasing price depend on the Cost and the technicality of the production (Year 3) ii) Embark on aggressive campaign for promotion (Year 4) iii) Seek legislative support to introduce mandatory blending (Year 4) iv) Explore possibility on Carbon trading (Year 4)
	Identify purchasing price (with upper and lower limits in relation to Oil prices)	Year 3	Member State/ Ministry of Petroleum	Member State	
	Take necessary steps to ensure proper distribution network or Blending with Gasoline.	Year 3-Year 4	Member State/ Ministry of Petroleum	Member State/ Ministry of Petroleum	
	Proposals for Carbon Trading	Year 4	National Nodal Point	Ministry of Environment	

f) Undertake railway network developments					
Main Components	**Detailed Actions**	**Scheduled Target**	**Resource/ Funding**	**Responsibility**	**Evaluation Milestones (listed in the parenthesis is the Year that is targeted to complete a particular activity)**
Undertake railway network developments	If railway is in existence, identify the lines that are overcrowded	Year 1	Min Transport	Min Transport	i) Initiate a study (Year 1) ii) Publish the Study Report (Year 3) iii) Call for expression of Interest in Modification (Year 3) iv) Undertake studies to increase existing rail speed or built new (Year 3) v) Publish the report (Year 4) vi) Invite investors (Year 5)
	Undertake feasibility study on improving the speed (where needed by electrifying too)	Year 1-Year3	Min Transport	Min Transport	
	Secure funding	Year 3	Member State	Member State	
	Implement Increase of Speed	Year 5	Member State	Member State	
Countries trying to introduce Railways	If railway is not in existence, undertake feasibility study to have major economic and political hubs connected by railway network	Year 1-Year 4	Member State/ Lending Organization	Member State	i) Call for feasibility study (Year 2) ii) Evaluate proposals (Year 3) iii) Tapping funding mechanisms (Year 3- Year 5) iv) Call for BOO/ BOOT investments (if there are no other ways) (Year 5)
	Invite investors to invest in BOO/ BOOT schemes	Year 5	Member State	Member State	

4.2 Conservation of Energy in Household Sector

The Household sector consumes between 35-50 % of the total primary energy consumed by the Member States. The energy consumption in households includes lighting, cooking and thermal comfort. Electrification of households in the region varies from 20% to 90%. Predominantly biomass is used for meeting the energy needs for food preparation, followed by petroleum gas (liquefied and piped). To achieve thermal comfort in the households during the winter and summer season, gas burning heaters, air conditioners, or biomass burning stoves (Chullah) are being used. Electric heaters are also in use. As the sector's consumes more than 1/3rd of the total primary energy, it is essential to give due importance to energy conservation.

The SWOT analysis was done to scan the environment and, based on that, the goals were set.

Strengths

- Commitment of the Leadership of Member States on EE&EC
- Expertise/ knowledge available in the region
- Energy labeling programmes are in progress in the region
- Awareness creation activities are being undertaken
- Very aggressive campaigning for CFL
- Experience in promoting ICS and Fuel shifting
- ICS, including the Third Generation of ICS, are in exploitation
- Possibilities for benefiting from CDM

Weaknesses

- Lack of enforcement power as the choice is with the consumer
- Insufficient funding for LED focused research
- Consumer behavior (e.g. not concerned/ no funds for replacements) affects the results of campaign
- CFLs and LEDs are costlier than incandescent bulbs
- Use of CNG and LPG to achieve thermal comfort inside the houses in the winter (inefficient approach)
- End-user behavior (reluctance to change)
- Lack of Intelligent (Socially accepted) approach in ICS promotion
- Inadequate funding for ICS promotion
- Centralized promotion of ICS has not worked
- Poor knowledge of the end-user behavior resulted in failures in ICS promotion
- Lack of support from community for ICS (pressure groups are lacking)

Opportunities

- Tax on incandescent bulbs
- Develop LEDs as an industry-new jobs creation

- Introduce natural light inside the houses (Solar tubes)-new jobs
- Fuel shifting for indoor thermal comfort during the winter season (from petroleum gas to biomass based)
- Ever rising cost of fossil fuels
- Chance for a CDM claim (GHG reduction)
- Chance for an ICS technology breakthrough
- Reduce deforestation (in some areas) Climate change and loss of biodiversity
- Improved health conditions (reduction of health related expenses) when using ICS
- Collaborative work for regional experts
- Introduction of Environmental Ambassadors (promoting ICS to replace Gas plates)
- Sustainably grown forests (Afforestation)
- Room for co-generation activities (use of grassfire, excess power to grid, etc) for small and medium scale industries

Threats

- Increase of income may hamper energy conservation at the household level
- Consumer behavior (not concerned/ no funds for replacements) affects the results of campaigns
- In relation to ICS, an increase of household income leads to fuel switching to Gas
- Rapid urbanization makes fossil fuels freely available (Gas, Furnace oil, Coal)
- Low cost for biomass (in some areas) may lead to a failure in energy conservation
- Rapid electrification in the Member States changes lifestyles of people as Media plays a negative role (e.g. by offering cooking lessons using Gas plates on TV)
- Heavy international lobbying for Coal and Gas usage
- In industries, an increase in production (from limited to mass) leads to fuel switching

Goal Setting

The SWOT analysis indicates that there is a huge potential for energy conservation in this sector. Some surveys conducted in the region suggest that there is a possibility for conservation of up to 30% of energy in comparison with the current level. However, a moderate goal of 15% reduction by 2021 is set under the current economic conditions but the target could be increased at any time, if needed. Consequently an Action Plan was developed to achieve that goal through diverse stakeholders' effort such as CFL promotion, ICS promotion, promotion of fuel switching, etc.

Goal: To reduce the Energy used by the Household sector by 15% by the Year 2021 considering that same level of comfort is maintained while other affecting factors remain as of 2012

To achieve the set Goal, the following Action Plan was developed involving several Components:

Action Plan for Energy Conservation at End-Use: Household Sector		
GOAL: To reduce the Energy used by the Household sector by 15% by the Year 2021 considering that same level of comfort is maintained while other affecting factors remain as of 2012		
Proposed Action Plan to Achieve the set Goal	Anticipated Contribution to Efficiency Improvement by (%)	**Component Weightage**
a) Impose CESS on incandescent bulbs and divert that funds to reduce the cost of CFLs and LEDs	20	In the SAARC Region total energy consumption in food preparation is relatively high compared to other users. More than a 75% of household in the region use bio-mass based cooking stoves. Use of Energy in achieving internal thermal comfort leads to excessive use of Fuels in the Energy Mix. This region comprising of developing countries has more load from lighting in the Electricity Load Curve than from other equipment.
b) Make energy labeling mandatory for household appliances	15	
c) Discourage use of ACs in hot weather and use of fossil fuels based heaters in cold weather conditions (for internal thermal comfort) and encourage use of Solar Based Air Conditioners and Solar Water Heaters	25	
d) Seek media involvement in energy conservation campaigns	Intangible, but high impact	
e) Introduce Energy conservation as a unit / subject in Junior/ Upper school curricula	Intangible, but high impact	
f) Encourage use of ICS for cooking in households and discouraging switching to Natural Gas and LPG based stoves	40	
Time frame for Implementation: Year 1= 2013 ; Year 2 = 2014; Year 3 = 2015; Year 4 = 2016; Year 5 = 2017; Year 6 = 2018; Year 7 = 2019; Year 8 = 2020; Year 9 = 2021		

a) Impose CESS on incandescent bulbs and divert that funds to reduce the cost of CFLs and LEDs					
Main Components	**Detailed Actions**	**Scheduled Target**	**Resource/ Funding**	**Responsibility**	**Evaluation Milestones (listed in the parenthesis is the Year that is targeted to complete a particular activity)**
Assess legal feasibility	Study legal feasibility	Year 1	Min Power	Min Power	i) Study the local production and import of all types of lamps to Compare the usage (Year 1) ii) Evaluate existing legal frame works for feasibility of banning incandescent lamps and also making mandatory use of LED lamps in some places (Year 1) iii) Introduce new legislations (Year 2) iv) Initiate public awareness campaign (Year 2-Year 5)
	If not in place, introduce new legal acts	Year 1-Year 2	Min Power	Min Power/ AG Office	
	Initiate an Awareness Campaign	Year 2- Year 5	Min Power	Min Power, Mass Media	
Prepare implementation mechanism	Identify how the collected CESS is channeled for promoting LED use	Year 2	Min Power	Min Power, Finance	i) CESS percentage and Channeling mechanism identified (Year 1) ii) Legalize CESS (Year 2) iii) Initiate PA campaign (Year 2) iv) Support local CFL manufacturers (Year 3)
	Enforce the legislations for CESS	Year 2	Min Power	Min Power, Finance	
	Initiate a mechanism for supporting the CFL manufac-tures	Year 3	Min Power	Min Power, Mass Media	
	Initiate aggressive campaign targeting the Consumers	Year 2	Min Power	Member State, Min Power	
Explore LED manufacturing Facility	Survey existing relevant manufacturing facilities	Year 1	Min Power, Industry	Min Power	i) Undertake a survey of existing light bulb manufacturing facilities (Year 1) ii) Undertake a feasibility study of CFL and LED manufacturing (Year 2) iii) If feasible Channel CESS funds to manufacturing facilities (Year 3) iv) Evaluate the progress of utilization of CESS funds by them (Year 5- Year 9)
	Support perspective LED manufacturing facilities	Year 3 –Year9	Min Power, Industry, Finance	Min Power	

b) Make energy labeling mandatory for household appliances

Main Components	Detailed Actions	Scheduled Target	Resource/ Funding	Responsibility	Evaluation Milestones (listed in the parenthesis is the Year that is targeted to complete a particular activity)
Identify commonly used household equipment (e.g. light bulbs, refrigerators, fans, A/Cs, gas water heaters, etc.) for making labeling mandatory	Initiate surveys to identify household equipment that consume more electricity	Year 1	Min Power	Min Power	i) Household commonly used equipment surveyed (Year 1) ii) Identify groups of equipment where consumption varies a lot (Year 2) iii) Replicate Energy Libeling that has taken place in other member countries (Year 2) iv) Energy labeling programme introduced for selected areas (Year 3)
	Assess the feasibility of Energy labeling the identified equip-ment	Year 2	Min Power, Commerce	Min Power	
	Embark on Energy labeling activity for the selected equipment	Year 2-Year 3	Member State/ Min Power	Min Power	
Introduce legislations	Assess the existing legal and regulatory framework for enforcing the Mandatory labeling	Year 1	Min Power	Min Power/ AG office	i) Study existing legal frame works for Energy labeling (Year 2) ii) If there are any gaps in the existing legislations or no legislations exist, introduce legal frame works (Year 2) iii) Implement and Monitor Energy Labeling programme (Year 3)
	If gaps are found or there is no legislation, take initiative to draft laws (Leading States in the SAARC Region may help.)	Year 1	Member State/ Min Power/ SEC	Min Power/ AG office	
	Legalize the Act	Year 2	Member State	Member State	
	Enforce the legislations	Year 2-Year 3	Member State	Member State	
Harmonization of labeling of appliances	The Member States may evaluate available labeling programmes in the region for adoption	Year 1	Member State	Member State	i) The MS studies Energy labeling programmes in other Member States (Year 1) ii) Programme gaps and similarities identified (Year 2) iii) Disseminate the information for adoption (Year 2)

c) Discourage use of ACs in hot weather and use of fossil fuels based heaters in cold weather conditions (for internal thermal comfort) and encourage use of Solar Based Air Conditioners and Solar Water Heaters					
Main Components	**Detailed Actions**	**Scheduled Target**	**Resource/ Funding**	**Responsibility**	**Evaluation Milestones (listed in the parenthesis is the Year that is targeted to complete a particular activity)**
Health hazard awareness creation (Gas based room heaters)	Engage Research Teams to identify indoor air pollution and its impact on human health when Gas room heaters are being used	Year 1	Member State/ Min Health	Min Health	i) Research task and TOR identified (Year 1) ii) Research is awarded (Year 1) iii) Research results are analyzed and published (Year 3) iv) PA campaign started (Year 3) v) Introduction of Insulations and Implement Building Codes (Year 3)
	Analyze the research results and present them giving prominence to the impact on health part	Year 1-Year 2	Min Health	Min Health	
	Introduce simple house insulating techniques as well as low cost air cooling systems (Ex: Desert Coolers)	Year 2	Min Power	Min Power, Environment	
	Launch Awareness campaigns/ Media appeals	Year 3	Min Health	Min Power	
Introduction of incremental tariff for electricity and gas	Identify demand increase patterns for Gas and Electricity	Year 1	Min Power, Petroleum	Min Power	i) Consider incremental tariff plan on Gas and Electricity as a measure for conservation (Year 1) ii) Undertake steps to channel collected additional money on investing low cost coolers and home insulations development (Year 4)
	Consider introducing differentiated tariffs for Gas and Electricity (after introducing insulating techniques)	Year 2-Year4	Member States	Member States	

d) Seek media involvement in energy conservation campaigns

Main Components	Detailed Actions	Scheduled Target	Resource/ Funding	Responsibility	Evaluation Milestones (listed in the parenthesis is the Year that is targeted to complete a particular activity)
Invite media to promote Energy Efficiency	Organize Energy Conservation information dissemination workshops EXCLUSIVELY for media personnel	Year 1- Year 2	Min Power, Mass Media	Min Power	i) Prepare list of Journalists who work in Science/ Energy programmes (Year 1) ii) Prepare list of Scientists who can / willing speak to media (Year 1) iii) Arrange Nationwide workshops for media personnel in promoting of Energy Efficiency (Year 1, Year 2) iv) Introduce some measures that encourage media personnel take the message to the public (Year 2)
	Media institutions are given list of Scientists engaged in EC activities	Year 1	Min Power, Mass Media, Science & Technology	Min Science & Technology	i) Identify evaluation criteria, panel of judges, amount of Reward (Year 1) ii) Advertised the Award and Call for nominations/ applications (Year 2) iii) Selection of the Winners and Runners-up (Year 2) iv) Reward the winners at a Gala event with participation of Highest possible national figure (Year 2) v) Monitor media initiatives and reward them (Year 3- Year 9)
	Invite Media to have regular discussions with Scientists	Year 1-Year 3	Min Power, Mass Media	Min Mass Media	
	Invite Media to remind viewers to save energy (once, every hour)	Year 1-Year 9	Min Power, Mass Media	Min Power, Mass Media	
Introduce an award for the Media institution doing best energy conservation campaign	Announce the Award and prepare criteria for selection	Year 1	Min Power, Mass Media	Min Power	i) Develop a programme to reward the media for EC campaigns (Year 1) ii) Develop mechanism to evaluate (Year 1) iii) Initiate annual award (Year 2- Year 9)
	Select, three outstanding performers from each stream of Media	Year 1-Year 9	Min Power	Min Power	
	Present the Awards with maximum possible participation of high profile Figures	Year 1-Year 9	Min Power	Member State/ Min Power	

e) Introduce Energy conservation as a unit / subject in Junior / Upper school curricula					
Main Components	**Detailed Actions**	**Scheduled Target**	**Resource/ Funding**	**Responsibility**	**Evaluation Milestones (listed in the parenthesis is the Year that is targeted to complete a particular activity)**
Introduction of Energy Conservation in to School curricular	Assess current Science curricula in Junior Schools	Year 1	Min Education	Min Education	i) Study the School curricula to see whether Energy Conservation is already there (Year 1) ii) If yes see ways to improve (Year 1) iii) If no, identify the ideal level in which that is to be introduced with the help of Experts (Year 1) iv) Contract curricular development (Year 1) v) Introduce the topic in to Curricular (Year 3)
	Identify most suitable year/ grade when Energy conserva-tion should be introduced	Year 1	Min Education	Min Education, Power	
	Evaluate the available competent resources for curricula development	Year 2	Min Education	Min Education, Power	
	Hire Specialists to develop the curricula	Year 2	Min Education, Power	Min Education	
	Launch Energy Conservation subjects in National School Curricula	Year 3	Min Education, Power	Min Education	
In the absence of resources, the SAARC Energy Centre may help in identifying competent resources from other Member States	Evaluate the competency of available resources for curricula development	Year 2	Min Education	Min Education	i) Contact SEC (Year 1) ii) The SEC contacts regional experts (Year 1) iii) Regional experts helps curricular development (Year 2) iv) The SEC reports to the Member State concern (Year 2) v) The Member State adopts the curricular (Year 3)
	If satisfactory resources not found, seek SEC assistance in identifying suitable personnel from other Member States	Year 3	Min Power, SEC	Min Education, Power	

f) Encourage use of ICS for cooking

Main Components	Detailed Actions	Scheduled Target	Resource/ Funding	Responsibility	Evaluation Milestones (listed in the parenthesis is the Year that is targeted to complete a particular activity)
Health hazard awareness creation (Indoor air pollution, TB, vision deterioration, etc.)	Initiates awareness campaign on health hazards based on already known facts	Year 1	Min Power, Environment	Min Power	i) Data gathering about health hazards from traditional cooking stoves (Year 1) ii) Hire a Scientist to develop the data in to information (Year 1) iii) Gather data/ information from other countries (Year 1) iv) Initiate awareness making campaign (Year 2)
	Hire suitable Scientists to Cement the Arguments and develop information dissemination mechanism	Year 1- Year 2	Min Power, Environment	Min Power, Environment	
Aggressive campaign of ICS with participation of Celebrities	Invite Celebrities (Goodwill Ambassadors) from Sports and Cinema to join hands with the campaign	Year 2	Min Power, Culture, Mass Media	Min Power, Mass Media	i) Request sports and/ or cinema celebrities join the ICS promotion campaign (Year 1) ii) Hire an advertising company for making the commercial (Year 1) iii) Fund the commercial on TV or seek funding support for the TV time (Year 1) iv) Embark on aggressive campaign for ICS (Year 2)
	Make a few TV advertisements involving Celebrities to promote the ICS	Year 2	Min Power, Culture, Mass Media	Min Power, Mass Media	
Organize competitions to further develop ICS to give blue flame and heat regulation ability	A sample size is identified to collect a feedback on ICS	Year 2	Min Power, Environment	Min Power	i) Sample and sample size is identified for the ICS feedback survey (Year 2) ii) Survey results analyzed for end-user perceptions (Year 2) iii) Announce a Nation-wide competition to develop new ICS to satisfy end-user perceptions and which have regulate Blue-Flame (Year 3) iv) Evaluate new designs and Reward the winners (Year 3) v) Embark on promotion of winning ICS to the public (Year 4)
	Feedback is analyzed	Year 3	Min Power	Min Power	
	Analyzed feedback is given as an input for further development of ICS	Year 3	Min Power	Min Power	
	National level Competition is organized to further develop the ICS	Year 3	Min Power	Min Power	
	Evaluates the New ICS and select winning models	Year 4	Min Power	Min Power	
	Reward the winners and promote the winning models with the help of Celebrities	Year 4	Member State/ Min Power	Min Power	

4.3 Conservation of Energy in Industrial Sector (Including Agriculture)

The Energy consumption by the industry sector in the SAARC Member States varies from 5% to 50% depending on the level of the industrial development of country. This disparity does not allow making generalized recommendations to conserve the energy in these consumer categories. Some Member States have very few industries or none at all, while some others can boast with their industries developed to a level which puts them at par with the fastest developing industrial economies. When conservation of energy in the industrial sector is considered, it is imperative to identify industry specific ways, as conservation methodologies vary depending on the type of the industry. That part is left for the Energy Managers, who are responsible for detailed planning. Nevertheless, general proper housekeeping will also lead to conservation of energy to a reasonable extent.

A SWOT analysis was conducted to assess the feasibility of introducing energy conservation and to derive an Action Plan. As mentioned earlier, only a general picture of industries was studied for the SWOT analysis, targeting those non-technical measures that may help in achieving the main objective.

Strengths

- Regulations exist to make hiring of Energy Managers mandatory (in classified industries in some Member States)
- With the availability of Energy Managing expertise, training is regularized (in some Member Countries)
- Experience of Energy Conservation exists in Industries (in some Member States)
- Industry realizes the necessity of Energy Management (for Cost saving)
- Different Energy Conservation Awards and Awareness Creation Campaigns are in place (in some Member States)
- GDP growth in Member States will lead to acquiring of new technologies that are energy efficient
- Industries are organized through different kinds of Chambers (Easy to approach)
- Easy to train workmanship

Weaknesses

- Industry feels hiring of Energy Managers increases their running costs
- Poor benchmarking and target setting
- Positive results of Energy Conservation are not measurable on the spot (difficulty in convincing)
- Limited opportunities to train Energy Managers (in some Member States)
- Absence of proper legislations that make hiring of Energy Managers mandatory (in some Member States)
- Awareness campaigns are not much effective
- Top management is more interested in Sales and Marketing rather than in Energy Management or R&D
- Resistance to change (from shop floor workers)

Opportunities

- GDP growth in Member States will lead to acquiring new technologies that are energy efficient
- Proper Tax reduction on import of energy efficient technologies will lead to the use of new technologies
- Low energy consuming products will have greater demand (Carbon foot print)
- Greater energy savings may lead to claiming of CDM funding as well as support out of other Kyoto protocol funding possibilities
- New industrial estates/zones amenable to adoption of energy efficient technologies
- Cost saving from deployment of efficient technologies in the prevailing high energy price regime

Threats

- Discovery of a new fuel type or discoveries of vast deposits of fossil fuels may lead to drop in the prices of fuels
- Another economic downturn in the West may lead to low production in Member States, thus reducing the energy efficiency initiatives
- The current pattern of fuel consumption in Member States and the upward trend of fossil fuels prices hamper the industrial growth as well as the growth of disposable income in Member States
- Non-affordability of industry to acquire new technologies that are energy efficient
- Poor Law and Order situation in some areas in Member States
- Non-tariff barriers to import of state-of-the-art technologies into the region (technology transfer issue)
- Resistance to change (from shop floor workers)

Goal Setting

The SWOT analysis has shown avenues for energy conservation as well as drawbacks in the region. Considering all the available information about the potential of energy savings in the industry and the results of the SWOT analysis, it is proposed to reduce energy consumption in this sector by 15% by the Year 2021.

Goal: To reduce by 15%, the Energy used per unit of Value Added products of the Industrial sector by the Year 2021.

The following Action Plan has been developed to accomplish the target of achieving the set Goal:

Action Plan for Energy Conservation at End-Use: Industry Sector (including Agriculture)		
GOAL: To reduce by 15% the Energy use per unit of Value Added product of the Industrial sector by the Year 2021 assuming that other related factors remain freeze as of in 2012		
Proposed Action Plan to Achieve the set Goal	**Anticipated Contribution (%)**	**Component Weightage**
a) Introduction of legislations for mandatory Energy Managers in Industry and for development of Energy Policy	35	The Industry and Its development vary very much in the SAARC Region. Same as energy conservation potential of different type of industries. But different survey indicated that the Industrial sector could save up to 35% of energy from the current consumption for the same product. There are number of ways to achieve EE, but dominant solutions can come from self-assessment by the Industry it-self which is to be done by Energy Managers.
b) Introduction of National rewarding system for best energy conserving industries	10	
c) Introduction of tax benefits or other incentives for industries, encouraging them to switch over to fuel efficient technologies	25	
d) Inefficient Agriculture pumps to be replaced	5	
e) Encourage industries to tap home-grown sources of sustainable energy (Renewable)	15	
f) Encourage industrial states/ zones/ parks to reduce the energy losses in transportation	10	
Time frame for Implementation: Year 1= 2013 ; Year 2 = 2014; Year 3 = 2015; Year 4 = 2016; Year 5 = 2017; Year 6 = 2018; Year 7 = 2019; Year 8 = 2020; Year 9 = 2021		

a) Introduction of legislations for mandatory Energy Managers in industry and for development of Energy Policy					
Main Components	**Detailed Actions**	**Scheduled Target**	**Resource/ Funding**	**Responsibility**	**Evaluation Milestones (listed in the parenthesis is the Year that is targeted to complete a particular activity)**
Member States with no or inadequate energy conservation policy takes actions to prepare comprehensive policy	Assess the current available policies	Year 1	Min Power	Min Power	vi) Appoint a team to study all available Energy related Policies (Year 1) vii) Identify Policy gaps (Year 1) viii) Prepare Acts and Policies for Energy Conservation (Year 1) ix) Initiate public awareness campaign (Year 2) x) Embark on legal enforcement (Year 2) xi) Re-visit the activity for feedback (Year 3)
	Appoint a group of experts to draft National Energy Conservation Policy	Year 1	Min Power	Min Power	
	Prepare Energy Conservation Act where needed	Year 2	Min Power/ AG Office	Min Power	
	Take initiatives promoting energy conservation in the Member States through legislations.	Year 3	Min Power/ AG Office	Min Power	
Member States where there are no legislations that make it mandatory hiring Energy Managers are to take initiatives to draft legislations	Assess the available legal frameworks	Year 1	Min Power	Min Power	i) Study the legislations (Year 1) ii) Identify the industry segments and size of the industry to introduce Energy Managers (Year 1) iii) If no room for Energy Managers in existing legislations, go to Action (iii) in above item (Year 1)
	Identify Industry segments for which hiring of EMs needs to be made mandatory	Year 1	Min Power	Min Power	
Member States where expertise is lacking for the purpose; seek help from more advanced Member States through SEC	Assess the available legal frameworks	Year 1	Min Power	Min Power	iv) Identification of Experts (Year 1) v) Needs assessment (Year 1) vi) Seek Assistance through the SEC for experts to help drafting the legislations (Year 2)
	Contact the SEC If expertise is not available	Year 2	Min Power/ SEC	Min Power/ SEC	

Main Components	Detailed Actions	Scheduled Target	Resource/ Funding	Responsibility	Evaluation Milestones (listed in the parenthesis is the Year that is targeted to complete a particular activity)
Member States take initiatives to institute a certification mechanism for Energy Managers	Assess available mechanism for Energy Management in Industries	Year 1	Min Power	Min Power	i) Study existing mechanisms to certify Energy Managers and their drawbacks (Year 1) ii) Consider introducing certification along with making it mandatory to hire EMs (Year 1) iii) If local expertise is not adequate, seek SEC help in arranging regional experts (Year 1) iv) Work towards legalizing Acts and regulations (Year 2)
	Study how to incorporate certification programme in the legislations	Year 2	Min Power	Min Power	
	Include inputs to Energy Conservation Act	Year 2	Min Power	Min Power	
Member States adopt Energy Labeling Programmes developed by other Member States or develop their own labeling system	Study whether Energy Labeling Programme is in existence	Year 1	Min Power	Min Power	i) Study whether energy labeling programme is in existence (Year 1) ii) If not, Consider developing own labeling programme or adopt from a Member State (Year 1) iii) If to be adopted, contact SEC (Year 1) iv) Make Energy Labeling mandatory for selected equipment (Year 2-Year 9)
	If not, adopt one of the labeling programmes developed by forefront countries in the region, and start effort to develop own labeling system	Year 2-Year 9	Min Power	Min Power/ SEC	

b) Introduction of National rewarding system for best energy conserving industries					
Main Components	**Detailed Actions**	**Scheduled Target**	**Resource/ Funding**	**Responsibility**	**Evaluation Milestones (listed in the parenthesis is the Year that is targeted to complete a particular activity)**
Identify Industry segments under which the rewarding competitions are to be organized	Identify high energy consuming industries	Year 1	Min Power	Min Power	i) Study local industry and segregate it according to the energy consumption Ex: per unit of product or total consumption (Year 1) ii) Develop a rewarding system for energy conservation and call for nominations (Year 2) iii) Evaluate the winners and reward them annually (Year 2) iv) Based on annual savings for a unit of production annually develop bench marks for other institutions in the sector (Year 3) v) Include benchmarking to Energy saving acts (Year 4) vi) Make these happen annually (Year 4- Year 9)
	Study how other countries in the region arrange rewarding systems (Member States may seek help from SEC)	Year 1	Min Power	Min Power	
	Announce National Award Systems (Forms of BEE may be used for evaluation)	Year 1	Min Power	Min Power	
	Select winners	Year 2-Year 9	Min Power	Min Power	
	Reward the winners at the highest possible level	Year 2-Year 9	Min Power	Member State/ Min Power	

c) Introduction of tax benefits or other incentives for industry, encouraging them to switch over to fuel efficient technologies					
Main Components	**Detailed Actions**	**Scheduled Target**	**Resource/ Funding**	**Responsibility**	**Evaluation Milestones (listed in the parenthesis is the Year that is targeted to complete a particular activity)**
Introduce Tax Benefit schemes	Assess the schemes of other forefront Member States	Year 1	Min Power/ SEC	Min Power/ SEC	i) Study whether there are any tax benefits or other benefits for the Industry who embark on fuel efficient technologies to conserve energy (Year 1) ii) Develop own scheme or adopt from an advanced Member Country (Year 1) iii) If needed seek SEC assistance (Year 1) iv) Make rewardsa legal binding (Year 1) v) Re-visit after two years for a feedback (Year 3) vi) Improve the scheme based on feedback (Year 4)
	Adopt the schemes with necessary modifications	Year 2	Min Power	Min Power	
	Legalize the scheme	Year 2	Min Power	Min Power	
	Implement the scheme	Year 2-Year 4	Min Power	Min Power	
d) Inefficient Agriculture pumps to be made energy efficient					
Re-Scaling of Agro pumps	Assess the Agro pumps' contribution to National Energy Demand	Year 1	Min Power, Agriculture	Min Power	i) Study the Agriculture pumps being used in a large scale (Year 1) ii) Estimate average energy consumption and ways to improve the efficiency (Year 1) iii) In case of inadequate expertise, seek assistance from the SEC (Year 1) iv) Re-scale the pumps where necessary (Year 2) v) Evaluate introduction of Solar Based water pumping in agriculture (Year 2)
	Member States may adopt successful schemes from forefront Member states (e.g. India)	Year 1-Year 2	Min Power, Agriculture	Min Power, Agriculture	

e) Encourage industries to tap home-grown sources of sustainable energy (Renewable)					
Main Components	**Detailed Actions**	**Scheduled Target**	**Resource/ Funding**	**Responsibility**	**Evaluation Milestones (listed in the parenthesis is the Year that is targeted to complete a particular activity)**
Encourage use of home-grown energy (renewable)for Industry	Member States identifies industry segments where this concept will be introduced easily	Year 1	Min Power	Min Power	i) Survey to determine the industry segments ready for fuel switching (Year 1) ii) Study ways to encourage fuel switching (Year 1) iii) Institute a mechanism that support use of renewable in Industry (Year 1) iv) Develop a rewarding mechanism for the industry who use renewable (Year 2)
	Initiate a promotion	Year 1	Min Power	Min Power	
	Establish an institutional mechanism to support the industries that are using home-grown sources of energy	Year 2	Min Power	Member State/ Min Power	
f) Encourage industrial states/ zones/ parks to reduce the energy losses in transportation / transmission					
Promotion of Industrial States/ Parks	Assess the working models of existing Parks/ Zones	Year 1	Min Power, Industry	Min Power, Industry	i) Assess existing industrial estate operations for minimizing transportation cost and self-sufficient zones (Year 1) ii) Develop promotion schemes so more and more industry moved in to specialized zones (Year 2) iii) Study possibilities of bulk transportation from and to Zone (Year 2) iv) If found acceptable continue promoting it (Year 3- Year 9)
	Explore possibilities to expand the parks	Year 2-Year 9 Industry	Min Power,	Min Power	
	Introduce additional benefits for industries which shift their factories to designated zones	Year 2	Min Power, Industry	Min Power	

4.4 Conservation of Energy in Large Commercial and Service Sector

The SAARC Member States can boast with the development of their tourism sectors where some of the world's top hotel chains are present. Hotels occupy large land areas and buildings, hence there is room for substantial energy conservation. Most of the hotels are designed to make the guests comfortable compromising efficient utilization of energy resources. Hospitals and Government buildings also occupy vast land areas and are usually over-designed and have outdated interiors, thus contributing to inefficient use of energy within the premises. Further, lack of proper building management systems also contributes to the unnecessary loss or use of energy.

A SWOT analysis was performed to assess the energy saving capability and ways to promote conservation in this sector.

Strengths

- Private ownership (savings matter)
- In most cases well educated staff (easy to make aware)
- Availability of expertise within the region
- Available experience in the sector
- Chains of hotels and groups of hospitals (easy to communicate)

Weaknesses

- Inadequate top management support
- Lack of Energy Managers within the premises (current status)
- Inadequate funding (belief that other things are more important)
- Inadequate introduction of energy efficient technologies
- Poor infrastructure in some places (old)
- Negligence (in government buildings)
- Small scale operators cannot afford changes (costly)
- Inappropriate building and interior designs contribute to high energy consumption
- Poor standards (direct adoption from other countries) may lead to high energy consumption

Opportunities

- Possibility to exploit locally available experts
- Potential for employment generation (Energy Managers)
- Chance to market renewable energy resources
- Opening of new avenues for energy conservation

Threats

- Sudden fall of fuel prices may lead to complete disregard of energy conservation
- Requirements of occupants of the premises may conflict with energy conservation
- Sudden income boost in the sector may lead to lack of interest in energy conservation

Goal Setting

Based on the SWOT analysis and other information, an Action Plan was developed to reduce the energy consumption in this sector by 15% by the Year 2021.

Goal: To reduce the Energy used per Unit of Value added product/ service by Large Commercial Service Sector by 15% by the Year 2021 in comparison to Year 2012

The following components of the Action Plan with time frame are identified to achieve the set Goal:

Action Plan for Energy Conservation at End-Use: Large Commercial and Service Sector		
GOAL: To reduce the Energy used per Unit of Value added service of Large Commercial Service Sector by 15% by the Year 2021 in comparison to 2012		
Proposed Action Plan to Achieve the set Goal	**Anticipated Contribution (%)**	**Component Weightage**
a) Benchmarking for Hotel sector (Electricity consumption per guest/night served) and introduction of CO2 foot-print	15	Significant energy conservation could be achieved by legalizing building Codes and making hiring of Energy Managers mandatory for certain size of industry. Introduction of Carbon foot print and the requirement of continuous improvement of carbon foot print will lead to reduce energy consumption
b) Enforce existing Building Codes or develop Codes if not are already in place	40	
c) Make hiring of Energy Managers mandatory for large Commercial/ Service entities (Electricity consumption > 400 kVA??)	30	
d) For large scale service and commercial entities, make energy auditing mandatory after every two yeas	15	
Time frame for Implementation: Year 1= 2013 ; Year 2 = 2014; Year 3 = 2015; Year 4 = 2016; Year 5 = 2017; Year 6 = 2018; Year 7 = 2019; Year 8 = 2020; Year 9 = 2021		

a) Benchmarking for hotel sector (Electricity consumption per guest/night served) and introduction of CO2 foot-print					
Main Components	**Detailed Actions**	**Scheduled Target**	**Resource/ Funding**	**Responsibility**	**Evaluation Milestones (listed in the parenthesis is the Year that is targeted to complete a particular activity)**
Benchmarking of Hotels (> 50 Rooms)	Identify a benchmark for hotels for energy consumption	Year 1-Year2	Min Power, Tourism	Min Power	v) Assess Energy Consumption per Guest per Night stay in a few leading hotels (Year 1) vi) Take the minimum as initial benchmarking and accept it as the industry benchmarking. Require other players to follow (Year 1) vii) Survey on international benchmarking for the sector (Year 1) viii) If international Benchmarking is less than local,accept the international figure as the benchmarking for the Sector and follow (Year 2) ix) Increase the benchmarking and take necessary steps to achieve it (Year 4-Year 9)
	Invite other players to target the benchmark	Year 3-Year 9	Min Tourism	Min Power, Tourism	
	Assess the achievements	Year 3-Year 9	Min Power, Tourism	Min Power	
	Increase benchmarking and repeat the exercise	Year 9 +	Min Power, Tourism	Min Power, Tourism	
Introduction of Carbon footprint	As a starting point, introduce calculation of Carbon footprint for Hotel sector	Year 1	Min Power, Tourism	Min Power, Tourism	i) Hire an expert to Calculate the Carbon foot-print in a luxury Hotel (Year 1) ii) Expand developing Carbon foot-print for the hotelier sector (Year 1) iii) Reward the lowest foot-print achiever (Year 2-Year 9) iv) Based on success expand the carbon-foot print calculation to other export oriented industries (Year 3- Year 9)
	Afterwards, introduce a rewarding mechanism for minimum Carbon footprints	Year 2	Min Power, Tourism	Min Tourism	
	Once it is successful in Hotel sector, take steps to expand the sphere of application	Year 3-Year 9	Min Power, Tourism	Min Power, Min Industries	

b) Enforce existing Building Codes or develop Codes if not already in place					
Main Components	**Detailed Actions**	**Scheduled Target**	**Resource/ Funding**	**Responsibility**	**Evaluation Milestones (listed in the parenthesis is the Year that is targeted to complete a particular activity)**
Building Codes	Study whether Building Codes are in existence	Year 1	Min Power	Min Power	i) Study the building codes for large commercial entity structures (Year 1) ii) If there are no building codes start developing or adopt from a Member State through SEC (Year 1) iii) Make it mandatory to abide by the codes (Year 2) iv) Revisit the activity for compliance (Year 3, Year 4) v) Building codes enforced (Year 4-Year 9)
	If in existence, enforce all aspects of the Codes	Year2-Year9		Member State	
	Ensure proper assessment methodology	Year2-Year3	Min Power	Min Power	
	Set and enforce time frame for old buildings to comply with	Year2-Year4	Min Power	Min Power	
	If Building Codes are not in existence, adopt the Codes from other Member States or develop them. The SEC may help in this regard.	Year2-Year4	Member State/ Min Power/ SEC	Member State/ Min Power/ SEC	

c) For large scale service and commercial entities, make energy auditing mandatory after every two yeas					
Main Components	**Detailed Actions**	**Scheduled Target**	**Resource/ Funding**	**Responsibility**	**Evaluation Milestones (listed in the parenthesis is the Year that is targeted to complete a particular activity)**
Energy Auditing	Assess the Minimum monthly Energy consumption above which Energy Audit is to is to be made mandatory	Year 1	Min Power	Member State/ Min Power	i) See whether EA has made mandatory for large entities (Year 1) ii) If not, take appropriate actions for the same (Year 1) iii) Introduce Bi-annual EA (Year 2) iv) Revisit the activity for better feedback after four years (Year 4) v) Mandatory Energy Audit continues (Year 5-Year 9)
	Impose mandatory Energy Auditing every two years with assessment of follow-up actions (BEE Evaluation form may be used)	Year 3-Year9	Min Power	Min Power	

d) Make hiring of Energy Managers mandatory for large Commercial/ Service entities (Electricity consumption > 400 kVA)					
Main Components	**Detailed Actions**	**Scheduled Target**	**Resource/ Funding**	**Responsibility**	**Evaluation Milestones (listed in the parenthesis is the Year that is targeted to complete a particular activity)**
Energy Managers	Assess the Minimum monthly Energy consumption above which hiring of Energy Manager is to be made mandatory	Year 1	Min Power	in Power	i) Study whether such programme is in existence (Year 1) ii) If no such programme in operation develop one (Year 1) iii) If expertise is inadequate to develop programme seek assistance from SEC (Year 1-Year 5) iv) Define the electricity consumption level beyond which EM hiring is mandatory (Year 2)
	Introduce the Mandatory hiring of EMs as decided	Year 3	Min Power	Min Power	
	Assess whether there is a scheme to train Energy Managers	Year 1-Year2	Min Power	Min Power	
	If not available, develop a scheme or train EMs in leading countries in the Region. The SEC may help in this regard.	Year3-Year5	Min Power/ SEC	Min Power	

Chapter 5 ENERGY CONSERVATION BY INTRODUCING ALTERNATE SOURCES OF ENERGY

It is vital to introduce as much indigenous energy to the national energy mix as possible, so as to reduce the burden of fossil fuel imports and for employment generation. Besides, the alternative energy sources are less polluting and environment friendly. As at this juncture, we are not considering nuclear power and animal power, the remaining alternative energies may be categorized into three groups.

5.1 Renewable Energy

Biomass; Biogas; Geothermal; Hydro power (mini, micro, and pico); Ocean power (Tidal, OTEC, and Wave); Solar based; and Wind energy harnessing are to be considered as renewable sources of Energy in the SAARC region. Normally, renewable energy costs are high compared to those of fossil fuels and traditional large hydro power. Their other disadvantage is that most of the renewable energy sources mentioned above are intermittent in nature or depend on weather pattern. In spite of these shortcomings, it is essential to examine the possibilities for introducing more renewable sources into the national energy mix.

In this context a SWOT analysis was conducted for scanning the environment. Noting the findings of the SWOT analysis and the current trends, a Goal was set to provide 10% of the total electric power generated in 2021 from renewable sources of energy.

Strengths

- Commitment of the Leadership
- Ever rising cost of fossil fuels forces the market to think for alternative sources
- Availability of Expertise knowledge
- Experience gained by the Member States
- Employment generation potential
- Chances for CDM funding
- Minimal environmental pollution
- Step towards Energy independence

Weaknesses

- Higher capital cost
- Higher per unit price of energy generated from renewable
- Low profile generation
- Intermittent generation
- Relatively higher funding requirements
- Larger Land area requirement
- Lack of intelligent (socially accepted) approach in promoting renewable energy
- Inadequate funding for promotion

- Poor centralized promotions
- Poor knowledge of end-user behavior resulted in failures (Biogas, Solar)
- Lack of proper pricing mechanism for supplying RE based energy to the Grid

Opportunities

- Chance of a CDM claim (GHG reduction)
- Chances of a technology breakthrough
- Collaborative work for regional experts
- Sustainably grown forests (Afforestation)
- Room for co-generation activities (use of grassfire, excess power to the grid, etc.)
- Employment generation

Threats

- Sudden drop of fossil fuels prices will cause a negative impact
- Accelerated economic growth in Member States may force them to forgo conservation
- Heavy international lobby for Coal and Gas
- High cost
- Immature technology
- Improper technology transfer

Goal Setting

The SWOT analysis reveals that the SAARC region has enormous potential for Renewable Energy and its utilization is supported at the top leadership level. Considering all the available information about the potential for renewable energy and the findings of the SWOT analysis, it is proposed to have 10% of total electricity generation from Renewable sources in the region.

Goal: To have a RE share of 10% in the total electricity supplied to the National Grid in SAARC Member States by the Year in terms of 2021.

The following Action Plan has been developed to accomplish the target of achieving the above Goal:

Action Plan for Energy Conservation by Introduction of various forms of Alternative Energy: Renewable Energy					
GOAL: To have a RE share of 10% in the total electricity supplied to the National Grid in SAARC Member States by the Year in terms of 2021					
Proposed Action Plan to Achieve the				**Anticipated Contribution (%)**	**Component Weightage**
a) Assessment of existing Power Generation Options and possible inputs of Renewable Energy (excluding large Hydro)				20	GDP growth of the region is in the range of 5%-9% p.a. Accordingly the power generation is expected to expand by 7%-12% annually. To achieve the set target supporting schemes for RE based power generation has to be radically introduced.
b) Adopting legal frameworks and incentives for new power generations from Renewable Energy				80	
Time frame for Implementation: Year 1= 2013 ; Year 2 = 2014; Year 3 = 2015; Year 4 = 2016; Year 5 = 2017; Year 6 = 2018; Year 7 = 2019; Year 8 = 2020; Year 9 = 2021					
a) Assessment of existing Power Generation Options and possible inputs of Renewable Energy					
Main Components	**Detailed Actions**	**Scheduled Target**	**Resource/ Funding**	**Responsibility**	**Evaluation Milestones (listed in the parenthesis is the Year that is targeted to complete a particular activity)**
Stocktaking	Assessment of possible inputs to National Grid from New Renewable (excluding Large hydro power)	Year 1	Min Power	Min Power	i) Existing Power Generation options assessed (year1) ii) Fuel switching options towards RE are considered (year1)
	Feasibility studies to achieve the target	Year1-Year 2	Min Power	Min Power	iii) The new RE options are adopted (without compromising power system reliability) (year2)

a) Adopting legal frameworks and incentives to support the target					
Main Components	**Detailed Actions**	**Scheduled Target**	**Resource/ Funding**	**Responsibility**	**Evaluation Milestones (listed in the parenthesis is the Year that is targeted to complete a particular activity)**
Incentives	Introduce incentives for Private sector's 'Renewable Energy based Power Generation	Year 1-Year 2	Min Power	Member State, Min Power	v) Develop policies so intensives for sustainable Green Power generation are legalized (year1) vi) Introduce fuel substitution and fuel switching incentives (year2) vii) Introduce net metering at the consumer level and Green Power Purchasing facility (year2) viii) Scheme that facilitates concerned consumers purchase green sustainable power introduced (year3)
	Introduce incentives for substituting fossil fuels in Industry/ Services by sustainable renewable energy	Year 1-Year 9	Min Power	Member State, Min Power	
	Introduce net metering facilities for large scale industries	Year 2 -Year 9	Min Power	Min Power	
	Introduce "Green Power Purchasing" facilities to concerned consumers	Year 3	Min Power	Min Power	

5.2 Bio-Fuels

The SARRC region has enormous potential for bio-fuels. Bio-fuels are produced from food crops such as Corn, Cassava, Soy gum, Soybean, Rice, Sugar cane, etc. Biomass based bio-fuel production is still in the experimental stage. Jatropha seeds, Rubber seeds, Turpentine latex, Algae are other forms of feedstock for bio-fuel production. Algae based feedstock is the most promising feedstock that does not compromise with food supply chain as well as not demand additional land use or water use. Therefore, it seems to be the Champion beside Cellulose based bio-fuel production.

The SWOT analysis done for scanning the environment to assess the success of promotion of Bio-fuels

Strengths

- Expertise knowledge in the region
- Chance of availing CDM benefits
- Commitment of the Leadership
- Ever rising cost of fossil fuels forces the market

Weaknesses

- End user behavior (reluctance to change)
- Lack of intelligent (socially accepted) approach
- Inadequate funding for promotion
- Centralized promotion has not worked
- Lack of proper pricing mechanism for Bio-fuels
- Competition from other cash crops (land is limited)
- Technology at primitive stage

Opportunities

- Chance for a CDM claim (GHG reduction)
- Chance for a technology breakthrough
- Reduce deforestation (in some areas), Climate change and loss of biodiversity
- Sustainably grown forests (Afforestation)
- Employment generation
- Convert barren lands to usable land

Threats

- Sudden drop of fossil fuels prices will cause a negative impact
- Accelerated economic growth in Member States may force to forgo conservation
- Heavy international lobby for Coal and Gas

Goal Setting

Considering all the macro-level and micro-level issues pertaining to the promotion of Bio-fuels and their use in the region and the findings of the SWOT analysis, a target of having 10% of the total transport energy requirements in the region in the Year 2021 met by Bio-fuels is set.

Goal: To meet 10% of total transport fuel by bio-fuels by the Year 2021 in real terms and adopt other fuel shifting options to minimize the import of fossil fuels.

The following Action Plan has been developed to accomplish the target of achieving the set Goal:

Action Plan for Energy Conservation by Introduction of Alternative Energy: Bio-fuels					
GOAL: To meet 10% of total transport fuel by bio-fuels by the Year 2021 and adopt other fuel shifting options for use of Bio-fuels in other sectors so to minimize the use of fossils fuels					
Proposed Action Plan to Achieve the				**Anticipated Contribution (%)**	**Component Weightage**
a) Assessment of the Country's Bio-fuel potential				5	GDP growth of the region is in the range of 5%-9% p.a. Accordingly the power generation is expected to expand by 7%-12% annually. To achieve the set target supporting schemes for RE based power generation has to be radically introduced.
b) Study ways to improve the production				10	
c) Undertake Policy development and introduce legislations to support Bio-fuel programme				85	
Time frame for Implementation: Year 1= 2013 ; Year 2 = 2014; Year 3 = 2015; Year 4 = 2016; Year 5 = 2017; Year 6 = 2018; Year 7 = 2019; Year 8 = 2020; Year 9 = 2021					
a) Assessment of Country's Bio-Fuels potential					
Main Components	**Detailed Actions**	**Scheduled Target**	**Resource/ Funding**	**Responsibility**	**Evaluation Milestones (listed in the parenthesis is the Year that is targeted to complete a particular activity)**
Bio-fuels Stocktaking	Assessment of possible inputs to National Grid from New Renewable (excluding Large hydro power)	Year 1	Min Power	Min Power	i) Total Bio-fuels production at the current stage is assessed (year1) ii) Total production potential from all the feedstock is evaluated (year1) iii) Feasibility Study in production, sale, and utilization is conducted (assuming the target as maximum potential) (year2)
	Feasibility studies to achieve the target	Year1-Year 2	Min Power	Min Power	

a) Study ways to improve the production					
Main Components	**Detailed Actions**	**Scheduled Target**	**Resource/ Funding**	**Responsibility**	**Evaluation Milestones (listed in the parenthesis is the Year that is targeted to complete a particular activity)**
Improve Bio-fuels production	Undertake studies as to how other countries have succeeded	Year 1-Year 2	Min Power, Agriculture	Min Science & Technology	ix) Survey of leading countries' success stories (year 1) x) Evaluate suitability of identified success stories' for replication in local conditions (year 2) xi) Based on success stories and local knowledge propose new approaches (year2) xii) Evaluate anticipated roadblocks (year 2) xiii) Propose remedial actions to avoid road-blocks (year 3) xiv) Start promotion at Grand Scale (year3-year 9)
	Recommend new approaches	Year 1-Year 2	Min Power, Agriculture	Min Science & Technology	
	Analyze anticipated roadblocks	Year 1-Year 2	Min Science & Technology	Min Science & Technology	
	Evaluate remedial actions	Year 1-Year 2	Min Science & Technology	Min Science & Technology, Petroleum	
	Propose way out and start promotion	Year 3-Year 9	Min Science & Technology, Power	Min Power	

Chapter 6 LEGISLATIVE MEASURES AND CAPACITY BUILDING

It is well known that several countries in the world as well as some SAARC Member States have achieved significant energy savings by simply introducing Energy Policies and various regulations. Thus this important aspect of the area of concern also needs to be properly addressed. It has two major components viz. Legal frameworks cum Policies, and Capacity building.

6.1 Introduction and Implementation of Legal Frameworks and Policies

As usual, the policies adopted and legal frameworks developed in the Member States in this regard are not comparable. Some Member States have adopted Energy Policies, Acts to conserve Energy, and have gone to the extent of adopting Bio-fuel policies, whereas some other Member States have not even embarked on the development of National Energy Policies. In order to discuss the way forward in the SAARC region, the usual SWOT analysis was conducted.

Strengths

- Expertise/knowledge available in the region
- Some Member States have demonstrated how policy changes can promote energy conservation in a big way
- Other Member States can adopt such policies and initiatives with suitable modifications

Weaknesses

- Uneven development among Member States
- Acceptance and implementation of policies by the key stakeholders
- Lack of Institutional arrangements for implementation

Opportunities

- Collaborative work for regional experts
- Huge indirect impact on Energy Conservation

Threats

- Accelerated economic growth in Member States may force them to forgo energy conservation specific to this goal

Goal Setting

Though the SWOT has given a gloomy picture, there is a chance that the region will be able to reduce its energy consumption by introducing legal frameworks. Thus a goal has been set for all the Member States to bring them to comparable situation.

GOAL: National Energy Policies, Energy Conservation Acts, Mandatory Labeling Programmes, and Mandatory Hiring of EMs are in place by end of 2021

The following Action Plan was developed with various components, considering the regional situation:

Action Plan for Energy Conservation by Introduction of Legislations and through Capacity Buildings: Introduction and Implementation of Legal Frameworks

GOAL: National Energy Policies, Energy Conservation Acts, Mandatory Labeling Programmes, mandatory Hiring of EMs are in place by end of 2021

Proposed Action Plan to Achieve the set Goal	Anticipated Contribution, %	Component Weightage
a) Assessment of existing energy related regulations	40	Regulation and Policy changes are enablers to implement the strategic plans and programs of national importance. Therefore, practically all the components contributes equally
b) Undertake preparation of laws and acts if they are not in place (Leading States in the region may help)	30	
c) Undertake introduction of Mandatory Labeling Programmes, Hiring of EMs, and Mandatory Energy Auditing	30	

Time frame for Implementation:
Year 1= 2013 ; Year 2 = 2014; Year 3 = 2015; Year 4 = 2016; Year 5 = 2017; Year 6 = 2018; Year 7 = 2019; Year 8 = 2020; Year 9 = 2021

a) Assessment of existing energy related regulations

Main Components	Detailed Actions	Scheduled Target	Resource/ Funding	Responsibility	Evaluation Milestones (listed in the parenthesis is the Year that is targeted to complete a particular activity)
Situation Analysis	Review all Energy related legal documents/policies	Year 1	Min Power/ AG Office	Min Power	i) Study all the legal documents relating to Energy Production, transportation, and Use (Year 1) ii) Identify overlapping and Gaps if any (Year 2) iii) Propose measures to address overlapping and Gaps (Year 3)
	Undertake a gap analysis	Year 1-Year 2	Min Power	Min Power	
	Identify legal vacuums and propose remedial measures	Year 2-Year 3	Min Power	Min Power/ AG Office	

b) Undertake preparation of laws and acts if they are not in place					
Main Components	**Detailed Actions**	**Scheduled Target**	**Resource/ Funding**	**Responsibility**	**Evaluation Milestones (listed in the parenthesis is the Year that is targeted to complete a particular activity)**
Legal Aspects	Identify legal requirements to encourage and enforce energy conservation	Year 1-Year2	Min Power/ AG Office	Min Power	i) Based on above results assign a drafting team (Year 3) ii) If local resources is not adequate seek SEC help (Year 2) iii) Adopt the legal framework (Year 3) iv) Implement and follow up (Year 4- Year 9)
	Consider feasibility of drafting them with own resources	Year 2	Min Power/ AG Office	Min Power	
	If unable, seek assistance from SEC	Year 2	Min Power/ AG Office	Min Power	
	Finalize the legal frameworks	Year 3-Year 9	Min Power/ AG Office	Min Power	
c) Undertake introduction of Mandatory Labeling Programmes, and Hiring of EMs and Energy Auditors					
Mandatory Programmes	Assess the current situation	Year 1	Min Power	Min Power	i) Excising energy labeling programmes assessed (Year 1) ii) If Labeling is in existence Identify how to expand (Year 2) iii) If Labeling is not there, consider developing programmes (Year 1) iv) If expertise is not available seek assistance from SEC (Year 2)
	Identify which mandatory EC programmes are needed to be introduce	Year 1-Year 2	Min Power	Min Power	
	Consider feasibility of drafting them with own resources	Year 2	Min Power/ AG Office	Min Power/ AG Office	
	If unable, seek assistance from SEC	Year 2	Min Power/ SEC	Min Power	

6.2 Introduction and Implementation of Capacity Building Activities

As in other sectors, capacity building is vital for efficient management of the energy sector. Energy conservation being a relatively new component in the process of energy sector management, there are not many professional with requisite knowledge and experience to support the various initiative required to support and implement energy conservation initiatives. However, some of the member states have taken the lead in the various aspects of this segment of energy sector management and have moved ahead with significant benefits. For example, capacity building for Energy Auditing is targeted to train professionals to conduct energy audit to identify misuses and wastage of energy. Similarly, capacity building in Energy Management leads to sustainable utilization of the recommendations made during the auditing process. When the situation within the region is analysed, it is seen that, while some Member States have programmes to train Energy Auditors and Energy Managers with Certification, some others do not even have qualified Energy Auditors or Managers.

In this context the SWOT analysis shows the ways for developing the capacities

Strengths

- Well established systems are in place in some Member States
- Training facilities to train professionals and workers already operational in some member countries Media sensitive population

Weaknesses

- Low affordability (Costly undertaking)
- Impact is not felt immediately

Opportunities

- Opportunity for exchange of experiences among Member States
- Opportunity to save between 10%-20% of total energy consumed in households through capacity building and awareness creation

Threats

- Migration of workforce (internal and external) hampers utilization of learned techniques

Goal Setting

- Based on the available information and the findings of the SWOT analysis, a target is set for Member States to embark on Capacity building activities

GOAL: Embark on Capacity building activities to produce Certified Energy Managers and Energy Auditors by 2021.

The following Action Plan has been developed to accomplish the target of achieving the set Goal:

Action Plan for Energy Conservation by Introduction of Legislations and Capacity Building: Introduction and Implementation of Capacity Building Activities					
GOAL: Member States embark on Capacity building activities to produce Certified Energy Managers and Energy Auditors by 2021					
Proposed Action Plan to Achieve the set Goal			Anticipated Contribution (%)	**Component Weightage**	
a) Assessment of the need for EC capacity building activities within the Country			20	Regulation and Policy changes are enablers to implement the strategic plans and programs of national importance. Therefore, practically all the components contribute equally.	
b) Assessment (Gap Analysis) of existing EC capacity building activities and bridge the gaps			40		
c) Undertake measures towards capacity building for bridging the Gaps, utilising own expertise			40		
Time frame for Implementation: Year 1= 2013 ; Year 2 = 2014; Year 3 = 2015; Year 4 = 2016; Year 5 = 2017; Year 6 = 2018; Year 7 = 2019; Year 8 = 2020; Year 9 = 2021					
a) Assessment of the need for ECcapacity building activities					
Main Components	**Detailed Actions**	**Scheduled Target**	**Resource/ Funding**	**Responsibility**	**Evaluation Milestones (listed in the parenthesis is the Year that is targeted to complete a particular activity)**
Need assessment	Assessment of the needs for EMs and EAs for the Economies of the Member States	Year 1	Min Power	SEC	i) The impact of EA and hiring of EM are assessed (Year 1) ii) If found essential identify levels where the EA and EM service needed (Year 1) iii) Survey on available EMs and EAs with in the country (Year 1) iv) Identify the shortages (Year 2)
	Identify the need to employ EMs, EAs, and Technicians	Year 1	Min Power, Science & Technology	Min Power	
	Assessment of the availability of EMs, EAs, and Technicians	Year 1-Year 2	Min Power	Min Power	

a) Assessment (Gap Analysis) of the existing EC capacity building activities					
Main Components	**Detailed Actions**	**Scheduled Target**	**Resource/ Funding**	**Responsibility**	**Evaluation Milestones (listed in the parenthesis is the Year that is targeted to complete a particular activity)**
Gap Analysis and Bridging the Gaps	Assess available resources to train required EMs, EAs, and Technicians	Year 1	Min Power, Science & Technology	Min Power	i) Based on the identified shortage, assess feasibility of engaging locally trained person or if sufficient number of professionals are not available, make arrangements for training the required manpower.(Year 2) ii) If feasible start training (Year 3) iii) If resources are inadequate locally then seek SEC assistance (Year 3) iv) Undertake study from available resources (Year 3) v) Start developing local capacities (Year 3-Year 9)
	Consider capacity building for bridging the Gaps, utilising own resources	Year 1-Year 3	Min Power, Science & Technology	Min Power	
	If unable to do so, seek SEC assistance	Year 2	Min Power, SEC	Member State	
	Visit www.energymanagertraining.com or visit www.energy.gov.lk	Year 3-Year 9 Science &	Min Power, Technology	Min Power	

Chapter 7 CONCLUSION

In order to maximize benefits of energy conservation the entire energy supply chain management concept was applied. A comprehensive approach for energy conservation is thus proposed in this Action Plan. The Action Plan identifies the following key areas for Energy Conservation:

- Energy production and generation
- Transmission and transportation
- End-use level
- Renewable and alternative energy
- Legislations and capacity building

A generalized SWOT analysis was applied on key areas, goals setting for them, local targets were developed based on global experiences, time bound evaluation milestones were identified, balanced score card (BSC) technique is proposed for progress evaluation.

The Action Plan is developed with a vision that proposed Energy Conservation Activities will take place within the time frame of 10 years, i.e. 2012 to 2021

Sectoral Action Plans were developed on the basis n the SWOT analysis. Evaluation of main focus areas and their sub-sections provided the energy conservation potential. The Action Plan proposes energy conservation targets for 2021 for the following Action Areas:

Action Area	Proposed Targets
Power Generation	Increase in efficiency by 2%
Fossil Fuel Mining	Decrease waste by 25%
Electricity Transmission	Reduce technical losses by 80%
Fossil Fuel Transportation	Reduce waste by 50%
Transport Sector	Reduce fuel consumption by 10%
Household Sector	Reduce energy consumption by 15%
Industrial Sector (Incl. Agriculture)	Reduce consumption by 15%
Large Commercial and Service	Reduce energy consumption by 15%
Renewable Energies	RE share in power supply 10%
Bio-Fuels	Share in transport fuel 10%
Legal Frameworks	Policies, Laws, Labeling Programmes
Capacity Building	Certified Energy Mangers/Auditors

The SAARC Energy Centre hopes that this effort will be a positive step to improve energy security as this least cost option will increase energy supplies while at the same time it will contribute towards environment protection.

ANNEXURES

Annexure I SEC FORMAT FOR COLLECTING INPUTS

The SEC prepared this format for collecting inputs from the Member States, and some Member States have responded to the SEC.

1. National policies and legislative frameworks relating to energy efficiency and conservation to benefit from mutual experiences for formulating and/or improving their respective policy/legislative environment.

2. Identification of relevant institutions and their activities for capacity building and promotion of energy efficiency in the country.

3. Experiences, expertise and best available practices especially in industries, buildings, power, transport and agriculture sectors for sharing with other Member States.

4. Status of development of standards, labeling program, testing procedures to promote energy efficiency of energy consuming equipment and appliances.

5. Information on programs launched for creating awareness, training and education, and outreach to promote energy management and conservation in all sectors of economy.

6. Proposal for programs and projects on energy conservation and efficiency for regional cooperation.

7. Information on public-private partnership in implementing energy conservation and efficiency practices.

8. Data for Energy Conservation Directory (listing sector specific energy efficient technologies adopted, and best practices followed).

9. SAARC Energy Centre has included a page on energy conservation and energy efficiency in the SAARC Energy Centre's website (www.saarcenergy.org), Member States may contribute by providing information on the subject for uploading the website.

10. Availability of trainings for capacity building of Energy Managers and Energy Auditors including Certification Examination.

11. Information on:

    - o Best management models and practices to promote energy efficiency
    - o Energy efficient technologies
    - o Energy audit methodologies
    - o Energy Service Companies (ESCOs) concept and practice, success and failures

12. Any other information which Member State may like to share for preparation of an Action Plan.

Annexure II

FORMAT DEVELOPED BY THE BEE, INDIA TO EVALUATE EE PERFORMANCES IN ESTABLISHMENTS

Draft Format for preparation of Energy Conservation Directory

Energy Conservation Measure Implemented in 2009-10

ID to be filled by SAARC Member Country	**Title of the measure**	**Sector**
Year: 2009-10		Technology
Description of the energy conservation measure:		
Picture/sketch/drawing before modification (if available)	**Picture/sketch/drawing after modification**	
Agency that executed the project (with complete address and email):		
Total investment, Rs.	**Year of implementation:**	
First Year energy cost, Rs.		
First Year other saving, Rs.		

On Annual basis						**OTHERS**
Energy consumption before						
Energy consumption after						
Energy tariff, Rs/kWh/Tones/Nm3/kh						

Plant/Establishment complete address: Contract person who could be contacted for more information:	We authorize_____ to use this information for dissemination Signature: _____ Date :_____

(To be filled up separately for each Energy Conservation Measure Implemented)

Annexure III REFERENCE LITERATURE

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