



**SAARC Energy Centre,
Islamabad**

SEC 2nd Strategic Plan (2018-2022)

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Executive Summary

SAARC Energy Centre (SEC) was established in 2006 at Islamabad and became functional in 2008. The overall objective is to initiate, promote and facilitate cooperation in energy sector of the SAARC member states for the benefit of all.

SEC's mandate is to:

- I. Initiate, coordinate and facilitate regional, joint and collective activities on energy in the SAARC region;
- II. Provide technical inputs for the SAARC working group on energy, energy ministers' forum and other SAARC meetings on energy;
- III. Assist the integration of regional energy strategies by providing relevant information and expertise; and
- IV. Be a catalyst for the economic growth and development of the South Asian region.

The importance and sensitivity of energy sector has enhanced dramatically during the last decade or so. Worldwide utilities, decision makers and planners are looking for identifying the most economical and sustainable energy resources besides focusing on demand side management. South Asia is now one of the most dynamic and fast growing economic regions and this growth is only going to increase over the years.

The SAARC (South Asian Association for Regional Cooperation) Member States, namely Afghanistan, Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan and Sri Lanka had signed SAARC Framework Agreement for Energy Cooperation (Electricity) on 27th November 2014. Objective of the agreement is to enable cross border trade of electricity on voluntary basis subject to laws, rules and regulations of respective member states and based on bilateral/trilateral/mutual agreements between the concerned Member States.

The key initiatives under SAARC include embarking on SAARC Energy Ring envisioned earlier. It also includes strategies to achieve higher aspirational target to improve energy efficiency, technology transfer and increase the uptake of renewable energy sources. Engagement of private sectors in energy/power market is one of the key targets in the next five-year plan. This five-year strategic plan will be for the implementation of short to medium-term measures to enhance energy security cooperation and to take further steps towards connectivity and integration. Under these conditions and requirements, SEC has developed the 2nd SEC Strategic Plan for the term 2018-2022.

A. Introduction

I. Background

The Heads of State or Government at the 13th SAARC Summit, held at Dhaka on 13th November 2005, agreed to establish the SAARC Energy Centre (SEC) in Islamabad. The primary objective for establishment of the SEC was to have a regional institution of excellence for the initiation, coordination and facilitation of SAARC programmes in energy. The Centre started its functioning in the year 2008. Over the last decade, SEC has carried out over one hundred program activities which include special projects, research studies, dissemination training and knowledge sharing workshops.

The 1st SEC Strategic and Operational Plan dated 6th September 2006 was prepared at the time of inception of the Centre where focus was more to start the Centre with few areas where it could make major contribution to the region. SEC has now prepared its 2nd 5-year strategic plan. SEC has a series of roles that it can play in order to operationalize the dimensions of regional cooperation in energy. It can be done by acting as a so-called facilitator between countries and supporting Member States. All South Asian countries expect to connect up not merely with the countries in their immediate neighborhood but they also look for opportunities beyond their immediate neighborhood. So, SEC needs to look at ways in which cooperation between different sub regions work and how to maximize and optimize those connections.

II. Vision, Mission, Objective and Goals of SEC

The Mission Statement for the SAARC Energy Centre was approved by the Energy Ministers of the SAARC countries in November 2005. It states that “The primary objective for the establishment of the Centre is to have a regional institution of excellence for the initiation, coordination, and facilitation of SAARC programmes in energy”. However, to align with the modern changes in the regional energy sector, SEC has updated its vision, mission, objective and goals statements. The following are the Vision, Mission, Objective and Goals of SEC.

i. Vision:

The Centre is envisioned as a catalyst for the economic growth and development of South Asia region by initiating, coordinating and facilitating regional as well as joint and collective activities on energy.

ii. Mission:

The Centre will provide technical inputs to the SAARC Working Group (and other) meetings on Energy, and will facilitate accelerating the integration of energy strategies within the region by providing relevant information, state-of-the-art technology and expertise.

iii. Objective:

The primary objective for the establishment of the Centre is to have a regional institution of excellence for the initiation, coordination and facilitation of SAARC programs in energy.

iv. Goals:

- I. To strengthen South Asia’s capacity to collectively address global and regional energy issues.
- II. To facilitate energy trade within the SAARC region, through the establishment of a regional electricity grid and natural gas pipelines.
- III. To promote more efficient use of energy within the SAARC region.
- IV. To enhance cooperation in the use of new and renewable energy sources in the region, thereby contributing towards more sustainable development in the SAARC member countries.
- V. To serve as a focal point for providing reliable energy data for the individual member countries and the South Asian region.
- VI. To enhance SAARC expertise in energy development and management.
- VII. To promote private sector investment and participation in energy activities in the region.
- VIII. To undertake programs to achieve the goals mentioned above.

SAARC Energy Centre is to play an important role in providing critical analysis and information for the important decisions that the countries of South Asia face in the energy and related sector. It is high time for the SEC to further strengthen its capacities, expertise, programmes

and activities aligning with the need of the present days and enhance its functioning as a 'Centre of Excellence' in the energy sector for South Asia.

The objective of the 2nd Strategic Plan is to further strengthen the plan and programs considering the lesson learnt so far and add upon the programmes that have become crucial at this point of time and plan for the future initiatives in the areas of energy. This strategic plan aims to improve and finalize the SEC's Strategic Roadmap (2018-2022) based on the lessons learnt feedback and advice from official from Member States, networking, research and knowledge sharing activities conducted during the last ten years with a critical review of SEC's current vision and mission. The remedial strategies for the issues and hurdles, if any, hindering the potential, conceived and expected achievements of SEC with respect to performance and impact in the energy dimension of the region will be considered for enhancing the activities ahead.

III. SEC Strategic Planning

The SAARC Energy Centre based on its vision and mission had planned to achieve most of its goals over a period of several years. Energy is a wide-ranging field. In the SEC 1st Strategic Plan, the Centre was initially concentrated on fields where it could make major contributions to the region. The programs were spread over the following five thematic areas of Strategic and Operational Plan of the SEC since its inception:

- I. Programme on 'Energy Trade between the SAARC Countries' (PENT);
- II. Programme on 'Integrated Assessments of Energy, Transport, and Environment' (PETREN);
- III. Programme to 'Minimize Oil Imports (PROMO) through Improvements in Energy Efficiency and Fuel Substitution';
- IV. Programme to 'Successfully Implement Technology Transfer'(POSIT); and
- V. Programme on 'Rural Electricity for Poverty Alleviation' (PREPA)

While SEC's contribution until now is acknowledged across the region as very effective. The same is endorsed in the report 'Impact Assessment and the Way Forward'. This SEC 2nd 5 Years Strategic Plan (2018-22) is to foresee a further and continuous development of SEC as a Centre of Excellence in the Region, for all matters and interventions related to the energy sector. The overall approach for the next Strategic Plan is to broaden the scope and impact of Programme activities in the changed and continuously changing scenario on the energy horizon of the Region.

Consequently, for its functioning over the next five years, the SEC needs to;

- i. Redefine its thematic areas in light of the strategic areas proposed in the 2nd Plan,
- ii. Review connectivity and integration in energy sector.

The development of SEC 2nd 5 Year Strategic Plan (2018-2022), has been envisioned by building on the progressive achievements of the previous plans. The plan will implement strategies and action plan through the nine thematic areas. The strategic plan is for the period of 5 years which will focus on the short to medium term strategies required to achieve energy security cooperation and move towards greater connectivity and integration. A review will be conducted at the end of the upcoming strategic plan period (2018-2022) in order to pave the way forward in chartering the roadmap for the next SEC strategic plan.

B. Implementation and Monitoring Mechanisms

For the purpose of implementation and monitoring the activities of SAARC Centers, various boards, committees, working groups etc. have been formed. These groups provide guidance to address key issues, challenges and concerns of common interest. It keeps track of the progress of the activities undertaken by SAARC Centres at various time intervals. The followings are the implementation and monitoring bodies formed for overlooking the programmes and activities under SAARC.

i. Governing Board

The SAARC Governing Board Member provides overall guidance and advice on the implementation of the SAARC activities. They also provide guidance to address key issues, challenges and concerns of common interest and to set policy directions to achieve the goals of the energy cooperation under the framework of the SAARC. The GB shall comprise of one representative from all Member States, representative of the SAARC Secretary General, a representative from the Ministry of Foreign/ External Affairs of the Host Government and the Director of the Regional Centre. Director of the Regional Centre shall act as the Member Secretary to the Governing Board.

The GB collectively recommends the implementation priorities and provides directions and advice to ensure coordination, and integration of SEC strategies and actions. In addition, they guide the formulation and implementation of the yearly work plan and each of the Program Area and review the annual progress updates. The GB during the meeting reviews the programmes that are being identified and recommends those on priority basis for implementing. Further they review the work programmes and suggest and recommend the program to be carried out subsequently.

ii. Council of Ministers

Council of Ministers comprises of the Ministers of Foreign /External Affairs of the Member States. The Council undertakes formulation of policies of the Association; review of progress of cooperation under SAARC; decision on new areas of cooperation; establishment of additional mechanism under SAARC, as deemed necessary; and decision on other matters of general interest to SAARC.

iii. Standing Committee

The Standing Committee comprises of the Foreign Secretaries of the SAARC Member States. They take measures /decisions relating to overall monitoring and coordination of programme of cooperation under different areas; approval of projects and programmes, including modalities of their financing; determination of inter-sectoral priorities; mobilization of regional and

external resources; and identification of new areas of cooperation based on appropriate studies.

iv. Programming Committee

The Programming Committee comprising of the Heads (JS/DG/Director) of SAARC Divisions of Member States to assist the Standing Committee. The Programming Committee considers the Calendar of Activities; Administrative and Financial Matters of the Secretariat and Regional Centres, Technical Committees, Working Groups, and Specialized Bodies.

v. Technical Committees

Technical Committees comprising representatives of Member States are responsible for the implementation, coordination and monitoring of the programmes in their respective areas of cooperation.

vi. Working Group on Energy

Working Groups formulate and oversee programmes and activities within the framework of SAARC to strengthen and promote regional cooperation in the area of energy. They coordinate, monitor and evaluate programmes in this regard. In recommending target-bound programmes and activities, they would also propose mechanisms and sources of finance to implement them. Further, they would also carry out the directives emanating from SAARC higher bodies. Working Groups meet regularly to provide inputs on the area of energy.

vii. Energy Expert Groups

Recognizing the vital area that requires focused attention, the Expert Groups on the following areas are identified.

- I. Oil and Gas;
- II. Electricity;
- III. Renewable Energy; and
- IV. Technology/Knowledge Sharing (including energy efficiency, coal, etc.).

The overall guidance and directions are stirred by higher level while the year to year program and activities are directed by the Governing Board. Yearly activities are executed by the SEC professionals in the form of workshop, seminars, reports, webinar etc. which are monitored by Governing Board and Programming Committee to keep track of the progress of the activities.

C. Future Strategic Areas

Since its creation, SEC has been conducting its activities under ambit of the five thematic areas. In view of the revolutionary changes in the global energy sector especially technological advancements, concern about the global warming, electricity for all strategy, renewable energy trend, clean energy replacing the conventional energy sources, technology transfer, energy efficiency, etc., it is high time that SEC reshape its programme horizon and redefine the fundamental thematic areas. Keeping in view the achievements made by the SEC during the last ten years or so and the development mentioned earlier along with recent global trends, key achievements and proposed plans of each programme areas to support the SEC goals for the next 5 years will be described in the following thematic areas.

With the expiry of the Millennium Development Goal by the end of 2015, a new development agenda was developed and is referred to as Sustainable Development Goals (SDGs). SDG have global set of 17 goals and 169 targets that nations are expected to refer to when designing their national agendas and political policies for period until 2030. The Goal number 7 (SDG7) has the overall objective: “By 2030, ensure access to affordable, reliable, sustainable, and modern energy for all”. Taking into consideration of the SDG7 goals and the mandate of the SAARC Energy Centre the following thematic areas for the next 5 Years Strategic Plan has been identified:

As such SEC is to consider following thematic areas for the next 5 Years Strategic Plan.

- I. Energy Statistics and Assessment
- II. Energy Strategy, Planning and Policy
- III. Regional Energy Trade and Cooperation
- IV. Renewable & Alternate Energy
- V. Rural Electrification and Energy Access
- VI. Energy Efficiency & Energy Conservation
- VII. Private Sector Participation in Energy and Power Markets
- VIII. Transfer of Technology for Clean Energy (including LNG, shale gas, clean coal technologies etc.)
- IX. Electric Transportations

The criteria for selection of the programs and activities shall be selected encompassing the above listed thematic areas. Such programs and activities should be the in-depth analyses and recommendations whereas the subsequent themes deal with the capacity building and interactions with policy-makers and stake-holders. SEC proposes the program activities along with the recommended agenda from the member states for the activities to be undertaken in the subsequent year. These programs should be undertaken in year on year basis with the final decision on the program is to be determined by the Programming Committee upon the

recommendation of the Governing Board. Details of the key proposed plans of each of the programme for the next 5 years will be described in the following sections.

I. Energy Statistics and Assessment

The energy sector is one of the pillars of growth, competitiveness and development for modern economies. Availability of the authentic and timely data is major prerequisite for energy efficient production facilities, enabling further analysis by assessing KPIs, condition or status monitoring applications and direct feedback or evaluation of efficiency measures. There should be standardized approach to collect energy relevant data wherever possible.

To keep up with the ongoing transformation of the energy sector in South Asia, there is a need for data that are accurate, timely and up-to-date. There should be available data that provides an overview of the most relevant annual energy related statistic for the South Asian nations as a whole and for each of its Member States. Setting up of a regional data base is one of the goals of the SAARC Energy Centre. Each of the SAARC countries has a database for collecting and organizing its energy data, but these have been developed independently, and are not strictly comparable. Regional energy policies need to be formulated on the basis of accurate and consistent regional data.

SEC can make an important contribution in this respect. SEC can put together a team from the SAARC countries to design a common and constant database and identify the types of data that would be of good use to policy makers. Type of data that might be collected on an annual basis include energy production, energy consumption, efficiency of energy use, energy imports, cost of energy import, use of firewood, agricultural wastes and other biomass, ratio of energy to GDP, use of energy efficient lights etc. SEC should develop the online databased system and update the data regularly in consultation with the member countries. Collaborating with various ministries in different SAARC countries, SEC can identify bold strategies to develop robust and reliable energy data and energy outlook to facilitate policy analysis on the various energy-related issues for SAARC Member States. Moderate efforts should also be made to have data related to environment, climate change as energy has significant role to play in these. A web-based tool is to be developed to facilitate the countries and the region to upload the required data. SEC should initiate for the initial scoping and development of the platform that countries can tune to suit the local context. This would be instrumental in crafting the right path for achieving the online data for individual country.

II. Energy Strategy, Planning and Policy

In most regions of the world policy-makers interact between different sectors while formulating energy policies. Likewise, interactions take place for the transportation sector, the environment

sector, and so on. It is important that policy making for energy-related sectors be integrated at least to the extent that each is familiar with how decisions in different sector affect each other. It is also vital to know how the different countries are linked with such policy and how such policies will affect the countries involved. The level of integration in energy policy and planning is still nascent among the SAARC Member States and much needs to be done to raise the expertise in this area. Efforts by all countries through development of enabling policy measures is required to take the South Asian countries ahead in energy sector. Integrated planning needs to be carried out that takes into consideration the impacts and benefits across whole economy. For individual countries to achieve the SDG energy targets, proper planning is a must.

SEC could make an important contribution to South Asian region by bringing together policymakers from the energy, environment, water, food, health and transportation sectors from each of the SAARC member countries on a regular basis. Such opportunities should be made best use to come up with ideas for way forward in energy related matters. Regional energy connectivity is a vital strategy to overcome energy deficiency in the SAARC nation. SEC need to study a longer view of global trends and its cross-cutting nature to address key energy challenges to enhance security, accessibility and sustainable development.

SEC should also look for avenue for capacity building for policy and decision makers through training, workshop and seminars. The Centre needs to put efforts to identify opportunities emerging from these trends for SAARC in order to maximize the benefits to support the SAARC theme. SEC will focus on topics to strengthen resilience and emergency preparedness in energy infrastructure/ facilities to facilitate SAARC Member States in energy planning and development process. It can also aim for better profile of SAARC Energy Centre internationally with regard to the growing intra-regional connectivity and interaction, through regular publications to highlight the various activities undertaken by SEC and other associated organizations. This will enable better communication to external stakeholders on the progress of current initiatives and achievements on energy cooperation.

III. Regional Energy Trade and Cooperation

The Islamabad Declaration of the twelfth SAARC Summit, held in January 2004 mandated “South Asian energy cooperation including the concept of an Energy Ring”. World over Regional energy integration has been playing an important role in securing and provision of energy services to millions of people. It provides an alternative supply source for operating reserves and support during emergencies by diversifying the available sources of energy supply. Increased energy cooperation among countries can bring economies of scale of investment, strengthen electricity sector financing capability, enhance competition, and improve sector efficiency. All the SAARC countries substantially import oil, gas, coal etc. for energy from countries outside SAARC region. This puts heavy financial strains on South Asian countries.

There are considerable opportunities for promoting flows of electricity and natural gas between SAARC countries. Nepal, Bhutan, India and Pakistan have ample hydro potentials and even harnessing part of these potentials can bring immense benefit to the overall region.

SAARC Energy Centre has to play an important role in fostering the development of regional interconnection of energy infrastructure through regional and intergovernmental dialogues, regional knowledge sharing workshop and seminars and implementing best practices suitable for the region. The center can examine the current obstacles to developing energy flows in the region, identify the quantitative and qualitative benefits that could accrue to the individual countries from the implementation of the energy ring and suggest ways to facilitate its implementation. Also, SEC can put up its effort to harmonize the legal and regulatory practices, technical standards and to identify possible financing models. It can also carry out the feasibility studies for various energy related projects, provide guidance to potential investors and creditors. It can assist regulatory bodies to carry out various studies, such as on Taxation and Tariff for Cross Border Electricity Trade, harmonized grid code, etc. SEC can also help the region with the mode and methods to be adopted for energy banking which is the current talks among Nepal and Bhutan with India.

SEC has been playing and further need to play an important role in fostering the development of regional interconnection of energy infrastructure though regional and intergovernmental dialogue, regional knowledge sharing and compiling best practices.

IV. Renewable & Alternate Energy

In the past the deployment of renewable energy technologies in SAARC countries was to encourage reduction in oil consumption and also on policies to mitigate environmental impacts of fossil fuel use, including the potential effects of climate change. The development of renewable and alternate energy in the SAARC covers hydro, solar photovoltaic, solar thermal, wind, bio-energy civil and waste. Others, such as ocean energy, fuel cell, civil nuclear energy, hydrogen and coal liquefaction /gasification are at developing stages. Technology transfer and meaningful partnerships among nations are required to make these energies meet its increasing requirements. As an alternative energy Civilian nuclear energy, can be considered for clean source of energy that can help SAARC meet its growing energy demand in the region. Thus, in long run a Nuclear Energy Co-Operation needs to be established and be responsible for specialized energy body to shepherd SAARC wide cooperation and facilitate information sharing and exchange technical assistance, networking and training on the use of nuclear energy for power generation purposes.

Energy storage has been gaining its popularity recently and it is important for the development and integration of renewable energy technologies. This energy storage technology would give us flexibility to produce and consume electricity continuously, increase reliability and

strengthen system resilience. SEC should take initiatives to familiarized SAARC nations on the available technologies through workshop, seminars, webinar, study reports etc. Different forms of energy storage may be studied, namely solid-state batteries, flow batteries, flywheels, compressed air, thermal etc. Efforts will be devoted to the commercialization and marketing of renewable energy technologies. There is a definite requirement to identify and address the constraints in the development and deployment of renewable energy in terms of the technology and financing which would enable the renewable industry and its players to be self-sustaining.

It is also envisaged to have a roadmap with clear policies, response plans and programmes for R&D in renewable energy which will enable the commercialization, investment, market and trade potential of renewable energy technologies to be realized in all SAARC nations. SEC can initiate the study on changing market dynamics on renewable, examine the new opportunities, assess the impact of recent policy and regulatory initiatives, discuss risks and challenges, and showcase the latest innovations, most promising technologies and noteworthy projects. The Centre should also provide platform to project developers, EPC companies and technology providers to share their experiences and exchange ideas through conference and workshops. Initiatives to harmonize standards/codes for solar photovoltaic and wind energy are crucial. SEC can also do studies in collaboration with other agencies to further explore the potential of ocean renewable energy in the SAARC region. It can collaborate with the International Renewable Energy Agency to initiated preparatory action on a joint initiative to apply a regional approach in facilitating the integration of various renewable energy into the regional power mix.

V. Rural Electrification and Energy Access

There are millions of people in South Asia who have no access to electricity. A number of technological options are available for rural electrification namely grid extension, off-grid diesel generation, mini-grids and distributed renewable energy. Stand-alone solar home system and renewable energy -based mini-grids can offer a more rapid means of increasing access to electricity, allowing immediate positive impacts on rural development. Where resources are available, micro-hydro or biomass gasification technologies can be explored to power motive and mechanical tools for on-farm activities. Use of solar PV for irrigation is increasingly becoming a preferred choice in many countries. Though, grid extension has always been the mainstay but in the practical front this has been a difficult solution for rural electrification. Frequent, downtime of diesel generator is unreliable for the supply in remote areas, in addition, they are emission intensive and cause local air pollution. Most of the people without electricity live in remote locations or in small communities where it has not been economically feasible to provide grid-based electricity. Energy Access means making electricity, heat, or other forms of

energy accessible to common man. Lack of energy access implies any quality of life issues relating to this lack of access. Mostly the rural part of the developing or underdeveloped countries still remain largely without efficient power infrastructure.

In the SAARC countries, several programs already exist to supply small amounts of electricity in such locations, using photovoltaic (PV), micro-hydro or wind system. SEC can work on to carry out an assessment of the current scenario of energy access to the rural populations. It should try to find the objectives and targets to remove the rural energy poverty and how member states can meet the challenges encountered and accomplish this important task. The study should cover the role that renewables offers, especially the wind and solar energy. The study can also have deeper look at related policies and case studies and tried to correlate those with the data about their implementation. The new technologies and emerging solutions need to be studied as well to enhance such targets. Research and policy implementation at this level can strengthen the power position of the country at the ground level.

VI. Energy Efficiency & Energy Conservation

The energy sector worldwide faces significant challenges that everyday become even more acute. Energy efficiency is viewed as the most cost-effective way of enhancing energy security and in addressing climate change and promoting competitiveness. Efforts are being made worldwide to have efficient use of energy. To address the limited global reserve of fossil fuels and volatile energy prices, the individual countries have been following a deliberate policy of diversifying and using energy sources efficiently. There should be collective efforts on energy efficiency towards its target of reduction in energy intensity at least in following areas but not limited to:

- I. Appliance Standardization and Labeling Schemes
- II. Energy Building Codes
- III. Energy Efficiency policy interventions and instruments
- IV. Energy Audits and assessments

As the economies of SAARC Member States are dependent on imported oil, therefore it is highly desirous to efficiently manage their energy supplies. Although some of the Member States are at different levels in their efforts towards Energy Efficiency and Energy Conservation measures by developing policies, independent institutions, appliances standardization etc. This combined effort at regional level will help Member States to have a consolidated effort in achieving energy efficiency by sharing each other experience and expertise. This will help the region in reduction for reliance on imported oil.

SEC can contribute towards the Energy Efficiency and Conservation in SAARC region to a great extent. The Centre can study and review the national policies and legislative frameworks, assist

in institutional strengthening and capacity building, organize workshop and seminars where people can share experience, expertise and best available practice especially in industries, buildings, power, transport and agriculture sectors, develop and harmonize standards, testing procedures, awareness program, works towards promoting public-private partnership in such practices, develop an Energy Conservation Directory, advertise through SEC's website, organize program of exchange of delegates to share experience and also SEC can prepare the action plan on cooperation in these areas.

In order to improve the Energy Efficiency in South Asia it is necessary to analyze the impacts on energy efficiency and the need for a systematic approach, energy efficiency challenges, assessment of site energy maturity and developing a forward strategy for power efficiency for industrial transformation. Smart Metering is seen as one way to Increase Energy Efficiency in South Asia. SEC should focus on smart metering infrastructure and technology solutions, smart meters, energy monitoring and retail partnerships study on demand response, data management, security and privacy, current business models and opportunities. SEC should also analyze the Impact of Renewable Energy on Energy Efficiency. Some of the areas that can be covered are on technical synergies and policy synergies. It is also to look at the Energy Management Processes like Operation and Energy, Maintenance activities impacts.

VII. Private Sector Participation in Energy and Power Markets

In recent years there is a wave of liberalization and privatization of infrastructure activities in developing countries inclusive of SAARC member states. The private sector has become an important financier and long-term operator of infrastructure activities in energy sector. The availability of long-term foreign capital and the opening of infrastructure sectors to private investment allowed the rapid increase in private infrastructure activities in developing countries. It is driven by the need to expand capacity and increase reliability in an environment of tight public budget constraints. However, for such infrastructure lenders will be more cautious, focusing more on project quality and taking a more realistic view of long-term project risks, including macroeconomic, political and regulatory. Project financiers will expect local and regional capital to play a greater role in project financing. Private participation and competition propelled by new technological developments will basically reduce the tariff and increases the efficiency of infrastructure utilization. Most private activities will take place in competitive environments as more governments recognize that competitive electricity markets can provide cheaper and more reliable electricity service than monopolies.

The private sector has a crucial role to play in achieving and mobilizing the additional investment needs in the energy sector. While the Governments needs to create an enabling investment environment for the private sector to implement their plan. Renewable energy

projects are mostly developed by private sector. However, political instability and currency volatility are some of the main risk associated with such investment, especially in developing countries. Participation of the foreign investors should be encouraged be it as a 100 per cent foreign-invested company, joint venture or public-private partnerships companies. Individual government should make effort to have a long-term electricity price for the renewable energy. Many of the investment in the energy sector needs huge upfront investments which increases the overall investment risks. Cost of financing in the developing countries are significantly higher due to issues of uncertainties with grid integration, project delays. International financing institutions can play an important role in avoiding the risk for private sector investments in energy sector development projects.

Energy infrastructure plays an important role in economies and is critical for development of South Asian nations. SEC should initiate program which would encourage individual government in South Asia to bring reforms and learning from best practices and can take steps towards resolving South Asia's energy crisis. Such initiative would not only help to close the gap between demand and supply but to improve the management of services in energy sector which contributes towards long-term improvements in over energy investment environments. Efforts should also be made to bring competitive wholesale markets to determine the spot price of electricity on an almost continuous basis, although firms can enter into long term contracts as well. While doing this most of the risks will be shared and involvement of firms like energy trading companies, investment banks or other parties get strengthened. SEC should look at various options by which the involvement of private firms are seen in the contracting out the construction of new energy projects. Involvement of private companies allows the publicly owned firm to reap benefits from more efficient plant construction, or new technologies that they might not otherwise know about.

VIII. Transfer of Technology for Clean Energy

A major challenge faced by SAARC member states is poverty elevation with minimal climatic deterioration. Poverty elevation requires significant industrial development fueled by reliable, economical and indigenous energy resources. SAARC region possess limited furnace oil resources. In this scenario, coal fired power generation is set to play a major role in power generation portfolio of SAARC member states in coming decades. Despite the recent efforts to enhance the share of electricity generation from renewable sources made by several countries in the SAARC region, coal is and will be going to be the single largest source of power generation in near future, particularly in India, Pakistan and Bangladesh. This inevitability of coal utilization for power generation in the region dictates that clean coal technologies must be employed to reduce environmental burden. 21st Century clean coal technologies offer higher

efficiency with reduced pollutant emissions particularly NO_x, SO_x and particulate matter. In the upcoming coal fired power plants in SAARC region, more than 50% deeply supercritical technology coupled with Low NO_x burners, flue gas desulfurization (FGD) units and electrostatic precipitators (EP). This trend will ensure that coal fired power generation will become cleaner from the past.

However, there are several areas that require immediate attention by the policy makers regarding coal fired power generation in the SAARC region. Deployment of integrated gasification combined cycle (IGCC) technology remains a key challenge. The major hurdle is contextualization of technology which is designed on low ash coals to indigenous coal resources. Research and development can be initiated targeted at specific deposits to develop dedicated gasifiers. Improving thermal efficiency of coal fired power plant indeed reduces carbon dioxide emission, however, deep cuts in carbon emissions may only be realized by carbon capture and storage (CCS). Therefore, the need of the hour is to invest in IGCC and CCS. Most of the coal in the SAARC countries has a high sulfur and low energy content. Thus, clean coal technologies will be required to make the best use of the coal, and to minimize the adverse environment and health impacts of using such coal. Technologies for the removal of sulfur prior to combustion, as well as several for flue gas removal could be transferred. SEC could play a valuable role by identifying the key social and infrastructure considerations for the successful transfer of technologies in these areas.

There are huge number of energy technologies in use in one or more countries of South Asia. A vast majority of them have been transferred from industrialized countries. In many cases, the transfer has been relatively straightforward, while in other cases, the technology had to be modified to work properly under the conditions prevailing locally. The only way the entire global energy system transition to clean energy is if its cost is lower and its performance is equal to or greater than cheap fossil fuels like natural gas, coal, and oil.

Unfortunately, today's clean energy technologies like wind, solar, electric vehicles, smart grids, and energy storage are still facing certain level of drawbacks. Solar and wind power are intermittent without energy storage and it still require significant advances in energy conversion efficiency. Electric vehicles are much expensive compared to gasoline powered cars, and significant infrastructure build-out like smart grids, charging infrastructure, and transmission lines are barriers to rapid deployment as well. Clean energy technologies have made dramatic progress and innovations have made it possible for rapid progress in renewable energy within short period of time, but much more is needed. Today's technologies won't be able to propel the world to deep reductions in global carbon emissions, but improving on today's technologies and developing new designs can. Clean energy innovation means support for the back-end research through testing, demonstration, commercialization, and smart

deployment of the technology pipeline. Each individual stages of innovation needs to interact within an innovation ecosystem and ensuring not only proper support for each, but proper linkages, collaboration, and institutional support is critical. This idea of supporting comprehensive energy innovation ecosystems need to be thoroughly studies in SAARC countries.

Several energy technologies, like wind, biomass and solar PV are already well established in some SAARC countries. These can be transferred to other SAARC countries.

Three-member states namely Bangladesh, India and Pakistan are already using natural gas. The current energy mix of both individual and collective may be studied. A look at the evolution of markets/ hubs and how it has shaped a more efficient way to price LNG can be discussed with the long-term oil linked prices. Apart from technologies, management techniques related to energy can also be transferred. SAARC countries can work towards management techniques in setting up of the infrastructure for use of compressed natural gas (CNG) in vehicles. Pakistan and India already have years of experience in the field of CNG and such experiences should be shared among rest of the countries so that it can accelerate the buildup of CNG vehicles. For LNG, they can explore cooperation in other areas such as promoting technical knowhow via training and development, exploring commercial linkages such as group buying or offering constructional capacities on a regional basis etc.

IX. Electric Transportation

Transport has a very important role in the socio-economic development of any county. Transport sector is a huge consumer of energy; it remains the largest consumer of petroleum-based fuels, accounting to 20% of global final energy consumption and 60% of total oil consumption. On the other hand, more than one third of the total greenhouse gas emission comes from the transport sector. This has not only exerted a strong pressure on the depleting resource but it also has huge negative impacts on environment and adverse effects on human health.

Hydrocarbon reserves in South Asia are limited; all SAARC Member States are net importers of petroleum products. Ever growing transport sector in the SAARC Member States has been constantly exerting pressure on the oil dependence as well as resulting in the environmental externalities. One of the measures, to relax the dependence on the petroleum products and thereby mitigate the environmental impacts, is to ensure the gradual replacement of the conventional vehicles with electric vehicles. There are number of issues associated with the use of electric vehicles. Electric vehicles provide short driving range, require long recharge time and offer low speeds. Deployment of electric vehicles would necessitate sufficient electric charging

stations. Different countries in the region have different levels of electrification and the fuel mixes for generating electricity, hence the indirect source to wheel emissions for EVs varies accordingly. However, electric vehicles are more energy efficient than the conventional vehicle. They, therefore, corresponds to lower fuel costs and also play role in the reduction of emissions. Using electric vehicles can reduce dependence on imported petroleum products and can hence contribute to ensure energy security. Besides, electric vehicle also helps in reducing the transport created noise pollution and other negative environmental impacts.

SAARC Energy Centre should work towards the advertising and familiarization of the use of Electric Vehicle. The Centre should carry out the studies or conduct familiarization workshops/seminars on growth factors for EV market, current manufacturing ability for PEV, HEV & BEV, manufacturing status for PEV, HEV & BEV, country wise determination & benchmarks in South Asia for electric vehicle adaptability, opportunities for smart grid players in electric vehicle market, regulatory and policy landscape for electric vehicles market in South Asia and the market size for HEV, PEV & BEV in South Asia.