

# Concept Paper of Activities

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## Concept Note of Webinar on “Pumped Storage Hydropower: Opportunities and Challenges in SAARC Region”

### Background

Pumped Storage Hydropower (PSH) is a proven technology which is cost effective, efficient, and operationally flexible. This grid-scale storage technology is used extensively to both store and redistribute electricity from periods of excess supply to periods of peak demand, and to provide grid reliability services with its generation and pumping modes. Globally, it provides 160 GW of the approximately 167 GW of energy storage in operation, accounting for over 97 percent of the world’s utility-scale energy storage applications<sup>1</sup>.

In SAARC Region, energy storage markets are still nascent yet there is vast potential for its development. With the rapid growth of renewables across SAARC Member States, PSH will have an increasingly important role in integrating Variable Renewable Energy (VRE) and ensuring power system reliability. The energy supply from VRE can't be regulated since they are dependent on the time of the day, seasons, and the vagaries of weather. Hence, there is an ever-increasing demand for energy storage assets. PSH are best suited in the present scenario for addressing this demand<sup>2</sup>.

With reliability, resilience and the push for a low carbon future being the major focus for today’s grid operators, future energy scenarios with increasing VRE and decreasing base load options creates challenges and a need for dependable solutions. PSH brings the added benefit of absorbing off-peak and excess electric generation, and is an important asset in integrating renewable energy resources.

### Introduction

The challenge will be for utility planners, industry stakeholders, regional market operators, and regulators to put into place policies that ensure the grid maintains reliability during this rapid development. Planning models demonstrate that adding more wind and solar requires greater amounts of storage and operational flexibility to assure grid resilience. The combination of increasing VRE and the retirement of fossil fueled dispatchable capacity makes hydropower and pumped storage the unique proven technology that can provide clean energy, flexibility and storage<sup>3</sup>.

In this context, SEC shall conduct a knowledge sharing Webinar on “Pumped Storage Hydropower: Opportunities and Challenges in SAARC Region”. The Webinar shall feature presentations, and interactive discussion sessions led by resource person(s) from regional/ international market.

### Objectives

The objective of this webinar is to discuss the need for developing PSH technology, and to explore what policy and regulatory changes are needed in the SAARC Region.

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<sup>1</sup> Prospect of Pumped Storage hydropower in Asia, Asia Clean Energy Forum, International hydropower association, 2023

<sup>2</sup> Guidelines on Pumped Storage Projects, Ministry of Power, Government of India, 2023

<sup>3</sup> Pumped Storage Report, National hydropower Association, 2021

**Major Aspects /Topics to be covered during the Webinar**

During the course of this webinar, the experts shall discuss scale of energy storage needs and the untapped potential for PSH in the SAARC region. The policy and market mechanisms necessary to provide revenue certainty and de-risk investment for the PSH deployment will be explored. Moreover, experience within and outside SAARC region, and the experts' insights on the opportunities and challenges for PSH will be discussed.

**Venue of the Webinar**

The webinar shall be broadcasted from the office of SAARC Energy Centre, Islamabad.

## Concept Note of Webinar on “Urbanization-Energy demand Nexus: challenges and mitigations”

### Background

Urbanization involves demographic, social and environmental evolution in the form of physical and economic changes arising due to shift from primary sector (agriculture) to secondary/tertiary sectors like manufacturing and services. The physical changes are primarily the provision of utilities through a municipal entity compared to rural communities where most of these are managed individually or informally. Therefore, urbanization has direct relation with energy demand, that is influenced by various factors associated with the process of urban development. Urbanization leads to increased energy consumption due to energy intensive large buildings, lifestyle, energy intensive transportation, technological advancements, industrialization, waste management, urban heat Island effect, and nature of businesses etc. If we look at the global energy consumption, cities account for two third of global energy consumption and three-quarters of global carbon emissions. From the beginning of the twenty first century, more than 130 million population has been added to cities of the region. With the predicted increase of 2.5 billion in urban population by 2050, the energy consumption will also increase accordingly<sup>4</sup>. Not an exception, urban population in South Asia has significantly increased (mainly in India, Pakistan, Bangladesh and Nepal), so has the energy demand<sup>5</sup>.

### Introduction

Given the growth in the region, urbanization will continue at a very high rate in the future, which will result in increased energy demand. Per capita energy consumption in urban areas is almost double of the rural population. Increased urbanization reflects increased national energy demand<sup>6</sup>. Effective planning and policies are required to cater this ever-increasing energy demand to ensure future economic growth. In order to discuss the urban growth patterns in the SAARC Member States, the impact of urbanization on energy demand, and ways to better respond to resultant increase in energy demand, SEC shall conduct a Webinar on “Importance and Role of Demand Side Energy Efficiency in Relation to Expanding Urbanization”. The Webinar shall feature presentations, and interactive discussion sessions led by resource person(s) from regional/ international market.

### Objectives

The objective of the webinar is to explore the interconnected dynamics of urbanization and resultant increase in energy demand, identify key challenges, examine case studies, highlight technological solutions, discuss relevant policies and planning, explore mitigation strategies and encourage collaboration among member states for efficient energy consumption. By achieving these objectives, the webinar aims to contribute to a better understanding of the complexities surrounding urbanization and energy, fostering discussions that lead to actionable insights and solutions for more sustainable and resilient urban development.

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<sup>4</sup> J. L. K. Z. J. F. M.-P. K. Qiang Wang, "Does urbanization lead to less residential energy consumption? A comparative study of 136 countries," *Energy*, p. 117765, 2020

<sup>5</sup> World Bank, "Demographic Trends and Urbanization," World Bank Group, Washington, 2021

<sup>6</sup> M. Z. Pengjun Zhao, "The impact of urbanisation on energy consumption: A 30-year review in China," *Urban Climate*, pp. 940-953, 2018

## **Major Aspects /Topics to be covered during the Webinar**

The following major areas/ topics shall be covered in this webinar:

- Introduction to Urbanization-Energy Nexus
- Impact of urbanization on energy demand and environmental consequences
- Responding to energy demand optimally, utilizing indigenous renewable resources
- Smart Cities and energy efficiency
- Public Transportation and Sustainable Mobility
- Mitigation Strategies and Best Practices to manage the increased energy demand
- Future Trends & Opportunities
- Panel Discussions and Stakeholder Perspectives

## **Venue of the Webinar**

The webinar shall be broadcasted from the office of SAARC Energy Centre, Islamabad.

## **Concept Note of Webinar on importance of digital technologies in effective management of power grid**

### **Background**

The rise in global energy demand and transition towards the low carbon-based economies, has paved way for decentralized technologies including Alternative and Renewable Energy Technologies. The increasing penetration of renewables in power grids and deployment of mini and micro grids for decentralized power generation has increased concerns of grid operators on the level of security, efficiency, availability, and durability of energy systems. However, the advent of digital technologies such as data logging sensors can facilitate the optimization and security of processes. On the other hand, the introduction of Information and Communication Technologies (ICT) such as Big Data, Internet of Things (IoT) and Artificial Intelligence (AI) techniques allows the development of sustainable and efficient models for the consumption and production of energy. The use of digital technologies coupled with ICT provides various benefits to the power sector such as:

- Flexibility in operational processes
- Ability to have accurate information in real time
- Efficient use of resources and increased productivity
- Monitoring of the entire chain from generation, transmission, distribution, and commercialization in a precise and exhaustive way
- Possibility to automate processes and increase the operational efficiency of distribution companies
- Adjusting supply and demand in real time, reducing ineffective operations
- Improves the prediction of failures and incidents, which allows to extend the life of equipment
- Allows generating useful information for analysis and operational optimization

### **Introduction**

Nowadays, digital technologies along with ICT applications are widely used for managing the power grids. It empowers the grid operators not only to effectively monitor and control the power generation and distribution systems but also making it possible for them to prevent and correct inefficiencies in real time, as well as decision-making based on predictive scientific and mathematical models.

In the SAARC region, power generation and distribution companies may find it useful to explore various advancements in digital technologies and practical applications of ICT to address the concerns arising due to large scale integration of variable renewable energy sources in power grids. In this context, SEC shall conduct a knowledge sharing Webinar on “importance of digital technologies in effective management of power grid”. The Webinar shall feature presentations, and interactive discussion sessions led by resource person(s) from regional/ international market.

### **Objectives**

The objective of this webinar is to introduce and familiarize professionals from the SAARC Member States with the advance digital technologies and the applicable use of ICT such as Big Data, AI, and IoT etc. in power sector. This webinar shall serve as a knowledge sharing event, especially for those who are working in the public/private electric utilities, and the Regulator/Energy Ministry.

**Major Aspects /Topics to be covered during the Webinar**

During the course of this webinar, the experts shall cover various applications of the digital technologies in power sector. Moreover, the experts will provide an overview of applicability of ICT such as the use of Machine Learning to optimize energy supply-demand, the integration of number of interconnected sensors, machines, and devices through IoT and the use of AI within the areas of generation, transmission and distribution, cyber security, and risk management.

**Venue of the Webinar**

The webinar shall be broadcasted from the office of SAARC Energy Centre, Islamabad.

## Concept Note of Webinar on “Modern Clean Cooking Technologies for Rural Households”

### Background

Present progress on SDG-7, falls far behind, including SDG 7.1: *Universal access to modern energy*<sup>7</sup>. As of 2022, Around 2.3 billion people lack access to clean cooking facilities, relying on the unsustainable resources of energy such as solid biomass, kerosene, or coal, as their primary cooking fuel<sup>8</sup>. The household air pollution, mostly from cooking smoke, is linked to around 3.7 million premature deaths a year<sup>9</sup>. The situation in South Asia is not very different, majority of the rural population depends on traditional energy resources for cooking, that leads to indoor air pollution, and health disparities.

Traditional cooking practices, is among the most pressing issues, particularly in low-income and rural settings. Clean cooking technologies is one of the solutions that can play a pivotal role to address the challenges associated with traditional cooking methods. Improved cookstoves, modern electric & PV cookers, solar cookers, and biogas systems are few examples of innovations designed to reduce emissions, minimize environmental impact, and enhance energy efficiency.

### Introduction

Clean cooking refers to sustainable fuels and modern cooking technologies that enable people to cook and heat their home in a way that is not harmful to their health and environment. By promoting the adoption of clean cooking technologies, we not only mitigate the negative effects on the environment but also improve the well-being of individuals and communities (particularly women and children), fostering a healthier and more sustainable future. SAARC Member States encounter numerous challenges in ensuring access to clean cooking, such as lack of enabling policy framework, acquiring financing (mainly green financing) and advancements in technology.

In this context SEC shall conduct a knowledge sharing webinar on “Modern Clean Cooking Technologies for Rural Households”. The Webinar shall feature presentations, and interactive discussion sessions led by resource person(s) from regional/ international market.

### Objectives

The overall objective of this webinar is to create awareness on the importance and benefits of modern clean cooking technologies, available clean cooking technologies, and catalyze action for widespread adoption of these technologies. By fostering collaboration and knowledge exchange, the webinar aims to empower individuals and communities with the information and tools necessary to make informed choices that benefit both their health and the environment.

### Major Aspects /Topics to be covered during the Webinar

The following aspects will be covered in the webinar (but not limited to):

- Introduction to Clean Cooking Technologies: A Global Overview
- Innovations in Improved Cookstoves
- Solar Cooking Solutions for Sustainable Living
- Financing Clean Cooking Projects: Challenges and Opportunities

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<sup>7</sup> <https://www.irena.org/Publications/2023/Jun/Tracking-SDG7-2023>

<sup>8</sup> *Energy Challenges for Clean Cooking in Asia, the Background, and Possible Policy Solutions*, ADB 2019

<sup>9</sup> <https://www.iea.org/reports/sdg7-data-and-projections/access-to-clean-cooking>



- Health and Environmental Impacts of Clean Cooking
- Policy Frameworks for Promoting Clean Cooking
- Real-life Experiences: Voices from the Field

### **Venue of the Webinar**

The Webinar shall be broadcasted from the office of SAARC Energy Centre, Islamabad.

## Concept Note of Webinar on “Demand stimulation techniques to cater likely excess electricity generation in Nepal”

### Background

Electricity is a commodity, that should be consumed at the time of generation. When the generation exceeds the demand, some excess power generating units have to be shut down. This idle sitting of large number of generators causes huge revenue loss. As a result, generation companies may not be able to repay their loans, which can eventually lead to bankruptcy the project companies and threatens the overall economy of the country into downturn.

Nepal is blessed with tremendous amount of hydropower with total potential of nearly 83,000 MW of which less than 3 % has been developed so far. In order to tap such huge potential, Nepal is developing hydropower with 238 under construction projects (cumulative capacity 8,792 MW) likely to come online soon and 109 projects (cumulative capacity 11,650 MW) in the process of getting generation license<sup>10</sup>. Hence, the total project capacity approaching the commercial operation date are found more than three times of current peak demand (around 2,600 MW) and projects at various level of development are found more than twenty times the current peak demand. Nepal has managed for limited export up to 452 MW of power from 10 hydropower projects to India<sup>11</sup>. However, due to low electricity demand (around 1,500 MW) and high generation, Nepal is reported to have 500 MW of excess electricity being wasted in October 2023<sup>12</sup>.

As there is limited development of economical technology to store bulk amount of electricity, there are two options available to consume the excess electricity. One option is to export the excess electricity to neighboring countries and the other option is to stimulate demand through expansion of electrical utilities and enhanced consumption in electric vehicles, industrial establishments and other easy to decarbonize sector besides domestic applications. Due to large lead time of high-capacity cross border infrastructure, the completion of such infrastructure in near future may not be possible. Therefore, the second option can be more effective to consume the excess electricity generation in Nepal.

### Introduction

While part of generated electricity may be consumed by usual demand growth and increased export, but the market development for consumption of near-future large excess electricity is still uncertain. Therefore, generating companies may have to bear unrecoverable loss from huge investment of around 16 billion USD (8,000 MW\*2 million USD/ MW) made in generating plants unless the immediate step for demand stimulation is initiated.

In this context, SEC shall conduct a Webinar on “demand stimulation techniques to cater likely excess electricity generation in Nepal”. The Webinar will present the figures of future excess electricity generation in Nepal and discuss the various options of enhanced electricity demand. It will recommend some viable consumption options for likely excess electricity. The activity shall include presentations, and interactive discussion sessions led by resource person(s) from regional/ international markets.

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<sup>10</sup> Nepal Electricity Authority Annual Report 2023

<sup>11</sup> Nepal Electricity Authority Annual Report 2023

<sup>12</sup> Spotlight, (<https://www.spotlightnepal.com/2023/10/27/nea-awaits-approval-india-export-additional-500-mw-electricity/>)

## **Objectives**

The objective of the Webinar is to facilitate the stakeholders of Nepal to introduce the most viable demand stimulation techniques so that the likely mismatch between demand and supply are balanced.

## **Major Aspects /Topics to be covered during the Webinar**

The Webinar aims to suggest the potential intervention on electricity demand side considering the socioeconomic needs of Nepal. The covered topics of the Webinar shall be the following:

- A brief overview and outlook of the power sector considering the excess generation in short and medium terms in Nepal
- Potential sectors of economy that can be electrified in line with socioeconomic needs and resource availability of Nepal
- Opportunities for electric vehicle, electric cooking, industrial establishment and other easy to decarbonize sector
- Recommendations for demand stimulation techniques that are applicable for short and medium terms
- Implementation strategy

## **Venue of the Webinar**

The webinar shall be broadcasted from the office of SAARC Energy Centre, Islamabad.

## Concept Note of Webinar on “Challenges and Opportunities of Solar Irrigation Pumps”

### Background

Increased reliance on sustainable irrigation is one of the strategies to adapt to climate change for farmer. In most part of the South Asia, groundwater provides the only reliable source of irrigation. South Asian Region is the largest extractor/user of groundwater, withdrawing approximately 250 km<sup>3</sup> of groundwater annually. It is estimated that there are approximately 21 million pumps in Bangladesh, India, Nepal, and Pakistan, of which roughly 12 million are electric and the rest are diesel<sup>13</sup>. With the rapid decline in the cost of solar energy technologies, solar irrigation has been gaining traction in South Asia as a replacement for diesel irrigation pumps. Solar Irrigation Pumps (SIPs) also require nominal operational and maintenance costs, produce no emissions, and offer automated features. SIP is also known to have direct employment generation potential<sup>14</sup>.

Beside opportunities, SIPs do have some challenges and problems. As the number of SIP installations increases, groundwater resources are over extracted leading to groundwater sustainability issue. Additionally, SIP system requires high initial costs and long payback period for return. SIP also needs lots of space and provides intermittent operation turning fully off during night. Therefore, irrigation productivity and sustainability of water resources become the major concerns with the massive use of SIPs.

### Introduction

Given some challenges as discussed in previous section, solar energy for water pumping may deserve a promising alternative to conventional electricity and diesel-based pumping systems. However, South Asia is still dominated by traditional irrigation pumps and the full benefits of SIPs are yet to reap. In this context, SEC shall conduct a webinar on “Challenges and Opportunities of Solar Irrigation Pumps”. The webinar will be up to 1.5 hours activity, including lectures, presentations and case studies from experts having knowledge and expertise of solar irrigation pumps. The webinar will discuss in detail the benefits, opportunities and challenges of both stand-alone, and solar grid-connected irrigation pumps. It will also highlight the best policies and regulatory interventions made globally and in South Asian countries. The Webinar will also highlight the socio-economic impact such as employment generation, fulfillment of water and energy need, and enhancement in agriculture productivity etc.

### Objectives

The objective of this Webinar is to spread awareness among the people of South Asia about the use of solar irrigation pump to improve the crop productivity in sustainable way. The Webinar will also be helpful to apply the acquired knowledge while creating, formulating and implementing SIP policies in the respective Member States.

### Major Aspects /Topics to be covered during the Webinar

The following aspects will be covered in the webinar (but not limited to):

- Industry readiness and status of SIP in South Asian Region

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<sup>13</sup> Shah, T., Rajan, A., Rai, G. P., Verma, S., & Durga, N. (2018). *Solar pumps and South Asia's energy-groundwater nexus: exploring implications and reimagining its future*. *Environmental Research Letters*, 13(11), 115003.

<sup>14</sup> Pradhan Mantri Kisan Urja Suraksha Evam Utthaan Mahabhiyan, 2019 (<https://static.pib.gov.in/WriteReadData/specificdocs/documents/2023/may/doc202351191401.pdf>)

- SIP promotion and management practices in South Asia and globally
- Challenges and opportunities of SIP in South Asian context
- Identification of the bottlenecks in the current implementation of SIP
- Financial, institutional, and technical aspects of different SIP promotion models in the groundwater abundant zones and ground water depletion zones
- Benefit to the farmer and potential increase in crops productivity
- Comparison of SIP, diesel power irrigation pump and grid connected irrigation pump
- Policy intervention, way forward for implementation of introduction of SIP

**Venue and date**

The Webinar shall be broadcasted from the office of SAARC Energy Centre, Islamabad.

## **Concept Note of Training workshop on “GHG Protocol for Measurement, Reporting and Management of Emissions”**

### **Background**

GHG Protocol is an initiative of World Resource Institute (WRI) and World Business Council for Sustainable Development (WBCSD). This protocol sets standardized frameworks to estimate GHG emissions from public and private sector entities, and develop mitigation strategies based on the estimated emissions. GHG Protocol is currently the most widely used standard; majority of large companies and numerous cities around the world have used GHG Protocol for measurement and management of their GHG emissions<sup>15</sup>.

GHG Protocol includes various standards for accounting and maintaining record of GHG emissions. The standards include Corporate Standard for organizations, Global Protocol for cities, Project protocol for accounting benefits of GHG reduction projects, Product Standard for reporting life cycle emissions of a product, and Policy and Action Standard for evaluating impacts of policies and actions on GHG emissions. In addition, Mitigation Goal Standard has been designed to help governments to set goals for GHG reduction and formulate policies to meet those goals.

### **Introduction**

The Article 13 of Paris Agreement establishes “Enhanced Transparency Framework (ETF)”, which includes reporting of GHG emissions and progress made towards achieving Nationally Determined Contribution (NDC) by each country. In this regard, equipping the relevant stakeholders of SAARC Countries with the essential knowledge about reporting and management of GHG emissions will help each Member State to progress towards achieving their NDCs in a credible and coherent manner. In this context, SEC shall conduct a three (03) days training workshop on “GHG Protocol for Measurement, Reporting and Management of Emissions” in Bangladesh.

The training workshop will cover the overview of GHG Protocol, types of accounting standards and brief on each of the accounting standards as well mitigation strategies. In addition, the participants will be given a comprehensive briefing on the estimation tools developed based on GHG protocol; emissions identification, reporting and tracking; setting mitigation goals and actions to achieve those goals. The participants will also be given knowledge on the impacts of policies on GHG emissions, key performance indicators and policy performance monitoring.

### **Objectives:**

This training workshop will be an invaluable opportunity for the professionals of Member States to familiarize with GHG Protocol and associated resources available. SEC envisages accomplishing the following objectives through this intervention:

- Capacity building of the energy & environment professionals from SAARC Member States on GHG Protocol
- Sharing experiences in reporting GHG emissions, relevant policy formation and mitigate climate change impact
- To get an overview of the potential for GHG reduction in public and private sector organizations
- To understand the environmental, financial, social, and technical benefits of reducing GHG

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<sup>15</sup> Greenhouse Gas Protocol (<https://ghgprotocol.org/about-us>)

emissions

### **Major Aspects to be Covered**

The training workshop will cover, but is not limited to the following broad contents:

- Fundamentals of GHG accounting and reporting
- Tracking emissions over time
- Setting up GHG reduction goals
- Reporting GHG Emissions
- Identification of all potential GHG effects of a policy
- Defining GHG assessment boundary
- Design of mitigation goals and relevant baseline scenario calculations
- Tracking progress towards the target goals
- Panel Discussions and Stakeholder Perspectives

### **Potential Professional Resource**

The experts/resource persons from regional/international market shall be engaged for the training workshop. They shall conduct the training through presentations, group discussions and exercises, and respond to questions by the participants.

### **Venue of Training workshop:**

The training workshop shall be organized for 3-days in Bangladesh. It will be attended by 10-20 delegates from the host Member State and 2 delegates each from rest of the Member States.

## **Concept Note of Training workshop on “Navigating the Energy Transition and its implication for SAARC region”**

### **Background:**

Today, with a changing climate putting pressure on communities and ecosystems worldwide, renewables and low-carbon energy solutions are being presented as solutions for achieving goal of a carbon-neutral economy. Mitigating GHG emissions from fossil fuels will require fossil fuel production to decline rapidly, as well as a fast and sustained establishment of alternative and cleaner modes of energy production and consumption.

South Asia is home to approximately 1.9 billion people or a quarter of the world’s population. The challenge for governments, businesses and citizens in South Asia is to embrace innovations that enable a cleaner pathway to growth. At the same time, Member States desperate not to lose out on the promise of growth, are looking to use whatever energy sources are available to secure a prosperous future. This requires, among other actions, a major shift of investment flows from fossils toward clean energy sources. Governments should create enabling environments for redirecting both public and private capital flows toward the clean energy transition, including the deployment of additional solar and wind capacity<sup>16</sup>.

Energy scenarios can play a key role in fostering such a transformation by identifying suitable energy pathways that can be translated into policy and regulatory frameworks conducive to a clean energy transition. They can also inform the shift of capital flows away from fossil-based energy production and toward renewable energy sources.

### **Introduction**

In this context, SEC shall conduct a 3-days Training workshop on “Navigating the Energy Transition and its implication for SAARC region” in Nepal. This training aims to inform policy-makers, investors, and companies on what is required to align their respective energy decisions with the goals of the Paris Agreement and their National Determined Contributions (NDCs). It shall provide an in-depth understanding of regulatory roles towards energy transition focusing on fundamentals, features, new developments, main drivers and challenges of energy transition, international policies and regulations culminating in a meaningful path to low carbon economy. Moreover, this training workshop will highlight the implications of 1.5°C scenarios for the phase-out of fossil fuels and the scale-up to renewables, barriers to transitions and solutions to such challenges, and tools for governments and financial institutions to navigate the current energy crisis while maintaining climate ambition.

### **Objectives**

The training workshop shall cover the potential future of the energy transition in SAARC region, and corresponding challenges and opportunities that plausibly could emerge. The workshop will explore how climate and clean energy policies should be designed with private and public financing in mind in order to promote investment in decarbonized resources. It shall provide discussion opportunities to the participants that would ultimately improve policy and market designs in their respective Member States.

### **Major Aspects to be covered during the Training**

This training workshop will cover, but is not limited to the following aspects:

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<sup>16</sup> *Navigating Energy Transitions report, International Institute for Sustainable Development, Oct 2022*



- Introduction to climate change and Energy Transition drive
- Phase-out of fossil-based generation plants
- Expansion of Renewables and clean energy technologies
- Effective Policies to drive decarbonization of Energy sector
- Mitigation pathways and scenarios
- Effects of shifting policies and market conditions
- Implications of new transitions on Economy
- Flexibility and Risks of transition
- Group discussions and exercises
- Any other(s)

### **Potential Professional Resource**

The experts/resource persons from regional/international market shall be engaged for the training workshop. They shall conduct the training through presentations, group discussions and exercises, and respond to questions by the participants.

### **Venue of the Training Workshop**

The training workshop shall be organized for 3-days in Nepal. It will be attended by 10-20 delegates from the host Member State and 2 delegates each from rest of the Member States.

## **Concept Note of Training workshop on “Energy Management in Residential and Commercial Buildings”**

### **Background**

Energy demand in SAARC region is expected to increase substantially in future. This is mainly due to the projected growth in population, and the economic and industrial growth of developing countries such as the SAARC Member States. Buildings are one of the largest energy-consumers that account for near 40% of energy use globally and are responsible for one third share in GHG emissions<sup>17</sup>. About 20% of these emissions can be avoided if we start using energy more efficiently. Monitoring energy consumption in real-time, changing energy wastage behavior of occupants and using automations with incorporated energy savings scenarios, are ways to decrease global energy footprint. Energy management in residential and commercial buildings is crucial for reducing energy consumption, lowering energy costs, and minimizing environmental impact. Effective energy management involves a combination of technology, behavioral changes, and efficient systems. In this context, SEC shall conduct a 3-days Training workshop on “Energy Management in Residential and Commercial Buildings” in Maldives.

### **Introduction**

The training workshop will cover various aspects of building management systems (BMS) including its design, implementation, and operation. It will provide an in-depth understanding of BMS tools and techniques required for effective implementation within a building. The learning will be backed by case studies and references of BMS Implementation within and outside the SAARC region. The training workshop will also cover energy saving potential in buildings, consumer behavior, role of policy, market forces and building energy codes. Special attention will be given to “Zero-energy building” concept. The participants will be given a comprehensive overview on subcategories of building envelope including heating/ cooling, lighting, along with equipment standardization. In addition, participants will be apprised on building life cycle assessment, health and indoor comfort, safety and functional aspects, and environmental impacts including GHG emission reduction potential.

### **Objectives**

The objective of this training workshop is to build and strengthen the capacity of SAARC professionals on the technical, economic and policy aspects of implementing energy conservation and efficiency in buildings. It will acquaint the participants with necessary knowledge and expertise to understand the importance and role of Building Management Systems, its design, working and effectiveness to optimize building performance.

### **Major Aspects /Topics to be covered during the Training workshop**

This training workshop will cover, but is not limited to the following aspects:

- Introduction to Energy Management in Buildings: The Role of Policy and Market Forces
- Existing barriers in achieving energy conservation and efficiency in the region
- Energy building codes
- Appliance’s standardization and labeling
- Introduction to EnMS approach and standards (ISO 50001)

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<sup>17</sup> Cao, Xiaodong & Xilei, Dai & Liu, Junjie. (2016). Building energy-consumption status worldwide and the state-of-the-art technologies for zero-energy buildings during the past decade. *Energy and Buildings*. 128. 10.1016/j.enbuild.2016.06.089.

- Energy Audits and Assessments
- Smart Home Technologies
- Zero-energy building concept
- Regional cooperation in energy conservation and efficiency programs
- Behavioral Changes and Awareness
- Environmental control and LCA (Life Cycle Assessment) approach in relation to energy efficiency of buildings
- Panel Discussions and Stakeholder Perspectives

### **Potential Professional Resource**

Renowned Resource Persons from Member States and outside the region in the field of energy conservation and efficiency in buildings will be invited to share their knowledge and experiences with the distinguished participants. They shall conduct the training through presentations, group discussions and exercises, and respond to questions by the participants.

### **Venue of the Training workshop**

The training workshop shall be organized for 3-days in Maldives. It will be attended by 10-20 delegates from the host Member State and 2 delegates each from rest of the Member States.

## Concept Note of Training workshop on “Energy Modelling on LEAP software”

### Background

In modern world, the challenges of growing energy demand and environmental pollution require innovative policies and governance on energy resources. A systematic transition towards more efficient energy regimes requires a sequence of actions at all policy levels<sup>18</sup>. In this regard, energy system modelling can assist policy and decision makers on power capacity expansion by illustrating different strategies to meet future demands and environmental targets of a country. These models can provide details of value of different technologies within the power system, conduct analysis, and suggest an optimal futuristic investment.

LEAP - Low Emissions Analysis Platform, is a widely used software tool for energy policy analysis and climate change mitigation assessment. It is an integrated modelling tool that can be used to track energy production, resource extraction, at different scales ranging from cities and states to national, regional, and global applications<sup>19</sup>.

This software tool is used globally for undertaking integrated resource planning, Greenhouse gas (GHG) mitigation assessments, and Low Emission Development Strategies (LEDS). The software has been used extensively by public and private sector, academics, consulting companies and electric utilities.

### Introduction

SAARC region has abundant energy resources, each Member State having significant indigenous resources in the form of fossil fuels and renewable energy. However, the majority of Member States are energy starved with major rural areas yet to be electrified. Energy resource potential of each Member State, if harnessed effectively, can enable them to have adequate or even surplus energy, reduce their dependence on imported fuel and lower their high electricity costs<sup>20</sup>.

LEAP software may help Member States to model their national energy systems, assess their current and likely future GHG emissions, including emission reduction and cost, and benefits resulting from proposed mitigation policies and measures. In this context, SEC shall conduct a 3-days Training workshop on “Energy Modelling on LEAP software” in Bhutan.

### Objectives

The training workshop shall introduce the design and functionality of LEAP software to the professionals to enhance their capacity on energy resource modelling. The software shall also enable professionals to develop integrated scenario-based climate mitigation assessments for their energy systems. The training shall enhance capacity of the SAARC professionals working in energy planning and analysis.

### Major Aspects to be covered during the Training

This training will cover, but is not limited to the following aspects:

- Introduction to LEAP software tool and its user interface
- Energy Balance and Sankey diagrams

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<sup>18</sup> A Critical Review of Sustainable Energy Policies for the Promotion of Renewable Energy Sources, Yuehong, Zafar, Manuel, MDPI, 2020.

<sup>19</sup> LEAP official website (<https://leap.sei.org>), accessed on 1<sup>st</sup> November, 2023.

<sup>20</sup> A Review of energy and power planning and policies of Pakistan, Nayyar, Aslam, Gordhan, Renewable and Sustainable Energy Reviews, 2017.

- Technology and Environmental Database
- Modelling methodologies
- Scenario Analysis and Cost benefit analysis
- Tools and Results
- Advanced modelling (Application Programming Interface API)
- Any other(s)

### **Potential Professional Resource**

The experts/resource persons from regional/international market shall be engaged for the training workshop. They shall conduct the training through hands-on exercises, presentations, group discussions, and respond to questions by the participants.

### **Venue of the Training Workshop**

The training workshop shall be organized for 3-days in Bhutan. It will be attended by 10-20 delegates from the host Member State and 2 delegates each from rest of the Member States.

## **Concept Note of Training workshop on “Understanding the functioning of Electricity Exchange”**

### **Background**

Trading of electricity through exchange has been recognized as the most efficient form of electricity market that ensure the transparent price discovery. This transparency is crucial in creating fair and competitive energy markets where buyers and sellers can make informed decisions. Moreover, as the electricity exchange platform provides market participants the real-time information on prices, it helps prevent price manipulation and encourages market stability. Globally, dozens of such electricity markets have been established to operate various market products such as term ahead, day ahead, intraday/continuous and future auctions.

However, except India, rest of the Member States are deprived from such efficient system of power trading. Indian exchange platform includes Indian Energy Exchange Limited (IEX), Power Exchange India Limited (PXIL) and Hindustan Power Exchange Limited (HPX), which offer a variety of products and operate in the same area. As the rest Member States are evolving towards the competitive regime of electricity sector from vertically integrated and single buyer regime, professionals from Member States are required to be equipped with necessary knowledge and ideas of exchange platform so that they may replicate the exchange establishment in respective countries.

### **Introduction**

In the context discussed above, SEC shall conduct a training on “Understanding the functioning of Electricity Exchange”. The training will impart the knowledge on prerequisites for establishment of exchange platform, resource management, and coordinating role with other stakeholders of power sector such as generators, system operator and regulator. To make the training more impactful, effort will be made to select the venue at the established exchange premises so that the participant will have more opportunity to gain knowledge in real time operation.

### **Objectives**

The overall objective of this event is to have the thorough understanding of electricity market functioning. This event will help the participants to equip with necessary ideas and skills for dealing with new electricity markets establishment and operation.

### **Major Aspects /Topics to be covered during the Training**

The training will focus on market product types, bidding mechanism, determination of market clearing price and volume, scheduling and dispatching of electricity, balancing the supply demand after dispatch, deviation settlement mechanism, payment securing mechanism of participant etc. The training will also impart the information on communication and coordination role of market operator with stakeholders. Training will also provide the information on division of bidding zones, dealing with the transmission constraints and wheeling charges adjustments etc.

### **Potential Professional Resource**

SEC shall engage resource person(s) having competency in electricity exchange and electricity trade. The resource person(s) from regional/ international market shall be engaged for training workshop. They shall conduct the training through presentation, group discussions and experiences and respond to question by the participants.

**Venue of the Training workshop**

The training workshop shall be organized for 3 days in India. It is expected to be attended by 10-20 delegates from host Member States and 2 delegates each from rest of the Member States.

## Concept Note of Training workshop on “Electric Vehicle and its Charging Infrastructure”

### Background

Rising energy prices, pollution concerns, and oil and gas import bills are driving the demand for Hybrid and Electric Vehicles, and related infrastructure. Electric vehicles are the key technology to decarbonize road transport, a sector that accounts for over 15% of global energy-related emissions. Recent years have seen exponential growth in the sale of Electric Vehicles together with improved range, wider model availability and increased performance. Electric vehicles (EVs) are no longer just a novel means of transportation, they have become an essential building block in the energy transition<sup>21</sup>.

This transition from Internal Combustion Engine vehicles to EVs will bring about significant changes in the technical, digital, and social aspects of energy and transportation infrastructure. The associated charging stations are a crucial component of electric vehicles and there is immense potential in this market for technological and business advancement. While most charging demand is currently met by home charging, publicly accessible chargers are increasingly needed in order to provide the same level of convenience and accessibility as for refueling conventional vehicles.

In recent years, in order to reduce emission of automobiles, the adoption of EVs had been taken place rapidly in various economies. The rapid development was mainly due to two reasons. One was the development of technologies related to EV as the research in power electronics, machines, batteries and control engineering got mature for EV. The other was well-established policies of economics directing the initialization of adopting EV. This included governments’ schemes of building charging facilities, subsidies/tax reduction encouraging consumers using EV and research programs for making an electric vehicle more competitive with a gasoline vehicle<sup>22</sup>.

### Introduction

In this context, SEC shall conduct a 3-days Training workshop on “Electric Vehicle and its Charging Infrastructure” in Pakistan. The training shall focus on the policy, infrastructure, standardization and technology of Electric Vehicles. It will explore the most important aspects of this new market, including the state-of-the-art technology and infrastructure of electric vehicles and charging systems.

The Training Workshop shall provide comprehensive knowledge and practical insights into the planning, design, and implementation of EV and its Charging Infrastructure. The training shall inform participants on the latest technology, market conditions and other issues.

### Objectives

This objective of this training is to equip participants with the necessary skills to navigate the complexities of EV infrastructure deployment, from assessing site suitability to developing robust charging networks. Through a blend of theoretical concepts, case studies, and hands-on exercises, participants will gain the expertise required to contribute effectively to the advancement of sustainable transportation solutions.

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<sup>21</sup> Tracking Electric Vehicles, International Energy Agency website (<https://www.iea.org/energy-system/transport/electric-vehicles>)

<sup>22</sup> Alternative Fuels Data Center, US Department of Energy website ([https://afdc.energy.gov/vehicles/electric\\_basics\\_ev.html](https://afdc.energy.gov/vehicles/electric_basics_ev.html))



## **Major Aspects to be covered during the Training**

This training workshop will cover, but is not limited to the following aspects:

- EV technology overview and its potential in SAARC region
- Government incentives and Policy impact
- EV technology development (Electronics, motors, machines, and batteries etc)
- Charging Station fundamentals and Distribution Grid
  - Location (home, office and public charging etc)
  - Accessibility and Demand
  - Charging Standards (Capacities, Voltage levels, type AC/DC)
  - Public and private funding
  - Charging impact on Grid (Tariff and others)
- Utilities interconnect policies and requirements
- Integration of EV infrastructure with Distributed Generation sources
- EV market trends (Overview, current status, future projection/Industry forecast)
- Smart Charging Solutions (Demand response and Load Management, Energy Storage and Peak shaving strategies)
- Economic and Life Cycle Analysis of EV
- Environmental and Social impacts of EVs
- Maintenance and Safety practices
- Codes and Standards regulation
- Case Studies: Successful Business Models
- Any other(s)

## **Potential Professional Resource**

The experts/resource persons from regional/international market shall be engaged for the training workshop. They shall conduct the training through presentations, group discussions and exercises, and respond to questions by the participants.

## **Venue of the Training Workshop**

The training workshop will be organized for 3-days in Pakistan. It will be attended by 10-20 delegates from the host Member State and 2 delegates each from rest of the Member States.

## **Concept Note of Training workshop on “Financial modelling for Renewable Energy Projects”**

### **Background**

Sustainable energy development implies an effective use of economic, human, technological, and renewable natural resources. Financially viable, and environmentally sound exploitation of Renewable Energy (RE) is the need of the day for a sustainable future. RE projects such as solar, wind and hydro do not emit the pollution to environment. However, they require significant amount of capital cost, possess considerable risk and incur operational cost. Therefore, the financial modeling of these project is to be carried out to evaluate the project's profitability and cost effectiveness. The results of the financial model are also used to compare alternative projects to select the most suitable one for implementation.

SAARC region has vast potential of untapped renewable energy and India alone has a plan to develop 500 GW from renewable energy by 2030. Similarly, Bangladesh is in the process of adding onshore wind power in its electricity mix. Pakistan, Sri Lanka and Maldives are considering to expand the solar power contribution in their renewable energy mix. But these renewable projects require a significance amount of investment where the investor looks primarily on the renewable project's cash flow for debt repayment. This necessitates a detailed analysis of the project's cash flows tested under a range of assumptions and scenarios to build the confidence of lenders and equity provider to fund the project.

### **Introduction**

In the context described above, SEC shall conduct a training workshop on financial modelling for Renewable Energy Projects. The training shall be conducted for three days in Sri Lanka. The training will use the standardized software platform to carry out in detail the RE project financing options and modeling. The Training Workshop shall provide comprehensive knowledge and modeling insights into the investors and owners of RE projects.

### **Objectives**

The overall objective of this event is to acquire the knowledge on financial modeling for RE Projects and to develop and analyze the financing options for renewable energy projects. This event will help the participants to make financing decision on renewable projects.

### **Major Aspects /Topics to be covered during the training**

The following aspects will be covered in the event (but not limited to):

- Basic of Renewable energy development: solar, wind, small hydropower
- Risk assumed and expected return of RE
- Financing terms used in RE: capital cost, debt, equity, operating cost, working capital, depreciation, tax, Return on investment etc.
- Types of finance and sources: equity, debt, grants, guarantees
- Assumption and Basic of modeling of generation, energy sales
- Building of project finance model from scratch in excel for wind, solar and small hydro projects
- Case study of financial management of RE projects
- Sizing of debt based on multiple covenants for wind and solar projects

- Consideration of multiple probability exceedance generation profiles (P50, P99 etc.) into the financial model
- Development of cash flow statements: income statement, balance sheet

### **Potential Professional Resource**

SEC shall invite resource person(s) having competency in project financing. The resource person(s) from regional/ international market shall be engaged for training workshop. They shall conduct the training through presentation, group discussions and experiences and respond to question by the participants.

### **Venue of the Training workshop**

The training workshop shall be organized for 3-days in Sri Lanka. It will be attended by 10-20 delegates from host Member States and 2 delegates each from rest of the Member States.