

Concept Paper		
“Training on Load/Power Flow Studies using PSS/E for Efficient National & Cross Border Interconnected Power Systems in South Asia” (3-day)		
Training Workshop	PENT	Thimphu, Bhutan

Background:

Electricity is considered as one of the main drivers of economic development leading to improvement of living standards of the people. In South Asia, a significant population has no access to electricity and plans are being envisaged to expand the power infrastructure. With the increased access to electricity, much of the economic activity is likely to be sparked thereby resulting in further increase in demand for power and energy. This will call for continuous expansion of power systems and consequently more and more power flow and system stability studies would be conducted to properly plan the expansion.

Power System Analysis is one of the core functions of the planning unit of any power transmission or distribution utility. It is a highly skilled task and requires to be performed for transmission/distribution planning, on regular basis. Such analyses are undertaken by carrying out different power system studies to simulate, analyze and optimize the network, using specially designed simulation software. (Some of the popular software are MATLAB, SINCAL, PSS/E, CYME, Power World Simulator, DigSilent-Power Factory). Power system planning and analysis tools have become a necessity for organizations throughout the electric power industry to address increasing complexity in modern grid systems. Precision of the analyses depends on the quality of the software and more importantly on the skills and experience of the engineer/planner handling the software.

Introduction:

In order to sustain the economic growth and cater power demand of the consumers due to increase in the access to electricity, it is imperative that the capacity building of the power system planners is ensured in the most appropriate manner, as an ongoing process. The need for relevant training becomes vital in view of the fact that system planners of South Asia usually comprise of young professionals due to brain drain phenomenon – true for almost all the SAARC Member States.

The SAARC framework for Energy (Electricity) Cooperation emphasizes on trade of electricity among the SAARC Member States and ensuring proper system

studies provides a necessary impetus to pursuing the overall SAARC objective. Therefore, it is important that a common and globally recognized power system analysis platform, such as, PSS/E be utilized to build the capacity of young professionals for its proficient use. Simulations of the interconnected systems in context to existing/upcoming India-Bangladesh, Bhutan-India, India-Nepal, Afghanistan-Pakistan connection points need to be comprehensively studied and analyzed for short circuit fault and stability aspects as a pre-requisite to smooth trade of electricity among the nations.

Consequently, SEC proposes to intervene through a 3-day SAARC Workshop “Hands-on Training on Load/Power Flow Studies using PSS/E for Efficient National and Cross Border Interconnected Power Systems in South Asia”.

Objectives:

The training Workshop will be an invaluable opportunity for the power system planners and analysts of the SAARC Member States. SEC envisages accomplishing the following objectives through the proposed intervention:

- Build capacity of the power planners/analysts in carrying out industry standard power system studies for development of Short-term, Mid-term and Long-term power plans including Generation Adequacy Forecasts and Transmission System Planning.
- Facilitate the participants with hands-on working opportunity on the renowned power system analysis tool using their own data
- Spontaneous response to the participants on various what-if situations regarding different scenarios and using multiple planning strategies

Major Aspects/Topics to be covered during the Workshop:

Following major aspects would be included in the scope of the training:

- Load Flow Studies
 - a) Stage by stage development of schemes of integration through existing and new transmission lines of 220 kV or higher level if required.
 - b) Integrate existing and new or future power plants into one grid system
 - c) Develop different alternative schemes of integration and determine technically and economically most feasible interconnection schemes of integration.
 - d) Analyze steady state performance of the integrated schemes under normal and contingency conditions for peak and off-peak conditions
 - e) Evolve future plan of new transmission lines and substations to cater for future needs of the country at the level of national grid

- Short Circuit Analyses
 - a) Determining the fault levels of existing and future substations to specify the ratings of switchgear of these substations.
 - b) Determining the fault levels of existing and new power plants to specify the ratings of switchgear at the switchyard equipment of these plants
 - c) Determining the fault levels to decide if switchgear at some existing substations needs to be replaced if the fault levels are exceeding the ratings of the existing switchgear.
- Transient and Dynamic Stability Analysis
 - a) Checking the system stability due to different disturbances happening in the system such as 3-Phase or Single Line-to-Ground faults
 - b) Checking the strength of the generating units in the existing and future power plants to withstand different disturbances occurring at different locations in the proposed integrated system
 - c) Determine the adequacy of the transmission network integrating the entire grid in terms of transfer of power from one end of the country to the other far end under disturbances and system outages.
 - d) Checking if there is any oscillatory instability or small-signal stability issues inherent in the system
 - e) Checking the voltage stability of at all locations of the system, far or near the location of disturbance.
 - f) Propose measures to strengthen the integrated system to achieve perfectly reliable and stable operation of system under all kinds of disturbances on the network.

Methodology:

An experienced team (up to four members) of professional Power System Analysts from the SAARC Region will be identified and engaged to conduct this training workshop for providing hands-on exposure to the power planners of the transmission/distribution utilities of the SAARC Member States. Video recording of the whole event would be managed and shared through SEC web portal for wider dissemination. The participants from the Member States will be requested to bring following input data for simulation, analyses and optimization purposes:

- Load forecast for next 20 years for all the load centers
- Future power generation expansion plans till next 20 years.

- Complete network data of the existing isolated system and future network expansion plans showing all the existing and future transmission lines and substations with loads to be represented there.
- Complete data of all the existing and future generation plants for steady state and dynamic stability studies.

Envisioned Outcome of the Workshop:

- Enhanced reliability and stability of the power system through application of the learning during the Workshop i.e. by carrying out power system studies with higher precision, in a professional manner
- Strengthening of technical manpower for analyzing and reviewing existing plans and preparing new plans for managing cross-border power export/import with the neighboring countries
- Each joining Member State would be facilitated with a competent team of trainers to share their experience with professionals of local power utilities

Potential Professional Resource / SEC's Intellectual Contribution:

SEC plans participation of two professionals from each of the SAARC Member States; preferable one each from Planning Component of the Power Transmission Utility and Power Distribution Utility. The delegation from each Member State will be required to give a ten-minute presentation to the participants of the workshop on the prevailing practices for the development of power system planning.

Venue of the Workshop:

The proposed 3-day workshop will be organized in Thimphu, Bhutan in collaboration with a relevant Bhutanese organization to be identified and suggested by the concerned GB Member.