Chapter 3
Planning Criteria

ABSTRACT

Planning criteria, in general, constitute a set of decision parameters or design variables with which the planner controls the planning scenarios. These criteria are similar to guiding principles and limitations placed on the scenarios for the purpose of narrowing down the selection process. Usually these criteria are defined and set by consensus after careful studies and analyses. Previous practices and experiences shape and form such planning criteria. However, they need to be revised every now and then in order to reflect changes in the power system, demand structures, and degree of acceptable risk.

Moreover, planning criteria represent boundary conditions that serve to eliminate unfeasible solutions and keep only the feasible ones. Therefore, they are needed in expansion studies of power systems to guarantee that the scenarios selected are all acceptable by the planners. Close coordination and continuous dialogue among power companies (generation, transmission, and distribution) are strongly recommended for proper planning in order to meet consumers’ demands and satisfaction.

Usually planning criteria are set by management, although some input from planners is needed. Knowledge of such criteria—and how they are calculated—provides planners with good practices and enhances the planning process.

INTRODUCTION

Planning is one of the most critical functions in the management process. Prudent planning practices will always lead to making appropriate decisions. Planning covers the period from the inception of an idea, project, or activity, up to the business-as-usual of an ongoing business. Strategic planning is the first step, where strategic directions of a business are set out and business plans are defined. In industrial based planning, the process covers the operational aspects of the business as well as the maintenance and updating of its operations and facilities. (Elkarmi, Abu-Shikhah, & Abu-Zarour, 2009).

In general, power system expansion planning (Chapter 9) aims to develop economically optimal, secure, and reliable plans that also address the environmental concerns for meeting the growing demand of electricity in the medium to long-term future.

Long-term expansion planning of power system results in an investment plan for future plant additions which will enable the system to
meet the growing demand. The input to such a process is the long term demand forecast (Chapter 5). The process is, however, governed by certain constraints and planning criteria. The constraints cover broad categories including: the condition of existing plants, fuel prices, regulatory issues, environmental concerns, commercial terms of power exchange with other systems, macro economic conditions, and financial status of the power company.

The planning criteria can be viewed as conditions and limitations selected by the management of the power company. They are usually designed to guide the evaluation process of the expansion scenarios for the most optimal ones. In other words planning criteria are important elements in the decision making process. They are reflections of the positive aspects, which the planners would like to have in any future plan. However, they are boundary factors to guarantee the plausibility of the scenarios being evaluated.

Historically, planning of power system expansion was a centralized process, and was the responsibility of one department in the power utility. The resulting expansion plan used to cover the generation, transmission, and distribution components of the power system. This was possible and acceptable at the time because the power utility was a vertical entity covering all power system components. Moreover, this planning model left the responsibility of setting the electricity tariff with the same utility that planned the power system expansion. Therefore, expansion decisions were, somehow, justified or supported by appropriate tariff decisions (Meier, 2006).

Currently, however, the situation is more complicated as the de-regulated models are adopted, and network planners are no longer involved in the generation expansion process. It should be noticeable that the lack of information leads to increased uncertainty in the planning process in the deregulated markets. Planners are challenged by different degrees of uncertainties. This leads to treating the total installed capacity, composition, and site issues of the future power plants as random variables. This in turn results in complicating the planning process and leads to arriving at suboptimal system investment. Practically, this means that the power system utility responsibility is split among several companies and each of them is responsible to plan the expansion of its component or subcomponent.

Generation expansion must put into consideration that the choice and installation of new plants is controlled by the network capabilities for power delivery. On the other hand, any further and future transmission infrastructure expansion must be capable of accommodating new plants, while preserving quality levels of supply quality and continuity.

Furthermore, strong coordination and continuous dialogue among power companies are prerequisites for proper planning in order to guarantee that there will be a match among all component plans. After all, consumers’ satisfaction and meeting their demand is a collective responsibility of the generation, transmission, and distribution companies.

Expansion planning must be applied in coherence at all stages of the electric power system. Power system planning is multidisciplinary that is segregated into the expansion planning in the areas of generation, transmission, and distribution planning.

The abovementioned planning areas are discussed in further details in the following sections.

**PLANNING EXPANSION**

**Generation**

All power generation planning is performed in the context of modifications to the existing system. (Meza, Yildirim, & Masud, 2007; Kannan, Baskar, & McCalley, 2009). The main factors that influence the planning process are: