

Electricity transmission network optimization model of supply and demand – the case in Taiwan electricity transmission system

Miao-Sheng Chen ^a

Chien-Liang Wang ^{b,c,*}

Sheng-Chuan Wang ^{d,e}

^a *Taichung Branch
Graduate Institute of Management Sciences
Nanhua University
Taiwan
R.O.C.*

^b *Graduate Institute of Management Sciences
Tamkang University
Taiwan
R.O.C.*

^c *Taichung Branch
Power Supply Department of Taiwan Power Company
Taiwan
R.O.C.*

^d *Department of Finance
Asia University
Wufong, Taichung
Taiwan
R.O.C.*

^e *Department of Industrial Management
National Yunlin University of Science and Technology
Touliu, Yunlin
Taiwan
R.O.C.*

*E-mail: henry_w@edirect168.com

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Abstract

The electricity system can be divided into power generation, transmission and distribution subsystems from the structure point of view. Electricity business is positioned as a public business and regulated by pricing and quantities due to the high publicly utilization. The power transmission system is responsible for power transmission from power generation plants to the areas of power utilization. Since there is the characteristic that electricity needs to produce and sell with immediate and instant balance, it is required to construct the complete power transmission network in charge of the power dispatching in order to provide stable electricity. The price of purchases and sales is closely related with the necessity of power supply and demand. The purpose of this paper is to introduce the optimization model of power supply and demand in the independent power transmission network for the maximization of consumer and producer's surplus in the liberalization of electricity business. We apply this model to discussing the relationships of electricity quantity and price of purchases and sales. In addition, the sensitive analysis is introduced as well. We conclude that the maximal profit of power transmission network will be decreased when quantity of power utilization, cost of power generation and maintenance cost of transmission network are increasing. Instead, the maximal profit of power transmission network will be increased when power transmission rate is increasing.

Keywords and phrases : Electricity system, publicly utilization, power transmission network, consumer and producer's surplus, liberalization of electricity business.

1. Introduction

Power generation and sales are the enormous and complicated production-demand supply chain systems. As referring to the electricity liberalization countries in the world, the electricity business is horizontally divided into three sectors, i.e. generation, transmission and distribution (including electricity sale). The generation and distribution business are open competition for electricity multi-supply. The transmission network is defined as monopolistic public system and restricted by the effective regulation. It provides a fair electricity transmission environment with supply and demand in order to eliminate the defect of interacting subsidy and enhance efficiency market operation with classified into mandatory and voluntary pool that combine with producers and consumers' contract. Each power generation sector can be produced powers independently. Each distribution sector can be taken charge of power marketing and distribution in its own area. Both of them are relatively