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The deregulation of Taiwan electricity supply industry

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Abstract

Taiwan is on the brink of embarking on an ambitious reform in the electricity sector. The future electricity market of Taiwan will be operated under the framework set out in the Electricity Act Amendment. Independent system operator (ISO) will be the core body of the future market operations and its establishment will therefore be the key to the liberalization. This paper presents the proposed implementation plan based on diverse factors considered by the officials. A three steps phased introduction of Taiwan ISO is discussed. During the proposed Phase I interim market arrangements, Taipower's System Operation Department will assume the role of System Operator for the market. The dispatch rules are largely based on the existing Taipower internal procedure. As competition increases, the need for increased transparency will necessitate the establishment of a fully independent ISO in Phase II to provide the real time dispatch services. This will be completed within 2 years after the passage of the Electricity Act Amendment Bill. In the last phase of the deregulation process a multilateral market arrangement for managing energy imbalance and transmission constraints will result in better outcomes in relation to the policy objectives of security and economic efficiency. The 2-year timeframe stipulated in the Electricity Act Amendment Bill is a challenge for the Government and the industry. However, a smoothly functioning Taiwan ISO will bring benefits to the industry and the country in general.

Keywords: Taiwan-ISO; Deregulation; Market design

1. Introduction

Taiwan imports around 97% of its energy. The island can only meet 3% of its energy needs from indigenous fuel resources and relies heavily on imported energy sources. In 1985, there was a 55% margin in spare capacity, but by 1992 this had fallen to below 5%, and it was raised to 13% in 2002. However, sufficient power is fundamental to growth in the economy. As a result of strong economic growth over a long period, electricity demand, with an average annual growth rate of more than 7%, has more than doubled in the last decade and for the next 10 years the forecast demand growth rate will reach 3.5% per annum. This puts considerable pressures on the electricity system. To be successful in this requires a suitable investment environment to be developed. So Taiwan's government designs to open up the electricity market.

Electrical power operation in Taiwan is moving toward liberalization and privatization due to the influence of the global economic trend. To open up private investment opportunities and enable funds to be more easily obtained, the government had proposed in 1999 to pass new legislation in 2000 to improve the investment environment, restructure the industry and privatize the state electricity utility Taipower.

1.1. Generation

At the end of 2001, Taipower operated 72 power plants with a total installed capacity of 30,136 MW. Taipower has 5144 MW of nuclear generating capacity at 3 plants; 20,570 MW of thermal generating capacity at 30 plants; 4422 MW of hydro-generating capacity at 39 plants. Peak demand is approximately 27 GW in

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2002. Installed capacity had been forecast to increase to almost 40,000 MW by 2005.

Owing to concerns about the pollution effects of coal-fired stations, the government energy policy promotes the use of LNG as the fuel for thermal generation. To comply with Taiwan's energy diversification policy and to meet increasing environmental concerns, the installed capacity of LNG-fired units is expected to increase. This will include both new Taipower plant and new independent power producers (IPPs). However, LNG is more expensive than coal as input for electricity generation and the government's policy goal of promoting LNG-fired generation plant cannot be achieved without intervention.

1.2. Transmission and distribution

Taipower has the monopoly power in transmission sector. Almost all transmission and distribution lines in Taiwan are owned by Taipower and dispatched by the Taipower's central or local dispatch centers. More than 45% of demand is concentrated in the northern region. However, the northern region has insufficient installed capacity and this results in heavy reliance on northward transmission. Taipower's inability to build sufficient capacity to keep pace with demand led to a severe power crisis during the summer peak-demand months in 1999.

Owing to the imbalance of the location of load and generation, in 2002 a third extra voltage transmission line, with a capacity of 2500 MW was added to the original two high-voltage transmission lines of 4500 MW capacity. Currently, Taipower devotes its efforts to promote the Sixth Transmission and Substation Scheme and invests more than NT $540 billions. Transmission congestion will be greatly improved after 2006.

Apart from transmission congestion, Taiwan has a significant electronics manufacturing industry that has been a major factor in achieving its earlier economic growth. This industry has very high requirements regarding both reliability and quality standards such as frequency deviation and voltage quality standards. Taipower invests continuously to strengthen the power system and to enhance the development of related industries, so as to improve the national economy.

1.3. Independent power producers

Taipower, the state-owned electric power utility, currently dominates Taiwan's electric power sector. In 1994, the Ministry of Economic Affairs (MOEA) of Taiwan produced documents entitled Operational Guidelines for Unbundling the Power Generation Industry, and Main Points in Handling Independent Power Program. These were intended to promote operating standards for independent power production. In 1994, Taiwan's government allowed IPPs to provide Taiwan's electricity. Independent power producers are required to sign 25-year power purchase agreements (PPA) with Taipower. To the end of 2001, Taipower has signed Power Purchase Agreements, totaling 5267 MW.

In conjunction with the electrical power liberalization policy, through two stages of open bidding for power generation, 11 IPPs were selected with total capacity of 10,300 MW. Of the first 11 IPP projects, only three had started construction by 1999 and only one of these had reached commercial operation. Despite the above difficulties in the construction sector, Taiwan today has an excellent diversified mix of generation plant types, helping it to manage fuel costs, if sufficient spare capacity can be achieved.

Taiwan's first major IPP, the coal-fired Mailiao plant owned by Formosa Plastics, began operation in 1999. It currently has a capacity of 1800 MW in three 600-MW generating units, and sells about three-quarters of its output to Taipower. Besides, a second, coal-fired IPP plant, Ho-Ping Power, begins commercial operation of its first 660-MW unit in March 2002, with a second unit beginning operation in September 2002. Ho-Ping is a joint venture including Taiwan Cement Corporation and Hong Kong's China Light and Power Corporation. Besides, two gas-fired IPPs (Shin Tao, Ever Power) have been in commercial operation in recent years.

In 1999, the Ministry of Economic Affairs held another open bidding (third stage of open bidding). Four IPPs were accepted, a total of 2910 MW of new capacity. By the end of 2001, Taipower has signed Power Purchase Agreements totaling 1905 MW with Star Energy, Sunba, Kuokuang Power Companies.

Taiwan's private and co-generation power plants accounted for 24.8% of the electricity generated in Taiwan, indicating that government's efforts to diversify its power resources has made progress. Taipower plays a very active role in helping these IPPs in building their power plants on schedule by providing them with technical consulting services, so as to solve the power shortage problem.

2. Taiwan power company

2.1. Introduction

Taiwan Power Company (Taipower) is a state-owned company and responsible for production and distribution of electric power in Taiwan. Nearly, two-thirds of Taiwan's power stations are owned by Taipower. Taipower's annual operating revenues are more than $25 billion and employed about 27,000 people. Thermal plant accounts for more than 60% of Taiwan's current power generation capacity and nuclear plant supplies a