

ANALYSIS

Electricity market integration: Global trends and implications for the EAS region



Yanrui Wu

Economics, Business School, University of Western Australia, Australia

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ABSTRACT

Electricity market integration in East Asia is an important component of the energy market integration (EMI) initiatives supported by the East Asian Summit (EAS) group. The objectives of this study are twofold, namely, a) to present a review of the trends in regional electricity market integration and b) to draw implications for electricity market development in the EAS area. Specifically, this project will review the trends of integration in the world's major electricity markets and analyze the experience and lessons in those markets. It will provide an examination of the electricity sectors in East Asia in terms of market development and connectivity. The findings in this study lead to several policy recommendations. First, the findings imply that all EAS members should strengthen their national electricity markets and hence promote internal market integration. Second, members are encouraged to explore the possibility of sub-regional inter-connectivity and cross-border electricity trade. Third, it is proposed that regulatory standards and rules should be harmonized over time. Finally, it is suggested that coordination in national policy making and development planning in the electricity sector could lead to more efficient allocation of resources within the region.

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1. Introduction

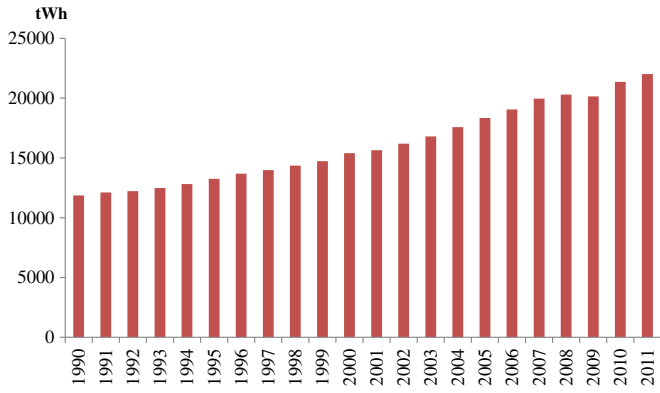
In the coming decades world demand for electricity is projected to have an average annual rate of growth of 2.3% which exceeds the growth rate (1.6%) of total energy use globally [1]. Thus the electricity sector plays an important role in promoting energy market integration (EMI) in the East Asian Summit (EAS) region. This report aims to present a brief review of the world's major electricity markets and global trends towards market integration. The findings are employed to draw implications for electricity market integration in the EAS area. The rest of the report begins with an overview of electricity demand in the world in Section 2. This is followed by discussions about the trends of electricity sector reforms and hence market integration initiatives in Section 3. Subsequently electricity markets in the EAS region are examined in Section 4. Policy recommendations are presented in Section 5 with the final section presenting concluding remarks (Section 6).

2. Global electricity demand

Electricity consumption in the world has maintained a steady growth trend in recent decades (Fig. 1). Total consumption almost doubled between 1990 and 2011. During the same period, the Asia Pacific region has overtaken Europe and North America to become the largest electricity consumer (Fig. 2). In 2010 the United States was still the largest single consumer with a share of 20.3% over the world total while China was just behind the US with a share of 19.7%. By 2011 China overtook the US to become the world's largest electricity user as well as producer with a share of 21.3% while the US share continuously declined to 19.6%. Japan is the third largest consumer with a share of about 5% followed by Russia (4th) and India (5th).

At the sector level, the industrial sector is still the largest electricity consumer in the world with a share of 40.2% in 2009 [3]. This figure, however, varies considerably across the countries ranging from 26% in the US to 39% in India and 74% in China (Table 1). The general trend is that electricity consumption shares have declined in major developed economies due to the delocalization of manufacturing activities, the growth of commercial and public service sectors and increasing ownership of appliances and electronic equipment in

E-mail address: yanrui.wu@uwa.edu.au.



Notes: The unit is terawatt hours (tWh). The raw data are drawn from BP [2].

Fig. 1. World electricity consumption, 1990–2011.

households. For example, among IEA member economies, the share of industrial electricity consumption declined from 49% in 1974 to 33% in 2007, with the US having the smallest industrial share among the members [4]. Residential consumption shares vary from 39% in the US to 24% in India and 12% in China (Table 1). Agriculture and transportation are included in the “others” category in Table 1. These two sectors generally account for small shares in electricity consumption in major economies. There are however exceptions. For example, agricultural consumption of electricity reported in Table 1 has a share of 19% in India [5].

Electricity generation is still dominated by coal (40%) followed in turn by natural gas, renewables, nuclear and liquids (Fig. 3). This pattern will probably remain for a long time. According to EIA [1], by 2030, the share of coal in electricity generation will decline slightly (36%) and the winners will be renewables (24%) and natural gas (24%) with nuclear power remaining the same (14%) and the share of liquids shrinking to about 2%.

3. Trends in market integration

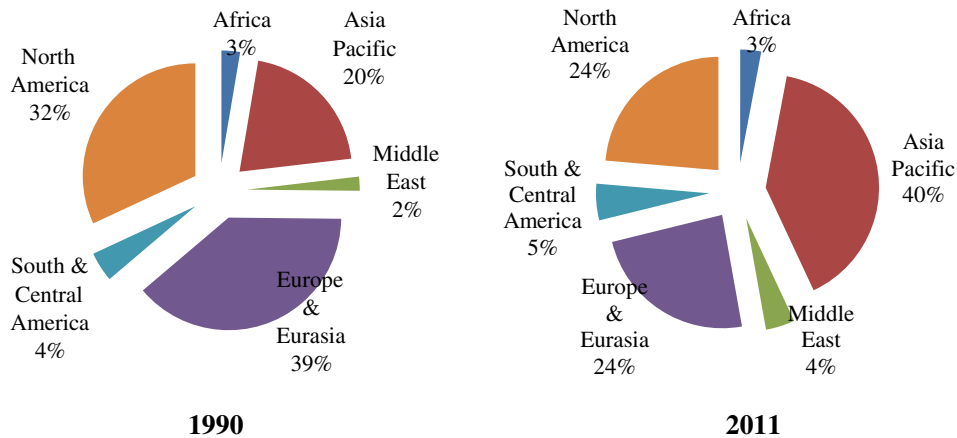
It has been argued that an integrated electricity market can improve efficiency in electricity supply, reduce costs of production and hence electricity prices, and raise standards of services due to increased competition. As global concerns for climate change increase, regional power integration could be an effective way to reduce carbon emissions [8]. Following these arguments, various policy measures have

Sectors	IEA (2007)	China (2010)	India (2010)	US (2010)
Industrial	33	74	39	26
Residential	31	12	24	39
Commercial	31	6	10	35
Others	5	8	27	0

Notes: Indian data cover the 2010/2011 financial year. Data are drawn from Refs. [4–7].

been implemented in order to promote national and regional electricity market integration. The progress of changes varies among the major markets. The large markets include the European Union (EU) and the United States (US). The relatively successful examples of small economies include Chile, New Zealand and Singapore. The reforms have led to the formation of national electricity markets in some countries such as Australia, Norway and the UK. In some regions cross-border trade has emerged through different kinds of cross-border access arrangements such as the France–Belgium–Netherlands connection and the Nordic market (Norway, Sweden, Finland and Denmark). Though electricity market integration has been challenged due to events such as the California electricity crises during 2000–01 and the 2003 New York black out, reforms are still debated and implemented in different forms [9].

Chile was the world’s first country introducing reforms in the electricity sector in 1982 [10]. Chile’s reform has been hailed as a successful example [11]. The main law that governs the electricity sector in Chile is the General Electric Services Law of 1982, which was amended in 2004 and 2005, respectively. Enactment of the law in 1982 led to the vertical and horizontal unbundling of the electricity sector. The process of privatization of state-owned utilities began in 1986 and was completed in 1998. Together with privatization was the establishment of a spot market for electricity and a contract market in which generators and large industrial users could trade freely. The electricity market in Chile is now characterized with free competition in generation and distribution while transmission is still regulated. Reforms have led to growth in Chile’s electricity sector for about two decades. But major blackouts and some other problems did occur. Therefore, Chile’s electricity sector is still facing some challenges and possibly further reforms. For example, Pollitt [12] pointed out the need to improve the transparency of the regulation and oversight of the industry and the inflexibility in regulations governing the power sector due to overly detailed specifications.



Notes: The raw data are drawn from BP [2].

Fig. 2. Electricity consumption shares by regions, 1990 and 2011.

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