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Electrical energy consumption and production of Turkey versus world

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Abstract

Energy issues are directly related to the development of a country and the living standards of its people. In this study, Turkey's energy resources, installed electric power capacity, electric energy production and consumption rates are investigated and compared with some other countries. And some comments have been made on the future electric energy production investments. Besides, the potentials of Turkey's energy resources are exposed also Turkey's electric energy production strategy is interpreted.

Keywords: Electrical energy consumption; Electrical energy production; Turkey

1. Introduction

Energy is an indispensable factor for the social and economic development of societies. The usage level of electricity is an indication of the economic prosperity of nations. In this respect, regional distribution of the world's primary energy consumption has never been uniform in the past. For instance, while North America consumes around 30% of the world's total primary energy, Africa's share remains at only 3% recently. About half of the world's total has been consumed only in North America and Western Europe together and the rest in the other five regions (Ediger, 2003).

In Turkey, the growing population, industrialization and increasing standard of living have considerably increased the dependence on imported energy. Consequently, in addition to the development of conventional energy resources, exploitation of non-conventional energy resources and energy conservation has become inevitable (EIE, 1985). Furthermore, Turkish energy consumption has risen dramatically over the past 20 years due to the combined demands of industrialization and urbanization. Turkey's primary energy consumption has increased from 32 mtoe (million tons of oil equivalent) in 1980 to 74 mtoe in 1998. According to the planning studies, Turkey's final consumption of primary energy is estimated to be 130 mtoe in 2005, 171 mtoe in 2010 and 298 mtoe in 2020. In other words, in 1999, domestic energy production met 36% of the total primary energy demand and will probably meet 28% in 2010 and 24% in 2020 (WEC-TNC 2000; Mendilcioglu, 2000). The level of Turkey's energy consumption is still low relative to similar sized countries, such as France and Germany, with gross inland consumptions of 235 and 339 mtoe in 1995 and with estimated values of 290 and 350 mtoe

Acronyms: Boo, Turkey's "Build-Own-Operate" program; Ceas, Cukurova Electric Inc.; USDOE, US Department of Energy; DSI, General directorate of state hydraulic works; EIE, General directorate of electrical power resources administration; GW, Gigawatt; GWh, Gigawatt hour; IEA, International energy agency; IMF, International monetary fund; kV, Kilovolt; MENR, Ministry of energy and natural resources of Turkey; MW, Megawatt; n-a, Not applicable; TWh, Terawatt ($=10^{12}$ W) hour.

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Table 1
Fuel shares of world electricity generation in 1973 and 2001 (IEA, 2003)

Year	Hydro %	Coal %	Oil %	Gas %	Nuclear %	Others[a]%	Total % (TWh)
1973	21	38.3	24.7	12.1	3.3	0.6	100 (6117)
2001	16.6	38.7	7.5	18.3	17.1	1.8	100 (15 476)

[a]Geothermal, solar, wind, combustible renewable and waste.

in 2020, respectively (European Commission, 1999). However, Turkey's upward trend may mean it will surpass these countries in the future (Hepbaşlı and Özalp, 2003).

Turkey is currently in a rapid industrialization process with a young and dynamic population of over 65 million (Tunc et al., 2006). Energy inputs for Turkey include both primary resources and minor contributions from other sources. The power plants, refineries, and coke production facilities of integrated steel factories can be analyzed together in the conversion sector. Although activities in this sector are not end uses, they involve significant losses. The diverse end users are dealt with by first aggregating them into sub-sectors and then into transportation, industrial, and residential and commercial sectors (WEC-TNC, 1997; İleri and Gürer, 1998).

2. Electrical energy in the world

2.1. Fuel shares of world electricity generation

The mix of primary fuels used to generate electricity has changed a great deal over the past three decades on a worldwide basis. Coal has remained the dominant fuel, although electricity generation from nuclear power increased rapidly from the 1970s through the mid-1980s, and natural-gas-fired generation has grown rapidly in the 1980s and 1990s. In contrast, due to the OPEC oil embargo of 1973–1974 and the Iranian Revolution of 1979, the use of oil for electricity generation has been slowing since the mid-1970s (Liman and Değer, 2004).

Continued increases in the use of natural gas for electricity generation are expected worldwide. Coal is projected to continue to retain the largest market share of electricity generation, but its importance is expected to be diminished somewhat by the rise in natural gas use. The role of nuclear power in the world's electricity markets is projected to lessen as reactors in industrialized nations reach the end of their life spans and few new reactors are expected to replace them. Generation from hydropower and other renewable energy sources are projected to grow by 56 percent over the next 24 years. The percentage changes of fuel shares of electricity generation for the years 1973 and 2001 are shown in Table 1 and Fig. 1. That coal is highly used fuel for electricity generation is seen from Fig. 1 and Table 1.

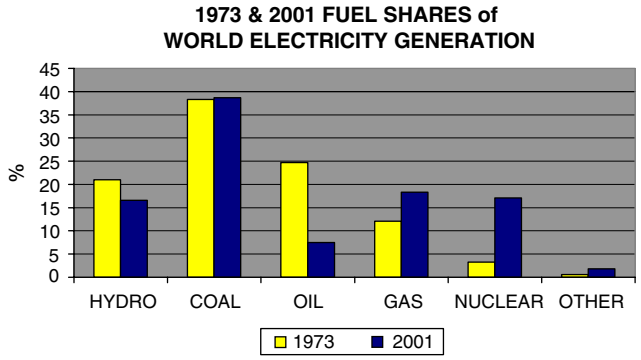

Fig. 1. Fuel shares of world electricity generation in 1973 and 2001 (IEA 2003).

Table 2
Producers of electricity in the world (2001) (IEA, 2003)

Producers	TWh	(%)
US	3864	25
China	1472	9.5
Japan	1033	6.7
Russia	889	5.7
Canada	588	3.8
Germany	580	3.7
India	577	3.7
France	546	3.5
UK	383	2.5
Brazil	328	2.1
Rest of the World	5216	33.8
World	15 476	100

2.1.1. Producers of electricity in the world

Electricity production amounts of the leading countries are given in Table 2.

The first three leading countries are US with 3864 TWh, China with 1472 TWh and Japan with 1033 TWh. These countries hold 41.2% of the total production in the World.

2.2. Examination of electricity in the world by source type

2.2.1. Hydro production

It is known that hydro is the cheapest source of electricity production. In other words, the country,