The World Energy Supply and Demand Projections to 2050

Background

Analyzing the future trend of global energy supply and demand is important for Japan because it depends on energy resource from foreign countries. There are concerns that the energy demand increase in Asia especially in China may accelerate the global warming and the depletion of fossil fuel resource such as oil. Quantitative approach to these points is indispensable to propose Japan's energy supply and demand strategy and preventive measures to global warming.

Objectives

Our purpose of this study is to obtain the future trend of world energy supply and demand and energy prices, and evaluate the possibility of resource depletion such as oil in the next five decades. In order to get the quantitative forecasts, we use CRIEPIs' World Energy Prices Model(WEPM) which enables us to get the projections by regions such as Asian NIES, ASEAN, China, other Asia, G7 nations and the other developed and non-developed countries.

Principal Results

One of the most characterized features of WEPM is that international fossil fuel prices are endogenously determined from the demand and supply balances of world markets. Endogenous price determination enables us to forecast the energy prices that adjusted to the trend of world energy supply and demand. Table 1 shows the main results using WEPM.

(1) The primary energy demand: In the forecast period, from 2000 to 2050, both the annual growth rate of GDP and primary energy demand will decrease to 1.7% and 1.0% respectively. A relatively high expansion of primary energy demand continues in Asia - 2.4% annually - , while the growth becomes duller in G7 nations, 0.5% annually, because of the progress of energy conservation.

(2) The primary energy supply: In the Asian countries especially in China and India, the primary energy supply will be still highly dependent on coal in the forecasting period, while substitution from oil to the natural gas advances in G7 nations. In the entire world, the oil and coal share of the primary energy decreases from the current state by 4-5 points, resulting 34.4% and 21.9% respectively in 2050. On the other hand, the natural gas share expands from 24.4% in 2000 to 34.0% in 2050. According to WEPM, oil resources will not be depleted in the next five decades because the demand simulated by WEPM will be smaller than remaining conventional oil reserves.

(3) Energy prices: Using WEPM, we calculated the international oil price that balances the above-mentioned supply and demand. The oil price (2002 US dollar in real term) goes without major change until 2025. From 2025 the oil price rises as supply of the conventional type oil is stringent and OPEC share expands, leading to 36.8 dollar per barrel in 2050. The LNG price of Asia is slightly higher than that of oil prices. Moreover, the coal price will decrease in real term after the latter half of the projection period, because of fuel shifts to the natural gas etc.

(4) The amount of the CO_2 emission: CO_2 emission originated from energy consumption increases to 1.7 times in 2050 compared to that in 2000, and becomes 38.4 billion tons (CO_2 conversion). 70 percent of this increment is due to Asia and this region's share of the emission of the world goes up from 24% in 2000 to 42% in 2050.

Future Developments

We are going to update periodically above world energy supply and demand projections. Moreover, we will analyze the impacts of different preventive measures taken by governments to global warming.

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Reference Hoshino, Yuko and Norihisa Sakurai, 2004, "The world energy supply and demand projections to 2050", CRIEPI Y03027

Table 1 Main Projection Results

year	Actual 2000	2025	2050	growth rate 00-50
World Primary Energy Demand (MTOE)	8,667	11710	14087	1.0%
G7 countries	3,500	4045	4407	0.5%
Other OECD countriest	1,185	1242	1282	0.2%
Asian countries	1,575	3626	5157	2.4%
China	723	1868	2672	2.6%
Other Non-OECD countries	2,407	2796	3241	0.6%
World Crude oil Production (Mt)	3,550	4961	5326	0.8%
OPEC	1,453	3455	4662	2.4%
Non-OPEC	2,097	1505	664	- 2.3%
World Primary Energy Prices				
Crude Oil[a] (US$/bbl)	30.4	40.5	103.1	2.5%
Cude Oil (2002US$/bbl)	31.6	23.6	36.8	0.3%
Steam Coal[b] (US$/t)	36.0	67.8	81.0	1.6%
Steam Coal (2002US$/t)	37.5	39.5	28.9	- 0.5%
Asian LNG[c] (US$/MBtu)	4.7	7.5	18.6	2.8%
Asian LNG (2002US$/MBtu)	4.9	4.3	6.7	0.6%
World CO_2 Emission (100MtCO_2)	220	330	384	1.1%
Asia (include China, India)	52	117	161	2.3%

Note
[a] Crude oil: WTI spot price,
[b] Steam Coal :North West Europe market price,
[c] Asian LNG: LNG import CIF price of Japan,

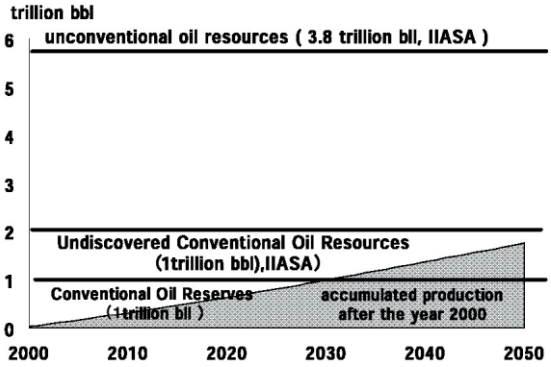

Fig.1 Possibility of oil depletion

Considering the accumulated oil production for the projection period, oil depletion doesn't seem to happen by 2050 if remaining reserves can be used (in shadowed part).

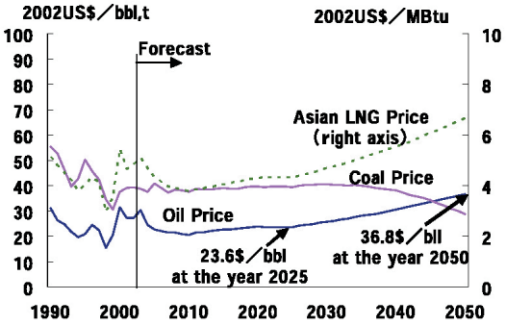

Fig.2 Outlook of primary energy price (US dollar in real term)

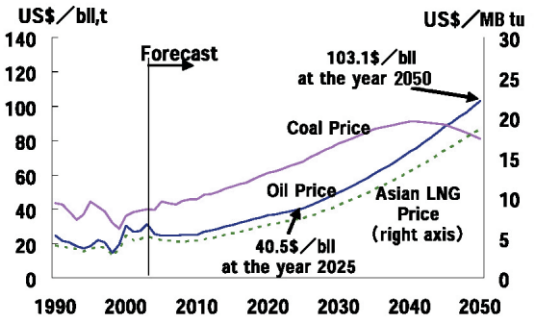

Fig.3 Outlook of primary energy price (2002 US dollar in nominal term)

International crude oil price in real term rises due to stringent supply and demand of the conventional type oil after about 2025.

Note) The recent short-term price fluctuation is ignored because this projection is based on the long-term supply-demand.

International crude oil price in nominal term rises 2.5% annually (average during 2000-2050). Coal price decreases because of the fuel shift to the natural gas after the year 2040.

Note) The recent short-term price fluctuation is ignored because this projection is based on the long-term supply-demand.