Symposium “Towards Low-Carbon Society in Asia”

February 22, 2011

Panelist

Dr. Kokichi Ito

Managing Director, Institute of Energy Economics, Japan (IEEJ)

B.A(Foreign Language, Economics), Sophia University

1970-1984 Century Research Center Corp.

1984-1985 Consultant (Energy Modeller),United Nations, DTCD

1988 Visiting Researcher, Energy Environment Center, Pennsylvania Univ

1985- The institute of Energy Economics, Japan

1995- Visiting Professor, Hosei University Graduate Schools

1. Introduction

World primary energy consumption more than doubled from 5,000 million tons of oil equivalent (Mtoe) in 1971 to 11,300 Mtoe in 2008. Particularly, Asia, which accounted for nearly 70% of the incremental growth in world primary energy consumption between 2000 and 2008, has been the growth center of the world’s energy consumption.

A target to halve the world greenhouse gas emissions by 2050 is gradually being accepted by the international community, but meeting the target should entail great challenges. In this regard, measures and timing to curb the expected growth trends in energy demand as well as CO_2 emissions from China, and India and other Asian countries will be critical to the world efforts to tackle climate change issues. We must also take into account the costs to reduce CO_2 emissions, which will be enormous especially when the reduction measures include massive social infrastructure development. Both technological and economic approaches are needed to pursue the realization of low carbon societies.

In this regard, we are developing scenarios for low carbon societies towards 2050, especially focusing on supply-demand balance of various energy sources, including oil, coal, natural gas, nuclear power, hydro and other renewables.

2. Energy Outlook through 2050

2.1 Assumptions and Scenario Settings

Reflecting the slowing of growth of developing countries, the world GDP is projected to increase slowly from 2035 to 2050 at an annual rate of 1.9%, compared with the annual average growth of 2.8% between 2008 and 2035. The world population is projected to reach 9.1 billion in 2050, from 6.7 billion in 2008. Crude oil price will reach $120/barrel in 2050, increasing from $115/barrel in 2035, as a result of rising oil production cost.

In this study, two scenarios are developed: the Reference Scenario and the Technologically Advanced Scenario. The Reference Scenario assumes the continuation of current economic and political situations, whereas in the Technologically Advanced Scenario (Tech. Adv. Scenario), advanced low-carbon technologies are assumed to become even more widespread around the world on the back of the promotion of international technology transfers mainly from developed countries to developing countries. Technologies assumed in the Tech. Adv. Scenario are shown in Table 1.

Table 1 Assumptions on Decarbonization Technologies

	2008	2035		2050	
	Actual	Reference	Tech. Adv.	Reference	Tech. Adv.
Nuclear	390 GW	615 GW	830 GW	840 GW	1,190 GW
Conversion Efficiency	Coal:34% Gas:40%	Coal: 40% Gas: 47%	Coal: 45% Gas: 50%	Coal: 41% Gas: 48%	Coal: 51% Gas: 53%
Photovoltaic	13 GW	165 GW	594 GW	450 GW	1,810 GW
CSP	0.3 GW	37 GW	127 GW	50 GW	410 GW
Wind	120 GW	467 GW	921 GW	870 GW	1,820 GW
Biomass Power Gen.	67 GW	210 GW	235 GW	300 GW	320 GW
Biofuel	48 Mtoe	164 Mtoe	272 Mtoe	200 Mtoe	350 Mtoe
CCS	-	0	2.6 bil. ton	0	10.1 bil. ton
Adv. Vehicle in Annual Sales PHEV EV/FCV	-	6% 0%	14% 13%	9% 2%	30% 32%
Average Fuel Efficiency of new vehicle sales	(2005) 12 km/L	17 km/L	25 km/L	18 km/L	30 km/L

2.2 Results

The world primary energy demand will expand from 11.3 Btoe in 2008 to 20.6 Btoe in 2050, showing a 1.8-fold increase from 2008. Non-OECD will lead the world’s primary energy demand growth, accounting for 95% from 2008 to 2050.

In both the Reference and the Tech. Adv. Scenarios, fossil fuels will continue to play a major role in meeting world energy demand in 2050, accounting for 84% and 69% respectively. Even in the Tech. Adv. Scenario, natural gas demand is expected to continue growing from 2008 to 2050 by

57%. These findings suggest continued need for investment in exploration and development of fossil fuel energy sources to facilitate stable supply. The share of non-fossil fuels in 2050 will reach 17% in the Reference Scenario, compared with 31% in the Tech. Adv. Scenario.

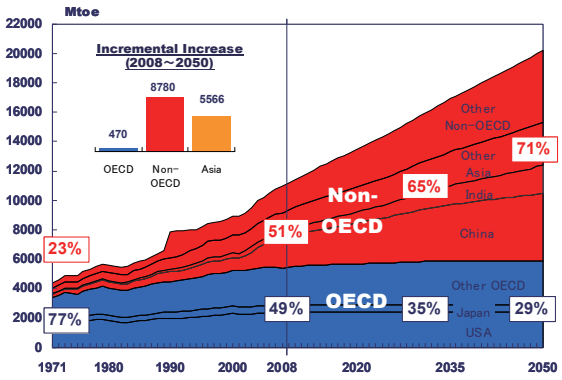

Fig.1 Primary Energy Demand through 2050 (World)

Asia will represent the largest potential for energy saving by 2050. For example, 45% of the world oil demand saving potential will be concentrated in Asia, and Asia will account for 68% of the world's coal demand saving potential.

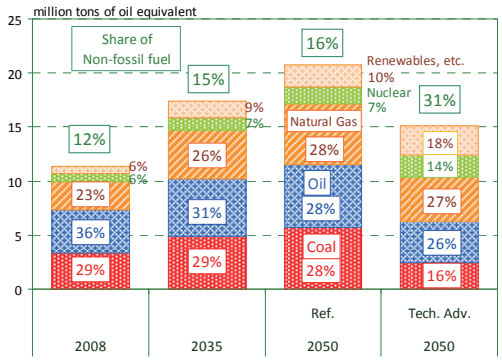

Fig.2 Primary Energy by Source (World)

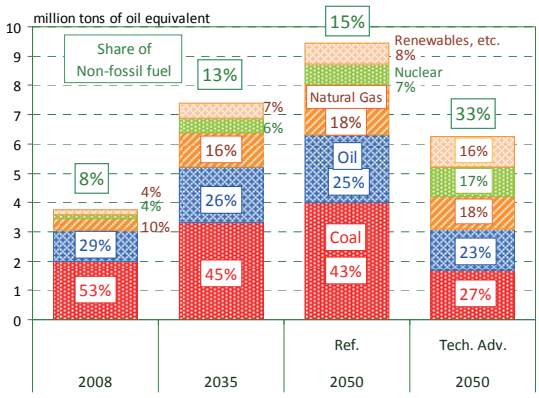

Fig. 3 Primary Energy by Source (Asia)

Under the Reference Scenario, world CO_2 emissions will increase from 29.4 Gt-CO_2 in 2008 to 50 Gt-CO_2 in 2050. In the Tech. Adv. Scenario, OECD and Non-OECD countries' CO_2 emissions will be 75% and 17% lower in 2050 compared with the 2008 level. The World's CO_2 emissions will be reduced by 41% in 2050 from the 2008 level.

Compared with OECD countries, Non-OECD countries will have larger CO_2 emissions reduction potential in 2050, accounting for 73%. Particularly, Asia will account for the largest share at 45% in the world CO_2 emissions reduction potential.

By technology, energy saving will greatly contribute to the CO_2 emissions reduction, accounting for 40% (or 13.1 Gt-CO_2 reduction) in 2050 (Fig.4). This will be followed by Carbon Capture and Sequestration (CCS : accounting for 30%), nuclear (12%), fuel switching (8%), renewable energy (7%), and biofuel (3%). Implementation of all these technologies is necessary for massive CO_2 reduction.

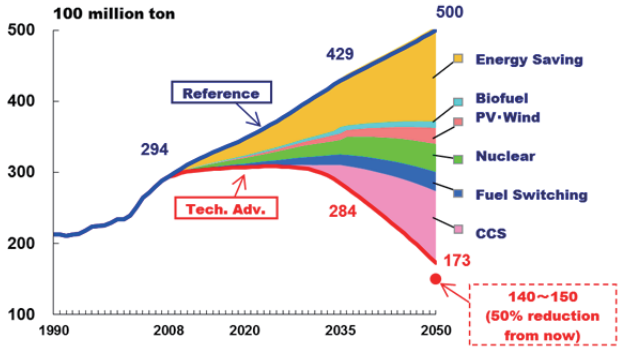

Fig.4 CO_2 emissions through 2050 (World)

3. Way Forward

In order to halve world CO_2 emissions by 2050, further efforts are necessary to develop and deploy innovative technologies. Technology breakthroughs are required in the fields of nuclear and renewables power generation, CCS, electricity storage, energy conservation and other technologies. Continuous efforts are needed to estimate as accurately as possible what is necessary to realize low-carbon societies in Asia, and what will be the costs for that.