

NEW ENERGY 50% INITIATIVE, 2030

- The 21st Century COE on Sustainable Energy System -

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1. REQUIREMENT FOR NEW ENERGY

Twenty-first century might be the special era, when the global limitation of natural resource and environment becomes crucial in all aspects. In 1997, the Kyoto Protocol was adopted as the agreement of COP-3 for preventing further global warming. However, the demand for world energy supply is projected to more than triple by 2060, supposing 2% GDP growth per year. This expansion could not be supplied by the development of the existing energy infrastructure in the future. Obviously, so-called north-south problem becomes clear as the severe resource competition. These are the reasons why new energy systems which satisfy the requirement of the Kyoto Protocol are argently requested.

Renewable energy, such as biomass, wind energy, solar energy and oceanic energy, are expected to supply two thirds of global energy demand in 2065, when the world population exceeds 10 billion (Figure 1). However, the current use of these renewable energy source is still in very low level compared to their theoretical potential of 10,000 times larger one than the global primary energy demand now, mainly because of their availability and cost (Table 1). So, lots of efforts are requested to attain the sustainable development using renewable energy, which are mainly attributed as the role of science and engineering for new energy systems.

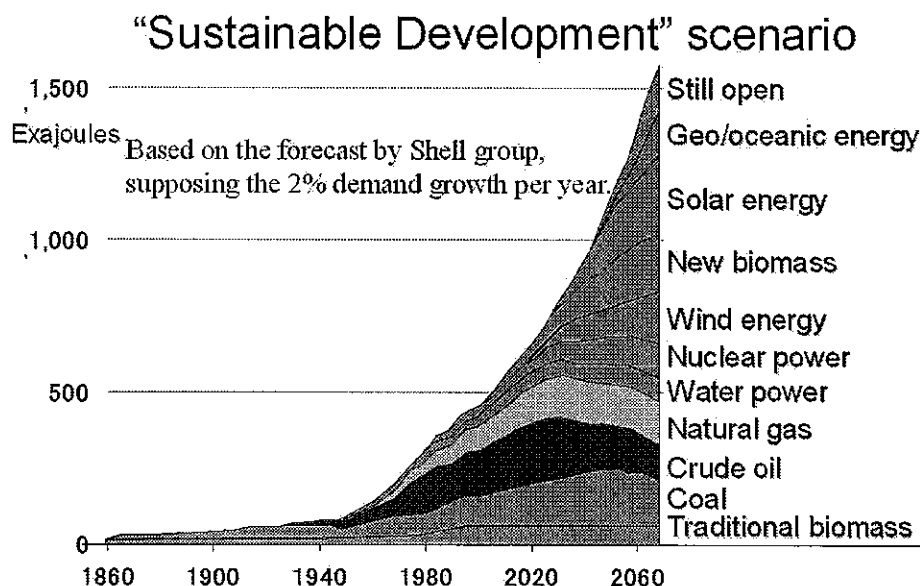


Figure 1 Global energy supply demand scenario up to 2065 (Shell Co. Ltd., 2001)

Source: SHELL (2001)

Resource	Current use	Technical potential	Theoretical potential
Hydropower	9	50	147
Biomass energy	50	>276	2900
Solar energy	0.1	>1,575	3,900,000
Wind energy	0.12	640	6000

Current use current potentials of selected of renewable energy sources. For comparison: global primary energy demand 402 exajoule/annum (1998). The electricity part of "current use" has been converted to primary energy utilising an efficiency factor of 0.385
Antonio Luque *et al.*, Handbook of Photovoltaic Science and Engineering (2005), WILEY, P.46

Table 1. Current use and potentials of global RE

2. COE PROGRAM ON SUSTAINABLE ENERGY SYSTEM IN KYOTO UNIVERSITY

To contribute this vital issue, we started the COE program on sustainable energy system, in 2002 funded by Ministry of Education and Science, Japan, as a five year's joint program among the graduate school of energy science, Institute of Advanced Energy, and Research Institute for Sustainable Humanosphere, Kyoto University.

Although Kyoto University has the most versatile scope of energy science in Japan, four research fields are subjected to develop in this COE program on the sustainable energy systems, namely solar energy, hydrogen energy, bio-energy, and evaluation technologies for new energy availability, all of which are also very important in Asian countries. Out of these research activities, we have already established research centers for the space power satellite station, nuclear fusion technology, hydrogen energy, bio-fuels, and organic solar cell, as not only for national but also for international centers of excellence, from the view point of basic new energy science and technology.

In order to developing the sustainable energy system, we need to expand our scope from the national or regional area to a global or wider area, by constructing the global network of new energy systems to find out the best mixture from many available options. Thus, our COE wants to contribute to the Asian community, through various kinds of co-operations. We have already prepared many kinds of communication site with Asian scientists, such as International Symposium on Sustainable Energy and Environment, jointly organized with JGSEE, and Eco-energy and Materials Science and Engineering Symposium, organized by Institute of Advanced Energy and Rajamangala University of Technology, Thailand. Recently we had also the joint researches in Bangkok for collaborating with Asian universities in new energy science and engineering by exchanging researchers and students.

Six energy-related COE programs are now being carried out in Japan, which held the first Inter-COE international symposium, in Tokyo, Oct., 2006. This is also the frame for advancing the international cooperation in the new energy field, covering more wide scope of research area.

3. NEW ENERGY 50% INITIATIVE, 2030

Besides the establishment of these research centers, we are also intending to dispatch the message for global issues, from the scientific view point. Recently, the 3rd ASEAN + 3 (China, Japan and Korea) Ministers on Energy Meeting (AMEM+3) was held on July 27, 2006 in Vientiane, Lao PDR. The Meeting

was chaired by H.E. Dr. Bosaykham Vongdara, Minister of Energy and Mines of Lao PDR and was attended by the Ministers on Energy from the ASEAN member countries, China, Japan and Korea. Discussions were focused on the importance of alternative energy sources, especially renewable energy. They agreed to pursue a joint study to facilitate both R&D and utilization of renewable energy. So, this type of cooperations in new energy developments will be agreed in global manner, since the idea is very common and beneficial to each other. Thus, it is quite easy to start the research cooperation in the academic sectors for enlarging the collaborations.

Recent discussion on the post Kyoto Protocol has been directed to the possible target for a global commitment, which can replace the emission cut of greenhouse gas. We are now proposing “New Energy 50% Initiative, 2030” as a feasible target for IPCC, which can be approved to all nations including Asian countries.

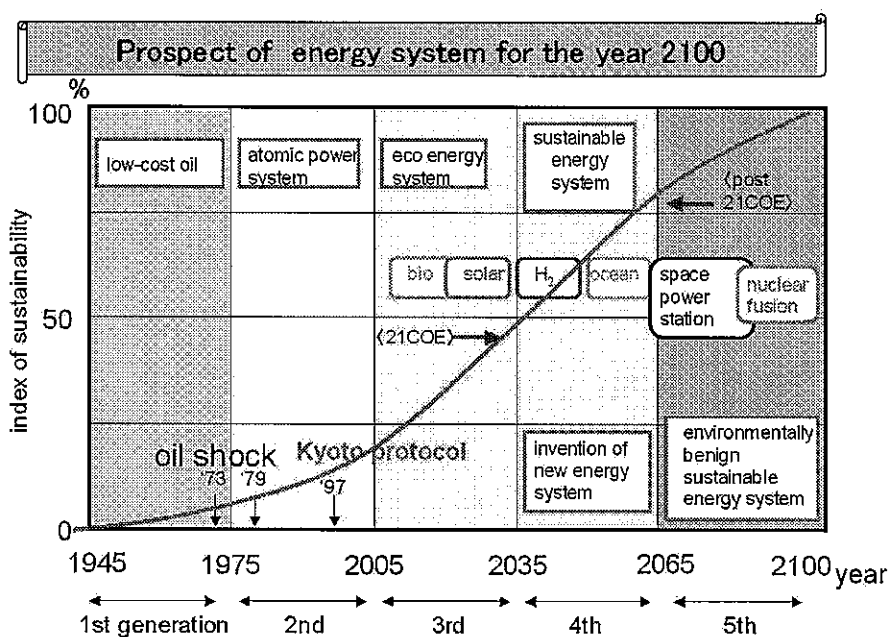


Figure 2. Alteration in Energy System after Second World War (S. Yoshikawa, 2006)

About the author

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Susumu Yoshikawa is a professor of Institute of Advanced Energy, Kyoto University. He graduated from Kyoto University in 1968. His major was organic synthesis, and current research interests are new energy systems related to solar energy, including solar energy conversion into electricity and chemical energy. Current research topics are organic photovoltaics, low dimensional nano-materials, and combinatorial chemistry. In 2005, he was appointed as the project leader of the 21st Century COE program on Sustainable Energy System (Ministry of Education, Japan), He is also the Project Leader of NEDO program on Next Generation Solar Cell, named "Supra-nano-structured organic thin film solar cell" (2006–2010). He got the Osaka Industrial Technology Award in 1991, and 58th Excellent Invention Award, from MITI, in 1999. He used to be the Director of Dept.of Organic Materials, Osaka National Research Institute, MITI, and also Guest Professor of Faculty of fibro-science, Kyoto Institute of Technology from 1995 to 1999.

He published many books as follows;

Frontier in New Energy Science (Kagakudojin, 2006), Leading-edge Technology for Thin-film Organic Solar Cell (CMC Publisher, 2005), Advance in Dye-sensitized Solar Cells(Eng. Educ. Publisher, 2005), New Development of Combinatorial Science (CMC Publisher, 2002), Plastic-film type Dye-sensitized Solar Cells (Gijutukyoku, 2002), Dye-sensitized Solar Cell for Practical Use (NTS Publisher, 2003), Combinatorial Chemistry (Kagakudojin, 1997)