



**The Japanese Government's
“Cool Earth – Innovative Energy Technology Programme”**

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CONTENTS

Summary	1
1. Background.....	2
2. Outline of “Cool Earth – Innovative Energy Technology Programme”	2
2.1 Innovative Energy Technologies to be Developed	2
2.1.1 Criteria for the Selection of Technologies.....	2
2.1.2 Innovative Energy Technologies to be Developed.....	3
2.1.3 Roadmaps for Innovative Energy Technologies.....	3
2.2 Promotion of International Co-operation in the Development of Innovative Energy Technologies	4
2.2.1 Current Status of Development and Roadmap in the World	4
2.2.2 Way of International Co-operation.....	5
2.2.3 Current Status and Direction of Future International Co-operations	6
2.3 Estimated Contribution of Innovative Energy Technologies to the Reduction of Carbon Dioxide Emissions	6
3. Conclusion.....	7

Summary

This note is aimed at outlining “Cool Earth – Innovative Energy Technology Programme”, which was issued as a report by a committee under the Japanese Ministry of Economy, Trade and Industry (METI) on 5 March 2008.

The committee was comprised of external experts including Japanese industry leaders. They identified 21 innovative energy technologies to be developed to halve global greenhouse gas emissions by 2050 and compiled a roadmap toward 2050 for each of the technologies. The members also explored the way of international co-operation for the development of these technologies. Their conclusion for the promotion of international co-operation is to start with strengthening information exchange, for example in conjunction with the International Energy Agency (IEA), and expanding ongoing international collaboration programmes.

The English versions for the programme and roadmaps are available at the following:

<http://www.meti.go.jp/english/newtopics/data/pdf/031320CoolEarth.pdf>

http://www.meti.go.jp/english/newtopics/data/pdf/CE_RoadMap.pdf

1. Background

On 24 May 2007, the then Japanese Prime Minister revealed “Cool Earth 50”, a new initiative on the climate change issue that proposed to set up a world-wide goal to halve the emissions of global warming gases by 2050. It is said that conventional technologies are not sufficient to achieve the ambitious target and the development of innovative technologies is essential. The Government considers that Japan has world-class energy technologies and Japan’s acceleration of developing these technologies should contribute not only to such large reduction of the emissions but also its competitiveness in the world.

In August 2007, the Ministry of Economy, Trade and Industry (METI) formed a committee consisted of external experts to identify innovative energy technologies to be developed, set up roadmaps for the technologies selected and discuss the future of international co-operation for the development. The experts included not only leading scientists such as Professor Hiroyuki Yoshikawa, President of the National Institute of Advanced Industrial Science and Technology (AIST) but also the leaders of the Japanese industry: Mr Tsunehisa Katsumata, Chief Executive of Tokyo Electric Power Company (TEPCO); Mr Fujio Cho, Chairman of Toyota Motor; Mr Katsuhiko Machida, Chairman of Sharp; and Mr Akio Mimura, President of Nippon Steel.

On 5 March 2008, the committee completed discussions and issued a report titled “Cool Earth – Innovative Energy Technology Programme”.

2. Outline of “Cool Earth – Innovative Energy Technology Programme”

The report has three main chapters on innovative energy technologies to be developed, and international co-operation. This section summarises the content of each of these main chapters.

2.1 Innovative Energy Technologies to be Developed

2.1.1 Criteria for the Selection of Technologies

The committee identified 21 energy technologies to be developed to cut global warming gases by half by 2050. The selection was conducted based on the following criteria:

- 1) Technologies that have the potential to contribute world-wide large carbon reduction by 2050
- 2) Technologies that have the potential to make significant improvement in performance, costs and the degree of deployment by either of the following:
 - a) The use of novel principle and material innovations including a new way of using existing materials (e.g. novel structure/ material for photovoltaic cells and catalysts alternative to platinum for fuel cells)
 - b) Innovations in the manufacturing process (e.g. steel making process to use hydrogen as reducing agent)
 - c) The demonstration of system composed of established elemental technologies (e.g. carbon capture and storage)
- 3) Technologies in which Japan can lead in the world

2.1.2 Innovative Energy Technologies to be Developed

The selected 21 technologies are listed in the table 1.

Table. 1 Innovative Energy Technologies

Sector	Innovative Energy Technology
Power generation/ transmission	High-efficiency natural gas fired power generation
	High-efficiency coal fired power generation
	Carbon capture and storage (CCS)
	Innovative photovoltaic power generation
	Advanced nuclear power generation
	High-efficiency superconducting power transmission
Transport	Intelligent transport system (ITS)
	Fuel cell vehicles (FCV)
	Plug-in hybrid vehicles and Electric vehicles (EV)
	Transport biofuels
Industry	Innovative materials/ manufacturing/ processing
	Innovative steel making process
Private sector	High-efficiency houses and buildings
	Next-generation high-efficiency lighting
	Stationary fuel cells
	High-efficiency heat pumps
	High-efficiency information devices and systems
	House energy management systems (HEMS), Building energy management systems (BEMS) and Regional energy management systems (REBS)
Cross-sectoral technologies	High-performance power storage
	Power electronics such as inverters using semiconductors for power generation, transmission, storage and electric appliances
	Hydrogen production, transport and storage

2.1.3 Roadmaps for Innovative Energy Technologies

The report includes roadmaps towards 2050 for all of the 21 technologies. Each of the roadmaps consists of the outline of the technology; a scenario of development including numerical targets for efficiency, costs and so on; and issues to be addressed for the effective development and deployment. The report emphasises the importance of regular updates and share of basic direction of development amongst stakeholders. These roadmaps are also illustrated and attached in a form of compact tables as an appendix as well.

2.2 Promotion of International Co-operation in the Development of Innovative Energy Technologies

2.2.1 Current Status of Development and Roadmap in the World

Although the importance of the development of innovative energy technologies is emphasised in global discussions, investment has not been increasing after a peak in 1980. It is also important that governments invest in the development since risks in such investment are so high that private companies cannot act alone. The Japanese Government is the one of the top investors in the development of energy technologies as shown in Figure 1. But it should be noted that the significant amounts in these investments go into nuclear power development. The figures excluding nuclear power investment are, for example, \$1,397m for Japan, \$2,573 for the US and \$90m for the UK.

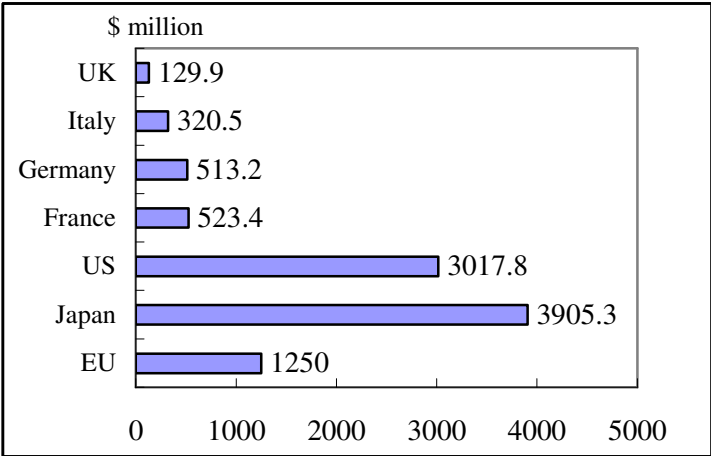


Figure 1. Government Investments in Energy Technology Development in 2005

N.B. EU’s figure is for 2007 (Source: IEA except EU, EC for EU)

In the science and technology area, the establishment of roadmaps has been activated in the world. For example, the International Technology Roadmap for Semiconductors is accelerating innovation in the ICT sector. Such trend can be observed in the energy technology sector, too. Japan, US and EU has set up such a roadmap independently.

2.2.2 Way of International Co-operation

The report insists that international co-operation is essential to accelerate the development of energy technologies as the solution of the climate change problem. It mentions the importance of sharing roadmaps world-wide, the benefits of international co-operation and points to be aware of in such co-operation.

- World-wide share of roadmaps

Sharing roadmaps internationally enables each country to understand the status of developments in the world and identify technologies to accelerate the development by strengthening international collaboration. It should be considered to establish international frameworks in conjunction with the International Energy Agency (IEA) to share roadmaps amongst countries and regions and to take technology developments forward steadily.

- Benefits of international co-operation

There are a number of benefits in international co-operation:

- Diversification of high risks that Japan solely cannot take in research and demonstration projects that require large and long-term investment,
- Acceleration of research and development by exploiting fundamental technologies and human resources that are not in Japan,
- Improvement in the efficiency of research and development by grasping the trend and expertise of cutting-edge technologies through information exchange with other nations, and
- Smooth deployment of technology in the market by promoting international standardisation.

- Points to be aware of in international co-operation

It is essential to consider the protection of intellectual properties and the prevention of unwanted technology leakage and make a good balance between competition and co-operation in order not to discourage private companies from the activities. As a possible solution, the report cites recent energy-saving co-operation between Japan and China, for which the two governments reached an agreement regarding intellectual properties before the launch of the co-operation.

2.2.3 Current Status and Direction of Future International Co-operations

There have already been a number of international programmes, ranging from nuclear power, a zero-emission coal-fired plant to fuel cells. These collaborations have various types of schemes from an information exchange programme to a co-funding project in which each participating country works on allocated areas.

The report describes an appropriate direction for future international co-operations as follows:

- Promote information exchange-oriented co-operation as the first step,
- Expand existing programmes, and
- Consider new collaborations based on the status of technology development and each country’s needs.

2.3 Estimated Contribution of Innovative Energy Technologies to the Reduction of Carbon Dioxide Emissions

It is said that in order to reduce the carbon emissions by half from the 2005 level of 27bn tonnes by 2050, the emissions of over 40bn tonnes needs to be cut, assuming the global economy will continue to grow steadily. Given that the selected innovative energy technologies will be developed as the roadmaps describe, the report estimated the contribution of the technologies to the reduction of carbon emissions as shown in Figure 2.

The estimation predicts that the contribution of the selected technologies will reach around 60%, which implies the development and deployment of innovative technologies is essential. The report emphasises that the development of one technology is not enough and Japan should take the initiatives in developing technologies in all sectors.

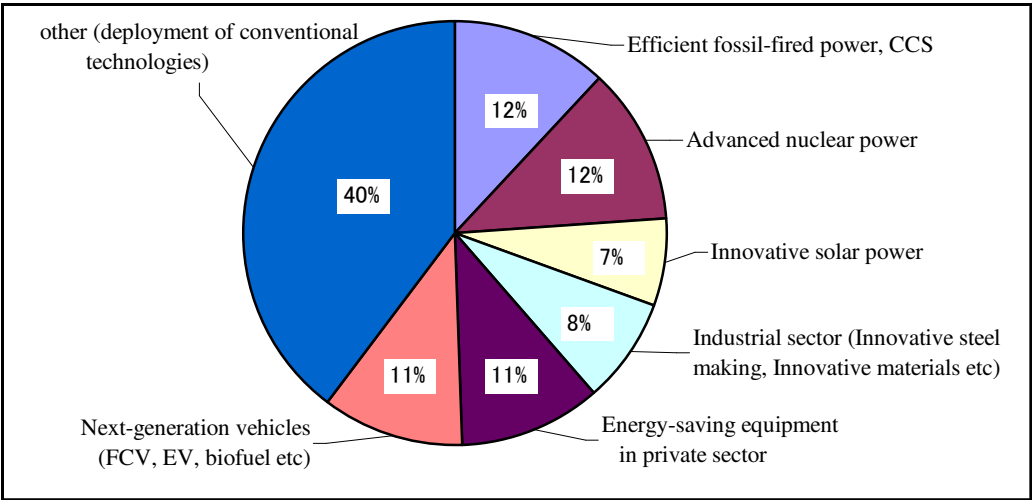


Figure 2. Estimated Contribution of Selected Innovative Energy Technologies to Halving Carbon Dioxide Emissions by 2050

3. Conclusion

The report pointed out the following three points are required for the steady progress of “Cool Earth – Innovative Energy Technology Programme”:

- Appropriate assignments of roles between the private and public sectors based on the progress of technology development,
- Smooth deployment of achievement from technology development, and
- Regular updates of roadmaps.

METI intends to share the Programme with other nations in the G8 Toyako Summit in Japan in July 2008. On the other hand, the Council for Science and Technology Policy (CSTP) chaired by Prime Minister Yasuo Fukuda agreed to form the Environment Energy Technology Innovation Plan in time for the summit. The plan's goal is similar to “Cool Earth – Innovative Energy Technology Programme”: to identify innovative energy technologies that retain Japan's advantage in environment and energy technologies and create breakthroughs toward zero carbon emissions; and to set up measures for the promotion the selected technologies. The CSTP's plan is likely to cover METI's Cool Earth Programme.

Japan is anyway eager to take the initiatives in the development of energy technologies and will propose strengthening international co-operation in the development in the G8 Summit.

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