

Nuclear Energy in Japan

- current status and future plan,
- importance of nuclear nonproliferation –

JAEA International Forum on Nuclear Nonproliferation
and Peaceful Use of Nuclear Energy in the Asia Pacific
Region, June 24-25, 2008, Tokyo, Japan

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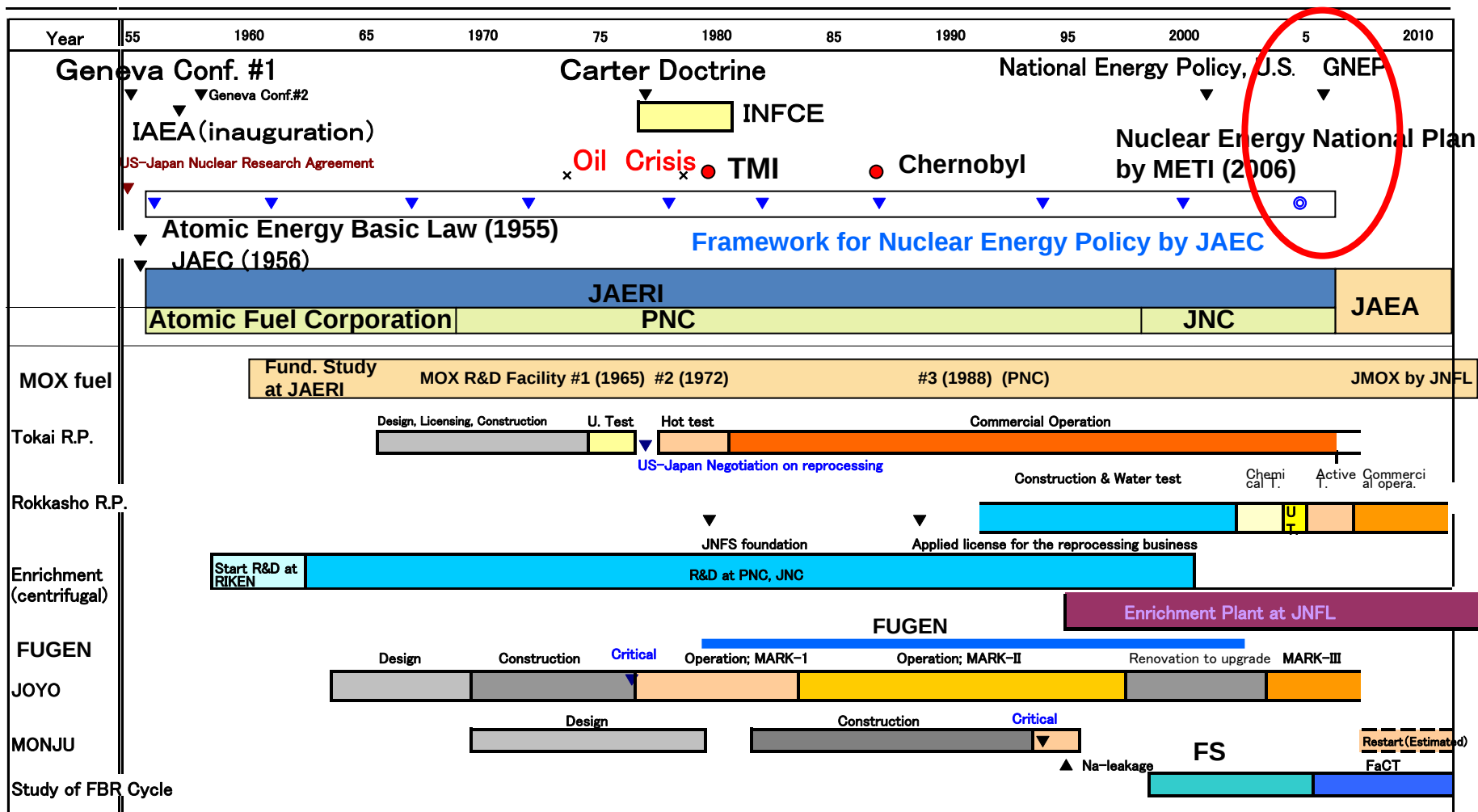
History of Nuclear Energy Research, Development and Utilization in Japan

Dream energy

INFUCE

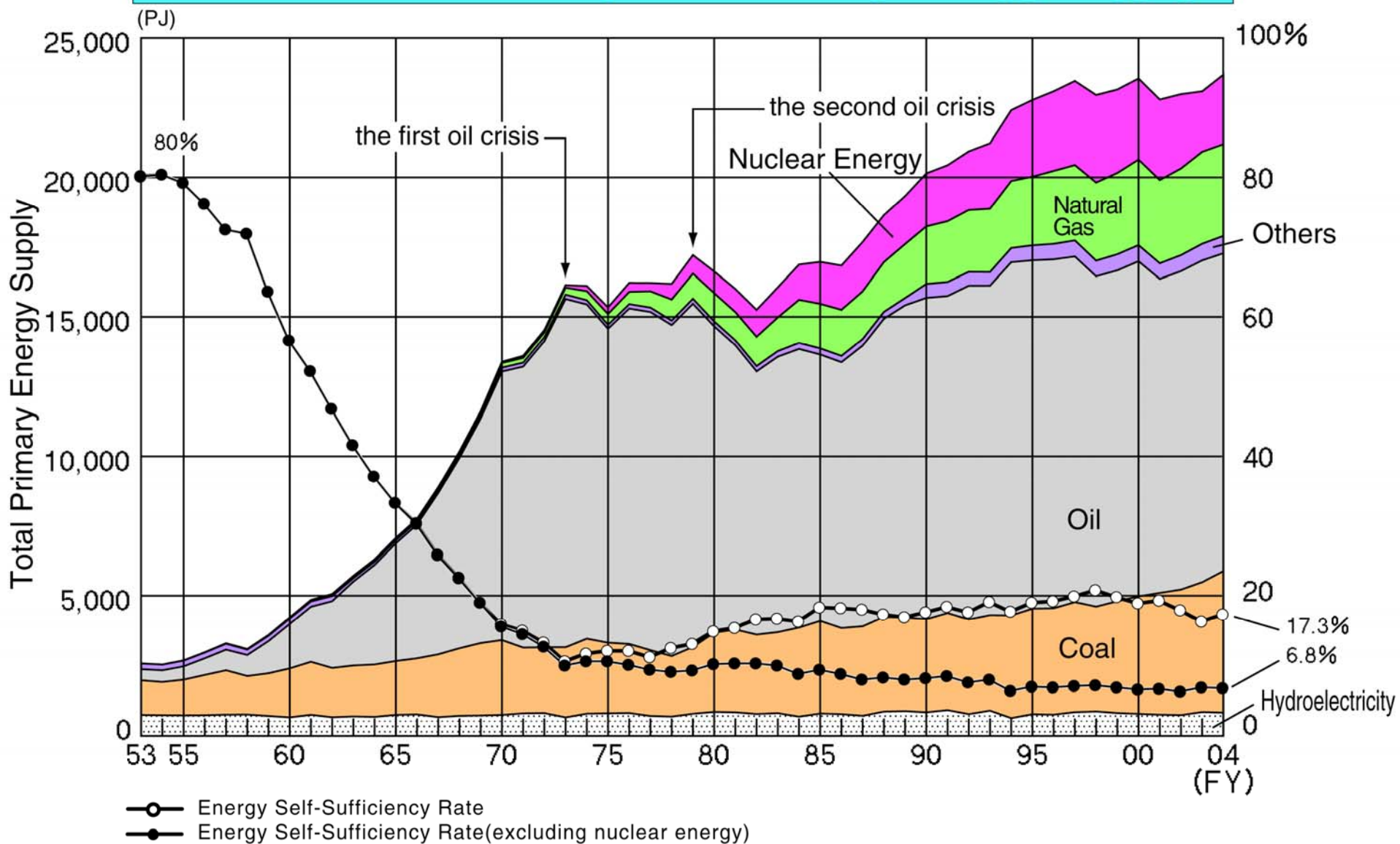
Winter time?

Renaissance



By S. Tanaka

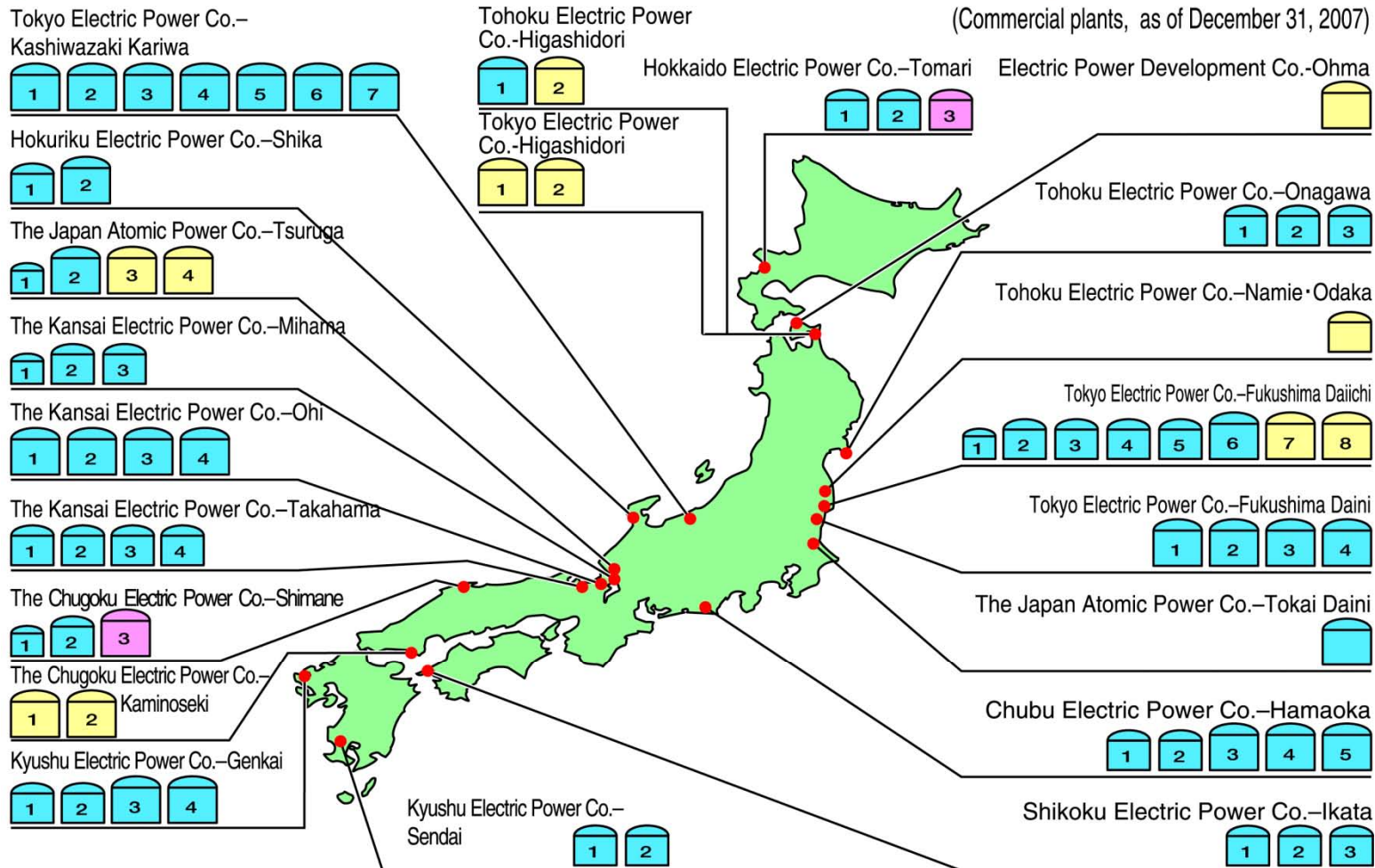
Historical Trend of Japan's Primary Energy Supply



(Note) 1PJ(=10¹⁵J) is equivalent to approximately 25,800,000 liters of crude oil in calorie.

(Source) Agency of Natural Resources and Energy

Nuclear Power Plants in Japan



Output scale



Under 500MW



Under 1,000MW



Over 1,000MW



Operating



Under construction



Preparing for construction

	Number of Units	Total Output (MW)
In operation	55	49,467
Under construction	2	2,285
Preparing for construction	11	14,945
Total	68	66,697

Japan's LWR Fuel Cycle

Pu utilization in LWR: efficient use of uranium (x1.15-1.20),
Supply Pu for future use, reduction of HLW volume

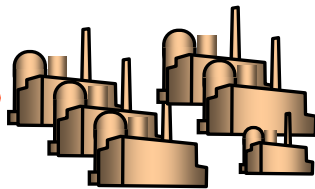
LWR Spent Fuels
1000 – 900 tHM/y

A Couple of
Interim Storage
Facilities



Mutsu city
Recycle Fuel Storage
Center : 5000 t

U
Fuels



NPP 55 units
LWR-MOX 16-18 units : Start from 2010

LWR-MOX



JNFL RRP : 800 tHM/y



JNFL MOX : 130 tMOX/y

Waste Treat.

Shallow, Mid-depth,
Deep-geological Dispos

原子力政策大綱

平成17年10月11日

原子力委員会

“Framework for Nuclear Energy Policy”

by Atomic Energy Commission (2005.10.11)

- 30 – 40 % or more of the total electricity production by nuclear
- Recycling is the basic nuclear policy (reprocessing, plutonium utilization in LWR)
- Commercial FBR should be introduced around 2050

Descriptions about nuclear nonproliferation in the “Framework for Nuclear Energy Policy”

Guarantee of Peaceful Uses

- Japan has been promoting research, development and utilization of nuclear energy **strictly for peaceful purposes**, while having set the goal of eliminating all nuclear weapons and adhering to the “**Three Non-nuclear Principles**” of not possessing, not producing, and not permitting the introduction of nuclear weapons into Japan, as the only country that suffered nuclear attacks.
- Japan has ratified the **Non-Proliferation Treaty (NPT)**, and concluded the **Comprehensive Safeguards Agreement** and the **Additional Protocol** with IAEA. – Japan should continue to uphold the “Three Non-nuclear Principles”, promote research, development and utilization of nuclear energy for peaceful purposes, actively participate in the international non-proliferation regimes, and secure strict application of the IAEA Safeguards as well as domestic safeguards.

Common understanding by the all the Japanese people and sending information to the international community

-Concerned parties should continue incessant efforts to maintain the heightened awareness of nuclear non-proliferation and make relevant efforts in public hearings and publicity activities, so that **all the Japanese people will share Japan's basic position** that non-proliferation and the system for it are **the major premises** of peaceful use of nuclear energy, and continue to **send strong messages regarding this position to the international community.**

Securing transparency in plutonium utilization

- Japan has declared the principle of **not possessing reserves of plutonium of which use is undermined**, and has been working on improving the control and disclosure of information pertaining to plutonium stock, in order to improve both national and international understanding and credibility regarding Japan's strict adherence to the peaceful use of plutonium.

Strengthening the international regime for non-proliferation and nuclear disarmament

- Japan will advance its **nuclear disarmament diplomacy** and further enhance the international regime for nuclear non-proliferation.
- Japan will continuously work toward early **CTBT ratification** and call for **FMCT (FM Cut-ff Treaty) talks** to start at the earliest possible time.
- Japan calls on the **international community to conclude** the IAEA's Comprehensive Safeguards Treaty and its Additional Protocol, in order to develop an environment that allows easy detection of undeclared nuclear material and nuclear activities.
- Japan will be actively involved in the discussions of the **Nuclear Suppliers Group** on export control issues for the maintenance and strengthening of the non-proliferation regime, and strive for its realization.
- Through a series of these activities in cooperation with the international community, **Japan will foster a globally shared awareness** that it is a major prerequisite for us enjoying benefits from the peaceful use of nuclear energy to strictly observe international norms and treaties, which have been enacted from the perspective of striking a balance between nuclear non-proliferation and the peaceful use of nuclear energy

Participating in discussion on new proposals

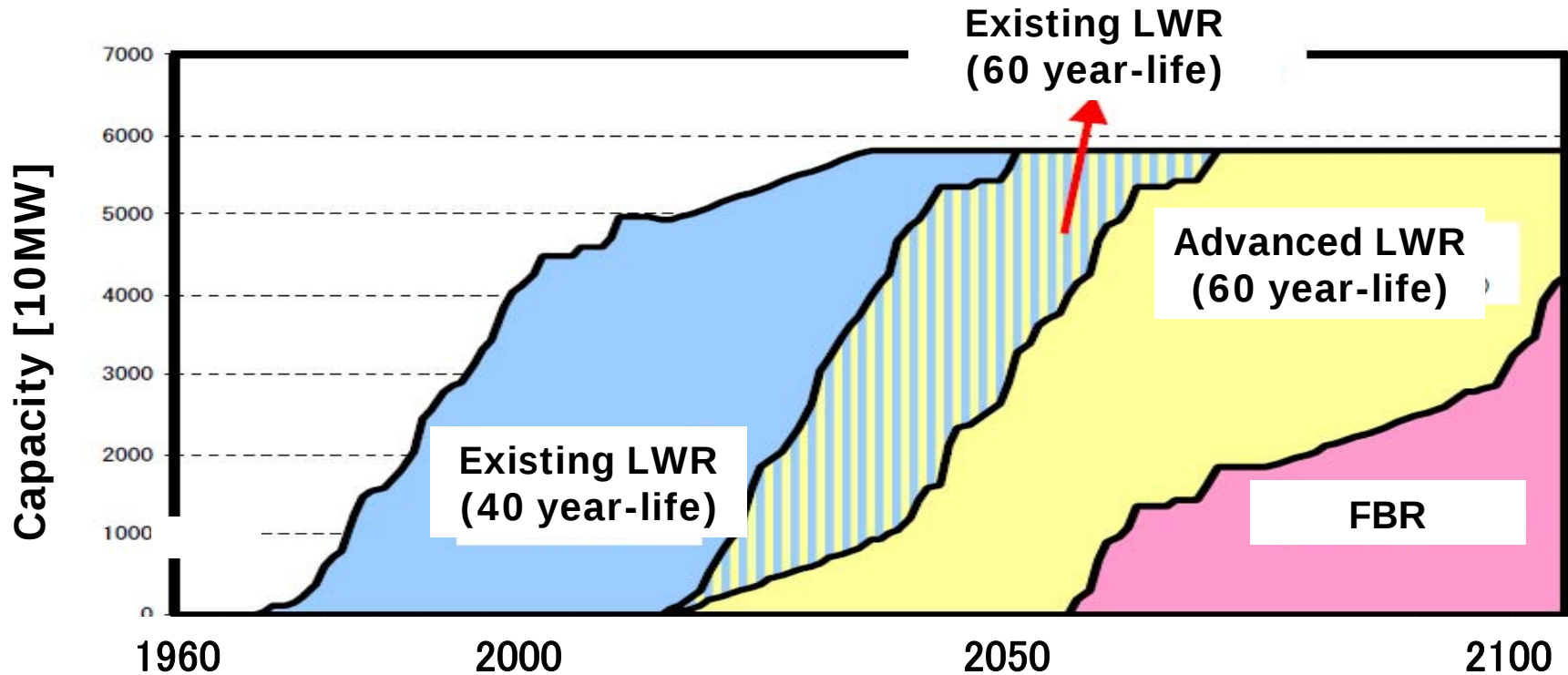
-Japan will actively participate in **discussions on new proposals** for maintenance and strengthening of the nuclear non-proliferation regime, including Multilateral Nuclear Approaches (MNA).

Knowledge management, human resources development, technologies development

- Japan will promote the development of **advanced measurement and accounting technology** to detect diversion to military uses and proliferation resistant technology to prevent diversion to military uses.
- In order to build a stronger foundation for non-proliferation efforts, we expect that the concerned parties, both domestic and foreign and including universities, **will cooperate with each other to develop human resources** capable of assuming these responsibilities.
- In light of the usefulness of the international knowledge network for the research and development activities in Japan, **multilateral and international networks** should be established and developed, such as for the improvement of the **mobility of human resources** and development of infrastructure for transmission of research data and related information.

Framework for Nuclear Energy Policy (2005)

Image of Future Nuclear Energy



Assume a saturation of 58GW
for illustrative purpose

原子力立国計画 日本の選択

Nuclear Energy National Plan
Japan's Choice

By Ministry of Economy, Trade and
Industry (METI)

経済産業省 資源エネルギー庁編

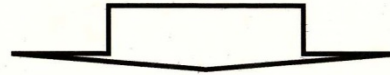
“The Nuclear Energy National Plan”

by METI (2006.8.8)

- Clear basic policy
- Government policy to keep 30-40% or more of electricity production by nuclear energy
- Steady promotion of nuclear fuel cycle and strategic support of related industries
- Early realization of FBR cycle
- Keeping and increasing of technology, industries and human resources
- Supporting international development
- International collaboration in nuclear energy and nonproliferation
- Disposal of radioactive waste disposal

Direction of Energy Policy

The direction of energy policy is not
Nuclear energy “OR” Renewable energy
but
Nuclear energy “AND” Renewable energy



Considering stable energy supply and the response to global warming, it is appropriate to expect that:

nuclear power generation will continue to account for at least its present level of 30-40% of Japan's total power generation beyond 2030, even after the replacement of the existing plants.

Five Basic Guidelines for Nuclear Energy Policy

- I. Establish a firm national strategy and policy framework that does not waver over time.
- II. For individual policy measures and time frames, maintain a “strategic flexibility” to adjust to global realities and technology trends.
- III. Break down the three-way standoff among government, electric power utilities, and plant makers, to achieve true communication and a shared vision among players. The government must take the first step by indicating the overall direction.
- IV. Place importance on policy measures of individual regions along the lines of national strategy.
- V. Ensure policy stability by basing strategy decisions on open and even-handed discussions.

Future Approach to Nuclear Power Policy

Basic Targets under the Framework for Nuclear Energy Policy (Adopted by Cabinet Oct. 2005)

1. Aim at maintaining or increasing the current level of nuclear power generation (30 to 40% of the total electricity generation) even after 2030
2. Steady advancement of the nuclear fuel cycle
3. Aim at commercial introduction of fast breeder reactors by 2050

Implementation Policies—The Nuclear Energy Nation Plan (Drafted June 2006)

1. Investment to construct new nuclear power plants and replace existing reactors in an era of electric power liberalization
2. Appropriate use of existing nuclear power plants with assuring safety as a key prerequisite
3. Steady advancement of the nuclear fuel cycle and strategic reinforcement of nuclear fuel cycle industries
4. Early commercialization of the fast breeder reactor cycle
5. Achieving and developing depth in technologies, industries and personnel
6. Support for the international development of Japan's nuclear power industry
7. Positive involvement in creating an international framework to uphold both nonproliferation and the expansion of nuclear power generation
8. Fostering trust between the state and communities where plants are located; highly detailed public hearings and public relations
9. Steady promotion of measures for disposal of radioactive wastes

Key Points of Japan's Nuclear Energy National Plan and Specific Actions (i)

METI

(1) New construction and expansion of nuclear power plants in the era of electric power liberalization

❑ Reduction and dispersal of nuclear power-specific risks (introduced in FY2006)

A system was introduced to accumulate costs for reprocessing spent fuel at the second reprocessing plant every fiscal year as a reserve.

❑ Reducing and leveling the initial investment and decommissioning costs

- In order to level the burden of depreciation for newly built and added reactors, a system was introduced to accumulate the cost beforehand as a reserve (introduced in FY2006).

- Based on the improvement of the clearance system, reserves for reactor decommissioning are being evaluated.

❑ Make the benefit of nuclear power generation visible (March 2007)

Criteria for a unified calculation method of emission coefficient to determine CO₂ emission were defined.

(2) Appropriate use of existing nuclear power plants with assuring safety as a key prerequisite

❑ Shift to more effective inspection system (reviewing the system with a view to start implementation from FY2008)

- Switching to inspection system compatible with different characteristics of individual plants and power utilities
- Shift to inspection system that is consistent during operation and shutdown

❑ Secure implementation of improved measures against aging (new system implemented from FY2006)

(3) Deploying strategy for acquiring natural

❑ Establishment of solid, strategic cooperation with Central Asia

Triggered by then Prime Minister Koizumi's visit in August 2006, strategic cooperation in the field of nuclear energy, including the joint development of uranium mines, re-conversion, fuel manufacturing, introduction of nuclear power generation and so forth was realized. In order to incorporate individual cooperation cases into a comprehensive package of bilateral nuclear energy cooperation, a high-level mission including both public and private sectors delegates, headed by METI Minister Amari, was dispatched this April.

❑ Support for the development of uranium mines (new budget for FY2007)

Supply of risk money for the exploration of and obtaining interest in mines by private companies

[New budget for FY2007, 1 billion yen]

(4) Promoting nuclear fuel cycle and strategically reinforcing of nuclear industries

❑ Stable promotion of nuclear fuel cycle

- November 2007 Start of full-fledged operation of the Rokkasho reprocessing plant
- By FY2010 Introduction of "pluthermal" (plutonium utilization) at 16 to 18 reactors
- Around FY2010 Introduction of a centrifugal separator at the Rokkasho uranium enriching plant
- 2012 Start of operation of a "pluthermal" MOX fuel plant

❑ Strategic enhancement of related industries

In the global trend of oligopoly and the enhancement of non-proliferation policy, aim to realize an independent structure of nuclear energy industry in Japan, and reinforce strategic industries such as enrichment and reprocessing.

(5) Early commercialization of fast breeder reactor

○ A demonstration reactor will be realized by around 2025, and a commercial reactor will be developed before 2050.

○ Costs necessary for the construction of a demonstration reactor will be divided as follows:

- Amounts equivalent to costs for an existing light-water reactor (LWR) will be borne by private sector as a general rule.
- Amounts exceeding the above will be mostly borne by the government.

❑ Full-fledged implementation of efforts for demonstration and commercialization (new budget for FY2007)

In order to achieve the early realization of a fast breed demonstration reactor and demonstration facilities for related cycle, "Study on Commercialization of the Fast-Breeder Reactor Cycle Systems" will be started.

[New budget for FY2007: 14 billion yen] (Joint Project with MEXT)

❑ Starting discussions to ensure smooth transition to demonstration and commercialization (July 2006)

For the smooth introduction of FBR demonstration facilities, discussion between five parties (METI, MEXT, power utilities, manufacturers and Japan Atomic Energy Agency) will be initiated.

❑ Establishment of systems for manufacturers to develop demonstration reactors (April 2007)

It was decided to concentrate the responsibility, authority and engineering functions in one core manufacturer upon the development of a fast breed demonstration reactor.

Key Points of Japan's Nuclear Energy National Plan and Specific Action (ii)

METI

(6) Assuring ample technical and human resources to support the next generation

❑ Launch of a public-private joint project to develop next-generation light-water reactors (started FY2006)

Development of next-generation light-water reactors suitable for the global market has started. This is the first public-private national project in 20 years. There will be a survey on commercialization for about two years before the start of full-scale development. .

❑ Assistance for on-site technician training and skills transfer (started FY2006)

Assist regional efforts in training and skills transfer of on-site technicians. Covers more than 20,000 personnel (in Aomori, Fukui, Niigata and Fukushima).

❑ Establishment of the "Training Program for Nuclear-Related Human Resources" at universities, etc. (New budget for FY2007) (Joint project with MEXT)

- (1) Developing educational materials for programs to assist nuclear energy education, inviting lecturers from the industrial arena, etc.
- (2) Assisting the field of fundamental technology supporting nuclear energy (structural strength, material strength, erosion/corrosion, etc.), in which concerns have arisen that research activities and the number of researchers are diminishing recently.
- (3) Offering an opportunity for students to familiarize themselves with the actual conditions and attractiveness of the nuclear energy industry and research sites.

(7) Supporting the international development of Japan's nuclear industry

Actively support the international development of Japan's nuclear industry by:

- Contributing to efforts to ease the tight energy supply-demand conditions around the world and combat global warming.
- Securing sufficient technological and human resources in the industry.
- METI Minister Amari and U.S. Secretary of Energy signed the joint statement on U.S.-Japan energy cooperation, which includes nuclear energy. The U.S.-Japan nuclear energy joint plan was formulated in April 2007.
- Cooperation on developing human resources (enhancing the safety training system for China and Vietnam)
- Providing knowledge and know-how to countries planning to introduce nuclear power generation (Vietnam, Indonesia and Kazakhstan) (started FY2006)

(8) Positive involvement in creating an international framework to uphold both nonproliferation and the expansion of nuclear power generation

Making the most of Japan's experiences and technologies, and positively cooperating and contributing in the movement towards forming a new international framework.

- Making specific contributions from Japan to the GNEP Initiative of U.S., including technological proposals (in September 2006) and dispatch of experts, aiming to achieve international standards
- Giving Japan's proposal in the discussion on ensuring fuel supply (IAEA General Conference in September 2006)

(9) Reinforcement of the relationships of trust between the government and local communities, implementing highly detailed hearings and publicity

❑ Reinforcing trust between the government and local communities

Continue with earnest efforts at each level with visible government input, in accordance with the actual conditions in each area.

- Strengthen direct dialog with residents of the local communities where plants are located (direct round-table discussions with small numbers of residents, etc.)
- Ultimately have the relevant government ministers announce the ideas and policies of the government.
- Etc.

❑ Implementing highly detailed hearings and publicity

- Focused efforts towards women and demographics of the next generation
- Utilization of experts outside the government on nuclear energy
- Etc.

❑ Assistance for regional development (started FY2006)

- (i) Offering a total of 2.5 billion yen to prefectures with reactors aged 30 years or more
- (ii) Offering 6 billion yen to prefectures agreeing to accept nuclear fuel cycle facilities
- Etc.

(10) Reinforcement of measures for the disposal of radioactive waste

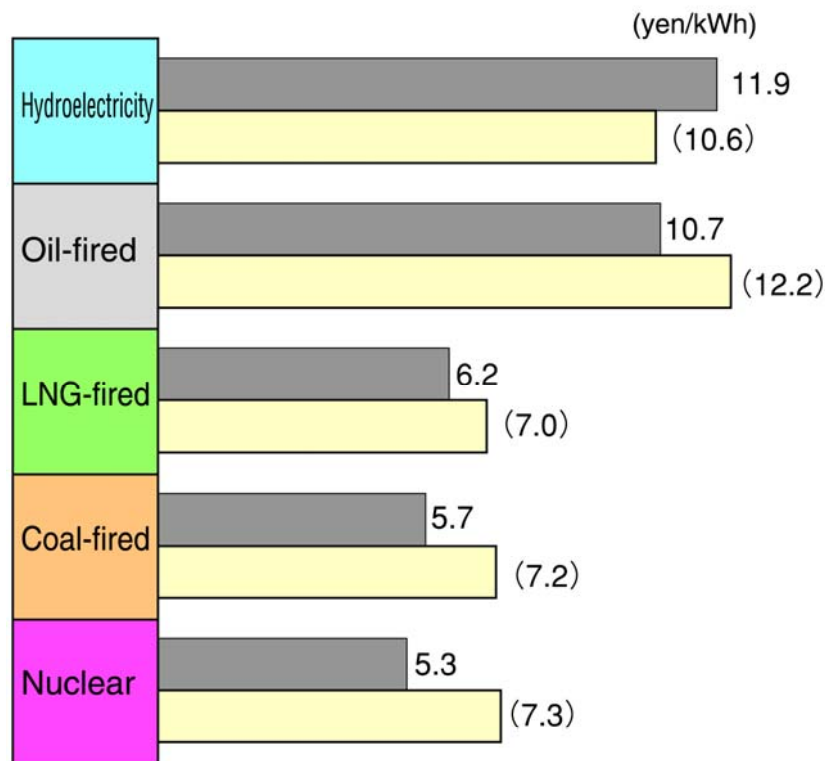
❑ Intensification of efforts to secure the location for an ultimate disposal facility for high-level radioactive wastes (HLW)

- Increase hearings and publicity, such as holding symposiums in individual regional blocks (started 2006)
- Substantial improvement of measures to assist local communities (Grants at the stage of documentary research: 210 million yen/year in FY2006 1 billion yen/year in FY2007)

❑ Establishing the institutional framework for geological disposal of TRU waste (legal changes)

- The "Specified Radioactive Waste Final Disposal Act" and other acts were revised in June 2007, to include the following radioactive waste as waste subject to ultimate disposal (geological disposal) by the Nuclear Waste Management Organization of Japan, and institutional measures were taken.
- TRU waste generated from reprocessing facilities that require geological disposal
 - HLW that are exchanged with TRU waste generated from reprocessing overseas and returned based on certain criteria

Generation Costs per kWh (sending end)



Upper ■ Generation cost when operating period is set at 40 years.
• Discount rate set at 3%

Lower ■ Generation cost when operating period is set at legal durable years for each power source.
(Hydroelectricity 40 years, Oil-fired 15 years, LNG-fired 15 years, Coal-fired 15 years, Nuclear 16 years).
• Discount rate set at 2%

< Premises of trial calculation >

Power source	Operation period	Utilization rate	Output per unit
Hydroelectricity	40 yrs	45%	15MW
Oil-fired	40 yrs	80%	400MW
LNG-fired	40 yrs	80%	1,500MW
Coal-fired	40 yrs	80%	900MW
Nuclear	40 yrs	80%	1,300MW

- Based on the assumption that a plant started operation in FY2002
- Exchange rate (avg. in FY2002) 121.98 yen/\$
- Fuel prices (avg. in FY2002)
 - Oil: 27.41\$/bbl
 - Coal: 35.5\$/t
 - LNG: 28,090 yen/t
- Fuel cost increase in oil, coal, & LNG IEA, "World Energy Outlook"

Breakdowns of nuclear fuel cycle costs

Nuclear fuel cycle expenses	1.47yen/kWh
Front-end	0.66yen/kWh
Back-end	0.81yen/kWh
Reprocessing of spent fuel (fuel transports included)	0.50yen/kWh
Intermediate storage of spent fuel (fuel transports included)	0.04yen/kWh
HLW storage, transports, disposal	0.15yen/kWh
TRU processing, storage, disposal	0.09yen/kWh
Decommissioning of reprocessing facilities	0.03yen/kWh

(Note) Operating period set at 40 years.(Discount rate set at 3%)

Evaluated in January 2004

(Source) Electricity Industry Committee's Subcommittee to Study Costs and Other Issues (January 2004)

Nuclear: small fraction of f

Plan of FBR Cycle R & D

1st step : Demonstration of reliability as a power generation plant.

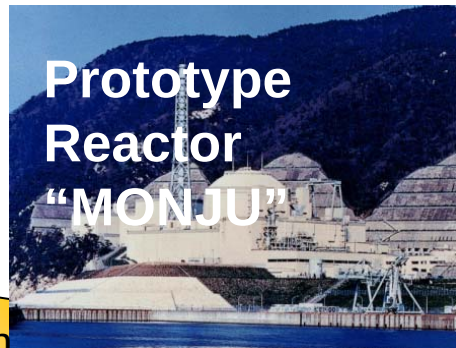
Establishment of Na handling technology.

2nd step : Development of high-performance fuel, reduction of environmental load

Before 2050



714,000kWt,
280,000kWe
1994 First criticality
1995 Sodium leakage
in the secondary system



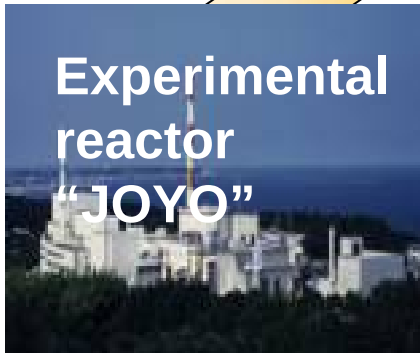
2025

Demonstration reactor

2015

Verification of
Demonstration
reactor

1978 Start of operation



2005

Strategy R & D of the R & D of FBR cycle
commercialization of Application (FaCT)
FBR

International cooperation

Basic research

R & D of
innovative
technology

Structural Change of the Nuclear Energy

Industry (Plant makers)

1980s

4 European Companies

[Brown Boveri et Cie, Asea, Framatome, Siemens,]

4 US Companies

[WH, Combustion Engineering, GE, Babcock & Wilcox]

3 Japan Companies

(MHI*, Hitachi, Toshiba)

Country by country independent makers

From Now

WH** – Toshiba
(US – Japan)

GE – Hitachi
(US – Japan)

AREVA – MHI*
(France – Japan)

(Rosatom)
(Russia)

Only international alliances survive

Market (New Build of NPP)

Past 10 years

JAPAN
US

8
0

Europe

0

Russia

1

India

6

China

6

S.E.Asia

0

Market was concentrated

From Now

13
33?

Finland, France, UK
Rumania, Lithuania
Bulgaria, Slovakia

40?

20?

30?

Vietnam, Indonesia
Kazakhstan, Turkey
Egypt, etc.

Market will be globalized

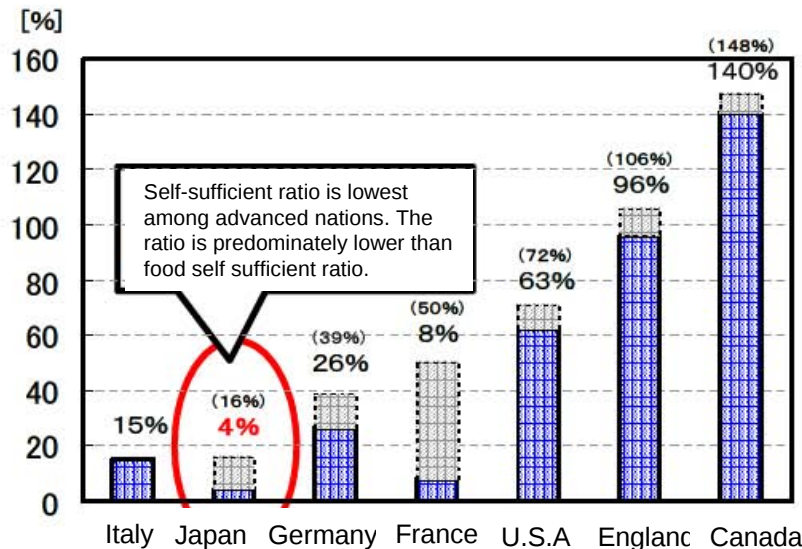
International cooperation on nuclear energy policy is necessary in order to combat such business risks as nuclear nonproliferation requirement.

* MHI: Mitsubishi Heavy Industry

** WH: Westinghouse

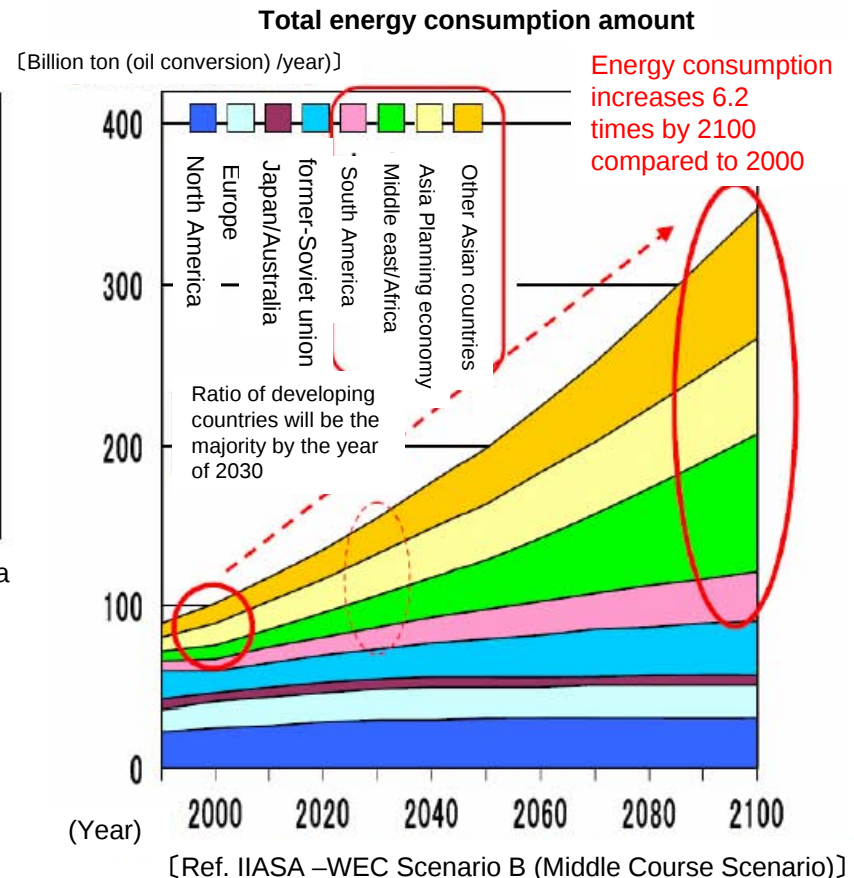
Growth in Energy Consumption

Energy self-sufficient ratio of major counties (2003) ■ Perspective of energy consumption



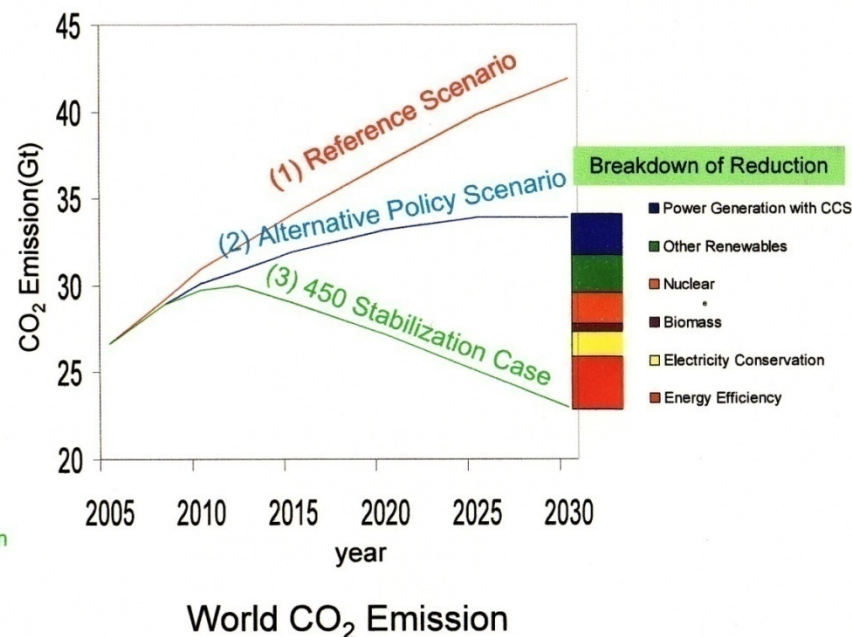
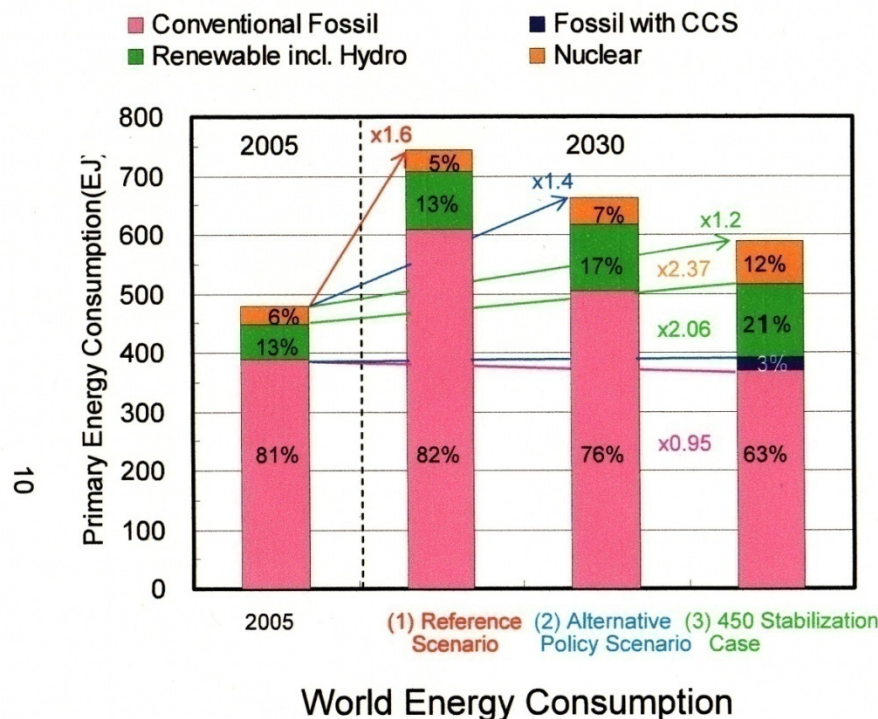
※Self-sufficient ratio indicates the ratio when electricity by nuclear power generation is imported.
(Parenthetic ratio indicates the ratio when electricity by nuclear power is generated in Japan)

(Ref.; OECD/IEA "Energy Balanced of OECD Countries 2002-2003")



Calculations of World Energy Consumption and CO₂ Emission

(ref. World Energy Outlook 2007)



(1) Reference Scenario: Government policies are assumed to remain unchanged from now.

(2) Alternative Policy Scenario: Implementation of currently considered policies and measures by governments are assumed.
(Example measures; Energy Conservation, Energy Efficiency, Use of Renewable Energy, Use of Nuclear Energy)

(3) 450 Stabilization Case: One possible pathway to halving greenhouse gas emission by 2050
(Greenhouse Gases Stabilization Level = 445-490ppm CO₂-eq, Global Mean Temperature +2.0-2.4C)

Actions Japan Should Take for the Expansion of Nuclear Energy Use in the World as a Measure against Global Warming (Reference data)

Actions Japan Should Take for the Expansion of Nuclear Energy Use in the World as a Measure against Global Warming

Report of The Atomic Energy Commission (AEC) “Round-table Conference on the Vision for Nuclear Energy Policy for Global Environment Protection and Security of Energy Supply” (March 13, 2008)

Japan should take the following six principal actions from the perspective of further promoting the peaceful use of nuclear energy on the global scale, while ensuring nuclear nonproliferation, safety and security, in parallel with actions to promote energy conservation, energy efficiency improvement and the use of renewable energy.

1. Principal Actions for the expansion of peaceful use of nuclear energy on a global scale such as a measure against global warming, while ensuring nuclear nonproliferation, safety and security

Action 1. Build a global consensus that the expansion of the peaceful use of nuclear energy is an essential measure against global warming, and develop international frameworks for the expansion

Action 2. Reinforce international efforts to ensure nuclear nonproliferation, safety and security, which is the prerequisite for the peaceful use of nuclear energy.

Action 3. Positively cooperate in the efforts of various countries to build and strengthen infrastructure for the promotion of the peaceful use of nuclear energy.

Action 4. Strengthen research and development activities in Japan, aiming to innovate the performance of nuclear energy technologies with a view to contributing to the global expansion of the peaceful use of nuclear energy.

2. Actions to Assure Steady Promotion of Nuclear Energy Use in Japan

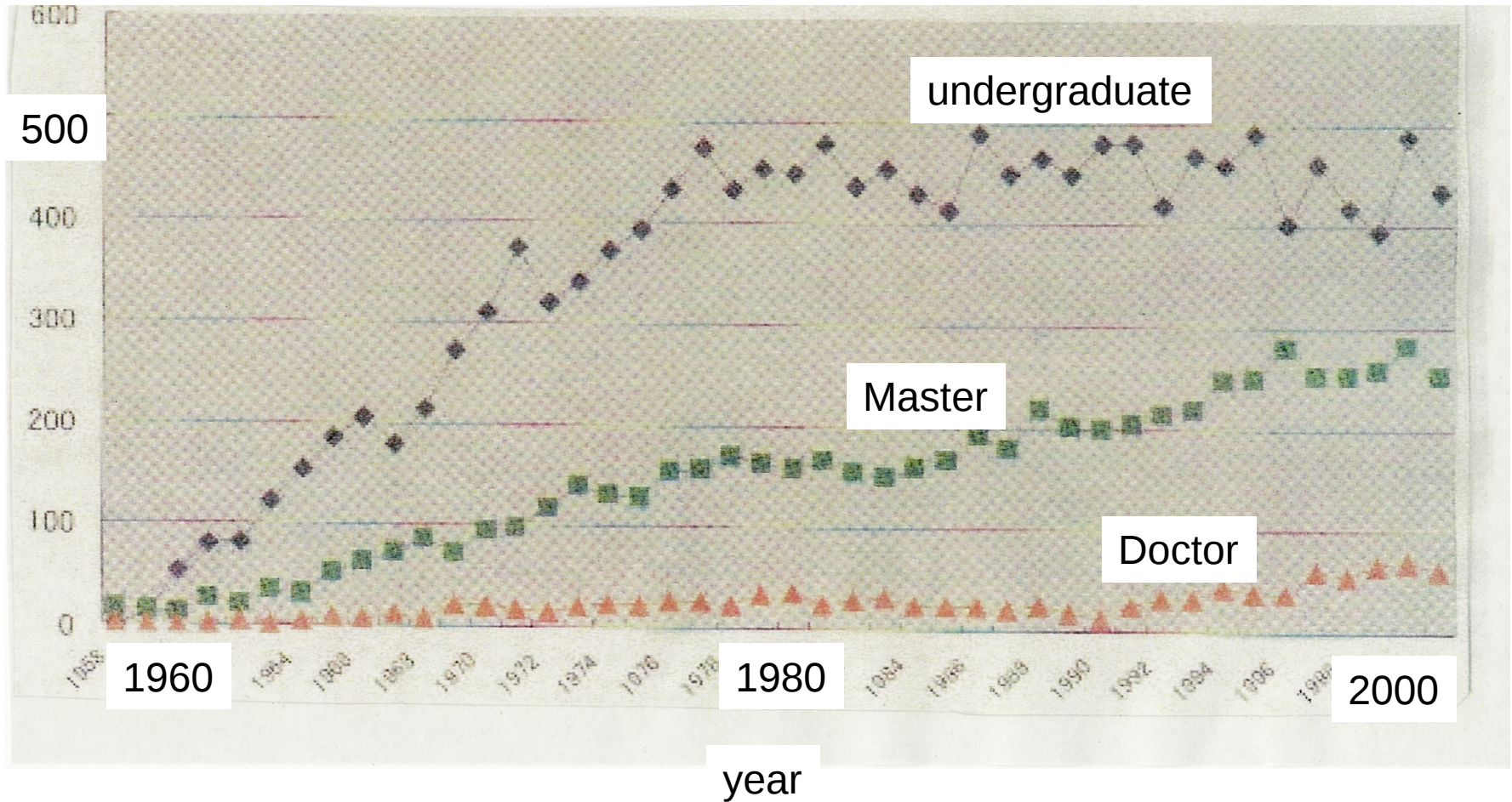
Action 5. Reinforce actions to tackle the nuclear energy policy issues related with the assurance of sound promotion of nuclear energy use in Japan

Action 6. Reinforce efforts for mutual understanding with the public on approaches for safe promotion of nuclear energy use.

Action 2. Reinforce international efforts to ensure nuclear nonproliferation, safety and security, which is the prerequisite for the peaceful use of nuclear energy.

- (i) Appeal the international community to strengthen the IAEA's human and financial resources**, so that measures assigned to the IAEA by international treaties including the Nuclear Non-proliferation Treaty (NPT) and the Convention on Nuclear Safety are implemented sufficiently.
- (ii) Enhance cooperation towards further advancement of the activities of the IAEA and the Nuclear Energy Agency of Organization for Economic Co-operation and Development (OECD/NEA) in formulating relevant technical standards and recommendations, based on Japan's unique experience as only one non-nuclear weapon state that is promoting large-scale nuclear energy use, employing the advanced technology systems.**
- (iii) In order to prevent nuclear proliferation, continuously contribute to reinforcing the IAEA safeguards, actively supporting its effort to universalize the IAEA Additional Protocol as well as actively participating and contributing to multinational discussions about the development of nuclear fuel supply assurance mechanisms to reduce the growth of nuclear proliferation risks.**

Number of students graduated per year



Institutes on Nuclear Nonproliferation

Atomic Energy Society of Japan, Committee for Nuclear Nonproliferation, Safeguards and Nuclear Security (recently founded)

Institute of Nuclear Materials Management (INMM) - Japan Branch

Japan Atomic Energy Agency, Nuclear Nonproliferation Science and Technology Center

Nuclear Material Control Center

Importance of Education on Nuclear Nonproliferation

Ex:
International Safeguard Lab. at the University of Tokyo in collaboration with JAEA

Global COE program: Nuclear Education and Research Initiative at the University of Tokyo

Global COE program of MEXT (JSPS) “Nuclear Education and Research Initiative” at the University of Tokyo

Members from 9 Departments of 3 Faculties and 1 institute of U.Tokyo

Systematic Education and Research
including Nuclear Energy Sociology

First in the World

Nuclear Energy Sociology

What is Technology for Society ?

In collaboration with people outside Univ.

Nuclear Energy

Technology Innovation

Through comprehensive and
interdisciplinary approach

Radiation Application

Therapy, diagnosis, biology, etc.

Spread in interdisciplinary fields:
medicine, agriculture and so on

Nuclear Energy Sociology

Nuclear Law/Legislation

- To pursue the issue of efficient yet safe nuclear energy
- To deal with the relation between technology and law

Nuclear Non-Proliferation

- To coexist with the peaceful use of nuclear energy
- To identify the technological and systematic problems

Harmonization of Society and Nuclear Technology

Public Communication

- To inform the public along with ways to improve general science and technological understanding
- To facilitate the education through civil lectures

Method: Practical Education

- Law/Legislation: Cooperation with Professors of the Graduate School of Law and Public Policy
- Non-Proliferation: Collaboration with visiting professors, Internship to IAEA
- Communication: Collaboration with Visiting Professor and Public Relation Specialist

To produce Ph.D students with the following capabilities:

- To study the regulation system, to identify problems, and to find solutions
- To serve in policy making in the world with the necessary expertise
- To communicate with the public on social aspects of nuclear energy