

Global Nuclear Safety Issues and Need for the International Cooperation

Kunihisa Soda
Commissioner
The Nuclear Safety Commission

*Presented at
the Special Symposium for the IAEA 50th Anniversary
April 10, 2007, Aomori, Japan*



Contents

□ Introduction

□ Global Nuclear Safety Issues

- Long-term operation and new build
- Knowledge management and nuclear infrastructure
- Stakeholder involvement

□ International Cooperation

□ Summary

Introduction

Background

(As of March 2007)

□ **Nuclear power generation in Japan**

- 55 units (23 PWR, 32 BWR) of commercial NPPs in operation with 49.6 GW capacity in total, 2 units (1 PWR, 1 ABWR) under construction, and 11 NPPs in preparation for construction in next 10 years
- Nuclear energy provides 30% of electric power supply and 12% of primary energy supply
- 2 Reprocessing Plants and 1 Enrichment facility in operation

□ **Nuclear energy policy**

- AEC: The Framework for Nuclear Energy, 2005

□ **Basic policy of nuclear safety**

- NSC: The Basic Policies of NSC, 2004

Introduction

The Basic Policies of NSC

- **To improve and reinforce quality of the activities for ensuring safety of nuclear facilities**
 - Enhancing review of the subsequent regulation, Restructuring and Revising the safety examination guidelines, and Strengthening radiation protection.
- **To further enhance nuclear safety regulation in near term**
 - Establishing safety goals, Utilizing risk information, and Exploring safety regulation systems for further improvement.
- **To establish firm basis of infrastructure for ensuring nuclear safety**
 - Promoting nuclear safety research, Training personnel, Fostering safety culture, Assuring transparency and traceability of nuclear regulation, Strengthening international collaboration, and Promoting dialogue with the general public.

Contents

□ Introduction

□ **Global Nuclear Safety Issues**

- Long term operation and new build
- Knowledge management and nuclear infrastructure
- Stakeholder involvement

□ International Cooperation

□ Summary

Global Nuclear Safety Issues

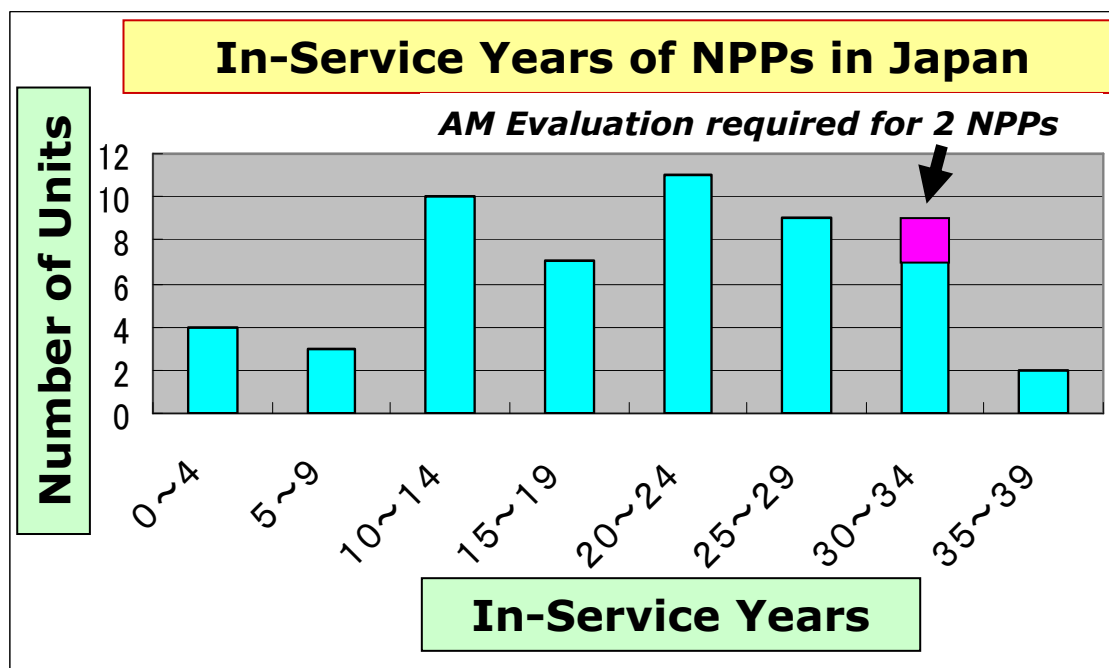
Perspectives of NSC

- **Increasing demands for extended life-time operation of existing power plants**
 - Ageing management is becoming one of the major internationally-common safety issues.
- **Need for maintaining knowledge base and nuclear infrastructure**
 - Nuclear infrastructure including expertise have to be maintained not only for nuclear safety, but also for new reactor development.
- **A global trend for construction of new nuclear power plants (*new build*)**
 - The next generation reactors are to be at higher level of safety and security as well as economically attractive.

Long-term Operation

Material Degradation and AM

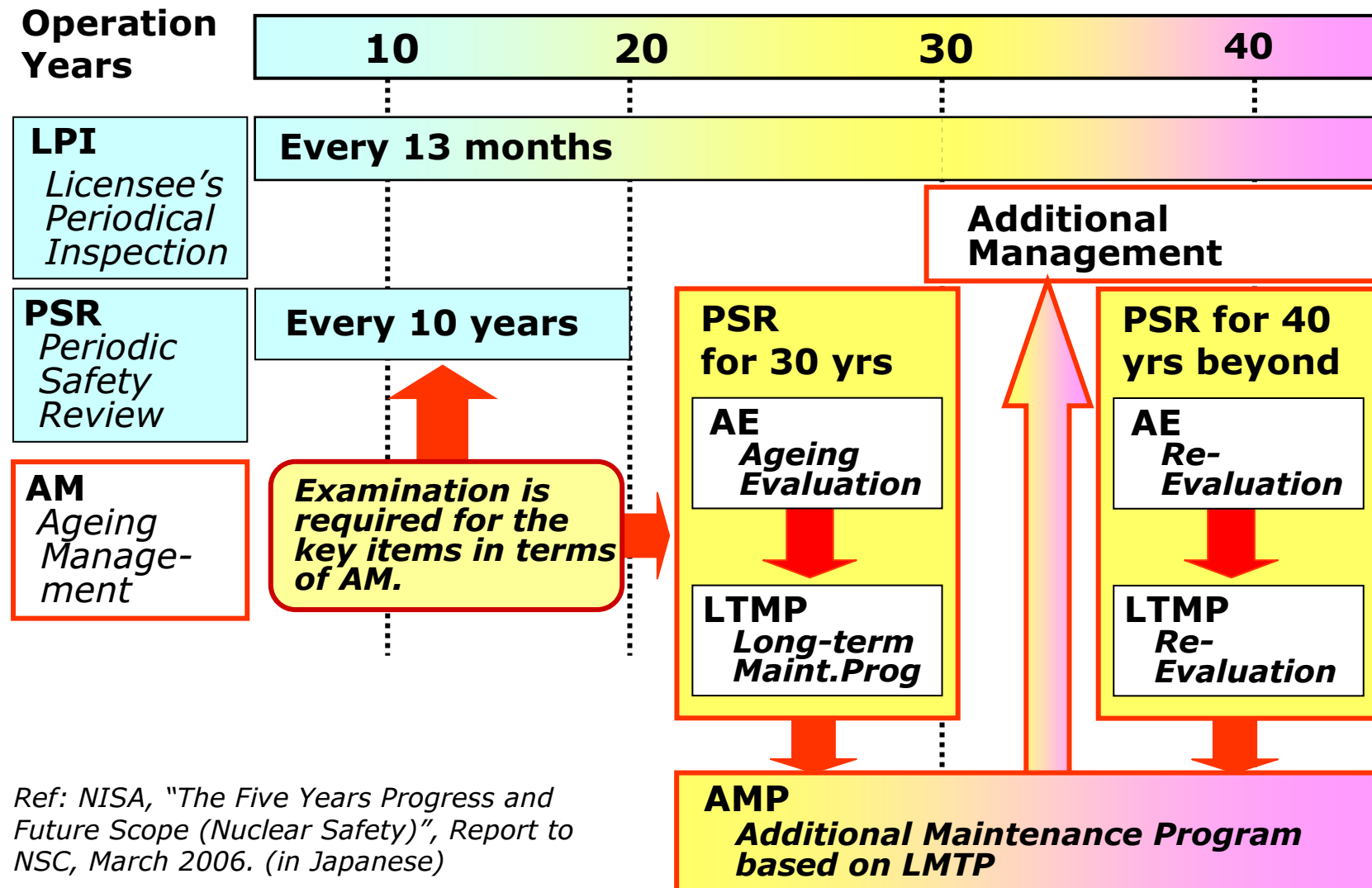
- As number of aged NPPs increases, Periodic Safety Review (PSR) and Ageing Management (AM) evaluation have become the regulatory requirement since Dec. 2005.



Note:

As of Oct. 2006, PSR is required for 9 NPPs and AM evaluation for 2 NPPs.

Long-term Maintenance Program *Ageing Management*



Material Degradation and AM

Topics for Safety Research

□ **Background**

- Understanding ageing mechanism and exploring technology of preventing troubles caused by ageing is needed.
- Development of technology on materials degradation and ageing management is given higher priority.

□ **Topics**

- Analysis of ageing phenomenon and predicting method for ageing process, Development of method for early detection and precise measurement of crack and degradation, and Development of method for evaluation of structural reliability

□ **Progress and Expectation**

- IASCC using JMTR and PFM research at JAEA, Development of database and technology for detection and sizing of defects at JNES
- Results are to be used for safe long-term operation and new reactor design.

Behavior of Advanced Fuel

Topics for Fuel Safety Research

□ **Background**

- Licenses for MOX fuel have been granted for 4 PWRs and 2 BWRs.
- J-Power's ABWR at Ohma that plans a flexible in-core fuel management scheme allowing the operation with full MOX core.

□ **Topics**

- Fuel failure boundaries under RIA and LOCA conditions by using NSRR and other test facilities
- Database for safety evaluation methodology of high burn-up fuel and full-MOX core

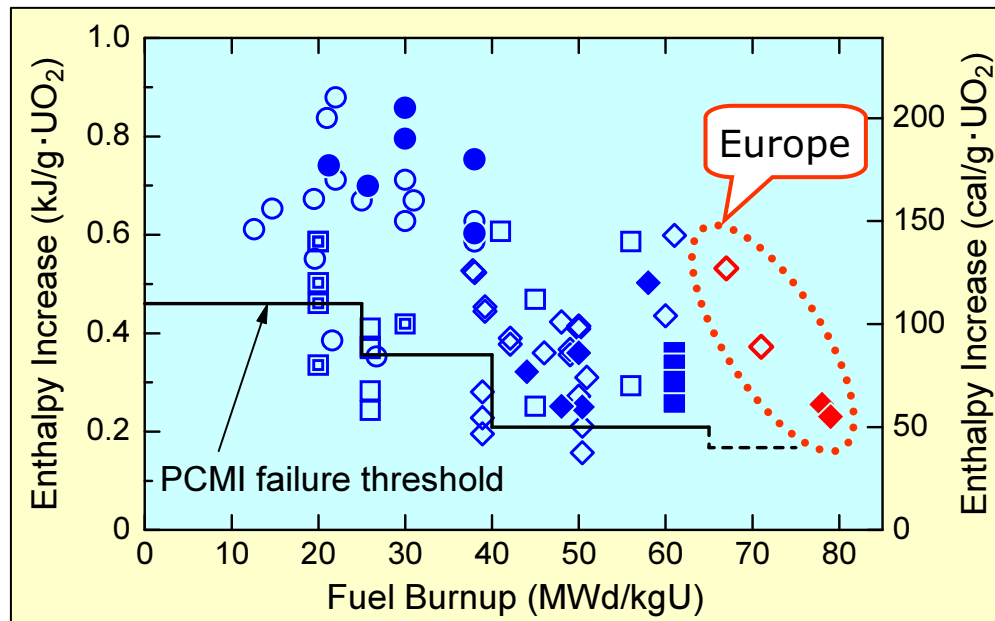
□ **Progress and Expectation**

- Behavior of high burnup UO_2 fuel and MOX fuel have been investigated at JAEA and JNES.
- Experimental data provide sound scientific data base for regulatory decision making.

Fuel Safety Research

NSRR Experiments

- High burn-up UO_2 and MOX fuels irradiated at NPPs in Japan and Europe (including Vandellós-II) are subjected to the RIA-simulating experiments at the NSRR of JAEA and data base has been extended to the higher burn-up range.



*RIA database from NSRR experiments**

NPP	No failure	Failure
Japan	○	●
Europe	◇	◆

Note: *) To be presented by T. Fuketa, et al, at TOPFUEL-2006. IAEA Aomori 2007 (KS/NSC)

Global Nuclear Safety Issues

Knowledge Management

□ **Education and Training**

- Department of Nuclear Professional School at University of Tokyo **(2005)**
- Licensed Professional Engineer in nuclear and radiation engineering **(2004)**

□ **Technical supporting organizations**

- The Japan Nuclear Engineering Safety Organization (JNES) **(2004)**
- The Japan Atomic Energy Agency (JAEA) **(2005)**

□ **Nuclear industry**

- The Japan Atomic Industrial Forum (JAIF) **(2006)**
- The Japan Nuclear Technology Institute (JANTI) **(2006)**

Global Nuclear Safety Issues

Nuclear Infrastructure

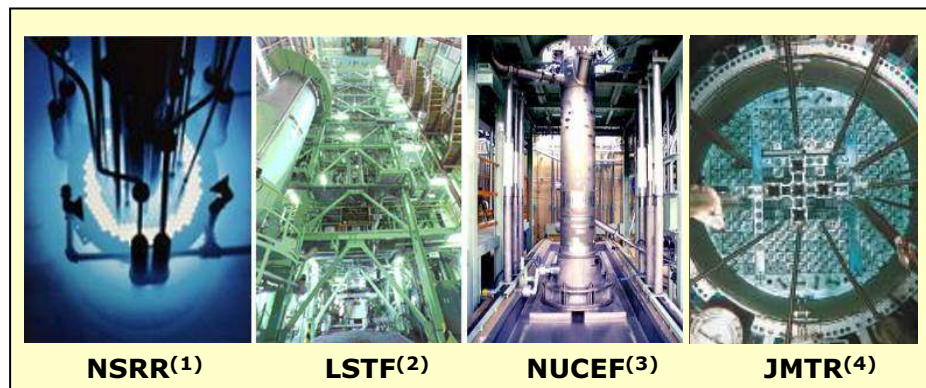
- Firm basis of nuclear infrastructure including experimental facilities and human resources must be maintained not only for nuclear safety research, but also for research and development of advanced reactor for the next generation.**
- Universities play an important role for this regard through education and research especially in basic nuclear science and technology.**
- Share and use of nuclear research facilities of importance to nuclear community for nuclear safety as well as R&D are strongly encouraged.**

Nuclear Research Infrastructures

Major Nuclear Facilities in Japan

- **Nuclear science and technology for education and research**
 - KUR, JRR-3, JRR-4 research reactor
 - TCA, FCA criticality assembly
- **Nuclear reactors R&D**
 - JMTR, NSRR, LSTF for LWR
 - Joyo, Monju for FBR
 - HTTR for HTGR
- **Nuclear fuel cycle R&D**
 - NUCEF for fuel reprocessing

Nuclear facilities used for LWR nuclear safety research at JAEA



IAEA Atom 2007 (KS/NSC)
Note: 1) Nuclear Safety Research Reactor, 2) Large Scale Test Facility, 3) Nuclear Criticality Safety Experimental Facility, 4) Japan Materials Testing Reactor

Global Nuclear Safety Issues

Stakeholder Involvement

□ **INSAG 20** *(Ref: INSAG-20,2007)*

- Public participation in decisions can promote a greater degree of understanding and can ensure more reasonable appreciation of risks and benefits.
- It is recommended that all countries create instruments that enhance stakeholder involvement.
- The active involvement of stakeholders in nuclear issues can provide a substantial improvement in safety and can enhance the general acceptability of the ultimate decisions made.

□ **NSC process of REG revision as an example**

- A special committee was established consisting of experts with many different views and 80 meetings were held during the 5 years in the presence of the public audience nearly 150 at every meeting. The committee responded all of the 700 public comments on the draft report and concluded the deliberation despite some disagreements remained.

Stakeholder Involvement

Lessons Learned from the Example

- The transparency of deliberation process to which the maximum attention was paid at this particular example is tremendously helpful for convincing a majority of the public of the conclusions finally extracted.
- The flexibility of deliberation process to facilitate the committee members to exchange different views as much as possible is also enormously helpful for moderating the conflicting opinions.
- One of the key elements for success is to be of patience, spending much time for deliberations without schedule-driven pressure.
- This happens to indicate that the concept of public sphere, advocated by Jürgen Habermas, for instance, that provides an open communication opportunity without compulsion, is extremely useful for safety communication in the nuclear arena as well.

Global Nuclear Safety Issues

Accountability and Communication

- **Procedural safety** is based on regulations such as safety examinations, construction or establishment permit, review of periodical safety assessment, inspection of safe operation, etc.
 - The public tends to demand the accountability with sufficient transparency and openness is of overriding importance, suggesting the need to take communication actions to the public sphere.
- **Substantive safety** is based on technologies employed in accordance with the defense-in-depth concept based on which actual safety measures are principally taken.
 - NSC envisions that a feedback derived from evolution of procedural safety could contribute to enhancing actual safety.

International Cooperation

- International cooperation is recognized as valuable and indispensable for advancing safety standard to higher level to ensure protecting the public and environment.**
- International coordination of research and development regarding ensuring and improving nuclear safety which are lead by the international organizations such as IAEA and other relevant organizations is regarded as extremely valuable and useful.**
- Use and share of nuclear infrastructure for research, development and knowledge management are encouraged.**

International Cooperation

Examples

□ **High standard of safety**

- IAEA Review CNS, IRRS, OSART etc.
- Multinational program MDEP, GEN-IV, GNEP, INPRO etc.
- Nuclear Safety INSAG, CSS etc.

□ **Safe long-term operation**

- SALTO, SCAP, etc

□ **Safe long-term HLW management**

- GNEP/AFCI, JC etc.

Summary

- **Ageing management for long-term operation, knowledge management and nuclear infrastructure for existing as well as the next generation reactors and stakeholder involvement are recognized as common safety issues.**
- **International cooperation is recognized as valuable and indispensable for advancing safety standard to higher level to ensure protecting the public and environment.**
- **The role of NSC is to provide a public sphere enabling open communication between the stakeholders. It is anticipated that IAEA may play a similar role internationally looking at globalization of nuclear industry.**

Thank you for your attention.

End of Slides.