

Katsuji MAEDA

NISA - Japon

Improvement and Consolidation of Ageing Management for Nuclear Power Plants in Japan

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Katsuji MAEDA

***Nuclear Power Plant Ageing Management Office
Nuclear and Industrial Safety Agency (NISA)
Ministry of Economy, Trade and Industry (METI)***

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1. Background of Ageing Management

- ***53 nuclear power plants (hereinafter referred to NPPs) are commercial operation in Japan at June, 2005. (Fig.1)***
- ***20 NPPs will have been operating 30 years in 2010 and some of them 40 years after starting commercial operation.***
- ***Under the above circumstances, it is generally thought that the Ageing management is a great challenge to ensure the safety and integrity of NPPs.***

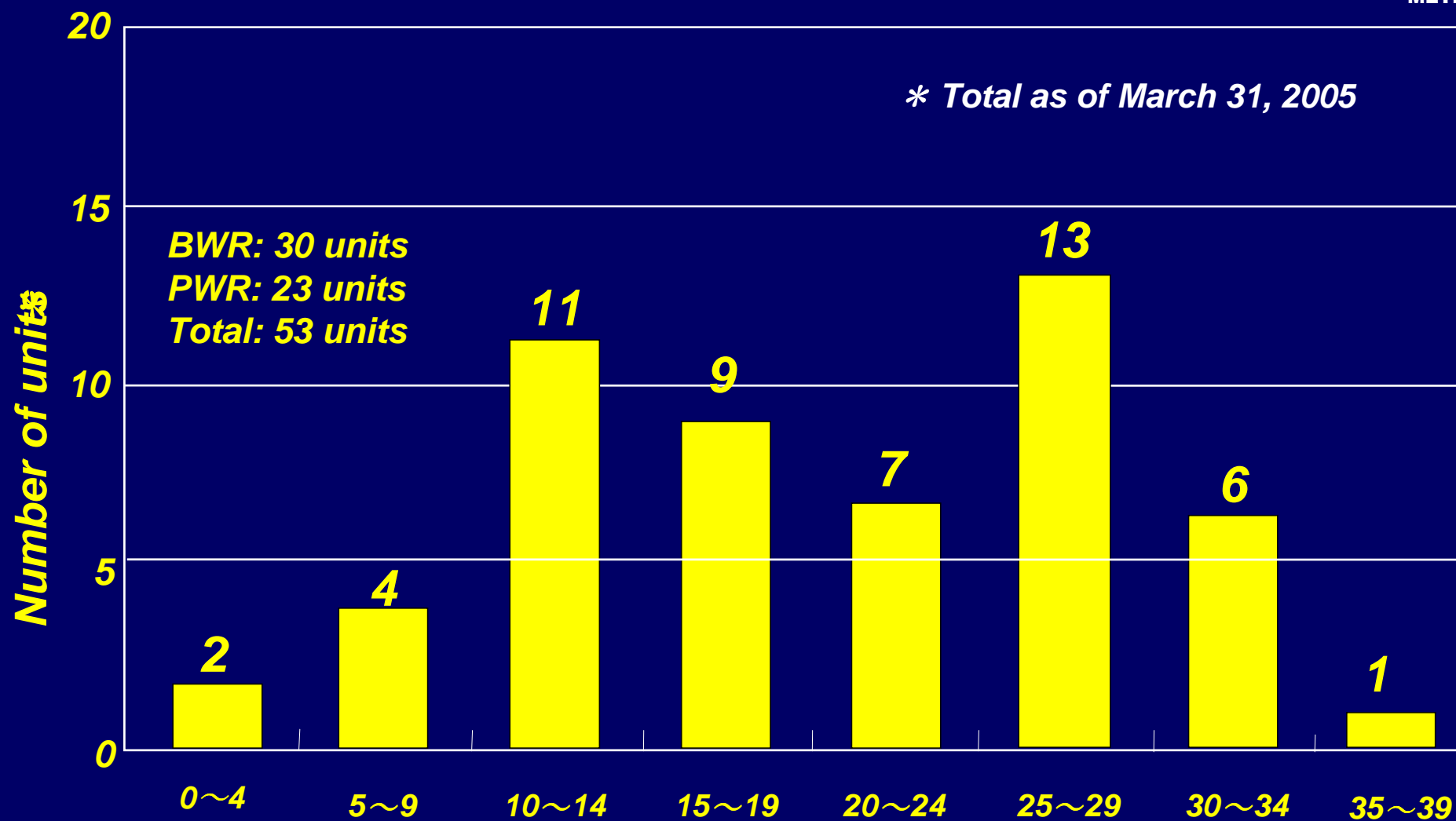


Fig. 1 Operation Years and Number of NPPs

2. Operating Period in Japanese NPP

1. Electric Utility Law Article 54

- *Nuclear Plant shall pass the legal inspection.*
- *The inspection requisitions are shown in Section 90 and 91 of Enforcement Regulation of Electric Utility Law*

2. Enforcement Regulation of Electric Utility Law

(Section 90)

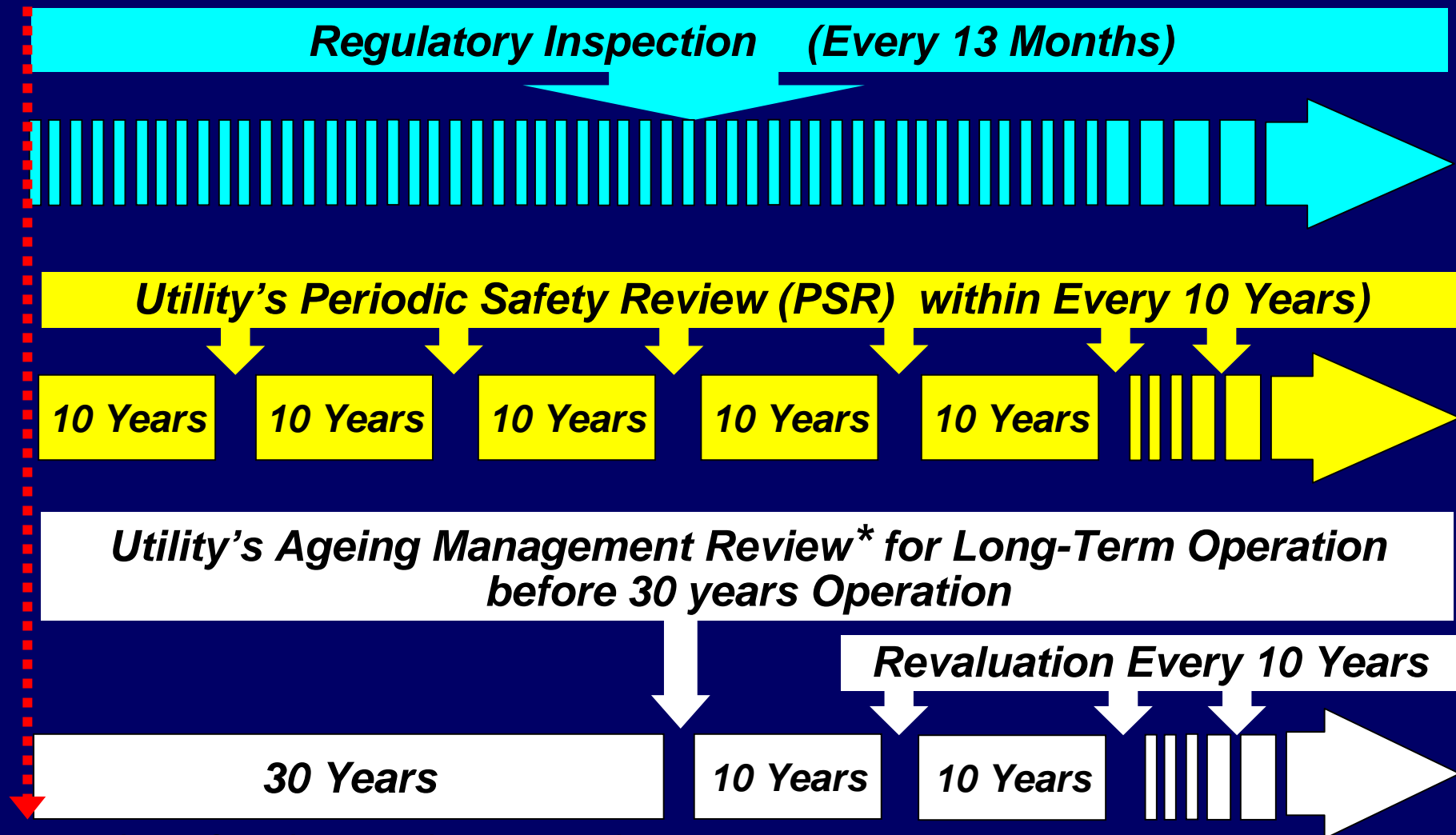
- *Utility shall be taken a periodic inspection of Nuclear Power Plant systems, structures and components (SSCs).*
- *The technical standards of each SSCs shall be examined at the periodic inspection*

(Section 91)

- *The periodic Inspection shall be conducted not exceed every 13 months. (This mean any nuclear power plant can not operate continuously beyond 13 months and any nuclear power plant can not operate beyond 13 months without passing legal inspections.)*

Regulation Related to Ageing Management

Start Commercial Operation



• Review on Operational Experiences and Ageing Phenomena

• Reflect the Latest Technological Knowledge

• Prepare Long Term Maintenance Plan

3. Basic Policy and Concept of AM

3.1 Basic Policy of Ageing Management

- *The Agency of Natural Resources and Energy prepared “The Basic Policy on the Ageing Management of NPPs” in April 1996 and required implementation Ageing Management (hereinafter referred to AM) as a voluntary measure.*

3.2 Contents of Requirements of AM Review

- *Implementation of technical evaluations of ageing effects before 30 years operation since commercial operation.*
- *Establishment a long-term maintenance program of the next 10 years based on the above results.*
- *The technical evaluations and long-term maintenance program should be reevaluated within every 10 years after 1st AM review.*

3.3 Concept of Ageing Degradation and Maintenance

Ageing Degradation Phenomena (Coping with Routine Maintenance Activities)

Key Ageing Phenomena (Coping with Additional Measures with Routine Maintenance Activities *)

***The long-term maintenance program, which utilities are required to establish in accordance with “The Basic Policy on the Ageing Management of Nuclear Power Plants” of 1996, corresponds to these additional measures.**

3.4 Concept of AM Analysis

- Selection, Extraction of SSCs and Ageing Phenomena**

1.1 Categorizing, Classifying and Grouping of SSCs

1.2 Extraction of Ageing Phenomena

2. Technical Evaluation of AM

2.1 Technical Evaluation of SSCs Integrity

- Evaluation by actual checking and monitoring data
- Analyses or calculation by assumption of long-term operation

2.2 Review of Current Maintenance Program (CMMP)

Preservation review of CMMP adequacy against ageing degradation on SSCs by assumption of long-term operation

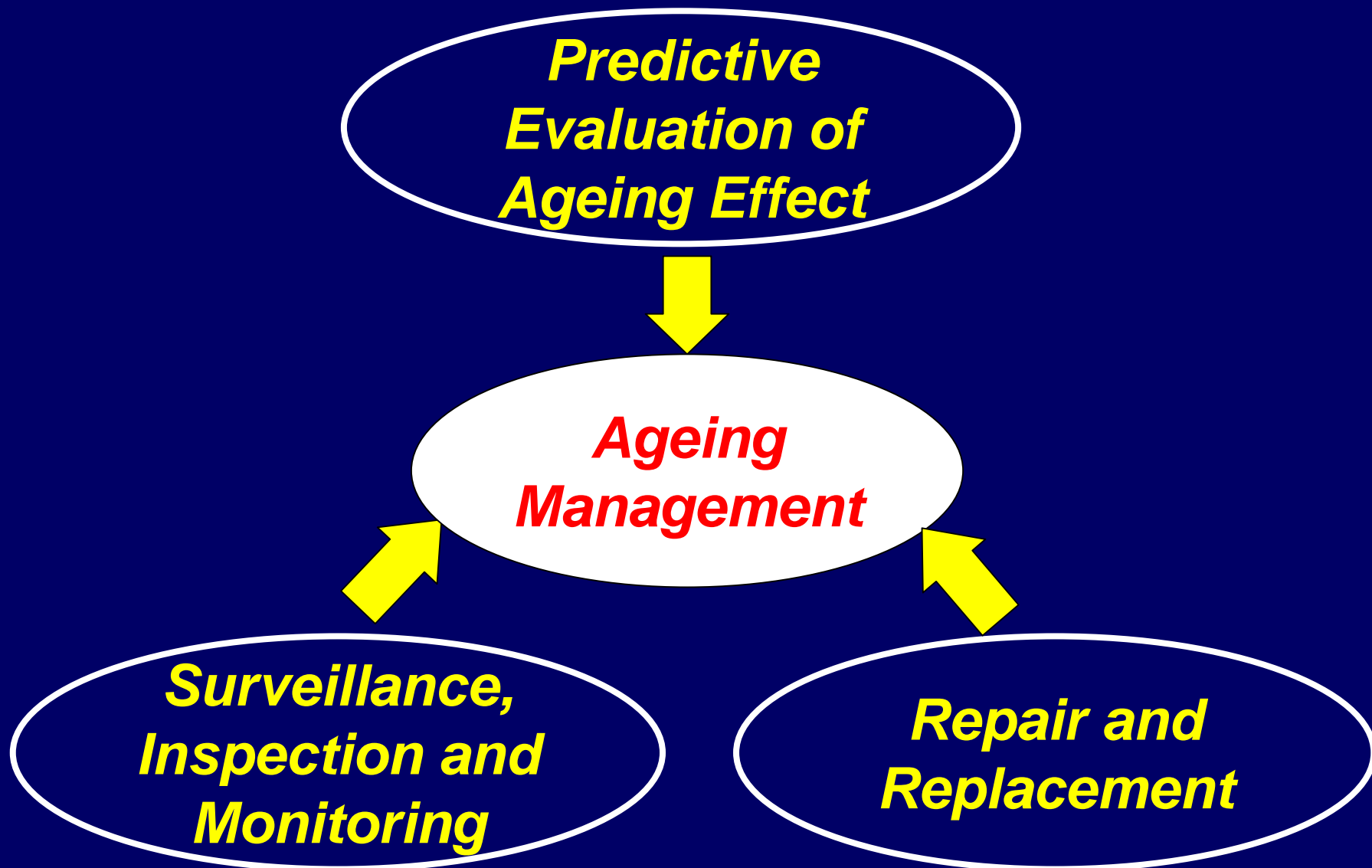
3. Measures against AM for Long-term Operation

3.1 Confirmation of CMMP to be continued adequately

3.2 Extraction of additional maintenance program on CMMS and establishment of long-term preservation plan

3.3 Extraction of Research and Development tasks

3.5 Elements of Ageing Management



4. Actual Achievement of AM Review

Implementation Number of AM Review

- ***The utilities have implemented AM review a voluntary activity in 9 NPPs in accordance with “The Basic Policy on the Ageing Management of NPPs” in April 1996. (Fig.2)***
- ***The Government has evaluated the adequacy of AM reviews of 9 plants and reported the results to the Nuclear Safety Commission (Table 1).***

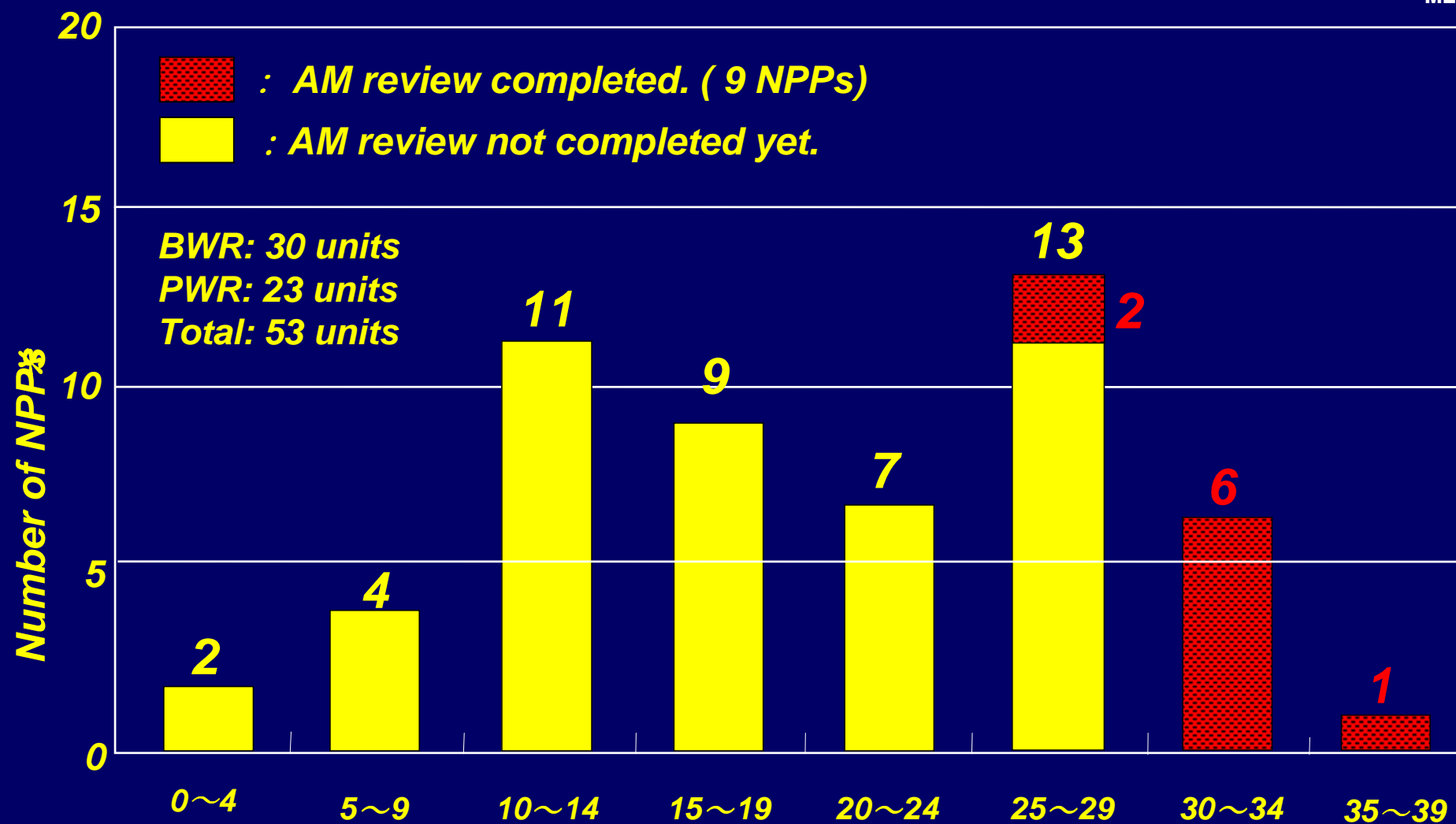


Fig. 2 Operation Years and Number of NPPs

Table 1 Evaluation of AM Review

Date of evaluation	NPPs
February 1999	<ul style="list-style-type: none">■ Tsuruga Nuclear Power Station Unit 1 (Japan Atomic Power Co.)■ Mihama Nuclear Power Station Unit 1 (Kansai Electric Power Co.)■ Fukushima Daiichi Nuclear Power Station Unit 1 (Tokyo Electric Power Co.)
June 2001	<ul style="list-style-type: none">■ Mihama Nuclear Power Station Unit 2 (Kansai Electric Power Co.)■ Fukushima Daiichi Nuclear Power Station Unit 2 (Tokyo Electric Power Co.)
March 2004	<ul style="list-style-type: none">■ Takahama Nuclear Power Station Unit 1 (Kansai Electric Power Co.)■ Takahama Nuclear Power Station Unit (Kansai Electric Power Co.)■ Genkai Nuclear Power Station Unit 1 (Kyushu Electric Power Co.)■ Shimane Nuclear Power Station Unit 1 (Chugoku Electric Power Co.)

5. Legal Obligation to Implement AM

- ***The AM has been legally specified as an obligation since October 2003 because ageing NPPs will increase year by year and it is required to keep integrity and safety sufficiently.***
- ***The AM review, technical evaluations of ageing effects and establishment of long-term maintenance program, should be implemented as legal matter since October 2003.***
- ***The AM review should be reevaluated within every 10 years after 1st AM review.***
- ***The AM has been specified to be implemented as one of the Quality Management System. (hereinafter referred to QMS)***
- ***NISA verifies that the AM shall be implemented according to QMS.***

6. Improvement and Consolidation of AM

6.1 Background of AM Consolidation

- *53 NPPs are operating at June, 2005, and 20 NPPs will have been operating 30 years and some of them 40 years in 2010 after starting operation.*
- *Ageing degradation will be frequently actualized in Aged NPPs, therefore more careful maintenance, inspection and management will be more important.*
- *Above circumstances, it is generally thought that the AM is a great challenge to ensure the safety and integrity of NPPs.*
- *The secondary pipe rupture accident of Mihama Unit 3 on August 9, 2004. The accident teaches and recognizes a further importance of AM now and future.*
- *It is necessary to re-verify if the AM have appropriately responded to ageing effect and to re-examine what the Government should enforce to the AM effectively.*

6. Improvement and Consolidation of AM

6.2 System Strengthen of NISA

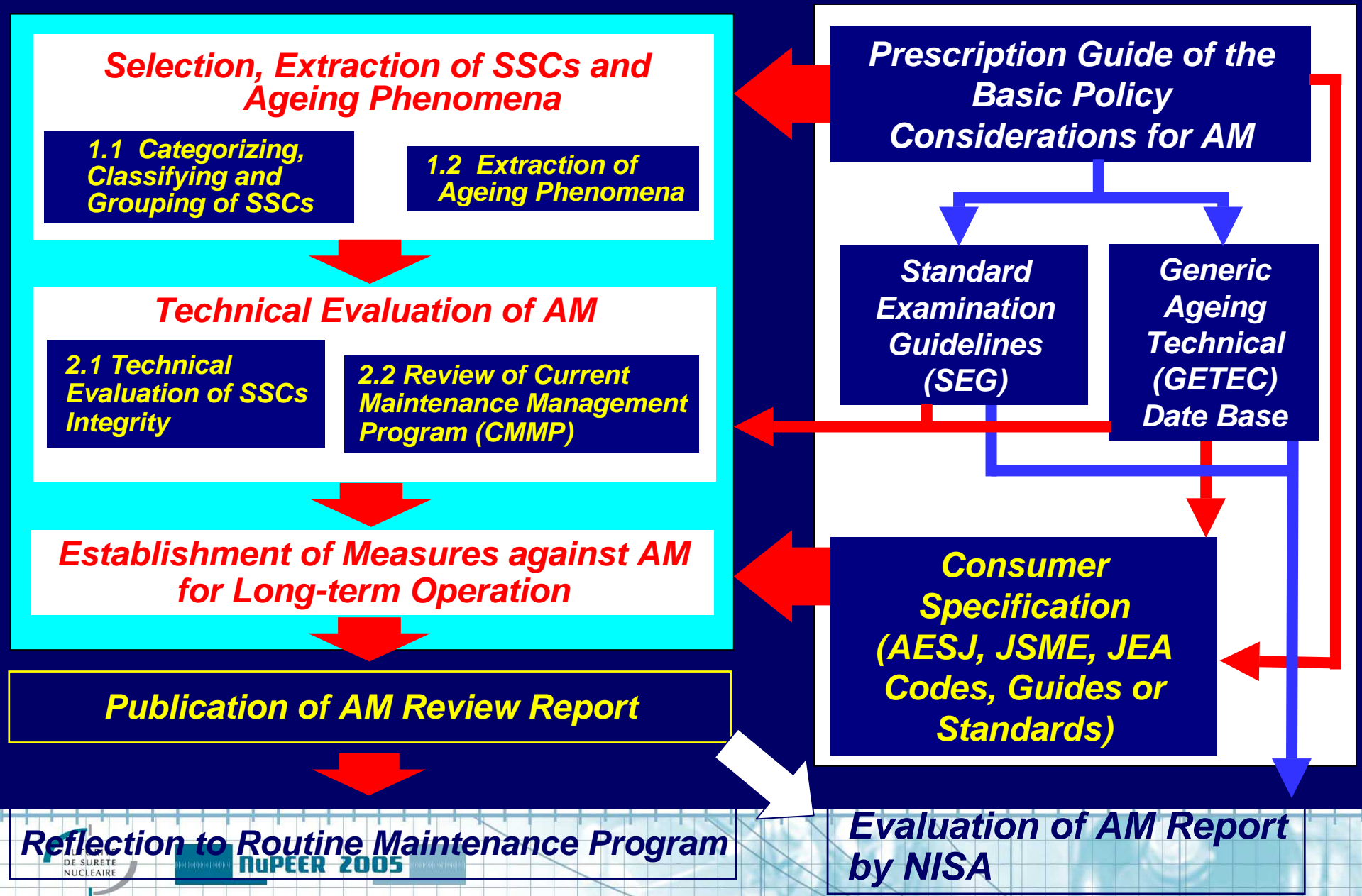
- **December 2004: “Nuclear Power Plant Ageing Management Office (AMO)” was established in NISA**
- **Missions of AMO**
 - **Constitution of Guidance Documents as follows**
 - **Prescription Guide of the Basic Policy Considerations**
 - **Standard Examination Guidelines**
 - **Generic Ageing Technical Data Base**
 - **Verification of utility's AM implementation**
 - **Provision of information with accountability and transparency to people**
 - **Selection of safety related Research & Developments reflected by importance and urgency**

6. Improvement and Consolidation of AM

6.3 System Strengthen of JNES?

- **December 2004: “Nuclear Power Plant Ageing Evaluation Office (AEO)” was established in JNES.**
- **Missions of AEO**
 - **Technical support to AMO of NISA**
 - **Preparation of standard manuals and procedures for technical evaluation of AM**
 - **Preparation and consolidation of principal data base for AM**
 - **Technical evaluation of licensees’ AM review**
 - **Implementation of safety related Research & Developments reflected by importance and urgency.**

Relationship among AM and Guidance Documents



6. Improvement and Consolidation of AM

6.4 The Examination Committee for Ageing Management

- *The Committee has been set up in the Subcommittee for Nuclear Safety in December 2004.*
- *The Committee has been reviewing and discussing the basic policy and important matters such as clarification of AM, constitution of guidance documents and technical base for AM and so on.*
- *The Committee has held 4 times and submitted an interim report in April, 2005. (Table 2)*
- *The Committee will submit the final report in August, 2005.*

Table 2 Deliberations of the Committee

1st	December 2004	<ul style="list-style-type: none">➤ Purposes and mission of the Committee➤ Extraction of issues to be examined
2nd	February 2005	<ul style="list-style-type: none">➤ Arrangement of Current status of AM conception based on confirmation of present situation of AM implementing➤ Review AM in other industries and foreign countries
3rd	February 2005	<ul style="list-style-type: none">➤ Principal roles of the Government in AM➤ Development and constitution of Guidance Documents for AM➤ Technical information base and collaboration for AM
4th	April 2005	<ul style="list-style-type: none">➤ Quality Management System for AM➤ Interim Report compiled deliberations in the Committee➤ Ageing management relating to the pipe wall thinning (Special measure on Mihama-3 accident)

7. Future Deliberations in the Committee

- ***Classification of SSCs in the scope of AM***
- ***Role of PSR for AM***
- ***Direction and promotion of safety related R&Ds***
- ***Active and effective collaborations among industry, government and academia (Fig.3)***

↔ Information Exchanges
↔ Umbrella Network

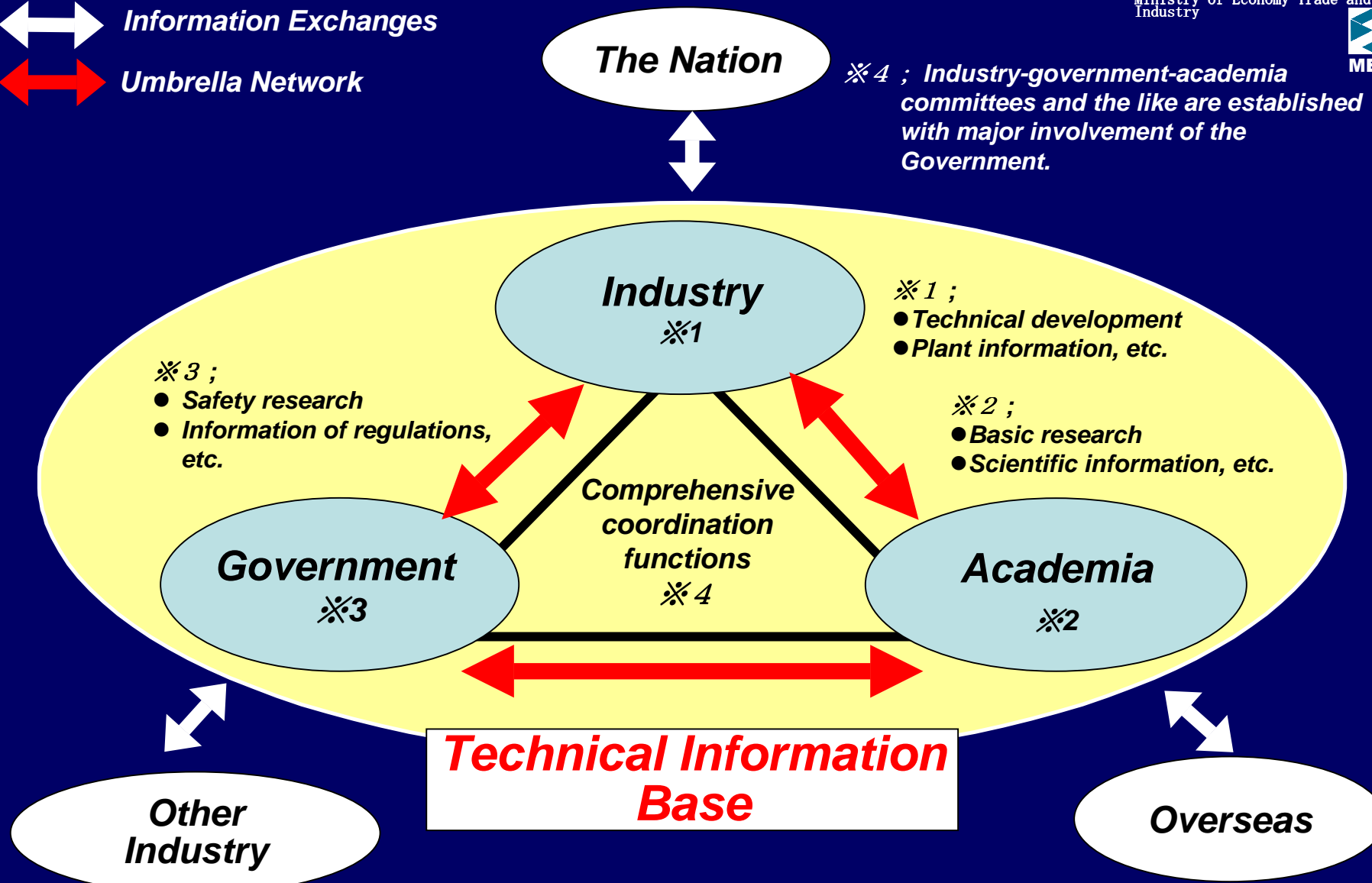


Fig. 3 Concept of Collaboration and Comprehensive Coordination Functions for for Information Exchange

7. Future Deliberations in the Committee

- ***Classification of SSCs in the scope of AM***
- ***Role of PSR for AM***
- ***Direction and promotion of safety related R&Ds***
- ***Active and effective collaborations among industry, government and academia (Fig.3)***
- ***Establishment of a technical information base, information networks and comprehensive coordination functions (Fig.4)***

Ageing Management

- Ensuring the safety and reliability of NPPs
- Implementation of effective safety regulations
- Establishment of maintenance technologies
- Formulation of evaluation standards and methods
- Accumulation and utilization of knowledge and data

Development of Technical Information Basis

Reflection of necessity, importance, and urgency of R&Ds

2. Research and Development

- Inspection and monitoring technologies
- Preventive maintenance, maintenance and repair technologies
- Evaluation technology for Ageing degradation

1. Technical Information

- Umbrella ageing information
- Plant operation experiences
- Scientific information, etc.

Reflection of Investigation and R&Ds results

Synthetic Technical Information Basis

Sharing and use of the information base among industry, government and academia

Fig. 4 Technical Information Basis for AM

7. Future Deliberations in the Committee

- **Classification of SSCs in the scope of AM**
- **Role of PSR for AM**
- **Direction and promotion of safety related R&Ds**
- **Active and effective collaborations among industry, government and academia (Fig.3)**
- **Establishment of a technical information base, information networks and comprehensive coordination functions (Fig.4)**
- **Development and consolidation of maintenance management and safety-ensuring activities for AM implementation (Fig.5)**

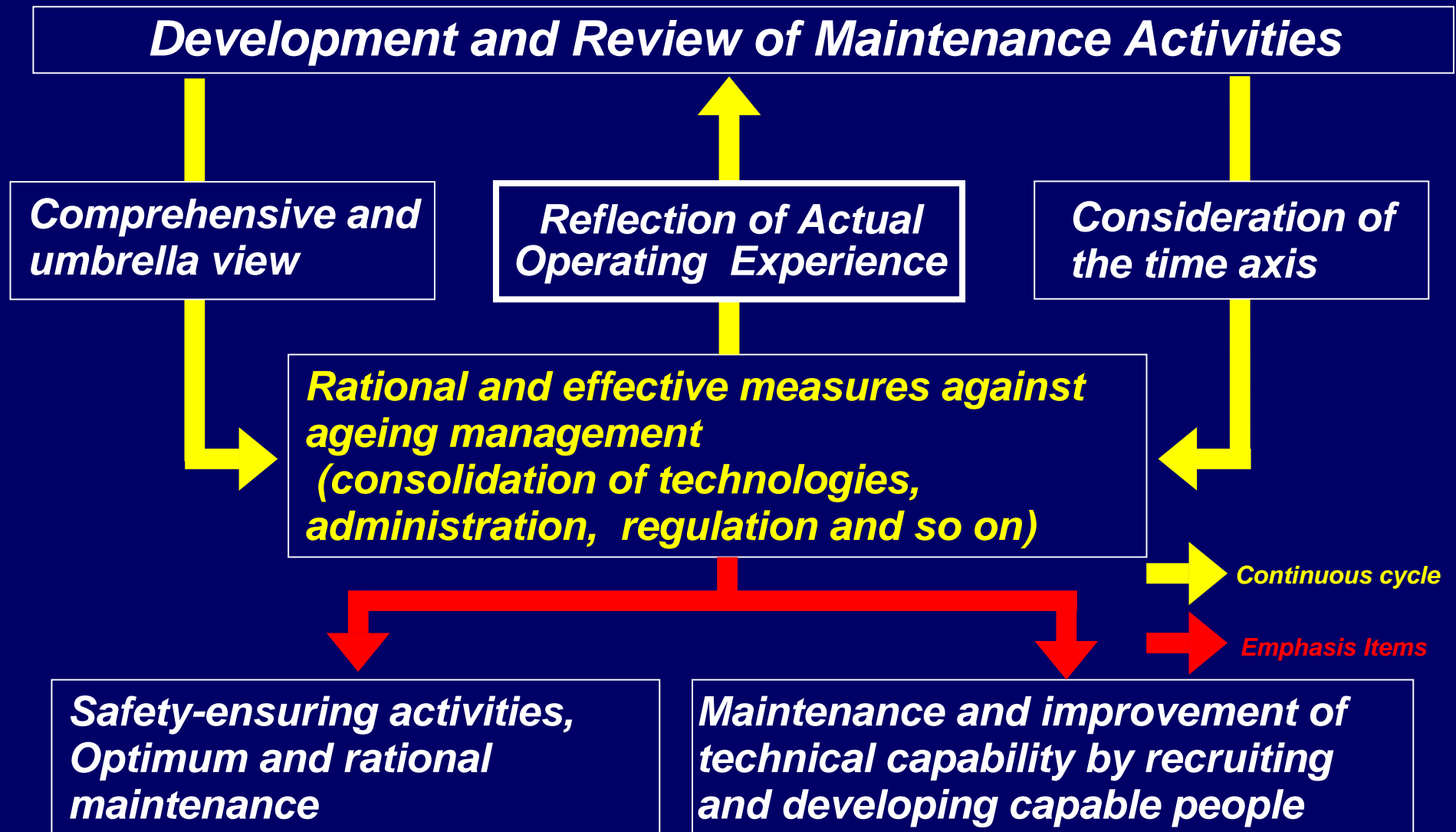


Fig. 5 Enhancement and Consolidation of Maintenance Activities for AM

7. Future Deliberations in the Committee

➤ Constitution of Guidance Documents

- **Prescription Guide of the Basic Policy Considerations**
- **Standard Examination Guidelines**
- **Generic Ageing Technical Data Base**

➤ Adequacy of timing and a period of AM review

(Now, 1st AM review is required before 30 years of the start of reactor operation and revaluations are required at intervals not exceeding 10 years.)

➤ Effective and rational safety regulations

➤ Measures against non-physical ageing such as safety culture, technical transfer, human resources, administration management, corporate culture and organizational climate

➤ Worldwide effective collaboration

The Final Report will be published in August, 2005