

IMPLEMENTATION OF NPP AGEING MANAGEMENT PROGRAMME

Module 4 Session 4

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IAEA

International Atomic Energy Agency

Presentation

1. Introduction

Objective of an ageing management programme (AMP)

2. Rationale for an AMP – need for:

AM of short and long lived SSCs

Coordination of relevant existing programmes

Use of a systematic AM process

3. Systematic ageing management process

4. Organizational model for AMP implementation

5. Conclusion

1. Introduction

- Objective of an ageing management programme:
to provide for the timely detection and mitigation of significant ageing effects in SSCs important to safety and reliability so as to ensure their integrity and functional capability and thus to contribute to continued safe and reliable NPP operation.
- This Session deals with organizational/ managerial aspects of ageing management (AM). It does not address technical aspects of AM.

2. Rationale for an AMP

2.1 Need to manage ageing of short and long lived SSCs

- ***Short and long lived active SSCs:***
 - usually require some maintenance many times during their service life
 - in many cases, existing maintenance and EQ programmes provide adequate AM for these SSCs.

- ***Long lived passive SSCs:***

(e.g. pressure boundary components, cables, and structures)

 - effective AMPs are needed because:
 - (a) maintenance is usually not planned during their service life
 - (b) premature degradation and failure may occur due to **unforeseen ageing phenomena or error induced ageing** caused by design, manufacturing, installation, or operating errors

2. Rationale for an AMP

2.2 Need to coordinate existing programmes that contribute to AM of SSCs

Relevant NPP programmes include:

- Preventive maintenance programmes
- Data collection and records management programmes
- EQ programmes
- Chemistry programmes
- Operating procedures
- Operating experience, significant events analysis, and research programmes
- Spare parts programmes
- RCM and PSA

2. Rationale for an AMP

2.2 Need to coordinate existing programmes that contribute to AM of SSCs (Cont'd)

➤ **Typical situation**

- There are many existing NPP and external (e.g. R&D, design, regulatory, standards) programmes that contribute to AM
- Responsibility for these programmes is distributed among a number of NPP and external organizations
- Frequently, coordinating and integrating mechanisms do not exist or are weak
- There are possible gaps/overlaps in the scope of these programmes

2. Rationale for an AMP

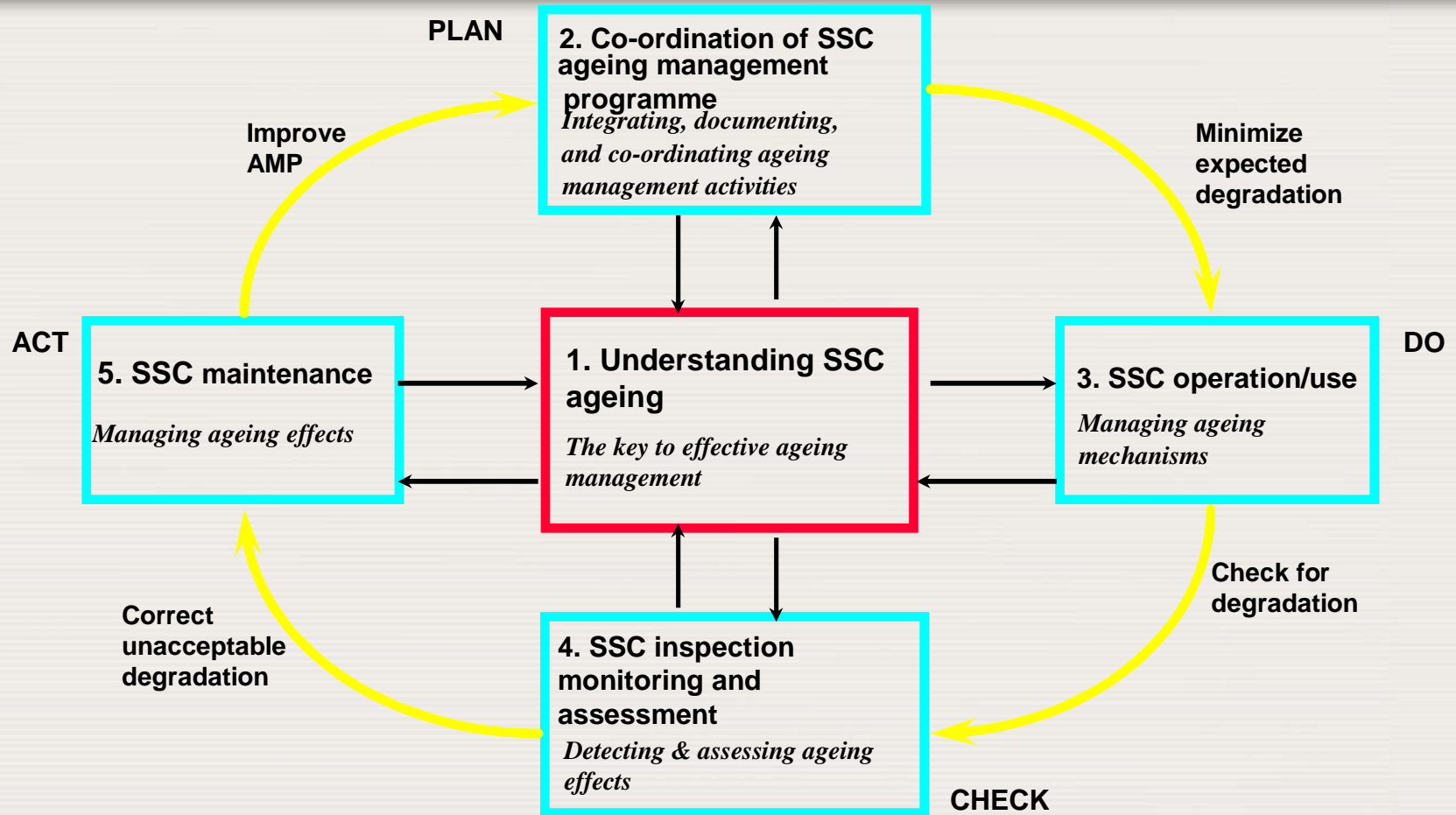
2.3 Need to use systematic AM process

- Experience shows that effective AM of SSCs can be best accomplished by coordinating programmes relevant to AM under **a proactive, umbrella type AMP** utilizing a systematic ageing management process.
- This requires **a team approach** involving NPP management, operations, maintenance and engineering organizations as well as external organizations – regulatory, design, manufacturing and R&D.

3. Systematic Ageing Management Process

- Framework for co-ordinating programmes and activities relating to the understanding, control, monitoring and mitigation of ageing of a plant component
- Adaptation of Deming's PLAN-DO-CHECK-ACT' cycle to ageing management
- Next slide shows the systematic AM process, illustrating a team approach.

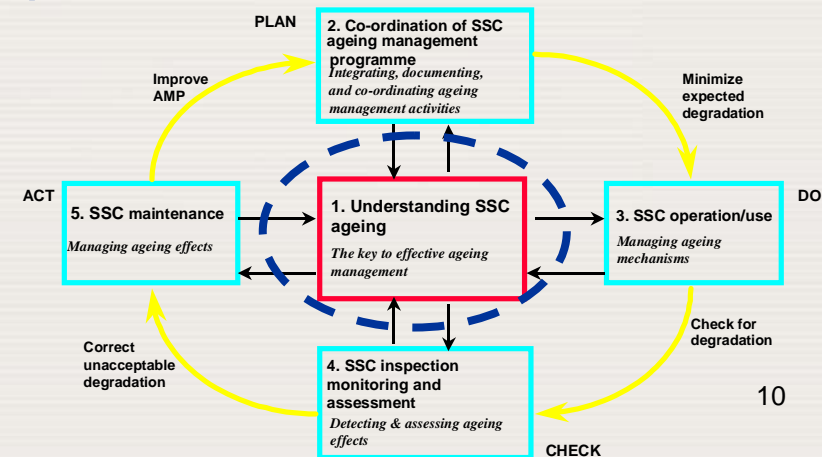
Systematic Ageing Management Process



SSC-system, structure component; AMP-ageing management programme

Understanding SSC ageing

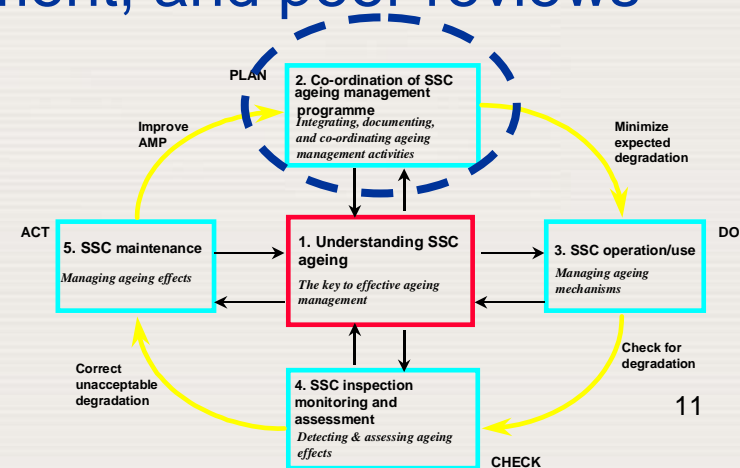
- Consists of knowledge of SSC materials and material properties, service conditions, ageing mechanisms, degradation sites, condition indicators, and consequences of age related degradation and failures
- Derived from the design basis, design and fabrication, operation and maintenance histories, inspection results, generic operating experience, research results
- Provides basis for the systematic AM process which enables optimizing and coordinating SSC operation and maintenance



Coordination of SSC ageing management programme (AMP)

Can improve significantly AMP effectiveness; it includes:

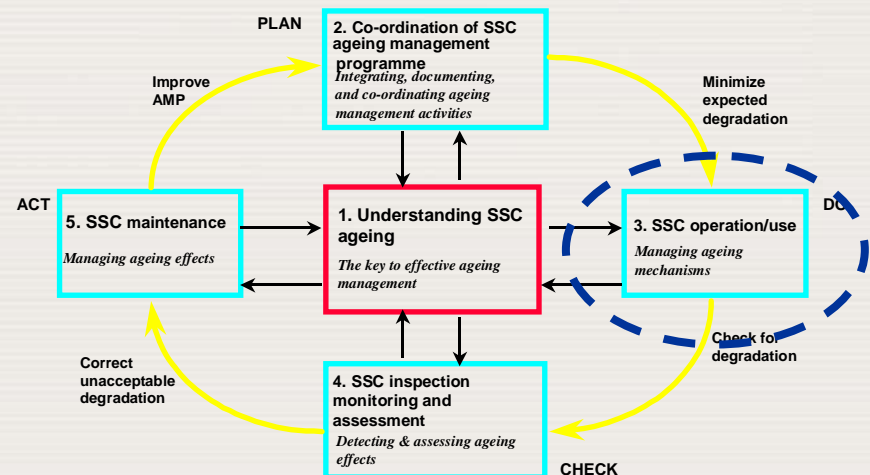
- **documentation** of
 - applicable regulatory requirements and safety criteria
 - relevant programmes and activities
- **description** of
 - mechanisms used for programme coordination and continuous improvement
- **coordination** of relevant programmes and activities
- **continuous improvement** of AMP effectiveness based on current understanding, self-assessment, and peer reviews



SSC operation/ use

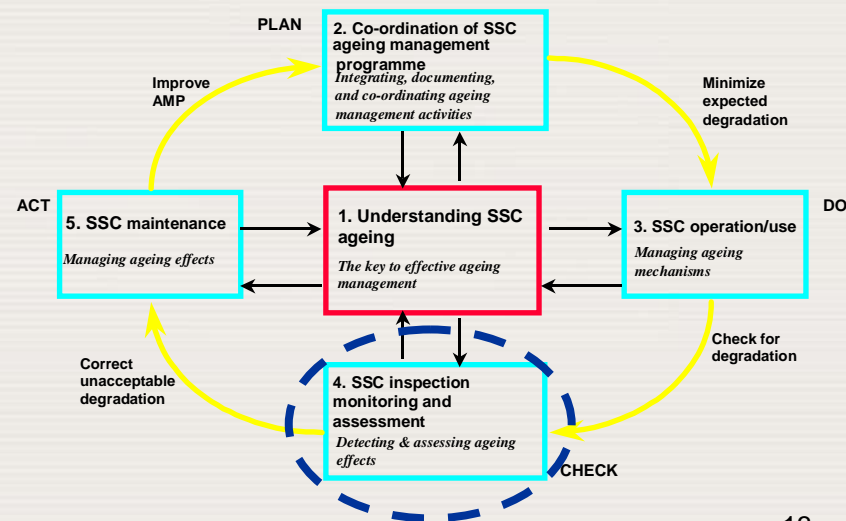
Aimed at minimizing expected SSC degradation through:

- **prudent operation** according to procedures and technical specifications
- **Chemistry control**
- **Environmental control**
- **Operating history**, incl. records of transients



SSC inspection, monitoring and assessment

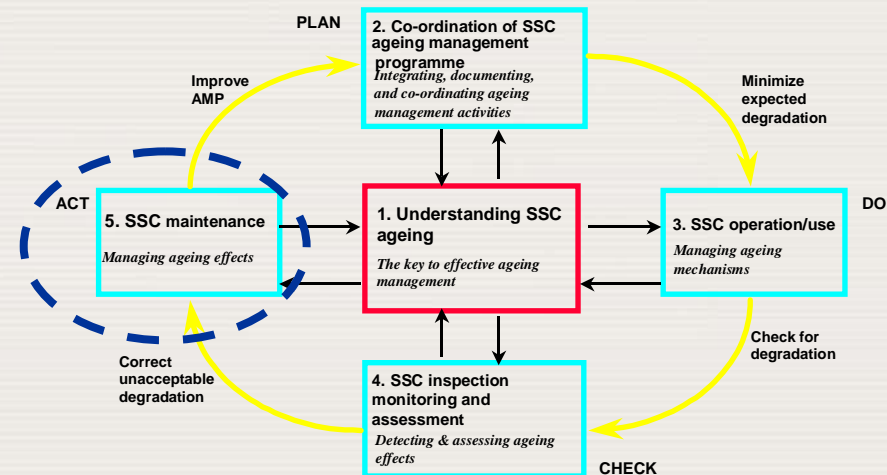
- Aimed to **detect and characterize SSC degradation** before safety margins are threatened
- **Essential input for decisions** on type and timing of maintenance, operational changes, and design modifications to manage detected ageing effects
- Includes:
 - **Test and calibration**
 - **In-service condition**
 - **Surveillance**
 - **Leak detection**
 - **Assessment of functional capability/ fitness for service**
 - **Record keeping**



SSC maintenance

Aimed at timely mitigation/correction of SSC degradation through:

- Preventive maintenance
- Corrective maintenance
- Spare parts management
- Replacement
- Record keeping



4. Organizational model for AMP implementation

AMP concept

- AMP is a comprehensive umbrella-type programme
- AMP evaluates, coordinates and integrates existing NPP and external programmes
- AMP does not replace existing programmes but, on the basis of evaluation, modifies them (reduce/enhance/eliminate/supplement) to achieve a systematic and integrated programme for effective AM
- The goal of AMP is to help ensure that required material condition of plant SSCs is maintained throughout NPP service life

4. Organizational model for AMP implementation (Cont'd)

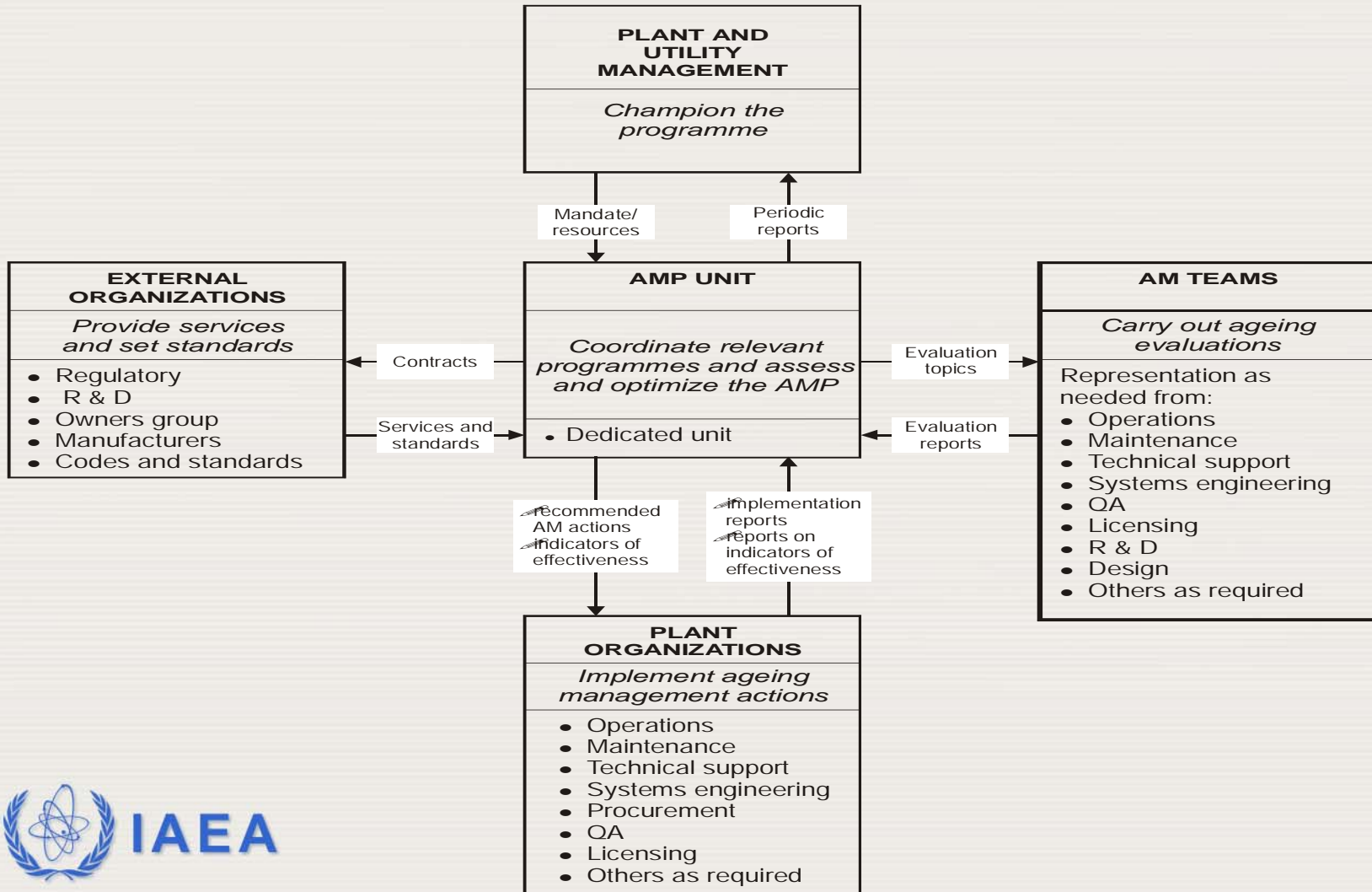
- Organizational model for AMP implementation is shown on the next slide. It includes six complementary functions:

<u>Organizational Unit</u>	<u>Function</u>
Plant and Utility Management	- Champion the AMP
AMP Unit	- Co-ordinate relevant programmes and activities; and - perform AMP self-assessment and optimization
Ageing Management Teams	- Carry out ageing evaluations
External Organizations	- Provide services and set standards
Plant Organizations	- Implement ageing management actions



Organization of an AMP: participating organizations, functions and their interfaces

Organizational model of ageing management programme (AMP) to facilitate implementation of the ageing management process



Responsibilities of NPP and utility management

- Define AMP objectives
- Define AMP responsibilities
- Provide required resources
- Monitor AMP effectiveness
- Approve/resolve major AMP actions/differences

Responsibilities of the AMP Unit

- Select SSCs to be covered by the AMP
- Organize and direct AM teams
- Coordinate AM actions
- Evaluate indicators of AMP effectiveness and optimize AMP
- Exchange information with external organizations – other NPPs, R&D, regulators, etc.
- Report to management

Note: Role of the AMP unit can be assigned to an existing NPP organization such as maintenance or QA division.

Responsibilities of the ageing management teams

- Perform screening to identify important SSCs
- Perform and update ageing evaluations
- Recommend AM actions and indicators of effectiveness

Note: A small utility will likely use relevant expert groups organized by an owners group rather than creating its own teams.

Responsibilities of external organizations

- Analyze information on ageing phenomena from NPPs
- Perform R&D studies
- Develop AM methods and technology
- Develop codes, standards, and regulatory requirements

Responsibilities of NPP organizations

- Evaluate recommended AM actions
- Recommend major AM actions to management for approval
- Implement AM actions
- Provide indicators of effectiveness to AMP Unit

AMP implementation

- Based on understanding of the systematic AM process and acceptance of the required team approach by all involved

- Initiated by utility/NPP management which should:
 - **Define AMP objective**
 - **Establish AMP Unit**
 - **Provide required resources and support**

AMP implementation (cont'd)

- Start with a pilot project
 - Dealing with several representative SSCs
 - To establish, refine and adopt AMP processes and interfaces

- Expand to a full scope AMP
 - Covering all important SSCs
once AMP processes and working relationships have been established, and implementing procedures written.

5. Conclusions

- Effective AM is a team effort
- Effective AM requires coordination and integration of existing NPP and external programmes relevant to AM
- Effective AM requires utilization of the systematic AM process, including a continuous improvement