



IAEA

60 Years

Atoms for Peace and Development

Why Safety Culture Oversight Matters

Why Safety Culture Oversight Matters

Regional Workshop on Nuclear Safety Culture Self- Assessment based on the New
Technology

Fukui, Japan
27 February – 3 March 2023

Jongile Majola

Overview

- Objective
- Why safety culture is important
- The importance of oversight
- Conclusion

Objective

Objective

- To foster a greater understanding of the process and issues attendant to promoting and supporting a strong safety culture in the context of a regulatory body

Objective

- To foster an increased awareness and understanding of the methods for monitoring and measuring management systems, safety culture and organisational performance

Why Safety Culture is Important

Fundamental Safety Principles

**Responsibility
for
Safety**

**Role of
Government**

**Leadership and
Management
for Safety**

**Justification of
Facilities and
Activities**



**Protective
Actions to
Reduce Existing
Or Unregulated
Radiation Risks**

**Emergency
Preparedness
and Response**

**Prevention
of Accidents**

**Protection of
Present and
Future
Generations**

**Optimization
of Protection**

**Limitation of
Risks to
Individuals**

Leadership and Management for Safety

- Effective leadership and management for safety means:
 - Leadership in safety matters at the top level – as well as at all other levels
 - Having an effective integrated management system that ensures the promotion of safety culture
 - Assessment of performance, use of feedback, and learning from experience
 - Use of a graded approach
 - Taking account of human factors and individual-technology-organisation (ITO) interactions
 - Being proactive and taking action to avoid or mitigate events or accidents

Integrated management system

- “Management system is a single integrated system used by an organization to manage the totality of its people, resources, processes, and tasks in order to meet an organization’s objectives and satisfy the stakeholders.”

[Source: IAEA; DPP for DS 456]

Management Systems and Safety Culture

- **Main aim of the integrated management system should be to achieve and enhance safety by:**
 - Bringing together in a coherent manner all the requirements for managing the organization
 - Describing the planned and systematic actions necessary to provide adequate confidence that all these requirements are satisfied
 - Ensuring that health, environmental, security, quality and economic requirements are not considered separately from safety requirements, to help preclude their possible negative impact on safety

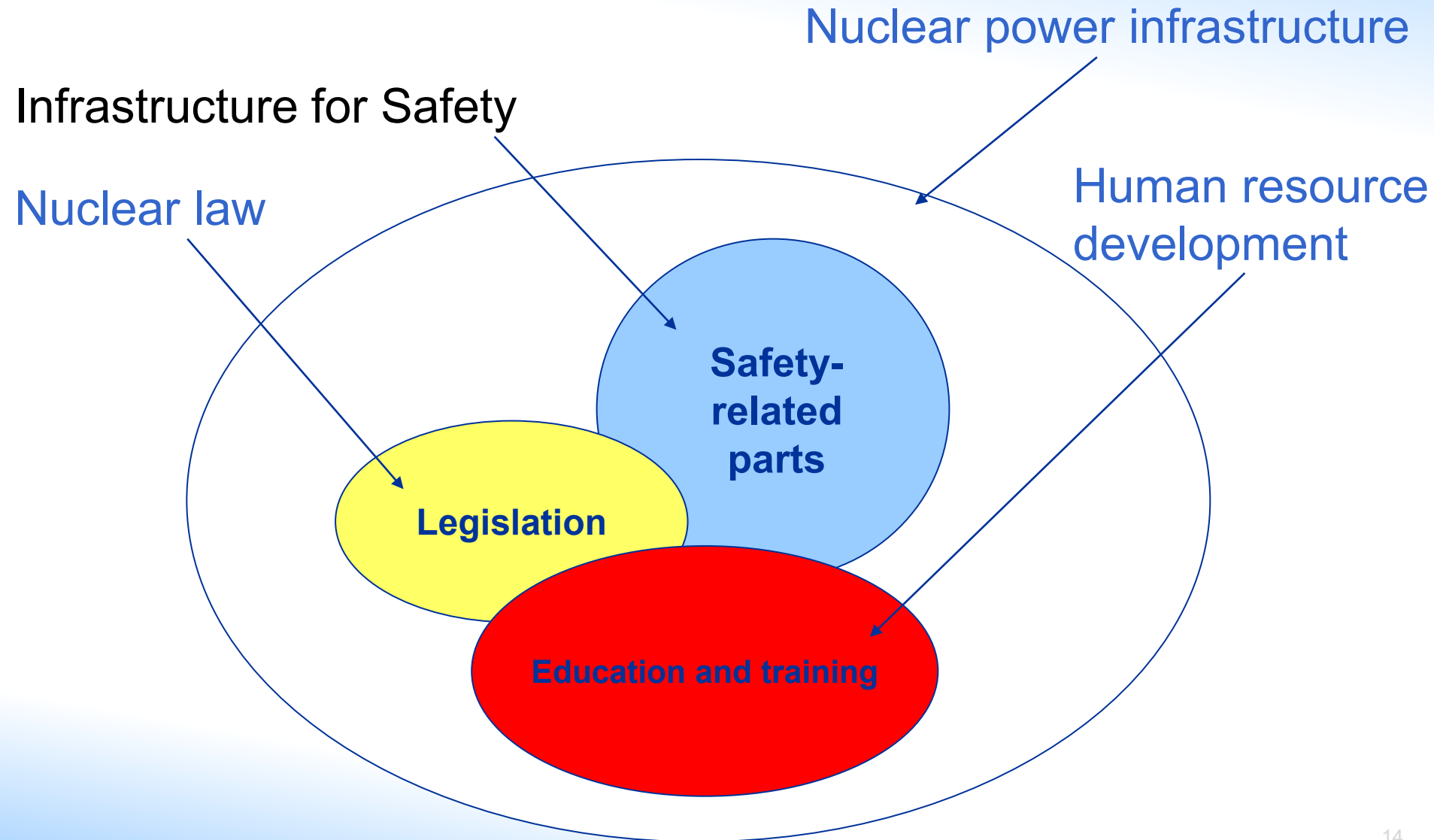
Management Systems and Safety Culture

- **Main aim of the integrated management system should be to achieve and enhance safety by:**
 - Identifying and integrating the requirements contained within:
 - The statutory and regulatory requirements of the Member State
 - All relevant IAEA Safety Requirements
 - Formal agreements with interested parties
 - Other relevant codes and standards adopted for use by the organization
 - Ensuring the promotion of safety and security culture, the regular assessment of safety performance and the application of lessons learned from experience

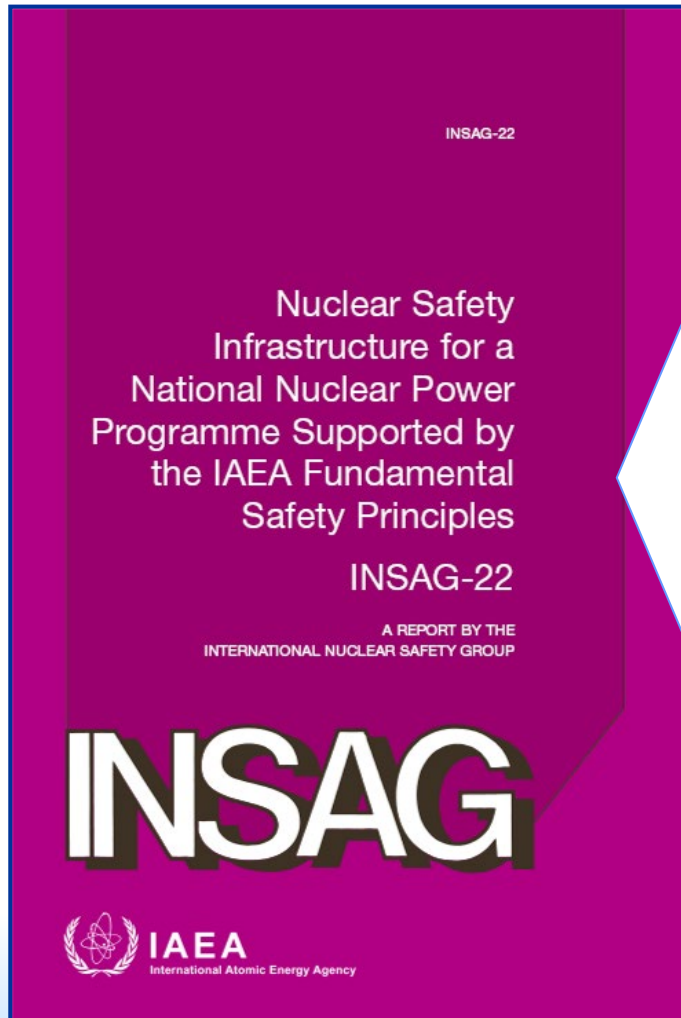
Management System and Safety Culture

- Establishing a nuclear power programme and building a nuclear power involves many challenges
 - The building of a nuclear power infrastructure
 - Legislation and regulatory infrastructure
 - Capacity building: both technical and soft skills including, leadership and management for safety
 - Physical and organisational infrastructure
 - Safety and security infrastructure

Management System, Safety Culture and Nuclear Power Infrastructure



The Concept of “Safety Infrastructure” by INSAG

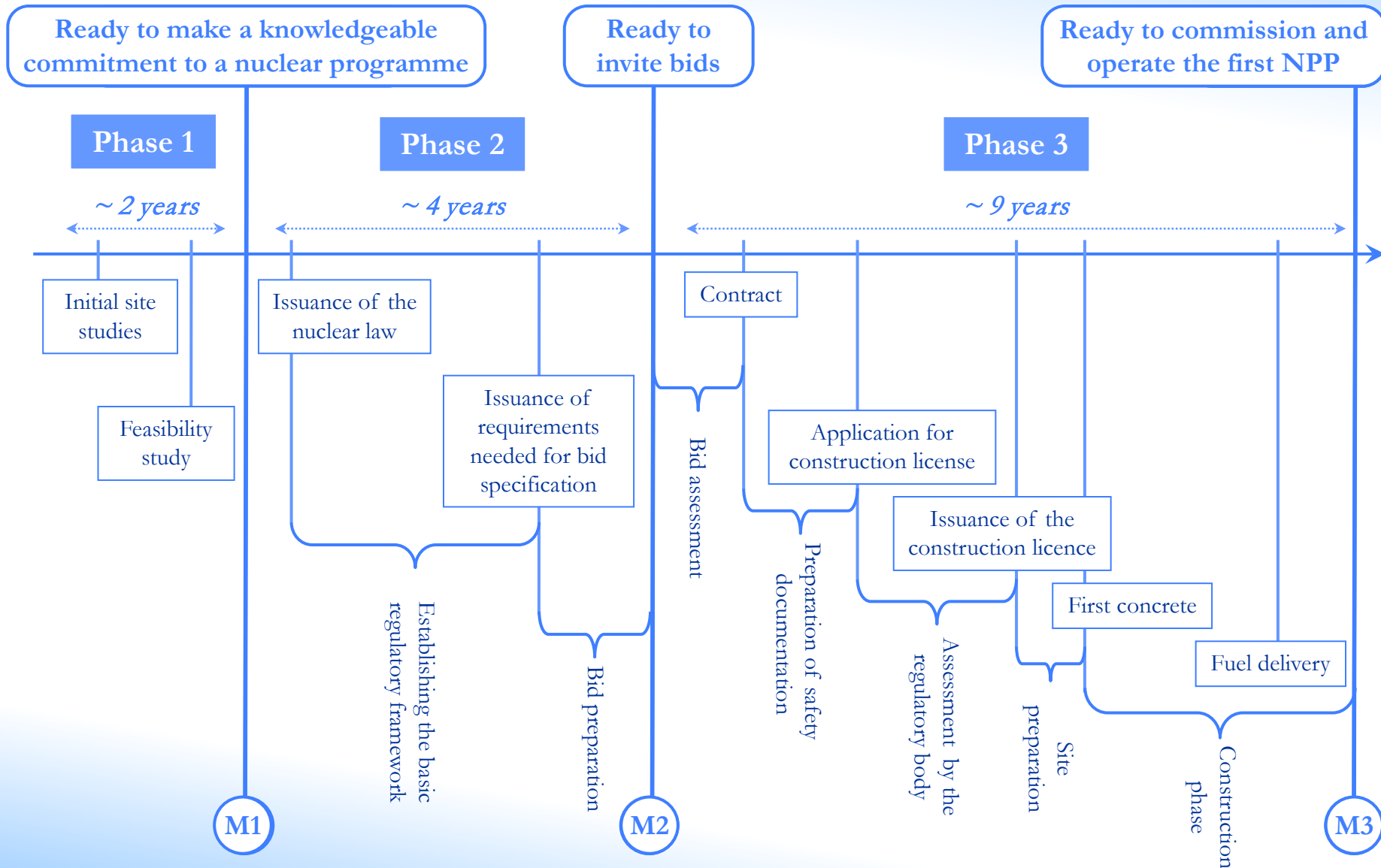


Nuclear Safety Infrastructure is the set of:

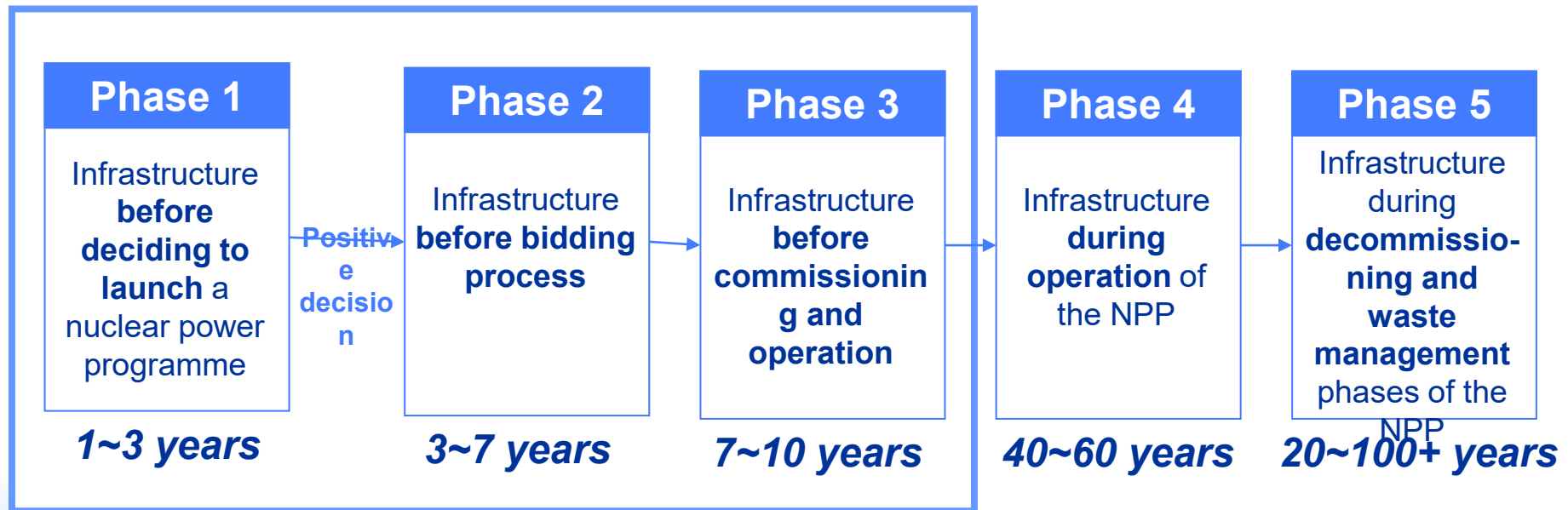
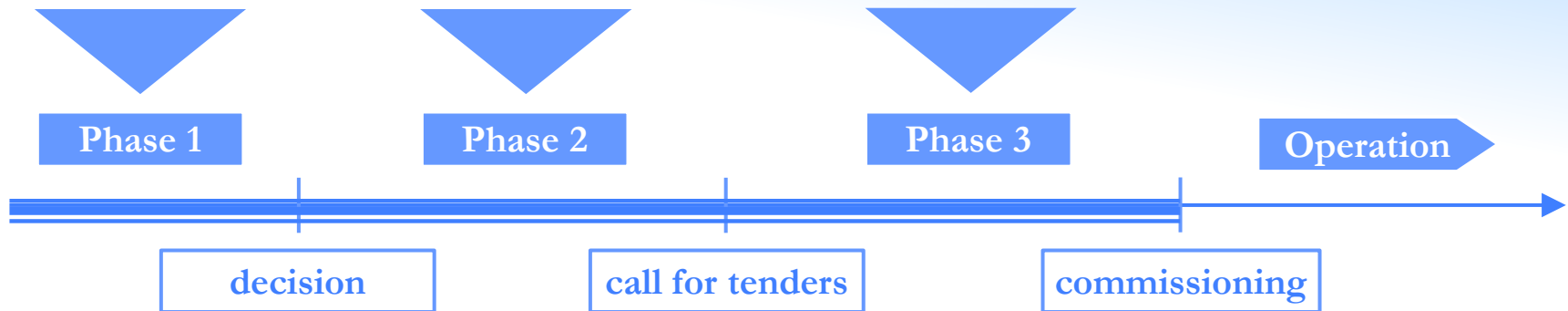
- institutional
- organizational
- technical

elements and conditions established in a Member State to provide a sound foundation for ensuring a sustainable high level of nuclear safety.

Management System and Safety Culture applicable throughout the development & operation of NPP

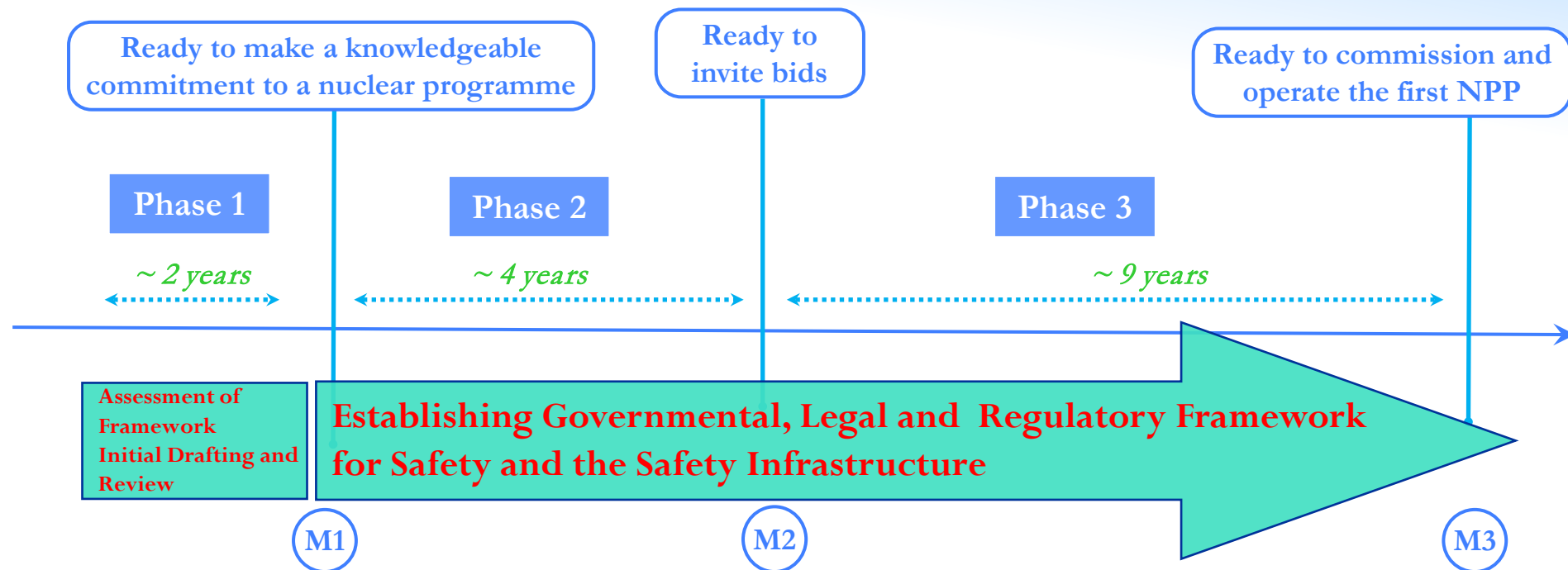


IAEA Management System and Safety Culture applicable throughout the development, operation and decommissioning of NPP



Phases based on INSAG 12 and the Milestones Document

Regulatory Priorities



- ✓ Phase 1 is mostly awareness and planning stage and should reflect an understanding of the obligations and implications of a nuclear power programme and implementation of the Fundamental Safety Principle 4.
- ✓ Phase 2 is implementation phase; efforts should focus on establishment or enhancement of the national safety infrastructure that is needed for safe and successful implementation of an NP Programme.

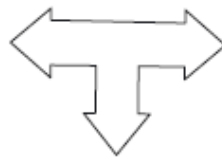
Regulatory Priorities

Challenges to Independence

CHALLENGES TO INDEPENDENCE IN REGULATORY DECISION MAKING

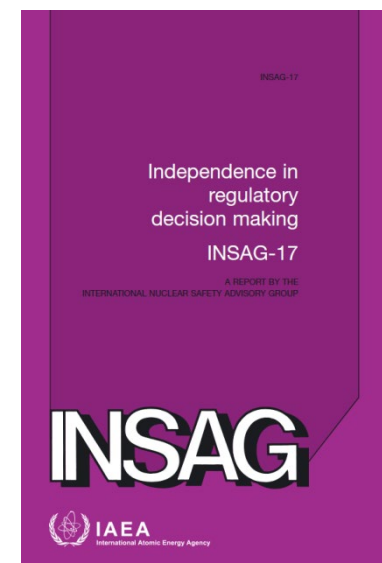
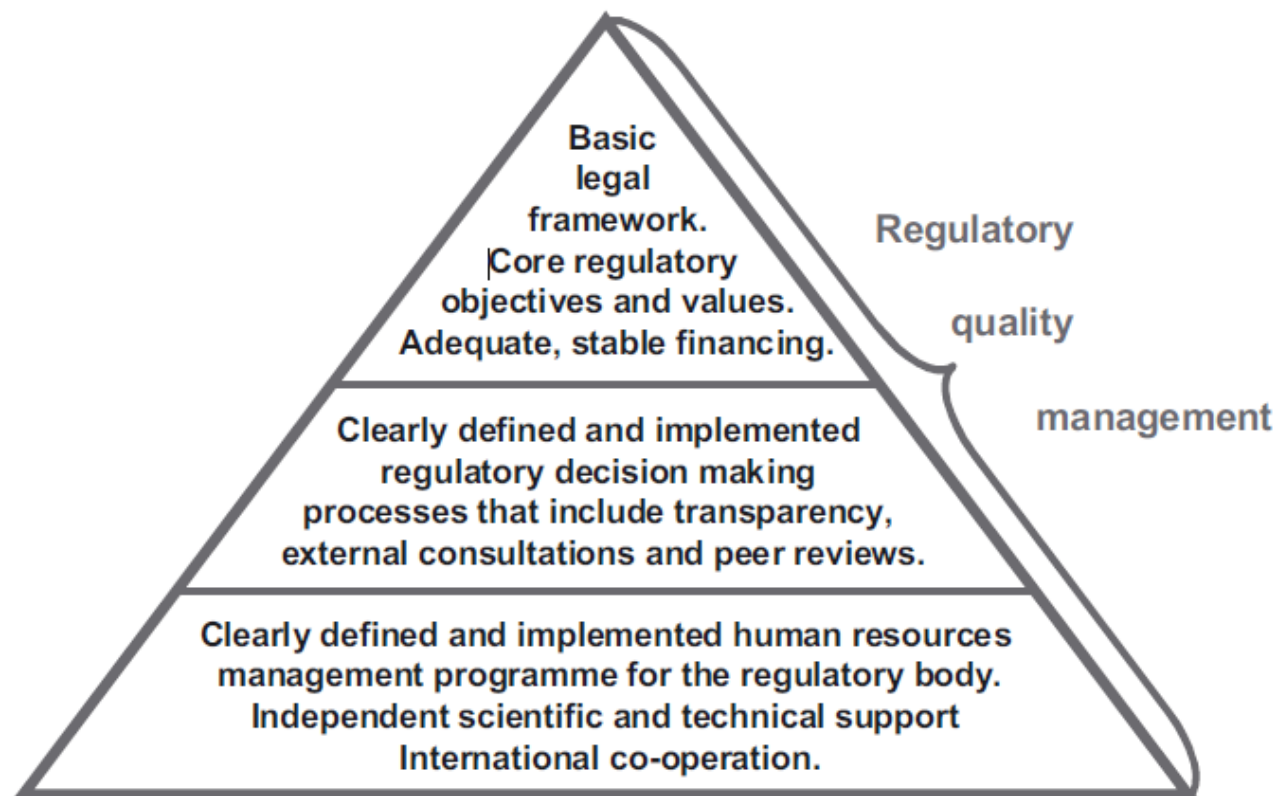
External interference

- Political interests
- Industrial interests
- Other interests



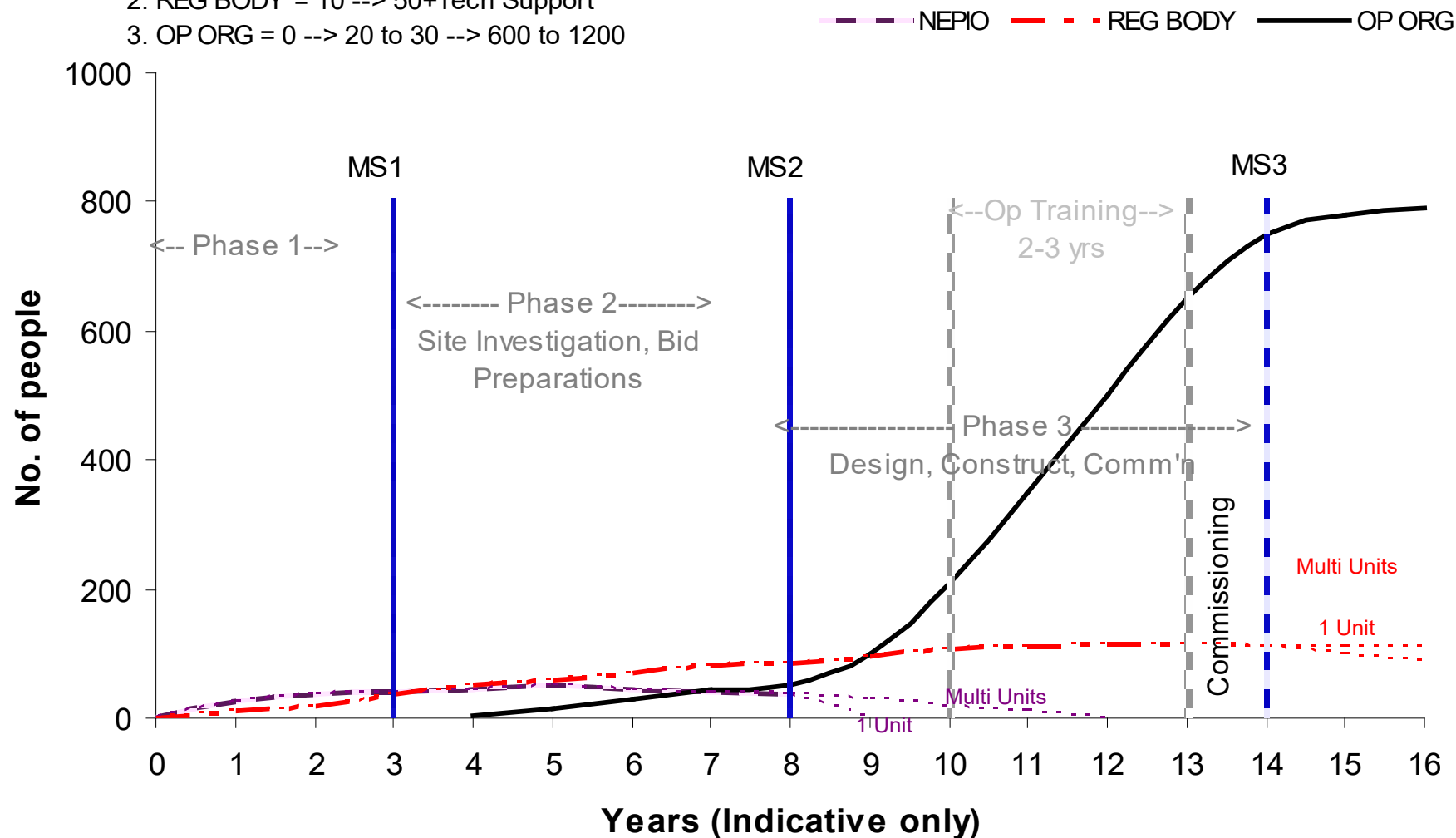
Internal deficiencies

- Lack of clear safety objectives and criteria
- Insufficient competence
- Overdependence on individual decision makers
- Lack of clear criteria for appointments (selection and promotion)

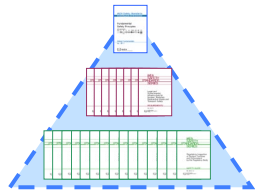


Scope, Complexity and Importance of Management System/SC Increases with time

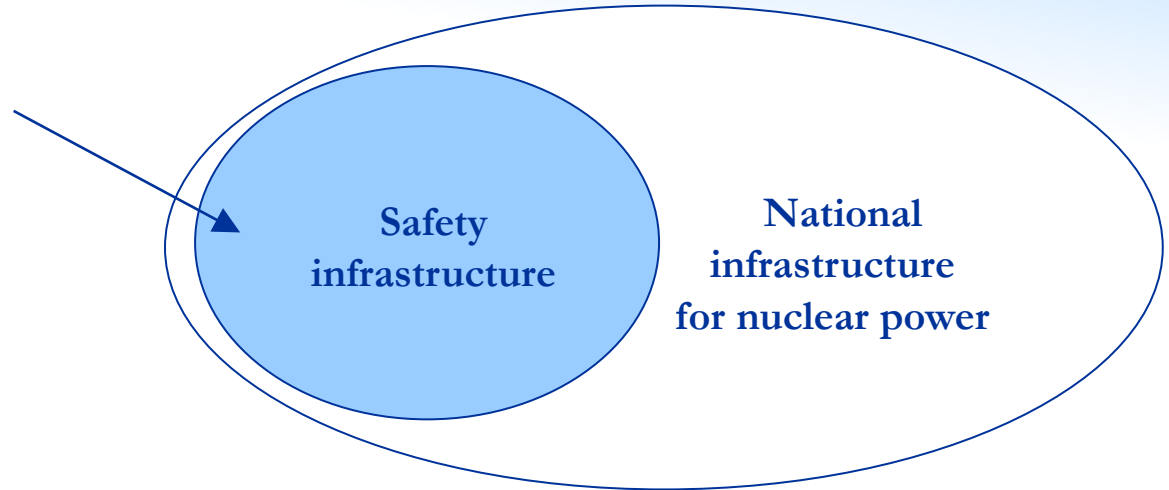
1. NEPIO = 10 --> 50 (Depending on Expert Group Support) --> 0 (close to)
2. REG BODY = 10 --> 50+Tech Support
3. OP ORG = 0 --> 20 to 30 --> 600 to 1200



Safety Infrastructure and Safety Standards



**IAEA
Safety
Standards**



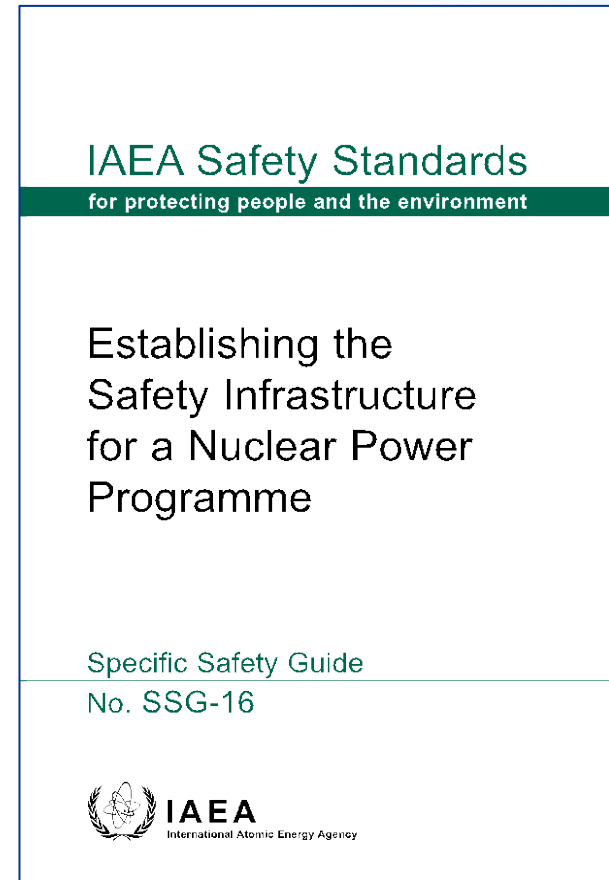
Importance of safety means safety-related elements have requirements which shall be complied with

Requirements are stated in IAEA Safety Standards

Safety Standards can be used not just during operations, but also in early phases of NPP development

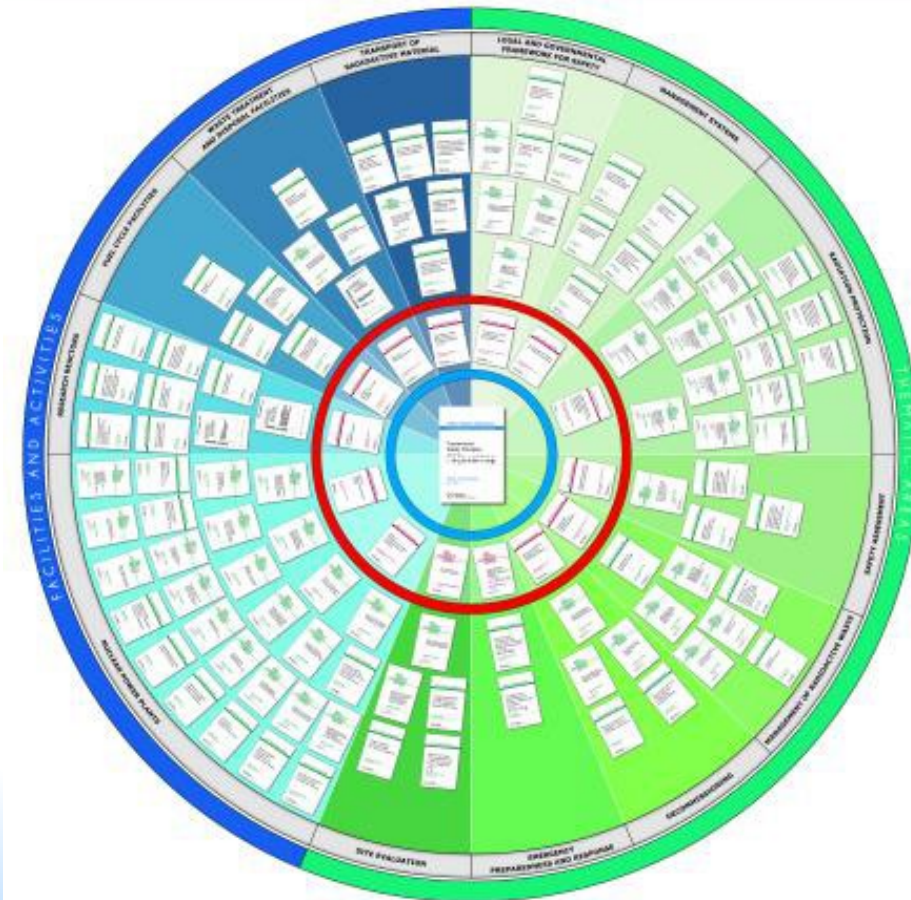
IAEA Safety Standards

- SSG-16
 - Provides a roadmap for the use of IAEA safety standards to build a nuclear safety infrastructure
 - 200 Suggested actions covering 20 (to 24) elements
 - Provides a basis for self-assessment
 - Need to use both SSG-16 and NG-G-3.1



Building Nuclear Infrastructure Using SSG-16

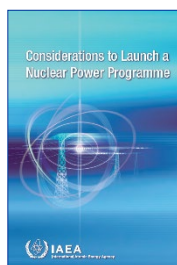
IAEA Safety Standards protecting people and the environment



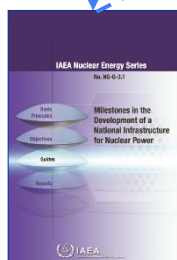
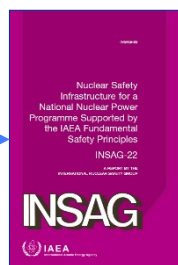
IAEA safety standards need to be complemented by industry standards and must be implemented within appropriate national regulatory infrastructures to be fully effective

IAEA Safety Standards

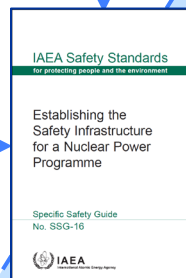
IAEA Nuclear Power Support Group's BROCHURE



International Nuclear Safety Group's REPORT-22



"Milestones" document IAEA NG-G-3.1



SSG-16



FUNDAMENTALS

IAEA SAFETY STANDARDS SERIES									
ST-1	ST-2	ST-3	ST-4	ST-5	ST-6	ST-7	ST-8	ST-9	ST-10

REQUIREMENTS

IAEA Safety Standards for protecting people and the environment	IAEA Safety Standards for protecting people and the environment
The Management System for Facilities and Activities	Leadership and Management for Safety
Safety Requirements No. GS-R-3	General Safety Requirements No. GS-R-2

GS-R-Part 2

GS-R-3

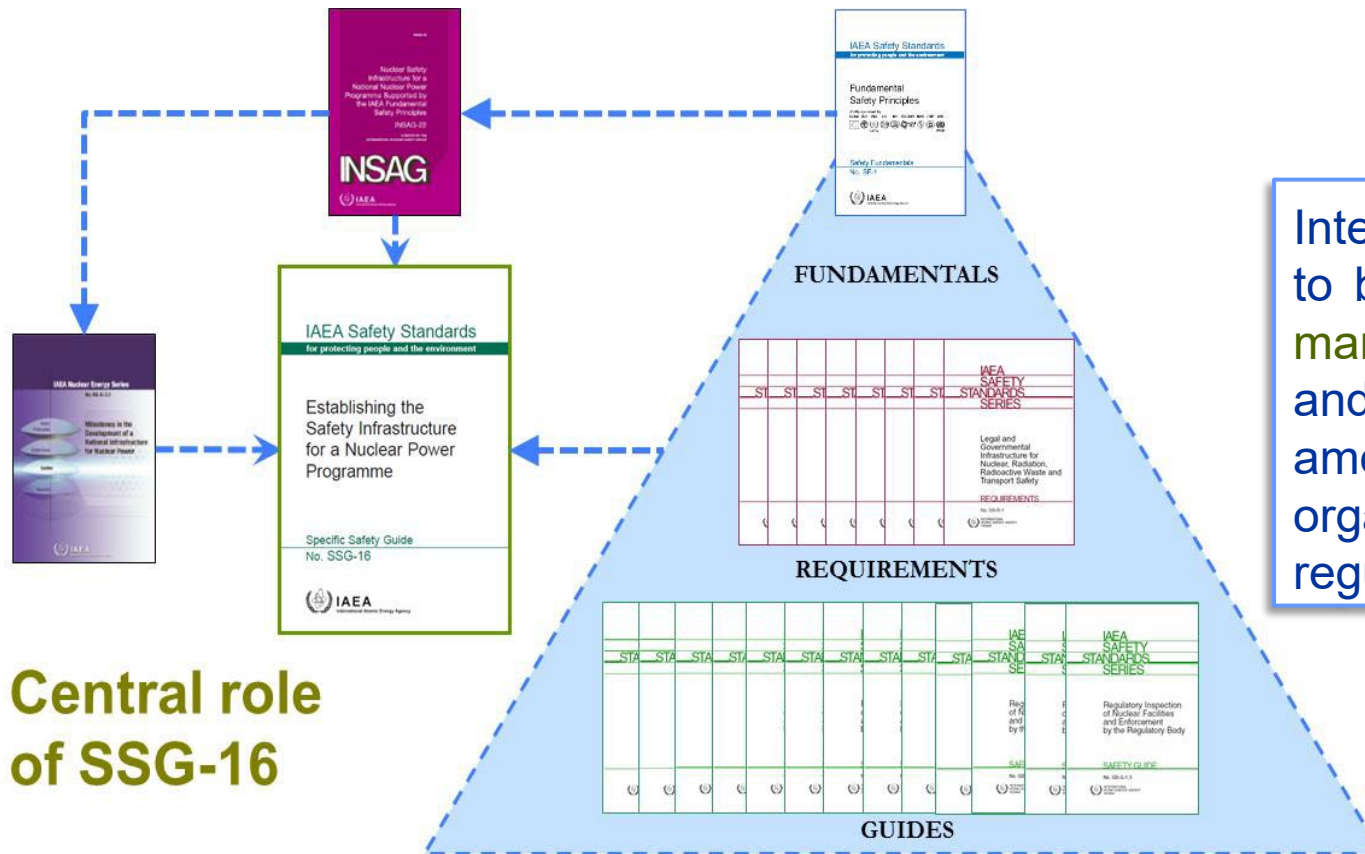
IAEA SAFETY STANDARDS SERIES									
STA-1	STA-2	STA-3	STA-4	STA-5	STA-6	STA-7	STA-8	STA-9	STA-10

GUIDES

IAEA SAFETY STANDARDS

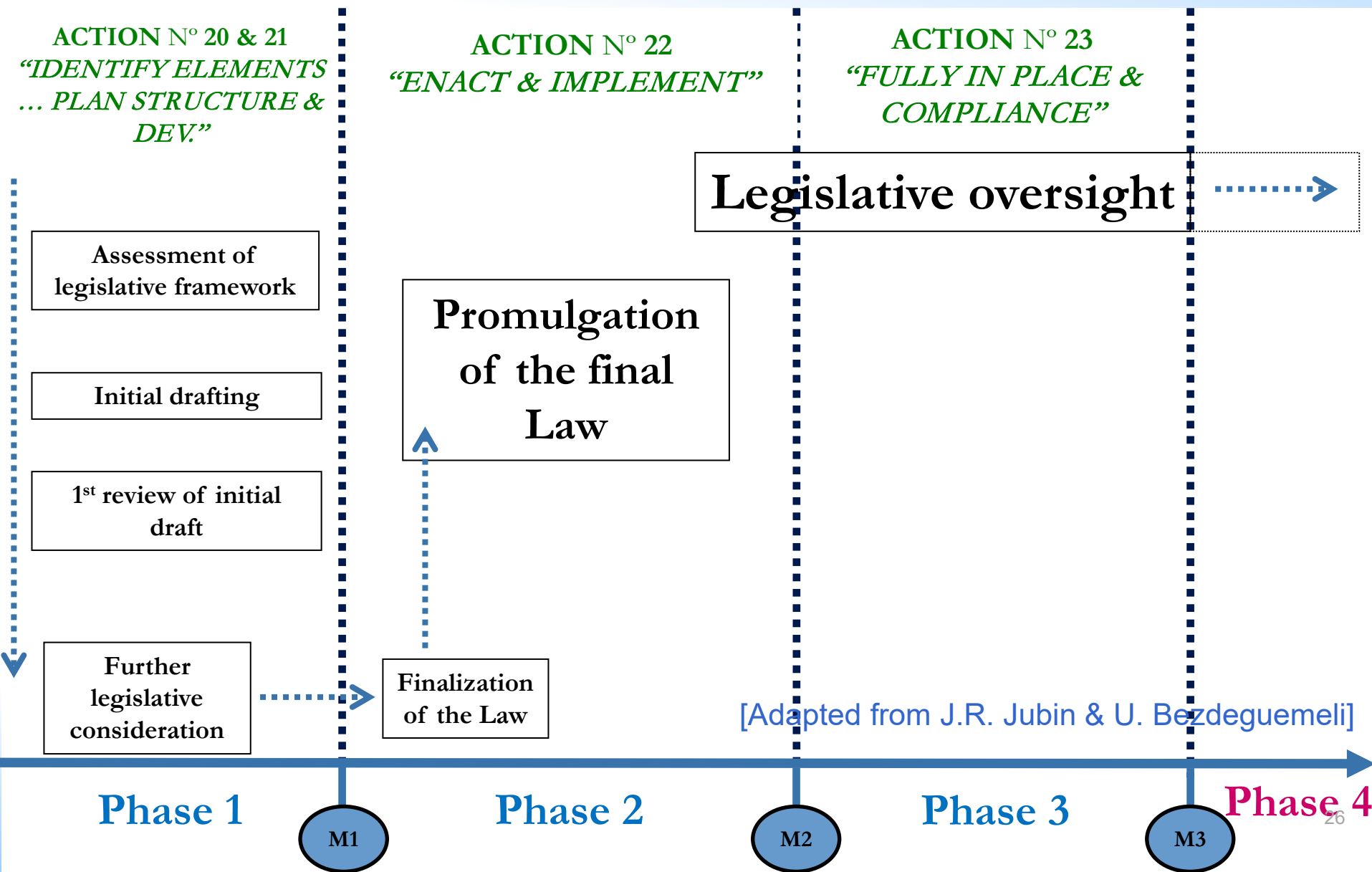
Establishing a Safety Infrastructure

Safety guide **SSG-16 Establishing the Safety Infrastructure for a Nuclear Power Programme** constitutes a “Road-map” to apply the entire suite of IAEA Safety Standards progressively during the early phases of the implementation of a nuclear power programme.



Intended to contribute to build leadership and management for safety, and safety culture amongst the involved organisations, including regulatory bodies

Regulatory Priorities - The Legislative Process for Nuclear Law: In the context of the three Phases of an NPP



Use of SSG-16 along with NG-G-3.1

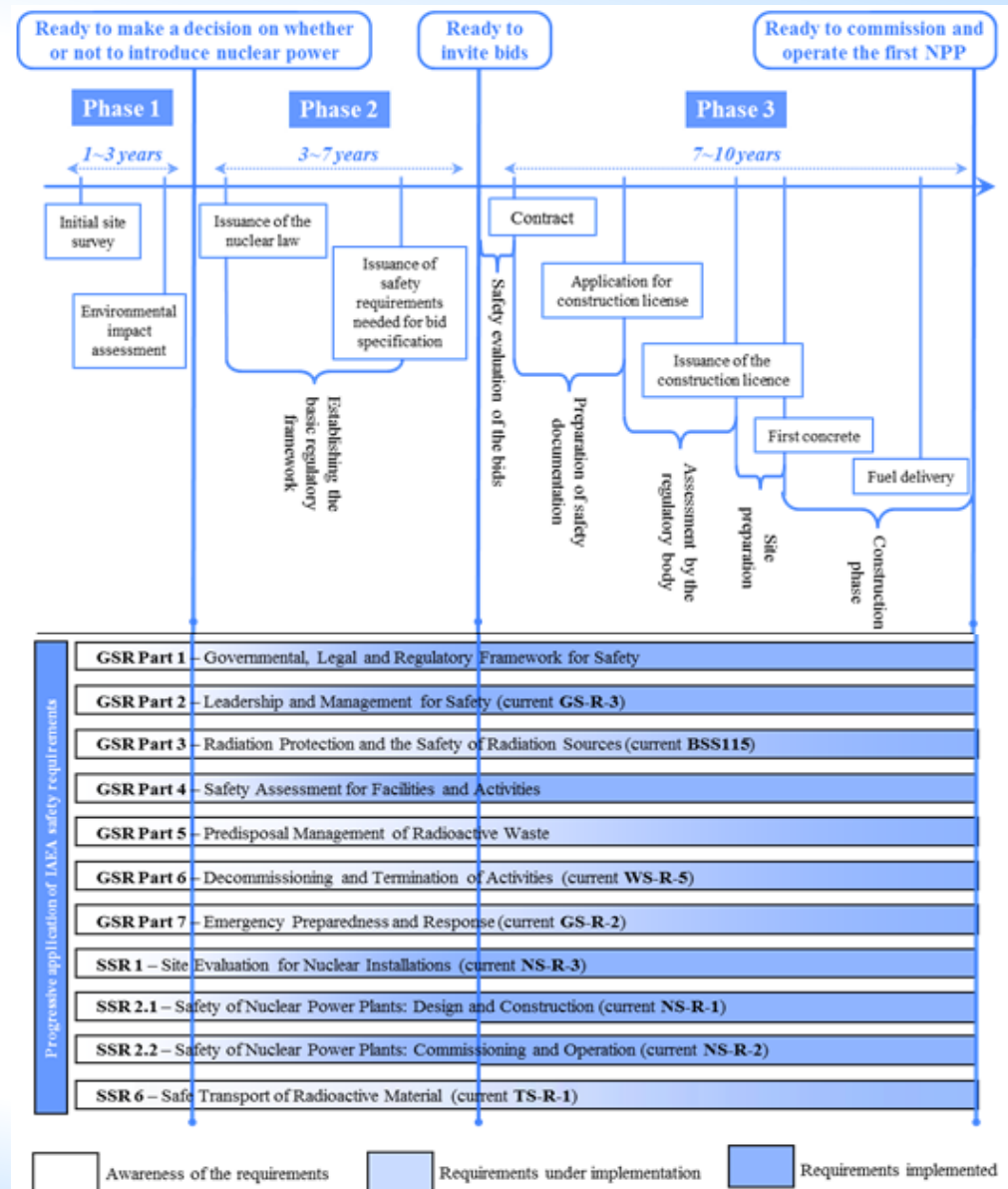
Chapters of SSG-16 (Safety Elements)	MAIN SUPPORTING IAEA SAFETY REQUIREMENTS IDENTIFIED	
Governmental programme management	GSR part 1	General Safety Requirements (GS)
Global safety regime	GSR part 1	
Legal framework	GSR part 1	
Regulatory framework	GSR part 1	
Transparency and openness	GSR part 1 <i>and others</i>	
Funding and financing	GSR part 1 <i>and others</i>	
External expert support	GSR part 1 <i>and others</i>	
Provision of technical services	GSR part 1 <i>and others</i>	
Leadership and management for safety	GS-R-3	
Human resources development	GS-R-3 <i>and others</i>	
Safety research	GS-R-3 <i>and others</i>	
Radiological protection and safety	GSR part 3	
Safety assessment	GSR part 4	
Radioactive waste safety and decommissioning	WS-R-2 / 5	Specific Safety Requirements (SS)
Emergency preparedness and response	GS-R-2	
Site selection and evaluation	NS-R-3	
Operating organization	SSR-2/2	
Safety qualification of industrial organizations	SSR-2/2 <i>and others</i>	
Technical infrastructure reliability	SSR-2/2 <i>and others</i>	
Design safety	SSR-2/1	
Preparation for commissioning	SSR-2/2	
Transport safety	TS-R-1	
Interfaces with nuclear security	-	

SSG-16 Overview

For each relevant IAEA Safety Requirements publication, at which stages:

- there should be awareness of the requirements
- implementation of the requirements should be started
- requirements should be fully implemented

The initial degree of the application of these requirements may vary from State to State depending on the use of radioactive sources and nuclear installations other than NPPs before considering the nuclear power option



SSG-16 Overview

Text format for each Phase: Example

ACTIONS 72-84: LEADERSHIP AND MANAGEMENT FOR SAFETY

Phase 2

Requirements

The following actions are recommended to be completed in this Phase as a step towards the full implementation of all relevant IAEA Safety Requirements:

- Requirements 1, 19, 35 GSR part 1
- Requirements of GS-R-3/GSR Part 2 as a whole...

Action

Action 75. The regulatory body and the operating organization should start developing and implementing effective management systems in their respective organizations and should promote a strong safety culture.

Additional text

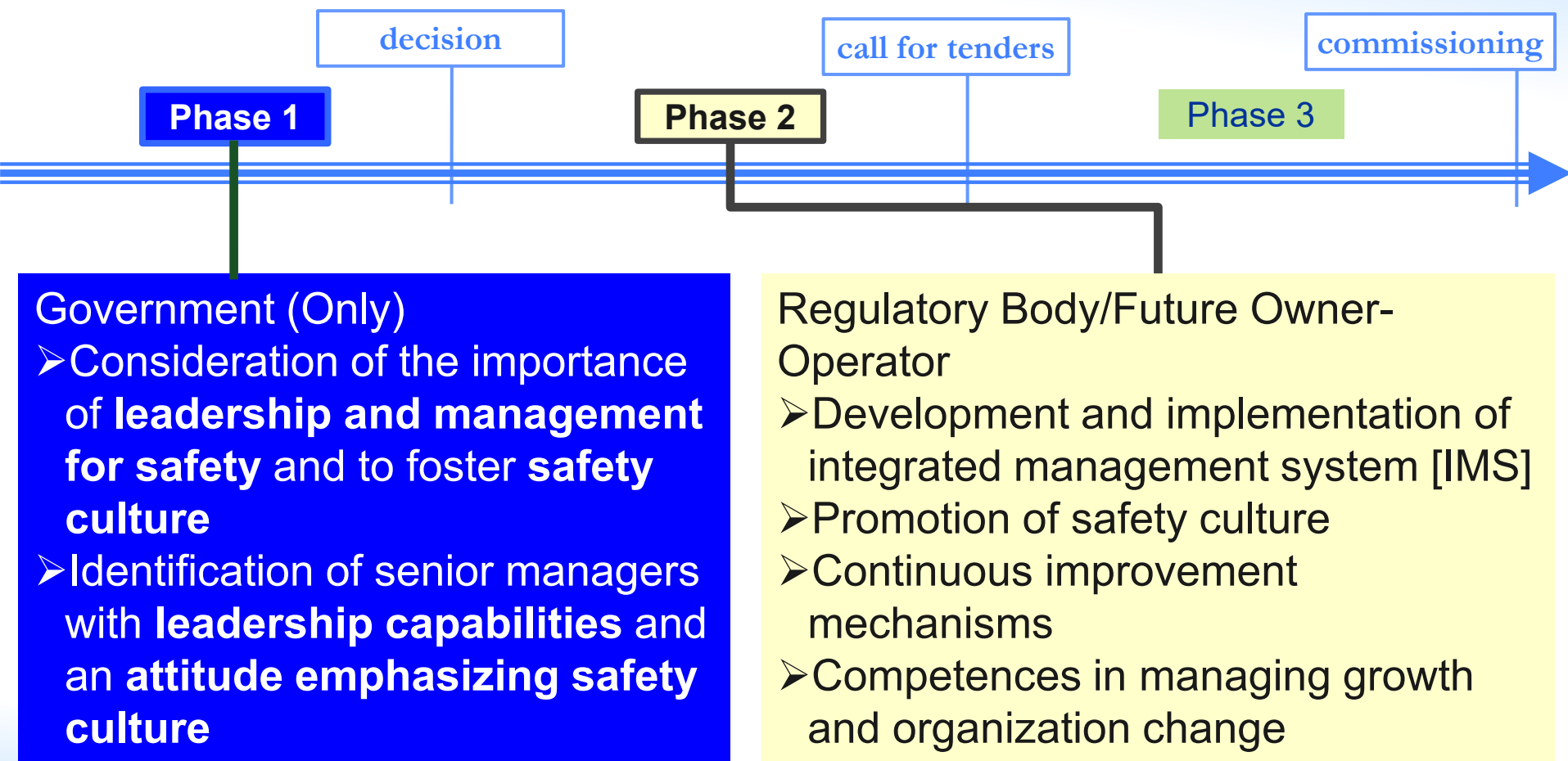
2.149 (...) As an effective way of establishing a safety culture and promoting the development of leadership for safety, management systems should be implemented that provide structure and direction to...

Leadership and management for safety

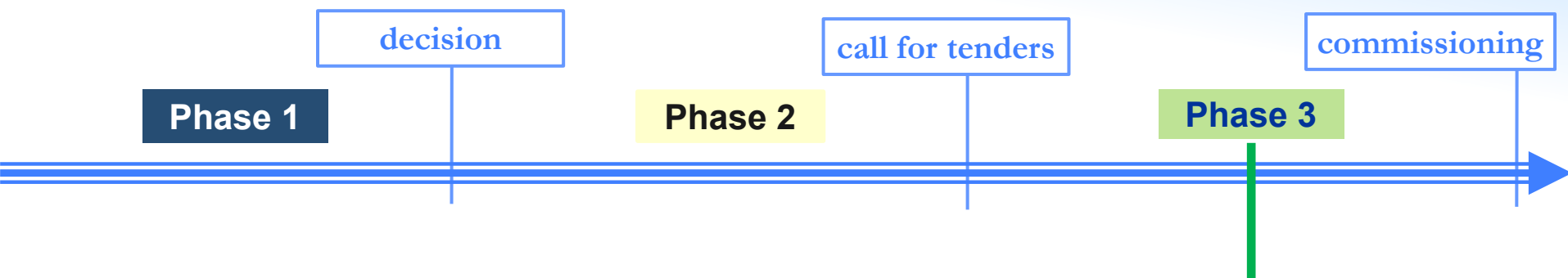
- **SSG-16: Actions 72-84**

- SSG-16 is intended to contribute to the building of leadership and management for safety and of a safety culture amongst the involved organisations in nuclear power programme, including the regulatory body.
- Start in phase 1, when identifying senior managers for the prospective organizations, the government should look for persons with leadership capabilities and an attitude emphasizing safety culture

Graded and Phased Development of Leadership and Management for Safety



Graded and Phased Development of Leadership and Management for Safety

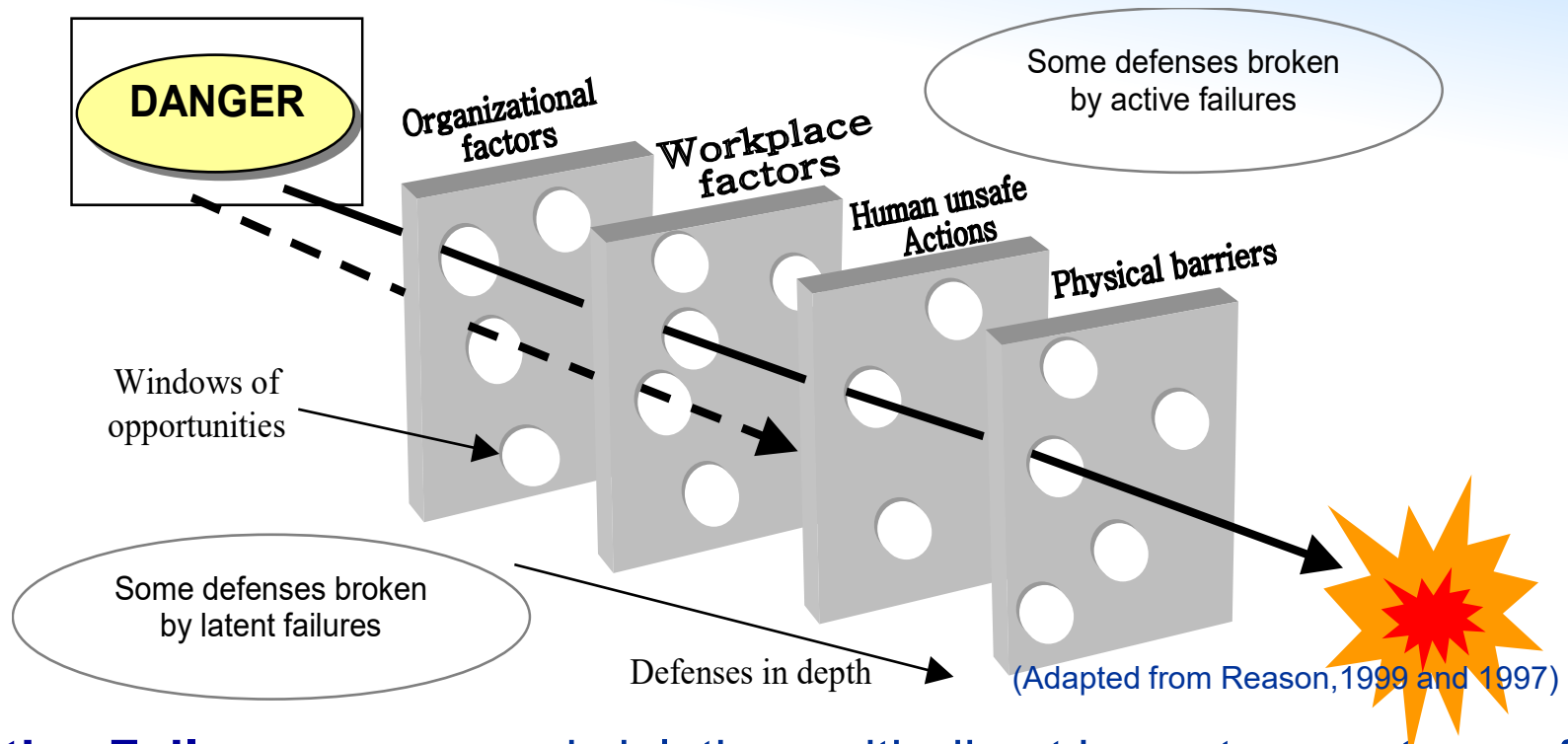


- Continuation to implement **Integrated Management System** promoting **Safety** and **Safety Culture**
- Effectiveness and **continuous improvement** of IMS
- Management and transfer of **safety related knowledge**
- **Leadership** and **succession development**
- **Regulatory oversight** of operator's programme on safety management
- Effective **leadership** and **effective management for safety**

The Need for a Management System

- MS needed to promote a strong safety culture
 - Safety culture affects safety performance
 - E.g.: Injury rates; accident rates; patient safety
 - Results supported across industries
 - Aerospace, healthcare, manufacturing, construction, agriculture, off-shore oil and gas, highway safety, maritime

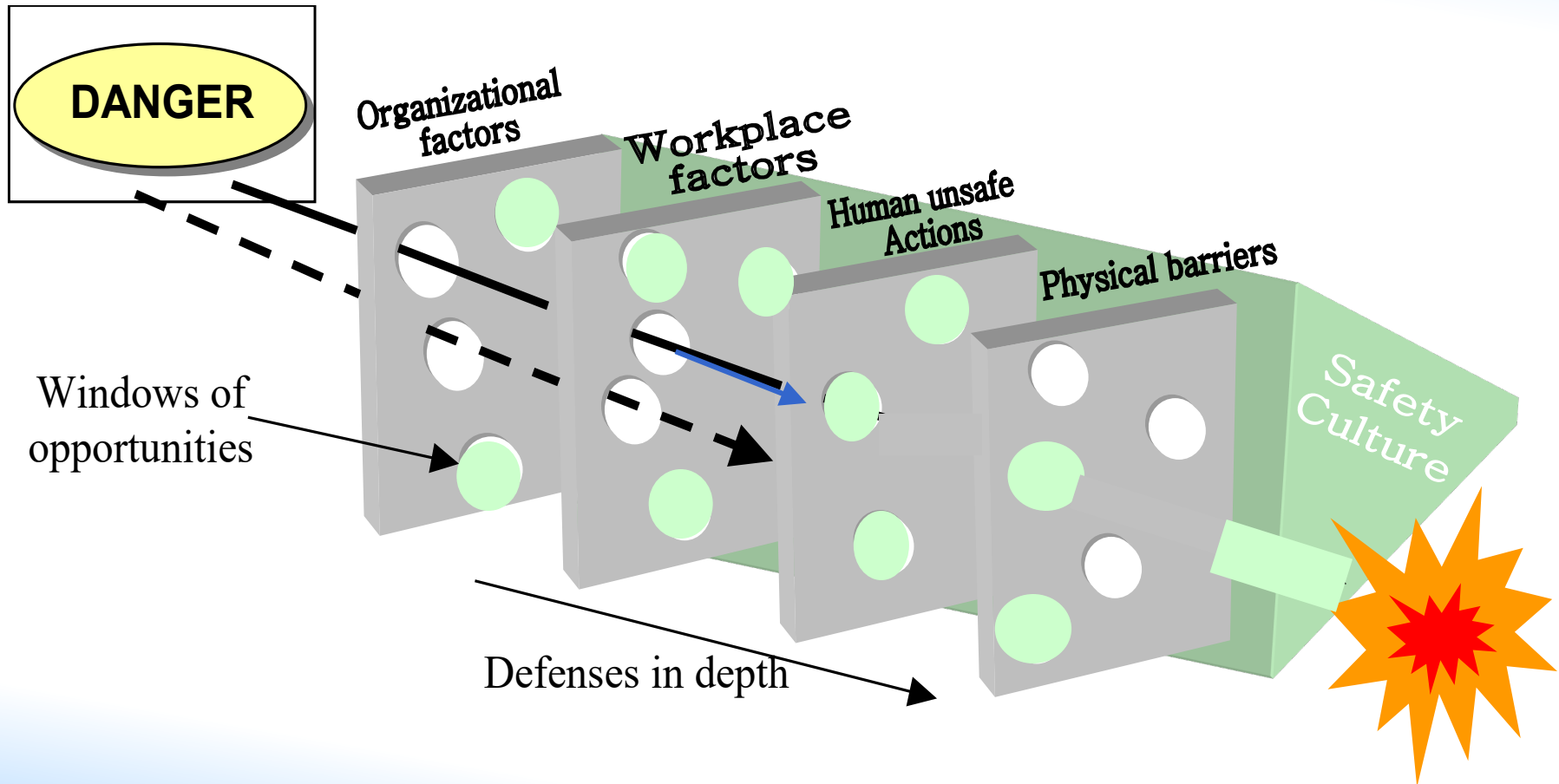
Accident Trajectory and Culture



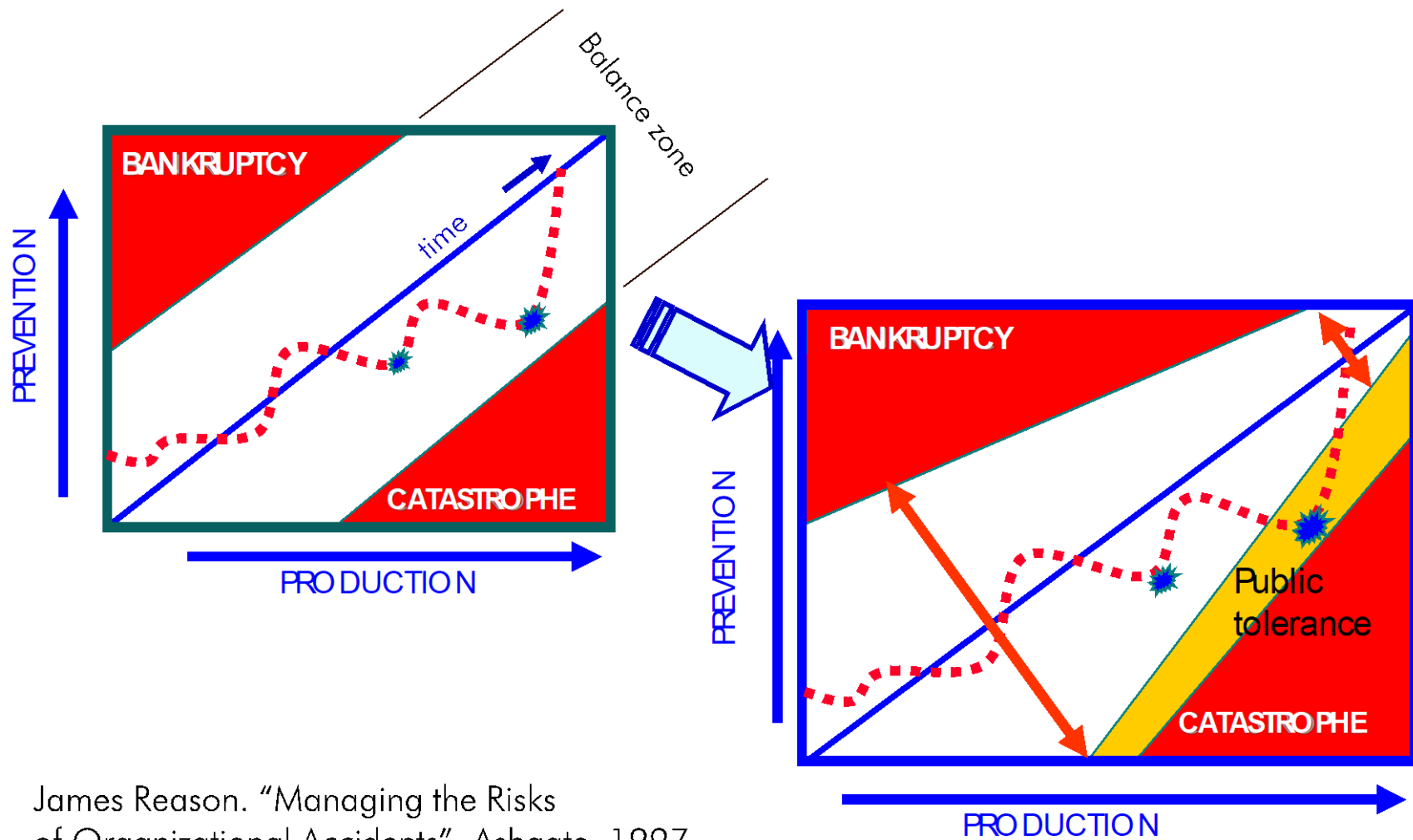
Active Failures: errors and violations with direct impact on system safety (Ex: front line operator inadequate action).

Latent Failures: errors involving several organizational factors (design, maintenance, communication, procedures, leadership, culture, etc.). (Ex: lack of openness to report near misses, incident and accident; deficient maintenance procedure, etc.).

Industrial Accident and Safety Culture



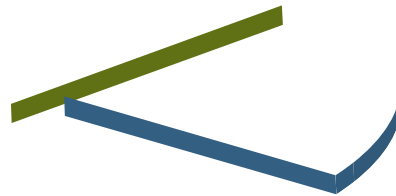
Why Safety Culture Matters



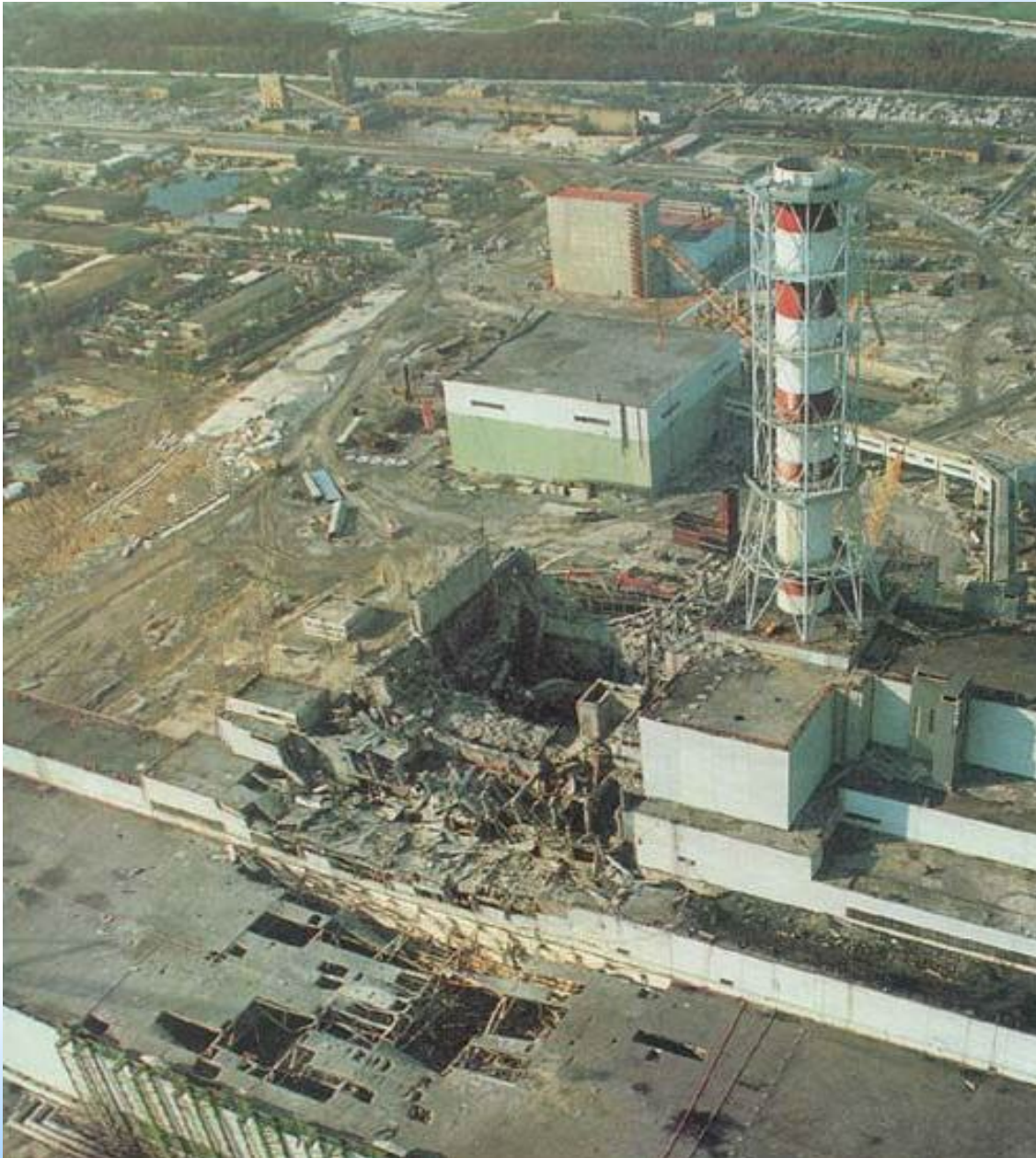
James Reason. "Managing the Risks of Organizational Accidents". Ashgate, 1997

The Need for a Management System and a Strong Safety Culture

- Research
 - Contribution of human error to the occurrence of events



Source: IAEA Nuclear Energy Series Report, NG-T-2.7, Managing Human Performance to Improve Nuclear Facility Operation



Conclusion after Chernobyl

The IAEA Advisory Group INSAG

*“A vital conclusion drawn from this behaviour is the importance of placing complete authority and responsibility for the safety of the plant on a senior member of the operations staff of the plant. Of equal importance, formal procedures must be properly reviewed and approved must be supplemented by the creation and maintenance of a ‘**nuclear safety culture**’”.*

The concept of the safety culture was now formally introduced in the area of nuclear safety.

(INSAG-1, 1986)

The IAEA Advisory Group INSAG

Definition of safety culture

*“Safety Culture is that assembly of characteristics and attitudes in organizations and individuals which establishes that, as an overriding priority, **protection and** safety issues receive the attention warranted by their significance”.*

(The 2022 IAEA glossary)

We Still Face the Safety Culture Challenge

Unit 1 Hydrogen Explosion



Damage to Units 1 and 3



Unit 3 Hydrogen Explosion



Many stakeholders have a different picture of what this technology entails. These images are powerful and effective in instilling fear, particularly when [dis]played over and over again



We want to avoid this...



Because it leads to this

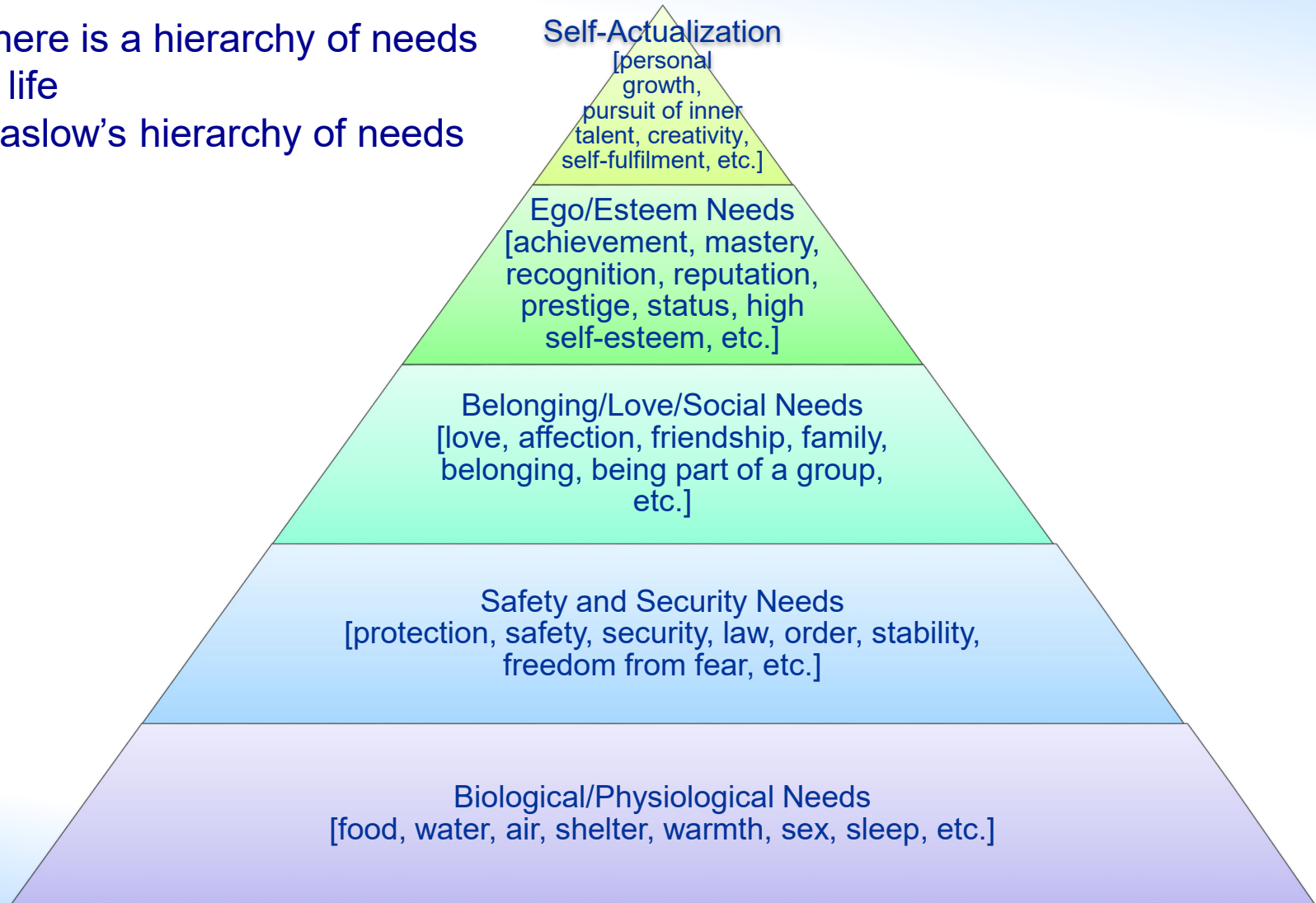


...And They Can Shut You Down



Manage Stakeholder Needs Well

- There is a hierarchy of needs in life
- Maslow's hierarchy of needs



Conclusion after the Fukushima Daiichi Accident



Quotation from the National Diet of Japan

“What must be admitted – very painfully – is that this was a disaster “Made in Japan.”

Its fundamental causes are to be found in the ingrained conventions of Japanese culture:

- our reflexive obedience;
- our reluctance to question authority;
- our devotion to ‘sticking with the program’;
- our groupism;
- and our insularity.

Had other Japanese been in the shoes of those who bear responsibility for this accident, the result may well have been the same.”

Lessons Learned from the Nuclear Accident at the Fukushima Daiichi Nuclear Power Station

“Behaviours prior to and during the Fukushima Daiichi event revealed the need to strengthen several aspects of nuclear safety culture. It would be beneficial for all nuclear operating organizations to examine their own practices and behaviors in light of this event and use case studies or other approaches to heighten awareness of safety culture principles and attributes.”

Nuclear Safety

Human and Organizational Factors

Lessons from Fukushima

- **Kenzo Oshima (NRA Commissioner)**
- **International Experts Meeting**
- **IAEA**
- **May, 2013**

What went wrong?

Manmade disaster

- Human error
 - Inaction, willful negligence
 - Failure in safety-first
- Flawed safety culture (the “myth of 100% nuclear safety”)

Emergency response

- TEPCO
- Command center
- Regulatory bodies

Was the accident preventable?

Yes, if...

- “Safety first” policy had been strictly enforced; risks had been squarely faced;
- Severe accident measures (defense-in-depth) were in place (esp. natural hazards);
- International safety standards and good practices had been followed;
- Delays in reinforcements had been avoided.....

The Importance of Oversight

Why Monitor and Conduct Oversight?

- Organisations need to check from time to time that:
 - They are addressing the reason for their existence; i.e.:
 - Are we addressing the need we are supposed to meet?
 - Are we effective?
 - Are we doing the right work?
 - They are using resources wisely and not being wasteful
 - Are we efficient
 - Are we doing the work right?

Why Monitor and Conduct Oversight?

- Are we employing the right
 - people, plans and strategies?
 - physical plant including tools and materials?
 - processes, procedures and tactics, information, and culture, etc. to attain objectives and goals to meet needs or requirements?
- The organisation itself is usually best positioned to answer the question
- Oversight helps to keep the organisation true to form

Why Monitor and Conduct Oversight?

- To answer question, organisation needs to monitor and measure the effectiveness of the management system to determine if organisational goals are met
 - Permits confirmation of the ability of processes to achieve intended results
 - Enables organisation to identify opportunities for improvement

Why Monitor and Conduct Oversight?

- Process development
 - The processes of the management system that are needed to achieve the goals, provide the means to meet all requirements and deliver the “products” of the regulatory body shall be identified, and their development shall be planned, implemented, assessed and continually improved
[From GS-R 3|5.1, 5.2, 5.3, 5.4, 5.5; GS-G-3.1|5.1, 5.9]

Why Monitor and Conduct Oversight?

- Monitoring, Measurement and Assessment
 - The effectiveness of the management system shall be monitored and measured including through self-assessment and independent assessment to confirm the ability of the processes to achieve the intended results, to evaluate performance of work and to identify opportunities for improvement of performance and of safety culture.
[From GS-R-3|6.1, 6.2, 6.3]

Why Monitor and Conduct Oversight?

- Monitoring, Measurement and Assessment
 - The Regulatory body should determine the causes of non-conformances and remedial actions to be taken to prevent their recurrence in its activities. The status and effectiveness of all corrective and preventive actions shall be monitored and reported to management.
 - Potential non-conformances that could detract from the organization's performance shall be identified using feedback from other organizations, both internal and external; through the use of research; through the sharing of knowledge and experience; and through the identification of best practices.
[From GS-R-3|6.11, 6.15, 6.16]

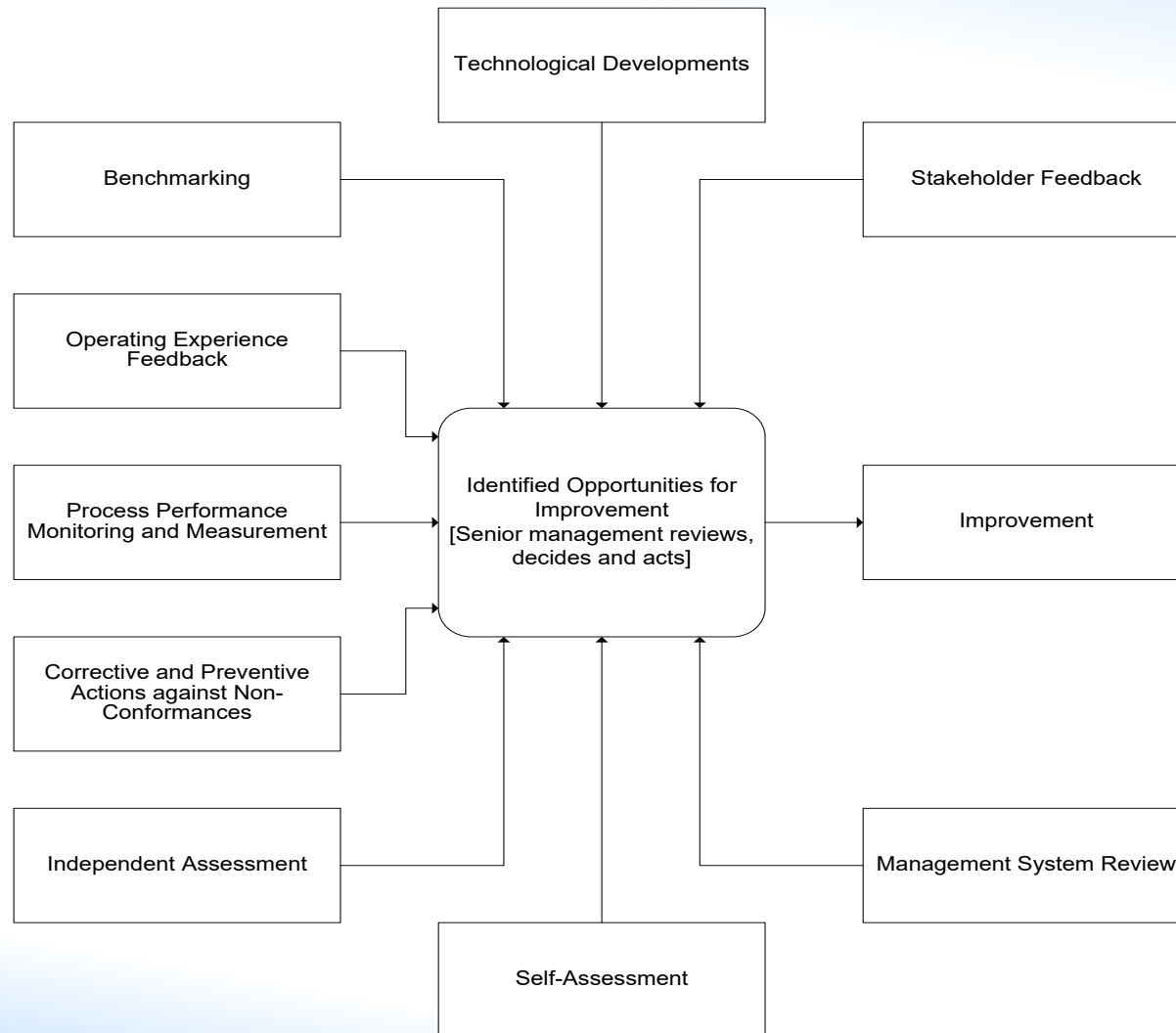
Why Monitor and Conduct Oversight?

- Improvement
 - Opportunities for the improvement of the management system shall be identified and actions to improve the processes shall be selected, planned and recorded. Improvement plans shall include plans for the provision of adequate resources, using project management methods. Actions for improvement shall be monitored through to their completion and the effectiveness of the improvement shall be checked.
[From GS-R-3|6.17, 6.18, 6.16; GS-G 3.1|6.78, 6.81]

Why Monitor and Conduct Oversight?

- Improvement
 - Individuals in the organization should be considered the best source of ideas for improvements. Even small improvements should be controlled in order to understand their cumulative effects.
[From GS-G 3.1|6.82]
 - Figure below illustrates the improvement processes and its impact on the management system
[From GS-G 3.5|6.69]

Assessing and Continually Improving



Why Monitor and Conduct Oversight?

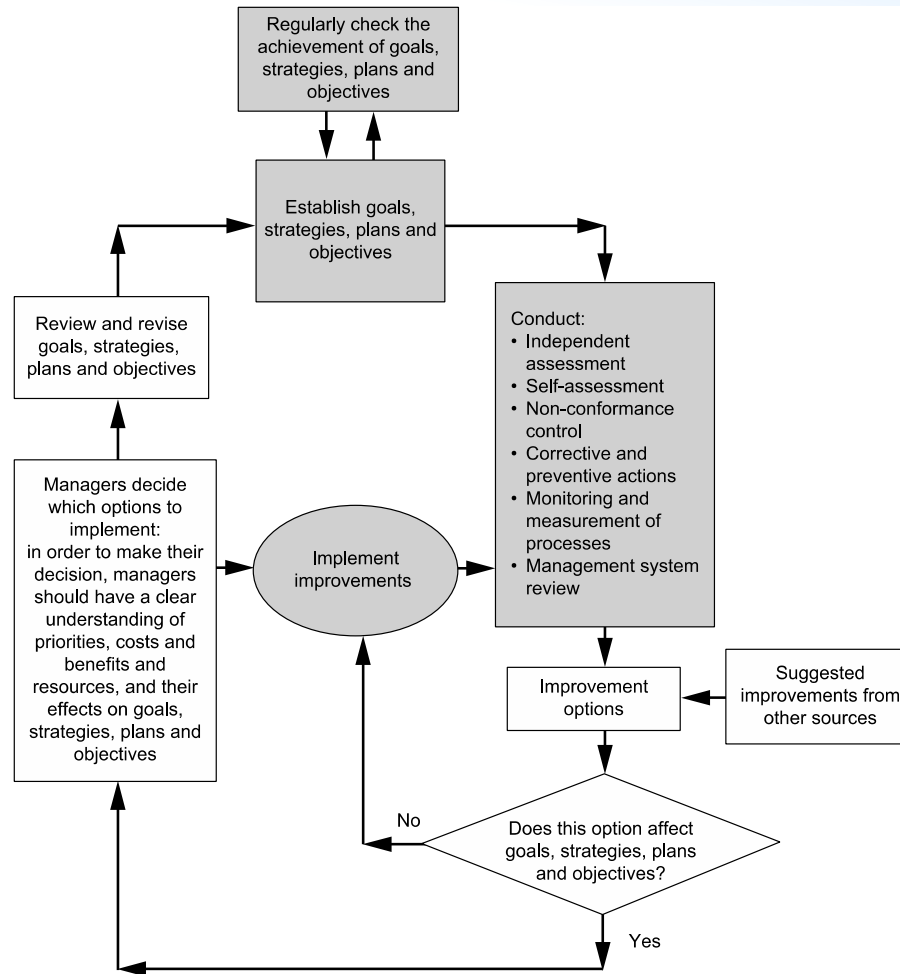


FIG. 3. The continual improvement cycle. The shaded boxes denote requirements for the management system [1]. The start box is the 'establish goals, strategies, plans and objectives' box.

Conclusion

Conclusion

- Culture is important – it affects safety performance
- A management system that promotes and supports a strong safety culture is essential
- Regulatory bodies can gain assurance that owners/operators of nuclear facilities and licensed activities have made adequate provision for robust management systems and the promotions and support for a strong safety culture

Conclusion

What is measured or monitored is managed

Thank you!

