



Canadian Nuclear
Safety Commission

Commission canadienne
de sûreté nucléaire

Management System Standards in the Canadian Nuclear Industry

Presented by:

*Pierre Lahaie
Director, Management Systems Division
Directorate of Safety Management
Canadian Nuclear Safety Commission*

*To:
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Outline



- Safety Management
- International Guidance on Safety Management
- Evolution of Management Systems
- The Canadian Regulatory Framework
- Evolution of the Canadian Standard: CSA N286
- Management Systems
- CSA N286-11

Safety Management: Status Quo



“The Nuclear Industry has over the years created a good understanding of the technical aspects of safety. The understanding of human and organisational factors in nuclear safety is far more rudimentary. One important component is to create an awareness of how organizational deficiencies may impact safety.”

Excerpt from “ Organizational factors and nuclear safety – issues to address in research and development”

Bjorn Wahlstrom and Carl Rollenhagen.

Presented at the 13th Annual Workshop on Human Performance/Root Cause/Trending/OPEX/Self Assessment, August 26-31,2007, Momterey, CA

Safety Management: Status Quo



“ The regulator has to be sure the licensee has the appropriate processes in place to manage safety and the appropriate tools to self-assess its effectiveness in managing activities which may impact on safety.

There is a trend for nuclear regulators to develop more formal regulatory requirements in the area of safety management and to assess licensee management systems”

Case Studies



- Three Mile Island (1979)
- Challenger Space Shuttle (1986)
- Chernobyl (1986)
- Piper Alpha Offshore Oil and Gas Platform(1988)
- Ladbroke Grove Rail Accident(1999)
- Tokai-Mura Criticality Accident(1999)
- Davis–Besse near miss (2002)
- Columbia Space Shuttle (2003)
- Identified human and organizational failures as a common theme

Case Studies



- Root causes of these events were linked to human and organizational issues
- Management failed to pay attention to technical failures



Case Studies



- In many of these cases (Davis-Besse, TMI, Tokai Mura, Ladbroke Grove) the key contributing factors to failures were inadequate regulatory frameworks, deficient inspection practices and failure to integrate known information into assessments



Safety Management



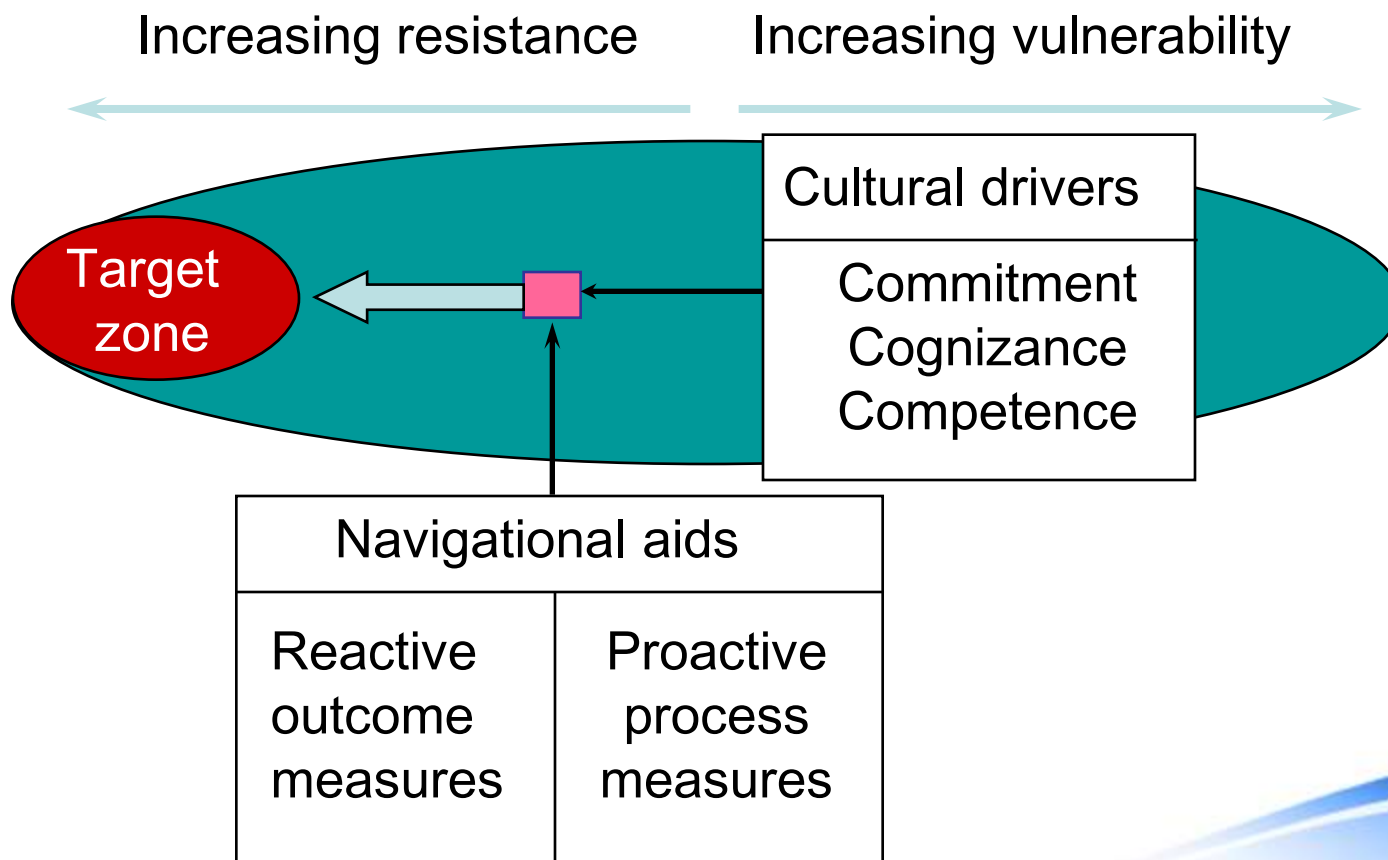
Safety Management:

- Part of an organization's business processes that provides resistance to hazards on an ongoing basis.
- Systematic, explicit and comprehensive processes for managing safety risks that aim to intervene in the accident causation process and break the accident causation chain.

Safety Management



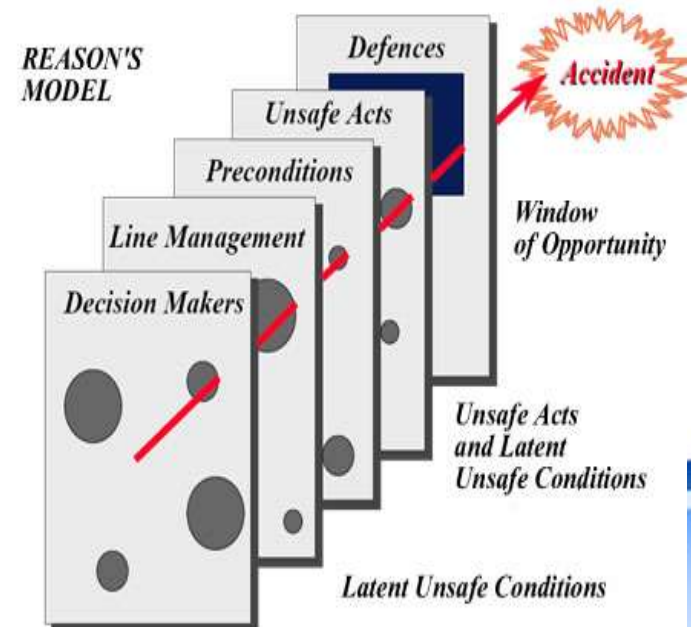
Navigating the Safety Space



Safety Management



- Includes preventing or detecting both latent and active failures (human, organizational or technical) in a continuing process of risk identification, assessment, control and monitoring across all aspects of the organisations' activities
- Internationally recognized reports and standards emphasize the fundamental importance of leadership and management of safety (INSAG-13, SF-1, GS-R-3)



International Guidance on Safety Management



- **INSAG-13**: a report by the **International Nuclear Safety Advisory Group** entitled “**Management of Operational Safety in Nuclear Power Plants**”(1999) states:

“ Organizations having a strong safety culture will have an effective safety management system with the support of all staff. However, the safety management system has a broader role in that it provides a framework by means of which the organization ensures good safety performance throughout the planning, control and supervision of safety related activities. The safety management system ,in turn, provides a means by which the organization promotes and supports a strong safety culture.”

International Guidance on Safety Management



- **SF-1 “Fundamental Safety Principles”(2006)** : an International Atomic Energy Association (IAEA) safety standard that lists ten basic principles to ensure the fundamental objective “to protect people and the environment from harmful effects of ionizing radiation” is met.
- **Principle 3: Management of Safety**

“Leadership in safety matters has to be demonstrated at the highest levels in the organization. Safety has to be achieved and maintained by means of an **effective management system**. This system has to integrate all aspects of management so that requirements for safety are established and applied coherently with other requirements, including those for human performance, quality and security. The management system also has to **ensure the promotion of safety culture, the regular assessment of safety performance and the applications of lessons learned from experience.**”

International Guidance on Safety Management



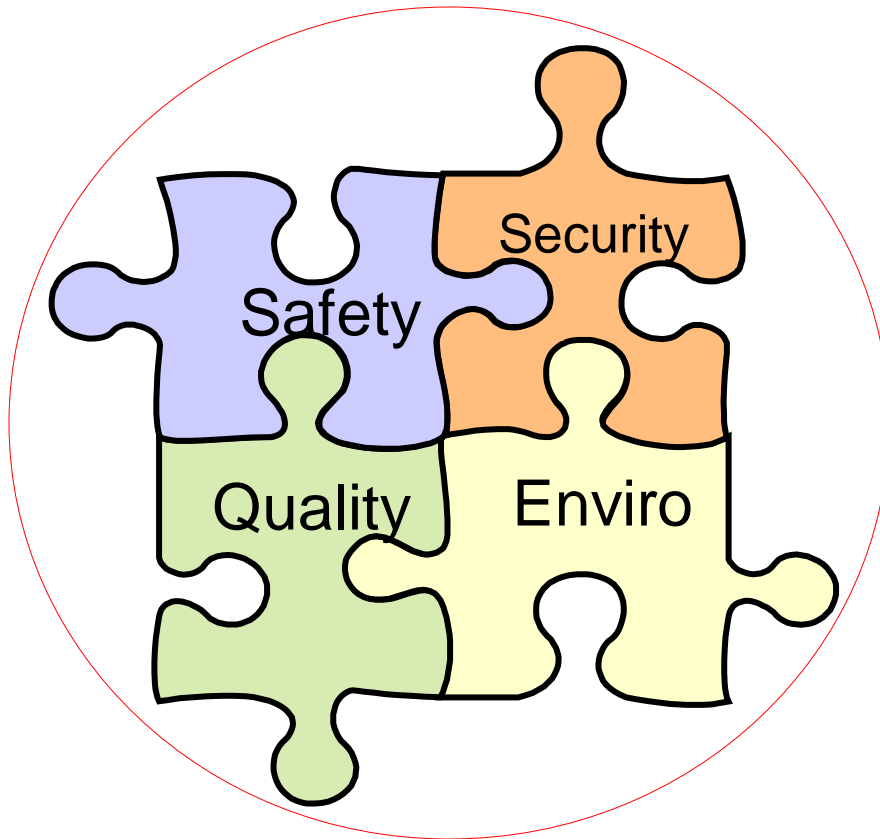
- **GS-R-3:” The Management System for Facilities and Activities”(2006) .**
- This is the latest IAEA Management System standard. It uses the term ‘management system’ which reflects and includes the initial concept of quality control and it’s evolution through quality assurance and quality management.
- The management system is a set of interrelated or interacting elements that establishes policies and objectives and which enables those objectives to be achieved in a safe, efficient and effective manner.

International Guidance on Safety Management



- **GS-R-3:” The Management System for Facilities and Activities” (2006) .**
- This Safety Requirements publication defines the requirements for establishing, implementing, assessing and continually improving a management system. A **management system** designed to fulfil these requirements **integrates safety, health, environmental, security, quality and economic elements.**
- **Safety is the fundamental principle upon which the management system is based**

Management Systems and Safety Management



This approach reduces the risk in the way the operator conducts its activities by strengthening operator awareness

that all processes, activities or actions have the potential to create a negative impact on safety

Safety Management



Safety Policy and Objectives are strategic

Performance measures enable good Safety Management

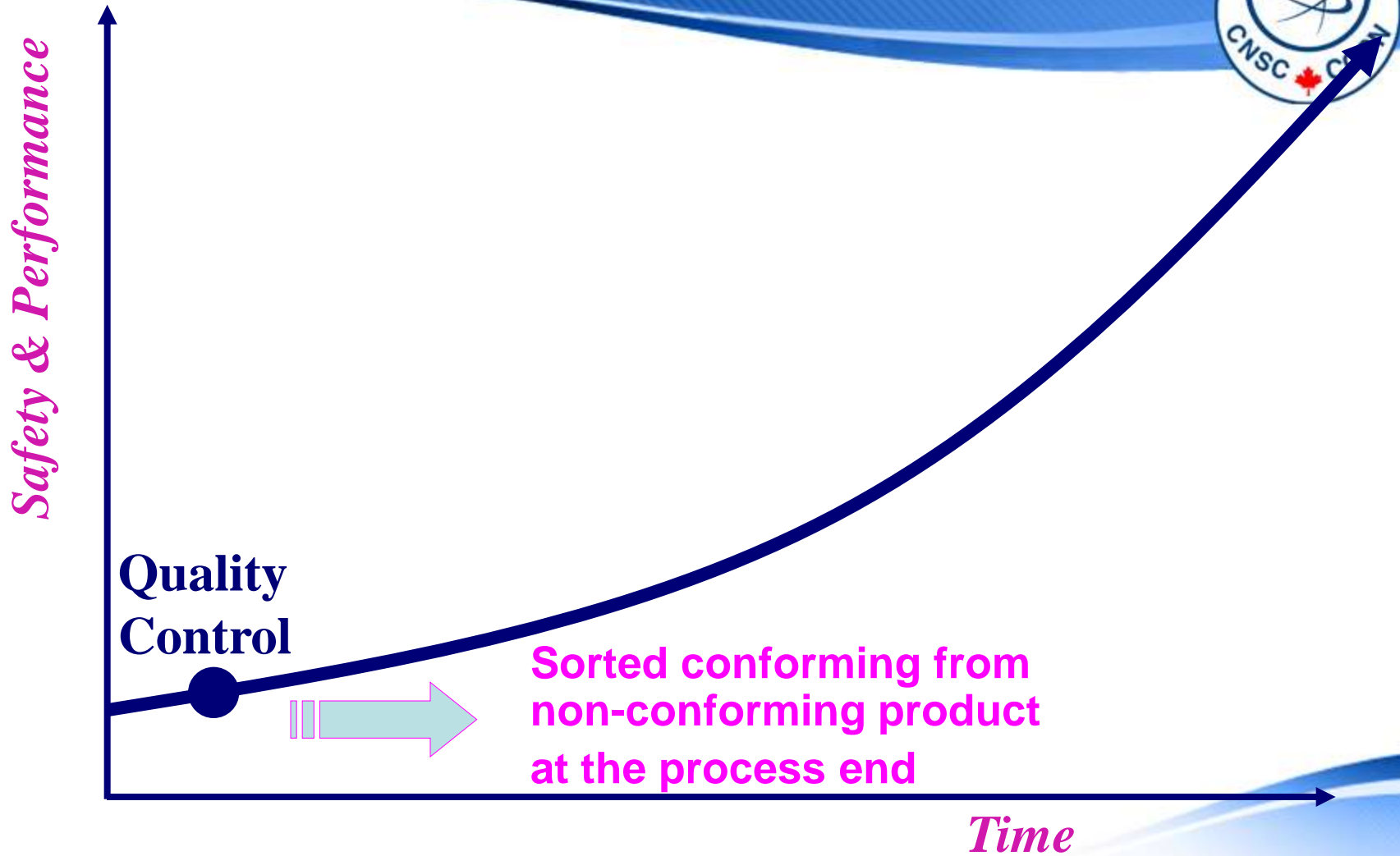
Management Systems are developed and effectively integrate safety considerations across core processes

A healthy Safety Culture exists; Values, roles and behaviours demonstrate this

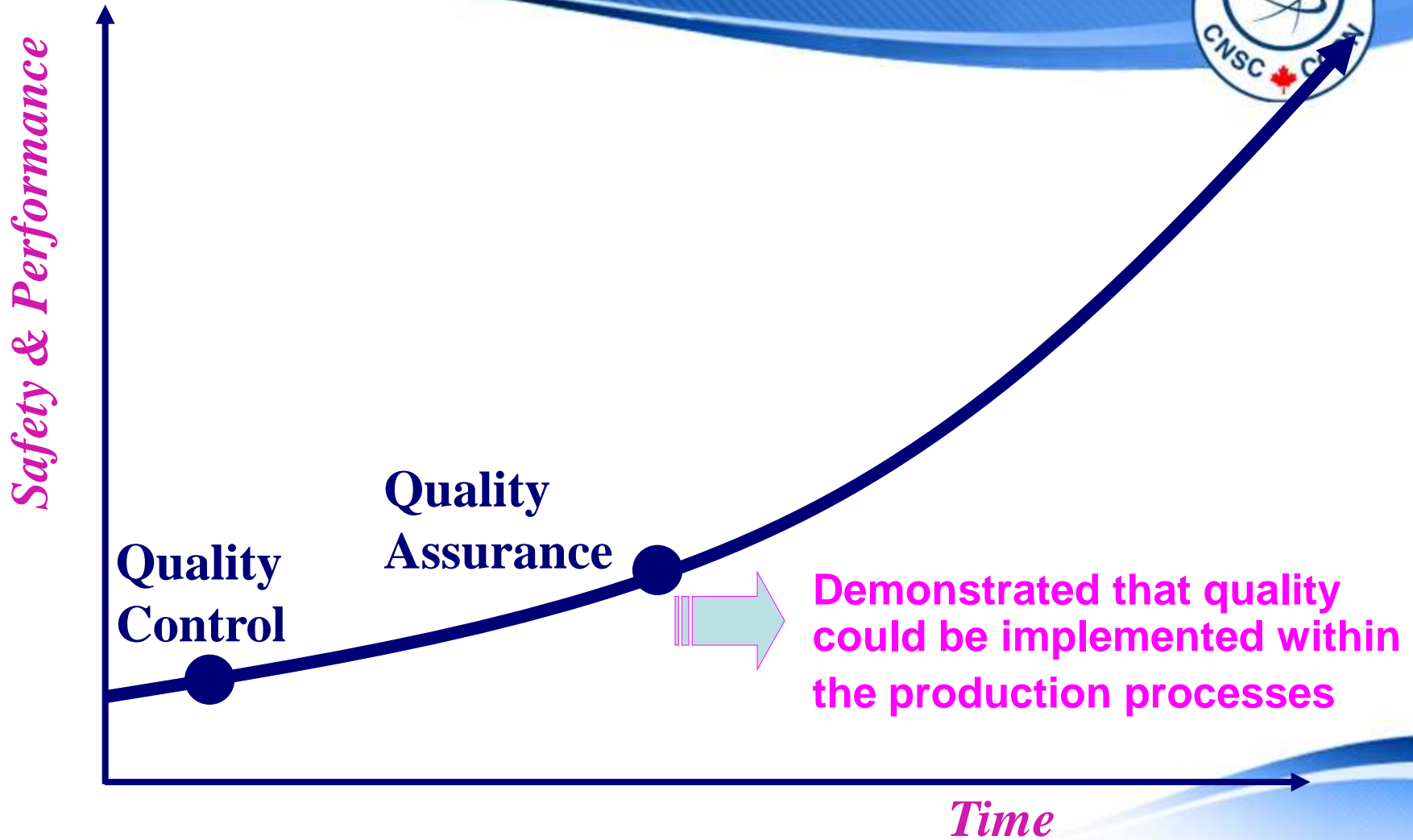
Organizational Learning occurs at all levels

Safety Principles guide decision making

Evolution of Management Systems



Evolution of Management Systems



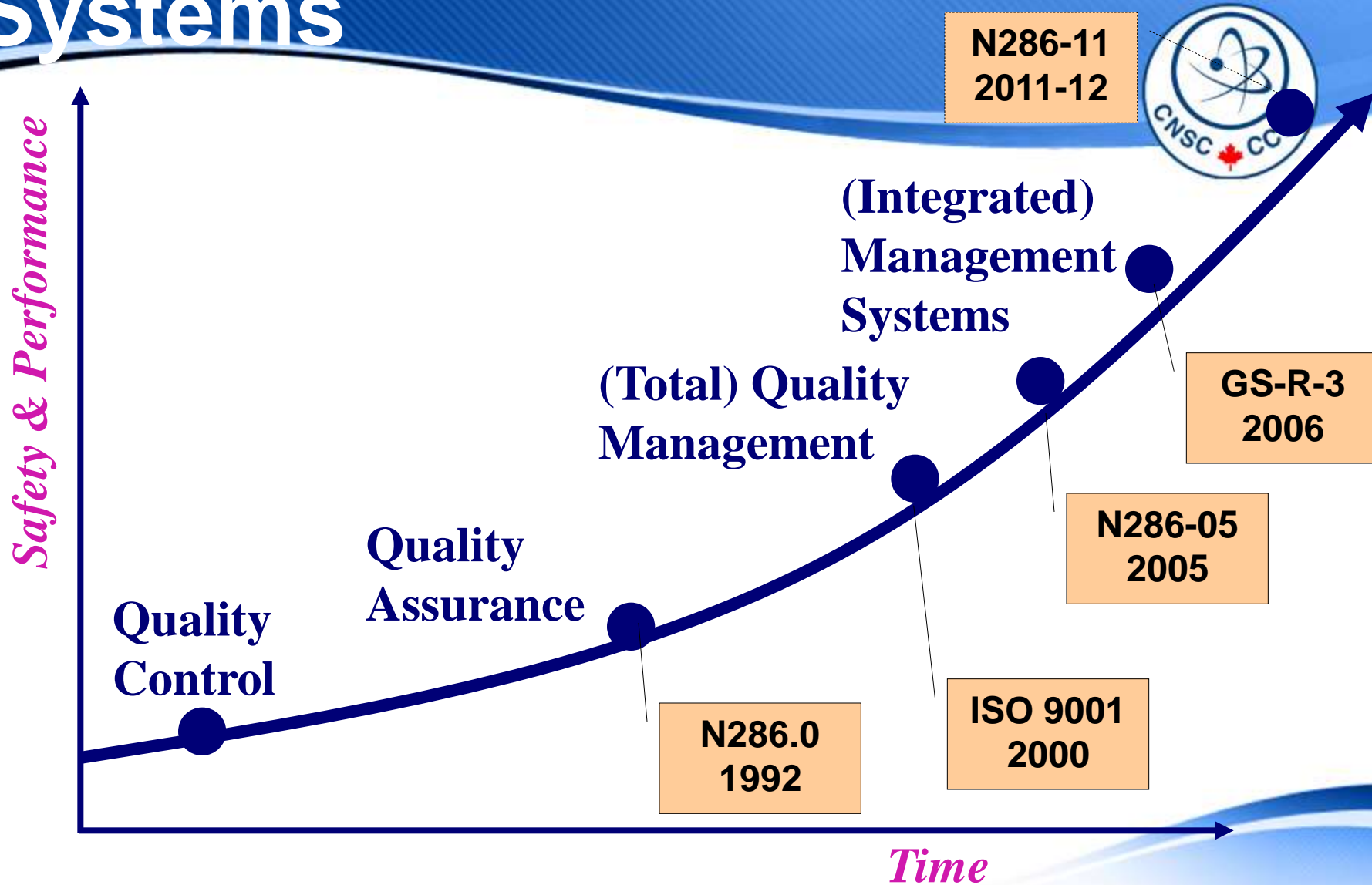
Evolution of Management Systems



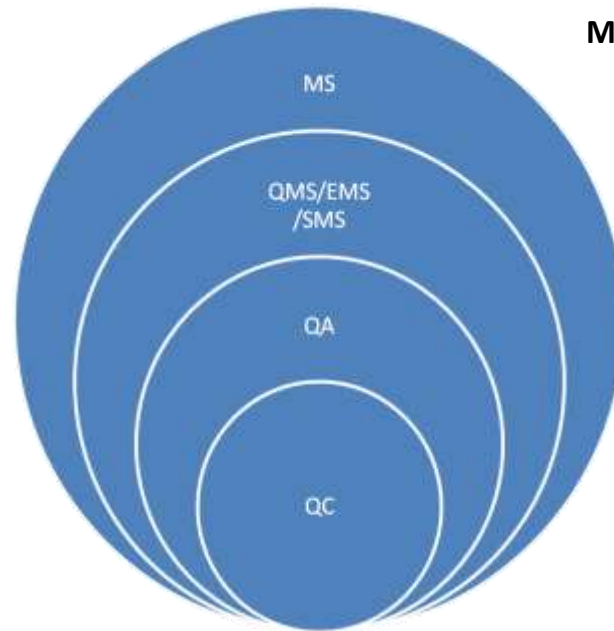
Evolution of Management Systems



Evolution of Management Systems



Evolution of Management Systems



MS program
output

Technical
program
output

Canadian Nuclear Safety Commission

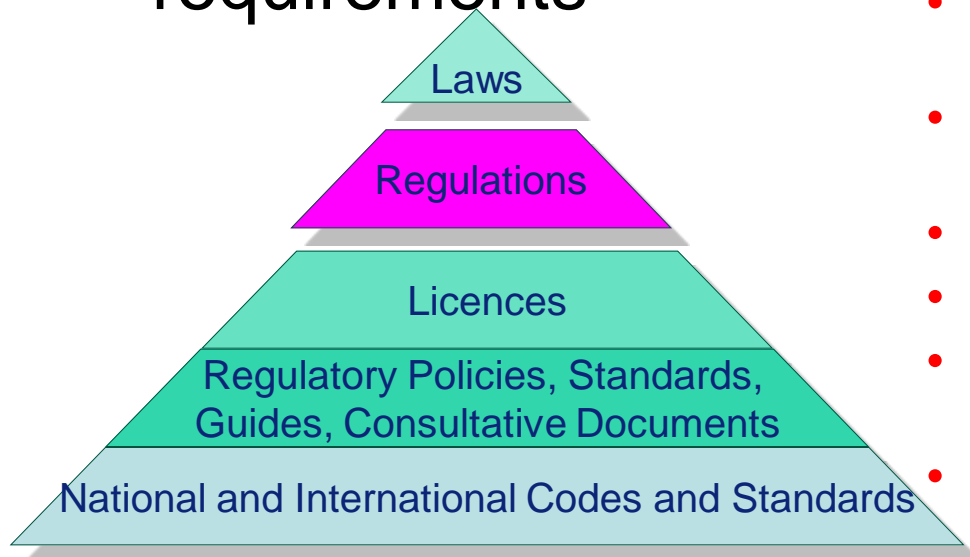


- Canada's nuclear watchdog
- Quasi-judicial body
- Independent of, but not isolated from, government
- Regulates the use of nuclear energy and materials to protect the health, safety and security of persons and the environment; and to respect Canada's international commitments on the peaceful use of nuclear energy

Regulatory Framework

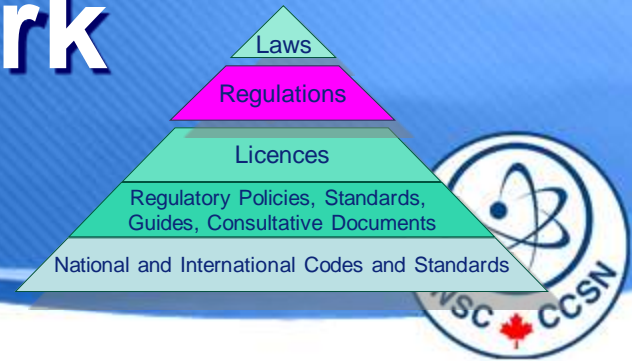


- NSCA allows establishment of regulations
- Give details of licensing process & requirements



- General
- Class I
- Class II and prescribed equipment
- Uranium Mines & Mills
- Nuclear Substances and Radiation Devices
- Packaging and Transport of Nuclear Substances
- Radiation Protection
- Nuclear Security
- Nuclear Non-Proliferation Import and Export Control
- CNSC Cost Recovery Fees

Regulatory Framework

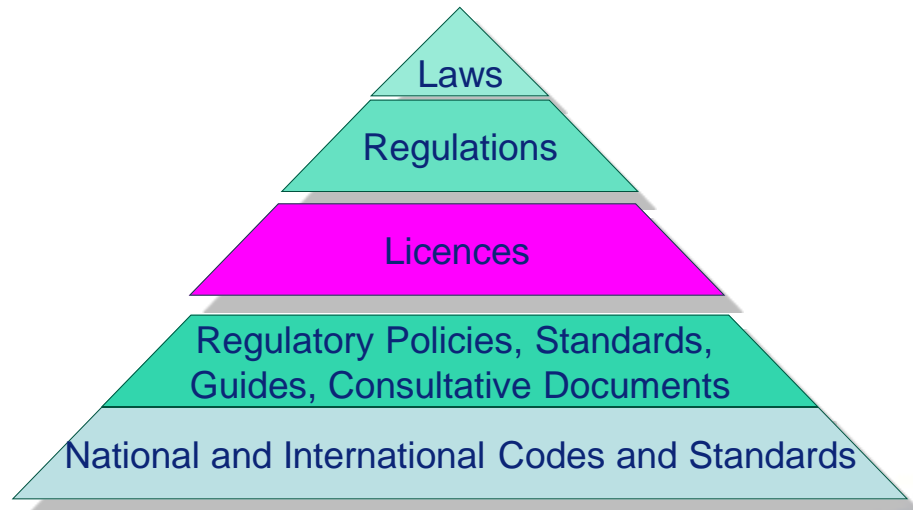


- An application for a licence in respect of a Class I nuclear facility, other than a licence to abandon, shall contain...
 - the proposed quality assurance program for the **activity to be licensed**
- The Class II Nuclear Facilities, Uranium Mines and Mills and Radiation Protection regulations have a similar clause.

Regulatory Framework



- **General Nuclear Safety and Control Regulations:**
 - defines “**licensed activity**” to mean an activity described in any of paragraphs 26(a) to (f) of the Act that a licence authorizes the licensee to carry on



Regulatory Framework



- The CNSC fully supports and recognizes the benefits of the evolution to Management System standards.
- The Nuclear Industry is actively developing Management Systems and management tools with the objective of enhancing safety and efficiency.
- It is beneficial for overall safety management due to a broader scope and senior management engagement.
- The Industry and Standards Associations are working together and leading the way in moving from separate programs, including QA, to all-encompassing Management Systems.
- A number of CNSC licensees have implemented MS, in some cases integrating Quality, Safety and Environment.
- Regulators, CNSC included, are also implementing MS.

Regulatory Framework



- Many Nuclear Regulators have adopted the IAEA guidance in GS-R-3 and have regulations requiring management systems.
- In the short term, the CNSC have requested NPP licensees to implement a Management System **via a license condition**. The Class 1 regulations have a requirement for a QA program
- In October 2008 the CNSC sent a letter to all NPP's supporting management system implementation according to N286-05
- All NPP's will be licensed to N286-05 by 2011

Evolution of the Canadian Standard- CSA N286



CSA N286.0-92 “Overall Quality Assurance Program Requirements for Nuclear Power Plants”

- This program encompasses all phases of a nuclear power plant life cycle.
- Based on a set of 16 management principles.
- This standard applies to **safety-related systems** and requires the owner to specify all equipment and activities to which it applies.
- The same intent for the second-tier standards, namely:

Evolution of the Canadian Standard- CSA N286



- **N286.1, Procurement QA for Nuclear Power Plants**
- **N286.2, Design QA for Nuclear Power Plants**
- **N286.3, Construction and Installation QA for Nuclear Power Plants**
- **N286.4, Commissioning QA for Nuclear Power Plants**
- **N286.5, Operations QA for Nuclear Power Plants**
- **N286.6, Decommissioning QA for Nuclear Power Plants**

Evolution to Management Systems



Evolution of the Canadian Standard- CSA N286



- **CSA N286-05: “Management System Requirements for Nuclear Power Plants”**
 - Management System Requirements for NPP’s (Feb 2005) Current CSA supported standard.
 - Also based on the management principles of N286.0.
 - Consolidation of N286.0 series(.1 to .6) into one document with additional focus for senior management.
 - Scope of N286-05 is broader with more focus on senior management rather than primarily the QA organization. This is desirable from a safety management performance assessment perspective.

Evolution of the Canadian Standard- CSA N286



- **CSA N286-05: “Management System Requirements for Nuclear Power Plants”**
- It has an Operational Safety Focus

*“Management of the organization is expected to develop and implement a management system that **fosters the safe operation of the nuclear power plant in all work activities** from the initial conception of a project to the decommissioning of a plant. In addition, management is expected to define and implement practices that contribute to excellence in worker performance.”*

Evolution of the Canadian Standard- CSA N286



- **CSA N286-05: “Management System Requirements for Nuclear Power Plants”**
- It introduces SAT, Risk and Business Planning concepts.
- End to end process as opposed to silo standards; closes the loop where life cycle phases co-exist.
- N286-05 is an integration of N286 series; facilitates the transition to MS integration for Canadian NPP’s.
- N286-05 includes requirements for new elements in the standard such as strategic planning, business plans and organizational design.

Evolution of the Canadian Standard- CSA N286



- **CSA N286-05: “Management System Requirements for Nuclear Power Plants”**
- It's structure provides a good framework for **integration** of regulatory requirements into core processes.
- 17 generic requirements applicable to all work activities
- 30 specific requirements, many of which are regulatory requirements (Design, Safety Analysis, Security, Emergency Procedures and Preparedness, Radiation Protection, Fire Protection, Waste Management, Effluent Control, Workplace Safety)

Evolution of the Canadian Standard- CSA N286



- **CSA N286-05: “Management System Requirements for Nuclear Power Plants”**
 - The 14 management system principles are as follows:
 - (1) The business is defined, planned, and controlled.
 - (2) The organization is defined and understood.
 - (3) Personnel are competent at the work they do.
 - (4) Personnel know what is expected of them.
 - (5) Work is planned.
 - (6) Experience is sought, shared, and used.
 - (7) Information is provided in time to the people who need it.
 - (8) The performance of work is controlled.
 - (9) The preparation and distribution of documents are controlled.
 - (10) Work is verified to confirm that it is correct.
 - (11) Problems are identified and resolved.
 - (12) Changes are controlled.
 - (13) Records are maintained.
 - (14) Assessments are performed.

Evolution of the Canadian Standard- CSA N286



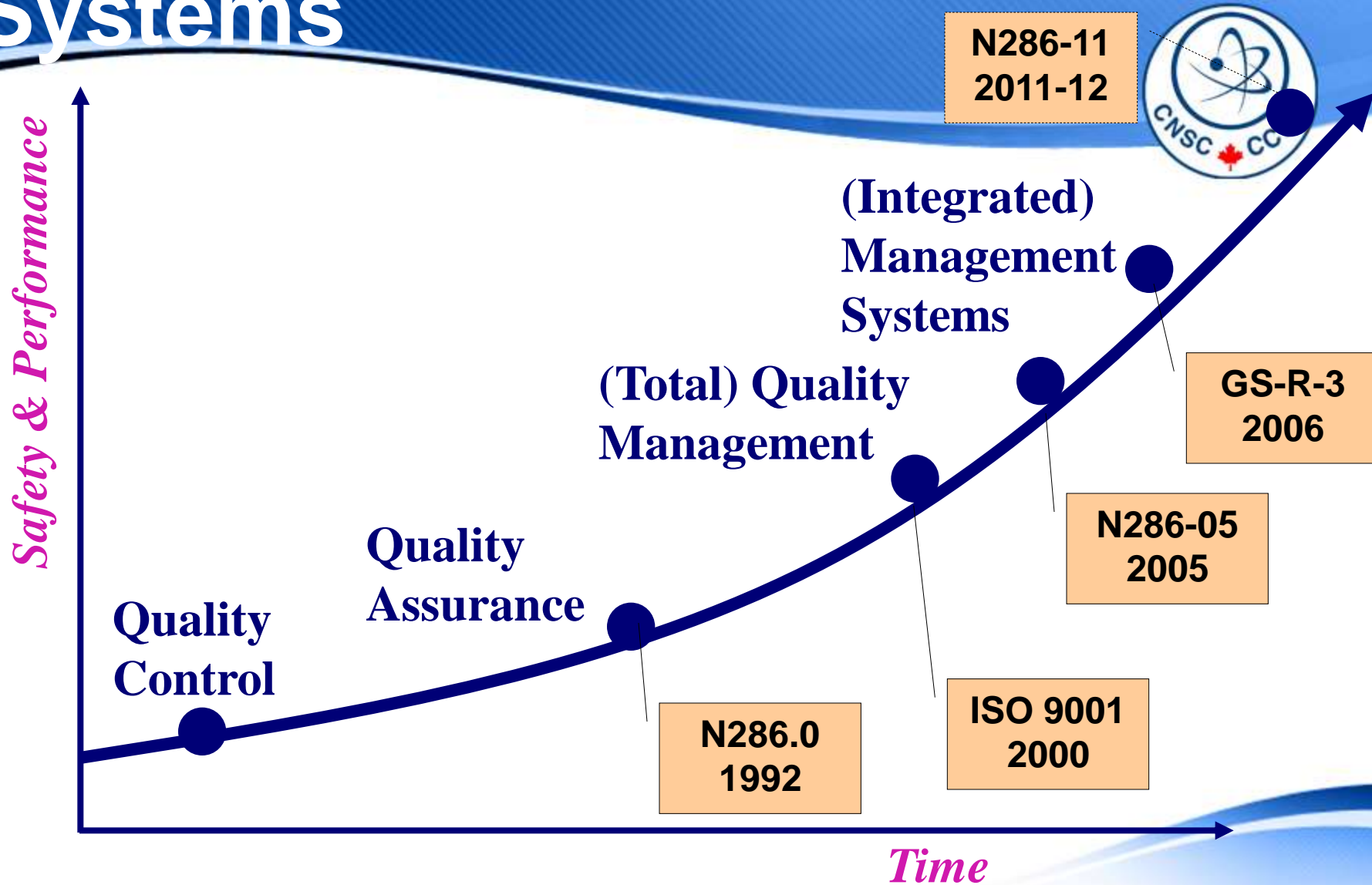
- **CSA N286-05: “Management System Requirements for Nuclear Power Plants”**
- **Note:** *The management system principles are to be used by the organization to guide activities during all stages of the nuclear power plant life cycle. **The principles apply when developing processes and when planning and performing work activities.***
- Therefore, the principles apply to all the generic requirements

Evolution of the Canadian Standard- CSA N286



- **CSA N286-05: “Management System Requirements for Nuclear Power Plants” Generic Requirements**
- 5.1 The business is defined, planned, and controlled 3
- 5.2 The organization is defined and understood 3
- 5.3 Personnel are competent at the work they do 3
- 5.4 Personnel know what is expected of them 4
- 5.5 Work is planned 4
- 5.6 Experience is sought, shared, and used 4
- 5.7 Information is provided in time to the people who need it 4
- 5.8 The performance of work is controlled 4
- 5.9 The preparation and distribution of documents are controlled 5
- 5.10 Work is verified to confirm that it is correct 5
- 5.10.1 General 5
- 5.10.2 Independence and extent of verification 5
- 5.11 Problems are identified and resolved 5
- 5.12 Changes are controlled 6
- 5.13 Records are maintained 6
- 5.14 Assessments are performed 6
- 5.14.1 Self-assessment 6
- 5.14.2 Independent assessments (including audits) 6

Evolution to Management Systems



Management Systems



Integrated Management Systems or Management Systems that integrate?

- A **management system integrates** all components/processes of a business into one coherent system to enable achievement of purpose and mission.
- A management system should integrate all currently formalised systems focusing on quality, health and safety, environment, personnel, finance, security, etc. This means that all processes and documents that describe them are integrated.
- Integrated Management is a concept whereby functional management is dispersed through an organisation so that managers manage a range of functions, i.e. a manufacturing manager would manage planning, manufacturing, safety, personnel, quality, environment, finance, etc.

Management Systems



The desire to integrate a company's management systems comes from within and usually for the following reasons:

- Reduce duplication and costs
- Reduce risks and increase profitability
- Balance conflicting objectives
- Eliminate conflicting responsibilities and relationships
- Diffuse the power system
- Turn the focus onto business goals
- Formalise informal systems
- Harmonise and optimise practices
- Create consistency
- Improve communication
- Facilitate training and development

Management Systems



- Integrated management system refers to a management system which integrates requirements into core processes.
- IAEA GS-R-3: “The Management System for Facilities and Activities” states that:

*“A Management System is a set of interrelated or interacting elements (system) for establishing policies and objectives and enabling the objectives to be achieved in an efficient and effective manner. **The Management System integrates safety, health, environment, security, quality and economic elements** to ensure that safety is properly taken into account in all activities of the organization(...)and to ensure the protection of people and the environment.”*
- CSA N286-05: “Management System Requirements for Nuclear Power Plants” states:

“Safe and reliable nuclear power plants require commitment and adherence to a set of management system principles and, consistent with these principles, the implementation of a planned and systematic pattern of actions that achieves the expected results.”

CSA N286-11 “ The Management System Requirements for Nuclear Facilities, Activities and Suppliers



- N286-11 defines the Management System as:
 - “The Management System brings together in a planned, systematic and **integrated manner all the requirements for managing the business** and the actions necessary to satisfy the requirements. **Safety is of paramount consideration in implementation of the management system.**”
 - “It is the role of Senior Management to **identify and integrate** business requirements for health, safety, environment, security, economics and product.”

CSA N286-11 “ The Management System Requirements for Nuclear Facilities, Activities and Suppliers



N286-11 Project Definition:

- To create a national standard for management systems that is internationally harmonized and integrates major business results such as safety, health, security, quality, environment and economics.
(IAEA GS-R-3 is a key seed document)
- The standard would be applicable beyond power reactors to all licensed facilities, activities, (as well as suppliers). This means beyond NPP to **other Class 1 and UMM licensees where a standard is not currently referenced.**

CSA N286-11 “ The Management System Requirements for Nuclear Facilities, Activities and Suppliers



N286-11 Structure:

- The generic requirements form the body of the standard that will apply to all users.
- Appendices being developed for the specific requirements of the different classes of licensees. (ie NPP's, Research, Manufacturing, UMM, Fuel facilities ,etc. May be useful for Class II).
- The appendices will refer to **applicable standards where appropriate** and not the basic requirements as in N286-05.
- First Generic requirement is “*Safety Culture*”.
- Introduction of “*Risk management*” as a separate requirement, not imbedded as it is in N286-05.

CSA N286-11 “ The Management System Requirements for Nuclear Facilities, Activities and Suppliers



N286-11 Structure:

- **Generic requirements**
- **4.1 Safety Culture**
- **4.2 Business Planning.....includes Risk Management**
- **4.3 Organization**
- **4.4 Resources.....financial, human and infrastructure**
- **4.5 Communication**
- **4.6 Information Management**
- **4.7 Work Management**
- **4.8 Problem Identification and Resolution**
- **4.9 Change**
- **4.10 Assessment**
- **4.11 Use of Experience**
- **4.12 Continual Improvement**

11 Technical Standards



- **N285A: Pressure Retaining Components & Systems**
- **N285B: Periodic & In-Service Inspection**
- **N286: Management System**
- **N287: Concrete Containment Structures**
- **N288: Environmental Radiation Protection**
- **N289: Seismic Design**
- **N290: Safety & Related Systems**
- **N291: Safety Related Structures**
- **N292: Waste Management**
- **N293: Fire Protection**
- **N294: Decommissioning**

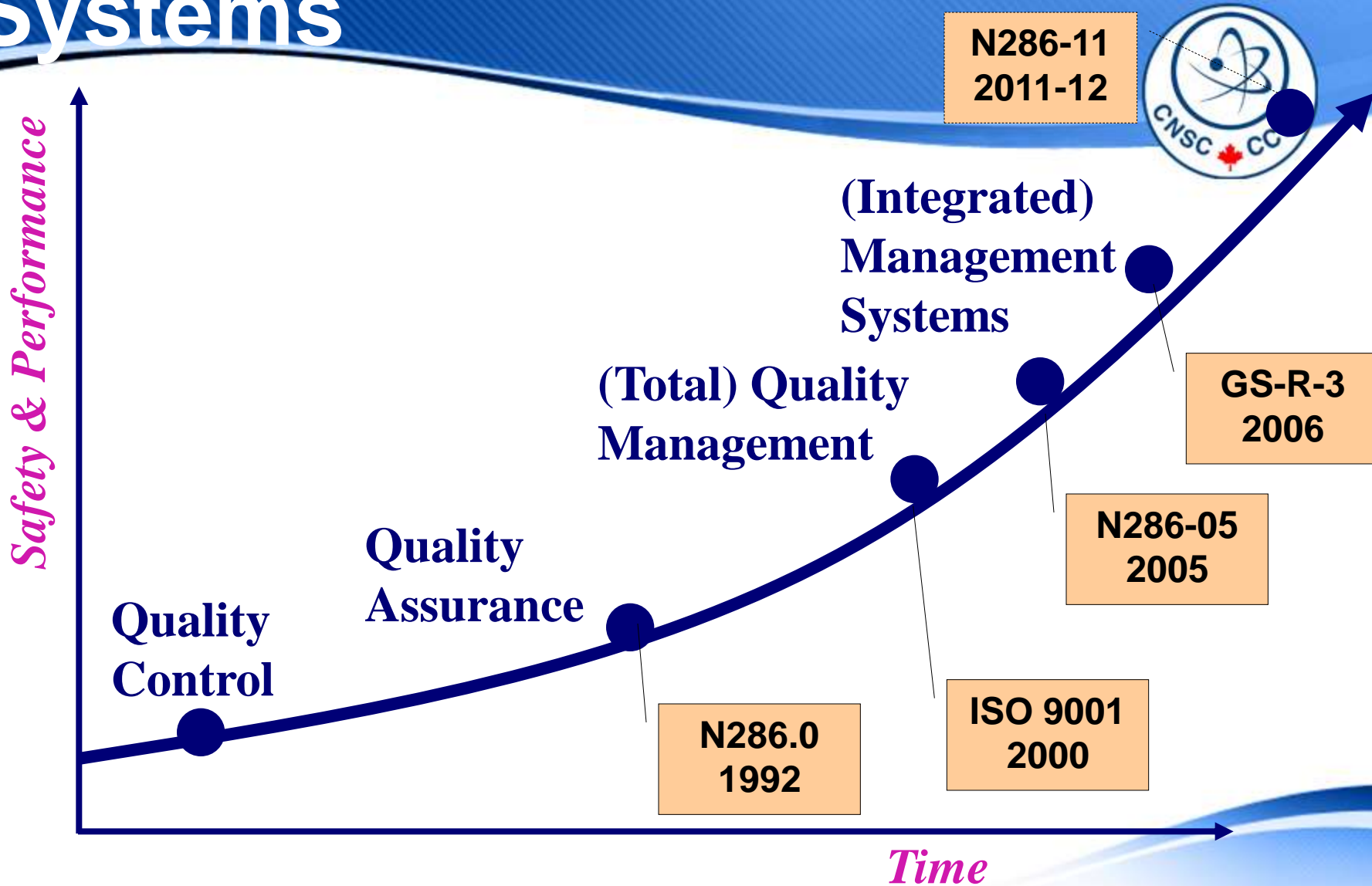
CSA N286-11 “ The Management System Requirements for Nuclear Facilities, Activities and Suppliers



N286-11 Structure:

- Application Guide will be prepared once standard is accepted by the CSA N286 Technical Committee.
- One part of the guide will be on a graded implementation of Management Systems for various classes of licensees
- N286-11 has the potential to be an **industry leading standard** as it will improve on IAEA guidance and be an all-inclusive document for Class 1 licensees. (the IAEA has numerous application guides for GS-R-3)

Evolution to Management Systems



CSA N286-11 “ The Management System Requirements for Nuclear Facilities, Activities and Suppliers



N286-11 Communication Strategy:

- The CSA N 286 Steering-Committee has met with senior management at NPP's, UMM , Research and Fuel Fabrication licensees to brief them on the current status of N286-11, “*The Management System Requirements for Nuclear Facilities, Activities and Suppliers*”
- Many favourable comments indicating understanding of benefits balanced with appropriate concerns
- A good cross section of Class 1 licensees as well as CNSC representatives participate on 3 CSA N286 groups
- Public review (CNSC, Licensees, Public) September 2010, publication in 2011/2012.

CSA N286-11 “ The Management System Requirements for Nuclear Facilities, Activities and Suppliers



N286-11 Communication Strategy:

- Many Class 1 licensees are getting some orientation to N286-11 so they may provide informed feedback through the public consultation process. Those on the Technical Committee have had one opportunity already.
- More orientation is being done at industry venues(i.e. Management System industry peer group, conferences etc.) or CSA meetings
- This will facilitate a transition to management systems for non-NPP Class 1 licensees

Key Messages



- The CNSC is adopting international best practices and moving forward with the licensing and compliance activities for licensee management systems, starting with Nuclear Power Plants
- The CNSC and licensees recognize the benefit of implementing management systems and the positive impact on safety management performance
- The CSA N 286-05 standard “Management System Requirements for Nuclear Power Plants” implies the integration of specific program requirements into the management system and is a good transition standard to CSA N286-11

Key Messages



- CSA N286-11 “ Management System Requirements for Nuclear Facilities, Activities and Suppliers” will be an improvement over internationally recognized standards such as the IAEA’s GS-R-3 and will further emphasize the focus on safety.
- The CSA Technical and Steering Committees have improved the communication strategy for these standards which will help facilitate feedback, understanding and implementation
- The CNSC will soon develop a regulatory strategy for the implementation of management system requirements for non-NPP Class 1 licensees

Acknowledgements



- **The CSA Technical Steering Committee for N286**
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- **The Management Systems Division, CNSC**



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Thank You !

Questions ?

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