The Application of Systemic Safety for Smaller Nuclear Installations

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Topics

- Development of ARPANSA's holistic approach
- Holistic Characteristics
- Promotion of the concept
- Inspection Programme
- Communication and Transparency

Small Nuclear Installations - Graded Approach

- Examples include: research reactors, nuclear pharmaceuticals production plant, waste management, radiation apparatus
- Have different range of safety risks
  - lower, more localised, inherent hazards
  - greater adaptability - more changes
  - usually government/public sector (not private)
  - different staffing/stakeholder pressures
- Less regulatory burden justified
- Less intrusiveness warranted

GSR Part 2 <u>requires</u> consideration of the interaction between technical, human and organisational factors

Development of the ARPANSA Holistic Safety Approach

Common Contributing Causes of Accidents[1]

- Leadership
- Operati... ...behaviours
- Organ... ...environ...
- Competenc...
- Risk assessment and management
- Oversight and scrutiny
- Organisational learning
- External regulation

Holistic
Safety

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- Designed to reduce safety vulnerabilities by addressing seven key characteristics of safety

[1] Prof. Richard Taylor, University of Bristol (UK), Safety Systems Research Centre

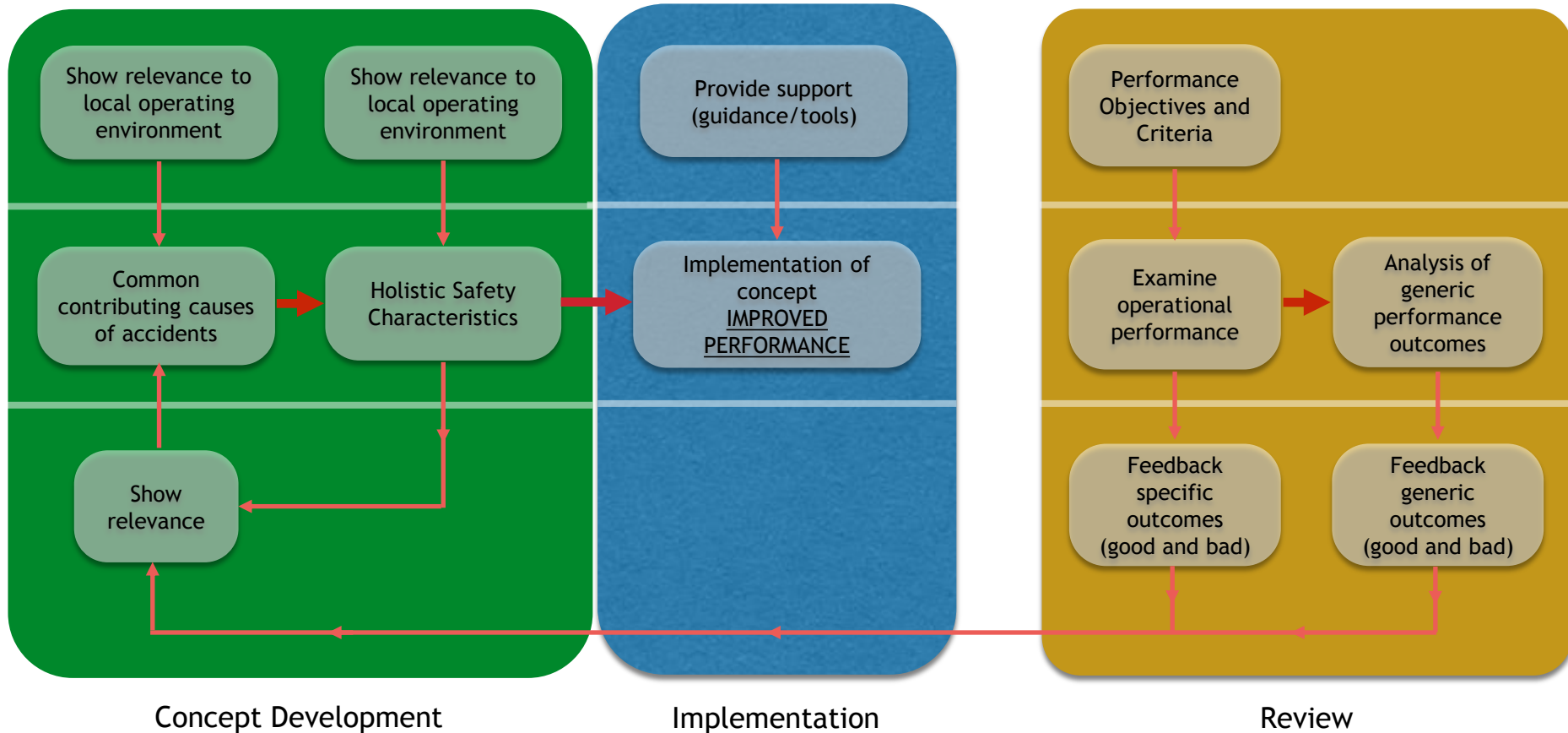- This is not a direct regulatory compliance tool

Holistic Safety Strategy

Holistic Safety Characteristics

Human Factors

1 – Human Aspects
Safe organisations take account of weaknesses and strengths in human performance

- Suitably qualified, experienced, competent people - SQEP
- Adequate training that is shown to be effective
- Accounting for Human Factors
  - In equipment and machine design
  - In process design
  - In the operating/business environment

Holistic Safety Characteristics

Human Factors

2 – Non Technical Skills

Safe organisations will possess and utilise effective non-technical skills

- Communication
- Leadership
- Team working
- Decision making
- Situational awareness

Holistic Safety Characteristics

Technological (System Structures and Components)

3 – Defence in Depth

Safe organisations will apply defence in depth throughout

- Prevent Failures – conservative, proven, quality, design
- Maintain desired operational states and detect failures
- Protect from DB accidents – safety systems
- Limit progression of an accident by design
- Mitigate consequences of BDB accidents (emergency management)

Holistic Safety Characteristics

Organisation and Cultural Factors

4 – Management System

Safe organisations integrate safety and environmental protection seamlessly.
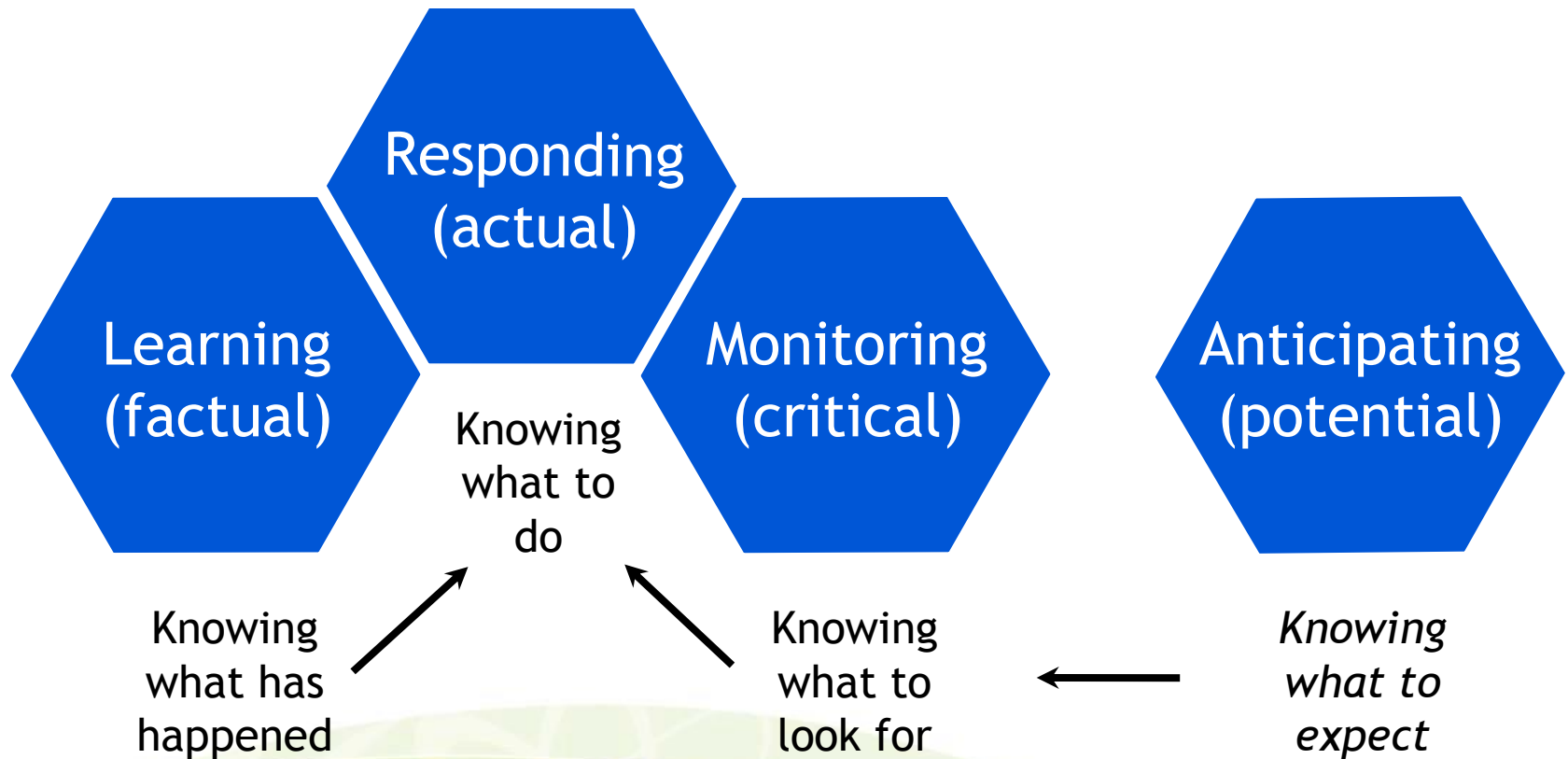
- Safety and environmental protection processes are fully integrated in the business management system
- All business activities consider implications for safety and environmental protection.

Holistic Safety Characteristics
5 - Resilience

Responding
(actual)

Learning
(factual)

Knowing
what to
do

Monitoring
(critical)

Anticipating
(potential)

Knowing
what has
happened

Knowing
what to
look for

*Knowing
what to
expect*

Holistic Safety Characteristics

Organisation and Cultural Factors

6 – Safety Culture

A safe organisations will at all levels possess shared values and beliefs for safety that produce behavioural norms that provide an appropriate and demonstrable attention to safety.

- Safety and security are clearly recognised values
- Leadership for safety and security is clear
- Accountabilities are clear
- Safety and security are integrated into all activities
- Safety and security is learning driven
- Integration across organisational boundaries

Holistic Safety Characteristics

Organisation and
Cultural Factors

7 – Protective Security and Nuclear Security Culture

Organisations with a good security culture will at all levels possess shared characteristics, attitudes and behaviours which serve as a means to support and enhance security

- Security Management is informed and integrated

Holistic Safety Guidelines

- We socialise our holistic expectations (meetings, conferences, forums, workshops, internet)

- ARPANSA expects licence holders to address the holistic characteristics and attributes (graded)

- Baseline inspections examine performance against our holistic characteristics through cross cutting performance objectives and criteria

- We also have the ability to undertaken augmented and thematic inspections

- We promote learning across our stakeholders based on our inspection findings (strengths and vulnerabilities)

Our aim is to assist licence holders to identify and shore up any safety or security vulnerabilities

Holistic Safety Sample Questions v1

A sample of questions that can be used in conjunction with the Holistic Safety Guidelines

Holistic Safety Guidelines v1

OPERATIONS SERVICES
OS-LA-SUP-240U
November 2012

ARPANSA's Inspection Programme

- Major review of inspection practices recently undertaken
- Emphasis on openness, clarity, reliability, and efficiency

- Inspection practices must support:
  - Emphasising licence holder responsibility to safety and security
  - Open and transparent stakeholder communication
  - Take actions that are proportionate to risks
  - Fostering a healthy, robust safety culture
  - Risk informed licensing, inspection and compliance activities
  - appropriate enforcement activities

- ARPANSA strives to:
  - Avoid unnecessary interventions
  - Communicate with licence holders clearly and effectively
  - Take actions that are proportionate to risks
  - Use a streamlined and co-ordinated approach compliance to oversight
  - Remain open and transparent
  - Perform frequent self assessments

Australian Government
Australian Radiation Protection and Nuclear Safety Agency

ARPANSA
Protecting people and the environment
from the harmful effects of radiation
REGULATORY
DELIVERY MODEL

Regulatory Services
December 2015

Inspection Performance Objectives and Criteria

Performance Reporting
Verification (BM 1)

Configuration Control (BM 2)

Inspection, Testing, and
Maintenance (BM 3)

Training (BM 4)

Event Protection (BM 5)

Security (BM 6)

Radiation Protection (BM 7)

Emergency Preparedness and
Response (BM8)

ARPANSA Facility
Performance
Objectives and Criteria

Safety Culture (CC 1)

Human Performance (CC 2)

Performance Improvement (CC 3)

- The resources applied are graded on the inherent risk of facility:
  – inspected on between 1 and 8 baseline modules in a single inspection
  – all cross cutting modules

List of baseline modules and
cross cutting inspection areas

15

Inspection Performance Objectives and Criteria

CC 1.6.1 - There is good communication and cooperation on safety and security matters across the entire organisation (taking into account any special security considerations).

CC 1.6.2 - An independent safety group, reporting directly to the CEO, exercises real powers to investigate and intervene across the organisation.

CC 1.6 - Integration across organisational boundaries - There are systems and a willingness across the organisation to work together in order to improve safety. A central safety group co-ordinates this effort and has real powers of intervention to enact improvements.

CC 1.5.1 - Questioning Attitudes - Questioning attitudes prevail at all organisational levels. Lateral thinking is encouraged and engaged. Distancing through differencing is discouraged.

CC 1.5.2 - Normalisation of Risk - Past success does not lead to complacency about risks or the normalisation of unsafe activities.

CC 1.5.3 - Open Reporting of Deviations takes place when something unexpected occurs, even when the outcome is good. Learning is facilitated an ability to recognise and diagnose deviations, the formulation of effective solutions and the review of modifications.

CC 1.5.4 - Organisational and operating experience is utilised in the development of training programs. The effectiveness of training is assessed in the workplace.

CC 1.5.5 - Learning from External Experience - Training needs take account of external lessons in similar industries.

CC 1.5.6 - Safety and Security Performance Indicators are used to track, trend and evaluate performance. Results are acted on.

CC 1.5.7 - Development of Individual Competencies - Processes are used to systematically develop individual competencies that take account of developing operational knowledge and experience.

CC 1.5 - Safety is learning driven - Good levels of organisational curiosity are present. People at all levels make efforts to understand, learn and share operational experience. performance indicators are used to evaluate actual performance. The reason for any deviation from an expected outcome is sought, where warranted by investigation and analysis.

CC 1.4.1 - Safety and Security is part of each business activity. It is evident that all business areas understand the impact that they have on safety and security.

CC 1.4.2 - High Standards of Documentation, Procedures and Instructions are maintained throughout the organisation.

CC 1.4.3 - Knowledge and Understanding of Work Processes - Individuals of the necessary knowledge and understanding of work processes affecting them. Leaders have wide awareness of work processes.

CC 1.4.4 - Factors affecting Motivation and Job Satisfaction are given due consideration. Good working conditions exist in regard to production pressures, workloads and stress.

CC 1.4.5 - There is Cross Functional and Interdisciplinary cooperation and teamwork.

CC 1.4.6 - Commitment to Excellence is Evident including through housekeeping and material conditions.

CC 1.4 - Safety and Security is integrated into all activities - Considering the safety and security implications of work is a routine process which is undertaken daily as normal business. This routine is reinforced through organisational policies and procedures.

CC 1.3.1 - Responsibility for Safety - It is acknowledged that the ultimate responsibility for safety lies with the licence holder (rather than the Regulatory, Contractor or other service provider).

CC 1.3.2 - Delegation of Responsibility - Management delegates responsibility with appropriate authority establishing clear accountabilities. Ownership of safety and security is evident and understood at all levels.

CC 1.3.3 - There is a high level of Compliance with procedures and instructions. Deficient proceeds and instructions are identified and corrected promptly to meet safe and secure operational needs.

CC 1.3.4 - Reporting of Deviations. Where there is a deviation from procedures, it is reported, risks are assessed and the procedures are updated (where appropriate in a timely manner).

CC 1.3 - Accountability for safety and security is clear - Workers at all levels of an organisation understand and accept their responsibilities for safety and security. Accountabilities are documented in everyday procedures and instructions. The special nature of nuclear safety and radiation protection is reflected in the quality of work activities.

Change Management processes are followed when a difficulty is encountered with procedure or instruction. Un-authorised and long term deviation from an approved procedure is not tolerated.

Management and workers strive to understand the unexpected - The reporting of deviations is undertaken for good as well as bad outcomes and investigations are undertaken where appropriate (organisational curiosity).

CC 1.1 - Safety and security are clearly recognised values - The importance of safety and security is apparent in all business undertakings even when there is no apparent direct link. Safe and secure operations are socially accepted.

CC 1.1.1 - Priority to Safety - Documentation, Communications and Decision Making demonstrate that a high priority is given to safety and security

CC 1.1.2 - Business Plans show the importance of safety and security.

CC 1.1.3 - Considerations in Resourcing - Safety and security is a primary consideration in the allocation of resources. There is a proactive and long term approach to safety and security.

CC 1.1.4 - Safety and Production go Hand in Hand - Individuals at all levels are convinced that safety and production are mutually supportive.

CC 1.1.5 - Safety and Security Conscious Behaviour is socially accepted and supported (both formally and informally) throughout the organisation.

Safety Culture (CC1) - The organisation has, at all levels, shared values and beliefs for safety that produce behaviour norms which provide an appropriate and demonstrable attention to safety.
Reference: REG-INS-SUP-280Q - December 2015

CC 1.2 - Leadership for safety and security is clear - Leaders have personal qualities, behaviours, styles and strategies that inspire, motivate and support other team members to achieve safe and reliable operations. Leaders establish, support and reinforce high standards of safety excellence to meet team objectives using international best practice safety standards. Leaders monitor safety and take prompt intervention at signs of declining or poor performance.

CC 1.2.1 - Leaders always demonstrate real commitment to safety and security. This commitment is recognised by workers at all levels. Leaders always model safe and secure behaviours.

CC 1.2.2 - Commitment to Safety and Security is evident at all levels of management. Management are involved in safety and security related activities.

CC 1.2.3 - Conservative Decision Making - Leaders provide informed questioning and strong oversight for safety and security and clearly and visibly support conservative decision-making.

CC 1.2.4 - Leadership ensures that safety and security is not just on paper - safe practices are followed even when difficult or inconvenient.

CC 1.2.5 - Communication and Openness - Management shows a continual effort to strive for openness and good communication throughout the organisation (both vertically and horizontally) whilst being mindful of the need to maintain appropriate security practices. Management seeks the active involvement of individuals in improving safety and security.

CC 1.2.6 - Acceptance of Good and Bad News - Management is receptive and seeks out operational information, both good and bad.

CC 1.2.7 - Relationships with Workers - Relationships between managers and workers are built on trust.

CC 1.2.8 - Criticism is Welcomed - Management objectively and constructively welcomes constructive criticism from both internal and external sources.

CC 1.2.9 - Perverse Incentives are Avoided - Leadership recognises the potential for perverse incentives.

CC 1.2.10 - Leadership Takes Account of Synergies between Safety and Security and recognises potential conflicting requirements. Leaders foster an approach that integrates safety and security in a mutually supporting manner.

Promotion of Safety and Security - Leaders look for new ways to better promote safety and security in the workplace.

Leadership Knowledge - Leaders have good understanding of how work is planned and how it is undertaken.

Leadership Training - Leaders receive basic training in the work being undertaken. Leaders participate in EPR training and exercises.

Collaboration is Encouraged between management and workers.

Reporting Practice - Leaders actively seek information on safety and security threats and vulnerabilities and deviations.

Safety and Security is a Meeting Topic - Leaders discuss safety as a normal part of business meetings.

Workers consider Leaders to be Approachable of all safety and security topics.

Inspection of Cross Cutting Areas

- All Inspectors are expected to cover the cross cutting areas of Safety Culture, Human Performance and Performance Improvement

- Inspections are very carefully planned for all inspection areas

- The role of the Inspection Team is to identify performance deficiencies in all areas inspected including the cross cutting areas.

- Additional "augmented" inspections can be used where there are concerns.

- Augmented Inspection Teams can include human and organisational safety specialists and specialist consultants where needed.

Analysis of Inspection Findings

- ARPANSA undertakes a range of regulatory follow up from each inspection.
- In addition ARPANSA:
  - conducts collective analysis of inspection outcomes including against the holistic characteristics
  - Shares information on common trends (non-identified)
  - Shares information on good practices
  - Undertakes surveys and reviews of the effectiveness of its inspection programme

ARPANSA aims to continuously improve practices throughout our licence holder community. Holistic safety is key principle in this improvement.

Performance Deficiencies

Performance Deficiencies

Performance Deficiencies

- Leadership issues
- Operational attitudes and behaviours
- Organisational (business) environment
- Competence
- Risk assessment and management
- Oversight and scrutiny
- Organisational learning
- External regulation
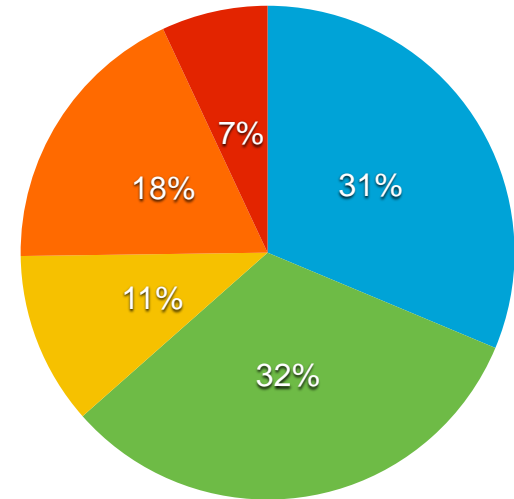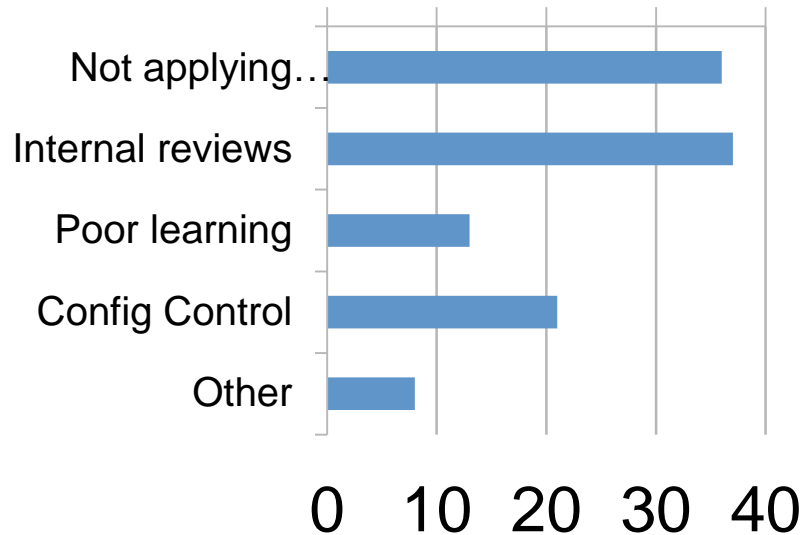
Bar chart categories: Not applying…, Internal reviews, Poor learning, Config Control, Other. X-axis: 0 10 20 30 40
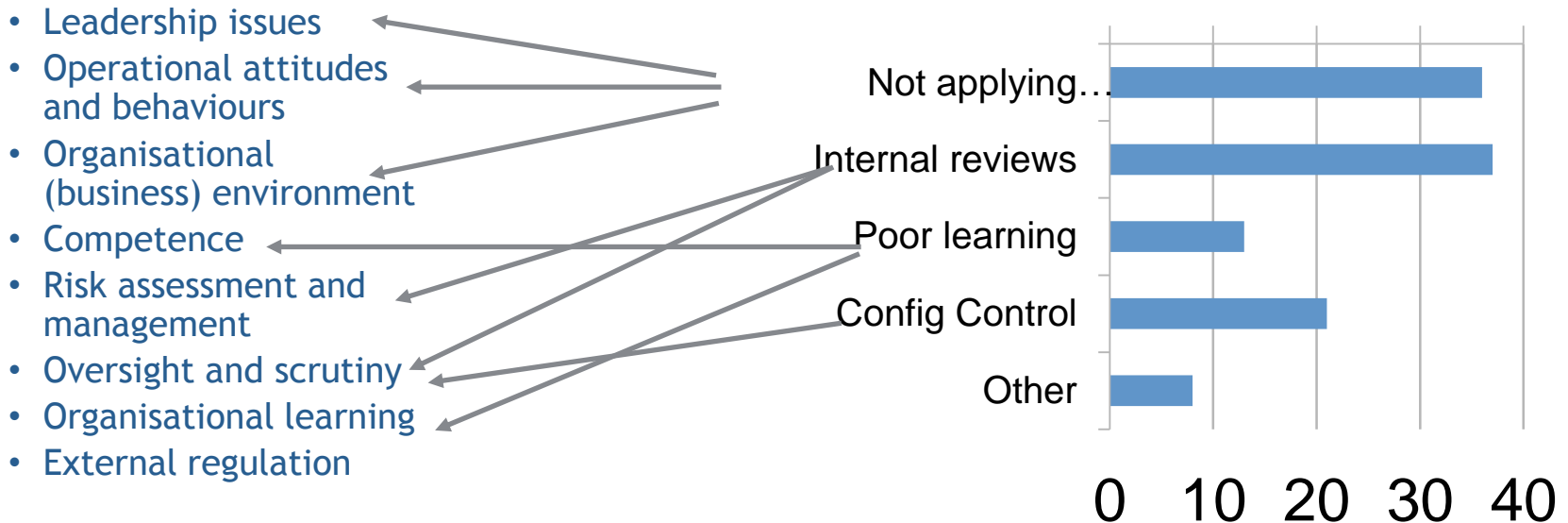
We can start to link common themes to vulnerabilities. This can present a powerful argument to bring about improvement.

Information on the ARPANSA Website

To encourage an holistic approach and in the interest of transparency there is extensive information on the ARPANSA website

Summary

- ARPANSA's holistic approach fits well with IAEA requirements and the methods used by many other nuclear operators and regulator.

- ARPANSA continues to co-operatively promote the holistic approach to its licence holders.

- ARPANSA has now incorporated the holistic characteristics into inspection performance objectives and criteria.

- Analysis of inspection findings can be linked to weaknesses associated with common contributing causes.

- ARPANSA will continue to adapt and improve its approach to holistic safety to its licence holders.

THANK YOU

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ARPANSA's Holistic Safety Webpage
www.arpansa.gov.au/Regulation/Holistic