



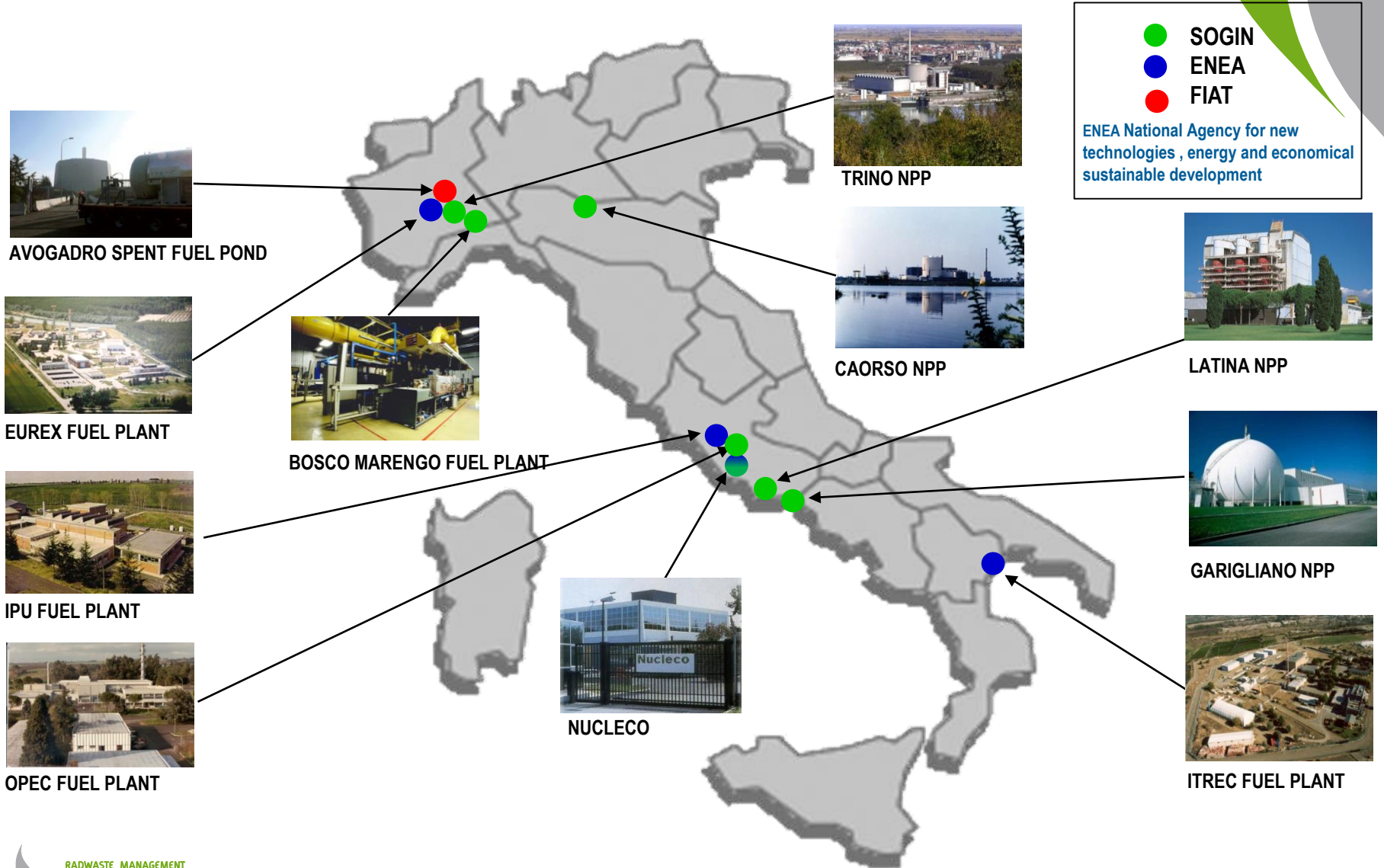
TRAINING METHODOLOGIES FOR SAFETY AND SECURITY CULTURE CONTINUOUS IMPROVEMENT

Carlo Rusconi, PhD

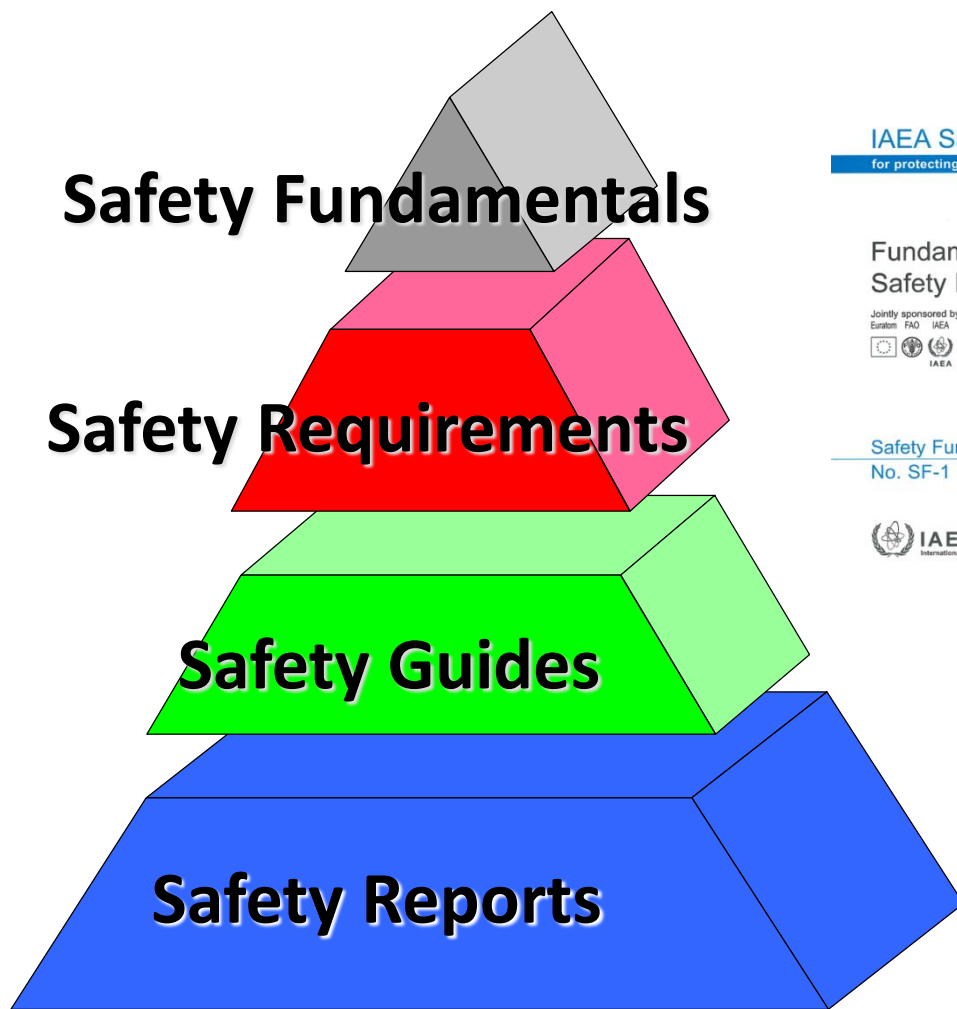
**2nd International CBRNe Workshop
"IW CBRNe 2015"**

- The Radwaste Management School (RMS) is the training centre of Sogin Group. It ensures high-level professional development and fosters management and technology innovation based on field experiences and nuclear safety and security expertise. By means of technical know-how Sogin has become a key player in the national and international nuclear industry
- RMS has been operating since 2008, providing education and training to the staff of SOGIN Group and external companies, in accordance with international safety and security standards and requirements established by the Italian Institutions. In this way, RMS guarantees the highest levels of safety and security in the field of decommissioning and radioactive waste management

Facilities under the SOGIN responsibility



- In the nuclear field, safety and security training has a key role to ensure safety and security standards
- The School operates for SOGIN human resources training and offers the same training service to other external organizations, institutions and companies
- In the safety field, the school provides specific courses on safety analysis and safety culture according to Italian Decree 230/95 on Radiation Protection and Nuclear Safety
- In the security field, the school is used for the periodic training (required by the Italian law DPCM July 22, 2011) of the personnel with security clearance
- Safety and security courses held at the School are open to the participation of institutional personnel



IAEA Safety Standards

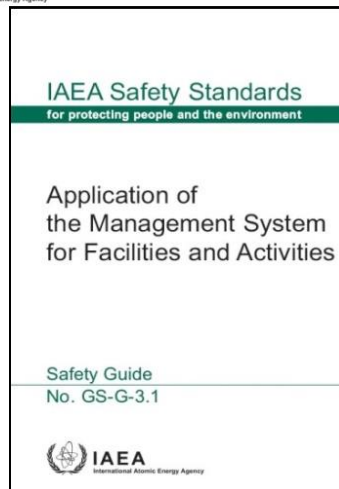
for protecting people and the environment

Fundamental Safety Principles

Jointly sponsored by
Euratom IAEA ILO IMO OECD/NEA PAHO UNEP WHO

Safety Fundamentals

No. SF-1



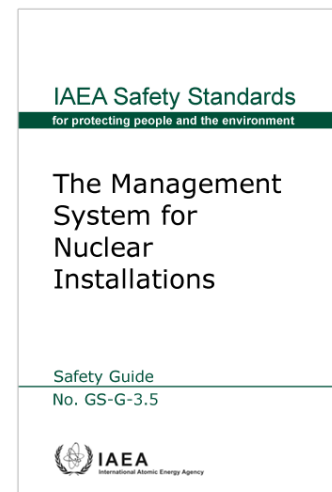
IAEA Safety Standards

for protecting people and the environment

The Management System for Facilities and Activities

Safety Requirements

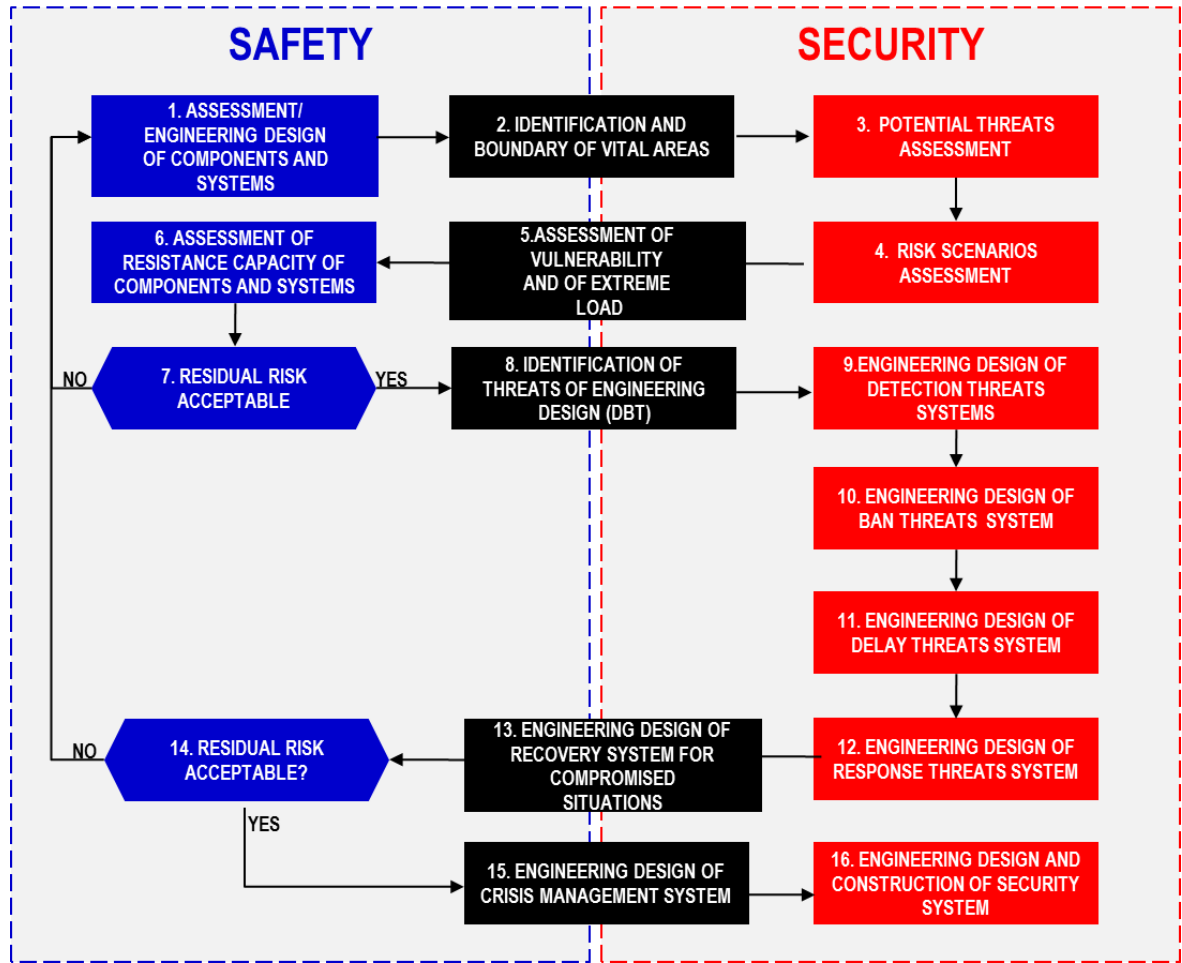
No. GS-R-3



- Security of nuclear plants and materials is the subject of a series of publications known as the IAEA **Nuclear Security Series**, which began in 2006 and are divided into the following categories:
 - **Fundamentals**, with objectives, concepts and principles of security in the nuclear field and the technical basis for recommendations regarding security.
 - **Recommendations**, with the description of best practices of intervention proposed for adoption by member countries in implementation of the "Nuclear Security Fundamentals".
 - **Implementing Guides**, with processing of detail in the "Recommendations" in particular areas of application and appropriate measures for their proper implementation.
 - **Technical Guidance**, with detailed descriptions of the methods of implementation of the surveillance and physical protection.
- The last category (Technical Guidance) is the closest to application of the measures of physical protection and is further divided as follows :
 - **Reference Manuals**, with detailed measures and instructions for the application of the "Implementing Guides" in specific fields of activity;
 - **Training Guides**, with manuals and instruction documents used in the IAEA's training courses in the field of nuclear security
 - **Service Guides**, with guides on the conduct and the goals of the IAEA's inspective missions related to security policy in the nuclear field

Design of a Nuclear Safety & Security System

- The design of a physical protection system requires a tight integration between safety and security features
- Specific prevention measures as detection, “freeze”/denial, “time of grace”/delay are adopted for both aspects



Protection of people, public health and environment is the common goal of safety and security policies and strategies.

Differences and analogies between safety and security are key points to optimize technical, organizational and training actions

SAFETY

- **Elements of risk scenario**
 - Hazards/accidents→DBA
 - Initiating events (natural ones, technical failures, human errors)
 - Barriers (physical and organizational ones)
 - Targets

SECURITY

- **Elements of risk scenario**
 - Threats→DBT
 - Triggers (internal/external, physical or cyber attacks)
 - Barriers (physical and organizational ones)
 - Targets

Definitions of safety and security culture

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

(IAEA INSAG 4)

Security culture is the assembly of **characteristics, attitudes** and **behaviour** of individuals, organizations and institutions which serves as a means to support and enhance nuclear security.

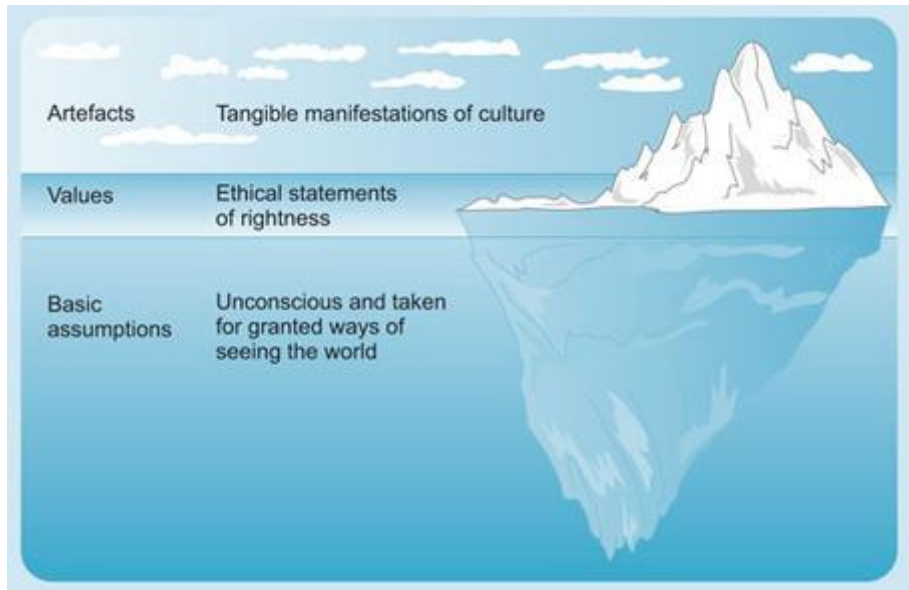
An appropriate nuclear security culture aims to ensure that the implementation of nuclear security measures receives the attention warranted by their significance.

(IAEA Nuclear Security Series No. 7)

Safety culture: An organization's **values and behaviors**—modeled by its leaders and internalized by its members—that serve to make nuclear safety the overriding priority.

(INPO 2004)

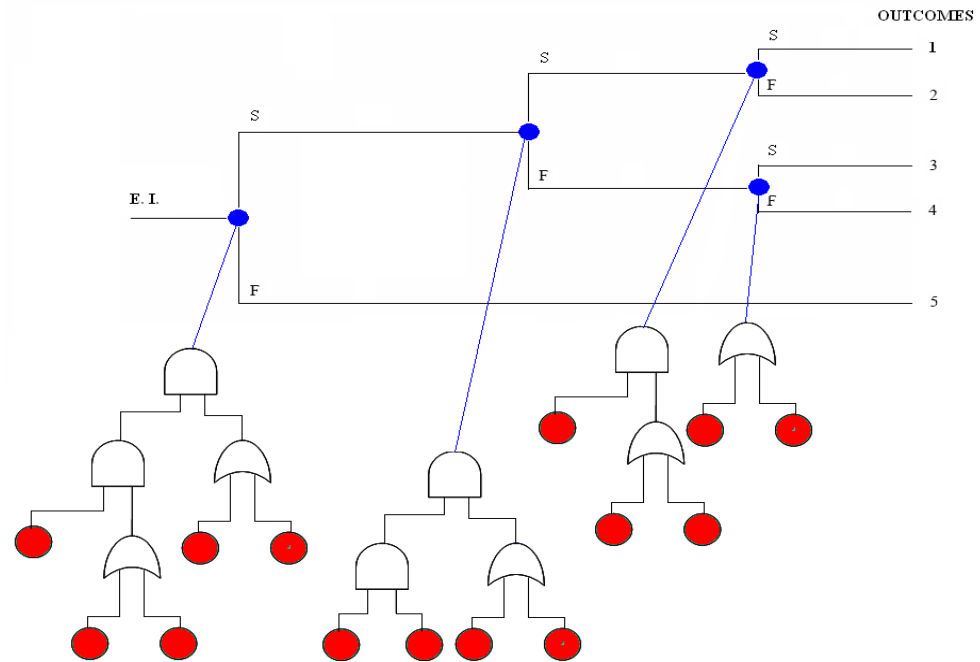
Schein's model of organizational culture



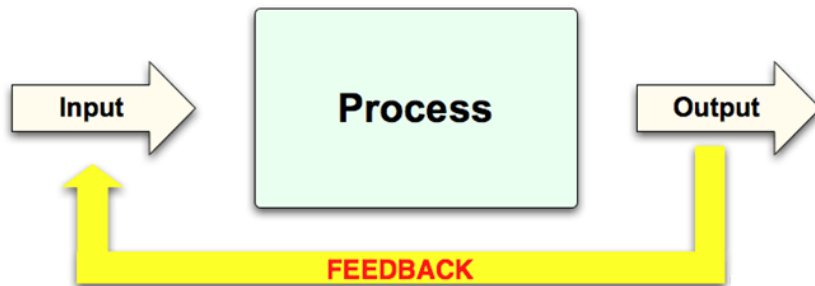
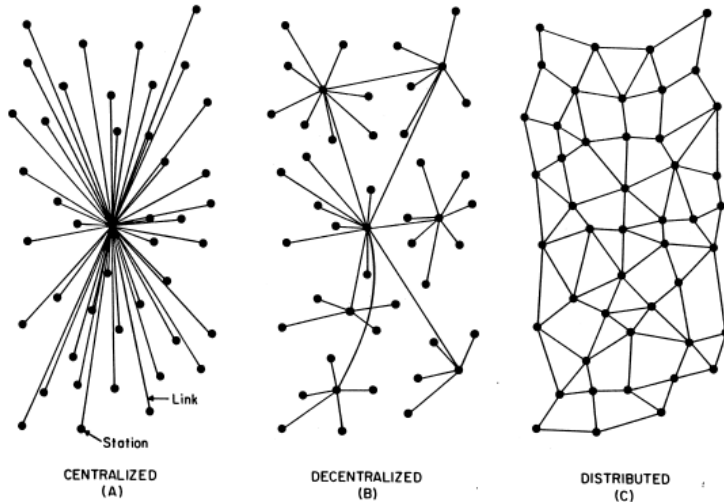
Organizational culture is the shared basic assumptions that are developed in an organization as it learns and copes with problems.

The basic assumptions that have worked well enough to be considered valid are taught to new members of the organization as the correct way to perceive, think, act, and feel. Culture is the sum total of a group's learning. Culture is for the group what character and personality are for the individual. (WANO GL 2006-02)

- The Human Factor (HF) is one of the most important and complex elements that nuclear safety and security analysis has to deal with
- Importance to link human actions to failure probabilities and integrate safety analysis methodologies (e.g. Fault Tree and Event Tree)
- In HRA methodologies the parameters, modifying failure probability distributions, represent the context where workers act



- HF, like many complex elements, has hidden but strong potentialities connected to internal dynamics
- the strong stimulus given to the integration of human, organizational and technical factors by IAEA and other organizations committed to nuclear safety & security has provided operators and regulators new methodologies for assessing and improving safety and security culture of organizations involved in industrial risk management
- Training on safety and security culture aims at enhancing knowledge and developing awareness of managers and workers about criticalities which could affect complex systems



- Complex systems often have network structures. Local changes can influence global system behavior depending on the nodes and links. Effects can appear with unforeseeable delays.
- Furthermore, complex systems contain a good amount of feedback to allow self regulation and the capacity of adapting to changes in context.
- The assessment of culture within an organization requires in-depth knowledge of its internal dynamics

- The teacher, becoming a group leader (coordinator), provides the students with “cards”, i.e. the concepts and the definitions that they will need in order to carry out simulations and role plays.
- Typical cards are:
 - Hazards and threats: in terms of physical, chemical, biological and organizational agents that represent the risk sources
 - Probability: expressed as confidence level according to subjective approach
 - Risk: expressed as a decisional variable, function of probability and damage related to adverse events
 - Risk scenario: expressed as a combination of hazards/threats, targets and exposure paths
 - Safety and security: expressed as risk control, according to operational approach
 - Other cards as human and organizational factors, context etc.

- After discussing former definitions (in particular, each worker's subjective perception of safety and security and risks), the more complex concepts of safety and security culture are introduced from IAEA documents
- This leads us to the introduction of Schein's levels of organization culture and to safety and security culture characteristics with particular emphasis on clear leadership, clear accountability and learning driven organization
- At this point of the training course participants are invited to talk about implicit and explicit aspects of their organization, focusing on:
 - Language and coding
 - Horizontal and vertical communication
 - Leadership and management
 - Statements and behavior
 - Declared values and beliefs
 - Individual and collective assumptions
 - Metaphor approach
 - Cognitive heuristics

- Case studies are analyzed according to interactive approach through simulations and role plays. At the end of the analysis session, the coordinator starts a collective brainstorming session, during which each group shares results and observations with the other groups to reach a joint conclusion.
- The analysis of the root causes of accidents is made using the following criteria for classification:
 - Technological aspects (lay-out, equipment, materials, safety and security systems etc.)
 - Human factors (motivation, qualification, skills, procedures, communication, training etc.)
 - Organizational factors (policy, management, accountability, procedures, communication, training etc.)
 - General context (i.e. related to the external environment and socio-geographical features)

- At the end of the brainstorming session, class outcomes are compared with the outcomes of experts that have carried out in-depth analyses of case-studies
- Of course, simulations do not claim to be a thorough or specialized examination but it is worth noting that the class generally identifies and classifies several causes and connections recognized by international experts.
- Simulations highlight the potentiality of brainstorming approaches and critical thinking and shows how important it is to correctly compare and integrate different points of view and backgrounds. As a result of these activities, participants learn to recognize the hidden causes that determine severe accidents, for example, lack of clear leadership and accountability, communication problems etc.

- At the end of the course, participants take part in a collective discussion in which each of them expresses his/her feelings and opinions about simulations, role-playing and interactions with the other participants and the actions he/she is thinking of taking to contribute to the improvement of his/her organization's safety and security culture.
- Here are some very interesting comments we have had:
 - “I had the chance to observe problems from different points of view, putting myself in other people's shoes” (a supply manager talking about hazard and threats recognition and case-studies)
 - “We especially enjoyed groupwork and brainstorming” (site maintenance and main office personnel)
 - “We became more and more aware of how much our decisions contribute in terms of safety and security for site workers” (procurement managers)
 - “I'm thinking about what I can do in my daily work to improve organization safety and security culture” (communication manager)

- The main goal of courses is to enhance knowledge and develop awareness of the importance of each individual's personal contribution to safety and security culture improvement among workers and managers
- It entails development of sense of responsibility and participation to safety and security issues → everyone in the organization should feel "safety and security manager" about his/her tasks and see links among different areas
- Specific technical, human and organizational aspects related to safety and security can be understood and improved only through a systemic view within the organization
 - It requires activation of good attitudes (curiosity, reflectivity, sharing and communication) and behaviors to go in depth inside the organization to change basic assumptions and internal dynamics when affecting individual perceptions, cognitive processes and group interactions in a misleading way
 - Involvement of managers and workers and of technical and administrative people gives classes the chance to interact in an actual and effective way in order to exploit team's potentialities to address complex challenges represented by safety and security culture continuous improvement

Thank you for your attention

rusconi@sogin.it

**Sharing experience
Improving know-how**