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INSC PROGRAMME

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ELSE- EUROPEAN LEADERSHIP FOR SAFETY EDUCATION

SYLLABUS

LEADERSHIP FOR SAFETY

ADVANCED TRAINING PROGRAMME

SEPTEMBER, 2024[1]

[1] The Syllabus was updated in September 2023.

Leadership for Safety Advanced Training Programme[1]

I. OBJECTIVES

This innovative advanced training programme has been developed in the frame of the European Leadership for Safety Education (ELSE) project, funded by the European Commission. Its main objectives are to (1) strengthen participants' understanding of issues related to leadership for safety in the context of complex organizations and (2) help them develop the ability to critically and knowledgeably practice leadership skills in the nuclear and radiological working environments—which are characterized by high levels of regulation and often competing objectives. Using a multidisciplinary approach that draws on the latest academic research results and including the performance of a personal project supervised by a senior expert, this advanced training programme is designed to complement existing training curricula currently provided by nuclear sector organizations such as the International Atomic Energy Agency (IAEA) and the World Association of Nuclear Operators (WANO).

The annual ELSE training cycle is composed of a 2-week, face-to-face session in September 2024 at Côte d'Azur University (UniCA, Nice France), prepared for by attending the ELSE massive open online course (MOOC) (60 hours of personal work) and followed by a personal leadership-related tutored project developed over a period of 6 months. The ELSE University Diploma is delivered after the 5-day concluding session (online), held in June 2025.

The ELSE programme is designed to:

- Expose participants to the most recent and interdisciplinary research on the topic of leadership for safety. Rather than adopting a traditional leader-centric approach, this programme focuses on leadership as a process that is embedded in collective organizational dynamics. Recent research indicates that leader-centric theories fail to explain the link between leaders' characteristics and organizational performance. The latter appears be correlated with the collective cultural traits of organizations rather than to types of leadership styles. Leadership as a process focuses attention on leadership activities that enhance the influence on and interactions with followers, to increase desirable organizational outcomes. It accounts for organizational complexity and the need to uncover mechanisms that explain the relationship between inputs (e.g., leadership-related activities) and outputs (e.g., organizational performance).
- Enhance managers' capacities for reflexivity, in particular being able to "see through" safety-related artefacts such as regulations, rules, procedures, and technological processes to identify and address safety issues effectively—as close as possible to their roots and together with their teams, management colleagues, and stakeholders.
- Prepare trainees to deal effectively with uncertainty in their work environment, thus increasing the high reliability and resilience levels of their organizations. Uncertainty itself is a source of risk that can be reduced but not completely eliminated. However, awareness of uncertainty allows organizations to maintain high levels of attention to safety in both routine and crisis situations.
- Provide a mix of academic and professional input, through lectures, exercises, case studies, personal work, feedback and debriefing sessions, and individual evaluations of progression. Trainees learn about theory related to leadership for safety and develop the practical skills they need to implement the newly acquired knowledge in their everyday work. They learn to navigate easily from concept to practice, because exercising leadership for safety requires them to alternate between "high beam" and "low beam" vision.

[1] This publication was produced with the financial support of the European Union. Its contents are the sole responsibility of its authors and do not necessarily reflect the views of the European Union.

II. DATES AND DURATION (CYCLE 2024/2025):

- Kick off online meeting, mid-April 2024: A 2-hour session to introduce the participants (about 20 trainees and the ELSE pedagogical team) and present the ELSE training organization and administration.
- ELSE MOOC attendance, April-July 2024: Preparatory online course introduces the key multidisciplinary notions related to ELSE training, with completion of the MOOC expected to require about 60 hours of online personal work.
- Two-week, face-to-face training session: 2–13 September 2024, Université Côte d'Azur, Nice, France.
- Individual current-position-related project: Part-time from mid-October 2024 to mid-April 2025, with tutoring from the ELSE project experts.
- Training synthesis and evaluation: June 2025 (attended online).

A Certificate of Attendance will be issued to all participants who attend the full programme. The "Leadership for Safety University Diploma" will be awarded by the Université Côte d'Azur (France) upon successful completion of all academic requirements (see Chapter VII below for more information).

III. WHO SHOULD ATTEND?

The ELSE training programme is intended for professionals from the nuclear sector (regulatory organizations, industry, or services) who have junior or mid-career managerial functions. Participants should be in positions that involve operational or functional responsibilities, with safety or radiological protection implications. Earlier participation in initiation courses on leadership for safety is a plus.

Good knowledge of the English language is necessary.

IV. LEARNING OUTCOMES

The training programme is focused on leadership development. Participants will:

- Acquire an in-depth comprehension of the direct or indirect implications of behaviours, organizational dynamics, and underlying beliefs and values related to nuclear-safety performance.
- Understand and reflect on the historical perspective, underlying mechanisms, and ethics of leadership for safety.
- Develop a capacity for reflexivity and learn how to effectively exercise leadership for safety in inherently complex and highly regulated nuclear and radiological environments, in both routine and emergency situations.
- Develop both multidisciplinary and international outlooks on the topic, through interactions with senior experts from different countries, by understanding the logic and principles that underlie the regulatory requirements set by the IAEA, and by engaging in lasting peer-networking opportunities.

V. PROGRAMME

The following training programme has been designed according to exchanges among more than 25 international experts, that took place during the ELSE scientific workshop in Nice, January 21–24, 2020. The exchanges and debates resulted in a consensus on the definition of the leadership for safety concept; they also helped identify key elements of the training content and the most relevant pedagogical methods. Three key points emerged:

- Leadership for safety results from an articulation of two different but interconnected key concepts: safety management (emphasizing managed safety that requires leadership processes) and leadership as a process.
- The relevant focus is not on individual leader characteristics but on the leadership process that involves exercising influence over individuals and teams.
- This influence process is embedded in complex organizational dynamics that shape the group's culture traits.

The ELSE Project has defined "leadership for safety" as "a process of influencing behaviour so it meets the expectations of safety management". As the process of influence is embedded in an organizational context, the ability to exercise this process of leadership depends on the understanding of:

- The expectations of safety management
- The organizational dynamics
- The process of influence itself (e.g., the leadership process).

Accordingly, the training is organized into three complementary and closely interconnected modules. Modules 1 & 2 take place during the 2-week face-to-face session at UniCA and build on the knowledge basis presented in the ELSE preparatory MOOC. The timetable in § VIII shows the pedagogical succession of courses, and § IX provides a synopsis for each course. Brief presentation of the lecturers can be found in § X.

Module 1 addresses key concepts and challenges of **safety managerial issues**, which are relevant to exercising leadership for safety in working environments that are characterized by high levels of risk.

In complex and "high risk" industrial organizations such as nuclear power plants, or chemical plants, safety is mainly based on "safety barriers" and a set of safety features (e.g., redundancy of equipment, preventive maintenance, reporting systems) in such a way that, if operated within its design limits and in line with prescribed procedures, severe accidents would essentially be eliminated. However, this kind of safety, also called "regulated safety", is somewhat idealistic, and insufficient, because of the difficulty to factor in all uncertainties. Research on high reliability organizations and on resilience mechanisms has shown that the intensive development of regulated safety, designed to increase reliability, can blunt the capacity of both operators and managers to respond appropriately in the case of unknown situations (i.e., any situation unforeseen by the regulated safety system). It can therefore reduce resilience, another important safety performance component. Indeed, it is now well recognized that managers are also expected to lead their team members in facing uncertain and unplanned situations, thus adding a dimension of "managed safety" to their role in implementing "regulated safety". Dealing with uncertainty is a key safety challenge in this type of environment.

Module 2 focuses on **organizational dynamics and leadership**. For each theme it presents the key concepts and key challenges which are relevant to exercising leadership for safety in working environments that are characterized by high levels of risk. More particularly, it analyses the underlying mechanisms of the leadership process, that unfold within organizations and are governed partly by social and emotional aspects of human inter-relations and partly by human–technology interactions.

According to the elements of knowledge introduced by the MOOC and those covered in Modules 1 and 2, the training gradually focuses on the practice of leadership for safety in the context of nuclear sector organizations (operators or regulatory organizations), with the help of dedicated case studies based on real-life situations.

Module 3 consists of a personal, 6-month **tutored project** on the theme of leadership for safety, developed by trainees on a part-time basis and in the context of their current professional positions. This personal project is elaborated on and followed through with the support of a referent expert provided by the ELSE Project. The project's outcome will be presented to the ELSE pedagogical team at the end of the training.

ELSE Programme Outline

1. MODULE 1: Safety management in high-risk environments

1.1 Managing Safety: current approach (key concepts)

1.1.1 Safety Management: an evolving problematic (MOOC & face to face)
1.1.2 Risk and Safety: a technical approach (MOOC)
1.1.3 Safety culture and safety climate (MOOC & face to face)
1.1.4 International safety standards in the nuclear industry: historical perspective and evolution (MOOC)

1.2 Dealing with uncertainty (key challenges)

1.2.1 Building high reliability organizations (MOOC & face to face)
1.2.2 Dealing with uncertainty in a collective manner: mindfulness, flexible rules, autonomy (MOOC & face to face)
1.2.3 Individual factors of dealing with uncertainty (MOOC & face to face)
A. Understanding Individual responses to uncertainty: a psychology outlook
B. Developing individual mindfulness

2. MODULE 2: Organizational dynamics and Leadership

2.1 Understanding organizational dynamics

Key concepts

2.1.1 Organizational structure & design (MOOC & face to face)
2.1.2 Fostering Learning in organization (MOOC & face to face)

Key challenges

2.1.3 Paradoxes and tensions (MOOC & face to face)
2.1.4 Uncertainty, complexity, and organizational limits: implications for safety (MOOC & face to face)

2.2 Leadership as a process of influence

Key Concepts

2.2.1 Leadership: definition and historical evolution of key concepts for safety (MOOC & face to face)
2.2.2 Mechanisms and practices of leadership as process (MOOC & face to face)

Key challenges

2.2.3 Developing leadership for safety (MOOC & face to face)
- Mechanisms and practices of leadership for safety
- Leadership for safety in the nuclear sector context

2.2.4 Global approach to risk management (MOOC & face to face)

3. MODULE 3: Developing effective leadership practices for improving safety in the nuclear sector

3.1 Personal project

3.1.1. Application of knowledge acquired in Modules 1 and 2 to identify and implement new leadership practices for improving safety in trainees' organizational context

3.1.2. Written report

3.2 Oral presentation of results

VI. PEDAGOGICAL METHODS

PREPARATORY ELSEMOOC

This MOOC is developed by the ELSE international pedagogical team, in cooperation with the Applied Sciences Institute of Toulouse (INSA Toulouse, France). It is composed of four "units" that introduce and illustrate the context, key concepts and challenges of safety management and leadership in high-risk industries. It takes about 60 hours to cover these four units. This MOOC is freely available online through INSA web platforms (https://seamonline.insa-toulouse.fr/mod/page/view.php?id=5965). The ELSE MOOC includes a "logbook" to be used by students for registering their personal notes as they go through the course. The attention of ELSE diploma trainees is drawn to the importance of this logbook; the lectures, exercises, and dialogue with attendees during the ELSE face-to-face training will refer regularly to the MOOC contents and to the trainees' personal input.

ELSE MOOC attendance is sanctioned by a certificate of attendance, which will be required at the opening of the ELSE face-to-face course.

COURSES

Lectures by senior academic and nuclear safety experts, case studies, discussions, and practical skills sessions will compose the first two-week part of the training programme. Small class size will encourage discussions and participation. Mentor-led discussion sessions with participants will focus on the practical application of concepts/theories and allow for open sharing of information and experiences. In particular:

- Lectures by senior academic and nuclear safety experts will allow deepening of the understanding of the key concepts presented in the MOOC.
- Debriefing sessions will focus on the practical application of classroom work and allow for information and experience sharing. The ultimate objective is to develop participants' reflexive capabilities.
- Case studies in groups of 3 or 4 persons, these cases will allow to apply the concepts and models developed during the courses in "real-life situations".

PERSONAL PROJECT ORGANIZATION

Trainees will be divided into four groups. Group supervision will be provided by senior researchers and/or nuclear industry actors.

Personal project supervision involves individual and collective sessions. At least 5 meetings with the pedagogical team will take place.

VII. TRAINING PROGRAMME EVALUATION

Trainee evaluation will cover each of the three modules:

1. **MODULE 1: Safety management in high-risk environments** (Coefficient 1,5)
   a. Trainee evaluation (after the 2-week course): 50%
   b. Trainee evaluation (final session): 50%
2. **MODULE 2: Organizational dynamics and Leadership** (Coefficient 1,5)
   a. Trainee evaluation (after the 2-week course): 50%
   b. Trainee evaluation (final session): 50%
3. **Developing efficient leadership practices for improving safety in the nuclear sector** (Coefficient 2)
   a. Written current position-related project report note: 60%
   b. Oral presentation grade: 40%

A weighted average of 10/20 or above will lead to the award of the "Leadership for Safety University Diploma" by the Université Côte d'Azur.

The efficiency of the training programme also will be evaluated through three steps:

- Evaluation of trainee's knowledge and representations at T0 T1 T2 T3
- MOOC evaluation by trainees
- Training evaluation by trainees

VIII. ELSEPROGRAMME TIMETABLE

Colour code	Lecture	Case study	Debriefing session	Trainee role play session	Course evaluation	Trainee test

ONLINE KICK-OFF MEETING, mid-April 2024:

Introduction of trainees and pedagogic team members
ELSE project presentation JR
Training presentation RK
Q&A
Course evaluation T0: pre-training competences evaluation

MOOC, April–August 2024:

This MOOC is freely available online through INSA web platforms (https://seamonline.insa-toulouse.fr/mod/page/view.php?id=5965).

INTENSIVE TWO-WEEK COURSE: 2-13 September 2024, UNIVERSITÉ CÔTE D'AZUR, NICE, FRANCE

Week 1

<table>
<tr><th>Monday, 2 September</th><th colspan="2">Tuesday, 3 September</th><th colspan="2">Wednesday, 4 September</th><th colspan="2">Thursday, 5 September</th><th colspan="2">Friday, 6 September</th></tr>
<tr><td>9h – 9h30 Welcome
9h30 – 10h
UniCA & UE welcome
10h – 10h30
Evaluation T1</td><td colspan="2">9h – 10h
Safety culture & climate
(VL & NK)</td><td colspan="2">9h – 10h
Fostering learning in Organization (CT)</td><td colspan="2">9h – 10h
Leadership: definition and historical evolution of key concepts for safety
(CP)</td><td colspan="2">9h – 10h
Building high reliability organizations
(RK + ER)</td></tr>
<tr><td>10h30 – 12h30
Face to face course presentation
(RK + CT)</td><td>10 – 13h
G1
Case study 1
(VL)</td><td>10h-13h
G2
Organizational structure & design
(RK & CT)</td><td>10h – 12h30
G1
Case study 2
(ND)</td><td>10h – 12h30
G2
Case study 3 (JLE)</td><td>10h – 13h
G1
Case study 4
(BJ)</td><td>10 – 13h
G2
Case study 5
(CP)</td><td>10h – 13h
G1
Case Study 7
(RK & ER)</td><td>10h – 13h
G2
Dealing with uncertainty in a collective manner: mindfulness, flexible rules, autonomy
(RSK)</td></tr>
<tr><td>12h30-13h30 lunch break</td><td colspan="2">13h-14h lunch break</td><td colspan="2">12h30-13h30 lunch break</td><td colspan="2">13h-14h lunch break</td><td colspan="2">13h-14h lunch break</td></tr>
<tr><td>13h30-15h
Safety management: an evolving problematic
(JR)
15h – 17h
Ice breaker & MOOC Debriefing
(RK + CT)</td><td>14h00 – 17h00
G1
Organizational structure & design
(RK + CT)</td><td>14h00 – 17h00
G2
Case study 1
(VL)</td><td>13h30 – 16h
G1
Case study 3
(JLE)
16h – 17h
Paradoxes & tensions
(BJ)</td><td>13h30 – 16h
G2
Case study 2 (ND)</td><td>14h – 17h
G1
Case study 5
(CP)</td><td>14h – 17h
G2
Case study 4
(BJ)</td><td>14h-17h
G1
Dealing with uncertainty in a collective manner: mindfulness, flexible rules, autonomy
(RSK)</td><td>14h-17h
G2
Case Study 7
(RK & ER)</td></tr>
</table>

Week 2

<table>
<tr><th>Monday, 9 September</th><th>Tuesday, 10 September</th><th>Wednesday, 11 September</th><th>Thursday, 12 September</th><th>Friday, 13 September</th></tr>
<tr><td colspan="2">9h – 10h
Uncertainty, complexity, and organizational limits – implications for safety
(KP)</td><td colspan="2">9h –10h30
Understanding Individual responses to uncertainty: a psychology outlook
(RF)</td><td colspan="2">9h – 10h
Mechanisms and practices of leadership for safety
(NK + CT)</td><td colspan="2">9h – 10h
Global approach to risk management
(YG)</td><td rowspan="2">10h30 -12h
Leadership for safety in the nuclear sector context
(JR)</td></tr>
<tr><td>10h – 13h
G1
Case study 6
(KP)</td><td>10h – 13h
G2
Debriefing & questions on lessons learned
(RK + CT)</td><td>10h30 – 12h30
G1
Role play exercise
(RF)</td><td>10h30 – 12h30
G2
Individual Mindfulness Role play exercise
(CD)</td><td>10h – 13h
G1
Case study 8
(NK)</td><td>10h – 13h
G2
Exercice Leadership practices
(RK + CT)</td><td>10h – 13h
G2
Case study 9
(YG)</td><td>10h – 13h
G2
Debriefing & questions on lessons learned
(RK + CT)</td><td>12h – 12h30
Evaluation T2</td></tr>
<tr><td colspan="2">13h – 14h lunch break</td><td colspan="2">12h30 –13h30 lunch</td><td colspan="2">13h-14h lunch break</td><td colspan="2">13h-14h lunch break</td><td>12h30-13h30 lunch break</td></tr>
<tr><td>14h – 17h
G1
Debriefing & questions on lessons learned
(RK + CT)</td><td>14h – 17h
G2
Case study 6
(KP)</td><td>13h30 – 15h30
G1
Individual Mindfulness Role play exercise
(CD)</td><td>13h30 – 15h30
G2
Role play exercise
(RF)</td><td rowspan="2">14h – 17h
G1
Exercise Leadership practices
(RK + CT)</td><td rowspan="2">14h – 17h
G2
Case study 8
(NK)</td><td rowspan="2">14h – 17h
G1
Debriefing & questions on lessons learned
(RK + CT)</td><td rowspan="2">14h – 17h
G2
Case study 9
(YG)</td><td>13h 30– 15h30
TRAINEE EVALUATION
(modules 1&2)</td></tr>
<tr><td colspan="2"></td><td colspan="2">15h30 – 17h
Mechanisms and practices of leadership as process
(CT & NK)</td><td>15h30 – 16h30
Presentation of personal project
(Module 3)
(RK +CT)</td></tr>
</table>

The composition of the pedagogical team :

BJ – Benoit JOURNE
CD – Carole Daniel
CP – Colin PILBEAM
CT– Catherine THOMAS
ER – Evelyne ROUBY
JLE – Jean-Louis ERMINE
JR – Jacques REPUSSARD
KP – Kristina POTOCNIK
ND - Nicolas DECHY
NK – Natalia JUBAULT KRASNOPEVTSEVA
RF – Rhona FLIN
RK – Renata KAMINSKA
RSK – Ravi S. KUDESIA
VL – Valérie LAGRANGE
YG – Yoann GUNTZBURGER

Final training synthesis and evaluation: June 2025 (online) – <u>dates to be confirmed</u>

<table>
<tr><th>Monday, 9 June</th><th>Tuesday, 10 June</th><th>Wednesday, 11 June</th><th>Thursday, 12 June</th><th>Friday, 13 June</th></tr>
<tr><td rowspan="4">Groups 2 & 4

9h30 – 12h00
14h00 – 16h30

2 Parallel sessions of presentation and discussion of 4 individual project reports: 40 minutes per report (20 Mn de presentation, 20 Mn de discussion), followed by a group debriefing on lessons learned.</td><td rowspan="4">Groups 1 & 3 & 5

9h30 – 12h30
14h00-17h00

3 Parallel sessions of presentation and discussion of 4/5 individual projectreports: 40 minutes per report (20 Mn de presentation, 20 Mn de discussion), followed by a group debriefing on lessons learned.</td><td></td><td></td><td></td></tr>
<tr><td>12h00-14h00
Collective exchange of views, with participation of two senior experts</td><td>12h00 -13h30
Trainee evaluation
(Module 1)</td><td>12h00 – 13h30
Trainee evaluation
(Module 2)</td></tr>
<tr><td>14h00 – 14h30
Evaluation T3</td><td rowspan="2"></td><td rowspan="2"></td></tr>
<tr><td></td></tr>
</table>

IX. COURSE SYNOPSIS

1. MODULE 1: SAFETY MANAGEMENT IN HIGH-RISK ENVIRONMENTS

1.1 Managing Safety: current approach (Key concepts)

Safety Management: an evolving problematic (1.1.1) - Jacques REPUSSARD

Keywords: risk, uncertainty, emergency situations, regulated safety, managed safety.

Synopsis: Industrial safety is primarily a social construct, in constant evolution under conflicting pressures with respect to its scope, objectives and modalities. At the end of this part, students should be aware of the different parameters which influence the management of safety issues in industry and recognize that these parameters are in permanent evolution over time. They should be able to understand, identify and differentiate aspects respectively related to managed safety and regulated safety, and to discuss them. They should start developing a questioning attitude with respect to their personal safety management practice.

The MOOC (Unit 1, Part 1) will introduce the key concepts. These concepts will be further explored during the face-to-face session at the University Côte d'Azur in Nice.

Risk and Safety: a technical approach (1.1.2) - Yoann GUNTZBURGER

Keywords: reliability, acceptable risk, inherently safer design, safety barriers, compliance and control.

Synopsis: Over the years, high-risk industrial organizations, such as nuclear power plants, have developed technical measures to maximize the safety of their activities. The objective of this session is for the participants to develop a comprehensive understanding of the foundational concepts that underpin a technical approach to risk and safety. During this session, participants will be invited to conceptualise safety as an emergent property of a system rather than the sole result of the reliability of individual technical components, and to reflect on the problem of acceptable risk. They will explore the fundamentals principles of inherently safer designs and safety barriers. Finally, the role and place of compliance and control within safety strategies will be analysed.

The MOOC (Unit 1, Part 2) will introduce these key concepts, the limits and implications of which will be later developed during the face-to-face sessions at Université-Côte-d'Azur.

Safety culture (values and beliefs)/safety climate (behaviours): academic and professional outlook (1.1.3) - Natalia JUBAULT KRASNOPEVTSEVA and Valérie LAGRANGE

Keywords: organizational culture, safety culture, safety climate, values

Synopsis:

Academic outlook: The International Atomic Energy Agency (IAEA) defines safety culture as the "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." The course will put this definition into the perspective of management science research. First, by referring to a three-level framework of organizational culture (basic assumptions, espoused values, and artifacts), the course will highlight the difficulties associated with the definition and operationalization of safety culture; it will show that safety culture (values) is closely related to safety climate (actions), which represents a surface manifestation of safety culture. Second, the course will explore safety culture's part in the broader organizational culture, highlighting that multiple subcultures coexist in organizations. Third, it will highlight that though organizational scholars define safety culture as the solution to consolidation of organizational members around values and redistribution of attention for decision making, the translation of safety and

reliability values and principles into operational behaviour remains an open question. From this perspective, the implementation of safety culture relates closely to another safety concept, that is, managed safety.

Professional lens: For more than 30 years, drawing lessons from major accidents (in particular Three Mile Island, Chernobyl, Fukushima, but also the Davis Besse incident and non-nuclear accidents) and from its operating experience from the nuclear fleet, the French nuclear operator, Electricité de France (EDF) has developed and enriched approaches and methods to enable everyone to assure their role in the nuclear industry by developing "a questioning attitude, a rigorous and prudent approach andgood communication".

These approaches and methods stem from knowledge of the human and social sciences (particularly ergonomics and sociology); they aim to develop a systemic approach in which the interactions between technical systems, people, and organizations are taken into account.

From a presentation of the fundamentals—that is, lessons learned from operating experiences, scientific knowledge, and concepts of the nuclear industry (IAEA, WANO)—the practices implemented by EDF will then be introduced according to real data from the experience of nuclear power plants (NPPs):

- Safety perception approach according to a safety culture questionnaire
- Self-assessment on safety leadership for each level of management

These practices will be resituated in the overall framework of the policy and requirements in terms of safety, safety culture, and human factors for EDF's nuclear fleet.

The MOOC (Unit 2, Part 1) will introduce the key concepts. Using the case study method, these concepts will be further explored during the face-to-face session at the University Côte d'Azur in Nice (Case Study 1).

International safety standards in the nuclear industry: historical perspective and evolution (1.1.4) - Didier LOUVAT

Keywords: IAEA safety standards; safety harmonization; standards development; ionising radiation

Synopsis: The IAEA safety standards highlight how authorities and other stakeholders agreed to ensure the safety of activities and facilities using ionising radiation. Developed through a process involving governments and organizations, the contents of these publications are the result of knowledge and experience gained from the use of nuclear technologies, the application of the safety standards themselves, and the consensus built on various cultural understandings of safety-related issues. The lecture reviews the successive standards-development steps, with a focus on the consensus-building process.

The MOOC (Unit 2, Part 4) will introduce the key concepts.

1.2 Dealing with uncertainty (Key challenges)

Building high reliability organizations and resilience: characteristics (1.2.1) – Renata KAMINSKA and Evelyne ROUBY

Keywords: highreliability organizations, reliability, resilience

Synopsis: The objective of this session is to better understand the characteristics and the functioning of high reliability organizations (HROs) such as nuclear power plants or air traffic control, in which errors, though low in number, have a very high impact. The notion of reliability relates to the notion of resilience, which is the organizational ability to both prevent and recover from crises. Resilience links closely to mindfulness. In this course, we will examine how five specific processes related to mindfulness—preoccupation with failure, reluctance to simplify interpretations, sensitivity to operations, commitment to resilience, and deference to expertise—contribute to high organizational reliability and resilience.

The MOOC (Unit 3, Part 3) will introduce the key concepts. These concepts will be further explored and illustrated by Case Study (7) during the face-to-face session at the University Côte d'Azur in Nice.

Dealing with uncertainty in a collective context: mindfulness, flexible rules, autonomy (1.2.2) – Ravi S. KUDESIA

Keywords: uncertainty, rules, autonomy, mindfulness, metacognition

Synopsis: Managing uncertainty requires achieving a balance between minimizing uncertainty (stability/regulated safety) and coping with uncertainty (flexibility/managed safety). First, the course will highlight the role of rules in managing uncertainty: from supporting stability to fostering flexibility through autonomy. Second, it will focus on how to develop managed safety, that is the organizational capacity to proactively cope with unexpected events. Managed safety relies on professional expertise, knowledge, and mindfulness. Mindfulness is the ability to induce active differentiation and refinement of existing categories and the creation of new categories out of streams of events, to develop a more nuanced appreciation of the context and find potential solutions. Third, the course will investigate how mindfulness training operates; mindfulness is a metacognitive practice that concerns the ways people adjust their information processing to the situations at hand. As a metacognitive practice, mindfulness is something we do individually; however, we will see that through our social interactions we can become mindful collectively, at the system level.

The MOOC (Unit 4, Part 1) will introduce the key concepts. These concepts will be further explored during the face-to-face session at the University Côte d'Azur in Nice.

Individual factors of dealing with uncertainty (1.2.3)

- #### Understanding Individual responses to uncertainty: a psychology outlook (1.2.3.A) – Rhona FLIN

Keywords: situation awareness, chronic unease, risk tolerance, decision making

Synopsis: Effective safety management requires an appreciation of how risk and uncertainty influence operational decisions and actions. Investigations of major accidents (e.g., Deepwater Horizon, RAF Nimrod) have indicated failures in situation awareness and decision making, coupled with overconfidence with regard to inherent risks.

In this session, we will focus on the individual psychological processes that relate to both workers' and managers' perceptions of the operational environment, with reference to judgements of risk and uncertainty that influence decision making. Drawing on research findings from higher-risk work settings (including aviation, surgery, offshore oil, and gas production), the concepts of situation awareness, chronic unease, and risk tolerance will be explored in relation to their applications for safety leaders' decision making and the management of uncertainty. One of the presenter's research projects (based at the University of Houston, U.S.A.), which examines whether mindfulness training interventions can be of value in safety-critical work settings also will be described.

The MOOC (Unit 4, Part 2) will introduce the key concepts. These concepts will be further explored and illustrated by role play exercises during the face-to-face session at the University Côte d'Azur in Nice.

- #### Developing individual mindfulness (1.2.3 B) – Carole Daniel

Keywords: present-focus, other-focus, self-regulation, stress management

Synopsis: In high-risk environments, fostering individual mindfulness is a key element in promoting safety. Mindfulness can significantly contribute to preventing accidents and promoting well-being and also plays a crucial role in decision-making. By cultivating an awareness of thoughts and emotions, individuals can make more informed choices, especially in situations where safety is paramount. This heightened awareness helps in avoiding impulsive actions that might lead to accidents or injuries. Moreover, practicing mindfulness can alleviate stress and anxiety, both of which can be detrimental to safety. A calm and focused mind is better

equipped to handle challenges and emergencies. By incorporating mindfulness techniques, such as deep breathing or meditation, individuals can better manage stress and maintain composure in high-pressure situations.

The concepts developed in The MOOC (Unit 4, Part 2) will be further explored by focusing on individual mindfulness and illustrated by role play exercises during the face-to-face session at the University Côte d'Azur in Nice.

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2. MODULE 2: Organizational dynamics and Leadership

2.1 Understanding organizational dynamics (Key concepts)

Organizational structure and design (2.1.1) – Renata KAMINSKA and Catherine THOMAS

Keywords: structure, design, coordination, cooperation, tensions

Synopsis: In this session, we will examine how organizations function. Organizations make it possible for individual members to accomplish more than they can on their own. Organization is a tool used by people to coordinate their actions to obtain something they desire. It includes two key elements: structure and culture. The structure is the sum of the ways in which an organization divides its labour into distinct tasks and then achieves coordination among them. Organizational rules and routines can tie disparate organizational units into one functioning whole. The culture is the set of shared values and norms that shapes organizational members' interactions. The choice of an appropriate structure is a big challenge. The design of organizational structure requires achieving a balance of numerous tensions: control versus autonomy, stability versus change, specialization versus integration. The course will highlight that organization is a complex system including emergent mutual influences between organizational structure and human actions.

The MOOC (Unit 1, Part 3) will introduce the key concepts. These concepts will be further explored during the face-to-face session at the University Côte d'Azur in Nice.

Fostering learning in organizations (2.1.2) Catherine THOMAS, Jean-Louis ERMINE and Nicolas DECHY

Keywords: learning, experience, knowledge creation, retention and transfer

Synopsis: This course starts with the premise that the ability to learn is an important source of safety and resilience improvement. At the organizational level, learning is defined as a change in an organization's knowledge that occurs as a function of the experience. This course will focus on organizational learning and its subprocesses of creating, retaining, and transferring knowledge. Task performance experience, the context in which it takes place, and knowledge processes are key notions that define organizational learning. The course also will explore the drivers and barriers of the learning processes. More specifically, it will focus on analysing the risk of superstitious learning in complex environments.

Through the implementation of a knowledge management system, deliberate learning is needed to mitigate the occurrence of superstitious learning. Knowledge management systems will be presented in two case studies.

The MOOC (Unit 2, Part 3) will introduce the key concepts. These concepts will be further explored during the debriefing face-to-face session at the University Côte d'Azur in Nice. They will be illustrated by Case Study 2 (system based on Return of Experience) by Nicolas Dechy and Case Study 3 (system based on Knowledge Capitalization) by J.L. Ermine.

2.2 Understanding organizational dynamics (Key challenges)

Evolution from risk management to safety management: regulated versus managed safety, paradoxes, and tensions (2.1.3) – Benoit JOURNE

Keywords: tensions, resilience, human and organizational factors, safety management practices

Synopsis: The aim of the session is to analyse safety management through the lens of the multiple tensions every complex organization faces, reflected in the tension between regulated and managed safety. Among the main tensions identified in the academic literature, we emphasize "anticipation" versus "resilience," "formal rules" versus "actual practices," "managers" versus "occupational groups," and "safety versus efficiency." Safety management is not meant to suppress such tensions, but to have the responsibility of designing and implementing acceptable balances and compromises. It aims to develop the ability to identify and collectively discuss safety issues embedded in day-to-day professional activities that are encompassed by quality assurance procedures, production objectives, and the local culture of interpersonal relationships. We analyse the ways in which nuclear power operators and other high-risk industries succeed–or not—in doing so.

This session draws from academic literature on human and organizational factors for safety. The MOOC (Unit 3, Part 1) will introduce the key concepts. Using the case study method, these concepts will be further explored during the face-to-face session at the University Côte d'Azur in Nice (Case Study 4).

Uncertainty, complexity, and organizational limits: implications for safety (2.1.4) - Kristina POTOCNIK

Keywords: organizational limits, sensemaking, cognition, mental models, accidents

Synopsis: In 1984, Charles Perrow argued that certain types of accidents—"normal accidents"—were inevitable in complex, tightly-coupled systems. These accidents typically result from interactions between different system components; they are difficult for designers to foresee and front-line operators to comprehend. Although some HROs operate with very low rates of error (as described in Session 1.2.1 of this programme), even very safe systems still suffer occasional catastrophic failures.

In this session, we will examine how limits to human cognition can affect the safety of complex systems. Sometimes these limits are observed in front-line operators who miss or misinterpret cues and anomalies and take the wrong actions (or fail to act at all). Sometimes we see limits in flawed designs, in which designers did not foresee certain combinations of conditions—perhaps because they had never occurred before. We examine the "paradox of almost totally safe systems," which suggests that the safer we make systems by design, the more we degrade the ability of operators to handle abnormal conditions. We examine the implications for safety leadership.

We also use the concept of limits to explain why crucial, safety-related information does not always reach those who need it, and why its significance is not always understood when it does.

We will draw on several case studies to illustrate these ideas, including Bhopal, the loss of the space shuttle Columbia, Air France 447, and the Boeing 737MAX.

The MOOC (Unit 4, Part 3) will introduce the key concepts. These concepts will be further explored and illustrated by Case Study (6) during the face-to-face session at the University Côte d'Azur in Nice.

2.2 Leadership as a process of influence: Key concepts

Leadership: definition and historical evolution of key concepts (2.2.1) – Colin PILBEAM

Keywords: leader, leadership, paradigm

Synopsis: Interest in leaders and leadership has a long history. In this session, we consider the chronological development of four successive paradigms of leadership, exploring the strengths and weaknesses of each in turn. We begin with heroic models of leadership, taking an individual (entity) perspective. We then consider

leadership as the relationship between leader, followers, and goals. Next, we briefly explore who is doing the "work of leadership" through plural conceptions of leadership, including shared and distributed models of leadership, and the achievement of Direction–Alignment–Commitment. Finally, we briefly examine the ways in which leaders shape the organizational and wider environmental context for others through a consideration of Technical and Adaptive Leadership and its application to the problems organizations face.

The MOOC (Unit 2, Part 2) will introduce the key concepts. These concepts will be further explored and illustrated by Case Study (5) during the face-to-face session at the University Côte d'Azur in Nice.

Mechanisms and practices of leadership as process (2.2.2) - Natalia JUBAULT KRASNOPEVTSEVA

Keywords: Direction, alignment, commitment, technical leadership, adaptive leadership, critical leadership

Synopsis: Building on the previous session, this session will further explore the different approaches of leadership and focus on leadership as process. We will provide the definition of leadership as process and discuss its characteristics. We will also discuss the implications of the processual approach for leaders and leadership within the organization. The session will also help to disentangle leadership practices and mechanisms and understand their interactions. Finally, we will present an integrative framework of the leadership influence process.

The MOOC (Unit 2, Part 2) will introduce the key concepts. These concepts will be further explored during the face-to-face session at the University Côte d'Azur in Nice.

2.2 Leadership asa process of influence: Key challenges

Developing leadership for safety (2.2.3)

Mechanisms and practices of leadership for safety (2.3.2 A) – Natalia JUBAULT KRASNOPEVTSEVA and Catherine THOMAS

Keywords: leadership for safety, leadership, influence, generative mechanisms, safety

Synopsis: This session, which concludes the training, aims to bring together the various elements presented in the MOOC and during the previous sessions (safety management, organizational dynamics, leadership as process) to better understand how leadership practices, interacting with the various factors of organizational dynamics, influence safety performance. More specifically, the course will reveal the complex mechanisms that explain the causal relationship between inputs (e.g., leader practices) and outputs (e.g., efficient safety performance). Indeed, the interactions of organizational dynamics and leadership are not easily observable, but their acknowledgement is crucial to advancing our understanding of how leaders exert influence.

The MOOC (Unit 4, Part 4) will introduce the key concepts. These concepts will be further explored and illustrated by Case Study (8) during the face-to-face session at the University Côte d'Azur in Nice. This case study will focus on leadership practices in the nuclear sector and enable better understanding of the theoretical models discussed in this training programme. It will be completed by exercises.

Leadership for safety in the nuclear sector context (2.3.3 B) - Jacques REPUSSARD

Keywords: leadership for safety, safety culture, nuclear plant management, nuclear safety regulation and control, risks associated to nuclear technologies.

Synopsis: The concepts developed so far through the ELSE Syllabus are relevant for a broad field of activities and technologies, as illustrated through the variety of case studies. This session focuses on the specific relevance of leadership for safety concepts for the nuclear industry, both from the nuclear operator and nuclear regulator points of view. Leadership for safety capability is a regulatory requirement (IAEA Safety Requirement 3 of GSR Part 2 "Leadership and Management for Safety"), as well as key to the development of a sustainable safety culture. Part of the session is dedicated to exchanges with attendees, to enhance their

understanding of the implications of the ELSE training in the context of their own professional development. This lecture illustrates how the implementation of an integrated management system contributes to sound leadership and provides some practical examples that illustrate the problem of leadership for safety in the nuclear industry specific context, with perspectives from both an operator's and a regulator's point of view.

Global approach to risk management (2.2.4) - Yoann GUNTZBURGER

Key words: Complexity, systems, integration of safety issues, ethics, Fukushima nuclear disaster

Synopsis: In this session, we will explore the nature and implications of a global approach to risk management. In technological industries, risk management is usually considered as a highly technical activity addressed mostly through technical approaches, although human and organizational aspects of safety are increasingly integrated.

First, we will present two contrasting perspectives regarding the ontological nature of risks: a "hard" perspective, found mostly in engineering science, toxicology, and economics, for which risk can be calculated, and a "soft" perspective, found mostly in sociology, psychology, and neurology, for which risks are mainly subjective and social constructs. Whereas for the former perspective, quantitative assessment can provide objective information about "real" risks, from the latter perspective, all assessment of risks, including from technical experts, involves normative and subjective assumptions such that risk cannot be "objective". This approach rejects the traditional opposition between expert knowledge and laypeople perceptions; it acknowledges a plurality of legitimate perspectives and the influence of cognitive biases in risk assessment.

Second, we will propose a global approach of risk management in complex socio-technical systems. This view considers therefore that the "technological" risk should not be considered in isolation, but deeply intertwined with cultural, historical, ecological, ethical, political, economic dimensions, which questions the relevance of traditional deterministic or probabilistic approaches to risk management. A global approach to risk management can help managers develop this global vision of integration of safety management issues.

During this session, it will be applied on a real-life case: The Fukushima nuclear disaster. These concepts developed in the MOOC (Unit 3, part 2) will be further explored and illustrated by case study (9) during the face-to-face session at the University Côte d'Azur in Nice.

X. PEDAGOGICAL TEAM LIST

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