The role of HOF in Unexpected and Extreme Situations: Contribution of the CSNI Working Group on Human & Organisational Factors (WGHOF)

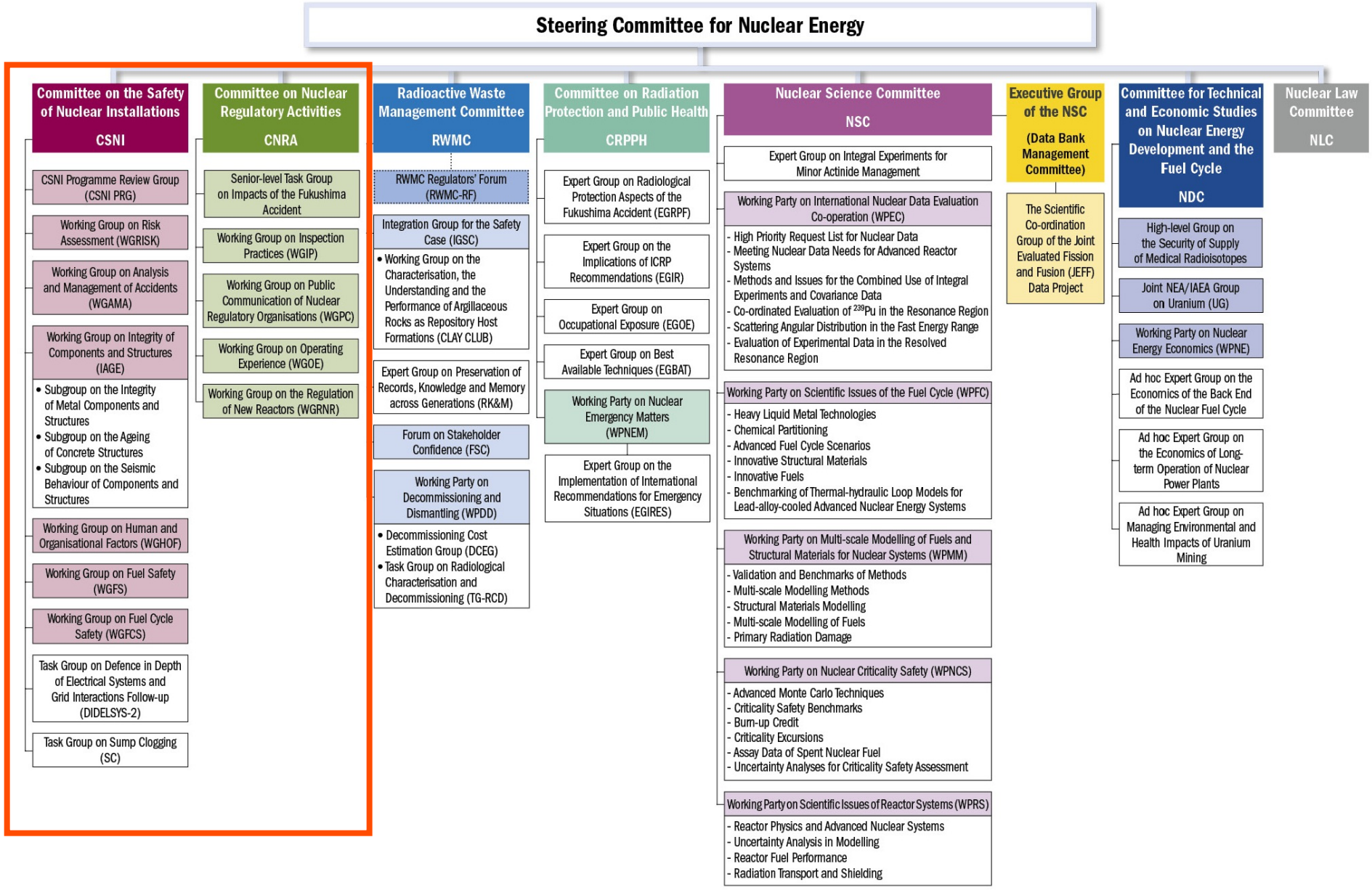
Daniel Tasset (IRSN, France),
Wolfgang Preischl (GRS, Germany)

IAEA IEM - 21-24 May 2013 (Vienna)

Content

- The Working Group on Human and Organisational Factors in the NEA/CSNI
- New task – Action post-Fukushima
- Conclusion

NEA structure



WGHOF Mission

- Mission of WGHOF
  - To improve the understanding and treatment of human and organisational factors within the **nuclear industry** in order to support the continued **safety performance** of nuclear installations and improve the effectiveness of **regulatory practices** in member countries.
- Composition of the group
  - HOF experts (22 countries represented)
  - Regulators, TSO, Researchers, Operators
  - Representation of : Halden Project, IAEA, EU
- Meetings : twice a year

WGHOF activities

- Scope of WGHOF activities
  - Act as a **forum** for exchange of information and experience
  - Identify and prioritise current and emergent **HOF issues**
  - Identify HOF **methodologies and practices**
  - Develop shared understanding and **common positions**
  - Facilitate international convergence on safety HOF issues
  - Sponsor specialists meetings, workshops and other means of fostering **international collaboration** with nuclear and other industries
  - advancing the current state of knowledge on HOF related issues important to nuclear safety though studies and technical reviews
  - …

WGHOF tasks and topics

- WGHOF tasks
  - A program and a task leader (CSNI approval)
  - Surveys, workshops, meetings, …
  - Deliverables : task report, booklet (CSNI Topical Opinion paper)

- Examples of topics addressed
  - HOF in NPP modification
  - Safety Management / Safety Culture
  - HOF in Plant maintenance
  - HOF in Root Cause Analysis of Events
  - Research on HOF in new plant technology
  - HRA developments and advancements in the field of nuclear risk assessment …

Content

- The Working Group on Human and Organisational Factors in the NEA/CSNI
- Task on HOF in post-Fukushima
-
- Conclusion

Action post-Fukushima in 2011

- First step in 2011
  - HOF issues discussed during WGHOF meetings
  - Good contribution of all members, in particular Japanese member (JNES)
  - Elaboration of a WGHOF “white paper” presented to CSNI in December 2011
- A first WGHOF message
  - Lessons to be learned in a reactive way on HOF during the accident phase, after the event occurred.
  - But there are lessons to learn **in a proactive way** on decision making in design and modifications for improving plant robustness.

White paper – HOF areas concerned

A revised set of HOF areas has been identified:

1. Organisational decisions on design and modification
2. Organisational barriers to learn from operating experience
3. Emergency Preparedness
4. Operating procedures for beyond design bases events (big fires, flooding, earthquakes, etc.).
5. Human performance under extreme conditions (catastrophe, radiation, heat, flood, etc.)
6. Operators training and exercising for severe accidents situations
7. V&V of scenarios and emergency operating procedures for severe accidents
8. Availability of contractors for accidents mitigation. Intelligent customer to mitigate the accident
9. Emergency organisation. Coordination with offsite support organisations. Competing demands
10. HOF issues in clean-up, decontamination and remediation activities.
11. In a more long term perspective, HOF in dismantling of damaged installations

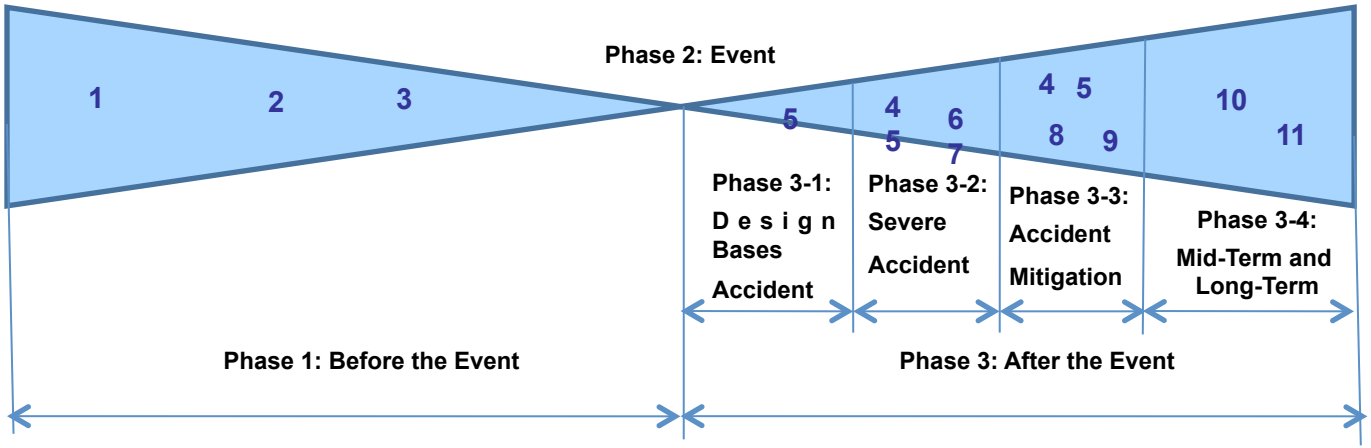


Figure: Bow-tie model

Action post-Fukushima in 2012

- Second step in 2012
  - HOF issues still discussed during WGHOF meetings
  - A project of task (CAPS) elaborated and submitted to CSNI in June for approval
- Messages from Fukushima accident
  - Accident not triggered by “human error” from operators
  - Positive role of the human operator to act even in a most demanding situation to maintain safety
  - Need for HOF research and practice to take distance of the prevailing safety approach which takes the human as a risk factor and attempt to eliminate the human from the loop.

Another safety paradigm for HOF

Fukushima accident is an opportunity :

–To show that HOF is not only dedicated to weaknesses and human errors analysis

–To present HOF as contributing factors to the robustness of facilities

To formulate HOF issues **in a positive way** with the objective to improve the capability of human to act in a severe and unexpected situation :

1)How to support the human operator to respond as appropriately as possible in the on-line situation?

2)How to train and design normal work so that the capabilities to act appropriately in any situation, even in one that is unexpected, will develop continuously?

3)How to design plants so that the capability of human actions is not automated away?

4)What are the characteristics of such safety management and regulatory approaches that support the capabilities of the personnel to develop their capabilities and act in need?

WGHOF task post-Fukushima

WGHOF Task (approved by CSNI in June 2012):

- Human performance under extreme conditions
  - to address issues around decision-making and problem-solving under very demanding conditions
  - drawing in experience and previous studies from other high hazard industries
  - report on human design/engineering principles important to support human intervention and performance under extreme conditions

- Outcome expected to provide basis for improvements and necessary research to account for HOF in design and use of measures for achieving highest level of human and organizational performance under extreme and unexpected conditions

WGHOF task post-Fukushima

- **Task Leader** : GRS (Germany)

- Contributors : Finland (VTT), USA (NRC), Japan (JNES), France (IRSN), Belgium (BelV), UK (ONR) and OECD/Halden project

- Final report expected by end of 2014
- One or two workshops organized in January and June 2014

Task Group

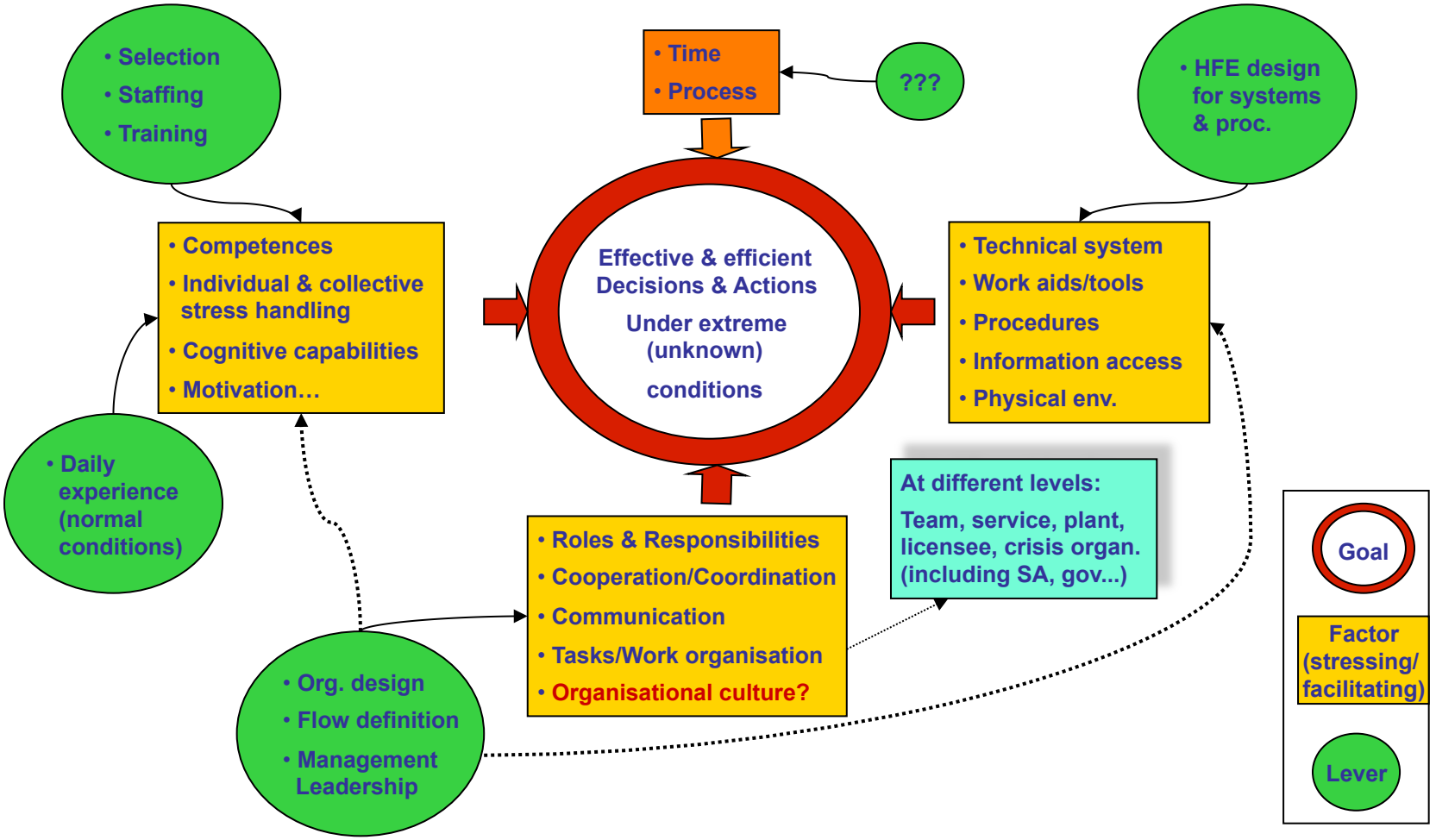
- First meeting of the task group in February 2013
- Hosted by GRS in Garching (Germany)
- Nine participants from 9 countries

HOF key factors

Three HOF areas are contributing to the possibility to prevent or mitigate severe consequences:

- Human capabilities (competencies including safety culture relevant attitudes, individual and collective stress handling).
- Human factors Engineering (HFE) aspects of the technical systems, work aids and tools, procedures, needed information and physical environment.
- Organizational aspects like roles and responsibilities, cooperation and coordination, communication, task and work flow, organizational culture. Different organizational levels should be considered.

Task Model : Key factors and relations



Workshop Outline (1)

- Objectives: To expand the amount of available information about **key factor areas** described by the model and to share information
- Expected participants
  - NEA members (regulator, TSO, research) and IAEA
  - Up to 4 invited key speakers from non-nuclear field
  - Licensees (e. g. EDF/France, ENBW/Germany…)
- First workshop hosted by ENSI/Switzerland (30 – 40 participants, end of January 2014, duration still to be defined)
- Workshop structure
  - Focus on presentations (invited experts, other participants)
  - Plenary and group discussion (still to be defined)

Workshop Outline (2)

- Expected key speakers
  - from aviation, research, chemical industry and if possible from military
  - NEA and WGHOF members support to fund them
  - provision of a list of potential experts/domains
- Development of a list of licensees to be specifically invited to the workshop (task group activity)

- Potential second workshop in May/June 2014 (depends on WS 1 results, still to be decided)

Conclusion

- TMI :
  - **to protect from** human errors
  - HMI, automatisms, training, design, …
- Tchernobyl :
  - **to protect from** organization failures
  - Safety culture, safety management, etc.

- Fukushima :
  - **to support**, to encourage, to reinforce human action as contributing to the robustness of installation
  - Key factors ?? …
  - Still a lot of research and developments to do … : decision under uncertainty, development of a shared representation of unexpected situation, capacity of innovation (use materials or equipments in a different ways they have been designed for, etc.)

Another possible task

- A question asked by CNRA
- On organisational culture and influences on safety
  - On the basis of the Fukushima accident
  - Cultural aspects in post-event response, but also in consideration of potential events before it happen …
  - Role of cultural biases, traits, on safety culture at different levels, plant, organisation, country level …

- A task to determine the state of understanding on cultural biases
- First step : WGHOF members to circulate information available on cultural studies and references, before next meeting

On behalf of WGHOF:

Thank you for your attention