From theory to the field : ASN's considerations on HOF related to contractors

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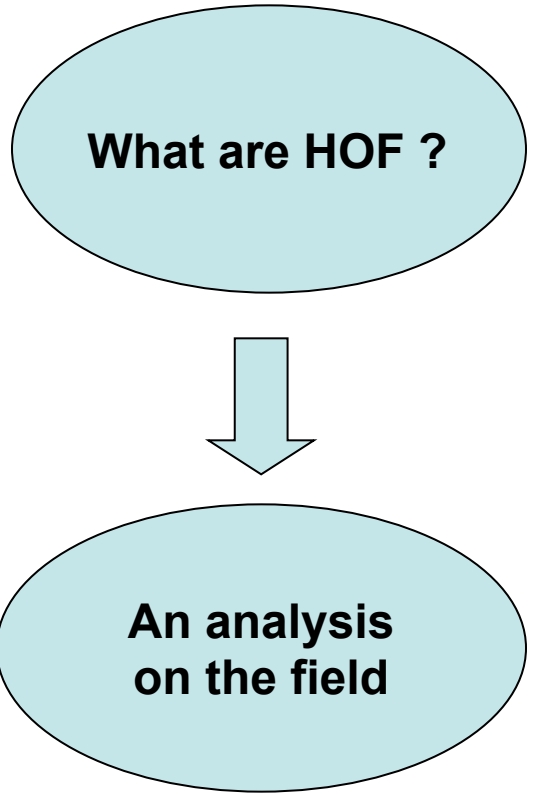
Content

- **A systemic perspective to improve the human and organizational aspects of nuclear safety**

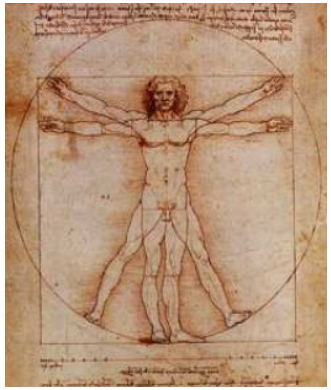
  Inappropriate resources lead to risks

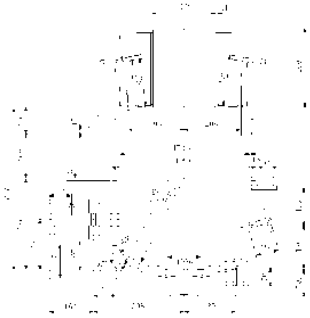
- **Example on the field : Using contractors in normal operating situations - HOF related to contractors**

  Experience and cooperation are to compensate for the constraints



A systemic perspective to improve the human and organizational aspects of nuclear safety





Socio-technical systems (1)

Operator

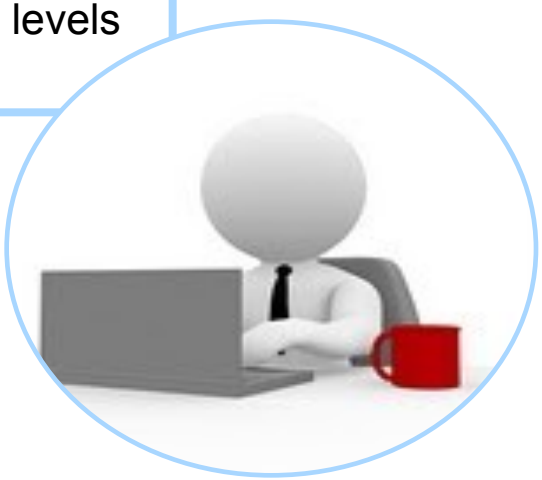
Physiological caracteristics
Skills
Etc.

HOF factors are particularly concerned with anything that has to do with the **people involved** (physiological characteristic, workforce, skills, motivation, fatigue, etc.),

Socio-technical systems (2)

Working environment

Light, thermal and sound levels
Etc.



HOF factors are also concerned with anything that has to do with the **working environment** (light, thermal and sound levels, etc.)

Socio-technical systems (3)

Material and technical systems

Tools
Documents, procedures
Softwares
Etc.

HOF factors are also concerned with anything that has to do with the **material and technical systems** (Tools, Documents, procedures, Softwares, etc.)

Socio-technical systems (4)

Organization

Work shift
Co-activity
Task distribution
Functional and hierachical links
Etc.

HOF factors are also concerned with anything that has to do with the **work organization** (work shift, co-activity, task distribution, functional and hierarchical links, etc.)

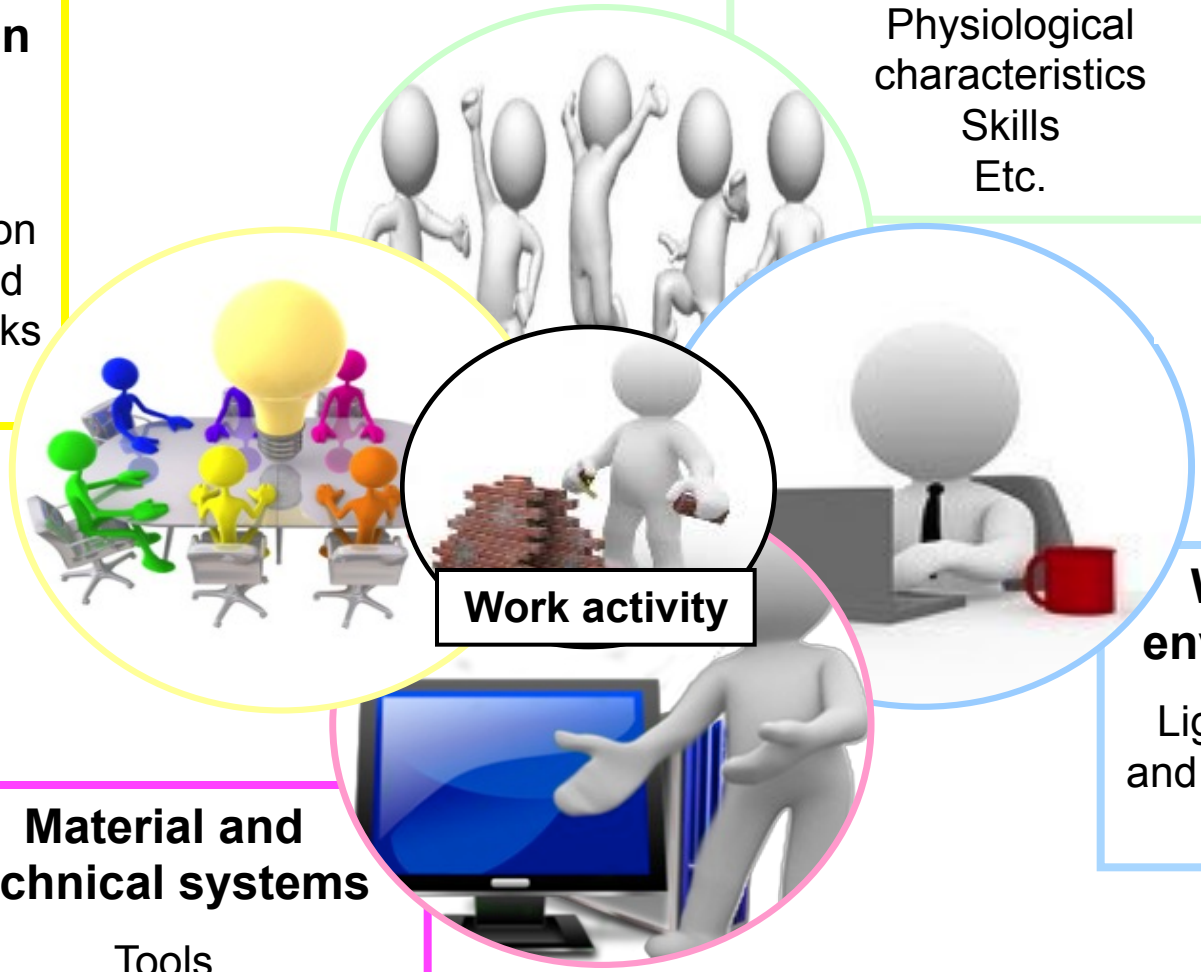
Socio-technical systems

Organization

Work shift
Co-activity
Task distribution
Functional and hierarchical links
Etc.

Operator

Physiological characteristics
Skills
Etc.



Working environment

Light, thermal and sound levels
Etc.

Material and technical systems

Tools
Documents, procedures
Software
Etc.

Variability of context

The **situations** actually encountered by individuals in the field **vary constantly** (equipment which does not react as expected, night-work, inexperienced colleague, varying levels of urgency, labour disputes, etc.)

Requiring the workers to **adapt the way they work** to attain the **expected outcome.** This adaptation has a **cost** (in terms of fatigue, stress, health, etc)

It is the licensee's responsibility to ensure that **workers are placed in satisfactory working conditions** and have the possibility to **adapt the way they are carrying out their tasks (room of manoeuvre) at an acceptable cost**

Human cost

Inappropriate resources can lead to risks. For instance :

inadequate tools,
poor design of man-machine interfaces,

cramped or poorly lit working environment,

Inadequate selection of individuals
insufficient training or practice,
professional teams destabilised by organisational change,
under-manning or insufficient time allocated for tasks

An operating situation in which performance is satisfactory but in which this was obtained at **very high human cost** to those involved is a **source of risk**

A **slight variation in the context** or **change of a member of personnel** can be enough to **prevent the required performance level from being reached**

The operator, a reliability vector, & sometime an unreliable factor

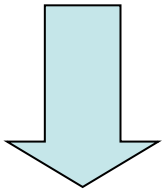
- The operator as the **unreliable factor ?**
  - (too) often considered as the weakest link in the organization
  - ➔Limitation of the operator's contribution (mechanisation)

- The operator as the **reliability vector ?**
  - Detect / correct deficiencies
  - Recovers from degraded situations
  - Bypass or compensate inefficient rules / process
  - Creates solutions

HOF related to contractors – study on the fields

Context

➢**Considerable use of outside contractors (80% of maintenance activities during reactor outages)**



HOF analysis of the work conditions of service providers during reactor outage maintenance activities

Framework for the intervention

- The analysis of the **work conditions** of service providers considered:
  - The **work resources** made available to them (equipment, information, human resources)
  - The **organisational framework** within which they work (the unit outages)

- The analysis of the **working relations between operators and the service providers** considered:
  - The **supervisory/surveillance relationship** which binds the initiator with the service providers
  - The **cooperative relationship** which exists between operators and the service providers, who form a single working unit

Analysis of work activity

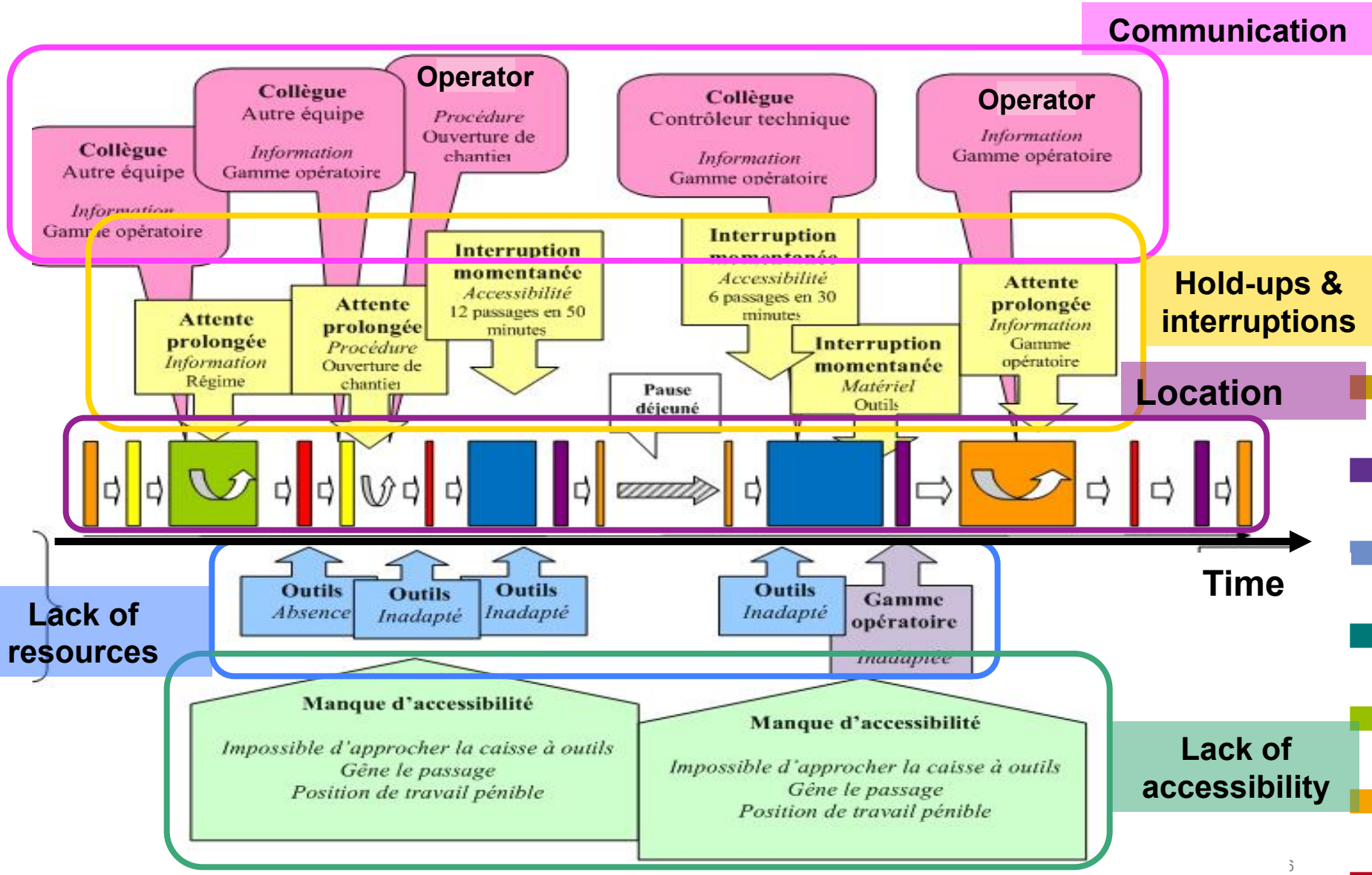
- **Professions studied :**
  - Valving
  - Logistics
  - Scaffolding
  - Study of the same activities in the **two nuclear facilities for <u>2 X 2 weeks</u>**

- **The analysis of work activity** involved **observing work** when and where it happens and **asking operators** about what they do (i.e. the task) and how they do it (i.e. the activity)

⇨ understanding how an operator reaches a set objective (the prescribed task) and if he fails to do so, why

- **17 systematic observations** (Valves, logistics, scaffolding)
- **Observation of 4 half-days of activity steering**
- **Interviews** with licensee managers and the sub-contractors employees

Contractor's work activity: a variety of constraints



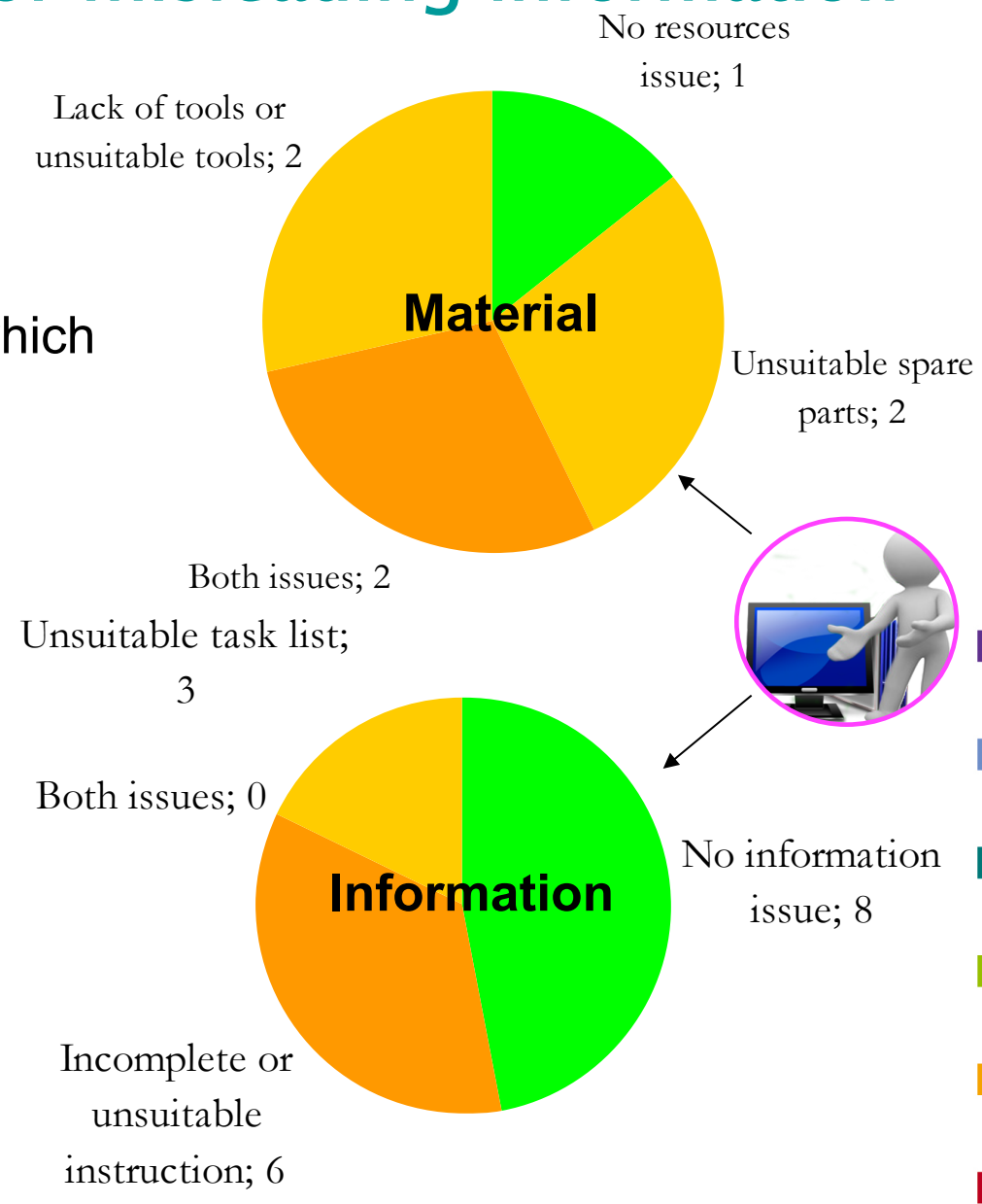
Results (1)

The constraints which disturb the activities of contractor employees

Insufficient material resources / Insfficient or misleading information

- Tools and spare parts: major resource problems for valve contractors
- A lack of material resources which affects every trade
- 7 valve tasks observed :

- Task lists not always reliable for valve contractors
- Instructions often vague for logistics, scaffolding
- 17 tasks observed (valve, scaffolding, logistics)



Activities interrupted and delayed because of a lack of resources

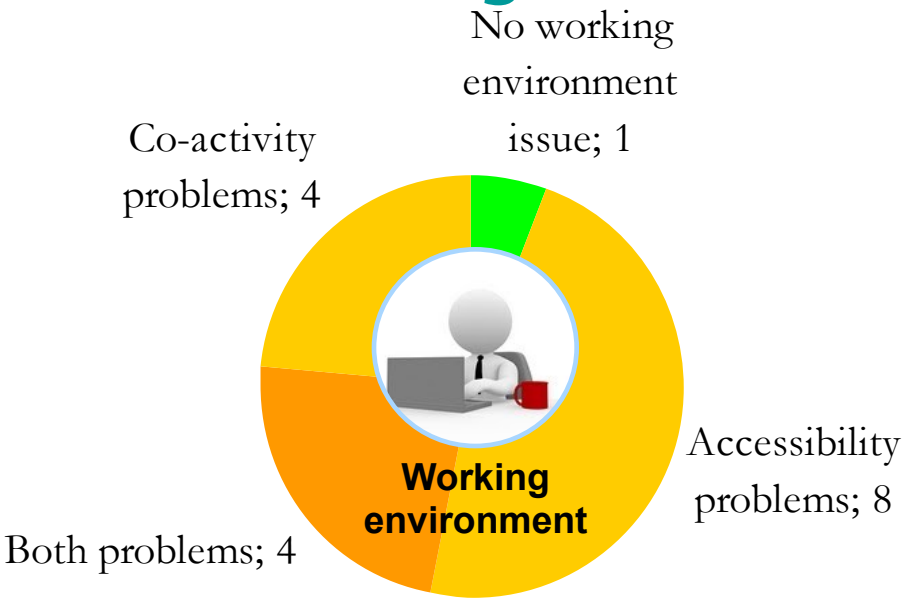
- **Hold-ups and interruptions because of a lack of resources**
  - *Spare parts, tools and other material resources:* work site interruptions, storehouse delays and deadlines missed
  - *Search for information and waiting for consignment regimes*
  - *Unavailability of certain interlocutors (e.g.:* surveillance officer*)*

- **Strategy and know-how to compensate for the lack of resources**
  - *Transfer of equipment*, "*coping and getting by*", *tool* "*retention*", "*theft*" between companies, "*loans*" between colleagues, use of *unsuitable tools*
  - *Search for information* from the people who initiated the request for intervention and *experience and know-how* making it possible to detect errors and compensate for the lack of information

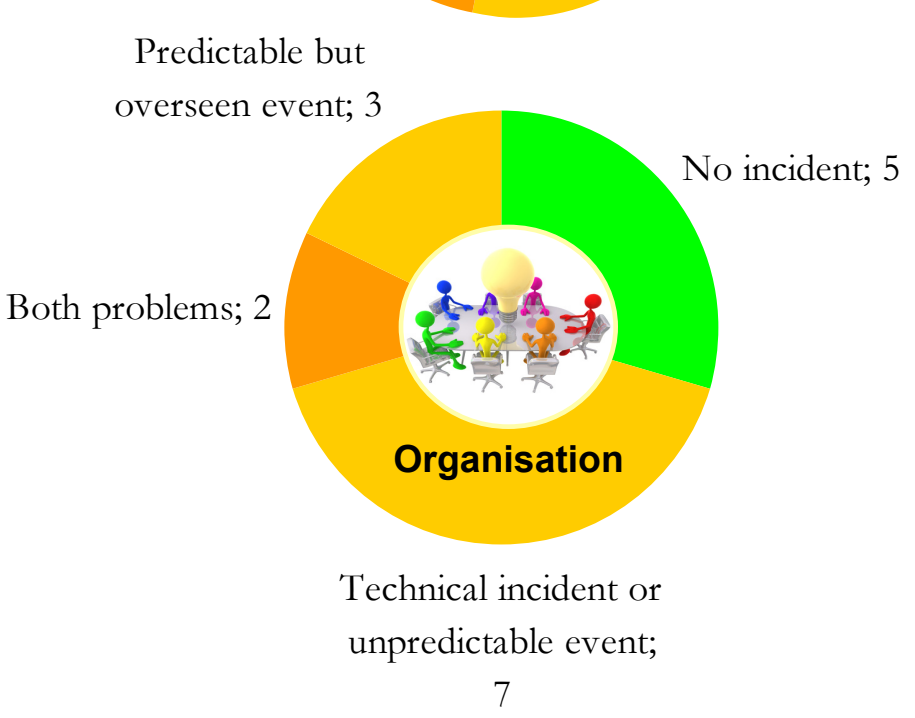
- **Insufficient resources, but know-how and experience often make up for them**

Working environment and organisation

- Lack of accessibility to work premises and equipment
- Co-activity which leads to additional difficulties



- Numerous **unpredictable incidents** increasing delays & interruptions
- Changes in priorities and emergencies on a daily basis
- Incident management strategies which cost time and energy and are sometimes to source of tension for workers



Results (2) : A supervisory relationship combined with a cooperative one

- **Interviews : A supervisory system which is seen as constrictive and sometimes counter-productive**
  - A supervisory system that can lead to interruptions and extended hold-ups, controls which are seen as superfluous, especially for the valve engineers

  ⇨ Precipitation and risk of mistakes

- **<u>BUT :</u> Relationships of trust and solidarity, as well as daily cooperation, which make activities easier to manage**
  1. **Collective strategies** (sometimes involving the project leader) make it possible to compensate for the lack of material and informational resources
  2. **Long-term partnership relations** help advance activities despite the procedural difficulties and the constraints of the organisation (the observations confirm this day-to-day relationship between providers and initiators)

Interpreting the results

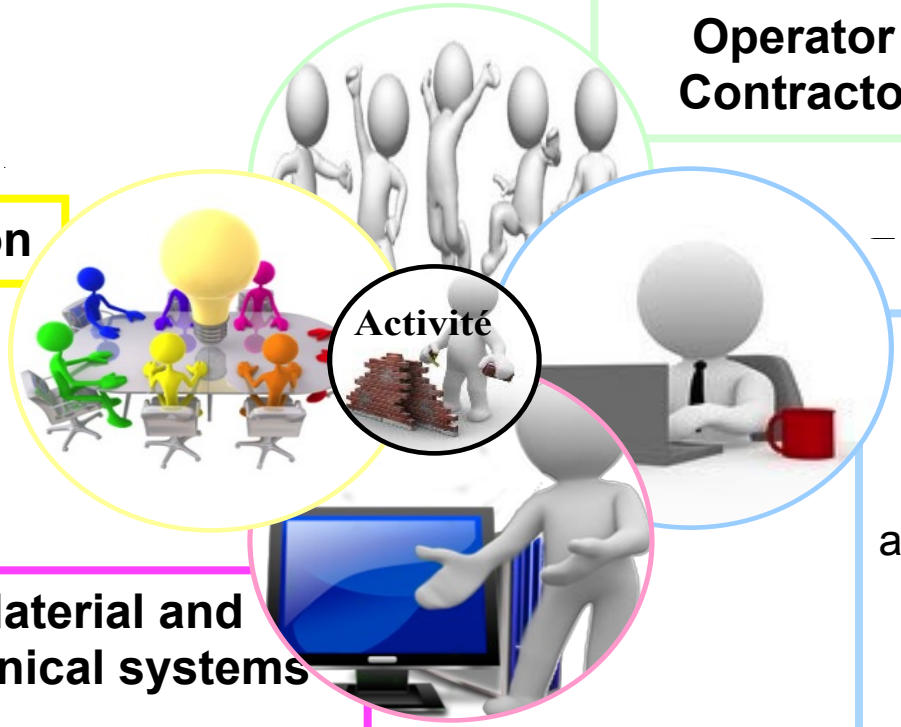
- **Result 1 :**
  - Working resources with **room for improvement** with regard to the simultaneous requirements of quality, safety and timeframe
  - There are various **positive examples**
  - Maintenance activities require **time and expertise**, which are probably underestimated

- **Result 2 :**
  - **Experience and cooperation** to compensate for the constraints of the work situation, potentially threatened by the instability of working groups

Result of the study

Operator = Contractors

Organisation



Working environment

Light, thermal and sound levels, Accessibility, Co-activity

Material and technical systems

Tools
Documents, procedures

Impacts on activity = Waiting, mistakes, interruptions, unforeseen events

Compensated by

Individual and collective strategy

Need for a <u>pluralistic approach</u> in order to develop these issues + need for <u>time</u> : Steering committee CoFSOH

Social, organisational and human factors steering committee

- Pluralistic approach (alike steering committee for Post Nuclear Accident Management or waste management)

- Participants
  - the licensees
  - the trades union organisations
  - NGO representatives
  - the French High Committee for Transparency and Information on Nuclear Security
  - the Ministry for Labour and the Ministries responsible for nuclear safety
  - HOF experts and researchers

- 3 working groups started in January 2013
  - Using contractors in normal operating situations: work organisation and conditions
  - Use of subcontracting: legal aspects
  - Management of emergency situations

Conclusion / relation with Fukushima

- Normal operation (or outage) vs. Emergency situation

- « Prepare to be unprepared » - whatever the situation, a proper working environment, training, tools, communication means etc. will be crucial in case of an unpredicted situation

- Get rid of the « superman fallacy »

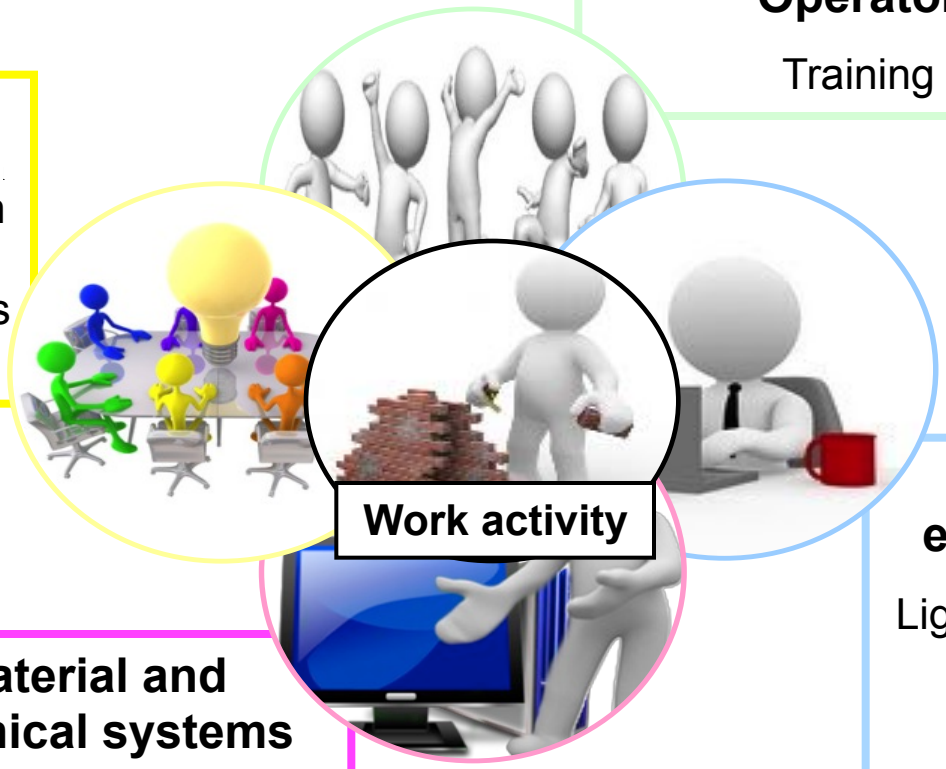
Conclusion / relation with Fukushima

Operator

Training

Organization

Task distribution
Functional and hierarchical links
Etc.



Working environment

Light, thermal and sound levels
Radiological situation

Material and technical systems

Tools
Food
Communication means