Enhancing nuclear safety

Annual report of the French industrial radiography incidents declared in 2014

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PRP-HOM/SER

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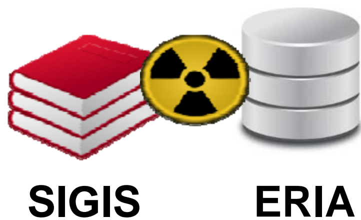
IRSN activities related to industrial radiography

Surveillance of operators' exposure to ionizing radiation

Dimensioning calculation (shielded enclosures)

National register for radioactive sources (Hass) and incidents database



SIGIS ERIA

Training and examination

Topic of the presentation : a feedback

- Significant radiological events in 2014 in France for industrial radiography activities
- Objective

Identify main causes of incidents

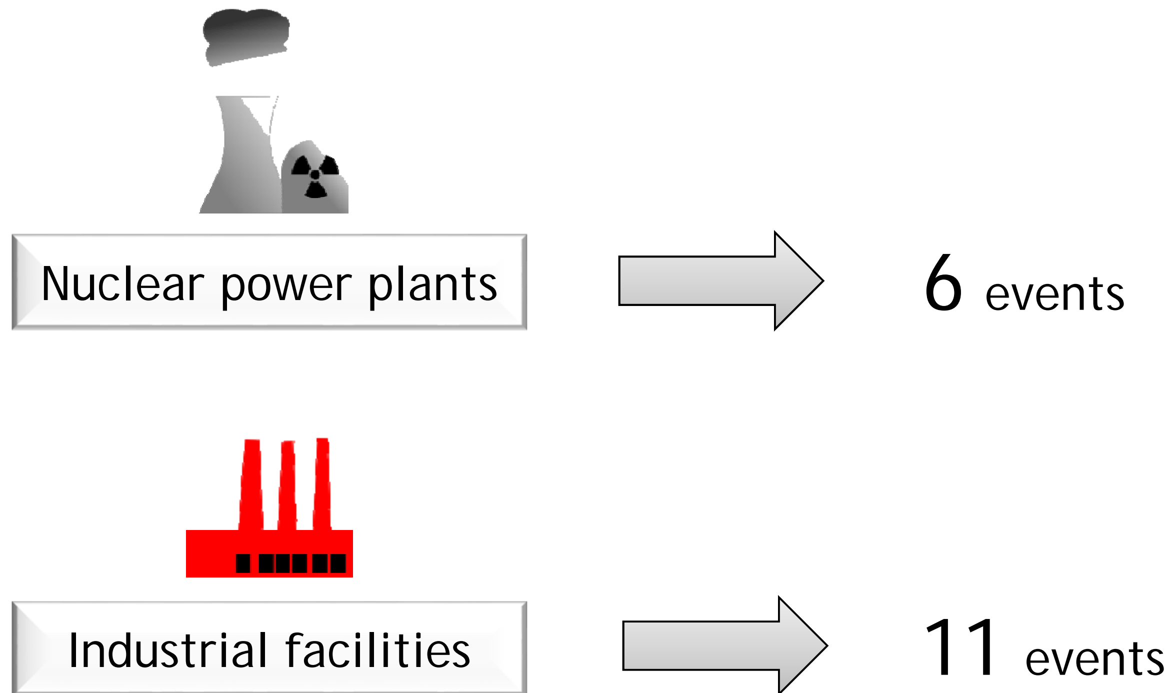
Analyse their evolution in time

Report of radiography incidents in France in 2014

- 17 significant events related to radiography

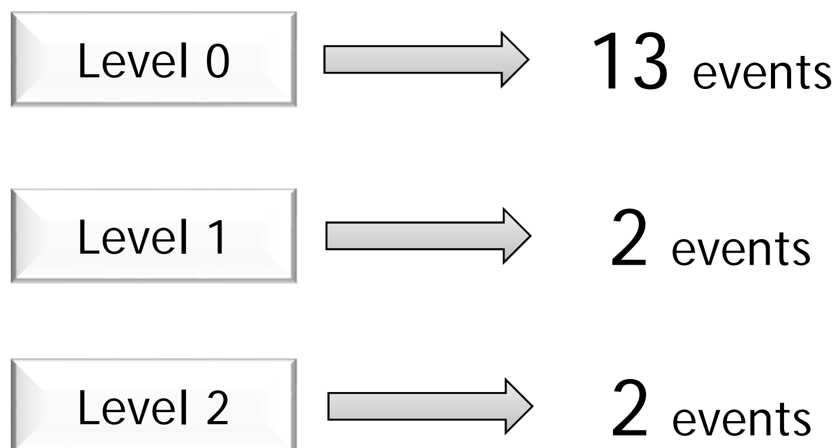
Report of radiography incidents in France in 2014

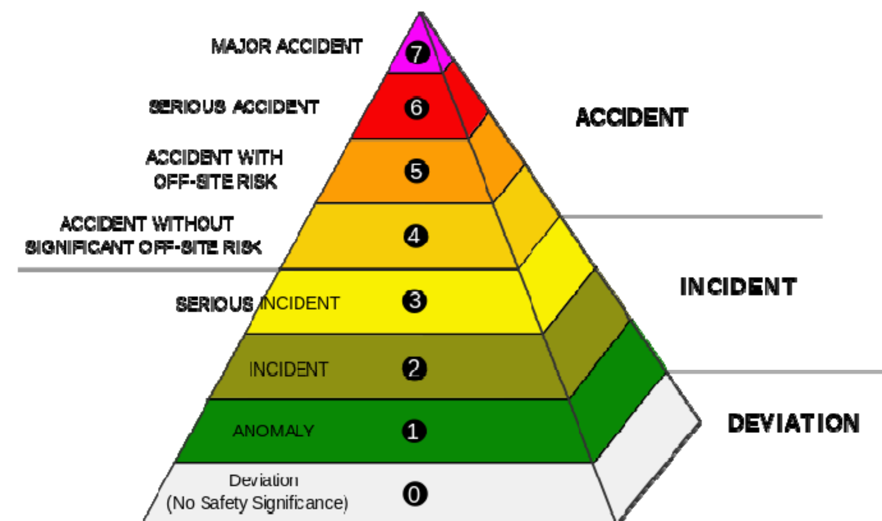
17 significant events - Where ?



Report of radiography incidents in France in 2014

17 significant events - INES Scale





Report of radiography incidents in France in 2014

➚ 17 significant events - The cause

Loss of control of radioactive source

9 events

Non-compliance with regulatory operational provisions

8 events

Equipment used in France

➚ Gam80/120

Equipment most widely used in France

600 devices in France, 90 % Gam80/120

Equipment in France

Radioactive source

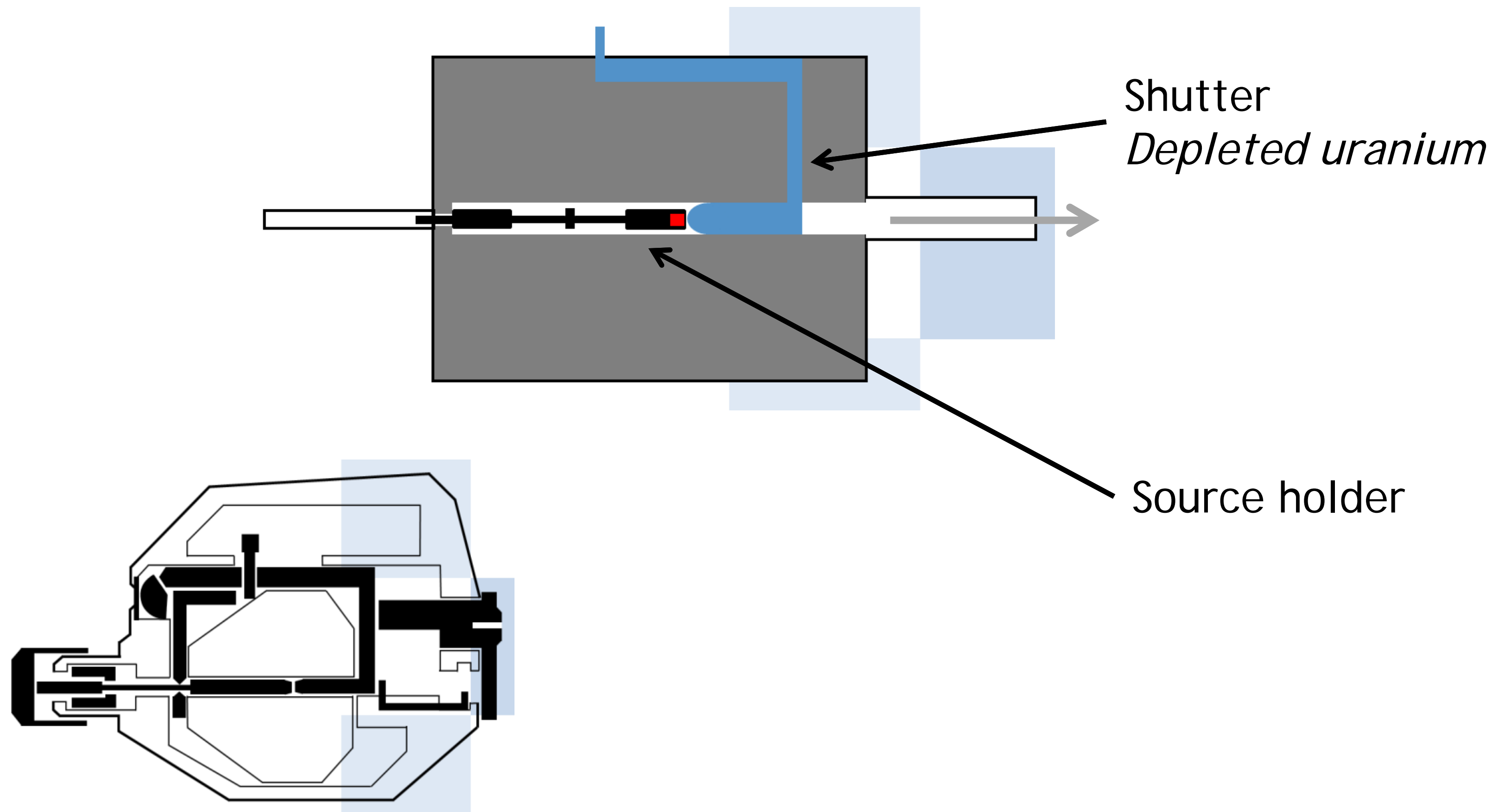
Ir192, Se75 (1-3 TBq)

Source holder

Exposure container

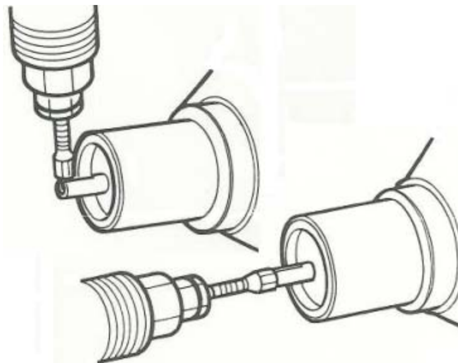
Equipment in France

➚ Shielded position



Equipment in France

Drive cable connection

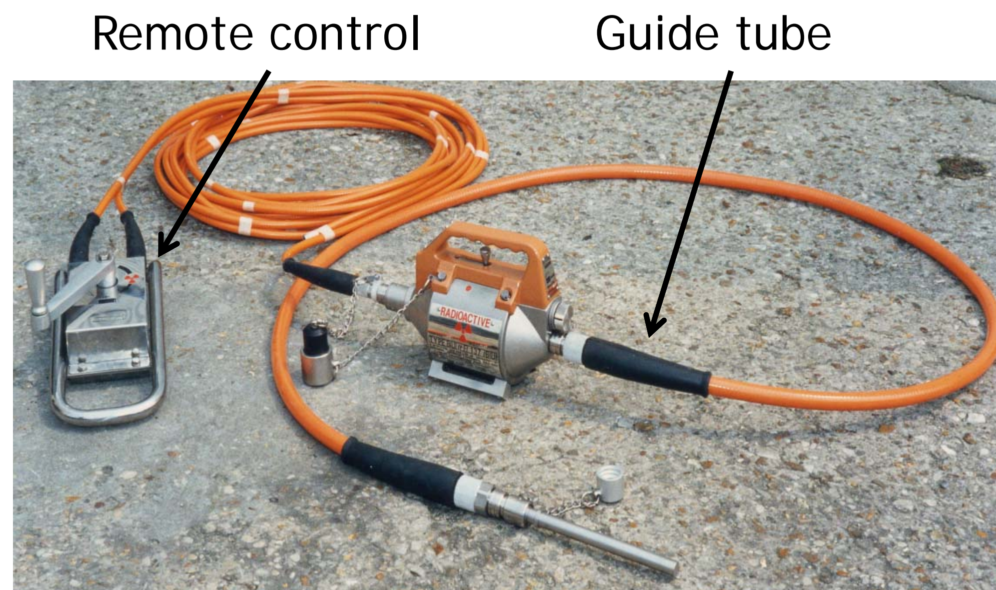


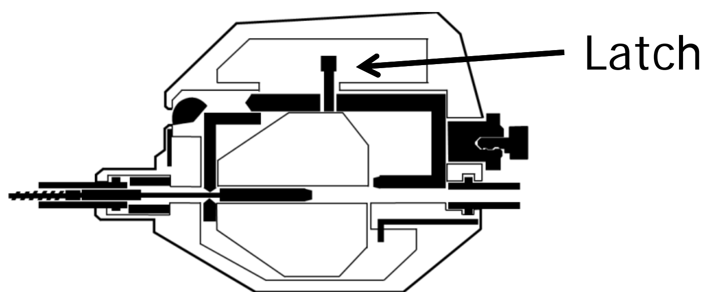
Equipment in France

➚ Guide tube connection

Remote control

Guide tube

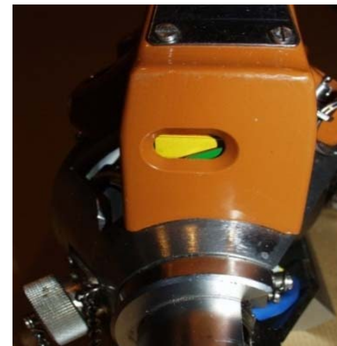




Latch

Equipment in France

➚ Indicators



Device unlocked

Shutter control removed

Source holder broken

Report of radiography incidents in France in 2014

↗ 17 significant events

Loss of control of radioactive source

9 events

Non-compliance with regulatory operational provisions

8 events

Report of radiography incidents in France in 2014

↗ 17 significant events

Loss of control of radioactive source

9 events

1. Source stuck in the equipment
2. Source no more controlled
3. Source out of the equipment

Report of radiography incidents in France in 2014

➚ 17 significant events

Loss of control of radioactive source

9 events

1. Source stuck in the equipment ⇨ 3 events
2. Source no more controlled
3. Source out of the equipment

Report of radiography incidents in France in 2014

Source becoming stuck in the equipment

	Source location	Cause	INES scale	Operator intervention	Dosimetric consequences
Event 1	Guide tube		Level 2	yes	22 mSv
Event 2	Container	Presence of an object in the container	Level 1	yes	no
Event 3	Guide tube		Level 0	no	no

Report of radiography incidents in France in 2014

Event 1 - Level 2

- Site radiography work (2 operators)
- Gam80 - Ir192 – 2,62 TBq
- 5th shot : source totally stuck in the guide tube

Prohibition of intervention

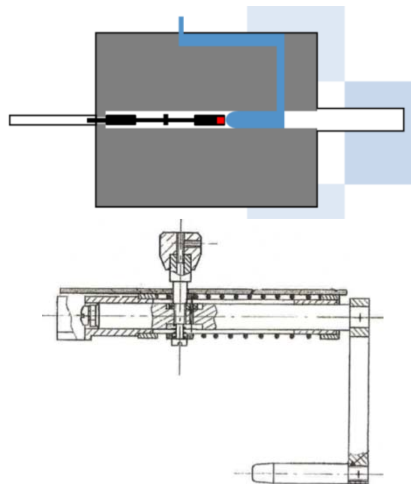
- With a metal rod, the operator pushed the source into the container
  - Dose : 22 mSv (in less than a minute)

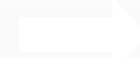
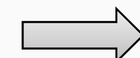
Report of radiography incidents in France in 2014

↗ 17 significant events

Loss of control of radioactive source

9 events



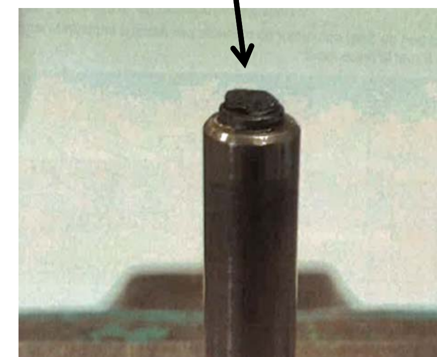
1. Source stuck in the equipment  3 events
2. Source no more controlled (shutter rupture)  6 events
3. Source out of the equipment

Report of radiography incidents in France in 2014

Rupture of the shutter

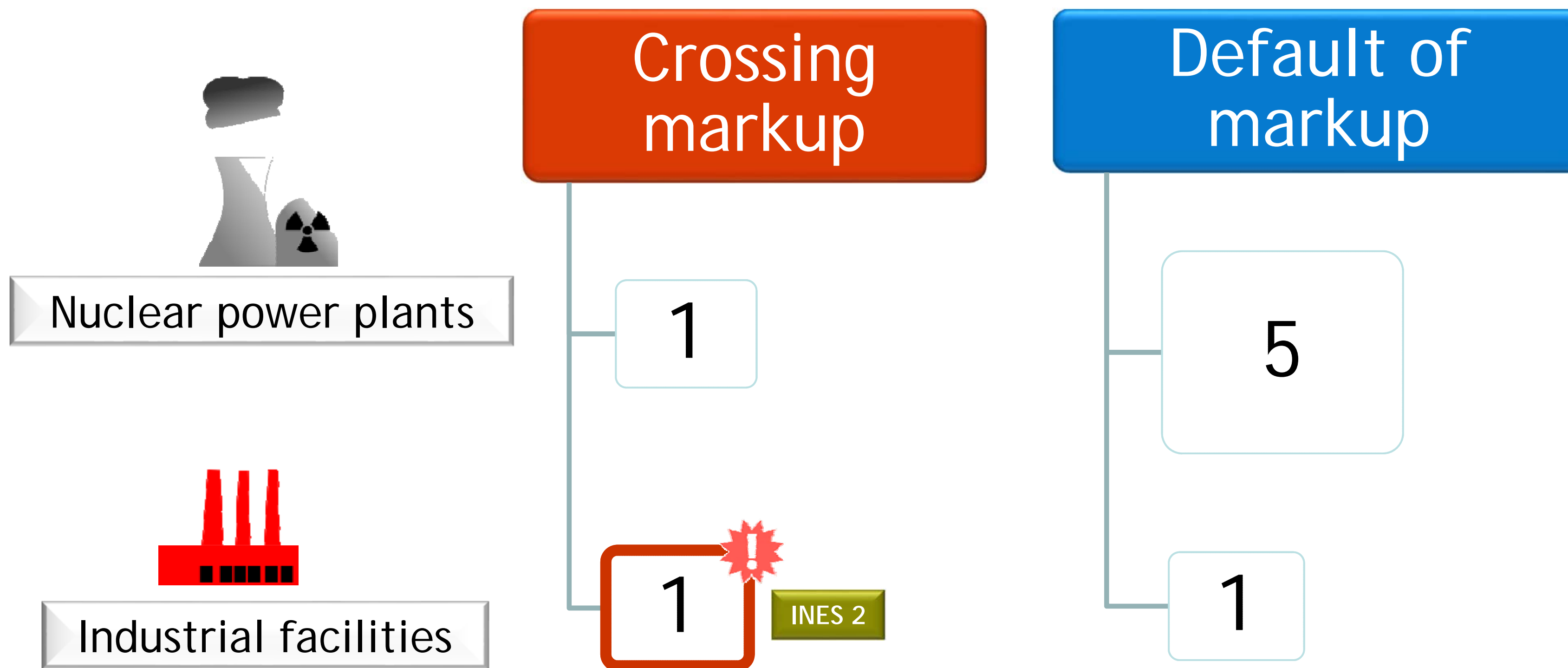
- Old equipment
- Hard to detect the problem
- Operator alerted by different indices
- Organization of a shutter change campaign by the supplier
- Information to all radiography companies

Rupture of the shutter

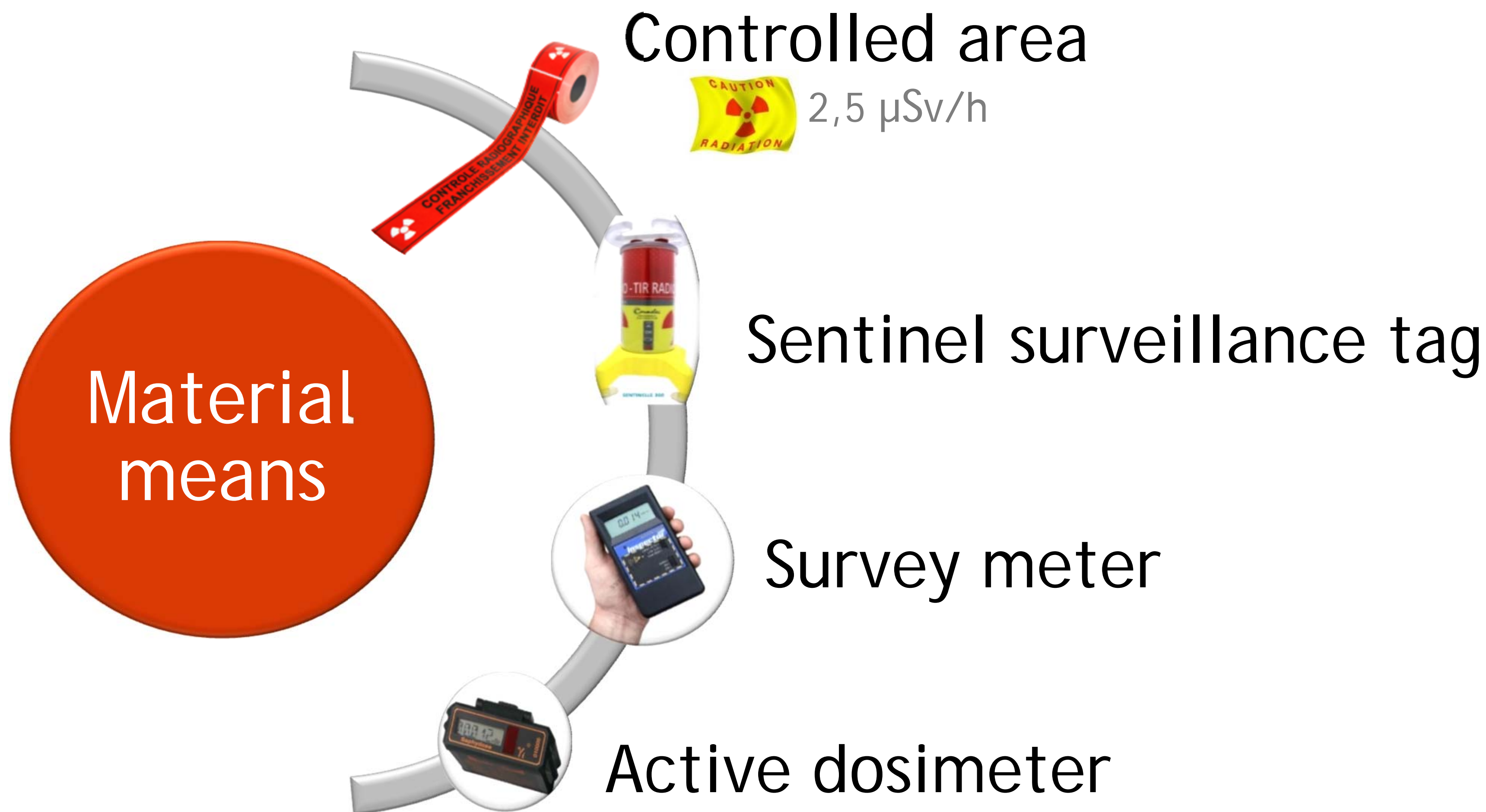


Non-compliance with regulatory operational provisions

8 events



Regulatory operational provisions



Regulatory operational provisions

Which must be performed

Collimator

Container

Sentinel surveillance tag

Notice

Notice

Barriers tapes

Barriers tapes

Nuclear power plants

Markup : main failures

Default of markup

5 *events*

INES 0

Nuclear power plants

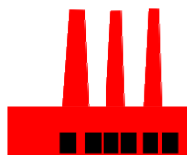
Markup : main failures

- Updated plans with entire topographic constraints

- **No dosimetric consequences** : the markup defects were highlighted by the controls performed before each shot

↗ 5 events / 6000 shots

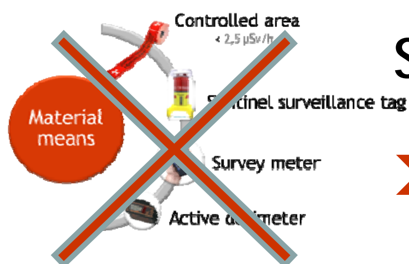
Organization "preparation / validation" robust and reliable



Industrial facilities

Default of markup - an atypical event

INES 0



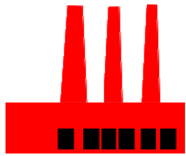
Shots were made without a controled aera

➔ Stakeholders could easily enter the shooting area

Discovered by an unannounced inspection authorities

➔ Fortunately no one has been exposed

Put out the importance of regular unannounced inspections

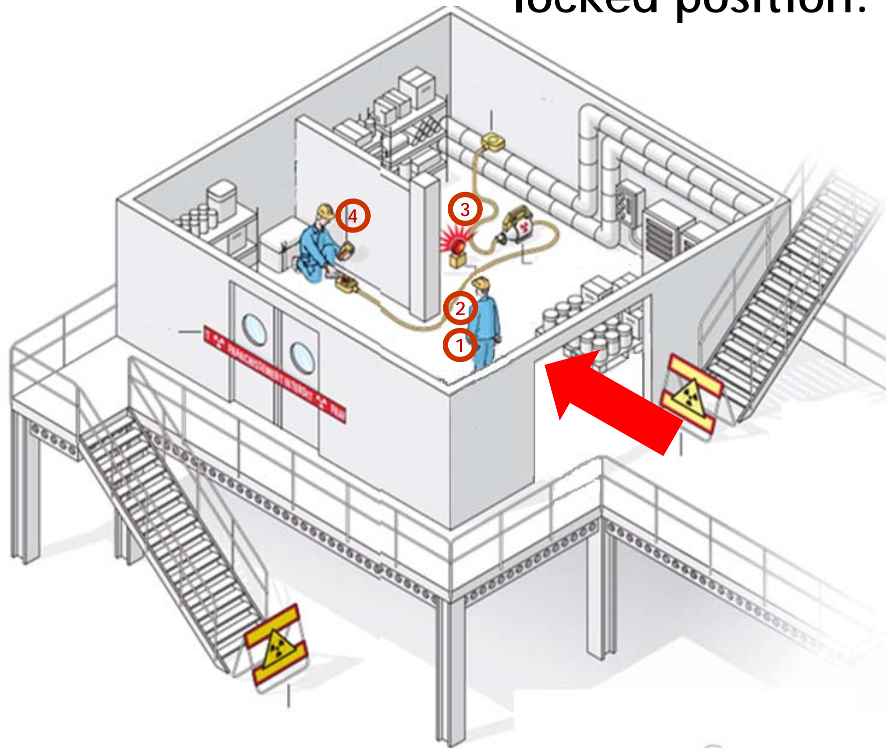


Industrial facilities

Crossing markup

INES 2

Believing the shooting ended, the operator entered to remove the film while the radioactive source was not in the locked position.



1 Without survey meter

2 Despite the active dosimeter alarm

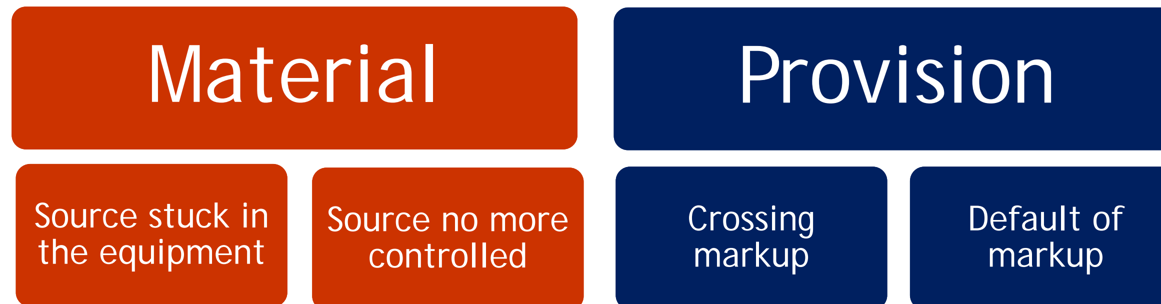
3 Regardless of the sentinel surveillance tag

4 Lack of communication

→ **5,3 mSv**

Conclusion

- 17 events divided into two typology :



- 2 events with dosimetric consequences (22 and 5 mSv)
- Few events comparated with the number of annual shooting
- Human and organizational factors mainly involved
- Importance of checks before shooting and unannounced inspections

Thank you for your attention

Questions