WGFCS Workshop

Periodic safety review of French fuel cycle facilities

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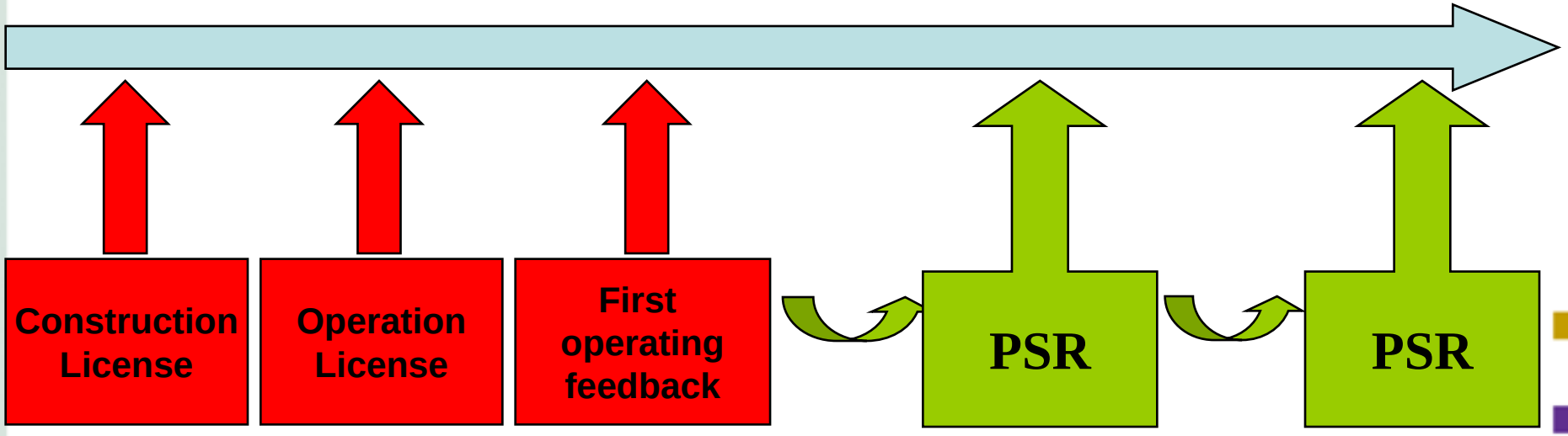
Safety assessments through a facility's life



Process defined by the authority

Periodic safety review in the French law

As safety can never be taken for granted, it has to be regularly reviewed.

The 5th article of the decree n° 63-1228 (December 11, 1963 [2]) specified that the safety of a nuclear facility may be reassessed at any time.

In June 2006, it was included in Law n° 2006-686 related to transparency and nuclear security.

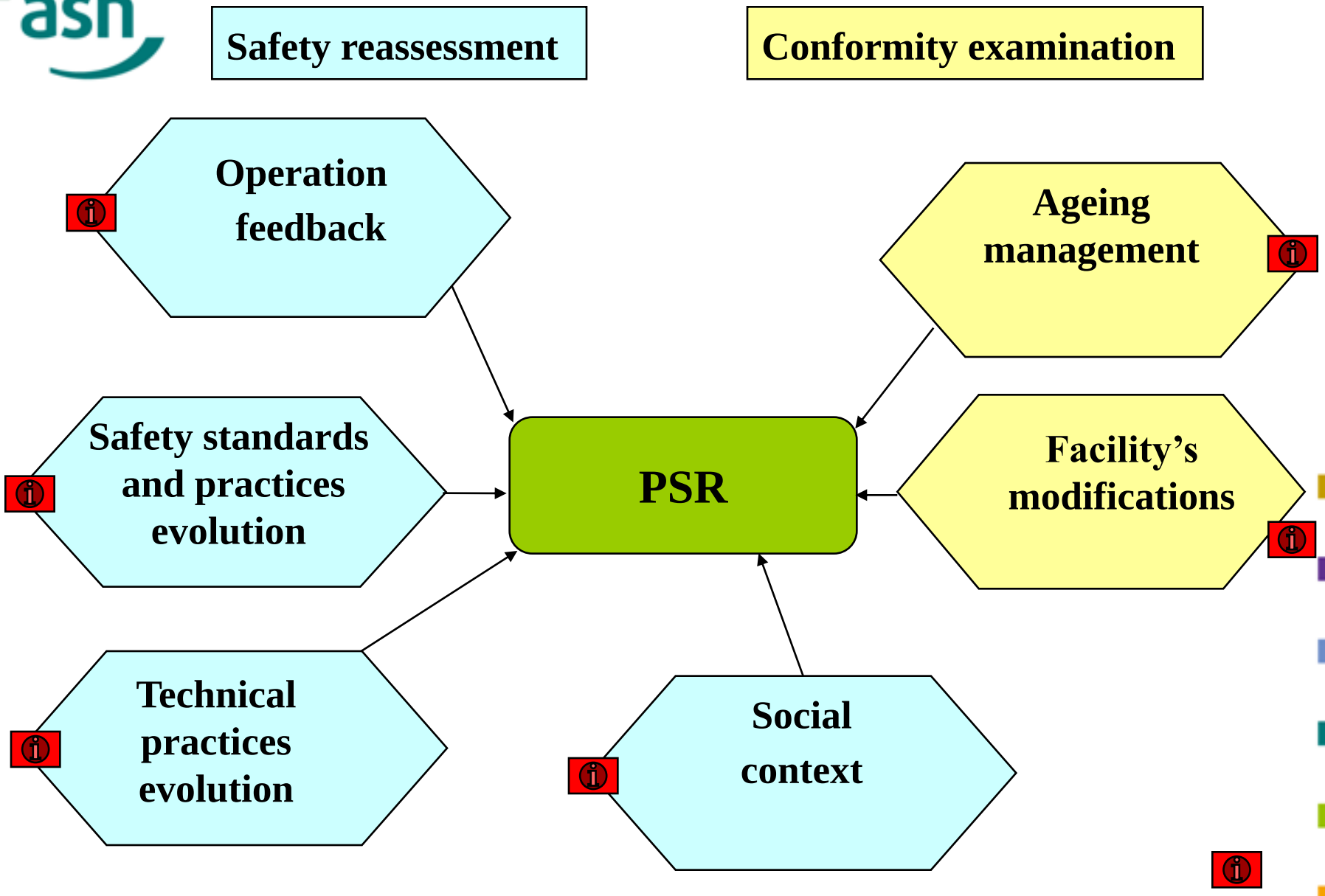
"***The licensee of a nuclear installation carries out a safety reassessment of its facility periodically, taking into account the best international practices… The periodic safety review should occur every ten years.***"

Objective of the periodic safety review

PSR objectives are :

• to avoid any serious discrepancy between the facility's state and new safety approaches, practices and regulations,

• to facilitate the on-going improvement of the facilities' safety and their operations.


Safety reassessment
Conformity examination
Operation feedback
Ageing management
Safety standards and practices evolution
PSR
Facility's modifications
Technical practices evolution
Social context

Ageing of equipment

The ageing of buildings, structures and equipment which could have an influence on the safety level must be examined particularly closely.

Some examples: pipes, vessels, anti-seismic support, expansion bellows...

Some causes :

- Wear
- Corrosion
- Concrete cracking….

Facility modifications

Internal facility modifications:

- Evolution of process, activity or operating conditions
- Evolution of the nuclear material processed
- Increase of the production capacity
- Building enlargement

…

External modifications:

- Evolution of the natural and human environment of the site
- Evolution of the environment knowledge (earthquake characterization,..)

Operating feedback

From the facility:

- production reports
- radiation protection issues and doses
- releases (liquid and gaseous)
- waste production and management
- anomalies, incidents
- staff training
- emergency exercise reports
- transportation reports

…

Events related to similar facilities:

- criticality accident of Tokaï-Mura in 1999
- flooding at Le Blayais NPP in 1999
- ...

Safety standards and practices evolution

New standards:

- Order related to liquid and gaseous releases of May 4, 1995
- Order related to the annual dose limits for the workers of March 31, 2003
- Order related to under pressure nuclear equipment of December 12, 2005
- Environment order of January 31, 2006 (Waste studies,…)
- Law n° 2006-686 of June 13, 2006 related to transparency and nuclear security
- …

New practices:

- Updating of safety fundamental rules (definition of earthquake, seismic design…)
- Guide related to fire protection
- …

Technical and industrial evolution

Automation
Use of burn up credit in criticality studies
Neutron radiation dosimetry
…

Increase of :
- fuel burn up
- ^{235}U content
- Pu content of Mox fuel

RepU enrichment and use

Social context

On-going safety improvement requests:

- from the public (after Tchernobyl accident, AZF accident,…)
- from the green associations (in the local information committees,..)
- from neighbouring countries
-…

PSR process

Licensee
- Risk examination
- Discrepancy identification
- Improvement proposals

IRSN
- Safety assessment

Standing group
- Advice and recommendations

ASN
- Decision notice

Risk examination

of external origin:

- earthquake

- flooding

- atmospheric conditions (frost, snow, wind, rain)

- fire (forest fires)

- aircraft crashes

- hazards due to the industrial environment (explosion, fire, toxic gas release)…

Risk examination

of internal origin:

- toxic and radioactive material spreading,
- internal and external exposure to radiations
- criticality,
- radiolysis and thermal risk,
- fire and explosion risks
- chemical and mechanical,
- **human and organisational factors,**
- **on site transportation…**

Risk examination

Reference documents:

- Creation decree
- Technical prescriptions
- Releases order
- Safety report
- General operating rules
- Emergency plan
- Waste study
- Improvement proposals

Discrepancy identification

Some examples:

- Absence of seismic resistance
- Risks related to human factors insufficiently taken into account
- Insufficient reliability of power supplies
- Criticality hazard control involving operational constraints
- Doses slightly over the licensee's objectives

…

Improvement proposals

Taking into account the future operation context:

- limited life time
- activity evolution
- material characteristic evolution

Some examples of improvement proposals:

- better seismic resistance
- radioactive material hold up limitation
- confinement improvement

To be associated with a timeframe

An increasing part of IRSN activities

Mobilization of specialists in all safety technical fields
(confinement, criticality, fire, earthquake,….)

Main difficulty: to evaluate the improvements proposed by the operator when the most recent safety practices cannot be implemented in an existing facility

One or two PSR each year

An increasing part of IRSN activities

INB	2008	2009	2010	2011	2012	2013	2014	2015	2016
EURODIF									
FBFC 98									
FBFC 63									
UP2									
UP3									
STE3									
MELOX									
TU5									

Provisional calendar of periodical safety reviews for French fuel cycle facilities

Nuclear Safety Authority decision

Different outcomes:

The reassessment and the authority decision can lead the operator to prefer the final shutdown of a facility rather than undertaking costly works in order to refurbish it.

Example, the plutonium technology facility (ATPu – see table 1) located in Cadarache :

- operation shutdown requested in the short term (finalized in 2006),
- radioactive material removal (mid 2008),
- final shutdown and dismantling in the medium term (by the end of 2013).

Nuclear Safety Authority decision

Different outcomes:

Reassessment can also lead the Nuclear Safety Authority to take into account the remaining lifetime of the facility and to authorize on-going operation, provided that suitable mitigation measures are carried out.

Example: the EURODIF gaseous diffusion enrichment plant (see table 2), which will be replaced by the Georges Besse II centrifuge enrichment plant, under construction.

Nuclear Safety Authority decision

Different outcomes:

the implementation of modifications considered to be necessary at the end of a reassessment can be the opportunity for the licensee to optimize its industrial tool.

Example: the FBFC plant located in Romans-sur-Isère (see table 3), where refurbishing was accompanied by an increase in production capacity.

Features of fuel cycle plants' PSR

- out-of-date design
- each facility has its own special features
- rare use of probabilistic safety assessment
- presence of waste without any final destination
- sometimes the long timeframe before improvement implementation requires adequate interim measures

Reassessment resources

Facility	FBFC 98	FBFC 63	MELOX
Date	2003	2006	2010
Reassessment by the licensee	10 man-year through 2 years	5 man-year through 2 year	10 man-year through 2 years
ASN/IRSN expertise	10 man-year through 1 year	6 man-year through 1 year	10 man-year through 1 year
Standing group	2 days	1 day	-
Works	100 Million Euros *	10 Million Euros	-

Conclusion

By the means of the periodical safety review, the Nuclear Safety Authority seeks to ensure a high safety level for the facilities under its control.

The recent adoption of these principles under the French law aims to develop and maintain an on-going improvement process to constantly raise the safety level of French nuclear facilities.