Decommissioning authorization process and controls in Italy

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Nuclear program background

Commercial utilization of nuclear power started in Italy in early ’60ies.

4 NPPs (Garigliano BWR, Trino PWR, Latina GCR and Caorso BWR) were commissioned and operated.

1 fuel fabrication facility (Bosco Marengo), 2 experimental reprocessing facilities (ITREC, EUREX) and 2 fuel research facilities (OPEC, IPU) were operated.

From ’50s to now 18 research reactors were also operated.

In 1987 all nuclear installations were shutdown on the basis of a Government decision taken after a national referendum.

Only 4 research reactors remain in operation.
Nuclear installations on the way of decommissioning

Under decommissioning
3 NPPs:  Trino (2012)
        Garigliano (2012)
        Caorso (2014)

1 Fuel fabrication plant: Bosco Marengo (2008)

Pre-decommissioning phase
1 NPP: Latina
2 Reprocessing facility: ITREC, EUREX
1 Fuel experimental facility: IPU
Authorization process & preventive controls
Decommissioning authorization licensing process

Legislation requires a comprehensive licensing process, based on the submission of the Overall Decommissioning Plans (DP) and on the performance of an articulate regulatory assessment. The decommissioning license is granted also based on an Environmental Impact Assessment (EIA).

Preparatory decommissioning activities can be performed before the decommissioning license is granted based upon “ad hoc” authorizations.

Tipical technical specifications are:
Submission of detailed projects and plans of operations
Management of RW
Clearance levels for materials
New effluent release limits
......

Legislative Decree 137/2017 established a public hearing phase before authorization granting
Decommissioning licence termination process

Unconditional release of the site w/o radiological constraints  (green field)
Authorized by Ministry of Economic Development on the basis of comments/observations received by involved Ministries and Region concerned, and on binding advices by ISIN

**Licensing documentation**

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**Overall Decommissioning Plan**

- Review & assessment

**Decommissioning Licence**

- Annex I: Prescriptions
- Annex II: Decommissioning Projects (PDD)

- Detailed Projects (DP) (construction/refurbishment of SSCs)
- Plans of Operations (PO)

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<th>PDD</th>
<th>Documents topics</th>
<th>DP/PO</th>
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<td>Interim storage facilities</td>
<td>Dismantling and reconstruction of Ex Compattatore</td>
<td>DP</td>
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<td>Adjustment of ECCS building</td>
<td>DP</td>
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<td>Realization/refurbishment of plant systems</td>
<td>Reactor building auxiliary systems refurbishment</td>
<td>DP</td>
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<td>Realization of WMF in turbine building</td>
<td>DP</td>
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<tr>
<td>Reactor building dismantling</td>
<td>Upper internals dismantling</td>
<td>PO</td>
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<td></td>
<td>Reactor building systems and components dismantling</td>
<td>PO</td>
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<tr>
<td>Auxiliary systems buildings dismantling</td>
<td>Turbine building systems and components dismantling</td>
<td>PO</td>
</tr>
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<td></td>
<td>FAT building systems and components dismantling</td>
<td>PO</td>
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Overall decommissioning plan - review & assessment

Verification of safety on Overall Decommissioning Plans:

- **Comprehensive strategy** until site unconditional release
- **Radiological characterization** of structures and components
- **Detailed safety case** for dismantling, waste treatment/conditioning and storage
- **Proven** decontamination & dismantling **technologies**
- **Site safety management** with special attention to contractors activities
- **Availability of adequate wastes storage capacity** for the full implementation of the decommissioning plan
- **Fire protection programme and risk analysis** (High level of fire protection)
- **Proper residual materials management**
- **Legally binding clearance levels and verification methodology**

The EEP is reviewed and downgraded during plant decommissioning depending on the safety relevance of the performed activities
activities relevant for nuclear safety and radiation protection shall be performed on the basis of decommissioning projects developed taking into account WENRA requirements on decommissioning and RWM....
DP & PO approval process - review & assessment

Verification of safety on DP/OP in relation to the Overall Decommissioning Plan attains to:

- **radiation protection objectives:** for normal operation they are established in the legislation and referred to the “below radiological concern criteria”; for accident conditions they are proposed by the licensee on the basis of its safety analysis;

- **detailed radiological characterization of SSCs:** focused on the completeness of the historical operational data and on the adequacy of the measurement campaign planned to obtain a complete characterization of the installations and as well as on the correct selection of the international standards assumed as reference; *(The Radiometric Characterization Plan shall be submitted by the licensee for approval)*

- **radioactive waste management strategy for processing:** The review of the strategy for the management of radioactive waste will assess its timely feasibility, the operative experience of the proposed treatment/conditioning process and the availability of adequate temporary storage facilities on the site;

- **design and operational status of SSCs useful for decommissioning:** the review of design and the operational status of SSCs useful for decommissioning is performed in order to define the necessary upgrades. Such systems modifications will be object of dedicated projects to be submitted for approval.
DP & PO approval process - review & assessment

➢ safety analysis: Safety analysis assessment is related to the considered event classification and completeness, to the failure analysis and to the evaluations of the consequences based on national and international standards and independent analysis.

➢ fire prevention & protection: Fire prevention and protection assessment is performed in order to verify the compliance with the defense in depth criteria.

➢ safety classification and design criteria of SSCs: A direct consequence of the safety analysis performed by the operator and assessed by ISIN. The quality class with the associated standards for the systems and components are based on international guidelines, while the loads associated to the seismic classification for SSCs are derived for the national standards with additional conservative margins.

➢ radiation protection of people and workers: Radiation protection of people and workers is assured by appropriated assessed radiation protection objectives. Workers exposure evaluations are assessed on the basis of ALARA principle with regard to exposition time, shielding or remote tools used, personal protection dispositive, etc. Concerning radiation protection of workers review and assessment is addressed to verify that adequate demonstration is provided that all decommissioning activities will be carried out in compliance with the dose restraints required by the national legislation and with the ALARA criteria.
Decommissioning licensing process

DP & PO approval process

Licencee

ISIN
  ISIN technical report

Approval granted + technical specifications

Answers

Request of additional information/evaluations

Licencee / ISIN Meetings

Licencee

DP/OP submission
On site inspections & controls
On site inspections & controls

During the implementation of decommissioning activities, on site inspections and control activities are conducted respectively by ISIN inspectors and technical staff.

For particular systems or structures whose malfunction can have a major impact on the safety and on the protection of public, workers and environment, also in factory control activities are conducted by ISIN technicians.

ISIN inspectors are entrusted with the qualification of law enforcement officers. In case of infringements, inspectors report to the Public Attorney of the jurisdiction the installation belongs to and have the authority to establish specifications in order to interrupt any violation in place.
On site inspections & controls

Surveillance activities are divided in:

**ordinary**, aimed at verifying compliance with law, licenses and with what is established in the documentation that regulates the management of the plant and/or the activities;

**related to ongoing operations**, aimed at verifying if performed activities comply with approved projects or operational plans;

**extraordinary**, related to the occurrence of anomalous events or the receipt of particular alerts.
Priority assigned for surveillance

Priorities for the *ordinary inspections* at different installations are assigned on the basis of an algorithm that identifies the *magnitude of the potential risk* of an installation, by considering general “criteria” and related “indicators”, both with defined associated weight (taking into account a *graded approach*).

### Input data

<table>
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<tr>
<th>Criteria</th>
<th>Weight</th>
<th>Indicators</th>
<th>Weight</th>
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<tbody>
<tr>
<td>Presence of RW (Physical status)</td>
<td>15</td>
<td>ILW liquid</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>LLW liquid</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ILW solid</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>LLW solid</td>
<td>2</td>
</tr>
<tr>
<td>Presence of RW (Cond/not Cond)</td>
<td>5</td>
<td>Conditioned</td>
<td>5</td>
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<tr>
<td></td>
<td></td>
<td>Mainly Conditioned</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Not Conditioned</td>
<td>1</td>
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<tr>
<td>.........</td>
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### Algorithm

[Diagram showing input data and algorithm steps with priority levels marked as TOP PRIORITY, HIGH PRIORITY, LOW PRIORITY]
Inspections & controls performed since the first NPP decommissioning authorization.

10 violations ➔ penal or administrative sanctions
(8% of total inspections)
Drums corrosion were detected

Specifications given to recover packaging integrity and report sent to the Public Attorney

Sentence for a fine given by the judge.
Inspection 2
Fire hazard

Fire principle in the cutting area during filter cutting (2015)
Specifications given for prosecution of activities
Restart of the activities (2017)
Fire principle detected in the same area with violation of specifications (2017)

Administrative sanction given by inspectors
.... the effective shipment of the materials shall be communicated to this Inspectorate at least 15 days in advance to allow surveillance activities......

Some components were cleared without communication

Measurements performed by the licencee in compliance with clearance level

Measurements were performed by regulator on other components of the same homogeneous group: no non conformity detected respect CL.

**Administrative sanction given by inspectors**
Final remarks

Adequate number and qualification in the staff

If not

More prescriptive regulatory framework

- More complicated management of the plant
- More complex regulatory control
- Delays in decommissioning activities

Extreme use of contractors and sub contractors

- Loss of capacity control
- Delays in decommissioning activities (tender procedures, trainings...)
- Risk of delays for contractors bankruptcy
Final remarks

From operation to decommissioning, number and types of inspections increase

more inspectors “multi-skills” needed

Managing the unexpected during inspections:
• Radiological findings
• Waste management
• Organizational issues
• Missing or inadequate records
• Potential workers and public exposures
• ......
Thanks!

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