

The Italian transposition of the EU BSS for NORM involving industries

Cristina Nuccetelli

National Institute of Health (ISS)

*National Center for Radiation Protection
and Computational Physics*

Rome, Italy



Introduction

The Italian transposition (Italian Legislative Decree 101/2020-**Italian LD**) of the 2013/59/Euratom Directive (**EU BSS**) was published on 12th August 2020 and went into effect on 27th of August 2020.

The EU BSS and, therefore, the Italian LD consider the NORM involving Industries as planned exposure situations (or practices).

In this kind of industrial activities large amounts of low activity concentration materials (NORMs) are typically present.

For this reason the graded approach is particularly useful and appropriate, as indicated by the EU BSS.

The Italian LD identifies many industrial sectors and for each one indicates detailed classes or types of practices involving NORM.

Some NORM involving industrial sectors were already listed in the Italian previous legislation: this list was updated and enlarged in order to account for the industrial sectors listed in Annex VI of the EU BSS and the Italian specific industrial activities

Industrial sectors and classes of practices involving NORM (Legislative Decree 101/2020)

Industrial sector	Class of practice
Coal-fired power plants	- Maintenance of boilers
Mining of ores other than uranium ore	- Extraction of granitoids, such as granites, ortogneiss, tuff, pozzolana, basalt, porphyry and lava
Zircon and zirconium industry	- Processing of zircon sands - Production of refractories, ceramics and tiles - Production of zirconium oxide and metallic zirconium
Mineral processing and primary iron production	- Extraction of rare earths from monazite - Extraction of tin, lead and copper - Processing of iron/niobium from pyrochlore ore - Extraction of aluminium from bauxite - Processing of iron/tantalum - Use of potassium chloride as additive in metals extraction by fusion
TiO ₂ pigment production	- Management and maintenance of titanium dioxide production plants

List of industrial sectors and classes of practices involving NORM ... (cont.)

Industrial sector	Class of practice
Processing of phosphatic and potassium minerals	<ul style="list-style-type: none"> - Thermal phosphorus production - Phosphoric acid production - Production and wholesale of phosphate and potassium fertilisers - Production and wholesale of potassium chloride
Cement production	<ul style="list-style-type: none"> - Maintenance of clinker ovens
Production of thorium compounds and manufacture of thorium-containing products	<ul style="list-style-type: none"> - Production of thorium compounds and manufacture, management and conservation of thorium-containing products, in particular welding electrodes with thorium, optical components having thorium and nets for gas lamps
Geothermal energy production	<ul style="list-style-type: none"> - Maintenance of high or medium-enthalpy geothermal energy systems
Oil and gas production	<ul style="list-style-type: none"> - Oil extraction and refining, gas extraction, in particular to the presence of muds and scales in pipes and oil containers
Ground water filtration facilities	<ul style="list-style-type: none"> - Management and maintenance of facilities
<i>Paper mill</i>	<ul style="list-style-type: none"> - <i>Maintenance of pipes</i>
<i>Cutting and sandblasting processing</i>	<ul style="list-style-type: none"> - <i>Plants using abrasive sands or minerals</i>

What are the most important new entries in the Italian legislation to manage this new and wide class of practices?

Following the approach of the EU BSS the following *tools* were introduced

- 1) Exemption and clearance levels in terms of activity concentration**
- 2) Exemption levels in terms of dose**
- 3) Classification of NORM residues (special category different from radioactive wastes)**
- 4) Authorized landfills**
- 5) Commodities**

What are the most important new entries....

1) Based on the EU BSS, **exemption and clearance levels (ELs and CLs) in terms of activity concentration** for solid materials were introduced in the Italian LD

Table 1

Radionuclide	ELs and CLs (kBq/kg)
Natural radionuclides from the U-238 series	1 kBq kg ⁻¹
Natural radionuclides from the Th-232 series	1 kBq kg ⁻¹
K-40	10 kBq kg ⁻¹
<i>Sub chains of Po-210 or Pb-210</i>	<i>5 kBq kg⁻¹</i>
<i>For oil sludge the exemption values are 5 times higher than the ones reported in table 1 and</i>	<i>- 100 kBq kg⁻¹ for U-nat, Th-230, Th-232, Po-210 or Pb-210 - 10 kBq/kg for Ra-228</i>

In Italic specific choices of the Italian legislation

ELs are not valid to exempt the incorporation of NORM residues into building materials

What are the most important new entries....

1) ELs and CLs in terms of activity concentration

What happens if ELs and CLs are not met?

In line with the EU BSS approach, a **graded procedure** was adopted in the Italian LD

In case the solid materials occurring in a certain production cycle have activity concentrations $>$ ELs and CLs,

practice can be exempted from notification and/or materials can be cleared if ELs and CLs in terms of dose are met

What are the most important new entries....

2) Exemption and clearance levels in terms of dose for the exemption of practices from notification and/or for the clearance of materials from practices are:

	EU BSS	Italian legislation
Workers	1 mSv/y	1 mSv/y
Members of the public	1 mSv/y	0.3 mSv/y

The assessment of doses to members of the public takes into account all the exposure pathways
In case of impact on drinking water, the level is 0.1 mSv per year

For members of the public, same dose criterion of **0.3 mSv/y** set in the previous legislation (*action level*) was maintained.

Is it possible to comply this dose level for members of the public with values of table 1 (1 kBq/kg for ^{238}U and ^{232}Th etc...)?

What are the most important new entries....

2) ELs and CLs in terms of dose (cont.)

An important logical connection exists in the EU BSS:

“...practices involving amounts of radioactive substances or activity concentrations below the exemption values laid down in... Table B (1 kBq/kg, ...etc), are deemed to comply with criterion (i) (doses of no radiological concern = 1 mSv per year for NORM) without further consideration.

But in Italy the dose of no radiological concern is 0.3 mSv per year

Is it possible to comply this dose level for members of the public values of table 1 (1 kBq/kg for ^{238}U and ^{232}Th etc...)?

In all cases the ELs and CLs in Table 1 ensures the respect of ELs and CLs in terms of dose for members of the public **with two exceptions**, verified by application of scenarios from RP 122 part II

- road construction
- disposal in landfills

In these cases special ELs are set

What are the most important new entries....

2) ELs and CLs in terms of dose (cont. I)

Special ELs and CLs in terms of activity concentration in solid materials to ensure that ELs and CLs in terms of dose for members of public are met:

For residues to be **disposed in landfills or reused for road construction**, the ELs are 50% of values reported in Table 1. **Higher values are allowed** if it is verified that the dose criterion for members of the public of 0.3 mSv per year is satisfied. Some activities in Task 2.8 of RadoNorm are dedicated to this topic.

Special case: if residues are incinerated, the practice is exempted if it is **verified that the dose criterion for members of the public is satisfied**, also in case the radiological contents of different radionuclides are below the ELs. (*Scenario not considered in RP 122 Part II. Experience in field*).

In Italy a project is underway to develop computational tools for radiation protection experts and regulators (funded by INAIL-Italian National Institute for Insurance against Accidents at Work) These tools are aimed to estimate doses for workers (and to less extent for members of the public) by analyzing in detail exposure scenarios in some NORM involving Industries (cement, geothermal, zircon, oil and gas,...).

3) Classification of NORM residues

The Italian Legislation introduces a classification of NORM residues

Class of NORM residue	ELs (kBq/kg)	Clearance
Exempted residues	Radiol. content < 50% of ELs	NO restriction for: <ul style="list-style-type: none"> - Recycling - Reuse ALSO for <u>road construction</u> - Conventional landfill(*)).
Exempted residues	50% of ELs < Radiol. content < ELs	NO restriction of recycling or reuse ONLY if the compliance with the dose criterion of 0.3 mSv per year is met: <ul style="list-style-type: none"> - Reuse ALSO for <u>road construction</u> - Conventional landfill(*)).

(*) compliance with legislation about conventional waste management is required

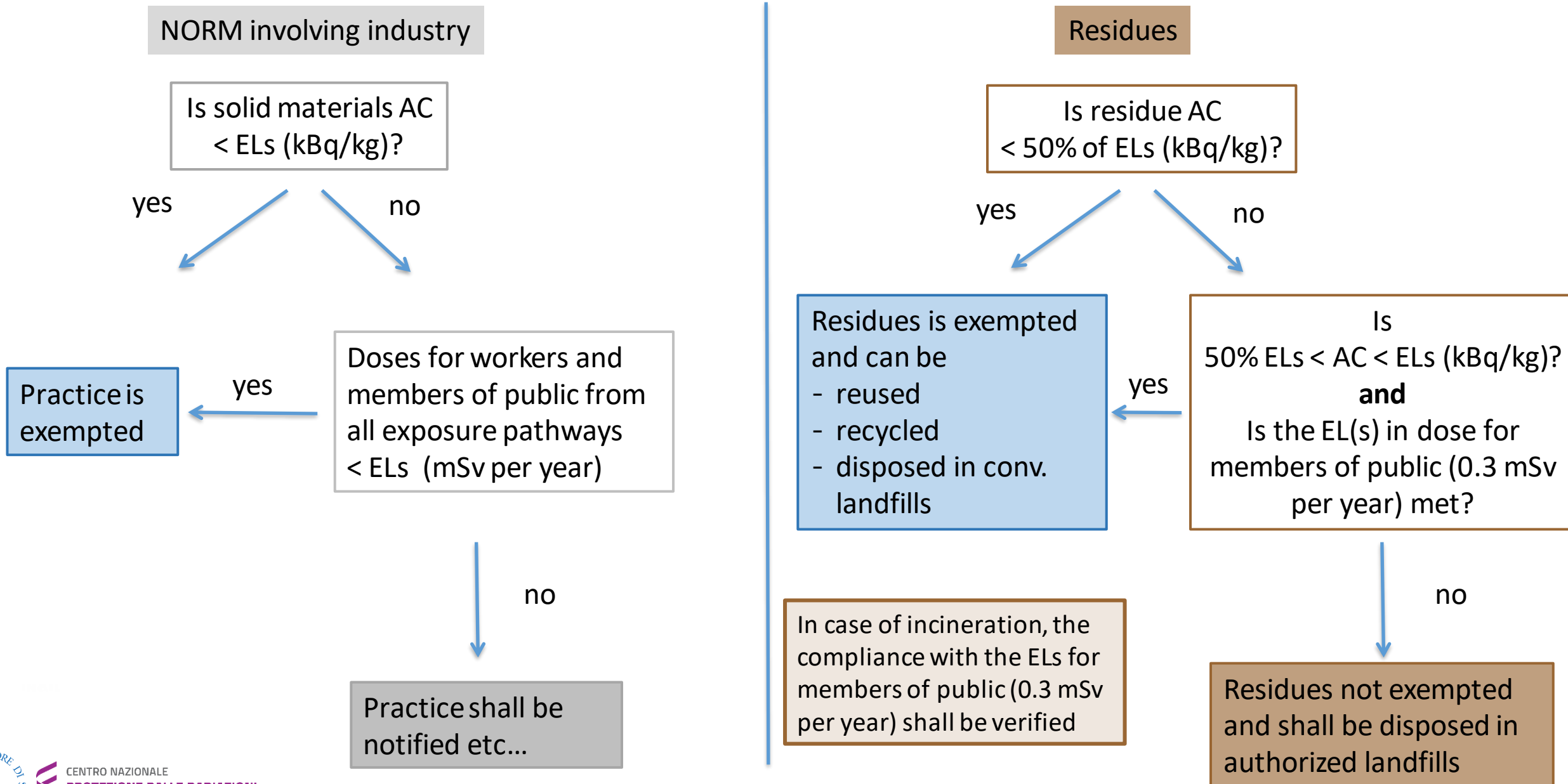
3) Classification of NORM residues (cont.)

The Italian Legislative Decree 101/2020 introduces a classification of NORM residues

Class of NORM residue	ELs (kBq/kg)	Clearance
Not exempted residues	Radiological content > ELs	Authorized landfills

Since the classification of residues and the authorized landfills are new entries in the Italian legislation, after a first phase of application it will be possible to make changes to take into account problems and/or difficult procedures not foreseen.

Scheme of the graded approach adopted by the Italian LD



4) Authorized landfills

Not exempted NORM residues can be disposed in **landfills for hazardous waste**, according to Council Directive 1999/31/EC and European Directive 850/2018, if the following requirements are fulfilled:

- NORM residues shall be disposed in separated and dedicated cells
- The presence of natural or artificial geological barriers
- Daily covering of disposed residues with clay
- Stable capping of full cells
- Etc.

This category of specialised and dedicated landfill shall require a **preventive authorization to store not exempted NORM residues**.

The preventive authorization is issued by the **Prefect** (representing the central government in an administrative area), after the consultation of local environmental and health authorities.

5) Commodities

As in EU BSS, in the new Italian legislation a list of types of existing exposure situations:

- (a)
- (b)
- (c) **Exposure to commodities** excluding food, animal feeding stuffs and drinking water incorporating
 - (i).....
 - (ii) naturally-occurring radionuclides, *such as commodities*.

A Reference Level of effective dose of 0.3 mSv/y has been set



Commodities* coming from NORM involving practices shall respect the Reference Level

The radiological content of Commodities shall ensure the respect of Reference Level

* e.g. refractories, fertilizers, ...

In summary

The obligation scheme follows a «graded approach», as required by EU BSS:

- a) If NOR materials and residues have a radiological content $<$ ELs and CLs (kBq/kg), the **practice is exempted from notification;**
- b) If NOR materials and residues have a radiological content $>$ ELs and CLs (kBq/kg), BUT effective doses of workers and members of the public $<$ ELs and CLs in terms of dose, **practice is exempted from notification**
- c) If doses of workers and member of the public $>$ ELs and CLs in terms of dose, **the notification is required and the undertaker shall adopt provisions about the protection of workers and of members of the public.**
- d) A **classification of NORM residues** (on the base of the radiological content) was introduced in the Italian radiological protection system
- e) **Special landfills** can be authorized to accept NOT exempted NORM residues.

Thank you for your attention

cristina.nuccetelli@iss.it