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## Quality Control of Neutron-Absorber Materials for the Nuclear Fuel Cycle. Principle of the JEN\_3 Neutron Backscattering Gauge

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It is projected that by 2030 there will be other nuclear reactors in addition to 437 reactors already operating commercially today in the world. A quarter to the third of the spent fuel rods from these reactors must be removed from a reactor every 12 to 24 months and stored between one and two years in the spent fuel pools. This delay allows the decrease of their radioactivity and thus their cooling, in order to facilitate transportation to the reprocessing plant.

During that pool storage period, prevention of criticality is ensured by the borated stainless steel plates, used as coated of the of the spent fuel pools.

In general, this material plays a major role in the nuclear fuel reprocessing industry as a neutron-absorber material.

Several metallurgy techniques have been developed for manufacturing the borated stainless steel plates.

To ensure a functional of radiation protecting and criticality, this material must meet strict specifications regarding the boron content and uniform distribution of the boron in the stainless steel plate.

CEA (French Atomic Energy Commission) has designed several gauges to provide proof through non-destructive inspection that the finished products fully satisfy their intended objectives.

The main geometries have been considered:

- Backscattering geometry, when the criticality shield must reduce the reflection of neutrons.
- Transmission geometry, when the shield must reduce the interaction of exchanging neutrons.

In this paper, we present the JEN-3 Backscattering neutron gauge. This gauge contains a neutron radioisotopic sealed source whose activity depends in the final control and the site constraints.

The neutron measurement is affected by randomness of the neutron emission and their interactions with the matter so, the uniform distribution of the boron will be checked by statistical criteria of acceptability.

The industrial prototypes are already installed and their performances have been validated in two manufactures of borated stainless steel plates (the first one in Austria and the second one in the US).

### Country/Organization invited to participate

France

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