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Assessment of Safety Systems Design of Industrial Irradiation Facilities in Brazil

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BACKGROUND

Accidents occurring in irradiation facilities have demonstrated that these facilities have safety-critical systems, which should be designed to meet proper safety requirements. The IAEA's publication SSG 8 provide specific and practical recommendations on the safe design and operation of irradiations facilities, for use by operating organizations, the designers of these facilities and by regulatory bodies. The first industrial irradiation facility in operation in Brazil was designed in the '70s. Since then, minor modifications and upgrades, as sensors replacement, have been introduced in order to reduce the technological gap in the control and safety systems, however, in the case of safety systems in irradiation facilities, the requirements concerning safety and reliability are of ultimate importance.

METHODOLOGY

This work evaluates the adequacy of existing safety systems and their sensors at Brazilian irradiation facilities, taking into account the recommended IAEA's design requirements.

The study is based on an assessment of the licencing process of irradiation facilities, as well as the experience of regulatory inspections in these facilities. It was also taken into account the knowledge, concepts and solutions developed to upgrade existing safety system in facilities throughout the world.

RESULTS

Irradiation facilities can be defined on the basis of its design and, in particular, the accessibility and shielding of the radioactive source. The Brazil facilities can be categorized into 9 panoramic γ irradiators (4 dry and 5 wet storage) and 4 panoramic irradiation facilities using generators.

Notable findings arising from this study include: a) Some sensors are not interlocked with the irradiator central controls unit, thus they not act automatically when a predetermined value is exceeded, this condition is normally observed, basically, on the radiation monitor of the water treatment system and on the fire protection system; b) In older irradiators the seismic detector is not installed; c) Redundant systems in the personnel access door can be improved, using pressure mats combined with optoelectronic barriers.

Additionally, it was considered if the irradiation facility can be operated only if all safety systems are in place and functioning.

CONCLUSION

It was carried out a diagnosis of the “state of the art” of safety systems of Brazilian industrial irradiators, taking into account the national regulations and the latest IAEA’s recommendations.

Some sensors of safety systems in oldest Brazilian irradiators can be improved, basically for automatic actuation, thus the upgrade of control systems in irradiator facilities would use the advances in computer technology, old control units based on relay logic should be replaced with a new one based on redundant programmable logic controllers, however, it should be emphasized that the operating organization should obtain the approval of the regulatory authority before implementing any modifications on the irradiator that may have significant implications for radiation protection.

Country/Organization invited to participate

Brazil

Primary author: Mr GOMES, Rogerio (Brazilian Nuclear Energy Commission, Brazil)

Co-authors: Mr COSTA, Evaldo Luiz (Brazilian Nuclear Energy Commission, Brazil); Mr LOPES GOMES, Joana D’Arc Ramos (Brazilian Nuclear Energy Commission, Brazil); Mr COSTA, Mara Lucia (Brazilian Nuclear Energy Commission, Brazil); Mr THOMÉ, Zieli (Militar Institute of Engineering, Brazil)

Presenter: Mr GOMES, Rogerio (Brazilian Nuclear Energy Commission, Brazil)

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