



Medical Isotope Production in Argentina: Status of the Construction of RA-10 Research Reactor

ABSTRACT

The RA-10 Argentine Nuclear Reactor is conceived as a multipurpose facility suitable for radioisotopes production, materials and fuel irradiation and neutron techniques applications.

Argentina leads the OPAL Project, which follows the technological evolution of research reactors for the production of radioisotopes, like the one that was built in 2007 in Australia. The RA-10 is a 30 MW power reactor. The construction license for this facility has been granted by ARN in 2014 and the building has started in 2016 in Ezeiza Atomic Center (CAE), near Buenos Aires city. The initial operation license is planned for the second half of 2021.

The increase of the production of radioisotopes could lead to more discharges of noble gases. IMS uses fission gases such as Xe-133 and Xe-135 for monitoring the earth for signs of nuclear explosion. Medical isotope production is the main contributor to the background of Xe-133 and Xe-135 into the atmosphere and these releases pose a potential problem for monitoring nuclear tests if not addressed.

To calculate the radionuclide discharges, the ARN uses optimized discharge values following the philosophy of "as low as reasonably achievable concept" (ALARA). The producer has the responsibility for evaluating the necessary improvement in engineering to minimize them.

RA10 RESEARCH REACTOR PROJECT

Project RA-10 includes the design, construction, assembly and operation of the nuclear reactor.

Design Stage: Finalized

The design of Reactor RA-10 begins in early 2010. Once the design phase was completed with more than 1,000,000 man-hours invested and more than 10,000 technical documents generated, construction and environmental licenses were obtained by CNEA, and social perception studies were carried out, civil works were tendered and the construction of the four buildings of the RA-10 project.

The Safety Preliminary Report was technically evaluated and approved by ARN. The construction license for the reactor has been released by the nuclear regulatory body in October 2014 and Environmental Impact Certificate has been granted by local authority, OPDS - Organismo para el Desarrollo Sustentable de la Provincia de Buenos Aires, in April 2016.

The CNEA designs and provides the essential nuclear developments, trains future operators and moves forward with various projects to ensure full use of the RA-10 applications. Meanwhile, in agreement with INVAP, the design, manufacture and provision of the components that, in a short time, will be part of this exclusive installation, are carried out.

Construction Stage: In progress (60% concluded)

The construction of the base of the reactor building was ending in May 2017. 3200 tons of concrete type H30 in the concrete slab were used.

Assembly of the main pool of the nuclear reactor was carried out in August 2018. This component demanded 12 thousand man hours, while its construction took 60 thousand man hours under strict quality standards.

The pool is one of the fundamental part of the RA-10, since it will house the core of components made up of fuel elements, control rods and other devices that constitute it.

This container is 14 meters high and 4.5 meters wide. Its design is the result of the work of engineers and technicians of the CNEA and INVAP.

After the assembly of the main pool, the assembly of the decay tank and the service pool will be made, which are the three largest components of the reactor. Subsequently, the building will be completed in its entirety.

Assembly Stage: Future activity

Next step will be the installation and montage of equipment, followed by the testing of equipment and circuits. Scheduled to 2020

HISTORY

In Argentina, the National Atomic Energy Commission (CNEA) has been producing Mo-99 since 1985, employing highly enriched uranium (HEU)/aluminum alloy targets. In the year 2000 the RA-3 reactor, located at the CAE, 40 km from Buenos Aires city, increased power from 5 to 10 MW to rise the production of Mo-99. Bearing in mind commitment of Argentina towards the Treaty on Non-Proliferation of Nuclear Weapons (NPT) and other world initiatives for stricter control of nuclear material, since 2002 CNEA has developed Mo-99 production methods changing from HEU to Lowly Enriched Uranium (LEU)/Material Testing Reactor (MTR) fuel elements.

Once it is operational, the RA-10 will ensure the self-supply of radioisotopes for the local market, export to the international market and, along with it, expand the Argentinian capacity for technological development, research in basic sciences and applications based on the use of advanced neutron techniques through the Argentine Laboratory of Neutron Beams (Laboratorio Argentino de Haces de Neutrones - LAHN). The LAHN will work alongside the reactor facilities, where professionals and technicians will be trained in order to achieve research capabilities in basic sciences and technological applications that contribute to the creation of a regional science and technology pole.

The planned expansion of radioisotopes production for medical and industries use, will put the CNEA in the ranking of large-scale producers in the global market (10%). Neutron techniques will allow the developing of fuel elements for research reactors, biotechnology and radiopharmacy studies among others.



RA-10 ARGENTINE MULTIPURPOSE NUCLEAR REACTOR:

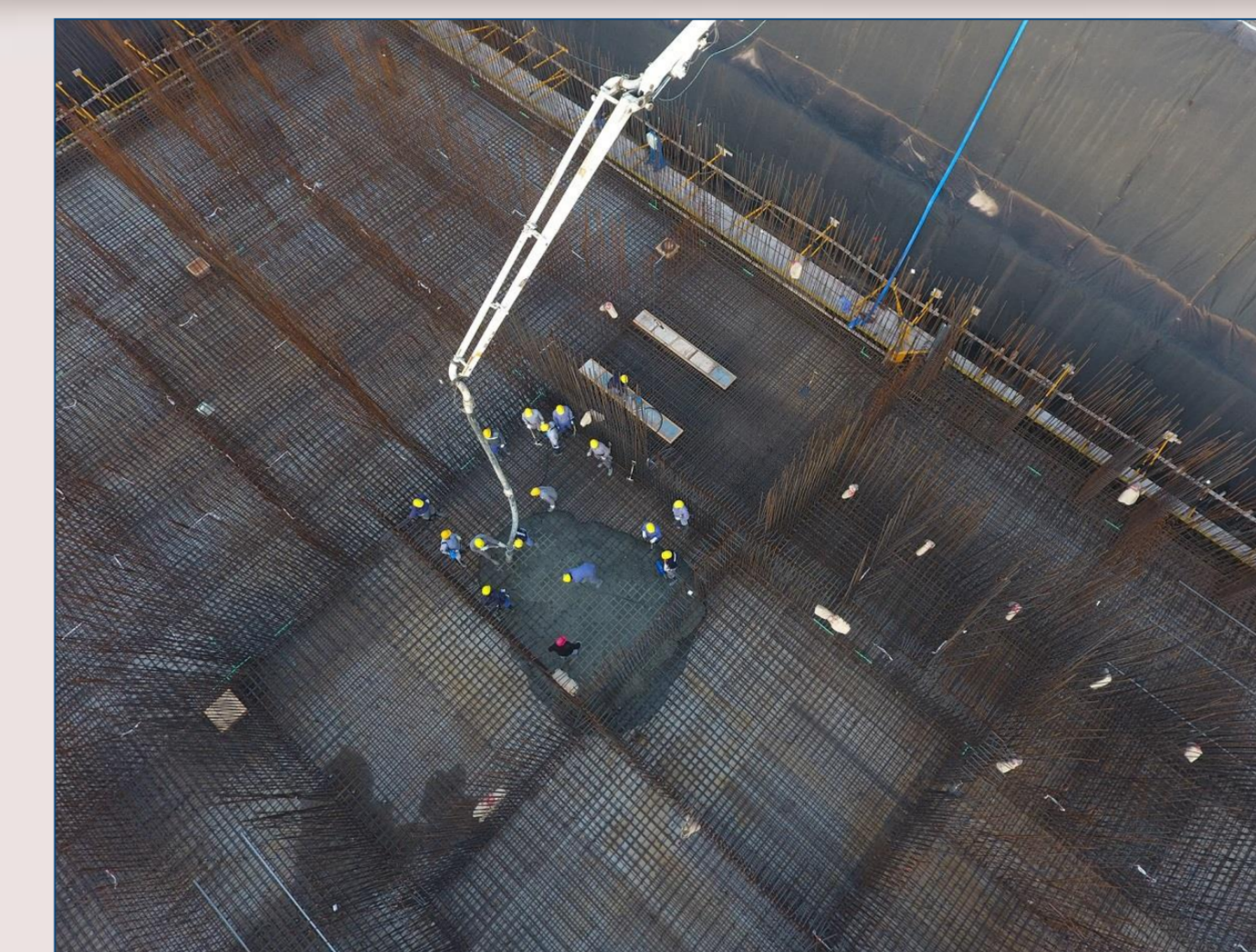
Technical characteristics **

- 30 MW power-Open pool type
- LEU MTR fuel elements
- Operation cycle 26 continuous days
- Mo-99 weekly production >2000 Ci/W
- Heavy water reflector .
- Water moderator – coolant / Upward coolant direction
- 2 independent shutdown systems: hafnium plates and heavy water reflector tank emptying

** Technical features published in www.argentina.gob.ar/comision-nacional-de-energia-atmica

NUCLEAR REGULATORY PHILOSOPHY

- ❖ By 2021 the CNEA expects to operate the RA-10 research reactor. The design meets the ARN Safety Regulations and International Atomic Energy Agency (IAEA) Standards. The project scheduled includes hold points for regulatory assessment and licensing of safety related stages.
- ❖ Initial Commissioning License for RA-10 research reactor: ARN use the concept of optimized authorized discharge to calculate annual discharge values following the philosophy of ALARA concept.
- ❖ The rise of production of Mo-99 could increase the noble gases discharges. In the side of producer is the responsibility for evaluating the improvement in engineering and devices necessary to minimize them.



Base of the reactor: It was ending in May 2017. To complete the concrete slab was used a similar amount to raise a building of 10 floor *



First quarter of 2018. Auxiliary building excavation finished. Reactor Building, construction advanced. Neutron Beam Building, started *



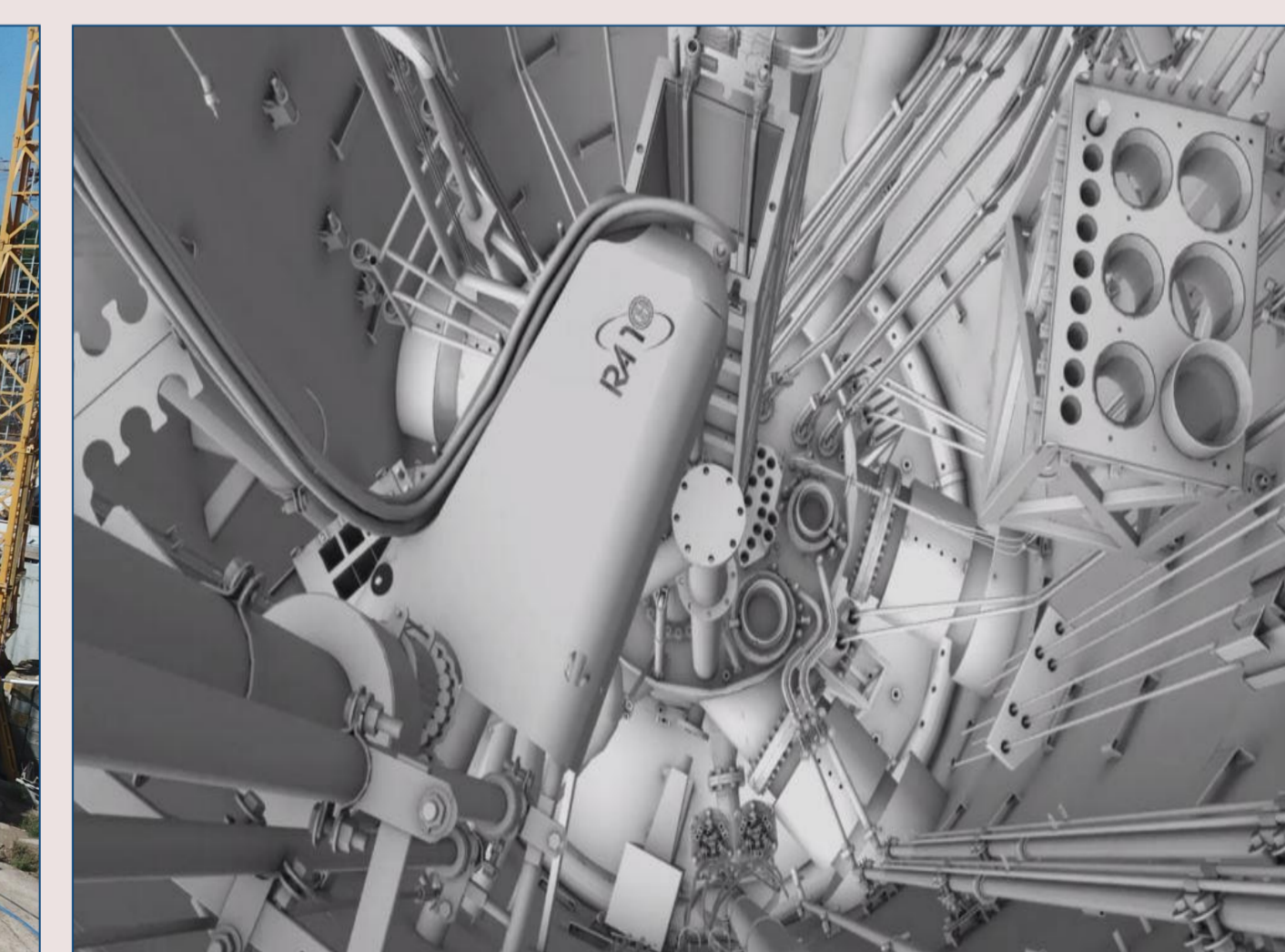
First quarter 2019: Panoramic view of the RA-10 construction *



View of reactor pool – which is equivalent to the pressure vessel if it were a power reactor – is a strategic component because it will house the core of the RA-10 *



View of the construction of the auxiliary building *



Activities for 2020: Montage and testing of equipment of the core reactor *

* Images published in www.argentina.gob.ar/comision-nacional-de-energia-atmica