

REATOR MULTIPROPÓSITO BRASILEIRO

Nuclear Technology in Service of Life



RMB
Reator
Multipropósito
Brasileiro

WHAT IS RMB – THE BRAZILIAN MULTIPURPOSE RESEARCH REACTOR?

In general terms, there are two main types of nuclear reactors: power reactors and research reactors. Nuclear power reactors use the energy released in nuclear reactions to produce electricity. Research reactors use the radiation generated in nuclear reactions for various applications. RMB consists of a research reactor with several purposes: production of radioisotopes for use in medicine and industry; testing of materials and nuclear fuels for power reactors; use of neutron beam for scientific and technological research in different fields of science; neutron activation analysis; production of tracers for application in research in agriculture and the environment; training of human resources in the nuclear area; and personnel training for operation and maintenance of power reactors.

RMB will have, in addition to the nuclear research reactor, an entire infrastructure of laboratories to carry out the proposed activities. The main laboratories are: radioisotope processing and handling laboratory; neutron beam laboratory; post-irradiation analysis laboratory; radiochemistry and activation analysis laboratory, as well as support facilities for researchers. RMB will be the catalyst for the establishment of a new national research centre for the application of radiation for the benefit of society.

Regarding the healthcare area, radioisotopes are the basis for the manufacture of radiopharmaceuticals, which are drugs composed of some radioactive substances, used for the diagnosis and treatment of diseases and different types of cancer. RMB will have the capacity to produce the radioisotopes that are currently imported and produced in research reactors of other countries. This autonomy shall reduce the risk of shortages, as well as the costs of radiopharmaceuticals production and medical examinations. This means better conditions for investment in the medical field with consequent expansion of nuclear medicine, aiming to assist a larger portion of the population.

- Production of tracers for application in research in agriculture, environment and biology, among others

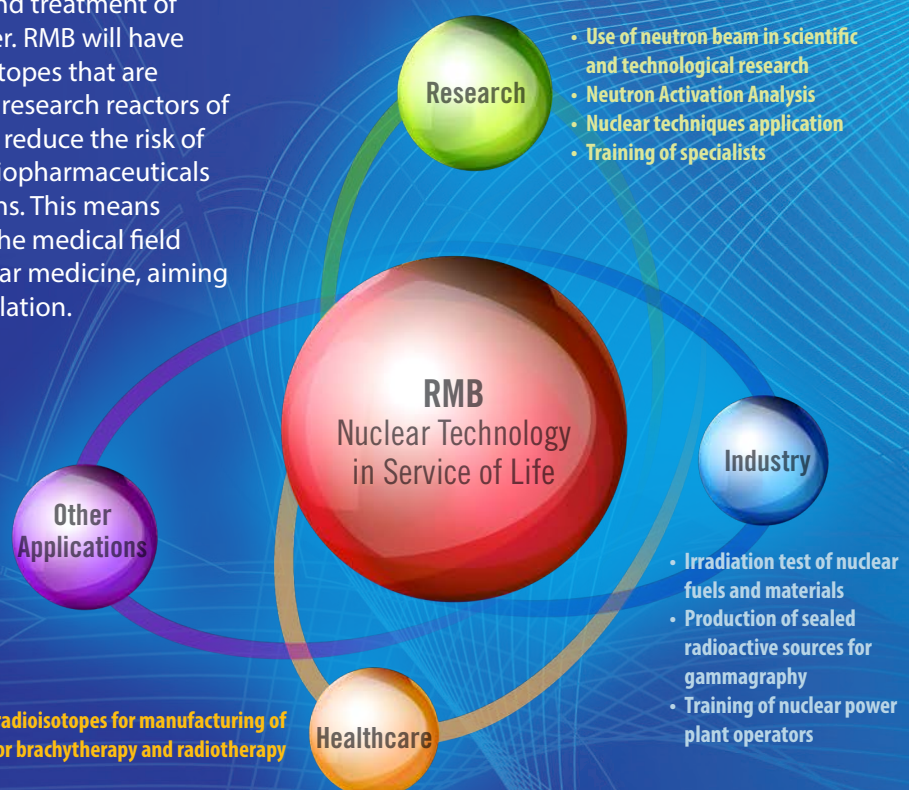
- Production of radioisotopes for manufacturing of radiopharmaceuticals and sources for brachytherapy and radiotherapy

ADVANCES IN PUBLIC HEALTHCARE IN BRAZIL

Radiopharmaceuticals allow physicians to visualize the functioning of living organs and tissues through images such as CT scans and scintigraphy. Therefore, RMB deployment shall bring many gains to the healthcare area and, in particular, to the users of the Public Healthcare System who normally do not have access to these types of procedures. Nowadays, they correspond to 30% of the users of nuclear medicine procedures in Brazil.

This technology is present in several medical areas such as cardiology, oncology, haematology and neurology. It allows the performance of accurate diagnoses of diseases and complications such as pulmonary embolism, acute infections, myocardial infarction, renal obstructions, and dementia. It is one of the best and most efficient ways to detect cancer, as it defines the type and extent of a tumour in the body, which helps choosing the most appropriate treatment for each case.

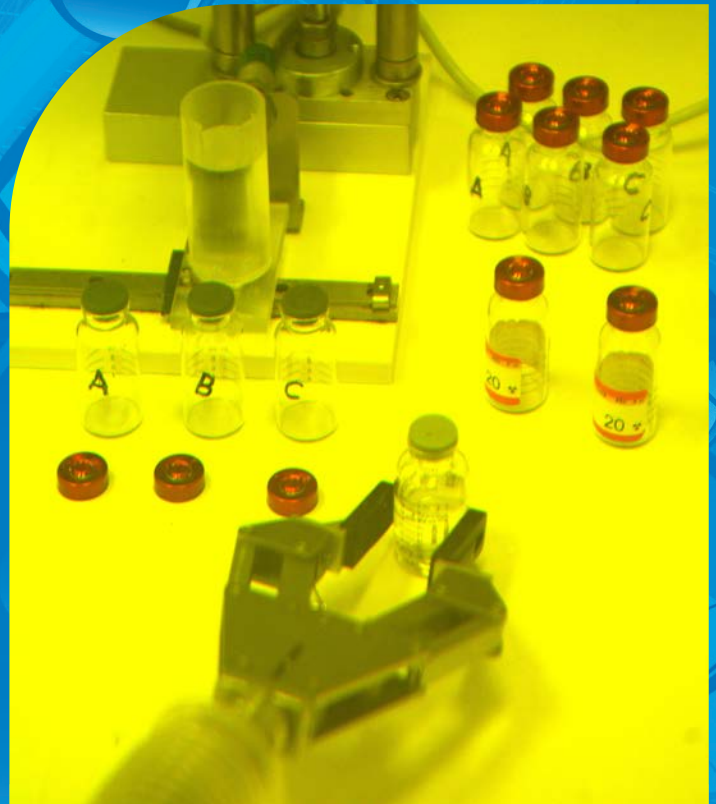
However, since 2009, Brazil has experienced difficulties in supplying ^{99m}Tc (technetium 99 isotope), which is the radioisotope used in about 80% of the nuclear medicine procedures. This supply difficulty began when the Canadian reactor responsible for 40% of ⁹⁹Mo (molybdenum 99) world production, and for all Brazilian demand, stopped operating. Brazil has diversified its suppliers, but its dependence on supplying hospitals and clinics with this basic input for tests applied in current health treatments has become evident.





What are radioisotopes?

Radioisotopes are the radioactive isotopes of an atom, that is, atoms that have the same atomic number but different mass number and that emit radiation. Radiopharmaceuticals have radioisotopes in their composition in order to fulfil their diagnostic and/or therapeutic activity. The radioisotopes used in radiopharmaceuticals manufacturing must have a short half-life (time in which their quantity is reduced by half), a level of radiation suitable for the procedure in which they will be used and, in principle, they must not be toxic.



What are radiopharmaceuticals?

Radiopharmaceuticals are substances with known biological affinity, whose molecules have at least one radioactive atom (radioisotope), and on which their pharmacological action will depend. They can be used for diagnostic purposes, identifying diseases, tumours and malfunctioning of an organ through imaging tests such as scintigraphy and tomography, or for therapeutic purposes, being important aids in oncological treatments.

SOROCABA



Sorocaba River - Photo: Paulo Ochandio

WHAT ARE THE BENEFITS OF RMB FOR LOCAL AND REGIONAL POPULATION?

RMB will be built in Iperó, which is a municipality in the interior of the State of São Paulo, near CINA, the Nuclear Industrial Centre of ARAMAR, where the prototype of the Brazilian nuclear submarine is being developed by the Brazilian Navy. RMB and CINA may contribute for Iperó to become the largest nuclear technology development hub in Brazil.

RMB will occupy an area of two million square meters in which the reactor and all its infrastructure will be installed. In the future, it is expected that RMB site will also comprise laboratories concerning research in nuclear fusion, particle accelerators and high-power lasers as well as laboratories for radiopharmaceuticals development and production.

There will be numerous benefits for regional population, as enterprises of this magnitude attract new companies and industries, create job opportunities for all levels of education and qualifications, and increase local economic activity. RMB will promote more investment in the areas of healthcare and education, bringing hospitals and medical clinics, facilitating the launch of new courses and universities, as well as attracting Brazilian and foreign students and researchers.

RMB is being planned to be a future-proof workplace, fully equipped to turn into a lively campus and to attract companies, research facilities and top talent in the field of nuclear technology applications and healthcare.

The project will also bring development to the urban infrastructure with the improvement of public roads and local highways.



IPERÓ





WHAT ARE THE BENEFITS OF RMB FOR BRAZIL?

Annually, in Brazil, approximately 2 million medical procedures using radiopharmaceuticals are performed. This represents a third of the country necessities and means millions of dollars spent on importing the radioisotopes necessary for the production of these radiopharmaceuticals.

With the implementation and entry into operation of RMB facilities, the country shall achieve self-sufficiency in the sector, leading to significant foreign exchange savings. In addition, RMB surplus production may be exported, as there are few reactors of this size in the world, while the demand for radioisotopes is continuously growing.

Thus, Brazil will be able to become a reference centre in nuclear medicine, attracting investments from the areas of healthcare, education and research. Researchers, students and professionals from several areas should look for opportunities to participate in RMB, which will naturally promote the formation of a new generation of specialized labour for the nuclear area and related areas.

RMB shall facilitate the development of new radiopharmaceuticals, expanding the possibilities of medical treatment for a greater number of diseases, for a greater number of people and at a lower cost.



← Iperó Sorocaba →





Nuclear and Industrial Centre of ARAMAR

- 1 Main Entrance
- 2 Researchers Building
- 3 Workshop Building
- 4 Radioisotope Processing Laboratory
- 5 Post Irradiation Analysis Laboratory
- 6 Spent Fuel Storage Building
- 7 Neutron Activation Analysis and Radiochemistry Laboratory
- 8 Reactor Building
- 9 Neutron Beam Laboratory
- 10 Radioactive Waste Processing and Storage

Is RMB safe?

Throughout RMB planning phase there was a great concern on the safety of workers and facilities, the population, and the environment. Therefore, from the conception and design phases, the safety criteria to be followed in the construction and operation of RMB are already defined, to comply with all the nuclear and environmental legislation in force in the country, which are the codes and standards of the National Commission for Nuclear Energy (CNEN) of Brazil as well as the resolutions of the Brazilian environmental authority, named IBAMA. In addition, the International Atomic Energy Agency (IAEA) procedures and guides are considered.

RMB in numbers



Investment of US\$500 million



Production of radioisotopes for more than 30 distinct types of radiopharmaceuticals



Possibility of doubling the number of annual procedures in nuclear medicine in Brazil



Guarantee of stability in radioisotopes supply



Contribution to the expansion of national clinics and hospitals that offer nuclear medicine services



Saving of over US\$ 15 million in radioisotopes import costs per year



Two million m² is the site area available to the deployment of the largest and most important centre for research and innovation in nuclear technology application in Brazil

RMB is being developed under the responsibility of the National Commission of Nuclear Energy (CNEN) of Brazil, which is an autarchy linked to the Ministry of Science, Technology and Innovation – MCTI of the Brazilian Government.

Concerning RMB, CNEN established a technical partnership with CTMSP, a technology centre of the Brazilian Navy, for the nuclear fuel production, and with AMAZUL, a defence technology company of Brazil for the development of the detailed engineering design of conventional systems of RMB reactor. In addition, CNEN signed a cooperation agreement with the Comisión Nacional de Energía Atómica – CNEA from Argentina.

RMB coordination office is located at the Nuclear Energy and Research Institute – IPEN, which is one of the technical-scientific units of CNEN and is located 130 km from the Municipality of Iperó, São Paulo, Brazil.



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