

# Enhancing safety, security and reliability

## IAEA peer review missions for research reactors

By Elisa Mattar

Setting up and maintaining a research reactor is a complex process — from siting and design, to commissioning, operation and protection of nuclear materials. At each step of the way, countries can request a peer review service from the IAEA to assist them in enhancing nuclear safety and security, as well as the performance of research reactors.

“The goal of peer review missions is to ensure research reactors continue to be used effectively and sustainably for the benefit of society,” said Amgad Shokr, Head of the Research Reactor Safety Section at the IAEA.

IAEA peer review missions, which are available upon request, involve teams of international, multidisciplinary experts who compare actual practices with IAEA standards for nuclear safety and international good practices, as well as with IAEA guidance for security and operation.

The missions identify areas that could be improved and provide host facilities with corresponding recommendations. Follow-up missions, if requested, are normally conducted 12 to 18 months later to review the actions taken by host facilities to address the original mission’s findings. Through these follow-up visits, the IAEA can also assist, upon request and as needed, in addressing the findings. The IAEA also supports countries in addressing mission recommendations as well as, where relevant, through its technical cooperation projects.

The IAEA peer review services focusing specifically on research reactors are the Integrated Safety Assessment of Research Reactors (INSARR) and the Operational and Maintenance Assessment for Research Reactors (OMARR), while the broader International Physical Protection Advisory Service (IPPAS) related to nuclear security, also covers research reactors.

### INSARR: a lifetime of safety

INSARR missions review nuclear safety during all phases of a research reactor’s lifetime. This covers the design and siting, commissioning and operation of

research reactors. Areas reviewed include organization and management, training programmes, safety analysis, operational limits and conditions, operating procedures, maintenance, radiation protection, modifications, experiments and emergency planning. The host facility operators can request a full-scope mission or a review that focuses on specific areas of interest.

In 2017, an INSARR mission was conducted in Jamaica at the country’s only research reactor, a JM-1 research reactor. “The INSARR mission in 2017 helped us chart the way forward for the safe operation of the facility for the next decade,” said Charles Grant, Director General of Jamaica’s International Centre for Environmental and Nuclear Sciences (ICENS).

Since the IAEA’s INSARR service was first launched in 1997, over 90 INSARR missions have been carried out at research reactors in 45 countries across the globe.

“An analysis of INSARR reviews since 2005 has shown that over 75% of the findings are resolved or have had satisfactory progress by the time of the follow-up visits,” said Shokr. “These findings indicate significant safety enhancements in many research reactors around the world and that our service is found useful by the hosts.”

### OMARR: reliable and efficient operations

OMARR review missions are focused on the operational and maintenance aspects that need to be addressed throughout a research reactor’s lifetime, including when starting a new research reactor project or reaching a particular milestone (learn about the Milestones approach on page 6). These missions identify areas for improvement, address specific operational challenges and create a platform for sharing experiences and good practices between international experts and local personnel.

“About 50% of the world’s operating research reactors are over 40 years old,” said Ram Sharma, a nuclear engineer in the IAEA’s Research Reactor Section. “They face a range

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of issues, including those related to ageing. OMARR missions help research reactor facilities reach optimal utilization of all financial and human resources throughout the facilities' operational life cycle."

Based on IAEA and international standards and related technical reports, OMARR missions provide recommendations and suggestions related to operations and maintenance, ageing management, human resources, quality assurance, management systems, plant asset and configuration management and plant modifications. The expected results include more efficient long term operation, better performance, improved safety and safety culture and optimized utilization of human and financial resources.

When implementing OMARR recommendations or planning for long term operation, countries can also request a follow-up OMARR mission to address ongoing research reactor issues.

In 2019, an OMARR mission was conducted in Indonesia and helped the country chart out the future operation of its research reactor. "The OMARR mission was very useful for our plan for the long term operation of our reactor and timely in support of ongoing activities," said Anhar Riza Antariksawan, Chairman of Indonesia's National Nuclear Energy Agency (BATAN). "It was especially important in helping us with resuming our reactor operation at full power using fresh TRIGA fuel, once it is available, and determining which modifications would be necessary if we were to convert to indigenous plate-type fuel instead."

### IPPAS: secure and protect

While INSARR and OMARR missions are primarily focused on the facility level, IPPAS review missions operate on a national level and focus on the physical protection of nuclear and other radioactive material. The review team compares the national nuclear security measures implemented to the IAEA Nuclear Security Series publications, the Convention on the Physical Protection of Nuclear Material and other international legal instruments.

"An IPPAS mission is an important step for a country to address any areas of improvement it may have in nuclear security on a facility or national level," said Kristof Horvath, a senior nuclear security officer at the IAEA. "They provide a positive opportunity to learn, without the need for an inspection or other intrusive measures."

Working with the national authorities — police force, customs and regulators — IPPAS missions also cover the transport of nuclear material and contingency situations. National legislation and regulations, licensing and response to theft or sabotage, as well as computer security, are also areas covered by these missions.

An IPPAS mission was conducted in Hungary in 2013 after the country set up a new nuclear security regime, with a follow-up mission in 2017. "The mission in 2013 led to significant improvements, particularly to our legal framework, computer security and security during transport," said Zsolt Stefanka, Acting Head of the Department of Radiation Sources, Safeguards and Security at the Hungarian Atomic Energy Authority.

### A research reactor pool from above.

(Photo: IAEA)