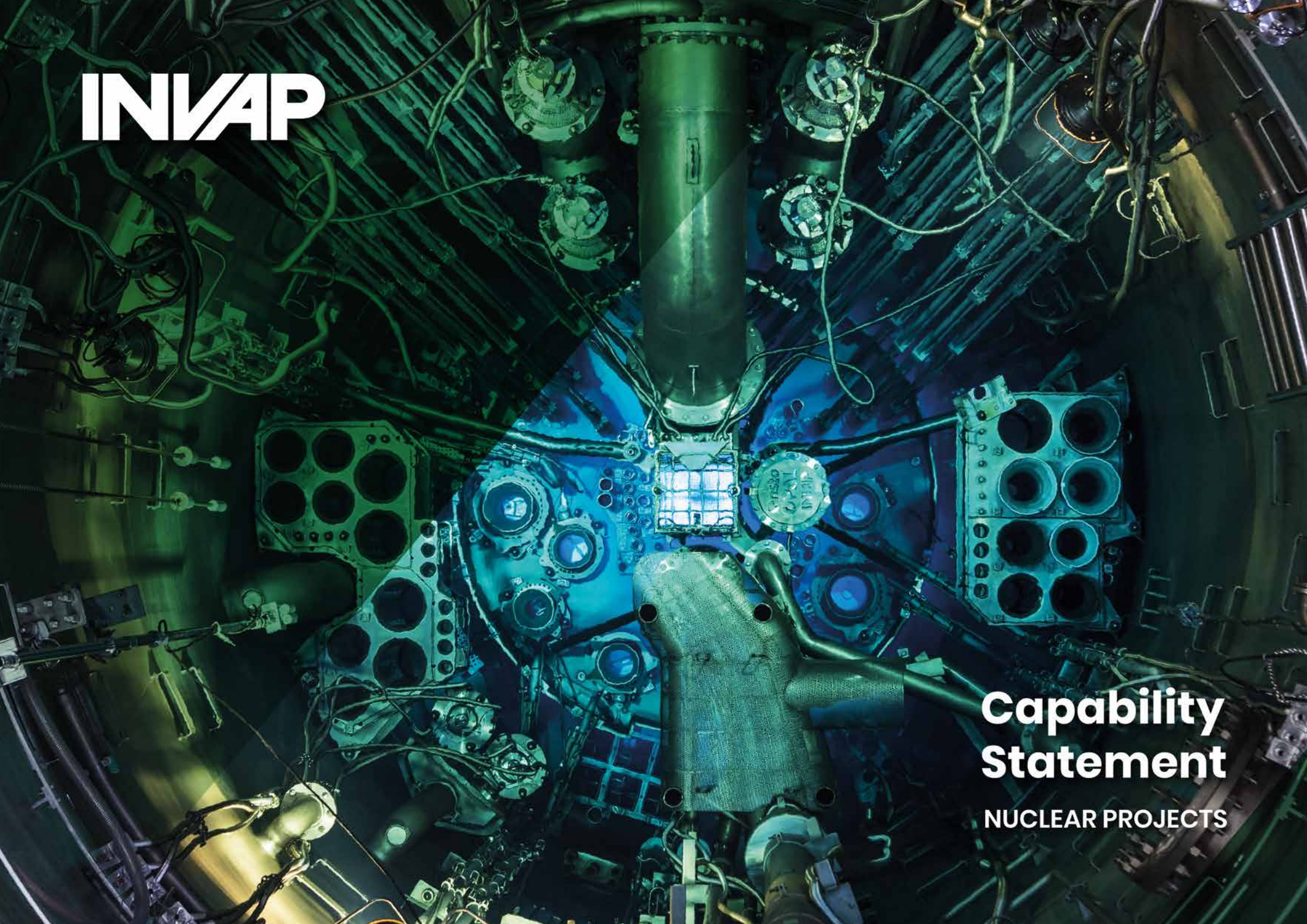
INVAP



Capability Statement

NUCLEAR PROJECTS

Nuclear technology


for a
sustainable tomorrow

Who we are

INVAP is a high-tech company specialized in custom designed complex projects.

Our business areas cover the fields of Nuclear, Space, Defense, Security, Environment and Medical Systems. We have designed and constructed nuclear research reactors for radioisotope production and science development, Low Earth Orbit (LEO) observation satellites and Geostationary Telecommunications Satellites, radar systems for air traffic control, defense and weather, as well as radiotherapy centers and other industrial plants in Argentina and worldwide.

All of our projects look forward to enhance quality of life and contribute to sustainable growth.

Headquarters, San Carlos de Bariloche

OPAL Reactor, Australia

Our main activities

Our projects are implemented by our different business units, each of which specializes in a different field of knowledge critical to a country's technological development.

Nuclear Projects

Space Projects

Defense, Security & Environment Projects

Medical Systems

Today, INVAP's nuclear business unit is working with:

International Atomic Energy Agency (IAEA)

Australian Nuclear Science and Technology Organization (ANSTO)

Egyptian Atomic Energy Authority (EAEA)

Brazilian National Nuclear Energy Commission (CNEN)

Pallas Foundation of the Netherlands

Argentine National Atomic Energy Commission (CNEA)

King Abdulaziz City for Science and Technology (KACST)

We have commissioned nuclear research reactors in Argentina, Peru, Algeria, Egypt and Australia; nuclear facilities such as radioisotope production plants and fuel manufacturing plants in India and Egypt, and development of the complete technological package to achieve the enrichment of uranium under contract from the argentine CNEA. INVAP complies with IAEA standards for the design, construction and commissioning of its nuclear projects.

INVAP in the world

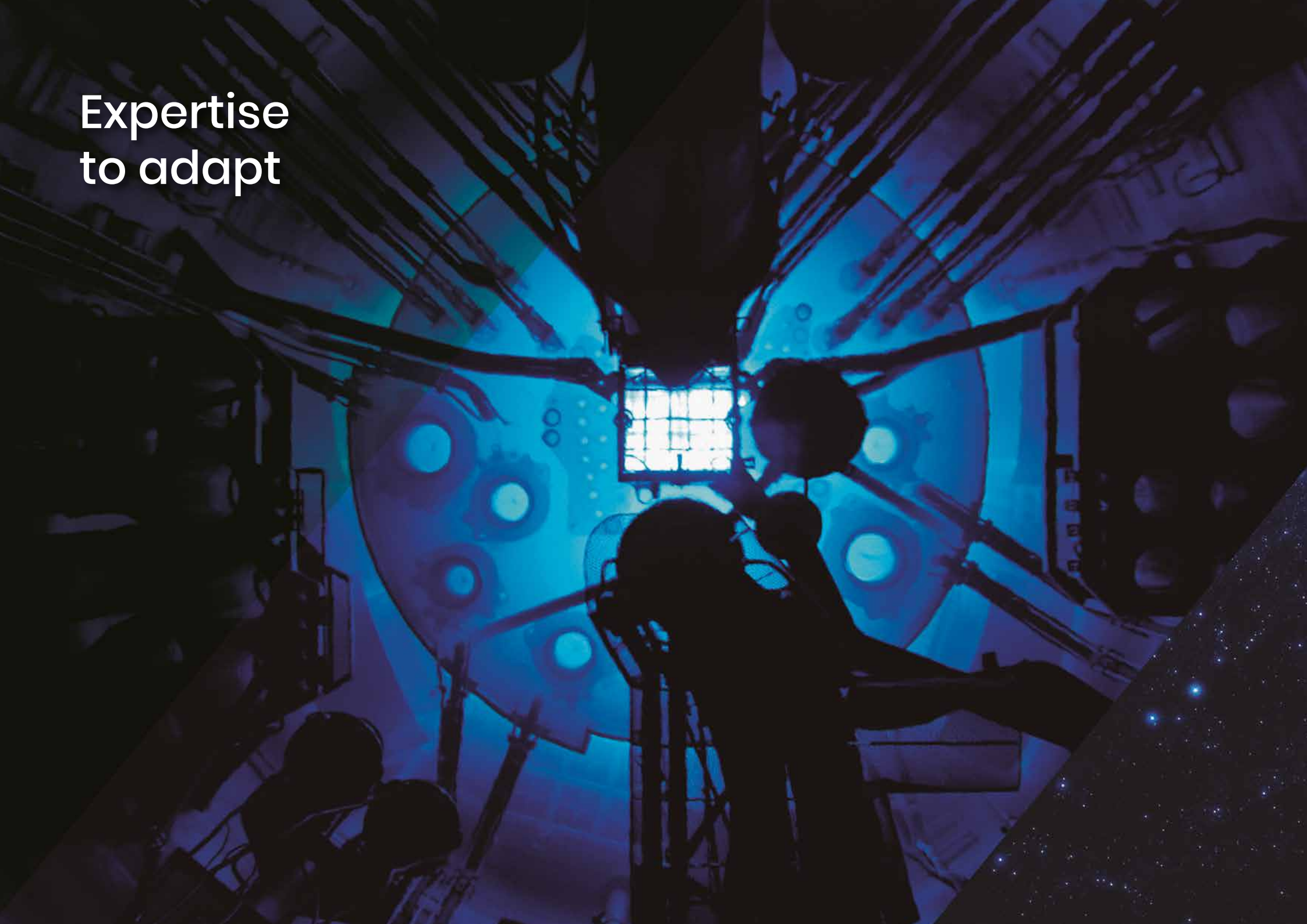
Our presence spans multiple countries, reflecting our experience in executing projects worldwide.

We have successfully established branches, subsidiaries, technical offices and joint ventures in countries on five continents.

Our ability to adapt to local practices and comply with laws and safety regulations, has been decisive in our capacity to operate in a variety of business environments.

INVAP's International Footprint

Argentina
Bolivia
Brazil
Chile
Peru
Venezuela
U.S.A.
Algeria
Egypt
Saudi Arabia
India
Romania
The Netherlands
Turkey
Australia
China
Japan


Expertise
to adapt


to different cultures

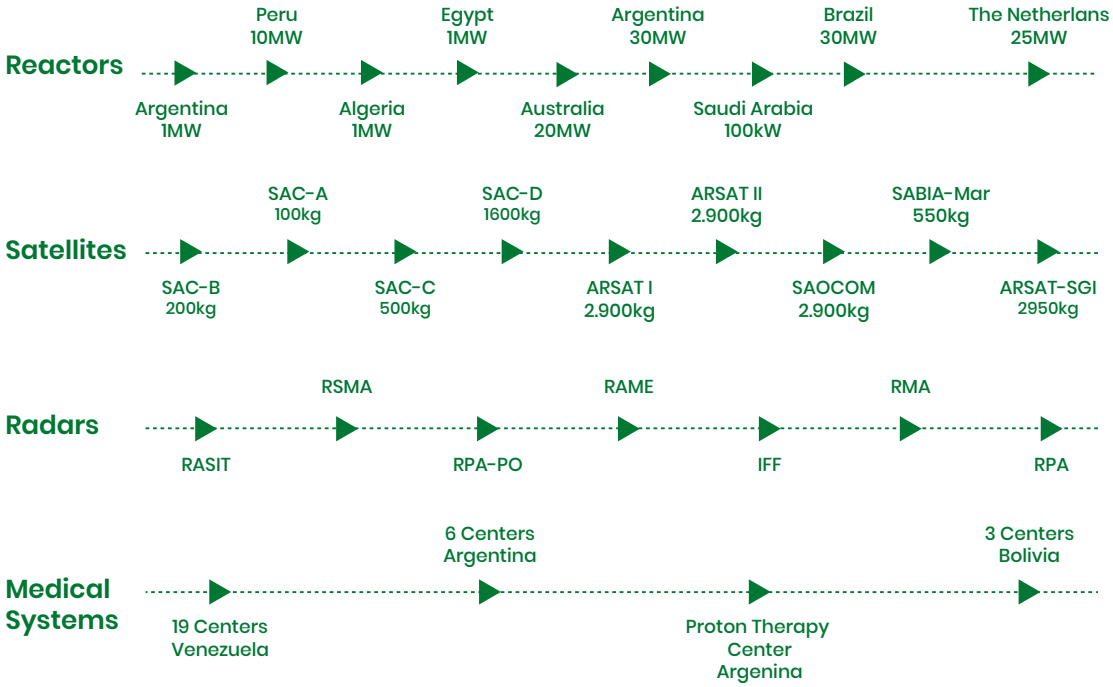
Our Mission

INVAP's mission is to develop and carry out worldwide complex technological projects, providing its customers with strategic value. The company creates genuine employment, thus encouraging the development of its home state and the communities where it operates.

Protection of the natural environment is of the outmust importance to INVAP.

The growing complexity and magnitude of INVAP's projects through the years is a living expression of its mission and powerful drive.

Progression of INVAP's developments in the last 47 years.



Company Profile

Headquartered in San Carlos de Bariloche, Patagonia Argentina, INVAP was founded on September 1st, 1976.

As a state-owned company under the jurisdiction of the Río Negro province, the Board consists of Directors representing the Province, the Argentine National Atomic Energy Commission (CNEA), and a representative of the personnel.

At present, INVAP encompasses a diverse group of companies specialized in international contracts with both private and state-owned organizations.

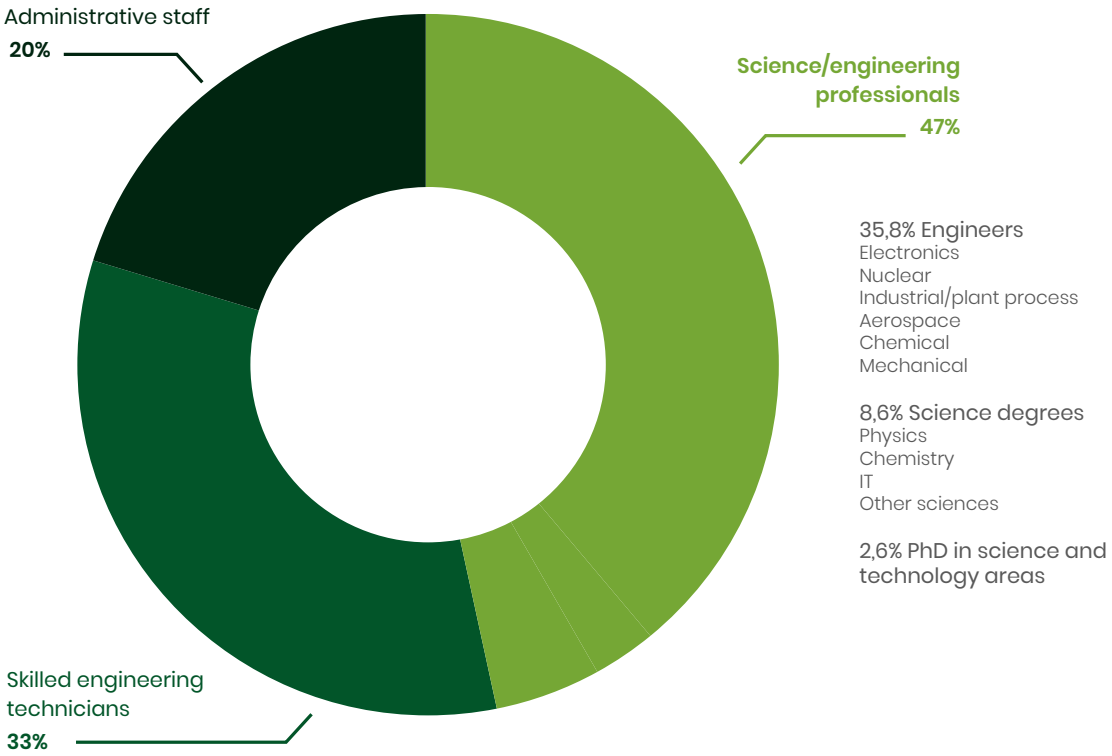
To further enhance our in-house capabilities, we actively engage in partnerships and collaborations with scientific organizations, partners, subcontractors, and consultants in Argentina and abroad. This strategic approach allows us to leverage a broader range of expertise to meet the evolving needs of our clients.

Across
5 continents

Employees
+1700

Annual revenue
+250 MUSD

Our People



35,8% Engineers
Electronics
Nuclear
Industrial/plant process
Aerospace
Chemical
Mechanical

8,6% Science degrees
Physics
Chemistry
IT
Other sciences

2,6% PhD in science and technology areas

Our values

- Ethics and Integrity
- Commitment
- Professionalism
- Creativity and Innovation
- Adaptability
- Teamwork

Multiculturality and Diversity

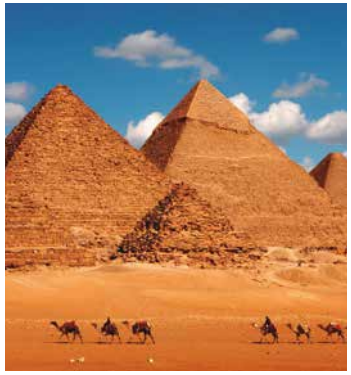
Over the years, we have undertaken projects in many countries of the world, in close collaboration with our customers and local organizations & companies.

With a team representing a myriad of backgrounds, we possess the adaptability to thrive in any culture.

We embrace diversity and multiculturalism as a driver of our success.







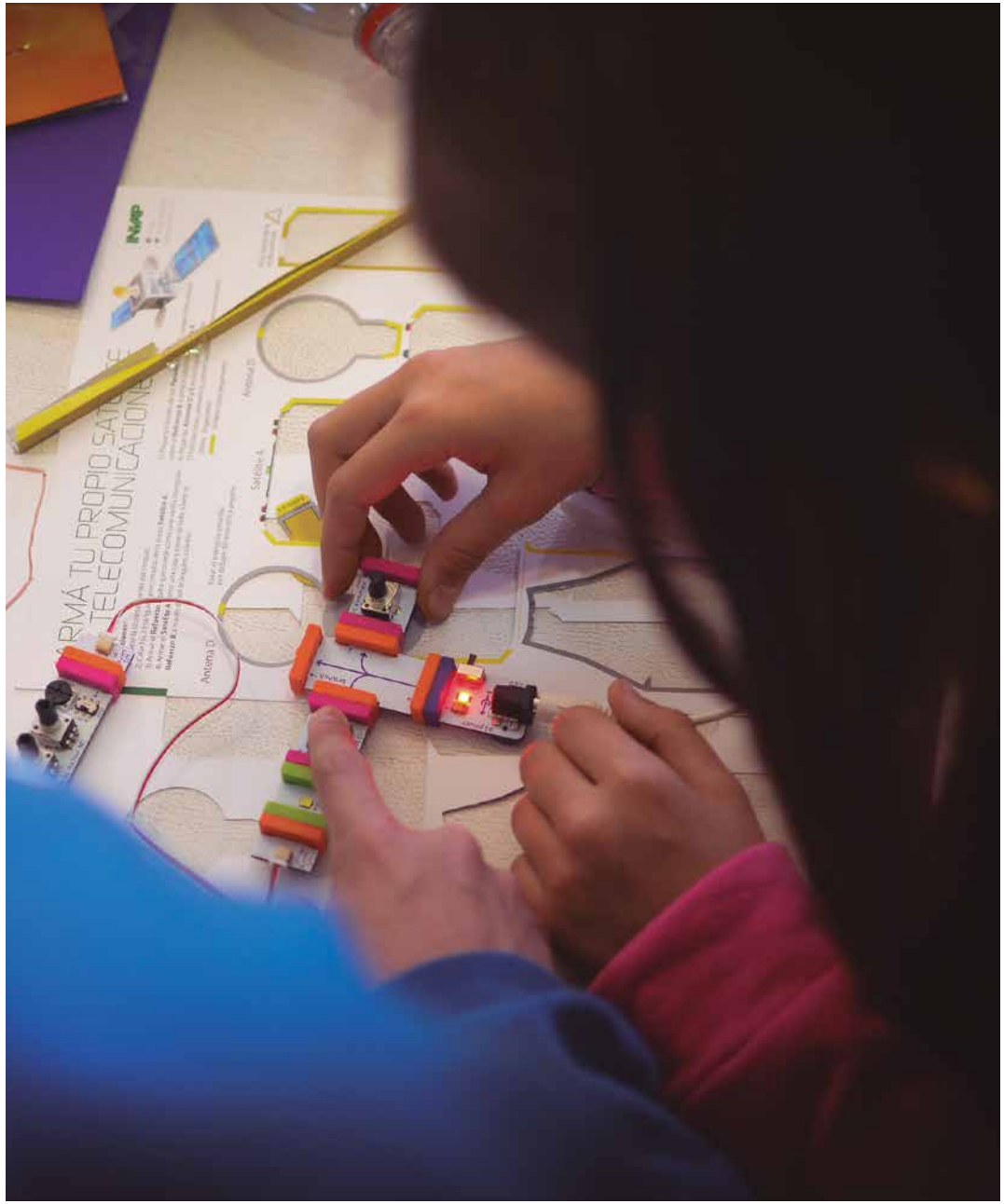
INVAP Foundation

INVAP Foundation was created in 2004 with the purpose of promoting social changes through technological development in projects with social impact.

The organization connects and articulates public and private actors, both in national and international fields, putting INVAP's wide experience and knowledge at the service of the community.

Its strategic axes are: social and productive development, communication and awareness, and institutional strengthening.

FUNDACIÓN INVAP



Corporate Social Responsibility (CSR)

At INVAP, we have assumed the responsibility of developing the appropriate competences to fulfill our mission and vision, to deepen the fundamental values of our company culture and to lead the necessary changes.

We are committed to promote sustainability in a transversal way throughout the company by means of an express policy, supported by the organizational structure, assuming a formal commitment with the employees, taking care of the relationship with the customers and protecting the environment.

We work to have a positive impact in the communities where we operate, developing local supplier chains, and promoting the economic growth of our country.

Since 2004, INVAP is adhered to the United Nations Global Compact as a reaffirmation of our commitment to respect Human Rights in all our operations and to promote sustainable development. Our actions are focused on contributing to the advancement of the global agenda of the Sustainable Development Goals (SDGs).


Let’s build


a strategic partnership

INVAP Core Competences

1. Solid system capabilities. INVAP implements a systems engineering approach for all of its developments, from system concept, analysis design and verification to component development.

2. Proven international project execution experience with a mission-critical mindset and a competitive cost/quality relation.

3. Customization. From its location in the heart of a technology cluster, INVAP provides a broad “on demand” know-how based on different technology specialties.

Quality Certification

INVAP continuously improves quality, environmental safety, and occupational health & safety under the requirements of ISO 9001 and ISO 14001.

Nuclear Safety Culture

At INVAP we are proud of our commitment to nuclear safety culture, making it the cornerstone of our operations. Our staff understands the importance of placing nuclear safety as our number one priority, ensuring that all aspects of our work adhere to the highest standards, fostering a culture of surveillance and accountability.

Peaceful Uses of Nuclear Energy

As an advocate of the peaceful uses of nuclear energy, INVAP is aligned with Argentina’s commitment as a signatory of the Nuclear Non-Proliferation Treaty. We develop nuclear technology for applications that benefit society, industry and the environment.

High-performance facilities

At our company, we excel in delivering complex projects of high-performance, designed to prioritize availability, enhance productivity, seamlessly integrate with the environment, and provide flexibility in their usage, ensuring they meet the evolving needs of our clients and exceed industry standards.

Integrated Management System

INVAP's Integrated Management System (IMS) aims to guarantee compliance with management objectives in accordance with company policy.

Effective Project Management for Complex Deliverables

We execute projects with a customized approach to align with our clients' objectives. Our project management capabilities allow us to coordinate the complexity and variety of work required to deliver complex projects over the long term, while ensuring sound planning and execution.

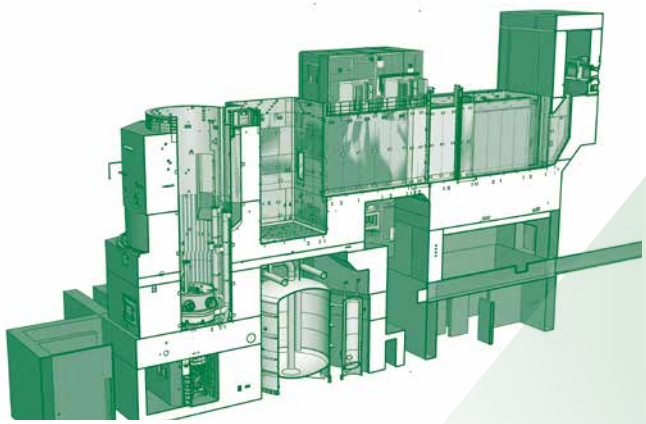
Enabling Ownership and Localization

In our company, we think beyond the project itself, focusing on the environment necessary for our clients to become owners of their facilities and be able to take full advantage of them in their operation, focusing on the quality, efficiency and functionality of our solutions.

We are commited to engaging local contractors during project delivery, as well as providing comprehensive, long-term support to ensure that the facilities and systems we develop are operational, reliable and successful throughout their life cycle.

Transparency Policy and Code of Conduct

INVAP's reputation is based not only on its technological capability but also on a tradition of ethical conduct. Business integrity is constitutive of the organization and it's recognized in Argentina and the world.



Cross-section of a multi-purpose reactor

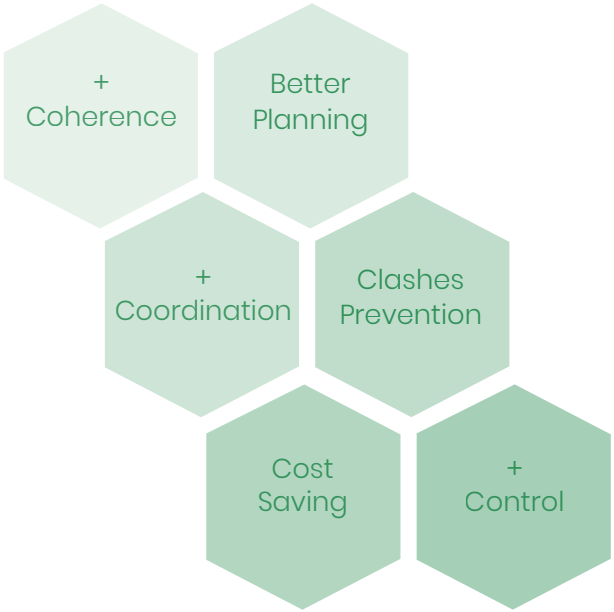
Building Information Modelling (BIM)

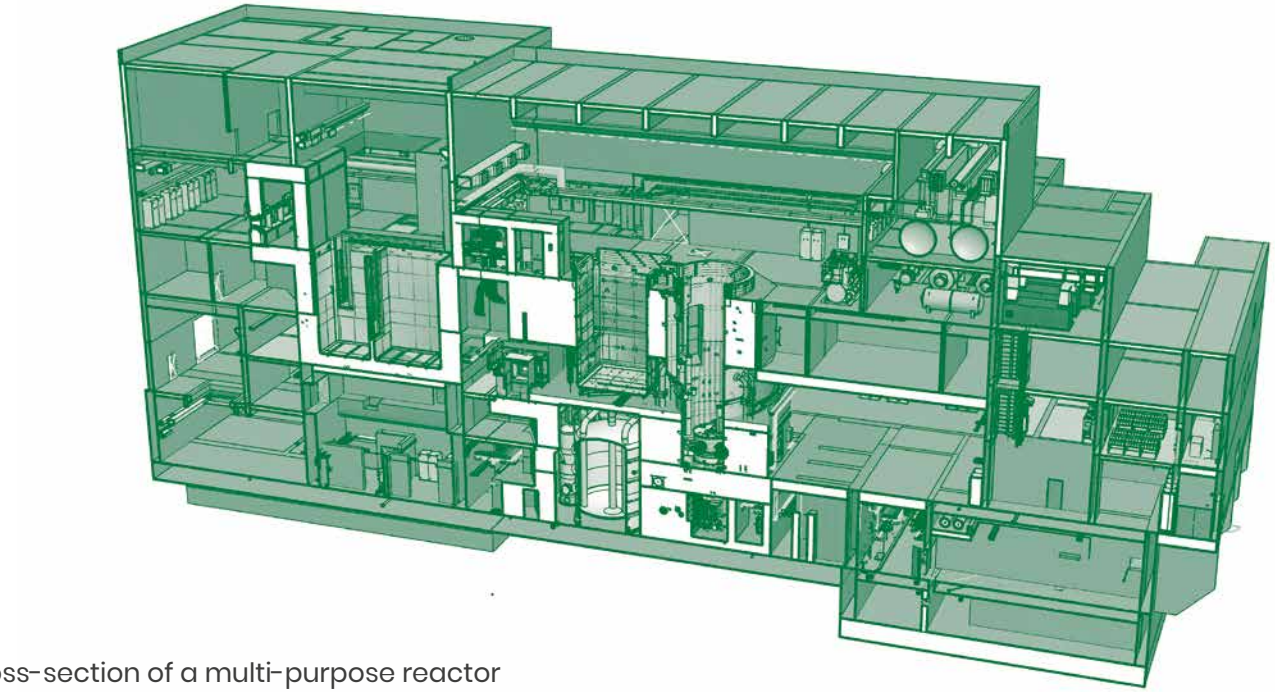
Digital transformation in engineering

INVAP embraces Building Information Modeling (BIM) methodology to improve decision making throughout the entire life cycle of our complex technological projects. By leveraging BIM, we achieve remarkable efficiency gains by minimizing rework, reducing conflicts and changes during construction, and detecting conflicts early on.

The collaborative nature of BIM processes allows for seamless data collection and management, facilitating coordination among all parties involved.

This holistic approach connects INVAP's teams, data and workflows throughout the project lifecycle, from design through construction and operations, ultimately resulting in superior results from our delivered projects.





Cross-section of a multi-purpose reactor

Technology Transfer & Training

INVAP as your strategic partner

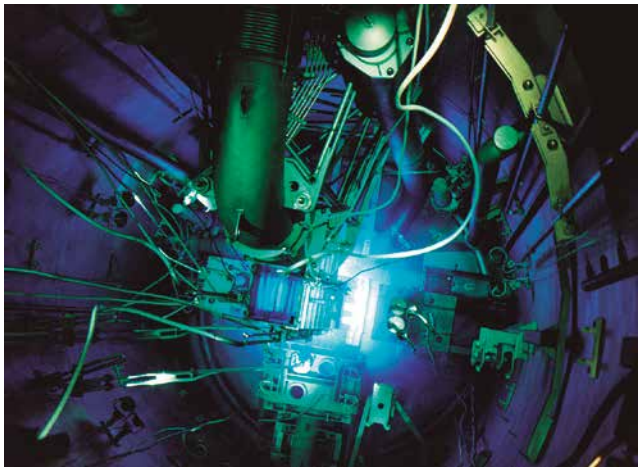
With a view to guaranteeing an adequate transfer of technology to its clients, INVAP has devised a participation system through which the company receives at its work teams, client's personnel for some period during the project execution.

INVAP is strongly convinced that certain type of work can only be learnt by doing, and the establishment of **team spirit with clients** has played a significant role in INVAP's achievements.

Reactor Pool

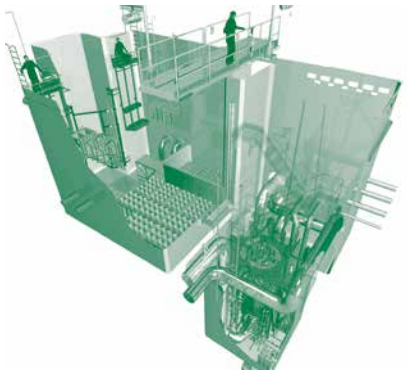
Avenues of Core Knowledge and Expertise at INVAP Nuclear Projects

To carry out its projects, INVAP Nuclear leads multidisciplinary project teams encompassing companies from all over the world, ensuring a seamless and efficient integration of efforts from design to commissioning.



Nuclear engineering

- Neutronic, thermal-hydraulic, and radiological protection design.
- Qualified tools, methods and design procedures for neutronic and thermal-hydraulic line.
- Safety first as a design criterion. Multi-physics modelling.
- Commissioning procedures.
- Fuel strategies.



Mechanical engineering of nuclear systems

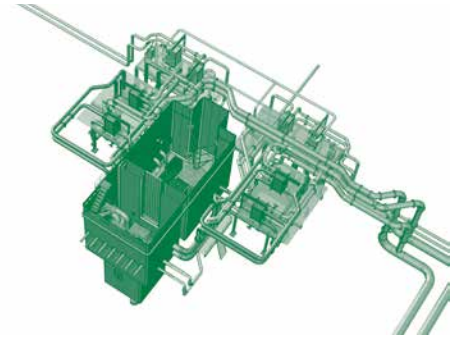
- Design of structures and components for nuclear reactors.
- Irradiation facilities including rigs for radio isotope production, pneumatic transfer systems, neutron beams, shutters, hot cells.
- Manufacturing and mock-ups of key nuclear components such as: reflector vessel and reflector vessel structures, reflectors and irradiation devices, first shutdown system and control rod drive mechanisms, reactor and service pools internal components, core grid.
- Expertise and skills in the use of industrial & nuclear materials, namely stainless steel, aluminum, cadmium, zircaloy, graphite and beryllium.

Plant process engineering and layout design & integration

- Process systems (nuclear: ventilation, waste; conventional: hydraulic, fire fighting, auxiliary services).
- Layout design and integration, electrical, physical and cyber-security.
- Control loops, hydraulic pipe network, transient hydraulic.
- Auxiliary systems, HVAC ductwork and fluid dynamics analysis.
- Radioactive waste management and treatment systems.

Instrumentation & control

- Reactor control and monitoring, reactor protection, radiation monitoring.
- First and second reactor protection systems, nucleonic instrumentation, reactor and monitoring system, post-accident monitoring systems and radiation monitoring systems.
- Control rooms.
- Nuclear instrumentation.



Core safety capabilities

- Core safety capabilities to support the safety demonstration: deterministic assessment, safety assessment, and probabilistic assessment. Licensing process: Preliminary Safety Analysis Report and Final Safety Analysis Report (PSAR/FSAR).
- Safety analysis to support engineering design.
- Failure modes and effects analysis.
- Deterministic and probabilistic analysis of human factor.
- Qualification of equipment and components by engineering models and prototype testing.
- Dose Assessment for the public and operators.

Nuclear technology


for a better health

PALLAS Reactor, The Netherlands

INVAP Nuclear Projects: Value Proposition

Design, construction and commissioning of nuclear projects

As global experts in the area of nuclear research reactors, our job is to deliver research reactor plants by conducting design, construction and commissioning projects tailored to our client's needs. We train our client's personnel to ensure a smooth hand over and transition to full operation.

Sustainable research reactors for medicine

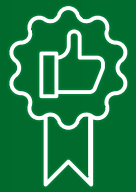
INVAP designs and provides research reactors to produce radioisotopes for medical diagnosis and treatment, as well as the radiochemical facilities needed to handle and process the radionuclides, which turn them into patient care products and biological viewpoints.

Research reactor as steping stone into nuclear power

Research Reactors can also be a useful step towards developing the first Nuclear Power Plant.

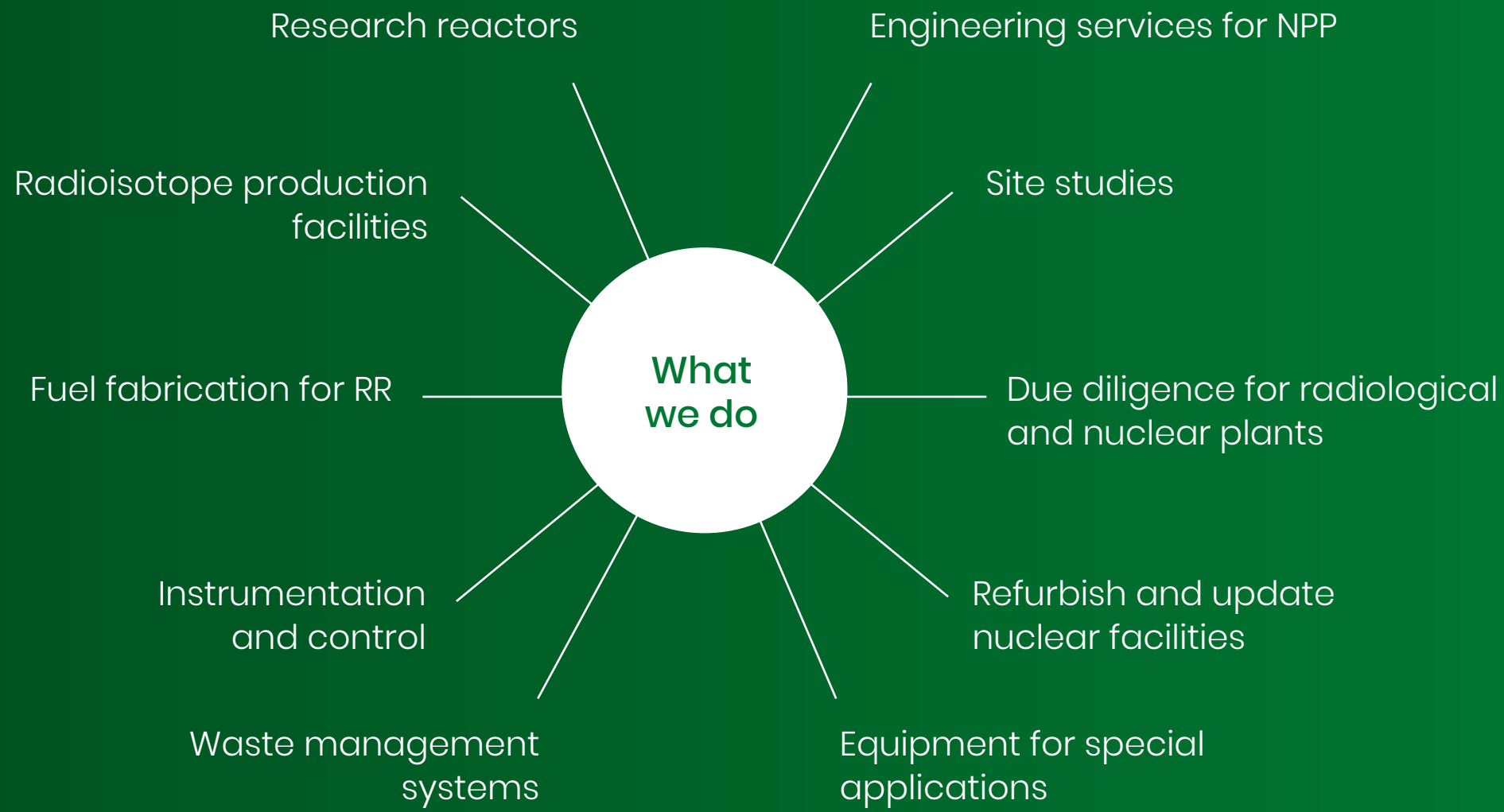
A research reactor programme might contribute to the introduction of nuclear power, by the development of the supporting infraestructure required for licensing, construction, operation and maintenance.

+47 years in the international nuclear market.



Reliable, safe, available.

Tailor-made solutions.


What we do
Research reactors
Engineering services for NPP
Radioisotope production facilities
Site studies
Fuel fabrication for RR
Due diligence for radiological and nuclear plants
Instrumentation and control
Refurbish and update nuclear facilities
Waste management systems
Equipment for special applications

What we do

INVAP operates with a team of highly-qualified staff that covers all the key areas encountered in a nuclear project, enabling the company to take the role of **Architect – Engineer and Design Authority.**

Design and build nuclear research reactors that are utilized for:

- Scientific research with neutron beams, cold neutron sources and neutron guides, and in/out of core irradiation devices.
- Production of radioisotopes for use in the medical, agronomic and industrial fields.
- Silicon doping.
- Fuel and material testing.
- Neutron radiography facilities.
- Neutron activation analysis.

Design and build radioisotope production plants for:

- Fabrication of targets for radioisotope production.
- Production of Iodine-125, Iodine-131 by fission, Molybdenum-99 by fission, Iridium-192 (medical and industrial sources) and Chromium-51, among others.
- Loading of Technetium-99 generators.
- Quality control.

Design and build equipment for the production of nuclear fuels:

- Fuel research and design for power reactors.
- Design and manufacturing of cap welding machines for fuel elements.
- Pneumatic powder conveying system.
- Powder compaction presses and molds.
- Controlled-atmosphere sintering furnaces.

Support for Nuclear Facilities

Design and manufacture of tools and systems, for aging, replacement, refurbish and substitution.

Design and build Waste Management Systems

Waste management plants for intermediate and low-level radioactive waste derived from the operation and maintenance of nuclear power plants.

Dry storage systems for nuclear used fuel assemblies as an interim solution for spent fuel.

Treatment of Natural Origin Radioactive Material (NORM) waste generated by accumulation of byproducts resulting from oil & gas processing operations.

Instrumentation and Control

High-tech designer and supplier of neutronic and radiation protection instruments and designer of reactor protection systems. Provision of total refurbishments of the whole I&C system in aged nuclear reactors.

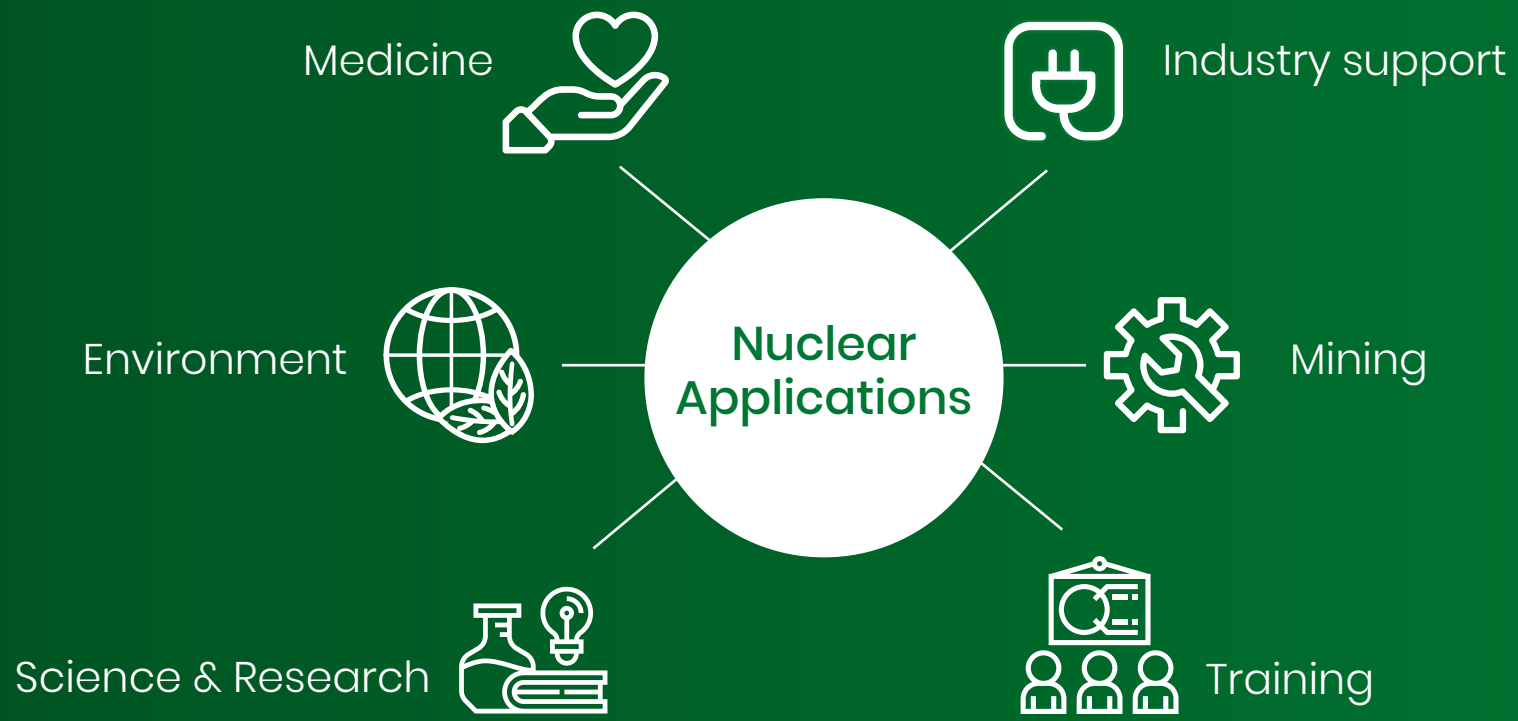
INVAP in-house product line of nucleonic instrumentation meets the requirements for measuring neutron and gamma flux in reactor cores and is qualified as IEEE class 1E for safety critical applications.

For People, by People: Applications of Nuclear Technology

Nuclear techonology has a wide range of applications in industry, mining, medicine and scientific fields that improves our every day lives.

Nuclear technology


for better diagnostics

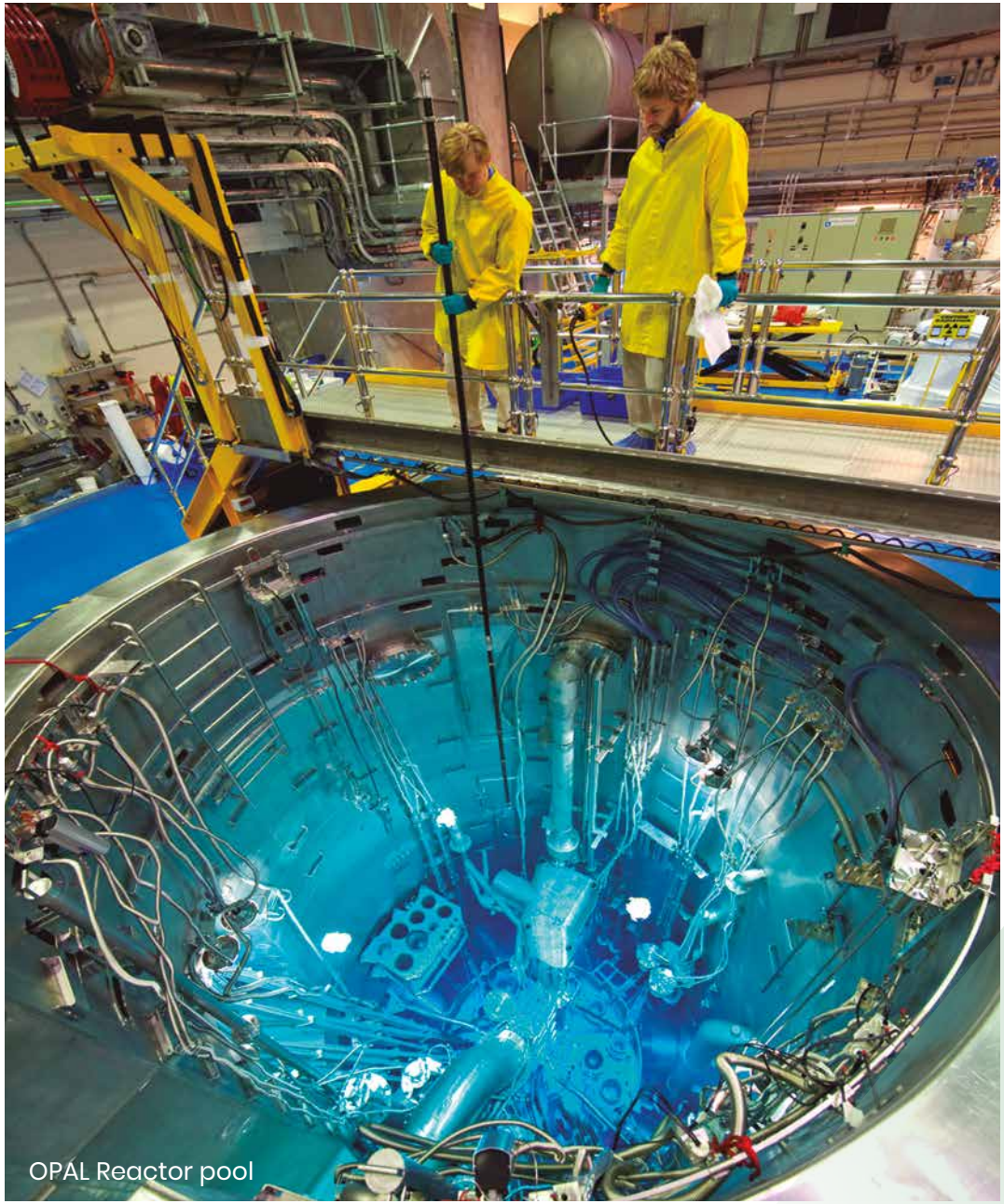

Medicine
Industry support
Environment
Nuclear Applications
Mining
Science & Research
Training

Role of Architect - Engineer & Design Authority for its Nuclear Projects

INVAP acts as the Architect-Engineer, Design Authority and overall responsible for its turnkey contracts; managing overall performance, quality, cost and schedule, from concept design, through basic and detail engineering, as well as procurement, manufacturing, construction, installation, preoperational testing and commissioning.

This includes the overall project management, systems engineering, safety demonstration and safety assessment, preparation of the PSAR/FSAR and support to its client through the review process by national nuclear regulators and the peer review missions undertaken by IAEA experts.

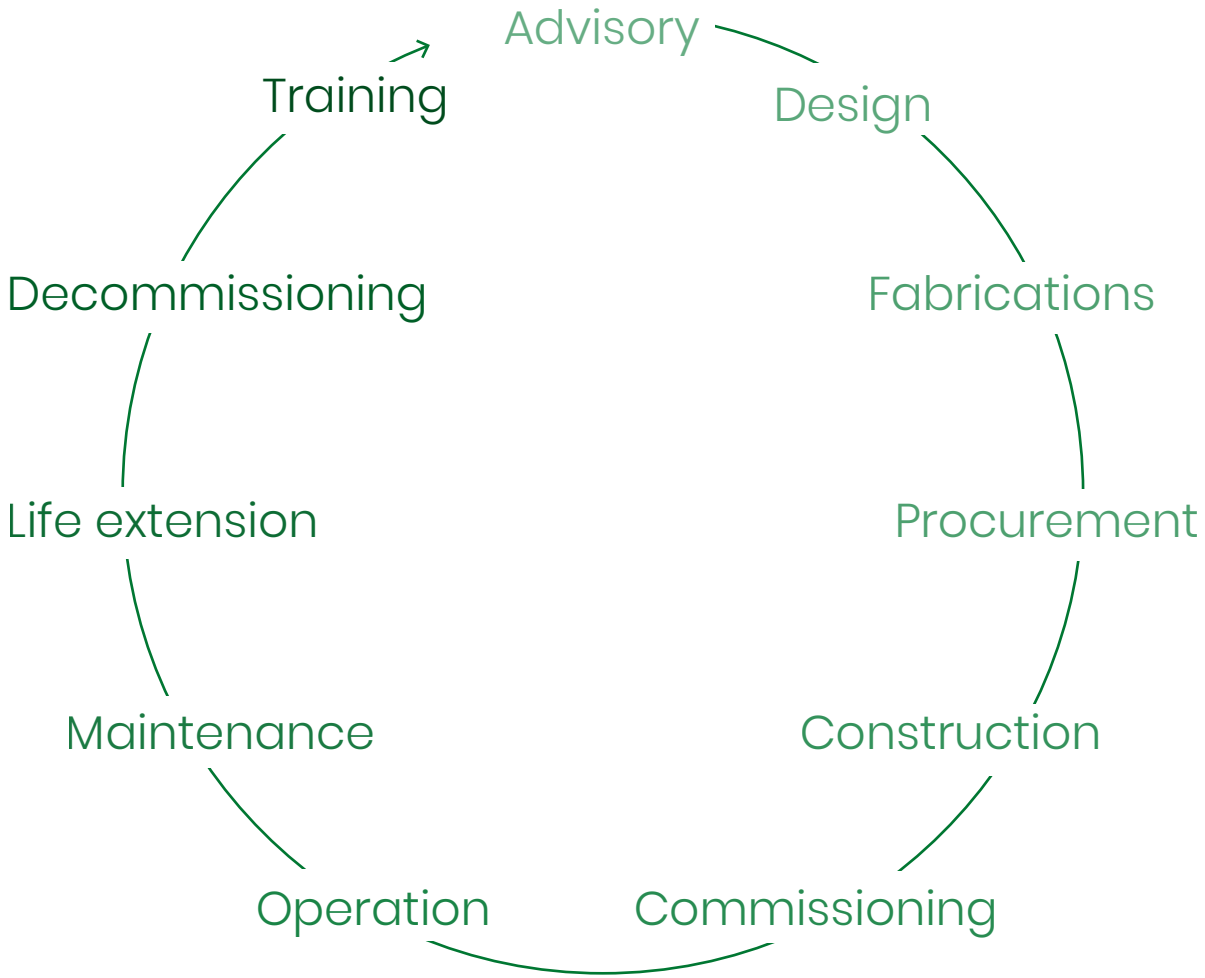
INVAP (with the client's vetting) is responsible for the selection and appointment of all the subcontractors and suppliers. As well as for the coaching and reviewing of the produced design, verifying the proper fulfilment of requirements (in particular key aspects related to nuclear safety, utilization, radiation protection and other specific reactor requirements).



OPAL Reactor pool

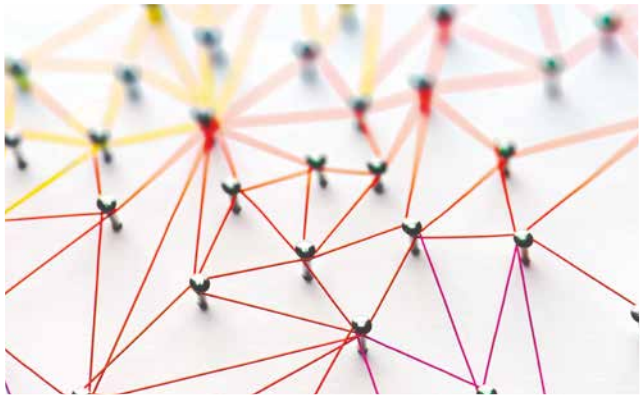
Expertise across the Nuclear Project Life-Cycle

INVAP's nuclear projects provide technological solutions tailored to each of its client's needs, and manages all stages of a system from the first consultation to the final turn-key product, while being diligent to meet the emerging customer needs both from the national to the international market level.



Nuclear Network of Expertise and Resources

INVAP, in its mission to develop a nuclear technology base in Argentina, maintains close ties with the Argentine Nuclear Energy Commission, the Balseiro Institute and other universities, scientific and research organizations within the country, consolidating a network of expertise and resources.



INVAP has also developed and kept an extensive network of qualified specialized subcontractors and suppliers, both in Argentina and in many countries, which enables the incorporation of world-class solutions and equipment to its projects.

Organizations, Consultants and Suppliers that have worked with INVAP in past nuclear projects

- National Atomic Energy Commission
- Australian Nuclear Science and Technology Organization
- John Holland Pty
- Mobilis B.V.
- Croon Wolter Droos
- Siemens
- MIRROTRON
- Air Liquide
- Evans Deakings Industries
- Hewlett Packard
- FOXBORO
- Petersburg Nuclear Physics Institute
- Centro de Investigación de Métodos Computacionales (CIMEC)
- James J. Johnson and Associates
- KAESER
- Linde
- Westinghouse
- Babcock Wilcox
- AECL
- INVENSYS
- Wormald
- Cox Richardson Architects
- Connell Wagner
- AMAZUL
- Wallischmuller
- La Calhene
- Saint-Gobain Sovis
- WalisschMiller

Overview of INVAP's delivered Nuclear Projects

RA6 1982

Designed, built and commissioned by INVAP for the Argentine Atomic Energy Commission (CNEA). The RA6 is 100% Argentine technology.
- Power: 1MW
- Use: research and training
- Location: Argentina

NUR 1989

Designed, built and commissioned by INVAP for HCR-COMENA (Algerian Atomic Energy authority).
- Power: 1MW
- Use: research, radioisotope production and training
- Location: Algeria

RA8 1997

Designed, built and commissioned by INVAP as a Critical Facility, to carry out tests supporting the CAREM nuclear power plant design.
- Power: 100W
- Use: measurement of nucleonic parameters and validation of the calculation line for the CAREM NPP
- Location: Argentina

Where we are now

ETRR2 1998

Designed, built and commissioned by INVAP for AEA (Egyptian Atomic Energy Authority).
- Power: 22MW
- Use: radioisotope production, research, beams utilization, BNCT neutrography, silicon transmutation and training
- Location: Egypt

OPAL 2006

Designed, built and commissioned by INVAP for ANSTO (Australian Nuclear Science and Technology Organization).
- Power: 20MW
- Use: radioisotope production, research, beams utilization (including cold neutrons) and silicon transmutation
- Location: Australia

PALLAS

- INVAP: contractor for design, engineering, procurement and construction management, for PALLAS Foundation
- Power: 25 MW
- Use: radiosisotope production for medicine, industry and research, and testing of nuclear fuels and materials
- Location: The Netherlands

RMB

- INVAP: contractor for design, engineering, manufacturing, nuclear installation testing and commissioning for IPEN
- Power: 30MW
- Use: radioisotope production, research, beams utilization (including cold neutrons) and silicon transmutation
- Location: Brazil

RA10

- INVAP: contractor for design, engineering, manufacturing, nuclear installation testing and commissioning for CNEA
- Power: 30MW
- Use: radioisotope production, research, beams utilization (including cold neutrons) and silicon transmutation
- Location: Argentina

LPRR

- INVAP: contractor for design, engineering, manufacturing, nuclear installation testing and commissioning for KACST
- Power: 100kW
- Use: training in nuclear science, radiochemistry and reactor fundamentals
- Location: Saudi Arabia

NUR+

- INVAP: contractor for design, engineering, manufacturing, nuclear installation testing and commissioning for COMENA
- Power: 3.5MW
- Use: extended range of research, radioisotope production and training
- Location: Algeria

Nuclear technology


for a
sustainable tomorrow

INVAP

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