2025 Annual Report

National Atomic Research Institute

Published in July , 2026

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Contents

Preface

Board Chair's Message

Looking back at 2025, artificial intelligence technologies have continued to advance rapidly. At the same time, global efforts toward net-zero emissions and sustainable development have accelerated. However, influenced by multiple factorsincluding extreme climate change, shifting geopolitical dynamics, and international tradethe overall development environment remains highly challenging.

Against this backdrop, atomic energy science and technology is becoming increasingly critical, playing an essential role in fields such as energy transition, advanced medical technology, and environmental sustainability. To this end, the Board of Directors has placed particular emphasis on the overall development of NARI. With regard to operational plans, resource allocation, and major strategic directions, representatives from various government agencies, along with experts and scholars from diverse fields, provide a wide range of professional insights. This enables the management team to operate with greater focus and efficiency in advancing the Institute's initiatives. Under this governance framework, NARI has steadily demonstrated the flexibility and dynamism inherent in an administrative corporation system.

The year 2025 was remarkable, owing to the collective efforts of all colleagues. NARI has remained committed to its core missions in the research and development of nuclear safety and nuclear backend. We have continued to enhance safety analysis, monitoring technologies, and professional support capabilities to ensure that Taiwan's nuclear-related facilities operate in compliance with safety standards, thereby safeguarding public safety.

In addition, in the fields of nuclear medicine and radiation applications for public welfare, NARI has actively advanced technological innovation and research and development, achieving a series of research breakthroughs. These accomplishments demonstrate Taiwan's strong scientific research capabilities and innovative capacity in the atomic energy science and technology as well as nuclear medicine sectors. Furthermore, efforts have been made to accelerate the translation of research outcomes into industrial applications, thereby enhancing public health and strengthening industrial competitiveness.

In the fields of new energy and cross-field system integration, NARI leverages its established expertise in atomic energy science and technology, electrical engineering, and information technology to strengthen its capabilities in integrating key technologies, expand into diverse application domains, and reinforce the technological foundation supporting Taiwan's energy transition. Besides, NARI has actively expanded its international collaboration network. Through participation in international technical exchanges and professional forums, it continues to enhance Taiwan's professional profile and substantive influence in the fields of atomic energy science and related technologies.

NARI, as an administrative corporation, undertakes the missions entrusted by the nation. It will continue to build its research and development capacity, strengthen its cross-disciplinary integration capabilities, and steadily enhance the application of its R&D outcomes and the creation of social value. Through its professional expertise, NARI remains committed to addressing public needs and aspires to contribute further to Taiwan's technological competitiveness and sustainable development.

Board Chair *Dr. Shin Chang*

President's Message

Since its establishment in September 2023, the National Atomic Research Institute (NARI) has leveraged its accumulated research achievements and technical expertise, focusing on three core pillars: nuclear safety and back-end processes, nuclear medicine and radiation applications for public welfare, and new energy and cross-disciplinary systems integration. In 2025, NARI further consolidated its R&D resources, strengthened its medium- to long-term strategic planning, and expanded international collaborations. Overall capacity and organizational maturity continued to grow.

Nuclear Safety and Nuclear Back-End

NARI continues to support the safe operation and decommissioning needs of Taiwan's nuclear facilities, advance key technologies in radioactive waste management, accident assessment, and emergency response, and keep abreast of emerging global developments in nuclear energy technologies. In 2025, NARI formally initiated preliminary research on small modular reactors (SMRs), with the aim of progressively establishing a research foundation for Taiwan's advanced nuclear energy technologies.

Nuclear Medicine and Radiation Applications for Public Welfare

Building on radiological technology, NARI has driven the R&D of radiopharmaceuticals and advanced application technologies, especially in molecular imaging and innovative drug development. Meanwhile, high-quality nuclear medicine technologies have continued to be introduced into clinical and commercial applications. In 2025, sales of nuclear medicine products approached NT$100 million. Over the past five years, we have provided more than 440,000 patients with radiopharmaceutical services, making a significant contribution to public health.

New Energy and Cross-Disciplinary Systems Integration

In alignment with the national 2050 Net-Zero Emissions Pathway and energy transition policies, NARI is actively advancing research in key net-zero technologies and systems integration. Our focus spans power system resilience, low-carbon energy, and resource circularity, while integrating R&D of key technologies, field validation, and application-scenario assessment. These efforts accelerate the development of critical technologies for Taiwan's net-zero transition.

2025 Milestones: Breakthroughs and Infrastructure Development

NARI achieved notable results across all areas in 2025, reflecting continued progress following our organizational restructuring. Key accomplishments include:

- Taiwan's first spherical tokamak experimental device the Formosa Integrated Research Spherical Tokamak (FIRST) was constructed in December 2025. The facility was independently developed and designed by a cross-disciplinary domestic team. System integration is scheduled to be completed by the end of 2026. It is expected to enter operational testing in 2027 and begin ignition-engineering studies, demonstrating Taiwan's pioneering capabilities in system integration and engineering implementation in the field of fusion research.
- The construction project for conversion of the 69 kV ultra-high-voltage substation to 22.8 kV was completed as scheduled in December 2025, ensuring a stable power supply for radiopharmaceutical production in nuclear medicine and supporting the implementation of key national research programs.
- The topping-out ceremony for Taiwan's first national-level 70 MeV medium-sized cyclotron building construction was held in December 2025; the construction project has also secured candidate certifications for both green and smart buildings. The project received a Grade A (85 points) rating in the 2025 annual construction quality inspection, with its

construction quality and management performance highly commended by the audit team. The facility is expected to be completed in 2026 and enter trial operation in 2027. In alignment with subsequent medium to long-term initiatives, it will further bolster Taiwan's self-reliant R&D capabilities and technological competitiveness.

Technology Promotion and IndustryAcademia Collaboration

NARI is dedicated to promoting technology transfer and fostering collaboration between academia and industry. We have signed Memoranda of Understanding (MOUs) with Taipei Veterans General Hospital, Far Eastern Memorial Hospital, Tungs' Taichung MetroHarbor Hospital, and Show Chwan Healthcare System. These partnerships establish long-term collaboration mechanisms between R&D and clinical practice, bridging the gap between nuclear medicine research and practical clinical application.

To facilitate knowledge exchange and practical applications, NARI hosted several major professional seminars in 2025, including the Taiwan Japan Modern Engineering and Technology Symposium, the Carbon Capture and Storage (CCS) Risk Assessment Workshop, the Symposium on the Development of Nuclear Medicine and Molecular Imaging Applications and International Seminars on the Development of Transport Evaluation Techniques for Spent Nuclear Fuel Final Disposal. These events helped deepen technical exchanges and foster further collaboration.

International Collaboration and Enhanced Competitiveness

NARI continues to strengthen global partnerships. In 2025, we established a significant technical exchange mechanism through quarterly virtual technical meetings with the Idaho National Laboratory (INL) in the United States. Moreover, NARI actively participated in key international forums, such as the Joint Standing Committee on Civil Nuclear Cooperation (JSCCNC) between Taiwan and the U.S. Moreover, diplomatic and representative offices in Taiwan including those from the United Kingdom, France, Belgium, Sweden, and Canadavisited NARI to engage in institutional exchanges. These visits focused on development strategies for advanced nuclear energy technology, system integration and application, and collaborative research directions. Through face-to-face exchanges and professional dialogues, both sides continued to deepen the foundations of the partnership while expanding opportunities for future technical cooperation and research links.

The following achievements reflect our strong innovation capabilities and technological potential:

- The 2025 R&D 100 Award: Dolacga Empowering Every Liver Function Decision. Winning in the pharmaceutical category is an extraordinarily rare achievement globally, highlighting NARI's world-class R&D capabilities and formidable international competitiveness in nuclear medicine.
- One Platinum, four Gold, three Silver, and five Bronze medals at the 2025 Taiwan Innotech Expo.
- Multiple wins at the 22nd National Innovation Award and the 13th Atomic Energy Safety Excellence Award, showcasing NARI's outstanding innovative strength and technological potential.

These accolades highlight NARI's exceptional innovation capabilities and the practical potential of our technologies.

Forging Ahead

Looking back at 2025, despite the challenges arising from the oil leak incident, NARI proved its ability to respond swiftly and coordinate effectively demonstrating organizational resilience that has grown even stronger since its reorganization into an administrative corporation.

With the sequential commencement of key initiatives, including:

- Research on Low-Carbon and High-Energy-Density Small Modular Reactors (SMRs)
- Net-Zero Emissions Pathway 2023-2026 Master Plan
- National Pharmaceutical Resilience Preparedness Program

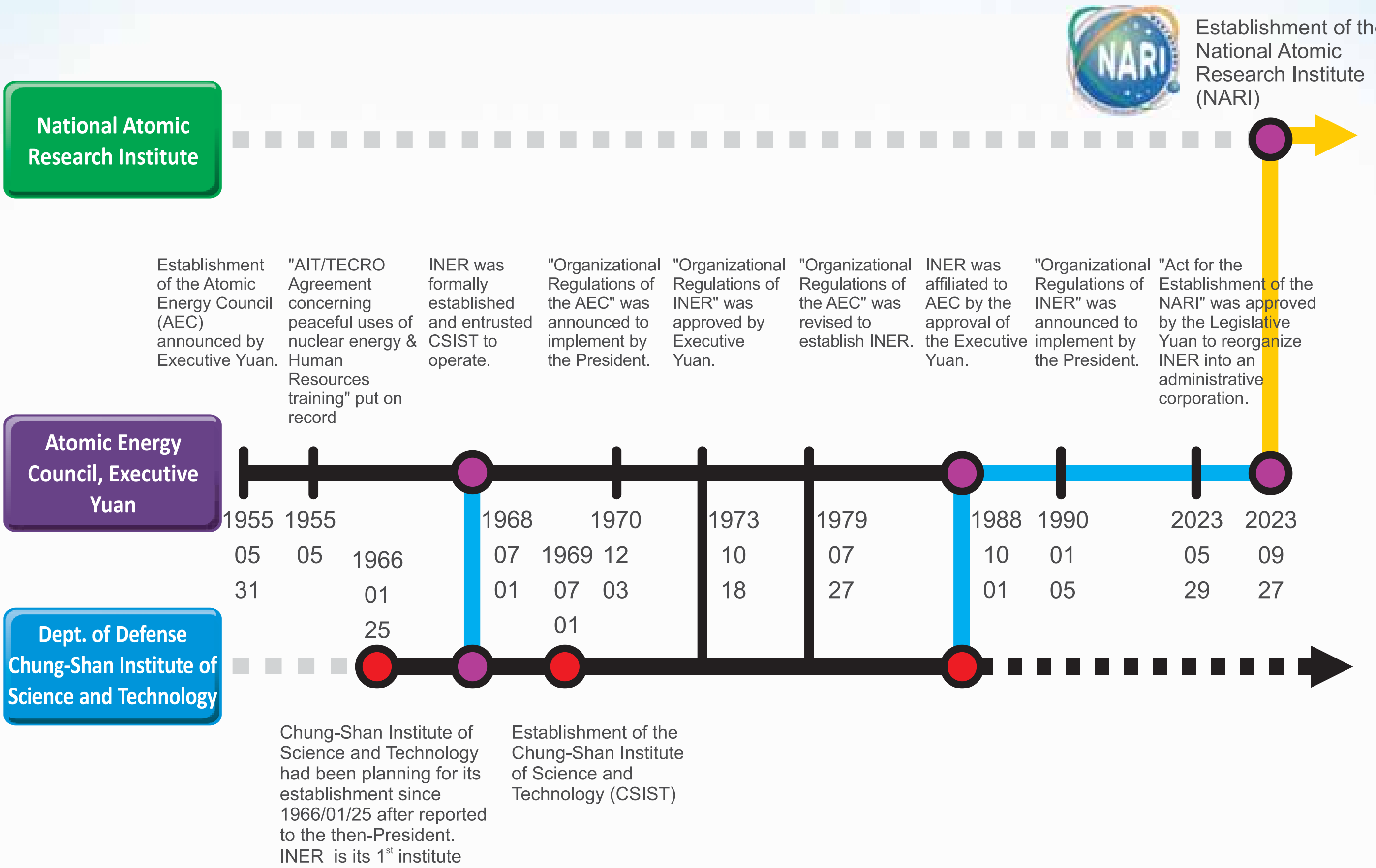
These programs will further provide powerful momentum for Taiwan's overall development.

Moving forward, NARI will remain talent-oriented and innovation-driven. We will steadily expand our key research initiatives and build a world-class professional team. Through pragmatic and resolute actions, we are committed to making concrete and lasting contributions to national technological advancement, energy transition, and social well-being.

President Dr. Tsu-Mu Kao

Historical Development

Organizational history of NARI



Establishment of the National Atomic Research Institute

1. National Atomic Research Institute (NARI), formerly known as the Institute of Nuclear Energy Research (INER), is the sole nuclear energy research institute in Taiwan. INER had been planning for its establishment since 1966/01/25 after reported to the then-President.

2. On 1968/05/09 the "Atomic Act" was announced to implement by the then-President. It is stated in the Article 4: For the purpose of promoting research and development of nuclear science and technology, exploiting nuclear energy resources and expanding nuclear applications to agriculture, industry and medicine, the Atomic Energy Council may establish research organizations. On 1968/07/01 INER was formally established and entrusted the Chung-Shan Institute of Science and Technology to operate.

3. On 1973/08/29 the "Organizational Regulations of the Institute of Nuclear Energy Research "was approved by the Executive Yuan.

4. On 1973/09/04 "Organizational Regulations of the Institute of Nuclear Energy Research" was announced to implement by Atomic Energy Council(AEC). It is decided that the date of anniversary of INER is on the 4^{th} September by the Chairman of AEC.

5. On 1988/10/01 INER was affiliated to AEC by the approval of the Executive Yuan.

6. On 1990/01/05 the "Organizational Regulations of the Institute of Nuclear Energy Research" was announced to implement by the then-President.

7. On 2023/05/29 the "Act for the Establishment of the National Atomic Research Institute" was approved by the Legislative Yuan to reorganize INER into an administrative corporation.

8. On 2023/06/21 the "Act for the Establishment of the National Atomic Research Institute" was announced to implement by the President.

9. On 2023/09/27 the National Atomic Research Institute (NARI) was formally established.

R&D and Innovation

R&D Achievements Summary:

Nuclear Safety and Nuclear Backend

National Atomic Research Institute (NARI), following its transition from INER, has continuously strengthened its technical capabilities in nuclear safety, decommissioning, and radioactive waste management. In response to Taiwan's energy transition and the progressive decommissioning of nuclear facilities, NARI has played a pivotal role in developing indigenous technologies to support nuclear power plant (NPP) safety, spent fuel management, and backend applications.

Building upon previous achievements, NARI has further expanded its research and development efforts to address emerging challenges associated with high-burnup fuel, large-scale decommissioning operations, and long-term radioactive waste disposal. The technologies developed can be broadly categorized into four areas: (1) nuclear fuel safety and storage technologies, (2) decommissioning and waste management technologies, (3) advanced safety assessment and environmental evaluation technologies, and (4) intelligent digital applications for operational safety.

1. Nuclear Fuel Safety and Storage Technologies

To support the long-term management of spent nuclear fuel, NARI has developed advanced fuel behavior analysis capabilities for high-burnup fuel under dry storage conditions. By adopting internationally recognized fuel performance codes and regulatory frameworks, NARI verified that cladding integrity, stress limits, and creep behavior remain within acceptable criteria for extended storage periods. These results confirm that high-burnup fuel can be safely stored without additional canning, significantly reducing storage costs.

In parallel, NARI successfully supported the dry storage operations at Chinshan NPP, achieving a major milestone by completing the full removal of spent nuclear fuel from the Unit 1 reactor core. This represents Taiwan's first full-scale implementation of dry storage loading and transfer operations, demonstrating NARI's capability in integrating engineering design, operational procedures, and regulatory compliance.

Furthermore, NARI has developed Taiwan's first and only flight dose assessment technology through the Flight Dose Calculator (FDC). This system enables accurate evaluation of cosmic radiation exposure for aircrew based on route and altitude. The results are consistent with international benchmarks such as ICRU and EURADOS, and the system has been adopted by the Nuclear Safety Commission (NSC) as a national assessment tool.

2. Decommissioning and Radioactive Waste Management Technologies

To address the challenges of large-scale decommissioning, NARI has developed a comprehensive suite of technologies for waste characterization, dismantling, and treatment. These include advanced sampling tools for radiological characterization, as well as underwater cutting technologies designed for high-dose-rate components. These systems enable safe dismantling operations in environments where conventional methods are not feasible, and have successfully been applied in the Taiwan Research Reactor (TRR) decommissioning project.

In addition, NARI has developed innovative electrochemical decontamination technology for radioactive metal surfaces, achieving decontamination efficiencies exceeding 99% while enabling material recycling and significant waste volume reduction. Complementing this, a new generation of low-level radioactive waste containers (C3 containers) has been developed, providing a 35% increase in storage capacity than C1 containers, thereby enhancing storage efficiency and reducing procurement costs.

To further improve operational efficiency and safety, NARI has introduced AI-based waste classification and occupational safety monitoring systems. By integrating image recognition, real-time monitoring, and early warning mechanisms, these systems significantly reduce reliance on manual inspection, minimize human error, and enhance radiation and workplace safety management.

3. Advanced Safety Assessment and Environmental Evaluation Technologies

NARI has also made significant progress in developing advanced analytical tools for long-term safety assessment. A three-dimensional groundwater flow and radionuclide transport modeling framework has been established to evaluate the performance of multi-barrier systems in high-level radioactive waste disposal. By coupling high-performance simulation tools, such as PFLOTRAN models and Darcy Tools, the system enables detailed analysis of radionuclide migration pathways over geological timescales, providing a robust scientific basis for safety cases.

In addition, NARI has advanced neutron radiography techniques through the development of color-enhanced imaging methods. These techniques significantly improve the visualization of low-atomic-number materials, enabling better observation of water distribution, thermal effects, and material changes within metal structures, thus expanding applications in both nuclear and non-nuclear fields.

4. Integrated Safety Management and Future Outlook

Through these integrated technological developments, NARI has demonstrated strong capabilities in addressing the full lifecycle challenges of nuclear facilities: from operation and safety assessment to decommissioning and waste disposal. These achievements not only enhance Taiwan's technical self-reliance but also align with international standards and best practices in nuclear safety.

Looking forward, NARI will continue to advance key technologies in nuclear safety, environmental protection, and digitalization, while strengthening collaboration with domestic and international partners. These efforts will further support national energy policy, ensure public and environmental safety, and promote sustainable development in the nuclear backend sector.

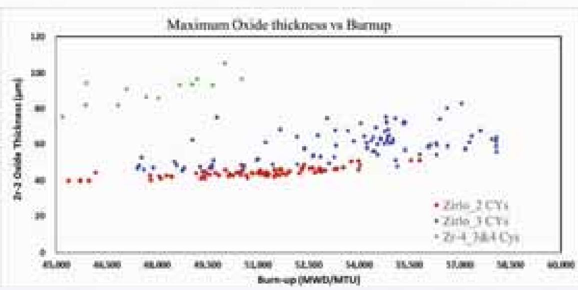
MEMO

Date . .

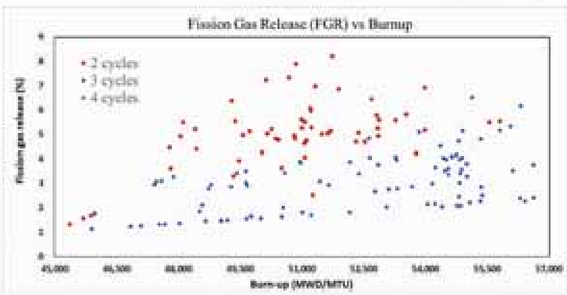
Characteristics Analysis and Integrity Assessment of PWR High-Burnup Spent Nuclear Fuel in Taiwan

Nuclear fuel behavior analysis codes are essential tools for evaluating fuel performance during operation and storage. Through rigorous numerical simulations, these codes predict critical physical parameters, providing a scientific foundation for fuel design, safety reviews, and back-end management. To improve efficiency and reduce spent nuclear fuel, the global nuclear industry is shifting towards high-burnup operations. However, high-burnup spent nuclear fuel suffers from increased radiation damage, leading to cladding oxidation and hydriding, which challenge the safety of long-term storage and final disposal. Therefore, developing precise analysis technologies to assess fuel characteristics under various storage conditions is vital. To ensure structural integrity, Taiwan must establish indigenous analysis capabilities and expert teams to support future dry storage and disposal safety evaluations.

NARI has successfully introduced and implemented an internationally recognized nuclear fuel behavior analysis code to simulate irradiated PWR high-burnup fuel in Taiwan's NPP. Based on ISG-11 Rev.3 and NUREG-2224, analyses revealed that fission gas release is driven by complex operational factors, and Zirlo cladding significantly outperforms Zr-4 in corrosion and hydriding resistance. Crucially for dry storage, under a conservative 400˚C limit, cladding hoop stresses remained below 90 MPa, preventing hydride reorientation damage. A 20-year simulation yielded a maximum strain of ~0.6%, well below the 2% creep limit. These results confirm that high-burnup fuel meets regulatory requirements and can be safely stored for up to 40 years without additional canning, significantly reducing storage costs. NARI's established indigenous capabilities now provide solid technical support for spent fuel management and can be expanded to future diverse storage scenarios.



Maximum oxide thickness distribution of irradiated PWR fuel rods

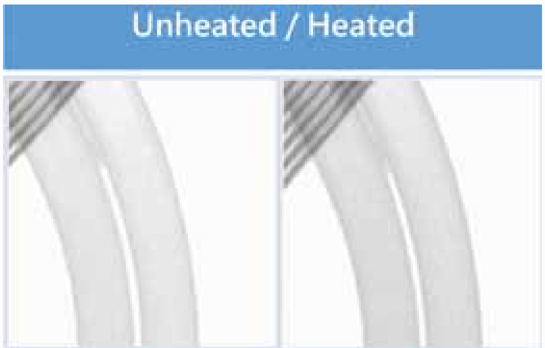


Fission gas release fraction distribution of irradiated PWR fuel rods

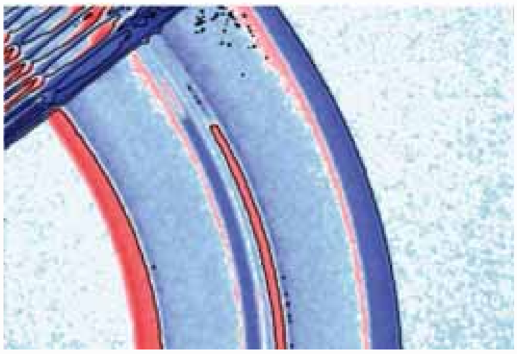
Analysis results of irradiated pwr high burnup fuel rods in Taiwan's NPP

Color-Enhanced Neutron Radiographic Imaging for Low-Atomic-Number Materials

The color-enhanced neutron radiography technique is based on neutron radiographic images and integrates image correction, differential analysis, and color mapping to visualize internal state variations within materials. Neutron images acquired under different operating conditions are first corrected for dark current, background, and beam non-uniformity to ensure consistency, followed by differential analysis to extract neutron attenuation changes. Color rendering is then applied to map these attenuation variations into distinct color distributions, enhancing subtle features that are difficult to distinguish in grayscale images. This technique supports the visualization of temperature-dependent effects, material redistribution, and state transitions, extending the analytical capability of neutron radiography for experimental and engineering applications.



Original neutron radiographs (unheated vs. Heated).



Color-enhanced image showing condensed water after heating (blue regions).

This technique enhances the interpretability of neutron radiographic images, enabling clear comparison of internal state variations under different operating conditions. Color rendering highlights local neutron attenuation differences, improving visualization of water and hydrogen-containing materials within metal-encapsulated structures. The method is non-destructive, flexible in processing, and well suited for experimental research and engineering analysis.

This technique supports non-destructive testing of metal-encapsulated structures and composite materials. It is particularly useful for analyzing water and hydrogen distribution as well as thermal effects. The method has been applied in projects for the Taiwan Space Agency (TASA).

Three-dimensional Radionuclide Transport Evaluation Techniques for Site-scale High-level Radioactive Waste Disposal Facilities

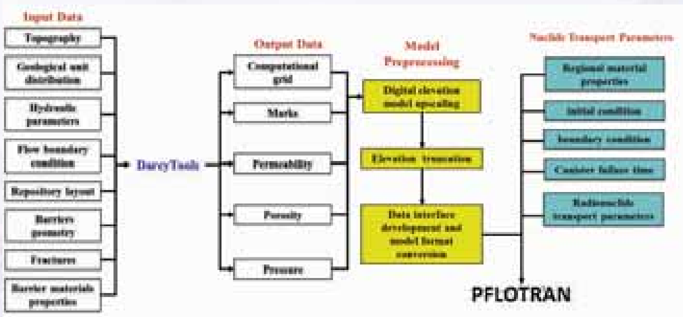
In the technological development of spent nuclear fuel final disposal, the core mission of Safety Assessment (SA) is to scientifically verify the effectiveness of the Multi-Barrier System (MBS), serving as a vital reference for safety cases. However, the decay and migration of radionuclides is an extremely slow process spanning tens of thousands of years. Constrained by current observation technologies and time costs, it is impossible to precisely reconstruct the complete dynamic evolution; thus, numerical simulation has become a key scientific technology for verifying the long-term safety of disposal sites.

Commissioned by Taipower's disposal project, the National Atomic Research Institute (NARI) developed 3D numerical simulation techniques to further quantify the dynamic processes of radionuclide release from canisters, transport through engineered barriers, and migration/retardation within the host rock, thereby assessing the impact on the biosphere. Utilizing the high-performance parallel computing capabilities of PFLOTRAN, this research accurately integrates 3D groundwater flow field data generated by Darcy Tools, transforming complex hydraulic characteristics into driving forces for radionuclide transport. Through this technical coupling, the simulation incorporates advection, diffusion, dispersion, and the retardation effects of the host rock, meticulously depicting the transport paths of radionuclides as they penetrate buffer materials and enter fracture networks. This study not only presents the spatiotemporal distribution of radioactivity at a site scale but also provides data-driven scientific support for the long-term effectiveness of the multi-barrier system, serving as essential scientific evidence to build public trust in final disposal.

This study successfully integrates the advanced technologies of Darcy Tools and PFLOTRAN to construct a 3D groundwater flow and radionuclide migration assessment model for dynamic evolutionary trend prediction. The R&D contributions and social benefits encompass three major dimensions:

1. Aligning with International Frontier Technologies to Enhance the Scientific Foundation of Safety Assessment: By integrating advanced numerical simulation tools and methodologies, this study establishes a high-fidelity 3D groundwater flow and radionuclide transport assessment model, strengthening both safety assessment capabilities and international competitiveness.
2. Strengthening Mechanistic Analysis of Radionuclide Transport and Developing Dynamic Evolution Models: Quantitatively analyzing radionuclide transport mechanisms and incorporating long-term evolution improves the accuracy of long-term safety assessments, serving as a critical reference for subsequent safety cases.
3. Visualizing Results to Enhance Social Trust and Risk Communication: Through 3D simulation and visual presentation, the assessment results are made trans- parent and concrete. This provides robust support for policy decision-making while improving public understanding and social acceptance.

Visualization of simulation analysis using Darcy Tools and PFLOTRAN



3D radionuclide transport modeling process

Electrochemical Technology Applied to the Low-Radioactive Contaminated Metal for Decontamination and Resource Recycling

Electrochemical technology applied to radioactive contaminated metal. A direct current is applied to a specific electrolyte, causing anodic dissolution and oxidation reactions on the metal surface (Fig.1). This removes radioactive nuclides on the surface (Fig.2) thereby achieving decontamination, volume reduction, and recycling of the metal materials. The technology can be applied to stainless steel, carbon steel, and other metal materials reused after decontamination. It can promote resource recycling and reduce the pressure and cost of radioactive waste storage.

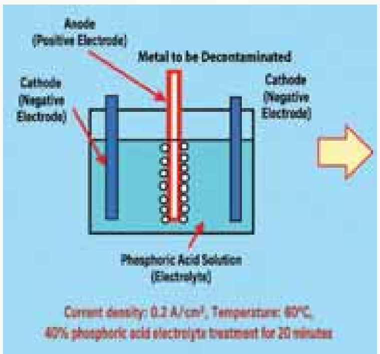


Fig. 1. Electrochemical treatment

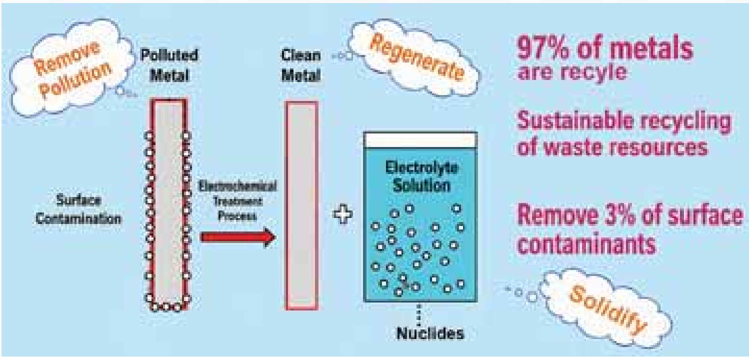


Fig. 2. Efficiency of electrochemical decontamination treatment

A circular electrochemical purification system (Fig.3) based on "decontamination-regeneration-solidification" was developed. This system decontaminates low-radioactive metal surfaces with a decontamination rate exceeding 99%. The cleaned metal is reused, offering energy-saving and environmental advantages compared to iron ore refining. Integrating acid recycling and inorganic solidification technologies, the system extends the acid lifetime to three times of traditional methods. It reduces the waste volume by 50% and secondary waste. The metal recycling reduces the storage pressure on radioactive waste. The disposal cost per barrel of radioactive waste is NT$62,000, so 1,000 barrels would require NT$62 million, representing a 97% reduction (Fig.4) and saving NT$60 million.

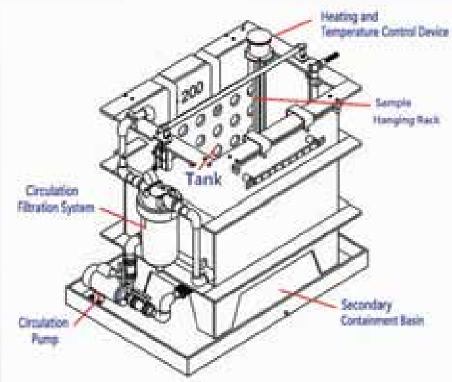


Fig. 3. Circular purification system

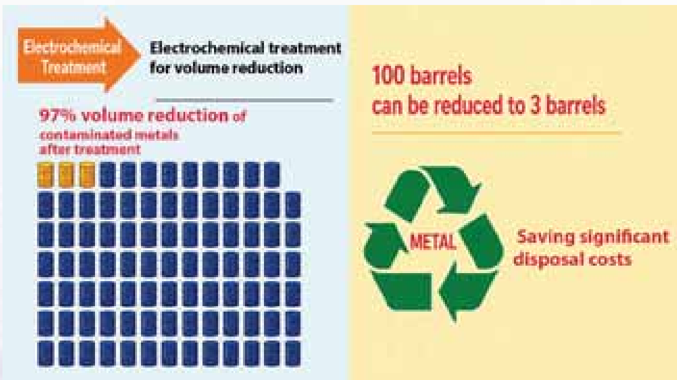
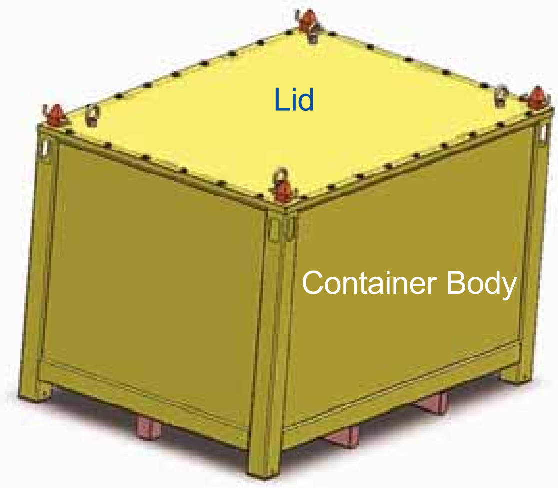


Fig. 4. Reduce pressure on waste storage

A Smart Solution for Low-Level Radioactive Waste Storage：The C3 Container

All the nuclear power plants in Taiwan are in the decommissioning phase, and Taiwan Research Reactor (TRR) is under dismantling process. Effectively and efficiently storing the low-level radioactive wastes (LLWs) during these processes would significantly promote the operation safety and reduce the cost of purchasing the LLW containers. For this, National Atomic Research Institute (NARI) successfully developed C1 and C2 containers. To further enhance the storage capacity and efficiency of the C1 container, NARI had developed a new type of LLW container "NARI-LRW-C3 LLW Container (C3 container)", and the usage permit of C3 container was granted on Oct. 27th 2025.

C1 and C3 containers have the same exterior dimensions, but C3 container has 35% more design weight storage capacity than C1 container. Therefore, NARI will not only replace C1 container with C3 container to store TRR dismantling wastes but also follow the C1 container experience to promote C3 container to Taipower Company to reduce the cost of purchasing LLW containers.



Depiction of C3 Container

Prototype of C3 Container

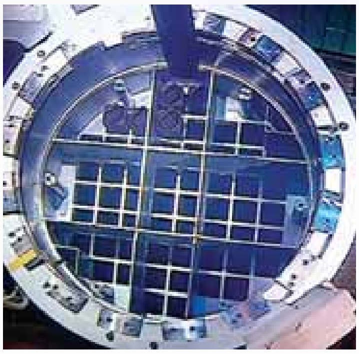
Item	Dimension (cm)	Weight (kg)	Material	Remark
General	180.7(L)x130.7(W)x129.8(H)		SS 400	
Tare Weight		700		
Lid	180.7(L)x130.7(W)x3.0(T)		SS 400	
Seal	1.5(W)x0.6		EPDM	
Max. Capacity	2.07 m^3			
Design Weight		4,500		Storage & IP2

Specifications of C3 container

A Milestone in Dry Storage Operations at Chinshan NPP: Complete Removal of Spent Nuclear Fuel from Unit 1 Reactor Core

To meet the decommissioning requirements of Chinshan Nuclear Power Plant (NPP), all spent nuclear fuel (SNF) must be completely removed from Unit 1 prior to reactor dismantling. Since 2005, National Atomic Research Institute (NARI) has been dedicated to Chinshan NPP outdoor dry storage project and accomplished equipment qualification, operational procedures, personnel training, and cross-agency coordination system.

Under the oversight of Nuclear Safety Commission (NSC), NARI integrated domestic and international technical teams and achieved the first spent nuclear fuel dry storage loading and transfer operations in Taiwan.



These operations include fuel loading, canister welding, concrete cask placement, and real-time radiation monitoring system installation. Following the trial operations, a report was submitted to the NSC, and the operation license was granted on May 1, 2025. This dry storage program formally entered the operation stage.

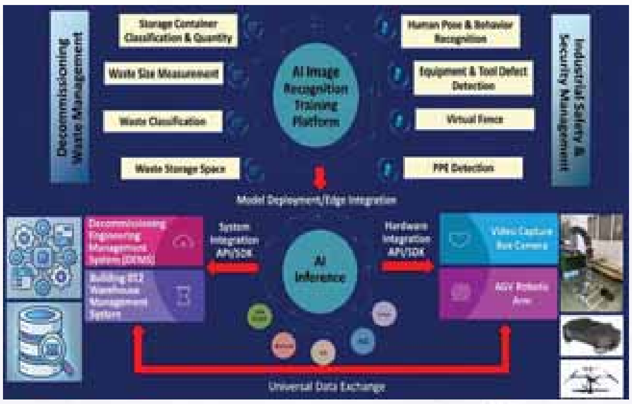
In July 2025, NARI started the formal SNF dry storage loading and transfer operations in Chinshan NPP. Through the collaboration between NARI and the contractors, 6 more storage casks were successfully loaded in December 2025, and a new milestone of completely moving out the SNFs dwelling in the unit 1 reactor core was reached. During this period, all operations were conducted under NSC oversight and in compliance with the ALARA principles. Moreover, the environmental and personnel radiation doses were well below the required limits. This successful experience forms the models of future dry storage operations and the associated radiation protection in Taiwan.

Furthermore, these operations and the associated results were reported not only on the webpages of Taipower Company and NSC but also as the "Top Story" of the front page of Uranium Exchange Company (UxC) website. This significantly promotes NARI's domestic and international reputation.

AI-Based Waste Classification and Smart Occupational Safety Early Warning Platform

As nuclear facilities step into the decommissioning phase, how to handle the classification, storage, and management of such large quantities of wastes, along with the occupational and radiation safety, has become a key issue. Currently, many waste identification processes still rely on manual inspection and paper-based records, which can be affected by human and environmental factors, such as personnel fatigue. This may result in misclassification, reducing efficiency, and increasing safety or environmental risks. To address these challenges, National Atomic Research Institute (NARI) has introduced artificial intelligence (AI) image recognition and digital visual support systems which are global industry trends now. Through intelligent image analysis and real-time monitoring, the system improves the accuracy and efficiency of waste management, reduces manual workload, and monitors personnel behavior and protective equipment usage. These advancements strengthen occupational and radiation safety controls and enhance the overall safety and quality of decommissioning operations.

NARI has developed the “AI-Based Waste Classification and Smart Occupational Safety Early Warning Platform”. The platform applies advanced image recognition technology at nuclear decommissioning sites, reducing reliance on manual inspection and minimizing human error. The system can identify various types of waste and storage containers, conduct quantity statistics and dimensional measurements, and monitor protective equipment usage and high-risk activities in real time. The system provides real-time alerts when potential hazards are detected. By integrating with existing management systems, the platform enables clearer waste tracking and intelligent management. This platform not only promotes operational safety and efficiency, reduce radiation and workplace risks, and improve environmental and public safety but also be applied in other industrial fields.



AI Image recognition model platform architecture diagram

Waste management and occupational safety inference

Study on Safety Evaluation and Maintenance Strategies for Long-Term Retained Structures and Components of Nuclear Power Plant

This study evaluates the safety of retained structure and components in nuclear power plants during the transitional phase to ensure that critical equipment continues to perform its intended safety functions prior to the complete removal of spent fuel from the spent fuel pool. In accordance with NUREG-1801 aging management principles, the flaw tolerance of the spent fuel pool cooling system and essential service seawater piping is assessed, and the acceptability of continued operation with flaws is determined using ASME Code Case N-513 to ensure structural integrity and reliability (Fig.1). A three-dimensional nonlinear seismic analysis incorporating updated site-specific hazard data is performed to evaluate stress demand, strength margins, and potential damage under beyond-design-basis earthquakes, confirming structural integrity under extreme conditions (Fig.2a & 2b). In addition, ASME NOG-1 and NUREG-0612 requirements are applied to review single-failure-proof criteria for the main crane of Reactor Building, with numerical simulations verifying the conservatism of the main girder design to support safe and effective subsequent operations (Fig.3).

Through systematic evaluation and technical analysis of key issues— including piping flaw tolerance, seismic structural integrity of the spent fuel pool, and operational safety requirements for heavy-load lifting equipment—the study advances maintenance management and safety assessment methodologies for retained systems and components during the transitional phase of nuclear power plant. By adhering to current regulatory standards while integrating recent developments in international nuclear safety practices, safety evaluation approaches can be effectively embedded across all stages of the plant life cycle, thereby sustaining a high level of overall safety performance and governance quality. This framework not only establishes a robust technical foundation for supporting future government energy policies—whether decommissioning or potential restart—but also reaffirms the long-standing institutional commitment to nuclear safety and a strong safety culture.

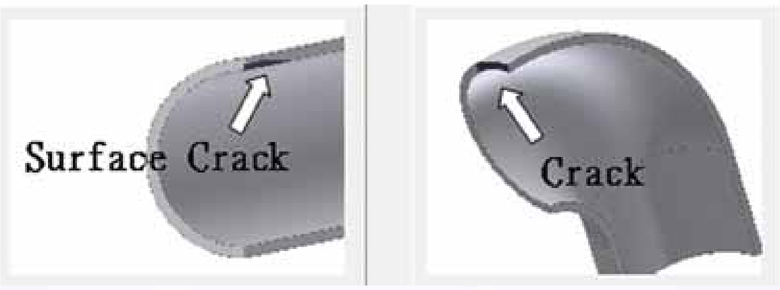


Fig. 1. Evaluation of cracks in piping components

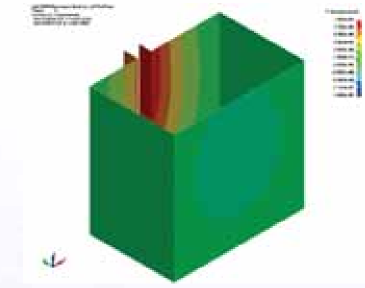


Fig. 2b. Structural evaluation of the spent fuel pool liner

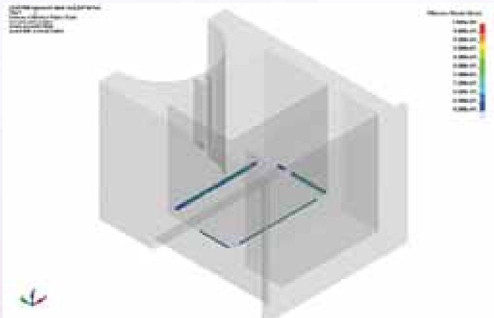


Fig. 2a. Structural evaluation of the spent fuel pool concrete wall

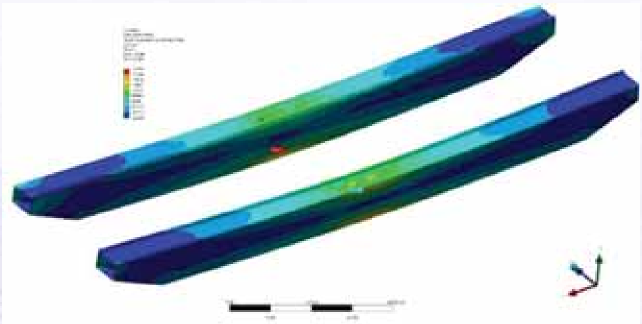


Fig. 3. Structural analysis of the main girder of the plant overhead crane

R&D Achievements Summary:

Nuclear Medicine and Radiation Applications for Public Welfare

NARI has long been dedicated to advancing the application of nuclear technology in healthcare and public welfare. By integrating radiopharmaceutical R&D, AI-enabled medical imaging, and radiation safety technologies, NARI has established a forward-looking and practice-oriented research framework. In 2025, NARI achieved tangible progress in radiopharmaceutical development, clinical translation, and radiation protection. Through cross-disciplinary integration and collaborations with medical institutions, research outcomes have been advanced from laboratory development to clinical and practical applications, strengthening Taiwan's technological capabilities and international competitiveness in precision medicine and radiation-related applications. These R&D achievements have also received recognition through major domestic and international awards.

In the field of radiopharmaceuticals, NARI focuses on the development of functional imaging and molecularly targeted nuclear medicine agents, targeting major diseases such as liver disorders, cardiovascular diseases, and cancer. These technologies not only enhance the quantitative assessment of organ function but also support clinical decision-making and prognostic evaluation. In addition, through optimized drug design and pharmacokinetic properties, the in vivo distribution and performance of these agents are improved, contributing to the advancement of precision diagnostics and treatment. Several developments have progressed to clinical trials or demonstrated readiness for clinical translation, reflecting a maturing pipeline from R&D to clinical application.

In AI-enabled medical imaging, NARI applies artificial intelligence technologies to develop brain function image data augmentation and analysis methods. By establishing physiologically grounded normative image frameworks, these approaches address the limitation of insufficient clinical reference samples. The technologies assist in identifying functional abnormalities in the brain and enhance diagnostic capability for neurodegenerative diseases. Furthermore, through multi-institutional data integration and model optimization, their applicability and robustness across different clinical settings are improved.

To enhance the accessibility and supply resilience of radiopharmaceuticals, NARI has continuously improved manufacturing processes and quality management systems, including extending product shelf life to better meet the needs of clinical institutions. These advancements contribute to improved healthcare service efficiency and strengthen domestic capabilities in radiopharmaceutical supply.

In radiation applications and safety, NARI continues to establish dose assessment and calibration systems aligned with international standards, strengthening radiation protection for both medical and occupational exposure. Computer-assisted analysis techniques have been introduced to improve the efficiency and consistency of dose interpretation. In parallel, NARI integrates core capabilities in radiation monitoring, dose assessment, and emergency preparedness, while enhancing inter-agency coordination and field exercise mechanisms. These efforts contribute to the continuous improvement of Taiwan's radiological emergency response and preparedness capacity, as well as the operational effectiveness of the overall protection system.

In cross-disciplinary collaboration and technology translation, NARI actively partners with medical institutions to accelerate the clinical implementation of radiopharmaceuticals and AI-enabled imaging technologies through clinical trials, validation studies, and implementation settings. These collaborations facilitate the integration of research and clinical resources. In addition, related technologies have been extended to radiation testing and verification in high-tech industries, demonstrating their cross-sector application potential.

In summary, through the integrated development of radiopharmaceuticals, AI-enabled imaging, and radiation applications, NARI is progressively establishing a complete value chain from research and validation to application. The Institute will continue to advance innovation and substantive contributions in precision medicine and civil applications of nuclear technology.

The IND Application for Atherosclerotic PET Diagnosis (APD) and AI-assisted Decision Support System (ADSS)

Metabolic syndrome (hypertension, hyperglycemia, and dyslipidemia) is the major risk factor for the development of atherosclerosis. Chronic vascular inflammation may lead to thrombosis, which in turn results in ischemic heart disease (myocardial infarction) and stroke. Accordingly, there is a critical global need for atherosclerosis-targeted PET diagnostic agents to enable early detection and comprehensive assessment of cardiovascular diseases. NARI has developed a novel positron emission tomography (PET) tracer, Ga-68-APD, for atherosclerosis imaging. Preclinical studies have demonstrated that Ga-68-APD shows significant accumulation in atherosclerotic lesions in murine models, along with rapid metabolism (Fig.1). This technology has been granted patents in Europe, the United States, Japan, and the Republic of China (Taiwan).

To further enhance clinical applicability, NARI has collaborated with industry partners, including Salomon, to develop an AI-assisted Decision Support System (ADSS) for lesion localization and severity grading. This system integrates artificial intelligence (AI) and three-dimensional mixed reality (MR) technologies (Fig. 2) and is expected to support clinical diagnosis and decision-making in medical institutions. Currently, memorandum of understanding (MOUs) have been signed with Taipei Veterans General Hospital, Taichung Veterans General Hospital, Tri-Service General Hospital, and Tungs' Taichung MetroHarbor Hospital. In addition, the study protocol has been approved by the Institutional Review Board (IRB) of Tungs' Hospital. Upon regulatory review and approval by the Food and Drug Administration of Taiwan (TFDA), a first-in-human Phase I/IIa clinical trial is expected to commence in the near future.

Cardiovascular diseases remain the leading cause of mortality worldwide. The integration of Ga-68-APD with ADSS aims to enable whole-body assessment of atherosclerosis. AI-based lesion localization and quantitative grading facilitate early-stage disease detection. It is anticipated that Ga-68-APD will advance into clinical application, contributing to early diagnosis, timely intervention, and improved global cardiovascular health.

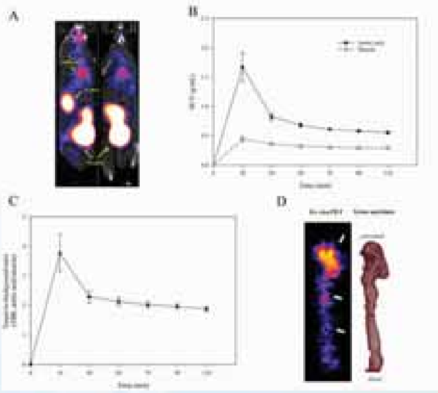


Fig. 1. Metabolism of Ga-68-APD

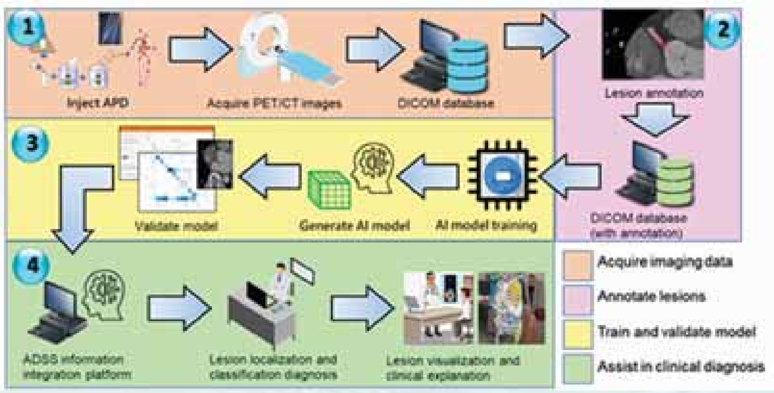


Fig. 2. 3D mixed reality (MR) technology ; a lesion localization and grading decision support system (ADSS)

International Certification of Excellence in Biodosimetry NARI's Biodosimetry Laboratory Achieves Top Ranking in International Comparison

On the critical front of nuclear energy and radiation safety protection, the National Atomic Research Institute (NARI) has once again demonstrated Taiwan's strong scientific capabilities on the global stage. On August 28, 2025, according to the final report released by Health Canada, NARI ranked among the top performers out of nine leading laboratories worldwide, based on its superior analytical accuracy. This is not only an honor, but also a distinguished recognition in NARI's implementation of the Nuclear Safety Commission – commissioned project, "Strengthening Research on Radiation Protection Calibration and Measurement Technologies in Taiwan."

With the support from the Nuclear Safety Commission, NARI's laboratory delivered outstanding performance. In the critical Z-Score statistical analyses, our Dicentric Chromosome Assay (DCA) technology exhibited high stability; with results from both Conventional Analysis (CONV) and Quick Scan (QS) falling within the 95% confidence interval. This demonstrated that Taiwan's radiation dose assessment capabilities have reached an international advanced level.

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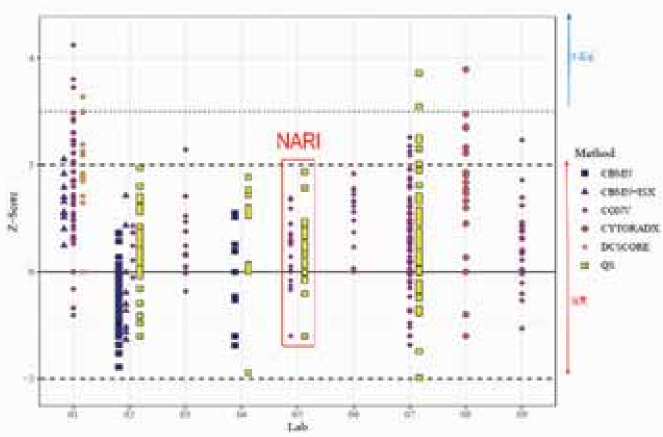
This research addresses the gap in localized radiation baseline data by optimizing Biological Dosimetry techniques and establishing population-specific assessment benchmarks. Through the integration of computer-assisted scoring systems, analytical efficiency has been significantly improved, along with enhanced accuracy in dose reconstruction for clinical applications during radiological emergencies. Furthermore, continuous accreditation under ISO/IEC 17025 ensures that all analytical results meet internationally recognized standards of quality and reliability. This framework provides a robust foundation for national radiation safety and supports the advancement of precision medicine, thereby safeguarding public health and long-term societal well-being.



Enhancing Supply Flexibility of Nuclear Medicine Radiopharmaceuticals: Extension of Iodine-123 MIBG Shelf Life to "18 Hours"

To enhance the resilience of domestic nuclear medicine supply and clinical accessibility, the National Atomic Research Institute (NARI) successfully extended the shelf life of INER MIBG <I-123> Injection improved to 18 hours through process optimization and quality validation. Iodine-123–labeled MIBG, a norepinephrine analog, selectively accumulates in sympathetic nervous system and is widely used for the diagnosis of pheochromocytoma and neuroblastoma. It is widely used for assessing cardiac sympathetic function and heart failure risk. NARI is also actively exploring its application to neurodegenerative diseases, including Lewy body dementia and Parkinson's disease. Supported by Taiwan's only 30 MeV cyclotron and a PIC/S GMP-compliant manufacturing facility, NARI completed three consecutive process validation batches and stability studies. Regulatory approval for the shelf-life extension has been obtained, and demonstrating robust domestic R&D and manufacturing integration capabilities.

MIBG <I-123> Injection

Pharmaceutical facilities

The shelf-life extension of Iodine-123 MIBG to 18 hours effectively alleviates supply constraints associated with its short shelf-life, particularly enhancing clinical scheduling and distribution in central and southern Taiwan. This advancement improves supply chain efficiency, reduces radiopharmaceutical waste and associated costs, and strengthens overall reliability. From a clinical perspective, this development supports timely diagnosis of neuroendocrine tumors, cardiac disorders, and neurodegenerative diseases. By enhancing accessibility and early diagnostic capacity, it contributes to improved public health outcomes and reinforces healthcare system resilience.

Establishment of National Eye Lens Dose Assessment Technologies for the Revised ICRP Limits

In response to the significant reduction in the occupational dose limit for the lens of the eye recommended in the International Commission on Radiological Protection (ICRP) Publication 118, NARI has proactively advanced to develop domestic eye lens dose assessment technologies. This effort aims to address potential technical challenges associated with aligning Taiwan's regulatory framework with international standards.

To establish national measurement standards, NARI has pioneered an eye-lens dose equivalent (Hp(3)) calibration system in compliance with ISO 4037-1 and ISO 6980-1 international standards. The technological development encompasses standard radiation calibration fields, including medium-energy X-ray systems (covering both narrow and wide spectra), a 137Cs high-energy photon system, and a 90Sr/90Y beta particle system. Furthermore, NARI refined specialized head phantoms and real-time monitoring devices, successfully establishing domestic calibration techniques for eye-lens dosemeters.

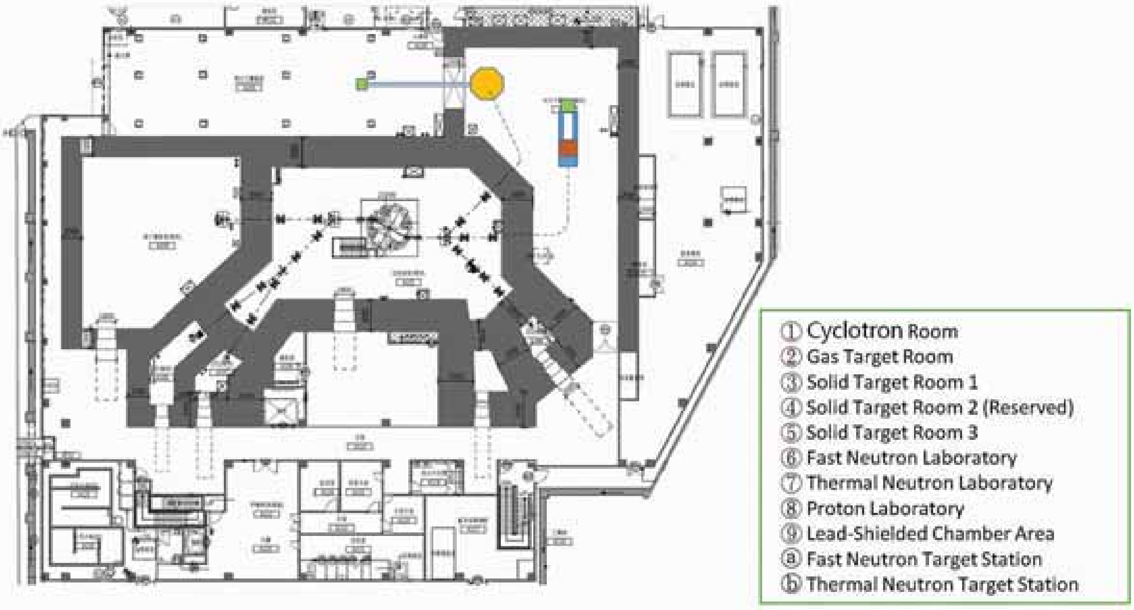
To ensure that domestic radiation dosimetry standards are consistent with international peers, NARI participated in international comparison tests led by the Asia Pacific Metrology Programme (APMP) to confirm measurement equivalence, thereby achieving the goal of international measurement traceability. The research and development of the calibration systems, along with the results of international comparisons, have been published in international journals of Metrologia and Radiation Protection Dosimetry, significantly enhancing Taiwan's international visibility and academic credibility in the field of radiation protection monitoring technology.

In terms of implementing domestic testing capabilities, NARI introduced ANSI/HPS and ISO 14146 standards, participating in the revision of the "Technical Specifications for Personnel External Dose Assessment in the Testing Field," and organized Taiwan's first proficiency testing for eye-lens dosemeters. This testing covered mainstream technologies such as thermoluminescent dosemeters (TLD) and optically stimulated luminescence dosemeters (OSLD). Ultimately, NARI guided all 7 domestic personnel dosimetry evaluation laboratories to pass the test, achieving a 100% pass rate. This achievement not only practically verifies that domestic laboratories possess the technical capability to provide accurate monitoring data, but also provides a solid technical quality assurance and scientific backing for the Nuclear Safety Commission (NSC) to promote new regulations in the future.

Head phantom and ionization chamber for eye lens dosimeter calibration

Radiation Safety Assessment of NARI's 70 MeV Cyclotron Facility Approved by the Competent Authority

To address the domestic gap in the 28~70 MeV cyclotron energy range, ensure a stable supply of radiopharmaceuticals for Taiwan's nuclear medicine clinical demand, advance precision radiomedicine, and support radiation hardness testing and advanced materials development for precision health, civilian, and defense industries, NARI has completed radiation safety assessment reports for both the 70 MeV cyclotron production facility and the high-intensity radiation facility. These reports have been reviewed and approved by the competent authority, thereby authorizing the commencement of facility construction. The assessment scope included source term analysis for the accelerator vault, solid and gas target rooms, and neutron laboratories; radiation shielding design and calculations; activation product evaluation; streaming dose analysis through penetrations; and occupational and public dose assessments. Conservative evaluations were conducted under bounding operational scenarios, assuming continuous full-power operation throughout the year at maximum beam current. In addition, a comprehensive inventory of on-site radiation facilities was established to evaluate cumulative dose contributions at the site boundary, integrating doses from both gaseous and liquid effluents to ensure the protection of workers and the public.



Through numerical simulations and conservative assumptions, the results indicate that, under the most unfavorable operating conditions, the annual effective dose to the nearest critical group located 50 meters north of the site boundary is approximately 0.033 mSv/year, significantly below the regulatory limit of 1 mSv/year. When combined with contributions from all on-site facilities, the total dose is approximately 0.48 mSv/year; including actual gaseous and liquid releases, the overall total is approximately 0.61 mSv/year. All results comply with the Ionizing Radiation Protection Safety Standards. These findings not only verify the adequacy and safety margin of the shielding design, while also providing a transparent and quantitative basis for risk communication to address public concerns regarding high-energy cyclotron facilities. Through rigorous technical assessment and regulatory compliance, NARI supports the development of radioisotope production and advanced research capabilities, while ensuring the protection of public health and the environment, and reinforcing public confidence in national critical infrastructure.

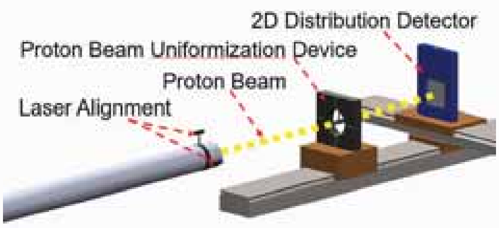
Proton Beam Uniformization Device

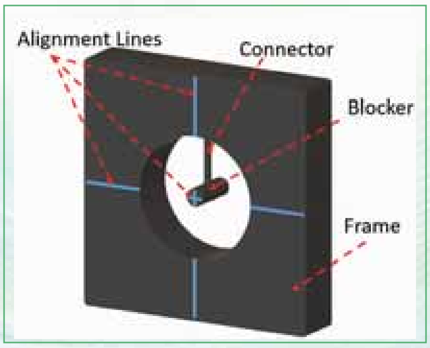
With the rapid growth of the global space industry, radiation tolerance has become a critical qualification criterion for electronic components. According to the European Space Agency (ESA) ESCC 25100 specification, proton irradiation tests for single event effects(SEE) require flux uniformity within 10% across the irradiation area to ensure measurement accuracy. However, proton beams generated by conventional cyclotrons typically exhibit a Gaussian distribution, characterized by a peak flux at the center and a steep decline toward the periphery. This intrinsic profile results in significant non-uniformity over large irradiation areas.

Traditional homogenization methods rely on quadrupole and multipole magnets to shape the magnetic field. While capable of achieving high efficiency and precision, such systems involve high capital costs, complex tuning procedures, and substantial spatial requirements, thereby limiting facility flexibility and scalability. To address these limitations, NARI has developed a compact and cost-effective Proton Beam Uniformization Device that can be readily integrated into existing proton beamlines, specifically targeting large-area irradiation applications in space radiation testing.

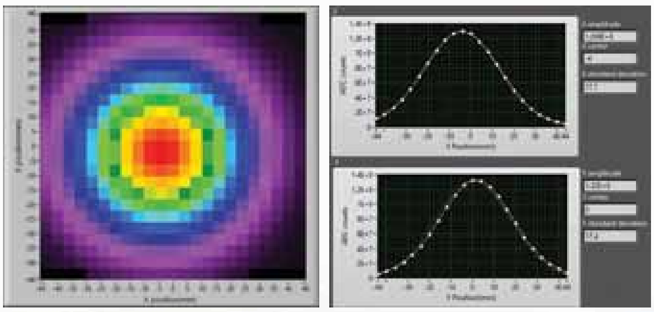
The device was designed using Monte Carlo simulation to optimize beam distribution and achieve a flux uniformity within 10%. It employs interchangeable central blocking elements with adjustable materials and thickness to attenuate the peak central flux and redistribute the beam intensity, thereby expanding the effective irradiation field. This passive design significantly improves uniformity while reducing system complexity and space requirements. Experiments validation using NARI's 30 MeV cyclotron demonstrates that the effective irradiation diameter can be increased from 15mm to 28mm under the ±10% uniformity criterion, corresponding to an approximately 3.5-fold increase in irradiation area.

The device has been granted a Taiwan invention patent (I876950) and successfully applied to radiation testing services for space components. This development enhance domestic radiation qualification capabilities and contributes to improving the reliability and resilience of satellites and critical electronic systems.

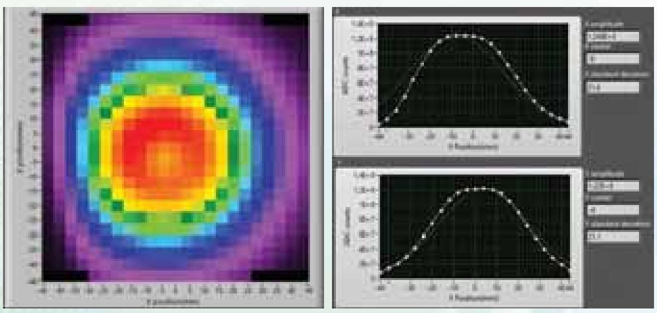




Schematic of the proton beam uniformization test setup



∅15 mm (Original Beam)



∅28 mm (O 10 mm Blocker)

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R&D Achievements Summary:

New Energy and Cross-Field System Integration

New energy and system integration technology is one of the three major R&D pillars of the National Atomic Research Institute (NARI). As a national research institute, NARI continues to pursue diversified technological development and industrial promotions. In this field, our R&D portfolio includes solar energy, wind power, smart grids, grid resilience, hydrogen energy and fuel cells, flow batteries, lithium batteries, energy-saving membranes, biogas, biorefining, negative carbon technologies, as well as plasma technology for consumer goods and waste treatment. In compliance with national sustainable development policies, we are steadily advancing R&D and innovation across various new energy sectors to secure autonomy in key technologies.

The 2025 annual report briefly outlines the progress of our new energy and cross-field system integration through two aspects: "R&D and Innovation" and "Highlights and Collaborative Promotion." The project names are listed as follows:

R&D and Innovation

- **From Silicon to Gallium Nitride (GaN):** Developing More Durable and Efficient Third-Generation Semiconductor Epitaxial Technology
- **Energy-saving Dehumidification Champion:** Adsorption Rotor Drying Equipment and Air Conditioning Systems
- **Plasma Sputtering with AI:** A Powerful Tool for Developing High-entropy Alloys for Seawater Electrolysis to Produce Hydrogen Production
- **Innovative Bio-circular Value-added Application Models:** Lignin Extraction Technology from Wood and Bamboo Resources
- **Exploring High-value Biogas Applications:** Greenhouse Gas Reforming and Conversion Technology
- **Assessment Technology:** The Impact of Power Plant Valve Leakage on Power Generation Losses
- **Grid Guardian:** A Risk-Informed Identification Tool for Power Grid Nodes

  Domestic Distribution Feeder: Dynamic Protection Analysis and Equipment Inspection Technology
- **Thermoelectric Conversion Modules:** Grid-Tied and Power Control Technologies for Heat-to-Power Conversion Modules

Highlights and Collaborative Promotion

- Flue Gas CO_2 Capture, Conversion, and Utilization Technology
- Establishing International Geologic Modeling and Risk Assessment Technologies for Carbon Storage
- Carbon Dioxide Capture and Circular Carbonation Utilization Technology from Flue Gas

The R&D and innovation projects listed above encompass: semiconductor epitaxy, energy conservation, plasma technology, integrated biomass energy utilization, efficiency improvement for traditional power plants, grid protection, dynamic inspection, and grid-tied control technologies. In particular, to ensure a stable power supply, we have introduced Quantitative Risk Assessment (QRA) to conduct systematic grid evaluations. By identifying critical nodes within the grid, the operator can take appropriate protective actions in advance, thereby enhancing the "supply resilience" of the power system.

Regarding the three items under Highlights and Collaborative Promotion, the "Flue Gas CO_2 Capture, Conversion, and Utilization Technology" was honored with the 22nd National Innovation Award. Next, NARI formally signed a Letter of Intent (LOI) for collaborative research and capacity building in carbon storage with the Battelle Memorial Institute to align our verification technologies with international expertise. Regarding the third project, we have formed a cross-sector alliance with Taiwan Sugar Corporation and Nice Group and signed an MOU to jointly advance CCSU (Carbon Capture, Storage, and Utilization) technology. Through close collaboration between industry, academia, and research, we aim to bridge the gap between laboratories and the market, creating a replicable and scalable net-zero business model.

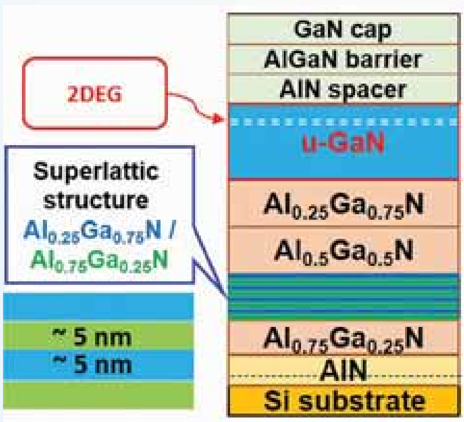
Currently, based on the concept of a circular economy, we aim to extend our research scope to sustainable biomass resource utilization, development and verification of next-generation Sustainable Aviation Fuel (SAF), low-carbon hydrogen technology, and net-zero smart grid projects integrated with carbon capture and utilization. Looking ahead, in compliance with national sustainability policies, we will persist in our professional excellence and advance our R&D efforts and innovation. By mastering autonomous key technologies, we aim to maintain Taiwan's international competitiveness in the new and renewable energy sectors and pursue a prosperous, sustainable, low-carbon society.

From Silicon to Gallium Nitride-Developing: More Durable and Higher-Efficiency Third-Generation Semiconductor Epitaxial Technologies

Semiconductor technology is a fundamental pillar of modern life, supporting the stable operation of smartphones, computers, communication base stations, electric vehicles, and renewable energy systems. As technology continues to advance and electricity demand grows rapidly, traditional silicon-based semiconductor materials are encountering limitations in performance and durability, especially for high-power, high-efficiency, and low-carbon applications. To meet the demands for high performance and low carbon emissions, third-generation semiconductors with high breakdown voltage and superior energy efficiency have captured the global research focus. Among them, Gallium Nitride (GaN), owing to its outstanding material properties, is widely regarded as a key next-generation material. Nevertheless, challenges remain in terms of manufacturing cost and process maturity, and achieving stable, high-quality GaN materials while balancing performance and cost has become a central issue for practical applications and industrialization.

In alignment with the development of wide-bandgap high-power device technologies, NARI has successfully developed high-quality GaN-on-Si heteroepitaxial technology using in-house GaN epitaxy facilities. Through innovative buffer layer and superlattice structure designs, the defect density has been significantly reduced, resulting in GaN films with enhanced stability and durability, well suited for subsequent high-power device applications. Based on the achievement, the team has also fabricated GaN High Electron Mobility Transistor (HEMT) devices, demonstrating high-speed and low-loss electron transport characteristics.

Compared with conventional semiconductors, GaN enables operation at higher voltages and power levels within a smaller size, while offering high-voltage tolerance, radiation hardness, and high efficiency. These advantages effectively reduce energy loss and heat generation, improving system durability and reliability. Beyond civilian applications, the results also show strong potential for advanced fields such as radiation-hardened space electronics, sensors, and control systems for nuclear fusion superconducting devices, providing a critical foundation for the development of high-efficiency, low-carbon, and high-reliability technologies.



Schematic illustration of a GaN High-Electron-Mobility Transistor (HEMT) device

Market applications of GaN devices

Champion of Energy Saving Dehumidifier： Dryer and Air Conditioning System of Adsorption Rotary Wheel

The climate of Taiwan is humid and hot, so the consuming electric energy of dehumidification and drying occupies a significant proportion of the nation. Drying is a necessary processing step for agricultural products. However, it generally lacks active energy management system functions, making it difficult to balance quality and energy efficiency. In addition, in terms of industrial air conditioning and dehumidification, the energy consumption of cleanrooms accounts for about half of the total energy consumption of the entire plant. Therefore, reducing the energy consumption of cleanroom air conditioning has become important. NARI continues the development of energy-saving adsorption rotary wheel technology and has developed a general-purpose energy-saving drying system with intelligent temperature and humidity control. It has also developed an adsorption rotary wheel air conditioning system of cleanroom, which has the advantages of reduced cooling load, lower dew point and energy saving.

NARI has developed a general-purpose energy-saving drying system with intelligent temperature and humidity control functions based on its adsorption rotary wheel technology. It is primarily for agricultural drying, especially for high-value agricultural products such as vanilla, shiitake mushrooms, and Antrodia camphorata, and gradually expanding to orchid greenhouses. Its energy saving and drying time can both be reduced by more than 50%, meeting the industrial requirement.

In addition, NARI developed an adsorption rotary wheel air conditioning system that integrates dehumidification wheels with heat exchangers and heat pumps, and applied it to cleanroom in the electronics and semiconductor industries. The overall system energy consumption index meets the US ASHRAE Good grade, also has an energy saving rate of 20-30%, and meets Taiwan Energy Administration's energy performance subsidy standards.

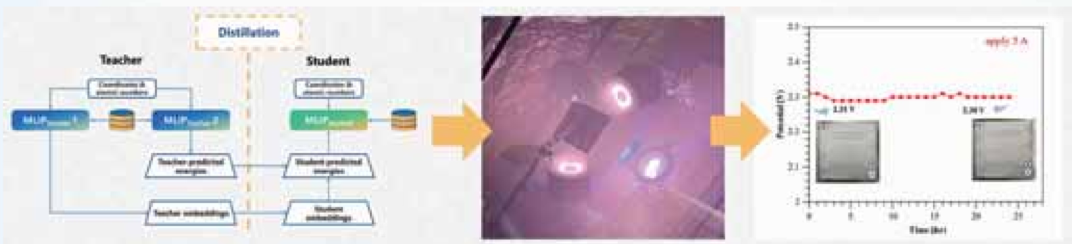
Dryer of adsorption rotary wheel

Air conditioning system of adsorption rotary wheel

Plasma Sputtering and AI：Powerful Tools for Developing High-entropy Alloys in Seawater Hydrogen Production

Factors such as national energy security, the greenhouse effect, and environmental pollution are driving increasing demand for energy transition. Hydrogen production via seawater electrolysis is regarded as a key sustainable technology for this transition. Since 97% of the Earth's water resources are seawater, developing a hydrogen economy based on seawater can avoid placing additional pressure on freshwater resources. However, the ionic composition of seawater causes electrode corrosion and degradation, making the development of highly active and stable electrode materials a critical priority. High-entropy alloys typically contain five or more elements and possess high mixing entropy. This high entropy stabilizes single-phase solid-solution structures, resulting in high strength and excellent resistance to seawater corrosion. In addition, the cocktail effect enables tunable catalytic activity for hydrogen production. NARI's first powerful tool, plasma-sputtered high-entropy alloy technology, employs high-energy plasma ions to bombard the target, sputtering atoms onto the electrode substrate to form a coating. The elemental composition is precisely controlled through target power and position. The low-temperature process prevents compositional deviations caused by element evaporation and suppresses segregation and coarse-grain formation, making it a highly effective approach for manufacturing hydrogen-production electrodes. NARI's second powerful tool, the machine learning interatomic potential (MLIP), is an AI-based computational model that establishes energy and force relationships between atoms. It is primarily used to replace traditional quantum-mechanical calculations and to rapidly predict the physical and chemical properties of materials or molecular systems, making it particularly suitable for high-entropy alloy electrocatalysts for hydrogen production.

NARI has signed multiple technology transfer agreements, integrating plasma sputtering with AI to demonstrate strong cross-disciplinary R&D capabilities. For the plasma-sputtered electrocatalysts, alkaline water electrolysis achieved a current density of 450 mA/cm^2 at an operating voltage of 1.9 V, with an energy efficiency exceeding 65% (LHV). Compared with the literature, the system exhibits excellent output performance and operational stability in the high-current-density region. Potentiodynamic polarization tests using saline to simulate seawater show that the corrosion current is significantly lower than that of 304 stainless steel, while the polarization resistance increases by more than an order of magnitude. These results indicate that, even without an external anti-corrosion coating, a stable protective layer forms and effectively suppresses electrochemical dissolution reactions. In the MLIP domain, NARI employs AI-driven training methods to assist electrode development, substantially reducing reliance on high-cost quantum calculations while improving the efficiency and reliability of material predictions. Related patents have been filed. Beyond hydrogen production electrodes, the technology can be applied to surface-reaction fields such as chemical vapor deposition and etching processes. It is expected to shorten R&D cycles, reduce experimental costs, and accelerate the industrialization of energy materials and advanced processing technologies, demonstrating strong industrial application potential.



AI predicted HEA compositions　Plasma deposition　Long-lasting seawater electrodes

Innovative Circular Biorefinery：Lignin Extraction Technology of Wood and Bamboo

In light of global net-zero carbon and industrial decarbonization trends, developing biorefinery technologies that use biomass to replace fossil resources for chemicals and low-carbon materials has become a critical strategy for reducing carbon emissions. Aromatic chemicals are key precursors for fuels and high-value products, while current production processes are heavily dependent on fossil resources, resulting in high carbon intensity and supply vulnerabilities. Biomass, primarily comprising cellulose, hemicellulose, and lignin, serves as a core foundation for biorefinery technologies. Lignin is the only abundant natural aromatic biopolymer, with a global stock of approximately 300 billion tons, representing a promising source of aromatic chemicals. However, currently less than 1% of lignin is recovered and converted into high-value products, with the residual part mainly landfilled or used as low-grade fuel, highlighting substantial gaps in resource utilization and value-added applications. Taiwan has abundant agricultural residues and domestic wood/bamboo resources. Establishing a high-efficiency lignin biorefinery platform can significantly enhance biomass utilization, expand aromatic chemical supply, and reduce reliance on fossil feedstocks and carbon emissions. An integrated biorefinery value chain can also be built by linking feedstock and product streams, achieving biomass valorization and circular utilization, thereby enhancing practical carbon reduction and realizing the net-zero vision.

This year, the National Atomic Research Institute (NARI) successfully developed key lignin extraction technologies with industrial potential. By leveraging domestic bamboo feedstock, a green-solvent-based process was established, producing lignin with purity up to 98%, in line with standards of international commercial lignin (95–98%). Kilogram-scale extraction equipment was constructed and successfully tested, establishing a country's first prototype mass-production process that addresses upstream raw material shortages while enhancing domestic lignin production capacity and technological expertise. The resulting high-purity lignin demonstrates strong potential for high-value applications, including sunscreens, flame retardants, and carbon fiber, elevating the economic value of agricultural and forestry residues. By integrating NARI's existing biorefinery platform, both cellulose and lignin can be fully utilized, paving the way for innovative, circular bio-based applications and realizing a vision of green, zero-waste, environmentally sustainable biorefinery.

Domestic wood/bamboo feedstock | Lignin sample | Potential product applications | Kilogram-scale lignin extraction system

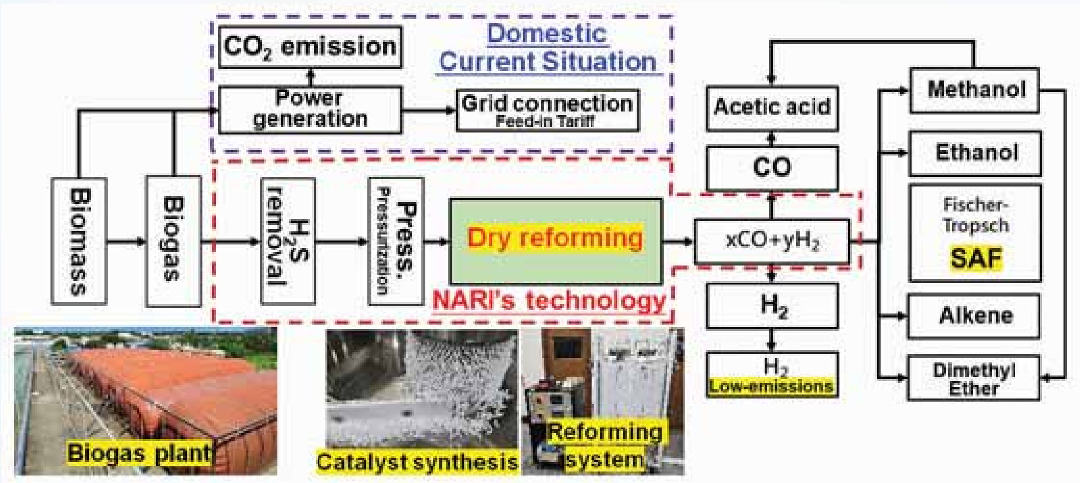
Exploration of High-Value Applications of Biogas：Greenhouse Gas Reforming and Conversion Technologies

The National Atomic Research Institute (NARI) focuses on the "high-value utilization of biogas" by integrating biogas upgrading with greenhouse gas (CH_4/CO_2) reforming technologies. Traditionally, biogas has been primarily used for power generation or direct combustion. In this approach, dry reforming is directly applied to convert CH_4 and CO_2 from emission sources into syngas (H_2/CO), which serves as a key feedstock for green hydrogen production, methanol synthesis, synthetic fuels, and other high-value chemicals. The main research focuses include:

- **Catalyst design:** Development of catalysts with high resistance to coking and sintering.
- **Reactor and thermal integration:** Optimization to reduce energy consumption.
- **Field validation:** Evaluation of carbon reduction benefits and commercialization feasibility, along with the establishment of a scalable demonstration platform to accelerate domestic circular carbon utilization of biogas resources.

A research team has successfully developed a domestically integrated technology for the high-value utilization of biogas and greenhouse gas reforming. The approach converts methane (Ch_4) and carbon dioxide (CO_2) into syngas (H_2/CO), a key feedstock for green hydrogen, synthetic fuels, and high-value chemicals. By designing highly stable, coke-resistant catalysts and optimizing reaction and separation processes, the technology overcomes the limitations of conventional biogas use, which is often restricted to combustion or power generation with lower efficiency and higher emissions.

This technology can be widely applied in sectors such as livestock farming and wastewater treatment plants. Taking a domestic biogas facility with a daily production of 4,000 m^3 as an example, it can achieve an annual carbon reduction of up to 2,000 tons, equivalent to the carbon sequestration effect of planting approximately 100,000 trees.



Framework for biogas conversion via greenhouse gas reforming

Assessment Techniques for the Impact of Power Plant Valve Leakage on Power Generation Losses

The climate change has driven a global trend toward net-zero emissions, prompting countries around the world to strive for more environmentally friendly power generation structures. The AI wave has further increased the demand for electricity, necessitating a greater focus on both power generation capacity and efficiency in the power industry. However, the solutions are nothing more than increasing supply and reducing consumption. Increasing supply means finding new power generation methods and structures, while reducing consumption means improving existing power generation facilities to increase efficiency and reduce energy losses.

Power plants have a large number of valves, and valve leakage can cause considerable efficiency losses. The "Assessment Techniques for the Impact of Power Plant Valve Leakage on Power Generation Losses" developed by NARI combines power plant operation information, Grashof empirical formulas, and the thermal performance analysis software PEPSE to calculate valve leakage flow and further estimate the power generation loss caused by this leakage flow. Power plants can then make valve improvements to reduce energy consumption during power generation. The overall assessment process is shown in Figure 1.

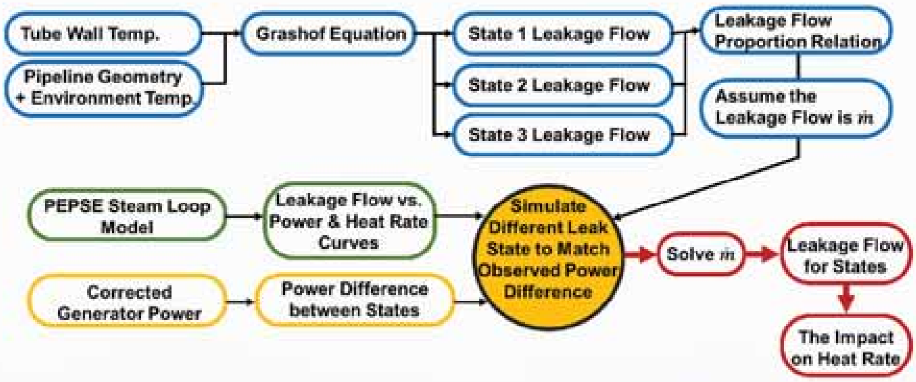


Fig. 1. Valve leakage flow analysis overall assessment flowchart

Item	Baseline Test Pre-Test 1 & 2*	Acceptance Test Post-Test 0		Acceptance Test Post-Test 1 & 2*
	FWH6	FWH6	FWH7	FWH6
Estimated Leakage Flow (kg/s)	12.11	25.07	40.13	42.79
Impact on Power (kW)	-1,355	-2,806	-5,948	-4,790
Impact on Heat Rate (kJ/kWh)	+16.0	+33.1	+70.0	+56.6

Table 1 Emergency drain valve leakage flow rate and its impact on power and heat rate

The Hoping Power Plant consists of two coal-fired units with each installed capacity of 660 MW. It is currently an important power source for North-East Power Grids of Taiwan and has been in commercial operation for over 20 years since 2002. In 2021 and 2023, the low-pressure turbines of Unit 2 and Unit 1 were replaced respectively, with the aim of improving power generation efficiency. During the testing conducted for the Unit 1 low-pressure turbine replacement project, significant leakage was found in the emergency drain valves of feedwater heaters No. 6 and No. 7 (FWH6 and FWH7) . This technology was then used for evaluation.

The evaluation results are shown in Table 1. In the baseline test (performance tests conducted before turbine replacement), the leakage of FWH6 reduced power generation by 1,355 kW. In the acceptance test (performance tests conducted after turbine replacement), the leakage of FWH6 and FWH7 caused a power generation loss of 2,806 to 5,948 kW. From the perspective of heat rate (the amount of fuel heat energy consumed per unit of power generation), this represents an increase in the fuel consumption required for power generation. The findings of this study were provided as a reference for Hoping, which quickly took action to reduce efficiency losses.

Grid Guardian: A Risk-Informed Identification Tool for Power Grid Nodes

The "Guardian" of the Grid ? Why Risk Assessment is Essential

Imagine Taiwan's power system as a massive spider web, connecting everything from major utility facilities to the streetlights. However, this web is not indestructible. Severe natural disasters, such as typhoons or earthquakes, may knock out entire power plants or substations, triggering large-scale blackouts. To safeguard power grid stability, our tool applies Probabilistic Risk Assessment (PRA) to perform a systematic risk assessment of the power grid (i.e., a health check). By identifying critical "nodes" where failure may induce cascading impacts, we can strengthen protections in advance. This enhances "grid resilience," improving the system's ability to restore power supply following disruptive events. Pinpointing these vulnerabilities supports stable power supply continuity.

The Risk-Informed Identification Tool for Grid Diagnostics

This tool performs grid "stress tests" using the formula: Risk = Hazard x Vulnerability x Exposure. Hazard integrates the frequency of Taiwan's 26 faults. Vulnerability represents the probability of equipment failure at power plants and substations during seismic events. Exposure represents the associated loss of load (MW) resulting from node failure. By combining these, the tool identifies high-risk nodes requiring priority protection. Our Visualized Operation Platform enables simulation of earthquake scenarios, predicting potential grid islanding scenarios. Its automatic ranking feature identifies critical nodes and impact zones, providing technical support for grid diagnostics and mitigation planning.

Seismic hazard risk analysis (Schematic Results)

Visualized exposure analysis and islanding distribution

From Operational Experience to Risk Early Warning

By applying PRA technology, a risk quantification analysis tool has been developed that identifies nodes with high failure frequencies and significant load-loss consequences. By comparing grid configurations during day and night peaks, the assessment results align with real-world operational experience.

The tool enables ranking of the risk and importance of grid nodes across Taiwan, pinpointing critical plants and substations. We can then analyze specific risk sources and develop concrete mitigation strategies to fundamentally optimize power planning. This supports resilience enhancement and blackout risk reduction.

Regional Distribution Feeder Dynamic Protection Analysis and Equipment Inspection Technology

In alignment with the government's policy goals to increase renewable energy deployment and promote net-zero emissions, the large-scale integration of renewable energy into the power grid has led to structural changes in the electricity supply systems. In 2012, the Executive Yuan approved the Smart Grid Master Plan. NARI is one of the members of the Smart Grid Promotion Task Force. In response to the rolling review revised by the Executive Yuan in February 2020, the R&D team has focused on the grid management domain to develop a regional distribution network management system, assisting Taiwan Power Company in enhancing feeder dispatch operations and renewable energy management capabilities. When a power system with multiple distributed energy resources experiences a fault, the source of fault current is no longer limited to a single feeder source as in traditional systems; instead, fault current may be contributed from multiple locations. This significantly increases the complexity of protection coordination design. Therefore, fault current calculation and protection coordination analysis technologies for distribution systems have been developed to manage the impact of renewable energy intermittency on grid operation and dispatch, thereby strengthening grid resilience and performance.

NARI has developed a dynamic protection analysis technology for distribution feeders, featuring flexible simulation of short-circuit fault currents from regional grid energy storage systems. The system can dynamically adjust protection device settings to account for the impact of short-circuit fault currents under grid-connected and islanded operation of energy storage systems on protection coordination. In addition, it integrates feeder protection device parameters and provides feeder protection coordination analysis and automatic protection curve tuning functions. By incorporating actual feeder operational data, distributed energy resources, and energy storage system architectures and parameters into a Geographic Information System (GIS), a comprehensive decision-making platform has been established. This platform assists power companies in calculating fault currents after feeder load transfer and in analyzing whether the coordination time intervals among protection devices along the feeder comply with applicable standards. Furthermore, a distribution equipment inspection system has also been developed to detect and analyze nine types of abnormal conditions in distribution protection equipment, thereby supporting power companies in performing inspection and maintenance operations more effectively.

Short-circuit fault currents from energy storage system and grid-connected/islanded mode analysis

Distribution protection equipment inspection system interface

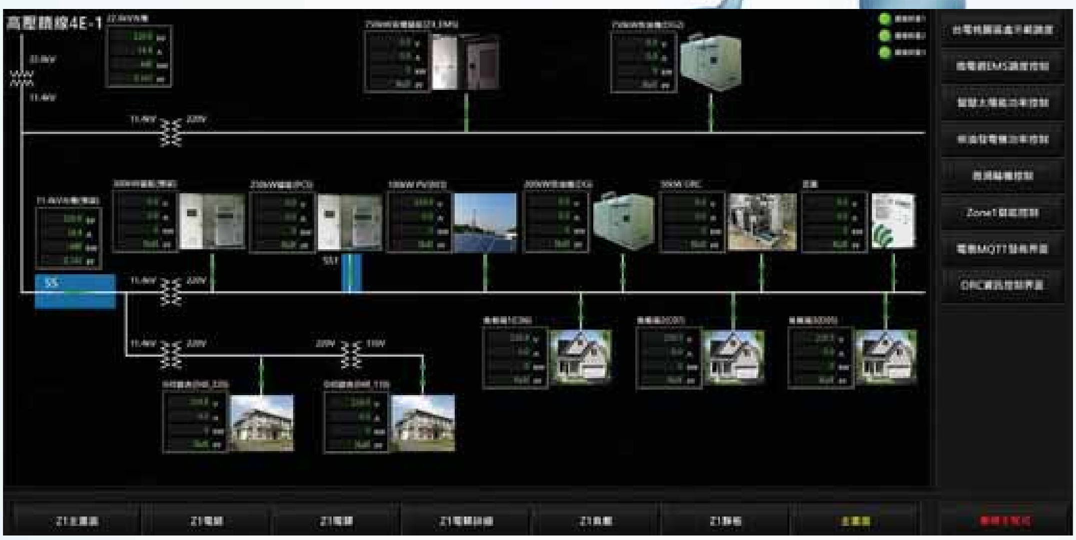
Grid-Tied and Power Control Technologies for Heat-to-Power Conversion Modules

The surge in renewable energy has introduced greater grid instability, necessitating Integrated Energy Systems (IES) capable of fast adjustment. Our project leverages heat-power integration and smart control to bolster microgrid resilience and load-following performance. To bridge the gap in domestic long-term validation facilities, we have built a physical thermal-electric and high-voltage microgrid integration platform. We develop scalable dispatching technologies to accelerate industrial energy transition and fulfill low-carbon requirements.

We developed an Integrated Energy System validated on an 11.4 kV microgrid, achieving the following:

- High Dispatchability: Achieves a 5 %/min ramp rate, supporting 24-hour islanded operation and ensuring stable facility power supply.
- Industrial Application: Provides direct low-carbon heat supply for chemical, plastic, and dyeing sectors while optimizing heat-to-power efficiency.
- Strategic Impact: Offers scalable regional solutions for science parks and critical infrastructure, accelerating progress toward 2050 Net-Zero goals.

Heat-to-power conversion modules



IES management platform

MEMO

Date . .

Highlights and Collaborative Promotion:Major Honors

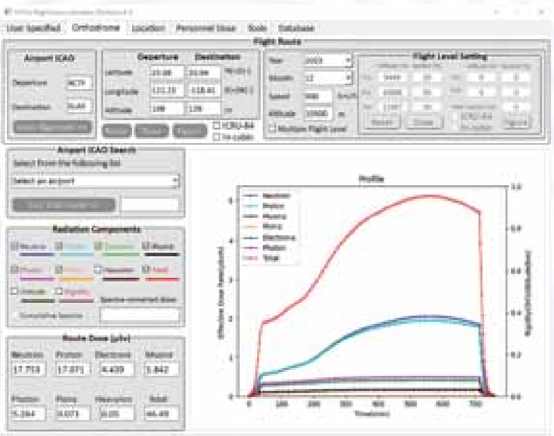
Nuclear Safety and Nuclear Backend

The Only Flight Dose Assessment Technology in Taiwan

International organizations like ICRP and the EU are increasingly focusing on the dose impact of cosmic rays on aircrews and issuing relevant management recommendations. However, a detailed investigation is challenging due to the complex particle types and the extremely wide energy range. Quantification using detectors is insufficient; accurate results require detailed calculations. NARI has developed an assessment program called Flight Dose Calculator (FDC), which comprehensively analyzes the characteristics of radiation doses along flight routes. The program is flexible, allowing for highly customized feature development.

NARI has established the only flight dose assessment technology in Taiwan. The developed program has shown consistent results with ICRU and EURADOS reports. It was invited by the EURADOS to participate in the latest international intercomparison of flight radiation dose assessment programs (first time for Taiwan). The program has been adopted by the NSC as the designated tool for the policy promoted in 2025. Dr. Yang from NARI also serves as the leader for relevant NSC's projects, guiding airlines in using the program to assess the doses of their aircrews, which contributes to establishing Taiwan's aircrew dose management system.

In line with the NSC's policy, the program will continue to be provided to domestic airlines for aircrew dose assessment after 2026. The program can also be applied to high-altitude electronic component radiation-hardened research, which is aligning with future technological development trends.

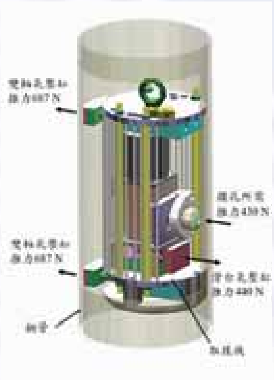


Flight dose calculator

Award ceremony

Development of Sampling and Underwater Cutting Technologies to Strengthen Decommissioning Capabilities

After 15 years of operation, Taiwan Research Reactor (TRR) was permanently shut down in 1988. To uphold intergenerational justice and ensure radiological and environmental safety, National Atomic Research Institute (NARI) has been dedicated to TRR decommissioning. As the first of the three similar reactors worldwide to be dismantled, TRR demolition lacks prior reference. The project faces immense challenges from the high radiation dose rate of internal components caused by neutron activation and confined workspaces that preclude the utilization of standard commercial equipment.



Sampling equipment and central experimental tube sampling

Underwater cutting of high-dose-rate components

To uphold ALARA (As Low As Reasonably Achievable) radiation protection principles, NARI has focused its R&D capacity on critical decommissioning technologies. For radiological characterization, the team developed compact, modular, and cost-effective tools, which were successfully used to sample central and horizontal experimental tubes. For reactor dismantling, an integrated underwater platform has been developed for dismantling high-dose-rate components, using water as radiation shielding. This platform features specialized underwater circular and band saws with advanced clamping, positioning, and rotating functions.

Through technical innovation, NARI has successfully overcome the challenges of high-radiation environments and completed the dismantling of the upper biological shield and the highly irradiated upper thermal shield. This R&D effort yielded seven invention patents for underwater dismantling and cutting devices, alongside multiple SCI journal and international conference papers, and accomplished Taiwan's first underwater mechanical cutting for high-dose-rate components. This success ensured the radiological safety of TRR decommissioning. Furthermore, the sampling expertise was promoted to Taiwan Power Company (TPC) for the bidding "RPV Neutron Activation Analysis Verification Project". NARI continues to apply this expertise to domestic nuclear plant decommissioning and bolster the autonomous technical capacity of Taiwan's nuclear back-end industry.

Nuclear Medicine and Radiation Applications for Public Welfare

Multivalent Lactoside Technology Applied to Liver Function Imaging Agent: NARI Receives the 2025 R&D 100 Award

Supported by the Nuclear Safety Commission, NARI has successfully developed the innovative Ga-68 Dolacga and received the R&D 100 Award in 2025, demonstrating Taiwan's advancement in radiopharmaceutical development. Ga-68 Dolacga, featuring a multivalent lactoside structure, is a PET imaging agent that enables quantitative visualization of liver function. By specifically targeting hepatic asialoglycoprotein receptors (ASGPRs), it allows accurate assessment of the spatial distribution of liver function.


Presented to
National Atomic Research Institute (NARI)
for the development of
Dolacga Empowers Every Liver Function Decision
Selected as
One of the 100 Most Technologically Significant New Products of the Year in Analytical/Test
2025 R&D 100 AWARDS Winner

Ga-68 Dolacga represents a significant milestone in nuclear medicine as the first radiopharmaceutical to receive the R&D 100 Award. It is the world's first peptidomimetic glycopeptide tracer designed for quantitative evaluation of functional liver mass through high-specificity targeting of ASGPRs, overcoming key limitations of conventional diagnostic approaches.

Although tracers such as Tc-99m GSA developed in Japan also target ASGPRs, they are limited by relatively high non-specific background signals and batch-to-batch structural variability. In contrast, the synthetic peptide-based structure of Dolacga enables highly precise targeting of ASGPRs on hepatocytes (approximately 100%), while maintaining low immunogenicity and delivering stable, high-resolution 3D PET imaging. In addition, Dolacga is formulated as a lyophilized kit with good stability and portability, and is fully compatible with generator-produced Ga-68. These features significantly enhance operational flexibility and facilitate broader clinical implementation.

Dolacga-The World's First Peptide: Based Quantitative Liver Function Imaging Agent

2025 Health and Welfare Professional Award

Dr. Mei-Hui Wang, Researcher at the Department of Isotope Applications Research, National Atomic Research Institute (NARI), developed Ga-68 Dolacga, the world's first peptide-based liver function imaging agent. This innovation enables precise delineation of liver tumors and quantitative assessment of liver function, representing a significant advancement in hepatic diagnostics. In recognition of her contributions, she was awarded the 3rd Class Health and Welfare Professional Medal in accordance with the relevant regulations.

衛生福利專業獎章證書

茲以國家原子能科技研究院同位素應用研究所研究員王美惠，開發全球首創胜肽型肝功能造影劑，為精準判定肝癌範圍與定量肝功能的創新突破，優於傳統檢驗，具有貢獻，依衛生福利部專業獎章頒給辦法規定，特頒給三等衛生福利專業獎章。

此證

部長 邱泰源

中華民國 114 年 7 月

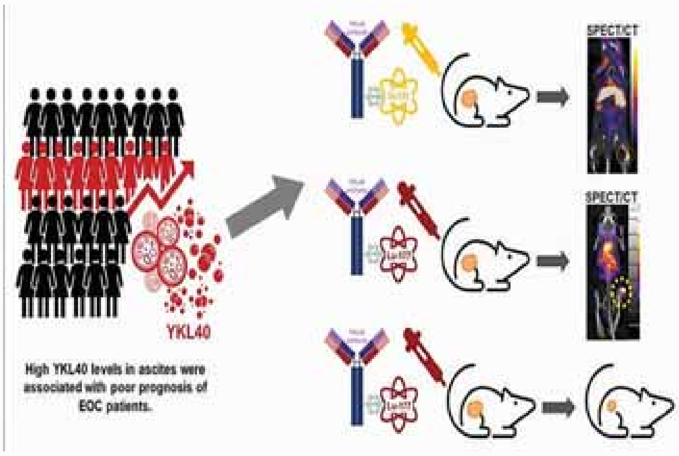
Researcher Dr. Wang has dedicated over 15 years to liver receptor imaging research. Through systematic investigation of the pathological variations of the Asialoglycoprotein Receptor (ASGPR) on liver cell membranes, she established an intravenous imaging approach on hepatocyte membranes, Ga-68 Dolacga. Ga-68 Dolacga is the first peptide-based radiopharmaceutical targeting hepatic ASGPR, enabling accurate and non-invasive quantification of both global and regional liver function. The technology incorporates a multivalent lactoside design to achieve high-specificity binding to ASGPR, supporting precise functional evaluation required for clinical decision-making. The innovation is supported by a comprehensive global patent portfolio and has completed Phase I/II clinical trials, with Phase III trials in the pipeline. This work has received multiple national and international recognitions, including the 2025 R&D 100 Award and the Gold Medal of the National Award for Excellence in Pharmaceutical Technology, demonstrating Taiwan's innovation capability in radiopharmaceutical development. In addition, Dr. Wang was awarded the 3rd Class Health and Welfare Professional Medal in recognition of her long-term contributions to radiopharmaceutical research.

Anti–Chitinase-3-Like Protein 1 (YKL-40) Neutralizing Antibody and Its Applications

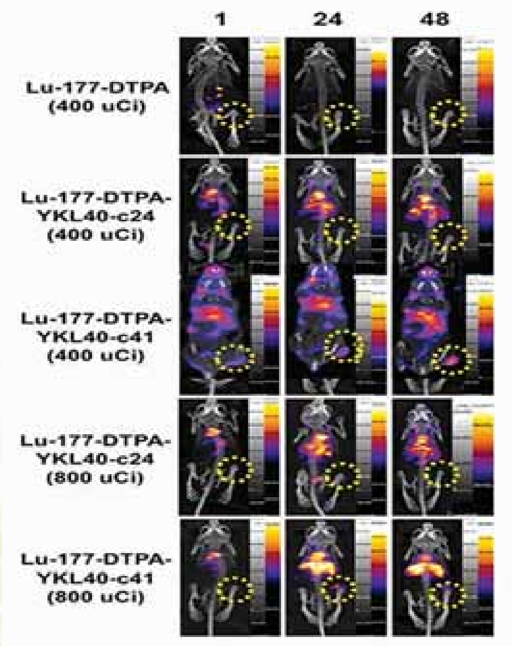
We, innovators
22nd 國家新創獎
National Innovation Award

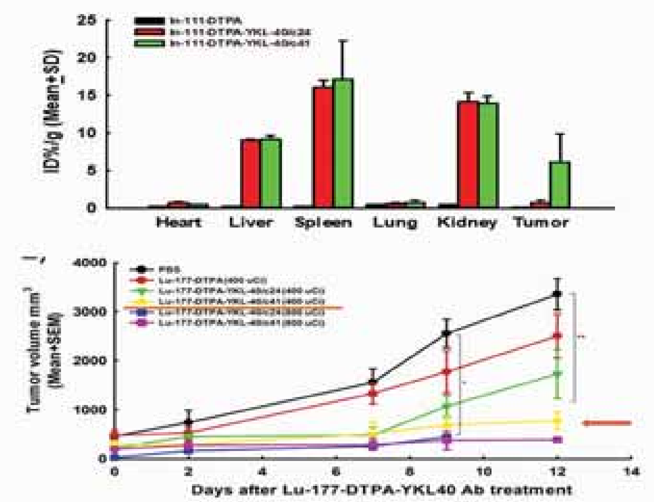
Ovarian cancer is the most lethal malignancies in women, with most patients diagnosed at advanced stages due to subtle early symptoms. Chitinase-3-like protein 1 (YKL-40, CHI3L1), highly expressed in ovarian cancer, is resulting in poor prognosis and high recurrence rates. A patented YKL-40 – specific neutralizing antibody was successfully developed with indium-111 (In-111) and lutetium-177 (Lu-177). The radiolabeled antibody exhibited high radiochemical purity, favorable in vivo stability, and demonstrated specific tumor accumulation with clear imaging in animal models. Treatment studies demonstrated effective tumor growth inhibition without significant toxicity, highlighting strong clinical translation potential.

This study successfully developed a patented YKL-40 neutralizing antibody and established targeted diagnostic and therapeutic drugs using the In-111 and Lu-177. The radiolabeled antibody possesses high radiopurity and excellent in vivo stability. The tumor volume significantly decreased by 47% – 61% after 17 days of treatment. Biodistribution study showed the drug mainly concentrated in tumor lesions and organs such as the spleen, kidneys, and liver. These results demonstrate that this YKL-40 targeted radioimmunotherapy can effectively inhibit tumor growth, showcasing excellent clinical application potential.



This work was conducted in collaboration with NTUH to develop a YKL-40 levels in ascites correlate with tumor grade, recurrence, drug resistance, and patient survival, indicating its potential as diagnostic and prognostic biomarker, as well as a therapeutic target. Integrating antibody engineering and molecular imaging, this work represents Taiwan's first radiotheranostic antibody for ovarian cancer and may contribute to the advancement of precision medicine.

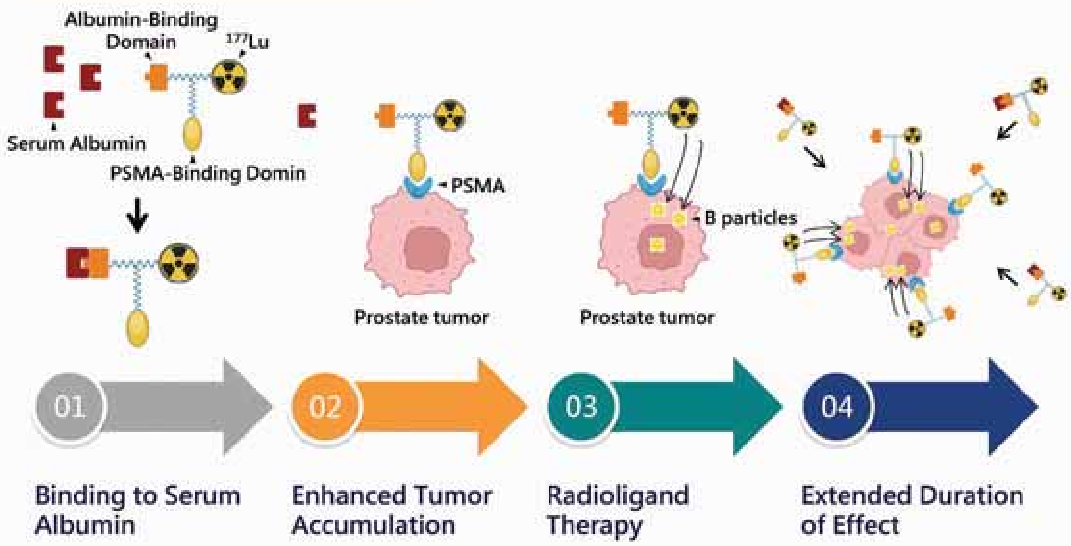




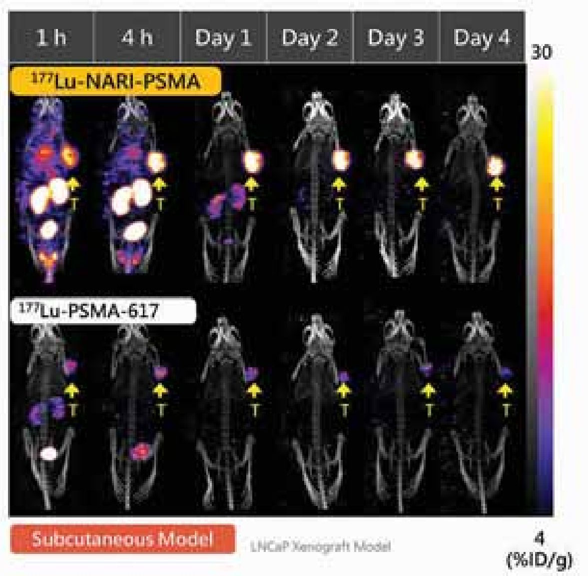
A Novel Long-acting PSMA-targeted Radiopharmaceutical for Prostate Cancer Therapy

^{177}Lu-NARI-PSMA, developed by the National Atomic Research Institute (NARI), is a long-acting radiopharmaceutical for the treatment of prostate cancer. Through a novel molecular design enabling reversible binding to serum albumin, the agent prolongs systemic circulation time and enhances tumor uptake. These characteristics contribute to improved therapeutic performance under conditions of reduced administered radioactivity and fewer dosing cycles.

Mechanism of Action



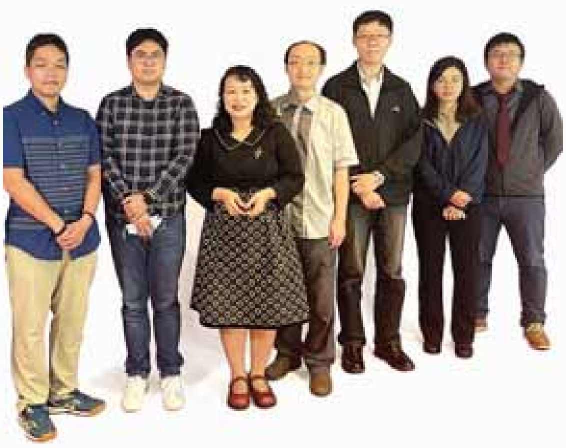
In single-dose treatments, ^{177}Lu-NARI-PSMA achieved a 90% survival rate at 90 days in tumor-bearing animal models—three times higher than that of the benchmark drugs. ^{177}Lu-NARI-PSMA was honored with the 21st National Innovation Award, and subsequently received the 22nd National Innovation Award - Excelsior Award in 2025. NARI is on track to complete all GLP safety trials and preparation of the Investigational New Drug (IND) application by the end of 2026.



^{177}Lu-NARI-PSMA is being developed to address three key clinical objectives : (1) reducing the required administered radioactivity, (2) optimizing dosing frequency, and (3) extending treatment intervals. These advancements have the potential to reduce overall treatment burden, potentially lowering the financial barrier for patients and improving accessibility to targeted radiopharmaceutical therapy for prostate cancer.

Quantitative Assessment of Residual Liver Function and Novel Liver Receptor Imaging Agent

Following the recognition of the National Innovation Award in 2013, NARI has advanced Ga-68 Dolacga from preclinical development to clinical trials, completing 87 human imaging studies. This liver Asialoglycoprotein Receptor (ASGPR) targeted tracer enables precise assessment of hepatocellular carcinoma (HCC) distribution and supports quantitative evaluation of regional liver function, addressing limitations associated with conventional imaging approaches. Manufacturing processes have been optimized to extend the product shelf life to up to two years. Clinical applications have also been progressively expanded to multiple liver cancer treatment cohorts, including hepatectomy, proton therapy, and ablative therapies.



國家新創獎
NATIONAL INNOVATION AWARD

This is to certify the completion of the National Innovation Award renewal and issue the Excelsior Award in recognition of continuing innovations and advancements in R&D to the project indicated below.

Project: Quantification method for remaining liver function and novel liver receptor imaging agent

Institute: National Atomic Research Institute

Research Center for ... and Medicine Policy

Chairperson Ging-Ping Wang

Dec. 31, 2025

Ga-68 Dolacga imaging has been to assess residual liver function in proton therapy patients. By delineating regions of reduced functional reserve, this approach supports function-guided treatment planning, enabling preferential irradiation of lower-functioning liver regions while sparing functional parenchyma and overall hepatic function. This application is currently being extended to radiofrequency ablation clinical cohort.

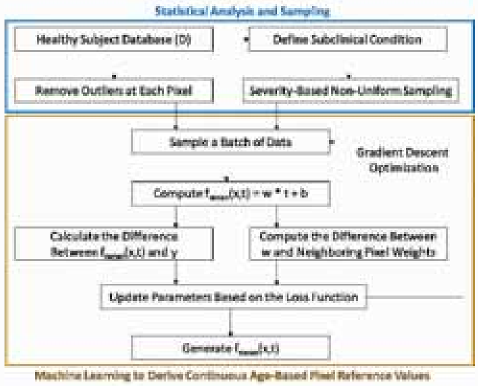
Brain-Function Image Data Augmentation Method

tie 鉑金獎 2025

As global populations continue to age, dementia and other neurodegenerative diseases have become critical public health challenges. Nuclear medicine cerebral blood flow imaging is capable of revealing functional abnormalities prior to the onset of structural changes, demonstrating strong potential for early detection. However, the development of clinical AI models has long been constrained by the limited availability of healthy subject data and inconsistencies in data standards. These challenges hinder the establishment of reliable normative references and compromise model stability as well as cross-institutional generalizability.

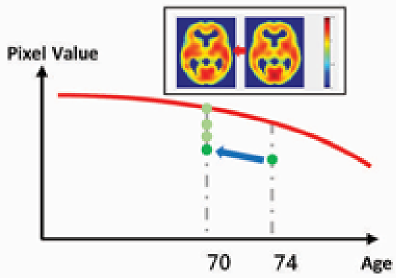
To address these limitations, our institute has developed a "Brain Function Image Data Augmentation Method." This technology overcomes the traditional dependence on large-scale healthy datasets by introducing a physiologically grounded image generation mechanism. It enables the construction of an age-adaptive digital normative framework that can estimate normal brain function patterns across different age groups, serving as a standardized reference for brain imaging analysis. Positioned at the data preparation stage prior to clinical AI model development, this method establishes a robust and scalable foundation for intelligent brain function imaging applications.

This method is grounded in known image expectation values and incorporates pixel-level ratio analysis together with a linear back-projection mechanism, enhanced by machine learning techniques to model physiologically plausible image variations across different age groups. It enables the generation of interpretable brain function data and supports the establishment of age-spanning degeneration benchmarks, even under conditions of limited healthy subject data. As a result, it significantly reduces the cost of database construction while improving the stability of AI model training. The technology has been granted invention patents in both Taiwan and the United States, and was awarded the Platinum Prize at the TIE Invention Competition, highlighting our institute's strong R&D capability and international competitiveness in foundational medical imaging AI technologies.



Workflow of the brain function image data augmentation method

The technology has been successfully implemented in a precision imaging platform for neurodegenerative diseases, where it serves as a core module supporting the establishment of brain function degeneration benchmarks, AI-based disease classification, and analytical software development. Through collaborative validation with hospitals and academic institutions, the system has demonstrated stable performance under limited data conditions and has received strong clinical recognition. Furthermore, the framework can be extended to other age-related brain function imaging applications, offering significant potential for interdisciplinary collaboration and international deployment.



Example of age-based image estimation

This technology enhances the consistency and efficiency of clinical image analysis, reduces data construction costs, and facilitates deeper collaboration among medical institutions, academia, and research organizations. It establishes a solid foundation for the long-term development of smart healthcare applications.

Looking ahead, we will further refine the digital normative framework and strengthen platform integration capabilities to expand its deployment in clinical settings. By incorporating AI-based predictive models, the system will support more advanced disease subtyping and risk assessment, ultimately advancing the global development of intelligent brain function imaging analysis.

Patent certificate and 2025 tie platinum award

R&D Team for Eye Lens Dose Radiation Protection Technology

In response to ICRP Publication 118, the occupational dose limit for the lens of the eye has been significantly reduced—100 mSv over five years (with no more than 50 mSv in any single year), NARI established a dedicated R&D team to systematically advance national capabilities in eye lens dose protection and support regulatory alignment with international standards.

NARI established a national calibration system for the eye lens dose equivalent (Hp(3)) compliant with ISO 4037 and ISO 8529. The team completed a comprehensive calibration system for X-rays and Gamma rays (^{137}Cs), ensuring measurement consistency and reliability. Furthermore, the team conducted Taiwan's first proficiency test for eye lens dosimetry, in which all seven participating laboratories (10 dosimeter sets) successfully met the required performance criteria, demonstrating the readiness of domestic measurement capabilities.

Since 2021, the team has surveyed over 2,000 personnel across 22 medical centers, 3 nuclear plants, and 2 industrial firms. The data identified interventional radiology staff as the highest-risk group, providing essential evidence for the NSC's management policies. To bridge regulatory gaps, the team provided an evidence base for regulatory risk classification and management strategies. The team further developed draft guidelines specifying the conditions for monitoring and standardized wearing positions of eye lens dosimeters.

The team held 124 workshops and 12 hospital seminars to address medical staff's concerns regarding the comfort and complexity of wearing dosimeters. By using evidence-based data, they successfully integrated radiation safety into clinical practice. Training programs, Q&A manuals, and educational materials were also developed to support sustained knowledge transfer and operational adoption.

NARI award winners' group photo


Radiation Emergency Response and Preparedness Team Receives the 13th Atomic Energy Safety Excellence Award for Teams

The Radiation Emergency Response and Preparedness Team of the National Atomic Research Institute (NARI) is dedicated to advancing research and practical applications in radiation disaster prevention and emergency response, with the aim of establishing a national radiation emergency response framework. The team integrates radiation monitoring, dose assessment, atmospheric dispersion modeling, and aerial radiological surveying to support preparedness, emergency response, and post-event monitoring and assessment. In recent years, in addition to continuously enhancing the nuclear accident emergency dose assessment system and nationwide environmental radiation monitoring applications, the team has participated in annual nuclear safety drills, strengthening coordination mechanisms between central and local authorities. Through interagency collaboration, the team has further improved Taiwan's early warning and decision-support capabilities for both domestic and overseas nuclear incidents, thereby contributing to the resilience of Taiwan's radiation emergency response system.

The team was honored with the 13th Atomic Energy Safety Excellence Award. Key technical developments include: (1) the innovative introduction of virtual reality – based source search and high-dose scenario simulation training, which enhances immersive learning effectiveness while eliminating radiation exposure risk; (2) the establishment of a professional unmanned aerial vehicle (UAV) team and the development of an integrated land, sea, and air radiological monitoring information system, successfully applied in annual nuclear safety exercises to demonstrate real-time radiation mapping and dose data integration capabilities; and (3) the in-house upgrade of Taiwan's aerial radiation spectrometry system, and establishing independent operation and modular upgrade capacity. In addition, our team operates and maintains both domestic and international nuclear accident emergency dose assessment systems. During the Taishan Nuclear Power Plant incident, atmospheric dispersion simulations and risk assessments were conducted to support decision-making by the competent authority.

To integrate artificial intelligence, automated monitoring, and smart emergency management approaches, promote relevant technologies to local governments and agencies, and strengthen international collaboration to support the continued development of Taiwan's radiation emergency response capabilities.

New Energy and Cross-Field System Integration

Flue Gas Carbon Dioxide Capture, Conversion, and Utilization Technology

NARI has long focused on developing flue gas CO_2 capture and conversion technologies based on carbonation mechanisms. This system directly treats industrial flue gas under ambient conditions without extra CO_2 purification, hydrogen, or catalysts, reducing energy use and system complexity. By modularly integrating CO_2 capture, carbonation, and carbonate/bicarbonate production, it achieves high industrial applicability and offers a practical solution for direct carbon reduction and resource recovery from flue gas.

Group photo of the R&D team at the award ceremony

Pilot-Scale carbon capture and conversion system

This technology was awarded the 22nd National Innovation Award. Its pilot system uses a continuous gas-liquid-solid three-phase reactor enhanced with microbubbles, significantly improving mass transfer and achieving high CO_2 capture and stable conversion in continuous operation. The system can produce sodium, potassium, and calcium carbonates and bicarbonates, demonstrating both carbon reduction and resource recovery benefits. It has been validated in a sugar plant, reaching TRL 7, showing potential for industrial adoption and commercial development.

This achievement delivers both carbon reduction and industrial feasibility, providing an immediately adoptable decarbonization solution. By turning CO_2 into marketable carbonate and bicarbonate products, it cuts emissions while creating economic value, helping industries lower carbon costs and earn carbon credits. It provides a concrete technological pathway for the net-zero transition, laying the foundation to achieve the 2050 net-zero emission target.

MEMO

Date . .

Highlights and Collaborative Promotion: Domestic and International Collaboration

Nuclear Medicine and Radiation Applications for Public Welfare

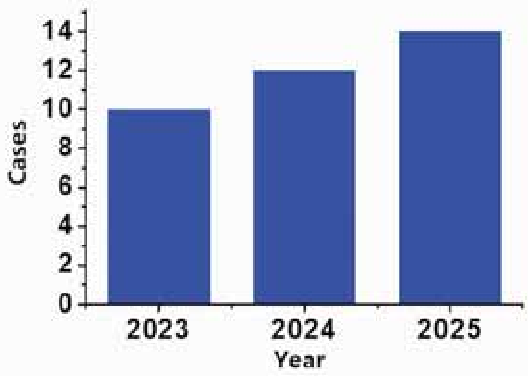
Clinical Applications of Radiopharmaceuticals and AI Imaging Platforms

On April 25, 2025, the National Atomic Research Institute and Chung Shan Medical University Hospital have signed a memorandum of understanding to initiate a collaboration to advance clinical applications of radiopharmaceuticals and AI imaging. The partnership focuses on I-123 MIBG research for neurodegenerative diseases and AI-enabled image analysis with the objective of enhancing the clinical translation of research and development outcomes into patient care.

This collaboration integrates research and clinical practice to strengthen the pathway from radiopharmaceutical development to clinical application. AI imaging platforms enhance diagnostic precision and efficiency, expanding applications in neurodegenerative and major diseases. The partnership supports the advancement of medical technologies, contributes to the development of Taiwan's smart healthcare and nuclear medicine.

MOU Signing Ceremony

Sustained Supply of I-123 MIBG



The collaboration involves clinical studies using I-123 MIBG and 99mTc-MIBI to establish diagnostic workflows for patients with diabetes and neurodegenerative comorbidities, improving accuracy in distinguishing vascular from sympathetic nerve dysfunction. Continuous supply of radiopharmaceuticals supports stable trial execution, facilitates sustained research– clinical collaboration, and lays the foundation for expanding neurodegenerative disease diagnostics.

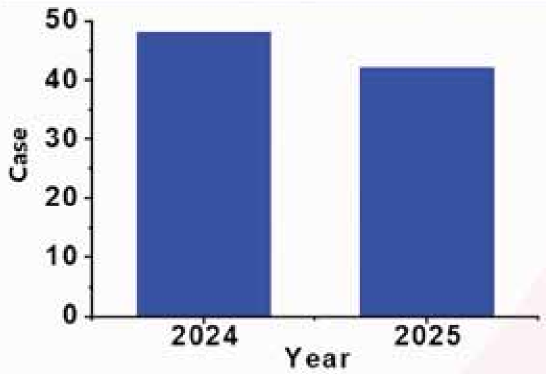
Clinical Applications of Radiopharmaceuticals and Intelligent Medical Imaging Platforms

On September 12, 2025, the National Atomic Research Institute and Show Chwan Healthcare System signed a Memorandum of Understanding to collaborate on clinical applications of radiopharmaceuticals and intelligent imaging platforms. This collaboration integrates NARI's expertise with Show Chwan's clinical and validation capabilities to advance innovative trials, expand the application of I-123 MIBG in neurodegenerative disease imaging, and implement intelligent image analysis to enhance nuclear medicine precision and efficiency.

The partnership integrates research and clinical resources to facilitate the translation of radiopharmaceuticals, enhancing Taiwan's precision nuclear medicine capabilities. Leveraging intelligent imaging improves diagnostic consistency and workflow efficiency. With the planned 70 MeV cyclotron, the collaboration strengthens radiopharmaceutical supply and new drug development, contributing to the advancement in nuclear precision medicine and smart healthcare.

MOU Signing Ceremony

Sustained Supply of I-123 MIBG



This collaboration applies I-123 MIBG imaging and artificial intelligence–based analysis to study diabetes-related cardiovascular and neurological complications. Clinical studies have examined the associations between autonomic dysfunction, arrhythmia, and cholesterol, while AI-assisted approaches improve the objectivity and efficiency of image quantification. Radiopharmaceutical supply supported study implementation and ensured stable research progress. Overall, it contributes to improving early detection of diabetes-related complications and support the integration of radiopharmaceuticals with intelligent imaging to improve clinical decision-making and patient care.

Next-Generation Molecularly Targeted Nuclear Medicine

To strengthen the integration of radiopharmaceutical development and clinical application in Taiwan, the National Atomic Research Institute (NARI) and Taipei Veterans General Hospital have signed a memorandum of understanding (MOU) on next-generation precision nuclear medicine and jointly established the nation's first Precision Nuclear Medicine Innovation Ward. By linking isotope and radiopharmaceutical R&D with clinical trials and medical practice, this partnership aims to accelerate clinical translation. This collaboration integrates isotope and radiopharmaceutical R&D capabilities with clinical research and healthcare services enhance drug supply resilience, promote innovation in imaging and theranostics, and strengthen Taiwan's capabilities in precision nuclear medicine.

This collaboration focuses on establishing a cross-institutional platform integrating research and clinical practice in precision nuclear medicine, supported by a new Innovation Ward. Key efforts include clinical evaluation of novel radiopharmaceuticals, development of AI-assisted imaging technologies, quantitative imaging methods, and integration of multicenter clinical and imaging data. By linking R&D with methodologies, the partnership facilitates the clinical adoption of emerging technologies, strengthen clinical evidence, enhance quality and efficiency of nuclear medicine services through the application of smart healthcare systems.

The establishment of this collaborative platform will accelerate the translation of domestic nuclear medicine radiopharmaceuticals from research to clinical practice, enhance the efficiency of validating new drugs and technologies, and create a scalable model for precision theranostics. By integrating cross-institutional data and applying AI, it will build valuable clinical and imaging resources, strengthen Taiwan's research capacity, support local production of radiopharmaceuticals, improve healthcare performance, foster related industries, and enhance Taiwan's global competitiveness in nuclear medicine.

Color-Enhanced Neutron Radiographic Imaging for Low-Atomic-Number Materials

On December 1, 2025, Dr. Tzu-Mu Kao, President of NARI, and Dr. Min-Che Tung, Chairman and Superintendent of Tungs' Taichung MetroHarbor Hospital, officially signed an MOU. This agreement strengthens their long-term partnership and focuses on advancing clinical validation for AI in precision imaging and radiopharmaceutical development. By bolstering the role of radiopharmaceuticals in smart healthcare, this collaboration establishes a robust foundation for future innovation in nuclear medicine.

Sign MOU with NARI and Tungs' Taichung MetroHarbor Hospital

NARI has long focused on the research, innovation, and application of AI in radiopharmaceuticals and medical imaging, contributing to the advancement of Taiwan's nuclear medicine sector. The partnership is expected to leverage the rich medical experience of Tungs' Hospital to accelerate the clinical application of radiopharmaceuticals and smart medical imaging, expanding access to innovative healthcare solutions.

Leveraging its clinical resources and experience in smart healthcare, the collaboration supports clinical validation in nuclear medicine and AI-assisted precision imaging. The partnership aims to accelerate new drug approvals and advance next-generation clinical support for the regulatory approval process, ultimately contributing to improved healthcare outcomes.

AI Analysis of Nuclear Imaging for Alzheimer's Screening

The National Atomic Research Institute (NARI) has developed "ECDaim," an AI-based software tool designed to assist clinicians in the interpretation of neurodegenerative brain disorders. The system utilizes Tc-99m ECD brain SPECT imaging in conjunction with a proprietary normative database to automatically highlight subtle regional blood flow anomalies, effectively enhancing diagnostic accuracy and clinical efficiency. To address challenges regarding inter-hospital data variability, NARI applies patented methodologies combined with machine learning techniques to establish age-continuous templates compatible with various imaging systems. This innovative technology has received multiple recognitions, including a Platinum Award at the 2025 Taiwan Innotech Expo (TIE).

NARI signed an MOU with Far Eastern Memorial Hospital (FEMH) on October 27, 2025, represented by Vice Presidents Jeng-Jong Wang and Chih-Hung Chang. FEMH, which hosts a Clinical AI Verification Center supported by the Ministry of Health and Welfare, provides to integrate NARI's brain imaging AI into nuclear medicine. The partnership focuses on Alzheimer's disease research and performance verification, providing an advanced AI-assisted tool to enhance clinical screening and diagnosis.

Shows the appearance of the ECDaim analysis software, which includes functions such as anomaly display and AI analysis model, and features award-winning patented technology.

Both parties will collaborate to verify AI performance for improving early dementia diagnosis accuracy. NARI will continue to promote cross-disciplinary integration and clinical collaboration to accelerate the clinical translation of smart healthcare innovations to continuously enhance AI performance and its practical value in medical applications.

Group photo of the participants from National Atomic Research Institute and Far Eastern Memorial Hospital who signed the cooperation agreement.

New Energy and Cross-Field System Integration

Establishing International Geologic Modeling and Risk Assessment Technologies for Carbon Storage

To align with global net-zero emission trends and enhance Taiwan's research capabilities in carbon sequestration, the National Atomic Research Institute (NARI) has actively promoted collaboration and exchange with top-tier international organizations. On November 25, 2025, NARI formally signed a Letter of Intent (LOI) for collaborative research and capacity building in carbon storage with the Battelle Memorial Institute. This partnership aims to leverage international technical exchanges to introduce Battelle's practical experience from the Midwest Regional Carbon Initiative (MRCI) in the United States. By doing so, NARI seeks to assist in establishing domestic geologic modeling and risk assessment capabilities for CO_2 sequestration, ensuring that the development of related verification technologies remains synchronized with the experiences of operational international cases.

A key highlight of this collaboration was the joint "CCS Risk Assessment Workshop," led by Dr. Neeraj Gupta, Battelle's Carbon Management Technology Lead. The professional team shared operational experiences from actual carbon sequestration sites and conducted in-depth discussions on CO_2 plume migration behavior and risk management methods. The workshop introduced practical applications of the NRAP risk assessment tool, Open-IAM, to perform quantitative risk analysis on critical factors such as CO_2 leakage probabilities in abandoned wells, caprock integrity, formation pressure changes, and dynamic reservoir simulation. Through case studies and hands-on technical exchanges, NARI's R&D team gained practical expertise in comprehensive risk management, providing a vital reference for the safety assessment and leakage risk management of potential offshore carbon sequestration sites in Taiwan.

Through the signing of this LOI and the technical workshop, NARI has progressively established risk assessment workflows and verification capabilities for carbon sequestration, strengthening third-party independent verification technologies for wellbore integrity, caprock sealing, and pressure evolution. Overall, this initiative has not only enhanced the practical experience of researchers but also accelerated the cultivation of professional talent. By transforming international expertise into a cornerstone for Taiwan's net-zero transition, NARI continues to advance the nation's sustainable energy policy goals.

Carbon Dioxide Capture and Circular Carbonation Utilization Technology from Flue Gas

In recent years, the NARI has continuously invested in the research and development of net-zero technologies. The core technology of this project, Flue Gas CO_2 Circular Carbonation Utilization Technology, captures carbon dioxide from industrial flue gas and directly converts it into stable carbonate and bicarbonate products. This technology transforms waste CO_2 into valuable chemical feedstocks, supporting national decarbonization and net-zero goals while demonstrating the industrial application of research outcomes.

On December 16, 2025, the NARI, Taiwan Sugar Corporation, and Nice Group signed an MOU to jointly advance Carbon Dioxide Capture and Circular Carbonation Utilization Technology from Flue Gas, selecting Huwei Sugar Factory as the demonstration site. The project converts CO_2 from biomass cogeneration flue gas into valuable carbonate and bicarbonate feedstocks for consumer cleaning products, integrating NARI's R&D and patents, Taiwan Sugar's flue gas resources, and Nice's market expertise, demonstrating concrete cross-sector carbon reduction efforts.

Photo of attendees at the tripartite MOU signing ceremony

Green circular technology for biofuel carbon capture and utilization

The key value of this collaboration is the establishment of a complete green value chain from technology development and field demonstration to commercialization. Through an integrated mechanism of validation, productization, business modeling, and industry diffusion, the project bridges decarbonization technologies to the market and creates a scalable, replicable net-zero transition model.

MEMO

Date . .

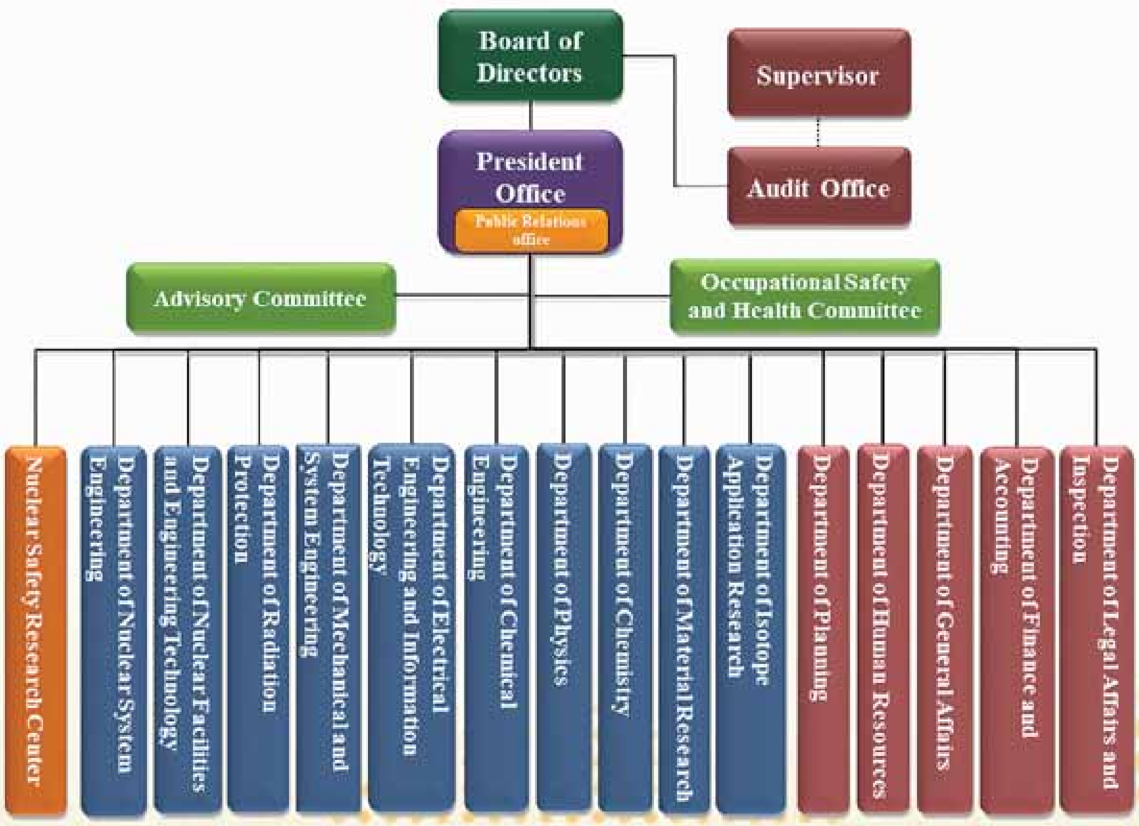
Current Operations and Management

Board of Directors and Supervisors

(Date: May 28, 2026)

Board Chair	Shin Chang
Director	Cheng-Wei Yu, Yao-Win Peter Hong, Li-ping Wu, Chih-Kang Chiang, Deng-Yuan Lu, Bei-Lei Huang, Susan Shur-Fen Gau, Jong-Shinn Wu, Faa-Jeng Lin, Szu-Li Chang, Hwen-Fen Hong, Chieh-Liang Wu
Executive Supervisor	Jia-Hang Li
Supervisor	Yun-Ying He, Hung-Yu Chuang

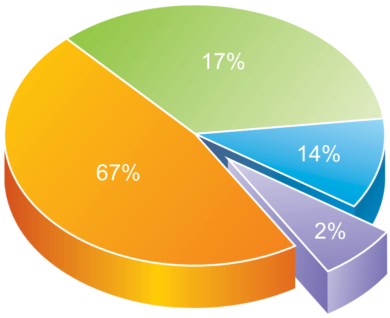
Organizational Chart



Human Resources

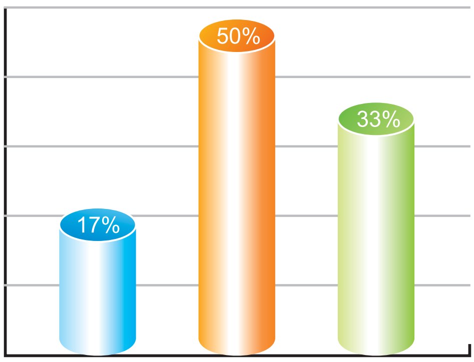
(Dec. 2025)

Number of Employees: 891 ／ Average Age: 46 years



Research Staffs	594 Persons	(67%)
Technicians	151 Persons	(17%)
Administrative Staffs	125 Persons	(14%)
Other Staffs	21 Persons	(2%)
Official Staffs	**891 Persons**	

Statistics of Educational Background



Ph.D.	152 Persons	(17%)
Master	445 Persons	(50%)
Bachelor's degree or below	294 Persons	(33%)

Financial Statements

Income and Operating Statement (Unit: NT)

Item	2025	2024
Income		
Business Revenue	2,725,387,270	2,768,372,888
Non-operating Income	20,491,246	8,204,340
Total Revenue	2,745,878,516	2,776,577,228
Expenses		
Business Costs and Expenses	2,533,911,724	2,508,877,403
Non-operating Expenses	5,408,431	0
Total Expenses	2,539,320,155	2,508,877,403
Net Income (Loss) before Taxes	206,558,361	267,699,825
Income Tax Expense (Benefit)	41,196,944	53,539,965
Net Income (Loss) for the Period	165,361,417	214,159,860

Balance Sheet (Unit: NT)

Item	2025	2024
Assets		
Current Assets	961,712,146	1,033,031,734
Property, Plant, and Equipment (PP&E)	813,191,981	941,148,207
Investment, Long-term receivables, and Advances.	2,400,000	0
Intangible Assets	163,467,028	176,556,814
Other Assets	1,188,444,914	479,694,862
Total Assets	3,129,216,069	2,630,431,617
Liabilities		
Current Liabilities	567,725,870	721,807,834
Other Liabilities	2,061,338,128	1,610,120,875
Total Liabilities	2,629,063,998	2,331,928,709
Net Worth		
Reserves	80,934,970	44,647,224
Accumulated Surplus	419,217,101	253,855,684
Total Net Worth	500,152,071	298,502,908
Total Liabilities and Equity	3,129,216,069	2,630,431,617

2025 highlighted events

2025.1.20 Haig S. Bagerdjian, Chairman of Global Medical Solutions, led his teams to visit NARI and held discussions on potential technical collaboration.

2025.4.19-20 The "Infinite Technology Knowledge of Nuclear Safety" event, organised by NSC and NARI at the National Taiwan Science Education Center in Taipei, drew an audience of 8,000.

2025.4.25 Dr. Ming-Che Tsai, Superintendent of Chung Shan Medical University Hospital, delivered a speech and signed a Memorandum of Understanding (MOU) on "Clinical Applications of Radiopharmaceuticals and AI Imaging Platforms" at NARI. This collaboration integrates research and clinical practice to advance radiopharmaceuticals from development to patient care. Dr. Pan-Fu Kao, Director of Chung Shan Medical University Hospital, accompanied Dr. Tsai during the visit to NARI's facilities.

2025.5.28 Wu Cheng-Wen, Minister without Portfolio and Minister of Science and Technology of Executive Yuan led a delegation from the National Science and Technology Council (NSTC), accompanied by Faa-Jeng Lin, Deputy Minister (Political); Ming-Chih Lai, Director of the Department of Natural Sciences and Sustainable Development; Yao-Wen Peter Hong, Director of the Department of Engineering and Technologies; Wei-Chen Chiu, Deputy Executive Secretary of the Office of Science and Technology; and Chi-Kang Kung, Deputy Director of the Department of Science Education Development and International Cooperation.

2025.6.2 The 75th Meeting of the Taoyuan Regional Network Center Management Committee was attended by 46 representatives from member institutions and schools in the Taoyuan region, including 37 participants in person and 9 participants online.

2025.6.27 The "Industry – Academia Joint Investment and Matchmaking Conference", jointly organised by NARI and the Department of Economic Development, Taoyuan City Government, highlighted innovative technologies and industry chain cooperation. The event attracted 15 prominent enterprises, hospitals, and academic institutions, including Delta Energy Co., Ltd.

2025.7.3 On July 3, the Asia-Pacific Interactive Seminar on the Current Status of Nuclear Medicine was hosted by the Show Chwan Health Care System and co-organised by NARI. On July 4, Dr. Wen-Sheng Huang, Medical Director of Chang Bing Show Chwan Memorial Hospital, led a delegation of 24 representatives attending the seminar to visit NARI. The delegation included nuclear medicine leaders and scholars from across the Asia-Pacific region, such as Peter Lin, Department Head of Liverpool Hospital (Australia); Benjapa Khiewvan, Chairman of Thai Board of Nuclear Medicine Committee(Thailand); Nadiah Abdul Razak, Nuclear Medicine Specialist at Kuala Lumpur Hospital (Malaysia); Ryan Yudistiro, Department of Nuclear Medicine, Mochtar Riady Comprehensive Cancer Centre Siloam Hospital (Indonesia); and Nguyen Chi Tam, Senior Nuclear Medicine Radiographer & Radiation safetyofficer at FV Hospital (Vietnam).The visit focused on radiopharmaceutical research and development as well as opportunities for international collaboration.

2025.8.7 A delegation from the British Office Taipei (BOT), led by Jessica Henry, Head of the Economics Section, and Shyam Desai, Head of the Economic Cooperation and Development Section, visited NARI with 5 other distinguished representatives to exchange views and further strengthen Taiwan – UK cooperation in energy technology.

2025.8.20 Representatives from the Canadian Trade Office in Taipei (CTOT), including Lesley-Ann Reed, Director of Trade and Investment & Senior Trade Commissioner ; Jordan Turley, Deputy Director of Trade and Investment; and Vanessa Chen, Senior Trade Commissioner, visited NARI to exchange views on science and technology cooperation. The visit further enhanced Taiwan – Canada exchanges in science and technology.

2025.8.22 A Historic Milestone in Scientific Research. In 2025, NARI once again earned international recognition for its innovative pharmaceutical technology, reaching new heights in Taiwan's biomedical industry. With a 63-year history, the R&D 100 Awards has rarely honoured pharmaceutical innovations—globally, only three such products had received the award through 2024. NARI's achievement underscores the pioneering role and highlights the significance of bringing Taiwan's nuclear medicine research to the global stage.

2025.8.25 A delegation from the French Office in Taipei, including Director, Franck Paris; Pauline Ravinet, Head of Science and Research Division Jonathan Drubay, Advisor for Innovation and Advanced Technologies; and Jean-Christophe Bonté, representative of CEA office in Taiwan, visited NARI to exchange views on nuclear technology and research innovation.

2025.9.12 NARI and the Show Chwan Health Care System signed a MOU to jointly promote the "Clinical Applications of Radiopharmaceuticals and Intelligent Medical Imaging Platforms." The partnership integrates research and clinical resources to accelerate the development and translation of radiopharma ceuticals, enhancing Taiwan's precision nuclear medicine capabilities.

2025.9.23 A delegation from the Belgian Office in Taipei (BOT), including Matthieu Branders, Director; Cédric Schampers, Deputy Director; Pauline Vancompernollev; Doris Wu, Trade & Investment Representative of the Flanders Investment and Trade (FIT); Philippe Tzou, Trade & Investment Commissioner of the Wallonia Export-Investment Agency (AWEX); and Florian Vanlangendonck, Technical Operations Leader of Ion Beam Applications S.A. (IBA), visited NARI to discuss and explore opportunities for multinational cooperation.

2025.9.25 Marking a new milestone in its journey of excellence and innovation, NARI celebrated its second anniversary, bringing together distinguished guests and staff to reflect on the Institute's remarkable growth and transformation.

2025.10.18 At the 2025 Taiwan Innotech Expo, NARI earned 13 awards, comprising one Platinum Medal, four Gold Medals, three Silver Medals, and five Bronze Medals.

2025.10.27 "ECDaim", a professional AI software designed to assist clinicians in diagnosing neurodegenerative diseases, was developed by NARI. Far Eastern Memorial Hospital will collaborate with NARI to verify the AI performance and improve the accuracy of early dementia diagnosis.

2025.11.13 A delegation from the Swedish Trade & Invest Council, led by Helena Reitberger, Representative, visited NARI to explore opportunities for collaboration in energy innovation.

2025.11.18-19 NARI, serving as the Nuclear Technology Applications session at the 35th Taiwan – Japan Modern Engineering and Technology Symposium, convened leading experts from Taiwan and Japan to engage in in-depth discussions on forward-looking topics in nuclear science. Key themes included "the Current Status and Future Plans of Small Modular Reactor (SMR) Research and Development in Japan" and "The Establishment of Target Technology for Proton Accelerator-Based Neutron Sources", highlighting the latest advancements in small modular reactor (SMR) development as well as cutting-edge neutron source and target technologies.

The session featured distinguished speakers from Japan, including Mr. Koike Daisuke of IHI Corporation, Dr. Morimoto Yasuomi of JGC Corporation, and Dr. Haga Katsuhiro of the J-PARC Center, JAEA. The invited experts shared the latest research progress, and practical industrial applications, fostering deeper bilateral exchange and strengthening Taiwan – Japan collaboration in advanced nuclear technologies.

2025.11.19 NARI and Taipei Veterans General Hospital jointly signed a MOU on "Next-Gen Molecular Targeted Nuclear Medicine", and jointly established "the nation's first Precision Nuclear Medicine Innovation Ward", this partnership aims to accelerate clinical translation, enhance drug supply resilience, promote innovation in imaging and theranostics, and strengthen Taiwan's competitiveness and future development in precision nuclear medicine.

2025.11.20 "Dolacga – Empowering Every Liver Function Decision" from NARI received the prestigious R&D 100 Award in 2025 and was invited to attend the official award ceremony, standing out among entries from 13 countries and regions, evaluated by 54 independent experts in a highly rigorous competition. Leveraging its world-leading nuclear medicine R&D capabilities, NARI distinguished itself globally— marking the first time a nuclear medicine radiopharmaceutical has received this honour.

2025.12.01 NARI and Tungs' Taichung MetroHarbor Hospital signed a MOU to collaborate on advancing the "Clinical Validation of AI in the Development of Precision Imaging-based Diagnostic Radiopharmaceutical." This corporation will enhance the capabilities and competitiveness of radiopharmaceuticals in smart healthcare and lay a solid foundation for future collaboration.

2025.12.16 NARI, Taiwan Sugar Corporation, and Nice Enterprise Co., Ltd. signed a tripartite Memorandum of Understanding (MOU) to jointly advance "Carbon Dioxide Capture and Circular Carbonation Utilization Technology from Flue Gas" .The project converts CO_2 from biomass cogeneration flue gas into valuable carbonate and bicarbonate feedstocks for consumer cleaning products.

2025.12.17 The 22nd National Innovation Award , NARI received a total of four honours, including two "Academic Research Category awards" in the fields of carbon capture, precision medicine and two "Excelsior Award" in nuclear medicine diagnostics.

2025.12.22 The 13th Atomic Energy Safety Excellence Award, NARI received a total of four honors, including two Team Awards and two Individual Awards.

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National Atomic Research Institute

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