



Nuclear Safety Commission

2023 ANNUAL REPORT





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The Nuclear Safety Commission's Vision

The Nuclear Safety Commission (NSC), in alignment with the Organization Reform for the Executive Yuan, has reintegrated the operating model of the nuclear regulation authority. On September 27, 2023, the Atomic Energy Council, Executive Yuan (AEC) was reorganized as a third-level independent agency directly under the Executive Yuan, renamed the NSC. The Fuel Cycle and Materials Administration, previously under the AEC, was merged into the NSC, while the Radiation Monitoring Center was reorganized as a fourth-level subordinate agency. The Institute of Nuclear Energy Research, which was also under the AEC, was restructured following the setup and experience of major international nuclear technology research institutions. It transitioned from a governmental agency to a non-departmental public body under the supervision of the NSC, renamed the National Atomic Research Institute (NARI). This reorganization aims to enhance the flexibility of organizational operations and improve the efficiency of promoting public affairs.

Following the organizational reform, the NSC inherits all the responsibilities previously held by the AEC, a second-level agency. The NSC establishes a commission composed of experts, scholars, and relevant agency personnel to independently exercise authority by law using a collegial system. The primary duties include safety regulations for the operation and decommissioning of domestic nuclear reactor facilities, workplace radiation safety regulations, regulations on the treatment and storage of radioactive materials and safety management of facilities, emergency response and preparedness for nuclear incidents and radiological disasters, and environmental radiation monitoring.

Additionally, the NSC will promote the development of civilian applications of nuclear technology, talent cultivation, and international cooperation. The NSC will also oversee the NARI's deepening of the atomic energy technology R&D and applications. This includes providing continued technical support to the NSC in safety regulation and carrying out public affairs related to atomic energy expertise and its extended technologies, thereby assisting the government in policy implementation and enhancing the efficiency of industrial development.

As the nuclear safety regulatory authority of our nation, the NSC will continue to strengthen its efforts to implement the following four key policy objectives, including “Enhancing Atomic Energy Safety Regulations to Ensure Public Safety”, “Promoting Innovation in Atomic Energy Technology and Cultivating Cross-Disciplinary Talent”, “Establishing Critical Nuclear Technologies to Accelerate Industrial Value Addition”, and “Developing energy and back-end technologies to promote industrial applications”.

The NSC will also build upon its existing foundation to further advance expertise in nuclear, radiation, and radioactive materials safety regulation, actively participate in international exchanges and align with global standards, promote the knowledge transfer and talent cultivation, and ensure transparency in information sharing. These efforts aim to safeguard public health and protect the environment while responding effectively to changes in socio-economic conditions and needs of policy developments.

NUCLEAR SAFETY COMMISSION



02 I The Nuclear Safety Commission's Vision

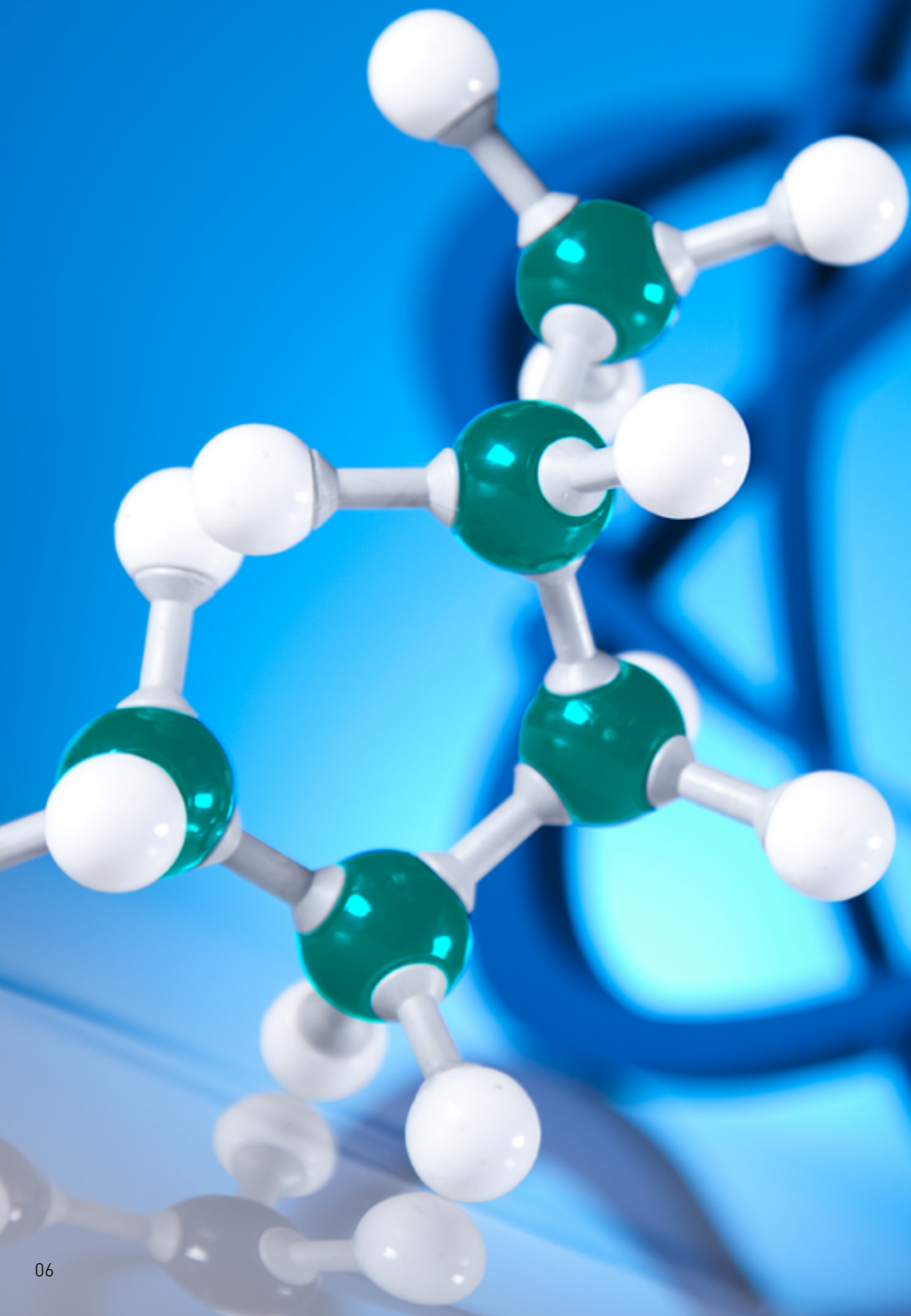
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Organization Structure

A. Organization Reform to Strengthen the Regulatory Independence

● The NSC was officially established on September 27

In response to the government's organizational reform, the Executive Yuan referenced and compared the organizational designs and development trends of international nuclear safety regulators. Following consultations and analyses with relevant domestic agencies, the operational model of the nuclear safety regulatory body was adjusted. The "AEC" was restructured as an independent agency directly under the Executive Yuan, becoming the "NSC", a third-level agency. The original Fuel Cycle and Materials Administration (FCMA) was incorporated into the NSC, and the Radiation Monitoring Center was reclassified as a fourth-level subordinate agency under the NSC. The Institute of Nuclear Energy Research (INER) was restructured as a non-departmental public body, now called the "NARI", considering the establishment and operational experiences of major international institutions in nuclear energy science and technology research and development. This restructuring places NARI under the supervision of the NSC. By easing regulations on human resources, procurement, accounting, and finance, and adopting an organizational model different from the public sector, the aim is to achieve more efficient and flexible management mechanisms to enhance overall operational effectiveness.

The NSC Organization Act passed its third reading in the Legislative Yuan and was promulgated by the President on June 21, 2023. The NSC was formally established and began operations on September 27. An oath of office ceremony for the NSC's first Chairperson, Dr. Tong-Yang Chen, was held on the same day, witnessed by Premier Chien-Jen Chen of the Executive Yuan and several distinguished guests. The first Chairperson of the NSC, Dr. Tong-Yang Chen, stated that the NSC will take over the responsibilities of the former Atomic Energy Council, Executive Yuan. It will be in charge of regulating nuclear waste, nuclear safety, and radiation safety. The NSC will continue to strengthen supervision and regulatory frameworks according to international trends, enhancing control over nuclear power plant safety, radiation safety, the treatment and storage of radioactive waste, and response mechanisms for nuclear and radiological emergencies.

Dr. Chen emphasized that the establishment of the NSC is just the beginning, and many challenges lie ahead. For the sustainable development of the environment and future generations, he hopes to work together with NSC colleagues to highlight the independence, professionalism, and objectivity of the NSC. He also hopes for increased support and encouragement from all sectors in embracing this new organizational model.

● The first Commission Meeting was held on October 31

The NSC held its first Commission Meeting on October 31, 2023. During the meeting, the First-Level Unit Supervisors took an oath of office in the presence of seven Commissioners. The meeting included a business profile of the NSC, a briefing on the Legislative Yuan's approval of the NSC Organization Act and its incidental resolution, to help Commissioners understand the current operations and future challenges of the NSC. Additionally, real-time information was provided on the measures taken in response to public concerns about Japan's discharge of tritium-containing wastewater. To further implement the spirit of the collegial system of independent agencies, the meeting also discussed the procedures of future Commission Meetings, the matters that should be brought to the committee for resolution, and the regular schedule for meetings.



Unveiling Ceremony of the NSC



The Premier of the Executive Yuan issues the appointment order for the Chairperson of the Commission

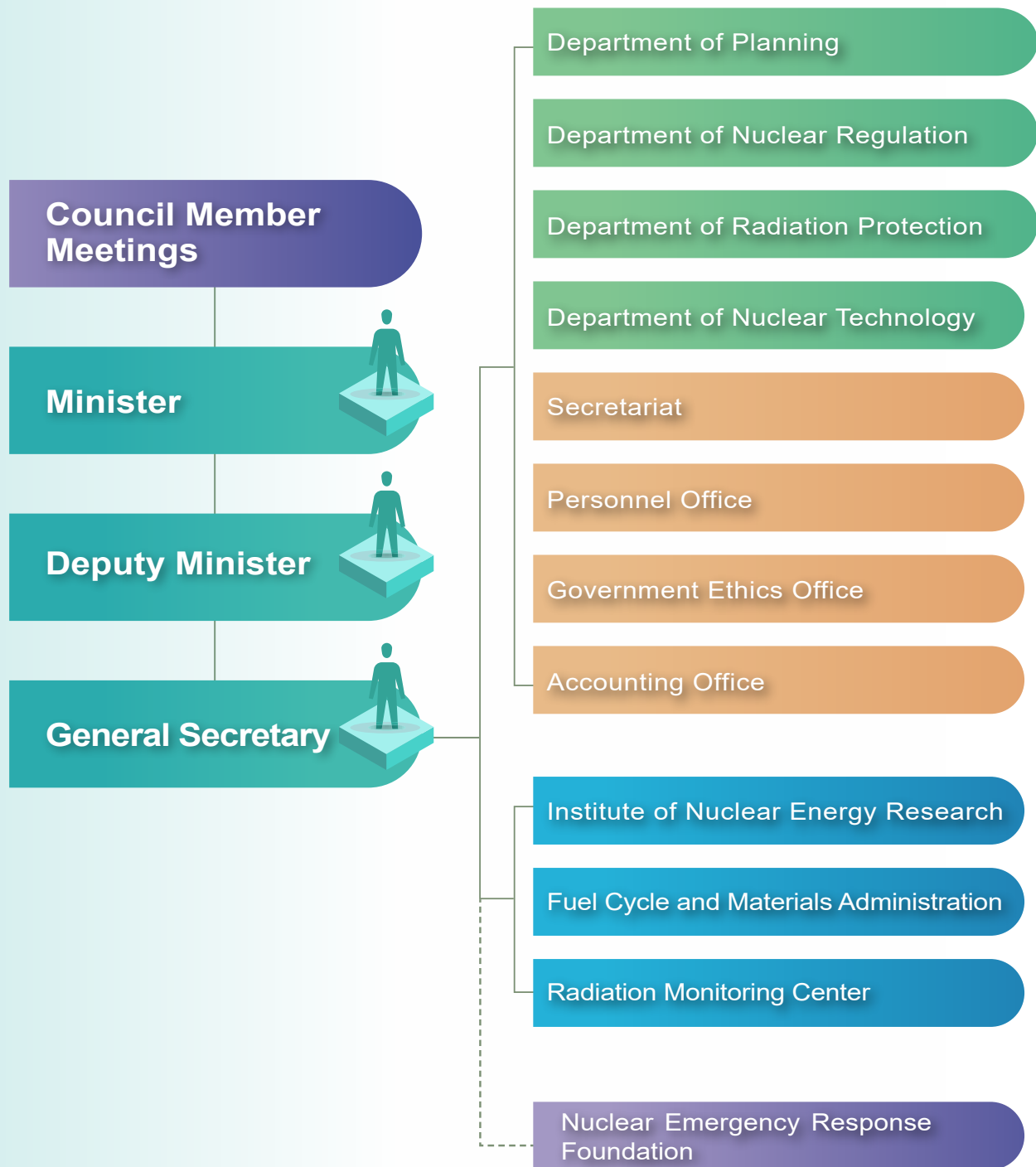


Supervisors of Various Units of the NSC Take Oath of Office

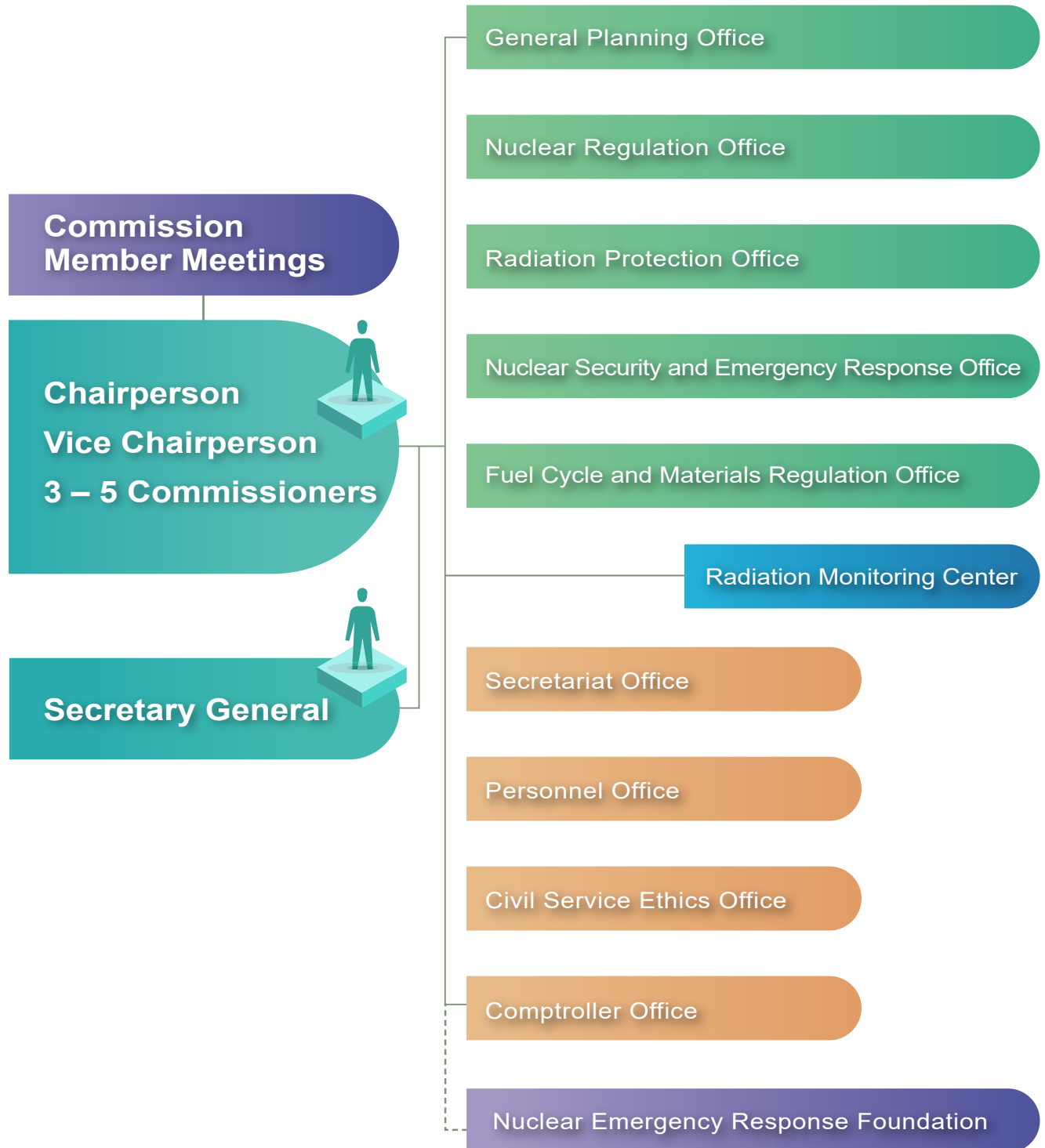


First Commission Meeting Held

B.Organizational Structure



Organizational Chart of the AEC (pre-reformed NSC)



Organizational Chart of the NSC

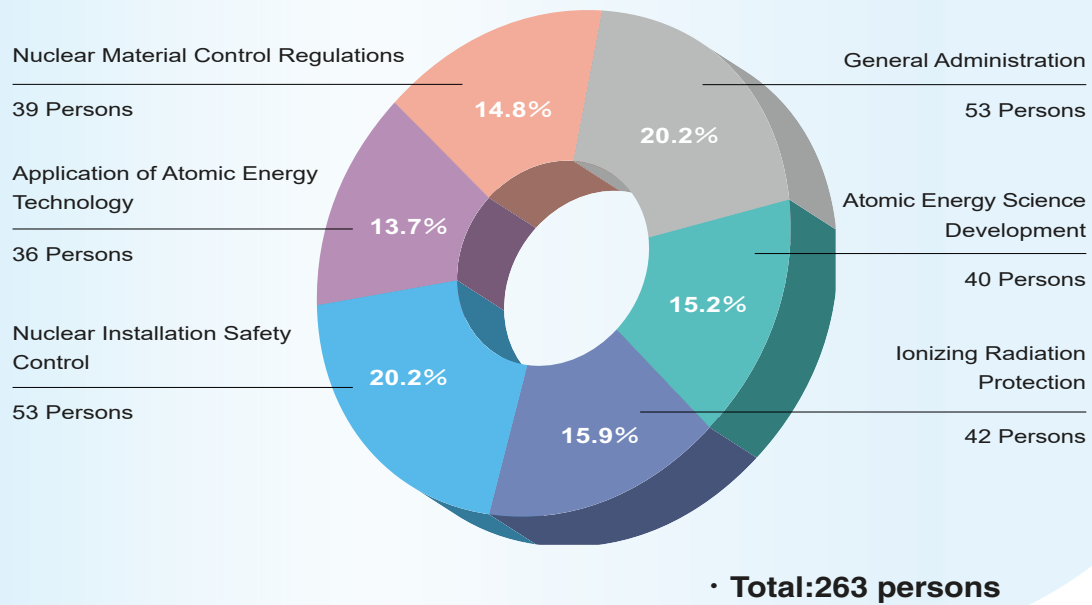




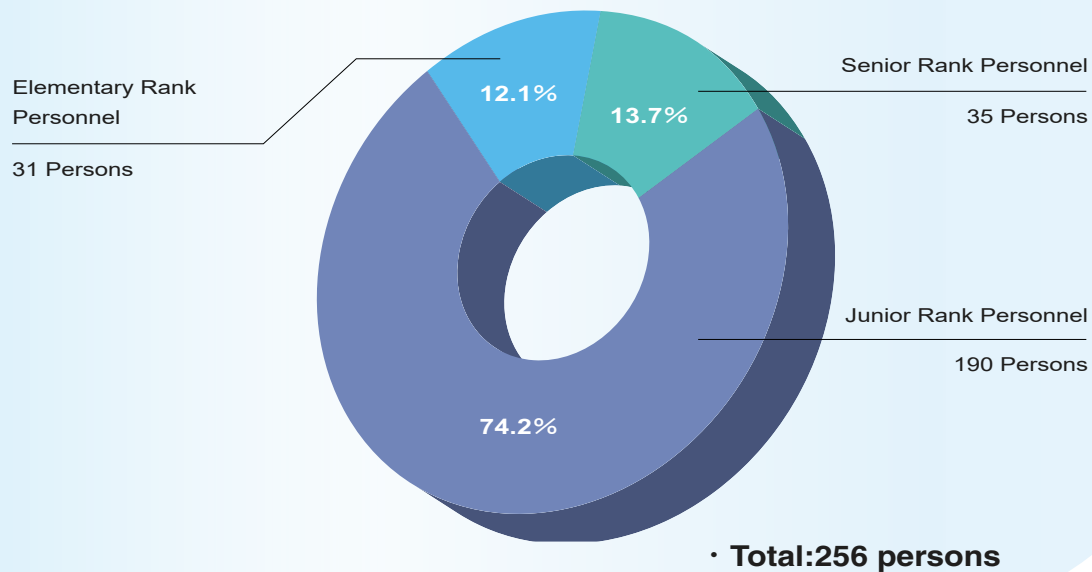
Manpower and Budget

Nuclear Safety Commission

Human Resources Breakdown for Fiscal Year 2023 (including 7 contractual employees)



Employees' Official Ranks in Fiscal Year 2023





Allocation of Budget Expenditure for Fiscal Year 2023

Nuclear Installation Safety
Control

61,593 Thousand NTD

Ionizing Radiation
Protection

52,561 Thousand NTD

Atomic Energy Science
Development

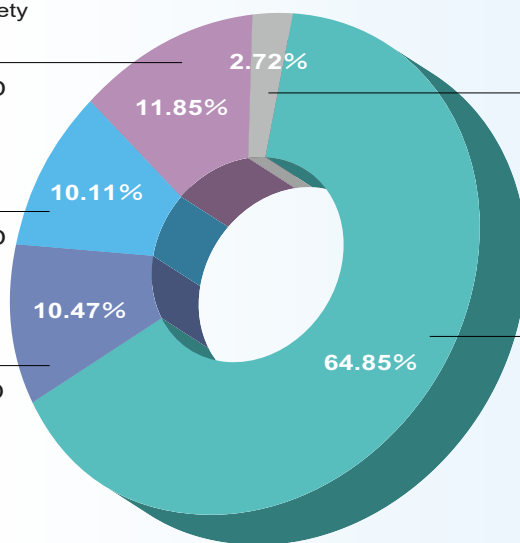
54,411 Thousand NTD

Nuclear Security and
Emergency Response

14,180 Thousand NTD

General Administration

337,123 Thousand NTD



• Total: NTD 519,868,000



The background of the slide is a dark blue triangle on the left side, containing a complex network of colorful lines (yellow, orange, red, pink, blue, green) that radiate from the bottom left corner. To the right of this triangle, the background is a solid light blue. In the center-right, there is a large, dark blue sphere with a white 'IV' inside it. The sphere has a glossy, reflective surface. The overall design is modern and tech-oriented.

IV

Key Governance Outcomes

A. Public Participation and Information Transparency

● Open to scrutiny: Enhancement of Dry Storage Safety Regulations during the Decommissioning Period through Public Participation

To ensure transparency in regulatory information, the NSC required Taiwan Power Company (TPC) to hold a public explanatory meeting in the area where the facility is located before submitting the construction license application for the low-level radioactive waste storage facility at the Chinshan Nuclear Power Plant (NPP). This meeting aimed to provide the public with an opportunity to participate in advance and offer their opinions. TPC held the public explanatory meeting on December 29, 2022, at New Taipei City Municipal Shimen Experimental Junior High School. Additionally, the NSC publicized and displayed the application form and documents from March 22 to May 21, 2023, in accordance with the law. During this period, the NSC accepted public comments and made relevant review information available on its website. To ensure the smooth conduct of the hearing, the NSC held preparatory hearings on June 13. Subsequently, on June 29, the NSC invited legislators, relevant agencies, the New Taipei City Council, the New Taipei City Government, representatives from Shimen District and the neighboring Chinshan District and Sanzhi District, environmental protection groups, and concerned citizens to participate in the hearing. This allowed all parties to fully express their opinions, thereby enhancing the credibility of this case.

To ensure transparency and promote public engagement by providing the general public with a full picture of the safety regulations for the decommissioning of the Chinshan NPP and dry storage operations, the NSC organized a Public Observation Program on April 26, 2023. Twenty-two people were invited to participate including representatives from the New Taipei City Government, Shimen District Office, as well as village chiefs and environmental protection groups. During the visit, the NSC provided updates on the decommissioning of the Chinshan NPP and the current progress of its indoor dry storage facilities. The visit also included an on-site observation of the annual integration drill for the dry storage facilities at the Chinshan NPP, followed by a discussion to gather opinions and understand the concerns of the local community.



Site visit meeting on the Chinshan NPP's decommissioning and dry storage facilities in 2023



Hearing for the construction license Application of the Low-Level Radioactive Waste Storage Facility for Decommissioning

● To Enhance Public Engagement, Promoting Local Involvement in the Parallel Monitoring Activity on Environmental Radiation on the Lanyu Island

To promote public engagement, ensure information disclosure, and facilitate environmental radiation sampling and analysis by a third party, the NSC organized an environmental radiation sampling process for parallel environmental monitoring on the Lanyu Island from May 10 to 11, 2023. The event invited representatives from the Council

of Indigenous Peoples, Taitung County Government, Lanyu Township Office, Lanyu Township Representative Council, as well as village chiefs, local environmental groups, and residents to participate. In 2023, environmental samples, including agricultural products, soil, water, and grass, were collected from six different Lanyu tribal villages. Samples analysis was entrusted to the Nuclear Science and Technology Development Center (NSTDC) at National Tsing Hua University (NTHU), which is accredited by the Taiwan Accreditation Foundation (TAF). Additionally, the samples were also sent to the NARI and TPC's Radiation Laboratory for measurement and analysis, allowing for comparison and validation of the results. After the NSTDC at NTHU completed the analysis of the samples, the reports were mailed directly to all participants. The latest parallel monitoring report was published on the NSC website for the public access. The results showed that no abnormal radiation has been detected since 2011 and all radiation doses fell within the variation range of background radiation.



Parallel Monitoring Activity on Environmental Radiation on the Lanyu Island: Pre-Sampling Briefing Session



Parallel Monitoring Activity on Environmental Radiation on the Lanyu Island: collecting water samples in the Ivalino Tribal Village

● Lighting up the Stars of Knowledge – NSC accompanies you in exploring science

Learning should gently extend a hand when students become curious about science and should consider the needs of urban and rural areas and special populations. Therefore, to enable students in remote areas to deeply learn about atomic energy popular science knowledge, the NSC organized fixed-point popular science activities at Wanli Junior High School, New Taipei City, and Chinshan High School. The activities focused on topics related to the decommissioning of nuclear power plants, nuclear emergency response, and seawater radiation monitoring. They included scavenger hunts, radiochemistry, and radiation detection experiments, allowing students to learn about ionizing radiation and related matters in their local environment, fostering greater attention and care for their hometown's environment. Additionally, the results from the 'pretest-teaching-retest' method show that out of the 93 students participating from both schools, approximately 85% improved in their post-test scores, indicating that the educational activities significantly enhanced their understanding of atomic energy science.

Recognizing the challenges disadvantaged children face in accessing popular science resources, the NSC took proactive measures to provide these students with opportunities to learn about atomic energy. The NSC invited children and parents from the Central Region Children's Home, Ministry of Health and Welfare (MOHW), and Maria Social Welfare Foundation to view popular science videos and participate in hands-on science activities. A total of 72 people attended four such events. Additionally, in collaboration with the main Banqiao Branch of the New Taipei City Public Library, the NSC organized "Explore Science with You" hands-on activities featuring popular science, with 209 students and 84 parents participating. The activities included reading picture

books, learning about Bug-Out Bags (BOBs), fingerprint experiments, and assembling small wind turbines. Through these engaging activities, both parents and students explored atomic energy-related popular science knowledge and were encouraged to address problems and difficulties with renewed courage, learning from mistakes and fostering resilience.

Additionally, to balance popular science resources between the eastern and western regions and enhance national scientific literacy in atomic energy, the NSC expanded its outreach for the first time to Hwa-Gang Junior High School in Hualien, eastern Taiwan, in May 2023. In August, the NSC organized the "Atomic Adventures – Quantum In Your Life" atomic energy science education exhibitions at Kuang San SOGO in Taichung. Each event lasted for two days and attracted a total of 4,274 and 3,472 attendees, respectively.

The exhibitions featured interactive games, model displays, and simple explanations to help students learn about atomic energy through play. In response to the discharge of tritium-contaminated wastewater from Fukushima, the events also included themed activities such as seawater sampling and radiation detection related to tritium. A scavenger hunt was designed around these themes to provide engaging and educational simulations, helping visitors understand government regulatory measures and the scientific significance of radiation detection data.

Additionally, the NSC continues to accept invitations from domestic scientific education institutions to participate in various popular science activities. These include the "63rd National Science Fair", the "2023 International Women and Girls in Science Bazaar", the "Taiwan National Science Train", and the "4th Taiwan Science Festival". The NSC actively encourages female students and families to engage in learning about atomic energy popular science knowledge and to experience diverse scientific activities related to atomic energy.

The NSC believes that a shimmer can become a torch. Through various hands-on science activities, the NSC aims to provide students across the country, including those in remote and disadvantaged areas, with knowledge about atomic energy. This effort strives to illuminate these regions and ensure that atomic energy popular science education blossoms in every corner of Taiwan.



Slowly Painting a Scientific Dream



Assembling a Small Wind Turbine



Regardless of gender, ethnicity, or age, everyone can be curious and enjoy the process of pursuing scientific knowledge



Embracing the Spirit of Experimentation: Measuring Radiation Levels with a Radiation Detector

● Holding a Public Meeting on the Safety Regulation of NPP Decommissioning

As the regulatory authority for nuclear power plant decommissioning safety, the NSC not only strictly enforces relevant regulatory activities but also continuously promotes public participation to enhance awareness of decommissioning safety regulation. At the same time, the NSC actively listens to public opinions and is committed to fostering communication with society.

At the beginning of the review of the NPP decommissioning plan, the NSC held a local public meeting on the review of the Maanshan NPP Decommissioning Plan in Hengchun Township. Before completing the review process, the NSC held another public meeting on January 17, 2023, inviting local residents, elected representatives, local government officials, citizen groups, and relevant agencies to participate. The TPC and the NSC not only respectively outlined the current status and review process of the Maanshan NPP decommissioning plan during the public meeting but also engaged in opinion exchange and discussions with local residents and other attendees on decommissioning-related issues. By listening to various opinions and suggestions, the NSC used these insights as references for reviewing the decommissioning plan.

The public feedback from this public meeting covered issues such as radioactive waste management, the construction of a dry storage facility, the safety of decommissioning activities, post-decommissioning site reuse, and local employment opportunities. In response to the comments, in addition to providing preliminary responses during the public meeting, detailed written responses were issued afterward. For the issues related to decommissioning safety regulation, the NSC has incorporated the feedback as references in its regulatory activities. Issues that fall under the jurisdiction of other authorities have been forwarded to the relevant agencies for reference. All relevant information from this event, including meeting records, comments from participants, and the NSC's responses, has been published on the NSC's website for public access.



Chairperson's Opening Remarks



NSC Presentation



TPC Presentation



Comments from Attendees



Comments from Attendees



TPC's Response and Explanation

● Conducting Diverse Communication Outreach to Deepen Knowledge of Nuclear Safety and Protection

1. Emergency Planning Zone (EPZ) Home Visits

In October 2023, the NSC initiated a one-month home visit program within the EPZ of Keelung City. Local residents were hired as home visitors to cover three districts and twelve neighborhoods, successfully visiting over 10,000 households.

The program aimed not only to introduce nuclear safety and protection knowledge but also to listen to residents' needs regarding nuclear emergency preparedness. To address the needs of new residents, home visitors prepared safety materials in multiple languages to reduce language barriers and ensure a broader understanding of nuclear safety information. Additionally, the NSC distributed a 2024 Emergency Preparedness Calendar that can be hanged on the wall to make safety information more accessible and convenient.

2.Participation in Local Government EPZ Communication and Outreach Activities

In addition to the annual nuclear safety drills, the NSC collaborates with local governments to encourage public participation in outreach and evacuation drills through various channels, aiming to strengthen community self-awareness and enhance disaster response capabilities. In 2023, the NSC organized 12 drill sessions in Keelung City, 9 sessions in Pingtung County, and 8 sessions in New Taipei City, with a total of 3,294 participants.

3.Production of the 2024 Nuclear Safety Preparedness Calendar and Creative Weekly Calendar

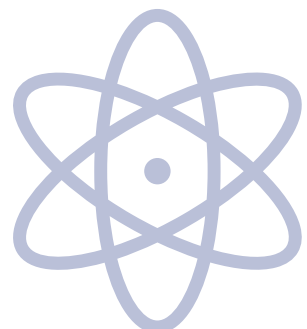
The NSC collected materials on local customs, regional scenery, and other aspects based on 63 environmental radiation monitoring station locations across the country. These materials were used in combination with public protection information cards and nuclear safety knowledge to create the 2024 Nuclear Safety Preparedness Calendar and Creative Weekly Calendar. These calendars were distributed to households within the EPZs of nuclear power plants. Additionally, these calendars were made available upon request on the official fan page "NSC Radiation Service Station" to enhance the spread of nuclear safety knowledge.

4.Combining Disaster Prevention Fair and 9/21 National Disaster Prevention Day for Public Science Activities

The NSC was invited to set up four popular science activity booths at Taipei City's Xinyi District, the National Taiwan Science Education Center, and Banqiao District in New Taipei City. These booths featured interactive games to promote eight key points of nuclear accident protection. The public was also encouraged to join the official fan page "NSC Radiation Service Station" and download the "Nuclear Safety E-Touch" app for information on radiation safety and emergency response. These activities attracted approximately 3,600 participants.

5.Creating a Nuclear Safety and Disaster Prevention Map

The NSC collaborated with professional teams to invite community members to participate in workshops to create a local nuclear safety and disaster prevention map. Additionally, they worked with teachers and students from Dapeng Elementary School in Wanli District, New Taipei City, to develop a campus disaster prevention map, which helps enhance nuclear safety and disaster prevention knowledge among the schools.





Home Visits by Outreach Personnel



Taipei City Disaster Prevention Fair



Communication and Outreach Activities within the EPZ



The 2024 Preparedness Calendar, and Creative Weekly Calendar



Production of Locally-Themed Nuclear Safety and Disaster Prevention Map



B. International Nuclear Safety Regulation Exchange Summary

● 9th NSC–NRA Nuclear Regulatory Information Exchange Meeting

The Nuclear Regulatory Information Exchange Meeting was held on October 30–31, 2023, in Tokyo by the NSC and Japan's Nuclear Regulatory Authority (NRA) to gain insights from international experiences related to nuclear and radiation safety regulations. The meeting was represented by the NSC Researcher LIU Wen–Chung to discuss the safety regulation of the operating and decommissioning nuclear power plants in Taiwan and Japan, the regulation and coping strategies for the discharge of tritium–contaminated wastewater from the Fukushima Daiichi Nuclear Power Plant, nuclear security and physical protection, as well as the regulation of radioactive waste in the decommissioning nuclear power plants. To better understand the operations related to the discharge of tritium–contaminated wastewater from the Fukushima Daiichi Nuclear Power Plant, the delegation visited the tritium wastewater discharge facilities and equipment at the plant, as well as the Marine Biology Raising Facility and the Chemical Analysis Building on November 1. They also visited the Okuma Analysis and Research Center at the Japan Atomic Energy Agency (JAEA) to learn about the third–party analysis of tritium–contaminated wastewater, which is carried out by the center on behalf of the Japanese government.

● 2023 Taiwan–US Civil Nuclear Cooperation Meeting

The “2023 Taiwan–US Civil Nuclear Cooperation Meeting” was held on December 4–5, 2023, in Taipei City. During the meeting, Taiwan's NSC provided briefings on the current status of nuclear safety regulations, NPP decommissioning management, emergency response mechanisms, back–end disposal plans, and progress on related research projects. The discussions also covered the execution of cooperative projects and future planning. On December 6, the delegation visited the National Synchrotron Radiation Research Center (NSRRC) and NTHU to introduce the developments in Taiwan's atomic energy applications and scientific research.

9th NSC–NRA Nuclear Regulatory Information Exchange Meeting



2023 Taiwan–US Civil Nuclear Cooperation Meeting

● 2023 Taiwan–U.S. Bilateral Nuclear Safety Control Technical Exchange Meeting (BTM)

The Taiwan–U.S. BTM is a regular event hosted alternately by Taiwan’s NSC and the U.S. Nuclear Regulatory Commission (NRC) since 2003. The meetings focus on exchanging practical experiences and discussing technical issues related to nuclear safety regulation, aiming to enhance cooperation and improve domestic nuclear safety regulatory practices.

In 2023, the meeting was hosted by the U.S. side and held at the headquarters of the NRC. The discussions covered several topics, including recent regulatory activities at nuclear power plants, seismic hazard evaluation, decommissioning regulations for nuclear power plants, radioactive waste management, the control situation of spent fuel dry storage facilities, risk assessment, security and emergency response at the initial stage of NPP decommissioning, and the regulatory development of Small Modular Reactors (SMRs). Under the arrangement of the U.S. side, the participants visited the NRC’s Operations Center to observe a nuclear emergency response plan exercise for the FitzPatrick Nuclear Power Plant. This included monitoring the mobilization and response following the notification of a nuclear accident, as well as gaining an understanding of the center’s operational procedures. Additionally, the delegation visited the Oyster Creek Nuclear Power Plant, which is currently undergoing decommissioning, along with its dry storage facilities. They gained firsthand insights into the planning and execution of the decommissioning activities at the plant. The visit included discussions and experience-sharing on decommissioning-related issues, drawing on the U.S. experience in nuclear power plant decommissioning and safety regulations. This serves as a reference for the NSC in supervising nuclear power plant decommissioning safety and implementing decommissioning regulatory operations.



Our Delegation Poses for a Group Photo with the U.S. Representatives in Front of the U.S. NRC Headquarters



Our Delegation Engages in Discussions and Exchanges with the U.S. Representatives



Our Delegation Poses for a Group Photo with U.S. Representatives at the NRC Operations Center



Our Delegation Poses for a Group Photo with NRC Personnel at the Oyster Creek Nuclear Power Plant

C. Our Country's Response to Japan's Release of ALPS Treated Water from Fukushima

● Closely Monitoring the Impact of Japan's ALPS Treated Water Release from Fukushima on our sea areas

To respond to Japan's ALPS Treated Water discharge that began in 2023, the NSC collaborated with various ministries to establish a cross-departmental platform. This platform has developed monitoring and diffusion technologies, implemented radiation background monitoring in sea areas, and initiated a four-year "Development of Preparation Measures for Oceanic Radionuclides Monitoring and Safety Analysis System". This program includes tracking the latest updates on Japan's discharge, establishing an Oceanic Diffusion Early Warning System, enhancing radiation monitoring for the marine environment and fish catches, and publicly sharing relevant information. The details are as follows:

1. Keep Track of the Latest Developments in Japan's Discharge to Ensure That They Comply with International Safety Standards

Before the ALPS Treated Water discharge, the NSC organized cross-departmental expert observation teams, conducted a third field observation in Japan in June 2023, and held 20 video conferences with the Japanese side. After the ALPS

Treated Water discharge, the teams returned to Japan in October for an on-site information exchange to gather relevant information of Japan's discharge.

2. Establish a Marine Diffusion Warning System to Grasp the Impact of ALPS Treated Water on Taiwan

Before the discharge of ALPS Treated Water, the NSC collaborated with the Central Weather Administration (CWA) to use historical ocean current data from the 3/11 Fukushima accident, combined with Japan's discharge plans, to preliminarily assess the transmission path and impact of the ALPS Treated Water on Taiwan. After the discharge, the diffusion model was established based on this data, and a 7-day marine diffusion early warning forecast was provided using the actual discharge conditions from Japan.

3. Strengthen Radiation Monitoring of Marine Environment and Fishery Products

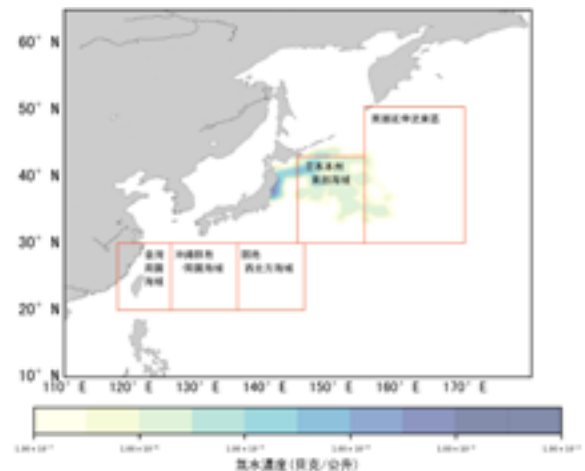
This year, over 4,270 samples of seawater, fishery products, Japanese imported seafood, and marine ecological samples were tested, with all results showing no abnormal radiation levels. Additionally, in response to the increasing demand for tritium testing in biological samples, the NSC has consolidated laboratory resources to implement the "Bio-Tritium Detection Capacity Enhancement Project". This project is expected to increase the testing capacity from 500 samples per year to 2,000 samples per year starting from June 2024.

4. Integrate Wastewater Discharge Information and Release it Through Multiple Channels

- (1) On June 13, 2023, the NSC held a meeting of the "Committee on Public Participation" to discuss "the monitoring of Japan's ALPS Treated Water discharge". Based on the committee's recommendations, the NSC continues to publish real-time radiation monitoring results for seawater and fishery products through the "Ocean Radioactive Information System (TW-ORIS)" to ensure the public receives accurate information and is not misled by false information.
- (2) In December 2023, the NSC held a seminar titled "Seminar on Real-time Forecasting of Radioactive Material Dispersion and Safety Assessment Technologies in National Waters", attended by 78 participants. The seminar covered various topics including radioactive substance marine diffusion analysis, catch sampling planning, radiation dose monitoring for Taiwan's inshore ecosystem, bio-tritium detection technology, and radiation dose assessment.
- (3) This year, further improvements have been made to the "TW-ORIS" platform. The platform's operation interface has been updated to provide information in a more popular science and visually engaging manner. Since the March 2023 revision, the platform has received over 180,000 visits. The update includes enhancing "Light Signals Warning" functions, which translate scientific data into easily understandable signals, and introduces three major real-time viewing features: The "IAEA Real-time Monitoring Information" feature allows users to connect to the International Atomic Energy Agency (IAEA) monitoring information page, providing the public with real-time updates on monitoring activities in Chinese. The "Weekly Diffusion Warning overview" feature provides insights into the diffusion trends of ALPS Treated Water from the Fukushima discharge and its potential impact on Taiwan's sea areas. The "Cross-departmental Integrated Radiation Monitoring Dashboard" is updated weekly with monitoring information on seawater, fishery, and imported food products from Japan.



Third Visit to Japan by Observation Team: Field Observation at Fukushima Daiichi Nuclear Plant



Distribution Map for the ALPS Treated Water Diffusion Early Warning



NSC Report on the Monitoring of Japan's ALPS Treated Water Discharge



Group Photo of Participants at the "Seminar on Real-time Forecasting of Radioactive Material Dispersion and Safety Assessment Technologies in National Waters"




● Expansion of Bio-Tritium Detection Capacity and Information Disclosure

1. Enhancement of Bio-Tritium Detection Capacity

Since August 24, 2023, Japan has begun the ocean discharge of ALPS Treated Water from the Fukushima Daiichi Nuclear Power Plant. Considering public concerns about food safety and the increased demand for tritium testing in fishery products and seafood, the Executive Yuan has instructed the NSC and the MOHW to collaborate on the "Bio-Tritium Detection Capacity Enhancement Project". From October 2023 to June 2024, the Taiwan Food and Drug Administration (TFDA) had reviewed and published the "Testing Method for Tritium in Food". Additionally, the NARI had assisted Radiation Monitoring Center (RMC) and the Kaohsiung City Department of Health to establish bio-tritium testing laboratories, increasing the number of such laboratories from one to three and raising the testing capacity from 500 to over 2,000 samples annually.

2. Disclosure of Bio-Tritium Detection Results

The NSC and NARI have jointly established the "TW-ORIS" platform to comprehensively collect and present various radiation monitoring results and diffusion forecasts in a scientific manner. This platform provides the public with accurate information in a popular science format. It includes ongoing testing of seawater, fishery products, and aquatic food products, with results aggregated and published every Tuesday on the "Cross-departmental Integrated Radiation Monitoring Dashboard" within the platform. To date, no anomalies have been detected.

漁業署 FA-HDA	食藥署 FDA	國海院
臺灣周邊海域經濟漁獲 及北太平洋秋刀魚	境內輸入 水產動物及藻類	臺灣海域沿岸 生態採集樣本
280件	100件	144件
		

Submission Units and Quantities for Bio-Tritium Samples



Public Disclosure of Bio-Tritium Detection Data –Cross departmental Integrated Radiation Monitoring Dashboard

D. Effective Oversight of Nuclear Power Plant Safety

● Strictly Overseeing the Safety of Operating Nuclear Power Plants

1. Conducting Safety inspections and regulation of Maanshan NPP Unit 2 during its refueling outage

Before the 27th refueling outage of the Maanshan Nuclear Power Plant Unit 2, the NSC first reviewed the outage plan to ensure that TPC had properly planned the maintenance activities. Then, an inspection team was formed to verify the quality of maintenance work and the implementation of safety management activities during this refueling outage, and to confirm that important maintenance activities comply with regulations. Additionally, in response to the COVID-19 pandemic, the team also assessed the implementation of pandemic prevention measures at the plant during the refueling outage to prevent any impact on the quality of these activities.

When the Maanshan Nuclear Power Plant Unit 2 completed the relevant refueling outage and submitted the criticality application, the NSC followed the procedure to review the submitted documents and dispatched several inspectors to conduct enhanced inspections. After assessing the results of the application document review, the on-site inspections during the refueling outage and the enhanced inspections, the NSC confirmed that the unit met the startup requirements and approved the criticality application on May 8, 2023. Additionally, regarding the application for parallel to the power grid after the refueling outage, the NSC conducted the document review and on-site inspections during the startup process, confirming that the unit's operational status met the requirements for grid connection, the NSC approved the application on May 11, 2023.

2. Conducting Project-Team Inspections

The NSC conducts various inspections for the operating nuclear power plant, including resident inspections, reactor oversight process inspections, and the inspections of the post-Fukushima safety enhancement measures. Reactor oversight process inspections are part of the annual inspection plan and focus on areas such as fire protection, problem identification and resolution, power systems, and equipment component design basis. These inspections ensure that the relevant activities comply with pertinent safety standards and quality requirements.

To ensure that nuclear power plant staff maintain high alert and effectively comprehend the plant conditions, the NSC conducts unannounced inspections outside of regular working hours in 2023. These inspections assess the performance of on-site personnel to ensure the plant's safe operation. Additionally, when a land typhoon warning is issued by the Central Weather Bureau, the NSC dispatches a second inspector to the plant to oversee the measures against the typhoons and flood around the clock, ensuring the plant's safe operation.



The NSC conducted taskforce enhanced inspections of the 27th refueling outage for the start-up of Maanshan NPP Unit 2 on May 8



The NSC conducted taskforce inspections of the 27th refueling outage for the Maanshan NPP Unit 2 on April 11



The NSC conducted the inspection of the post-Fukushima safety enhancement measures at the Maanshan NPP from June 5 to 9, 2023



The NSC conducted the 2nd unannounced inspection at the Maanshan NPP on August 30

● Strictly implementing safety regulation of NPP decommissioning

1. Conducting inspections of decommissioning activities at the Chinshan NPP and the Kuosheng NPP

The Chinshan NPP has entered the decommissioning phase; however, since the dry storage facility for spent nuclear fuel has not yet been operational, spent nuclear fuel remains in the reactor core. During this period, the NSC continues to conduct safety inspections according to the procedures used during operation. This includes reactor oversight process inspections, the inspection of the post-Fukushima safety enhancement measures, and maintenance inspections to ensure that the plant is adhering to regulations and to make certain the safety of spent nuclear fuel storage. Additionally, to ensure that the TPC implements the decommissioning plan effectively, the NSC also conducts quarterly inspections. These inspections are carried out by teams composed of staff from relevant NSC offices, who perform on-site verification of the decommissioning activities at the Chinshan NPP and follow-up the resolution of important regulatory issues.

The operating license for the Kuosheng NPP Unit 2 expired on March 14, 2023, marking its transition to the decommissioning phase. To review the preparation for the decommissioning activities of the Kuosheng NPP Unit 2, the NSC conducted a series of inspections before and during the unit's shutdown. These inspections included a project inspection for the decommissioning preparation and an inspection on the procedures for ceasing operation following the expiration of the operation license. These measures are in place to ensure a smooth transition from the operation phase to the decommissioning phase for the Kuosheng NPP Unit 2.

2. Concluding the review of the Maanshan Nuclear Power Plant decommissioning plan

The operating licenses for the Maanshan NPP Unit 1 and Unit 2 are set to expire on July 27, 2024, and May 17, 2025, respectively. Under the Nuclear Reactor Facilities Regulation Act, the TPC applied for the decommissioning of the Maanshan NPP to the NSC. The NSC received the application in July 2021 and, taking into account the review experience from the decommissioning plans of the Chinshan NPP and the Kuosheng NPP, has properly arranged the review and public participation activities for this case. In August 2021, after completing the acceptance review and confirming that the application documents met the required criteria, a technical review team consisting of external experts and the NSC staff members began the substantive review of the decommissioning plan proposed by the TPC. After three rounds of review, a total of 355 review comments were made. It was confirmed that The TPC had appropriately assessed and planned for the key decommissioning activities. The NSC completed the review of the Maanshan NPP decommissioning plan in April 2023.



The TPC must subsequently submit the environmental impact assessment (EIA) materials approved by the environmental protection authority after completing the review of the decommissioning plan's EIA. The NSC will then confirm that these materials comply with the provisions of Article 23 of the Nuclear Regulation Act before granting the decommissioning permission for the Maanshan NPP.



On November 28, an on-site inspection was conducted for the preparation of planned demolition of the 69kV switchyard at the Chinshan NPP



The NSC carried out the inspection for the comprehensive safety assessment of the Chinshan NPP on August 30 in 2023 (focusing on the verification of back-up equipment junction points)



On October 18, an on-site inspection was conducted to assess the equipment alignment at the Kuosheng NPP for implementing the Specific Major Incident Guideline



On February 15, an inspection was conducted to review the waterline arrangement at the simulated fire scene of the Kuosheng NPP



A joint wrap-up conference (video/face-to-face) was held on February 14 to comprehensively review the Maanshan NPP decommissioning plan



● Enhancing nuclear safety regulation effectiveness

1. Participating in international technology conferences

In September 2023, the NSC sent a staffer to attend the 26th meeting of the Component Operational Experience, Degradation and Ageing Programme (CODAP). During the meeting, the staffer shared Taiwan's recent regulatory experiences and gathered the latest international case studies on the aging and degradation of nuclear power plant components. Additionally, the NSC collected information on safety regulation practices and experiences from various countries, as well as trends in international nuclear safety technology development. This information will be served as a reference for Taiwan's nuclear power plants in formulating regulatory measures, to implement preventive measures to mitigate degradation and enhance the safety of nuclear power plant.

2. Strengthening personnel training and refinement of regulatory procedures

To enhance the technical abilities of nuclear safety regulation staff and strengthen their understanding of international nuclear technology developments, the NSC conducted advanced on-the-job training for nuclear power plant inspectors. Additionally, the NSC addressed technical issues related to operating and decommissioning units. In August 2023, personnel were sent to Japan to participate in decommissioning training courses and visit decommissioning nuclear power plants. In October, the NSC staffers attended the training in the United States on the "Multi-Agency Radiation Survey and Assessment of Materials and Equipment Manual (MARSAME)". They also participated in the "International Symposium on Environmental Restoration and Radioactive Waste Management" organized by the American Society of Mechanical Engineers (ASME) in Germany. At the same time, the NSC strengthened the technical capabilities of regulatory personnel by organizing experience-sharing activities for staffers who participated in overseas training. Additionally, the NSC continuously reviewed and updated regulation procedure manuals, including those for "Resident Inspection During Typhoons", "Convening the Nuclear Regulation Meetings for Operating Power Plants and Related Works" and "Public Participation for Nuclear Reactor Facilities Regulation". These efforts aimed to enhance the reactor oversight process and improve regulation procedures.

3. Holding Advisory Committee on Nuclear Safety (ACNS) and NPP Regulation meetings

To enhance the efficiency and effectiveness of safety regulation for nuclear power plant operation and decommissioning, the NSC held four ACNS meetings, two safety regulation project team meetings for decommissioning nuclear power plants, and three decommissioning regulation communication meetings in 2023. The topics discussed in these meetings included the execution and scheduling of decommissioning activities, maintenance strategies for systems and equipment, as well as the regulation of decommissioning activities and handling of international maintenance issues. The opinions and discussions from these meetings will serve as a reference for regulation. Additionally, two nuclear regulatory and decommissioning regulation meetings were held, where the NSC engaged in discussions and exchanges of opinions with the TPC on issues related to operation and decommissioning safety regulation.



In August, personnel were sent to Japan to participate in a decommissioning training course and visit the Mihama Nuclear Power Plant



Component Operational Experience, Degradation, and Ageing Programme (CODAP) meeting in September



On September 8, advanced on-the-job training for nuclear power plant inspectors was conducted



The 20th meeting of the Safety Regulation Project Team for Decommissioning Nuclear Power Plant was held in June (video/face-to-face conference)



The NSC held the first ACNS meeting of the year on March 31 (video/face-to-face conference)

E. Enhancing Radiation Protection and Safety Management

● Comprehensively Supervise the Radiation Doses of Radiation Workers Nationwide to Ensure Their Safety

To effectively manage the radiation doses of radiation workers and ensure their safety, the NSC established the "Radiation Workers Dose Database in Taiwan" based on the authorization provided in Paragraph 5, Article 15 of the Ionizing Radiation Protection Act. Through individual monitoring, database creation, and statistical analysis, this initiative aims to better protect the safety of radiation workers.

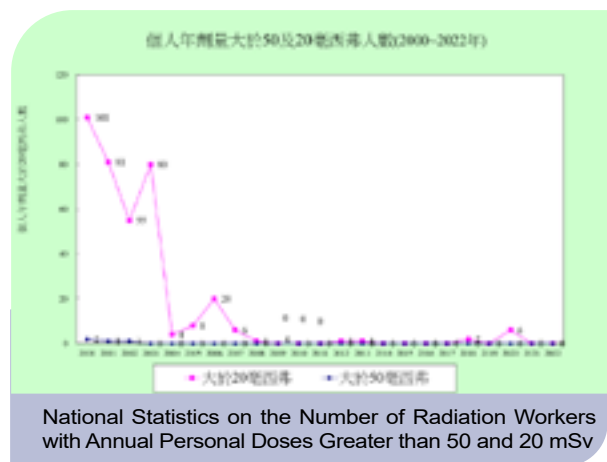
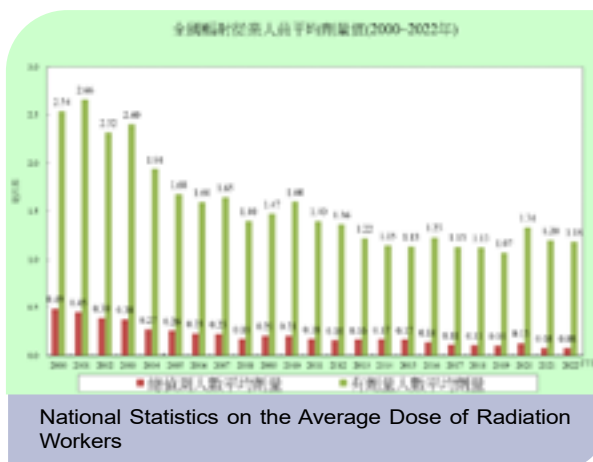
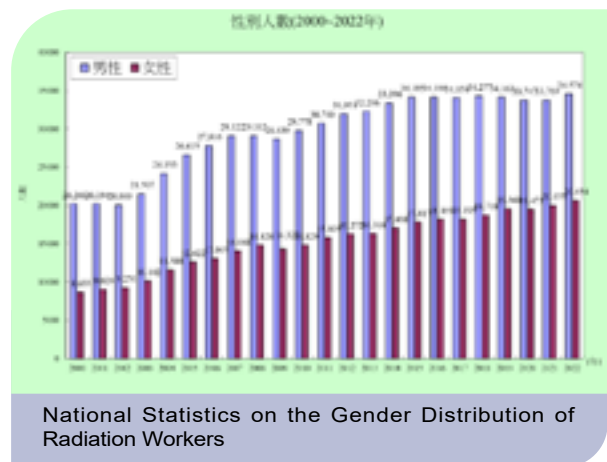
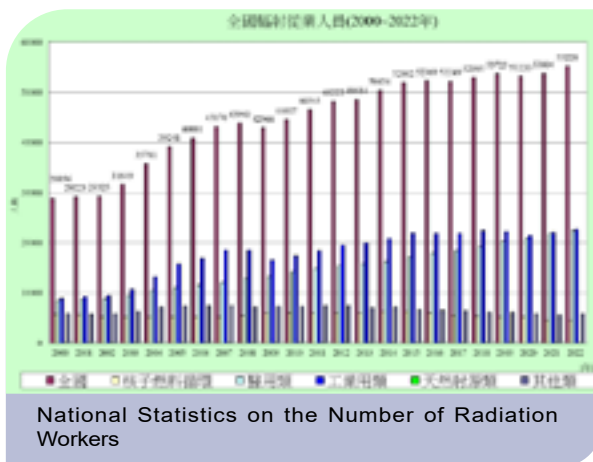
With the increasing use of radiation in civilian applications, the number of radiation workers in Taiwan has been rising annually. Currently, there are over 55,000 radiation workers distributed across various fields, including nuclear installations, medical institutions, academic research agencies, industries, and military and police organizations. The ratio of men to women among these workers is approximately 7:3. Overall, there has been a slight annual increase in the proportion of women, which has remained above 33% since 2007.

Statistical data shows that the annual average dose for radiation workers in Taiwan has been decreasing over the years, dropping from 0.49 millisieverts (mSv) in 2000 to 0.08 mSv in 2022. Most workers' doses fall within the range of background radiation values. For instance, in 2022, 93% of the radiation workers did not receive any additional radiation exposure above the background radiation intensity. As for the remaining 7% of workers, their mean radiation value decreased from 2.54 mSv in 2000 to 1.18 mSv in 2022, indicating continuous improvement in the regulation of radiation safety and exposure control under the principle of As Low As Reasonably Achievable (ALARA).

In addition to tracking the dose statistics for all radiation workers in Taiwan, the NSC closely monitors the individual doses received by each worker. This ensures that the dose each radiation worker is exposed to does not exceed regulatory limits and is kept ALARA. Since 2008, new regulations have been implemented, including an annual dose limit of no more than 50 mSv and a cumulative dose limit of no more than 100 mSv over any consecutive five-year period. These measures further ensure the radiation safety of workers.

Dose statistics reveal that in 2000, two radiation workers, and in 2001 and 2002, one radiation worker each, received an annual dose exceeding 50 mSv. However, since 2003, no workers have exceeded the 50 mSv annual dose limit. Additionally, the number of radiation workers in Taiwan with an individual annual dose exceeding 20 mSv has significantly decreased from 101 in 2000 to zero in 2022. Over the 15 years from 2008 to 2022, only 11 workers had an annual dose exceeding 20 mSv. This indicates substantial progress in Taiwan's radiation safety management and the self-management practices of radiation workplaces.





● Incorporating X-ray machines used for cardiac catheterization or angiography into the Radiation Medical Exposure Quality Assurance Program ensures the protection of public radiation safety.

To enhance and ensure the radiation medical quality of the 394 X-ray machines used for cardiac catheterization or angiography across the nation, the NSC included them in the "Radiation Medical Exposure Quality Assurance Standards" in 2023, which was officially implemented on July 1. X-ray machines used in cardiovascular invasive procedures must undergo regular quality assurance tests conducted by professional personnel, covering 9 quality assurance inspection items in three main areas: radiation safety, image quality, and radiation dose. Implementing these quality assurance measures will improve the radiation medical exposure quality in nearly 140 medical institutions nationwide, providing higher-quality radiation medical services to tens of thousands of patients annually.

The quality assurance for radiation medical equipment is a management system for optimization. Over 600 quality assurance professionals trained by the NSC are distributed across hospitals nationwide. Using advanced radiation dose measurement instruments and image phantoms, qualified personnel conduct routine quality assurance

tests on equipment. During the testing process, if dose or image errors are detected, the hospital's medical exposure quality assurance organization will perform comprehensive evaluations, supervision, or adjustments to ensure gaining clear medical images while maintaining radiation doses ALARA. This approach aims to optimize the quality of radiological diagnosis and treatment.

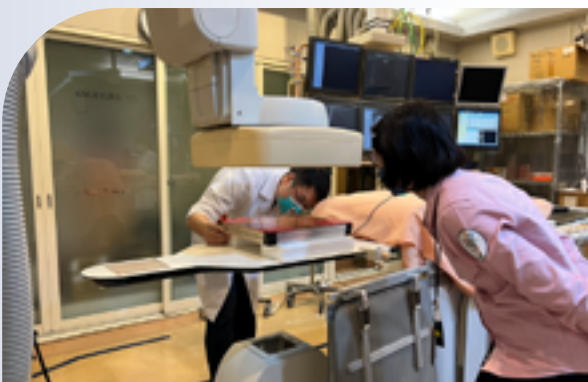
Since 2003, the NSC has been continuously advancing the Quality Assurance Program. It has now incorporated the quality assurance standards on 12 categorized radiation medical equipment. This includes mammography units, computed tomography scanners, and X-ray machines used for cardiac catheterization or angiography, and equipment for radiation therapy such as medical linear accelerators, Cyber Knives and Gamma Knives. In the future, the NSC will align with cutting-edge radiation medical technologies in Taiwan, actively promoting quality assurance practices and continuously updating related regulations and standards. This effort aims to ensure a higher quality, stable, and safe radiation medical environment, protecting the medical radiation safety for the public.



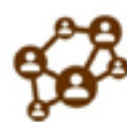
X-ray Machines for Cardiac Catheterization or Angiography



Quality Assurance Personnel Conducting Quality Assurance Tests



NSC Conducting Quality Assurance Inspections of X-ray Machines for Cardiac Catheterization or Angiography



品保組織

規劃管理、會商監督



品保計畫

量測標準、測試頻率



品保人員

專業操作、分析評估



品保檢測儀器

定期校驗、精準測量



Hospital Management Process Flowchart for Radiation Medical Exposure Quality Assurance

F. Enhancing Radiation Emergency Preparedness and Cybersecurity Protection

● Enhance war scenarios, verify cross-regional support between Taipei, New Taipei, and Keelung, and properly conduct the nuclear safety drill

In 2023, the No.29 Nuclear Emergency Exercise took place at the Kuosheng NPP as the simulated accident site. Although the risk of an actual incident at this plant is relatively low, the exercise conservatively considered the scenario of a nuclear power plant facing a combined disaster along with a nuclear incident, also taking into account the situation in the Russia–Ukraine war to ensure the plant's autonomy defense capabilities. Additionally, representatives from Non-Governmental Organizations (NGOs) were continuously invited to join the unannounced scenario design team. Unannounced and randomly selected scenarios were given on the site to enhance the effectiveness of the unannounced exercises. The exercise was conducted in two stages: a 'Full-scope Exercise' and a 'Field Exercise'. The specific details of each stage were listed as follows:

1. Table-Top Exercise

The exercise was held on August 17, 2023, at the Near-Site Coordination Post of the National Nuclear Emergency Response Center. Participants included representatives from various relevant central government agencies, the New Taipei City, Keelung City, and Taipei City Emergency Response Centers (including local Incident Command Posts), the Nuclear Emergency Radiation Monitoring and Dose Assessment Center, Front Coordination Post of the National Military Command Center, TPC's Nuclear Emergency Support Center, Kuosheng NPP, and the NSC Emergency Response Team. Additionally, the Coast Guard Administration of the Ocean Affairs Council was invited to participate via video conferencing. The exercise involved discussions on accident development and preemptive response mechanisms, with a total of 390 participants.

2. Full-Scope Exercise

On September 12, 2023, the exercise was conducted within the Kuosheng NPP, and from September 13 to 14, it extended to the surrounding areas of the plant. The exercises at various stations were live-streamed for public viewing. Additionally, an unannounced mobilization test was conducted at the Kuosheng NPP on September 10. Below is a summary of the exercise:

- (1) On September 10, 2023, not at the regular business hours, the NSC performed unannounced mobilization and communication tests for the emergency response organizations at Kuosheng NPP to keep response team members on alert. All tested personnel were able to return to their posts on time, complete the setup of the Emergency Support Center, and conduct video communication tests. They also carried out disaster relief tasks to ensure the safety of the nuclear power plant.
- (2) On September 12, 2023, Kuosheng NPP conducted an internal exercise focused on ensuring the redundancy and diversity of the plant's water and power supplies. The drill also included preparations for potential volcanic ash from the Tatun Volcano eruption and simulated the protection of critical infrastructure against fire caused by drone attacks during wartime. On the same morning, Taipei Veterans General Hospital coordinated with the plant's Emergency Response Personnel to carry out a medical exercise for radiological casualties.

- (3) On September 13–14, 2023, the RMC and the Armed Forces conducted a joint land, sea, and airborne radiation monitoring and detection drill, with participation from New Taipei City, Keelung City, and Taipei City. The exercise demonstrated the capability for cross-regional disaster relief support. Drill activities included the mobilization of wartime Civil Defense Organizations to assist in public protection actions, Taipei City supporting Keelung City with accommodation arrangements, school's students' accommodation from evacuation zones, and the evacuation and accommodation of disadvantaged groups, including those in hospitals and nursing homes. In addition, notifications were sent to the general public through various channels, including the nuclear accident alert, Cell Broadcast Service (CBS), civil defense broadcasting system, police broadcasting radio, and local Facebook pages. Additionally, in the EPZ of New Taipei City and Keelung City, middle and elementary schools conducted nuclear safety protection education in classrooms immediately following the alert. During the exercise, unannounced and randomly selected scenarios were given on the spot to verify the emergency response capabilities of personnel and enhance preparedness effectiveness.
- (4) This field exercise was the first time to have international observers to participate after the COVID–19 pandemic eased. With 30 participants, it was the largest number of international observers in the history of our nuclear safety drills, highlighting the international recognition of our nuclear emergency exercises. Additionally, the off-site drills considered both information transparency and pandemic prevention, with online live streaming to allow more people to understand the government's response actions.

This exercise integrated the mobilization capabilities of central and local governments, as well as the military, to conduct various drills pragmatically. It effectively demonstrated the government's ability to respond to complex disasters, validating the emergency response capabilities of nuclear power plants. The exercise significantly enhanced the resilience of responses to complex disaster scenarios.



Drill at the Near-Site Coordination Post, National Nuclear Emergency Response Center



New Taipei City Emergency Operations Center Drill



Keelung City Emergency Operations Center Drill



Taipei City Emergency Operations Center Drill



Front Coordination Post of the National Military Command Center Drill



TPC Nuclear Emergency Support Center Drill



RMC Drill



Land, Sea, and Airborne Radiation Monitoring and Detection Drill at the RMC



Unannounced Mobilization Tests for the Emergency Response Organizations at Kuosheng NPP



Volcanic Ash Protection and Response Drill



Vehicle Decontamination Drill at Keelung Backup Protection Station (National Highway No. 3)



Student Accommodation Drill (Zhongjiao Elementary School, New Taipei City to Wu Hua Elementary School)



Shelter Drill for the Public at Taishan Gymnasium



Taipei City's Cross-Regional Support for Shelter Capacity Drill

● Implement measures to address wartime threats, ensuring the safety and security of nuclear power plants

The attacks on nuclear power plants during the Russia–Ukraine war highlighted the need for countries to enhance wartime response measures. Following international practices, on May 24, 2023, the NSC convened a seminar with TPC entitled "Seminar on the Mitigation of War Damage and Contingency of NPP in Response to Military Attacks" to assess the impact on nuclear safety, nuclear safeguard, and nuclear security of

the "plant site, reactor core and spent fuel pool". The seminar also evaluated the IAEA's Seven Pillars of Nuclear Safety and decision-making criteria for on-duty personnel to maintain unit safety. The seminar required nuclear power plants to review the appropriateness of their existing procedures. The Nuclear Emergency Exercise in 2023 strengthened its focus on wartime scenarios. The Table-top Exercise incorporated elements such as NPP autonomy defense and joint defense and response exercises involving military, police, and Coast Guard units. During the on-site Exercise, the scenario simulated a drone attack on the oil groove at Kuosheng NPP, resulting in an extensive fire. This rigorous examination aimed to test the potential scenarios that nuclear power plants might face and validate their emergency response and self-defense capabilities, including simulating response strategies to massive damages within NPPs and validating the emergency response capabilities of NPPs facing complex disasters.

In addition to disaster preparedness operations, each nuclear power plant has conducted nuclear security and anti-terrorism exercises to prepare for sabotage attempts by non-state actors during wartime threats or natural disasters, as required by the NSC. The table-top exercise uses a confrontation-type approach to simulate intruders invading the facility, with joint, unscripted drills executed by the nuclear plant, Coast Guard units, and local police. The on-site exercise simulates scenarios where intruders take advantage of natural disasters to infiltrate the facility. Local police provide external support, and joint live drills are conducted to assess the nuclear power plant's procedures and capabilities in responding to security incidents.



The Kuosheng NPP's nuclear emergency exercise simulated an attack and included disaster response exercises



On-site Exercise of the Nuclear Safety and Anti-Terrorism Drill at Kuosheng Nuclear Power Plant



Nuclear Security and Anti-Terrorism Tabletop Drill at Chinshan Nuclear Power Plant



Nuclear Security and Anti-Terrorism Tabletop Drill at Maanshan Nuclear Power Plant

● Revise Regulations and Plans to Enhance the Radiation Disaster Response Mechanism

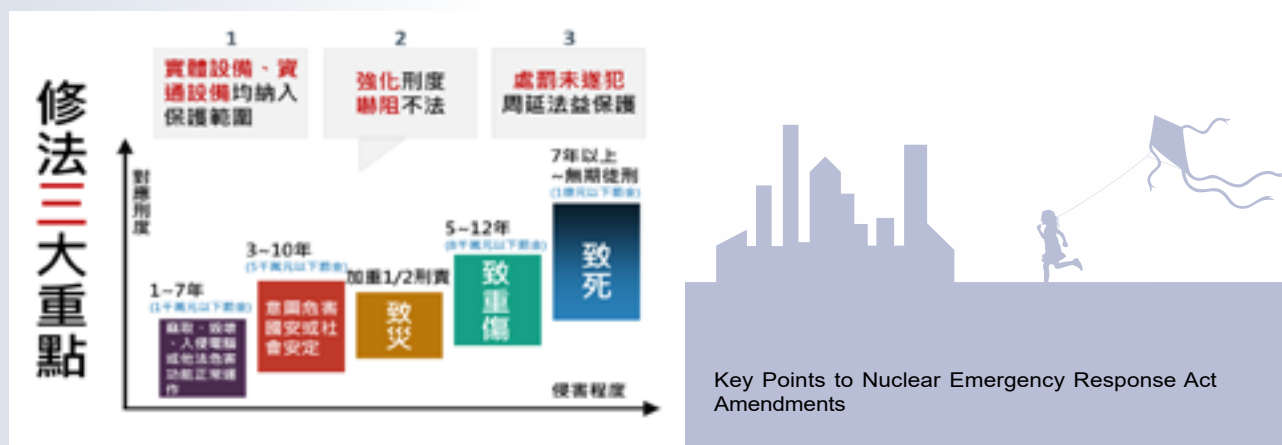
Considering that illegal attacks against nuclear reactor facilities could jeopardize their normal operations, potentially causing the release of radioactive materials, and significantly impact public health, safety, and national security, the NSC has reviewed the Nuclear Emergency Response Act. The Commission has added Articles 31–1 and 31–2 and revised Article 45 of the Act. New criminal penalties have been included for both physical and cyber threats to nuclear reactor facilities, with a layered approach based on the type and severity of the offense, ensuring that the punishment is proportionate to the crime and effectively protects legal interests. The amendments were issued by the President on June 28, 2023, under Order No. HUA–ZONG–YI–YI–ZI–No.11200054161, and became effective on the same day.

In recent years, global warming has led to frequent occurrence of extreme weather events, often escalating into complex disasters. Taking lessons from the 2011 Fukushima nuclear disaster in Japan, radiation disaster response authorities must regularly review their disaster relief capabilities and emergency mobilization efficiency. At the same time, it is essential to integrate the disaster response capabilities of relevant units based on actual needs and ensure the effective execution of radiation monitoring tasks in the event of a nuclear accident. Additionally, in line with the organizational restructuring of the Executive Yuan, the "Operational Directions for Nuclear Emergency Radiation Monitoring and Dose Assessment Center" were revised and issued on September 23, 2023, following consultations with relevant organizations. These revisions became effective on September 27, 2023.

The NSC is the central regulatory authority for radiation disaster management as defined by the Disaster Prevention and Protection Act. It has established the "Radiological Emergency Response Plan" as a basis for different levels of government to execute radiation disaster mitigation, routine preparedness, emergency response, post-disaster recovery and reconstruction. Since its enactment in 2004, the plan has undergone six revisions, with the most recent amendment approved on June 29, 2023, during the 48th Central Disaster Prevention and Protection Council meeting. The key revisions include:

1. Addition of security response mechanisms for nuclear power plants during military crises.
2. Measures for handling discharge of tritium-contaminated wastewater from Fukushima.
3. Enhancement of evacuation and sheltering needs for persons with disabilities and vulnerable groups, and consideration of gender equality.
4. Inclusion of nuclear accident response regulations during special infectious disease outbreaks.

These revisions provide local governments with references for drafting regional disaster prevention plans to address radiation hazards, and continuous improvement of the nation's radiation disaster response efforts.



● Conducting Diverse Radiation Disaster Drills to Enhance Radiation Disaster Response Capabilities

The NSC not only strengthens radiation disaster response preparedness but also continuously helps emergency response personnel become familiar with response mechanisms through radiation disaster drills. Considering international circumstances, the NSC has expanded the types of radiation disaster drills to include dirty bomb drills and overseas nuclear disaster drills, inviting central government agencies and local governments to participate, aiming to improve cross-agency response cooperation efficiency. The following is a detailed description of the nuclear disaster drills held this year:

- (1) Considering changes in international environments, the Executive Yuan's All-Out Defense Mobilization, Disaster Prevention and Response (Min-An No. 9) exercise focused on wartime response measures. The NSC dispatched a Radiological Emergency Response Team to participate in dirty bomb event drills in Taipei City and Tainan City, providing professional technical support to assist local government first-line emergency response personnel on-site. Through cooperation among local government departments and central government support, these drills help local governments become familiar with response measures for dirty bomb events.
- (2) To enhance communication, coordination, and decision-making during the event of a foreign nuclear accident, central government agencies, as well as the governments of the surrounding islands of Penghu County, Kinmen County, and Lienchiang County, were invited to participate in a tabletop simulation exercise. This exercise focused on discussing various response operations for overseas nuclear accidents and developing response strategies and action plans through group discussions for different disaster scenarios. This helps disaster response personnel become familiar with the key points of response actions and strengthens the effectiveness of our response to foreign nuclear accidents.



Group discussions for simulated response drills to foreign nuclear disasters



The Radiological Emergency Response Team assists with radiation detection operations at the site of a dirty bomb incident



● Enhancing Information and Communication Technology Services as a Support for Nuclear Safety Regulation

1. Continuously Strengthening Management to Safeguard Information and Communication Security

According to the Executive Yuan's requirements, the NSC has repeatedly strengthened inspections of products (including software, hardware, and services) that may pose a threat to national information and communication security. The NSC has also ensured that the resilience of external websites is enhanced to address increasingly severe cybersecurity threats and safeguard information and communication security.

Under the Cybersecurity Management Act, the NSC regularly conducts information security diagnostics and penetration tests to identify vulnerabilities early and actively address them. This proactive approach helps prevent malicious actors from exploiting specific weaknesses to gain unauthorized access, thereby enhancing information and communication security protection.

In response to organizational restructuring and updates to ISO 27001, the NSC has thoroughly reviewed and updated all cybersecurity management documents and related forms. These updates are designed to adapt to current conditions, provide more comprehensive control measures, and continue to publicize and reinforce the implementation of these regulations.

2. Smooth Transition of ICT Services in response to organizational restructuring

In response to organizational restructuring, the NSC has made adjustments to its ICT services, including internal and external domains, personal computers, ICT systems, cybersecurity, and internal specifications. The NSC applied to the Ministry of Digital Affairs for an external domain and has carried out the setup and testing of the new domain for ICT systems, as well as applied for SSL for the new domain. Additionally, data migration from old to new email systems was completed after adjustments to internal network domains, and the personal computers of all staff were reconfigured accordingly. Enhanced cybersecurity monitoring was implemented before and after the restructuring to prevent security risks due to misconfiguration. In addition, relevant regulations were simultaneously adjusted to align with the restructured organization of government agencies.



Enhancing information and communication services as a support for nuclear safety regulation

With meticulous planning and execution, the NSC's ICT services transitioned smoothly after the organizational restructuring, continuing to provide uninterrupted service. This ensures the continuity of all ICT equipment services. Moving forward, efforts will be made to further enhance operations and increase efficiency.

G. Nuclear Material and Radioactive Waste Regulation

● Integration with Nuclear Power Plant Decommissioning: Conducting Rigorous Safety Reviews and Hearings for Low-Level Radioactive Waste Storage

To ensure the successful decommissioning of the Chinshan NPP within 25 years, the NSC has required the TPC to adhere to the decommissioning schedule outlined at the Chinshan NPP Decommissioning Plan. The TPC is required to submit the construction license application for the low-level radioactive waste storage facility by January 2024 and complete the facility by December 2028 to address the storage needs for radioactive waste generated during the decommissioning of the Chinshan NPP. On December 29, 2022, the TPC held a public explanatory meeting at Shimen Experimental Junior High School in New Taipei City as required. The TPC submitted the construction license application for the low-level radioactive waste storage facility on January 30, 2023. After verifying the completeness of the application documents through procedural review, the NSC accepted the application on March 14, 2023. The application documents were publicized and displayed from March 22 to May 21, 2023, and a hearing was held on June 29, 2023.

Additionally, to ensure the storage safety of radioactive waste from the decommissioning of nuclear power plants, the NSC has reviewed the TPC five applications for use of containers for holding low-level radioactive waste. The NSC assembled a team of experts and scholars with relevant expertise, along with internal staff, to conduct a review of the containers. This review focused on structural strength, operational safety, sealing design, and corrosion resistance, ensuring the safety of radioactive waste storage.



Review meeting for TPC's Application for use of containers for holding low-level radioactive waste



Hearing for the construction license Application of the Low-Level Radioactive Waste Storage Facility for Decommissioning

● Supervising Spent Nuclear Fuel Dry Storage Plan, Requiring Implementation of Rolling Review of Disposal Technologies

In response to the decommissioning of nuclear power plants, the TPC is actively advancing the construction plans for indoor dry storage facilities at the Chinshan, Kuosheng and Maanshan nuclear power plants and is planning to initiate procurement and bidding processes. The NSC supervises the TPC's efforts by holding regular discussions on the regulation of dry storage facility to monitor the progress of

construction plans and address related safety and technical issues, preparing for future licensing safety reviews. Additionally, the NSC continuously collects and analyzes safety regulations and operational experiences from advanced nuclear countries, and collaborates with domestic scholars and experts to develop thermal–hydraulic and radiation shielding safety review technologies for dry storage facilities, ensuring preparation for the safety review of construction licenses.

In 2023, the NSC completed the project inspection of the periodic maintenance of plant equipment, and annual integrate drill at the Chinshan NPP. The NSC rigorously audited the TPC's performance to ensure they maintained the manpower and technical level for hot testing activities at the outdoor dry storage facility of the Chinshan NPP. For the first–phase dry storage facility at the second nuclear power plant, the NSC established inspection teams each quarter to conduct project inspections and supervise the TPC to ensure the implementation of the third–level quality assurance self–inspection procedures, thereby ensuring the quality of the casks and equipment manufacturing.

In December 2022, the TPC submitted the Spent Nuclear Fuel Final Disposal Plan (2022 version) to NSC for review, and it was approved in September 2023. The NSC will continue to monitor international news, actively urge the TPC to follow international trends, and continuously improve technology and capabilities during the spent nuclear fuel final disposal. This effort aims to align Taiwan's high–level waste disposal technology with international standards and achieve the objectives of the high–level waste disposal plan phase.

The NSC, as the safety regulator for radioactive waste, has established Regulations on the Final Disposal of High Level Radioactive Waste and Safety Management of the Facilities, as well as Site Standards for High–Level Radioactive Waste Disposal Facilities, based on the authorization of the Nuclear Materials and Radioactive Waste Management Act. These regulations specify the safety standards and site criteria for the final disposal of spent nuclear fuel. This year, the NSC has also completed a Draft Guidelines for Safety Analysis Reports on the Final Disposal of Spent Fuel, which TPC will follow during the execution of the final disposal plan.



Integration Drill at the Dry Storage Facility at the Chinshan NPP



Inspection of dry storage equipment fabrication for the Kuosheng NPP

● Strengthening Regulation of Radioactive Waste Operation and Ensuring Safety of its Facilities

Although Taiwan's nuclear power plants approach decommissioning phase as their operating licenses expired in succession, the radioactive waste storage and processing systems within these facilities must continue to operate. The NSC requires the TPC to submit safety assessment reports for the continued operation of these radioactive waste storage or processing systems. In 2023, the NSC completed the review of safety assessment reports for the low–level radioactive liquid treatment system, solidification system, and storage areas during the decommissioning of the Maanshan NPP. Additionally, the NSC has reviewed the safety assessment report of the NO.1 low–level

radioactive waste storage facility during the decommissioning period at the Kuosheng NPP. The Commission required an aging management assessment plan for the systems, equipment, and components to ensure the operational safety of the radioactive waste management systems.

To ensure the structural safety of radioactive waste facilities, the NSC requires the TPC to follow the Ministry of the Interior's Seismic Design Specifications and Commentary of Buildings. They must use the maximum acceleration coefficient for earthquakes (2,500-year earthquake recurrence interval) and apply the importance factor (I) for buildings, set at the highest standard with 1.5. Additionally, the Commission has mandated the review of existing radioactive waste facilities, specifically requiring the TPC to reinforce the structures of the volume reduction center at the Kuosheng NPP.

The NSC emphasizes the emergency response capabilities of radioactive waste facilities, requiring each facility for handling and storing radioactive waste to conduct annual emergency exercises. The NSC conducted on-site inspections of the annual emergency exercise and required the TPC to submit review reports. This is to continuously improve the ability to respond to emergencies and ensure public health and environmental quality.

The removal of nuclear waste from Lanyu Island has been a topic that our government have taken a strong interest. The NSC regularly convenes inter-ministerial meetings with the Ministry of Economic Affairs and the Council of Indigenous Peoples to jointly supervise TPC to make progress on relocation of the Lanyu Island storage site. Additionally, TPC is required to submit quarterly progress reports on the relocation of the Lanyu Island storage site to the Executive Yuan's Nuclear-Free Homeland Task Force for tracking purposes.

The NSC has directed the TPC to complete all preparations for the relocation and is supervising the re-sealing of all nuclear waste at the Lanyu Island storage site by the TPC. All tasks in the "Implementation Plan for Enhancement of Operational Safety at the Lanyu Island Storage Site" were completed by the TPC, and the storage site has been restored to a static storage mode. Additionally,



Project Inspection of Structural Reinforcement Work at the Volume Reduction Center of Kuosheng NPP



2023 Radioactive Waste Facility Emergency Exercise at the Chinshan NPP



11th Inter-Ministerial Meeting on Relocation of the Lanyu Island Storage Site



2023 Emergency Exercise at the Lanyu Island Storage Site

to actively advance the relocation of nuclear waste, the NSC requires TPC to plan and design vessels for marine transportation of low-level radioactive waste, dredging and Structure Reinforcement work at Longmen Harbor of Lanyu Island, and prepare the transportation plan for nuclear waste from Lanyu Island. The NSC will continue to closely supervise the TPC on upgrades to the safety of nuclear waste storage site before the barrels of nuclear waste are removed from Lanyu Island, and organize regular emergency exercises. Environmental radiation on Lanyu Island will also be closely monitored.

● Supervising the Decommissioning of Taiwan's Research Reactor Facilities and the Centralized Management of Small-Scale Radioactive Waste

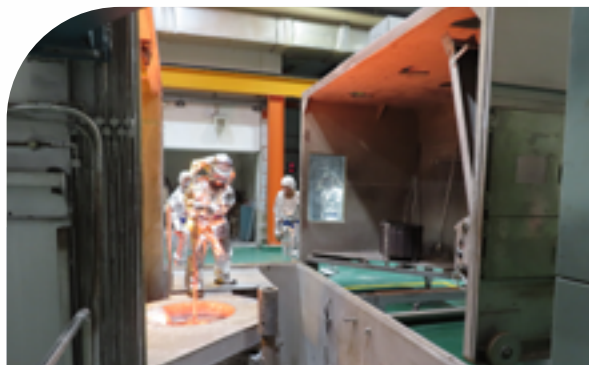
The AEC issued a decommissioning license for the Taiwan Research Reactor (TRR) at the INER in April 2004 and required the commencement of decommissioning activities according to the plan. To ensure safety during the decommissioning process, the NSC has continuously dispatched personnel for inspections during its decommissioning period, strictly requiring the NARI to adhere to all operational procedures to ensure safety. In the fiscal year 2023, under the NSC's oversight, NARI has completed the TRR fuel dry storage area clearance project. Additionally, the NSC has reviewed and approved the "Safety Assessment Report for the TRR Waste Ion Exchange Resin Stabilization Equipment in Building 012", enabling NARI to proceed with waste treatment operations.

NARI is responsible for receiving low-level radioactive waste and radioactive sources (i.e., Small producers' radioactive waste) generated by medical, agricultural, industrial, academic, and research institutions in Taiwan. It assists in the centralized treatment and storage of these materials. NARI currently operates 13 facilities for low-level radioactive waste processing and storage. The NSC not only conducts regular and irregular inspections of facility operations but also requires NARI to renew facility operating licenses and perform ten-year re-evaluations of storage facilities under The Nuclear Materials and Radioactive Waste Management Act. In 2023, the NSC completed safety reviews for NARI's nuclear materials and fuel storage facility at Building 020, Building 036A/K/U, and the disassembly plant in Building 074, as well as for the uranium hexafluoride (UF₆) operations area, ensuring the safety of radioactive waste treatment and storage operations.

The NSC strictly monitors the decommissioning progress of the TRR and the operation of low-level radioactive waste treatment facilities. It will continue to oversee NARI's adherence to the approved plans for various operations and ensure the implementation of occupational and radiation safety measures to safeguard both personnel and the environment.



TRR Vessel Waste Dismantling Operations



Metal Waste Melting and Volume Reduction Operation at Radioactive contaminated Metal Smelting Facility

H. Enhancing Environmental Radiation Monitoring

● 2023 Sea Area Environmental Radiation Monitoring

In response to overseas radiation anomalies and the proliferation of nuclear power plants along the southeastern coast of China, which could potentially spread radioactive materials through ocean currents and contaminate Taiwan's coastal environment, the RMC initiated the "Taiwan Marine Radiation Monitoring and Investigation Plan" in 2017. This plan, developed in collaboration with relevant government departments, aims to establish a baseline for environmental radiation around Taiwan's sea areas. This includes monitoring radioactive cesium in seawater, tritium in seawater, radioactive cesium in marine organisms, and radioactive cesium in sediments. By the end of 2022, a total of 3,133 samples had been collected and analyzed, including 1,730 seawater samples, 1,051 marine samples, and 352 sediment (including seabed mud) samples.

In 2023, the RMC incorporated marine environmental monitoring into its annual environmental radiation monitoring plan. The Center continued inter-ministerial collaboration, with the RMC handling sample collection from the sea, and the Coast Guard Administration, Ocean Conservation Administration, Fisheries Research Institute, and Fisheries Agency assisting in sampling seawater, seafood, and sediment. Monitoring stations included key fishing ports on the Taiwanese coast, sea areas near NPPs, sea areas of offshore islands, coastal sea areas, and surrounding fishing grounds. All samples were sent to the RMC for radioactivity analysis. In 2023, a total of 569 seawater samples, 352 marine samples, and 13 sediment samples were analyzed, with all results showing no abnormal radiation levels.

The RMC conducts regular sampling and analysis of marine environmental samples to monitor the long-term radiation levels around sea areas of Taiwan. This ongoing surveillance ensures the safety of marine environmental radiation. The RMC also periodically publishes marine monitoring data to maintain the reputation of marine economy in Taiwan.



Map of Sampling Locations for Marine Radiation Monitoring

Sample Types	Number of Analyzed Samples	Analyzed Radionuclides
Seawater	569	Cesium-134, Cesium-137, Tritium, Strontium-90, Gamma-emitting Radionuclides (Cobalt-60, Ruthenium-106, Antimony-125)
Sediment	13	Cesium-134, Cesium-137, Potassium-40, Cobalt-60, Thorium Series, Uranium Series
Seafood	352	Cesium-134, Cesium-137, Potassium-40, Iodine-131, Thorium Series, Uranium Series, Strontium-90

2023 Marine and Land Radiation Survey Sample Types, Analyzed Radionuclides and Number of Samples

● Biennial Meeting on Intercomparison Program of Radioactivity Analysis in Environmental Samples with Japan Chemical Analysis Center (JCAC)

In order to improve the radioactivity analytical techniques, the RMC has been collaborating with JCAC since 1986 under a technical cooperation program. Both Taiwan and Japan take turns hosting the Meeting of Intercomparison Program of Radioactivity Analysis in Environmental Samples. Due to the COVID-19 pandemic, the Intercomparison Program was temporarily suspended. However, with the easing of the pandemic and Japan's lifting of border controls, the 32nd "Meeting on Intercomparison Program of Radioactivity Analysis in Environmental Samples with the JCAC" was held in Japan from June 14 to June 16, 2023. After the meeting, both parties signed a Memorandum of Understanding (MOU), deciding to include tritium activity analysis in seawater starting in 2024 and to resume the biennial comparative analysis of environmental samples and technical personnel training and exchange activities.

According to the MOU signed on October 30, 2019, the RMC and the JCAC conducted an analysis of environmental soil, tea leaves, groundwater, seawater, and thermoluminescent dosimeters (TLDs). The results from a total of 23 radionuclides analyses for the five types of comparative samples and accumulated dose measurements by TLDs were evaluated, showing that the comparison coefficient of determination met the evaluation criteria of $En \leq 1$. This indicates that the analytical levels of both parties are consistent.



Taiwan–Japan Environmental Sample Radioactivity Analysis Comparison Experiment Discussion Meeting



Signing of the MOU between both parties

● Upgrade and Update of Spectral Advanced Radiological Computer System (SPARCS)

After a nuclear incident, using unmanned aerial vehicles to detect radiation intensity over large areas on the ground can overcome obstacles such as road closures and transportation difficulties caused by other natural disasters. This provides rapid information on the distribution of contaminants, serving as a reference for decision-making in emergency response and public protection measures during a nuclear incident.

The NSC currently has four SPARCS and one set of spare components for routine maintenance. The data acquisition and transmission module (ATU) of the SPARCS is a U.S. military-grade controlled item, not available through standard commercial channels. To address the issue of ATU unavailability, the NARI began evaluating an upgrade to the SPARCS in 2020, using commodification multi-channel analysis modules to replace the existing ATU. Compatibility

testing with commercial nuclear instruments was completed. From 2021 to 2022, the integration of multiple detection instruments and data was tested through practical aerial flight tests, evaluating the feasibility of hardware upgrades and establishing self-maintenance and repair capabilities.

In 2023, the NSC through the RMC and the NARI, procured commodification multi-channel analysis modules. The upgrade of two existing SPARCS, SPARCS-M and SPARCS-A, has been completed. One of these upgraded systems has already been utilized in practical aerial radiation detection training in the southern region. The commercial nuclear instrument modules acquired for the system upgrade can replace the original SPARCS components, such as the detector cap, control modules of the detector box, and the ATU. These new modules use USB ports for power and data transmission, which reduces the weight and number of components required for the SPARCS on helicopters. This also shortens the preparation time needed for system installation on the helicopter before flights, thereby enhancing the operational stability of the system.



Diagram of Aerial Radiation Detection Operations Executed with the Upgraded Multi-Channel Analyzer (MCA) Nuclear Instrument Module



SPARCS for Aerial Radiation Detection with the Upgraded MCA Nuclear Instrument Module

● Taiwan Environmental Radiation Detection Map Background Radiation Data Establishment Project

To align with the Executive Yuan's "Forward-Looking Infrastructure Development Program— Digital Public Infrastructure" initiative and to provide scientific data on environmental radiation changes, achieving the three core objectives of "Disclosure of Government Information", "Disaster Information Sharing" and "Information Value-Added", the RMC has integrated nationwide environmental radiation monitoring information and applied Geographic Information Systems (GIS) to develop and establish the "Taiwan Environmental Radiation Detection Map". This map was officially launched and made accessible to the public on December 28, 2020, providing real-time monitoring data on environmental radiation and background radiation detection data.

The map displays different colors based on radiation dose rate numerical values, and by clicking on each monitoring point, users can view information such as the radiation dose rate, detection time, and GPS location. In 2021, the map was updated to include data related to "drinking water" and "TLDs". In 2022, a new feature was added that allows users to look up the results of radioactive content analysis in "imported food" and the integration of the "Radiation Data Visualization System for Nuclear Emergency Response Stages." In 2023, the map was further enhanced with a "real-time location display function for airborne radiation monitoring by the Nuclear Accident Radiation Monitoring Center," consolidating data from marine environmental radiation surveys, airborne radiation monitoring, and marine radiation detection.

The "Taiwan Environmental Radiation Detection Map" was developed while referencing the European Union's Practices and Guidelines for Decision-Making on Public Protective Actions in a Nuclear Accident. Taiwan's main island is divided into 551 honeycomb cells, each with a 5-kilometer side length, to form a honeycombed pattern area. Radiation detection data for these honeycombed pattern areas are displayed on the map in different colors, categorized by dose rate values. Additionally, to establish background radiation data for nuclear power plants, the RMC divided the EPZ around the nuclear power plants into 89 smaller hexagons, each with a side length of about 1.5 kilometers (55 hexagons for the Chinshan and the Kuosheng Nuclear Power Plants and 34 hexagons for the Maanshan Nuclear Power Plant). Before 2022, only 283 of the 551 honeycomb cells had background radiation data, and only 41 of the 89 smaller hexagons had such data. To fill in the gaps, the center used Google Maps' aerial view feature to identify accessible roads and plan detection routes for vehicle-mounted radiation detection. This effort began on June 14, 2023, and by November 16, 2023, background radiation point detection had been completed for 161 honeycomb cells and 47 smaller hexagons.

As of the end of 2023, the "Taiwan Environmental Radiation Detection Map" had completed radiation detection at 444 points across Taiwan's main island, achieving an 80.6% coverage rate for background radiation data in this region. Within the 89 small hexagons in the EPZ around nuclear power plants, 88 have obtained background radiation data, resulting in a coverage rate of 98.9%. For Taiwan's main island, apart from certain mountainous areas that are inaccessible to vehicles or have impassable roads due to natural disasters, the rest of the regions have completed the establishment of background radiation data. For the remaining hexagons without data, the RMC will continue its efforts by collaborating with various government agencies, increasing manpower, and conducting aerial surveys to complete the necessary data collection.



"Taiwan Environmental Radiation Detection Map" Showing Environmental Background Radiation and Honeycomb Pattern Areas



Marine Environmental Radiation



Shipborne Radiation Monitoring at Sea



Helicopter Aerial Radiation Monitoring



Drinking Water Testing Data

I. Advancing Atomic Energy Technology Research and Development

● FixCarbon Technology: Carbon–Negative Bioplastics from Afforestation

1. Introduction to the FixCarbon Technology by the NARI

The NARI has achieved a significant milestone by winning the prestigious "2023 R&D 100 Awards", often referred to as the "Oscars of Technology", for its "FixCarbon Technology: Carbon–Negative Bioplastics from Afforestation". The innovative FixCarbon technology developed by the NARI overcomes the limitations of using fibrous materials by employing advanced techniques such as saccharification of fibrous raw materials, bacterial strain development, and product purification. This groundbreaking technology has globally demonstrated, for the first time, the potential of fibrous raw materials to be successfully converted into chemicals from biomass. The innovative aspects of this technology include:

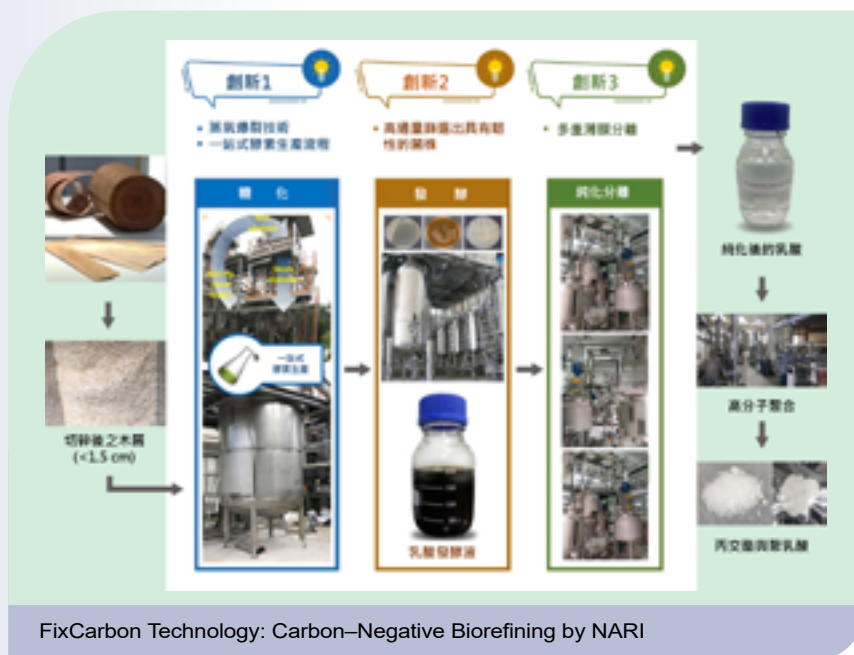
- (1) Saccharification of Fibrous Raw Materials: Employing a unique preparation technique and on-site enzyme production to convert cellulose into fermentable sugars.
- (2) Bacterial Strain Development: By utilizing high-throughput screening (HTS) techniques, resilient and specialized bacterial strains are developed to produce the desired biochemicals.

- (3) Product Purification: The process effectively reduces fermented liquid protein and impurities, resulting in a byproduct that increases the purity of lactic acid for various commercial applications.

2.The FixCarbon Technology's Commercial and Environmental Benefits

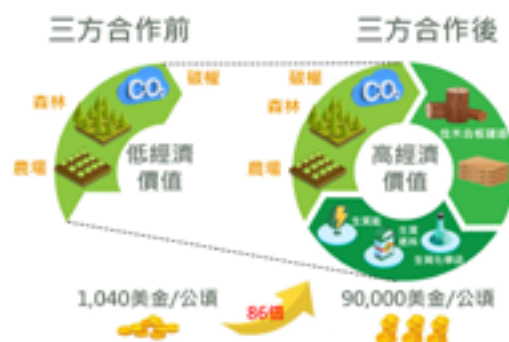
The NARI'S FixCarbon Technology has overcome the technical bottlenecks in utilizing non-food biomass, transforming forest waste into high-value green products. The remaining materials from the process are applied to green energy production, replacing fossil fuels to meet electricity and thermal energy needs. This not only pioneers an innovative forest management model that integrates forest carbon sequestration with biorefining, but also achieves the goals of zero waste and a negative carbon footprint in the process. Additionally, it has facilitated a tripartite collaboration with New Zealand industries, successfully verifying the conversion of leftover waste wood chips from plywood factories into lactic acid-derived chemicals, whose economic value is 86 times higher than solely enhancing forest carbon sink.

With the advancement of the European Union's Carbon Border Adjustment Mechanism (CBAM), the development of carbon credits and carbon tax systems has become a mainstream international trend. Considering that currently, approximately 60% to 90% of the carbon footprint of industrial products comes from imported raw materials, producing low-carbon or carbon-negative raw materials through this technology and replacing imported materials could significantly contribute to carbon reduction. Moreover, by fully utilizing the entire composition of biomass sources and applying circular economy practices, the carbon reduction benefits, operational resilience, and international competitiveness of export-oriented industries or those within international supply chains can be enhanced. This will also assist industries in achieving transformation and realizing their carbon reduction goals.





Innovative Forest Management Model Integrating Forest Carbon Sink with Biorefining, Developed by NARI



Application of NARI's Technology in Enhancing Forest Carbon Sink Value in New Zealand

● A Non-Invasive Diagnostic Tool for Systemic Vasculitis and Blockage – Atherosclerosis Imaging Agent

1.Introduction to Atherosclerosis

Metabolic syndrome, which includes conditions such as hypertension, high blood sugar, and hyperlipidemia, is a primary cause of atherosclerosis. The chronic inflammation of blood vessels leads to the formation of thrombi, which can result in ischemic heart disease (myocardial infarction) and stroke. Atherosclerosis commonly occurs in large and medium-sized arteries, including the aorta, coronary arteries, cerebral arteries, and renal arteries. To achieve early detection and treatment, and to be useful in monitoring therapeutic efficacy, there is an urgent global need to develop atherosclerosis imaging agent for the early diagnosis of cardiovascular diseases.

2.Causes and Clinical Status of Atherosclerosis

Atherosclerotic lesions are caused by chronic inflammation of the blood vessels. This process begins with the early deposition of fats, followed by calcification and plaque formation, and eventually leads to the formation of thrombi. In the later stages, these changes can result in life-threatening conditions such as myocardial infarction and stroke. Current clinical imaging techniques can only detect atherosclerosis in its middle to late stages. The most commonly used myocardial perfusion imaging agent, such as Thallium-201-TlCl and Technetium-99m-MIBI, are only effective in diagnosing severely obstructed coronary arteries of the heart. However, these agents are not suitable for diagnosing systemic atherosclerotic lesions.

3.Innovative Research and Development Concept

Literature indicates that atherosclerotic lesions often accumulate large numbers of activated macrophages expressing the chemokine receptor CXCR4. The NARI has developed a small-molecule CXCR4-targeted nuclear medicine diagnostic drug by using computer simulation techniques. Based on the CXCR4 antagonist TIQ-15, a novel atherosclerosis imaging agent named APD was designed. This agent can be labeled with radionuclides for Single Photon Emission Computed Tomography (SPECT) or Positron Emission Tomography (PET) imaging. The chemical structure of this drug has been patented in the

USA (2024), Japan (2023) and Taiwan (2022), with patent applications pending in the European Union. The research and development achievements of APD have been recognized with several accolades, including first place in the Oral Presentation Research (Excellence Award) at the 2021 Taiwan Nuclear Medicine Annual Conference, a Bronze Medal at the 2023 Taiwan Innotech Expo, and the 2023 National Innovation Award. Furthermore, APD was selected as one of the "Top Ten Highlighted Technologies" of the year. Preliminary toxicity tests have shown that even at doses exceeding 1,500 times the amount used in humans, APD exhibited no signs of toxicity.

4. Research and Development Achievements

Using an atherosclerotic model (ApoE^{-/-}) in mice for PET imaging, Gallium-68-APD demonstrated drug accumulation at the atherosclerotic lesion site within one hour, with rapid excretion through the kidneys and bladder. The target-to-background ratio (TBR) was 17.68 ± 0.71 (n=3), which is at least five times higher than that of Gallium-68-Pentixafor, a drug currently used in international human clinical trials. In comparison to clinically used drugs such as Fluorine-18-FDG and Fluorine-18-NaF, Fluorine-18-FDG tends to accumulate heavily in the myocardium, making it less effective for specific imaging and diagnosis of atherosclerotic lesions. However, Fluorine-18-NaF is only suitable for imaging and diagnosing lesions in the middle to late stages when calcification has occurred, thus making it unsuitable for early detection of the disease.

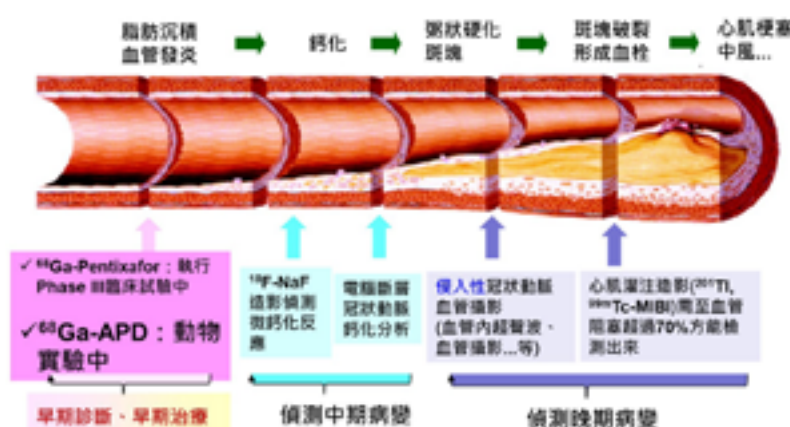
5. Evaluation of the Efficacy of Clinical Drugs and Biotech Foods

NARI, in collaboration with the National Taiwan University Hospital and National Taiwan University College of Medicine, successfully applied Gallium-68-APD for non-invasive diagnostics to evaluate the effects of diabetes medication (SGLT2 inhibitors) and bromelain (pineapple enzyme). Following this, the effectiveness of commonly available cardiovascular-related biotech foods (such as red yeast rice, natto, etc.) was assessed. By cross-referencing these results with biochemical data from blood tests (including cholesterol, triglycerides, etc.), it was discovered that different biotech foods have varying effects on improving blood lipid levels and reducing vascular plaques. Interestingly, when these foods were consumed in combination, their effects could either synergize or, conversely, inhibit each other. As a result, this diagnostic technology platform proves to be an effective tool for the rapid screening and development of compound biotech foods or clinical therapeutic drugs in the future.

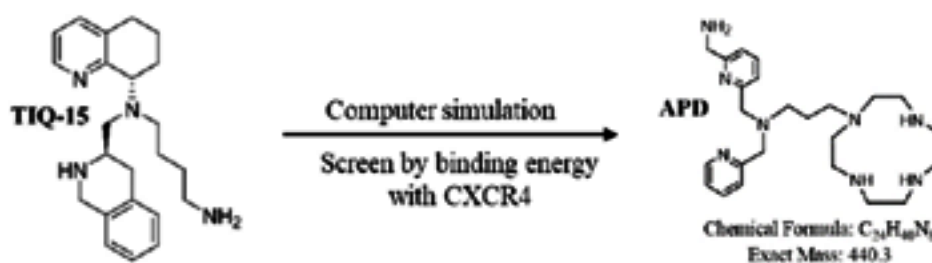


6.Future Plans, Development, and Expectations

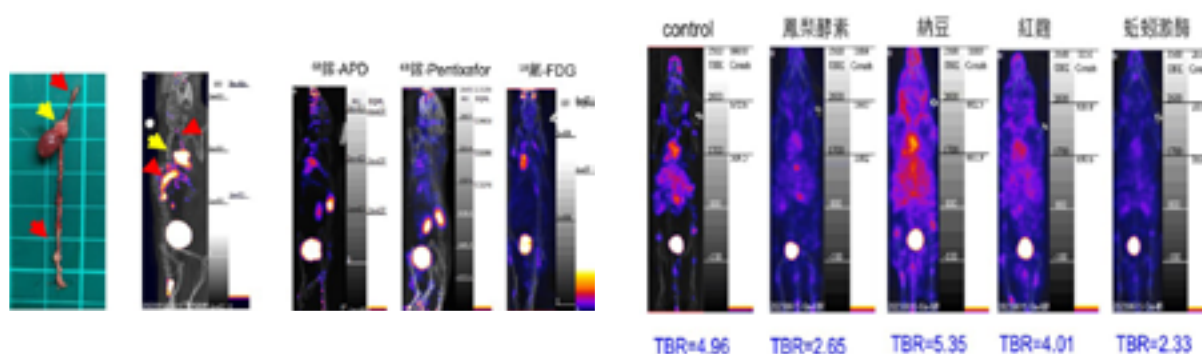
Thallium-201-TlCl is only suitable for diagnosing severe heart disease, whereas Gallium-68-APD can be used for diagnosing unstable plaques systemic vascular plaques. Additionally, the radiation dose received by the human body with Gallium-68-APD is only 2.8% of that from Thallium-201-TlCl. Whether applied to the clinical diagnosis of systemic atherosclerosis or used as a technological platform for the development of new drugs and biotech foods for atherosclerosis treatment, APD has immense market potential.



Atherosclerosis Progression and Current Clinical Applications



Design of the Novel Atherosclerosis Contrast Media APD Based on the TIQ-15 Structure Using Computer Simulation Technology



PET Imaging in Atherosclerosis Model Mice: Gallium-68 APD Shows Superior Drug Accumulation at Lesion Sites, Outperforming Gallium-68-Pentixafor and Fluorine-18 FDG

Evaluation of Cardiovascular-Related Biotech Food Efficacy Using the Gallium-68 APD Technology Platform





Chronicle of Major Events

Date	Major Events
January 4 to 10	On-site inspection of the resilience of each unit and its affiliated agencies' websites, including the enhancement of cyber resilience, and whether they have products that pose a threat to national cybersecurity.
January 5, April 14, July 25 and November 2	Completed 4 rounds of "Analysis Results of Tap Water Sample Radiation Content in the Taiwan Area" testing and sent the results to Taiwan Water Corporation, with a total of 473 samples tested.
January 6	Former Vice President Annette Lu was invited to give a speech on "Taiwan's Challenges and Future Prospects." After her speech, Vice President Lu visited the Radionuclides in Food Radioactivity Testing Laboratory and the Biological Tritium Testing Laboratory at INER.
January 9	Attended the inauguration ceremony of the new Radiation Portal Monitor (RPM) at Kaohsiung Customs, Ministry of Finance (MOF). Also hosted a visit from personnel of the Office of Nuclear Smuggling Detection and Deterrence, United States Department of Energy (DOE/ NNSA/NSDD), who toured the RMC's testing laboratory and participated in a discussion session.
January 10, March 28, August 30 and September 15	Held 4 meetings of the "Rules Committee for Atomic Energy Council, Executive Yuan" in 2023.
January 10 to 12	Collaborated with Kaohsiung Customs to organize the "2022 Megaports Initiative Workshop and Educational Training on Radiation Incident Response and Management", with a total of 60 participants.
January 11	For consumer markets and New Year's shopping areas, 40 types of products including imported shiitake mushrooms, mushrooms, cashews, scallops, abalone, escargots, wood ear mushrooms, ginkgo seeds, dried fruits, jujubes, walnut cakes, pickled plums, dried shrimps, pistachios, blueberries, and other items were tested for radioactivity. The testing results, which met national regulatory standards, were published on the AEC website.
January 11, April 26, July 26 and November 17	Convened 4 meetings on "Interdepartmental Response to Emissions Containing Tritium-Contaminated Wastewater from the Fukushima Daiichi Nuclear Plant Disaster".
January 12, March 3, March 31, September 23 and November 21	Convened 3 meetings to review the "Safety Analysis Report for the Restoration of the Cask Loading Pool at the Kuosheng NPP. Sent review comments on the report to the TPC. Agreed to the TPC's responses and requested that they submit a revised edition of the report.
January 13	NSC conducted the Structural Reinforcement Inspection Project for the Volume Reduction Center at the Kuosheng NPP.



Date	Major Events
January 17, February 14, April 18 and 24	Convened meetings including a local briefing on the review of the Maanshan NPP Decommissioning Plan, a comprehensive review council summary, and an information disclosure review. Also reviewed was the Maanshan NPP Decommissioning Plan.
January 18	Issued and implemented the “Regulations Governing the Commendation for Public Education on Radiation Disaster Prevention and Protection”.
January 31	The “Environmental Monitoring in Taiwan 2023” was completed and published online.
January to December	Implemented the 2023 Medical Consultation and Subsequent Medical Care Program for Residents of Radioactively Contaminated Buildings and completed health examinations for 822 residents.
January to December	Organized the 2023 Home Visit Program for Residents of Low–Radioactive–Contamination Buildings and conducted health visits for 604 households.
January to December	Conducted unannounced radiation work site inspections for 45 radiographic inspection firms to enhance radiation protection measures.
January to December	The AEC's “2023–2026 Environmental Radiation Monitoring and Safety Assessment Countermeasure Plan for Radioactive Materials in the National Sea Areas” was approved by the Executive Yuan. Following the discharge of ALPS treated water from Japan, 10 progress updates on our nation's countermeasures were released.
February 6 to 10, June 5 to 9, August 7 to 11 and November 6 to 10	Conducted reactor oversight inspections for the Maanshan NPP during Q1 and Q4 of 2022 and conducted the inspection of the post–Fukushima safety enhancement measures during Q2.
February 13 to 21, March 14 to 30, May 3 to August 30, May 22 to 26, July 24 to 31, October 16 to 20 and September 8 to Next January 5	<p>Conducted various inspections at the Kuosheng NPP, including:</p> <ul style="list-style-type: none"> Q1 reactor oversight process inspection focusing on fire protection. Inspection of Unit 2 decommissioning preparation activities. Inspection of the ceased operation of Unit 2 operating license expiration. Inspection of the first maintenance surveillance cycle (MSC) for Unit 1. Q2 inspection of decommissioning plan implementation and reactor oversight process focusing on the electric power system. Q3 inspection of decommissioning plan implementation and reactor oversight process focusing on equipment component design criteria. Q4 inspection of decommissioning plan implementation and overall safety assessment. <p>Additionally, the NSC inspected the first MSC at the Kuosheng NPP Unit 2.</p>

Date	Major Events
February 16 and August 17	The “2023 Radioactive Analysis Results of Water Samples from the Feitsui Reservoir Catchment Area”, covering both the first and second halves of the year, were completed with a total of four reports. The results were submitted in writing to the Taipei Feitsui Reservoir Administration.
February 20, March 20, April 24, May 22, June 26 and August 28	Convened 6 meetings of the “2023 Atomic Energy Council, Executive Yuan”.
February 24 and October 20	The “2023 Analysis Results of Tap Water Sample Radiation Content in the Kinmen Area” for both the first and second halves of the year, totaling 55 samples, were completed. The results were submitted in writing to the Kinmen County Waterworks.
March 5	Participated in the “2023 International Women and Girls in Science Bazaar”, encouraging female students to pursue careers in the scientific and technical fields.
March 10	Approved the preliminary safety case report for the spent nuclear fuel final disposal in Taiwan for reference.
March 13 to 17, May 29 to June 2, August 28 to September 1, September 5 to December 29 and November 23 to 29	Conducted Q1 through Q4 inspections of the decommissioning plan implementation and reactor oversight process at the Chinshan NPP, as well as the inspection of the third MSC for Unit 1.
March 14	NSC accepted Taiwan Power Company's application for a construction license for the low-level radioactive waste storage facility for decommissioning at the Chinshan NPP and conducted information disclosure.
March 15 to 17	NSC implemented a Q1 inspection of manufacturing quality of the outdoor dry storage facility's sealed steel casks at the Kuosheng NPP.
March 20, June 21, September 8 and December 15	Convened 4 meetings of the “2023 Marine Radiation Monitoring Working Group”.
March 21, March 25 and April 15	Conducted the first unannounced inspection of the Maanshan, Kuosheng, and Chinshan NPPs in 2023.
March 21, August 23 and December 20	Convened 3 meetings of the “2023 Nuclear Emergency Response Foundation Management Committee”.
March 22	NSC reviewed and approved the report on the sipping test results for the first phase of the dry storage facilities for spent nuclear fuel at the Kuosheng NPP.



Date	Major Events
March 24	NSC implemented a special inspection of the monitoring and transportation equipment for the dry storage facilities at the Chinshan NPP.
March 27	Convened the meeting of 2023 aerial radiation monitoring flight training program at for the Southern–district Radiation Monitoring Center.
March 28	Director–General Charn–Ying Chen of the INER was invited by the “Taiwan Space Radiation Verification & Testing Alliance” to give a speech and sign a new agreement, aiming to strengthen capabilities in space radiation verification for electronic components.
March 29	The Executive Yuan approved the “Social Development Acceleration Plan Through Radiation Safety Management in Civilian Applications of Atomic Energy”.
March 30 to May 13	Inspected the 27 th refueling outage of the Maanshan NPP Unit 2.
March 31	Hosted the “2023 Radiation Safety and Control Awareness Seminar for Radiation Protection Detection Businesses”.
March 31, June 30, September 30 and December 29	Convened 4 meetings of the 17 th Advisory Committee on Nuclear Safety (ACNS).
March to November	Conducted the annual radiation safety inspection for the sales service industry, completing inspections for 40 businesses.
March to November	Conducted the annual radiation safety inspections for non–medical Category I and Category II sealed radioactive sources, radioactive material production facilities, nuclear medicine pharmacies, and high–intensity radiation facilities, completing inspections for 28 businesses.
March to November	Conducted the annual inspections on radiation protection and medical exposure quality assurance practices for medical institutions with a scale above two or more specialties relevant to radiation applications, completing inspections for 50 medical institutions.
March to July	Conducted the annual radiation safety inspection for airport baggage X–ray machines, completing inspections for 16 units at the Aviation Police Bureau, National Police Agency, Ministry of the Interior.
April 13	A delegation of 14 members from the Canadian House of Commons Committee on Visiting Mission for Diplomatic and National Defence, along with officials from the Ministry of Foreign Affairs stationed in Canada, visited the high–level radioactive laboratory and plasma R&D facilities at INER and participated in a symposium exchange.
April 17 to June 2	The NSC inspected the 2023 integrated drill for the dry storage facilities at the Chinshan NPP.

Date	Major Events
April 19 to 21	The “2023 Taiwan–France Radiation Protection and Nuclear Energy Safety Exchange” meeting was held in Taiwan. On April 21, the French Institute for Radiation Protection and Nuclear Safety (IRSN) visited several laboratories at INER and participated in a symposium exchange.
April 20	The NSC reviewed and approved the ten–year reassessment report for the disassembly plant at INER's Building 074.
April 26	The NSC implemented a site visit on the Chinshan NPP's decommissioning and dry storage facilities.
April 28, May 8, August 8 and September 23	Completed the following reports: The Q4 2022 “Quarterly Report on Environmental Radiation Monitoring of Nuclear Facilities in the Taiwan Area”. The “Annual Report 2022 on Environmental Radiation Monitoring of Nuclear Facilities in the Taiwan Area”. The Q1 to Q3 2023 “Quarterly Reports on Environmental Radiation Monitoring of Nuclear Facilities in the Taiwan Area”. These reports were sent to relevant units and government publication sales outlets and were published online.
April 28, August 18 and December 15	Convened three meetings of the 18 th Ionizing Radiation Safety Advisory Board.
April 30 to May 1 and August 12 to 13	Organized atomic energy science exhibitions in Taichung and Hualien to enhance public understanding of atomic energy through face–to–face communication. The two events attracted a total of 7,746 visitors.
May 6 and October 28	Organized the first and second sessions of the 2023 “Certification Examination for Radiation Protection Professionals and Radiation Operators on Radiation Safety.
May 9 to 12, October 16 to 20 and December 11	Collaborated on training for “Nuclear Cybersecurity Technical Exchange Workshop”, “Workshop on Response Force Assessment Technical Exchange”, and “Unmanned Aircraft System and Counter–UAS Technical Exchange” with the U.S. Department of Energy (DOE/ NNSA).
May 10	Tina Wilson, Business Representative of the New Zealand Commerce and Industry Office (NZCIO), along with representatives from New Zealand BioForestry, Tupu Angitu, New Zealand Forest Managers, and the Chairman of Johnson Company's forestry division, 14 people in total, visited INER. The main focus of the visit was on INER's FixCarbon technology.
May 10 to 11	NSC implemented the 2023 Environmental Parallel Monitoring Program for Lanyu Island.
May 11	NSC implemented the review and site inspection meeting for uranium hexafluoride transportation at INER.



Date	Major Events
May 15	Completed the “2022 Report on Enhanced Radiation Monitoring and Assessment of Imported Food” to serve as a reference for future sampling and monitoring.
May 3 to 4, May 16 to 17, June 7 to 9, August 29, October 13 and September 14 to 15, November 16 to 30	<p>Training Summary of the Nuclear Emergency Radiation Monitoring and Dose Assessment Center in Southern Taiwan includes:</p> <p>Operation of aerial radiation detection instrumentation, and onboard simulation training, with a total of 17 participants.</p> <p>Aerial detection flight training at the Aviation and Special Forces Command, with a total of 25 participants.</p> <p>Basic training and retraining for responders, with a total of 65 participants.</p> <p>Terrestrial radiation detection training in land areas of Taiwan, with 18 participants.</p> <p>Marine radiation detection and sampling training in marine areas of Taiwan, with 14 participants.</p> <p>Aerial detection flight training using newly procured Nuclear Instrument Module (NIM) equipment with the National Airborne Service Corps, with 23 participants.</p> <p>AVID software operation and Radiation Dose Assessment System operation, with 17 participants.</p>
May 17 and November 15	Convened two meetings of the 2023 Nuclear Power Plant Decommissioning Regulation.
May 18	The NSC organized the 2023 Examination for Operators of Radioactive Waste Treatment Facilities.
May 23 and June 1	Organized “Targeted Science Education Activities” at Wanli Junior High School and Jinshan High School in New Taipei City. Provided schools in emergency response areas with a science curriculum on nuclear emergency response, nuclear power plant decommissioning, and nuclear waste management.
May 24	Organized the 2022 Results Presentation Conference for the “Research Projects Commissioned by the Atomic Energy Council, Executive Yuan”, featuring 49 projects across 6 sessions. The event was attended by 273 participants from industry, academia, and research institutions.
May 29	The Legislative Yuan passed the NSC Organization Act and the Act for the Establishment of the NARI on the third reading.
May 29, August 28 and December 20	NSC convened first to third meetings of the 8 th Advisory Committee on Radioactive Materials Safety.

Date	Major Events
May 30, June 17, July 3, July 10, August 9, August 28, August 29 to September 15	<p>Summary of Fix for the D08 Anchor Bolt Repair at the Kuosheng NPP Unit 1:</p> <p>Convened a meeting to explain the fracture incident of the D08 anchor bolt on the support skirt clearance of the reactor at the Kuosheng NPP Unit 1.</p> <p>Sent the first review comments to the TPC on the "Inspection Results and Subsequent Planning for the D08 Anchor Bolt on the Reactor Support Skirt Clearance at the Kuosheng NPP Unit 1".</p> <p>Convened a meeting to explain the inspection results and subsequent planning for the D08 anchor bolt on the reactor support skirt at the Kuosheng NPP Unit 1.</p> <p>Sent the second review comments to the TPC regarding the "Inspection Results and Subsequent Planning for the D08 Anchor Bolt on the Reactor Support Skirt at the Kuosheng NPP Unit 1".</p> <p>Sent review comments to the TPC on the "R1 Version of the Inspection Results and Subsequent Planning for the D08 Anchor Bolt on the Reactor Support Skirt at the Kuosheng NPP Unit 1".</p> <p>Approved the TPC's responses and revised plan regarding the review comments for the "R1 Version of the Inspection Results and Subsequent Planning for the D08 Anchor Bolt on the Reactor Support Skirt at the Kuosheng NPP Unit 1".</p> <p>Conducted a special inspection of the D08 anchor bolt repair work at the Kuosheng NPP Unit 1.</p>
May 31, July 4 and July 4	Conducted the annual visits and inspections at the Maanshan, Chinshan, and Kuosheng NPPs.
June 1	Performed annual training for the Radiological Emergency Response Team.
June 5	Deputy Director Ming-Chi Lu of the Taoyuan City Environmental Protection Bureau, together with 5 councilors from the City Council including Mr. Chih-Wen Chen, Ms. Hsien-Lien Wang, Mr. Ching-Ping Huang, Mr. Pei-Chen Yu, Mr. Tao Ling, and secretaries from their offices in a total of 30 people, visited INER for discussions regarding the current status of LLW storage. A technical tour in INER was arranged.
June 7	Published the country's "2022 Annual Statistical Report on Occupational Radiation Exposure in Taiwan".
June 7	Issued the revised provisions for Article 2 and Article 3 of the "Fee-Charging Standards for Radiation Monitoring Center, Nuclear Safety Commission, Executive Yuan".
June 7 and November 24	Completed the semi-annual reports for the "Radioactive Fallout and Food Investigation" for the second half of 2022 and the first half of 2023. The reports were sent to all relevant units and government publications exhibitions and sales outlets and were also published online.
June 9	Reviewed the Decommissioning Plan (2023 Edition) for the TRR and the Zero Power Reactor at Lungtan (ZPRL) facilities at the INER.



Date	Major Events
June 12 to 17	The third expert observer group was organized to visit the Fukushima Daiichi Nuclear Power Plant (TEPCO) in Tokyo, Japan. The group observed the status of the facilities and operations related to the discharge of "ALPS treated water". Additionally, they visited relevant test laboratories and units to engage in technical and informational exchanges.
June 13 and December 28	Two meetings of the "2023 Committee on Public Participation" were convened.
June 14	The NSC reviewed and approved the "Safety Assessment Report for the TRR Waste Ion Exchange Resin Stabilizing Equipment in the INER's 012 Building".
June 14 to December 8	The "Taiwan Environmental Radiation Mapping Project" for background radiation data was carried out from June 14 to November 16. A total of 208 fixed-point background radiation detections were completed, and vehicle-mounted radiation detection results were obtained for 31 routes. The final project report was approved on December 8.
June 14 to 16	Participated in the "32 nd Taiwan–Japan Comparative Analysis of Radioactivity" conference and facility visit.
June 15	Added new governmental open data dataset: "Survey of Soil Radioactive Content in Taiwan".
June 15	The IAEA published the "Safeguards Statement for 2022", declaring Taiwan as a country where "all nuclear materials have been used for peaceful purposes" for the 17 th consecutive year.
June 17	Hosted the 2022 "Atomic Science Collaborative Research Program" Results Presentation Conference.
June 18 to 25	Participated in the "2023 Taiwan–US Bilateral Nuclear Safety Regulation Technical Exchange" Meeting.
June 20	Reported to the Executive Yuan on the "Government's Response Measures for the Discharge of Tritium-Contaminated Wastewater from the Fukushima Daiichi Nuclear Power Plant".
June 26	The NSC reviewed and approved the 10-Year Reassessment Report for the Nuclear Materials and Fuel Storage Facility at Building 020, INER.
June 28	NSC reviewed and approved the 10-Year Reassessment Report for the Nuclear Materials and Fuel Storage Facility at Buildings 036A/K/U, INER.
June 28	Amendments to the "Nuclear Emergency Response Act" were issued.

Date	Major Events
June 28 and December 27	Convened two meetings of the "2023 Nuclear Safety Regulation".
June 29	NSC conducted a hearing for the construction license application of the "Low-Level Radioactive Waste Storage Facility for decommissioning at the Chinshan NPP" submitted by Taiwan Power Company.
June 29	The basic design report of the "70 MeV Medium-sized Cyclotron Building New Construction Project" has been approved by the Engineering Committee.
June 29	The "Radiological Emergency Response Plan" has been approved by the 48 th Central Emergency Operations Center (CEOC) meeting.
July 1	Announced the amendments to the "Standards for Medical Exposure Quality Assurance" and the "Measures for the Administration of the Establishment of Medical Exposure Quality Assurance Organizations and Professionals and the Entrustment of Relevant Institutions". These amendments include incorporating x-ray machines used for cardiac catheterization or angiography into the scope.
July 1 and September 10	Conducted unannounced mobilization and communication tests not at the business hours for the emergency response organizations at the Chinshan NPP and Kuosheng NPP separately.
July 4	Organized the "2022 Gamma Comparison Experiment for the Radionuclides in Foods Testing Laboratory" seminar. Participating organizations included: <ul style="list-style-type: none"> • Central Center for Regional Administration, Taiwan Food and Drug Administration, Ministry of Health and Welfare • Public Health Inspection Division, Department of Health, New Taipei City Government • Office of Food and Drug Safety, Health Bureau, Taichung City Government • Laboratory Center, Public Health Bureau, Tainan City Government • Laboratory Medicine, Department of Health, Kaohsiung City Government • Radioactivity Analysis Backup Laboratory, Science and Technology Center for Disaster Reduction, National Pingtung University of Science and Technology • A total of 20 participants attended.
July 6, September 12 and November 2 to 3	Conducted inspections of emergency response plan exercise for the nuclear reactor facility at the Chinshan, Maanshan, and Kuosheng NPPs.
July 17 and November 28	Completed the "Analysis Results of Radioactive Content in Tap Water Samples for Lienchiang County Water Supply Plant" for the first and second halves of 2023, with a total of 19 samples each half-year. The results were sent to the Lienchiang County Water Supply Plant.



Date	Major Events
July 19	Approved the report by Taiwan Power Company on the "Analysis and Planning of Emergency Response Measures for Public Protection in the Emergency Response Zones at the Chinshan, Kuosheng and Maanshan Nuclear Power Plants".
July 19 and December 19	Convened two meetings of the "Safety Regulation Project Team for Nuclear Power Plant Decommissioning".
July 22	The "2023 Symposium on the Development of Nuclear Medicine and Molecular Imaging Applications" was held at the Taipei University of Technology, featuring 8 keynote speeches. The total number of attendees was 220, including 100 in-person and 120 online participants.
July 25	Participated in the radiation projectile (dirty bomb) response drill of the Tainan Min-An No.9 Drill.
July 31 to August 4	Conducted the inspection of the "Nuclear Power Plant Decommissioning Period Task Management Project".
July to September	Executed administrative inspections for the personal data file security maintenance at 13 ionizing radiation equipment manufacturing enterprises nationwide.
August 4	NSC reviewed and approved the safety assessment report of the NO.1 low-level radioactive waste storage facility during the decommissioning period at the Kuosheng NPP.
August 9 and December 5	Completed the analysis results of 28 water samples for radioactive content from the Taipei Water Department affiliated Purification Plant for the first and second halves of 2023, and sent the results to the Taipei Water Department.
August 10 to 13, August 23 to 26	Organized popular science hands-on activities in Taichung City and New Taipei City. Science short films and hands-on activities provided disadvantaged students with opportunities to learn about atomic energy. A total of 365 participants attended the two events.
August 16, 26 and 30	Conducted the second unannounced inspection at the Kuosheng, Maanshan, and Chinshan NPPs in 2023.
August 17	Conducted the 2023 No. 29 Table-Top Exercise of the Nuclear Emergency Drill.
August 21	Minister without Portfolio of Executive Yuan Mr. Ching-Sen Chang led officials from the Office of Energy and Carbon Reduction, the Ministry of Agriculture, the Ministry of Economic Affairs, the National Science Council, the Ocean Affairs Council, and the Environmental Protection Administration in visiting 9 key research and development facilities at INER.

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August 24	Completed the "TW-ORIS" ocean dispersion warning and analysis system. Since the start of ALPS treated water discharge from Japan, the system has been tracking and daily forecasting impacts on Taiwan's maritime areas.
August 24	The "FixCarbon Technology: Carbon-Negative Bioplastics from Afforestation" was awarded the 2023 R&D 100 Awards and has received this honor for three consecutive years.
August 24, November 10 and 23	Participated in the "9 th Calibration Proficiency Testing Seminar for Radiation Detection Instruments" organized by the National Radiation Standard Laboratory (NRSL) of the NARI.
August 25	The Chi-Peng Lectures invited Chi-Huey Wong, Academician of Academia Sinica, to deliver a lecture titled "Glycoscience in the Development of Precision Medicine". Additionally, a visit was made to four facilities, including the Division of Nuclear Pharmaceuticals at the INER.
August 31	At the Executive Yuan meeting, reported on the "Government's Response to the Discharge of ALPS treated water from the Fukushima Daiichi NPP". This included an explanation of the government's response plan and measures taken.
August 31	In response to the government organizational restructuring, presented a slide presentation to Premier Chien-Jen Chen on the "Future Operational Planning of the Nuclear Safety Commission and the National Atomic Research Institute", detailing relevant business operations and showcasing research and development capacity.
August 31	The INER won the National Science and Technology Council (NSTC) "2023 Future Tech Award" for their technology on "Design and Low-Carbon Mass-Production Solution-Coated Fabrication of Flexible Semitransparent Organic Photovoltaic Modules".
September 5	The "2023 Biomass Energy Net Zero Emissions Technology Application Seminar" was held at the IEAT Conference Center in Taipei. The seminar included 5 keynote speeches and was attended by a total of 53 people.
September 5 to 8	The 2023 International Advisory Meeting on Neutron Science in Taiwan was held, inviting five renowned neutron facility experts from abroad, including NIST and ORNL from the United States, RIKEN from Japan, and ISIS from the United Kingdom. Domestic experts and scholars from TSMC, China Steel Corporation, Synchrotron Radiation Research Center, Central University, and Tsing Hua University also participated in the discussions. The entire conference had a total of 50 participants.



Date	Major Events
September 6 to 15, September 9 to 22, September 18 to October 5	Conducted the 2023 Advanced Specialized On-the-Job Training for Nuclear Power Plant Inspectors, including retraining for main testers and resident inspectors at the Chinshan NPP and retraining for main testers and resident inspectors at the Kuosheng NPP.
September 12 to 14	Conducted the 2023 No.29 Field Exercise of the Nuclear Emergency Drill at the Kuosheng NPP and the surrounding area.
September 13	Conducted an inspection of full-scale nuclear security and anti-terrorism drills at the Kuosheng NPP.
September 16	Hosted the 2023 "Community Gathering for Residents of Radioactively Contaminated Buildings" at Taipei City Hospital Renai Branch.
September 19	NSC approved the Spent Nuclear Fuel Final Disposal Plan (2022 Revised Version)
September 19	Convened a consultation meeting with experts on amendments to the Atomic Energy Act
September 23	Revised and issued the "Operational Guidelines for the Nuclear Emergency Radiation Monitoring Center and Dose Assessment Center".
September 23 to December 11	In response to government organizational reform, updated the bulletin boards at 41 of the 63 nationwide monitoring stations.
September 25	Published the country's "2022 Annual Statistical Report on the Application and Management of Ionizing Radiation".
September 27	The NSC was officially inaugurated. During the ceremony, which was witnessed by Premier Chien-Jen Chen and several distinguished guests, Dr. Tong-Yang Chen was formally appointed as the first Chairperson of the NSC.
September 27	In response to the organizational reform of government administrations, the NSC completed the update and transition of its information and communication system, as well as the transfer of email accounts and correspondence, ensuring a smooth transition.
September 27	The INER has been restructured into Taiwan's 11 th incorporated administrative agency, renamed the NARI. The first chairman is Dr. Hsin Chang, Deputy Chairperson of the NSC.
October 1 to 30	Conducted the home visit program in Keelung City's EPZ as part of the emergency preparedness plan.
October 13	Convened the "2023 Technical Meeting on Nuclear Safeguards".

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October 18	A group of 39 individuals from the Department of Medical Imaging and Radiology at Shu–Zen Junior College of Medicine and Management visited the RMC.
October 19, 24, 26 and 31	Organized the “Radiation Disaster Prevention and Rescue Workshops for Local Governments” in northern, central, southern, and eastern Taiwan.
October 30 to 31	Convened the “9 th NSC–NRA Nuclear Regulatory Information Exchange Meeting” in Tokyo, Japan.
October 31 and December 26	Convened two meetings of the Nuclear Safety Commission.
November 6 to 10	Assisted and participated in the U.S. Department of Energy and FBI's Radiation Detection and Investigation Technology (RDIT) workshop held in Kaohsiung. The workshop involved inter–agency joint training with the National Security Bureau (NSB), prosecution investigators, police, fire service, and customs. The training covered topics including emergency response to radiation crimes, digital forensics, and forensic science.
November 7, 14 and 28	Convened three sessions of the “2023 Radiation Safety Briefings for the Radiographic Inspection Operators” in northern, central, and southern Taiwan.
November 14	Passed the 2023 IAEA proficiency tests, including gamma nuclides, gross beta, tritium, and strontium–90.
November 17 and December 13	Conducted an inspection of unscripted table–top nuclear security and anti–terrorism exercises at the Chinshan and Maanshan NPP.
November 20	The National Report of the Republic of China for the Convention on Nuclear Safety 2023 (Chinese version) was added to the “International Convention on Nuclear Safety” webpage.
November 21	NSC conducted an inspection of the transportation for the components of the dry storage casks at the Kuosheng NPP.
November 21 and 28	Conducted two sessions of “2023 Advanced Training for Emergency Response Officers and Decision Makers for Nuclear Accidents” in northern and southern Taiwan.



Date	Major Events
November 22	Convened the “34 th Sino–Japanese Modern Engineering and Technology Symposium on Nuclear Energy Group A” meeting, inviting Japan's Hideki Tsuji, Principal Investigator from the Fukushima District Joint Research Center, NIES, to share technical insights on the topic “Dynamic Distribution of Radioactive Cesium in Rivers, Dams, and Lakes”. Participating institutions included the Radioactivity Analysis Backup Laboratory at the Science and Technology Center for Disaster Reduction, the National Pingtung University of Science and Technology (NPUST), Tsing Hua University, and the Radiation Laboratory at the TPC.
November 27	Convened the 56 th Meeting on “Radiation Protection and Regulation for Nuclear Facilities”.
November 28, December 7 and 14	Conducted the 3 rd unannounced inspection at the Maanshan, Kuosheng, and the Chinshan NPPs in 2023.
November 30	Organized the "Radiation Safety Education Propaganda Meeting for Air Crews”.
December 4 to 5	Held the "2023 Taiwan–US Civil Nuclear Cooperation Meeting" in Taipei.
December 6	Hosted the "Seminar on Real–time Forecasting of Radioactive Material Dispersion and Safety Assessment Technologies in National Waters”.
December 13 to 14	In collaboration with Kaohsiung Customs and the U.S. Department of Energy's National Nuclear Security Administration (NNSA), hosted the "2023 Megaports Initiative Workshop and Educational Training on Radiation Incident Response and Management". The workshop focused on improving detection techniques under the Megaports Initiative, with participants including Kaohsiung Customs detection personnel and members of the Radiation Emergency Response Team (composed of NSC, its affiliated agencies, and NARI).
December 26	Hosted the "2023 Atomic Energy Safety Outstanding Awards and Outstanding Contribution to Research and Development of Radioactive Materials and Safe Operation Awards" ceremony.

Nuclear Safety Commission

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