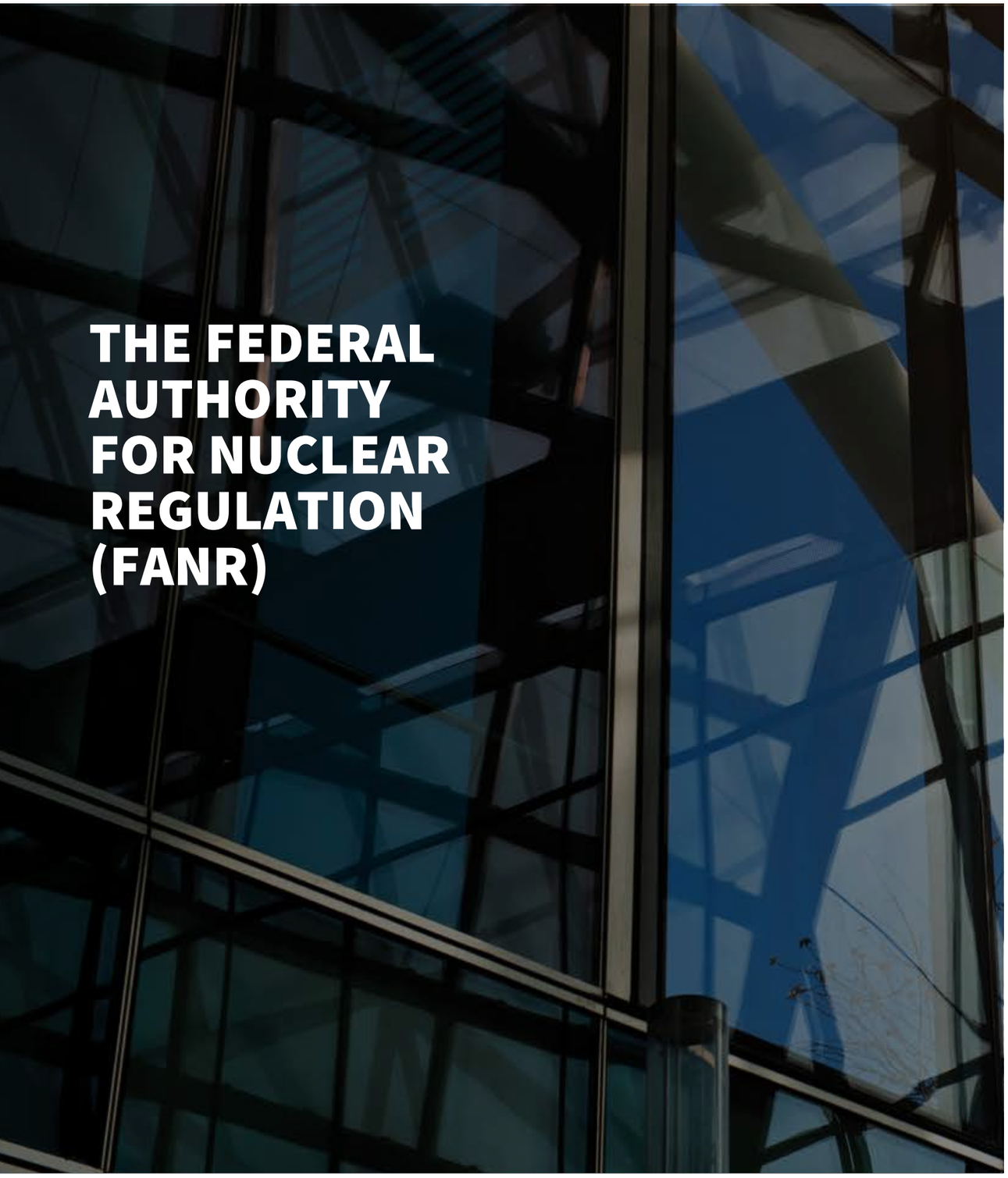
FANR
الهيئة الاتحادية للرقابة النووية
Federal Authority for Nuclear Regulation

United Arab Emirates

2021 ANNUAL REPORT

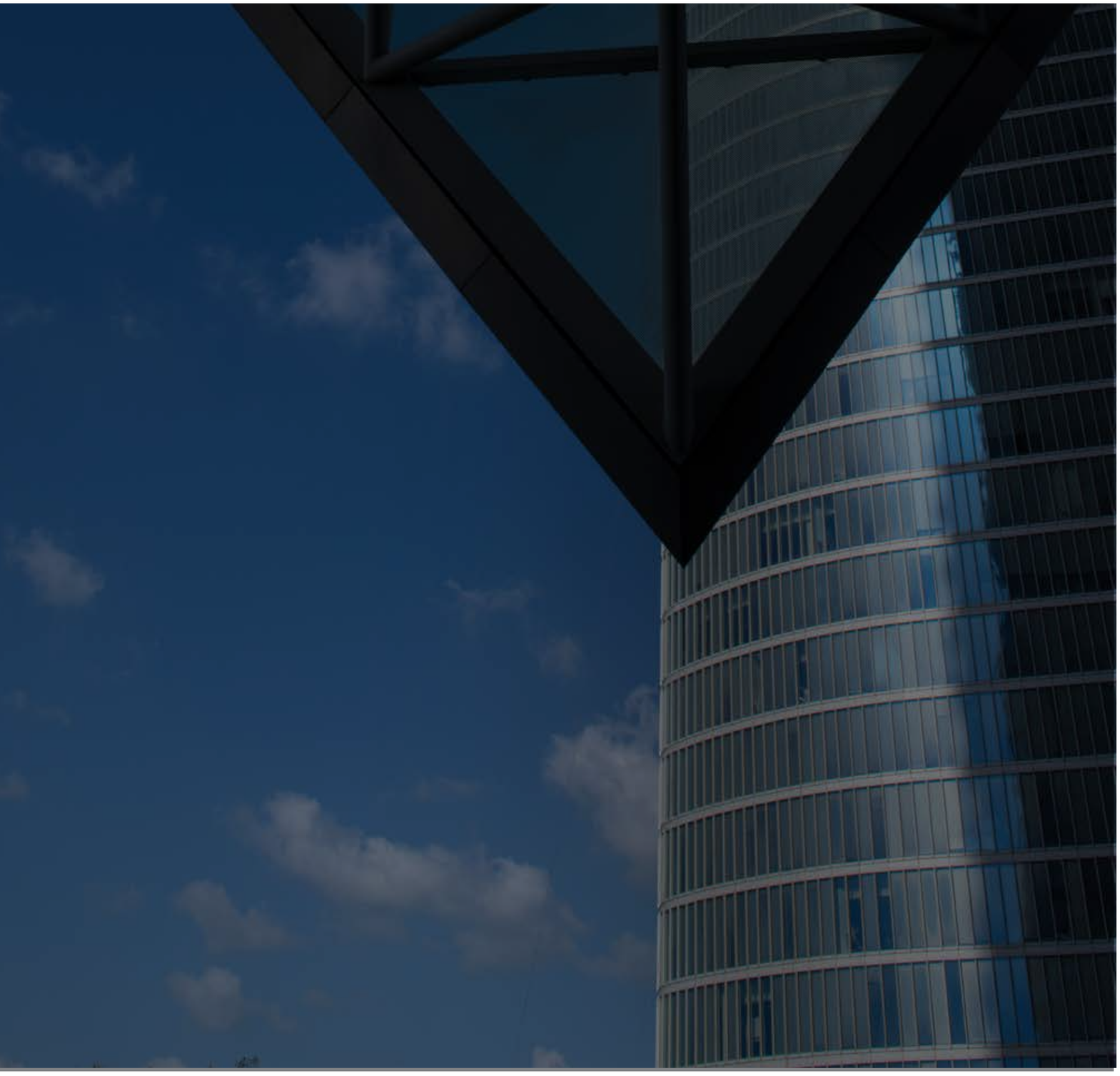
Federal Authority | هيئة اتحادية

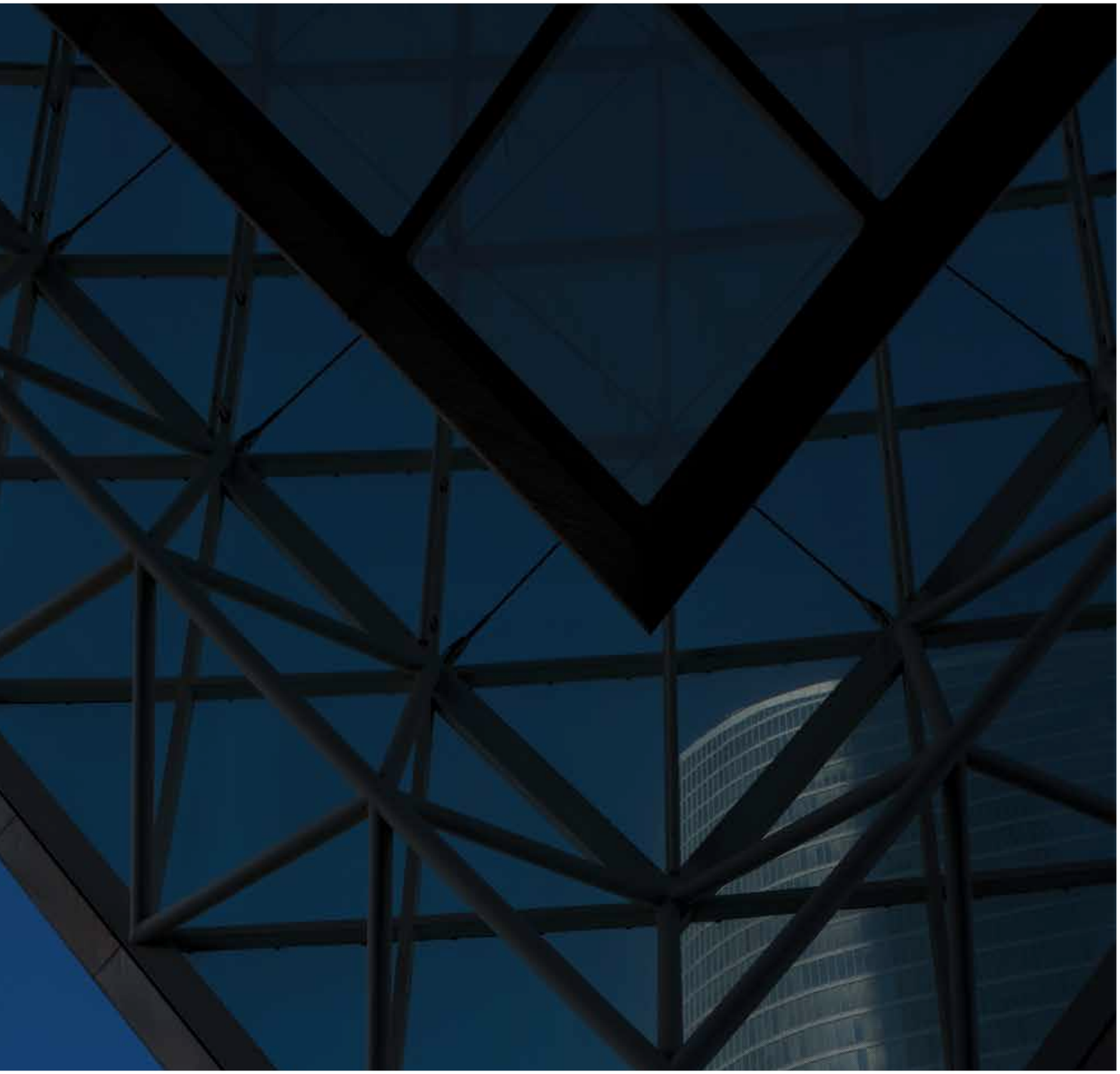


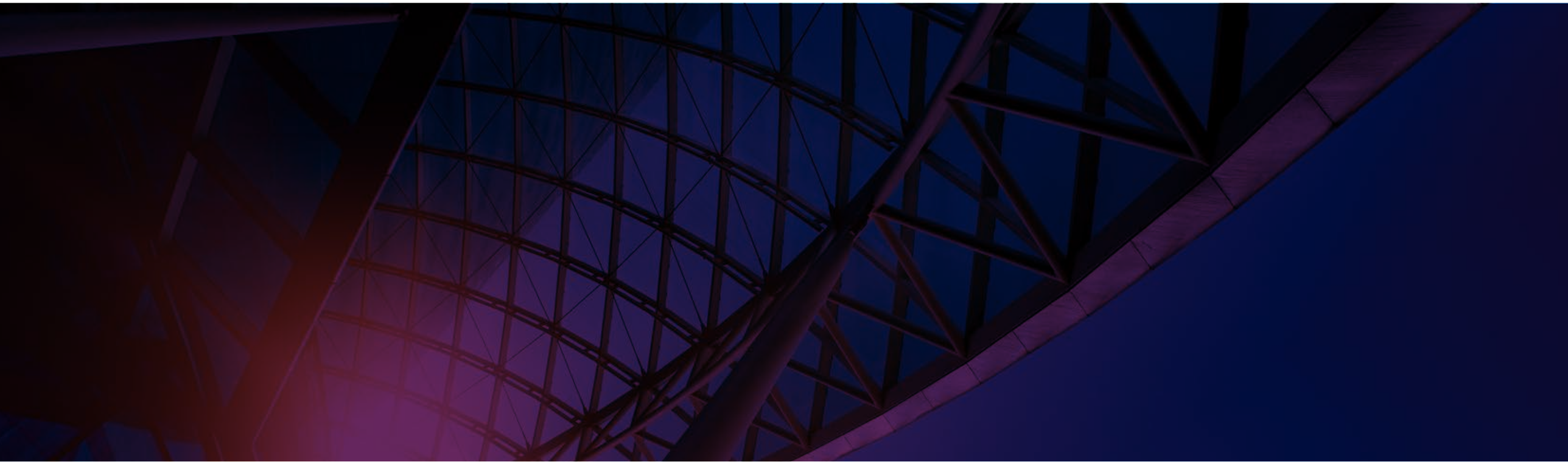
THE FEDERAL AUTHORITY FOR NUCLEAR REGULATION (FANR)

was established in 2009 with the goal of contributing to the future growth and prosperity of the United Arab Emirates (UAE) and its people by meeting the highest standards of nuclear safety, security, and safeguards. Throughout the 12 years since its inception, FANR has successfully fulfilled its mandate to ensure the safe, secure, and peaceful use of nuclear energy and radiation sources in the UAE.

Each year, a FANR Annual Report is submitted to the Minister of Presidential Affairs pursuant to Article 11 of the Federal Law by Decree No. (6) of 2009 Concerning the Peaceful Uses of Nuclear Energy. This Annual Report highlights activities and achievements of FANR during the 12-month period ending on 31 December 2021.







01.

2021 OVERVIEW

MESSAGE FROM THE CHAIRMAN OF FANR BOARD OF MANAGEMENT

2021 WAS ANOTHER REMARKABLE YEAR FOR THE UAE.

2021 was another remarkable year for the UAE. The government celebrated the nation's Golden Jubilee, announced the preparations for the next 50 years, and declared the UAE Net Zero by 2050 Strategic Initiative, a national drive to achieve net-zero emissions by 2050 supporting the UAE's efforts to combat climate change. FANR fully supports the UAE government's mandate to protect the environment.

During the year, FANR maintained its mandate to ensure the peaceful, safe, and secure use of nuclear energy and radiation sources alongside the sustainable development of the UAE's regulatory infrastructure.

It is my pleasure to share this Annual Report, which details FANR's main achievements for the review period. FANR robustly carried out its regulatory oversight responsibilities while issuing the Operating Licence for the Barakah Nuclear Power Plant (NPP) Unit 2, including supervising all testing phases. Also, the Barakah NPP Unit 1 became commercially operational, making the UAE the first Arab country to operate a nuclear power plant. The Barakah NPP is our top priority, as it will contribute to the UAE's energy grid and meet our beloved country's ambitions to diversify energy sources. It is FANR's mission to ensure that the Barakah NPP is built safely and securely, and operates safely, securely, and peacefully.

By hosting the largest nuclear emergency exercise of the International Atomic Energy Agency (IAEA) in October 2021 (ConvEx-3), FANR demonstrated, along with its national and international stakeholder, a strong preparedness and response system to address a nuclear or radiological emergency. The participation of over 75 countries, 111 international laboratories, and 12 international organisations, as well as all the national emergency centres, ConvEx-3, confirmed the importance and scale of the exercise.

FANR role as a regulator requires extensive knowledge and expertise. Hence, we are proud to have qualified Emirati nuclear experts working side-by-side with FANR's foreign experts in nuclear safety, nuclear security, radiation safety and nuclear non-proliferation. We place substantial emphasis on research and development, and work diligently with national and international partners to build together a robust regulatory framework to ensure that our Emirati experts are ready to lead the regulation of the nuclear industry in the UAE.

H.E. ABDULLA AL SUWAIDI
Chairman of the Board of Management of FANR

MESSAGE FROM FANR DIRECTOR GENERAL

THROUGHOUT 2021, FANR CONTINUED TO PURSUE ITS VISION TO BE A GLOBALLY RECOGNISED NUCLEAR REGULATOR BY PROVIDING THOROUGH OVERSIGHT OF THE UAE'S NUCLEAR AND RADIOLOGICAL SECTORS.

FANR has built a rigorous regulatory infrastructure that supports its mission to protect the public and the environment and ensure the safe, secure, and peaceful nature of all nuclear activities in the country.

In March 2021, FANR marked another historic milestone by issuing an Operating Licence for the Barakah NPP Unit 2. The licence, issued for a duration of 60 years, authorised Nawah Energy Company (Nawah) to commission and operate that unit. This milestone marked the culmination of FANR's efforts since receiving in 2015 the Operating Licence Application for Unit 1 and Unit 2 from the Emirates Nuclear Energy Corporation (ENEC) on behalf of Nawah. FANR followed a systematic review process that included a thorough assessment of the application documentation, robust regulatory oversight, and inspections. Meanwhile, the Barakah NPP Unit 1 became commercially operational in April 2021, following equally robust testing and oversight by FANR. Our regulatory work at the Barakah NPP is on-going to ensure its safety and security, as well as delivering on FANR's commitment to the community

In nuclear non-proliferation, FANR continued to fulfil its mission, as mandated by UAE nuclear law, to regulate the nation's nuclear sector for peaceful purposes. We carried out over 70 safeguards-related inspections (including five at the Barakah NPP), and 85 import/export control inspections, ensuring compliance with FANR regulations. FANR issued 24 nuclear-regulated import and export licences.

Protecting the public and the environment is at the core of FANR's mandate. Hence FANR is leading the Radiation Protection Committee (RPC) to develop an integrated strategy for radiation protection in the UAE. The RPC provides a platform for cooperation on radiation protection matters, ensuring the necessary infrastructure to support regulatory decisions. In 2021, as part of creating a national database of qualified experts in radiation protection, FANR recognised 18 experts in advisory roles for entities and private companies working with sources of ionizing radiation.

Another aspect of FANR's mandate is measuring and monitoring radiation levels to ensure a safe level in the UAE environment. We achieve this through our 18 radioactivity monitoring stations across the UAE, and our Environmental Monitoring Laboratory.

As part of our regulatory mission to license and inspect facilities that use radiation sources, we carried out 300 inspections for medical and non-medical purposes. FANR issued a total of 1,279 licences and 1,404 import/export radiation source permits in 2021.

FANR efforts to boost research and development capability continued during the period covered by this report. We worked closely with the French Institute for Radiological Protection and Nuclear Safety to enhance FANR's capacity to estimate and measure movements of radionuclides in the environment. We also worked with the Organisation for Economic Co-operation and Development on accident management knowledge in power plants.

Building Emirati capability in the nuclear regulatory sector has always been, and still is, a priority for FANR, to ensure the sustainability of our regulatory mandate. In 2021, we qualified an additional 14 inspectors as part of FANR Inspectors Qualification Programme. This raised the number of qualified inspectors carrying out licensee inspections across the country to more than 80. We are proud that two female employees obtained post-graduate degrees (Master's and PhD) in nuclear engineering. A third female completed a nine-month intensive safeguards training programme at the IAEA, paving the way to become the first Emirati female international nuclear non-proliferation inspector.

We started intensive work on developing FANR's 2023-2026 strategy, detailing our future roadmap in regulating the UAE's nuclear and radiological sectors. The strategy will focus on waste management, research and development, the regulatory framework, strategic national and international cooperation, as well as other regulatory matters.

CHRISTER VIKTORSSON
FANR Director General

ACHIEVEMENTS IN 2021

We are proud to have achieved several noteworthy milestones during the year under review:

INTERNATIONAL ATOMIC ENERGY AGENCY CONVEX-3 "BARAKAH UAE" – CONVEX-3

is one of the world's most complex exercises, taking place every three to five (3-5) years to evaluate the response capabilities and early notification of international emergencies in cases of nuclear or radiological emergencies, according to international emergency conventions. Over **75 countries and 12 international organisations** participated in the exercise, which FANR facilitated successfully under the IAEA supervision. Essentially, the exercise demonstrated the UAE's readiness and capability to deal with unusual situations in cases of nuclear and radiological emergencies.

MORE THAN 475 INSPECTIONS

FANR inspectors conducted **40 inspections** at the Barakah NPP (covering nuclear safety, security, and non-proliferation); **301 inspections** of medical and non-medical activities and facilities (announced, unannounced and reactive inspections); **70 safeguards-related inspections** (including five at the Barakah NPP); **85 import/export** control inspections; and **64 inspections** of licensee facilities using radioactive material.

OVER 2,680 LICENCES AND PERMITS

FANR issued **1,279 licences** (comprising 290 new licences, 611 renewed licence, and 378 amended licences), while 23 licences were surrendered by licensees; **1,404 radiation source permits** (980 import, 424 export) were granted. FANR also introduced FANR-REG-29, **"Registration and Licensing of Radiation Sources"**, which is a new regulation and authorization process for the planning, conducting, modification and termination of regulated activities in facilities using radiation sources.

ENHANCED LICENSING PROCESS

FANR introduced a web-based service offering prompt approval for diagnostic radiology to support the UAE health sector's efforts to halt the spread of COVID-19 by establishing screening centres, complemented by published FANR advice on using mobile medical X-ray equipment outside licensed facilities. The web-based service is available to all FANR licensees as part of our everyday operations. More than **40 requests** were received during the review period, leading to **65 radiation generators** being approved for exclusive use in combating the pandemic.

COMPREHENSIVE ENVIRONMENTAL MONITORING

FANR Environmental Monitoring Laboratory continued to monitor radioactivity levels in the UAE environment from the samples and findings collected from **18 gamma** monitoring stations across the country. More than **250 samples** of water, soil, sediment, air, and vegetation were collected and analysed during the year. FANR also reviewed and assessed licensees' environmental monitoring reports and analysed material transported across the UAE borders.

02.

ABOUT FANR

OUR STRATEGY

FANR was established in September 2009 as the regulator of the nuclear sector in the UAE, pursuant to Federal Law by Decree No. (6) of 2009 Concerning the Peaceful Uses of Nuclear Energy. FANR is proud to fulfil its mandate to protect the country's public, workers and the environment through our vision, mission, and core values.

OUR VISION

To be globally recognised
as a leading nuclear regulator

OUR MISSION

To protect the public and the environment from the harmful effects of ionizing radiation and to ensure the exclusively peaceful use of nuclear energy in an integrated manner with the concerned authorities and according to international best practices as well as capacity building of Emiratis in the nuclear field and various technical fields.

OUR CORE VALUES

- Safety Culture
- Transparency
- Collaboration
- Independence
- Excellence

OUR BOARD OF MANAGEMENT

FANR Board of Management (BoM) is our decision-making body, comprising members appointed pursuant to a resolution of the UAE Cabinet. The Board of Management sanctions and implements vital decisions that impact the overall performance of FANR.

H.E. Abdulla Al Suwaidi
Chairman

H.E. Ambassador Hamad Ali Al Kaabi
Deputy Chairman

H.E. Mrs Razan Khalifa Al Mubarak
Member

H.E. Dr Abdul Qader Ebrahim Alkhayat
Member

H.E. Dr Ali Mohamed Shaheen Ahmed
Member

H.E. Mr Yousif Ahmed Al Ali
Member

H.E. Mr Yousef Abdulrahman Al Nuaimi
Member

OUR ORGANISATIONAL STRUCTURE

FANR organisational structure is designed to allow for our mandate to be implemented, ensuring that the highest standards of nuclear and radiological safety, security and non-proliferation are achieved in the UAE.

FANR HAS TWO DIVISIONS:

ADMINISTRATION

The Legal Affairs Department and Corporate Development Department fall under FANR Director General's Office.

OPERATIONS

The Internal Audit Department, which is an independent function established to evaluate the adequacy and effectiveness of FANR controls, systems, policies, and procedures, comes under the auspices of the BoM's Audit and Risk Committee (ARC).

03.

BARAKAH NUCLEAR POWER PLANT

LICENCES AND ASSESSMENTS
INSPECTIONS
OPERATIONAL TRAINING

LICENCES AND ASSESSMENTS

During 2021, FANR completed the review and assessment of Nawah's licence application to operate the Barakah NPP Unit 2.

THE PROCESS INCLUDED **A COMPREHENSIVE PROGRAMME OF INSPECTIONS**

to support the findings that the unit had been constructed in accordance with FANR requirements and to confirm Nawah's readiness to operate the unit. FANR issued license for the operation of Unit 2 of the Barakah Nuclear Power Plant in March 2021.

FANR also completed the review and assessment of Nawah's licence application to handle and store unirradiated nuclear fuel at the Barakah NPP Unit 3.

THE REVIEW AND ASSESSMENT PROCESS INCLUDED **INSPECTING THE UNIT'S FUEL HANDLING AND STORAGE AREA AS WELL AS NAWAH'S CAPABILITY AND READINESS**

to receive unirradiated nuclear fuel. The licence for handling and storage of unirradiated nuclear fuel at the Barakah NPP Unit 3 was issued by FANR in October 2021.

INSPECTIONS

FANR monitored and evaluated the licensed activities at the Barakah NPP throughout the year by conducting inspections led by inspectors from FANR Headquarters as well as FANR's resident inspectors at the Barakah site. The resident inspectors' scope of work included monitoring the day-to-day construction of the plant as well as commissioning and operations activities to ensure proper and complete fulfilment of FANR regulatory requirements.

FANR inspectors also had oversight responsibility for closely monitoring and reviewing the results of the commissioning tests in **Unit 3 and Unit 4** of the Barakah NPP and the power ascension tests on **Unit 2** of the Barakah NPP.

FANR conducted **33 nuclear safety inspections** during the review period, covering site construction, commissioning, operational readiness, power ascension testing, vendor inspection activities, and operational activities.

OPERATIONAL TRAINING

To ensure the preparedness of FANR cadre for the operational phase, Emirati staff received further skills enhancement training with respect to the design and operation of the Barakah NPP. The focus fell into two primary areas:

GENERAL FUNDAMENTALS TRAINING

which included modules on the basic scientific and technical subjects related to the nuclear power plant operations, namely Reactor Theory, Fuel and Physics, Heat and Thermodynamics, and Fluid Mechanics.

STATION SYSTEMS TRAINING

which included introductory level training on plant specific systems and basic operational requirements, namely, Reactor Systems and Components, Reactor Auxiliary Systems, Safety Systems, Containment, Turbine and Auxiliary Systems, Generators and Auxiliary Systems, and Electrical Systems.

These training activities were open to all Nuclear Safety technical staff. Selected Emirati staff were then identified as **the first Class of 8 to participate in the Nawah-delivered Management Senior Reactor Operator (SRO) course**, with the objective of enhancing FANR staff competencies. The same course is delivered to Nawah staff who have no operator training, but require more detailed plant knowledge and some operational awareness.

The operational training initiative is part of FANR's internal training programme and supports our goal of ensuring that Emiratis do have the required skills and knowledge to contribute effectively to FANR's core functions.

04.

NUCLEAR SAFETY

CONSTRUCTION AND OPERATING EXPERIENCE FEEDBACK

As the UAE's nuclear regulatory body, FANR is responsible for regulating the design, siting, construction, operation, and decommissioning of all nuclear facilities in the country, including NPPs. The operator in charge of running and operating any nuclear facility holds overall and final responsibility for safety.

Fulfilling FANR responsibilities entails oversight of nuclear safety, security, and safeguards in accordance with the requirements of national and international legislation by issuing regulations and regulatory guides to implement UAE law. Our role also involves a programme of assessment, authorisation, inspection, and enforcement to ensure the operator's compliance with requirements.

In 2021, FANR Nuclear Safety conducted an in-depth review and assessment of the applications for operating licences for Unit 2 and Unit 3 of the Barakah NPP.
A licence is only granted once the applicant's proposals and commitments comply with FANR's stringent safety requirements. In March 2021, FANR Board of Management approved an Operating Licence for Barakah NPP Unit 2.

FANR has a permanent resident inspectors' office at the Barakah NPP, with five inspectors monitoring construction and commissioning activities full-time. This ensured continuous inspection of construction at the Barakah NPP Unit 3 and Unit 4. FANR inspectors also conducted inspections throughout the initial testing of the reactor at the Barakah NPP Unit 2, from fuel load to power ascension testing at 50% power. The Barakah NPP Unit 1 started commercial operation in April 2021.

CONSTRUCTION AND OPERATING EXPERIENCE FEEDBACK

**FANR's construction and operating experience feedback (COEF) programme is a core process within its Integrated Management System (IMS).
The COEF programme was established to review events worldwide, learn lessons, and implement corrective actions to avoid similar events recurring.
This provides two fundamental benefits:**

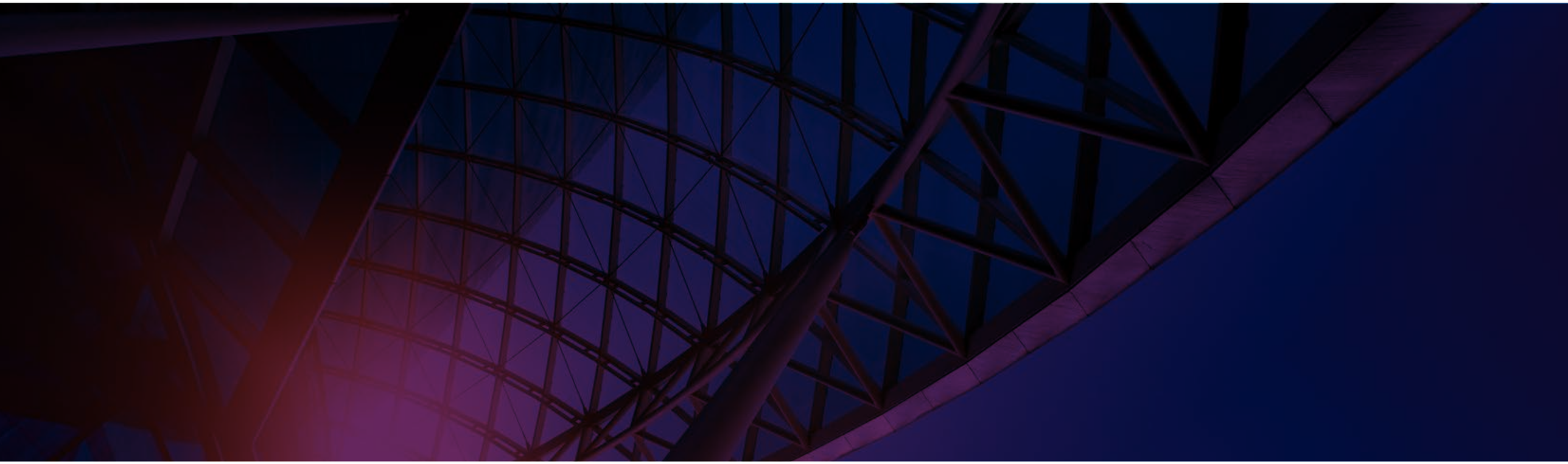
1.

Trend analysis to identify patterns in events and conditions, in turn providing intelligence to prevent the reoccurrence of undesirable events or conditions.

2.

Learning and gaining knowledge from past events in nuclear and radiological safety, security, and safeguards to prevent or minimise the risk of future events.

During the year, FANR held 11 COEF screening meetings that collectively reviewed 13 Nawah reports and 30 international reports from the International Reporting System (IRS). An international system jointly managed by the IAEA and the Nuclear Energy Agency of the Organization for Economic Cooperation and Development, the IRS enables participating countries to exchange operational experience to improve the safety of NPPs. This information is shared internally for review or action, as appropriate. To enhance the competence of Emirati staff with respect to the design and operation of the Barakah NPP, 20 FANR employees participated in COEF screening meetings to benefit from technical presentations on reviewed events.



05.

NUCLEAR SECURITY

REVISION OF FANR-REG-08

PHYSICAL PROTECTION AND TRANSPORT SECURITY PLANS

OVERSIGHT OF UNITS IN OPERATION

BUSINESS CONTINUITY MANAGEMENT

INTERNATIONAL PRESENCE

REVISION OF FANR-REG-08

The update of the regulation for Physical Protection of Nuclear Material and Nuclear Facilities FANR-REG-08 (Rev.1) began this year. The initial version focused on four main topics required to receive an IAEA International Physical Protection Advisory Services (IPPAS) mission on the construction of the Barakah NPP (2016). The revision has the following objectives:

1.

To consider the regulatory experience gained since the publication of FANR-REG-08 (Version 1), with particular regard for implementing the regulation during the construction of Unit 1 and Unit 2 of the Barakah NPP; evaluating the operating licence applications for Unit 1 and Unit 2 of the Barakah NPP; and issuing the Operating Licence for the Barakah NPP Unit 1.

2.

To further strengthen FANR's implementation of the relevant IAEA Nuclear Security Series, particularly the IAEA Nuclear Security Recommendations on the Physical Protection of Nuclear Material and Nuclear Facilities, Nuclear Security Series No. 13 (INFCIRC/Rev. 225/Revision 5).

In accordance with the process for maintaining regulations, a working group of knowledgeable FANR staff is responsible for the revision task. The first step in the process was achieved at the end of 2021, when FANR's management approved a draft of Version 2.

PHYSICAL PROTECTION AND TRANSPORT SECURITY PLANS

FANR reviewed and approved the Physical Protection Plan for Operation of the Barakah NPP Unit 2 as well as complementary documents, such as the Cyber Security Programme Manual. This was pursuant to FANR issuing the Barakah NPP Unit 2 Operating Licence in March 2021.

FANR began assessing the Physical Protection Plan for Operation of the Barakah NPP Unit 3 as well as complementary documents during the review period. This involved an on-site nuclear security inspection of the Barakah NPP Unit 3 to check that it has been built as per the requirements of the cyber security and physical protection system.

In addition, FANR reviewed the Transport Security Plans for unirradiated nuclear fuel of Unit 3 and for refuelling Unit 1 at the Barakah NPPP. Both were approved in April 2021, following the issuance of licences for transporting unirradiated nuclear fuel, and operating the Barakah NPP Unit 1.

OVERSIGHT OF UNITS IN OPERATION

To ensure the nuclear security of Unit 1 and Unit 2 of the Barakah NPP in the operational state, FANR inspectors conducted three security inspections on site (intrusion detection system, management of nuclear security event, and security organisation).

We also reviewed the regular reports on physical protection submitted by Nawah in accordance with the licence conditions for operation. These reports allow FANR to monitor and assess nuclear security events, physical security and cyber security drills/exercises, and compensatory measures implemented during each timeframe.

FANR reviewed and assessed 130 applications for a licence to conduct regulated activity using radiation sources of Category 1, 2, and 3. A total of 64 reactive 3S (safety, security, and safeguards) inspections were conducted for Category 1, 2, and 3 FANR licensees.

BUSINESS CONTINUITY MANAGEMENT

A Business Continuity Management (BCM) awareness session was held for FANR staff in December 2021,

offering a comprehensive explanation of BCM in the context of our efforts to embed FANR's resilience strategy across the organisation. Aligned with existing FANR policies and procedures, the session included an overview of the BCM lifecycle from policy and programme management through to BCMS plan documentation.

INTERNATIONAL PRESENCE

FANR staff participated in the International Conference on the Safe and Secure Transport of Nuclear and Radioactive Materials, which was held in Vienna, Austria, in December 2021. The paper presented by FANR covered the transportation of unirradiated nuclear fuel from Korea to the Barakah NPP in collaboration with the Nuclear Safety and Security Commission of South Korea.

FANR staff also participated in a workshop in March 2021 organized by the Nuclear and Radiological Regulatory Commission of the Kingdom of Saudi Arabia. The programme included seven FANR-authored presentations on diverse topics such as physical security for nuclear facilities, radiation security, detection of nuclear and radioactive material out of regulatory control, orphan sources statutes in the UAE, and FANR's internal and information security.

06.

NUCLEAR NON-PROLIFERATION

INSPECTIONS

FANR-REG-09-REV.01

GLOBAL ENGAGEMENT

NUCLEAR EXPORT CONTROL SMART SYSTEMS

ACCOUNTING FOR AND CONTROL OF NUCLEAR MATERIAL

As always, FANR submitted correct and complete nuclear material accounting reports, facility attachment records and additional protocol declarations to the IAEA on time. FANR's national and international cooperation continued through our involvement in system integrations, international joint studies, licensing, and verification activities for more than 70 entities, training and national outreach programmes, all of which collectively raises the bar for nuclear non-proliferation and global safeguards standards. Moreover, FANR contributed to various procedural actions of the UAE government and to the communication with the IAEA to complete formalities for the rescinding by the UAE of its small quantities protocol to the safeguards agreement between the IAEA and the UAE.

INSPECTIONS

FANR conducted Ten safeguards and export controls inspections at the Barakah NPP, including:

4

Inspections relating to export control.

5

Safeguards-Related inspections.

A joint safeguards and export control operational readiness inspection at the Barakah NPP Unit 3 in October/November 2021 to assess the readiness of the operator to meet its safeguards and export control obligations, and to support a recommendation to FANR Board of Management on issuing an Operating Licence to Nawah.

We also conducted **39 safeguards-related inspections** at locations outside facilities (LOFs),

the majority of which were integrated **3S inspections** involving both remote and physical inspection techniques.

Additionally, **85 inspections** took place at premises of licensees and parties involved in transferring regulated items to ensure compliance with the (FANR-REG-09), "Regulation on the Export and Import Control of Nuclear Material, Nuclear Related Items and Nuclear Related Dual-use Items".

FANR-REG-09-REV.01

In accordance with our programme for reviewing regulations every five years, we updated **FANR-REG-09 in 2021**, i.e., five years after its initial issuance in 2016.

FANR Board of Management approved the revised text on 31 March 2021 and the regulation came into force on 16 June 2021, one month after its publication in the Official Gazette.

The major revisions relate to modified and added definitions, introduction of a catch-all clause, requirement of an internal compliance programme, simplification of notifications to FANR, and the requirement for FANR approvals/consent. FANR delivered six training sessions to licensees on the requirements resulting from the revised regulation.

GLOBAL ENGAGEMENT

FANR continued to engage regularly with the global non-proliferation community this year, with staff presenting two papers at the INMM/ESARDA Joint Annual Meeting in August 2021 entitled FANR Experiences with Hybrid Export/Import Inspection Techniques at the Barakah NPP. In addition, FANR staff presented a paper entitled Licensing of Imports and Exports of Nuclear Material and Certain Equipment, Software and Technology for the Barakah NPP Project at the 2021 International Congress on Advances in Nuclear Power Plants (ICAPP).

Through participation in consultancy meetings and presentation of a UAE case study, FANR also **supported the IAEA in preparing a guidance document entitled NE Series Publication** on Enhancing Safeguards Infrastructure to Support the Introduction of Nuclear Power Establishing and Maintaining State Safeguards Infrastructure. Our goal in these initiatives was to assist nuclear newcomer states by sharing lessons learnt while developing the UAE national safeguards system.

In August 2021, **FANR staff participated in a panel of experts at the DOE/NNSA INSEP's Webinar** for International Safeguards Professionals (WISP) to discuss Developing Safeguards Regulations. Over 130 people from 59 different countries attended the webinar and heard from FANR about the extensive efforts and experiences gained during the development of our safeguards regulations.

Marking a major personal and corporate milestone in 2021, **a FANR employee became the first UAE participant to complete a 10-month IAEA Safeguards Traineeship Programme in Vienna, Austria.** The programme, which prepares students to become IAEA Safeguards inspectors, provides practical training in strategy, concepts, and planning relevant to safeguards measurements and techniques, including physical visits to nuclear facilities in the IAEA member states.

NUCLEAR EXPORT CONTROL SMART SYSTEMS

The Nuclear Technology Portal (NuTech), developed by FANR and launched in 2018, is the first automated nuclear import and export control system in the region. In addition to helping businesses in the UAE with the process of importing and exporting regulated items, NuTech seeks to prevent diversion, misuse, and illicit trafficking of nuclear equipment and technology in line with the international nuclear non-proliferation regime. Over 15,000 requests were processed in 2021, with 98% of the daily requests being processed and completed in the same day. Since its establishment, the NuTech Portal has undergone several enhancements to support compliance with the requirements of FANR-REG-09, Regulation on the Export and Import Control of Nuclear Material, Nuclear Related Items and Nuclear Related Dual-use Items.

For example, NuTech has been integrated with the General Authority of Ports, Borders, and Free Zone Security's (Manafth) Advance Cargo Information (ACI) system, helping the UAE to improve continuously on the Logistics Performance Index as part of the UAE 2021 National Agenda. NuTech uses artificial intelligence and machine learning technology to analyse the data provided from ports, custom authorities, international shipping companies, intelligence, and open sources to check if incoming shipments to the UAE match with the targets of each entity and then before sending notifications to the respective entity to prompt relevant actions, as appropriate.

FANR also strengthened import/export control in the UAE free zones by providing training and establishing effective communications and initiatives, such as FANR/JAFZA-Trakhees Project. Cooperating with the relevant entities, FANR has gained access to JAFZA's licensing data and at the time of review period was in the process of obtaining access to the Trakhees licensing system to support the implementation of national and international obligations in nuclear import and export control as well as safeguards.

Fawri Tick, developed in 2020, is a smart system that integrates details of financial crimes with various federal and local authorities and facilitates both communication and decision-making among them. This enables the concerned authorities to take the necessary action within few hours. There was a substantial increase in the number of cases submitted through Fawri Tick and also in the number of entities registered in 2021. The system has been adopted as the National System for the Implementation of Targeted Financial Sanctions (TFS), coordinated by the Executive Office for Goods and Material Subject to Import and Export.

ACCOUNTING FOR AND CONTROL OF NUCLEAR MATERIAL

The UAE's State System of Accounting for and Control of Nuclear material (SSAC) maintained effective and efficient operation throughout the year. By the end of 2021, SSAC included five operational material balance areas. Each of the four units at the Barakah NPP represents one material balance area and the fifth material balance area covers LOFs (companies that customarily handle small quantities of nuclear material and typically practice industrial radiography, well logging and laboratory analysis). At the beginning of the review period, 75 LOFs were licensed and had been registered within the SSAC.

Subsidiary arrangements (facility attachments) for Unit 3 and Unit 4 of the Barakah NPP entered into force on 8 April 2021, and all power plant units at the time of drafting this report have had facility attachments. These arrangements formally define the technical and administrative procedures to implement the measures provided for in the Safeguards Agreement between the UAE and the IAEA.

Physical inventory-taking activities in three material balance areas were conducted in February 2021, where IAEA safeguards inspectors conducted physical inventory verifications in the following month. The IAEA subsequently confirmed that the results from the inspections were satisfactory, and the material balance periods were closed. Moreover, the IAEA conducted Design Information Verifications for Unit 1 and Unit 2 of Barakah NPP in March 2021, and for Unit 3 and Unit 4 in December 2021.

07.

RADIATION SAFETY

INSPECTIONS

We activated FANR Business Continuity Procedure during the pandemic. This included forming an internal committee to coordinate logistics and arrangements to ensure business continuity in our regulatory activities across safety, security, and safeguards. Inspections were conducted as usual, using remote inspection techniques where appropriate. In this regard, FANR prepared detailed instructions for using remote inspection techniques either exclusively or supported with physical inspection techniques, as necessary. All inspections were planned in accordance with the guidelines of the authorities in charge for containing the spread of COVID-19. In the limited number of instances where FANR could not perform inspection activities as required by FANR inspection programme, we worked with licensees and other regulatory authorities as applicable to postpone or modify inspections without impacting licensees' operation or compromising regulatory outcomes.

FANR's radiation safety inspection programme, which focuses on high and medium risk facilities and activities, continued throughout 2021. By the end of the year, FANR radiation safety inspectors had carried out **301 inspections** across the UAE, including announced, unannounced, and reactive inspections. FANR also conducted five pre-licensing inspections for new radiotherapy facilitates.

FANR inspectors conducted inspections at the Barakah NPP to evaluate **radiation protection programmes**, including

- The Alara Planning
- Contamination Control
- Dosimetry
- Radioactive Waste
- Radiological Hazard Assessment
- Radiation Monitoring Instrumentation
- Leak Detection

As part of our regulatory activities, **12 FANR inspectors** evaluated Nawah's arrangements to respond to an emergency affecting two units simultaneously (one of the conditions for the exercise). FANR also supported the National Crisis, Emergency, and Management Authority (NCEMA) by assigning five controllers and evaluators to the National Operations Centre, Al Ruwais Emergency Response Centre, and conducing field activities.

RADIOACTIVE WASTE

FANR prepared the fourth National Report of the UAE in accordance with the Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management (the Joint Convention) and submitted it to the IAEA for review.

FANR also submitted its own National Report for the Seventh Review Meeting of the Contracting Parties of the Joint Convention.

We also participated actively in the Radioactive Waste Management Working Group organised by ENEC for key stakeholders and presented updates on waste management at the Sixth Meeting, held in November 2021.

IAEA SAFETY STANDARDS COMMITTEES

FANR staff participated in various IAEA Safety Standards Committees intended for peer review of draft safety guides and standards by the IAEA member states.

These include the Radiation Safety Standards Committee (RASSC) Emergency Preparedness and Response Standards Committee (EPReSC), the Transport Safety Standards Committee (TRANSSC), the Waste Safety Standards Committee (WASSC) and the Nuclear Safety Committee (NUSSC).

ENVIRONMENTAL PROTECTION

FANR's independent radiological environmental monitoring programme monitors radiation and radioactive material throughout the UAE to meet the statutory requirements on monitoring radiation and advise government entities on matters related to radiation protection aspects of environmental protection, public health, radioactive waste, water use, consumption of food, and land use.

The programme is implemented largely through FANR Environmental Laboratory in Abu Dhabi and various monitoring stations across the UAE. More than 250 samples were collected during the year from different media, such as airborne particulates and airborne iodine, soil, surface water, date palm fruit, and sediment. Moreover, more than 800,000 individual measurements of gamma dose rates were collected throughout the UAE via a network of 18 gamma monitoring stations and Optically Stimulated Luminescent (OSL) dosimeters that determine the ambient gamma radiation. As expected, natural radionuclides were detected in all the samples, but the dose rates in the UAE are incredibly low compared to most of the other countries.

FANR Environmental Laboratory participated in the IAEA's Analytical Laboratories for the Measurement of Environmental Radioactivity (ALMERA) 2021 inter-laboratory proficiency testing programme (IAEA-TEL-2021-04) and met the acceptance criteria in the international inter-comparison. The ALMERA programme has a network of more than 190 laboratories representing 90 countries from around the world; it tests the ability of radiochemistry laboratories to analyse radioactive samples and accurately report the results.

250 SAMPLES

800,000 INDIVIDUAL MEASUREMENTS OF GAMMA DOSE

18 GAMMA MONITORING STATIONS

190 LABORATORIES REPRESENTING **90 COUNTRIES**

SECONDARY STANDARDS DOSIMETRY LABORATORY

FANR's Secondary Standards Dosimetry Laboratory (SSDL), located on the campus of Khalifa University, officially began providing calibration services in 2019.

The SSDL carried out a total of
819
calibrations in 2021

30%
increase compared with the calibrations conducted in 2020

and achieved a customer satisfaction rate of
99%

The SSDL portal has been substantially enhanced since its launch in 2020 to facilitate the relationship between the SSDL and customers, who can send calibration requests directly through the SSDL portal, follow the status of the request, download the calibration certificates for each device, and provide feedback on the quality of the service received.

In February 2021, FANR's SSDL became a member of the new GULFMET Technical Committee of Ionizing Radiation. FANR representatives have since been appointed as the committee's chair and secretary to lead collaboration with other SSDLs in the region. In April 2021, the UAE Ministry of Industry and Advanced Technology (MOIAT) nominated FANR SSDL as the Designated Institute in the area of ionizing radiation in the International Bureau of Weights and Measures.

These significant achievements underline the capacity of FANR's SSDL to supply radiation calibration services to end-users of radiation measurement devices in the medical, nuclear, and industrial sectors even under unforeseen and difficult circumstances. They also corroborate the national and international recognition of the SSDL's competence and high-quality results.

In 2021, FANR continued working on a recommendation to the Cabinet of fees for the calibration services provided by FANR's Secondary Standards Dosimetry Laboratory. As a result, on 28 December 2021, the Cabinet issued Resolution No. (104) of 2021 Concerning the Fees for the Calibration Services Provided by FANR's Secondary Standards Dosimetry Laboratory. The resolution entered into force on 30 January 2022 (i.e., 30 days from the date of its publication in the Official Gazette (No. 718) on 30 December 2021).

RADIATION PROTECTION COMMITTEE (RPC)

The committee was established in 2011 following a decision of FANR Board of Management based on Article 67 of Federal Law by Decree No. (6) of 2009 Concerning the Peaceful Uses of Nuclear Energy. The committee is headed by FANR Director General and its membership includes representatives from:

- The Armed Forces
- Ministry of Interior
- Ministry of Health and Prevention
- Ministry of Climate Change and Environment
- Emirates Nuclear Energy Corporation
- Federal Customs Authority
- Khalifa University
- Department of Health — Abu Dhabi
- Dubai Health Authority
- Environment Agency — Abu Dhabi
- National Emergency, Crisis, and Disasters Management Authority
- General Authority for the Security of Ports, Borders, and Free Zones
- Nawah Energy Company
- Abu Dhabi Centre for Public Health
- Abu Dhabi National Oil Company (ADNOC)

The RPC promotes collaboration between various bodies and gives advice and recommendations on how to improve the radiation protection infrastructure in the UAE, how to develop a unified national guide on matters related to radiation protection as well as an emergency plan to respond to radiological disasters, and how to promote awareness of radiation protection.

The committee also provides an environment for inter-agency cooperation on important radiation protection matters to ensure appropriate radiation protection resources and infrastructure in the UAE in the event of planned, emergency, and existing exposure situations. This includes the ability to perform analytical measurements, evaluate measurement results for making coordinated regulatory decisions, implement associated actions to protect people and the environment, and ensure the availability of radiation protection professionals in the UAE.

The RPC implements action plans through working groups and taskforces that operate according to specific terms of reference.

The RPC working groups currently include:

- The Medical Applications Working Group
- The Orphan Sources Strategy Working Group
- The National Strategy for Education, Training and Qualification in Radiation Protection Working Group
- The National Environmental Radiation Measurements Working Group

The RPC taskforces include:

- **Taskforce A:** National Protection Strategy for Radiological and Nuclear Emergency
- **Taskforce B:** Health Surveillance
- **Taskforce C:** Radiation Dosimetry Infrastructure (external, internal, and cytogenetic)

In 2021, the RPC conducted four meetings in addition to regular meetings of the working groups and recorded several achievements:

- **Eighteen qualified radiation protection experts were identified**, and their names were published in the UAE temporary list as experts who are able to provide authoritative advice to employers on matters relating to compliance with the applicable legal requirements and technical standards in respect of public and occupational exposure to ionizing radiation.
- **A paper was published** on the importance of a medical physicists in the country due to the increase in the number of medical facilities, especially radiotherapy facilities, which, in turn, require the existence of a robust radiation safety education and training system to assure the safety of patients and workers.
- **A survey was conducted** to assess public participation in a radon survey.
- **The UAE current analytical** measurement capabilities were identified.
- **Discussions were held** on the approach to establishing the diagnostic referral guidelines in the UAE, and the way forward.
- **A Search and Recovery campaign** was conducted in an industrial area, where a FANR team visited about 75 scrap dealers in Mussafah. The search was conducted by car and the team held physical meetings with the management of these facilities to explain and introduce the orphan sources concerns and the necessary steps to protect the individuals working there and the environment. FANR team highlighted the importance of having a detector at the entrance of every facility before accepting and processing scrap metal for recycling and also highlighted the need to initially understand the source of scrap metal to be prepared if the sender's activity involves using radioactive material.
- **The role of different entities towards consumer products** containing radioactive materials was explained by FANR team, using the example of decorative pendants.

08.

EMERGENCY PREPAREDNESS

CONVEX-3 BARAKAH UAE

In 2021, FANR's emergency preparedness and response efforts focused on implementing the largest and most complex of the IAEA exercises, namely ConvEx-3 Barakah UAE. FANR led the implementation of three International Technical Group Meetings, three meetings with the International Electrotechnical Commission (IEC) head to follow the exercise implementation, two meetings with KSA in line with current cooperation agreements between the Nuclear and Radiological Regulatory Commission (NRRC) and FANR, three training and exercise activities on the IAEA social media simulator, and weekly meetings with Nawah to discuss technical aspects of the exercise.

More Than **150** **FANR** Staff

More than 150 FANR staff were involved directly and almost every FANR employee was involved somehow in implementing the exercise.

FANR also participated and provided technical advice during interactions with Barakah Exercises Preparation Committee, NCEMA (meetings with National Operations Centre, Media Committee, exercise organisers, legal department, and during HAZMAT preparation exercises), Nawah, the Gulf Cooperation Council (GCC) Emergency Management Centre, Abu Dhabi Police (meetings with Abu Dhabi Police Chief Commander and ADLOC), and the Joint Emergency Radiation Monitoring and Assessment Team (JERMAT).

36 **HOUR** Exercise

In preparation for the exercise, a 36-hour continuous rehearsal took place from 27 to 28 September, testing current arrangements but with different scenarios. The actual 36-hour exercise was successfully implemented on 26 and 27 October 2021. We activated FANR emergency organisation, involving 42 of our Emergency Response Organisation (ERO) members, and nine evaluators/-controllers assigned to FANR Headquarters. FANR also supported the exercise by implementing and following the activities of the assistance mission and international observers, with five FANR staff assigned to escort these teams.

3 Response & Assistance Networks **(RANETs)**

The exercise marked several remarkable achievements. For the first time during a ConvEx-3 exercise, assistance teams from the IAEA and three Response and Assistance Networks (RANETs) were deployed to a realistic accident state to support radiation monitoring and assessment efforts. For the first time, a social media Simulator was used to provide inputs related to information on the public domain in a more realistic manner. For the first time, also, the UAE tested its overall arrangements for responding continuously to these emergencies for 36 hours (no off-sequence activities).

EMERGENCY OPERATIONS CENTRE

FANR Emergency Operations Centre was fully operational throughout 2021 and its arrangements were tested successfully during both the ConvEx-3 rehearsal and the main exercise.

Improvements were made to FANR Emergency Management System (FEMS) to continue automating several tasks. Arrangements were made to connect through FEMS to the Nawah emergency management system (based on the same technology as FEMS) and access basic data relating to the emergency (for example, an emergency classification level for every unit at the Barakah NPP).
A redundant connection to Nawah systems was established through a Virtual Desktop Infrastructure for emergency and exercise purposes.

EMERGENCY TRAINING, DRILLS AND EXERCISES

FANR Emergency Response Organisation (FERO) participated in all applicable international IAEA exercises in 2021, such as the ConvEx-2b exercise focusing on arrangements to request assistance from the IAEA. During this two-day exercise, the IAEA drafted the initial Assistance Action Plan (AAP), which FANR, JERMAT, NCEMA and Health Authorities reviewed and agreed on.
The AAP also had input and agreement from the IAEA, the USA, and the Republic of Korea – as assisting entities – and was used as the basis for deploying assistance teams during the ConvEx-3 exercise.

FANR Emergency Preparedness and Response team conducted two general training sessions during the year, covering topics in line with the approved qualification cards for FERO members.
This was complemented by specific training and tabletop exercises on a variety of topics. FANR also participated in the routine drills that Nawah conducts internally, as an opportunity to follow their scenario and evaluate the FERO arrangements.

Additionally, FANR conducted several tabletop exercises for JERMAT members, developing scenarios in coordination with Nawah to test the capabilities of the teams assigned to Al Ruwais Emergency Response Centre and the capabilities of field teams. Several recommendations were provided to JERMAT from the lessons learned during the tabletop exercises.

COMPETENT AUTHORITY

As the competent authority for emergencies that may occur at national and international level, FANR followed the recommendations from the IAEA's 10th Competent Authority Meeting and all applicable actions were implemented successfully.

During 2021, FANR provided experts to the IAEA for a webinar on Termination of a Nuclear or Radiological Emergency Irrespective of Its Cause and participated in one of the IAEA's EPReSC meetings.

REGULATIONS AND REGULATORY GUIDES

FANR regulations and regulatory guides take into account the IAEA safety standards as well as other nuclear regulatory best practices and operational experience.

Preparation of new and review of the existing regulations of FANR in 2021 was done in accordance with FANR's Regulations Master Plan for 2021-2026, which was approved by FANR Board of Management in March 2021. During the review period covered by this report, FANR developed and revised four regulations and four regulatory guides. Moreover, all FANR regulations and regulatory guides are subject to a systematic review and update process every five years.

In the review process, **9 regulations** were thoroughly reviewed to decide if any required revision, updating or withdrawal; the following criteria were, accordingly, taken into full consideration and applied where appropriate:

- Experience from FANR licensing, inspection, and enforcement activities.
- Operating experience within the UAE and from other countries.
- IAEA amendments to its standards and/or guidance documents.
- Amendments to other international standards/guidance documents that support FANR's regulatory framework.
- Research and development findings.

FANR's four regulations that entered into force in 2021 are:

FANR-REG-09 (V.1)
"Regulation on the Export and Import Control of Nuclear Material, Nuclear Related Items and Nuclear Related Dual-use Items"

FANR-REG-12 (V.1)
"Regulation for Emergency Preparedness and Response for Nuclear Facilities"

FANR-REG-23 (V.1)
"Regulation on Security of Radioactive Sources"

FANR-REG-29 (V.0)
"Regulation on the Registration and Licensing of Radiation Sources"

Another regulation approved by FANR Board of Management in 2021 is

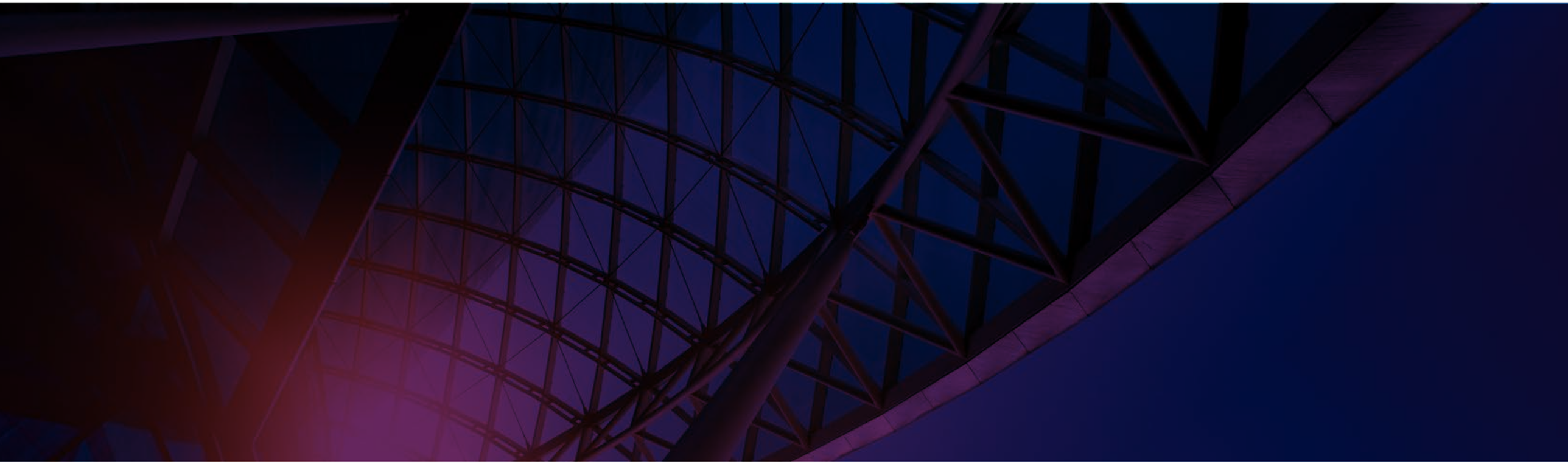
FANR-REG-13 (V.1)
"Regulation for the Safe Transport of Radioactive Material".

FANR GLOSSARY

FANR Safety, Security, and Safeguards Glossary is a comprehensive compilation of all the terms included in Federal Law by Decree No.(6) of 2009 Concerning the Peaceful Uses of Nuclear Energy (the Nuclear Law), Federal Law by Decree No.(4) of 2012 Concerning Civil Liability for Nuclear Damage, FANR regulations and regulatory guides, and their respective definitions.

A 2021 Edition of FANR Glossary was released during the review period and reflecting the updates to the legislative and regulatory framework of FANR since the initial glossary was issued in 2011.

This document, which has already been published on FANR website, is developed and maintained for information purposes only. Key achievement in the area of in-house linguistic services provided by the Legal Department's Translation and Editing team, is translation into Arabic of FANR's Safety Security and Safeguard Glossary, which is a unified glossary of terminology defined in FANR's regulations and regulatory guides. The glossary facilitates a proper understanding of the specialized nuclear terminology among the Arabic-speaking users.



09.

NATIONAL & INTERNATIONAL COLLABORATION

NATIONAL COOPERATION

FANR continued its effective engagement throughout 2021 with the national stakeholders with the view of maintaining close relations and furthering mutual cooperation efforts with various entities to support the relevant and operational needs.

A TOTAL OF 36 JOINT ACTIVITIES AND PROJECTS

were achieved, including system integration, cyber security measures, handling orphan sources, inspections, training government officials in radiation safety, joint exercises, and emergency preparedness.

ALMOST 30 MEETINGS

were organised with multiple government entities for benchmarking, information exchange, emergency preparedness, and mutual relations building.

FANR SIGNED 2 MEMORANDA

of understanding with Smart Dubai Government Establishment to collaborate in support services for licensees and the Social Security Fund for the Employees of the Ministry of Interior (Fazaa) to benefit from the range of services provided to members of the Fazaa programme.

Due to the COVID-19 pandemic restrictions, FANR introduced a virtual outreach programme to different government entities to continue raising awareness of FANR roles, responsibilities, and regulatory activities.

4 GOVERNMENT OUTREACH SESSIONS

were conducted, reaching more than **300 government officials** in the Governments of Ras Al Khaimah and Fujairah, the Ministry of Industry and Advanced Technology, the Ministry of Foreign Affairs and International Cooperation.

LICENSEES' ENGAGEMENT

FANR organized its annual 'Meet Your Regulator' event, which gave us the opportunity to share FANR regulatory experiences with our licensees and discuss requirements to strengthen the safety and security culture in the peaceful use of ionizing radiation in the UAE.

The 3-session event attracted over 890 participants, who learnt about the latest regulatory requirements for the medical and non-medical sectors.

The subject matter included a general update on FANR's regulatory framework, including the newly issued FANR-REG-29, Regulation on the Registration and Licensing of Radiation Sources, and FANR subject matter experts (SME) explaining the new licensing process, which includes registration for low-risk facilities based on specific criteria. Information was also provided on the new smart licensing system and WASL customer relations system, licensing process and requirements, safety assessment, medical waste management, implementing the radiation protection programme, and instilling a safety culture.

NATIONAL WORKSHOP

In cooperation with the Federal Authority for Government Human Resources (FAHR), **FANR, conducted a one-day workshop to highlight the importance of information security and business continuity challenges** during the pandemic and shared the lessons learned.

UAE government entities representing nuclear regulation, emergency preparedness and public health underscored the criticality of information security, emergency preparedness, and mental health to protect the community and equip entities to fulfil their mandates, especially in times of emergencies.

INTERNATIONAL COOPERATION

FANR positioned the UAE's nuclear energy policy principles on the international level by participating in a range of bilateral and multilateral cooperation frameworks that also promote nuclear safety and radiation protection in the UAE.

Bilaterally, FANR aims to take advantage of the progress achieved in nuclear safety, exchange regulatory experiences, and requests technical assistance, as needed. Through collaboration with multiple international regulators and expert institutions, FANR continues to have access to international expertise, regulations, technical information, and operating experience to enhance and advance nuclear safety in UAE.

Two strategic cooperation efforts are underway at the review period with:

The Republic of Korea through FANR membership in a high-level consultation committee along with other national stakeholders; and

The Kingdom of Saudi Arabia, in which FANR is leading in the area of nuclear regulation.

At the multilateral level, FANR maintained close cooperation ties with the IAEA and the Nuclear Energy Agency by taking part in these organisations' technical programmes, e.g., the IAEA technical programme to develop the capabilities of newcomer countries and reinforce safety worldwide through safety standards and peer review. FANR technical staff contributed to the programme by presenting relevant content to IAEA committees whose work focuses on drafting standards documents and sharing experiences in key regulatory areas.

FANR attaches significant importance to the technical assistance programme which the IAEA offers to its member states, including IAEA review missions and advisory services. To date, more than 10 missions have attended by the UAE, including an integrated regulatory review mission addressing the national regulatory framework. FANR will continue to seek further peer review missions, especially those devoted to further develop the regulatory infrastructure in areas related to waste management, radiation protection, and will request the return of other missions, as needed.

To support the IAEA's work to build capacity in its member states, FANR hosts IAEA workshops for countries embarking on nuclear programmes. For instance, FANR hosted an inter-regional workshop on the roles and responsibilities of regulatory bodies for the IAEA member states that are developing new nuclear energy programmes or expanding their current ones.

Moreover, FANR participates in the IAEA main conferences and forums. During the review period, these events included the IAEA General Conference, the Regulatory Cooperation Forum, and the 2021 Fukushima Daiichi Conference.

The latter represented the national arrangement for Emergency Preparedness and Response, where FANR plays a key role by providing technical advice to national stakeholders and undertaking independent assessments in nuclear or radiological emergencies.

As UAE is party to key international conventions on nuclear matters, FANR serves as the competent authority for two main nuclear safety conventions: the Convention on Nuclear Safety (CNS), and the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management (JC). In compliance with the CNS and the JC, FANR compiles and submit national reports on the UAE's commitment to nuclear safety and to spent fuel and radioactive waste management. The UAE national report for the 7th Review Meeting of the Contracting Parties to the Joint Convention was submitted by FANR at the end of 2020.

The UAE national reports are publically available for review and comments by all Contracting Parties to CNS and JC.

In 2021, FANR participated in the activities of various working groups under the auspices of the Organisation for Economic Co-operation and Development's Nuclear Energy Agency (OECD NEA).

FANR Legal Affairs Department (LAD) represented the UAE in the following:

- Working Party on Nuclear Liability and Transport (WPNLT) Workshop on the Qualification of Nuclear Substances and Nuclear Liability, which took place on 29 and 30 March 2021.
- Working Party on the Legal Aspects of Nuclear Safety (WPLANS) meeting which took place on 19 and 20 May 2021. FANR LAD representative delivered a presentation on developments in the UAE regulatory framework and the licensing activities of FANR.
The LAD also led the UAE delegation to attend the meetings of the Nuclear Law Committee (NLC) of the OECD NEA, which took place from 9 to 11 June 2021. A number of actions were requested by the NLC from the participating delegations; in response, FANR LAD prepared the UAE input on the nuclear operator liability amounts and financial security limits, the priority rules on compensation for nuclear damage in national legislation, and the principle of reciprocity in national legislations relating to compensation of nuclear damage.
- Working Party of on Nuclear Liability and Transport (WPNLT), which took place on 23 and 24 November 2021.

Thanks to the initiative and contribution of FANR's LAD, the OECD NEA published in its Nuclear Law Bulletin updates on the legislative and regulatory activities in the UAE, making such information about the UAE and FANR efforts available to a broad range of readers internationally. Thus, the Nuclear Law Bulletin No. (106) – Volume 2021/1, published by the OECD NEA, includes an article on the UAE regulatory updates in 2020-2021 describing the four regulations of FANR, which entered into force in 2021.

10.

RESEARCH & DEVELOPMENT

HALDEN REACTOR PROJECT

OECD NUCLEAR ENERGY AGENCY ATLAS-3 PROJECT

OECD NUCLEAR ENERGY AGENCY CODAP - PHASE 4 PROJECT

The Federal Law by Decree No. (6) of 2009 Concerning the Peaceful Uses of Nuclear Energy empowers FANR to conduct and support research and development studies relevant to FANR's scope of work as well as to initiation and coordination of safety-related research and development work with other authorities. To this end, FANR collaborates with firms in responsible nations to nurture research and development capabilities within our own nuclear energy programme, while leveraging the operating experience of other countries on major safety issues.

HALDEN REACTOR PROJECT

FANR remained a participant in the Halden Reactor Project in 2021, with the aim of advancing capacity-building initiatives in human and organisational factors, as well as in fuel and materials research.

The Halden Reactor Project completed a restructuring of research programmes following the closure of the Halden reactor in 2019. The legacy database project, which collates and organises all results and data collected over several years of fuels and materials research, progressed well and a functioning database for member countries has been implemented. FANR was a regular contributor to this effort through virtual workshops and meetings. The database will provide an excellent educational resource for FANR and other UAE entities and will also support improvements to regulatory activities.

The Human Technology Organisation research programme progressed well during the review period. FANR actively supported the execution of the new programme and used past programme deliverables to support capacity-building and internal mentoring initiatives.

FANR continued to involve a diverse group of Emirati employees in the Halden Programme Group meetings to strengthen our capacity and technical competence.

OECD NUCLEAR ENERGY AGENCY ATLAS-3 PROJECT

FANR renewed its participation in the ATLAS Phase 3 project in 2021 with the view to continue building up the local human capability on nuclear safety in UAE using the Safety Analysis Project and the lessons learned from the implementation of the OECD-ATLAS project and to expand the research capability on the system code development and the experimental measurement of the local T-H phenomena.

By participating in this project, the nuclear safety experts involved in the research related the OECD/Nuclear Energy Agency Atlas Phase 3 Project in UAE will certainly benefit from the state-of-the-art issues in the Light Water Reactor and establish the necessary framework to deliver the acquired knowledge on nuclear safety to the future users of nuclear system codes.

Furthermore, all experience gained from the ATLAS project will be used as a foundation for the UAE to reinforce an independent research capability such as building the national research institute, Emirates Nuclear Technology Center (ENTC).

OECD NUCLEAR ENERGY AGENCY CODAP - PHASE 4 PROJECT

In 2021, FANR joined Phase 4 of the OECD/Nuclear Energy Agency Component Operational Experience, Degradation and Aging Programme (CODAP). CODAP combines the follow-up of two previous OECD/Nuclear Energy Agency projects: the Pipe Failure Data Exchange Project (OPDE) and the stress corrosion cracking part of the Stress Corrosion Cracking and Cable Ageing Project (SCAP).

The programme will be executed over the next 3 years and will collect and analyse information on passive metallic and selected non-metallic component degradation and failures to promote a better understanding of underlying causes, impact on operations and safety, and prevention.
The project will be providing aging management programme support that addresses current operability determination practices, performance of new materials in the field (such as Alloy 690 and other super-austenitic stainless steels), and best practices of licence renewals and long-term operations.

Furthermore, the programme will provide FANR to access and exchange existing and future information with other participating organizations to improve regulatory decision making on component material degradation, aging management, and operability determination.

ENTC

Since its inception in 2020, FANR continues to be an active member of the Senior Management Board, the Steering Committee, and the Scientific Technical Committee of the ENTC. The first Scientific Technical Committee was established in 2021 with both Emirati and expatriate members to provide the necessary technical review and recommendations for the Steering Committee consideration.

The ENTC is a cooperation between ENEC, the Federal Authority for Nuclear Regulation (FANR) and Khalifa University with the view of maintaining and enhancing the national nuclear and radiological technology programmes, conducting technical analysis of the nuclear technology sector to meet stakeholders developing needs, developing nuclear technology capabilities in the UAE in order to become an internationally recognized innovator, and providing scientific research of new nuclear technology approaches and applications which can be incorporated into the national research and development and innovation system.

11.

CORPORATE GOVERNANCE

SECRETARIAT OF FANR'S BOARD OF MANAGEMENT

INTEGRATED MANAGEMENT SYSTEM

- ISO certifications
- Architecture of Integrated Information Systems and Business Process-Reengineering Project
- Risk Management Framework
- Performance Monitoring Framework

AUDIT & RISK COMMITTEE

INTERNAL AUDIT

SECRETARIAT OF FANR'S BOARD OF MANAGEMENT

In 2021, with the appointment by the by the Cabinet of the 4th formation FANR's Board of Management since the establishment of FANR in 2009, certain appointments by the new FANR's Board had to be made as per the applicable legislation.

This included appointment of a Secretary of the Board, in relation to which, the Board of Management appointed a Secretariat of the Board for the first time. The Secretariat consists of four members of the LAD.

This decision demonstrates the readiness of the Board of Management to take an innovative approach to managing conventional roles as the Board realized certain benefits in having the Secretariat of FANR's Board of Management compared to having a sole Board Secretary. Such benefits include availability of a broader range of resources to cover the extensive role of the Board Secretary under the legislation issued in 2020 (i.e. Guide to Board Governance the UAE Federal Government 2020 (the "Guide"), approved by the Cabinet Resolution No. (2/9f) of 2020).

The setting of the Board Secretariat also provides an 'on-the-job' training and learning opportunity for the two young Legal Officers of the LAD, who are the members of the Secretariat of FANR's Board of Management, to prepare them for responsible roles at FANR.

INTEGRATED MANAGEMENT SYSTEM (IMS)

FANR operates an integrated management system that was established according to the IAEA standards. FANR's IMS enables us to fulfil responsibilities and roles in a safe, effective, and efficient way in accordance with the general policies set out by the Board of Management.

REVISION OF FANR'S CORE PROCESS (CP.1) FOR DEVELOPMENT AND REVISION OF FANR REGULATORY FRAMEWORK

In 2021, the CP.1 "Development and Revision of FANR Regulatory Framework Process" was revised in order to strengthen and optimize FANR's internal work on regulations. FANR developed an enhanced process for the drafting of new and revision of existing FANR regulations. The process of engagement with external stakeholders was also optimized, and the revised process proved to introduce an efficient method for the development and revision of regulations.

INTERNATIONAL STANDARDISATION ORGANISATION (ISO) CERTIFICATIONS

In 2021, FANR received six ISO certifications through the British Standards Institution (BSI).

ISO CERTIFICATION	SCOPE
ISO 20000-1:2018 Information Technology — Service Management	To deliver core ICT services to all business units and locations of FANR by Information & Communication Technology (ICT) Department to meet the business requirements with customer satisfaction in line with the Service Catalogue Version 2.0
ISO 20400:2017 Sustainable Procurement	Provision of Procurement sustainability management according to BS ISO 20400:2017 Guideline
ISO 31000:2018 Risk Management	Provision of risk management system according to the requirements of ISO 31000:2018
PAS 3000:2015 Smart Working	Provision of implementing smart work requirements as per PAS 3000:2015
ISO 56002:2019 Innovation Management Systems	Provision of Innovation management system according to the requirements of ISO 56002:2019 Guideline
PAS 99 Integrated Management Systems	The regulation and management of services related to the nuclear sector in the United Arab Emirates include licencing, compliance monitoring for safety, security, safeguards and radiation protection, and the provision of services related to the radiation protection infrastructure in line with the requirements of PAS 99 for ISO 9001, 14001, 45001, 27001 & 20000 ISO Standards

ARCHITECTURE OF INTEGRATED INFORMATION SYSTEMS AND BUSINESS PROCESS REENGINEERING PROJECT

The Business Process Reengineering (BPR) Project was launched in 2021 to complement Architecture of Integrated Information Systems (ARIS) by enhancing the procedures in terms of efficiency, effectiveness, governance, robustness, and clarity. The project was completed during the year, with all **27 FANR processes** and sub procedures reviewed with 564 areas of improvement identified and reflected in the latest version of the IMS documents".

RISK MANAGEMENT FRAMEWORK

A full risk identification, analysis, and treatment follow-up cycle was conducted in 2021, **covering 175 monitored operational risks**. An Enterprise Risk Management procedure was developed to further augment risk management activities.

PERFORMANCE MONITORING FRAMEWORK

FANR has adopted the UAE Government Performance Management Framework to monitor progress against our organisation's strategic plan.

The Government Performance Management System allows relevant FANR staff at all functional levels to see the whole picture, understand the connection between organisational processes and the entity's strategic priorities, and ultimately realise the connection between the entity's priorities and those of the government. The Government Performance Management System also allows FANR to achieve its strategic priorities while focusing on the community's public benefit, by linking performance management and outcomes. Strategic and operational plans ensure the optimal use of resources to achieve the desired results. The Federal Government Performance Management System promotes good practices in monitoring strategic and operational performance, to reinforce learning opportunities, support decision-making and governance within federal entities, and ensure optimal results.

AUDIT AND RISK COMMITTEE (ARC)

The ARC supports FANR Board of Management by providing advice on matters relating to governance.

Key milestones achieved in 2021 included:

- Supporting FANR Internal Audit by reviewing the 2021 entity-wide FANR Risk Refresh results and approving the 2021 Risk-Based Internal Audit Plan.
- Reviewing the results of the Annual Internal Quality Assessment and Improved Programme, conducted by FANR Internal Audit.
- Reviewing progress on the Anti-Fraud Framework Project, comprising:
  a) Preventive controls – ensured the code of conduct is in place and reviewed the Anti-Fraud Policy.
  b) Detective controls – provided direction on a whistleblowing system for FANR, reviewed the description of the same system, and monitored progress on establishing the whistleblowing channels.
  c) Response activities – provided direction on forming a Fraud Investigation Committee.
- Reviewing FANR management's progress in implementing corrective actions in response to the findings of the State Audit Institution, Internal Audit and External Audit, such as improvements in governance and strengthening various internal controls.
- Reviewing the State Audit Institution's report on FANR for 2020 and the management's responses to the observations identified within the report.
- Providing guidance to FANR's management and maintaining oversight over the external auditors for the closure and issuance of formal financial statements for the year ending 31 December 2020.
- Evaluating the performance of FANR's external auditors and the Internal Audit Department and providing constructive feedback.

INTERNAL AUDIT

FANR's Internal Audit Department adds value to and improves operations by bringing a systematic and disciplined approach to the organisation's risk management, control, and governance processes.

The following activities were carried out in 2021:

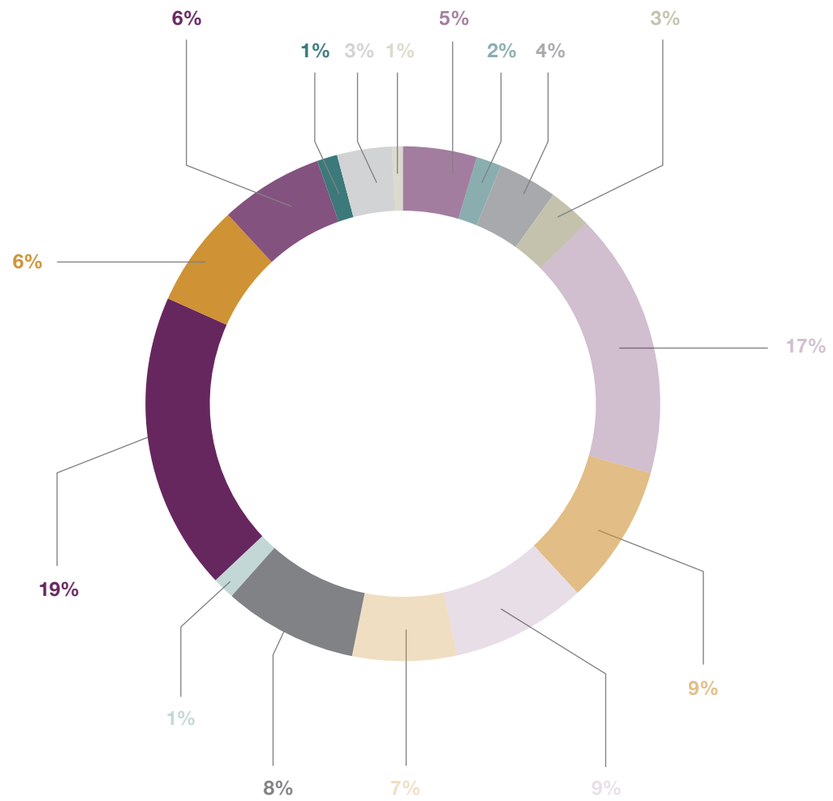
- Working towards implementing the Anti-Fraud Framework Project at FANR in line with Cabinet Resolution No. 4/11 of 2018, which involved developing the required procedures, policies; and initiating establishment of the whistleblowing reporting channels.
- Conducting an entity-wide risk-related exercise, which included developing a consolidated enterprise risk register (linked to FANR Operational Plan initiatives and the IMS processes and procedures) and developing a two-year risk-based internal audit plan to ensure coverage of the identified high risks through audits over a two-year period.
- Conducting a COVID-19 risk assessment exercise to ensure that the risks arising from the situation caused by the pandemic were managed well at FANR.
- Completing and reporting the results of six activities, including budget and control activities audits, data analysis assignment (continuous audit and continuous monitoring engagement) and follow-up audits based on the approved annual risk-based internal audit plan.
- Conducting semi-annual follow-up reviews on agreed management action plans for Internal Audit Observations, State Audit Observations, and External Audit Observations to enhance internal controls across FANR.
- Conducting awareness sessions to improve employees' knowledge of the role of FANR's Internal Audit Department.
- Automating the follow-up process for monitoring and reporting on the closure status of all agreed audit actions.

12.

FINANCIAL STATEMENTS

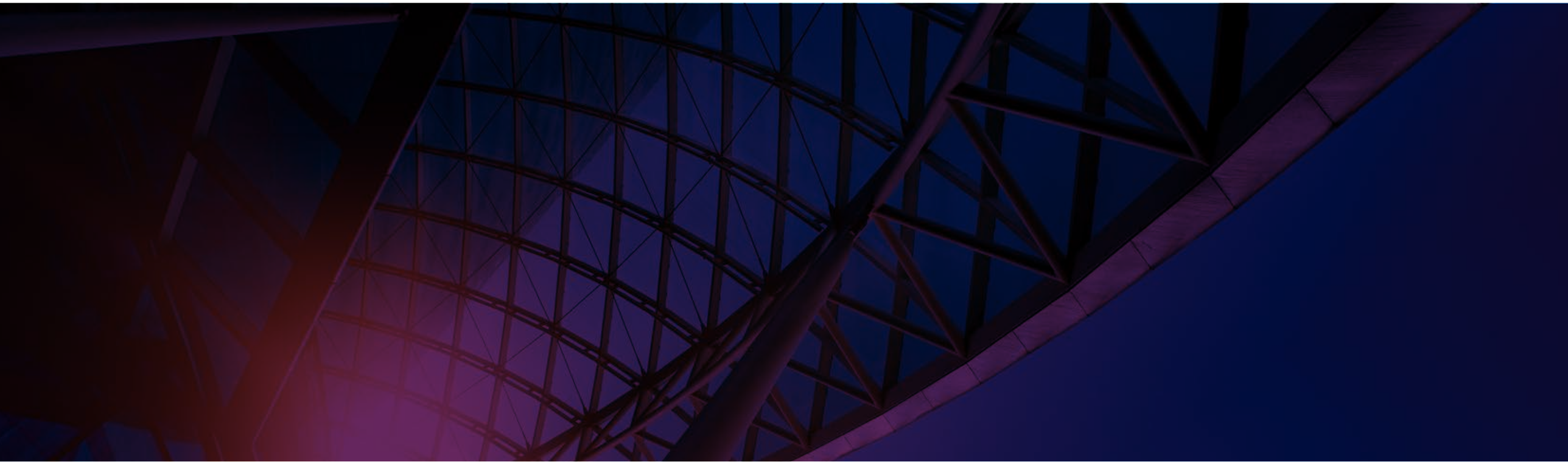
FANR EXPENDITURE IN 2021

DEPARTMENT	2020 EXPENDITURES
Corporate Development Department	12,550,309.18
Deputy Director General for Administration's Office	1,820,073.24
Deputy Director General for Operations' Office	3,451,264.49
Director General	4,319,080.53
Education & Training Department	17,352,417.94
Finance & Control Department	9,326,267.51
Government Communications Department	10,025,808.07
Human Resources Department	17,556,303.24
Information & Communications Technology	23,009,961.61
Internal Audit Department	3,779,438.04
Legal Affairs Department	7,234,286.18
Nuclear Safety Department	50,679,323.81
Nuclear Security Department	17,714,665.74
Radiation Safety Department	45,284,136.00
Safeguards Department	22,768,177.89
Supply Chain & General Services Department	23,742,086.53
GRAND TOTAL	**270,613,600.00**



Corporate Development Department	5%
Director General	2%
Government Communication Department	4%
Legal Department	3%
Radiation Safety Department	17%
Supply Chain & General Services Department	9%
ICT Department	9%
Nuclear Security Department	7%

Safeguards Department	8%
Internal Audit Department	1%
Nuclear Safety Department	19%
Education & Training Department	6%
Human Resource Department	6%
DDGO	1%
Finance & Control Department	3%
DDGA	1%



13.

HUMAN CAPITAL

EMIRATISATION

- Women at FANR

TRAINING AND DEVELOPMENT

- Leadership and Management Development Programme
- Scholarship Programme
- Competency Development Framework
- Developee Programme for Fresh Emirati Graduates'
- Internal Training Programme
- Inspectors Qualification Programme

KNOWLEDGE MANAGEMENT

- ISO 30401:2018 Knowledge Management Systems

POSITIVE CULTURE

INNOVATION

TOLERANCE

EMIRATISATION

At FANR we are committed to optimising the skills, processes and resources needed to excel and realise our corporate vision.

Long-term career opportunities for Emirati employees at FANR are encouraged through focused recruitment, competency-based progression, knowledge transfer, and training and development programmes. During the review period Emiratis accounted for 72% of FANR 242 total workforce. FANR continues to attract talented Emiratis to support FANR Emiratization target, as 14 additional Emiratis were recruited in 2021. We implement extensive programmes to foster and nurture our organisation's resources, skills, and processes.

72%
Emiratis
of our
242
Employees

14
Additional Emiratis
were recruited in 2021

FANR constantly aims to excel in recruiting, retaining, and developing talented people, led by the efforts of the UAE government to empower and have UAE National expertise in nuclear-related fields. We maintain that, with proper training and expert guidance, goal-oriented people with remarkable levels of enthusiasm and dedication for work will easily develop the necessary skills.

To this end, we have hired expert employees to transfer knowledge to young professional Emirati employees.

Besides business continuity, **FANR believes in pooling knowledge and using all human resources;** accordingly, we strive to hire multi-national people with diverse professional experiences and academic backgrounds for our core specialist positions.

WOMEN AT FANR

Women play a fundamental role in fulfilling FANR's mandate. FANR has therefore assigned two Emirati Champions to enable Gender Balance and Equality, as per the government's direction.

Women make up over 43% of our overall workforce. They hold 50% of leadership positions and play key roles in our Nuclear Safety, Nuclear Security, Radiation Safety, and Education and Training Departments.

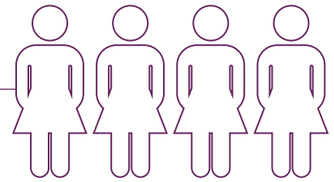
FANR believes that Emirati women can make a significant contribution to the nuclear regulation. This is reflected in the fact that 33% of our technical employees and 15 of FANR engineers are female.

43%
Women of Overall Workforce

50%
Hold Leadership Positions

33%
Technical Employees

15
Engineers



TRAINING & DEVELOPMENT

Through FANR's educational and vocational programmes, we conduct various training and development initiatives, including:

LEADERSHIP AND MANAGEMENT DEVELOPMENT PROGRAMME

This programme provides a platform for FANR employees to become better leaders and contributors within FANR, as well as valuable contributors to FANR's broader regulatory and transparency goals. FANR leadership competency framework, designed in 2019, serves as the baseline for all leadership programmes. In 2021, 90% of FANR directors and managers attended leadership training based on their respective competency assessments.

90%
Attended Leadership Training

SCHOLARSHIP PROGRAMME

FANR grants scholarships to Emirati employees to complete qualifications at leading institutions such as Zayed University, Manchester University, the Korea Institute of Nuclear Safety, the Korea Advanced Institute of Science and Technology, and Khalifa University.

In 2021, FANR celebrated the graduation of our first Emirati female employee to complete a PhD in Nuclear Engineering at Khalifa University (thesis title: The Development of a Methodology for Risk Analysis and Management in Sharing Electrical Power in Nuclear Power Plants). Moreover, two other employees graduated with MSc degrees in Nuclear Engineering; one is a FANR's Nuclear Safety Department employee (thesis title: The Scaling Effect Analysis of LSTF/ATLAS Test Facilities on 1% Reactor Pressure Vessel Top Head Break Loss of Coolant Accident) via OECD-ATLAS project; the second employee is a FANR's Radiation Safety Department employee (thesis title: The Use of Global Oceanic Datasets to Support Design and Operation of the Barakah NPP).

COMPETENCY DEVELOPMENT FRAMEWORK

In 2021, technical and behavioural competency assessments were conducted to highlight focused training and development needs. **A Competency Framework Automation System was launched in 2020,** with additional services to facilitate the assessments and follow-ups between employees and their line managers. The Competency Development Framework was also integrated with the HR Performance Appraisal System, providing an additional monitoring tool to ensure that continuous development is integral to our annual performance objectives.

DEVELOPEE PROGRAMME FOR FRESH EMIRATI GRADUATES

This FANR programme is designed to provide fresh Emirati engineering and science graduates with the fundamental knowledge necessary to understand technical concepts applicable to nuclear engineering, radiation protection and regulation.

In 2021, FANR placed six Developees on a tailored development track programme in Radiation Safety, two of who completed all modules of their development programme and graduated in July and November 2021, respectively.

INTERNAL TRAINING PROGRAMME

In 2021, 536 internal and external training events were conducted for 97% of FANR employees. This included technical and non-technical training provided by both expatriate employees and Emiratis.

536 Internal & External Training Events

For **97%** of FANR Employees

INSPECTORS QUALIFICATION PROGRAMME

During the review period, FANR workforce included 81 inspectors qualified to carry out inspections at nuclear and industrial facilities in the UAE, of whom 55 are Emirati. The qualification follows a rigid programme including initial training topics, an inspector job-shadowing programme, and Ministry of Justice training to become authorised judicial officers.

81
Inspectors

55
Are Emiratis

KNOWLEDGE MANAGEMENT

Knowledge is the nuclear industry's most valuable asset and resource. It is the foundation for safe and sustainable operations. FANR therefore invests in knowledge acquisition and retention.

In 2021, FANR Knowledge Management Programme continued to develop our Knowledge Management Framework. The primary focus was on identifying knowledge to be maintained and to be acquired via different programmes in FANR. Critical knowledge identification exercises took place in selected departments to support preparations for knowledge transfer from experienced staff to less experienced staff. The secondary focus was on adapting the lessons learnt in knowledge management practices to FANR processes and procedures to enhance services to employees. A third focus was on improving knowledge transfer plan activities, as part of our continuous improvement efforts.

ISO 30401:2018 KNOWLEDGE MANAGEMENT SYSTEMS

In 2020, FANR became the first nuclear regulator to achieve the ISO 30401:2018 certification for Knowledge Management Systems.

The intent of this standard is to set sound knowledge management principles and requirements. This year FANR Knowledge Management Programme underwent its first external audit, which was concluded without any non-conformances and earned a Compliance Certificate. This achievement was the result of good planning and execution by the Knowledge Management Project, adopting the lessons learnt, and continuous improvement of the programme's process, procedures, and activities.

POSITIVE CULTURE

Employee happiness and wellbeing, both of which are fundamental goals at FANR, are inspired by the UAE's National Happiness and Wellbeing Programme. FANR ongoing Employee Happiness and Well-being Programme aims to create a positive and encouraging work environment that meets staff needs and caters for their happiness.

Multiple initiatives aimed at enhancing the work environment were implemented during the year.
For example, the Employee Happiness Wellbeing Programme conducted 15 activities focused on employee engagement, volunteering, mental health, team spirit, and positivity.

15
Activities

focused on employee engagement, volunteering, mental health, team spirit, and positivity.

More than **17 internal events** were conducted to increase staff engagement, a sense of belonging, and loyalty. FANR's internal events **scored staff satisfaction rate of 97% in 2021.**

INNOVATION

FANR launched an innovation strategy in 2019. The strategy is aligned with the UAE Vision 2021, where innovation is part of the pillar United in Knowledge, which focuses on innovative Emiratis building a competitive economy.
FANR's innovation strategy aims to develop and discover innovative solutions t o contribute to our vision to be a globally recognised leading nuclear regulator.

The year under review featured a FANR Innovation Week, which included interactive sessions on fostering innovation in the nuclear industry, FANR staff success stories relating to innovation and virtual innovation games.

INTELLECTUAL PROPERTY

In 2021, FANR worked with the Ministry of Economy to obtain Intellectual Property certificates for 2 of its prominent smart systems making it a total of 4 IP certificates:
FAWRI TICK, first of its kind system that supports the UAE government in Combating Proliferation Financing. It was officially adopted by the Executive Office for Combating Money Laundering and Terrorist Financing as the UAE portal to combat proliferation financing.

Regulatory Oversight Management System (ROMS). The system provides an integrated solution to manage all regulatory oversight data for the Barakah Nuclear Power Plant to enhance how FANR measures the licensee's performance.

FANR invested as well in its employees where a FANR Staff graduated from the Intellectual Property Expert Diploma Program.

TOLERANCE

FANR has formed a Tolerance Working Group in charge of fostering and promoting a culture of tolerance in the organisation. The working group implemented multiple activities in 2021 to enhance societal cohesion among our employees.

To activate and promote the role of FANR in national tolerance activities and initiatives, we participated in and supported festivals and other planned activities organized by the Ministry of Tolerance during the year.

14. PURSUING EXCELLENCE

In 2021, FANR participated in the 6th cycle of the Mohammed Bin Rashid Award for Government Excellence to demonstrate our strengths and capabilities as a leading nuclear regulator. **Proudly, FANR was shortlisted for the Leading Federal Entity Award (less than 500 employees) and two FANR staff were shortlisted in the following categories:**

- **Youth Employee**
- **Future Jobs Employee**

15.

ANNUAL STAKEHOLDER SURVEYS

ANNUAL STAKEHOLDER SURVEYS

FANR primary stakeholders include customers, employees, partners, suppliers, and the community.

FANR developed and launched comprehensive surveys targeting each stakeholder group separately. This includes communication effectiveness, customer satisfaction levels, awareness about FANR services, community awareness, trust in FANR as a regulatory body, and the employee's happiness and wellbeing.

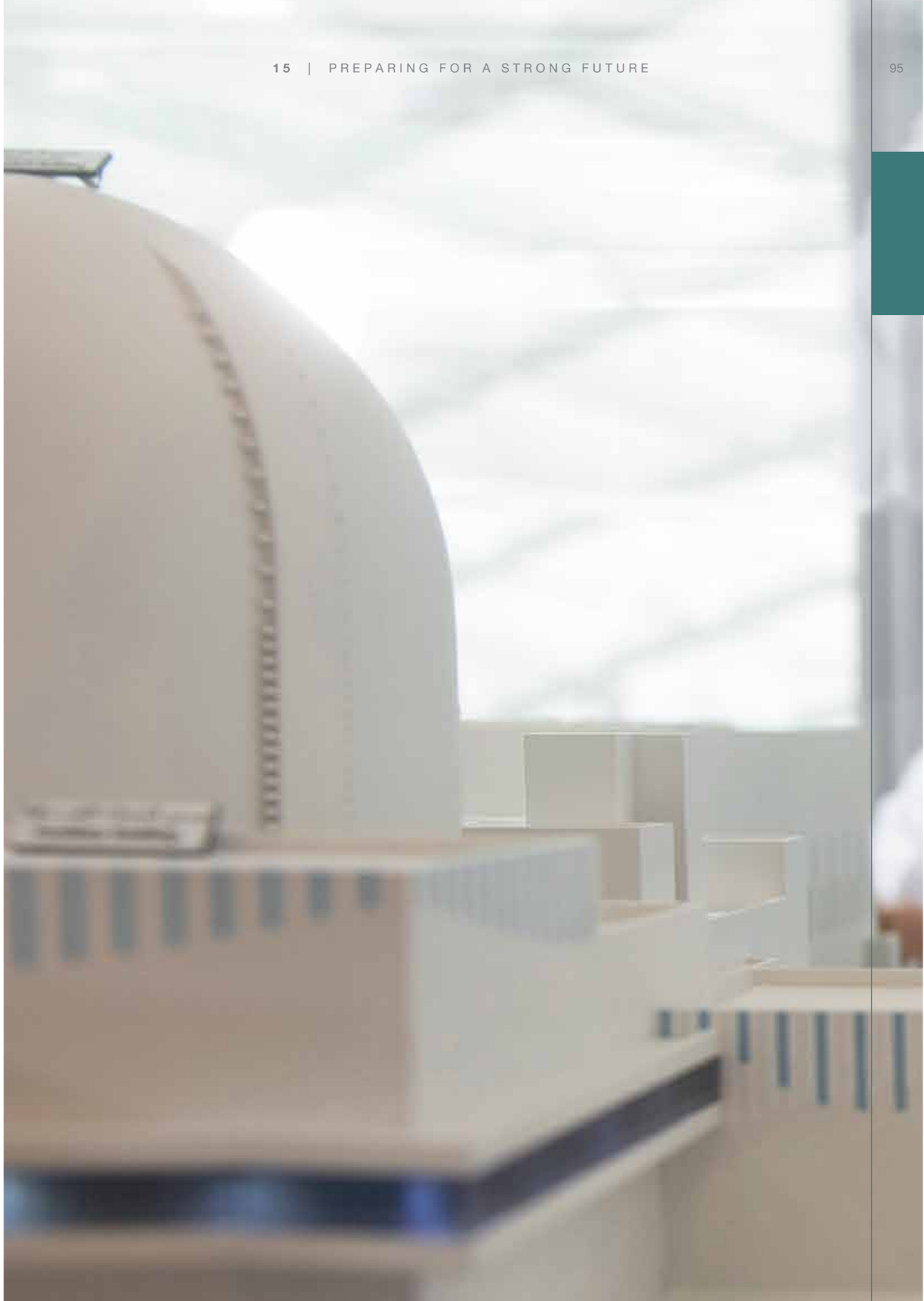
The surveys were in line with the Prime Minister's Office requirements, the Government Excellence Model (GEM 2.0), and the Global Star Rating System for Services.

FANR takes the survey results as one of the tools for the annual improvement of its operational plans.

Stakeholder	2020	2021
	General Happiness	General Happiness
Customers	89.7%	90.2%
Employees	80.6%	79.9%
Community	70.9%	67%
Partners	88.2%	92.5%
Suppliers	87.4%	95.7%

The TRUST was a combination of 3 surveys:

2021	Community Survey	Customer Survey	Partner Survey	Trust in FANR
Trust in FANR regulatory system for nuclear and radioactive safety	77%	92%	91%	87%
Trust in FANR nuclear and radiological emergency preparedness	73%	92%	93%	86%



16.

PREPARING FOR A STRONG FUTURE

2023-2026 STRATEGY

2023-2026 STRATEGY

FANR has already started intensive work and efforts to develop its 2023-2026 strategy, detailing our future roadmap in regulating the UAE's nuclear and radiological sectors.

Work on the strategy is set to be completed in 2022 and will focus on operational oversight of Barakah, the users of radiation sources and facilities, waste management, research and development, the regulatory framework, and strategic national and international cooperation.