

# **Federal Authority for Nuclear Regulation (FANR) Experiences with Hybrid Export/Import Inspection Techniques at Barakah Nuclear Power Plant During the COVID-19 Pandemic**

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## **ABSTRACT**

Inspectors of FANR's Safeguards Department/Export and Import Section conduct quarterly inspections on the Barakah Nuclear Power Plant (NPP) site in order to verify the Licensees' compliance with the respective FANR regulation and licence conditions and the correctness and completeness of the Licensees' quarterly reports. Such reports record all nuclear material, equipment, software and technology listed in Part 1 and Part 2 of the Nuclear Suppliers Group Guidelines imported or (re-)exported during a calendar quarter. FANR export/import inspections also ensure the correctness of the UAE's quarterly declarations subsequently submitted to the IAEA pursuant to Article 2.a.(ix) of the Additional Protocol. Considering the necessity to exercise precautionary measures to minimize the spread of the virus during the COVID-19 pandemic, FANR export/import inspectors conducted inspections on the Barakah NPP site utilizing both remote and physical inspection techniques. The combination of both techniques, known as a 'hybrid' technique, employed both on-line meeting software and the support of a FANR resident inspector on site. This paper describes the challenges for FANR export/import inspections due to the pandemic, the options available, the solutions chosen, the experiences gained and the lessons learned from conducting inspections using non-traditional techniques.

## **INTRODUCTION**

The United Arab Emirates is one of the most recent nuclear Newcomer Countries. Its nuclear programme took off in late 2009 when the recently established Emirates Nuclear Energy Corporation (ENEC) selected the Korea Electric Power Corporation (KEPCO) as the prime contractor for the construction of four APR-1400 reactors at Barakah, located in the Al Dhafra Region in the west of the Abu Dhabi Emirate. The KEPCO group also involved Samsung, Hyundai and Doosan, as well as Westinghouse, whose System 80+ design (certified in the USA) had been developed into the APR-1400.

The Federal Authority for Nuclear Regulation (FANR) was established in 2009 as the UAE's nuclear regulator and State Regulatory Authority (SRA) responsible for safeguards implementation.

ENEC began the construction of Unit 1 of the Barakah NPP in 2012, with the construction works for Units 2, 3 and 4 commencing in 2013, 2014 and 2015, respectively. ENEC established Nawah Energy Company in 2016 for the operation and maintenance of the Barakah NPPs. FANR issued the operating licence to Nawah for Unit 1 of Barakah NPP in February 2020 and for Unit 2 in March 2021. Unit 1 successfully achieved 100 per cent of the rated reactor power capacity in December 2020 and commercial operation started on 6 April 2021. Fuel loading at Barakah Unit 2 was completed in March 2021 and the plant is scheduled to achieve full power by September 2021. By March 2021, 94% of the construction works of Barakah Unit 3 and 88% of Barakah Unit 4 were completed. Unit 3 is scheduled to become commercially operational in 2023, Unit 4 in 2024.

The UAE acceded to the Treaty on the Non-Proliferation of Nuclear Weapons (NPT) in 1995. Its Comprehensive Safeguards Agreement entered into force in 2003. [1] The UAE also signed an Additional Protocol to its Safeguards Agreement, which entered into force in 2010. [2] Article 2.a.(ix) of the Additional Protocol requires the submission of quarterly declarations of exports of specified equipment and non-nuclear material to the International Atomic Energy Agency (IAEA) and, upon IAEA requests, also the confirmation of imports of such equipment and non-nuclear material. As a demonstration of the complete transparency of its nuclear programme, the UAE has voluntarily committed to declare all imports of such equipment and non-nuclear material without any prior IAEA request, and has been submitting quarterly declarations under Article 2.a.(ix) of the Additional Protocol on exports and imports.

In addition, the UAE voluntarily implements the provisions of the Nuclear Suppliers Group Guidelines, Part 1 and Part 2. [3] This requirement is embedded in FANR-REG-09, the “Regulation on the Export and Import Control of Nuclear Material, Nuclear Related Items and Nuclear Related Dual-Use Items”. [4]

Imports of equipment and related technology by ENEC for the Barakah NPP project started in 2014. Since then, a large number of imports as well as some re-exports have been carried out, which are monitored by FANR based on the licence conditions and on the provisions of FANR-REG-09, through notifications and quarterly reporting by ENEC and Nawah. FANR corroborates the information contained in ENEC’s and Nawah’s quarterly reports with the notifications and supporting documents submitted by ENEC and Nawah during the respective quarter.

These notifications and quarterly reports also form the basis for the quarterly inspections by FANR’s Export and Import Section at Barakah NPP. During these inspections any inconsistencies in the documents submitted by ENEC and Nawah to FANR are addressed and subsequently corrected by the licensees. FANR inspectors then inspect equipment that has not yet been installed in the storage areas of Barakah NPP and already installed equipment in the respective units, comparing the actual items against packing lists, ENEC’s receiving inspection reports and other supporting documents. Once FANR confirms that all information is correct and complete, the information about equipment imported or exported during the respective quarter, together with information from other FANR licensees who transfer relevant controlled material and equipment, is assembled into the quarterly declaration under Article 2.a.(ix) Additional Protocol for submission to the IAEA by FANR.

## **COVID-19: EFFECTS AND CHALLENGES**

As the world came to a halt in March 2021, operations at the Barakah Nuclear Power plant continued. FANR regulatory activities did not stop either, however, there were some major changes in the access and scheduling of inspections.

At the start of the pandemic the effects of COVID-19 were not yet fully understood. In the UAE strict measures were taken to limit physical interactions in all aspects. Those who could perform their work remotely were requested to work from home. There were curfew times and exit permits were only issued for emergency cases.

Only essential workers were exempt from those restrictions, including selected FANR staff and resident inspectors and the staff at Barakah NPP. In addition, strict measures were introduced to

limit access to the Barakah site only to FANR resident inspectors and licensee and subcontractor staff essential for the operation of Barakah NPP. The Barakah site was locked down and the essential employees were selected from each FANR Department to stay on site, including a few FANR resident inspectors. A shift rotation was set up so as not to compromise business continuity while allowing physical verification of the licensee by FANR. The presence of the licensee's workforce was also limited, with most of their staff working remotely.

If a positive COVID-19 case was detected in a shift all personnel in contact were quarantined for 14 days and until two consecutive PCR tests were negative, which meant that the other shift groups had to work for a longer period of time until the quarantined colleagues recovered or were released from quarantine. Limiting the access to the FANR resident inspectors meant that inspectors from FANR Headquarters were not able to conduct their scheduled inspections. They rescheduled their inspection activities depending on the availability of the resident inspectors to take up these additional inspections.

FANR employees and inspectors faced additional challenges since all were required to work from home and restrictions were enforced suddenly and without much prior warning. While all FANR employees work on laptops (not desktops) they could take their laptops home, but in order to access the local network each employee required VPN access. Initially the number of VPN accounts was very limited and therefore, VPN access was initially granted on a prioritized basis while the other employees were able to work using Webmail.

Another challenge were the travel restrictions around the world. Since some FANR employees were on annual leave at the time of the lockdown they were stuck outside the UAE without being able to return to the UAE or having access to their office laptops.

Since there was no FANR staff at FANR Headquarters, holding physical meetings was out of the question. Staff opted to utilize the Skype Business application already installed on all FANR laptops, which took some time to get used to. Additional virtual platforms were introduced such as Zoom, Cisco Webex, and MS Teams. Since each FANR department, each company, government entity and licensee had their preferred platform, it was a challenge to use all of them in a proficient manner. It took some time for FANR to settle with MS Teams as the official online communication platform since it was used by all official government entities in the UAE.

On an individual level each employee faced different challenges working remotely from their homes such as network issues or lack of private work space, together with different IT issues, which the FANR IT support team tried to resolve by phone.

## **SOLUTIONS**

Prior to the COVID-19 pandemic all FANR inspections at the Barakah site had been conducted physically to assure the Safety, Security and Safeguards of the Barakah project. FANR's export and import team used to visit the site four times a year for about three days at the beginning of a new calendar quarter to verify the equipment and technology imported during the preceding quarter.

The sudden and unexpected challenges of the COVID-19 pandemic required each organization to respond rapidly and to find solutions that would not disturb the continuity of the work activities while at the same time following the precautionary measures introduced to minimize the spread of

the virus.

The strict new measures prompted FANR's export and import team to identify viable approaches for conducting inspections at the Barakah NPP site. They came up with the concept of conducting FANR's quarterly import/export inspections in a hybrid manner, with part of the inspection activities being carried out remotely using an online platform and the physical verification activities on the Barakah site being conducted with the assistance of FANR resident inspectors.

The remote inspection activities comprised the entrance meeting between the FANR inspection team, the licensee and the subcontractors through a secure platform, to discuss the inspection schedule and the planned sequence of the physical inspection activities. The FANR resident inspector on site who supported the remote FANR team then conducted the physical verification of the equipment received during the past calendar quarter. In the meantime the FANR remote team conducted the other inspection activities online. During the document review and the consistency check between notifications and quarterly reports relevant documents were displayed online for ease of discussion. The verification of technology documents was also conducted online where the licensee displayed randomly selected technology documents in the ENEC/Nawah database.

The cooperation with the FANR resident inspector on site who supported the remote team worked very well. All physical verification activities of the equipment declared in the quarterly report for the preceding calendar quarter were completed despite the limited presence by the licensee's staff and subcontractors on site.

After the physical verification was completed, the FANR resident inspector met with the FANR export and import team virtually to discuss the results of the verification and the observations made during the inspection. The exit meeting to discuss the inspection outcomes and observations between the FANR and the licensee teams was then also held virtually.

## **LESSONS LEARNED AND RECOMMENDATIONS**

The COVID-19 pandemic posed a hitherto unprecedented challenge to modern life. Most countries turned out to be only poorly prepared to face those challenges. Responses often required the introduction of strict and often unproven measures to contain the spread of the virus, both at the country and at the individual level.

The main lesson learned is: always be well prepared for any unexpected and extraordinary events, including for 100 year pandemics! This includes actions such as:

- establishing a task force that can rapidly respond to emergency situations such as a pandemic;
- updating current procedures in order to include changes to existing work processes;
- setting up and maintaining the necessary IT infrastructure to support remote work , secure data submission and the handling of large files; and
- thinking out of the box to identify new ways of working to meet work objectives.

In the case of FANR, the authority set up an operational working group to tackle the COVID-19 challenges as well as "The Team", which is composed of staff from several FANR departments who are responsible for the timely response to any situations arising from the pandemic, including

the monitoring of staff by conducting regular PCR tests. FANR also established a Remote Inspection Working Group that reviewed existing inspection procedures and identified new methods for meeting the inspection goals and that modified the FANR inspection program to minimize the spread of COVID-19 while continuing to conduct mission-critical inspections. It also identified new techniques and technologies to support remote inspections, such as using inspector goggles for addressing access restrictions. Many FANR licensees and other entities found difficulties in conforming to new FANR inspection requirements, which needed to be addressed before the changes were implemented.

For the Barakah export and import related inspections, FANR introduced and implemented the solution of hybrid inspections, requiring a minimal amount of physical presence while ensuring business continuity. Shifting some inspection activities to an online platform may eventually reduce the number of required inspectors on site even when the pandemic is over. One further advantage is that inspectors attending on on-line platforms will not require site access security clearances and gate passes. This will allow a larger number of inspectors, licensees and subcontractors to participate in the some of the inspection activities virtually.

## **CONCLUSIONS**

Despite some of the challenges encountered at the onset, FANR import and export hybrid inspections prove to be an effective and efficient way to conduct inspections during extraordinary times such as the COVID-19 pandemic. Dividing inspection activities into such that lend themselves to be conducted remotely and such that need to be carried out physically allows for a more efficient conduct of inspections and the involvement of more staff in different locations. This solution may be considered in business continuity plans and may even be utilized permanently during certain types of inspection such as selected export and import related verification activities.

## **ACKNOWLEDGMENTS**

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## **REFERENCES**

1. Published by the IAEA as Information Circular (INFCIRC) 622.
2. Published by the IAEA as Information Circular (INFCIRC) 622/Add.1.
3. The Nuclear Suppliers Group Guidelines, Part 1 and Part 2, and their revisions are published by the International Atomic Energy Agency on its website as information circulars: INFCIRC/254/Part 1 and INFCIRC/254/Part 2.
4. FANR-REG-09 was updated in May 2021 and is published in English and Arabic on FANR's website: <https://www.fanr.gov.ae/en/Documents/FANR-REG-09%20V.1%20ENG%20with%20cover.pdf>