

The Regulatory Framework for a United Arab Emirates Spent Fuel and Radioactive Waste Management Strategy – 14090

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ABSTRACT

The establishment of a nuclear energy programme in the United Arab Emirates (UAE) on a sustainable basis and in accordance with the highest standards of safety, security and non-proliferation requires that the UAE develop and implement a radioactive waste management strategy. The commitment to effectively manage radioactive waste was made in the UAE Nuclear Policy Paper on the potential development of nuclear power and a framework legal approach to management and disposal of waste (including the basis for the funding arrangements) is included in the UAE Nuclear Law. The development and implementation of the regulatory framework for such a strategy is also consistent with the UAE's commitments under the Joint Convention on the safety of Spent Fuel Management and the Safety of Radioactive Waste Management and it was foreshadowed in the UAE's National Report to the 4th Review Meeting under the Joint Convention in May 2012.

The legal framework envisages the formation of a national waste management organisation to take forward the implementation of the strategy. There will be a need for early examination of the potential for siting disposal facilities within the UAE and this will require the development of a waste disposal regulatory framework.

INTRODUCTION AND BACKGROUND

The UAE government established in April 2008, the “Policy of the United Arab Emirates on the Evaluation and Potential Development of Peaceful Nuclear Energy” (the Nuclear Policy). The Nuclear Policy was based on a study of viable options to meet future energy needs, and focused on the potential benefits of nuclear power for the UAE people, the environment, and the economy.[1]

The Nuclear Policy makes the following commitments in the development of nuclear energy in the UAE:

- Complete operational transparency
- Pursuance of the highest standards of non-proliferation
- Pursuance of the highest standards of safety and security
- Conformance to International Atomic Energy Agency (IAEA) standards in evaluating and potentially establishing a peaceful nuclear energy programme
- Development of peaceful domestic nuclear power capability in partnership with the governments and firms of responsible nations, as well with the assistance of appropriate expert organisations
- Assurance that the peaceful domestic nuclear power programme is developed in a manner that best ensures long-term sustainability

The UAE has moved forward on the commitments outlined in its Nuclear Policy through the adoption of the relevant international instruments for nuclear safety, security, and non-proliferation, and through the formal establishment of the Federal Authority for Nuclear Regulation (FANR) with Federal Law by Decree No 6 of 2009 and the Emirates Nuclear Energy Corporation (ENEC) with Abu Dhabi Law No 21 of 2009.

The UAE has made multiple bilateral government-to-government cooperative arrangements, and engaged with the IAEA in peer review and assessment activities. The bilateral agreements enabled the UAE to obtain scientific and technical information and assistance from other countries, and to acquire materials and equipment. On the industry level, ENEC joined the World Association of Nuclear Operators in October 2010 and participates in sharing experience through peer reviews and feedback reports.

The UAE has also established a high-level group of international experts, the International Advisory Board (IAB), to advise the government on progress in achieving and maintaining the Nuclear Policy objectives.

The UAE has chosen an advanced third-generation light water reactor (LWR), known as APR1400 to ensure safety at the highest levels. The APR1400 design is an advanced version of the Combustion Engineering (now Westinghouse) System 80+, a design certified by the United States Nuclear Regulatory Commission. On 27 December 2009, ENEC awarded a consortium led by Korean Electric Power Company (KEPCO) a contract to supply the UAE with four nuclear power reactors. All four plants are scheduled to be online by 2020. The scope of the contract covers engineering, procurement, construction, fuel, and operations and maintenance support.

In December 2010, ENEC submitted its first application to FANR for a licence to construct the first two units of a nuclear facility at the proposed site of Barakah in the Western Region of Abu Dhabi. The application included a comprehensive Preliminary Safety Analysis Report (PSAR) based on the Shin-Kori Units 3 and 4 facility in Korea, for which the Korean authorities issued a construction permit in 2008, and which serves as the reference plant for the UAE.

In July 2012 FANR has granted ENEC a licence to construct two nuclear power reactor units at its proposed Barakah site in the Western Region of the Abu Dhabi Emirate and the reactors are under construction. Also, ENEC submitted the second application for the construction of the second two units Barakah units 3 and 4 to FANR on 1 March 2013 and it is under review.

To complement and expand upon the goals laid down in the nuclear power programme, a specific strategy for the national radioactive waste management programme must be developed, agreed and documented.

UAE Waste Management Regulatory Framework

The UAE nuclear programme is in its early stages. But the UAE accepts that it is not too early to plan for spent fuel and radioactive waste management. The UAE government has recognized the need to put into place the necessary legislative, regulatory, and organisational framework to ensure the safety, security and environmental acceptability of its spent fuel management and radioactive waste management.

The Federal Law by Decree No 6 of 2009, Regarding the Peaceful uses of Nuclear Energy addresses issues of radioactive waste and decommissioning, where;

- Article 40.1 affirms the responsibility of licensees to safely manage and store radioactive waste from its generation until delivery to an entity designated by the UAE Cabinet to manage disposal of such material.
- Article 40.3 requires FANR to adopt rules for safe management of radioactive waste.
- Article 41 provides that the UAE Cabinet will issue a policy regarding long-term management of spent fuel and nuclear waste.
- Article 41.3 prohibits import of spent nuclear fuel and nuclear waste derived from nuclear energy applications outside the UAE, for the purpose of long term storage or disposal in the UAE's lands and sites.
- Article 42 establishes a legal regime for decommissioning of nuclear installations, and for radioactive waste management including establishment by the UAE Cabinet of a Decommissioning Trust Fund to be financed through fees collected from licensees.

The UAE's Regulator (FANR) regulates the nuclear sector in the UAE in line with the UAE Nuclear Law, Nuclear Policy, international treaties and international best practices. In the

area of radioactive waste management, FANR has promulgated 'Regulation for Radiation Protection and Pre-disposal Radioactive Waste Management in Nuclear Facilities' (FANR-REG-11) [3] which establishes requirements for radioactive waste management in Nuclear Facilities. FANR-REG-11 covers:

- General requirements for pre-disposal management
- Steps in the pre-disposal management of radioactive waste
- Pre-disposal radioactive waste management facilities and activities
- Clearance levels and discharges of radioactive material
- Environmental monitoring programme.

Moreover, FANR regulation 'Basic Safety Standards for Facilities and Activities involving Ionizing Radiation other than Nuclear Facilities' (FANR-REG-24) [4] also establishes requirements for radioactive waste management. FANR-REG-24 covers:

- Possession, use, manufacture or handling of any regulated material in the state
- Storage of any regulated material within the state
- Disposal of any regulated material within the state

In addition, FANR is drafting FANR-REG-26 Regulation for Predisposal Management of Radioactive Waste and FANR Regulatory Guide RG-018 on Predisposal Radioactive Waste Management to support the waste management strategy.

A comprehensive national strategy for the safe management of spent nuclear fuel and radioactive wastes in the UAE is under development to accommodate all radioactive wastes arising in the UAE. It will be consistent with the national nuclear energy policy. The strategy chosen will strike a balance between concrete planning bases while maintaining alternative options open. Safety and security will be the prime concerns of the waste management strategy. The strategy, when adopted, will ensure that the UAE meets its international obligations for the safe and secure management of nuclear waste.

Key factors which will influence the national waste management strategy are:

- Current spent fuel management practices
- Fuel cycle options (fuel leasing, direct disposal or reprocessing);
- Technologies that are foreseen;
- Location (where the waste management facilities might be located); and
- The 'roadmap' for the timing of when decisions must be made about the establishment of different facilities

CURRENT PROPOSED SPENT FUEL AND RADIOACTIVE WASTE MANAGEMENT PRACTICES

At this stage of the UAE civil nuclear energy programme, the UAE has no spent fuel or spent fuel facilities.

ENEC has planned set of measures for the management of spent fuel and radioactive waste as follows:

- The design of the Barakah Nuclear Power Plant has sufficient capacity in the spent fuel storage pool for 20 years of operation for each NPP.
- The proposed plant design including storage of low and intermediate waste at plant site for a minimum of 10 years for four nuclear units.

PATH FORWARD A WASTE MANAGEMENT STRATEGY

The UAE has made a commitment not to enrich uranium or reprocess spent fuel, so there will be neither enrichment nor reprocessing facilities within the UAE. Based on that, the UAE is looking at long-term spent fuel and radioactive waste management options to fulfill the commitments. Different types of waste management options are considered; waste disposal facilities in UAE, external spent fuel reprocessing service, fuel leasing or spent fuel disposal facility abroad.

The UAE will keep open the waste management options that require services to be provided by other countries, whether these are provision of a disposal facilities, spent fuel leasing or reprocessing abroad. None of these services is required until spent fuel is ready for shipping or disposal, and these time points are one to several decades into the future. Meanwhile, the UAE focus on siting studies for waste management facilities that must be, or may have to be, implemented nationally. This can begin with assessment of the suitability of the Barakah site for a disposal facility, a low and intermediate level waste management facility. In case a separate low and intermediate level waste storage site is necessary, a programme for examining siting possibilities for all such facilities would be initiated at the start of the NPP programme. This not only gives input for future planning, but also demonstrates to the national public and to the international nuclear community that the UAE is taking its back-end responsibilities seriously. In parallel with these national studies, the UAE should continue its dialogue with Foreign Service providers and also with regional partner nations that might eventually be co-owners or co-users of jointly owned waste management facilities in the Arabian Gulf region.

CONCLUSION

The development of a potential national strategy for the management of high-level waste and spent nuclear fuel will continue to present challenges in setting the strategic direction of the UAE spent fuel and high-level waste management programmes; As well as, in setting the direction of associated agency programmes related to nuclear waste storage, transport, and disposal.

The UAE is committed to the highest standards of security and safety. Therefore, additional measures will be needed over the coming years as the UAE nuclear programme evolves and progresses, such as:

- Developing regulations and guides on safety of radioactive waste disposal facilities, near-surface and geological, with particular emphasis on siting
- Establishing a waste management organisation with well-defined roles and responsibilities and organisational approach
- Waste transport logistics should be established in the period 2030-2040, when key facility siting work is under way
- The UAE should encourage and be actively involved in regional discussions about possible sharing of all types of waste management activities and facilities

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