

**ICEM07-7280**

## **DECOMMISSIONING OF THE IRAQ FORMER NUCLEAR COMPLEX**

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### **ABSTRACT**

A number of sites in Iraq have some degree of radiological contamination and require decommissioning and remediation in order to ensure radiological safety. Many of these sites in Iraq are located at the nuclear research centre at Al Tuwaitha. The International Atomic Energy Agency (IAEA) Board of Governors has approved a project to assist the Government of Iraq in the evaluation and decommissioning of former facilities that used radioactive materials. The project is divided into three phases: Phase 1: collect and analyze all available data and conduct training of the Iraqi staff, Phase 2: develop a decommissioning and remediation plan, and Phase 3: implement field activities relating to decommissioning, remediation and site selection suitable for final disposal of waste.

Four working groups have been established to complete the Phase 1 work and significant progress has been made in drafting a new nuclear law which will provide the legal basis for the licensing of the decommissioning of the former nuclear complex. Work is also underway to collect and analysis existing data, to prioritize future activities and to develop a waste management strategy. This will be a long-term and costly project.

### **INTRODUCTION**

There are a number of sites in Iraq which have been used for nuclear activities and which contain potentially significant amounts of radioactive material. Many of these sites suffered substantial physical damage during the Gulf Wars and several have been subject to looting of materials and equipment as a consequence of the challenging security situation in the country.

The principal nuclear site in Iraq is Tuwaitha, the nuclear research centre which contains several facilities including research reactors and hot cells. The other key sites include Wardiya/Location C (a waste storage area) and Naddaf/Location B (a former temporary spent fuel storage area), Adaya (rubble and equipment burial site), Qaim (fertilizer plant and uranium extraction), Jesira (Uranium processing and waste storage), Rashdiya (centrifuge facility), Atheer (uranium metal), the Geopilot Plant (uranium extraction) and Tarmiya (enrichment plant).

All of these sites have some degree of contamination and require decommissioning and remediation in order to ensure radiological safety. In December 2004 the Government of Iraq requested IAEA assistance to determine the effort needed to implement this work and to set up plans and programmes for its delivery. The IAEA Board of Governors has approved a project to assist the Government of Iraq in the evaluation and decommissioning of former facilities that used radioactive materials and inform the Iraq Government this approval in May 2005. An initiating meeting was convened in Vienna in

February 2006 attended by the Iraqi Minister for Science and Technology and by representatives from sixteen countries, including the US, and the European Commission. The meeting agreed the broad scope of the assistance project.

The project is coordinated by the Waste Safety Section within the IAEA Division of Radiation, Transport and Waste Safety, with input and support from other IAEA Divisions and by many Member States. Several U.S. agencies, including Texas Tech University's Center for Environmental Radiation Studies, Sandia National Laboratories and the Nuclear Regulatory Commission are assisting in the program. The project seeks to develop Iraq's entire nuclear facility dismantlement and radioactive waste disposal program, from laws/regulations through disposal of radioactive wastes at properly licensed facilities..

## PROPOSED APPROACH OF THE PROJECT

Based on the outcome of the initial meeting, the project is divided into three phases as follows:

Phase 1: The objective of this phase is:

a- To collect and analyse all available data with the goal to identify all sites and facilities that might need remediation or decommissioning.

b- Evaluate the RWTS facility at Tuwaitha Site with the aim of assessing its possible use during the next phases for waste treatment.

c- Conduct training of the Iraqi staff.

Phase 2: Based on the information gathered in phase 1, an overall plan will be prepared in close cooperation with the IAEA for obtaining the complementary information needed to complete a decommissioning and remediation plan as well as site selection plan for a permanent waste disposal site.

Phase 3: Based on the information completed in phase 2, field activities will begin to be performed relating to the decommissioning, remediation and site selection suitable for final disposal of waste. This will be a long-term and costly project. Therefore the Iraqi Government needs at this phase IAEA assistance in its efforts to approach donors and supply experts.

## PROJECT SITUATION

### Working Groups

To perform the phase 1 activities Iraq established four working groups to work with the IAEA in close cooperation. These are:

- Working Group1 (WG1): Data collection and analysis Working Group,
- Working Group2 (WG2): Prioritization system development Working Group
- Working Group3 (WG3): Decommissioning and waste management strategy working group
- Working Group4 (WG4): Law and Regulation working group (this was originally as part of WG3).

## Current Activities

### *Law and Regulations*

Work is well advanced on drafting a new nuclear law which will provide the legal basis for the licensing of the decommissioning of the former nuclear complex. This law is being coordinated with a new law addressing the prohibition of Weapons of Mass Destruction. The law has been translated in Arabic language by the Iraqi experts and submitted to higher authority to take its way through normal procedures for laws approval according to Iraqi regulations. A set of supporting regulations is also being drafted covering detailed requirements for Radiation Protection, Decommissioning and Waste Management. This overall set of laws and regulations will replace all the relevant legislation currently in existence within Iraq. This drafting work should be largely complete by the end of 2007.

### *Data Collection and Analysis (Data Characterisation)*

The current work is aiming to assemble, collate and assess all the data currently in existence, to assess and identify the data gaps and to prepare a plan for the collection of all the data necessary to underpin the Decommissioning Plan. For that reason an action plan for six months for WG1 & WG2 was established and implemented for Al-Tuwaitha site. The identification and justification of the necessary equipment, expertise and services to support this future work is included in this current activity, as is the assessment of a data management system which will support the documentation of the characterisation data based on facility mapping and also track the material, once decommissioning commences, through the waste management processes.

### *Prioritisation System*

The project has developed the principles and outline application of a system to prioritise the sites and facilities in Iraq in order to facilitate the orderly and logical development of the decommissioning plan. The system contains both quantitative risk-based elements and wider judgemental modifying factors. The system is being populated with site/facility data, initially mainly using 'best estimate' data but data quality will be upgraded as more substantive characterisation data becomes available.

### *Waste Management Strategy*

Iraq presented in IAEA Meeting in February 2006 a report titled "Status of the radioactive waste in Iraq". The report gives an estimation of existing radioactive solid waste to be more than 500 tones and liquid waste of about 270 cubic meters without taking into consideration the amount of the huge contaminated scrap and soil as well as the amount of the expected solid and liquid waste which will come from decommissioning and remediation of future activities. It is stated also in this report that the radioactive waste treatment station (RWTS) in Al-Tuwaitha site is not qualified for processing such an amount of solid and liquid radioactive waste. Moreover the RWTS needs to be rehabilitated.

Therefore the International experience and current practice relevant to decommissioning waste management, material sentencing and clearance, treatment and packaging of waste, and waste disposal options are being reviewed. Visits have been made to US disposal facilities in Nevada and Utah and to waste management and disposal activities in Germany and France. Emphasis is being given to understanding the strategic issues involved and the interaction between disposal requirements and decommissioning operations.

### **Future Work Programme**

The balance of effort on the above four work streams is expected to change over the coming period as the issues come together in support of the development of the overall Decommissioning Plan. This will increasingly become the dominant component, requiring substantial input from the characterisation data and waste management work streams. The prioritisation work will be subsumed as an integral part of the Plan.

#### *Law and Regulation*

Two further Technical Meetings are necessary to complete the drafting activity – including the development of Transport and Security Regulations. Emphasis will then be needed on ensuring that the newly established Regulatory Body (IRCA) develops practical expertise in the application of the regulations, particularly regarding decommissioning and waste management activities which will be new to Iraq. This will require visits/attachment to experienced regulators in other countries etc.

#### *Characterisation Data*

A very significant programme of work is anticipated in order to provide the necessary underpinning for the Decommissioning Plan. The hands-on work within Iraq will be funded locally, but significant external support, coaching and review will be required if the work is to be achieved in the necessary timeframe and at the necessary quality. Support for the review of external records (IAEA, supplier countries) is needed. In addition there will be some equipment purchase necessary to support the project, together with funding for the provision of the data management system.

#### *Waste Management*

The preliminary assessment of international waste management and disposal approaches obtained in the current programme must be reviewed against the developing data on

the Iraq waste management streams, and the appropriate waste management options assessed and approved. Whilst the work will be led by Iraqi personnel, it is essential that international expertise is available to guide and review this vital activity as the project moves towards an agreed waste management strategy. It is very likely that the early development of interim waste storage will greatly assist the project. Assessment of options for waste disposal (e.g. shallow burial), including potential sites, will also be necessary at this stage of the project. Again it is essential that international expertise is available to support these developments through Technical Meetings and relevant visits.

#### *Decommissioning Plan*

The development of the Decommissioning Plan is the central activity over the coming period, supported by the above work streams. There is no experience or expertise within Iraq on which to base the development of the plan, and it will therefore be necessary to provide training, support and coaching in order to bring in the international experience. Preliminary development of the proposed project management organisation will be necessary, and the assessment and procurement of project management and work management systems must be undertaken. External advice on safety assessment, environmental assessment, operational safety control and quality assurance management system will need to be planned.

### **Longer Term Project Completion**

The Decommissioning Plan will provide the platform for the development of the funding requirement for delivery of the project and for the overall project implementation plan.

Working within an international cooperation framework, which is expected to explore the potential mechanisms for Member State support and involvement in this work, the final phase (Phase 3) of the project will provide for the implementation of the demolition, decommissioning, remediation and waste management activities. These will no doubt take several years to come to completion. At this stage Iraq will need IAEA assistance to approach donors as well as technical experts and to arrange specialized training for staff.