SETTING UP A DECONTAMINATION and DISMANTLING (D&D) SCENARIO –

METHODOLOGY AND TOOLS DEVELOPED

LEOPARD - 9194

F. PRADOURA
SGN AREVA group- Process Engineer, Decommissioning and Waste Management Business,
CDE/DEM UP2-400 Project,
SGN, 25 avenue de Tourville, 50 120 Equeurdreville, FRANCE

ABSTRACT

At the **AREVA NC La Hague** site, the former nuclear spent fuel reprocessing plant UP2-400 was shutdown on December 30, 2003. Since then, the cleaning up and dismantling activities have been carried by the DV/PRO project, which is the program management organization settled by AREVA NC, for valorization projects.

SGN, part of the *AREVA* NC Engineering Business Unit, operates as the main contractor of the DV/PRO project and provides project management services related to decommissioning and waste management. Hence, SGN is in charge of building D&D's scenarios for all the facilities of the UP2-400 plant, in compliance with safety, technical and financial requirements. Main outputs are logic diagrams, block flow diagrams, wastes and effluents throughputs.

In order to meet with AREVA NC's requirements and expectations, SGN developed specific process and tools methods adapted to the scale and complexity of decommissioning a plant with several facilities, with different kind of processes (chemical, mechanical), some of which are in operation and other being dismantled. Considering the number of technical data and inputs to be managed, this methodology leads to complex outputs such as schedules, throughputs, work packages... The development, the maintenance and the modification of these outputs become more and more difficult with the complexity and the size of the plant considered.

To cope with these issues, **SGN CDE/DEM UP2-400** project team has developed a dedicated tool to assist and optimize in elaborating D&D scenarios. This tool is named **LEOPARD** (*L*ogiciel d'*E*laboration et d'*O*ptimisation des *P*rogrammes d'*A*ssainissement *R*adiologique et de *D*émantèlement) (Software for the Development and Optimization of Radiological Clean up and Dismantling Programs).

The availability of this tool allowed the rapid construction of a test case (demonstrator) that has convinced **DV/PRO** of its numerous advantages and of the future further development potentials. Presentations of **LEOPARD** to other nuclear operators have also generated interest and adaptation to the D&D of other type of plants (such as enrichment) is overseen with great interest.

INTRODUCTION

At the **AREVA NC La Hague** site, the former reprocessing plant UP2-400 was shut down on December, 30th 2003. The Decontamination and Dismantling (D&D) operations of the plant have started, while the two other plants of the La Hague site, UP3 and UP2-800, are in operation.

Given the stakes, a dedicated **AREVA NC** project, named **DV/PRO**, has been settled as the contracting authority for the D&D of UP2-400. Project management for the development of D&D's scenarios has been awarded to **SGN, part of The AREVA NC Engineering Business Unit**.

The main challenges in developing D&D scenarios are:

-   A strict regulatory environment (in the field of dosimetry, safety, waste management, environmental protection…),

-   Long term timeframe associated with stringent schedule deadlines,

-   The huge economical and technical impact of each choice made in setting up these scenarios.

SGN is in charge of the engineering, the design, the cost estimate and the development of the scenarios for the D&D of the UP2-400 facility, including:

-   A comprehensive project planning with major milestones, estimated work duration, waste flows, dosimetry and resource needs.

-   Identification and organization of the tasks to be undertaken, grouped together in work packages

NOMENCLATURE

CDE: Cessation Définitive d'Exploitation - Final operating shutdowm

CODI: Concepteur D'Intervention – D&D Scenario Designer

DEM: Démantèlement – Dismantling

LEOPARD: Logiciel d'Elaboration et d'Optimisation des Programmes d'Assainissement Radiologique et de Démantèlement – Software for the Development and Optimization of Radiological Clean Up and Dismantling Programs

DV/PRO: Direction Valorisation / Projet – Valorization Direction / Project management

METHODOLOGY

In order to meet with client requirements and expectations for the development of cleaning up/dismantling scenarios, the methodology developed by **SGN** is based on a functional analysis of the work to be performed.

This analysis includes the following sequences:

1. Compilation and analysis of basic data inputs (radiological and technical status, inventories). These data also include transverse requirements: interfaces with the facilities in operations, ventilation …

2. Definition of the tasks to be carried out per room or hot cell. These actions are previously defined in a list including around thirty generic functions (from the definition of an initial condition of a pipe, to the removal of a concrete structure).

3. Edition of a block diagram of the sequencing logics between these tasks.

4. Edition of the deliverables (schedule, waste flows, resources …).

5. Gathering the tasks to set up the work packages. This progressive gathering takes into account the following requirements:

   o Time

   Duration shall not exceed two to three years, without any protracted period of inactivity between two clean up/dismantling tasks of a same work package.

   o Trades / Work trainings

   Identification of the tasks involving specific trades or trainings (i e remote operation) and gathering these tasks within a same work package.

   o Size

   The objective is to set up important work packages to simplify the management of the interface, cost optimization and to minimize the numbers of tenders or orders.

   o Multiplicity

   The total number of work packages should enable an easy over view of the financial breakdown for the dismantling of a facility: it should not exceed 30 to 40 work packages.

   o Limiting the work area

   The purpose is to limit the coactivity (interfaces, conflicts) between two work packages to be performed concurrently.

This methodology, applied to a facility including 300 rooms (case of MAPu facility: Plutonium Finishing Facility), leads to thousands of clean up and dismantling tasks resulting to a high complexity of the scenario's breakdown at the facility level, and furthermore for the whole UP2-400 plant!

THE ISSUE

The difficulties encountered when developing an overall D&D's scenario are two folds:

- At the facility level, managing these thousands of interconnected individual tasks might increase the complexity and difficulty to integrate the evolution of assumptions and scenarios, as shown on drawing 1 hereafter.
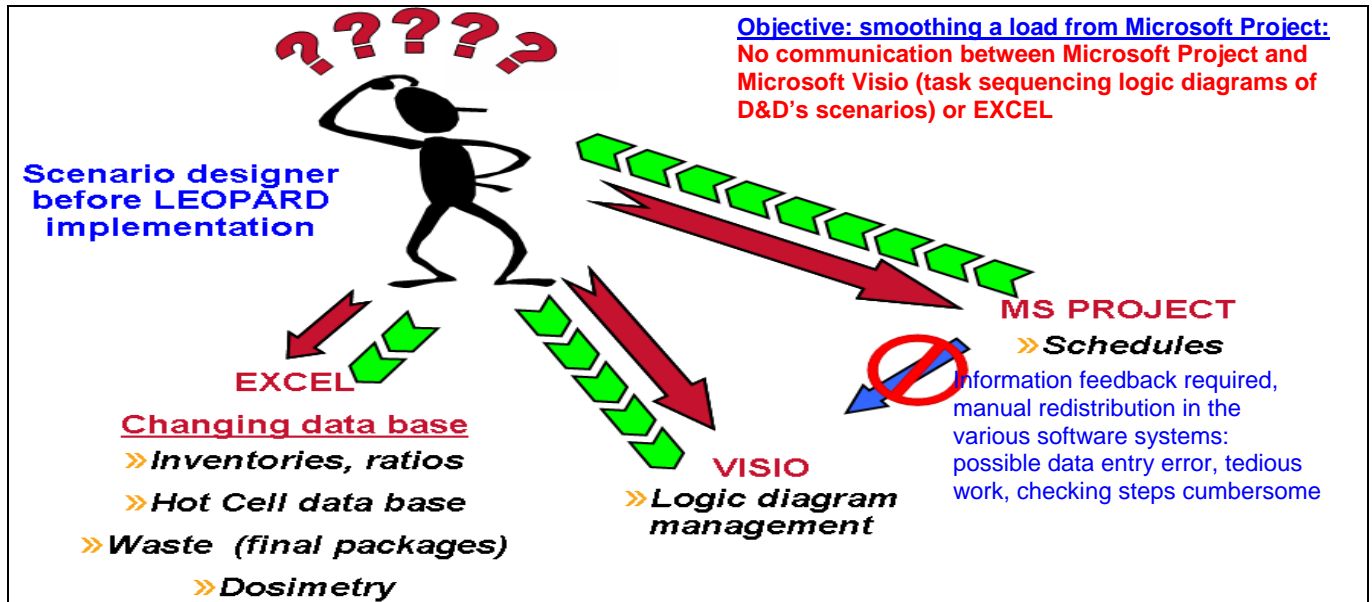

Figure 1 – Problem encountered in a facility when developing and maintaining an overall D&D's scenario

At UP2-400 plant level, it was difficult to have a clear transverse view, mainly for the following reasons:

- Delicate standardization of deliverables due to the specificity of each facility,

- Considering the possible impact of postponing or anticipating an operation in an UP2-400 facility is complex due to the interfaces between the various facilities (active trenches, ventilation…)

- Smoothing the overall load of support facilities (waste conditioning, declassifying waste not adapted for surface storage into waste consistent with a surface storage) is also complex and is significantly influenced by the dismantling operations, as shown on figure 2 of the following page.
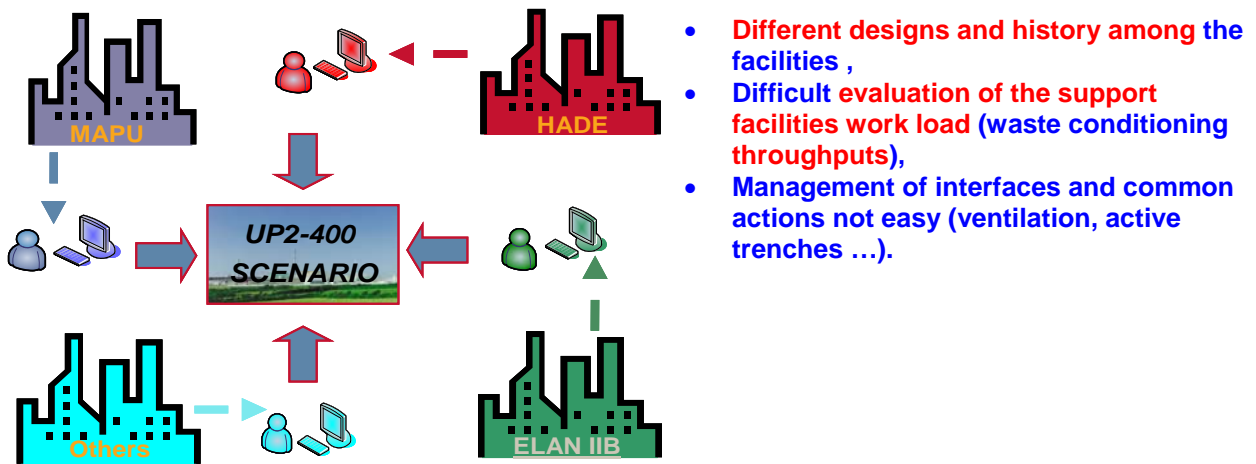
Figure 2 – Issues encountered for D&D's scenarios at UP2-400 plant level

Before **LEOPARD**, it was difficult to meet with client expectations, it required both a comprehensive vision over a long period of time (evaluation of the support facilities work load) and a detailed vision on specific issues (cost estimate of a work package).

SOLUTION AND APPROACH ADOPTED

The presentation of this issue by **SGN CDE/DEM UP2-400** team during a brainstorming meeting held mid 2006 by the Decommissioning and Waste Management experts led to the emergence of a solution: SGN Quality and Methods Departments suggested to assess the advantages of ARIS software (database and process management).

Once the interest of ARIS software has been demonstrated, the whole **SGN CDE/DEM UP2-400** team became deeply involved and opted for a graded approach aimed at integrating, from the design of the tool, the experience of SGN specialists so as to:

- Obtain the client validation of our tool to switch the decommissioning scenarios of the other UP2-400 facilities into LEOPARD tool,

- Take advantage of the results obtained in real time to improve the scenarios in progress.

However, the first objective of this tool is to optimize engineering work hours via the automation of a certain number of tasks with a low added value: the expertise of SGN team remains essential

LEOPARD is actually a tool developed as an aid for the design and the optimization of overall D&D scenarios.

Since mid-2006, the development improvement of **LEOPARD** has been carried out and now enables an automatic management of all technical and financial data of D&D's scenarios, while ensuring a perfect traceability of the evolutions of an overall scenario.

From now on, the outputs generated by *LEOPARD* are the following:

- The task sequencing logic diagram,

- The schedules,

- The associated resources,

- Various balances (waste, dosimetry)

- Throughputs,

- Work packages estimates.

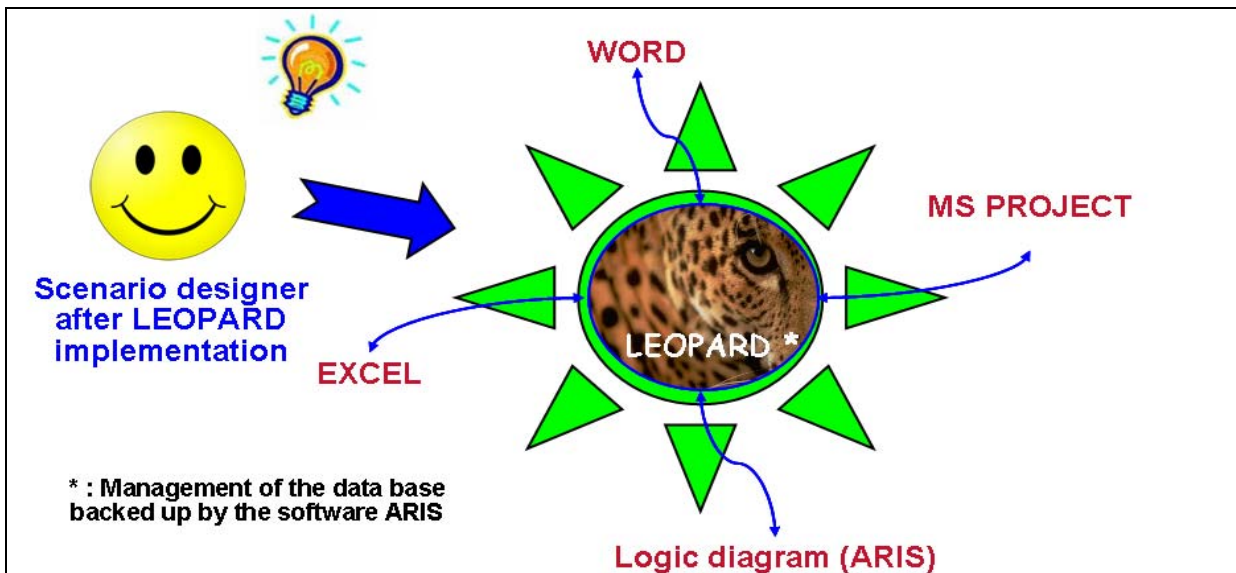The general structure of *LEOPARD* is shown on figure 3 hereafter

Figure 3 - LEOPARD operating principles and interfaces

GAINS

Within an engineering cost reduction objective context, *LEOPARD* limits the time needed to process data and tasks without actual added value and enables our collaborators to focus only on tasks with a strong technical added value. It enables us to answer more rapidly when changes occur or when new pieces of information are added to the specifications of the project.

It can also be used by SGN to propose new options in the D&D scenarios and anticipate some its needs.

The pilot tool demonstrated to *AREVA NC DV/PRO* Client, is a real success and resulted in:

- The Client request to switch all UP2-400 facilities into *LEOPARD.*

- Sharing out *LEOPARD* tool on a system common to *AREVA NC La Hague* and *SGN.*

- The Client request to continue our thought on an overall architecture of computerized dismantling tools, such as represented on figure 4 hereafter:
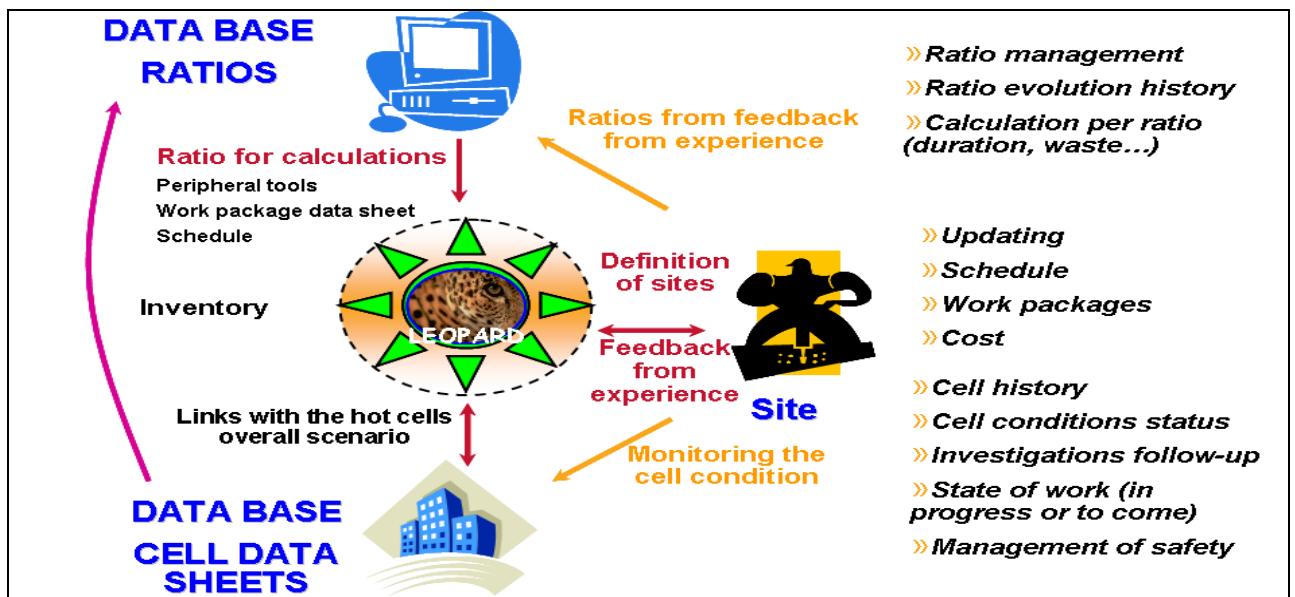

Figure 4 – Overall architecture of dismantling tools

This future tool would therefore enable from the inventory section of the hot cells data base and ratio data base, to define all technical data (estimation of durations, waste, workforce, and dosimetry) which can be directly transferred into LEOPARD.

LEOPARD would then generate the schedule, the waste flow and the breakdown in work packages (as it is already the case).

At the same time, this tool would enable:

- Integrating the feedback from experience from cleanup/dismantling sites, with regards to both the modification of a ratio (pipe cutting hourly rate…), and the room history,

- Following the investigations (information on the radiological conditions of a room or a specific item of equipment) and integrating the results,

- Following the evolution of the safety aspect of a room or hot cell throughout the clean up and dismantling operations.

CONCLUSION

While LEOPARD has been developed for the decommissioning activities of the La Hague Site, this tool, and the associated methodology, has been presented to other nuclear facility operators involved in dismantling (***EURODIF GB I Enrichment Plant and Marcoule APM** facility*) and aroused a great interest.

Those presentations were good opportunities to demonstrate that LEOPARD's design was an efficient answer to dismantling common issues and in particular concerning the management of schedule/technical data/financial data interfaces.

Furthermore, thanks to its gradual construction, LEOPARD remains a flexible and adaptable tool; able to rapidly and easily take into account requirements and specificities of each type of site/facility.

SGN's teams are now able and willing to propose their services to operators and utilities interested by this type of tool and its associated methodology, allowing them/you to:

- Benefit from the experience gained by SGN through its various Nuclear Decommissioning activities in France (Marcoule, La Hague, Cadarache) and Abroad (Ukraine, Russia, USA, UK…)

- Gain Cost efficiency by only focusing on D&D's objectives and not on means to reach them

- Optimize D&D scenario thanks to the wide variety of option and criteria it can manages at the same time