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NUCLEAR ENERGY AGENCY
RADIOACTIVE WASTE MANAGEMENT COMMITTEE

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Working Party on Decommissioning and Dismantling (WPDD)

2nd Meeting of the Decommissioning Cost Estimation Group (DCEG)

Proceedings of the Topical Sessions on:
(1) "Building Robust Cost Methodologies - Necessary Attributes of Different Types of Cost Model"; and
(2) "Inventory Management"

Held in Stockholm, Sweden
16-17 June 2009

English - Or. English

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FOREWORD

The Decommissioning Cost Estimation Group (DCEG) was set up in November 2007 by the NEA Working Party on Decommissioning and Dismantling (WPDD). Its main remit is to foster the exchange of information and experience amongst its members on cost estimation issues and to define and conduct studies aimed at improving the reliability and transparency of cost estimates. Its members are drawn from 12 member states of the OECD, together with representatives from the European Commission and the IAEA.

At its second plenary meeting, in Stockholm (16-17 June, 2009), the DCEG held two related topical sessions, on "Building Robust Cost Methodologies – Necessary Attributes of Different Types of Cost Model" and on "Inventory Management". This report documents these sessions. The main text summarises the main points from the presentations and discussions and includes a summary of the main conclusions from the sessions. Appendix 1 and 2 provide the agendas of the topical sessions and the list of attendees respectively. Copies of the presentations made are attached to this report in the form of a CD-Rom. DCEG members are also able to access the presentations on line, via the WPDD Members' Area, on the following address: http://www.nea.fr/html/rwm/welcome.html

Mr Staffan Lindskog, SSM, and Mr. Thomas S. LaGuardia, LaGuardia & Associates, co-chaired the first topical session and Mr. Sergio Vidaechea, ENRESA, and Mr. Robert Barker, CNSC, co-chaired the second topical session.

Acknowledgement

The WPDD wishes to express its gratitude to Messrs. Lindskog, LaGuardia, Vidaechea and Barker, as well as to all those presenting papers, for their efforts in making the topical session a success.

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First Topical Session

"BUILDING ROBUST COST METHODOLOGIES – NECESSARY ATTRIBUTES OF DIFFERENT TYPES OF COST MODEL"

Co-Chairs: Thomas LaGuardia & Staffan Lindskog

SUMMARY OF PRESENTATIONS AND DISCUSSIONS

Patrick O'SULLIVAN
NEA Secretariat

Introduction

Thomas LaGuardia (Co-Chair) opening the topical session, noted that the level of accuracy being achieved in estimating decommissioning costs had increased very significantly during the past decade, reflecting the experience gained in actual decommissioning projects over that time period and the increasing reliability of the available cost estimating tools.

Overview and Role of Different Estimating Methods and Associated Cost Models

Patrick Devaux (French Atomic Energy Commission) said that the purpose of decommissioning cost estimates changed during the project lifetime and this may require adjustments to the costing methodology:

- Design phase – required for comparison of different maintenance options or for replacement of major plant components
- Operational phase – input to planning for final shutdown and beyond
- Dismantling phase – to control the flow of financial commitments and to determine remaining financing needs

During project implementation there were significant benefits to be gained from using actual project data to benchmark the cost models, e.g. to help analyse the draft of actual costs and to update cost ratios and hypotheses used in the costing methods.

He said the keys to success and long term reliability of a decommissioning costing framework included:

- Ensuring the cost estimate was traceable and could easily be revised on the basis of experience gained during project implementation
- The data bases supporting the cost estimate should be secure and be available to others who are interested in the data, in particular to the relevant project managers
- Final reports should be circulated to stakeholders and should be understandable by them.

There followed a discussion about the practicalities of undertaking cost benchmarking exercises. It was noted in particular that major reliance needs to be placed on "own" data due to the difficulty of (often) not knowing the underlying assumptions being used in compiling other data.

Attributes of Simplified Models (Illustrated by an Example from the Spanish Programme)

Sergio Vidaechea (ENRESA) said that ENRESA had developed a simplified costing model in order to have a methodology to estimate the cost of dismantling the entire fleet of Spanish power plants, due to financing considerations. This was based on a specific WBS that was intended to be specific to Spanish requirements. The results were also mapped onto the yellow Book cost structure to facilitate international benchmarking comparisons.

An ENRESA cost analysis undertaken in 2001 suggested the following were important cost drivers cost drivers:

- Immediate or deferred dismantling
- The level of technology and experience available
- Availability of disposal facilities and necessary funding
- The management strategy for large components including the RPV (in situ segmentation or one-piece removal)
- The selected dismantling sequence
- Socio-political factors and utility pressure for site clearance
- Changing regulatory requirements and associated uncertainties

He supported the need for a standardised cost structure, as provided by the Yellow Book, to facilitate international cost comparisons, but cautioned that many countries would wish to retain a specific WBS adapted to their adopted dismantling strategy. The more detailed is the national WBS, the easier is the translation of the estimated costs to the YB structure.

There followed a discussion about how to cope with situations where there is limited inventory information. S. Vidaechea said this was not normally a problem for power plants, where comprehensive inventory data was usually available, with little variation in the radionuclide vector (i.e. the spectrum of nuclides present) throughout the plant. The issue was more problematic, however, for research reactors and for other research installations, due to greater variation in the spectrum of radionuclides present.

It was noted in the following discussion that a typical timeframe for decommissioning a nuclear power plant was 7 years, e.g. the time taken to dismantle the Maine Yankee plant was 7-8 years.

Cost Estimation for a Reference Commercial Reactor

Matthias Edelborg (Westinghouse Electric Sweden AB) explained that the main content of a typical cost study comprised:

- The assumed 'technical platform' for dismantling work

  This comprised: the techniques (and their associated performance levels) for dismantling the RPV and internals; the waste handling systems; the systems for processing contaminated and non-contaminated materials; building surveys and building demolition techniques.

- Material and waste inventories

  It was common to divide a nuclear power plant into a number of major areas, e.g. the reactor containment, the reactor building, the turbine building, the remaining rooms in the controlled area and rooms in uncontrolled areas. A detailed material inventory should be developed for each area and a map of contamination levels should be drawn up. This information enables a combines materials (tonnes) and activity (Bq) inventories to be calculated, e.g. divided according to 4-5 different bands of specific activity levels

- Dismantling waste estimates

  Waste volumes may be estimated according to waste category and package type

- Activity duration and cost calculations

  Different methodologies are typically applied to calculating the cost of time-dependent activities, the cost of dismantling large components (using data based on experience with similar components) and the cost of dismantling other systems (based on a 'model' approach linked to materials and activity inventory levels).

During the subsequent discussion it was noted that cost models inevitably use average data. In order to assure the traceability of estimated costs it was very important that the basis for the estimate, i.e. the detailed assumptions used to develop specific costs, were recorded.

Attributes of Detailed Models (Illustrated by an Example from the Slovak Programme)

Vladimir Daniska (DECONTA, Slovak Republic) explained the main elements of the OMEGA code, first developed by DECOM (Slovakia) during the period 1999-2003 using the Yellow Book cost structure. The computational approach uses EXCEL spreadsheets and the cost calculation methodology is based upon a unit cost factor approach, with manpower calculations being based on the assumed resource requirement per task for different professions. Investment and expense costs are also based on unit factors, based on a categorisation of inventory items, and contingency costs are applied to each activity. The calculations used information provided in an inventory database for the facility – this data being organised according to a hierarchical structure, i.e. buildings, floors and rooms.

He noted that the phasing of decommissioning costs could be calculated by adding further hierarchical levels to the Yellow Book cost structure, which levels are then used to indicate specific phases. This feature was already implemented in the Omega code. Further developments of the code that are currently being implemented include direct linkage of outputs to project schedules (GANTT charts) and the development of modules to calculate radiation exposure to personnel; and modules for optimising waste management approaches.

A simplified version of the Omega code has been developed with support from the International Atomic Energy Agency; this code is currently in a test phase, being used in connection with cost estimations for research reactors.

Decommissioning Cost Estimation for NPPs in Japan

Hiroshi Rindo (JAEA) said that, following an amendment in 2005 to the Law concerning the regulation of nuclear reactor decommissioning, the removal of spent fuel from the reactor was now included within a decommissioning project for the purposes of funding provision. The required provisions for decommissioning were determined in accordance with the requirements of the Electricity Business Law. These provisions were calculated on the basis of standard decommissioning procedures, i.e. the intent was to ensure that calculated decommissioning costs were reasonable, to ensure fairness between generations. Provisions were also required for waste management costs, and the adoption in Japanese legislation of clearance criteria in 2008 had resulted in significant reductions in anticipated waste management costs.

Mitsuo Tachibana (JAEA) described the main cost evaluation systems being used by JAEA: DECOST (a simplified decommissioning cost estimation code) and COSMARD-Nu (a computer system for planning and evaluation of reactor decommissioning and nuclear fuel facilities decommissioning). DECOST was developed to study the cost of decommissioning JAEA's fleet of 230 nuclear installations. These are categorised according to the radiation levels that apply and the dismantling methods expected to be used. In general the approach used is to develop unit cost factors that relate the costs of decontamination, dismantling, activity measurement, demolition etc. to cell areas, weights of equipment, weights of structures etc. as appropriate. A linear relationship is assumed between required manpower levels and the weight of equipment or the area in question, based on JAEA's experience of different dismantling methods.

Decommissioning the German Reprocessing Facility WAK – Experiences in Cost Modelling and Status of Verification

Joachin Reinelt (Wiederaufarbeitungsanlage Rückbau- und Entsorgungs GmbH) said the WAK project had recently been made part of the Energiewerke Nord GmbH group, together with the High Temperature Reactor (AVR) at Jülich. The current phase of work (2003 – 2016) involved the manual dismantling of the facility; this will be followed by the demolition phase (2019 -2023). In parallel with the decommissioning project, a facility for HLLW vitrification would be operated during 2009 – 2010 and this would also subsequently be dismantled. The vitrified waste would be stored in a special facility that had been constructed on the site.

He said the cost estimate for dismantling the WAK facility was made using an internally-developed cost methodology based on EXCEL spreadsheets, using cost coefficients developed internally based on the experience with previous projects in Germany. The estimate was updated approximately every 2 years and future cost inflation was assumed to be 3% per annum. According to the reporting scheme adopted the major cost components were: operation (i.e. decontamination and dismantling); site infrastructure; demolition; vitrification plant and waste storage costs. He noted that the programme of radiological measurements represented a very significant cost component.

Discussion

T. LaGuardia said the discussion would be structured according to the questions noted on the agenda:

<u>Question 1</u> *Applying a graded approach – when to use simplified vs. detailed models, and how to know when a simplified model provides an adequate level of comfort that results are within a certain accuracy range?*

It was suggested that the main driver for undertaking cost estimations early in the lifetime of a project was to ensure that sufficient funds could be set aside for decommissioning. Such estimates are required during the operation of the facility as funds need to be collected during this phase. As this will generally be before detailed inventory information is available, a simplified cost estimate must therefore be used. Such an estimate must necessarily incorporate higher contingency allowances than apply to detailed estimates.

The level of detail of a cost is dependent on the level of detail provided in the preliminary project plan. As the preliminary plan becomes progressively more detailed, then more detailed cost estimates may also be developed. It was noted that in some countries, e.g. the US, the overall level of contingency needs to be clearly stated, and should not be obscured within the cost calculation. In the US, the NRC specifies in detail how inaccuracies should be addressed in the model, though other national regulators tend to take a less prescriptive approach.

It was suggested that a detailed inventory model should be developed as soon as reasonably practicable. In any event, the transition period during shutdown of the facility to the start of active decommissioning provided an opportunity to collect such detailed information; by this time the detailed decommissioning strategy will also be known.

The level of ground contamination remains a significant area of uncertainty in cost estimates until detailed soil investigations can be undertaken. In projects with a potential for such contamination this is typically an issue of significant uncertainty.

Question 2 *Gathering experiences from other decommissioning projects; how estimates may be benchmarked against data from actual projects*

This issue is very problematic in practically all programmes, because the progress monitoring system used by the contractor will usually not generate information that can be fed directly into the cost model. The contractor may also be in a conflict of interest situation, whereby it is not in their financial interest to tell the owner when activities have been completed at lower cost than originally forecast. In this situation, either the owner will need to make separate arrangements to collect data on progress with individual tasks or the contractor may need to be paid to provide data in the form needed by the cost estimators. It may also be necessary to break projects down into very small parts, with detailed progress checks being made on short timeframes, e.g. every 2 weeks.

Question 3 *Should different types of cost model be used for estimating costs for different types of facility (research reactors, fuel cycle facilities etc.)?*

It was noted that the all decommissioning cost models share the same basic requirements: knowledge of the inventory and knowledge of the technologies that will be used for decontamination and dismantling, including the extent to which remote vs. non-remote technologies will be used. All estimates need to make an allowance for the aspects that are not well known or well defined; such allowances will inevitably be more significant when there is limited knowledge of the inventory or of the technologies being used.

Summary of Topical Session

T. LaGuardia (Co-Chair) said the discussions showed that there were a variety of cost models in use and the estimating tools were becoming increasingly accurate as experience from decommissioning projects was fed back into the models. The main current challenge is to continue and extend this process. There were significant benefits to be gained from greater sharing of information between projects and he urged decommissioning organisations to extend their efforts in this regard.

Second Topical Session
“INVENTORY MANAGEMENT”

Co-Chairs: Sergio Vidaechea (ENRESA, Spain) & Robert Barker (CNSC, Canada)

SUMMARY OF PRESENTATIONS AND DISCUSSIONS

Patrick O'SULLIVAN
NEA Secretariat

Introduction

Robert Barker (CNSC, Co-Chair) opened the topical session. He said it was a requirement in many countries that preliminary decommissioning plans and associated cost estimates be reviewed by regulatory authorities as part of the licensing process for new nuclear installations. Some regulators, such as the USNRC prescribe detailed requirements regarding how cost estimates should be developed and presented, whereas others, such as CNSC, allow more leeway to licensees in the development of their cost estimates, provided that the information contained within the cost estimate is traceable and defensible.

Sergio Vidaechea (Co-Chair) noted that the availability of inventory information was crucial to any cost estimate. Inevitably, inventory information will be incomplete to a greater or lesser extent, especially in terms of radiological information. A significant issue in cost estimation is how to deal with the ensuing uncertainty in the estimate.

Overview of Inventory Needs for Different Cost Models

Vincent Vanel (French Atomic Energy Commission) said that the required level of detail about the inventory was related to the type of cost model being used. He proposed 3 main levels of detail and associated characterisation requirements:

- No characterisation – weight of materials determined by visual estimate (requiring 2-3 days per facility)
- General (non-detailed) characterisation – amounts of different wastes (e.g. LLW) are estimated per room (requiring 1 day per 3-5 rooms)
- Detailed characterisation – dimensions of plant and piping are determined by detailed review of drawings etc. (requiring several days to several weeks per room.

The first of the above approaches is typically applied to cost estimates based on analogy with other estimates (i.e. €/m3 of cell); the second is used for parametric cost estimates (hours per kg of equipment) and the third approach is used for analytical cost estimates (hours per specific task).

It was important that preparatory work be undertaken prior to developing an inventory, including acquiring knowledge about the facility and available data sources, and developing appropriate software for data storage and sequencing. Inventory development involved much repetitive activity and therefore maintaining the motivation of those involved was important

During the subsequent discussion it was noted that a full record of contamination incidents should be developed. Interviews of the retired workforce may provide useful information, though these needed to be undertaken with caution as contamination incidents may have been forgotten or, for issues of potential liability, be otherwise not mentioned.

Inventory needs for cost estimations for fuel cycle facilities, including developing cost estimates where characterisation is inadequate

Giuseppe Marini (SOGIN) noted that, during the lifetime of a nuclear installation, the purpose of the cost estimate changed, with a requirement for increasing levels of detail and accuracy:

- Cost estimate for funding provisioning – based on comparison with similar facilities
- Cost estimate for licensing – based on a preliminary waste inventory and characterisation
- Cost estimate for decommissioning contract award – based on a detailed design and inventory
- Cost estimate for realisation – based on actual decommissioning strategy adopted by the contractor

He provided an update on the cost estimation process for the EUREX (Enriched Uranium Extraction) plant at Saluggia and for the ITREC (Fuel Element Treatment and Reprocessing) Plant at Trisaia, both of which have been shut down for several years, i.e. since 1984 and 1987 respectively. Current work on site is focussed on preparatory tasks for active dismantling, such as fuel pool cleaning and decontamination at EUREX and installing equipment for removal of fuel from the spent fuel pool at ITREC.

Detailed characterisation activities are currently underway at both sites, and for which a budget in the order of €5 million has been allocated, which will facilitate the development of detailed material and radiological inventories. Detailed cost estimates will be developed using this inventory information.

Inventory Management Tools for NPP Cost Estimates

Thomas S. LaGuardia (LaGuardia and Associates) said that an accurate cost estimate is heavily dependent on a detailed inventory of systems and structures, labour costs, fuel disposition, waste management, and ultimate disposition of the facility. A key element of this inventory is a site characterization program which identifies both radiological and hazardous/toxic materials on site, related to the physical inventory of equipment and structures.

The major elements of an inventory management programme needs to address the following categories:

- Plant Structures
- Plant Systems (piping, valves, filters, ducting, electrical conduit, etc.)
- Labour Costs (utility management staff labour)
- General Facility Information
- Operations Information
- NSSS Components (reactor vessel & internals, steam generators, pressurisers, etc.)
- Major Plant Systems (turbines, generators, condensers, feedwater heaters, etc.)
- Hazardous and Mixed Waste (radioactive and hazardous/toxic)
- Spent Fuel
- Site Restoration
- Insurance
- Labour Costs (Craft labour)

The time required to assemble this information can be 1-2 months and therefore it is important to request this information early in the cost estimate project to ensure needed data will be available in a timely manner. Hazardous and toxic materials are more difficult to measure and this process could be very time consuming, e.g. samples may need to be sent to a laboratory for testing. Further, associated cost data may be difficult to obtain and a range of sources may need to be used. He said that assessment of historical records will help to identify the areas requiring detailed characterisation. Soil decontamination costs could also be very significant and should be included within the cost estimate for decommissioning.

It was noted in subsequent discussion that the costs of characterising asbestos (e.g. often present in older facilities for insulating steam lines), and of its subsequent removal, may be very significant, perhaps more than €1 million for one facility.

Inventory Management Tools and Experiences from the German Decommissioning Programme

Thomas Lexow (NIS Ingenieurgesellschaft mbH) described the cost methodology used by NIS, which is currently used to perform cost calculations in Germany, Belgium, the Netherlands, France, Switzerland, Austria and Italy. According to the computational scheme adopted, plant inventory data is typically organized as a separate database, with which the cost calculation module interacts, as well as interacting with the project schedule, in order to develop the cost estimate. The project schedule (set out in MS Project or in Primavera software) is also provided as an input to the overall calculation.

The inventory data is stored as component-related data (e.g. types, material, dimensions, mass and surface) and room-related data (e.g. surfaces, depth of contamination, relevant plant operation history). A material mass analysis is undertaken as part of the cost calculation, which distinguishes between primary masses (available at the beginning of the project) and secondary masses (auxiliary materials and consumables arising during dismantling). The total mass after treatment and conditioning is differentiated between that which is scheduled for free release for reuse, that which is free material for disposal and that which is categorized as radioactive waste.

Three different levels of contamination are assigned to the plant (low, medium and high), together with three geometrical categories (small, medium and large). All components are therefore assigned to one of 9 possible categories for the purposes of the cost calculation.

He noted that the collection of plant inventory data for a typical nuclear power plant (Brunsbüttel) involved 6-7 people and took a period of about 6 months. It involved the collection of about 30,000 separate records.

During the subsequent discussion it was noted that the cost of characterisation was often very significant. It was suggested that it may sometimes be more appropriate to divert available resources to decontamination rather than to characterisation, though it was recognized that this represents a difficult balance which depends also on the level of detail required for the particular cost calculation being undertaken. It was noted also that the costs of characterisation for modern plants were likely to be much lower than for older plants.

Discussion

S. Vidaechea said the discussion would be structured according to the prescribed questions on the agenda:

<u>*Question 1*</u>   *Demonstrating the reliability of inventory and characterization records?*

It was noted that only auxiliary safety systems can be accessed while a plant is still operating for walk downs. This is usually not problematic as primary systems are usually well defined, provided good configuration control has been maintained. It was suggested that one of the secondary systems should be nominated for the purpose of physical verification, e.g. at 5-year time intervals. It was noted also that good access opportunities be provided during component replacements.

Question 2 *How to reconstruct missing inventory information?*

The standard methods that may be used include: checking operational history (including reviewing operational records and undertaking discussions with current or past plant operators) and theoretical calculations of nuclide activation. The latter are also helpful in determining the most opportune time to dismantle plant items. It was suggested that recent technological developments (e.g. using remote gamma spectrometry) will also be helpful in this regard.

Question 3 *Soil and groundwater contamination – how to estimate contamination levels to sufficient levels of accuracy and how to estimate the inventory*

The issue of soil contamination can result in significant delays and cost overruns in decommissioning projects; contaminated soil may also represent a significant proportion of the radioactive waste resulting from a decommissioning project, e.g. at ENRESA's PIMIC project (part of CIEMAT's research centre in Madrid), more VLLW will come from soil contamination than from demolition. This situation may arise due to lack of records of contamination incidents, or because soil contamination was ignored in preparing the cost estimate.

Potential chemical or fuel oil spills should also be considered in estimating levels of soil contamination.

It was noted also that plant drawings may not show 'temporary works', which may still be present on site. In this regard, it is often helpful to review construction photographs, where these exist. These are also helpful in cases where reinforcement drawings are incorrect, which causes problems if diamond wire cutting techniques are being used. Aerial photographs also may be useful, e.g. to indicate the presence of buried trenches and structures.

Many countries have established clearance levels for nuclear sites (e.g. as described in recent reports by the NEA and the IAEA), and how these are framed will have a significant impact on the approach used for estimating soil contamination levels, e.g. Canada has established clearance levels, but in cases where using them may be impracticable, licensees may also use a case-by-case approach based on a site-specific pathways analysis. It was noted that the RESRAD code is increasingly being used, especially for research reactor sites. In the US, this is a regulatory requirement.

Question 4 *Role of nuclide vectors in cost calculations?*

This issue is related mainly to estimating levels of surface contamination. Having insufficient information on alpha vectors may cause problems due to certain cutting technologies not being feasible in the event of the presence of certain alpha nuclides.

Summary of Topical Session

R. Barker observed that the level of detail required of the material inventory is related to the level of detail required of the cost estimate. This is currently an issue on which national positions differ (for estimates made prior to decommissioning), though increasing experience in developing preliminary decommissioning plans is likely to lead to greater uniformity over time.

He also noted that there is an emerging trend in the regulatory environment, particularly in terms of the expansion of criteria for hazardous waste, and a trend towards involvement by multiple regulatory agencies. These issues would inevitably also impact on cost estimates for decommissioning.

Additionally, there are currently a range of national positions on what 'greenfield' and 'brownfield' sites comprise; in particular there are different views on the depth below ground level to which slightly contaminated materials should be removed as a condition of site release. Such issues could lead to significant uncertainty in future decommissioning costs and he expected that greater harmonisation of national positions would occur over time, perhaps aided by international organisations.

Appendix 1

AGENDAS OF TOPICAL SESSIONS:

(1) BUILDING ROBUST COST METHODOLOGIES – NECESSARY ATTRIBUTES OF DIFFERENT TYPES OF COST MODEL

(2) INVENTORY MANAGEMENT

16-17 JUNE 2009

16 JUNE 2009		
Topical Session (1) **"BUILDING ROBUST COST METHODOLOGIES – NECESSARY ATTRIBUTES OF DIFFERENT TYPES OF COST MODEL"**		
Co-Chair: Staffan Lindskog **Co-Chair: Thomas LaGuardia**		
14:00	**1.**	**INTRODUCTION TO THE TOPICAL SESSION** *Session Chair* • Decommissioning cost calculations are used for different purposes, including scoping calculations (order of magnitude estimate), funding/budgetary calculations and detailed calculations for project management purposes. This topical session will include presentations on the different types of estimating method and the attributes needed to build up different types of model, from simplified to detailed methods, and their limitations. An important aim will be to define those parameters that represent good practice for different types of models.
14:10	**2.**	**OVERVIEW AND ROLE OF DIFFERENT ESTIMATING METHODS AND ASSOCIATED COST MODELS** *Patrick Devaux (CEA)*
14:30	**3.**	**ATTRIBUTES OF SIMPLIFIED MODELS (ILLUSTRATED BY AN EXAMPLE FROM SPANISH PROGRAMME)** *Sergio Vidaechea (ENRESA)*
14:50	**4.**	**COST ESTIMATION FOR A REFERENCE COMMERCIAL REACTOR** *Mathias Edelborg (Westinghouse Electric AB)*
15:10	**5.**	**ATTRIBUTES OF DETAILED MODELS (ILLUSTRATED BY AN EXAMPLE FROM THE SLOVAK PROGRAMME)** *Vladimír Daniška (DECONTA)*
15:30		*Break*
16:00	**6.**	**DECOMMISSIONING OF THE JAPANESE RESEARCH FACILITIES - COST ESTIMATION METHOD**

		Hiroshi Rindo, Mitsuo Tachibana, JAEA
16:20	**7.**	**DECOMMISSIONING OF THE GERMAN REPROCESSING FACILITIES WAK - EXPERIENCES IN COST MODELLING AND STATUS OF VERIFICATION** *Joachim Reinelt, WAK GmbH*
16:40	**8.**	**PANEL-BASED DISCUSSION** Possible issues for discussion (to be decided by the panel chairs taking account of time constraints): • *Graded approach – when to use simplified vs. detailed models?* • *How to know when a simplified model provides an adequate level of comfort that results are within a certain accuracy range* • *Experience in comparing estimated costs against actual costs – lessons learned* • *Should different types of cost model be used for estimating costs for different types of facility (research reactors, fuel cycle facilities etc.)?*
17:30	**9.**	**REPORT BY RAPPORTEUR AND DISCUSSION ON FURTHER STEPS** *Thomas S. LaGuardia*
17:50	**10.**	**CLOSING REMARKS** *Session Chair*
18:00		*Adjourn*

17 JUNE 2009 (DAY 2)		
Topical Session (2) **"INVENTORY MANAGEMENT"**		
Co-Chair: Sergio Vidaechea (ENRESA, Spain) **Co-Chair: Robert Barker (CNSA, Canada)**		
09:00	**1.**	**INTRODUCTION TO THE TOPICAL SESSION** *Session Chairs* • The inventory of input data for cost estimation needs to be managed throughout the lifetime of a facility. The inventory database must be updated in line with the ongoing developments on the project. This may suggest the need for a shared database. A good inventory is usually a precondition for a successfully managed project and, conversely, a lack of traceability of the inventory will usually have a significant negative impact. The topical session will explore inventory needs for different types of nuclear facility and for different situations, and generally will aim to identify good practice in terms of inventory management.
09:10	**2.**	**OVERVIEW ON INVENTORY NEEDS FOR DIFFERENT COST MODELS** *Vincent Vanel (CEA)*
09:30	**3.**	**INVENTORY NEEDS FOR COST ESTIMATIONS FOR FUEL CYCLE FACILITIES, INCLUDING DEVELOPING COST ESTIMATES WHERE CHARACTERISATION IS INADEQUATE** *Giuseppe Marini (SOGIN)*
09:50	**4.**	**INVENTORY MANAGEMENT TOOLS FOR NPP COST ESTIMATES (ILLUSTRATED BY AN EXAMPLE FROM THE US PROGRAMME)** *Thomas LaGuardia*
10:10	**5.**	**INVENTORY MANAGEMENT TOOLS AND EXPERIENCES FROM THE GERMAN DECOMMISSIONING PROGRAMME** *Thomas Lexow (Siempelkamp, Germany)*
10:30		*Break*

11:00	**6.**	**PANEL-BASED DISCUSSION** Possible issues for discussion (to be decided by the panel chairs taking account of time constraints): • *Demonstration of reliability of inventory and characterisation records (e.g. using system walk downs)* • *How to reconstruct missing inventory information?* • *Technology developments – getting the correct balance between an accurate characterisation and the equipment costs (cost benefit)* • *Calculation of activation levels in NPPs – experiences and limitations; methods of verification of activation calculations.* • *Soil and groundwater contamination – how to estimate contamination levels to sufficient levels of accuracy and how to estimate the inventory* • *Role of nuclide vectors in cost calculations?*
12:00	**7.**	**REPORT BY RAPPORTEUR AND DISCUSSION ON FURTHER STEPS** *Rapporteur*
12:20	**8.**	**CLOSING REMARKS** *Chair*
12:30		*Adjourn*

Appendix 2

LIST OF PARTICIPANTS

Belgium	Luc NOYNAERT – SCK CEN
	Ronny SIMENON – ONDRAF/NIRAS
Canada	Robert BARKER – Canadian Nuclear Safety Commission
	John KENNARD – Liability Management Department, NWMO
France	Maxime DAVOUST – EDF
	Sylvain DESECURES – EDF CIDEN
	Patrick DEVAUX – CEA/MARCOULE
	Christophe MAOCEC – MEEDDAT/DGEC/SD4
	Vincent VANEL – CEA/MARCOULE
Germany	Uwe ALTMANN – E.ON Kernkraft GmbH
	Thomas LEXOW – NIS Ingenieurgesellschaft MBH
	Joachim REINELT – WAK GmbH
Italy	Paolo CAPOFERRO – Sogin S.p.A.
	Giuseppe MARINI – Sogin S.p.A.
Japan	Hiroshi RINDO – Japan Atomic Energy Agency (JAEA)
	Mitsuo TACHIBANA – Japan Atomic Energy Agency (JAEA)
Luxembourg	Thomas KIRCHNER –European Commission, DG-TREN
Netherlands	Ad LAAN - COVRA (Centrale Organisatie voor Radioactief Afval)
Slovak Republic	Vladimir DANISKA – Deconta a.s.
Spain	Sergio VIDAECHEA – Enresa
Sweden	Jan CARLSSON – Decommissioning Planning Swedish Nuclear Fuel and Waste Management Co. (SKB)
	Fredirik DE LA GARDIE – Decommissioning Planning Swedish Nuclear Fuel and Waste Management Co. (SKB)
	Mathias EDELBORG – Westinghous Electric Sweden AB
	Gunnar HEDIN – Westinghouse Electric Sweden AB

	Henrik EFRAIMSSON - Swedish Radiation Safety Authoriy (SSM)
	Staffan LINDSKOG – Swedish Radiation Safety Authoriy (SSM)
	Christian SCHOULTZ – Swedish Radiation Safety Authoriy (SSM)
United Kingdom	Gregory OWEN – British Energy
United States	Geoffrey GRIFFITHS – TLG Services, Inc.
	Thomas S. LAGUARDIA – LaGuardia & Associates, LLC
International Organisations	Michele LARAIA – Nuclear Fuel Cycle and Waste Technology Division (I.A.E.A.)
	Patrick O'SULLIVAN – OECD Nuclear Energy Agency