AREVA

AREVA TA Experience in Decommissioning and Waste Management and the International Decommissioning network

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AREVA TA

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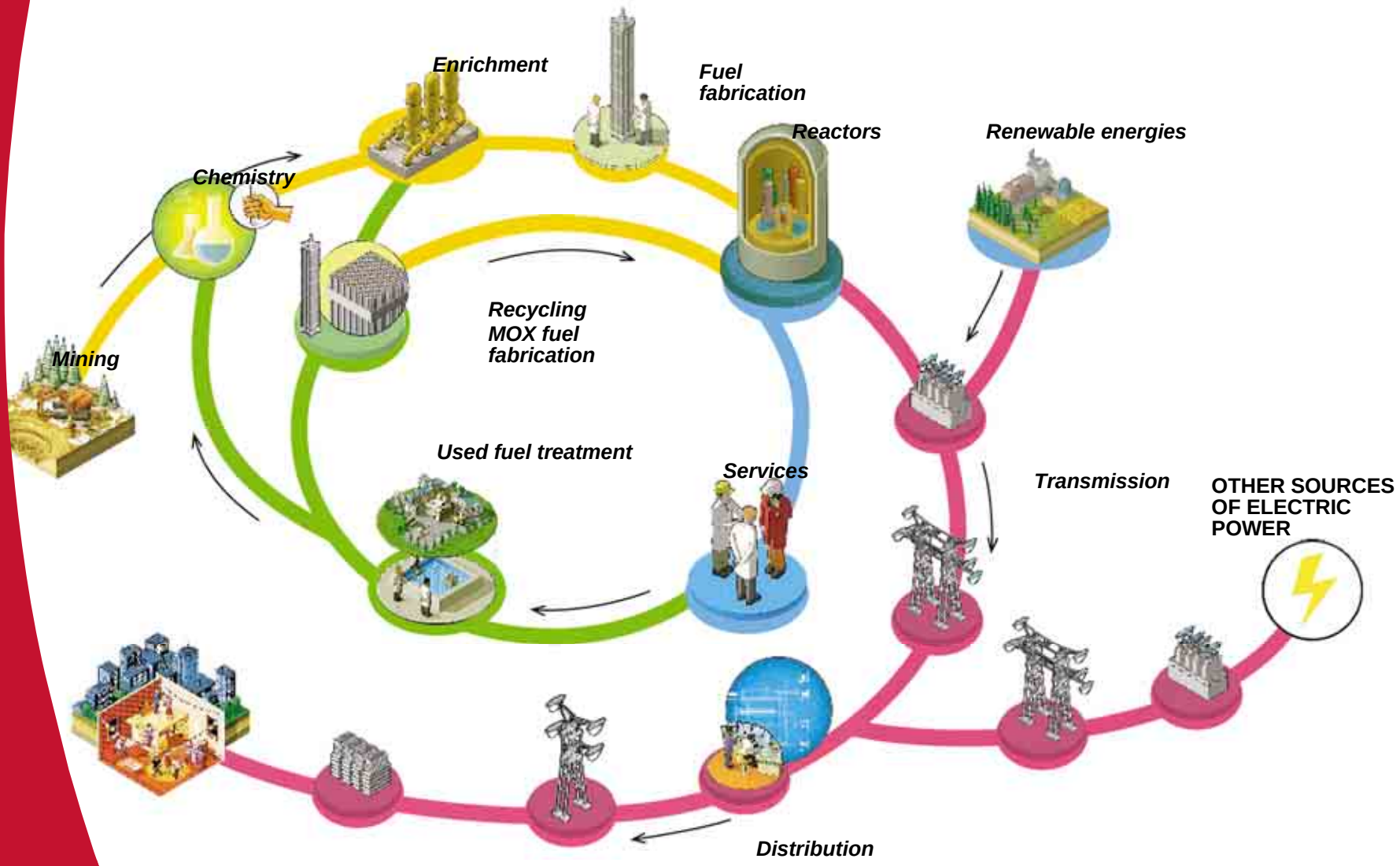
Presentation of AREVA and AREVA TA

An integrated offer serving energy professionals



Front End Division	Reactors and Services Division	Back End Division	Transmission & Distribution Divison

Organization of the group

AREVA NC

AREVA NP

AREVA

AREVA NC

FRONT END division

- Mining
- Chemistry
- Enrichment
- Fuel

EURIWARE

REACTORS & SERVICES division

- Plants
- Equipment
- Nuclear Services
- Nuclear Measurement
- Consulting & Information Systems
- **AREVA TA**
- Renewable Energies

BACK END division

- Nuclear site value development
- Recycling
- Logistics
- Clean-up
- Engineering

CANBERRA

TRANSMISSION & DISTRIBUTION division

- Products
- Services
- Systems
- Automation

AREVA TA: Three main sectors

ENERGY & PROPULSION	COMMAND & CONTROL, MEASURING	ENGINEERING EXPERTISE TRAINING
		
Reactors	**Transportation & Vital Systems**	**Engineering for complex systems**
Services	ELTA Electronic Equipment for harsh environment	PRINCIPIA Modelling physical phenomena
Fuels	01dB-METRAVIB Noise & Vibration reduction Solutions	AXILYA Safety & Performance Management
TPI Mechanical Components	CORYS T.E.S.S (*) **Simulation tools**	**Training**
Expertise and skills of both a designer and an industrial operator	**Technical excellence dedicated to industrial performance**	**Innovation for systems' performances**

Large Synergies in AREVA for Decommissioning and Waste Management

AREVA NC
AREVA NP
AREVA TA

» ***Engineering, decommissioning projects, waste management, development of specific tools***

STMI

» ***Cleanup, decommissioning work***

CANBERRA

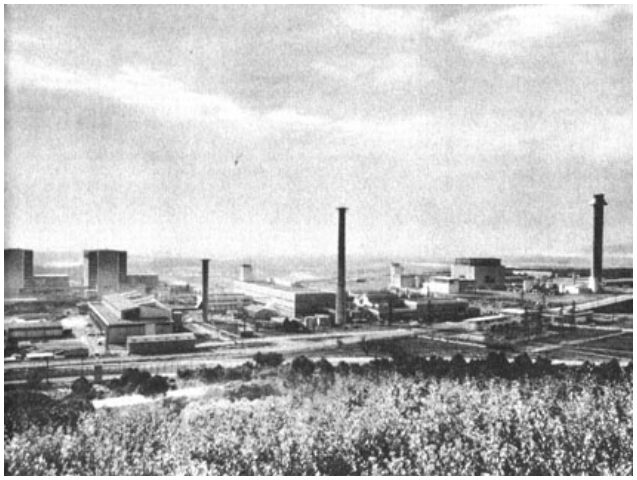
» ***Nuclear measurements for facility and waste characterization***

EURIWARE

» ***Development and industrialization of softwares, Services***

AREVA Key Experience in Decommissioning and Waste Management

AREVA Experience in Decommissioning / Waste Management : National Experience



Marcoule UP1 reprocessing plant

Cleanup and dismantling of hot cells

Retrieval of radwaste (bituminized),…

AREVA NC, AREVA TA,..

Decommissioning of parts of Brennilis NPP

(heavy water reactor)

(AREVA NP, AREVA NC, AREVA TA,..)

- ***G2-G3 GC reactors in Marcoule,***
- ***Hot cells for TRU metallurgy in Fontenay-Aux-Roses CEA Centre***
- ***Liquid Treatment Station in CEA Grenoble Center***
- ***SILOE research reactor in Grenoble CEA Center***

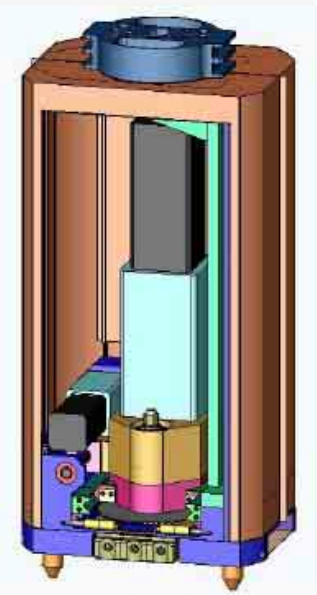
and …

AREVA Experience in Decommissioning/ Waste management: International Experience

Decommissioning of Dounreay FBR (UK)

AREVA NP was in charge of:

- The fuel retrieval facility installed on the reactor
- The tools deployed in the reactor vessel
- The flasks for fuel and tool transfer in the DFR sphere



Sawing tool : design, testing, realisation

AREVA Experience in Decommissioning/ Waste Management: International Experience

1 - Silos upper slab
2/3- Silos before clean-up
4 - Silos after clean-up
5 - Vandellos 1 GCR Spain

AREVA NP:

Cleanup of Vandellos-1 (Spain) GCR Waste Storage Silos

- 3 x 1500 m^3 concrete silos
- 1120 tonnes of mixed waste
- Total activity 3000 TBq
- 200 000 graphite sleeves
- 492 metallic absorbers
- 2 irradiated fuel elements
- 180 m^3 plastic and metallic waste

Leader in this major turnkey project (1993-1997)

- Waste retrieval
- Waste processing
- On-site interim storage

AREVA Experience in Decommissioning/ Waste Management: International Experience

- **Hanford (USA) : (Project Hanford Management Contract)**
- **Sellafield (UK)**
- **Dounreay (UK), Waste retrieval process for the Shaft and Wet Silo**
- **Institute for Radioelements , Fleurus (Belgium) Cleanup of hot cells C1 & C2**
- **Etc.**

AREVA TA international Experience in Decommissioning and Waste Management

Paldiski (Estonia) training facility:

2 submarine reactors

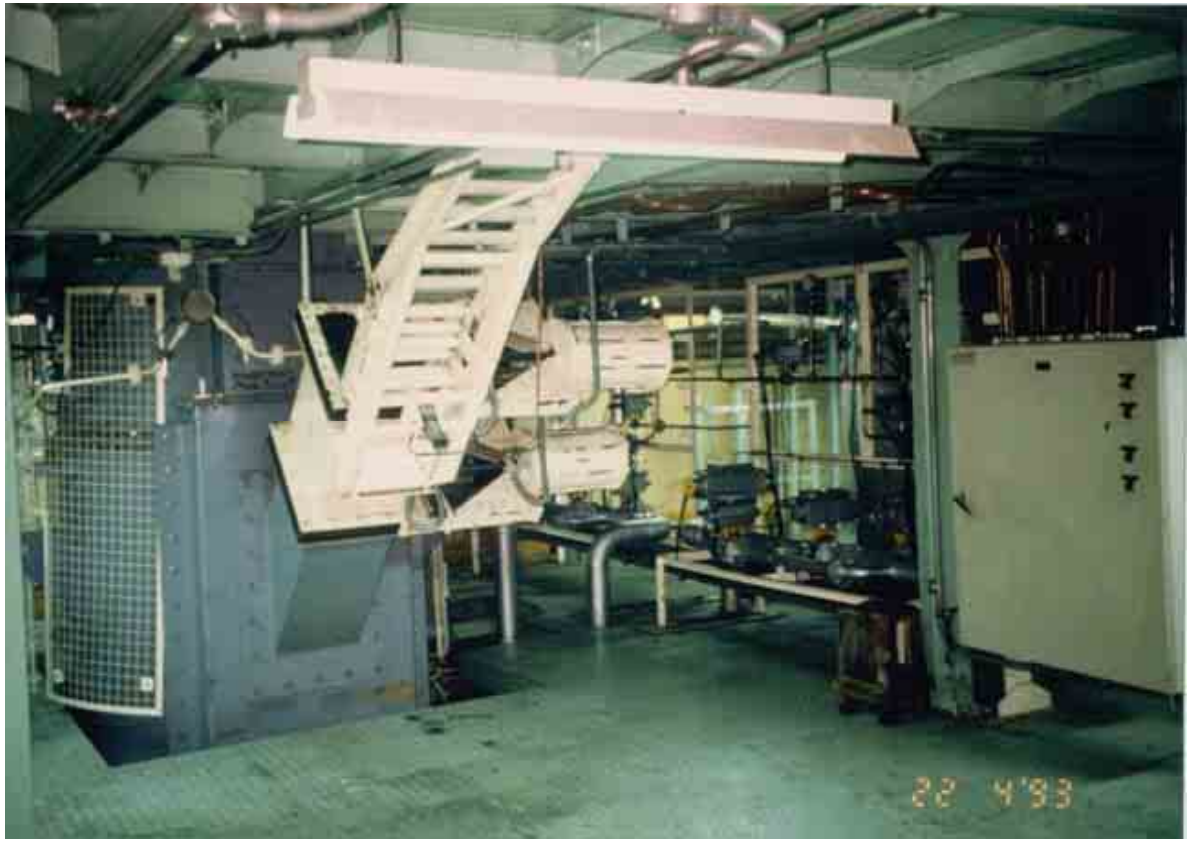
Cleanup, sarcophagus strengthening

Chernobyl (Ukraina)

Cleanup, sarcophagus strengthening

AREVA TA international Experience in Decommissioning and Waste Management

- **BATAN (Indonesia) LLRW incineration plant**



- Ongoing project: LLW incineration unit at Severodvindsk, Russia

AREVA TA international Experience in Decommissioning and Waste Management

- **Waste Conditioning and Disposal Facility of El Cabril (Spain)**

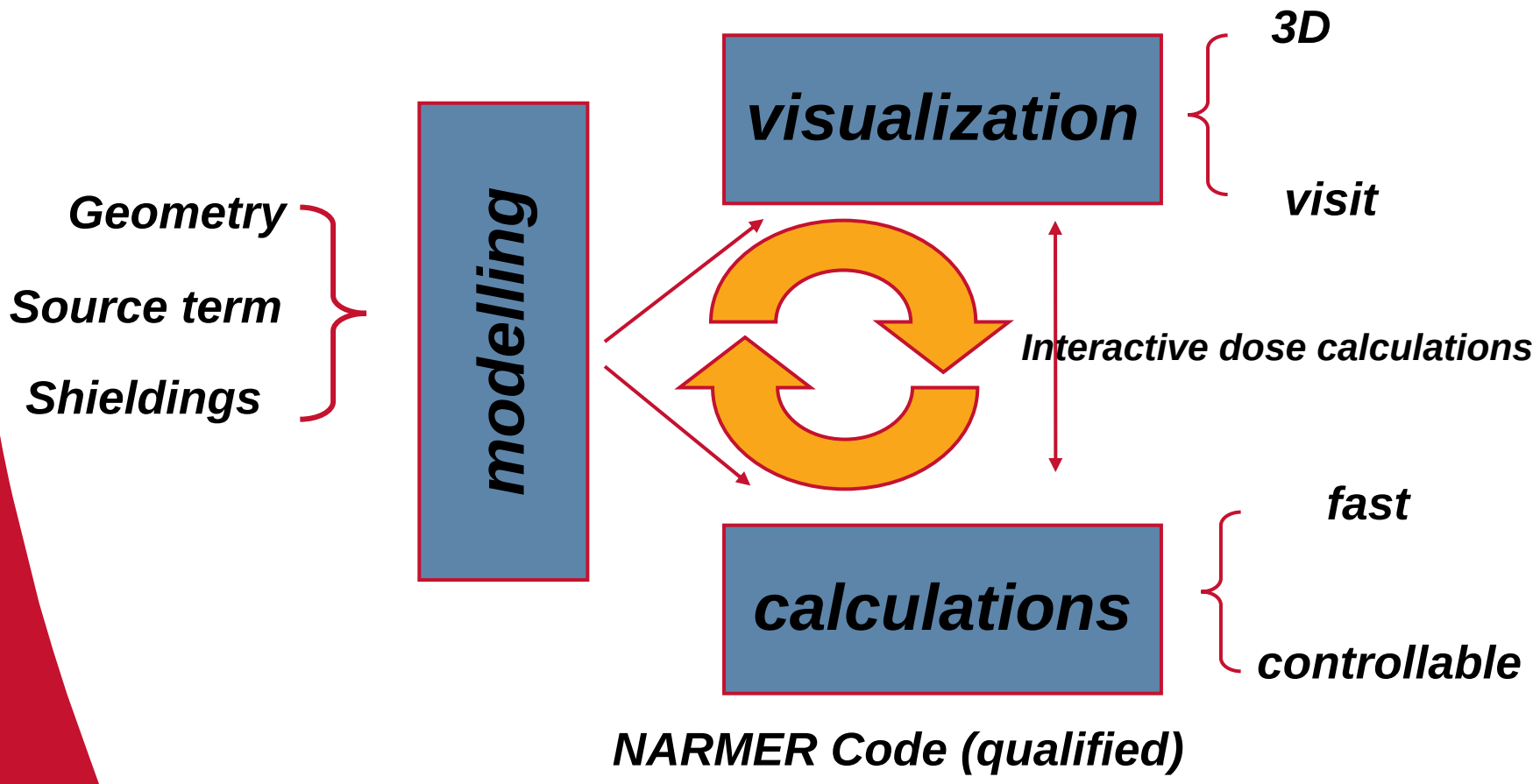
LILW disposal facility

Centre de l'Aube

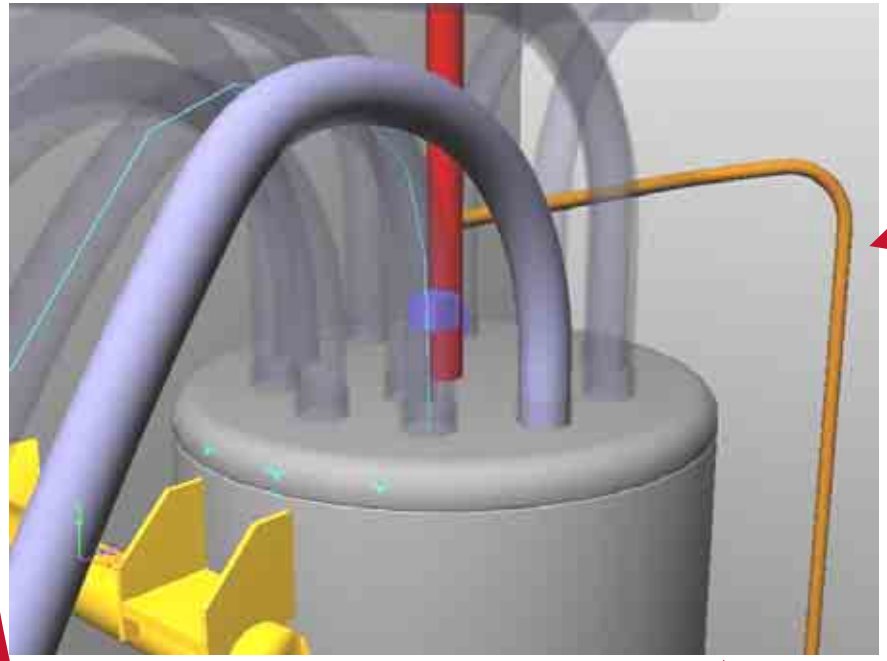
NARVEOS
A Solution for Dismantling Screenwriting and Dose Optimization

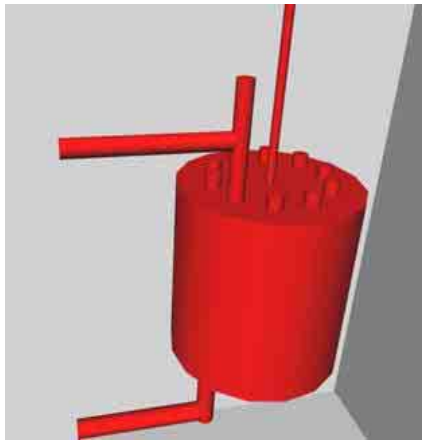
The NARVEOS Solution

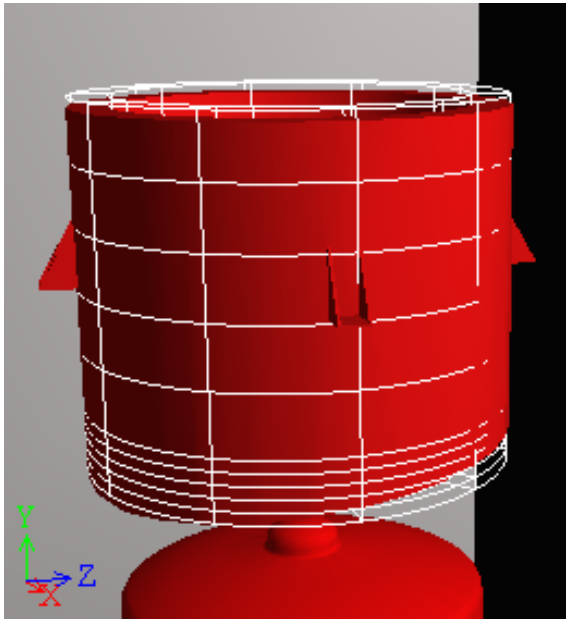
- **Definition of dismantling scenarios and dose optimization (gamma)**



Modelling of objects to be dismantled





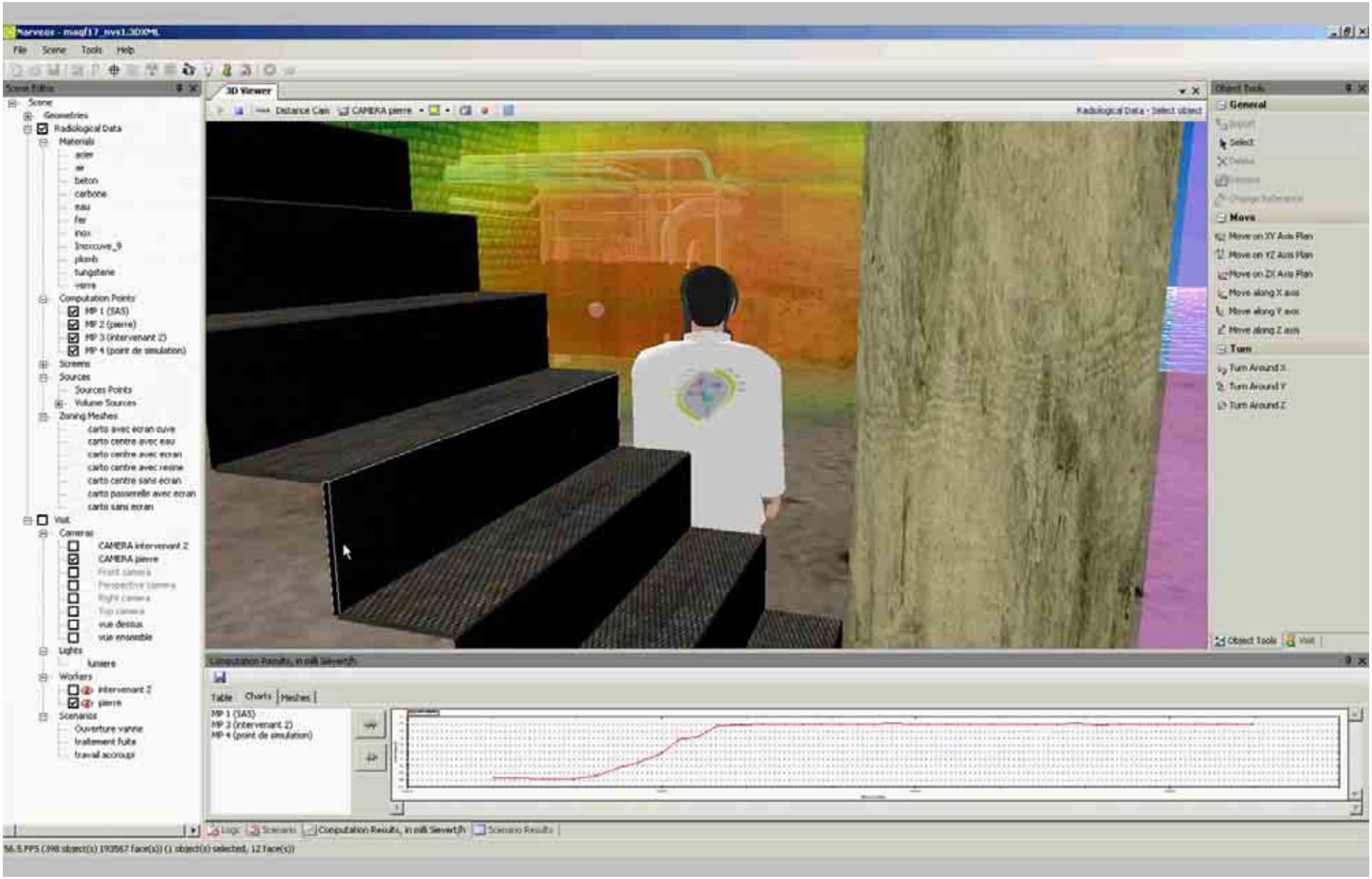


The NARVEOS solution

- Visualization of modelled work conditions and scenarios

and

Interactive dose calculations


File Scene Tools Help
Scene Editor
Scene
Geometries
Radiological Data
Materials
acier
air
beton
carbone
eau
fer
inox
Inoxcuve_9
plomb
tungstene
verre
Computation Points
MP 1 (SAS)
MP 2 (pierre)
MP 3 (intervenant 2)
MP 4 (point de simulation)
Screens
Sources
Sources Points
Volume Sources
Zoning Meshes
carto avec ecran cuve
carto centre avec eau
carto centre avec ecran
carto centre avec resine
carto centre sans ecran
carto passerelle avec ecran
carto sans ecran
Visit
Cameras
CAMERA intervenant 2
CAMERA pierre
vue dessus
vue ensemble
Lights
lumiere
Workers
intervenant 2
pierre
Scenarios
Ouverture vanne
traitement fuite
travail accroupi
3D Viewer
Distance Cam
CAMERA pierre
Radiological Data - Select object
Object Tools
General
Select
Move
Move on XY Axis Plan
Move on YZ Axis Plan
Move on ZX Axis Plan
Move along X axis
Move along Y axis
Move along Z axis
Turn
Turn Around X
Turn Around Y
Turn Around Z
Object Tools
Visit
Computation Results, in milli Sievert/h
Table
Charts
Meshes
MP 1 (SAS)
MP 3 (intervenant 2)
MP 4 (point de simulation)
Logs
Scenario
Computation Results, in milli Sievert/h
Scenario Results
56.5 FPS (398 object(s) 193567 face(s)) (1 object(s) selected, 12 face(s))

The NARVEOS solution

- **NARVEOS (based on CHAVIR software) aims to:**
  - **Define dismantling work conditions and to elaborate and select scenarios**
  - **Consider radiation protection constraints at the beginning of the studies**
  - **Valorize available data such as computerized models**
- **NARVEOS is also a tool for follow-up of work**
  - **Refit numerical models for better dose predictions**
- **Communication tool (Subcontractors , Regulatory Body)**

Example of AREVA TA Activities in Decommissioning: the Gremikha Remediation Project

IAEA Contact Expert Group

»IAEA Decommissioning activities

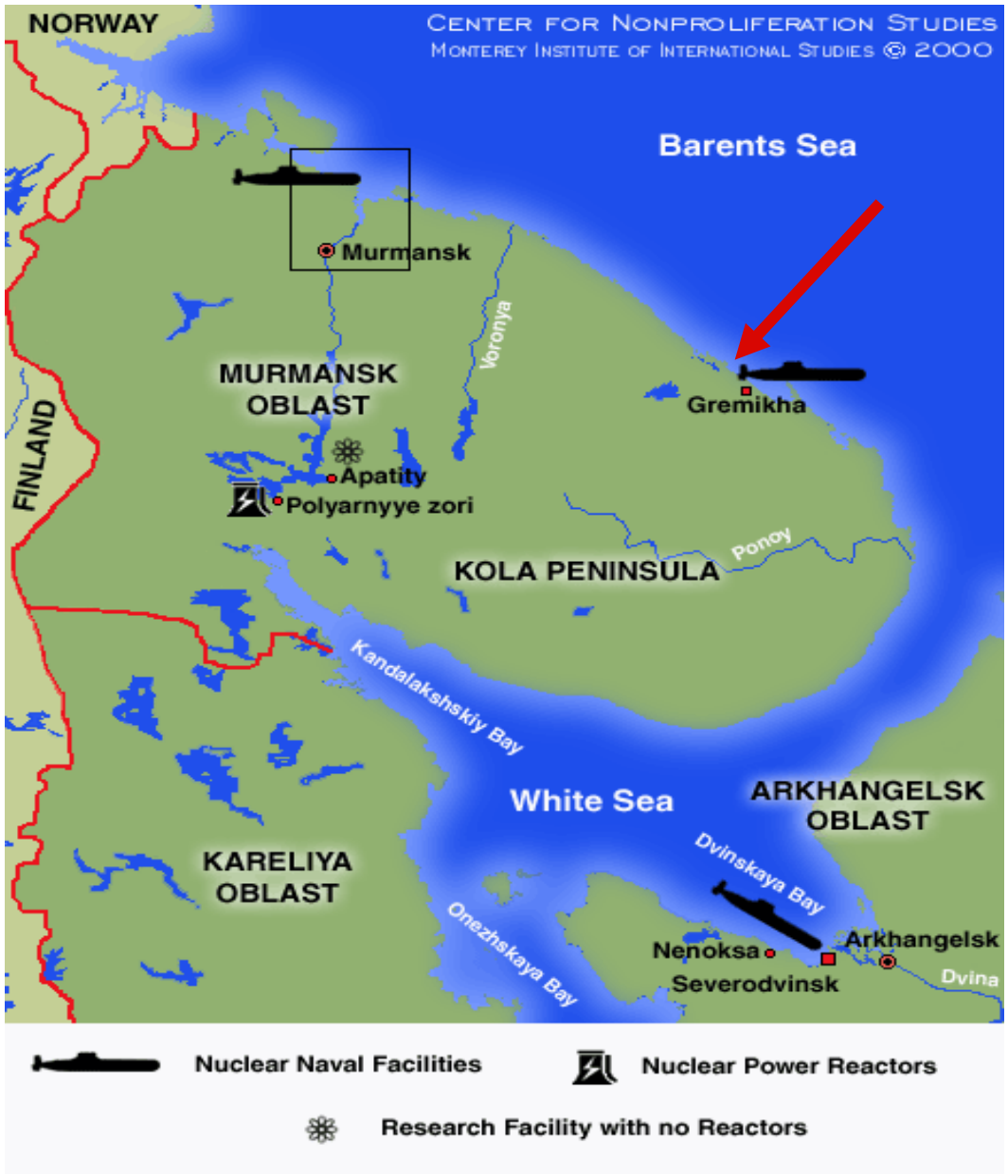
»International Projects

»Contact Expert Group (CEG)

- **to promote international cooperation and assistance in the field of resolving problems caused by radioactive waste and spent nuclear fuel left as a Cold War legacy. The Global Partnership Programme against the Spread of Weapons and Materials of Mass Destruction launched at the G-8 Summit in 2002, which was later joined by a number of other nations,**
- **Remediation of the naval maintenance base of Gremikha**

  Management of radioactive waste and spent nuclear fuel, decommissioning of facilities and site remediation

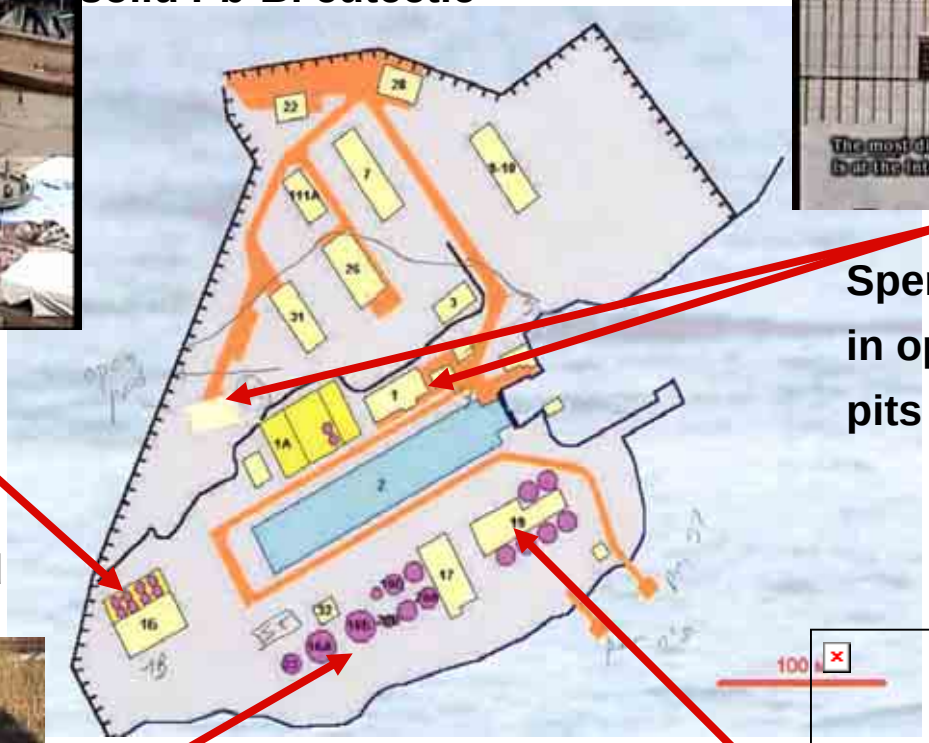
The Gremikha Coastal Maintenance Base



The Gremikha Coastal Maintenance Base

Spent cores from Alpha Class submarines in solid Pb-Bi eutectic

Spent nuclear VVR fuel in open air pad and in pits in building 1



Liquid radwaste (L-ILW) in underground tanks

Solid radwaste (L-ILW, HLW) In building 19

Framework and Objectives of the Gremikha Project

- **Project implemented in the framework of the G8 Global Partnership**
- **French Representative: CEA/PMG8 (Atomic Energy Commission)**
- **French Engineering Company AREVA TA (AREVA NP, AREVA RMC)**

- **Russian Representative: ROSATOM**
- **Main Russian contractors :**
  - **Kurtchatov Institute**
  - **SevRAO (operator of Gremikha site)**
    - **Sub-contractors: VNIPIET, NIKIET, IPPE, NIIAR**

Objectives of the overall Project:

=> Evacuation of all spent nuclear fuel (VVR fuel, spent 'Alpha' cores')
and of liquid and solid radioactive waste (except VLLW)

=> Dismantling of facilities and site cleanup

Engineering Work performed by AREVA TA for the GREMIKHA Project

Since 2005 :

- **Comprehensive radiological and engineering survey of the site**
  - **Definition of survey programme, appraisal of results**
- **Conceptual design studies for evacuation of nuclear and radioactive materials and site remediation**
  - **Appraisal of Russian studies (focus on technical feasibility, nuclear safety and radiation protection)**
- **Detailed studies related to spent nuclear fuel inventory and characterization, detailed studies for evacuation of undamaged fuel assemblies**
  - **Appraisal of Russian technical solutions (focus on technical feasibility, nuclear safety and radiation protection)**

Comprehensive Engineering and Radiological Survey

Comprehensive Engineering and Radiological Survey

Management of SNF from 'Alpha' spent cores

- Removal of spent core from submarine
- Handling spent core in its eutectic
- reservoir to its storage position

Evacuation of undamaged SNF assemblies

SNF type 6 containers prepared in July 2008, before transfer of SNF assemblies on the SEREBRIANKA service ship (October to December 2008)

Evacuation of undamaged SNF assemblies

Conclusions

Conclusions: AREVA TA and the International Decommissioning Network

- **AREVA Group offers the world nuclear industry and IAEA members a unique combination of skills for dismantling, cleanup and waste management projects, drawing on the combined experiences of all AREVA units**
- **It is the interest of the community and for the Nuclear Renaissance that DECOM Project would be achieved satisfactorily troughought the world**
- **Main objectives of AREVA decommisioning strategy are to :**
  - **enhance the feed back**
  - **contribute to performance improvements**
  - **value professionals**
  - **put innovation forward**
    - **to remain a centre of excellence**

Conclusions: AREVA TA and the International Decommissioning Network (2)

- **AREVA TA joined the IDN in November 2008 at the meeting in Vienna.**
- **AREVA TA wants to commit as a member in IDN activities such as :**
  - **participating consistently in Technical and Advisory meetings**
  - **Providing qualified and experienced individuals for expert missions to support participants**
  - **Providing qualified peers to support the IAEA's efforts on peer reviews**
  - **Hosting and participating to training courses, fellowship and scientific visits for participants.**

Thanks to Jean Bernard THEVENON – AREVA EURIWARE for its contribution to NARVEOS presentation

Thanks to Boris S. Stepennov – RRC Kurtchatov Institute, Russian Federation and Alexandre Gorbatchev – CEA PMG8, France, for their contribution to the presentation of Gremikha Project

THANK YOU FOR YOUR ATTENTION