



Belgoprocess



Belgatom

CEG Petten, May 26-28, 2004

Belgian Expertise in the Dismantling and Remediation of Contaminated Nuclear Sites

CEG Petten, 26-28 May 2004

Belgian team approach

- Belgatom
 - ⌘ Architect engineer, program management, consultancy
- Belgoprocess
 - ⌘ Operator experience, industrial D&D activities, consultancy
- SCK-CEN
 - ⌘ R&DD of processes and technologies in radwaste management and industrial project in D&D



Belgoprocess



STUDIECENTRUM VOOR KERNENERGIE
CENTRE D'ETUDE DE L'ENERGIE NUCLEAIRE

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CEG Petten, 26-28 May 2004

Content

- General expertise available in Belgium relevant to the subject of the CEG Workshop
- Specific projects demonstrating the implementation of this expertise
- Focus on specific subjects
- Potential services
- General company data



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Basic expertise in radwaste management

- Volume reduction phase
 - ☞ Incineration
 - ☞ Supercompaction
 - ☞ Cutting
 - ☞ Evaporation
 - ☞ Flocculation



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Basic expertise in radwaste management

- Remote operations
 - ⌘ High level waste
 - ⌘ Reactor internals
 - ⌘ Spent fuel

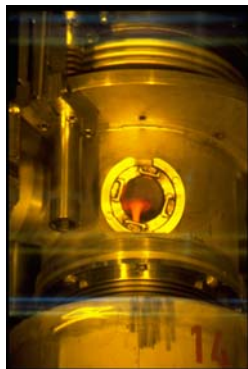


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Basic expertise in radwaste management

- Immobilization phase
 - ⌘ Cementation
 - ⌘ Bituminization
 - ⌘ Vitrification



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Basic expertise in radwaste management

- Interim storage prior to disposal
 - ⌘ LLW
 - ⌘ ILW
 - ⌘ HLW



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Basic expertise in radiological measurements

- Non destructive assay
- Radiological measurements for D&D (before, during and after dismantling)
- Radioactive waste characterization and codes



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CEG Peleman, 26-28 May 2004

Basic expertise in decontamination

- Decontamination of metals
 - ☞ Dry abrasive blasting
 - ☞ Wet blasting
 - ☞ Chemical
 - ☞ Electrochemical
 - ☞ CO² shot blasting



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Basic expertise in decontamination

- The C.O.R.D.® process:
a three step full system decontamination before segmenting with the aim to limit the transfer of surface contaminants during subsequent segmentation (applied on PWR primary loop)
- The Me.D.O.C. process:
thorough decontamination of segmented pieces by oxidation with Cerium IV in order to release them as non radioactive waste
- The Z.O.E. installation:
decontamination by wet abrasive cleaning of large metallic pieces to free release

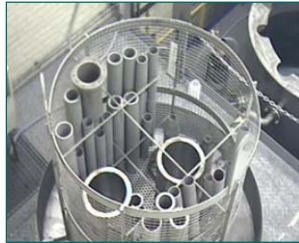


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Basic expertise in decontamination

- MEDOC installation
- More than 85% of material cleared
- Waste reduction 95%



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Basic expertise in decontamination

- Decontamination of concrete
 - ⌘ Dry abrasive blasting
 - ⌘ Shaving
 - ⌘ High pressure water jet
 - ⌘ CO² shot blasting



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Basic expertise in dismantling technologies

■ Metal cutting

- ⌘ hydraulic shears
- ⌘ plasma arc torches
- ⌘ high pressure water jet cutting
- ⌘ under water spark-erosion
- ⌘ electric Discharge Machining
- ⌘ thermal & electrical techniques



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Basic expertise in dismantling technologies

■ Concrete cutting

- ⌘ pneumatic demolishing
- ⌘ diamond cable saw
- ⌘ diamond encrusted blade saw
- ⌘ use of robotics



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North West Russia / Improvement of the Safety INTERIM STORAGE of L & ILW

- Assessment of the waste quantities on each producer site
- Assessment of the needed storage capacities
- Conceptual design of a centralised interim storage facility



- MSCO
- RTP Atomflot
- Nerpa & Severodvinsk
- Northern Fleet
- Kola NPP
- Radon Murmansk

Belgatom - Belgoprocess – VNIPIET
(1997 – 2000)

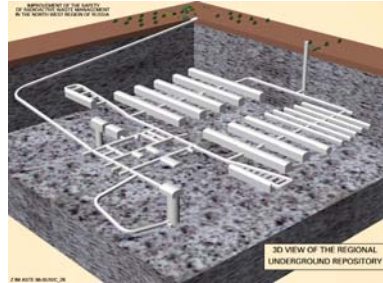


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North West Russia / Improvement of the Safety FINAL DISPOSAL of L & ILW

- Selection and ranking of suitable sites (Kola, Archangelsk & Novaya Zemlya areas)
- Repository conceptual design, Including costs & time schedule
- Environmental Impact Assessment (PSA studies for each potential site)



SGN & ANDRA, Antea BRGM,
Belgatom & SCK-CEN
VNIPIET & Mining Institute of Kola
(1997 – 2000)



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CEG Peñón, 26-28 May 2004

Kozloduy NPP

EC / Technical design for Decommissioning Units 1&2

- Selection of a decommissioning approach
- Selection of decontamination processes and dismantling techniques
- Scheduling the decommissioning activities
- Radiological characterization of contaminated equipment and materials
- Environmental Impact Assessment report



Belgatom – EWN
(1999 – 2001)

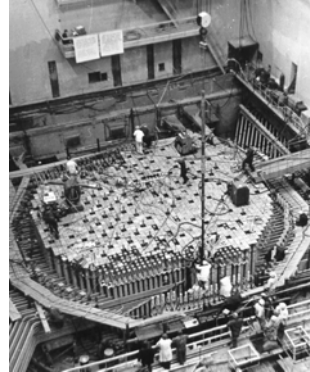


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CEG Peñón, 26-28 May 2004

Ignalina NPP Units 1&2 EBRD / Decommissioning Project Management Unit

- Final Decommissionin Plan
- Environmental Impact Assessment Report
- Decommissioning Project of Phase 1
- Management of new investments:
 - ⌘ Radwaste T&C facilities
(supercompaction, incineration & cementation)
 - ⌘ Spent fuel interim storage building
 - ⌘ Radwaste interim storage building



NNC - Belgatom - Swedpower
(1999 – 2004)



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Chernobyl NPP EBRD / Liquid Radwaste Treatment Plant (LRTP)

- Unloading and transfer of sludges from
 - ⌘ 6 tanks of 5.000 m³ (underground)
 - ⌘ 10 tanks of 1.000 m³
- Construction of a cementation facility



Belgatom – SGN – Ansaldo
(1999 – 2005)



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Belgium / Site Remediation

- Historical waste management
- Waste characterisation & mapping
- Construction of a containment
- Waste retrieval and handling
- Waste processing and repackaging



ONDRRAF-NIRAS,
Belgoprocess & Belgatom
(1998 – 2004)



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Eurochemic reprocessing plant: D&D project

- Decommissioning of the main process building and peripheral storage buildings
- Industrial approach
- Cost management
- Decontamination to free release levels and reuse as secondary materials:
80 % of material inventory



Belgoprocess
(1990 – 2008)



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Open storage pond: D&D project

- Decommissioning of the old infrastructure for liquid waste and sludge treatment/storage
- Alpha and Ra contaminated
- Minimization and segregation of radioactive wastes to minimize costs
- Final stage: green field



Belgoproces
(2002 – 2003)



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BR3 decommissioning project

- BR3, the first PWR in Europe
- In operation from 1962 to 1987, 10.5 MWe
- Decommissioning programme started in 1989 as an EC pilot dismantling project
- Three main operations
 - ⌘ chemical decontamination of primary loop
 - ⌘ remote dismantling of internals and vessel
 - ⌘ thorough decontamination of metallic components after segmentation

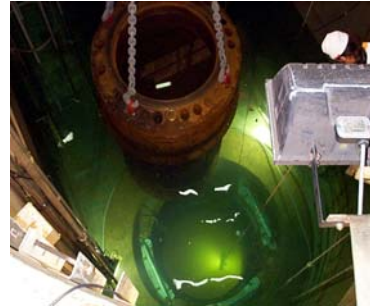
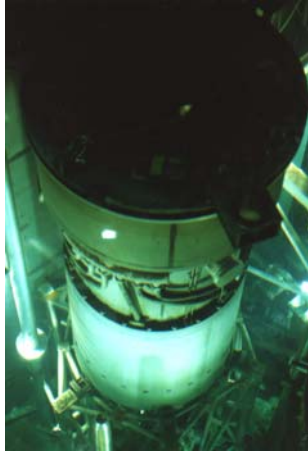


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SCK-CEN (1989 – 2005)

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Dismantling of Internals and RPV of BR3

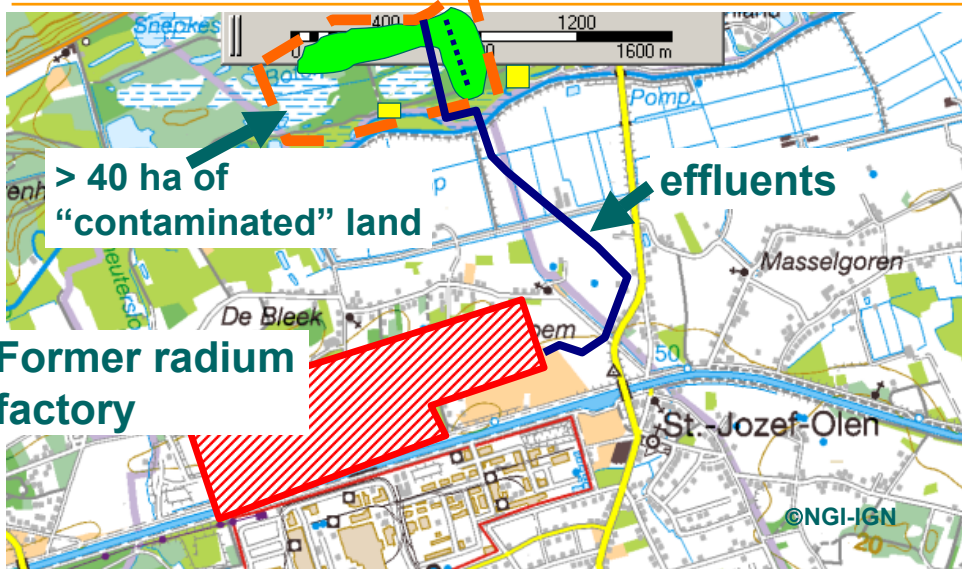


Dismantling performed underwater
Cutting techniques were benchmarked
Remote Controlled mechanical cutting selected
Comparison of immediate and differed dismantling



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Assessment of health risks related to various possible uses of radium contaminated land



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Relevant Repository Related Research

- Characterisation of sites & potential host formations
- The characterisation of conditioned reprocessing waste
- The establishment of a scientific-technical basis for geological disposal
- Studies on the long-term behavior of waste packages and engineered barriers under geological disposal conditions
- The development of a repository design, including engineering aspects such as repository construction, backfilling and sealing



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Environmental Impact Assessment Radwaste Disposal

- All kinds of waste: LLW, ILW, HLW, spent fuel, P&T waste, special waste types
- All kinds of repositories: surface and geological
- Development of methodologies
- Scenario identification
- Hydrogeological modelling



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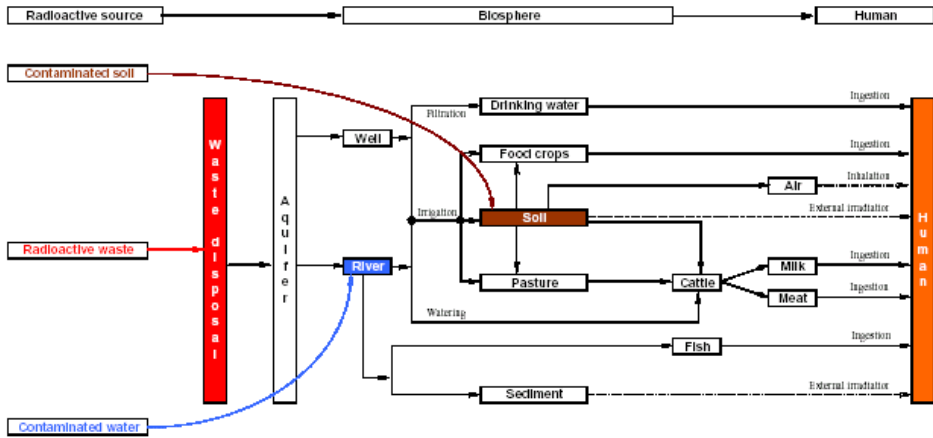
Environmental Impact Assessment Radwaste Disposal

- Consequence analysis
- Sensitivity and uncertainty analysis
- Chemotoxicity evaluation
- Chemical reactive coupled transport

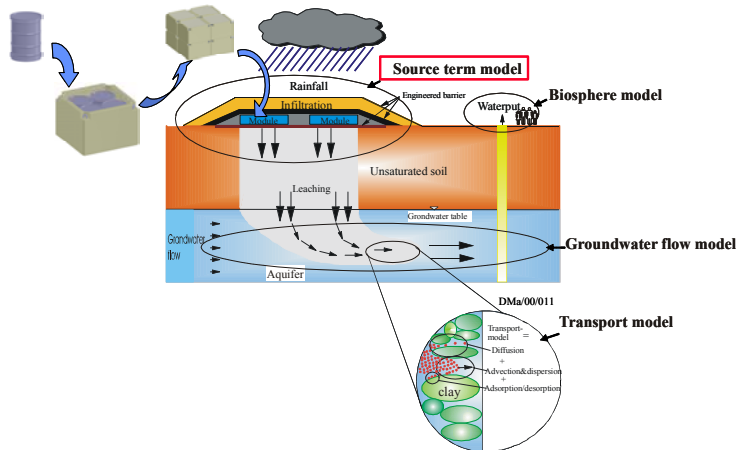


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Environmental Impact Assessment



Models for natural spreading of radionuclides



Decommissioning & Decontamination Experience

- Expertise in radioprotection aspects, waste minimization, cost, reduction and industrial safety are used for international cooperation
- IAEA and EC expert groups
- OECD guidelines, advices and position papers
- Training courses and research projects (IAEA, NATO,...)
- Decommissioning planning, dismantling strategies and cost estimation
- Use of robotics and specific decontamination tools



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Belgian supporting services

- Program and project management to define and implement technical programs at justifiable costs according to the customer needs.
- Supporting services:
 - ⌘ Environmental impact assesement
 - ⌘ Safety analyses & radioprotection studies
 - ⌘ Decommissioning planning and costing
 - ⌘ Licensing
 - ⌘ Decommissioning project management



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Belgian team

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