RBMN Project
Repository for Low- and Intermediate-Level Wastes

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PRESENT SCENARIO

Angra 1
Angra 2

Angra 3

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PRESENT SCENARIO

- Applications
  - Medicine
  - Industry
  - Environment
  - R&D
  - And others.

- ~2,500 radioactive installations

- This scenario justifies the construction of a national repository.
LEGAL FRAMEWORK

  - CNEN is in charge to receive and store safely the radioactive wastes coming from the use of nuclear energy and radionuclides in Brazil.
  - CNEN is responsible for their disposal. The repository design, construction and implementation are under CNEN responsibility. These activities can be delegated, but the responsibility not.
RBMN Project

- It starts in 2009, as part of the national solution for the storage of radioactive waste generated in Brazil.

- It aims at implementing the National Repository to store the low- and intermediate-level radioactive wastes from NPPs operation, and activities that use radioactive materials.
INVENTORY – ASSUMPTIONS

- Repository Operation
  - Start: 2018
  - Closure: 2080
- Nuclear Power Plants
  - Angra 1, 2 and 3
  - Four new ones
  - Operation: 60 years
- Brazilian Multipurpose Reactor (RMB)
- New Units of Production INB
- Decommissioning wastes
# Estimated Inventory

<table>
<thead>
<tr>
<th>Origin</th>
<th>LILW (m$^3$)</th>
<th>VLLW (m$^3$)</th>
<th>TOTAL (m$^3$)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Minimum</td>
<td>Maximum</td>
<td>Minimum</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NPP operation</td>
<td>10,340</td>
<td>28,340</td>
<td>-</td>
</tr>
<tr>
<td>Other installations</td>
<td>1,083</td>
<td>1,517</td>
<td>-</td>
</tr>
<tr>
<td>Decommissioning</td>
<td>6,353</td>
<td>6,392</td>
<td>21,150</td>
</tr>
<tr>
<td>TOTAL (m$^3$)</td>
<td>17,776</td>
<td>36,249</td>
<td>21,150</td>
</tr>
</tbody>
</table>

LILW = Low and intermediate-level wastes; VLLW = Very low-level wastes

Not included: Sealed disused sources; lightning sources and smoke detectors; NORM
**Repository: References**

**France**
- **L’Aube**
  - Operator: ANDRA
  - Expected Volume: 1,000,000 m³
  - Start: 1992
  - 59 NPPs

**Spain**
- **El Cabrillo**
  - Operator: ENRESA
  - Expected Volume: 180,000 m³
  - Start: 1992
  - 07 NPPs
PREVIOUS EXPERIENCE

Abadia de Goiás
Repository Concept

Packages ➔ Container ➔ Module
REPOSITORY CONCEPT
REPOSITORY FOR LOW- AND INTERMEDIATE-LEVEL WASTES

✓ Passive installation
✓ Treated wastes according established criteria
✓ Multiple barriers
✓ Safety analysis for long-term
✓ Performance study for long-term
✓ Radiological control
✓ Environmental control
✓ Monitoring for 300 years (Institutional control)
Repository - Schema

- Usina de Argamassa
- Controle e verificação
- Recepção / Armazenamento / Triagem / Acondicionamento
- P&D Ambiental
- Segurança
- Administração
- Serviços Gerais

Área de Deposição dos Rejeitos

Baixo e Médio Níveis de Radiação

Área de dos Rejeitos

Deposição de Muito Nível de Radiação

Baixo Nível de Radiação
Repository: WBS

RBMN Project

Initiation

Inventory

Site Selection

Basic Design

Construction

Project Closure

Executive Design

Licensing

Conceptual Design

Project Management

Administrative Coordination

Technical Coordination

Commissioning
# Site Selection Process

<table>
<thead>
<tr>
<th>PHASE</th>
<th>DECISION</th>
<th>Political Territorial Scope</th>
<th>Scale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interest area</td>
<td>Governmental</td>
<td>Brazilian states</td>
<td>---</td>
</tr>
<tr>
<td>Preliminary areas</td>
<td>Technical</td>
<td>Municípios (preliminary)</td>
<td>1: 1,000,000</td>
</tr>
<tr>
<td>Potential Areas</td>
<td>Public Acceptance</td>
<td>Municípios (Potential)</td>
<td>---</td>
</tr>
<tr>
<td>Candidates</td>
<td>Technical/Public Acceptance</td>
<td>Candidate Polygons</td>
<td>1: 10,000</td>
</tr>
<tr>
<td>Characterization of Local Candidates and final choice</td>
<td>Technical/Public Acceptance Governmental</td>
<td>Candidate Polygons</td>
<td>1: 10,000</td>
</tr>
</tbody>
</table>
# Environmental and Nuclear Licensing Process

<table>
<thead>
<tr>
<th>Licensing</th>
<th>1ª Phase</th>
<th>2ª Phase</th>
<th>3ª Phase</th>
</tr>
</thead>
<tbody>
<tr>
<td>Environmental</td>
<td>License</td>
<td>LP Previous License</td>
<td>LI Installation License</td>
</tr>
<tr>
<td>Demand</td>
<td>Approval of the Repository site</td>
<td>Repository Construction</td>
<td>Repository Operation</td>
</tr>
<tr>
<td>Nuclear</td>
<td>Approval Certificates</td>
<td>CARL Site Report</td>
<td>CARAS Safety Analysis Report</td>
</tr>
<tr>
<td>Demand</td>
<td>Approval of the local</td>
<td>Construction and Operation</td>
<td>Closing</td>
</tr>
</tbody>
</table>
MAIN ACTIVITIES

2008
- Launched

2009
- Preliminary Scope
- Preliminary Chronogram

2010
- First studies - Site Selection

2011
- Preliminary areas
- Workshop Legal Framework
- Workshop Site selection

2012
- Strategy to have candidates
- Licensing scope
- Concept for the repository
- Workshop - Nuclear Licensing

2013
- Terms of Reference – IBAMA
- Questionnaire to establish the inventory
- Conceptual Project
ACTIVITIES FOR 2013

- Inventory
- Local selected
- EIA
- Nuclear Licensing
- Conceptual Project
PROJECT RBMN: CRITICAL PHASES

- **Conceptual Design**
  - Acceptance criteria for the waste packages (historical and future inventory)
  - Procedures to bring safety and protection of human beings and environment, building public confidence.

- **Site Selection - Find a place that reaches:**
  - Technical criteria: ecological, geological, physiographic and socio-economical factors
  - Public acceptance
PROJECT RBMN: CRITICAL PHASES

- Licensing
  - Environmental and nuclear
  - Involving two different regulators

- Construction
  - Quality control of materials and processes
  - Documentation
  - Safety analyses requirements
Challenges

- Brazil`s history began in 1500 – 512 years.
- The Repository construction and release
  - about 360 years, i.e. longer than a half of Brazilian history
  - This aspect is very new for the Brazilian people, bringing a new dimension to public acceptance.
- The event occurred in Fukushima is still on people mind
  - the differences between a NPP and a repository are not clear.
The first repository in Brazil to be licensed for several wastes and radionuclides

- optimize the resources and the time, associated to the quality in order to give confidence to all stakeholders.

The first repository in South America

- real challenge for the continent.

- very carefully managed, in order not to have problems, mainly with public acceptance.
CONCLUSION

- The RBMN Project is part of the national solution for the storage of radioactive waste generated by the use of radioisotopes and nuclear energy in Brazil.
- The Repository should meet the requirements of IBAMA and DRS, and also answer the questions raised by the stakeholders.
CONCLUSION

- It is necessary to work with transparency within the legal base, in the way that doesn’t compromise the technical work.

- The whole system depends on the repository licensing, which will be held for the first time by Nuclear Regulatory Body and IBAMA.

- The discussion with the municipalities, where the repository will be installed, may require political negotiations, and certainly hearings, that will affect the schedule.
RBMN Project success will be translated by obtaining the commissioning and full acceptance and satisfaction of all involved, meaning that all expected results and benefits were produced.

SUSTENTABILITY

✓ The waste management is a key component for achieving the sustainability in the nuclear area.

✓ Sustainable Community is the one “that can satisfy their own needs without reducing the opportunities of future generations.” (Lester Brown)

CAPRA in TRIGUEIRO, 2005, 19
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Thanks
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