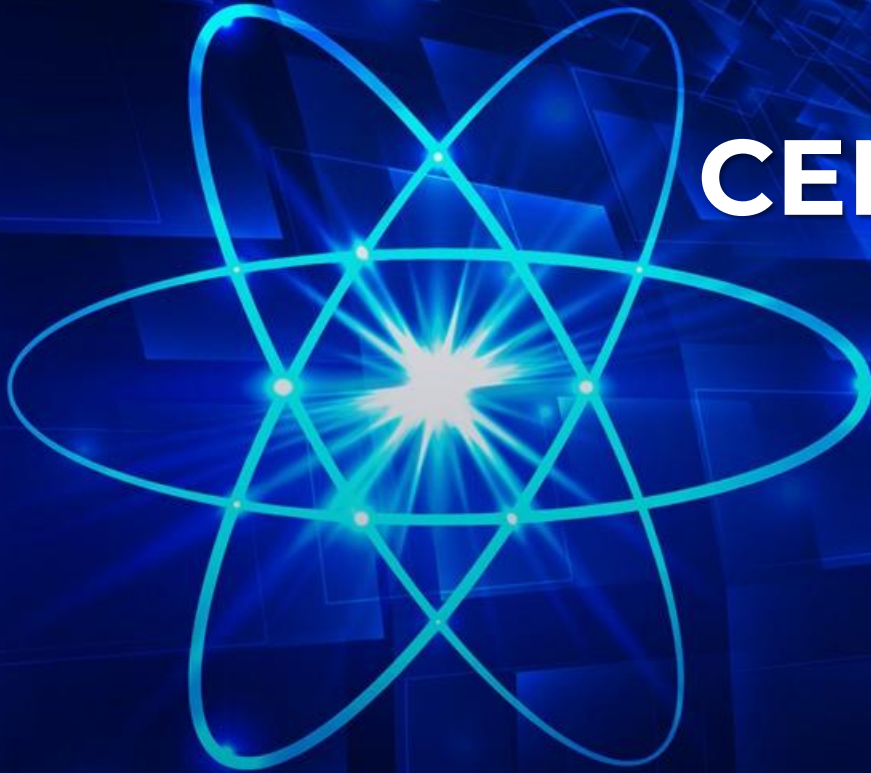


Comissão Nacional de Energia Nuclear

# CENTENA: sustainable solution for radioactive wastes



**Clédola Cássia Oliveira de Tello**  
CDTN/CNEN



# Sustainability

- The quality of being able to continue over a period of time
- The quality of causing little or no damage to the environment and therefore able to continue for a long time

(dictionary.cambridge.org)



# Sustainability

- In 1987, the United Nations Brundtland Commission defined sustainability as “meeting the needs of the present without compromising the ability of future generations to meet their own needs.”

The concept of sustainability is complex, as it addresses a set of interdependent variables, but we can say that it must have the ability to integrate social, energy, economic and environmental issues.

- A human activity to be considered sustainable should be:
  - ✓ Ecologically correct
  - ✓ Economically viable
  - ✓ Socially fair
  - ✓ Culturally diverse



# The five Ps





# Sustainable Development Goals (SDGs)

- **United Nations**  
“One place where the world's nations can gather together, discuss common problems and find shared solutions.”
  - **Action including all countries**
    - Promote prosperity while protecting the planet.
    - Ending poverty must go hand in hand with strategies to:
      - build economic growth and meet a range of social needs,
      - include education, health, social protection and employment opportunities,
      - combat climate change and protect the environment.



**What is the relationship  
between  
waste and sustainability**





# Industrial wastes



<http://www.mpgp.mp.br/portal/noticia/mp-investiga-despejo-irregular-de-residuos-da-construcao-civil-em-area-vizinha-ao-paco>



<https://www.eosconsultores.com.br/os-numeros-dos-residuos-solidos-no-mundo/>



# Industrial wastes







# Wastes

## All human activities produce waste

France generates the following amounts of waste\* per inhabitant per year:



**13.8 t**

of trade waste  
(construction, industry, agriculture, health care activities)



**354 kg**

of household waste



**100 kg**

of toxic industrial waste

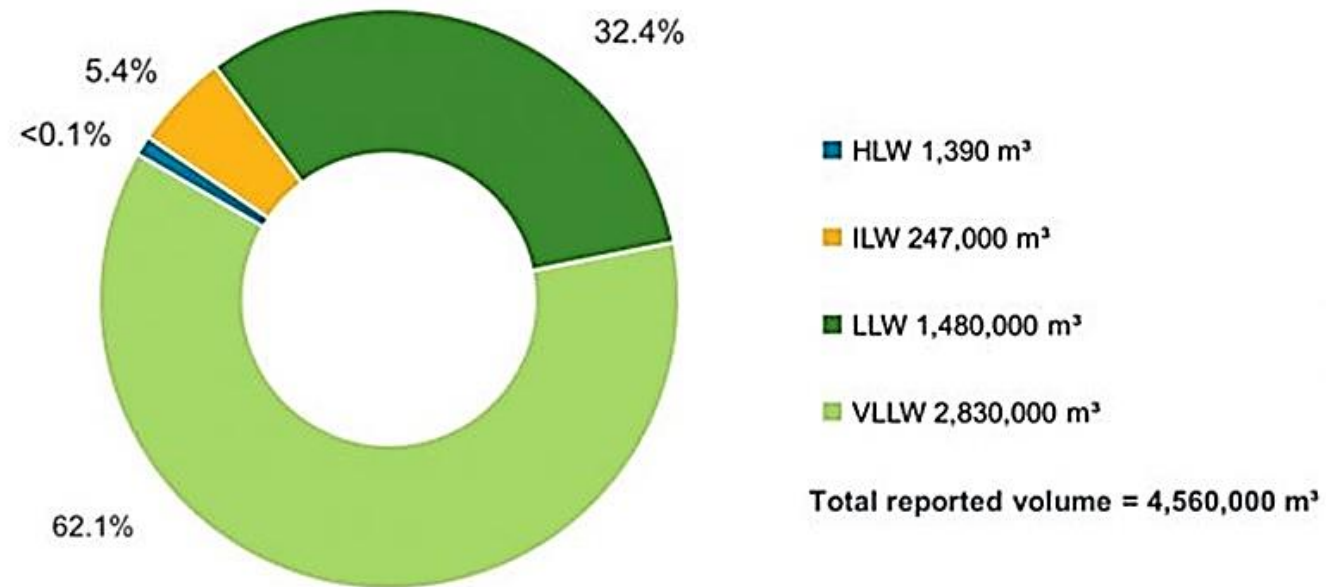


**2 kg**

of radioactive waste

Of this waste:  
60% is from the nuclear industry, and 40% from other sectors

\* Source ADEME (2016)





# Radioactive wastes



**CDTN /CNEN**



**IPEN/CNEN**



**Eletronuclear**



**FCN - INB**



# SUSTAINABLE DEVELOPMENT GOALS (SDGs)/UN



**Nuclear techniques to combat pests**



**Nuclear Medicine**



**Aquifer quality control using isotopic techniques**



**Zero-emission nuclear power plants**



**Process control by nuclear techniques**



**Low emission electrical generation**



**Isotopic techniques in agriculture**

**CENTENA**



## Centro Tecnológico Nuclear e Ambiental

“Um núcleo de segurança e  
sustentabilidade para o Brasil”

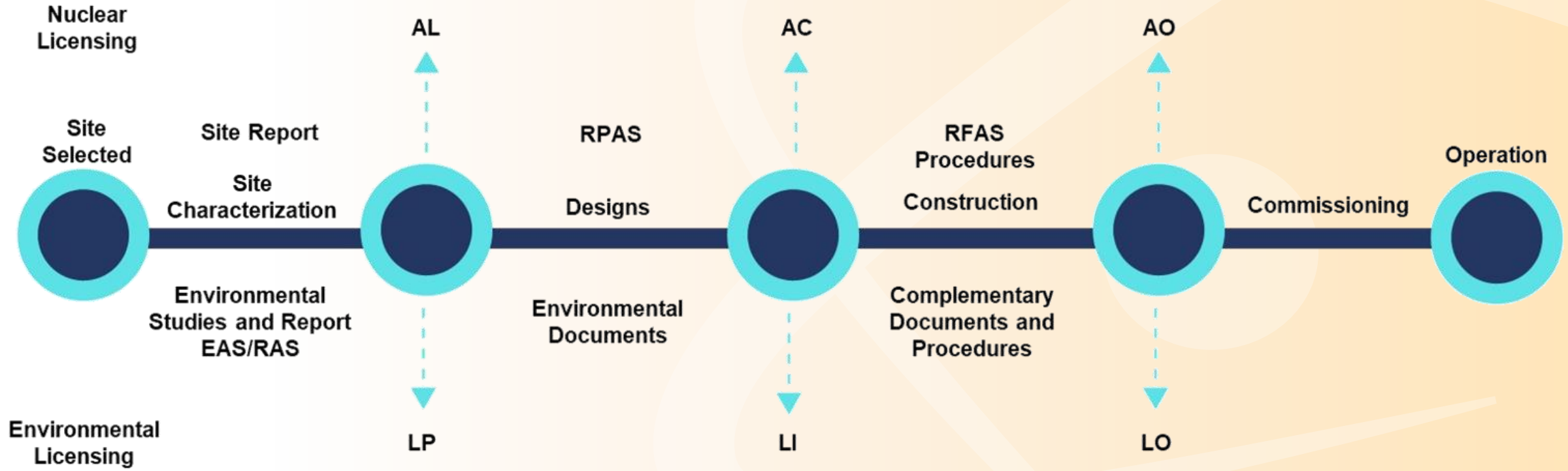


The CENTENA Project aims to design, build, license and put into operation the CENTENA – Nuclear and Environmental Technological Center – whose main functions will be to store low and intermediate-level radioactive waste from the use of nuclear energy in Brazil, and carry out RD&I activities in the Radioactive Waste Management area.



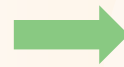
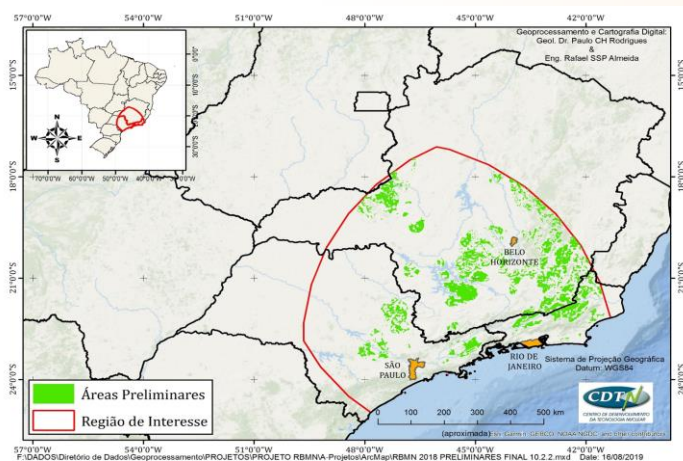
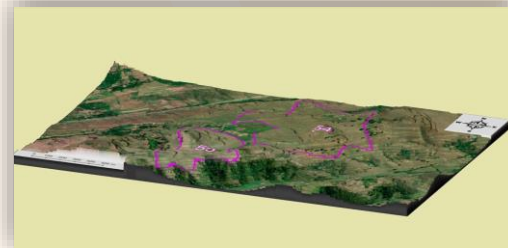
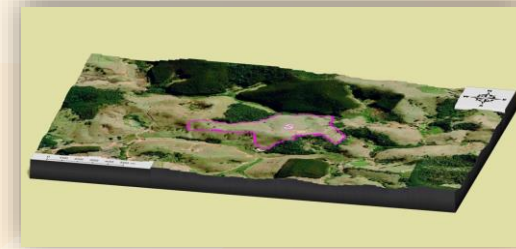
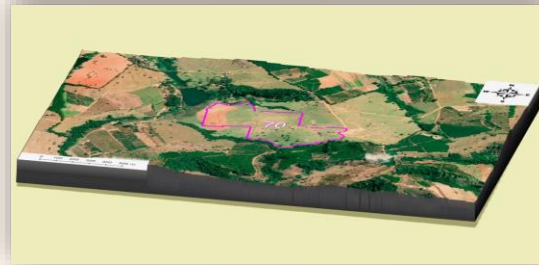
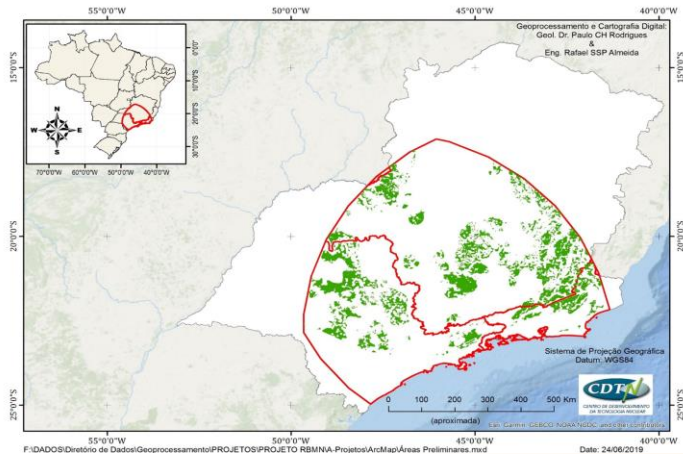


# CENTENA Project Status





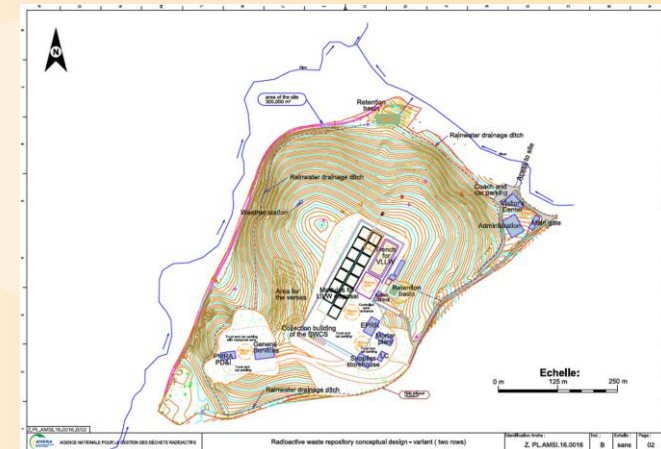
## What happens till now?





# What happened till now?

- ✓ Preliminary Conceptual Design (ANDRA);
- ✓ Preliminary Communication Plan;
- ✓ Communication material;
- ✓ Workshop with the main RW generators;
- ✓ Establishment of a work group by GSI, which define the goals and responsibilities related to CENTENA;







# What happened till now?

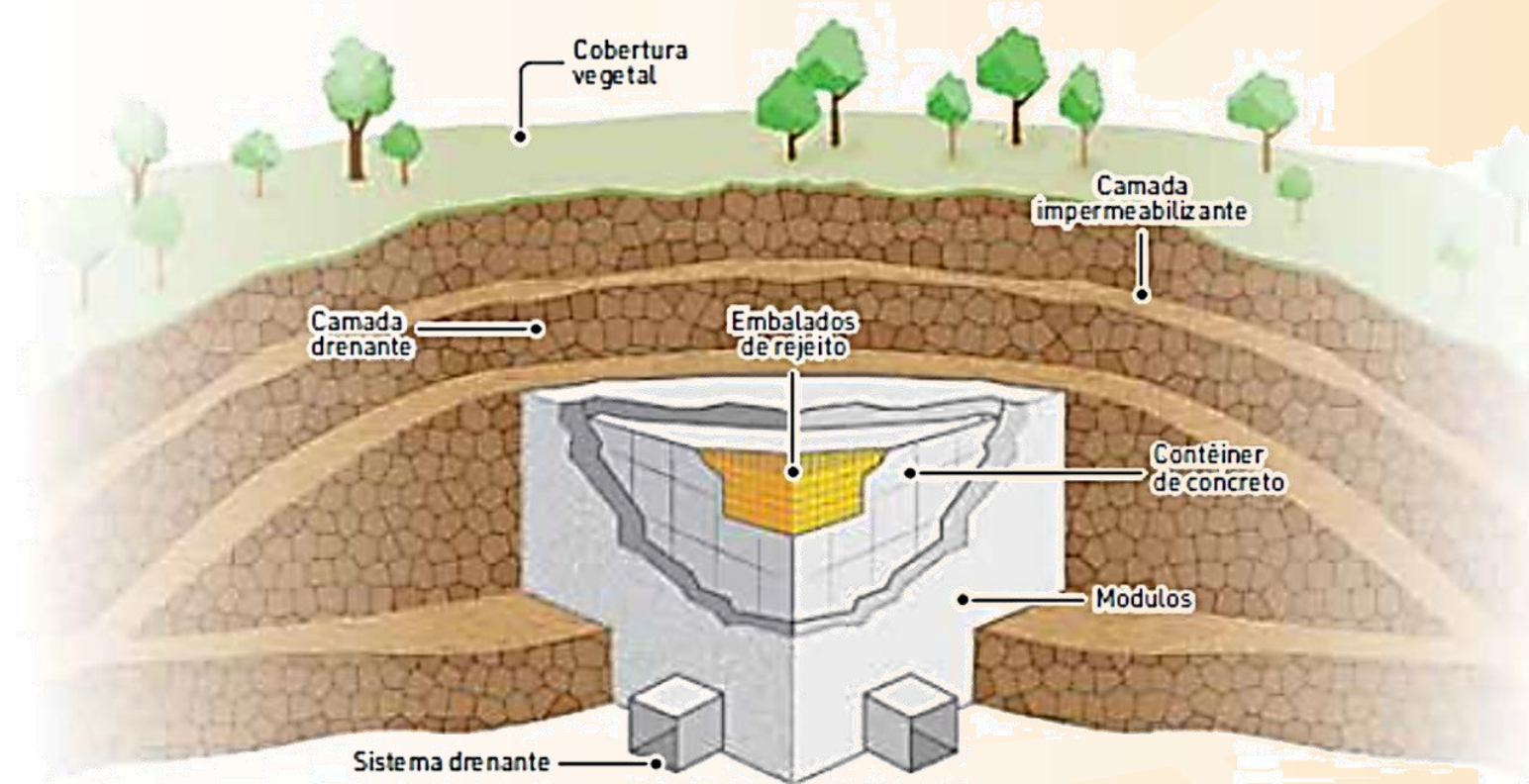
- ✓ Studies to define the Waste Acceptance Criteria (WAC);
- ✓ Study of the positive and negative impacts of the Repository in Abadia de Goiás – CRCN-CO;
- ✓ R&D activities to study the different barriers for the disposal system;
- ✓ Lato sensu Course - Specialization in “Radioactive waste management”;
- ✓ Preliminary Business Plan.





# RD&I Activities

## Multibarriers Concept





CENTENA  
CENTRO TECNOLÓGICO  
NUCLEAR E AMBIENTAL

## CENTENA: sustainable solution for radioactive wastes

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CENTRO DE DESENVOLVIMENTO  
DA TECNOLOGIA NUCLEAR

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MINISTÉRIO DA  
CIÊNCIA, TECNOLOGIA  
E INOVAÇÃO

GOVERNO FEDERAL  
UNIAO E RECONSTRUÇÃO



## What happened till now?

- ✓ Themes for RD&I activities identified;
- ✓ Establishment of partnerships;
- ✓ Risk management plan;
- ✓ Workshop “Opportunities” with different stakeholders;
- ✓ Public Communication Program.



# What comes next?

- ✓ Communication Program for the region;
- ✓ Characterization of the site;
- ✓ Environmental and radiological studies;
- ✓ Site Reports for both Regulators;
- ✓ Request for the initial environmental and nuclear licenses





# Challenges

- The first repository in Brazil to be licensed for several wastes and radionuclides.
- Technical – qualified HR;
- Political – continuous compromise;
- Legal – agreement between the regulators and
  - have acquisitions compatible with the cronogram;
- Financial – budget.



# Challenges

- ✓ The discussion with the stakeholders, especially those from the region where the repository will be installed, will require political negotiations, and certainly hearings, that can affect the schedule.
- ✓ It will be necessary optimize the resources and the time, preserving the quality, in order to give confidence to all stakeholders.





# Conclusion

- ✓ The CENTENA Project brings a national solution for the safe storage of radioactive waste (LILW) generated by the use of radioisotopes and nuclear energy in Brazil.
- ✓ Release of interim storage and the waste packages will be stored permanently.
- ✓ Centralized and secure storage, allowing the optimization of the steps linked to waste disposal.





# Conclusion

- ✓ CENTENA is the solution to closing the cycle of nuclear energy applications in the country!
- ✓ Increase in technical-scientific knowledge in this area, based on studies carried out in its RD&I unit on the topic of WM and the environment.





# Sustainability of Nuclear Area

- ✓ *The waste management is a key component for achieving the sustainability in the nuclear area.*
- ✓ *Waste life cycle – from generation to disposal.*





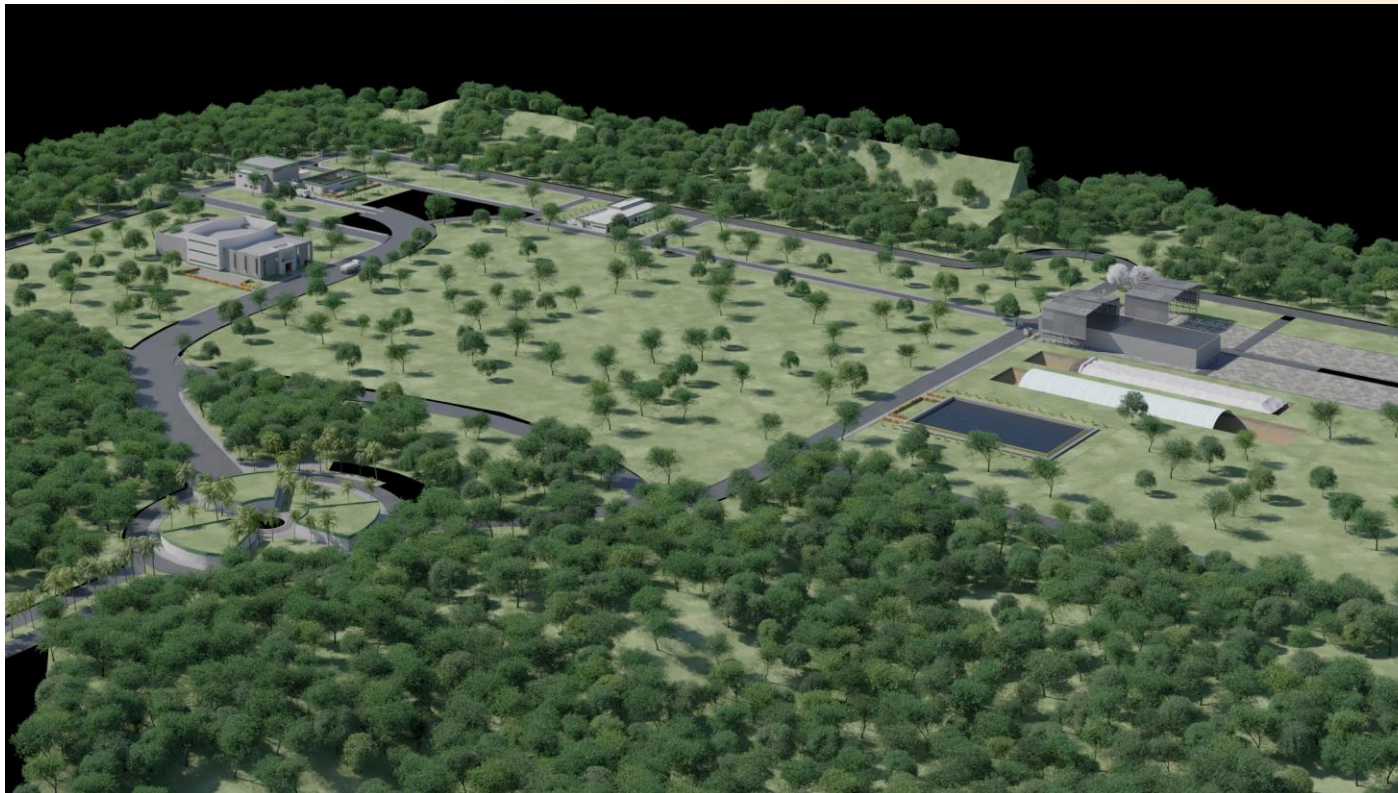
# Stakeholders

- ✓ CDTN: SEGRE, SEAMA, SEENG, SELOG, SEMAV, SENAN, SETEC, SETRE, ASCOM, DIFES (PG e BIC);
- ✓ CNEN, DPD and Institutes;
- ✓ MCTI, SUV, ASPAR;
- ✓ UFMG (LabGEO da EE), FUMEC (LESC);
- ✓ CETEM, FUNDEP, IEBT, AMAZUL, UNB.
- ✓ CNEN, CAPES, CNPq, FAPEMIG - specialization scholarships





# CENTENA



Comissão Nacional  
de Energia Nuclear

# Thanks

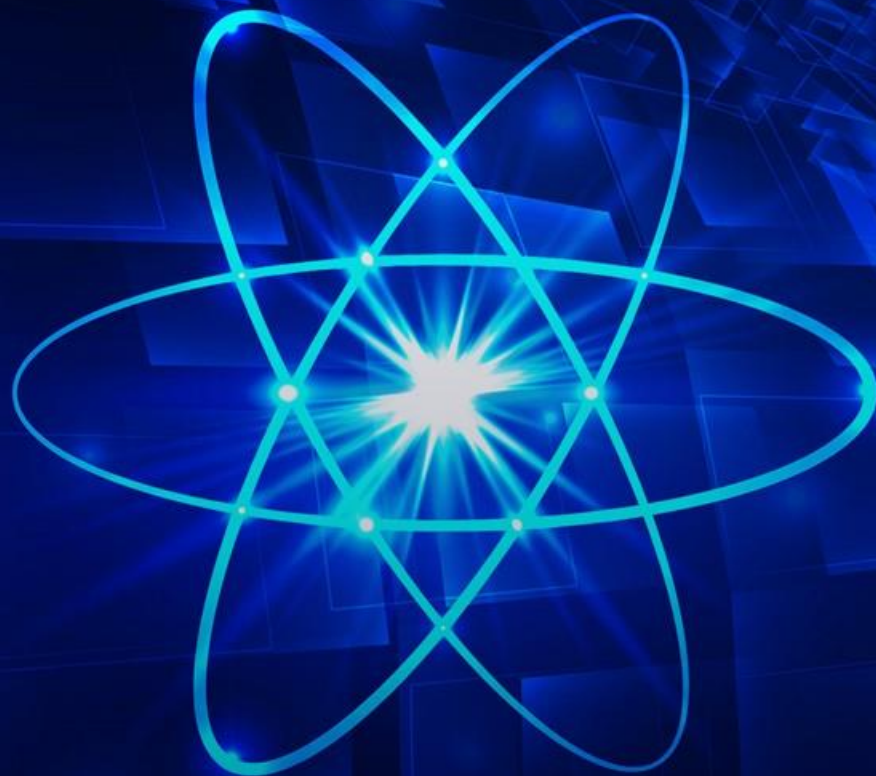
CDTN/CNEN

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