

# Brazilian Presentation

---

## RESEARCH REACTOR DECOMMISSIONING ACTIVITIES – BRAZIL

---

Pablo Andrade Grossi  
Clédola Cassia O. de Tello



Ministério da  
Ciência e Tecnologia



# Contents

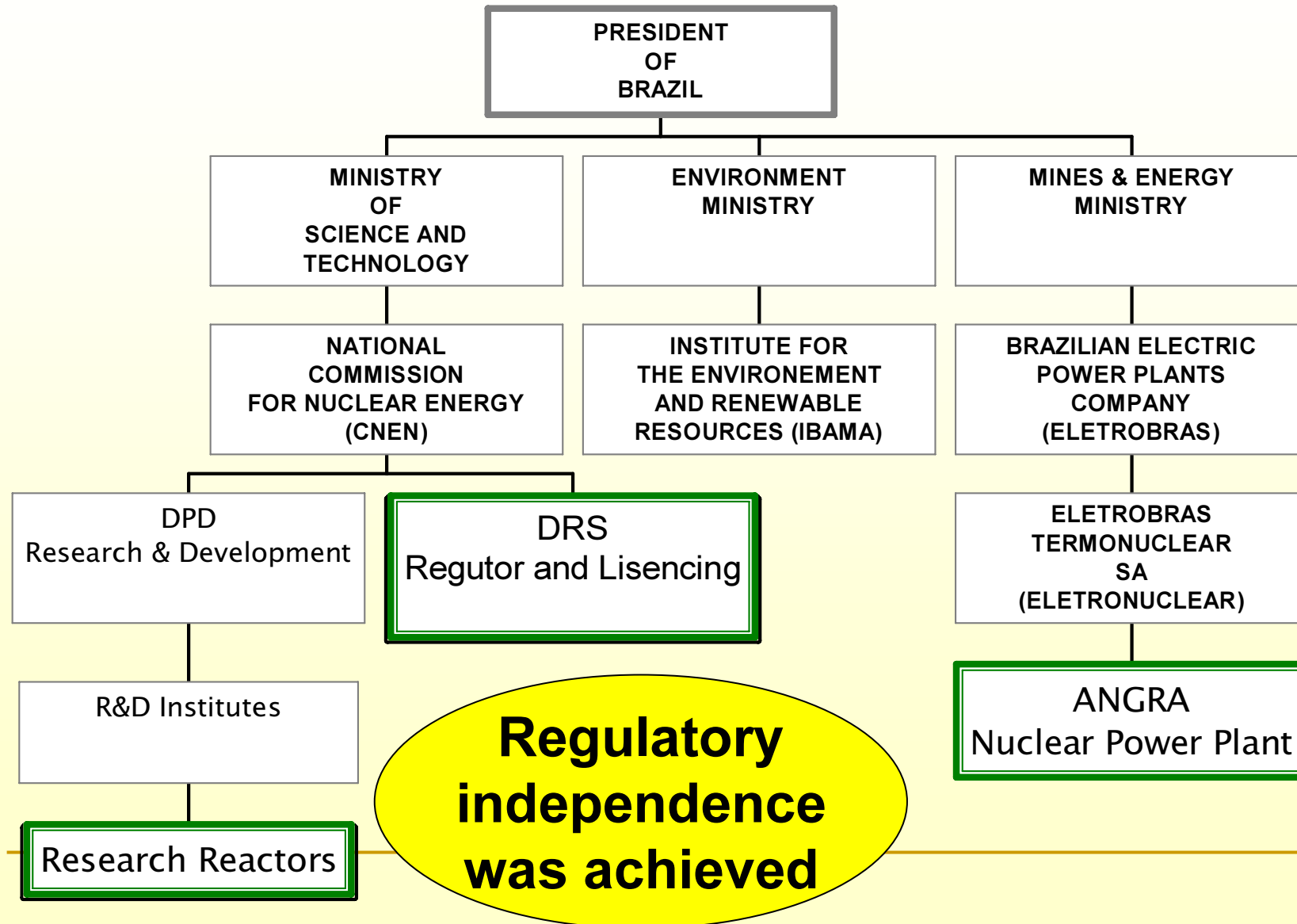
- **Introduction**
  - **Brazilian legal and regulatory framework**
  - **IPR-R1 Research Reactor decommissioning plan and decommissioning strategy**
  - **End state of IPR-R1 decommissioning activities**
  - **Cost estimate and funding**
  - **Management of materials / waste and release from nuclear regulatory control**
  - **Decommissioning expertise and tools**
-

# INTRODUCTION

- Four research reactors are operated by the federal research institutes.

<i>FACILITY</i>	<i>POWER (kW)</i>	<i>TYPE</i>	<i>STATUS</i>
ARGONAUTA	0.20	ARGONAUTA	Oper.
IEA-R1	5,000.00	POOL	Oper.
IPEN-MB 01	0.10	ZPR TANK	Oper.
<b>IPR-R1</b>	<b>250</b>	<b>TRIGA-Mark I</b>	<b>Oper.</b>

# Brazilian Nuclear Structure



# Legal and Regulatory Framework

*For research reactors there is no specific decommissioning policy.*

The *operator has no fixed rules* to perform the decommissioning work.

The *report for each phase* must be sent to the regulatory body to *be approved*.

*Some licensing norms* present decommissioning *guidelines* for the report preparation, but there aren't any established requirements *for each step*. These guidelines are only a suggestion.

# Legal and Regulatory Framework

## National Report of Brazil

for the

Joint Convention on the safety of spent fuel management and on the safety of radioactive waste management

Describes the decommissioning of one nuclear facility in Brazil:

USAM - Monazite Sand Treatment Facility

NATIONAL REPORT  
OF  
BRAZIL  
  
FOR THE  
JOINT CONVENTION ON THE SAFETY OF SPENT FUEL MANAGEMENT  
AND ON THE SAFETY OF RADIOACTIVE WASTE MANAGEMENT

May 2006

# Legal and Regulatory Framework

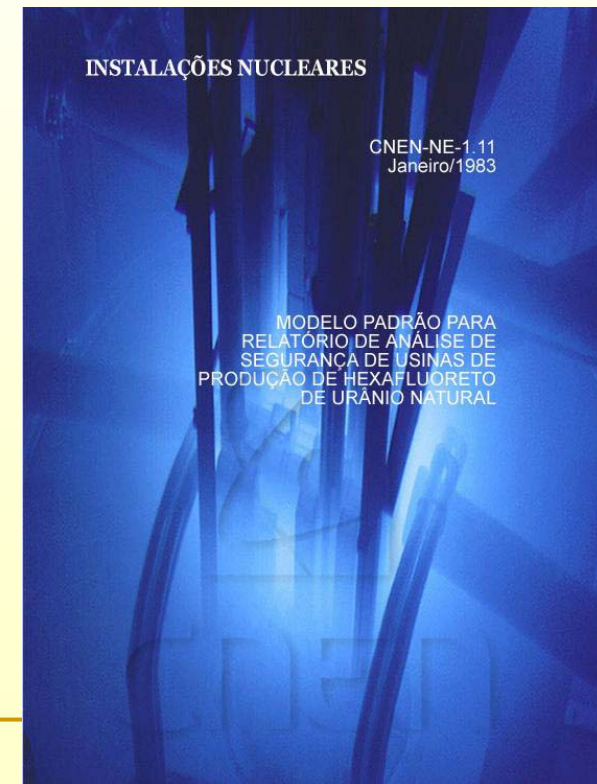
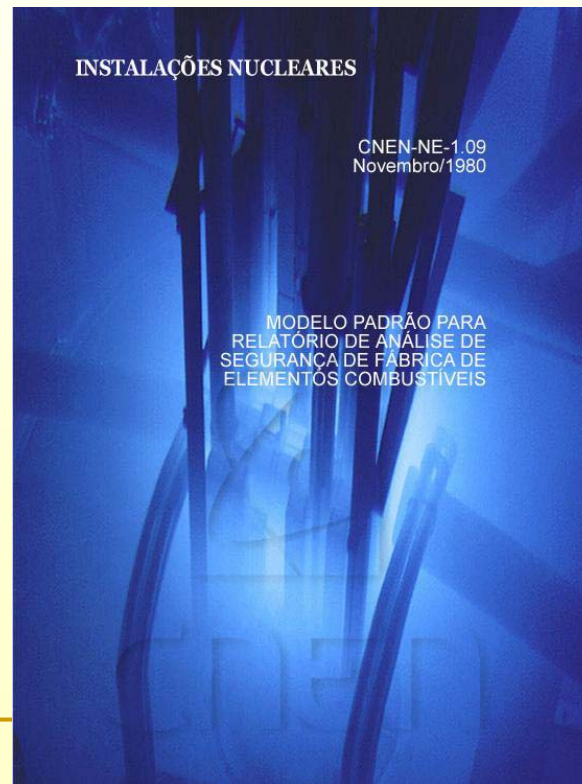


- Nuclear Facilities Licensing (CNEN-NE-1.04)

# Legal and Regulatory Framework

- Safety Assessment Report Guidelines

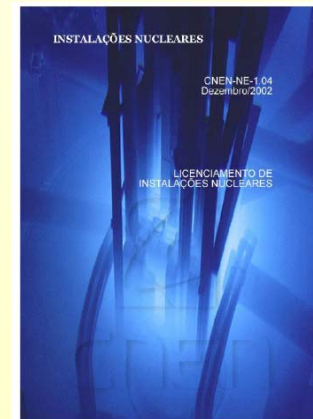
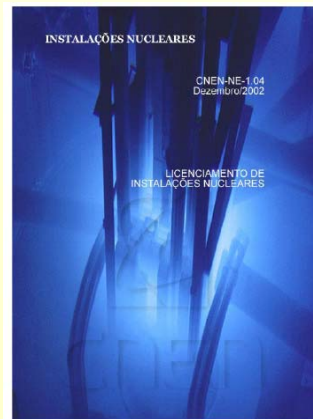
(CNEN-NE-1.08, CNEN-NE-1.09, CNEN-NE-1.11)





# Legal and Regulatory Framework

- 3.01 (Basic Instructions for Radiation Protection)
- 6.02 (Licensing of Radioactive Installations)
- 6.05 (Management of Radioactive Wastes)



# Legal and Regulatory Framework



- Brazil: A Country Profile on Sustainable Energy Development

Discussion about Nuclear Power Plants Decommissioning

# Legal and Regulatory Framework

***In Brazil*** when the national regulations don't cover a specific nuclear and radioactive issues the ***consensus is to:***

***Use the IAEA recommendations.***

# DECOMMISSIONING PLAN

- Brazil do *not have a decommissioning policy.*
  - Then IPR-R1 did not have a decommissioning plan as part of its original licensing documentation.
-

# DECOMMISSIONING PLAN

- **Introduction;**  
*done*
- **Facility description:** Physical description of the site and facility; operational history; systems and equipment; radioactive and toxic material inventory;  
*done*
- **Decommissioning strategy:**  
*partly done*
- **Project management:** resources; organization and responsibilities; review and monitoring arrangements; training and qualifications; reporting and records;  
*to be done*

# DECOMMISSIONING PLAN

- ***Decommissioning activities:*** description and schedule of phases and tasks; decontamination activities; dismantling; waste management; surveillance and maintenance programs; ***to be done***
- ***Safety assessment:*** dose predictions for tasks; demonstration of ALARA for tasks; radiation monitoring and protection system; physical security and materials control; management of safety; risk analysis; operating rules and instructions; justification of safety for workers, general population, and environment; ***to be done (established norm and procedures*** by CNEN 3.01 and CDTN, ***internal competency*** identified)

# DECOMMISSIONING PLAN

- ***Environmental impact assessment:***  
***to be done*** (CDTN has environmental protection ***staff***)
- ***Quality assurance program:***  
***partly done*** (application of the existing procedures)
- ***Radiation protection and safety program:***  
***partly done*** (CDTN has radiological and environmental protection ***staff***)
- ***Radiological criteria clearance:***  
***partly done*** (***exemption levels established*** and CDTN has radiological and environmental protection ***staff***).



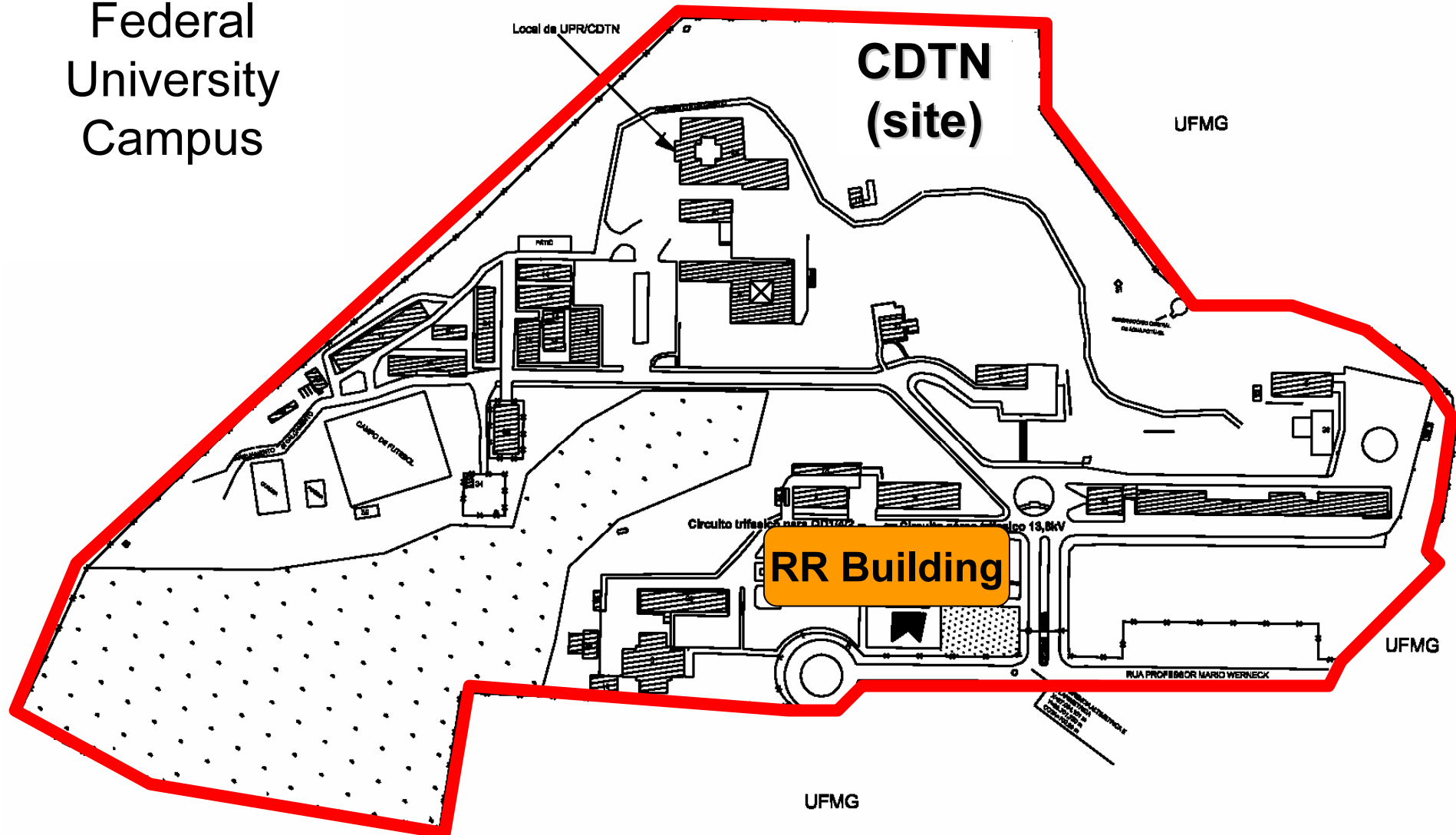
# DECOMMISSIONING STRATEGY

- There are *two possible strategies*, since the reactor *lifetime* is about *at least 10 years*.
  - *Immediate total dismantling (green field)*
  - *Safe enclosure (restricted uses, brown field)*
- Just before the shutdown the strategy will be *selected considering* the legislation, political and economical *situation*.

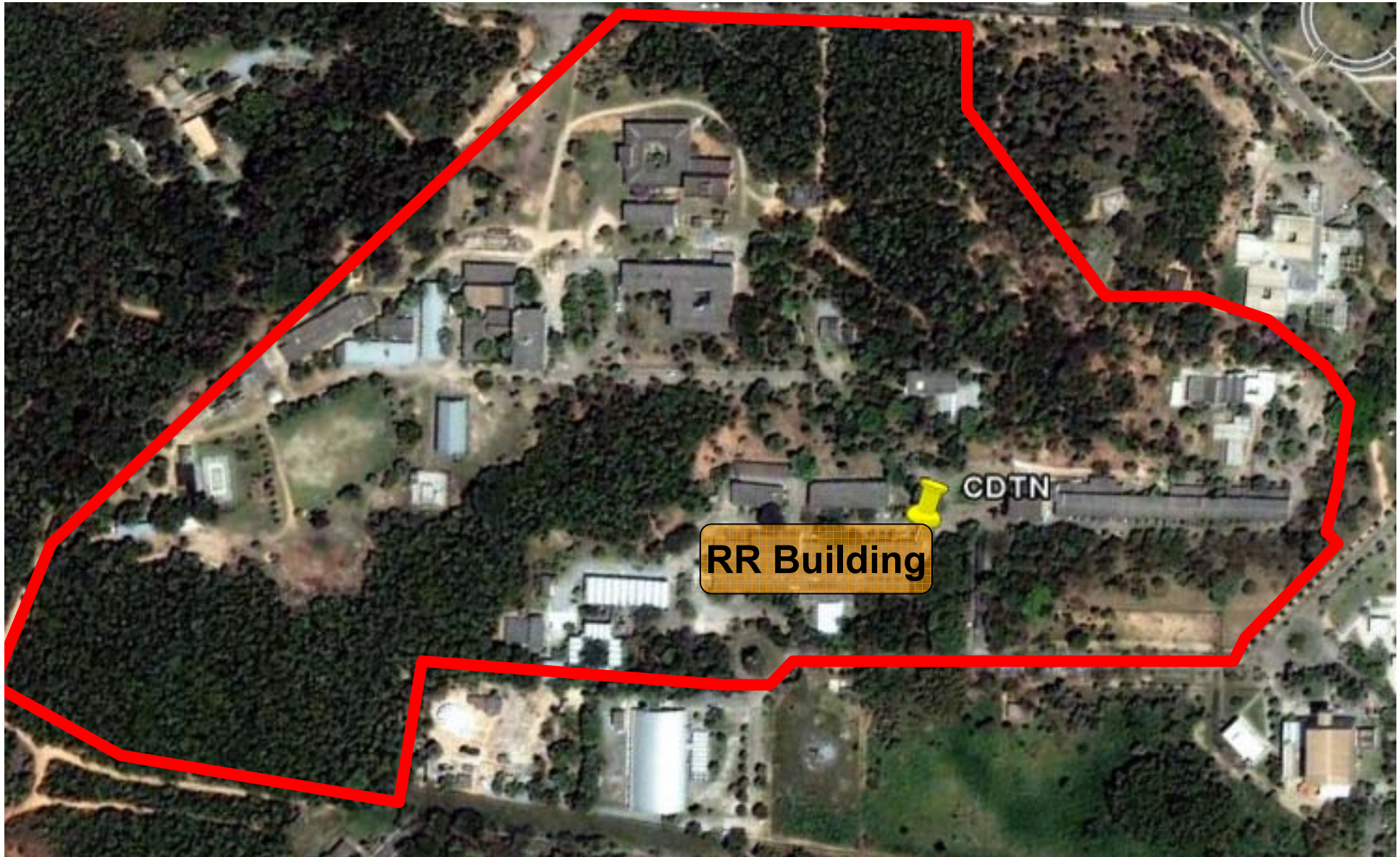


# Reactor Location

Federal  
University  
Campus

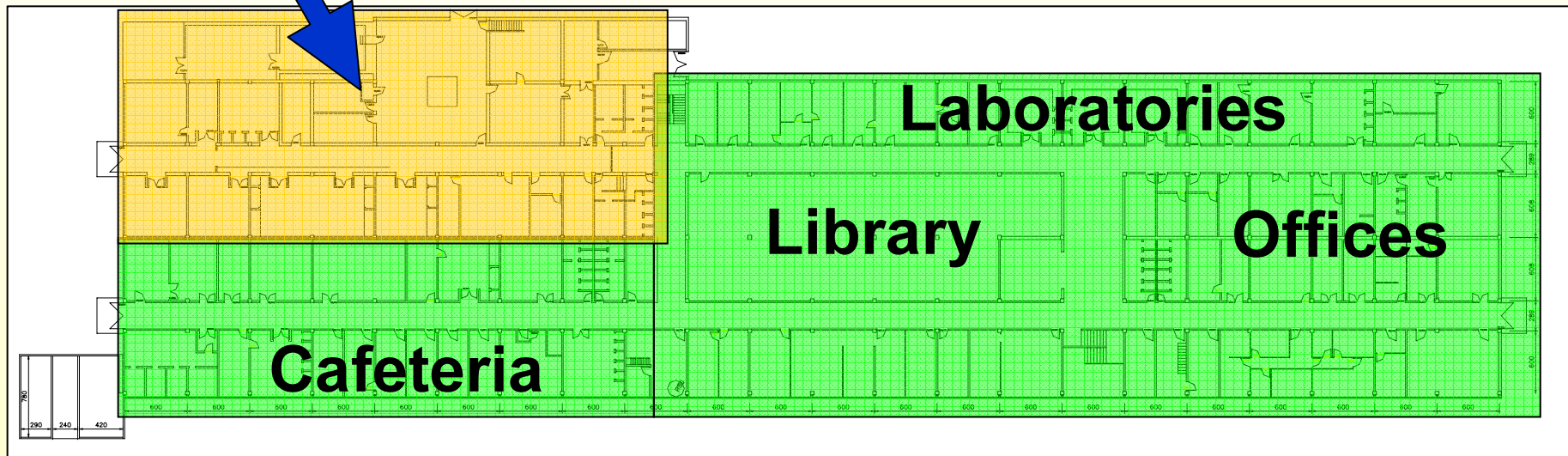
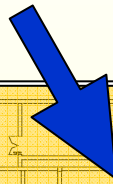


# Reactor Location



# Reactor Building

**Reactor  
Facility**

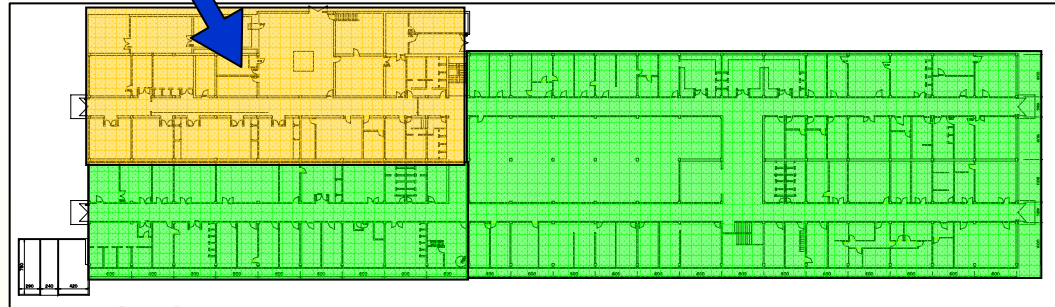


 Restricted Area

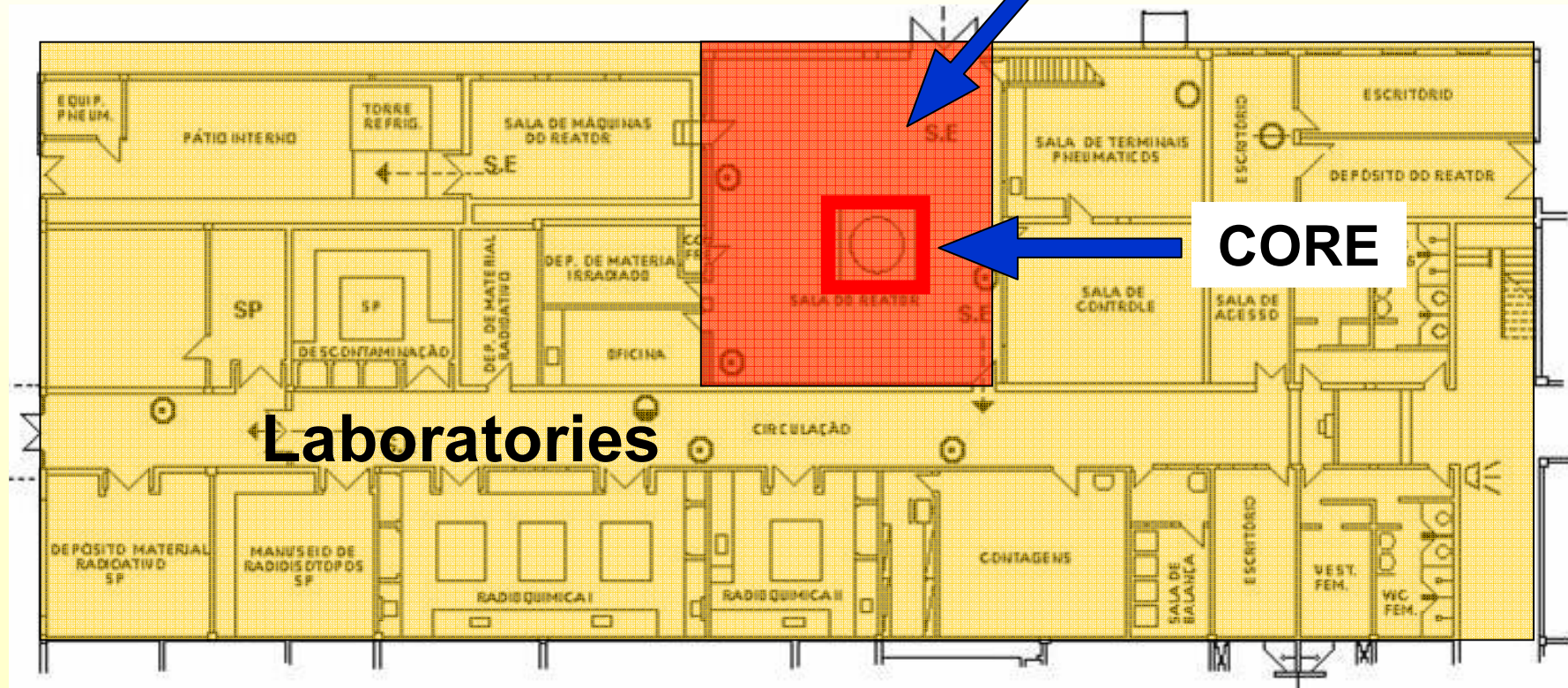
 Unrestricted Area



# Reactor Facility



## Reactor Room



# End state of decommissioning activities

- The final goal of the ***first strategy*** is the ***unrestricted use of the local.***
- In the ***second strategy*** initially the local will be classified for ***restricted use (brown field)***

*(as a historical piece of a TRIGA technology)*

After some decades the final goal will be the ***unrestricted use*** of the place, ***after the full decontamination.***

# Cost and Funding

- ***The IPR-R1 Reactor belongs to CDTN***, one research institute of CNEN, then the ***decommissioning costs will be provided by CNEN.***
- ***CNEN is a public institution*** of the Science and Technology Ministry, so:
- ***Decommissioning Costs*** should be estimated in advance and ***the budget*** would be defined in accordance of the ***previewed institutional project.***

# Management of materials/waste

- The ***dismantling will occur only in the facility rooms (when necessary)*** because the RR building is integrate with laboratories, offices, a library and a cafeteria.
- The ***radioactive wastes*** will be classified and collected following the ***regulatory body norm:***  
CNEN 6.05 – Radioactive Waste Management.

# Management of materials/waste

- Bailing, crushing, cementation, chemical precipitation and immobilization are the ***treatment options available in CDTN.***
- Low and intermediate waste will be stored in the ***Intermediate Storage Facility in CDTN .***
- Other materials will be classified as ***recyclable, regular or hazardous material*** and treated according to the environmental standards (***10.000 ABNT Norm Series***).



# Release from nuclear regulatory control

- ***The radiological protection staff will define the release criteria for material and facility rooms following the regulatory body norms:***
  - ❑ 3.01 (Basic Instructions for Radiation Protection)
  - ❑ 6.02 (Licensing of Radioactive Installations)
  - ❑ 6.05 (Management of Radioactive Wastes), and internal procedures.

# Decommissioning expertise and tools

- ***There was already a decommissioning experience in Brazil***, done in USAM Monazite Sand Treatment Facility.
- This facility has produced rare earth since 1950's. ***The area is now free of regulatory control for unrestricted use.***
- ***CDTN has expertise*** to perform the majority of decommissioning works, and for other ones there are enough enterprises in Brazil to carry out them.

# CONCLUSION

- ***Now is time for IPR-R1 decommissioning planning.***
- ***The main task will be the management of internal groups (matrix structure) to develop the decommissioning planning and in the future perform the decommissioning activities in a joint work.***

# CONCLUSION

- There was a International Congress in Santos, Brazil, in October and we presented the paper **“IPR-R1 TRIGA Research Reactor Decommissioning: Preliminary Plan”**. The objective is to join dispersed expertise in Brazil and know about isolated experiences in decommissioning.



---

# THANKS

---



Ministério da  
Ciência e Tecnologia

