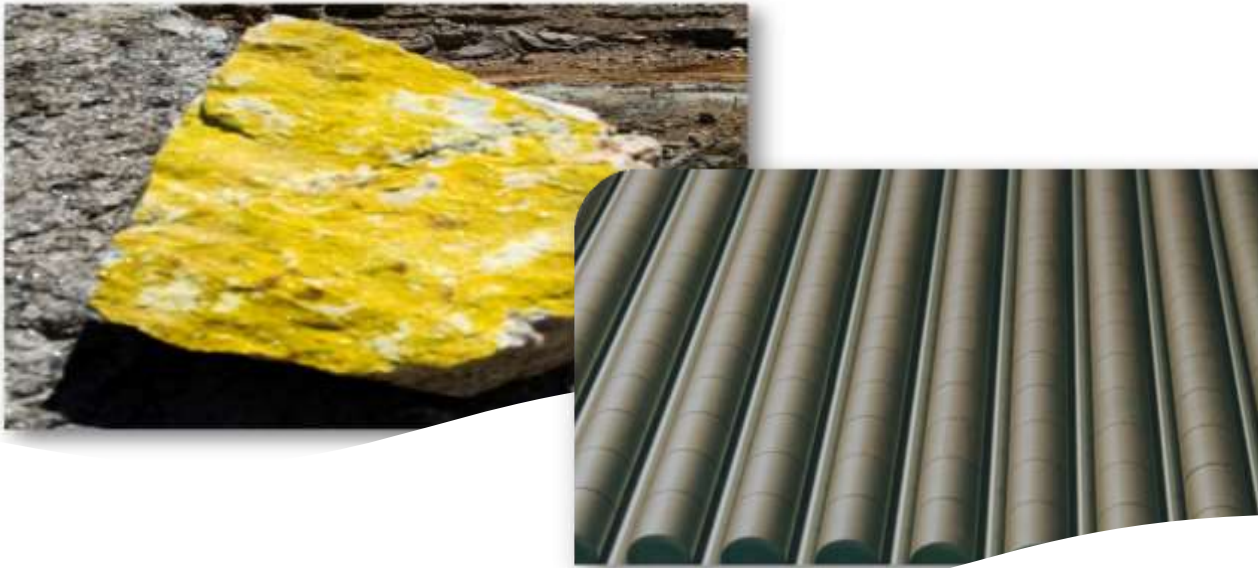


INB SOLUTIONS FOR REDUCING ENVIRONMENTAL IMPACTS THROUGH ITS ATIVITIES IN THE NUCLEAR FUEL CYCLE



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Introduction

- ⚡ **Public Company**
 - Brazilian Ministry of Mines and Energy – MME
- ⚡ **Operates the state monopoly on nuclear fuel cycle activities in Brazil**
- ⚡ **Products and Services on the Nuclear Fuel Cycle**



Nuclear fuel supply to Brazilian reactors Angra 1, 2 and 3



The Nuclear Fuel Cycle at INB



Uranium Mining & Mineral Processing

→ **Operating plant at Caetité – State of Bahia**



Conversion

→ **No operating industrial facilities in Brazil**



Enrichment

Planning for the Future



Reconversion

Operating plants at Resende – State of Rio de Janeiro



Pellets Fabrication



Fuel Assembly Fabrication

**INB - five stages
of nuclear fuel
production in the
same site**

**Facilitate
implementation
of solutions to
reduce
environmental
impacts**



Nuclear Fuel Fabrication Plant

FCN - Resende, Rio de Janeiro

**UF₆ Enrichment,
Reconversion to UO₂ and
Pelletizing**

**Fuel Components and
Fuel Assembly Factory**





⚡ **UO₂ Powder Production**

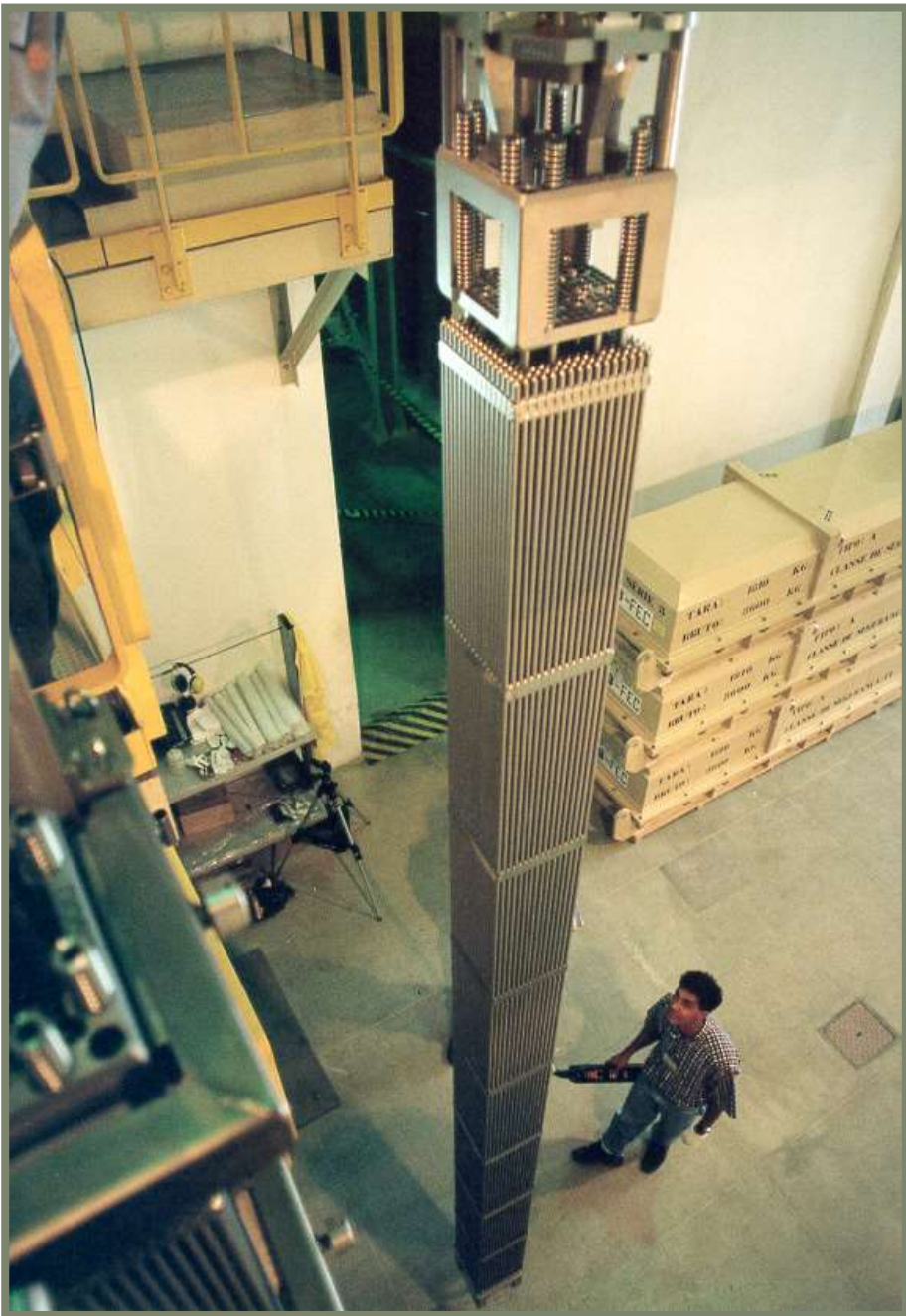
Capacity: 160 t/y UO₂

⚡ **UO₂ Pellet Production**

Capacity: 120 t/y UO₂

Capacity is enough for Angra 1, 2, 3





Components & Fuel Assembly

Capacity: 240 t/y UO_2

Capacity is enough for Angra 1, 2, 3, +





Enrichment Plant

- INB Modular Construction
- Ultracentrifuges:
 - Technology developed in Brazil by the CTMSP - Centro Tecnológico da Marinha em São Paulo.
- Under Operation at INB:
 - Ten cascades installed in four modules.
 - Current production: 70 t SWU/year
 - 70% of Angra 1 need

Nuclear Fuel Brazilian Scenario

- ⚡ INB has intention to make part of international fuel cycle market (uranium first).
- ⚡ Initially to meet internal demand.

Time Line	Demands	Fuel Fabrication
•Actually	•CNAAAA •CTMSP	•Angra 1 + Angra 2 + Angra 3 first core •LABGENE (Navy Technology Center - SP)
•As of 2029	•CNAAAA	•Angra 1 + Angra 2 + Angra 3 (Fuel Reloads)
•By 2032	•CNAAAA •New site	•Angra 1 + Angra 2 + Angra 3 + NPP 4 •RMB (Brazilian Multipurpose Reactor)
•By 2050 (PNE 2050)	•CNAAAA •New Site(s)	•Angra 1 + Angra 2 + Angra 3 + NPP 4 + NPP 5 + NPP 6 ... •Small Modular Reactors

Benefits of Centralized INB Resende Site

- **Efficiency:** centralizing operations lead to more efficient use of resources such as water, energy, and raw materials;
- **Waste:** more integrated and efficient waste management system reducing the risk of environmental contamination;
- **Monitoring:** facilitate the implementation of comprehensive environmental monitoring systems which allows more effective tracking of emissions, effluents, and other environmental parameters, enabling quicker response to any potential issues;
- **Ecosystems:** minimizes habitat fragmentation and preserves larger contiguous areas of natural ecosystems, which is crucial for maintaining biodiversity and ecological integrity;
- **Emissions:** significant reduction in greenhouse gas emissions and other pollutants associated with transportation.

INB
measurements
and solutions to
reduce
environmental
impacts in the
Resende site




green

INB measurements and solutions to reduce environmental impacts in the Resende site

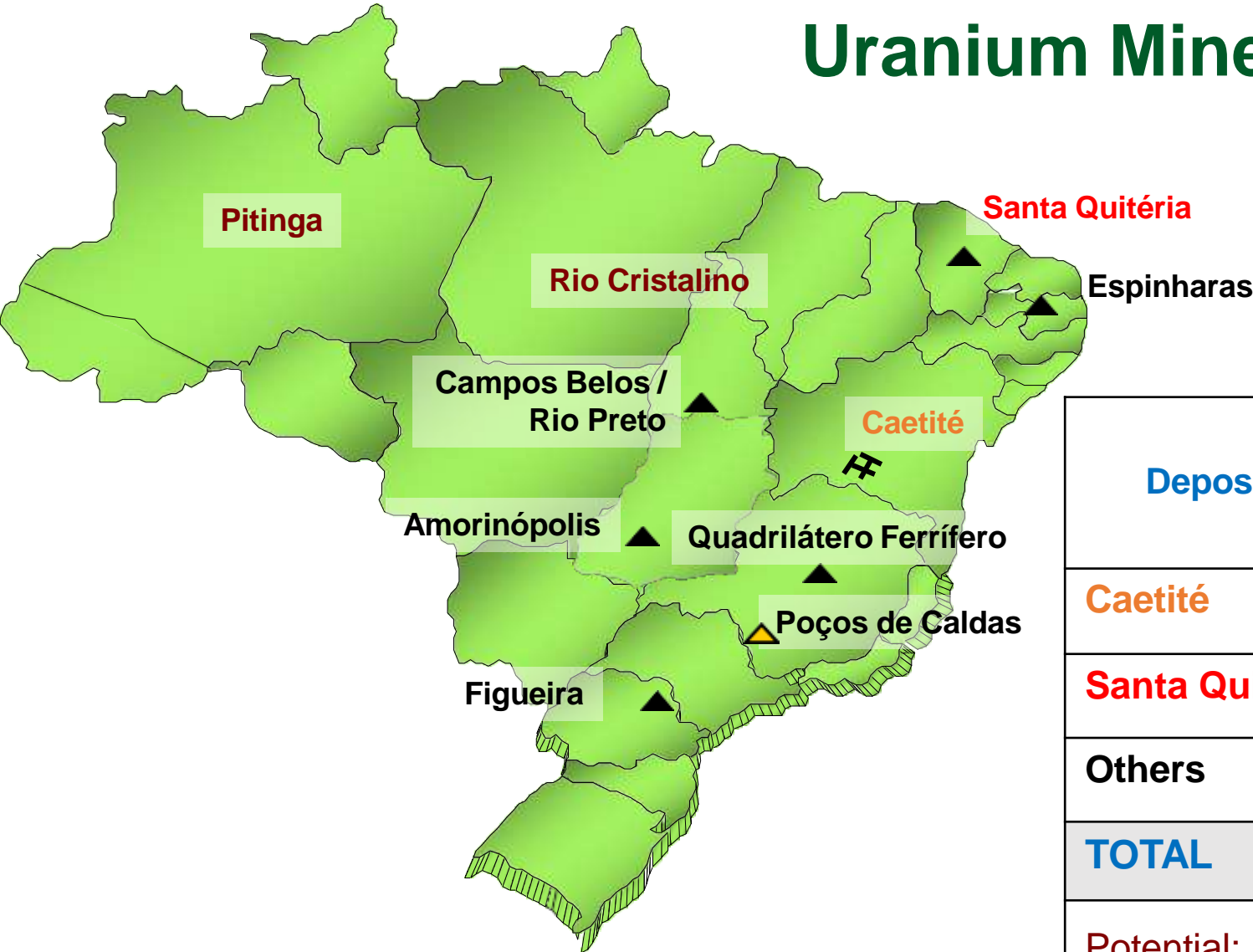
- **INB's industrial processes are based on research, development, innovation, and high-level infrastructure. FCN is certified under ISO 9001, ISO 14001, and ISO 45001 standards;**
- **The environmental monitoring programs of the industrial units encompass the tracking of various matrices at points located inside and outside the facilities;**
- **INB controls and influences the management of environmental aspects within its responsibility and that of its contractors, thus contributing to responsible production and consumption;**
- **The planting of seedlings from three Brazilian biomes contributes to the reforestation of extensive areas and the sequestration of carbon, helping to mitigate global warming;**
- **The environmental recovery programs and effluent treatment ensure that discharges into water bodies do not generate any impact on the biogeochemical cycle of water;**
- **The environmental recovery programs, waste management, and environmental education achieve exceptional results in protecting, restoring, and promoting the sustainable use of terrestrial.**

**Some examples
of INB mining
measurements
and solutions to
reduce
environmental
impacts**



green

Uranium Mineral Resources in Brasil



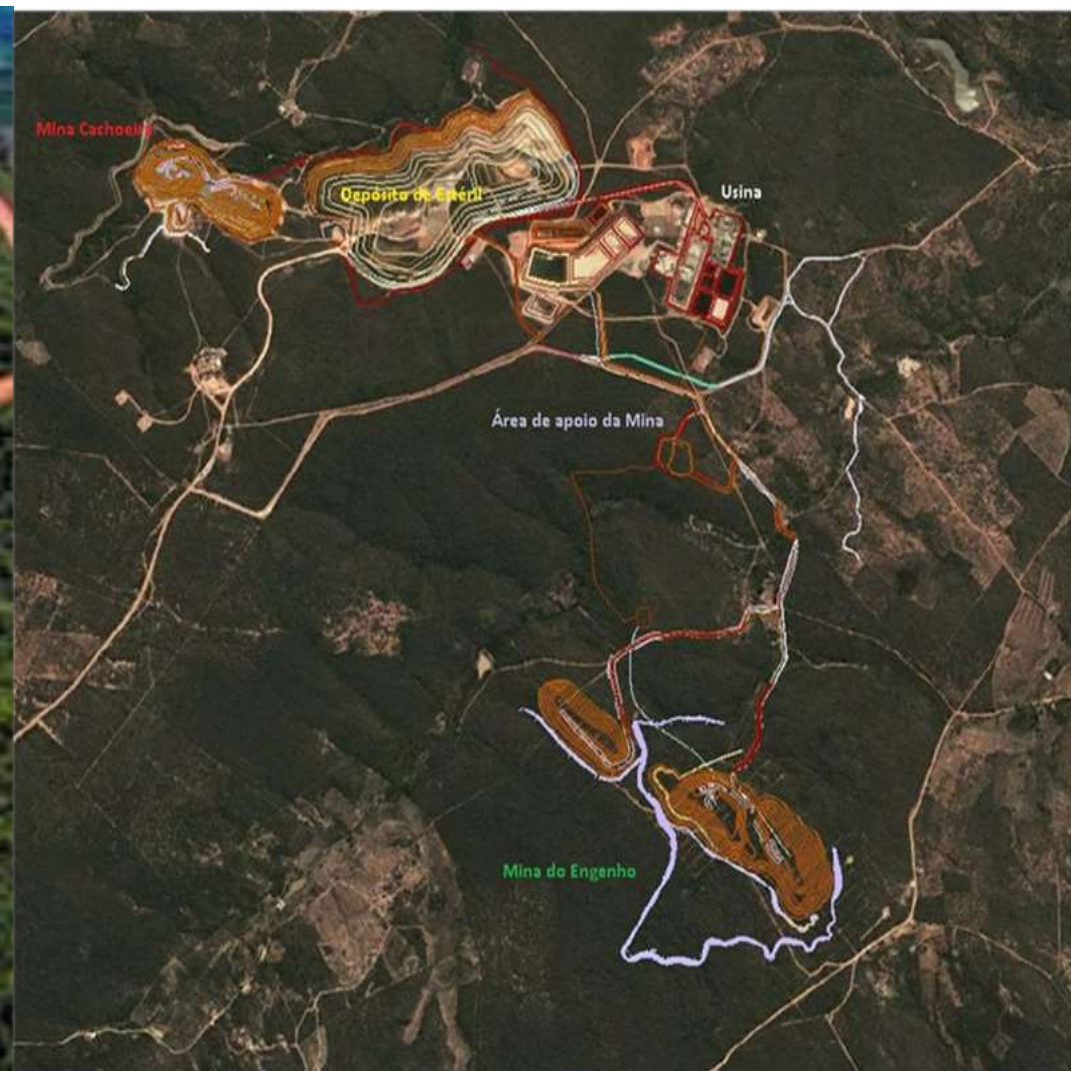
Deposits	Tonnes of U ₃ O ₈ (Uranium Concentrate)		
	Measured & Indicated	Inferred	Total
Caetité	51,520	35,569	87,089
Santa Quitéria	75,010	4,614	79,624
Others	39,500	26,600	66,100
TOTAL	166,030	66,783	232,813 *

Potential: Rio Cristalino (PA): +150,000 t U₃O₈
 Pitinga (AM): +150,000 t U₃O₈

* Only about 1/3 of the territory has been prospected.

(ref: INB internal reports 2023)

Caetité mining – INB Current Uranium Exploration



⚡ Caetité Recovery of Degraded Areas



Santa Quitéria Project - Environmental Aspects

- **Mining-industrial complex that involves the mining and processing of ore called colophanite (a combination of phosphate and uranium), aimed at producing phosphate derivatives (fertilizers and products for animal feed).**
- **The phosphate derivatives is to be commercialized and the Santa Quitéria Project will also have an units for removing impurities and for the production of uranium concentrate.**
- **Capacity → 2,300 tons of uranium (U₃O₈) per year.**

⚡ Santa Quitéria Project - Environmental Aspects

■ Evolution of the project and technologies:

	1 st concept	New concept	
↓ directly affected area	918 ha	380 ha	↓ 58,6%
↓ vegetation suppression area	791 ha	360 ha	↓ 54,5%
↓ interference in pit	5	4	↓ 20%
↓ Water consumption	1.036 m ³ /h	855 m ³ /h	↓ 17,5%
↓ external energy source	18 MWh	4 MWh	↓ 77,8%
Wast dams	considered	not considered	
Accommodation	not considered	considered	
Technology	Di-hidrato	Hemi-hidrato	

Santa Quitéria Project - Macro Schedule

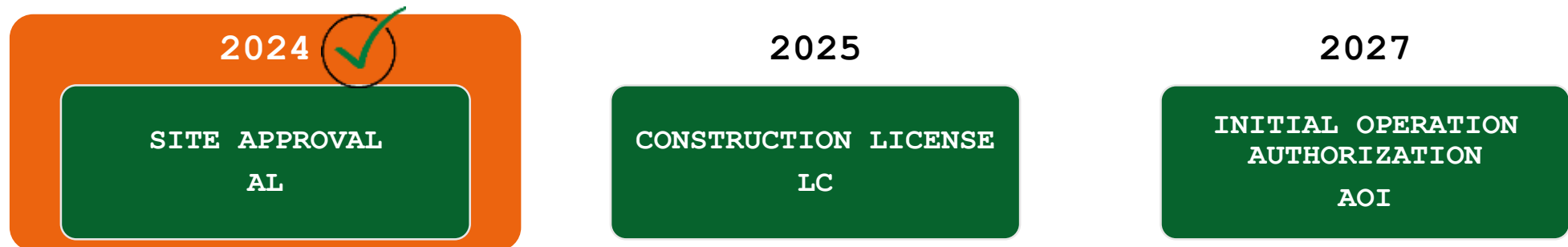
ENVIRONMENTAL LICENSING

Process: 02001.0014391/2020-17



NUCLEAR INSTALLATION LICENSING

Processo: 1341.003137/2022-31



Decommissioning and Deactivation Fund (FDD)

- **INB has implemented a decommissioning program for its operational units, by establishing a Decommissioning and Deactivation Fund (FDD) in order to ensures the safe and responsible deactivation of both the nuclear fuel factory and the uranium exploration sites.**
- **This proactive initiative not only minimizes environmental risks but also highlight INB's commitment to sustainability and regulatory compliance, promoting responsible and sustainable practices and contributes to a cleaner and safer environment, ensuring a positive legacy for future generations.**

INB Final Message

- **INB reaffirms its commitment to environmental sustainability and societal safety.**
- **By implementing safety protocols and responsible operational practices, INB ensures that its nuclear activities minimize environmental impacts and protect public health, through continuous investments in clean technologies and environmental recovery programs.**
- **Our goal is to ensure that future generations is going to have a cleaner and safer environment, demonstrating that technological progress can be harmonized with environmental responsibility.**

Thank you!

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