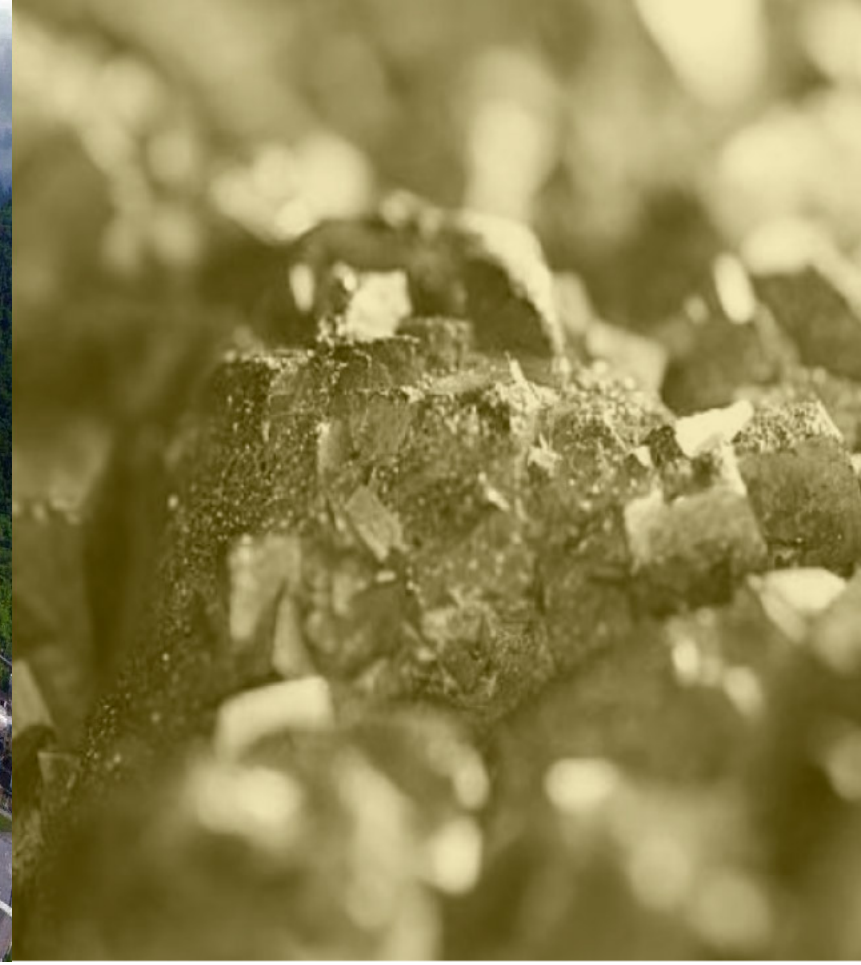




# MINISTRY OF MINES & ENERGY

## Nuclear Energy Projects and Plans in Brazil

30/06/2021

# AGENDA

1. ENERGY PLANNING
2. NUCLEAR GENERATION
3. URANIUM MINING
4. CLOSING REMARKS





MINISTRY OF MINES AND ENERGY

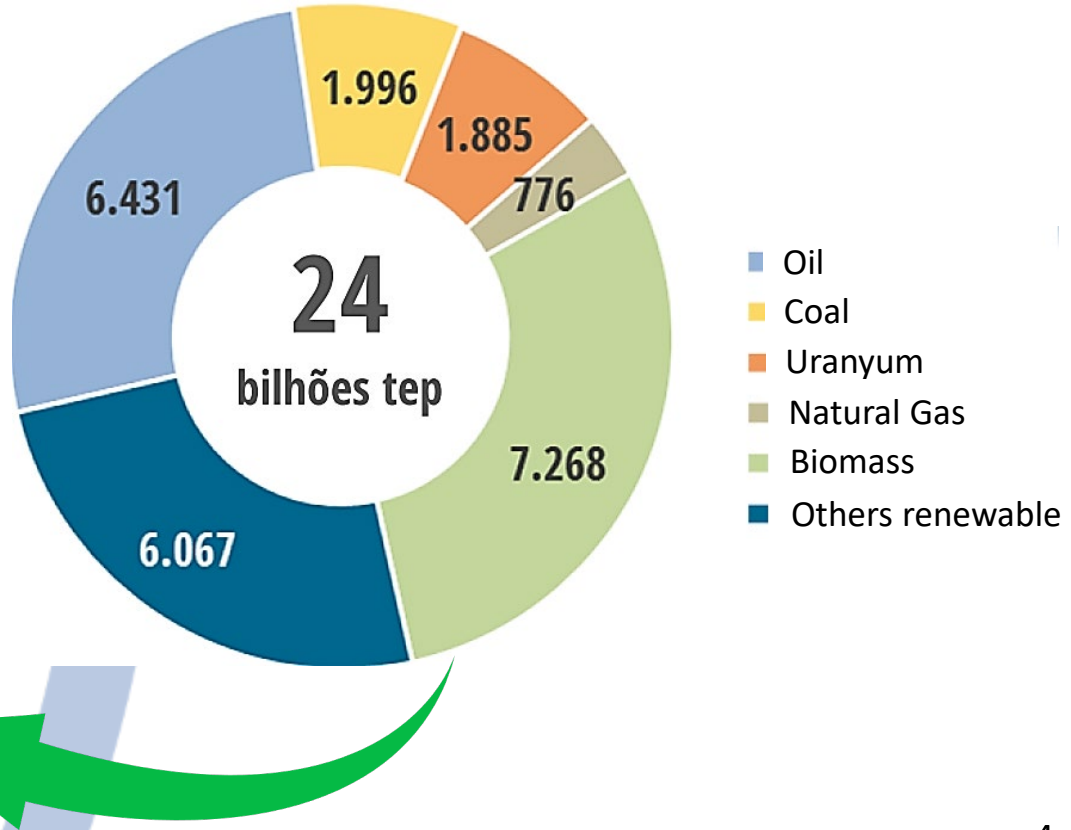
# ENERGY PLANNING

# 1

# LONG-TERM PLANNING STRATEGIES - PNE 2050


Nuclear energy in Brazil will involve investments of **US $ 27 billion**

The government plans to reach an installed nuclear power capacity of **10 Gigawatts** in the next **30 years**




**Renewable resources represent more than 50% of energy resources !!!**

(Source: MME, 2020; EPE, 2020)

# NUCLEAR GENERATION

- Nuclear Authority
- ANGRA 3 – Resume of Angra 3
- ANGRA 1 - Long Term Operation
- UAS - Dry Cask Storage

# Legal Framework (Split-up of CNEN)

- Separation of R&D activities from Regulation and Inspection activities;
- Creation of the Brazilian Nuclear Regulatory Authority;
  - ✓ AUTHORITY
    - Standards;
    - Oversight;
    - Licensing.
  - ✓ CNEN
    - Promotion;
    - Research .

# ANGRA 3 – NUCLEAR POWER PLANT


- **Installed capacity: 1,405 MW**
- **Basic Project: Siemens / KWU, current Areva**
- **PWR Reactor (Pressurized Water Reactor)**
- **Area: about 82,000 m²**
- **Concrete: 200,000 m³**
- **Steel: 30,800 t**
- **Equipment: 17 thousand t**
- **Painting: 370 thousand m²**
- **Degree of nationalization: 54% (in value)**

(Source: Eletronuclear)

# ANGRA 3 – CRITICAL PATH ACCELERATION PLAN

## Motivation

An alternative solution to mantain **C.O.D in nov/26.**

## Scope

Advance civil construction and erection works, as well as mantaining critical supplies.


## Start May 2020

- Contracting Owners Engineering and conclusion of engineering design
- National Supplies contract renegociations
- Debt and new supplies negotiations

**July 2021** → Sign civil works contracts.

**December 2021** → Start of works on site (first concrete)

(Source: Eletronuclear)

# ANGRA 1 - LONG TERM OPERATION

Beginning of commercial operation (1985, design for 40 years)

Expiration of current license (2024) and beginning of the anticipated extended life - 20 years

Anticipated expiration of renewed license (2044)

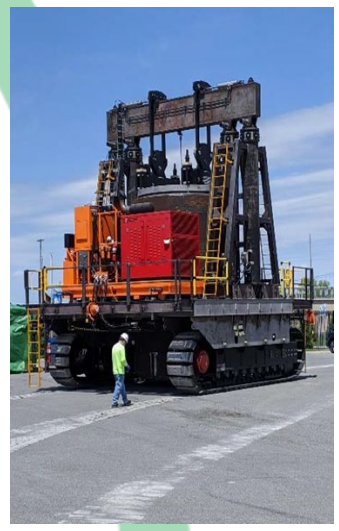
(Source: Eletronuclear)

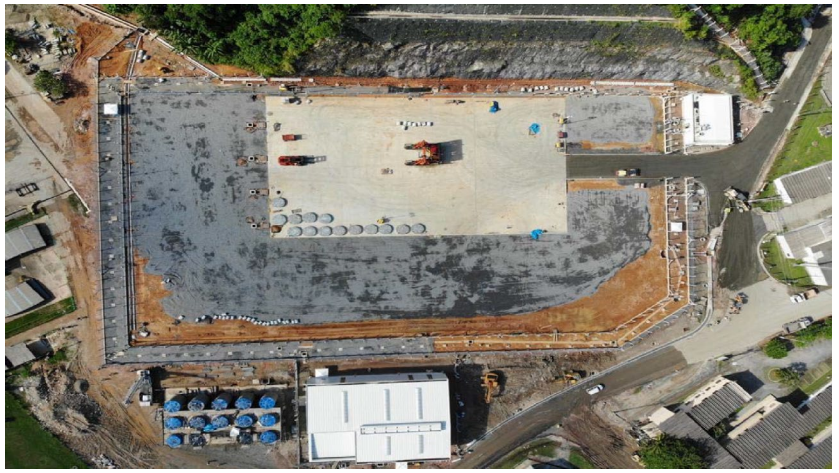
# SPENT FUEL DRY STORAGE FACILITY - UAS

**UAS will initially have 15 modules**

| TRANSFER CAPACITY | |
|---|---|
| Angra 1 | Angra 2 |
| 222 fuel elements | 288 fuel elements |

The repository can hold up to 72 modules, to store used fuel until 2045

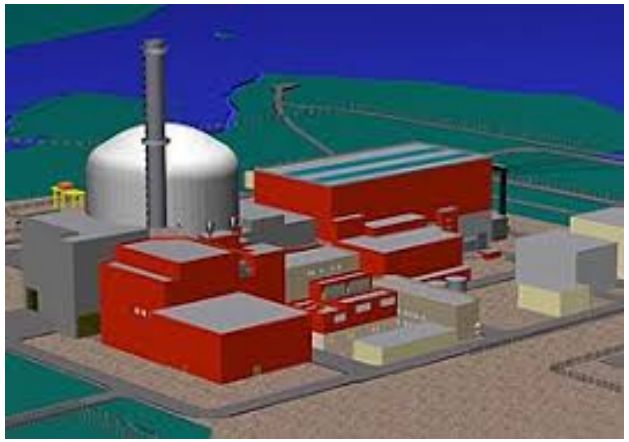




(Source: Eletronuclear)

# FORESEEN EXPANSION

**AP1000 Project**
(Source: Westinghouse)

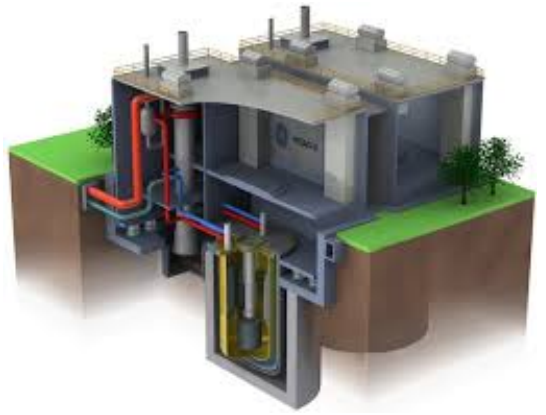


**EPR Project**
(Source: Framatom)


**Location of New Sites - Candidate Areas**
(Source: Eletronuclear)

- The government plans to reach an installed nuclear power capacity of 8 to 10 Gigawatts in the next 30 years;
- Implementation of Small Modular Reactors - **SMR**;
- Locational study of New Nuclear Sites.

**A Cutaway of the Reactor Building SMR design**
(Source: NuScale)

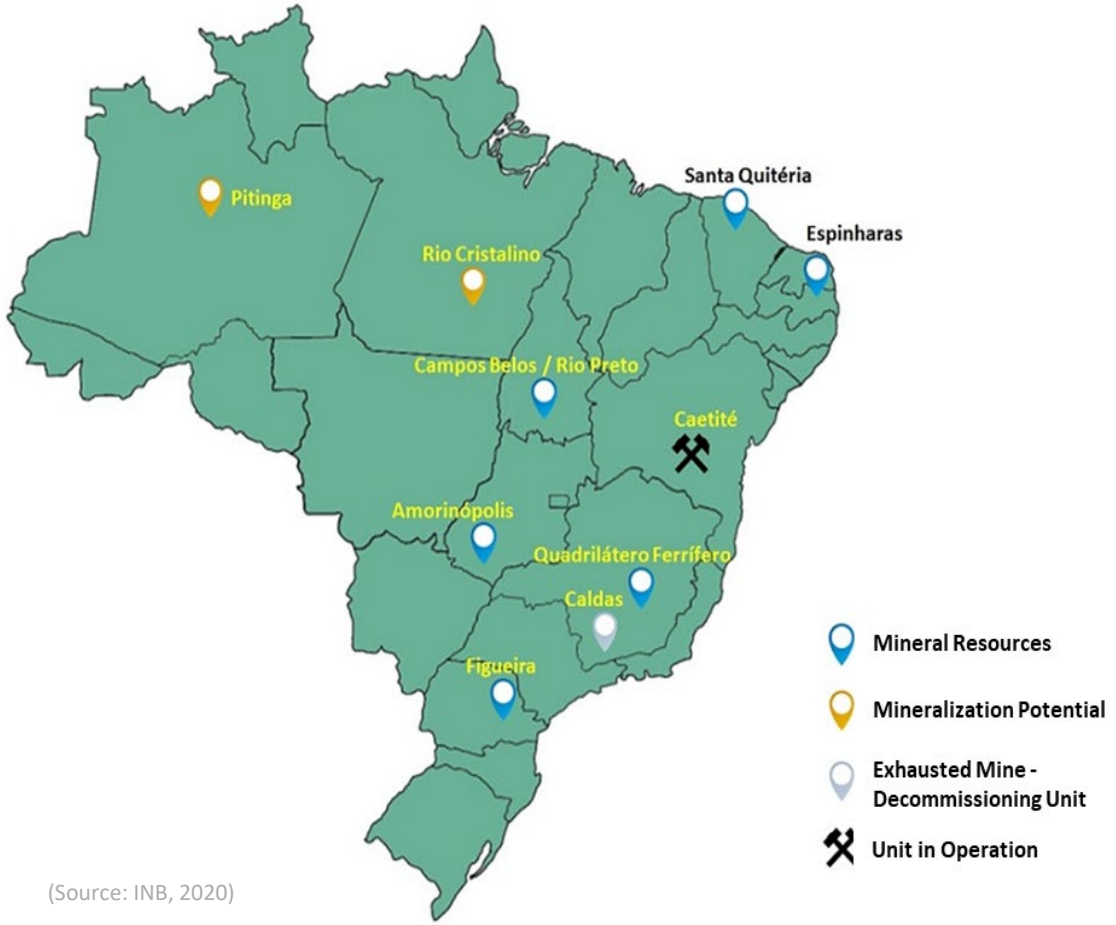


***A cutaway of the PRISM design***
(Source: GE Hitachi)

# URANIUM MINING

3

# BRAZILIAN PROJECTS FOR URANIUM PRODUCTION



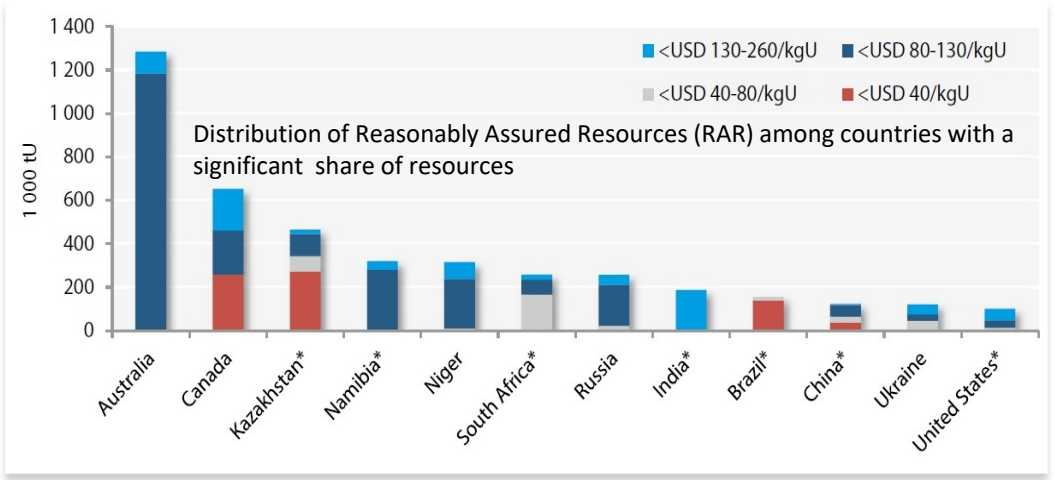

(Source: INB, 2020)

Brazilian mineral resources have evolved from **9,400 tonnes**, known in 1975, to the current amount of **244,788 t of U3O8**, which can be expanded with new prospecting and mineral research work since only 33% of the national territory was surveyed.

The northern region of the country has the potential to house more than **300,000 tons of Uranium**.

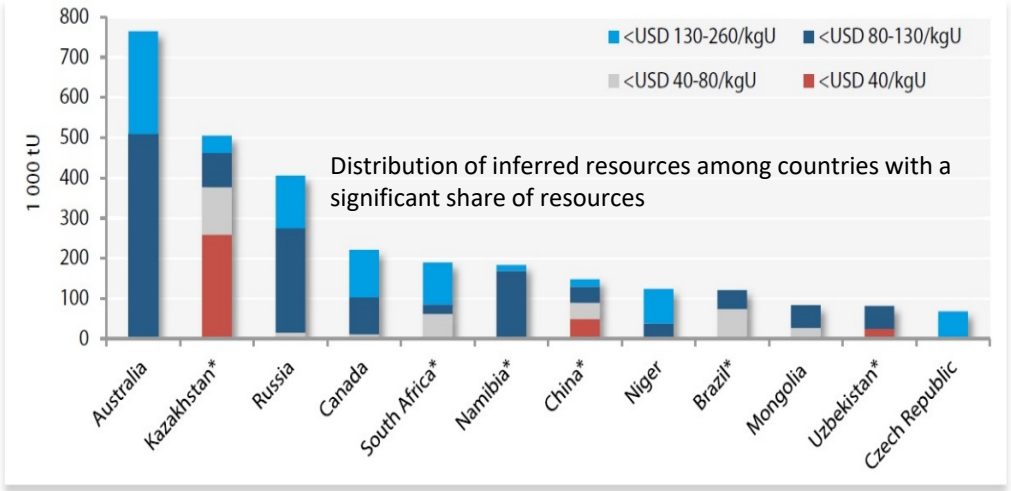
# BRAZIL'S POSITION IN THE WORLD RANKING

- Brazil has significant uranium resources.
- The resources are in the order of **244,788t of U3O8** in Brazil and are distributed among the states of Bahia, Ceará, Paraná and Minas Gerais, among others.
- According to NEA and IAEA, the countries with the greatest potential for uranium resources are: Australia, Kazakhstan, Russia, Canada, South Africa, Namibia, China, Niger, **Brazil**, Mongolia, Uzbekistan, Czech Republic.




Fonte: NEA and IAEA

* Secretariat estimate or partial estimate.




* Secretariat estimate or partial estimate.

# Resumption of Uranium Production in Brazil - Caetité

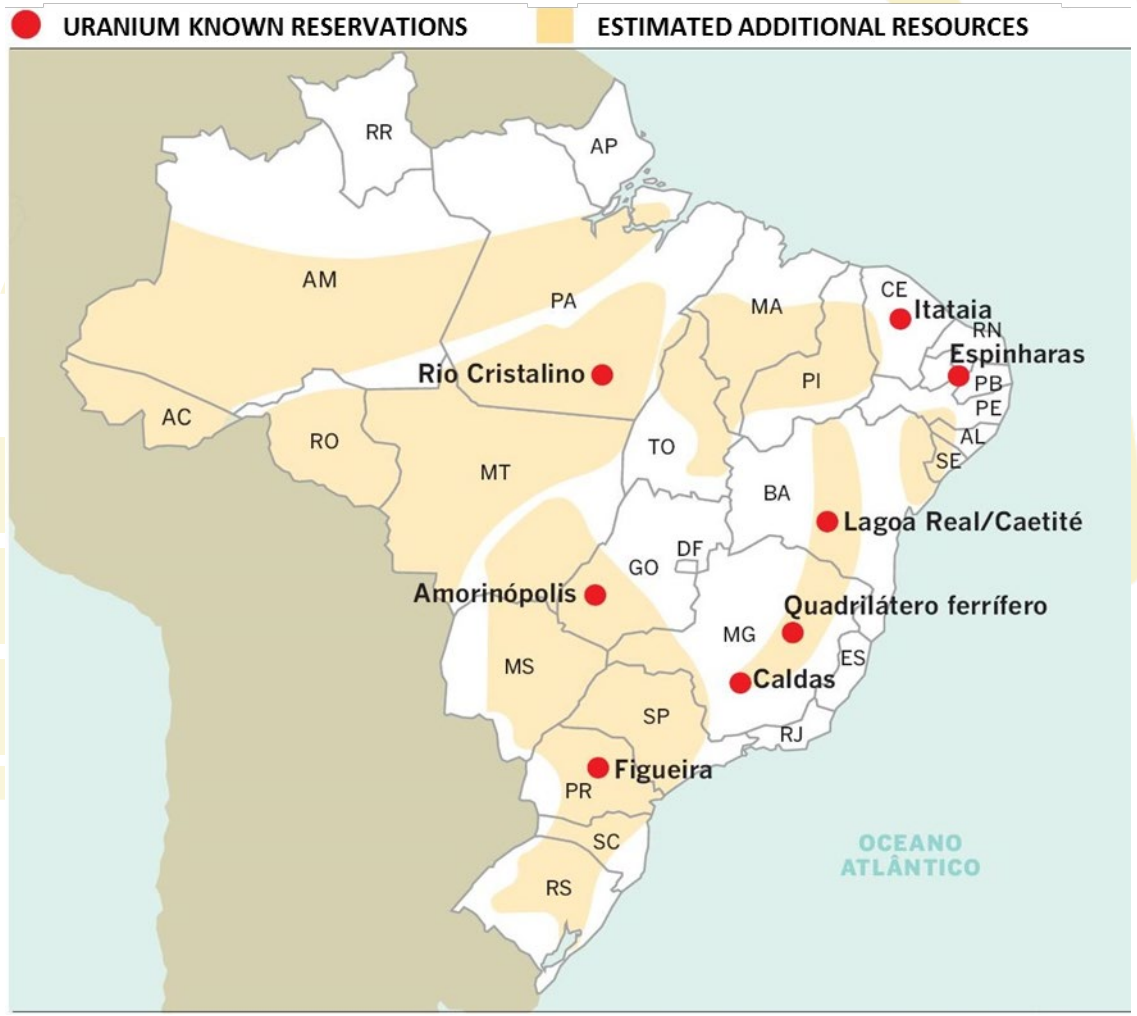
- On January 1, 2021, Brazil resumed uranium production at a new mine in the municipality of Caetité in the state of Bahia, at the Uranium Concentration Unit of Indústrias Nucleares do Brasil (INB).
- The Caetité unit will have two initial activities in the nuclear fuel cycle: **Mining** and **Uranium Processing**, resulting in the Uranium Concentrate, also known as Yellowcake (U3O8).
- The expectation is that **260 tons/2022 to 800 tons/2027** of uranium concentrate will be produced per year, when the Engenho Mine reaches its full capacity.

# SANTA QUITÉRIA MINE

The **Santa Quitéria Consortium** is a **partnership between INB and Galvani Fertilizantes** (a company that produces phosphate fertilizers) for the implementation of a joint mining project. The purpose of the partnership is to explore **Uranium and Phosphate**, found in an associated way in the Itataia deposit, located in the municipality of Santa Quitéria (Ceará).

**Phosphate** is predominant, with **Resourses of 111 million tons** and **Uranium** reserves are **80,000 tons**.

The investment forecast is approximately **US$ 165 million**, with an expectation of production **in 2025** by the Consórcio Santa Quitéria of **240,000 tons of phosphate** and **2,264 tons of uranium concentrate per year**.




# RESUME OF PROSPECTING IN BRAZIL

- Brazil plans to resume mineral prospecting to **determine and evaluate new uranium** deposits.
- INB researches in several states, such as Pará, Roraima, Ceará, Bahia and Minas Gerais.
- The expectation is that in **ten years**, Brazil will have increased its reserves to **1 million tons**, equivalent to Australia's current reserves.

# CLOSING REMARKS

# 4

## THANK YOU

MINISTRY OF
MINES AND ENERGY

PÁTRIA AMADA
BRASIL
BRAZILIAN GOVERNMENT