

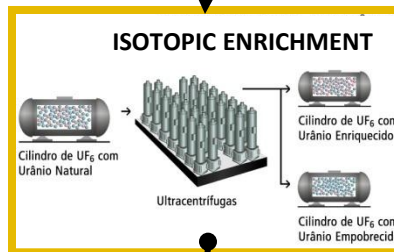
# **FUTURE OF URANIUM MINING IN BRASIL**

## **Innovation in Nuclear Technology 2012**

### **DECEMBER 2012**

**SERGIO MAJDALANI**  
**DIRETORIA DE RECURSOS MINERAIS**

# Nuclear Fuel Cycle





## BRIEF HISTORY OF THE PROSPECTIVE WORK

- ✓ During the decades of 70 and 80 NUCLEBRÁS invested about US \$ 170 million in prospecting activities of radioactive minerals. The result was the discovery of several promising regions for the occurrence of these resources, distributed throughout the national territory.
- ✓ After the finding of more than 300,000 t of uranium concentrate ( $U_3O_8$ ), volume far exceeds requirements of the Brazilian nuclear program, the entire structure of geological and prospecting was disabled and for more than 20 years no further work was done.

Country	Tonnes U	% of World
Australia	1,673,000	31
Kazakhstan	651,000	12
Canada	485,000	9
Russia	480,000	9
South Africa	295,000	5
Namibia	284,00	5
Brazil	279,000	5
Niger	272,000	5
USA	207,000	4
China	171,000	3
Jordan	112,000	2
Uzbekistan	111,000	2
Ukraine	105,000	2
India	80,000	1,5
Mongolia	49,000	1
Others	150,000	3

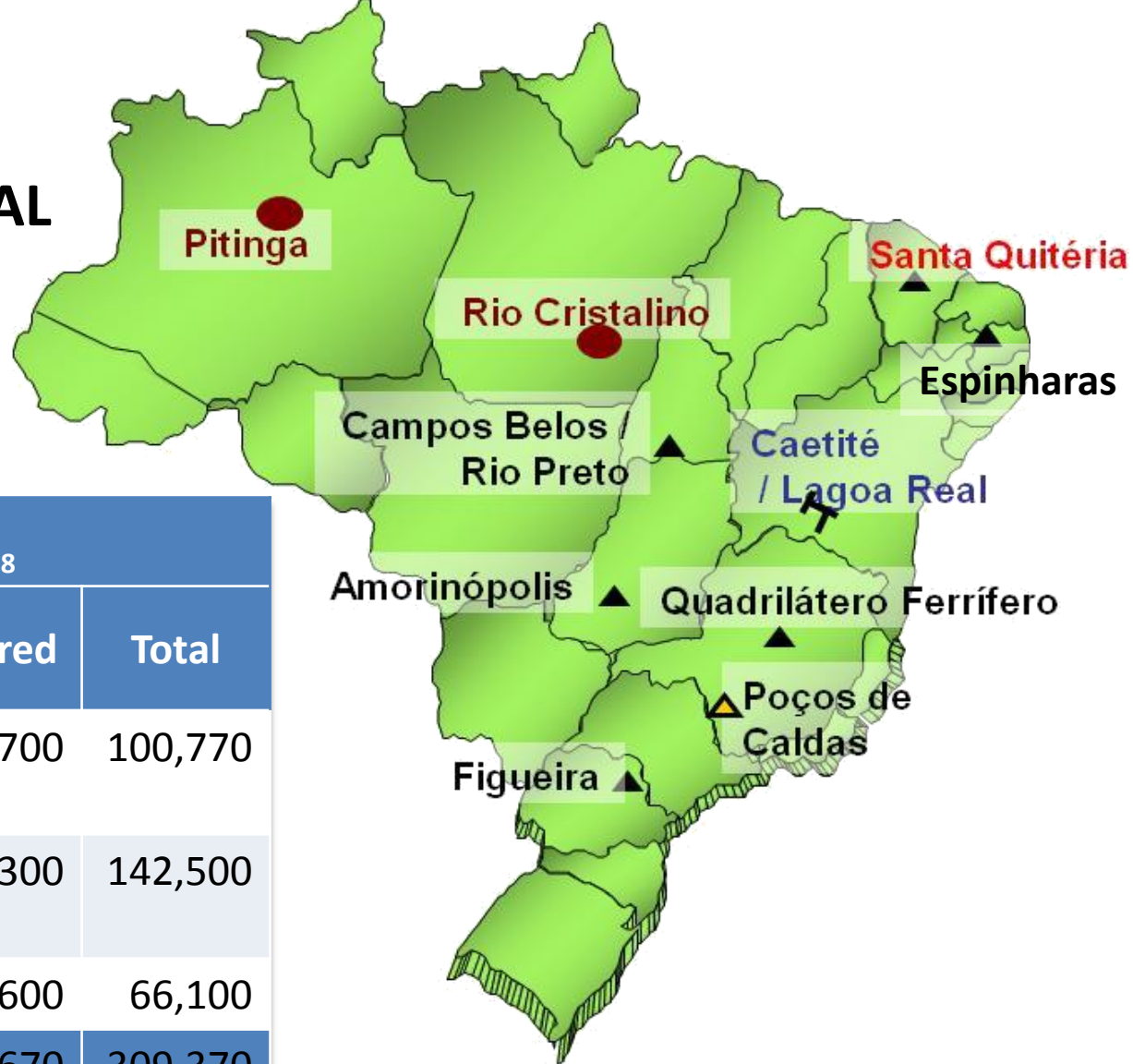
# IDENTIFIED RESOURCES

t U RECOVERABLE < 130 US\$/kg

**World Total 5,404,000**

Source: WNA

# URANIUM GEOLOGICAL RESOURCES



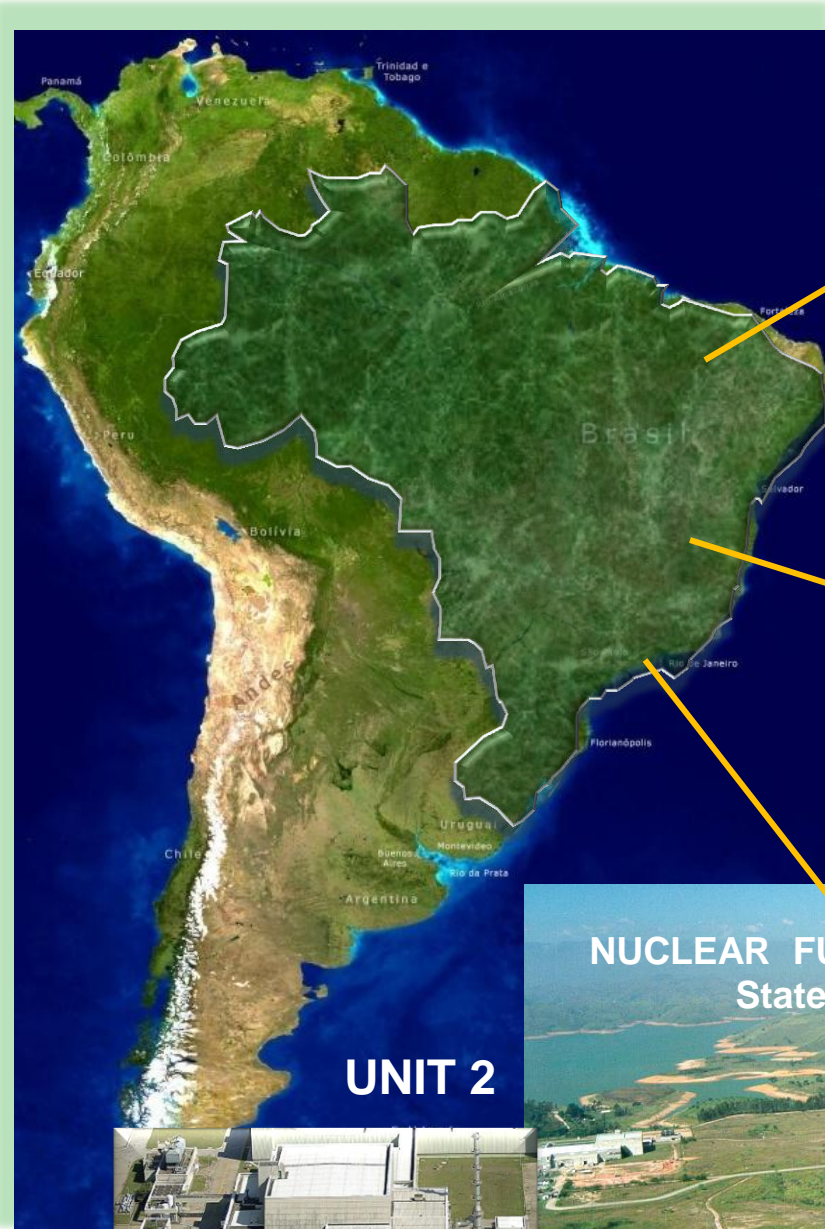
Deposits	t U <sub>3</sub> O <sub>8</sub>		
	Measured / Indicated	Inferred	Total
Caetité / Lagoa Real	94,000	6,700	100,770
Santa Quitéria	91,200	51,300	142,500
Others	36,500	26,600	66,100
<b>Total</b>	<b>224,700</b>	<b>84,670</b>	<b>309,370</b>

**PROGNOSTICATED: PITINGA (AM): 150,000**

**RIO CRISTALINO (PA): 150,000**

**SPECULATIVE: 500,000**





**SANTA QUITERIA  
PROJECT  
PHOSPHATE-  
URANIUM DEPOSIT  
(State of Ceará)**

## **INB's Mining and Industrial Units**



**URANIUM CONCENTRATE UNIT – URA  
CAETITÉ / State of Bahia**



**NUCLEAR FUEL FABRICATION PLANT  
State of Rio de Janeiro**

**UNIT 1**

**UNIT 2**



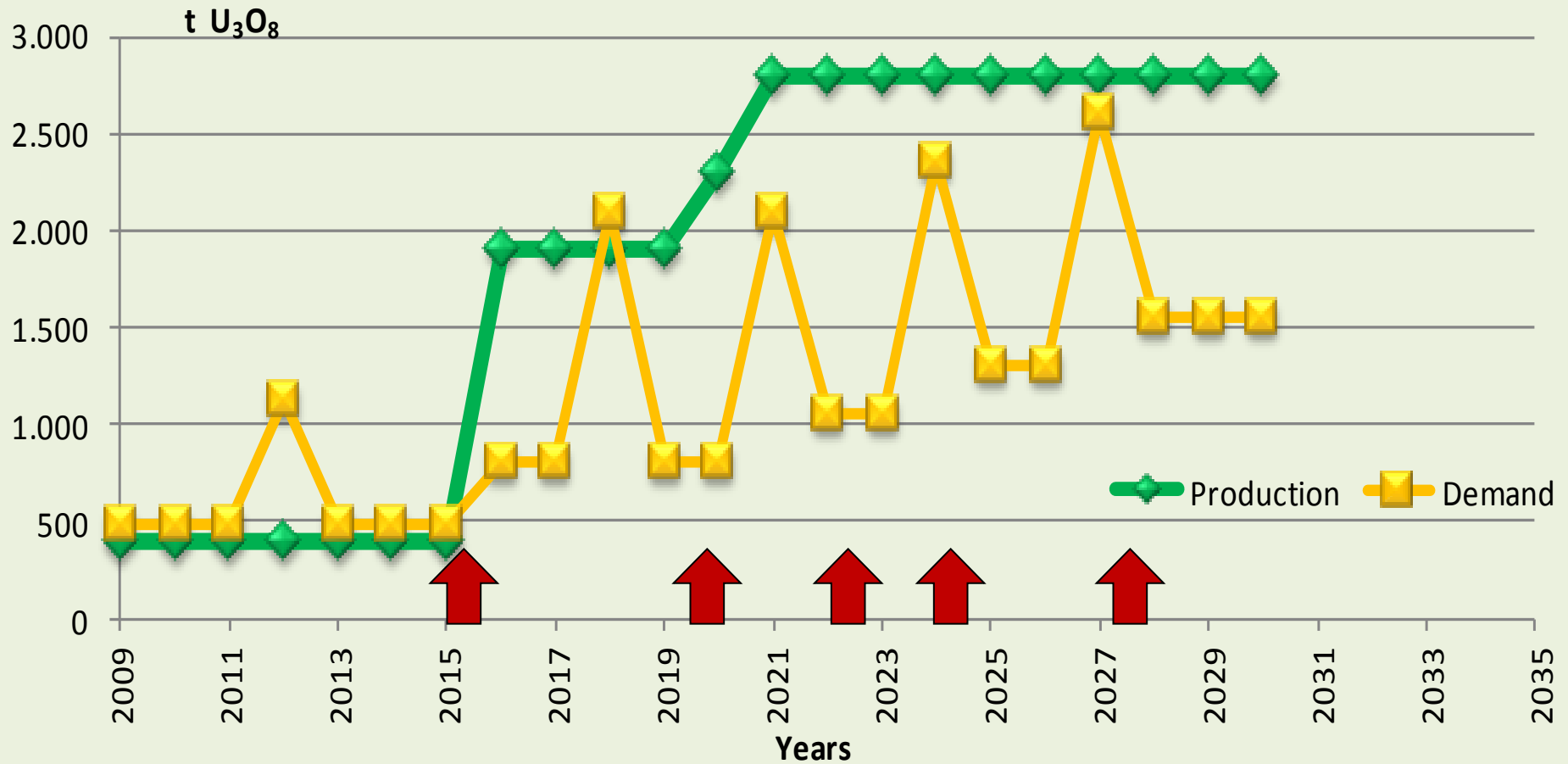
# URANIUM REQUIREMENTS x PRODUCTION

RECOVERABLE URANIUM (U <sub>3</sub> O <sub>8</sub> t)	
Caetité	80,000
Santa Quitéria	107,000
<b>Total</b>	<b>187,000</b>

AVAILABLE	REQUIREMENT	BALANCE
<b>187,000</b>	<b>100,000</b>	<b>87,000</b>

URANIUM REQUIREMENTS U <sub>3</sub> O <sub>8</sub> t – nuclear power plants lifetime (60 YEARS)	
<b>ANGRA 1</b>	4,800
<b>ANGRA 2</b>	16,000
<b>ANGRA 3</b>	19,200
<b>N1</b>	15,000
<b>N2</b>	15,000
<b>N3</b>	15,000
<b>N4</b>	15,000
<b>TOTAL</b>	<b>100,000</b>

# $\text{U}_3\text{O}_8$ SUPPLY AND DEMAND





# EXPLORATION WORKS

**2011**

**Geophysics and Geological mapping  
North Part of Lagoa Real Province  
70 km<sup>2</sup>**

**2012**

**Exploration and Development Drillings  
10,000 m**

# INB CAETITÉ

## Yellowcake Production



1 - Effluent dam

3 - Heap Leaching Yard

5 - Milling Area

2 - Grinding Area

4 - Liquer Pond

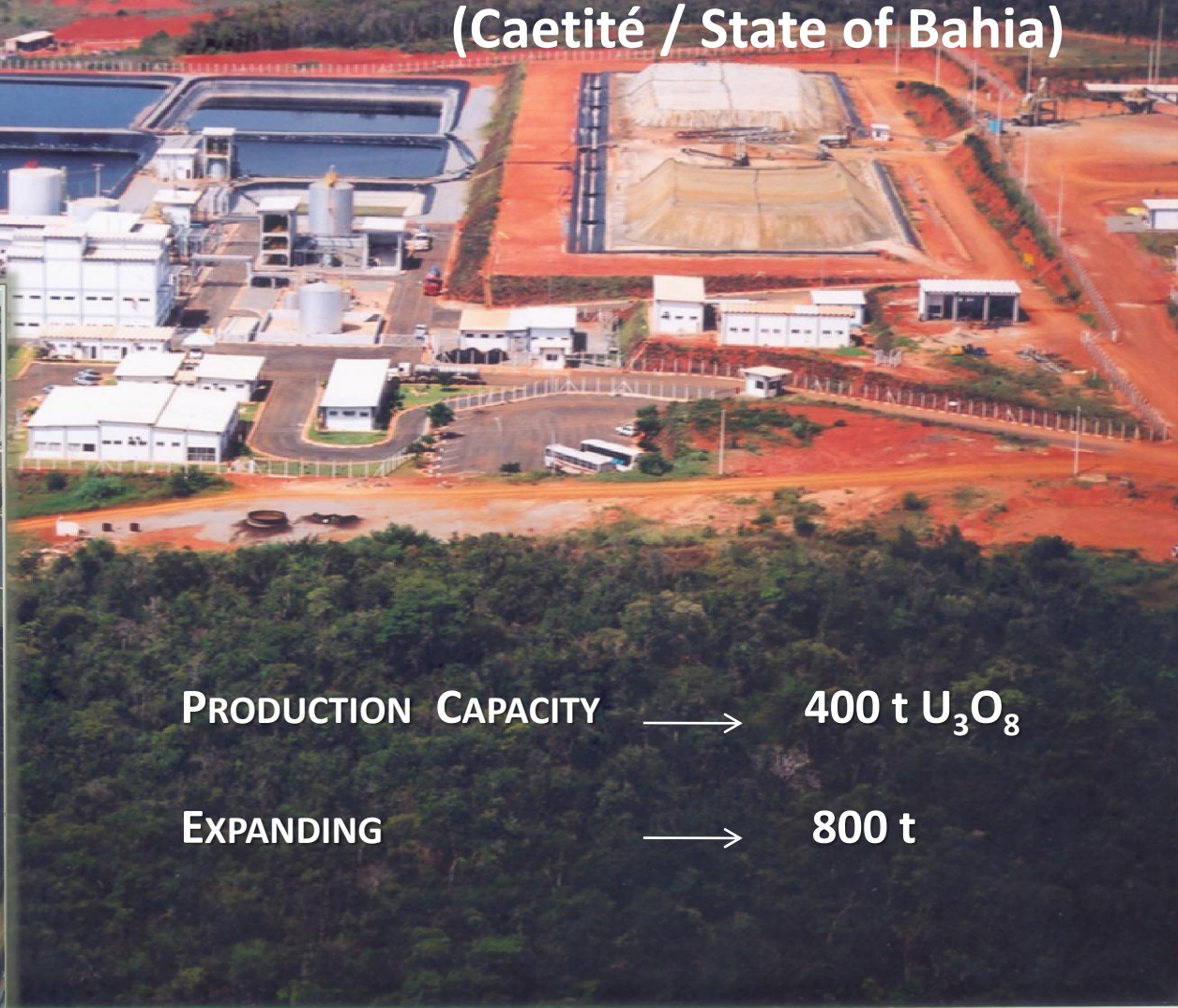
6 - Administration





# URANIUM CONCENTRATE UNIT – URA

(Caetité / State of Bahia)



PRODUCTION CAPACITY → 400 t  $U_3O_8$

EXPANDING → 800 t



**MINING**



**URANIUM ORE**

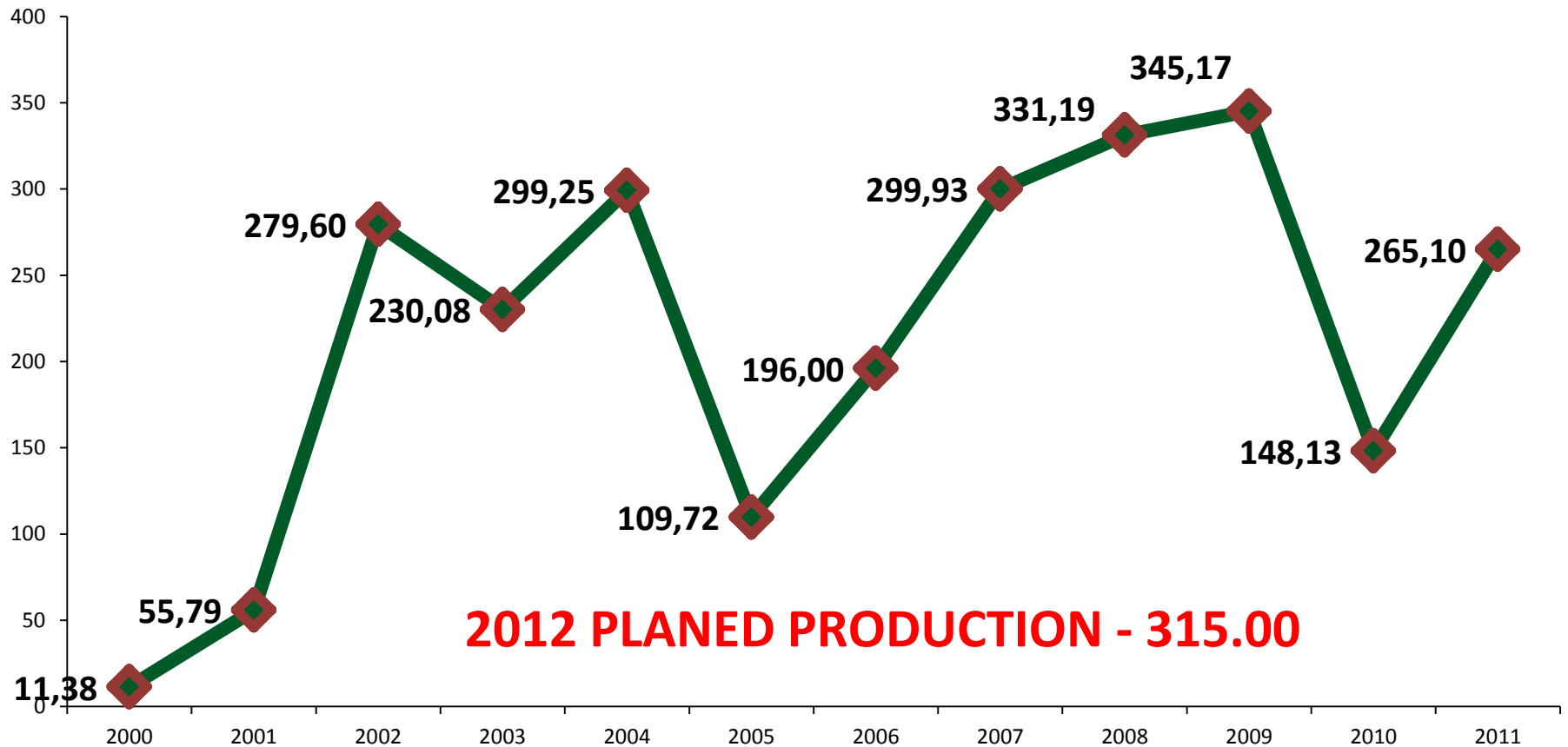
## **URANIUM MINING**

**Uranium Concentrate Unit (URA)**

# URANIUM CONCENTRATE PRODUCTION – tU

Caetité Unit

Nominal Capacity – 340 tU/y



# SANTA QUITÉRIA PROJECT





# Santa Quiteria Project

## Phosphate-uranium deposit

Total ore reserve: 80 million t

Average contents: 11%  $P_2O_5$   
0,1%  $U_3O_8$

Reserves :

Phosphate: 9 million t  $P_2O_5$

Uranium: 80 thousand t  $U_3O_8$

Uranium production – 970 t U/y

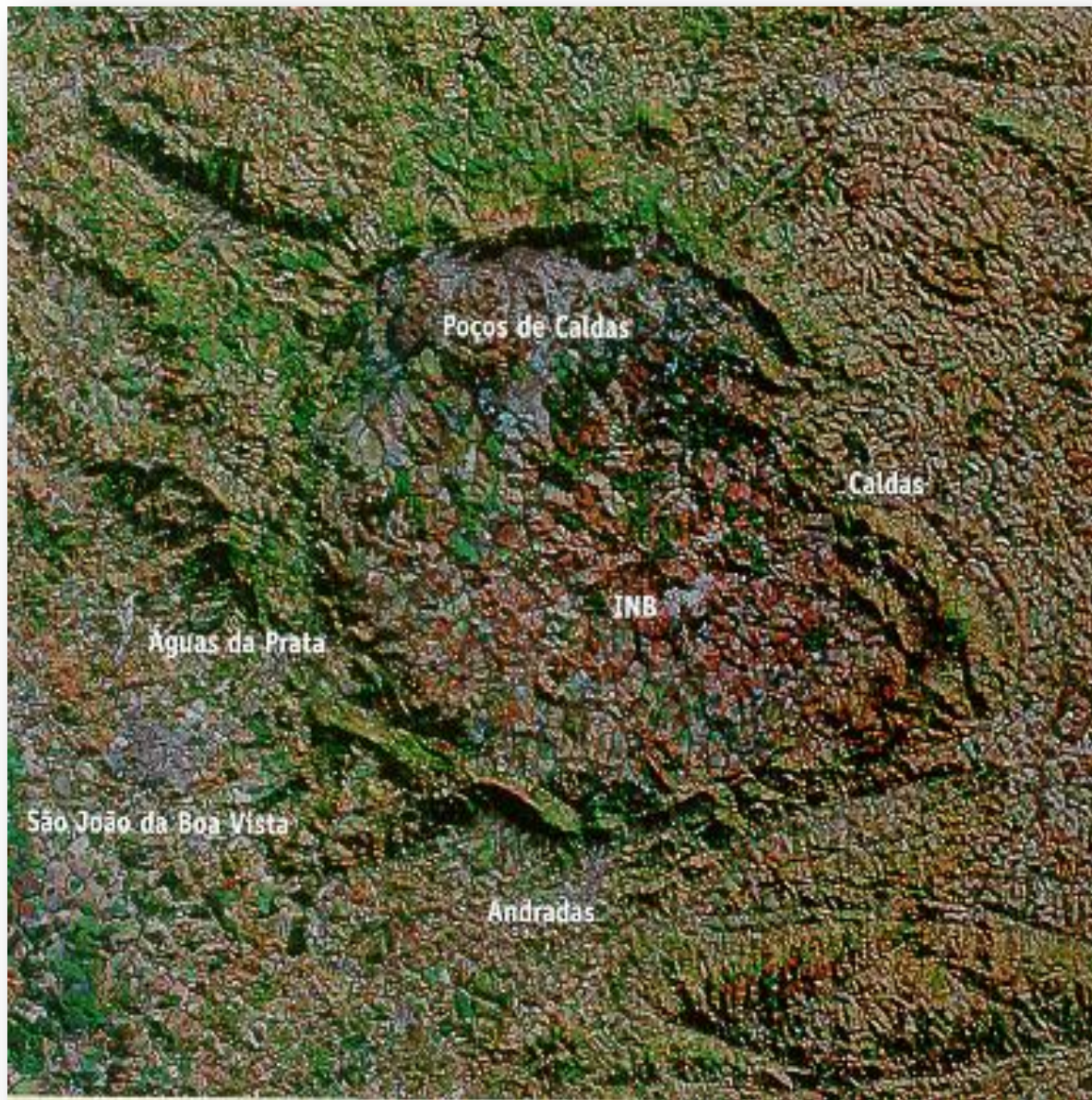
Entry into Production – 2015



Uranium-bearing phosphate



## Satellite image Caldas region



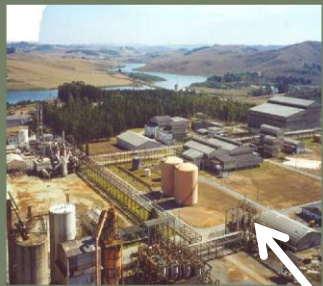


# INB CALDAS – Pit Mine





# INB CALDAS DECOMMISSIONING/ REMEDIATION PLAN



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[www.inb.gov.br](http://www.inb.gov.br)