

# *The role of hydropower in Brazil*

*Jerson Kelman – General Director of ANEEL*



**Brazil**  
8,5 million km<sup>2</sup>  
180 million people

# ***Brazilian Electricity Sector***

## ***Main Aspects***

**Interconnected System with continental dimensions**

**Hydrothermal composition - installed capacity: 100,000 MW (75% Hydro)**

**Transmission System – extension: 100,000 Km**

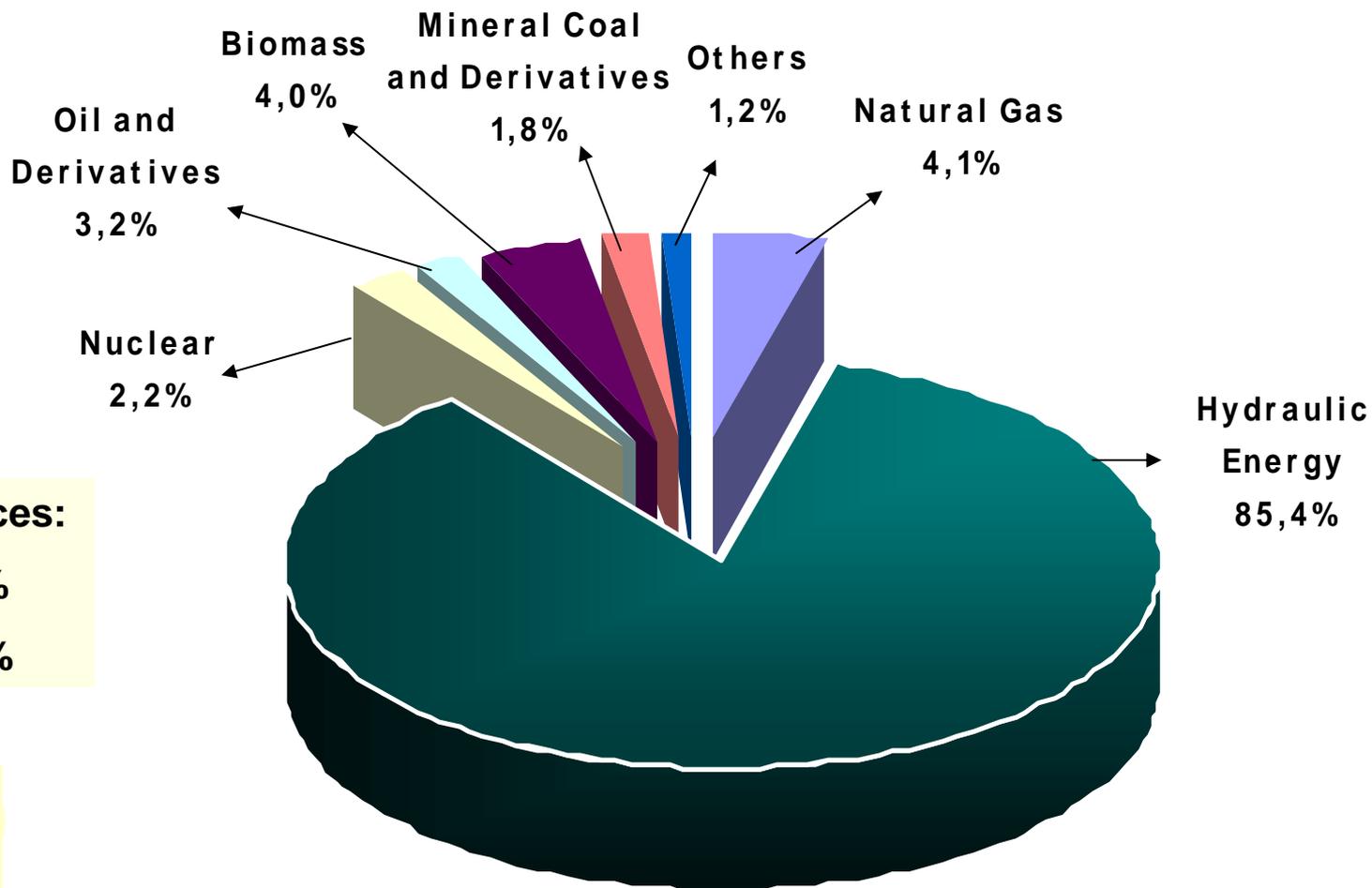
**Dispatches centralized by a National Operator**

**Model of market competition, composed of private agents and state companies, controlled by an independent Regulatory Agency - ANEEL**

**Commercialization in regulated and free environments**



# Brazilian Electricity Matrix (2005)



## Renewable Sources:

Brazil 2005 – 89%

World 2003 – 18%

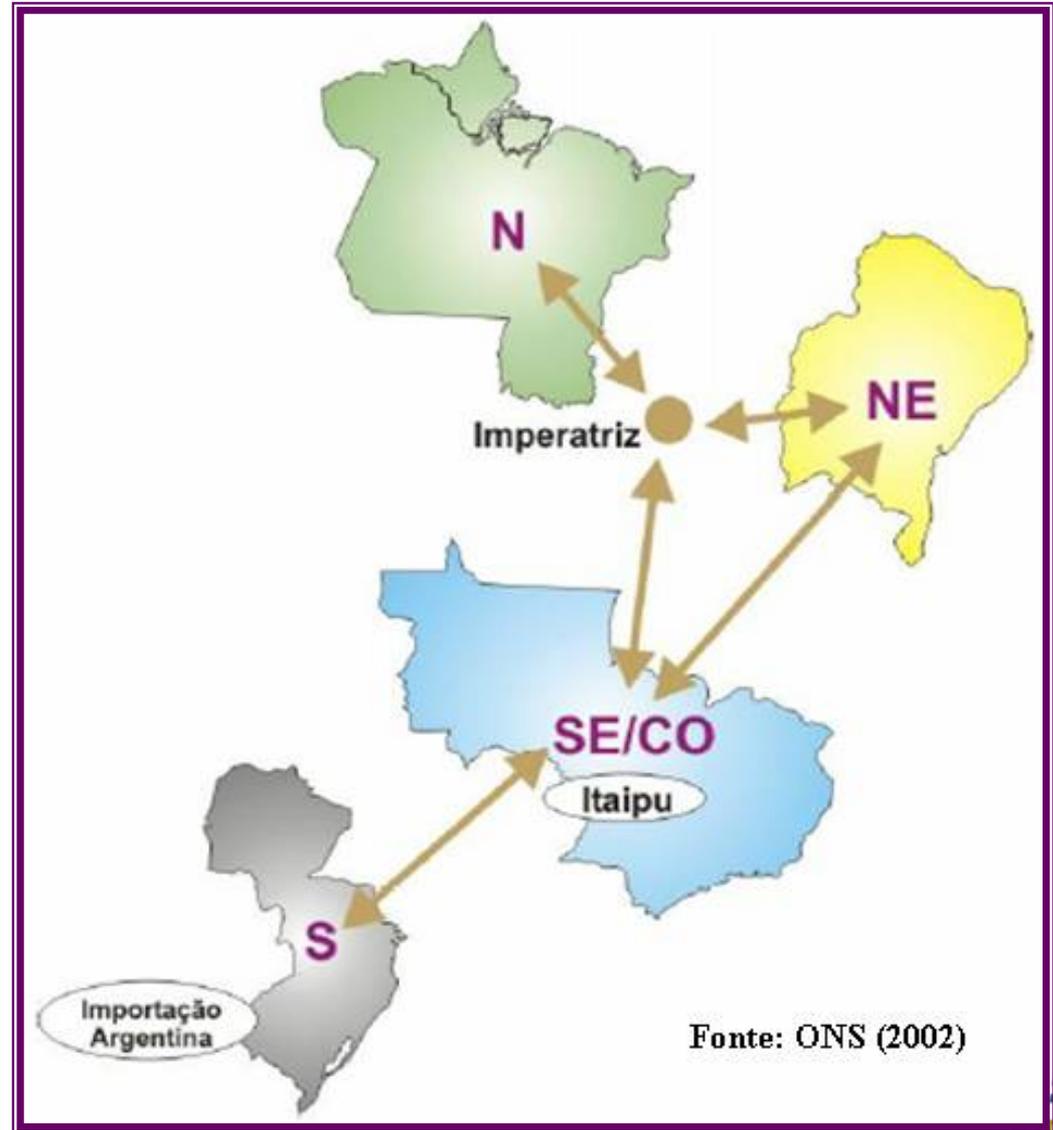
100%  
441.6  
TWh/year

Matrix related to electricity generation.  
It includes Itaipu's importation.

Source: MME - 2006

# Hydrological Diversity

Energy is transmitted through big blocks

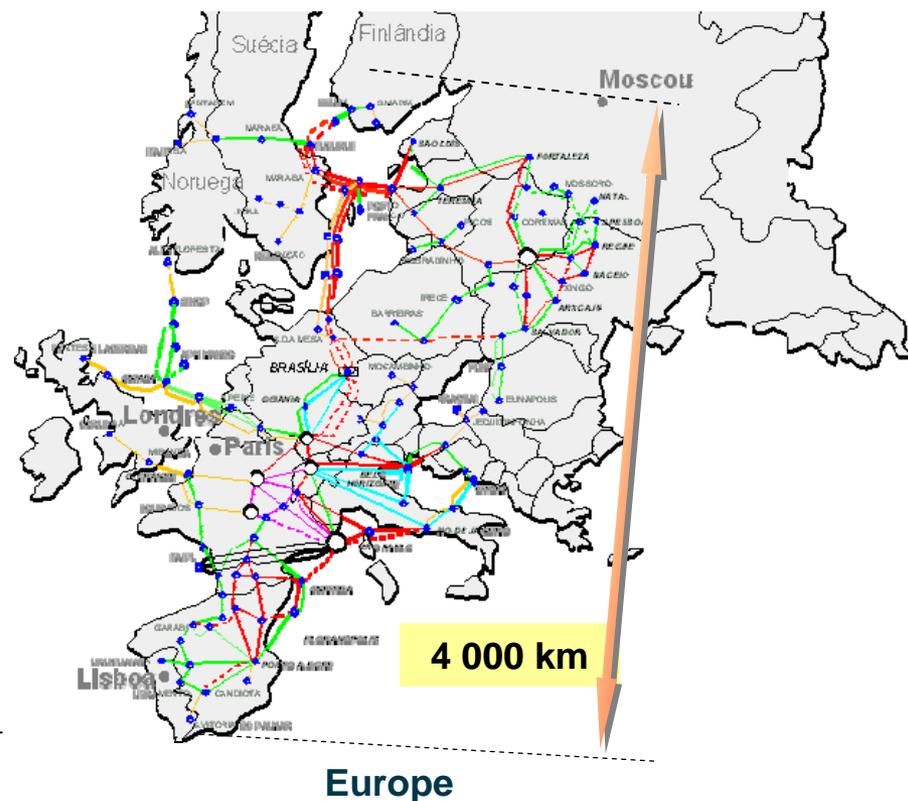
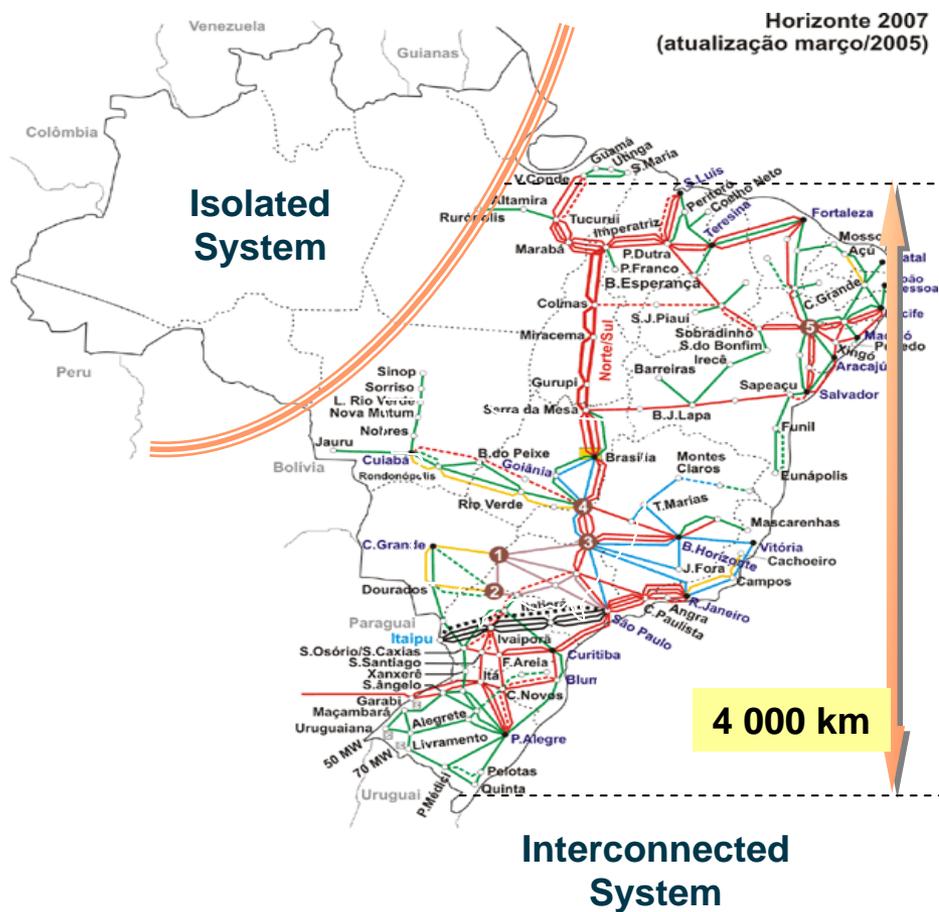


# Brazilian Electricity Sector

## Main Aspects



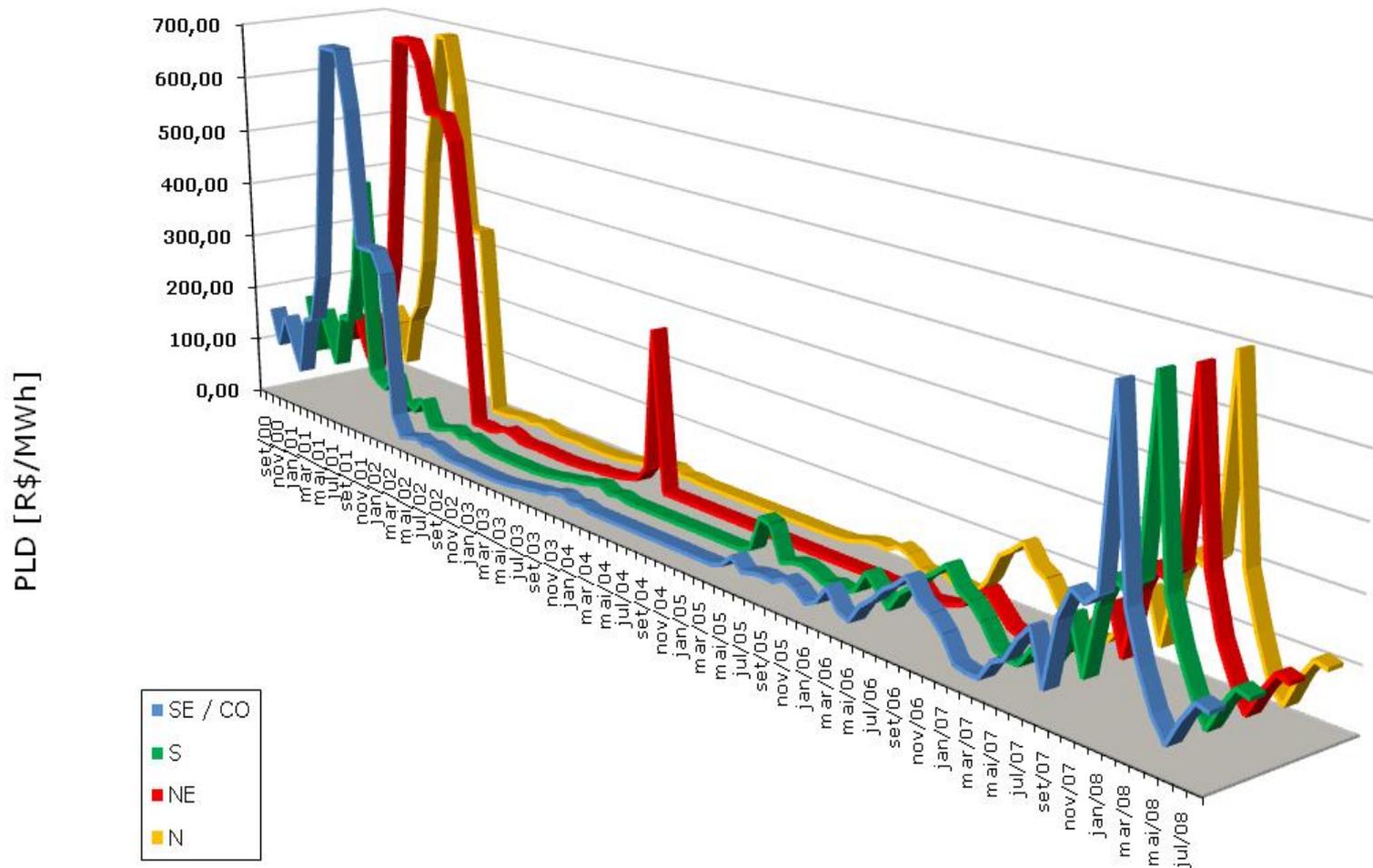
## National Interconnected System



# Short term marginal cost Spot price

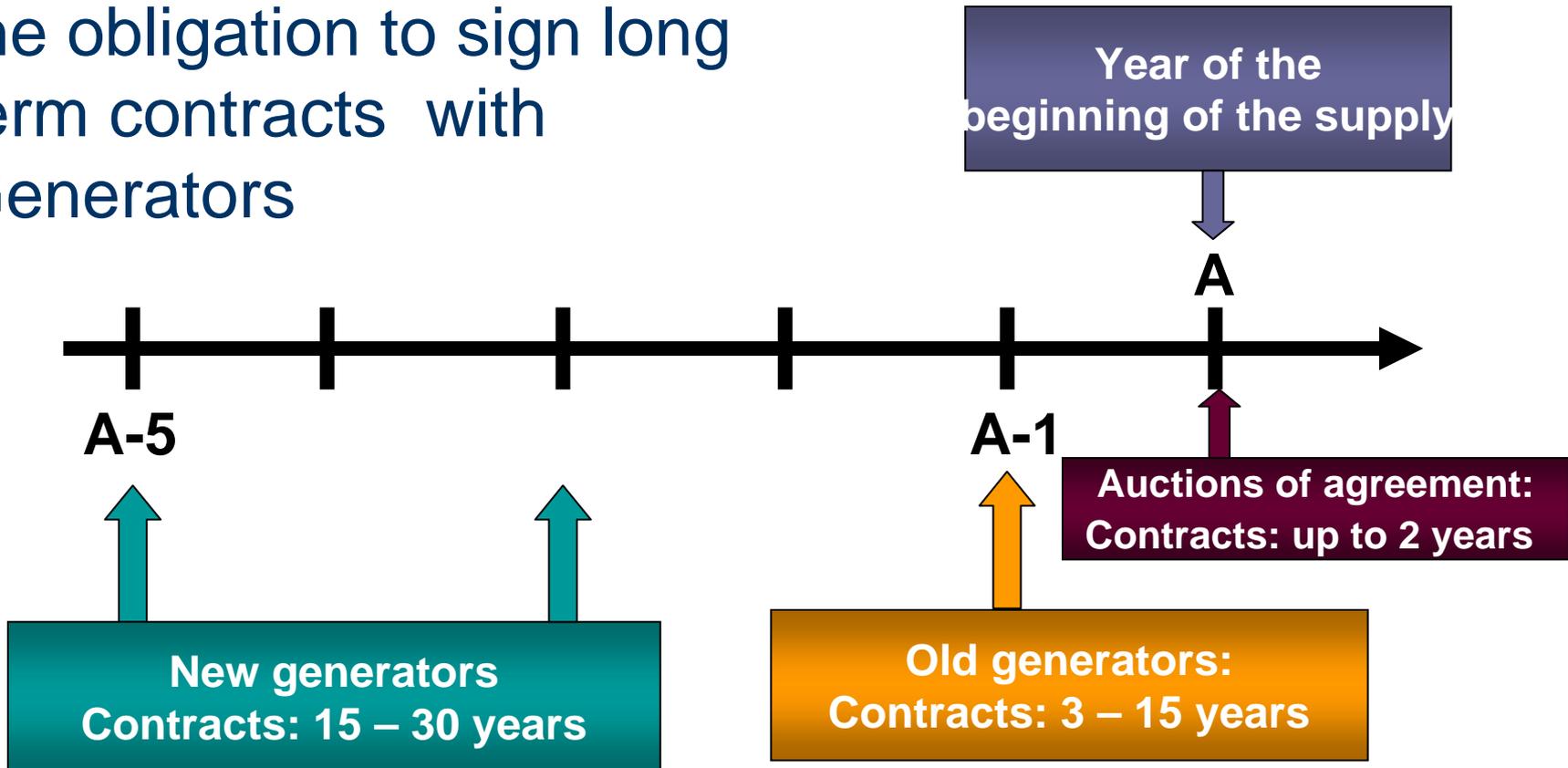


## Evolução do PLD



# Auctions

Distribution Utilities have the obligation to sign long term contracts with Generators



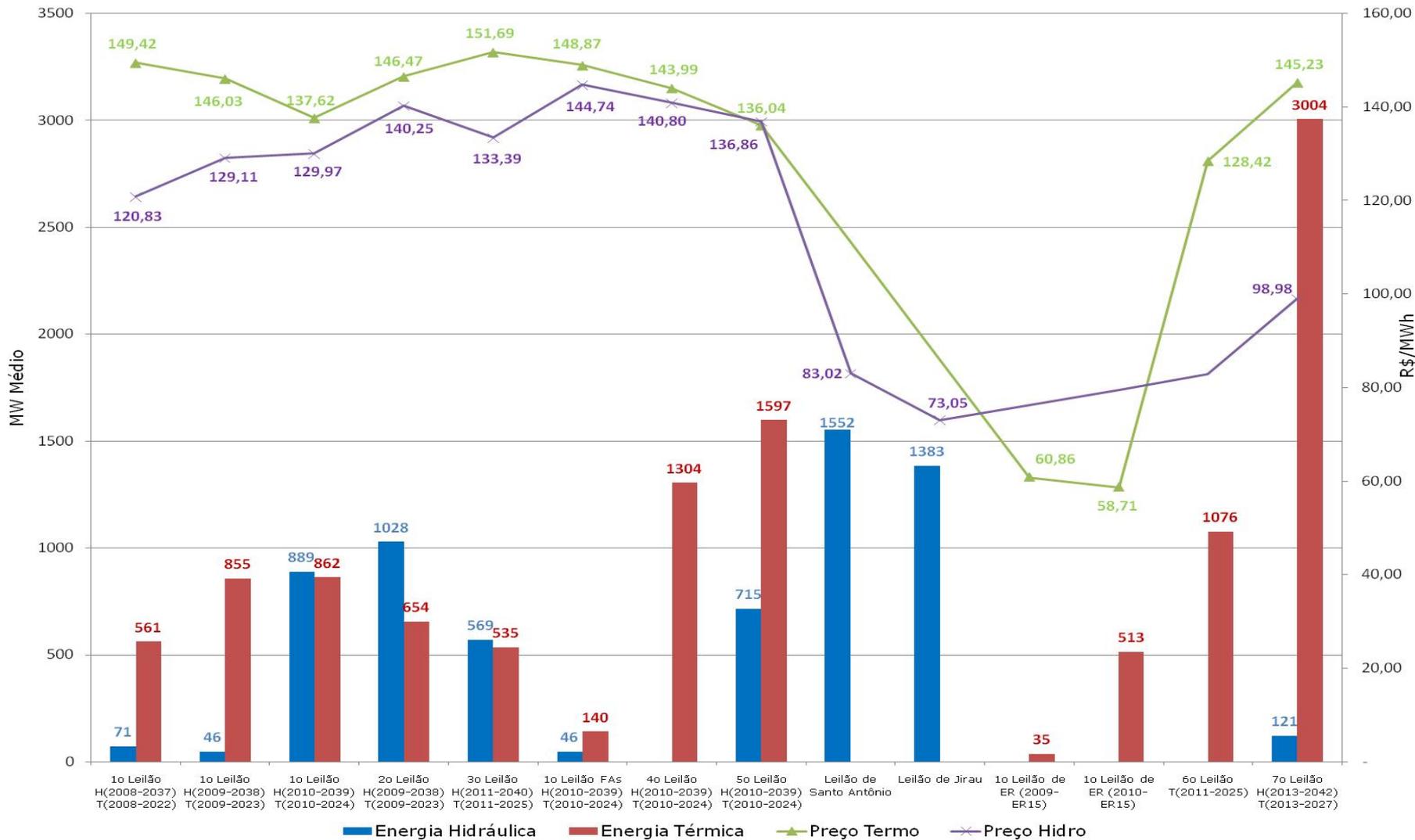
# Result of the auctions

1 US\$ = 2 R\$

1MWmedio = 8760 MWh/year



Resultados dos Leilões de Energia Nova, Fonte Alternativa e Energia de Reserva

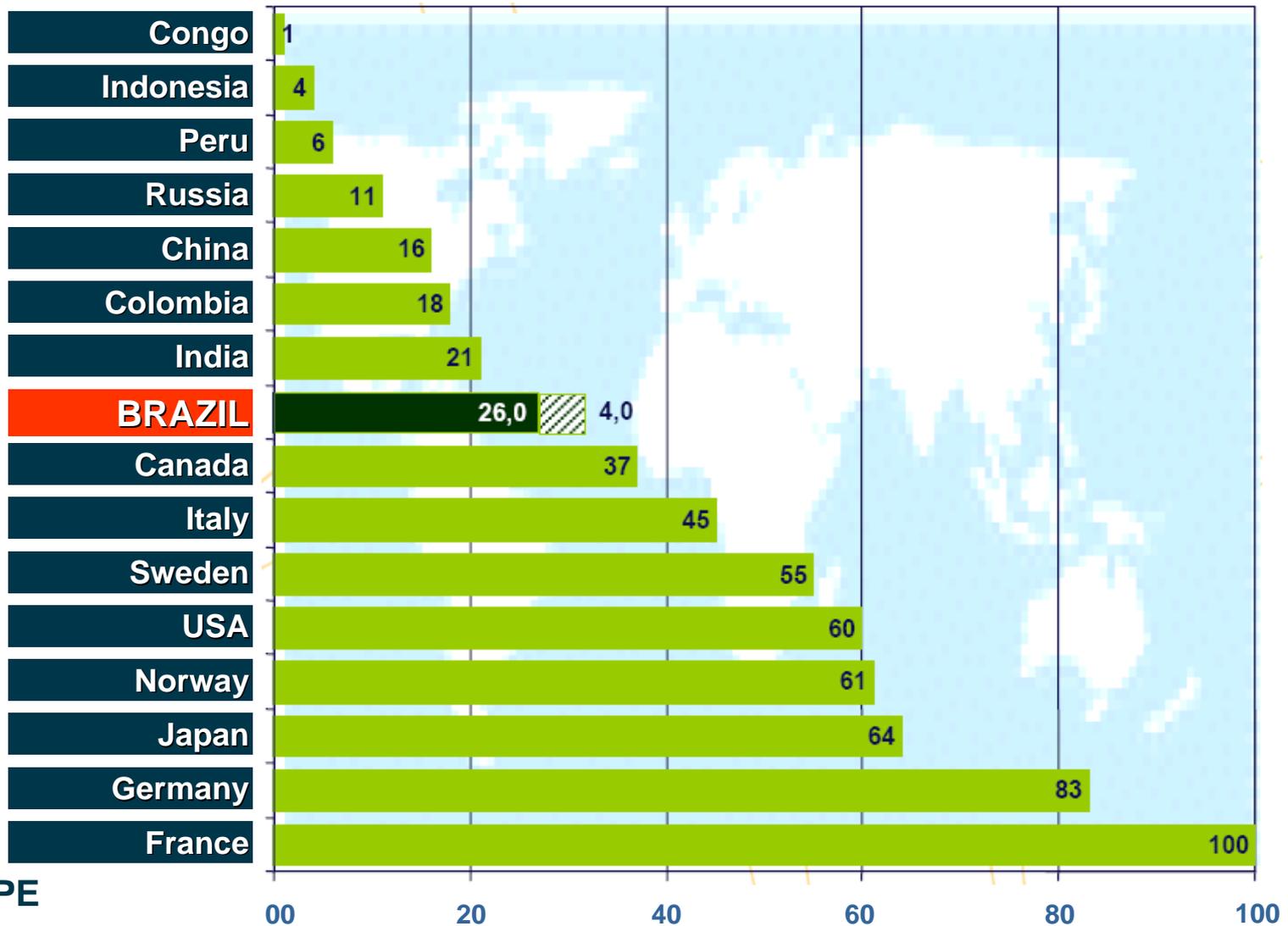


# *Result of the auctions*



- **Sale of Energy: 17278 MWmean ~ 150 million MWh/year**
- **37% Hydro and 67% Thermal**
- **Total sale: ~ US\$ 200 billion**
- **Sale of the last auction (Tuesday, September 30, 2008):  
3125 MWmean ~ 27 million MWh/year; US\$ 30 billion**

# Hydroelectric potential utilized

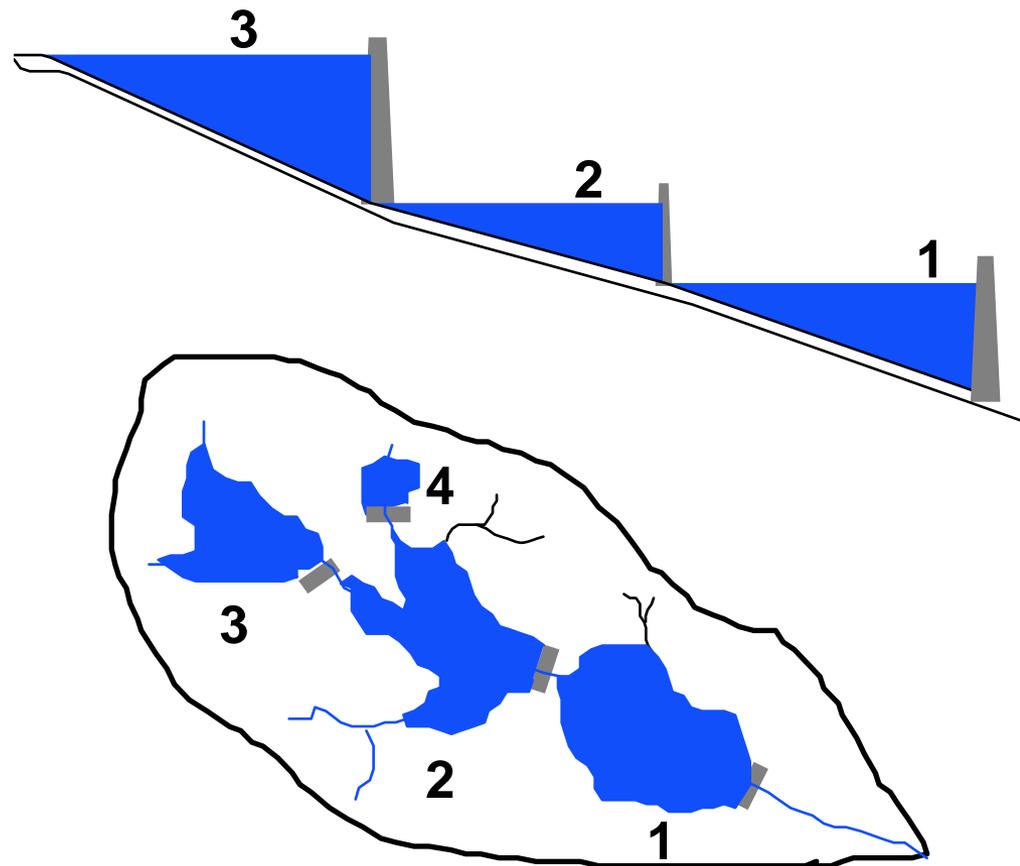


Source: EPE

# RIVER BASIN INVENTORY



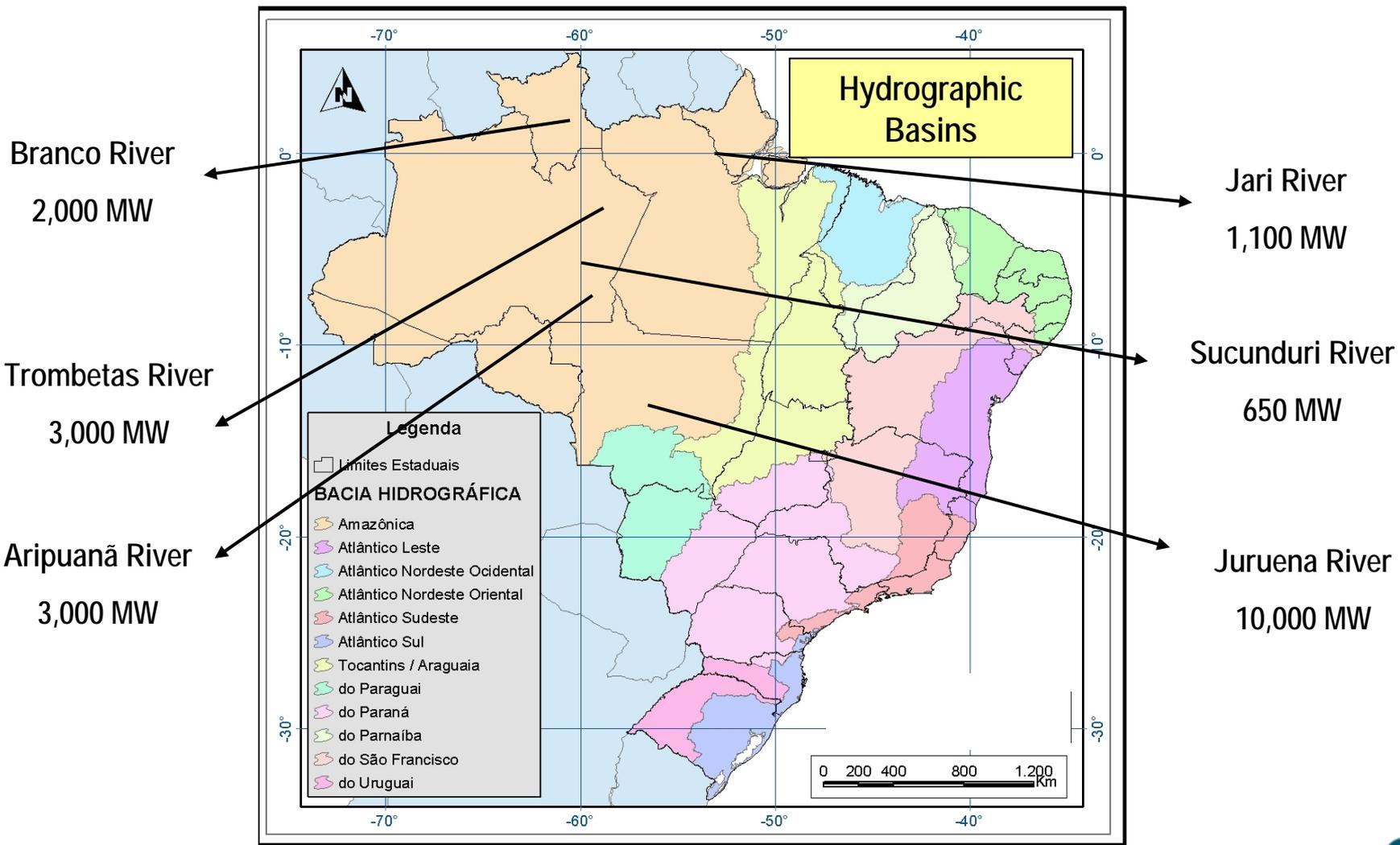
- Valuation of the multiple implications of projects
- Definition of better use of the hydro potential of the basin
- Interaction with the planning of other sectors engaged in the basin



# HYDRO POWER INVENTORIES TO BE CONCLUDED IN THE NEXT COUPLE OF YEARS



Total: 19,750 MW



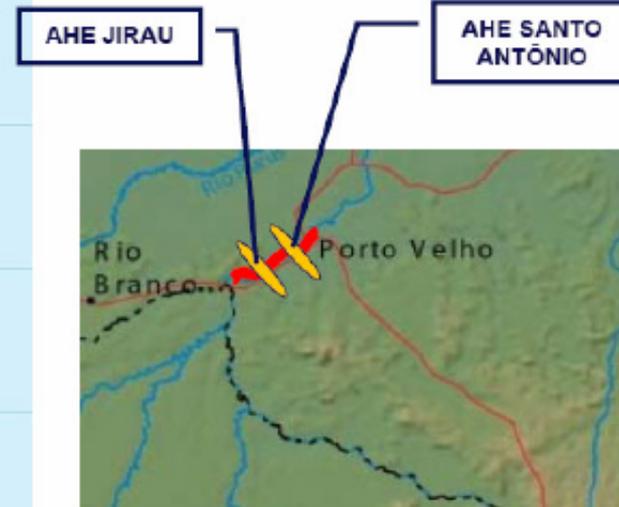
# The new hydropower frontier: Tributaries of the Amazon river



## The Madeira River Project



Energy sold at 37 US\$/MWh



# *The Madeira River*



15 12 2006

# ***Hydroplants in the Madeira River***



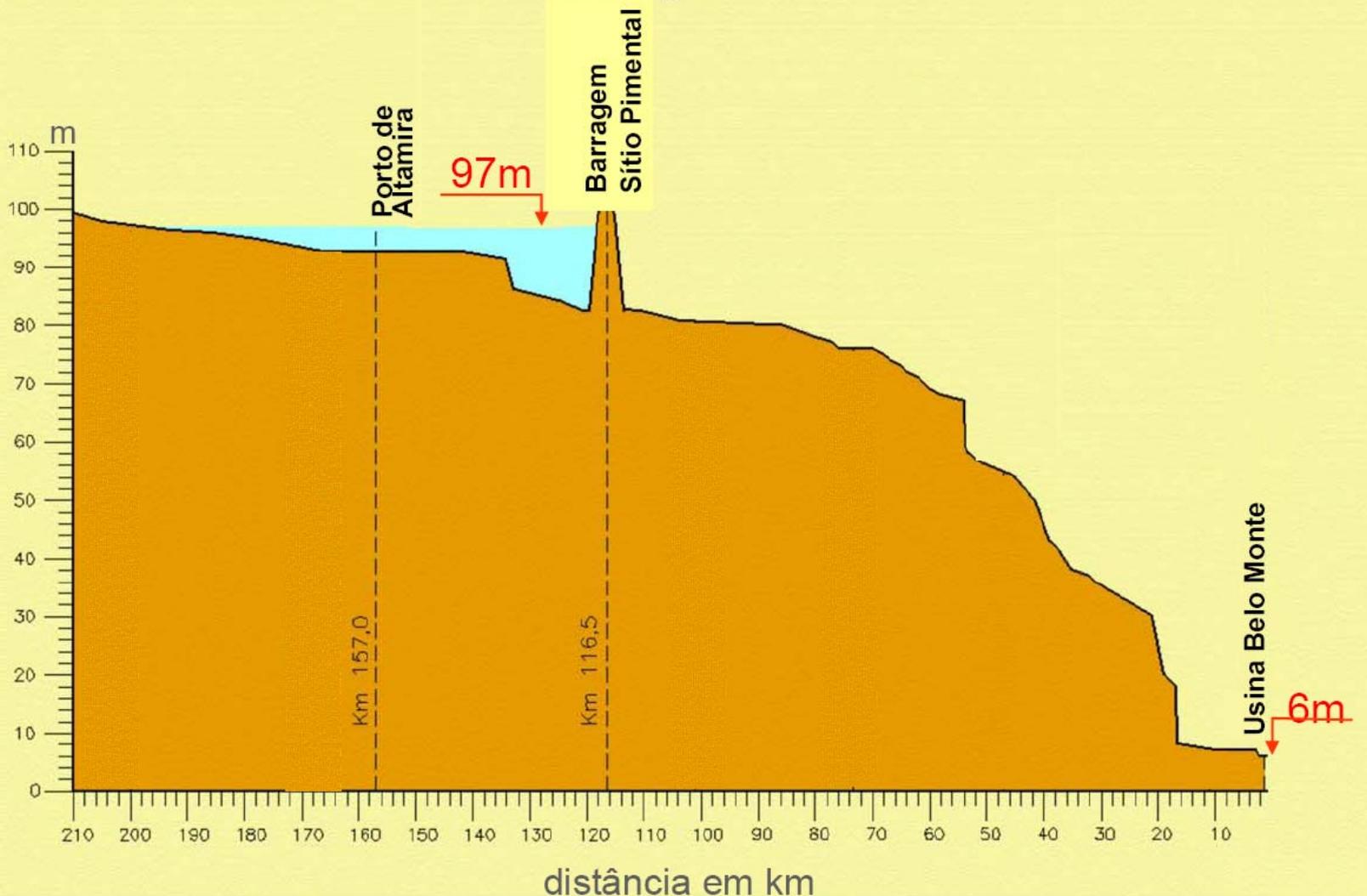
	<b>SANTO ANTÔNIO</b>	<b>JIRAU</b>
<b>Water level (m)</b>	<b>70</b>	<b>90</b>
<b>Installed Capacity (MW)</b>	<b>3150</b>	<b>3300</b>
<b>Reference Fall (m)</b>	<b>13.9</b>	<b>15.2</b>
<b>Type of Turbine</b>	<b>Bulb</b>	<b>Bulb</b>
<b>Unitary Power (MW)</b>	<b>71.6</b>	<b>75.0</b>
<b>Number of Units</b>	<b>44</b>	<b>44</b>
<b>Flooded Area per Installed Capacity (Km<sup>2</sup>/MW)</b>	<b>0.03</b>	<b>0.04</b>



# Belo Monte Hydroplant Longitudinal Profile



## Perfil na Volta Grande do Xingu



# Belo Monte Hydroplant Minimizing the flooded area



Figura 3 - CHE Belo Monte – Solução antiga



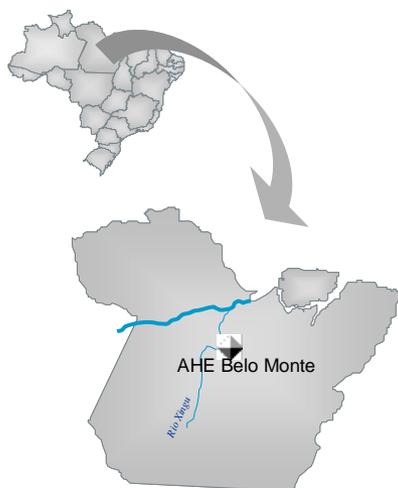
Figura 4 - CHE Belo Monte – Solução atual



## Belo Monte

### Xingu River

- Installed power: 11.181 MW
- Operation of the first machine (prevision): 2014



AHE BELO MONTE PROJECT

***Thank you!***

**Brazilian Electricity Regulatory Agency – ANEEL**

SGAN – Quadra 603 – Módulos “I” e “J”

Brasília – DF – 70830-030

Brazil

TEL. 55 (61) 2192 8600

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