

Empresa de Pesquisa Energética

Uma Empresa do Ministério de Minas e Energia



## **BRAZIL POWER SECTOR EXPANSION PLANNING**

Mesa V: Planeamiento energético ¿ Como se resuelve en el mundo ?

#### IV SEMINARIO ESTRATEGICO

#### LA ARGENTINA Y EL PLANEAMIENTO ENERGETICO

Mauricio T. Tolmasquim CEO Energy Research Office - EPE

Buenos Aires, September 5<sup>th</sup>, 2008



#### SUMMARY

- Highlights of the Brazilian Electric Sector
- The New Regulatory Framework for the Electric Sector
- Brazilian Power Sector Planning
- About EPE
- Next Steps



## HIGHLIGHTS OF THE BRAZILIAN ELECTRIC SECTOR



#### **GENERAL CHARACTERISTICS**

Installed Capacity	100.5 GW	
Hydraulic	77.7 GW	77.3%
Thermal	20.8 GW	20.7%
Nuclear	2.0 GW	2.0%

61.2 million (dec/07) Energy Production 447 TWh/year (\*) (equal to 58% of South America) 62,894 MWh/h (apr/07) (\*\*) (equal to United Kingdom or Italy)

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Peak Load

• Users

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Transmission

Distribution

85% state-owned 15% private-owned 26 utilities (15 private) 64 utilities (80% private)



(\*\*) National Interconnected System only



Surface area: 8.5 million km<sup>2</sup> (= continental USA + 1/2 Alaska)



## **ENERGY CONSUMPTION PROSPECTS (TWh)**

			in TWh
Year	Consumption Supplied by Discos	Self Production	Total
2007	377.2	35.4	412.6
2012	480.4	63.8	544.2
2017	604.2	102.3	706.4
Growth (% p.y.)			
2007-2017	4.8	11.2	5.5
		GDP (% p.y.)	5.0
		Elasticity (e)	1.10

### **EXPANSION OF GENERATION (MW)**



Source: MME

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## **ELECTRICITY SUPPLY STRUCTURE**



epe



## **REMAINING POTENTIAL OF HYDRO IN BRAZIL**





Source: EPE (PNE 2030)





### **BRAZILIAN POWER GRID AT PERSPECTIVE**



epe

## **STAND-ALONE SYSTEMS CONNECTIONS**





Sources: ANEEL, ONS & MME



## THE NEW REGULATORY FRAMEWORK FOR THE ELECTRIC SECTOR





## WHY REVIEW THE ELECTRIC SECTOR MODEL IN BRAZIL?

- Electricity rationing in 2001-2002
- Sector companies undergoing financial and economic

crisis in 2001-2002, recovering during 2003

Lack of electricity for 12 million Brazilians



## **SCENARIO BEFORE 2003**

- Difficulties for investments and no competition: absence of cost of expansion references and "self-dealing" (incentives for contracting within the same economic group)
- Rising prices for final consumer
- Generators have no PPA guarantees
- High environmental risk
- High risk in the short-term market



Consumption grows faster then capacity





## PURCHASE OF POWER THROUGH AUCTION PLUS SURCHARGE

Auction Based on Payment of Highest Surcharge: 3,090% !!!! US\$ 2.1 billion



**HIGH TARIFFS** 

REAL INCREASE OF 40% BETWEEN 1995 AND 2002





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## NEW REGULATORY FRAMEWORK FOR THE ELECTRIC SECTOR

Restructuring of the planning sector (Creation of Energy Research Office - EPE)

• Effective monitoring of conditions of service (creation of the Committee for System Monitoring)

 End of self dealing and promotion of efficient pricing mechanism (auction)

 Promoting social integration (universalization of the energy service for 12 million people)

- Prior Environmental License required
- All consumers must be totally covered by electricity contracts
- All contracts must be backed up by physical production capacity (security of supply)
- Reliance on long-term contracts (up to 30 years), but there is a spot market



#### **TWO CONTRACTING ENVIRONMENTS**

## **COMPETITIVE GENERATION**



Supply prices freely negotiated





#### WHOLESALE COMPETITION

#### Generators must contract with all distributors, in proportion to their energy needs







## **POWER AUCTIONS**

#### • TYPES

- Separate auctions for existing energy and new energy
- 3 years- and 5 years-ahead of start of supply
- Dutch Auction (the lower price wins)
- BUYERS
  - Discos are responsible for load forecast
  - They can pass through the contract costs to customers
- BIDDERS
  - Private or state-owned companies
  - Brazilian or Foreign Companies
- ENERGY SOURCES
  - All energy sources
- WINNERS
  - Winners of new energy auctions will award long-term PPA's and hydro concessions
- MITIGATION OF ENVIRONMENTAL RISKS
  - Only projects with pre-approved environmental license are auctioned off



## **RESTRUCTURING OF THE BRAZILIAN ELECTRIC SECTOR**

## COMMERCIALIZATION MODEL





## **BRAZILIAN POWER SECTOR PLANNING**





- National Council for Energy Policy (CNPE)
  - High level Council empowered with establishing guidelines for energy policy
- Ministry of Mines and Energy (MME)
  - Responsible for energy policy and energy planning.
- Energy Research Office (EPE)
  - Responsible for the implementation of studies that will assist MME`s planning.
- Electric Energy National Agency (ANEEL)
  - Responsible for regulation, control and mediation.
- Electric System National Operator (ONS)
  - Responsible for the operation of the National Interconnected System.
- Chamber for the Commerce of Electric Energy (CCEE)
  - Responsible for the management of contracts and for short term accounting and short term liquidation.



## PLANNING PROCESS AND ROLE OF EPE





## HYDRO POWER PLANTS PLANNING PROCESS



### **RIVER BASIN INVENTORY**

• Valuation of the multiple implications of projects

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





## MAXIMIZE THE ECONOMIC-ENERGY EFFICIENCY MINIMIZE THE SOCIAL & ENVIRONMENTAL IMPACTS





### **INTEGRATED ENVIRONMENTAL EVALUATION - IEE**

#### OBJECTIVE

Identify and valuate the cumulative and synergistic effects resulting from environmental impacts caused by the potentials hydroelectric plants in a river basin

## **INTEGRATED ENVIRONMENTAL EVALUATION STUDIES**



epe

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Preparation and monitoring of Environmental Impact Studies, ensuring the integration of energy, engineering, social and economic aspects, according to the document "Instructions for Feasibility Studies of the Hydroelectric Projects" (1997)



## **FEASIBILITY HYDRO POWER PLANTS STUDIES**





## **ABOUT EPE**





### **EPE ROLE**

 $\geq$  EPE is a 100% State-owned Office, related to the Ministry of Mines and Energy, created by Law # 10.847, of April 16<sup>th</sup>, 2004 > EPE started to work in January 2<sup>nd</sup>, 2005 > EPE is responsible for power sector planning studies: electric sector, oil & gas sector, renewable sources, nuclear power and energy efficiency

Its studies give support to establish governmental policies for the energy sector



#### **EPE STRUCTURE**

> EPE has a Presidency and 4 Directories:

- 1. Economic and Demand Studies and Long Term Integrated Energy Planning
- 2. Power Studies (Generation, Transmission and Environment)
- 3. Oil & Gas and Bioenergy Studies
- 4. Corporative Management



- Integrated Environmental Evaluation of Hydrographic Basins
- New Hydro Power Inventories and Feasibility Hydro Power Plants Evaluation
- 2006, 2007 & 2008 Brazilian Energy Balance
- 25-year Integrated Energy Plan PNE 2030
- 10-year Energy Sector Expansion Planning (2007-2016)
- Economic forecasting studies up to 2030 (monthly)
- Energy demand forecasting studies up to 2030 (quarterly)
- 5-year Transmission Expansion Program
- Long Distance Engineering, Planning and Specification Studies
- Economic and Engineering Studies for support the power expansion auctions
- Several studies in oil & gas area



#### SOME RESULTS UP TO 2005 RESUMPTION OF PLANNING – AUCTIONS (MW)

• 9 New Energy Auctions

32,164 MW

2,379

- For supply the needs of the market expansion
- 1 New Energy Auction
  - MW
    - Above the needs of the market
    - Goal: Increase the security of supply

## 34,543 MW

Hydro, Small Hydro, Oil, Natural Gas, Coal & Biomass



1 US\$ = 1,7 R\$



## NEXT STEPS





- Start of supply: 2011 (15 years' PPA)
- It will be held on September 17<sup>th</sup>, 2008
- Price Cap = US\$ 88.2 / MWh (\*)
- Qualified and Prospect Bidders:

Sources	Units	Capacity (MW)	Energy (MWmed)	
Wind	49	2,578.8	893.7	
Sugar Cane Biomass	49	2,217.4	890.9	
Other Biomass	6	250.0	205.9	
Liquefied Natural Gas (LNG)	2	504.0	272.0	
Natural Gas	1	65.9	33.1	
Oil	86	15,016.7	7,830.7	
Total	193	20,632.8	10,126.3	

(\*) 1 US\$ = 1,7 R\$



## A - 5 AUCTION (2008)

- Concession of Public Use and Energy
- Start of supply: 2013 (30 years' PPA)
- It will be held on September 30<sup>th</sup>, 2008
- Price Cap = US\$ 85.9 / MWh (\*)



### **BELO MONTE HYDROPOWER PLANT**

## It will be held on September, 2009

Technical Data	Belo Monte (principal)	Belo Monte (addicted)	Belo Monte (total)
Capacity (MW)	11,000	181	11,181
Energy (MWmed)	4,719	77	4,796
Generators	20	7	27
Turbines	Francis	Bulb	
Units (MW)	550.0	25.9	
Investments (US\$ billion)			7.0





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(Energy Research Office)

Ministry of Mines and Energy

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