

Brazilian CHP and DE Market

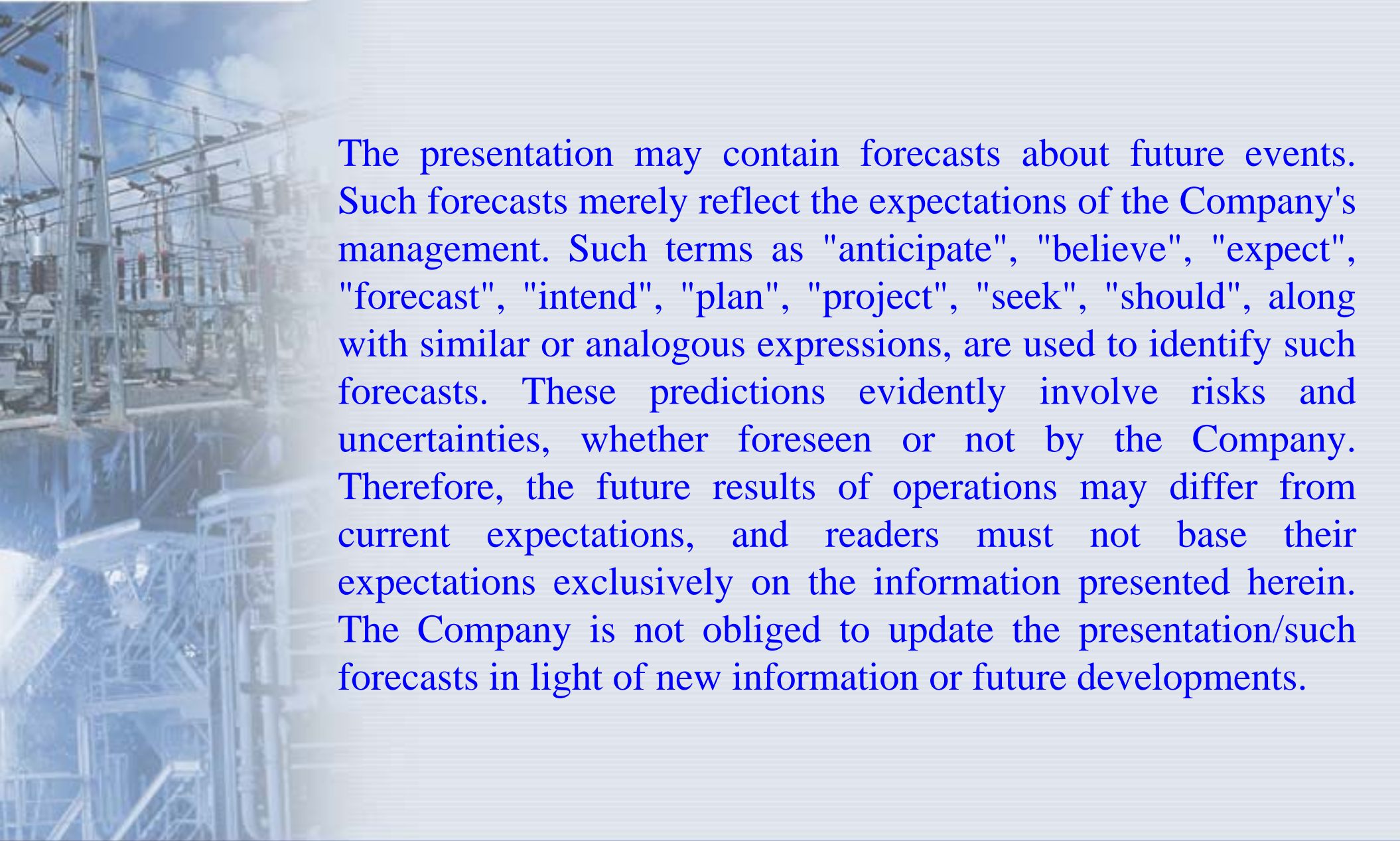
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New York


Antonio C P Maia

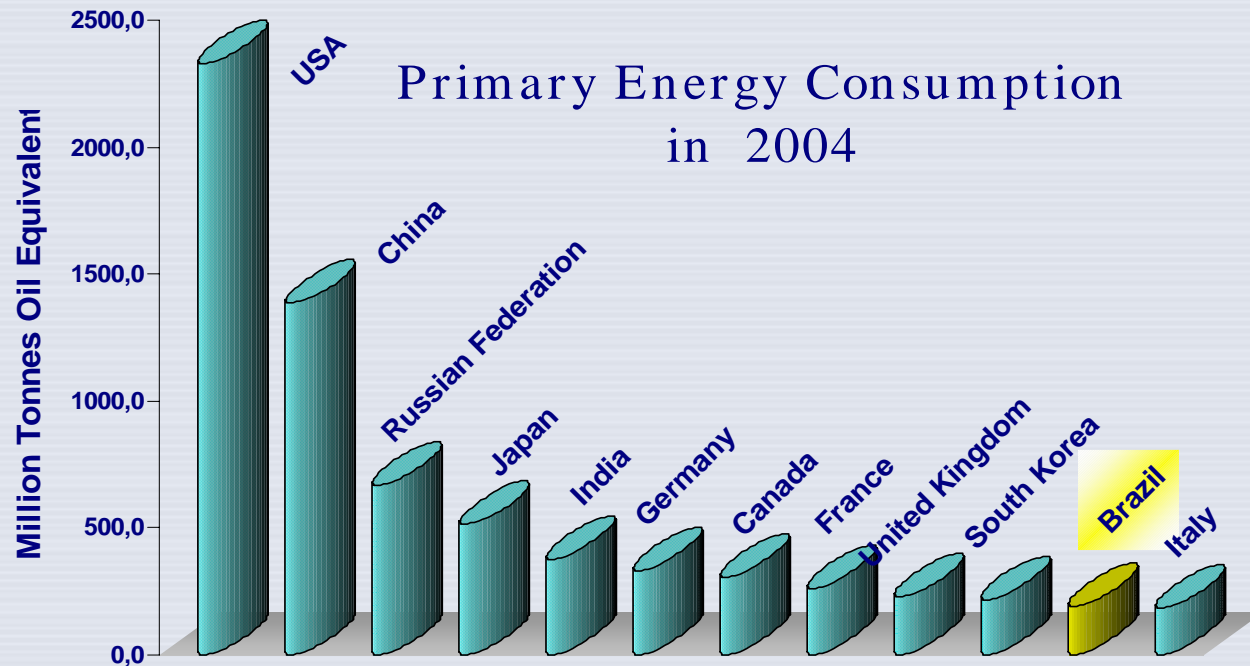
CHP and DE Manager

Natural Gas Marketing Development



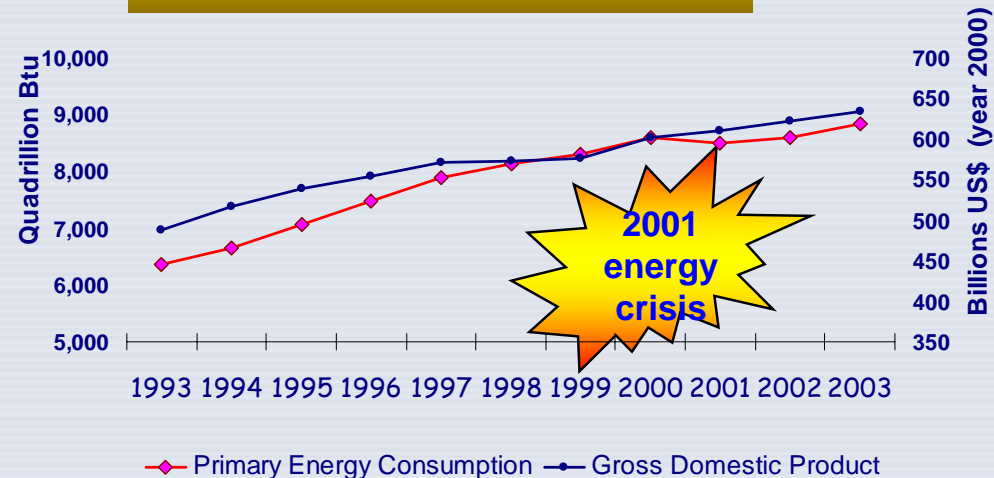
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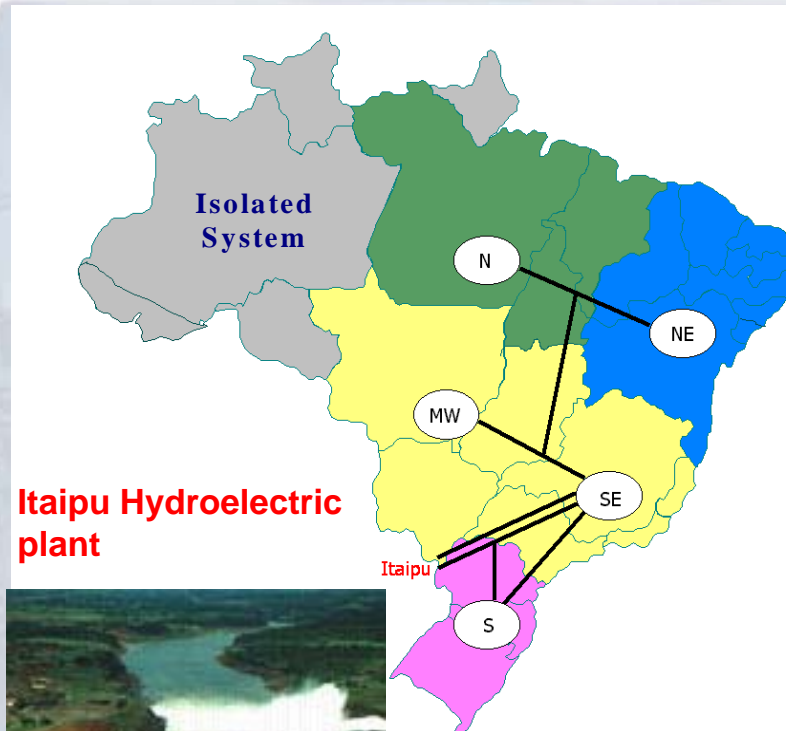
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- **Overview of the energy sector in Brazil:**
 - ✓ Energy Consumption
 - ✓ National Power System & Production profile
 - **Supply Demand Balance**
 - **A new model for the electricity sector**
 - **CHP and DE in Brazil**
 - ✓ NG-fired CHP and DE
 - ✓ Bioelectricity (Sugarcane bagasse-based DE)
 - **Final remarks**
 - ✓ Key issues
 - ✓ Lessons to be learned



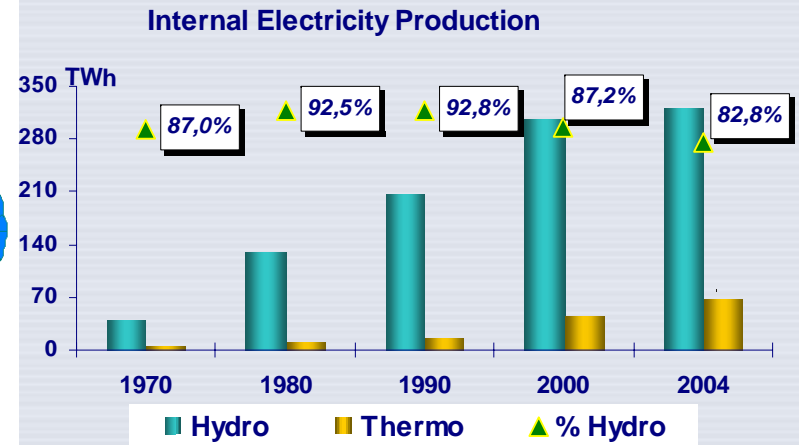
Brazilian Primary Energy Consumption versus GDP

Brazil	1983	2003	%
Population (Millions)	128,11	178,47	39%
Primary Energy Consumption (10 ¹⁵ Btu)	3,96	8,83	123%
Gross Domestic Product (Billions US\$ - year 2000)	350,77	633,43	81%





Itaipu Hydroelectric plant



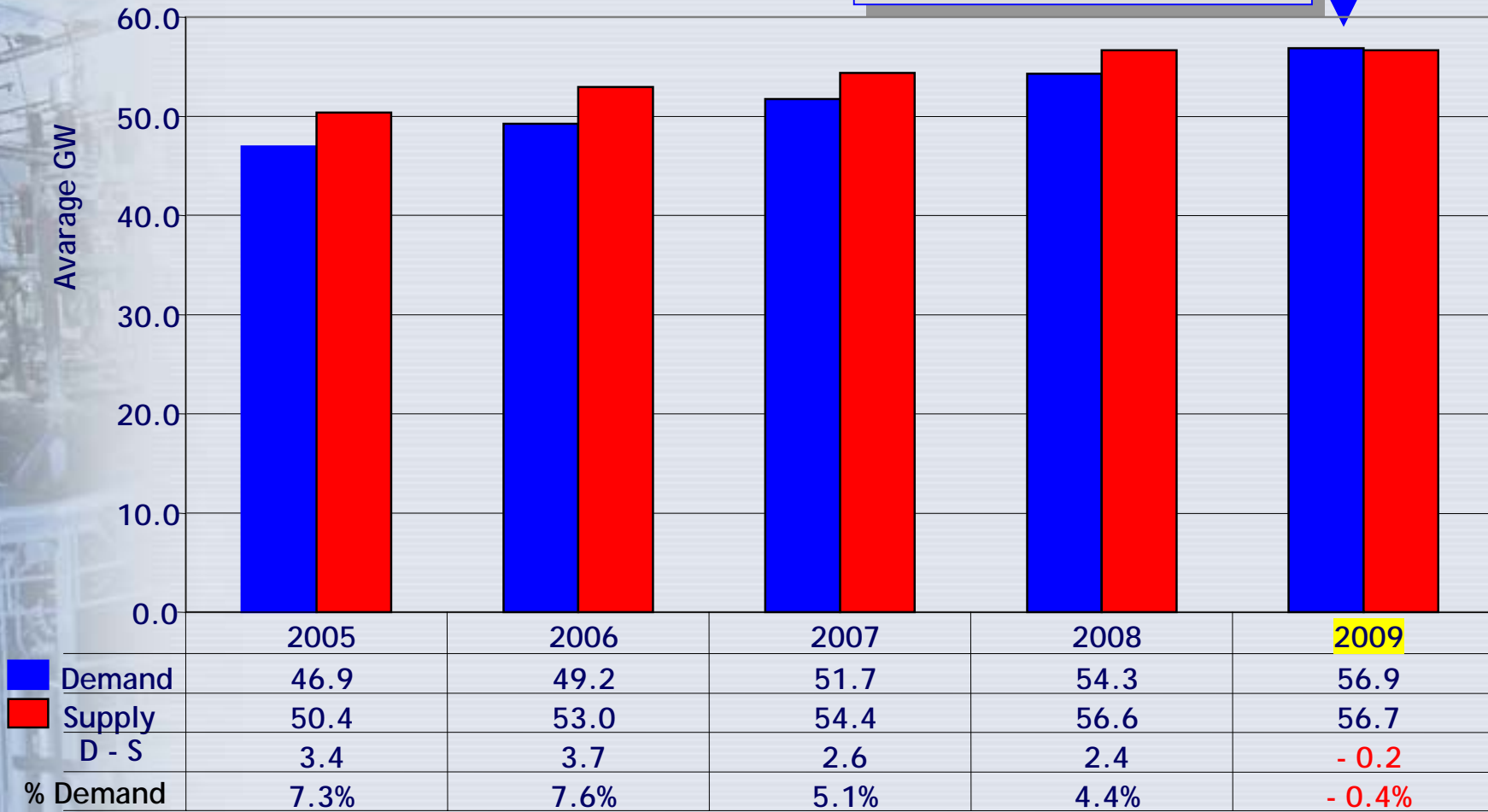
PROFILE		
Surface area:	8,5	Million km ²
Installed capacity	90,7	GW
Production:	44,2	GW average
Peak Demand:	57,0	GW average
Generation Segment (*1)	11	companies
Total revenues (2003):	9	US\$ billion
Transmission Segment (*2)	26	companies
Total revenues (2003):	1,6	US\$ billion
Distribution Segment (*3)	64	DISCOs
Total revenues (2003):	16	US\$ billion

*1 15% energy produced by private companies
 *2 17 private out of 26
 *3 80% energy consumed distributed by private companies

Hydro plants are jointly operated, to take advantage of hydrological diversity (exports from “wet” to “dry” basins)

Premise: 5.4% annual load growth (4.0% GDP growth)

Existing supply matches demand



About 3,500 MW of additional capacity must enter the system every year, starting 2010. INVESTMENT DECISIONS MUST BE MADE NOW (2005)!

Law 10,848/04, executive decree 5,163/04 and further regulation

Underlying Goals: Supply guarantee & modest tariff charges

Contracting Mechanism		
Where ?	How ?	Who ?
Regulated Contracting Environment ACR	Via auctions, contract costs can be passed through to customers	Electricity distributors (DISCOs)
Free Contracting Environment ACL	Via bilateral contracts, directly negotiated	Market players (but DISCOs): free consumers & trade companies.

Requirements

- 100% supply guarantee;
- Public invitation to contract directly from the DE projects;
- Generators must provide evidence of underlying energy sources

Energy Research Company

planning

National Agency for Electric Energy

coordination

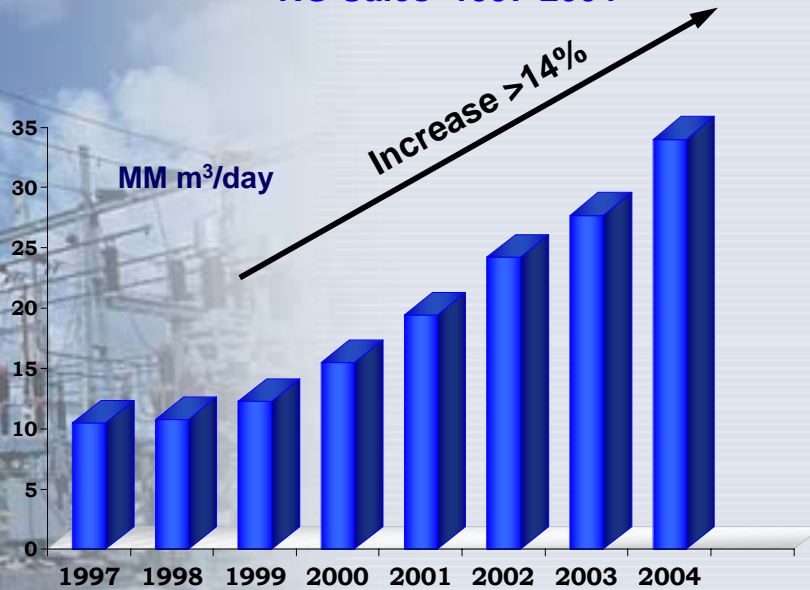
Chamber for Electrical Energy Trading

conduction

Implications

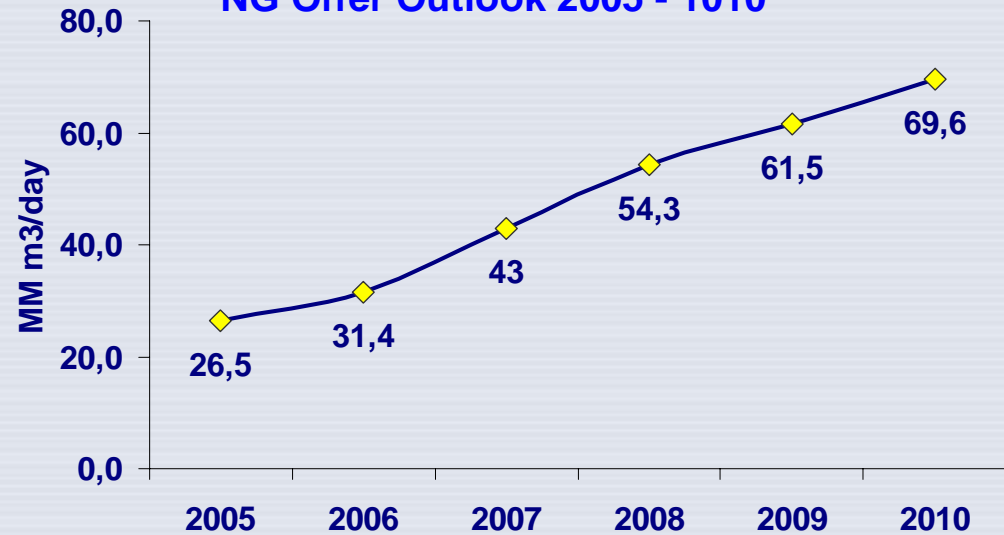
- All committed consumers must be 100% covered by energy supply contracts;
- Although supply contracts are financial (forward contracts), they must be backed by physical production capacity (“ballast”);
- The need to sign new contracts to cover additional load is the driver for the entrance of new capacity.

NG Sales 1997-2004



Source: PETROBRAS BP 2006-2010

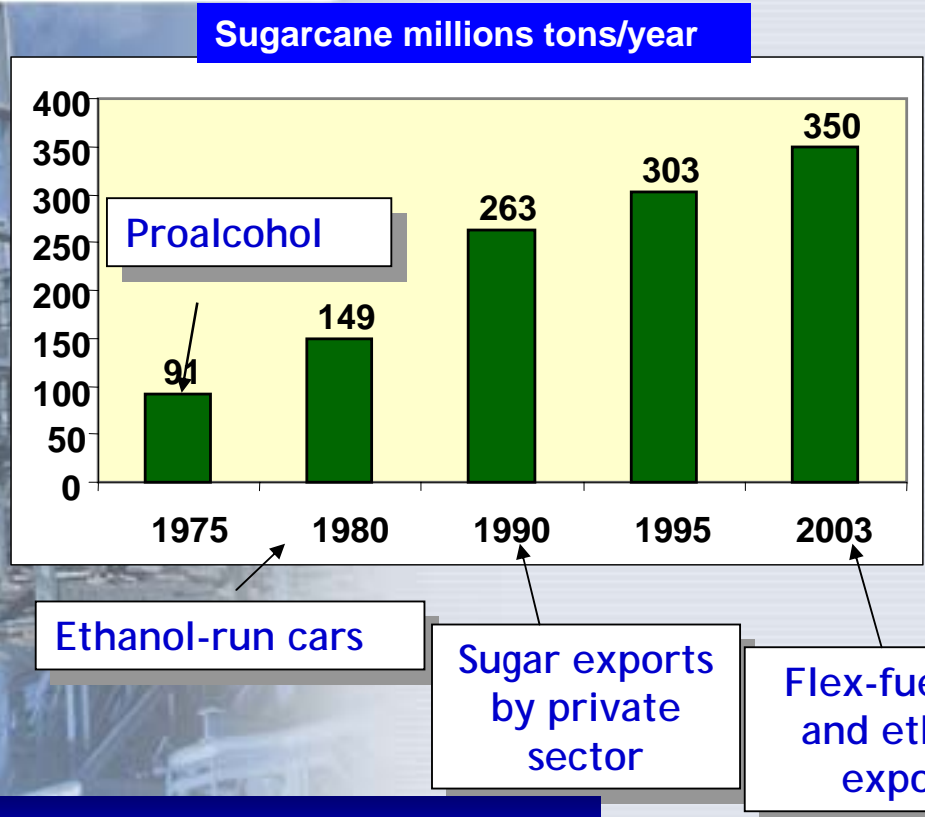
NG Offer Outlook 2005 - 2010



Natural gas sales : 35 MM m³/day
Natural gas production: 46 MM m³/day
Imports from Bolivia: 20 MM m³/day
 ⇒ **Offer: 15 MM m³/day**

NATURAL GAS 2004

	Albacora Leste + Barracuda + Caratinga + Peroá-Cangoá	Manati + Golfinho F1 + Jubarte F1	Espadarte + Peroá-Cangoa F2 + Roncador + Urucu + Golfinho F2	Marlim Sul + Marlim Leste + Mexilhão / Cedro	Frade
Additional Volume Million m³/day	4,9	11,6	11,3	7,2	8,1



- ✓ Located in the electric demand center of national grid ;
- ✓ Synergy with hydro production pattern: matches the hydro dry season;
- ✓ Local manufactures with installed capacity to supply equipments to new projects (up to 1,200 MW/year)



Sugarcane industry prospects:
2010/11 crop: 570 million tons



Sugarcane Bagasse – biomass with potential to make a meaningful contribution to the energy balance

Sugarcane Bagasse-based DE – aided by propitious structural conditions and aggregated value perception

564 MW from bio DE projects are registered to the Auction to be held in December 2005

Key Drivers

- The new model for the electricity sector:
 - ✓ Sale of Decentralized surplus Energy through Regulated Contracting Environment, via auctions
 - ✓ Greater flexibility for purchasing surplus generation from DE
 - ✓ Short timescale for DE projects development
 - ✓ Preliminary environmental license requested in the auctions associated with greater environmental concerns
 - ✓ Need to anticipate additional energy supplies
- Strong growth of sugar/ethanol sector associated with increasing need for improved efficiency in sugar mills
- Recent and relevant natural gas discoveries
- Need for reliability of energy supply

Key Barriers

- Electricity distribution tariff revision policy oriented by asset-based remuneration mechanism
- Strong hydro (central) generation culture
- Need for updated rules on interconnection and recognition of DE contribution to the reduction in investments and losses through the T&D systems
- Immature natural gas market, still missing transport and distribution infrastructure

Key Facts

- National fuel prices follow international prices and can be volatile
- Electricity and Natural Gas sectors have their own dynamics

The new contracting mechanism already brought out bioelectricity potential.

NG-fired DE still constrained by CG plants needs in the short run.

And LESSONS still TO BE LEARNED!