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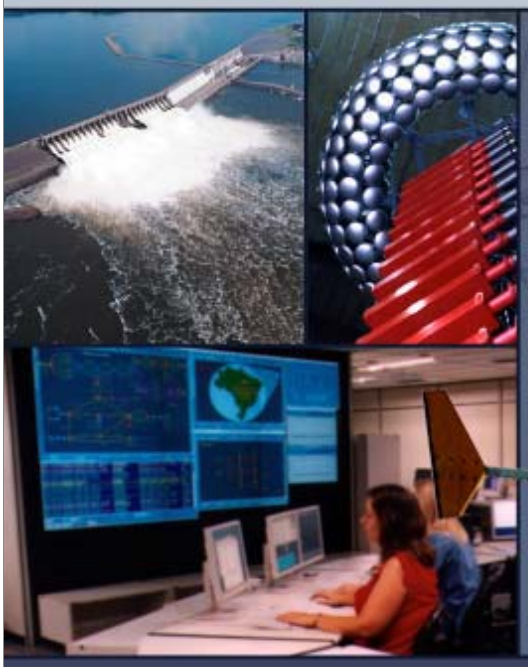


Wind Energy Brazil:
Considerations on small, intermediate and large size systems

NEET Workshop - Brasilia

November 2007

www.cresesb.cepel.br

I – Introduction

• Wind energy in the framework of the PNE 2030 and concern with the global heating

II - Small Size Systems

• Situation in Brazil

• Rural Eletrification – LPT (Electricity Universalization Program)

III - Intermediate Size Systems

• An example of feasibility

IV - Large Size Systems

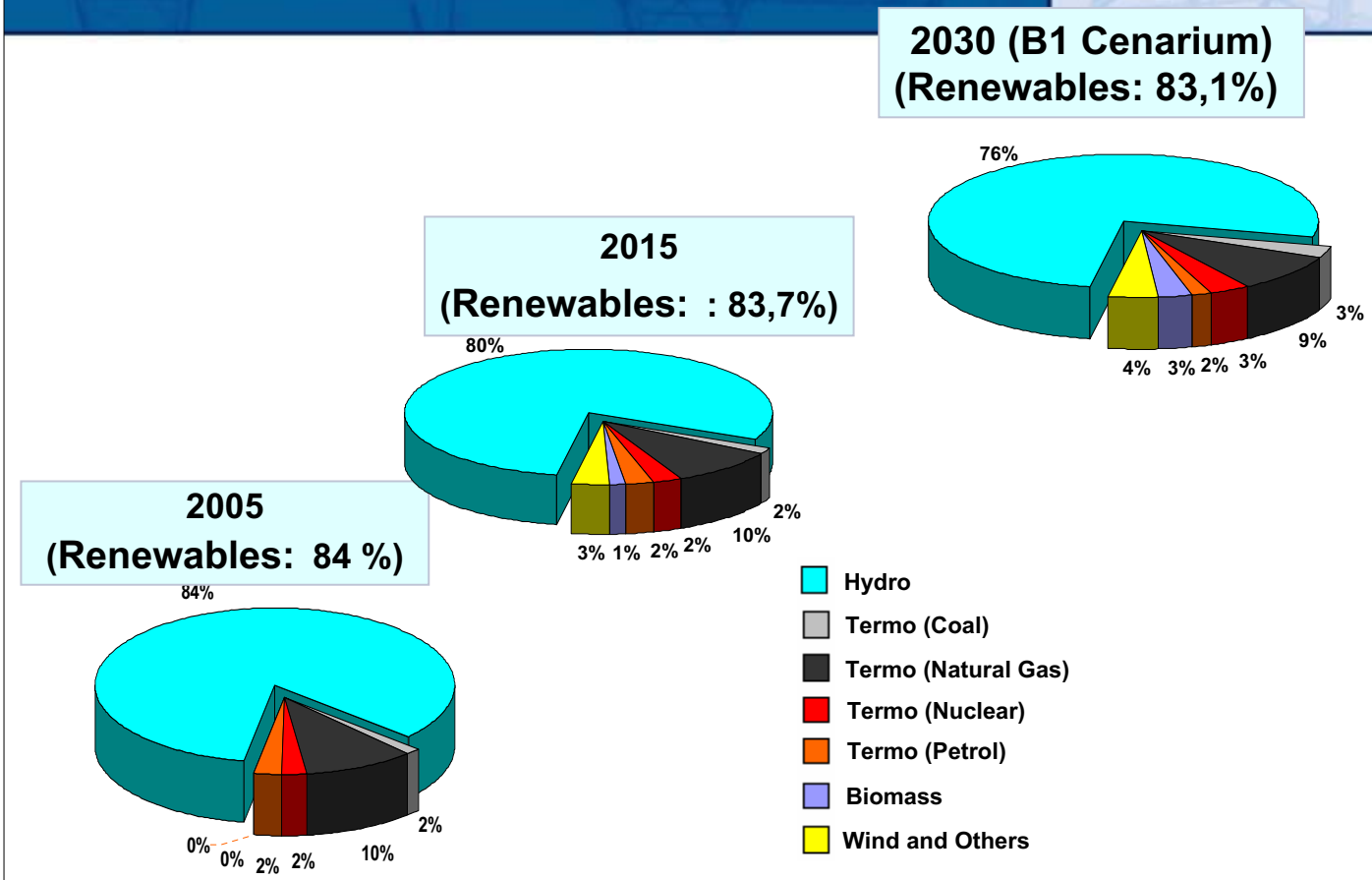
• Summary of the situation

V – Conclusions

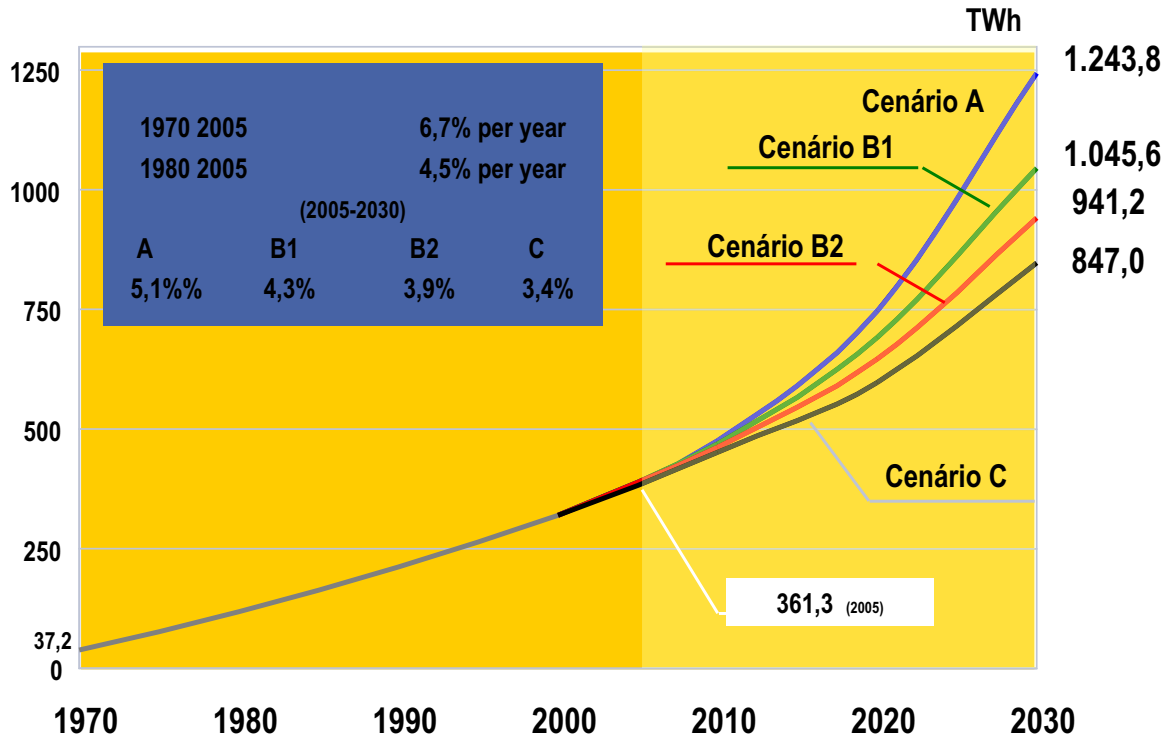
• Gone with the wind?

I – Introduction

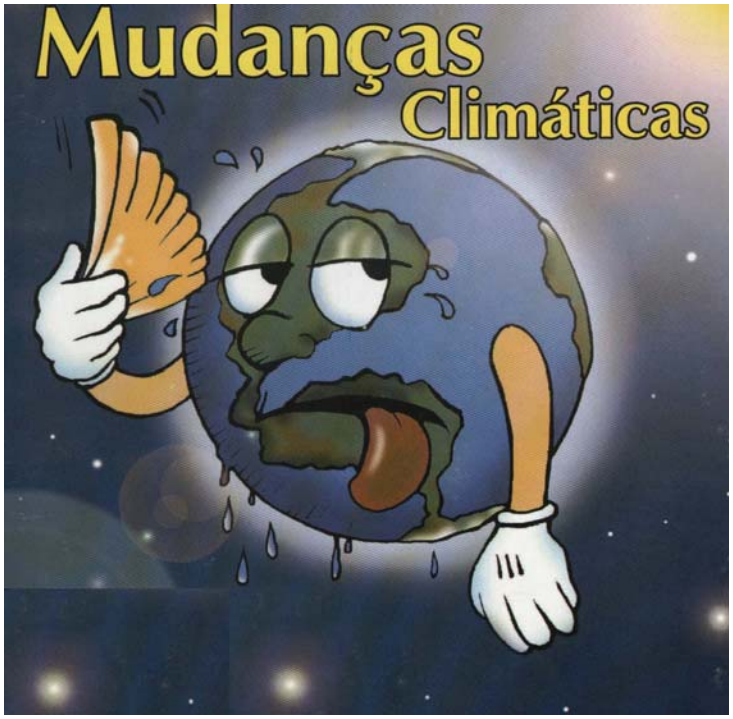
Electrical Mix



Eletricity: projection of consumption increase



Global Heating



Source: Instituto de Pesquisa ambiental da Amazônia

CO2 Emission of Diverse Technologies (ton/GWh)

Coal (conventional plant)	**1000**
Gas	**500**
Wind	**7**
Large Hydro	**4**

Wind Energy Applications – Electricity Generation

Small Size (≤10 kW)
- Residential
- Farms
- Remote Applications

Intermediate Size (10- 500 kW)
- Hybrid Systems
- Distributed Generation

Large Size (500 kW - 2+MW)
- Wind Farms
- Distributed Generation

II – Small Size Sistems

Wind Energy Applications – Electricity Generation

Small Size (≤10 kW)

- Residential
- Farms
- Remote Applications

Wind Energy Applications – Electricity Generation

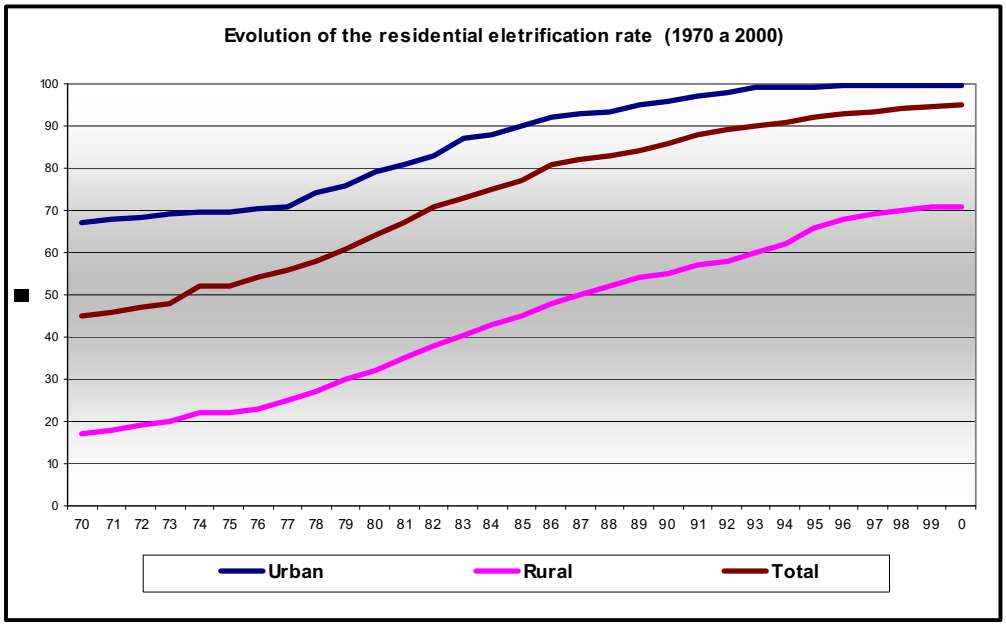
- High quality wind turbines technologicaly developed and produced in Brazil in commercial scale
- Clientes are not grid connected
- Complete system of 1 kW: R$12.000,00
- Complete system of 5 kW: R$ 45.000,00
- System of 10 kW: under development

Wind Energy Applications – Electricity Generation

Some initiatives to stimulate this sector:

- Special long term credits with lower interest rates
- Tax incentive policies
- Export incentives
- Legislation for grid connection
- Use of smal wind systems at the LPT

Universalization: chalenges



Source: CEPEL-DTE Report - 211035/2003 - giannini@cepel.br

LPT 05.09.07

Region	Acummulated Connections	Number of People	Resources (R$)
Norte	183.496	917.480	718.352.612,02
Nordeste	614.919	3.074.595	2.019.508.013,03
Sudeste	292.228	1.461.140	643.597.231,31
Sul	106.740	553.700	203.594.187,27
Centro-Oeste	93.789	468.945	387.784.257,47
TOTAL	**1.291.172**	**6.358.420**	**3.972.836.301,10**

Crescimento da População

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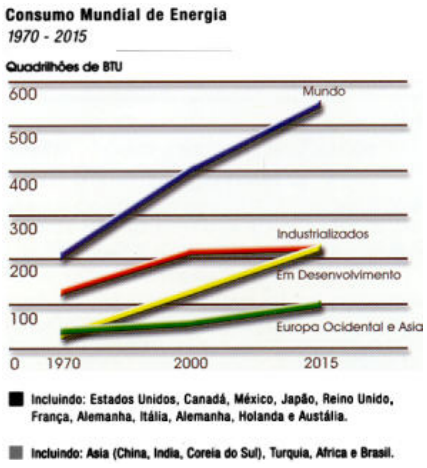

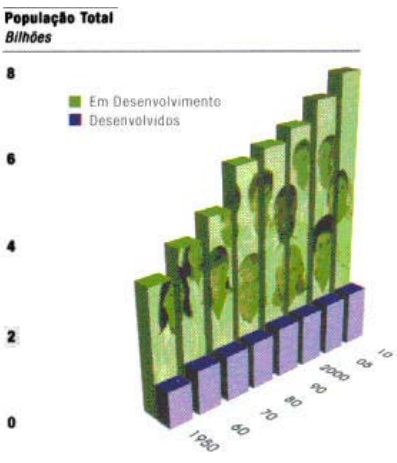

FONTE: Informativo da Eletronuclear - agosto 2001

III – Intermediate Size Sistems

Intermediate Size (10- 500 kW)

- Hybrid Systems
- Distributed Generation

A promissing feasibility study (preliminary results)

- Costumer: Hospital supplied by the grid
- Load: 380 kW
- Monthly Average Demand:
  - Peak: 345,5 kW
  - Out of Peak: 335,9 kW

A promissing feasibility study (preliminary results)

- Proposed alternative supply:
  - Wind turbine and grid (peak and out of peak)
  - Diesel Generator as back up in peak hours with no wind
- Total investment: R$ 2.536.410,00
- Yearly Savings: **R$ 423.076,63**

A promissing feasibility study (preliminary results)

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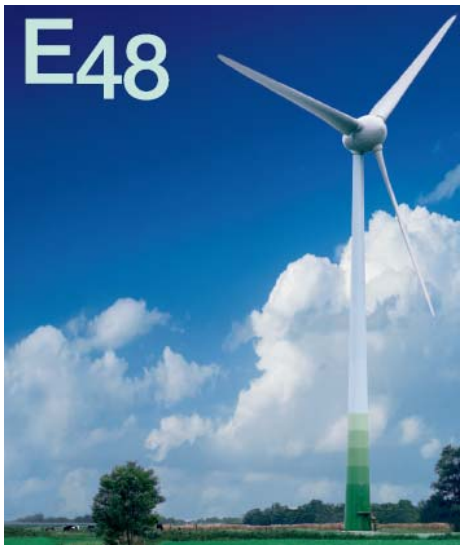
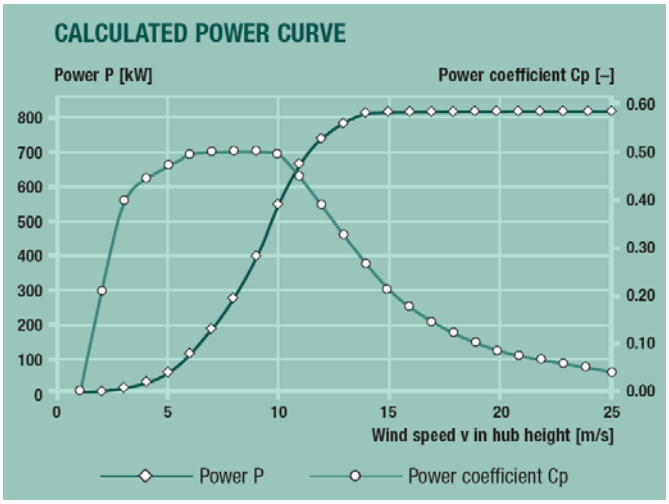
- **Wind turbine considered**





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IV – Large Size Sistems

Large Size (500 kW - 2+MW)

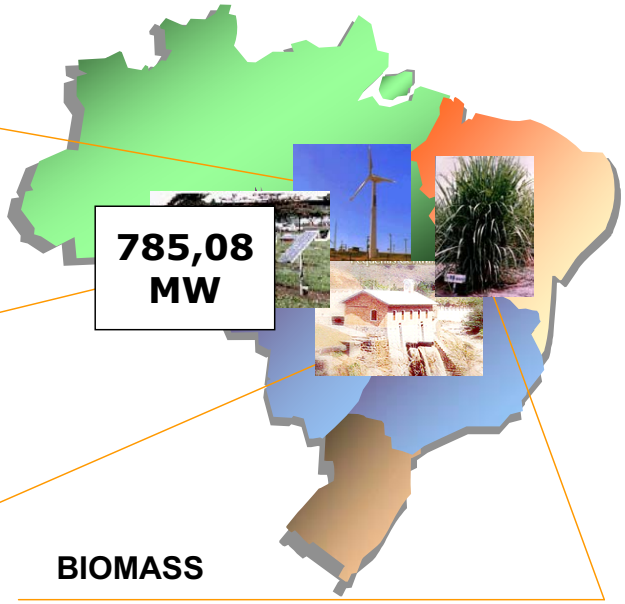
- Wind Farms
- Distributed Generation

PROINFA
Electric Energy Alternative Sources Incentive Program

Wind: 208,3 MW

5 wind farms

December 2006



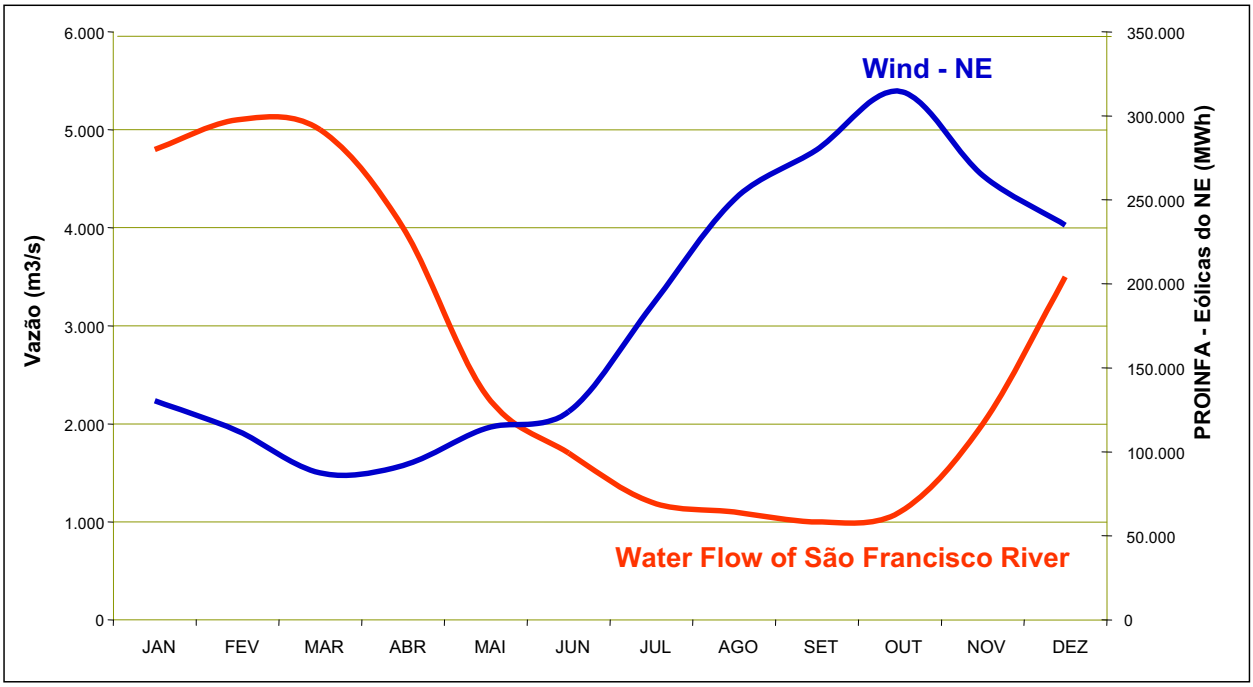
PCH

162,34 MW

BIOMASS

414,44 MW

(Fonte: EMME,2007)

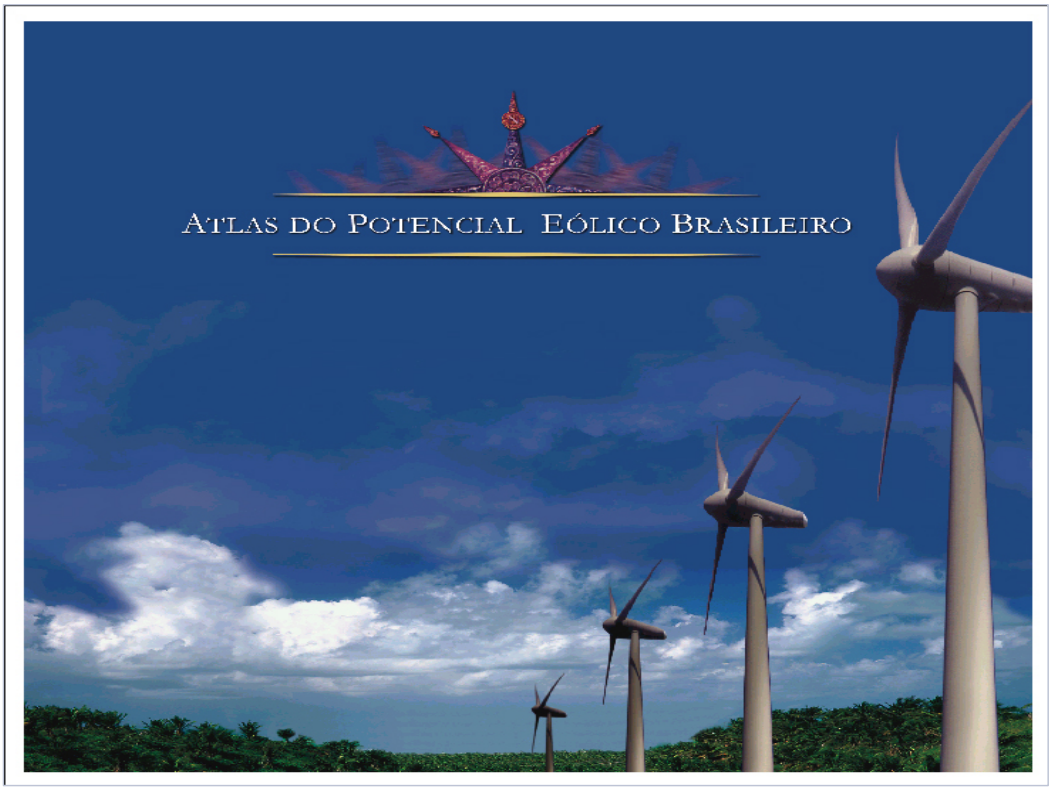


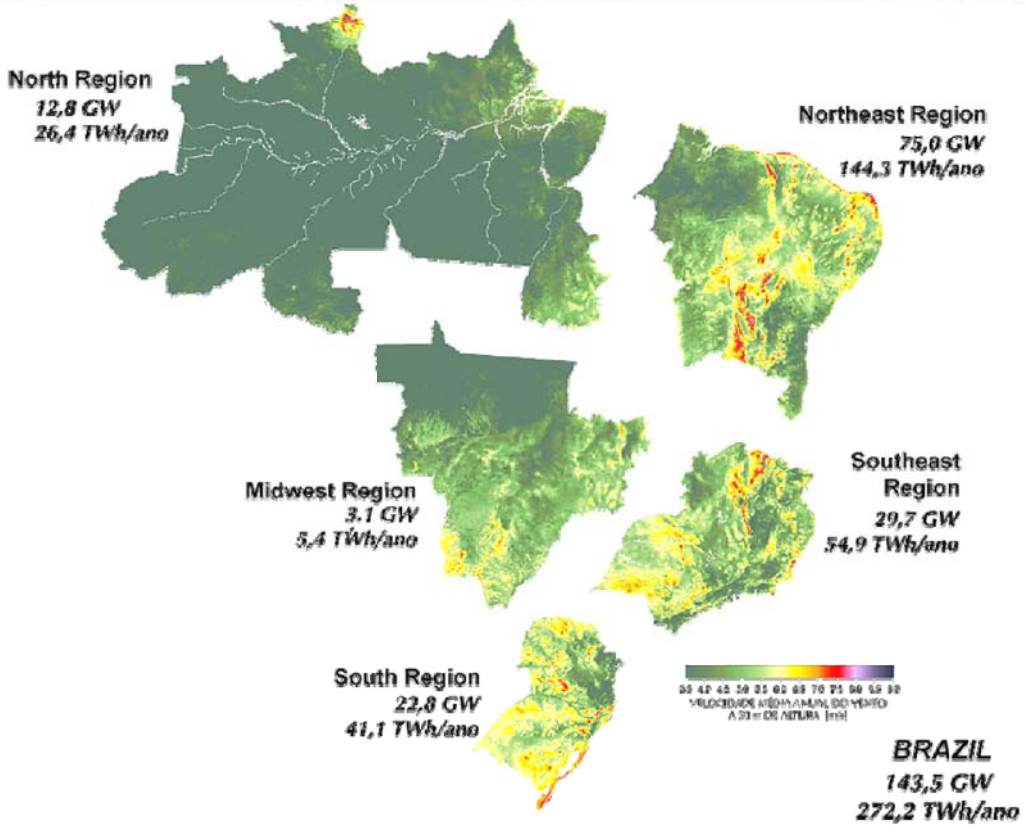
- **It is not feasible, with the present technology, to store large amounts of energy generated by na intermitent source of energy as the wind.**

- **The combined utilization of Hydro and Wind, improves the energetic potential of both sources due to the seazonal complementary characteristics of them.**

V – Conclusions

Wind Atlas





- **Energy prices for energy generated by large wind farms are approaching the prices of conventional sources (R$ 200,00 – wind ; R$ 137,00 – conventional).**

- **With lower prices of equipment and with better wind characteristics than previous expected, the penetration of wind energy in Brazil it will be higher than conservative nowadays forecast.**

- **Intermediate and small systems can be economically feasible in applications even with the present conditions.**

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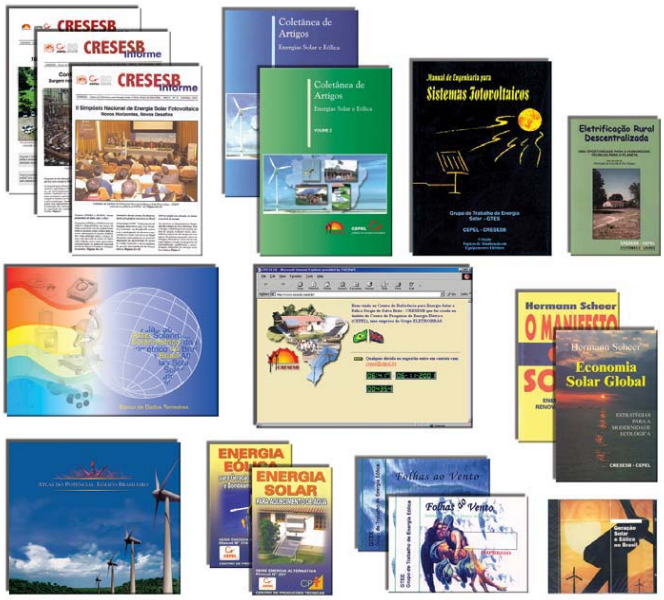

OBRIGADO PELA ATENÇÃO!

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A energia que movimenta o Brasil

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