



Centro de Pesquisas de Energia Elétrica

Grupo Eletrobrás



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Design of the New Information Centre of CRESESB

RIO6 – World Energy & Climate Event

Marco Galdino

November, 17-18, 2006



Eletrobrás 

Ministério de
Minas e Energia



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CEPEL

- **Electric Power Research Centre (Centro de Pesquisas de Energia Elétrica)**
- **CEPEL is a not-for-profit organization which belongs to the ELETROBRAS Group (ELETROBRAS – Brazilian Federal Electric Utilities Holding Company)**
- **Headquarters located at Cidade Universitária, Ilha do Fundão, UFRJ Campus (Federal University), Rio de Janeiro**
- **More than 30 years of R&D in electric power generation (including renewables), transmission and distribution, and also in operation and planning of electric systems**

CEPEL

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CEPEL Main Building - Fundão Island, Rio de Janeiro

RIO06 | NOV 2006

CRESESB

- **The Brazilian Reference Centre for Solar and Wind Energy (Centro de Referência de Energia Solar e Eólica Sérgio de Salvo Brito)**
- **CEPEL harbours CRESESB**
- **Supported by MME – Brazilian Ministry for Mines and Energy (Ministério de Minas e Energia)**

CRESESB – Main Objective

- **Foster the development of solar and wind energy in Brazil through dissemination of information and supporting studies, projects and events**

Activities of CRESESB

- **Publications (Brazilian Solar and Wind atlases, PV manual, books, etc.)**
- **Internet site (www.cresesb.cepel.br)**
- **Support for events (seminars, workshops, etc.)**
- **Operation of the Solar House (visitation, courses)**
- **PV courses**
- **Technical support to the MME (Ministry for Mines and Energy)**
- **Support for studies and projects**

New Information Centre

Objective of the New Centre

- Increasing the dissemination of information on Wind and Solar energy, adding to the Solar House and other existing resources of CRESESB

New Resources

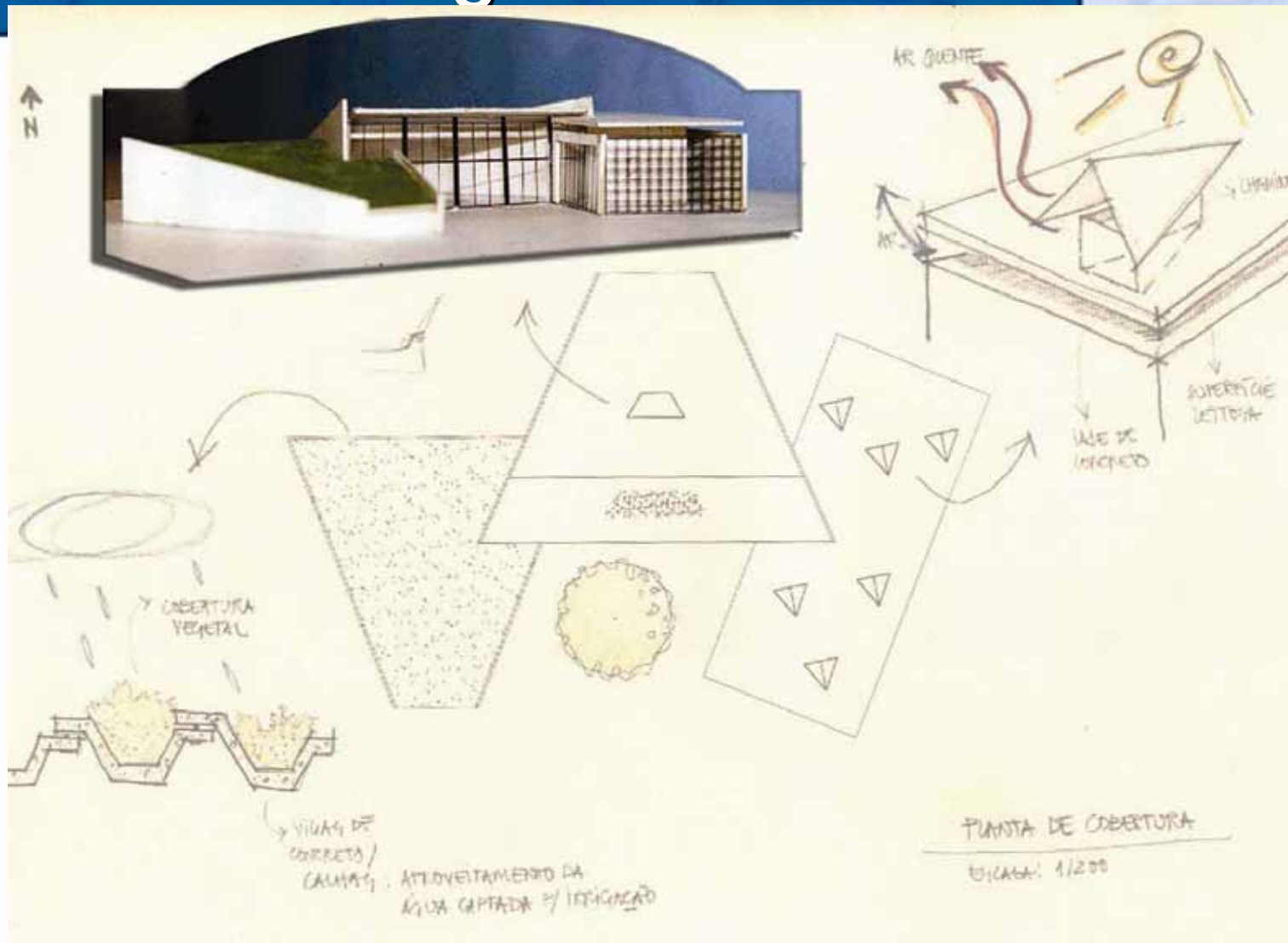
- Library and virtual library
- Rooms for the staff of CRESESB
- Multimedia classroom
- Study room
- Exposition hall
- Intended to receive visiting researchers during short stays

New Information Centre - design



- Project elaborated jointly by the School of Architecture of UFF – Universidade Federal Fluminense (Fluminense Federal University, Niterói), LABCECA – Laboratory for Energy Conservation and Ambient Comfort (Laboratório para Conservação de Energia e Conforto Ambiental) and CEPEL
- Project encloses concepts of Bioclimatic Architecture, BIPV – Building Integrated Photovoltaics and Energy Efficiency
- Six projects elaborated by groups of students of architecture, oriented by UFF (Prof. Louise Lomardo), and by CRESESB staff and CATE staff
- The Centre will be built at CEPEL´s backyard, next to the Solar House

New Information Centre - design



Project of students Estefânia Mello and Lana Carmona

Bioclimatic Architecture

- Providing human comfort (lighting and temperature) and reducing the energy consumption through adequacy of the building to the local conditions

Building Projected for the Information Center

- Exposition hall opened to South to receive natural lighting and little heat
- West wing (rooms and library) equipped with shadowing devices, a green façade and a double roof with a ventilated air gap
- East Wing (classroom) has a green roof for thermal insulation and cooling (evapotranspiration)
- Skylights for natural lighting in the bathrooms

Other characteristics

Rainwater Collection

- Rainwater will be collected on the roof, filtered (activated coal filter) and stored to be used for watering and floor washing (WC?)

BIPV

- Building integrated Photovoltaic System, installed on the roof with optimum orientation/inclination, in harmony with the architectonic design

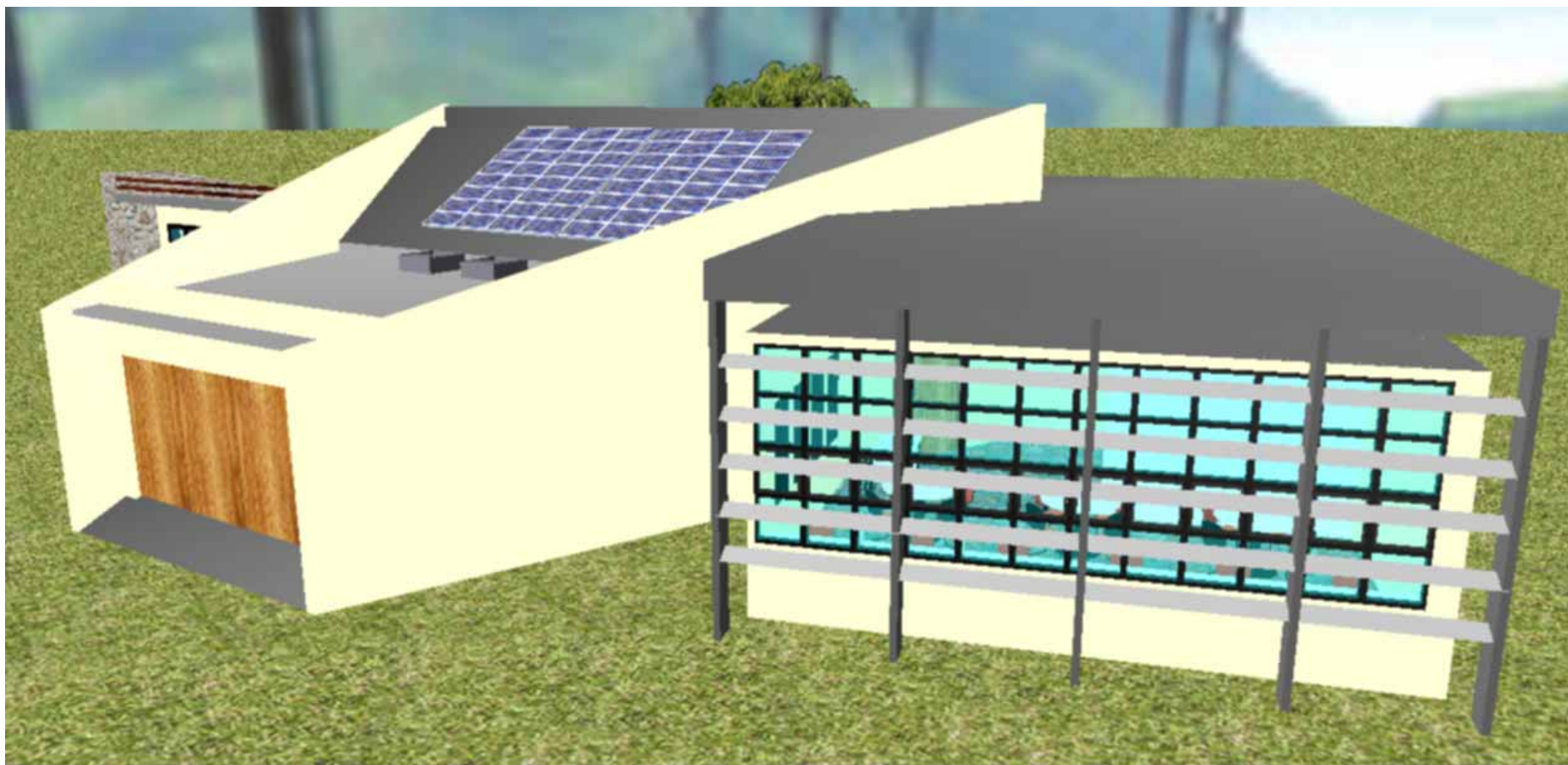
Wind Turbine

- A small grid-connected wind turbine in the range of 1kW will be installed

Irrigation

- A small PV system for irrigation is also being considered

North Façade



Electric Load and Energy Consumption

- Civil, electric, lighting and air conditioning projects still in progress

Estimated Electric Load (total 95.3kWh/day)

- Air conditioner with 154.000BTU/h and consumption of 68kWh/day
- Lighting load of ~2kW and consumption of 13.6kWh/day
- Other loads (computers, refrigerator, etc) with consumption of 13.7kWh/day

- Simulations using the program Visual DOE will help to estimate more accurately the consumption of electric energy for lighting and air conditioning and to choose construction materials (eg. glazing, etc)

Sizing of the PV system

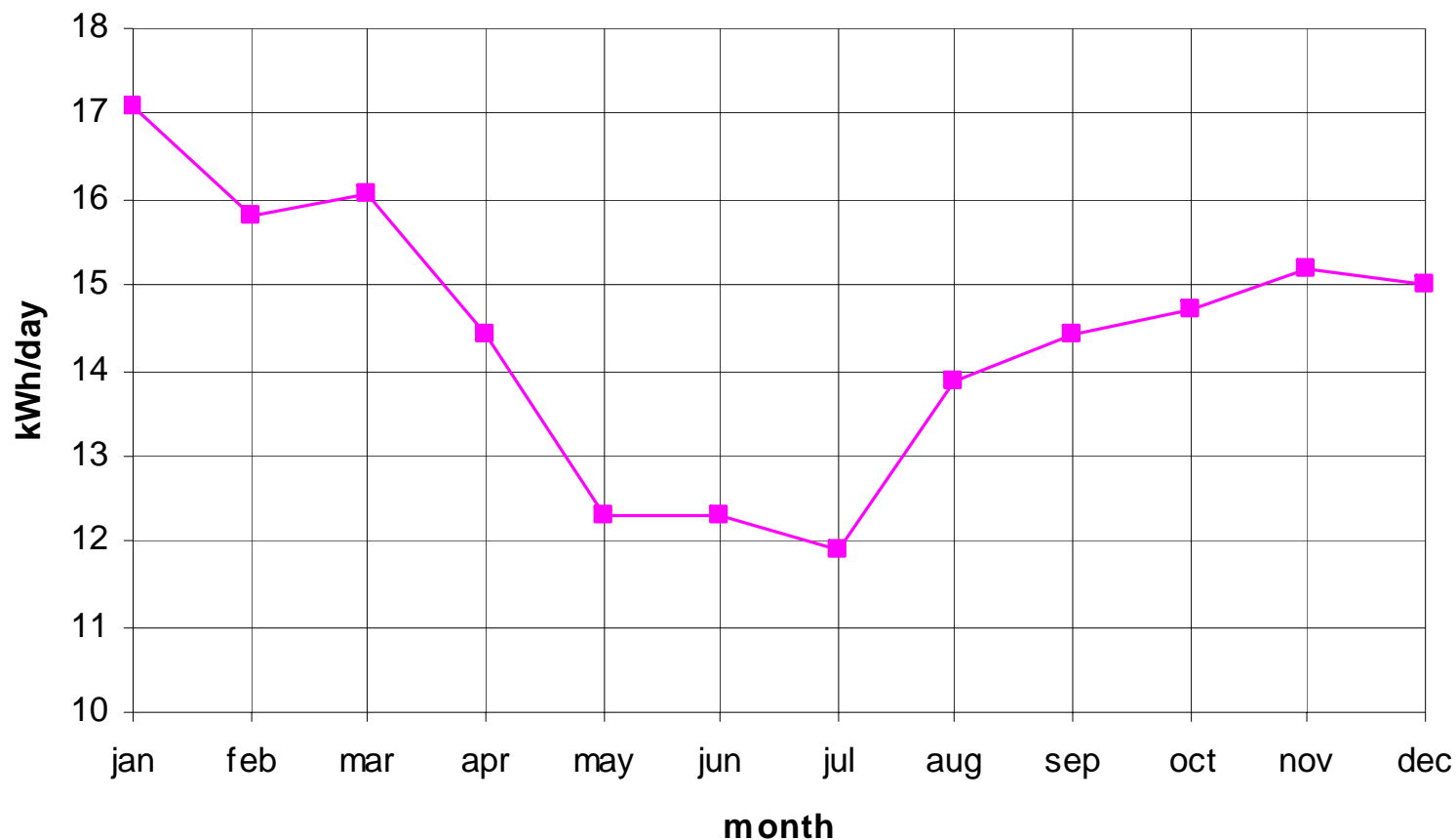
- Sizing of the PV system based on the former experience regarding the grid-connected PV system (16kWp) already installed in CEPEL since 2002

Sizing

- PV panel of ~4kWp
- 3 inverters of 1.1kW (each)
- Inverter Sizing factor (P_{inv}/P_{pv}) of 0.9
- Calculated annual generation of 5,262kWh (preliminary, according to the cf of the CEPEL's system) - 23% of the estimated consumption of the building

Sizing of the PV system

monthly daily generation calculated



Average daily PV generation calculated in the range from 12kWh/day (Jul) to 17kWh/day(Jan)

- A PC-based data acquisition system will measure and store the necessary environmental and electrical quantities, to allow performance evaluation of the project
- These data is intended also to be made available to the public through the internet in the future

Data to be Measured

- Solar radiation on the horizontal plane and on the plane of the PV array (W/m^2)
- Ambient temperature ($^{\circ}\text{C}$) and humidity (%)
- Wind speed (m/s) and direction ($^{\circ}$)
- Indoor temperature in the several rooms ($^{\circ}\text{C}$)

- Temperature of the PV array ($^{\circ}\text{C}$)
- Voltage (dc V), current (dc A) and power (W) of the PV Array
- Current (ac A) and active power (W) injected into the grid by each inverter
- Current (ac A) and power (W) consumed in the several circuits of the building (air conditioning, lighting, etc)
- etc.

Thank you for the attention !



CEPEL - Centro de Pesquisas de
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www.cepel.br

CRESESB - Centro de Referência de
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