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SHC
SOLAR HEATING & COOLING PROGRAMME
INTERNATIONAL ENERGY AGENCY

Presentation of PIMENT Laboratory

Location : Reunion Island (southern hemisphere !!!– tropical area :Africa!!!)

Main research topics :

Demand side management (DSM), renewable energy, simulation and control of energy systems, environmental and urban studies

Four research groups :

- Team Applied Mathematics for complex systems
- Team Buildings Physics
- Team Energy systems and Renewable energy
- Team Environmental engineering and urban studies

Keypoints:

- 23 permanent researchers (6 Profs, 3 A/P, 14 Senior lecturers)
- 11 PhD students
- 14 associate researchers

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Team renewable energy and energy systems

- Net Zero Energy Buildings (IEA task 40)
- Solar cooling systems
- Integration of renewable energy systems to buildings
- Ocean energy (thermal and mechanical)
- Integration of renewable energy into the electricity grid

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Experimental platforms

- IUT Pilot site in DSM and RE
  - 200 m2 of PV panels
  - Wind turbine
  - PV solar wings
- Real scale monitored systems
  - Solar cooling set-up
  - NZEB (Net Zero Energy Building)
  - Real scale building test cell
- Test cells under control or outdoor conditions (270 m2)
  - 200 m2 of PV panels
  - Small cell building test cells
  - Test bench for solar collectors
  - fully equipped weather station
  - Test cells under controlled conditions
  - Test bench for small air conditioning units

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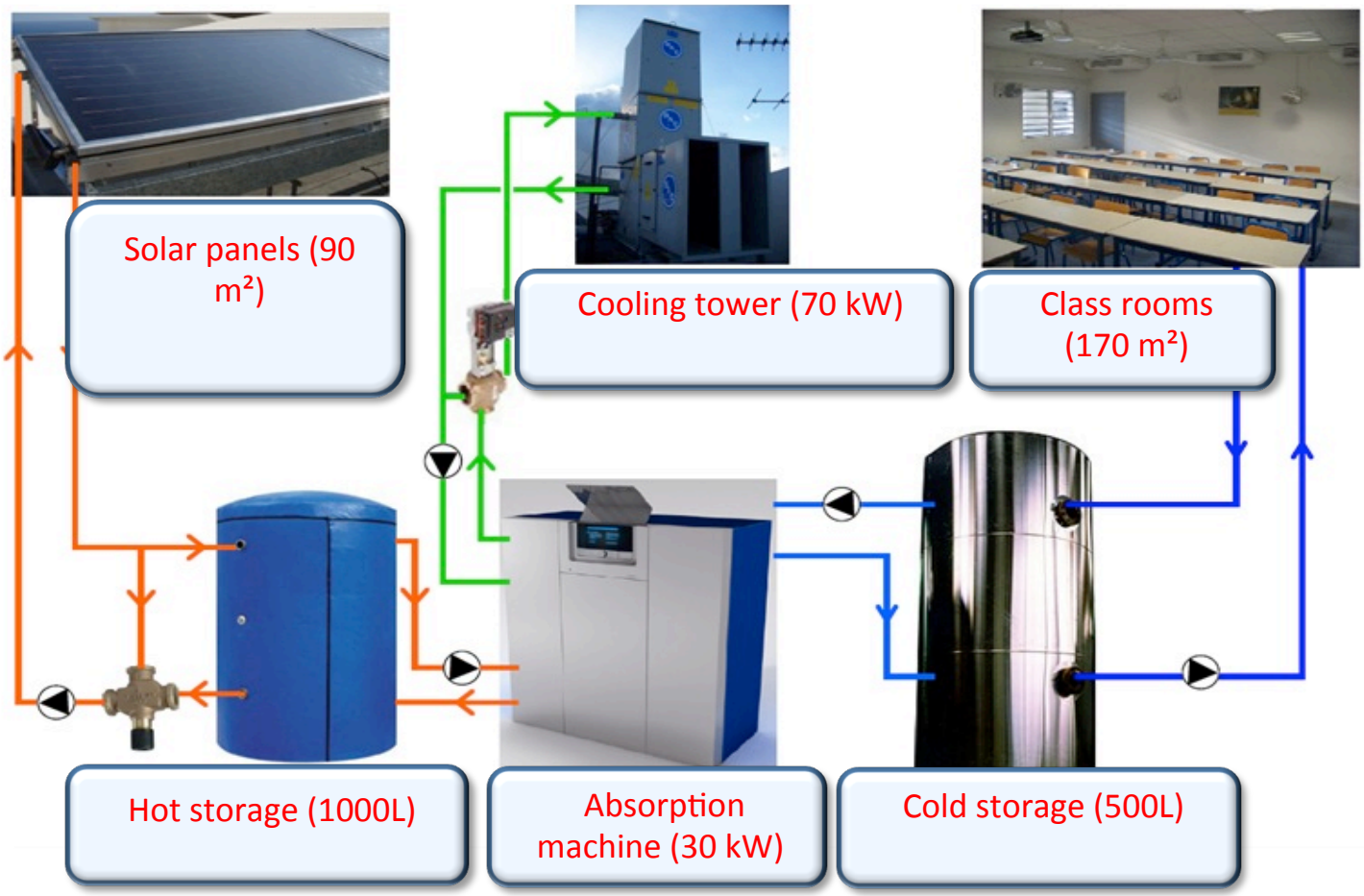
Rafsol installation:



Only cooling

No backcup

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Rafsol installation:

- 4 years of experimental investigations.
- Fully instrumented : Level III for performance evaluation according to task 38 procedure
- Still some improvement to explore :
  - Targets :
    - Electricity consumption of heat rejection loop : > 60%
    - 3 < COPelec< 5 (annual experimental values)
    - Lower operation cost
  - Tracks :

    Lower auxiliary energy consumptions
    - Adapted components
    - Better control strategies

Main interests in the New Task

- Find low energy cooling systems suitable for tropical climate (low heating needs)
- Finding answers everybody's asking on solar cooling: guaranteed energy performance, cost…

⇒Interest in : Subtask B

  - Sizing tool
    - Similar work as megapics project
    - Existing models

Main interests in the New Task

⇒Interest in : subtask C

- labeling of existing installation
  - Considering :
    - buildings and systems
    - Maintenance
    - Implementation
    - Behavior of users
    - …

Issue : defining the global performance through suitable parameters.

Ongoing and new R&D projects related to the New Task

- Previous research program on solar cooling:
  - RAFSOL : full scale solar cooling installation (30kW)
  - ORASOL : French National Research Agency (ANR) program for optimization of solar cooling processes

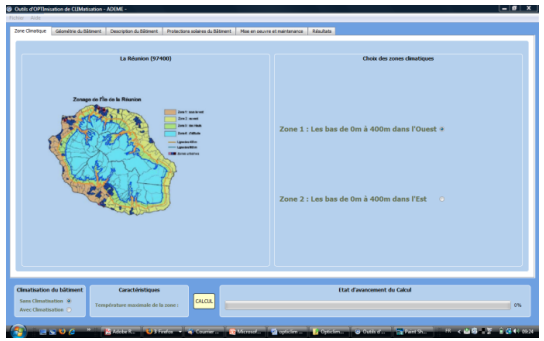
    Based on numerical and experimental comparison of 4 solar cooling technologies
  - Task 38 : participation on subtask B & C (simulation benchmark and experimental studies)
- Ongoing research program :
  - Megapics (ANR)
- Future research programs :
  - New ANR program (SEED) on :
    - Control strategies
    - Heat rejection
    - …

Inputs to the Work Plan

- Experimental set up : Rafsol installation :
  - Fully instrumented
  - Only for cooling
  - In tropical climate

- Results from ORASOL project

- Labeling procedure for conventional AC systems
  OPTICLIM project



- Validated models :
  - Components and whole installation
  - Simplified and detailed models

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