



Network of Universities  
from the Capitals of Europe



# Energy for a Sustainable Future - University of Lisbon

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UNICA Green Academic Footprint (UGAF)  
– 3rd Open Workshop  
6-7 June 2013, University of Lisbon



# Developed and Supported Projects

- Energy Production (Photovoltaic Systems)
- Energy Performance Certification For Buildings
- Energy Efficiency
  - Led's
  - Solar Thermal Systems
  - Remote Management
- Green Roofs
- Mobility





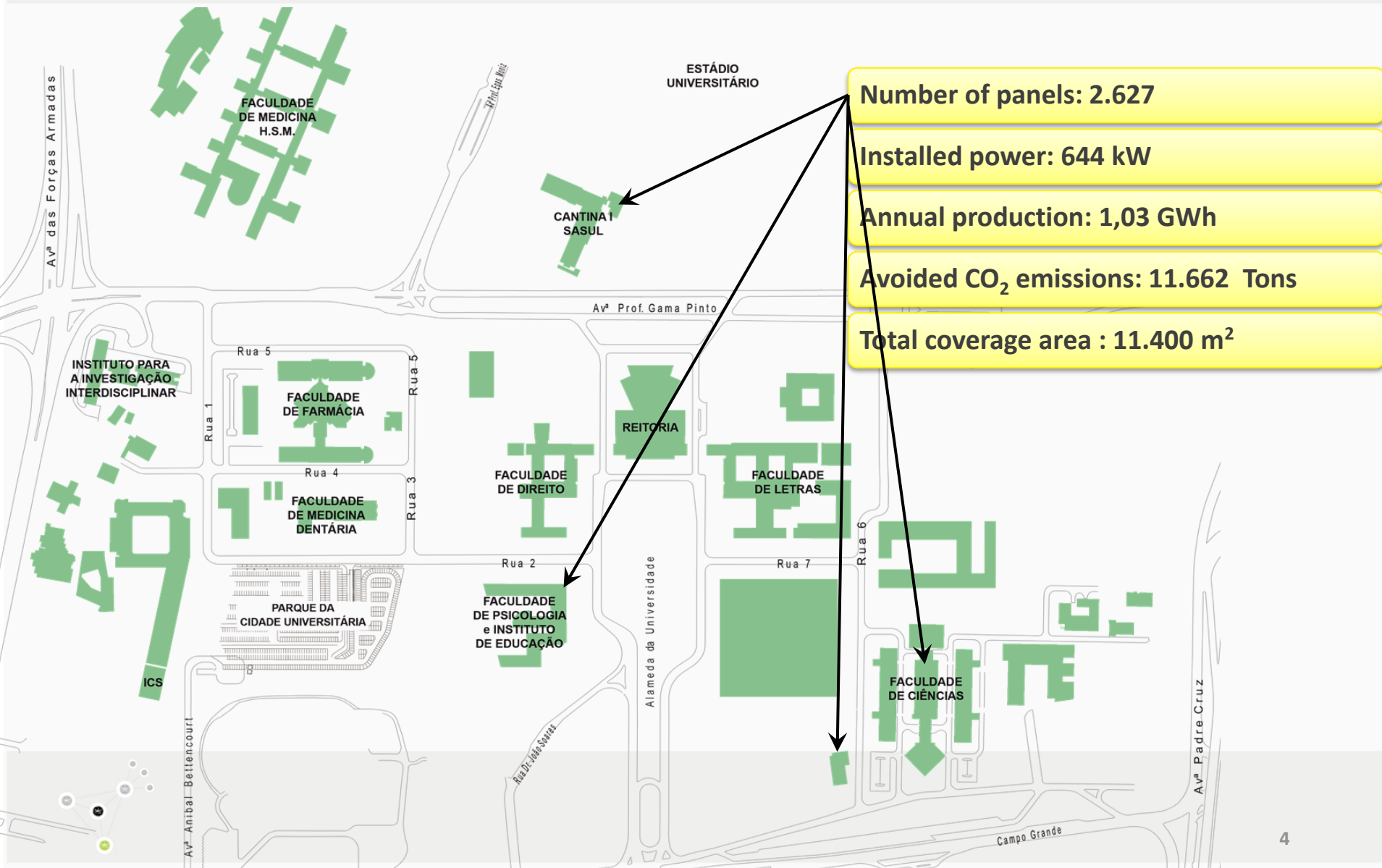
Energy Production

# PHOTOVOLTAIC SYSTEMS





## ENERGY PRODUCTION – 1st PHASE



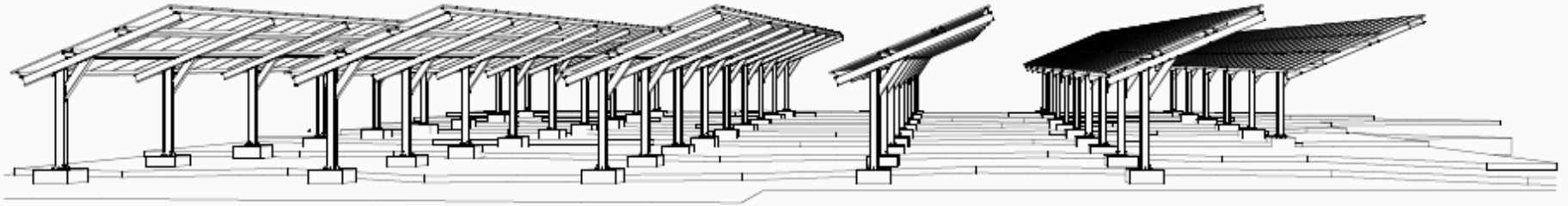


**1.146 Panels**  
**Connection to Grid Power: 250 kW**  
**Installed Power: 280 kWp**  
**Annual Production: 450.800 kWh**





# Energy Production – Faculty of Science



**522 Panels (Parking system)**

**Connection to Grid Power: 116 kW**

**Installed Power: 128 kWp**

**Annual Production: 205.280 kWh**



# Energy Production – Faculty Psychology and Education Institute



**592 Panels**  
**Connection to Grid Power: 116 kW**  
**Installed Power: 145 kWp**  
**Annual Production: 233.240 kWh**



## Energy Production – Canteen



**354 Panels**

**Connection to Grid Power: 75 kW**

**Installed Power: 86,73 kWp**

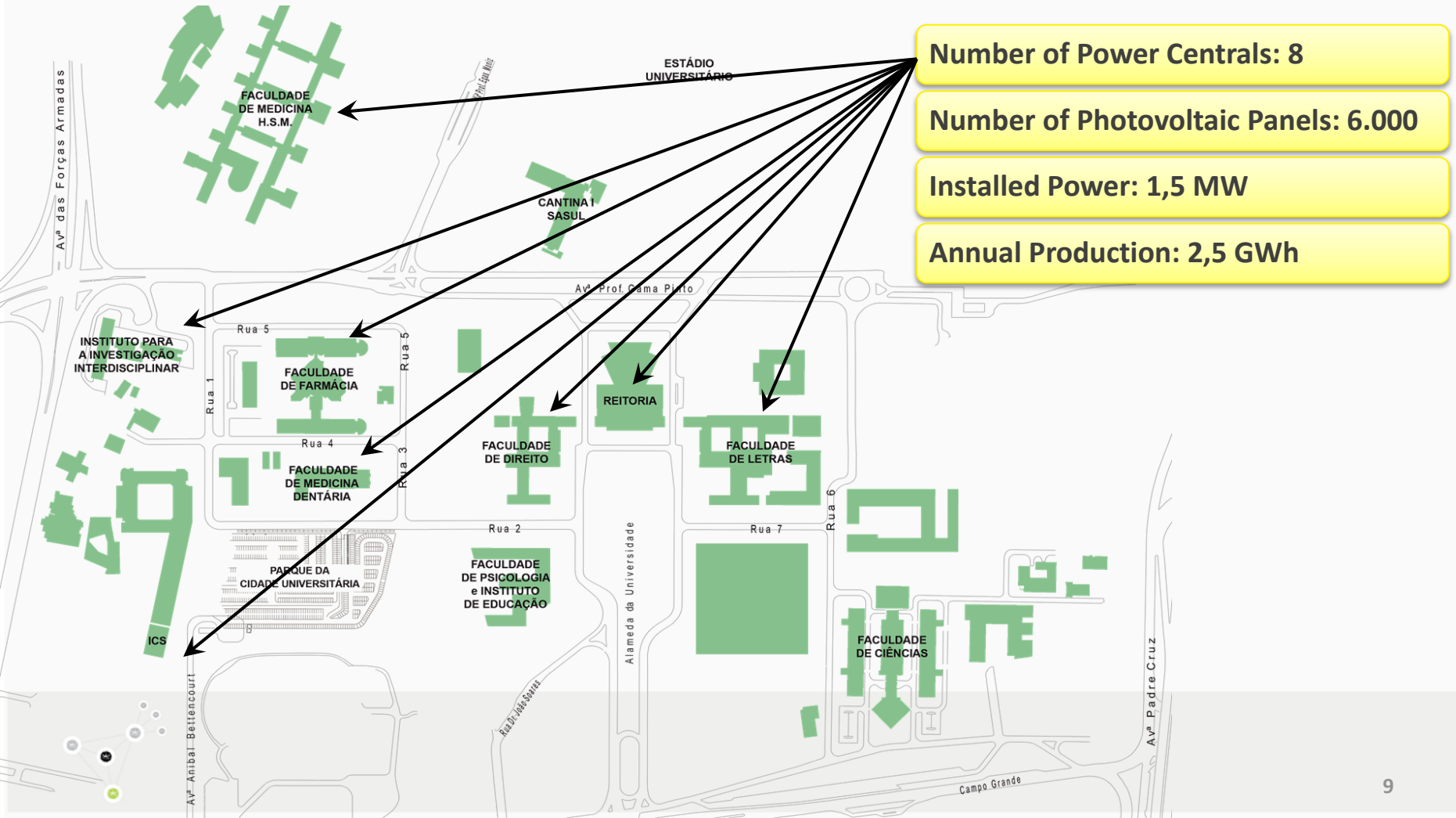
**Annual Production: 139.160 kWh**





# ENERGY PRODUCTION – 2nd PHASE

From June to October 2013





# ENERGY PERFORMANCE CERTIFICATION FOR BUILDINGS



## Energy and Indoor Air Quality Audits:

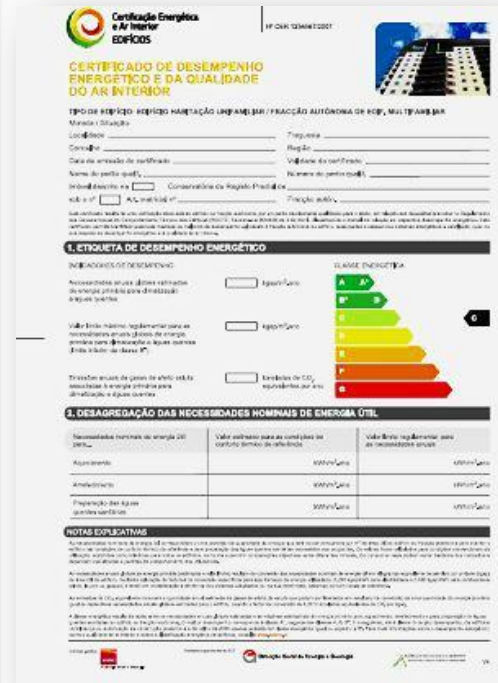
- Sciences Faculty (Buildings - C1, C2, C4, C7);
- Psychology Faculty and Education Institute;
- Canteen;
- Institute for Interdisciplinary Research.

**Started:** October 2012;

**Current state:** Energy audits ended; 2<sup>nd</sup> sampling of indoor air quality;

**Results:** Energy efficiency measures implemented in buildings in order to reduce energy consumption.

*Transposed from the Directive N. 2002/91/CE, of the European Parliament and Council*



**CERTEFICADO DE DESEMPENHO ENERGETICO E DA QUALIDADE DO AR INTERIOR**

TIPO DE EDIFICIO: HABITACAO UNIPERSONAL FRACCIONADA AUTONOMA DE BOM, MULTIFAMILIAR

Localidade: \_\_\_\_\_

Condição: \_\_\_\_\_

Data de emissão do certificado: \_\_\_\_\_

Nome do ponto de venda: \_\_\_\_\_

Indicador de eficiência energética: \_\_\_\_\_

Indicador de qualidade do ar interior: \_\_\_\_\_

**1. ETIQUETA DE DESEMPENHO ENERGETICO**

Indicador de eficiência energética: \_\_\_\_\_

Indicador de qualidade do ar interior: \_\_\_\_\_

**2. DESAGREGACAO DAS NECESSIDADES NOMINAIS DE ENERGIA UTIL**

Necessidade nominal de energia útil (kWh/m²/ano)	Valor estimado para as condições de referência	Valor limite regulamentar para as necessidades nominais
Aquecimento	100000 kWh/m²/ano	100000 kWh/m²/ano
Arrefecimento	100000 kWh/m²/ano	100000 kWh/m²/ano
Preparação das águas quentes sanitárias	100000 kWh/m²/ano	100000 kWh/m²/ano

**NOTAS EXPLICATIVAS**

As necessidades nominais de energia útil (kWh/m²/ano) são determinadas com base na metodologia de cálculo descrita no Anexo I da Diretiva 2002/91/CE, considerando as características técnicas do edifício e as condições de referência estabelecidas na Diretiva 2002/91/CE.

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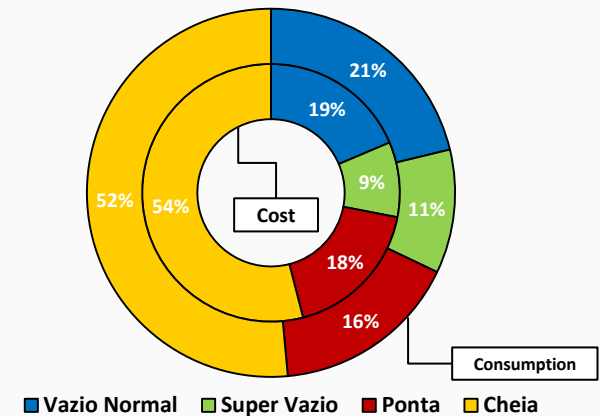
# ENERGY EFFICIENCY



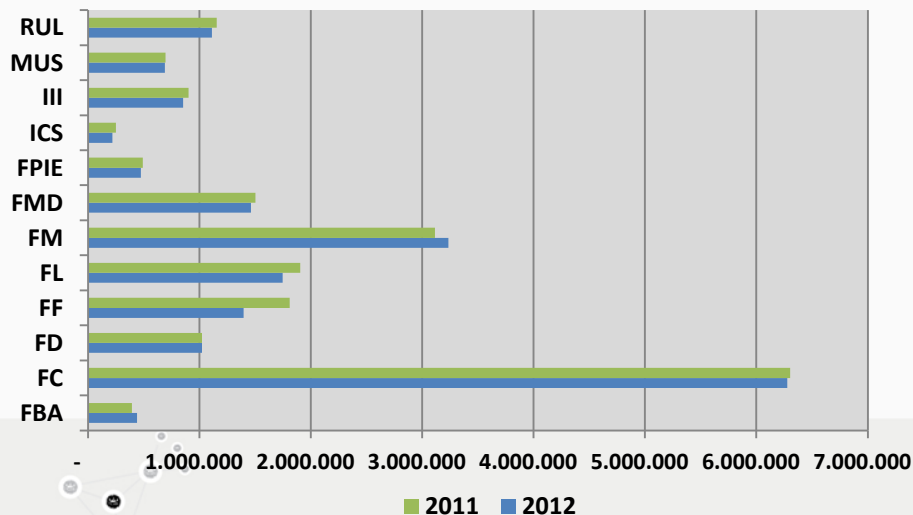
## Energy Efficiency

- Consumption reduction;
- Electricity and gas contracts management;
- Energy management system implementation;
- Awareness of academic communities;
- Equipment replacement (more efficient equipment);
- Monitoring of energy consumption;
- Annual reporting of each faculties' energy consumption.

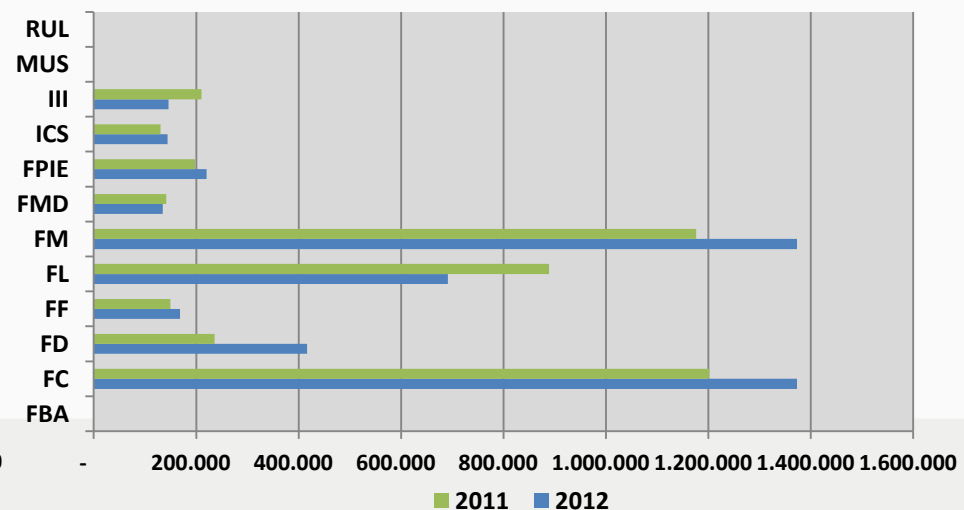
Annual Electricity Consumption Distribution (2012)



Annual Electricity Consumption per Unit (kVAh)



Annual Gas Consumption per Unit (kWh)



# Energy Efficiency – LED LAMPS

Lamp replacement (more than 200.000):

- Halogen e incandescent;
- Fluorescent;
- Street lighting.

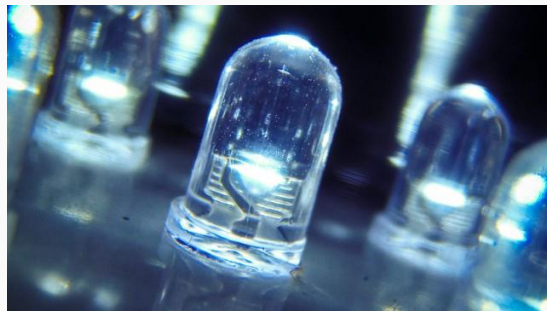
Light quality improvement

Cost reduction

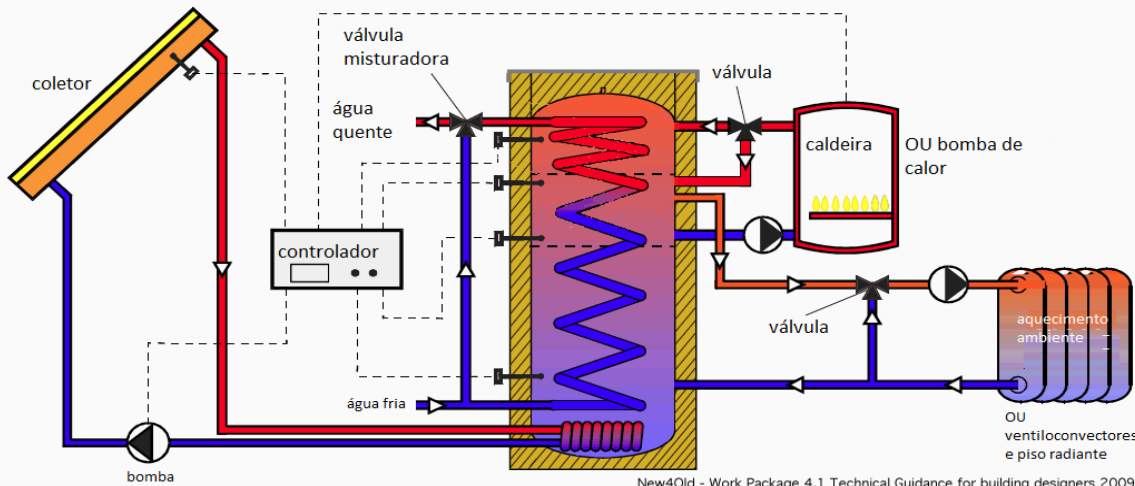
Equipment's lifespan extended

Reduced thermal load

*Flicker* and reactive energy reduction



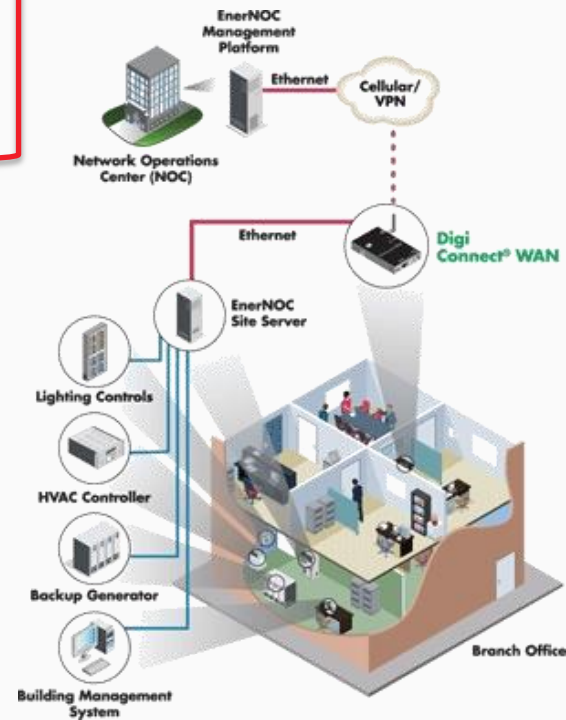
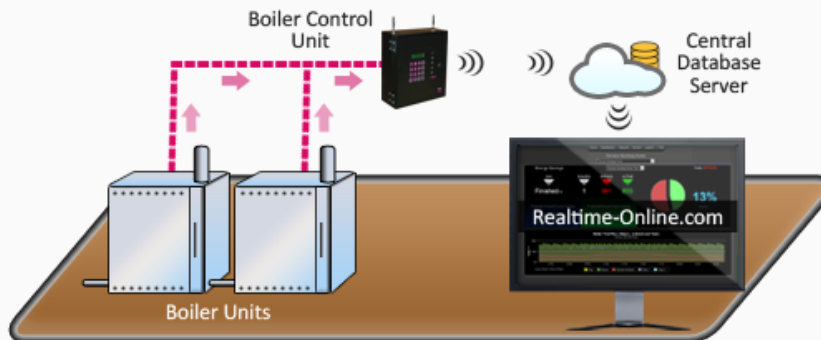
Gas consumption reduction;  
Installation to support existing gas boilers (hot water and heating);  
Solar fraction of 35 – 40%;  
Installation on rooftops.



New4Old - Work Package 4.1 Technical Guidance for building designers 2009



Consumption control;  
Installation of electricity partial meters;  
Structuring of consumptions per building, floor and/or room;  
Adequacy of efficiency measures for each monitored sector;  
Active consumption reduction.







# GREEN ROOFTOPS

# Green Rooftops

Reduction of thermal range in buildings;  
About 50% retention of precipitation;  
Carbon sequestration in vegetable biomass;  
Biodiversity promotion through indigenous species.





# MOBILITY – BICYCLE PARKING

# Mobility – Bicycle Parking

Acquisition and installation of bicycle parking systems - **200 parking spaces**

- ✓ Faculty of Sciences
- ✓ Faculty of Pharmacy
- ✓ Faculty of Letters







# THE UNIVERSITY AND THE CITY...

# The University and the City...

- ✓ The University and the implemented projects can be objects of study for other Universities and public organisms;
- ✓ The University can act as demonstration of the applicability of these projects for the city:
  - Example – Lisboa e-Nova, Lisbon’s municipal energy agency, organized a “Solar Technologies Tour” in Lisbon and one of the interest points was the Universities’ photovoltaic production facilities;
  - Researchers from the Lisbon University can use the photovoltaic power plants to carry out any studies on renewable energies and photovoltaic technology;
- ✓ Decentralized energy production:
  - Reduces the import of fossil fuels;
  - Reduces CO2 emissions;
  - Improves the cities’ air quality (the power plant is located about 30 km from Lisbon);
  - Reduces grid losses (the consumption points are closer to the production centers).



# The University and the City...

- ✓ The Energy Efficiency projects may serve as “test tube” for other public entities;
- ✓ Public awareness importance through media reports:
  - Technology usage – LED’s;
  - Energy consumption reduction;
  - Life quality improvement (lower air pollution, improved building insolation, lower energy costs);
- ✓ Mobility changes:
  - Reduces traffic around the University;
  - Reduces CO2 emissions by reducing traffic;
  - Improves life quality by inducing exercise;
  - Raises awareness on health and environmental benefits.



THE BOTTOM LINE IS THAT **WE AIM** TO BE THE  
***TRANSITION PLATFORM*** FOR A **MORE**  
**SUSTAINABLE CITY!**







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# Thank you very much!

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