

RENEWABLE ENERGIES Chair

University of Évora

An overview: history, strategy, on going projects

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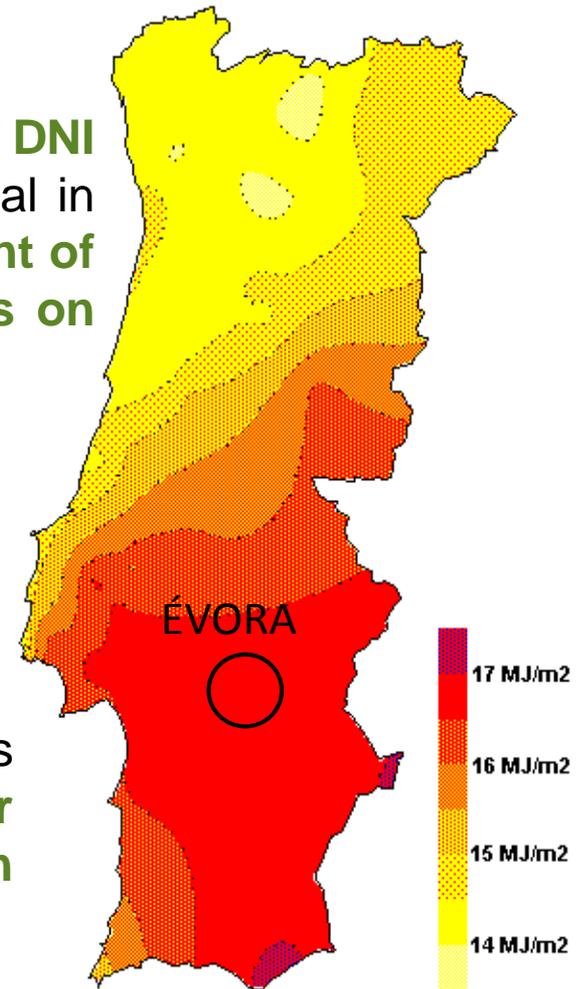
| Renewable Energies NB Chair: background

□ Solar Energy at U.Évora

Located in the heart of the **region with highest DNI potential in Portugal** (and one of the highest potential in Europe) the Univ. Évora is investing in the **development of activities in the field of RE with a particular focus on Solar Energy:**

- Engineering License in RE (first in Portugal)
- Master Sc. degree in Solar Energy Engineering
- Doctoral program in Mechatronics and Energy

Aiming at establishing world class R&D activities in this field, the **RE NB Chair was created in November 2010**, with a particular **focus on solar concentration technologies and applications.**



| Renewable Energies NB Chair: team

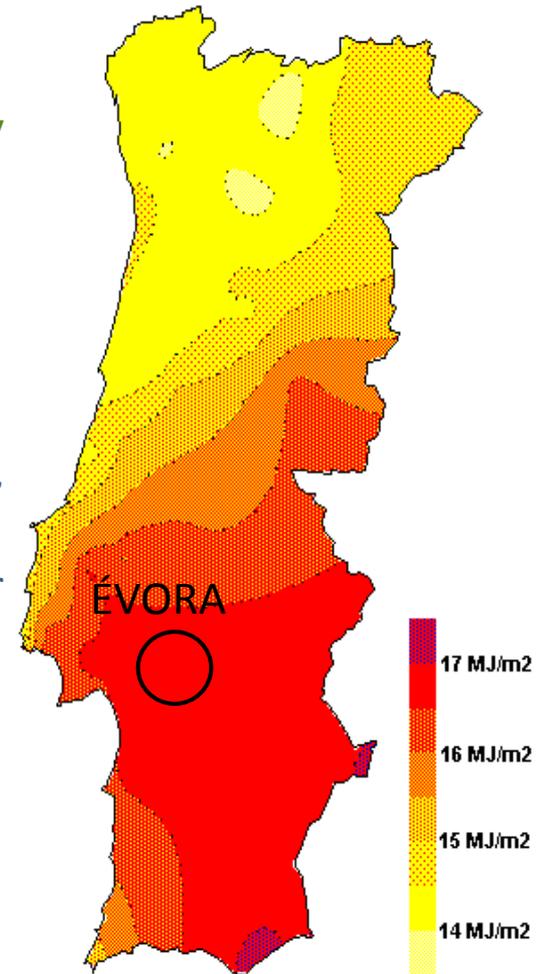
- ❑ **Multidisciplinary team** covering different topics in solar concentration systems and applications

~4 years after its creation the **Chair's team currently comprises:**

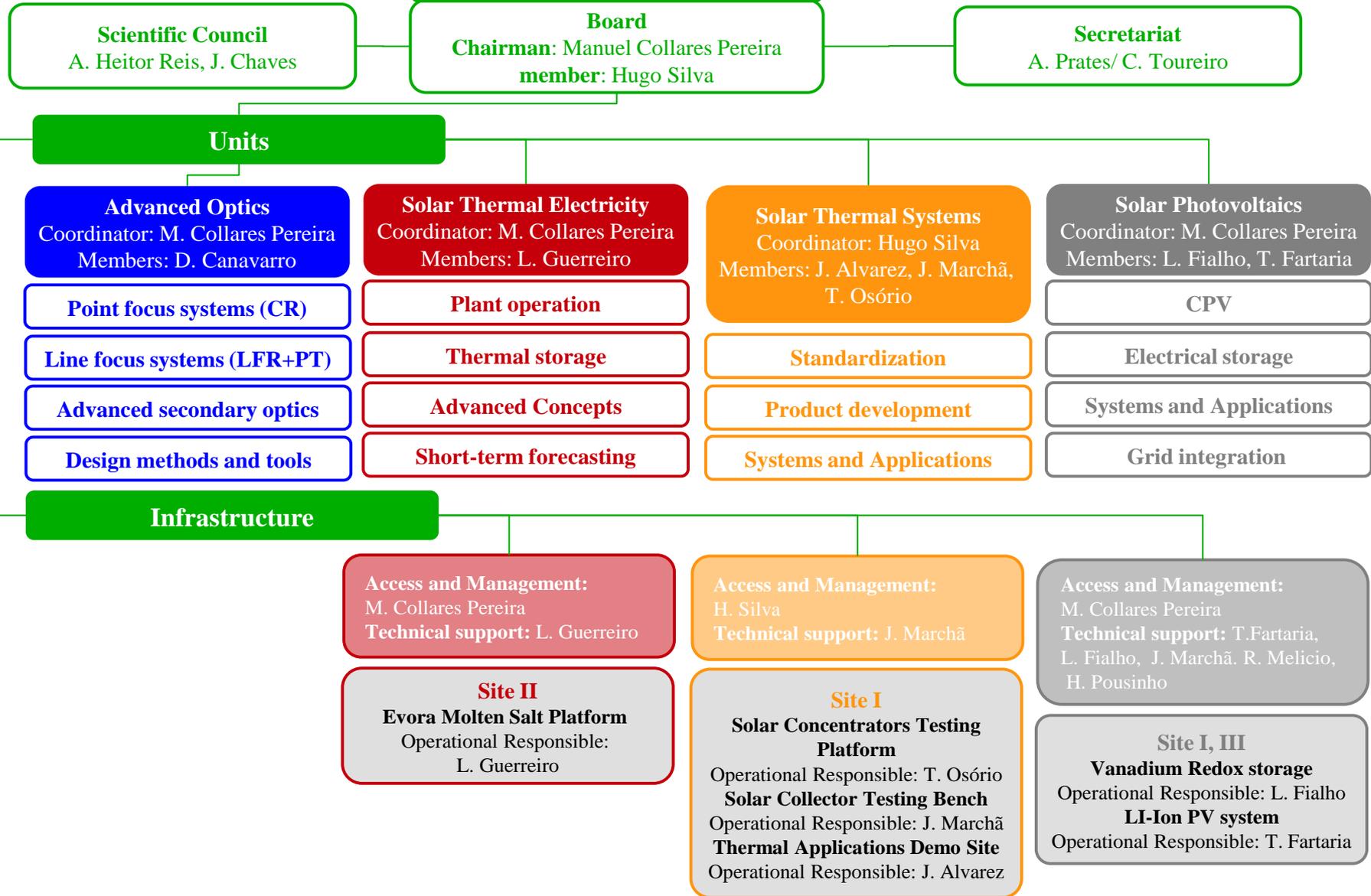
- Chairman: Prof. Dr. Manuel Collares Pereira
- PostDoc /Aux. Researcher : Diogo Canavarro (Ph.D. U Évora)
- Hugo Gonçalves da Silva
- Research Assistant: João Marchã
- 6 PhD students: Luís Guerreiro, Tiago Osório, Tomás Fartaria, Luis Fialho, Afonso Cavaco, José Alvarez

Several final students at License and Master's levels, from year to year

The team will grow with the admission of new students and researchers (on a new projects base) and is completed through the **cooperation with different related U.Évora Departments (e.g. Geophysics, Mechatronics, Chemistry...)**



NB Renewable Energies Chair



| Renewable Energies NB Chair: Research topics/results

- Advanced Optics
- Solar Thermal Electricity
- Solar Thermal Applications (Industrial Process Heat, Dessalination, Cooling...)
- PV- BIPV, grid interface engineering
- Energy Storage (thermal, electrochemical)
- (...)
- **Publications: 12 in Major Journals**
10 in International Solar Conferences
(Proceedings with Referees)

| Renewable Energies NB Chair: Existing projects and participations

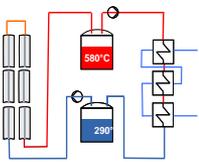
The Chair participates in :

- EU-SOLARIS
- STAGE-STE
- SFERA-II

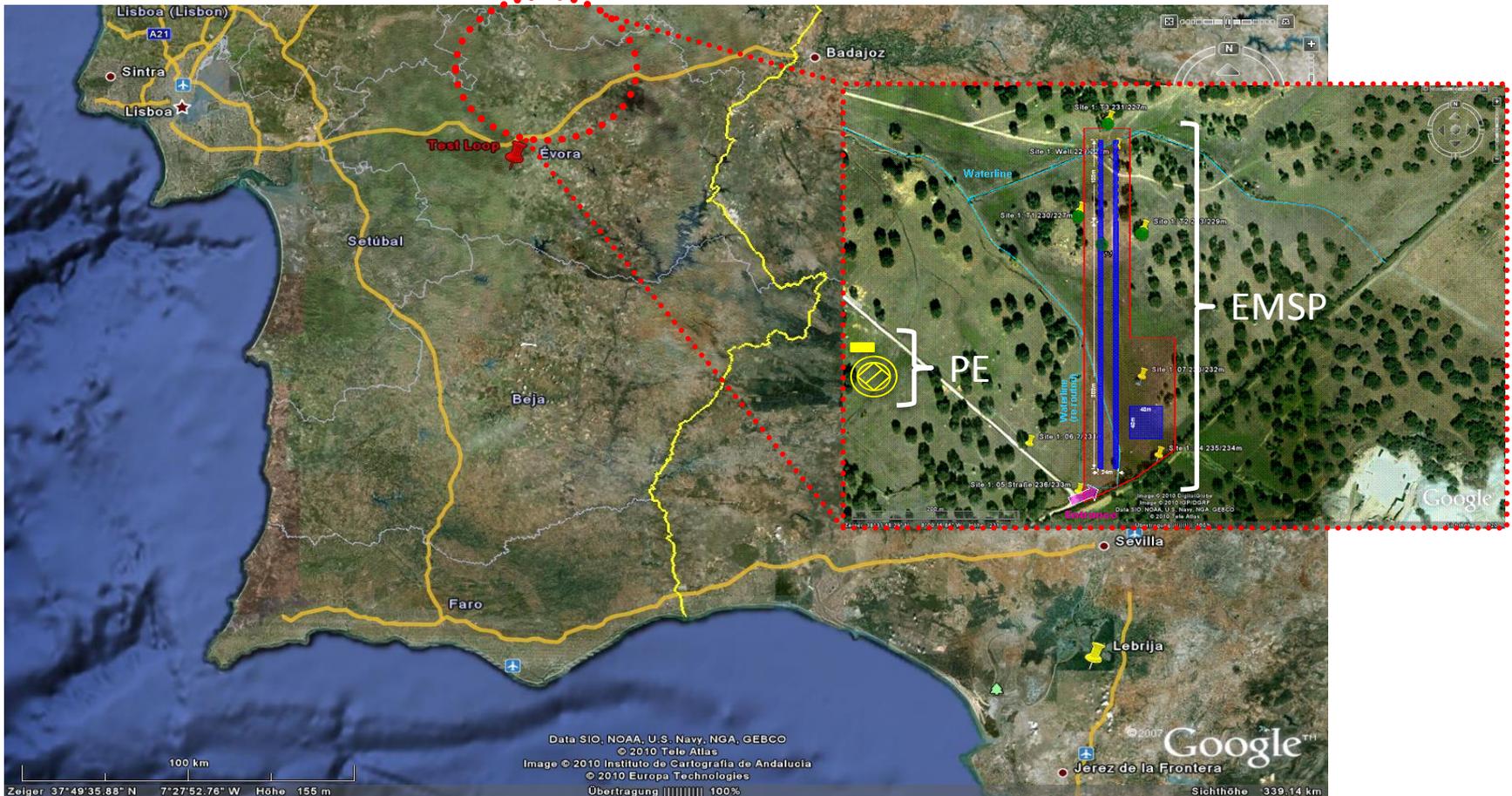
and also in FP7 projects

- PVCROPS
- REELCOOP

It participates as well in IEA's Task 49



Herdade da Mitra- platforms for concentrator testing and solar field+ energy storage testing



Circuito de sais fundidos ($T < 580^{\circ}\text{C}$) - EMSP
 Plataforma de $18 \times 13 \text{m}^2$ para ensaio de módulos de grande dimensão ($T < 400^{\circ}\text{C}$) - PE

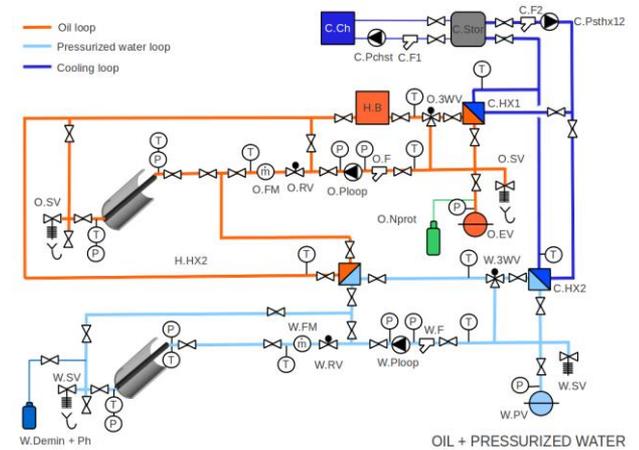
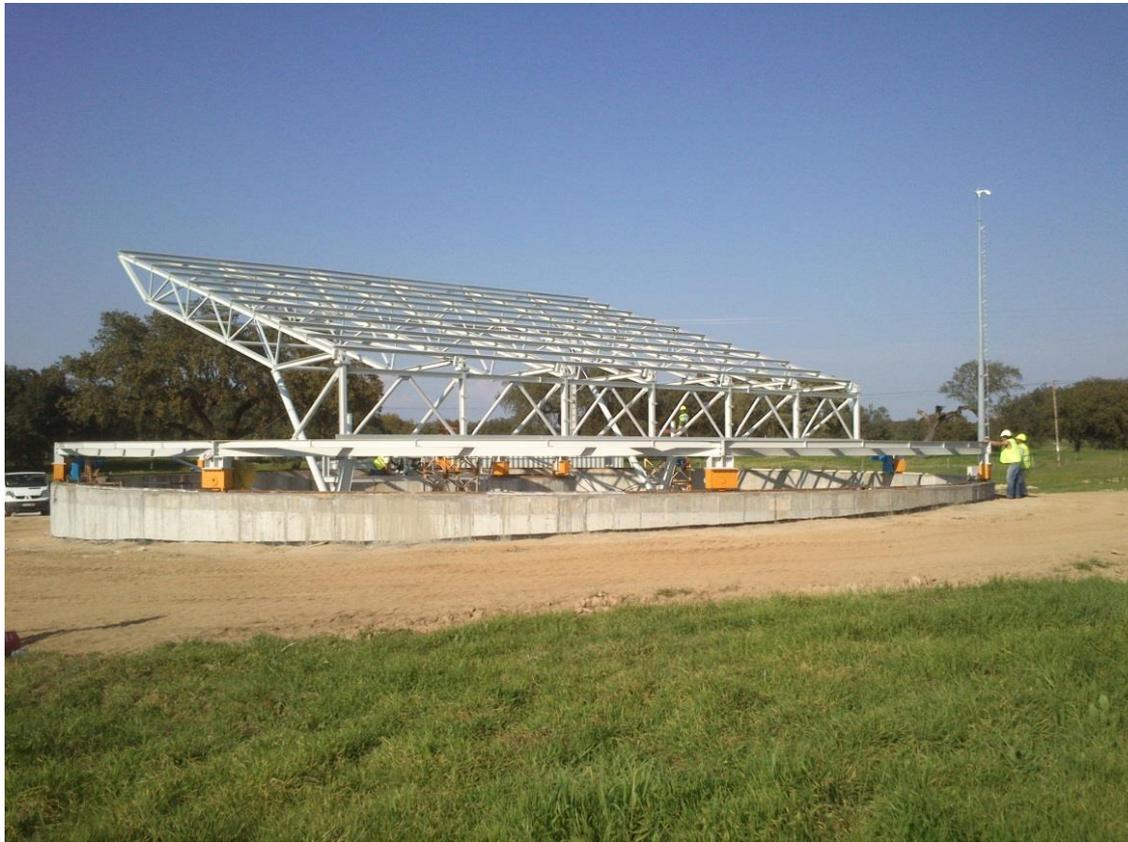


Evora Molten Salt Platform- EMSP;
T<580°C; with storage and steam
production (540°C, 100bar)

- 1,6MWth- Ultimate Trough
(Flabeg)
- 1.5MWth- LFR Ematched
(InnovLFR : Project H2020)



2-axis Tracking Platform (13x18m²); financed from QREN- InAlentejo
 Full large concentrator modules testing : Oil loop (T<400°C) ;
 pressurized water loop (T<250°C)



| Renewable Energies NB Chair: Research agreements

- DLR
- Fraunhofer ISE
- **HSP-2** : DLR+U. Evora + 6 companies:
- BASF
- SBP Sonne GmbH
- YARA Industrial GmbH
- TSK Flagsol Engineering GmbH
- FLABEG FE GmbH
- STEINMÜLLER Engineering GmbH



| Renewable Energies NB Chair: Horizon 2020 proposals

3 proposals just approved

InnovLFR (U.Evora) -Innovative LFR concentrator for cost competitive Solar Thermal Electricity

Maslowaten (U.Politecnica de Madrid) Market uptake of an innovative irrigation Solution based on **LOW WATER-ENERGY** consumption

PreFlexMS (Alstom) Predictable & Flexible Molten Salts Solar Power Plant (PreFlexMS)

INIESC-the opportunity

- Brings together the two leading institutions in Portugal with competence in Solar Concentration in its multiple aspects : U. Évora (Renewable Energies NB Chair) and LNEG
- High complementarity
- Presently with strong and active pursue of several important R&D topics in SEC
- Substantial Infrastructure type investment already made
- Strong integration with ESFRI and other european R&D networks and projects

Example of Advanced Optics: Linear Fresnel Etendue matched- XX-SMS

XX-SMS

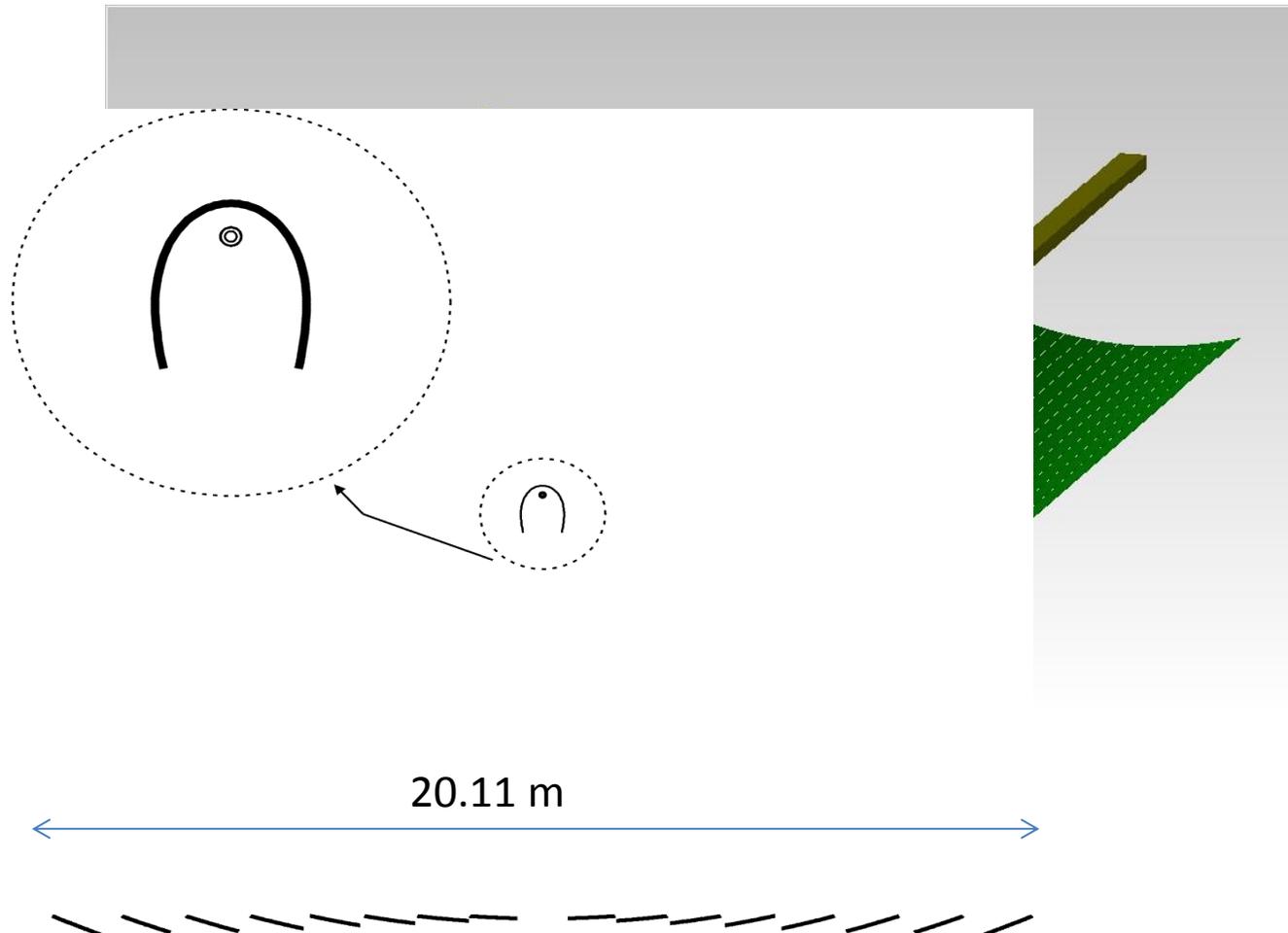
$C=74x$

$CAP \sim 0.57$

Same 70mm tube

Same acceptance
angle

expected $\eta=14\%$



PVCROPS- Vanadium Redox Flow Battery; site Herdade da Mitra; BIPV



6.2 kW PV system on roof of building
5kW battery
60KWh storage capacity



PV CROPS: advanced Li-Ion batteries

5KW

32kWh storage capacity



DNI measurement in Alentejo

Universidade de Évora +
AREANATEJO

and IPES associates :

Lógica

Enercoutim

Integrum Solar

Inegi

+

LNEG, Generg



Creation of IPES, a not for profit association (Instituto Português de Energia Solar (2012)), integrating the R&D institutions, Energy Agencies, the finance sector and some of the main companies interested in Solar Thermal Electricity and PV in Portugal. **IPES aims at being a catalyst for R,D&D+I in Solar Energy in Portugal, promoting technology transfer to its associates and among them, actively supporting the definition and the promotion of adequate enerav policies for the sector**



NOVO BANCO
CREDITE

OPEN RENEWABLES
Dreen - De VIRIS

TÜV Rheinland PORTUGAL

RAUL César FERREIRA
INTEGRUM Energia
(Grupo SONAE)

SCHREDER Lighting

MARTIFER Solar
ENERCOUTIM

UEVORA

ADENE

INEGI

AREANATEJO

EXOSUN

SUNOK

EFACEC

GENERG

EDPi

ISQ

ENERGYIN

LÓGICA

SUN AID

PCTE

In conclusion

U. Evora: **Renewable Energies Chair**

It is a work in progress

Jointly with LNEG, creation of the Research Infrastructure **INIESC**, to be the leading institution for solar concentrating technologies in Portugal

Establishing an essential network with the most active and important European R&D Institutions in the Solar field

Setting itself up to work with top European (and Portuguese) companies in this field