



Solar Thermal Power Plants **SOLAIR** TECHNOLOGY



... Clean Electricity from Solar
Energy and Atmospheric Air



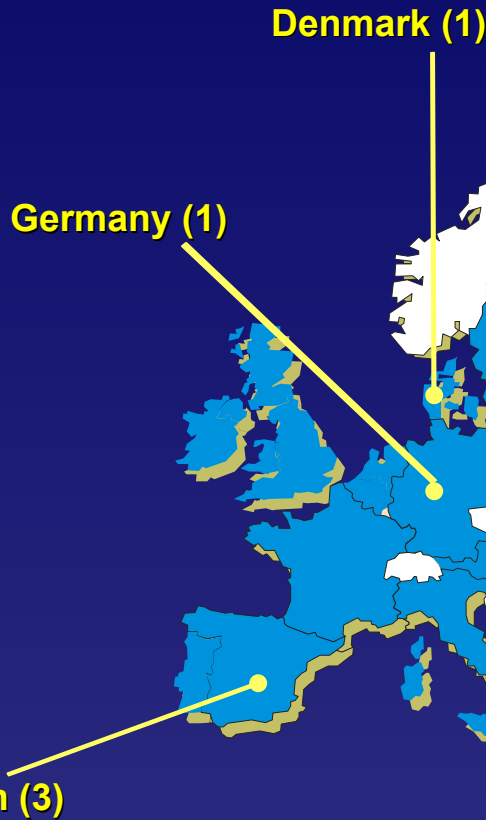
Dr. Manuel Romero
CIEMAT
Plataforma Solar de
Almería



SOLAIR EUROPEAN CONSORTIUM



HelioTech

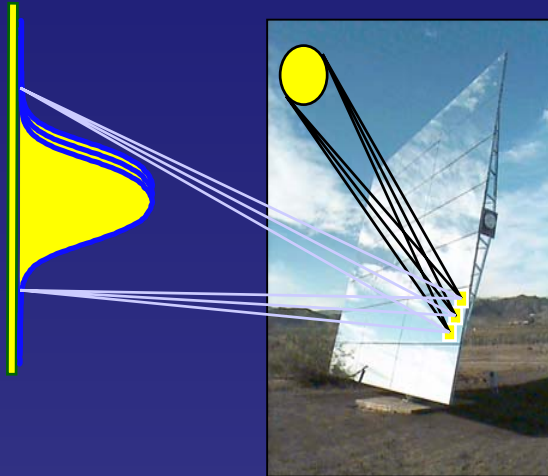
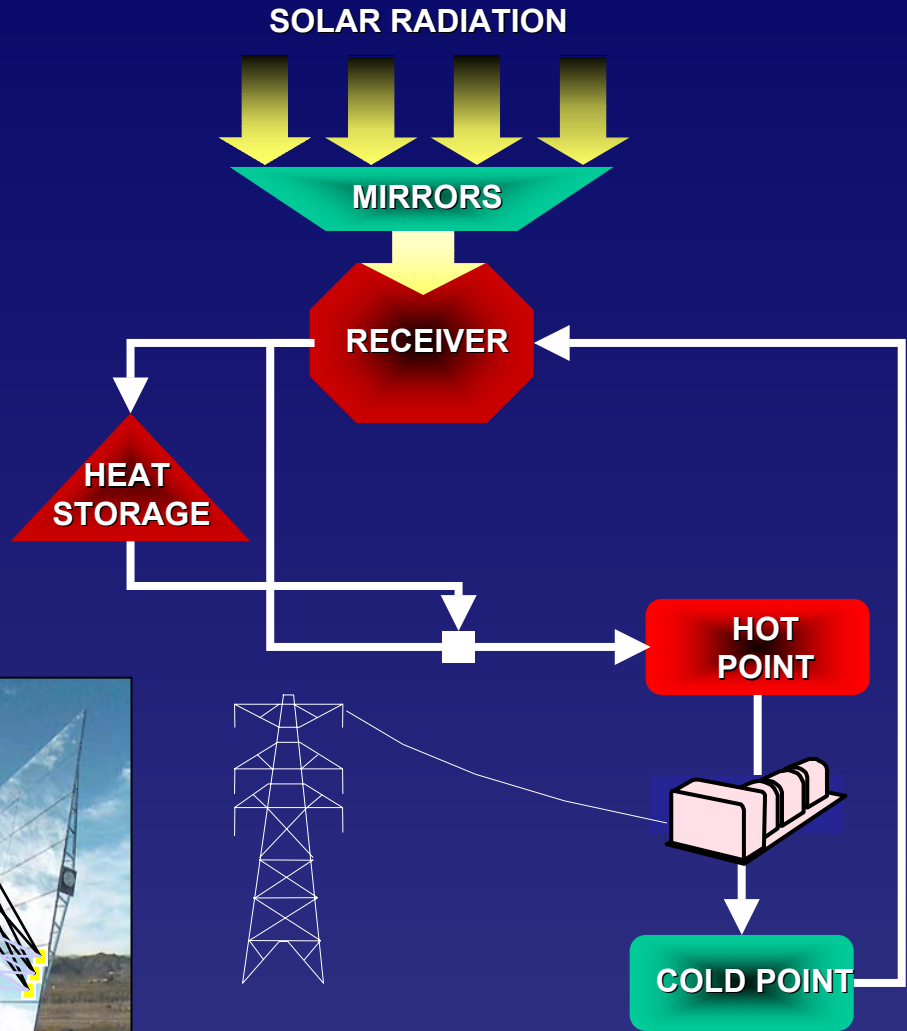


CERTH

A combination of solar R&D, solar engineering, ceramics and materials science



What is solar thermal power all about?





What is solar thermal power all about?



- ★ Best solar **integration** into conventional thermal power plants.
- ★ Thermal storage means **dispatchability** without perturbations of the grid.



Potential of Solar Thermal Power Plants - A huge reservoir in the sunbelt -



With Solar Thermal Power Plants,
each square meter of mirror
produces
up to 500kWh of electricity per year,
avoiding.....
12 tons of carbon dioxide emissions
and saving
2.5 tons of fossil fuel
over its 25 year lifetime.

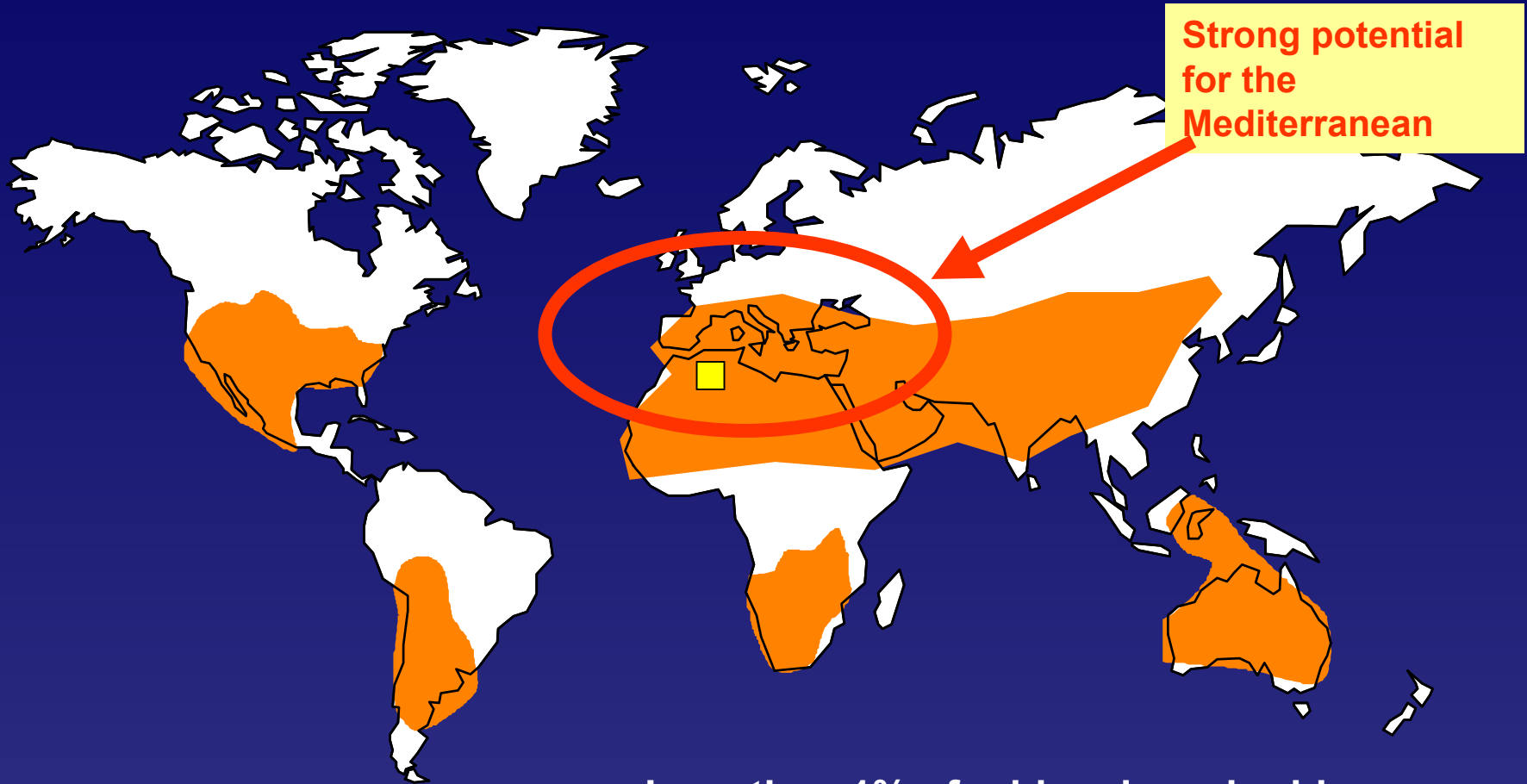


How
relevant are
those
figures?



Potential of Solar Thermal Power Plants

- A huge reservoir in the sunbelt -



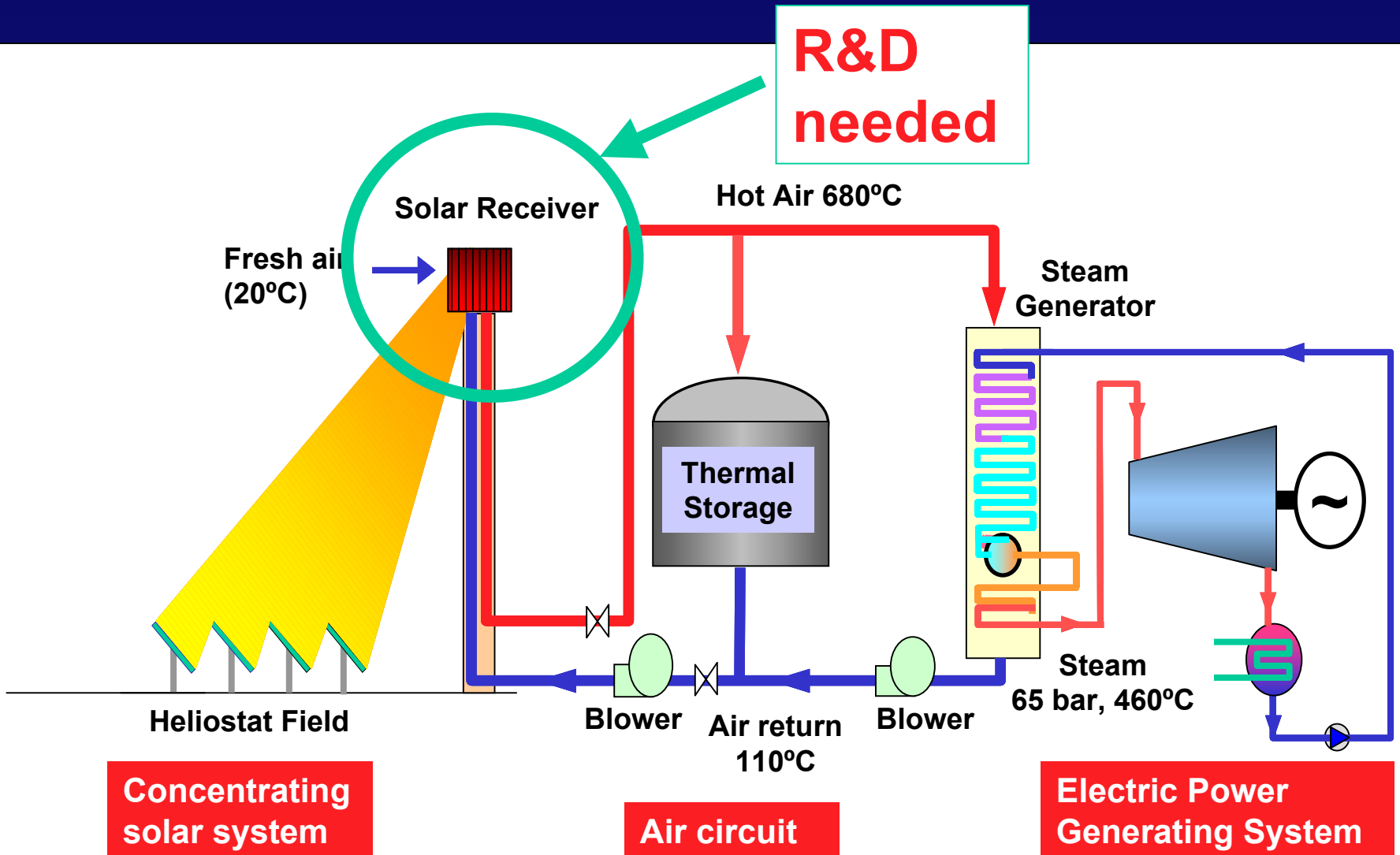
Strong potential for the Mediterranean

Less than 1% of arid and semi-arid areas are enough to supply the annual World demand of electricity!!



The SOLAIR scheme

Solar + Air = Electricity





SOLAIR Project Objectives



Develop receiver (technology not available in 1999):

- Efficient
- Low-cost
- Simple

Ceramic solar absorber, that allows:

- high solar concentration
- longer material lifetime
- stable at high temperatures (over 1,000°C)

Modular design strategy

(from 200kW to 3,000 kW and upwards!!!!)

1999 -----> 2003 ----->2006



SOLAR FACILITIES USED



Plataforma Solar de Almería, CIEMAT (Spain)



Solar Furnace German Aerospace Centre, Cologne (Germany)



SOLAIR EC PROJECT: THE ACHIEVEMENTS

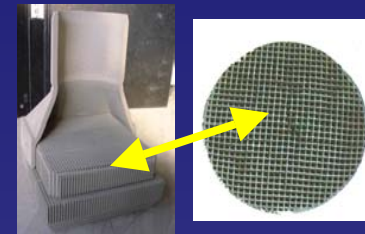
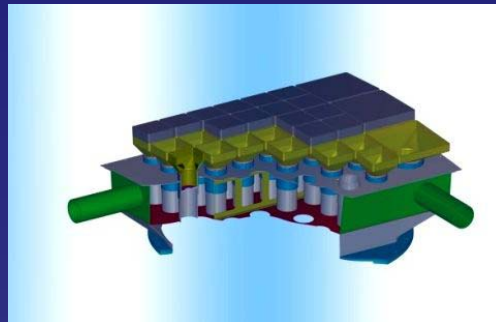
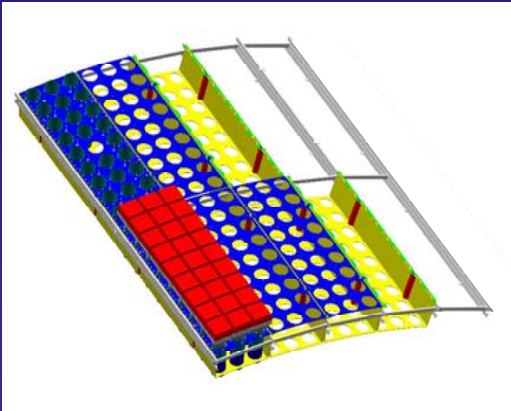


Commercial module

Proof-of-concept module

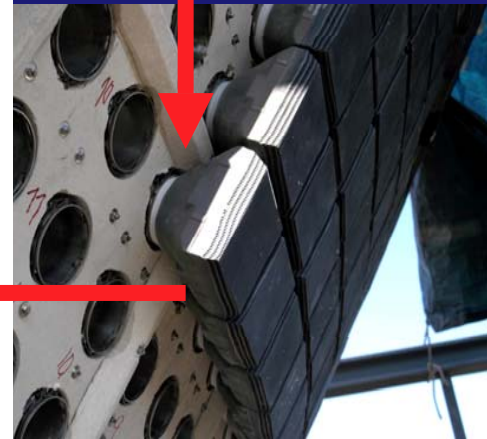
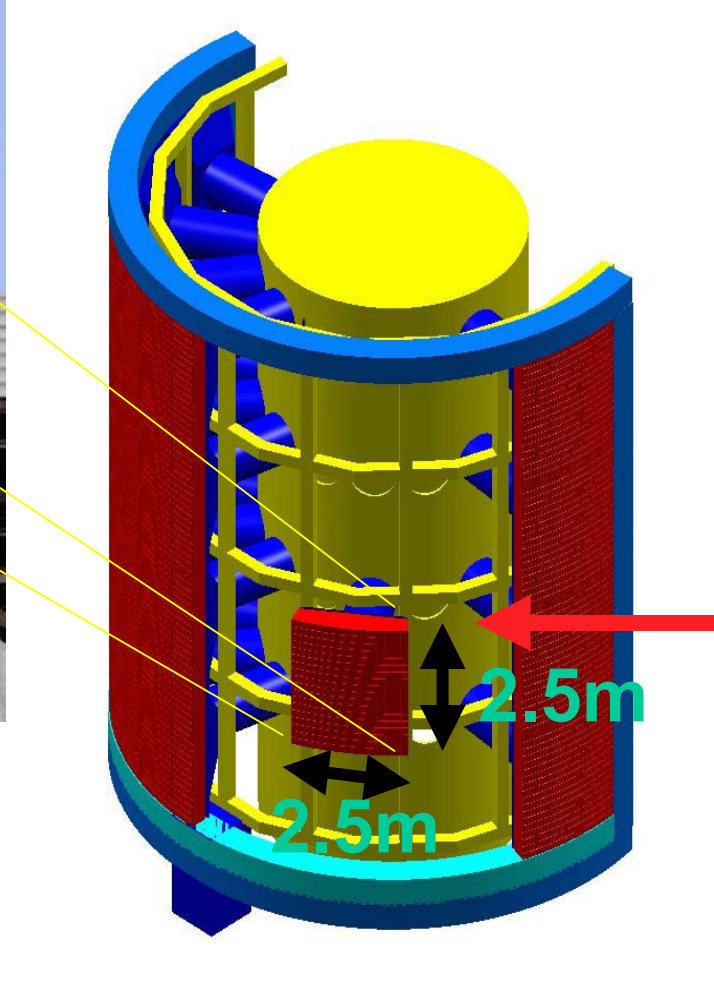
Ceramic cups

Ceramic Honeycomb





Receiver design : Maximum modularity



- Any size
- The same module



SOLAIR 3MW receiver testing



-Producing superheated steam at 440°C

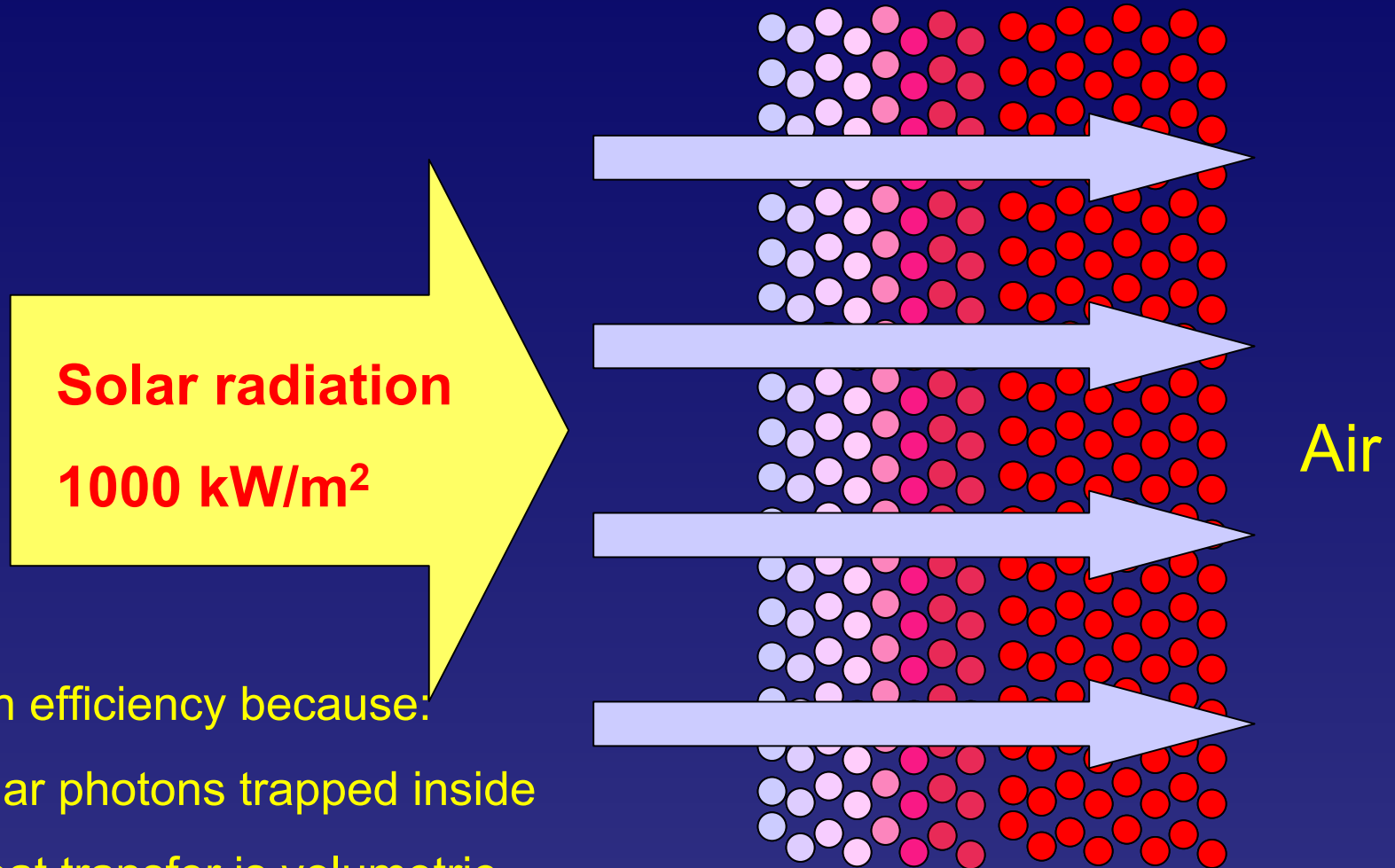
- Pilot plant including receiver, heat storage and steam generator

80% efficiency from solar to air!!!!

Up to 1000°C air temperature achieved!!!!



SOLAIR absorber working principle: A Solar hair dryer!!!



High efficiency because:

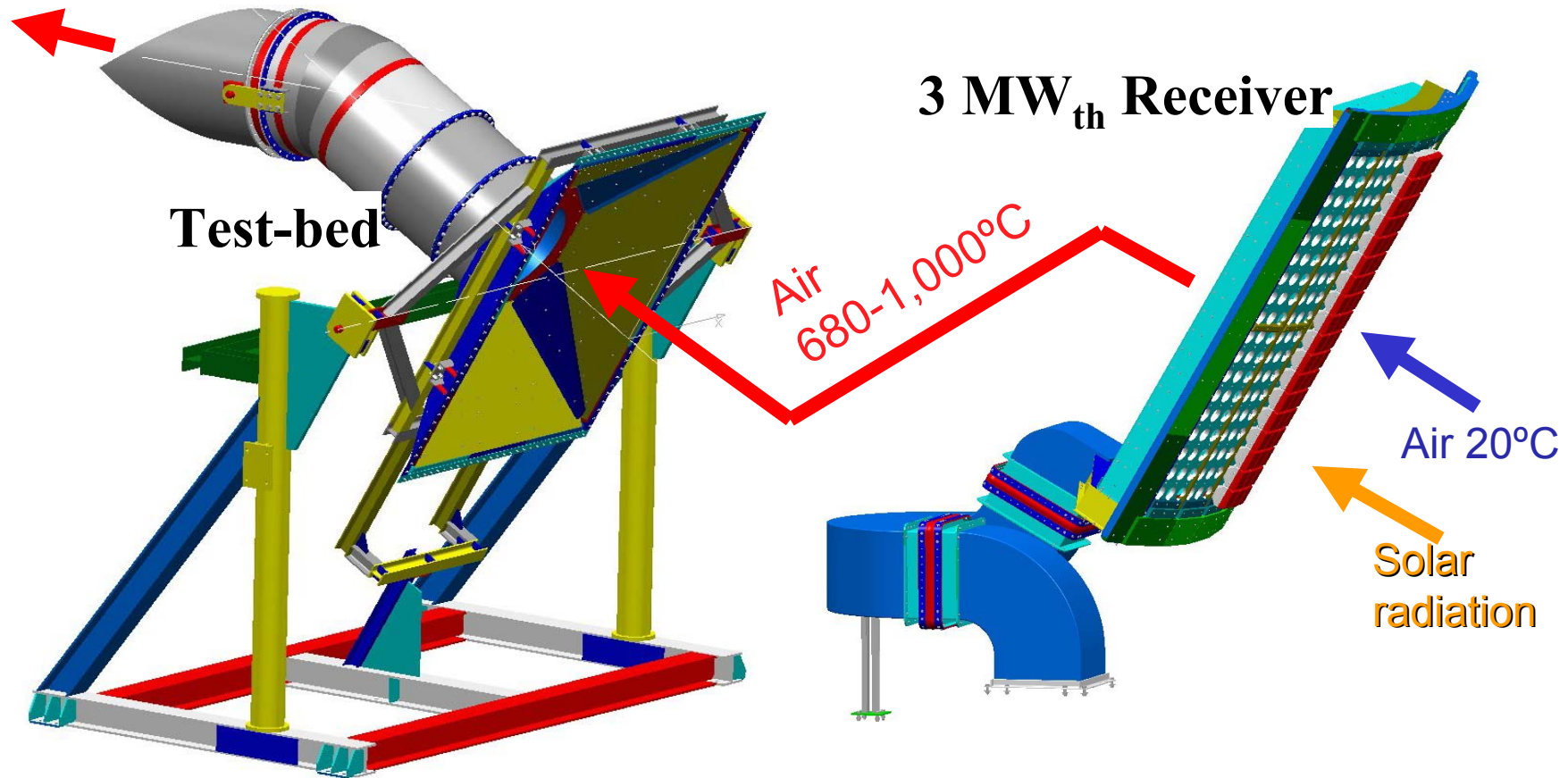
- Solar photons trapped inside
- Heat transfer is volumetric



SOLAIR absorber working principle: A Solar hair dryer!!!



to steam
generator

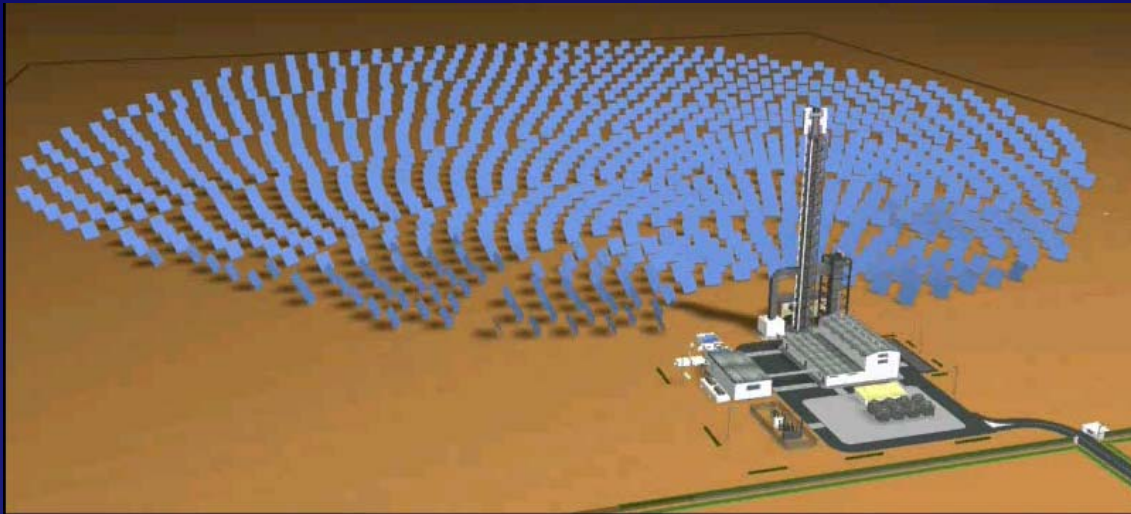




What follows?

Early commercial project by 2006

Somewhere in Spain



Nominal power

- 10 MW (electric power)

Heliostats

- Mirrors 90,000 m²

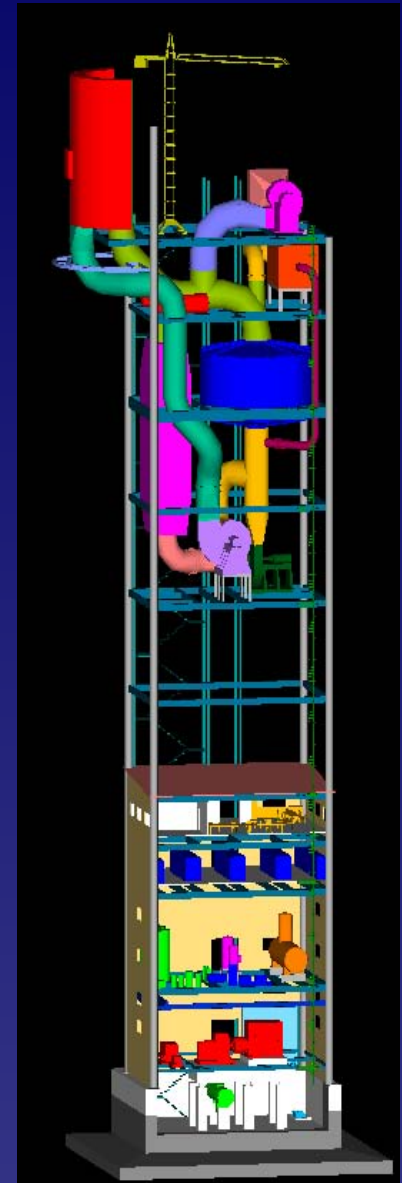
Tower

- Height 95 m

Receiver

- Height 10m

SOLAIR-10 power plant





•Solar power plants:

- Technology required and detailed engineering ready for first-of-its-kind commercial plant
- KAM (Germany) have expressed interest in supplying turn-key plants.
- LiqTech/Heliotech (Denmark) and Saint Gobain Ceramics (Germany), have expressed interest in supplying an industrial-scale ceramic absorber.



Project spin-off



Use of ceramic material as a filter for separating particles from liquids and hot gases:

- for diesel engine exhaust on buses, trucks, trains, etc
- for separating yeast and sterilizing beer in breweries
- for sterilizing milk by separating bacteria and viruses in dairies, avoiding the pasteurization



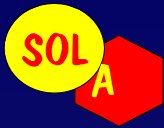
Diesel Particle Filter for a city bus



LiqTech144mm: ceramic module for sterilizing beer and milk



Conclusions



- SOLAIR means electricity production by profiting from solar energy and air available for free in nature.
- After testing of a 3-MW pilot module, the SOLAIR receiver (key system) has been proven efficient and mature.
- Modularity and simplicity is its distinctive feature: From dozens to thousands of kW with the same module architecture.
- The European SOLAIR consortium offers the technology to Independent Power Promoters and Utilities.
- Detailed engineering for an early plant has already been completed.
- The potential is enormous for arid and semi-arid areas, all over the world.
- Spin-off, as a filter for liquids.