MOSAIC Project Description

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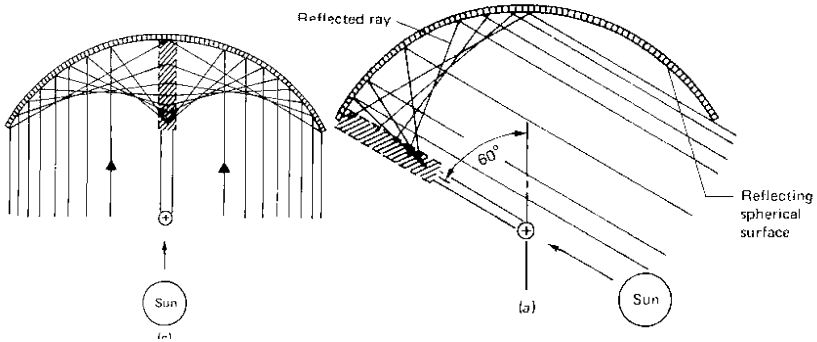
Hemispherical Concept

Characteristics:

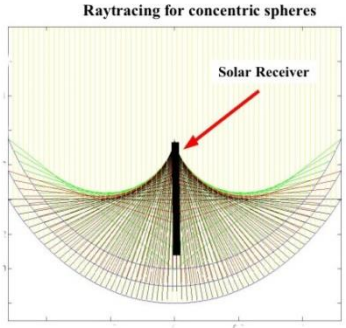
- Fixed mirror concept
- Spherical reflector
- Linear receiver

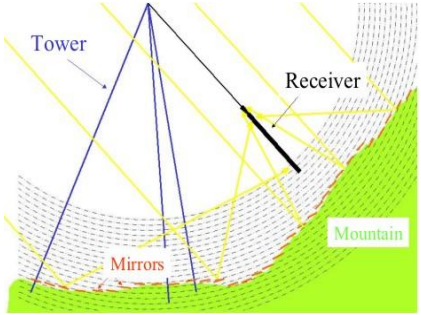
Single tracking system
But huge civil works



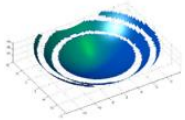
Fresnel approach could be taken:

- A series of concentric spheres also concentrates in a single line
- Easily adapted to any terrain shape



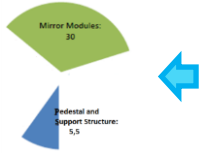


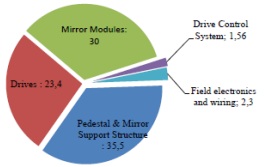
Previous experiences and inspirations

	Non EU projects			EU Projects			Other possible inspirations	
	Experience 1	Experience 2	Experience 3	Experience 4	Experience 5	Experience 6	A	B
Description	Hemispherical reflector power plant	Hemispherical reflector power plant	Hemispherical reflector power plant	Hemispherical reflector power plant	Hemispherical Fresnel reflector demonstrator	Design of a semi-fresnel hemispherical fixed reflector	Hemispherical radio-telescope	Hemispherical radio-telescope
Photograph								
Date	1970's	1990's	2000's	Late 1990's	Early 2000's	2004		
Validation site	Crosbyton, TX, USA	Auroville, India	Armenia	Republic of Crete	UK	No experimental validation	Arecibo, Puerto Rico	Guizhou, China
Characteristics	19.7m diameter	15m diameter	Data not available	30m diameter 110kWt / 35kWe	Proof of concept	Theoretical design	305m diameter (5 arcsec accuracy)	500m diameter
HTF temp	Steam at 538 °C	Steam	Air at 850°C	Air at 850°C	-	-	N/A	N/A
Status	Decommissioned	Working	Not completed	Decommissioned	-	Positive techno-economic analysis	Working	Open

Key advantages

- Cost effective system:
  - Non-tracking mirror concentrators
  - No need for wiring
  - Cheaper and easier to install and repair structures/mirrors:
    - Fixed and located at ground level with low wind forces



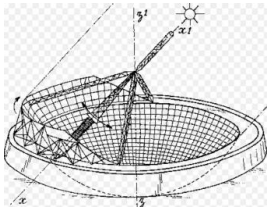


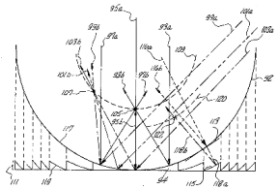
- High and progressive concentration ratios leading to optimized receivers, storage and cycles:
  - 3D concentration but a single linear focus lead to an easier receiver design
  - Progressive concentration allows for optimum receiver design (minimum losses)
  - High temperatures and efficiencies
  - Lower costs for storage system

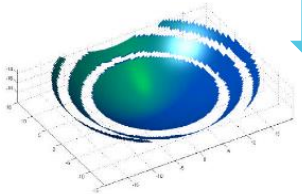
- Modular and flexible design
  - Suitable for distributed applications
  - Affordable investment required to validate/optimise the concept

Selected approach

- Non-tracking hemispherical semi-Fresnel mirror concentrators
  - Optimised mirror use. Only those mirrors supplying over 400kWh/year per m^2 will be implemented
- Modular multi-bowl system:
  - Suitable for distributed applications
  - Affordable investment required to validate/optimise the concept
- Novel implementation: Neither Fresnel nor bowl concept
  - Optimum concentration ratio at the minimum cost for civil works







Main challenges

- A single tracking system per module but much more complicated:
  - Mobile receiver at high temperature and under high fluxes
  - Long displacements
  - Feeding and dragging
- A new and tailored receiver is required:
  - Progressive concentration with high fluxes
  - Feeding and draining of the mobile receiver
- Limited flux control

Project Goals

- Main goal: “Reduce LCOE[1] (between 20 to 25%) for CSP by a non-tracking mirror concentrators modular approach”
  - Global CAPEX reduction up to 30%, from low cost mirror field, low cost receiver, etc.
  - OPEX reduction between 15% -25% from less and simpler tracking system, better accessibility, automated cleaning, less water consumption, etc.
- Develop all required components for the concept:
  - Solar field including tailored mirrors
  - Cost effective tracking system and receiver
  - Modular storage system
  - Demonstrate the concept at a relevant scale
- Define the most promising cases for commercial applications (distributed and large plants)

[1] Reference case 100 MW, Molten Salts Tower, DNI 2050, south of Spain. $LCOE_{ref}$=0,14€/kwh