

The Vision of Stobbe Tech & DLR

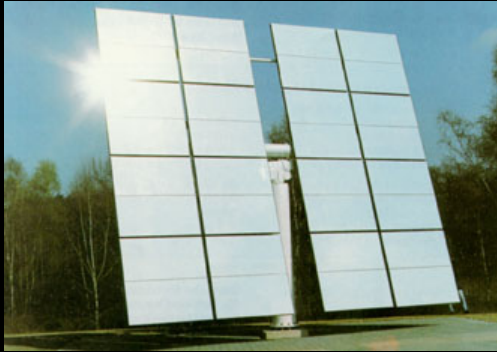


Stobbe Tech & DLR Solar Thermal
Power Plant Technology

The Objective

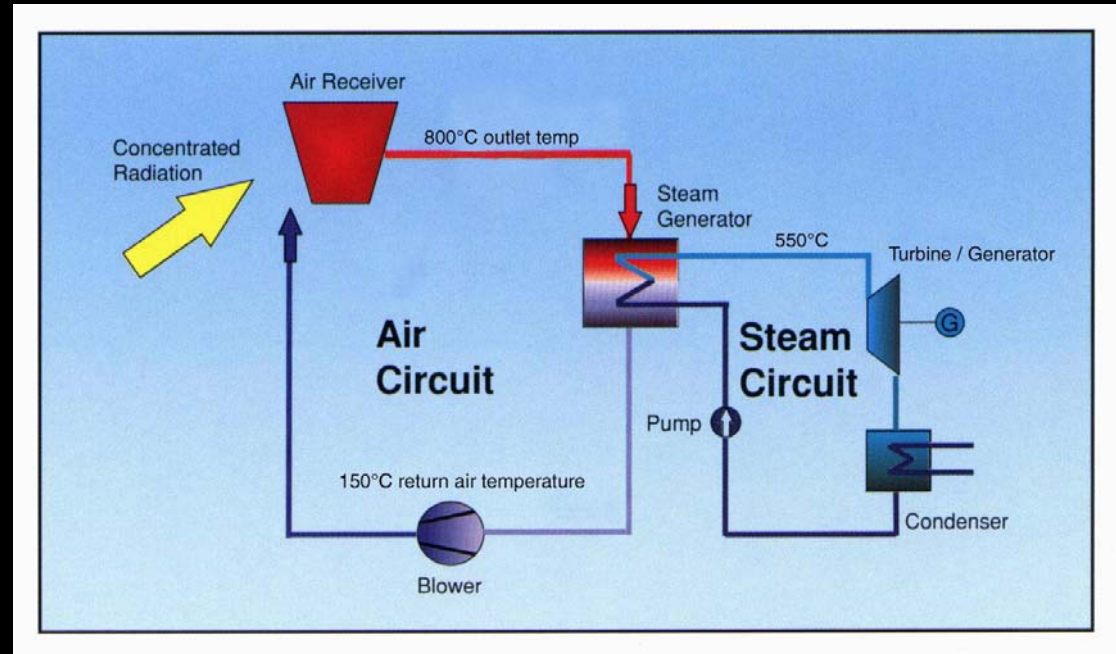
- Solar Cells (photo voltaic - PV) can only fulfil a few percent of the global need for clean electrical power
- Wind turbines could in best case supply 30% of the needed renewable energies
- Solar Thermal Power Plants, STPP is the only alternative to fulfil the worlds enormous expectation of clean electrical energy
- The World Bank expect investment in the range of 3×10^{12} USD in STPP over some 20-30 years
- The EU Commissions White paper see the potential of 12% renewable energy penetration in 2010 being as much as 100 GW installed power
- DLR, Deutsches Zentrum für Luft- und Raumfahrt has developed and supply the overall technology package
- HelioTech has developed and supply ceramic Volumetric Receiver modules for DLRs technology starting with projects in Spain

The VR technology in principle



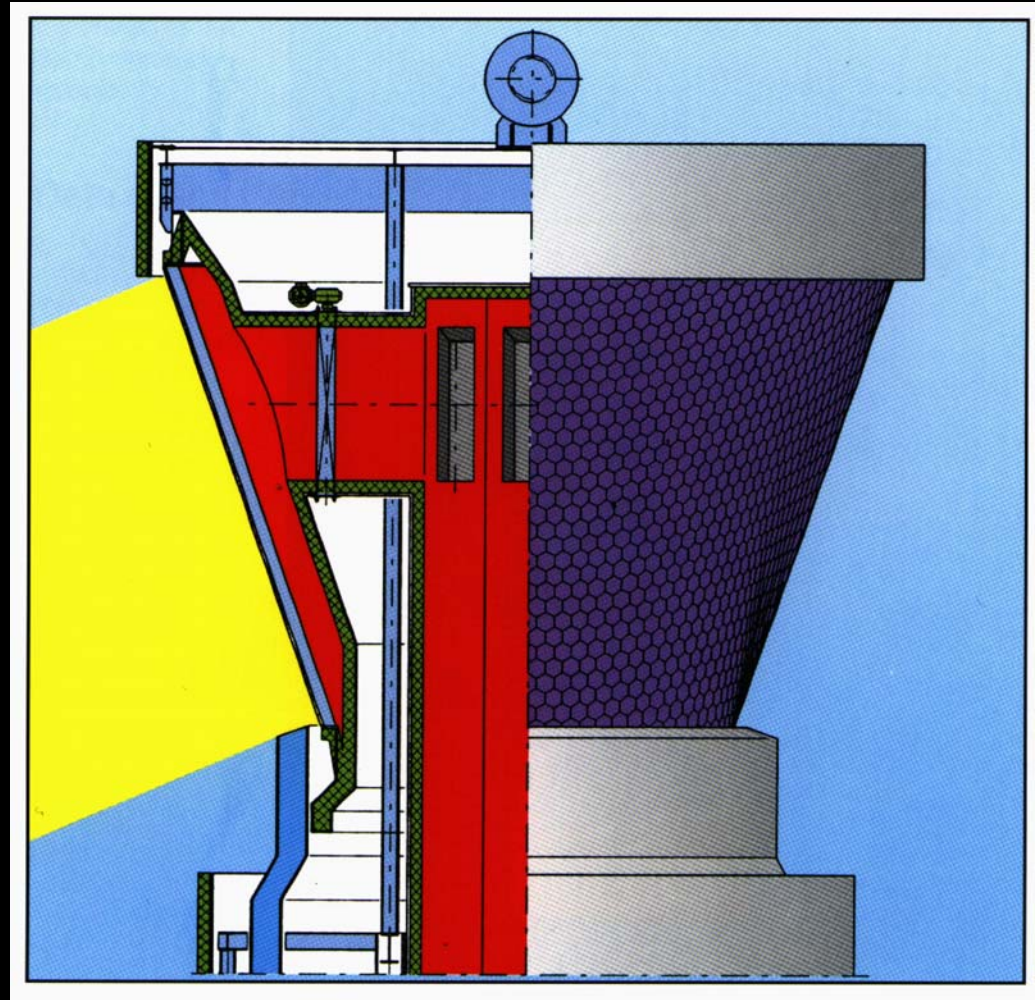
- VR = Volumetric Receiver is a transformer of short wave energy from the sun to long wave energy which can be exchanged with conventional technology

- Thousands of heliostats on the ground each with a moving 40-100 m² mirrors reflects the sun to the Volumetric air Receiver surface on top of a very high concrete tower
- The hot air exchange its energy to water being turned into >500°C/100 Bar steam which turn a conventional steam turbine linked to a generator.



The Receiver in details

- The concentrated radiation is >1 MW/m² on the ceramic surface which is being cooled by atmospheric air being pumped through the modules to the heat exchanger inside the tower
- For a 50 MW_{el} power plant some 250 m² ceramic surface is needed being thousands of ceramic units covering the 8-10 meter diameter tower top
- Each of the many units of the surface are assembled from one extruded honeycomb monolith and one casted cup
- The units may be from hexagonal or square shape design ranging from 125 to 250 mm in size



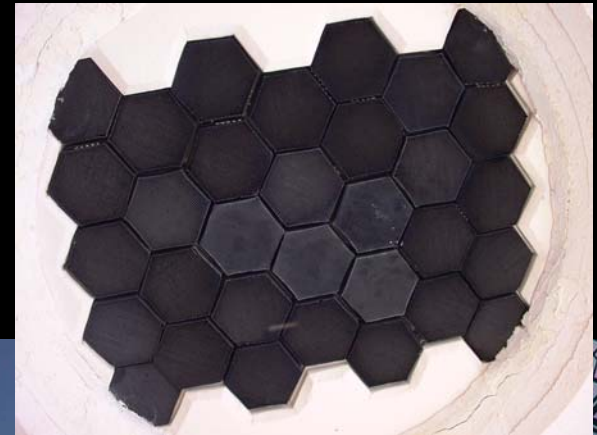
The ceramics in detail

- Each of the units of the Volumetric Receiver surface is assembled from one extruded honeycomb monolith and one casted cup
- Both the monolith and the cup are manufactured from Silicon Carbide
- The monolith is designed to withstand the $>1000^{\circ}\text{C}$ frontal surface temperature and higher than 800°C outlet temperature
- The cups being supported by a return air cooled steel construction with air gaps in between the cups for improved system efficiency



The SolAir project

- The European Commission support financially a R&D / demonstration project, named SolAir in Spain who has the largest sun research center in Europe
- The partners being Inabensa from Spain, Deutsches Zentrum für Luft- und Raumfahrt and StobbeTech
- The current system in operation is in size 0,2 MW_{th} consisting of more than 30 ceramic units. All mounted on a 40 meter high steel tower at PSA, Plataforma Solar de Almeria in the south of Spain.
- Different concepts and configuration are being tested independently by HelioTech at PSA
- Different control technologies are being tested by DLR



Next Steps

- The SolAir project is planned to demonstrate a 3 MW_{th} system year 2002 for some month duration
- Stobbe Tech seek to improve its business and technology base by further tests, strategic alliances and protection of IPR
- The Stobbe Tech vision is to develop and supply internationally all the ceramic parts for Solar Thermal Power Plants
- HelioTech seek a closer colaboration with a European based manufacturer of Silicon Carbide articles for the business
- DLR and Stobbe Tech seek a business alliance with an organisation huge enough to commercialise the technologies into complete power plants ranging 100 mio x10⁶ USD each