Gesto ENERGY SOLUTIONS

Solar Consulting Services

CSP Services
Concentrating Solar Power Services

CONSULTING SERVICES AFRICA

SIJ | SOLAR-INSTITUT JÜLICH
FH AACHEN
UNIVERSITY OF APPLIED SCIENCES

CSP TECHNOLOGY OVERVIEW
NAMIBIA SOLAR RESOURCE AND DNI ANALYSIS
ENVIRONMENTAL ANALYSIS AND SITE SELECTION
TOP 5 SITES SELECTION AND GROUND MEASUREMENTS
FINANCIAL ANALYSIS AND CSP BUSINESS MODEL
CSP DEVELOPMENT AND IMPLICATIONS FOR NAMIBIA

Technology transfer program – Cooperation opportunities

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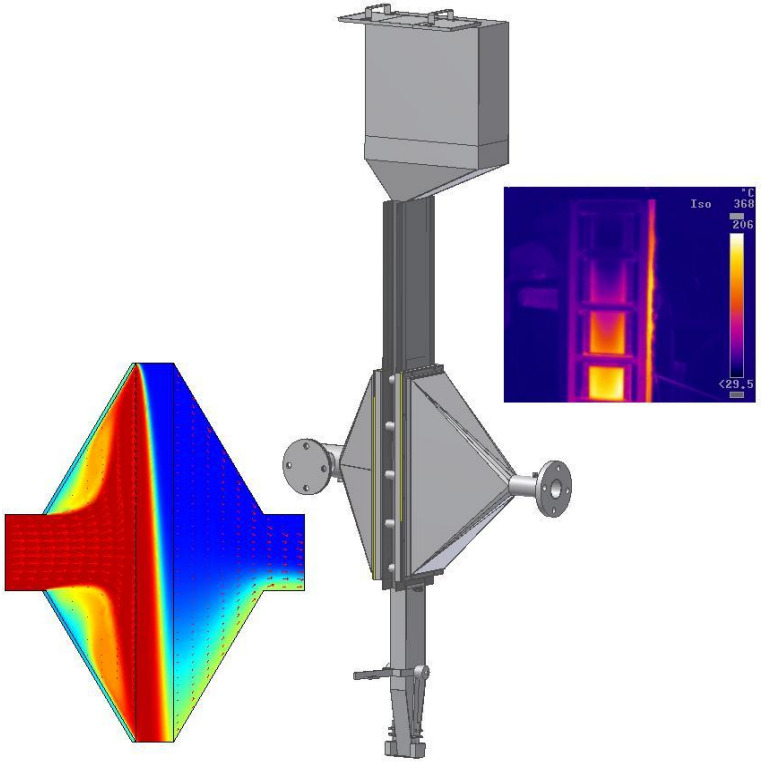
Introduction

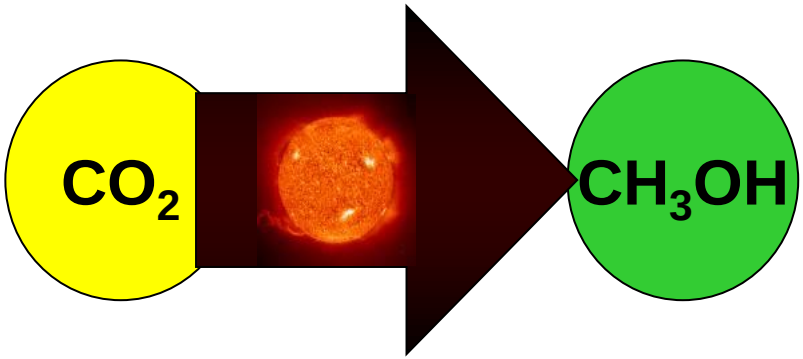
- Solar-Institut Jülich
  - The Solar-Institut Jülich (SIJ) is a central scientific institution of the Aachen University of Applied Sciences
  - Around 60 staff work under the management of Prof. Dr.-Ing. Bernhard Hoffschmidt on innovative, application-oriented designs in the field of renewable and efficient energy use in direct cooperation with the industry, universities and research institutions
  - Currently around 37 research projects
  - Core research areas:
    - System simulation (CSP)
    - Ecological balance studies (Life Cycle Assessment)
    - Component design
    - Electricity grid simulation for different future scenarios
    - Development and optimization (heliostats, porous absorbers, TES)
    - Solar thermal systems
    - Efficient building technology
    - System analysis and resource productivity
    - CSP Training and capacity building
    - Solar water desalination
    - Solar concentrated chemical processes
    - Solar tower hybridisation with gas turbine or/and burner using natural gas/biogas or biomass (publication for solar tower hybridisation with biomass in North Italy)

Expertise of SIJ

Development and demo of CSP technology

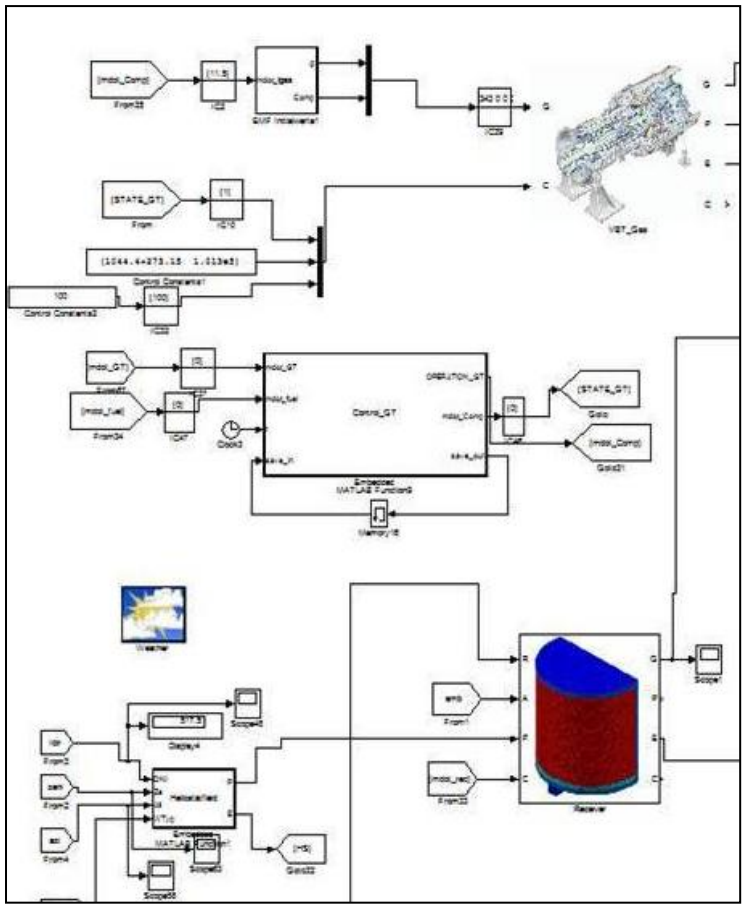


Development of high-temperature thermal storage using quartz sand



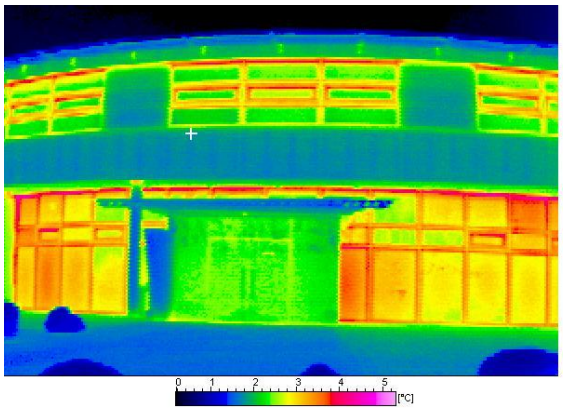
NEW: Solar methanol production

Expertise of SIJ



Simulation and design of solar thermal power plants

Solar process heat



Energy efficiency in buildings

Expertise of SIJ

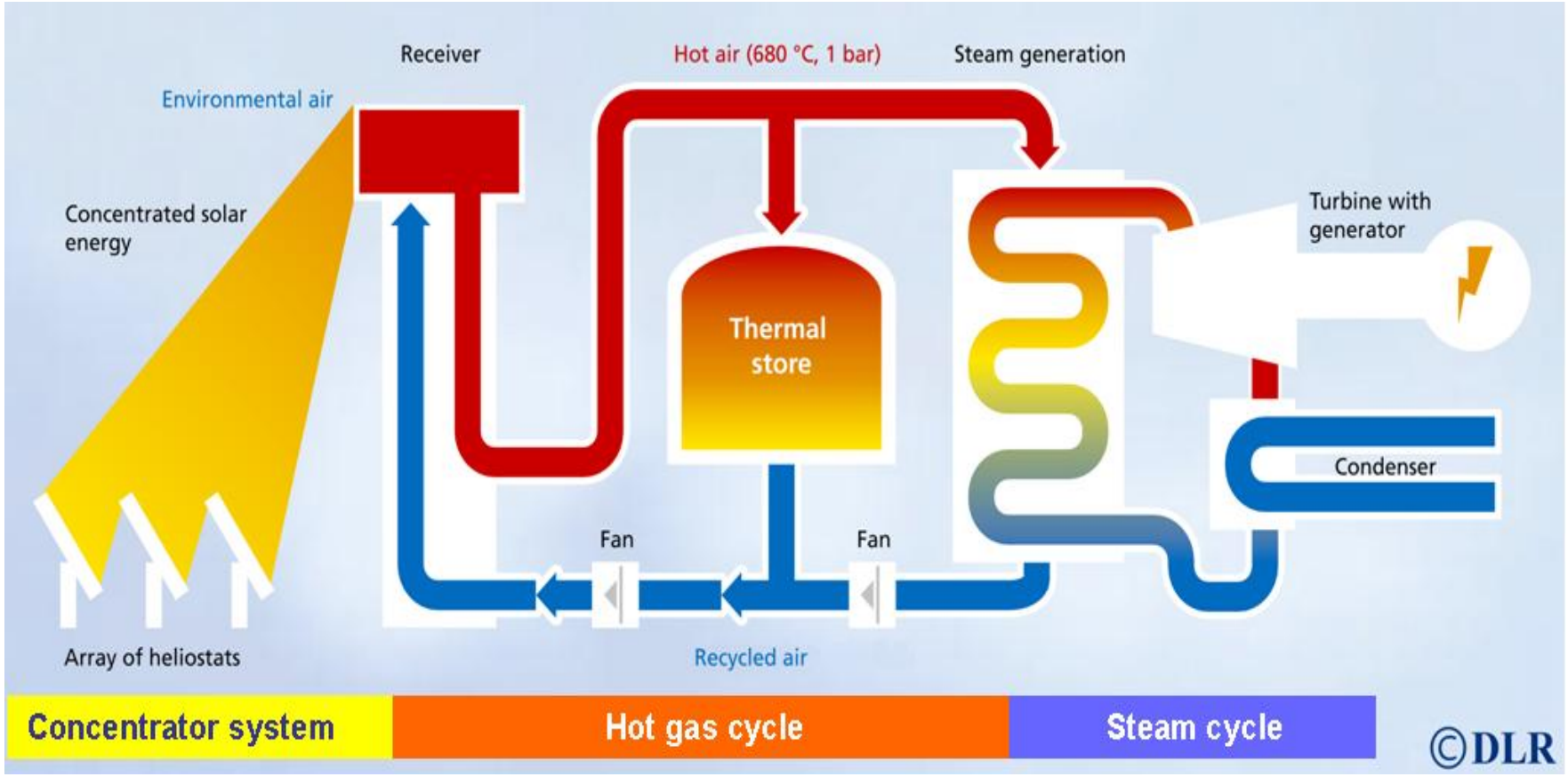
Solar-Institut Jülich (SIJ) of AcUAS only university worldwide with full access to the latest type of CSP technology build and operated at Jülich, Germany

<u>Objectives:</u>

- **demonstration**
- **cooperation**
- **dissemination**
- **continuous development**
- **excellent research**

Solar Tower Jülich

- Heliostat mirror area: 18,000 m²
- Number of mirrors: 2150
- Heat transfer medium: ambient air
- Air temperature: ~700°C
- Ceramic storage
- Nominal power: 1.5 MW_e



Source: DLR

Solar Tower Jülich

- Construction completed in Winter 2008 in less than 1 year
- Production of electricity and feed into local grid
- Open volumetric air receiver technology demonstration and R&D activities
- Owner of plant: DLR (German Aerospace Center)
- The Solar-Institut Jülich has an exclusive right to access the site of the Solar Tower Jülich and to use measured data for research purposes
- The Solar Tower Jülich was built by the general contractor Kraftanlagen München (KAM), a German piping and plant construction company

Source: SIJ

Solar Tower Jülich

- KAM has experience in the following areas:
  - Power plant technology
  - Energy technology
  - Renewable energies
  - Underground piping construction
  - Utility services
  - Chemical and petrochemical industries
  - Fabrication
  - Engineering services
- Around 2400 employees
- Research projects for the development of solar thermal power plants for many years
- Service range by KAM: from engineering, fabrication and erection to commissioning and maintenance
- Owns several subsidiaries for engineering and construction

  (Kraftanlagen Middle East L.L.C. (Abu Dhabi, UAE),

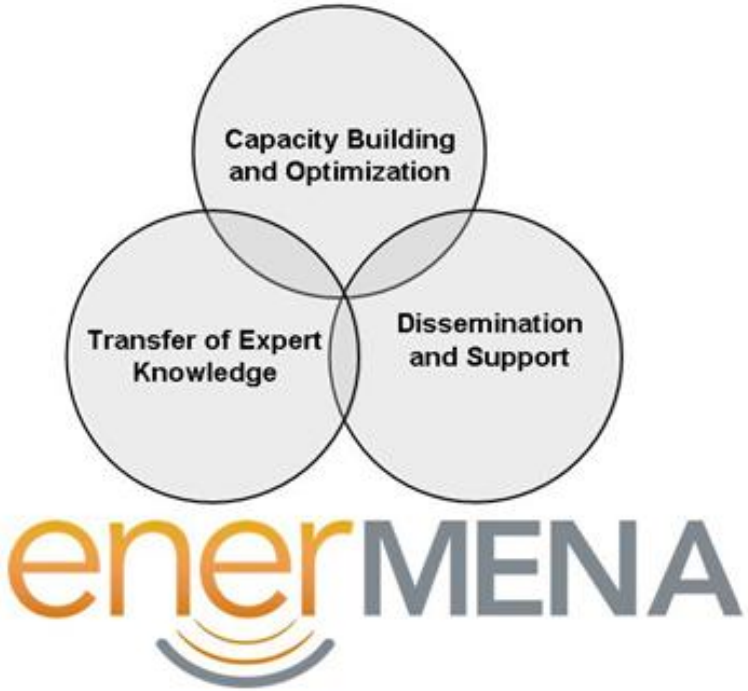
  Kraftanlagen Power Plants GmbH (Munich – Germany) – International EPC etc.)

Kraftanlagen München

Source: SIJ

Experience of the Solar-Institut Jülich (SIJ) with training programs in CSP

- Experience gained in project enerMENA
  - Coordinated by the German Aerospace Center (DLR)
  - Project partners: Solar-Institut Jülich (SIJ) of AcUAS, University of Kassel
  - Project aims to transfer knowledge of the CSP technology to universities and other institutions in the Middle East and North Africa such that local know-how is built up
  - On-site training for teachers and professors (i.e. the multiplicators of knowledge)
  - Lecture support with teaching material
  - enerMENA aims to disseminate CSP technology and to support market development
  - 2 x Workshop Jordan (Professor training, researchers)
  - 2 x Workshop Morocco (Professor training, researchers)



Funded by:

Federal Foreign Office

Alsol Project
Solar tower power plant Algeria

- Project: Solar tower power plant Algeria
- Aim: - Compilation of a catalogue for the realisation of a Technology Park in close vicinity to the future solar tower power plant located at Bourkika/Tipaza (DZ)
  - feasibility study of solar power tower plant with open volumetric air receiver

- Tasks: Component inquiry, factory rating, price enquiries; Linking of the topics for demonstration purposes

- Funded by: BMU, MESRS

Bundesministerium für Umwelt, Naturs und Reaktorsicher

ALGERIA الجزائر

http://www.mesrs.dz

Experience of the SIJ with training programs in CSP

- Knowledge transfer through on-site training experience
  - CSP technology training with Algerian engineers within the AlSol project
  - Thorough on-site training at the Solar Tower Jülich (STJ) in cooperation with the DLR and Kraftanlagen München (KAM)
  - Project continuance and enhancement are envisaged

Source: SIJ

Source: Kraftanlagen München & IATech GmbH

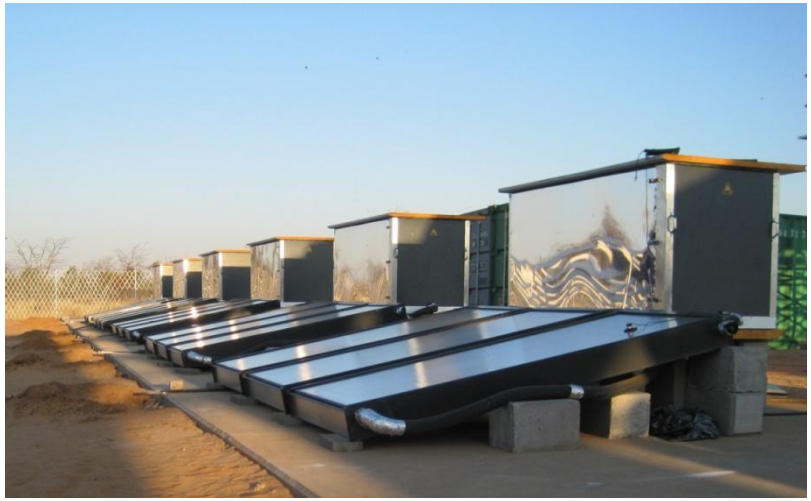
Experience of the SIJ with training programs in CSP

- The SIJ is the main R&D institute at the Aachen University of Applied Sciences
  - Annual Summer School gives students the opportunity to gain knowledge in renewable energies at the Aachen University of Applied Sciences
  - Since 25 years
  - Participants: German speaking students and researchers from across the world
  - Lectures: Industry representatives, researchers

Source: FH Aachen, Andreas Hermann

Experience of the SIJ in Namibia

- Integrated water resources management for the Cuvelai-Etosha Basin
  - **Aim:** Further development and practical realisation of an integrated water resources management (IWRM) for the catchment basin Cuvelai with focus on the Cuvelai-Etosha Basin in the central north of Namibia
  - Basis of existence for the population living permanently secured
  - essential contribution towards the reduction of poverty & prevention of crises can be achieved in the region
  - Water desalination component development for application in Namibia (Akutsima, Omusati) within the project "CuveWaters"
  - Groundwater desalination (key activity SIJ)



Source: SIJ

Research Opportunities

- CSP
  - Component development (e.g. heliostats, control, storage)
  - System (simulation solar-only, storage, hybridisation)
- Weather data and power plant measured data analysis
- LCA analysis
- Solar concentrated chemical processes for fuel production
- Solar water desalination
- Training of specialists (professors and researches) for CSP (concept, training courses)


Thank you for your attention!