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

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 is the only university worldwide with full access to the latest type of CSP technology build and operated at Jülich, Germany.

Objectives:
- demonstration
- cooperation
- dissemination
- continuous development
- excellent research
- 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<sub>e</sub>
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
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.)
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:
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
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
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)
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!