Project funded by: Federal Ministry for the Environment, Nature Conservation and Nuclear Safety

In cooperation with: REEEI – Polytechnic of Namibia; Fraunhofer Institut Solare Energiesysteme; LAHMEYER INTERNATIONAL

Seminar Schedule Concentrating Solar Power (CSP)

A seminar within the scope of the "TREE - Transfer Renewable Energy & Efficiency" - Project

Windhoek, 23 – 25 March 2009

Day one - 23 March 2009 – CSP for Decision Makers

9.00 **Opening Session**
Dr. Tjama Tjivikua, Rector, Polytechnic of Namibia
Welcome address
Mr. Matthias Hansen, Counsellor, German Embassy in Namibia
Address on German support
Mr.Berthold Breid, CEO, Renewables Academy
Presentation of the TREE-project and introduction of the lecturers

- Dr. Werner Platzer, Head of Department Materials Research and Applied Optics Fraunhofer Institute for Solar Energy Systems ISE
- Dr. Matthias Hampel, Project Manager, Lahmeyer International GmbH
- Anton Neuhäuser, Project Manager, Fraunhofer Institute for Solar Energy Systems ISE

9.45 **Introduction to CSP**
Solar thermal power plant technologies I
11.15 Coffee break
11.45 **Solar thermal power plant technologies II**
Project phases and tendering procedures
13.15 Lunch break
14.15 **Global players**
Business models, finance & opportunities
15.45 Coffee break
16.15 **Ecology, barriers, risk assessment, political policies**
Economics and future developments
Summing up and conclusions
17.45 End of day 1

Detailed CSP-seminar content – 23 March 2009 - Decision Makers

Introduction and Motivation	• Operation and types • Fundamentals and overview of CSP technologies • Global and regional potential • Opportunities for the regional economy
Solar thermal power plant technologies I	• Parabolic trough/Linear fresnel/ Dish and tower systems • Operation and components • Characteristics and state of development • Types and cost breakdowns • Manufacturers and example projects
Solar thermal power plant technologies II	• Conversion of heat into electricity • Power plant technologies and components • Integration of the solar field with the power plant • Operation effect of storage • Manufacturers and example projects
Project phases and tendering procedures	• Overview of project phases and planning • Selection of project participants • Planning • Open, restricted & competitive tendering and negotiation • Time constraints and assessment of offers
Global Player (EPC, OEMs, designers, subcontractors)	• Technology providers • Suppliers & subcontractors • Project developers • Engineering, Procurement & Construction (EPC) • Overview of international companies in all areas
Business models, finance & opportunities	• Project consortium • Private Public Partnership options (PPP) • Bankability and criteria • Cash flow and funding options
Ecology, barriers, risk assessment, political policies	• Siting criteria and infrastructure • Ecological impact • Risk categories and components • Conditions for funding • National and international programs
Economics and future developments	• Cost breakdown for building a power plant • Learning curves • Potential for technological development • Global market development

Day two - 24 March 2009 – CSP for Engineers

9.00 **Opening Session**
Mr.Berthold Breid, CEO Renewables Academy
Presentation of the TREE-project and introduction of the lecturers

- Dr. Werner Platzer, Head of Department Materials Research and Applied Optics Fraunhofer Institute for Solar Energy Systems ISE
- Dr. Matthias Hampel, Project Manager, Lahmeyer International GmbH
- Anton Neuhäuser, Project Manager, Fraunhofer Institute for Solar Energy Systems ISE

9.30 **Introduction to CSP**
Parabolic trough systems

11.00 Coffee break

11.30 **Fresnel collectors**
Solar towers and dish systems

13.00 Lunch break

14.00 **Storage technologies**
Power generation

15.30 Coffee break

16.00 **Cooling, maintenance and operation**
Siting and criteria
Summing up and conclusions

17.30 End of day 2

Detailed CSP-seminar content – Engineers – 24 March 2009

Introduction and Motivation	• Operation and types • Fundamentals and overview of CSP technologies • Global and regional potential • Opportunities for the regional economy
Parabolic trough systems	• Operation and concentration limits • Components: characteristics and state of development • Performance data: optical and thermal • Structural variants, Cost breakdown • Manufacturers and example projects
Fresnel collectors	• Operation and concentration limits • Components: characteristics and state of development • Performance data: optical and thermal • Geometrical variants, Cost breakdown • Advantages and disadvantages compared to trough systems • Manufacturers and example projects
Solar towers and Dish systems	• Heliostatic field, Receiver types • Options for the heat transfer medium • Cost breakdown • Manufacturers, variants and reference projects
Storage technologies	• Reasons for storage and classifications • System design using storage • Storage variants and their application • Costs and performance data
Power Generation	• Conversion of heat into electricity • Thermodynamic cycles • Power plant technology and components • Integration of the solar field with the power plant
Cooling, maintenance and operation	• Efficiency of power plant and condensation temperature • Wet cooling as default process • Dry cooling and hybrid cooling • Water and electricity consumption • Pollution and wash cycles • Personnel and operating costs • Maintenance
Siting and criteria	• Irradiation requirements for CSP • Necessary infrastructure • Exclusion criteria: technical, environmental, economic • Site analysis and aids

Day three - 25 March 2009 – CSP for Engineers

9.00 **Determining potential irradiation**
Modeling and Design

10.30 Coffee break

11.00 **Project phases and timescales, reasons for project overruns**
Tendering procedures and selection of project participants

12.30 Lunch break

13.30 **Global Players (EPC, OEMs, designers, subcontractors)**
Business models, finance & risk assessment

15.00 Coffee break

15.30 **Combinations of cooling and desalination**
Economics and future developments

17.00 End of day 3

Detailed CSP-seminar content – 25 March 2009 – CSP for Engineers

Determining potential irradiation	• Fundamentals of solar irradiation • Global and temporal distribution • Measurement techniques and accuracy • Sources of data on irradiation
Modeling and Design	• Objectives of the simulation • Application areas of different simulation methods • Overview of programs • Optimization and design • Examples of exemplary results
Project phases and timescales, reasons for project overruns	• Schematic breakdown of project schedule • Approaches to planning and those involved • Project delays and critical paths • Examples from practice
Tendering procedures and selection of project participants	• Tendering procedures and budgets • Open, restricted & competitive tendering and negotiation • Time constraints and assessment of offers • Assessment criteria
Global Players (EPC, OEMs, designers, subcontractors)	• Technology providers • Suppliers & subcontractors • Project developers • Engineering, Procurement & Construction (EPC) • Overview of global companies in all areas
Business models, finance & risk assessment	• Project consortium • Private Public Partnership options (PPP) • Bankability and criteria • Cash flow and funding options • Risk categories and components
Combinations of cooling and desalination	• Fundamentals of desalination • Desalination technologies (MED, MSF, RO, membrane) • Integration with power plants and boundary conditions • Absorption and adsorption cooling • Cooling applications and load profiles • Performance range • Island applications vs grid-connected operation
Economics and future developments	• Cost breakdown for building a power plant • Learning curves • Potential for technological development • Global market development