

Geothermal Training Course on Geothermal Electricity

An initiative of European partner institutions of the pan-European project **GEOELEC**

Potsdam, 15-18 April 2013
hosted by GFZ German Research Centre for Geosciences
Telegrafenberg, 14473 Potsdam
Building H, Seminar rooms

Agenda

April 15, 2013

Market aspects
Legal, environmental, financial aspects

April 16–18, 2013

Technical Courses

April 17, 2013

Site visit: Geothermal research site Groß Schönebeck

Day 1: April 15, 2013, 9.00 – 17.30

9.00 – 9.20 Welcome and introduction

P. Dumas, European Geothermal Energy Council (EGEC)

D. Bruhn, German Research Centre for Geosciences (GFZ), Germany

9.20 – 9.45 Short round of introduction

Session I: Market aspects

C. Karytsas, D. Mendrinou, Centre for Renewable Energy Sources and Saving (CRESS), Greece

9.45 – 10.30 International geothermal market overview

Geothermal resources of Europe can contribute to the EU targets of 20% less greenhouse gas emissions, 20% RES share and 20% more energy efficiency by 2020. The session provides an overview of the present status and future prospects of global geothermal electricity market niche, including

- market size (turnover, capacities, energy yields),
- near term growth, quality of resources, technologies employed,
- competition, energy costs, market barriers and incentives.

Case studies: The Soultz project, the first EGS plant, Simbach-Braunau, a low temperature plant

10.30 – 11.00 Coffee break

Session II: Legal, environmental and financial aspects

T. Reif, G. Wolter, Lawyer's Office Gaßner, Groth, Siederer & Coll. (GGSC), Germany

F. Jaudin, Bureau de Recherches Géologiques et Minières (BRGM), France

Stringent demands of investors and banks require an accurate planning of geothermal power projects; more precisely of the technology and phases of the project and the expected financial inflow and outflow. Risk management specially focuses on drilling risks and evaluates the risks in terms of their probability and economic consequences and prospects of suitable insurance products in Europe. The development of geothermal electricity in Europe depends on national legislations, for investors it is important to know in advance about current legal barriers and law-related conflicts.

11.00 – 11.45 Risk insurance for geothermal projects

- risk management: drilling
- existing insurance concepts to cover the geological risk in Europe
- risk insurance scheme at European level

11.45 – 12.30 Regulatory barriers

- Regulation of geothermal electricity through national legislation
- Legal barriers and law-related conflicts

12.30 – 14.00 Lunch break

optional: 13.00 Guided tour around the historical science campus 'Telegrafenberg'

14.00 – 15.30 Financing / Costs of geothermal power projects

- work cycle / capital investment for geothermal projects
- financing of geothermal projects

15.30 – 16.00 Coffee break

16.00 – 17.30 Financing / Costs of geothermal power projects

- market demands for project financing

Day 2: April 16, 2013, 9.00 – 18.00

Session III: Geothermal Exploration

A. Manzella, National Research Council (CNR), Italy; J.-D. van Wees, Organization for Applied Scientific Research (TNO), Netherlands; P. Durst, Bureau de Recherches Géologiques et Minières, (BRGM), France

The session provides an overview of exploration methodologies, describing a step-by-step procedure on how to locate a reservoir using different techniques. It introduces tools and approaches to investigate resources from regional, local and reservoir scales. Examples will be provided to various geo-environments depending on the geological context of the site: from sedimentary to volcanic to crystalline reservoirs, both for natural system and EGS perspectives.

9.00 – 9.30 Overview: What is geothermal energy: origin and relation with earth dynamics

- Thermal phenomena and earth internal structures
- Plate tectonics and geothermal energy
- The different types of geothermal energy

9.30 – 10.45 Resource assessment: targets and tools

- An overview of targets
- Geophysical methods
- Geochemical methods

10.45 – 11.15 Coffee break

11.15 – 12.15 Resource assessment: targets and tools

- Geological and hydrogeological assessment
- Remote sensing
- Stress field analysis for EGS

12.15 – 13.30 Site screening

- Best practice to localize a geothermal site

Case study: The Soultz project

13.30 – 14.30 Lunch break

Session IV: EGS Technology

J.-D. van Wees, Organization for Applied Scientific Research, (TNO), Netherlands; G. Zimmermann, German Research Centre for Geosciences, (GFZ), Germany; P. Durst, Bureau de Recherches Géologiques et Minières (BRGM), France

This session provides an insight into the process of hydraulic fracturing and induced seismicity in EGS projects. Basic concepts of geomechanics and hydraulic fracking, results of hydraulic stimulation and induced seismicity in EGS projects will be covered by lessons learned from the GEISER FP7 project.

14.30 – 15.30 Basic concepts

- Rock mechanics and tectonics
- Hydraulic stimulation: objectives, physical principles and best practices from oil and gas

15.30 – 16.00 Coffee break

16.00 – 18.00 Case studies: The Soultz project and the Groß Schönebeck project

- Enhancing flow rates
- Induced seismicity

19.00 – 22.00 Get-together (Potsdam)

Day 3: April 17, 2013, 8.00 – 19.00

Site visit: Geothermal research site Groß Schönebeck

8.30 Departure Telegrafenberg (by bus)

10.00 – 11.00 Geothermal research site Gross Schoenebeck

The Groß Schönebeck geothermal test site consists of two research wells used as an in situ laboratory. New methods for drilling, hydraulic fracturing, well testing and monitoring have been developed and tested under natural conditions. Special focus is on the reduction of risks and costs in geothermal exploration and exploitation, and on engineering of accessible reservoirs addressing similar geological settings worldwide.

11:00 Coffee break

11:20 Departure to the Conference centre Joachimsthal (by bus)

Session V: Drilling

W. Brandt, Geothermie Consulting – Engineering – Supervision, Germany

Venue: Conference centre Joachimsthal

The session provides a survey of technical solutions and related costs for drilling and completion of geothermal production and reinjection wells.

12.00 – 14.00 Types of geothermal wells and appropriate casing schemes

- Basic requirements: flow rate and temperature and its implications on wellbore schemes

Case studies: The Soultz project, The Groß Schönebeck project, Bavarian basin; research: Monobores

14.00 – 15.00 Lunch break

15.00 – 17.00 Drilling and completion of geothermal wells

- Drilling technology
- Test and stimulation techniques, pumps
- Costs

17.30 Departure to Potsdam (by bus)

19.00 Arrival Potsdam

Day 4: April 18, 2013, 9.00 – 17.30

Session VI: Flash steam and binary technology

E. Hallgrímsdóttir, Mannvit Reykjavik, Iceland; P. Bombarda, Politecnico di Milano, Italy

The session provides an overview of geothermal power plants with focus on flash and binary thermodynamic cycles, geothermal steam gathering system and mechanical equipment used. The course will provide examples and highlight the special features of utilizing geothermal fluid for power generation.

- Thermodynamic modeling for process flow.
- Design process of geothermal steam gathering system.
- Different design considerations compared to conventional steam plants
- Operation and maintenance

9.00 – 10.30 Process flow and steam gathering system

- Presentations reviewing different cycles and design process
- Demonstration of thermodynamic models for different working cycles
- Calculated example showing methods used within geothermal steam gathering system design

Case study: The Soultz project

10.30 – 11.00 Coffee break

11.00 – 12.30 Mechanical equipment and operation and maintenance

- Presentations presenting features of mechanical equipment used in geothermal power plants and their operation and maintenance
- Calculated example showing methods used for basic engineering within mechanical equipment design in geothermal energy
- Photographs of extreme conditions shown and discussed with solutions

12.30 – 13.00 The environmental issues report

- Overview of possible environmental impact
- Environmental management procedures

13.00 – 14.00 Lunch break

Session VII: Plant operation, energy supply and grid integration

F. Heilemann, S. Reith, EnBW Energie Baden-Württemberg, Germany

The session provides a broad understanding of the grid integration of geothermal energy. Although electric power cables are the most obvious precondition for a grid connection, many other topics become important in this context. The session will therefore answer beside technical also regulatory and economical questions.

14.00 – 15.30 Fundamentals of energy economics

- regulation and energy trade
- electricity grid
- demand for geothermal power

15.30 – 16.00 Coffee break

16.00 – 17.30 Grid integration of geothermal power

- approach for the grid integration of an increasing share of renewable power generation
- process of grid integration, costs of grid integration

Case study: The Soultz project

17.30 Conclusion / Feedback