ENGINE- G*eothermal lighthouse projects in Europe*

Information gathered during the ENGINE co-ordination action (ENhanced Geothermal Innovative Network for Europe)
http://engine.brgm.fr/
Last update April 2008

Project Name: Geothermal Power Plant Altheim
Project Leader: City of Altheim
Contact Person: Gerhard Pernecker
Web-site: www.altheim.eu
Country: Austria
Location: Altheim, Upper Austria

Types of resource: Low Enthalpy
Main on-site operators: Trans Globe Energy; Turboden
Number of wells: 2306 m and 3078 m
Type of wells: vertical production well and deviated injection well
Well configuration: Doublet
Distance between well at Depth: 1700 m horizontal at final depth
Temperature at Total Depth: unknown
Combination with other energy sources: no
Geothermal co-operation: Heat and electricity

Geothermal potential: about 20 MW_{th}
Installed capacity: 11 MW_{th} and 1 MW_{el}
Running capacity: 11 MW_{th} and 1 MW_{el}

Short description of ***Exploration History*** *(Limit this section; no more than 200 words)*:

- **No exploration well.**
- **Production well Altheim1/vertical:**
  - **Drilling time: about 2 month (February to April 1989)**
  - **Total depth: TVD 2472 m;(Top crystalline: 2458 m)**
  - **Production well Altheim 1a/deviated(redevelopment of Altheim 1:**
  - **Drilling time about 3 month (January to March 1990)**
  - **Total depth: 2306 m (point of deviation: 1772 m), open hole 2145 m - 2306 m**
  - **Horizontal distance at top Malmstone (2146m) between Altheim 1 and Altheim 1a: 22 m**
  - **Flow rate: 100 l/s by using a 350kW-down-hole-pump at a pressure drop of 16 bar**
- **Injection well Altheim 2/deviated**
  - **Drilling time: 8 month, from December 1997 to August 1998 (due to different problems like loss of bore hole, losses of bit cones, pipe stucks etc.)**
  - **Total depth: TVD 2165 m, MD 3078; open hole 2984 m - 3078 m**
  - **Flow rate: during the pump test - 71 l/s artesian, head temperature 93 ° C**

Possible keywords:

- Objective of project: **District heating and power production**
- Important dates: **District heating - energy supply about 20 MWh_{th}/year, substitution of about 2500 to of fossil fuels; power production - supply to the public grid up to about 20 MWh_{el}/year**
- Main geological context [stratigraphy, sedimentary fms, volcanism, granite intrusions, faults, graben etc..]: **See attachment: geology Altheim Th-2**
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- Project funding: **European Commission, Provincial Government of Upper Austria, Federal Government of Austria; Energie AG Oberösterreich (Electricity Company)**
- Distribution network - **what does that mean?**

Reservoir Characteristics ***(Limit this section; no more than 200 words):***

Possible keywords:

- Type of reservoir [fractured, porous or both]: **fractured**
- Hosted lithology/rock/mineralogy/fluids: [composition] **karstic malmstone**
- Fracture system: **fault system**
- Stress field: **alpine orogene stress in the northern Molasse Basin**
- Temperature range or temperature profile: **well head temperature about 104 ° C**
- Simulation types [hydraulic, thermal, chemical] **none**
- Main reservoir characteristics [porosity, (natural) permeability etc.] **production well: transmissivity 1,1 · 10^{-3} m^2/s, permeability 2,75 · 10^{-5} m/s, (thickness of the aquifer 280 m);**
- Connectivity between wells: **unknown**
- Occurrence of natural brines: **sweet water**
- Flow rate: Production well **100 l/s, Injection well 71 l/s**
- Storage capacity **unknown**

Exploitation ***(Limit this section; no more than 200 words):***

Possible keywords:

- Type of exploitation/power plant [ORG, Kalina cycle, single flush etc.] **ORC**
- Type of secondary fluid [ammoniac etc.]: **an azeotropic mixture of hydro fluorocarbon and perfluoropolyether**
- Production quail ability [day/year] **district heating: 365 days/year, power production: up to about 300 days/year**
- Cooling system [water, air]: **river wate**r
- Injection fluid [water, salty water etc.] **sweet water - salinity 1,3 g/l**

- Need for special tools [pumps, turbine etc.] **Down hole pump 350 kW (oversized)!; surface injection pump 75 kW; turbine developed by the Italian Company Turboden - single stage, 1500 rpm, full admission, reaction, supersonic, variable statoric nozzle area**
- Development/improvement of methods (chemical frac. etc..) **none**
- Monitoring and optimising of field/area using computer models **no**
- Assessment of environmental impact: district heating: **reduction of the local CO2 emissions: about 70 %, substitution of about 2.500 to of fossil fuels**

On-going or future works planes ***(Limit this section; no more than 200 words):***

Possible keywords:

- Next important event [major hydraulic test, new geophysical measurements etc.] **none**
- Future plans ? e.g.: **none**
  - New wells
  - Optimizing of existing.. or building new power plants..
  - Implementation of new tools..
  - Implementation of new methods..
  - .. new exploration phase..

ENGINE partners involved in the Project:

- Use list of partners (No.1–31) from ENGINE Web-site http://engine.brgm.fr/partners.asp

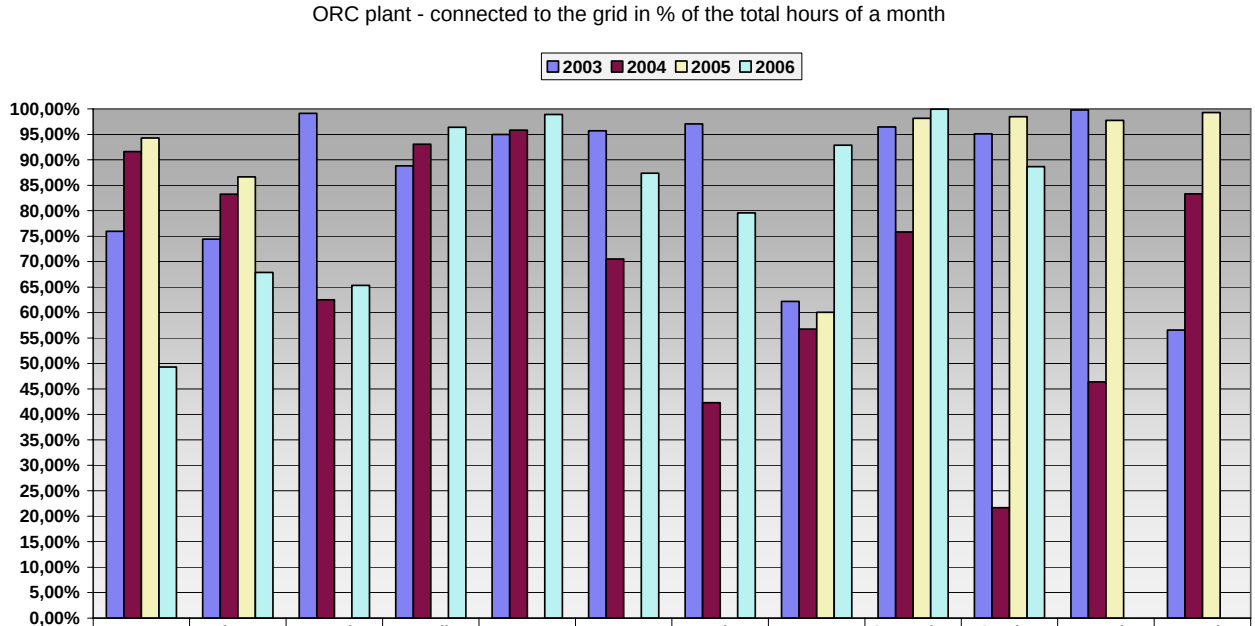
Main References *(no more than 5 references):*

- Proceedings, 21st Workshop on Geothermal Reservoir Engineering, Stanford University, January 22-24, 1996, SGP-TR-151, 73-77
- Best practice projects yearbook 1997-2000, European Commission, Contract N° NNE5/2000/126, 6.1-6.2
- Renewable Energy Journal, N° 11 - November 2001, 26-28
- GLOBE Europe Parliamentary Fora, Building the Framework for Sustainable Energy Policies, Parliament of the Republic of Slovenia, 6 - 7 February, 2003
- 8. Symposium Energieinnovation, 4. - 5. Februar 2004, Technische Universität Graz, OVE-Schriftreihe Nr. 36, ISBN 3-85133-033-1
- The International Workshop on the development of capacities and technical skills related to the climate change, City of Litomerice, Czech Republic, May 26-27, 2005

NB: Please provide a site picture, - and if possible, a few relevant figures would be appreciated

Figure 1 : View to the evaporator, demister, vapour pipes and generator

Figure 2 : Power house



	January	February	March	April	May	June	July	August	September	October	November	December
2003	75,97%	74,40%	99,13%	88,82%	94,96%	95,69%	97,04%	62,20%	96,46%	95,09%	99,79%	56,59%
2004	91,63%	83,26%	62,53%	93,06%	95,83%	70,52%	42,31%	56,75%	75,83%	21,67%	46,39%	83,33%
2005	94,29%	86,64%	0,00%	0,00%	0,00%	0,00%	0,00%	60,08%	98,16%	98,49%	97,74%	99,29%
2006	49,29%	67,89%	65,32%	96,39%	98,89%	87,36%	79,57%	92,88%	99,97%	88,68%	0,00%	0,00%

Figure 3 : ORC Plant

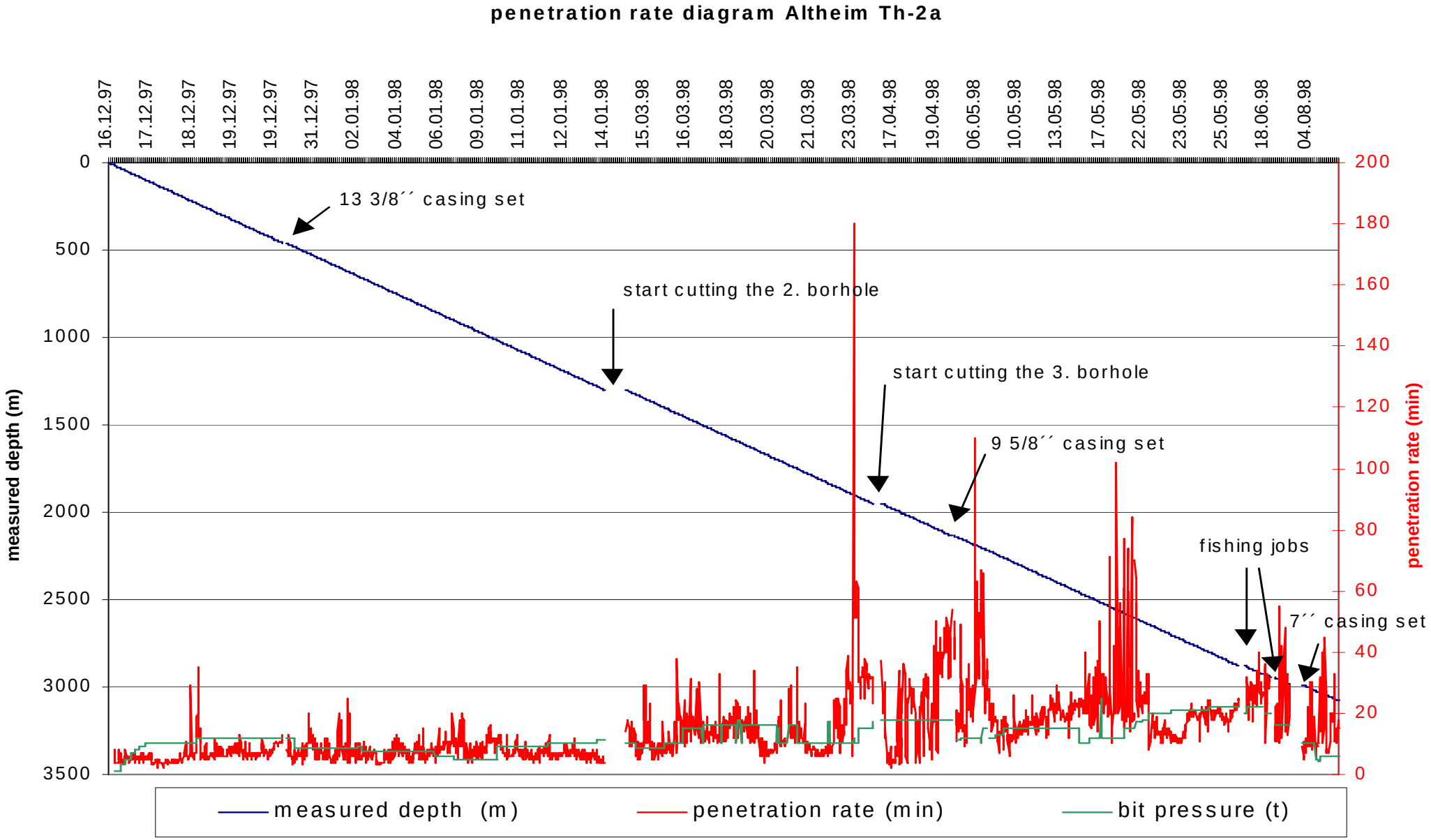


Figure 4 : Penetration diagram