GEOTHERMAL HEAT STORAGE
OFTRINGEN

Philip Klingler
Designing our habitat

COMPETENCES

> ENERGY
> BUILDING TECHNOLOGIES
> GENERAL PLANNING
> CIVIL ENGINEERING
> CONSTRUCTION
> SAFETY
> ENVIRONMENT

22 Companies

1057 Employees

since 1862
LOCATIONS IN SWITZERLAND

24 LOCATIONS
LOCATIONS WORLDWIDE

10 LOCATIONS

Gruner GmbH, Köln
Gruner GmbH, Stuttgart
Gruner GmbH, Leipzig
Gruner GmbH, Wien

Stucky Balkans d.o.o., Belgrad
Stucky Caucasus Ltd, Tbilisi
Stucky Teknik Ltd, Ankara

Stucky Asia, Bangkok

Gruner Peru S.A.C, Lima
ENERGY FOCUS

> Geothermal energy
> District heating
> Hydro power
> Energy plants
> Power transmission
ENERGY REFERENCES

Hydro dam Muttsee, Glarner Alps
for: Axpo Power AG

Geothermal district heating Riehen
for: Erdwärmeriehen AG

ETDE, Mosambik
for: ETDE France
Now back to Oftringen...
Increased geothermal gradient
Geothermal Timeline of Oftringen

> 2007 Deep BHE reveals a high geothermal gradient
> 2012 Study on the potential of deep geothermal energy
> 2013 Conclusion preliminary design study
> Nov. 2013 Incorporation of Erdwärme Oftringen AG
> 2014 Deep exploration well (swissnuclear) reveals high geothermal gradient too
> 2014/2015 roundup of private and public investors
> May 2015 Exploration licence approved
> 2015 … just a minute…
Preliminary design study: Geological Model
On the basis of a thorough geological analysis four potential areas of interest were defined.

→ Section 1 was chosen
## Preliminary design study: site evaluation

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<th>Geology</th>
<th>Building stability</th>
<th>Noise</th>
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District heating sales potential study

Goals

- Verification of expected district heating sales potential
- Pathways for district heating network
- Cost evaluation
- Basis for economic evaluation

Results

- Connection Power: 21-40 MW (theoretical 71 MW)
- Heat sales potential: 49-93 GWh (theoretical 166 GWh)
Potential for district heating in Oftringen

**Potential** (Study "nova")
- 72 MW
- 166 GWh/a

**Current district heating** (ebm)
- 8.5 MW
- 20 GWh/a
District heating development Oftringen

**Phase 1**
Development DH & Replacement of fossil heatings
- **21 MW**
- **49 GWh/a**
- 250 – 300 households

**Phase 2**
Full development of DH
(66 % connection concentration)
- **40 MW**
- **93 GWh/a**
- Over 600 households
Project idea

How can we optimize costs of peak load plant?

How can we reduce risks of not insufficient geothermal reservoir properties?
Project idea

Geothermal energy - seasonal heat storage - incineration erzo
Function in winter

- **Cold well**
- **Warm well**
- **Heat pump possible**
- **Discharging heat storage**

District heating Oftringen
Function in summer

Cold well

Heat pump possible

Discharging heat storage

Warm well

District heating Oftringen
Kopplung erzo / Geothermie Oftringen

Two-stage steam turbine

- Kessel 24 MW
- Generator 3.8 MW – 5.3 MW
- Kondensator 5 MW – 18 MW
- Kondensat-Vorwärmung 0.7 MW – 2.5 MW
- Drossel 6 bara bis 2-3 bara

Peak load HE

- 70 - 90°C VL
- Fernwärme 0 – 12 MW
- 50°C RL

Charging HE

- 70 - 90°C VL
- Fernwärme 0 – 5 MW
- 50°C RL

Cold well

- Winter: 50 RL
- Sommer: 50 VL

Warm well

- Winter: 75 VL
- Sommer: 100 RL

Geo-HE

- Geothermie - 6 MW
- + 6 MW

Ƞ:\n- 16%
- 6%
Steam extraction of low pressure steam

Two-stage steam turbine

Boiler
24 MW

400 °C
40 bara

Ƞ: 16%

Ƞ: 6%

Ƞ: 3%-1%

130 °C - 90 °C

50 °C

Generator
3.8 MW – 5.3 MW

Cooling Tower
5 MW – 18 MW
Modelling

> Validation of the idea
> Determination of energetic parameters for an economic evaluation
Hydrogeological reservoir model
Reducing Risks

Temperature:

> Increasing temperature for direct use through heat storage

Hydraulic short cut:

> Reversing flow directions eliminate the risk of a hydraulic short cut.

> No permanent reservoir cooling

Multi-reservoir strategy

> More independence of reservoir temperature
Multi-Reservoir-Strategy

- Primary Reservoir: Muschelkalk (triassic)
- Alternative Reservoirs:
  - Top cristalline basement
  - Mesozoic limestones
Projekt status

> Preliminary design study concluded
> Heat consumption potential study concluded
> Licence for seismic exploration approved

> Letters of intent of private investors
> Government subsidies pending
Next steps

2015
> Concluding process for public subsidies
> Incorporation of a supply and maintenance/running company

2016
> Stakeholder orientated marketing and communication
> Seismic exploration study
> First investments for district heating extension

2017
> Geological & technical planning for geothermal wells & reservoir management
Conclusion

- Synergies of incineration (erzo) – geothermal energy (ewo) and district heating
- Use of excess heat (erzo) in summer due to innovative heat storage system
- Reduction of project risks
- Site is geologically representative for other sites in Switzerland (and Europe) and has a high copy potential
- Optimizing investment costs for geothermal energy and district heating
- Building on existing structures
- High Standard for supply guarantee with low costs through integration of "erzo"
Thank you for your attention!