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Pre-feasibility studies of geothermal energy uses for heating in selected towns and pilot project proposals

Sochaczew

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M. Balcer – **expert**

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Assumptions concerning the geothermal parameters (Balcer, 2017):

- **aquifer level: Lower Cretaceous**
- **borehole depth: 1 400-1 600 m under the ground level**
- **assumed maximum water flow rate 80 - 120 m^3/h**
- **assumed geothermal water temperature: 40°C**
- **assumed annual average geothermal water cooling: 20°C (ahp) or 10°C (chp)**
- **assumed maximum thermal capacity of the geothermal source: ~ 3.5 MW**
- **water mineralisation will probably be below 1 g/L which will allow for a single-well operation. Cooled water can be reused, e.g. as potable water (similarly to the system used in Mszczonów).**

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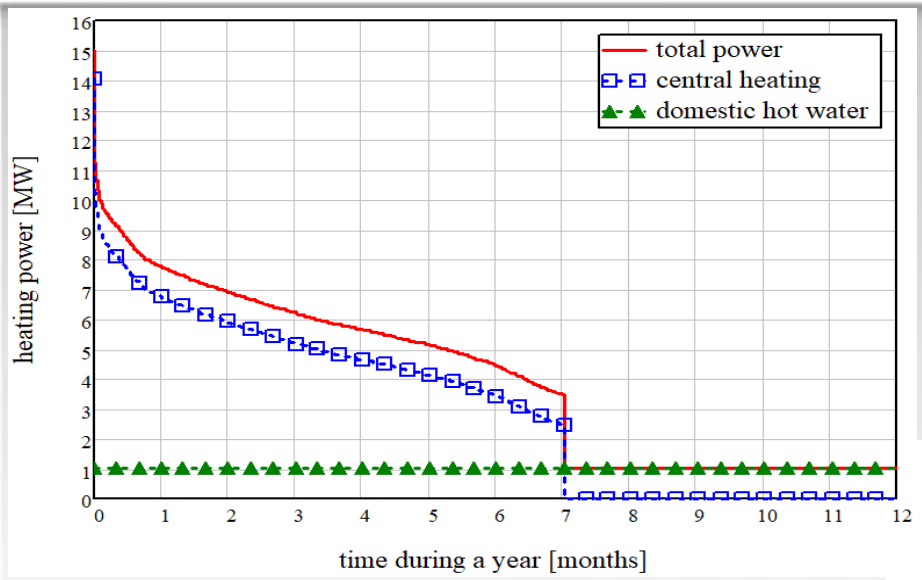
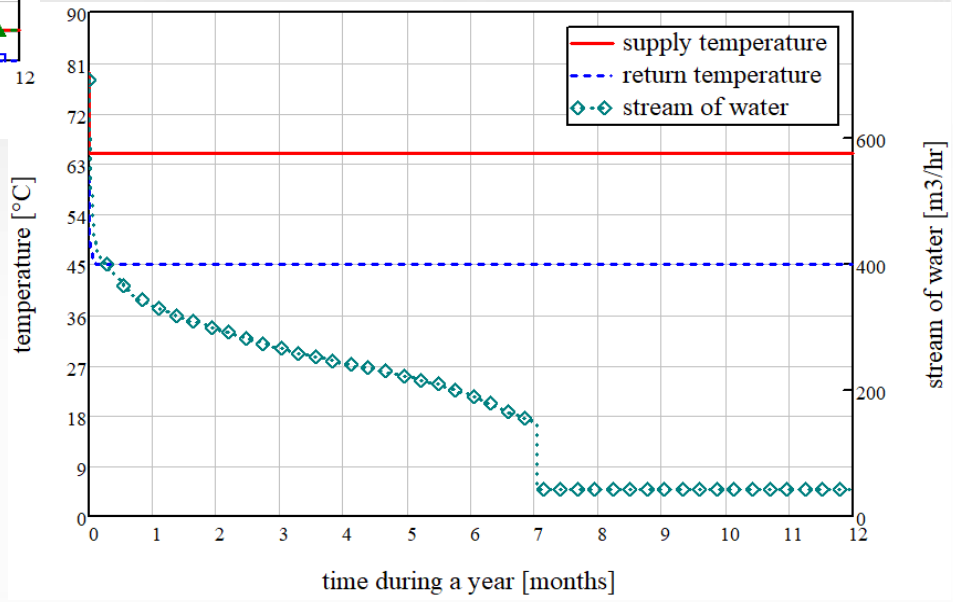


CURRENT SITUATION

Energy source: Geotermia Poddębice
~15 MW, ~142 TJ/yr

Characteristic of the thermal power demand for the recipient currently served vs time.
Curve ordered by total power



Control of power delivery - dynamic curve

Space heating 80/60/20/-20°C
Hot tap water 65/45°C

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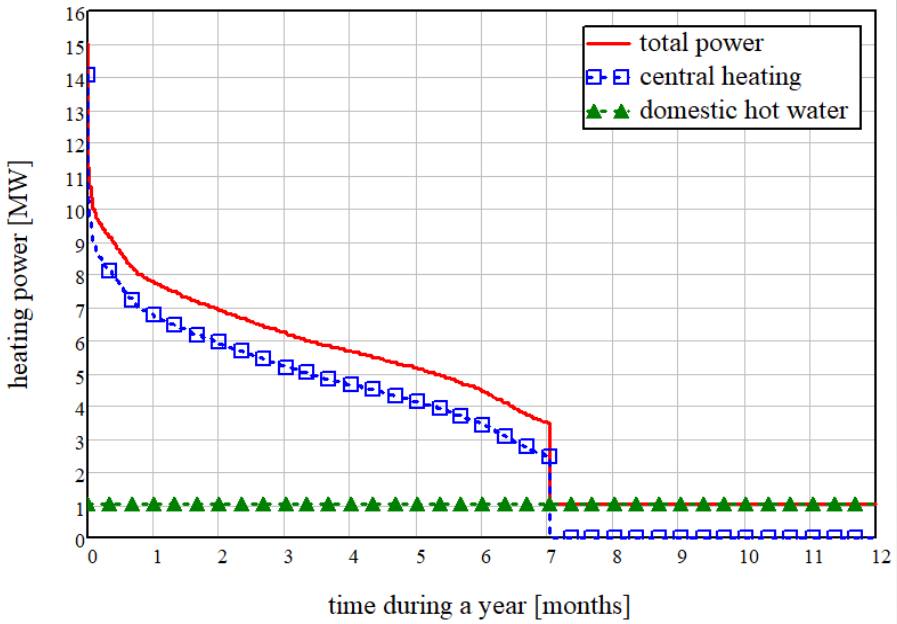
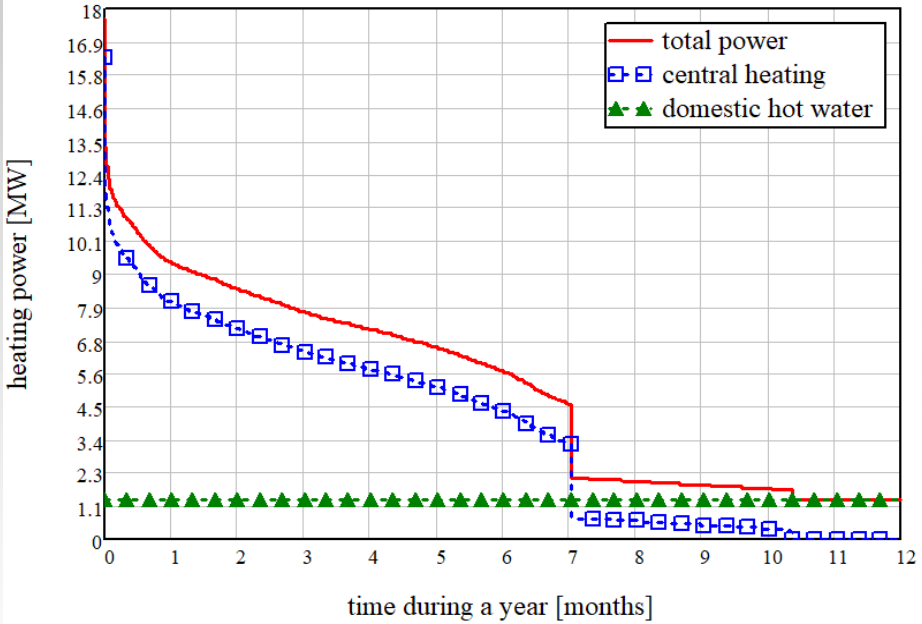
Power demand vs. time

A–ctual energy user



E-xtended energy user



considered oprions:

- **ngA (n-atural g-as A-ctual user)**
- **ngE (n-atural g-as E-xtended user)**
- **ahpA (a-sorption h-eat p-ump A-ctual user)**
- **chpA (c-mpressor h-eat p-ump A-ctual user)**
- **ahpE (a-bsorption h-eat p-ump E-xtended user)**
- **chpE (c-mpressor h-eat p-ump E-xtended user)**

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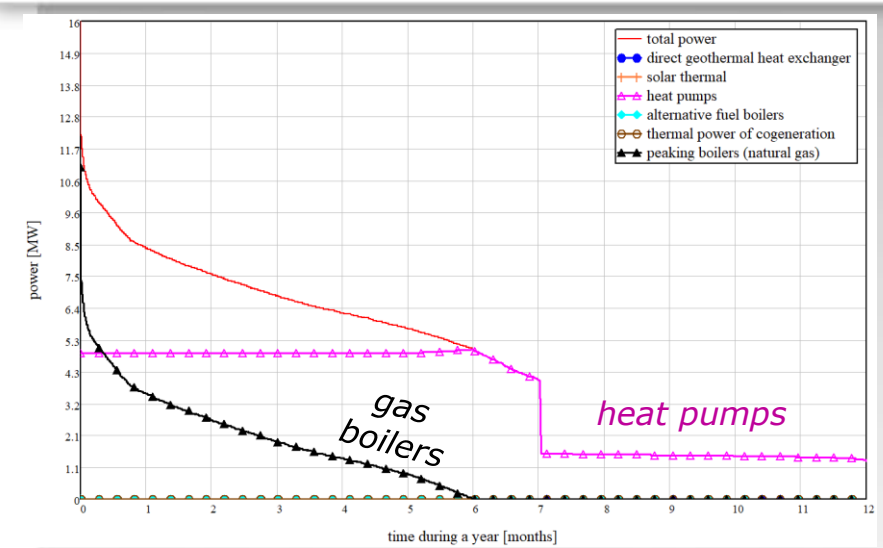
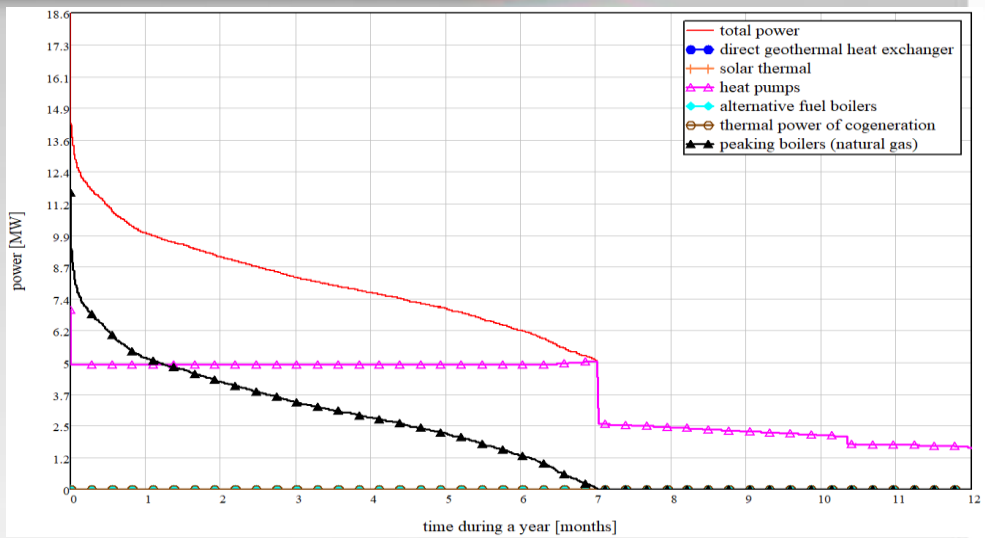


A–ctual energy user



E-xtended energy user

Summary
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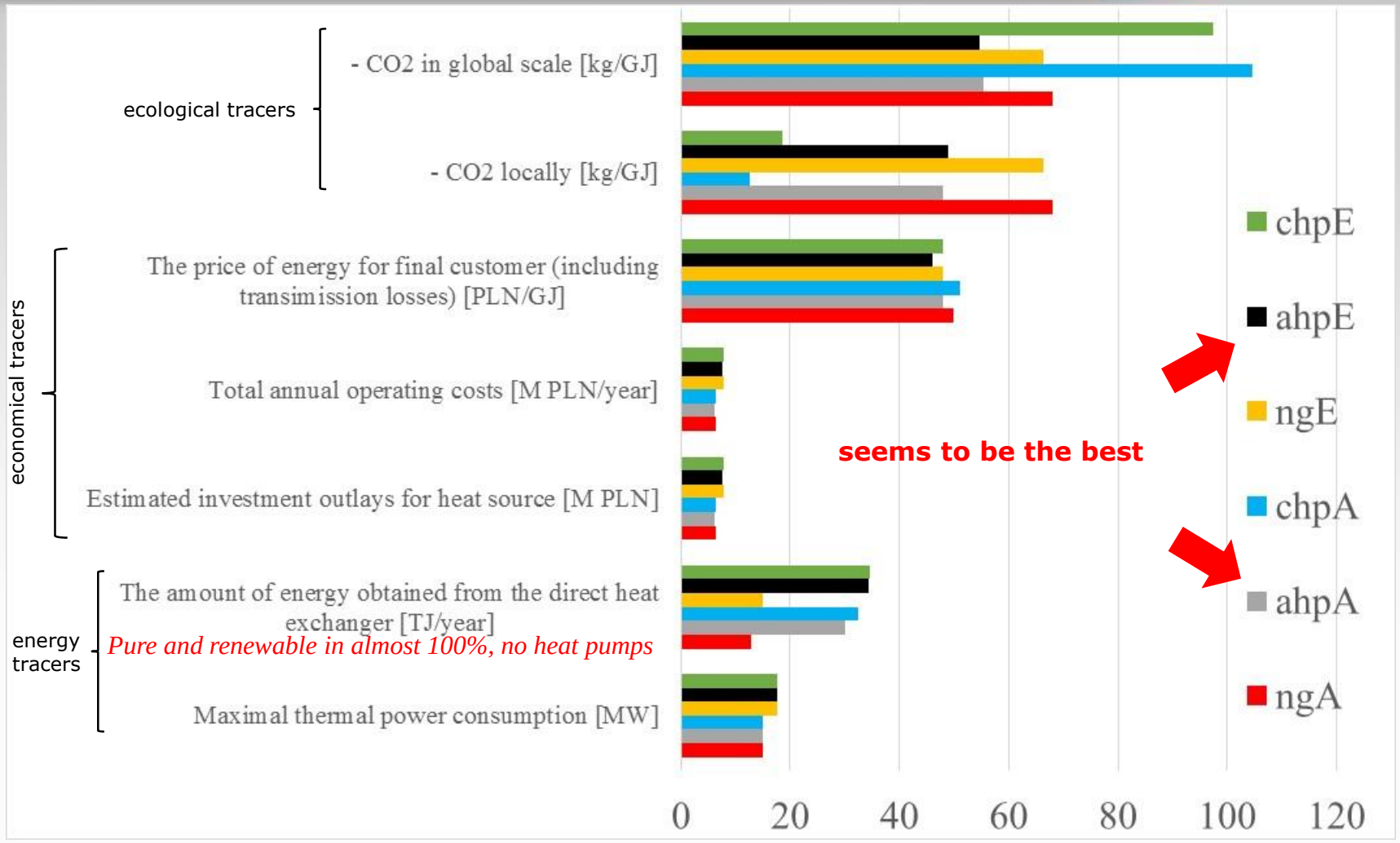

Summary

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O.P. Einarsson – **OS**

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There are quite a few radiator manufacturers that supply so-called “forced convection radiators”. These units are equipped with finned coils and a fan, that increases air flow and therefore convection in these units. These manufacturers are, for example, Licon (www.liconheat.com), Veneto (www.kinnan.se) and various others.

These forced convection units are somewhat thicker than normal wall-mounted radiators but the overall size. Noise levels from these units are very low (20-30 dBA) and they are able to heat houses from water as cold as 35-40°C.

Since the proposed geothermal heating system in Sochaczew is to use low mineralization geothermal fluid from upper cretaceous layers at 40°C (suitable as drinking water), it would be ideal to install this type of forced convection radiators in a couple of buildings near the proposed geothermal well. The cleanliness of the water would mean that no heat exchanger would be needed. Cooling of the geothermal water would also be within 10°C, so there would be negligible risk from scaling due to temperature change. Installing a fine filter on the low-temperature radiator would be sufficient.

Typical heat load in a single 100 m² apartment is around 5-6 kW, so water flow to this type of radiator would be around 0,1 l/s for a single apartment, if the geothermal fluid cools from 40 down to 30°C. This would therefore require a standard DN 20 mm (3/4”) pipe to/from the house.

The proposed pilot project is to install one of these radiators in an apartment near the proposed geothermal well. The 30°C return geothermal fluid would be collected and combined with the 40°C fluid from the production well, with negligible cooling of the geothermal fluid to the heat pump. Cost of this radiator installation would be minimal.

Pilot proposition, next steps
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Because of low geothermal water resurces temperature Sochaczew needs heat pumps - but the primary target is reduction of supply and return water temperature.

1. **Geothermal energy utilisation controlling – reduction of return water temperature (automatization, telemetry and telecontrol),**

2. **Reduction of return temperature by increasing the surface of radiators and large surface heating (floor heating etc.) and cascade use of geotermal Energy,**

3. **Determining the conditions for new customers (required operating parameters),**

4. **Wider use of central domestic hot tap water.**

ATES –Aquifer Termal Energy Storage
Sochaczew
K. Midttomme

There are two scenarios for which an ATES would be a preferable solution for Sochaczew

- If there is a cooling need, either comfort cooling or industrial cooling (including e.g. shopping malls and data centers, drying processes). In this case the upper aquifer should be used as a reservoir.
- If there is excess waste heat available with temperature above 40 °C. In this case the temperature in the 40°C aquifer can be increased, making it possible to run the heat pumps more efficiently, increasing the efficiency of the system.

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