

Geothermal energy use in Hungary

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3. The re-injection story
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1. POTENTIAL

POTENTIAL

Geothermal resources-I: the heat

New data are available

(Hungarian Geological Survey, 2004)

- Annual energy supplied by Earth's heat flow:
(dynamic resources): **264 PJ/year**
- Accumulated energy in rocks and liquid:
(static resources): **343.000 PJ**

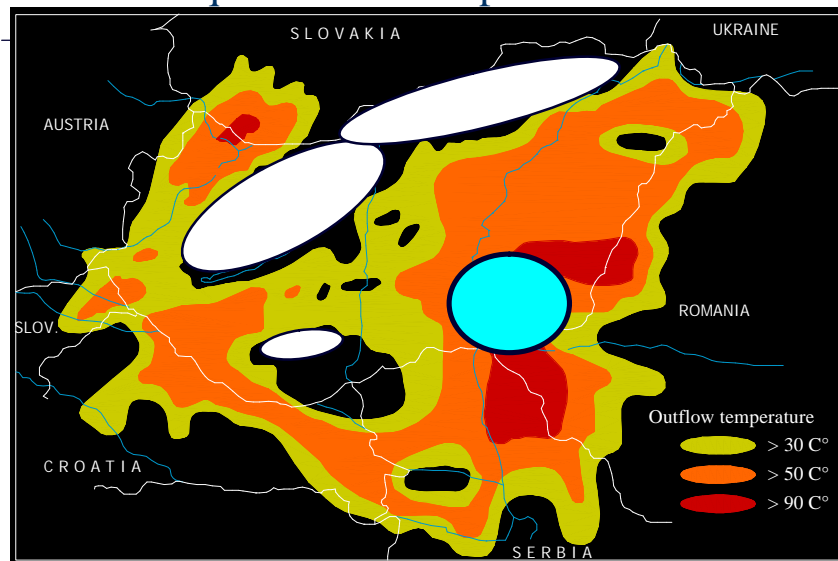
(Annual primer energy consumption: ~ 1100 PJ/year)

Geothermal resources-II: the water

No up-to-date data are available

- All subsurface water resource between 0-2400 m (Liebe, 1980) 2500 km³
- Geothermal water resource: ?

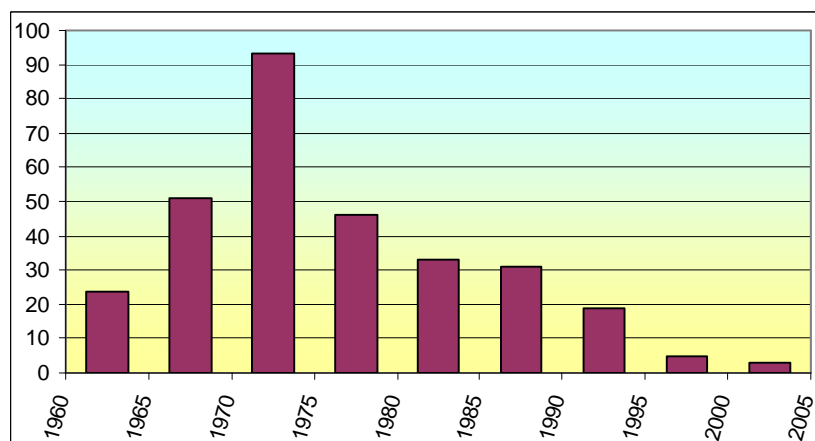
The upper-pannonian sandstone geothermal aquifer in the Carpathian basin



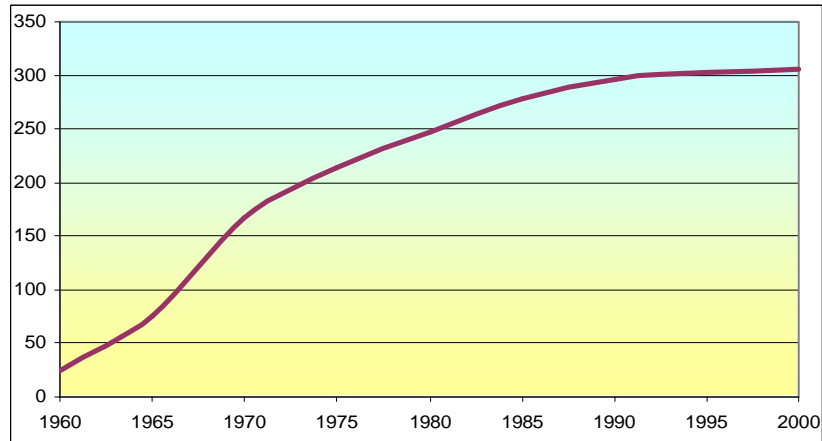
2. Historical overview

Historical overview

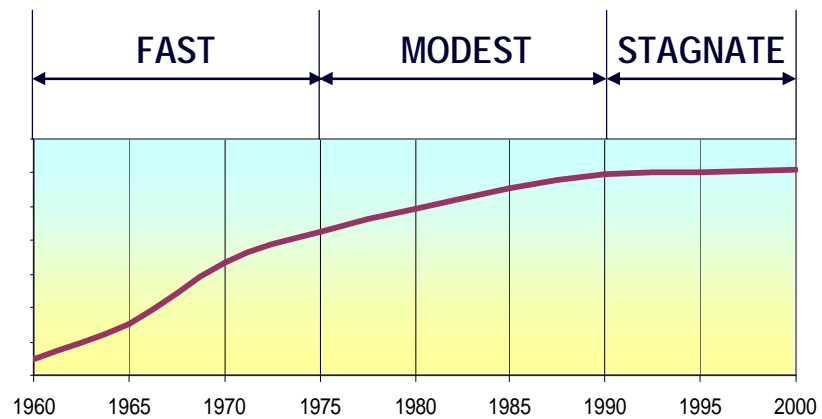
The number of wells drilled from 1960 to 2000



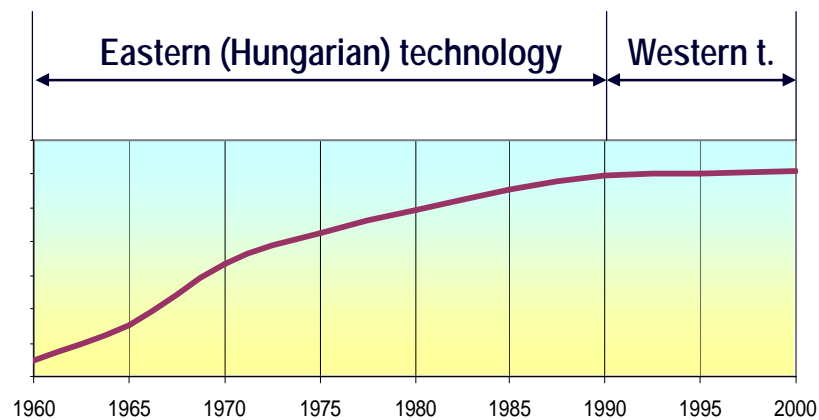
Development curve of geothermal utilization



Quantitative development



Qualitative development



Features of the utilizations

- Using waters below 100°C
- Harnessing waters mainly for horticultural purposes
- TDS from 700 to 15 000 mg/l, mostly between 2000 and 3000 mg/l
- High content of Na^+ and HCO_3^-
- Corrosion and scaling problems (in some cases)

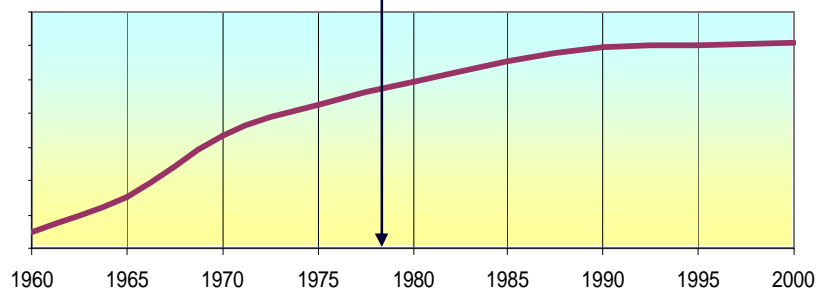
3. THE RE-INJECTION STORY

THE RE-INJECTION STORY

The first experiment



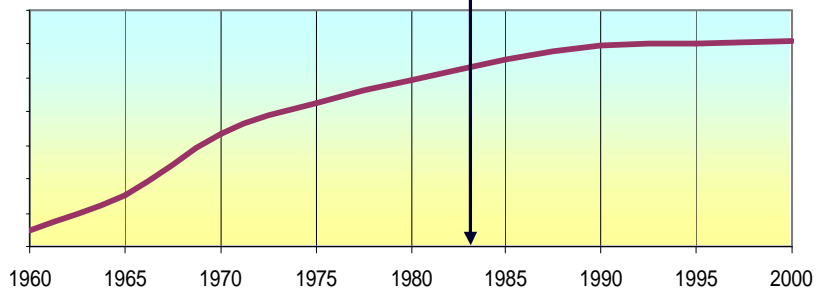
Szeged - Mihálytelek
1978



THE RE-INJECTION STORY

An international conference

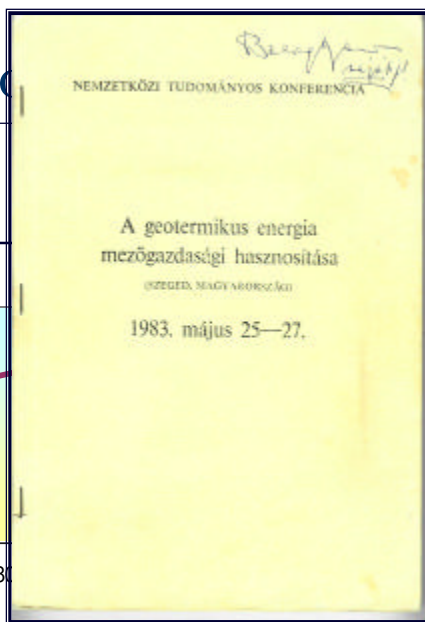
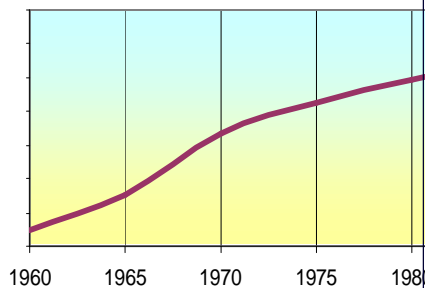
Szeged -1983



THE RE-INJECTION STORY

An international conference

Szeged -1983



THE RE-INJECTION STORY

A full range re-injection: Szeged-Felsováros

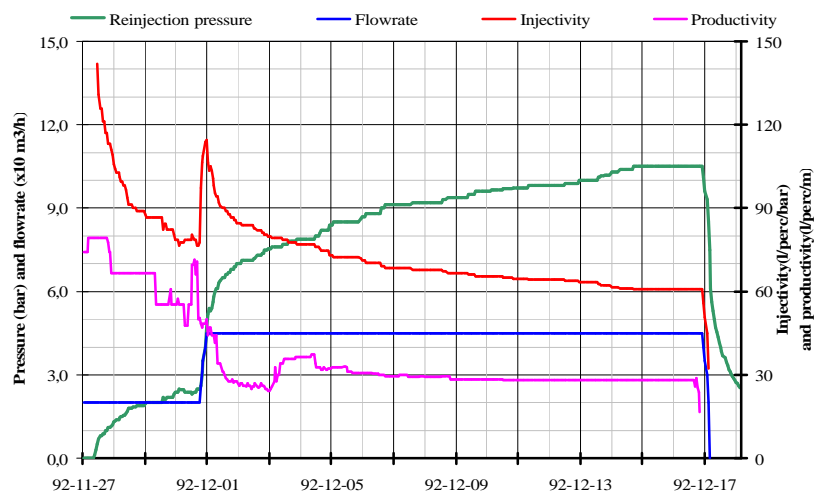


- 1983. Drilling of wells: (KBFI)
- 1984. Dec. to 1985 June. First experiment
Sand deposit at the bottom.
- 1988. Well cleaning
- 1992. Experiment financed by PHARE.
Insufficient results to continue
- 1992. Nov. Another re-injection test
- 1994. Bidding for construction
- 1995. June: Project start up.
- 1998. April: Stop of re-injection.

THE RE-INJECTION STORY

Re-injection test in Szeged-Felsováros

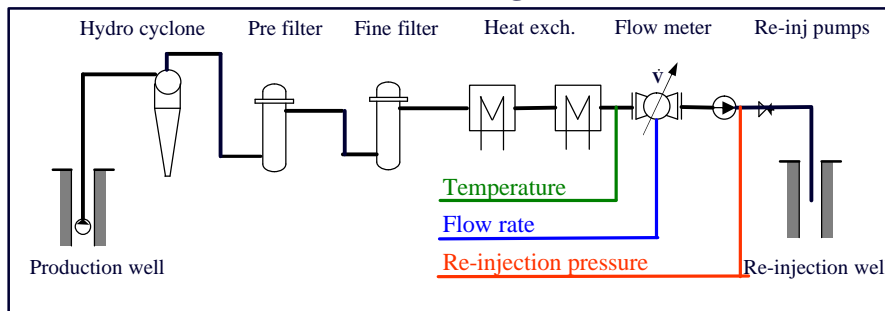
1992. Nov 27. - 1992. Dec. 17.



THE RE-INJECTION STORY

Szeged-Felsováros:
Operation in a fully closed loop.

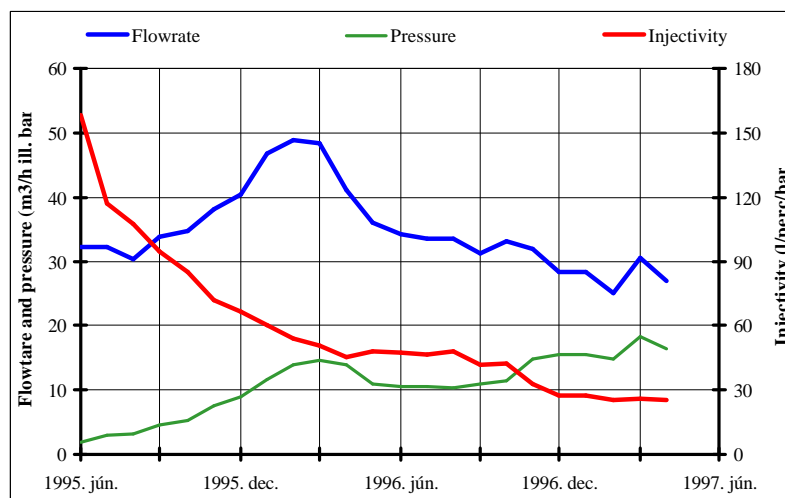
Connection diagram



- Careful filtering is required (2 μm).
- Sudden changes of flowrate have to be avoided.

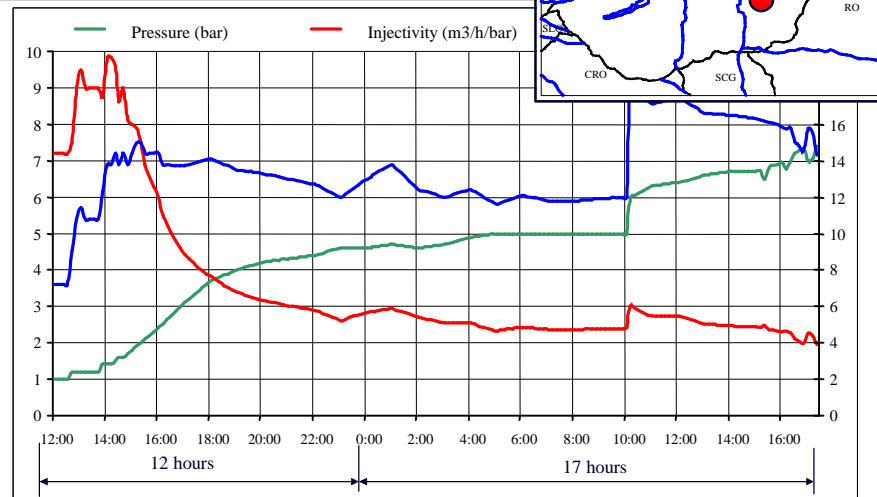
THE RE-INJECTION STORY

Running of re-injection in Szeged-Felsováros
1995. June - 1997. April



THE RE-INJECTION STORY

A very short re-injection test in Szarvas, 1987. March



THE RE-INJECTION STORY

How did a re-injection operator work?

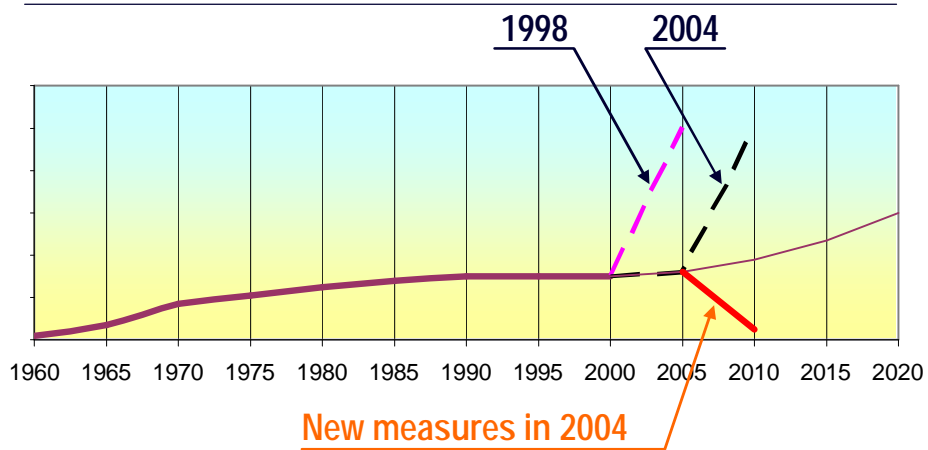
The Hungarian experience:

- Did not pay water fee and sewage penalty.
- Tried to re-inject but if the cost of operation rised too high he chose the less expensive solution → let the water off on the surface
- In this case he saved the cost of electricity (re-injection pumps) and well maintenance.
- Reported the successful re-injection to the authority.

4. THE future

THE future

Forecasts



New measures in 2004

1. **Modification of sewage penalty decree**
The government decree 220/2004 increased the penalty items of over-the-limit emissions **70** (that is seventy) times as against the former rate.
2. **Significant growth of water reserves contribution (water fee)**
3. **Modification of the water management law:**
“Any geothermal water exploited exclusively for the purpose of energy utilisation shall be returned to earth.”

Tasks for the future

- Real database.
- Good legal environment.
- Modernization of existing systems.
- Building new systems.
- Development of re-injection technology.
- Electricity production.
- Using abandoned hydrocarbon wells.

Tasks for the manufacturers

1. Technology for reduction of Na^+ concentration in cooled geothermal waters:
Requirement: operation cost must not exceed 0,10 Euro/m³.
2. Heat pumps specially designed for 30°C waters (as the heat source):
Requirement: COP should be, at least, 6.

5. THE role of hga

Activity of HGA in the recent years

- Hungarian Geothermal Association issued its “Statement on the status of harnessing geothermal energy in Hungary” on 20th October 2004.
- HGA managed to make modified the government decree 220/2004 on sewage penalty.
- The existing users may survive.

Aim of HGA for the future

- Creating new measures that may be observed.
- Leading users to observe the laws.



**THANK YOU FOR YOUR
ATTENTION!**

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