Geothermal district heating projects in the South Great Plain

Tamás Medgyes, Balázs Kóbor, János Szanyi

University of Szeged, Hungary
✉ tmedgyes@tavho.ikv.hu

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The 2000's - The South Great Plain region is catching up with geothermal

2008-2010: A brand new geothermal district heating system complete with waste gas utilization is built and starts to operate in Mórahalom

2009-2012: A pulsation test is carried out in the Szentes geothermal field – the largest agricultural geothermal operation in Europe, to lay the grounds for reinjection after decades of surface discharge

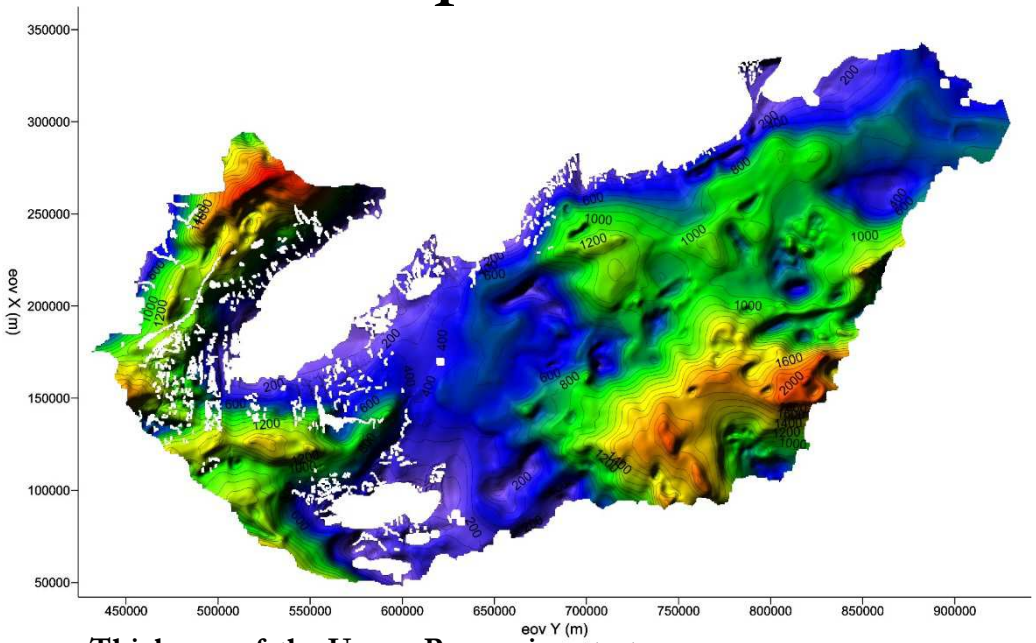
2010: Geothermal heating is introduced to a TESCO store in Hódmezővásárhely, and to the building of the Faculty of Engineering at the University of Szeged

2012-2013 A non-functioning geothermal district heating system is completely overhauled, expanded and starts to operate in Csongrád

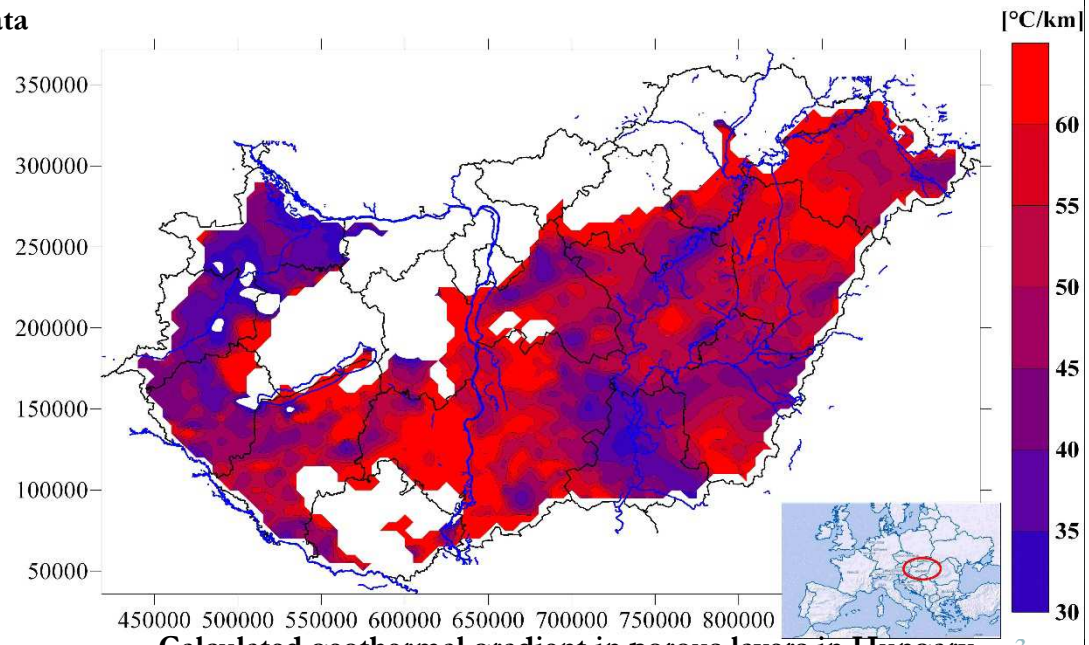
2012-2014: Two new geothermal district heating systems are built and start to operate in Szeged

2013-2015: A defunct production well is reopened, and a new geothermal district heating system is built in Makó

Geothermal potential

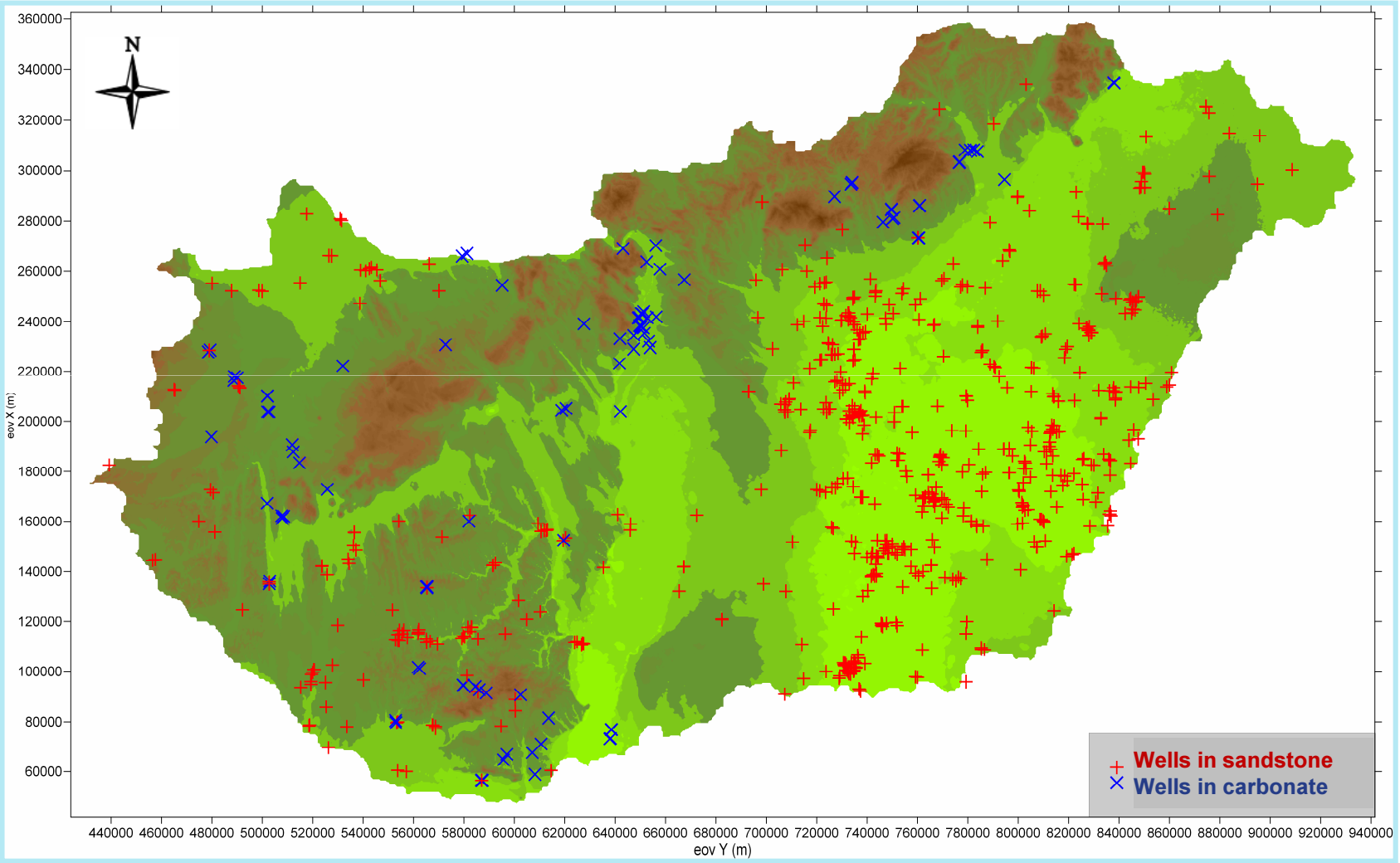


Thickness of the Upper-Pannonian strata



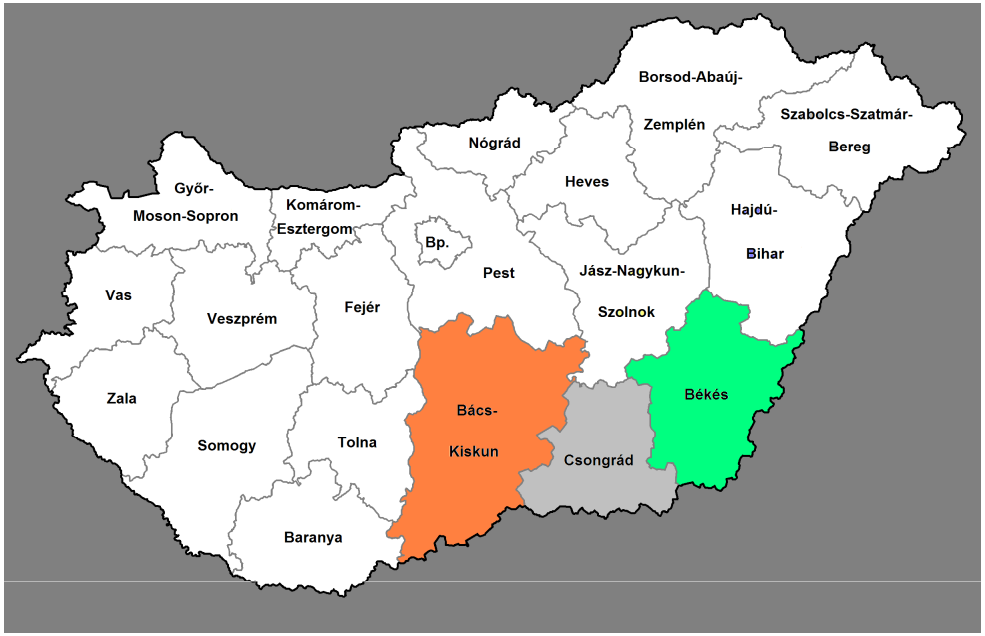
Calculated geothermal gradient in porous layers in Hungary

Geothermal potential



Locations of thermal wells

Heat market


Borsod-Abaúj-
Zemplén
Szabolcs-Szatmár-
Bereg
Nógrád
Győr-
Moson-Sopron
Komárom-
Esztergom
Heves
Hajdú-
Bihar
Bp.
Pest
Jász-Nagykun-
Szolnok
Vas
Veszprém
Fejér
Zala
Somogy
Tolna
Bács-
Kiskun
Csongrád
Békés
Baranya

Lajosmizse
Kecskemét
Kiskunfélegyháza
Soltvadkert
Kalocsa
Kiskunmajsa
Baja
Mórahalom
Szeged
Mindszent
Szentes
Hódmezővásárhely
Makó
Dévaványa
Gyomaendrőd
Szarvas
Kondoros
Békéscsaba
Gyula
Orosháza

Added value

Department of Mineralogy, Geochemistry and Petrology – Institute of Geography and Geology – Faculty of Science and Informatics - University of Szeged (http://www.asvanytan.hu)

4 research groups:
Organic and environmental geochemistry RG
Fractured fluid reservoirs research RG,
Strategic Funds regional development RG
Hydrogeology and geothermics RG.

The deparment has 8 laboratories, where trained personnel carry out
Crystal structure and mineral phase identification (with RIGAKU Ultima IV X-ray Diffractometer, THERMO DXR Raman microscope, Hitachi S-4700 Scanning Electronmicroscope)
Qualitative and quantitative major and trace metal analysis (with RIGAKU Supermini Wavelength Dispersive X-ray Fluorescence Spectrometer)
Elemental distribution analysis (with HORIBA Jobin-Yvon XGT-5000 Micro X-Ray Fluorescence Spectrometer with element-mapping function)
Cathodoluminescence and UV fluorescence imaging and spectrometry, image processing and analysis (with Linkam THMSG 600°C programmable heating/cooling stage, Reliotron VII cathodoluminescence apparatus, Ocean Optics QE Pro spectrometer, Olympus BX43 polarizing microscope; BX41 petrographic microscope (transmitted & reflected light); HBO 100W/2 mercury arc lamp; DP73 high-performance Peltier cooled digital camera; UC30 digital color camera; Stream Essentials advanced micro-imaging software; CellSense advanced micro-imaging software)

Added value

The South Great Plain Thermal Energy Cluster

(http://datek.co.hu)

InnoGeo Research Ltd

BRUNNEN Heat-technics Ltd

Greenmen Energy Ltd

GEOSZ Ltd

Project Admin Ltd

Hungarian Thermal Energy Association

et al.

Geothermal Cascade System in Mórahalom

Activities of the development

- The establishment of the geothermal cascade system in the public institutions of the town
- The construction of 1 ~1,400 m deep production well
- The construction of 2 ~900 m deep reinjection well
- The establishment of ~ 2,800 m new thermal conduit
- The creation of 7 new heating stations
- The establishment of an up-to-date PLC control system

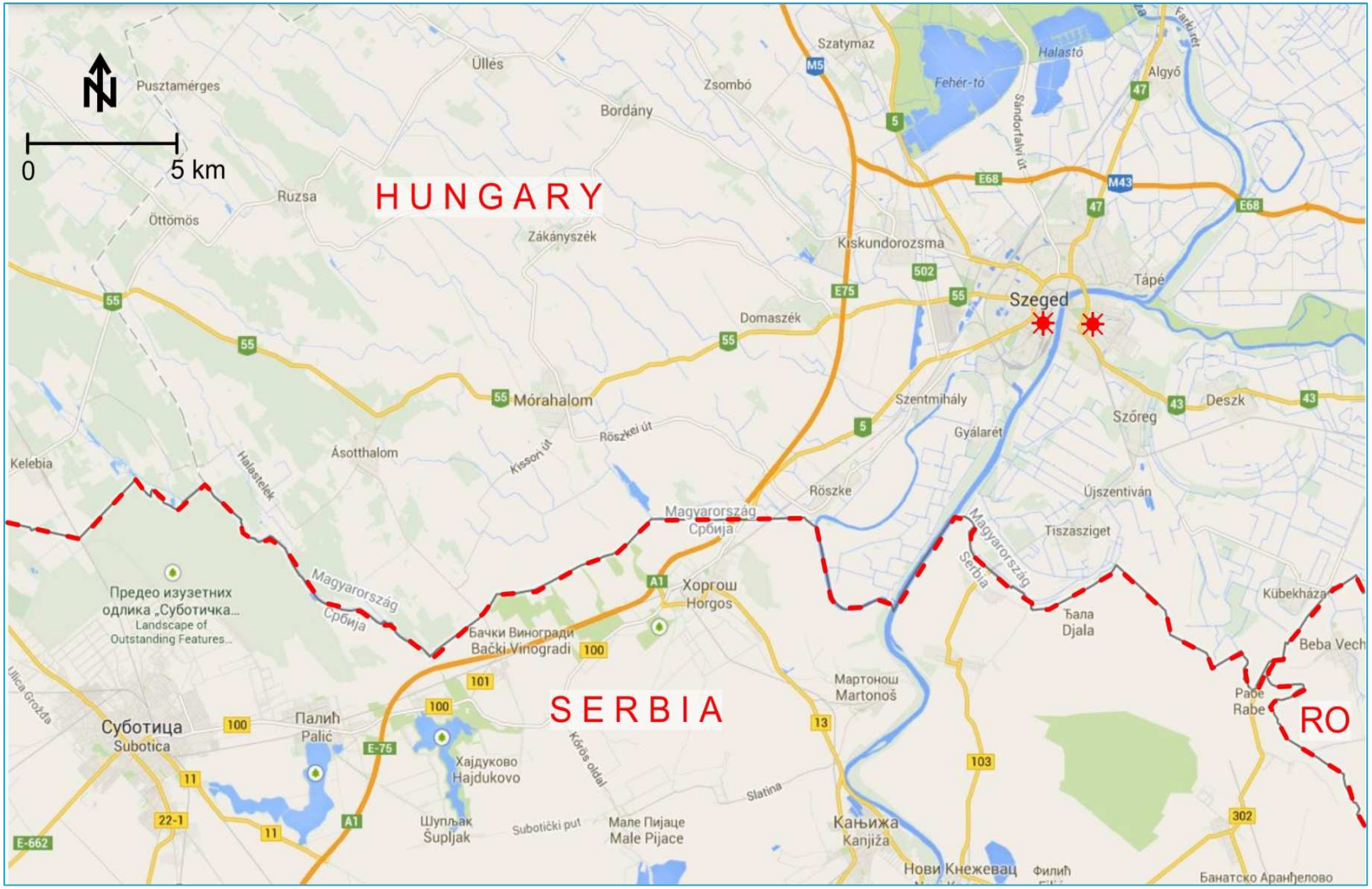
The investment's energetic and environmental indicators

- 2.6 MW installed new geothermal heat capacity
- Geothermal energy usage 0% -> 80%
- 14,441 GJ fossil energy sparing
- 481,907 m3 /year gas replacement
- 866 t CO2 emission reduction
- 318 kg NxOx emission reduction
- 605 kg CO emission reduction

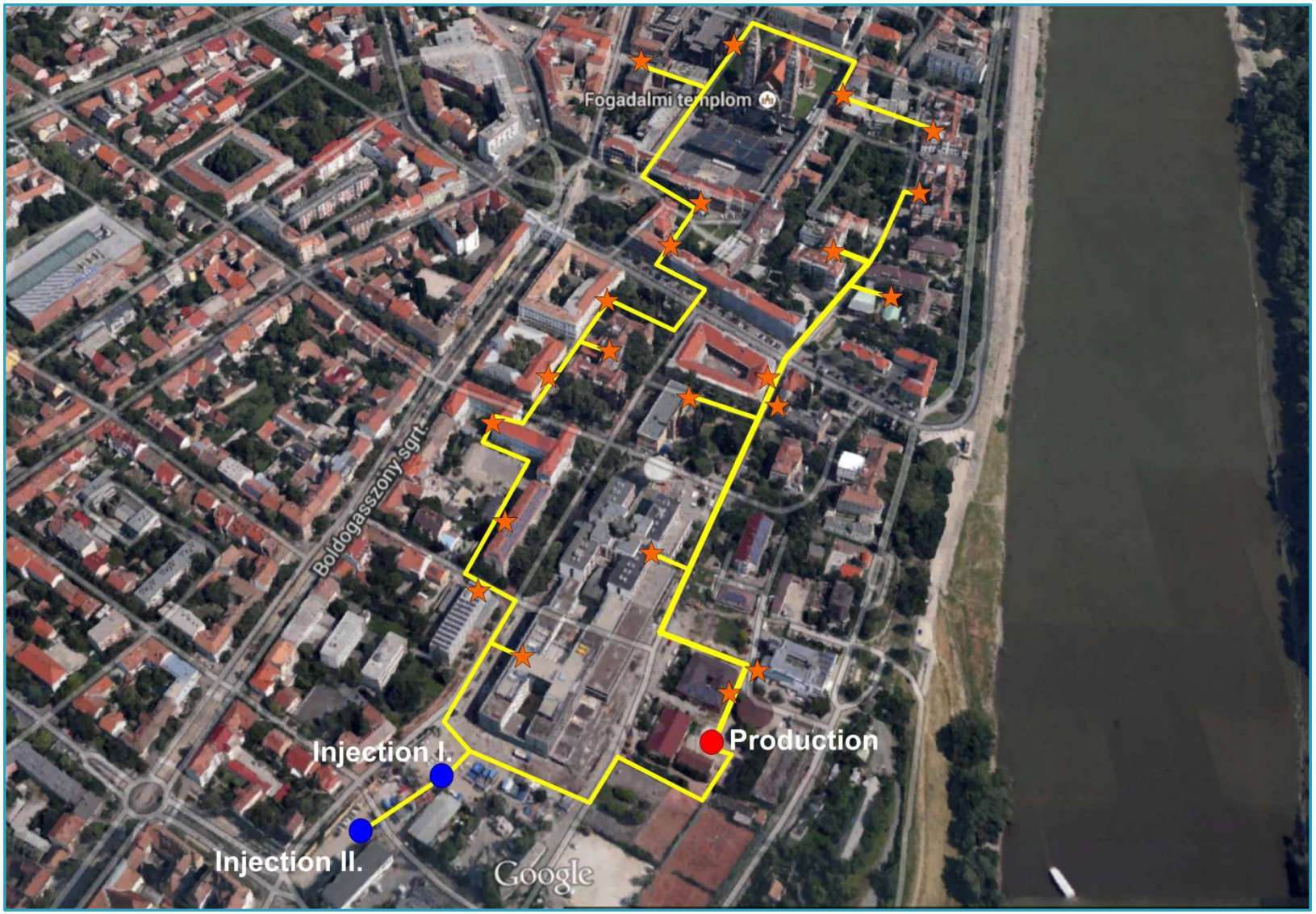
The investment's financial indicators

- Investment cost: net 1.5 M Euro
- EU support: gross 0.75 M Euro (50%)
- 600 Euro/kW specific historical cost
- CO2 reduction's specific investment cost 60 Euro/t
- Operational cost: net 70,000 Euro / year

The twin systems in Szeged



The geothermal cascade system in the city center



Parameters of the downtown geothermal circle

Construction of the 4.4 MW_{th} project

- 1 production well (1,995 m)
- 2 injection wells (1,350 m; 1,750 m)
- pipe line ~ 3,300 m
- 25 new heating centres
- Online PLC control system

Outcomes of the project

- Produced geothermal energy: 55,239 GJ/y
- Natural gas reduction: 1.8 million m^3/y
- CO_2 reduction: 3,633 t/y
- Spending on investment: 6.6 million €
- Investment/produced energy: 1,410 €/kW)
- Specific investment of CO_2 reduction: 1,830 €/t
- Maintenance cost: 280,000 €/y
- Profit: 0.45 million €/year

Geothermal cascade system in New-Szeged

Parameters of the New-Szeged geothermal circle

Construction of the 4.5 MW_{th} project

- 1 production well (2,000 m)
- 2 injection wells (1,250 m; 1,700 m)
- pipe line ~ 4,400 m
- 12 new heating centres
- Online PLC control system

Outcomes of the project

- Produced geothermal energy: 37,167 GJ/y
- Natural gas reduction: 1.2 million m^3/y
- CO_2 reduction: 2,343 t/y
- Spending on investment: 4.2 million €
- Investment/produced energy: 860 €/kW)
- Specific investment of CO_2 reduction: 1,780 €/t
- Maintenance cost: 193,300 €/y
- Profit: 0.37 €/y

Thank you for your kind attention –
see you tomorrow in Szeged and Mórahalom