Sustainable District Energy Conference

23-25 October, 2019

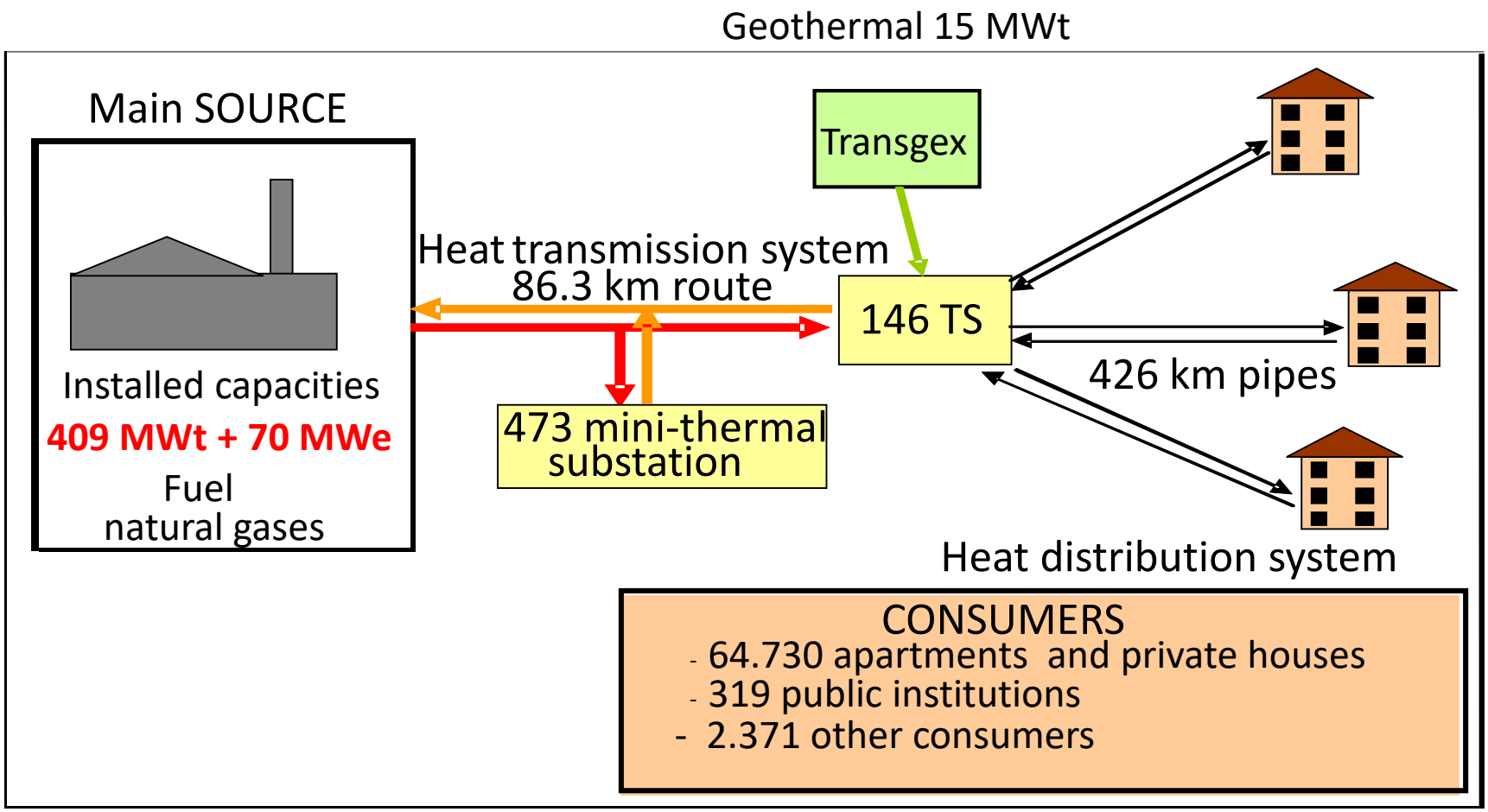
Geothermal projects financed by EEA Grants in Oradea Municipality (Romania)

Positioning Oradea

	Population	Surface/km2
ROMANIA	20.121.000	238.391
Bihor County	600.223	7.544
Oradea Metropolitan Area	251.000	792
ORADEA Municipality	201.000	116

Description ORADEA DISTRICT HEATING SYSTEM

- 100% owned by the Oradea Municipality
- operated by SC *Termoficare Oradea* SA (company owned by Oradea Municipality)
- covering services for 70% of the population
- In December 2017, a number of 64.730 apartments in blocks of flats and houses, 319 public institutions and 2.371 other consumers were supplied with heat/tap water by the district heating system
- Oradea DHS figures in 2018: 680,530 Mwht consumption in 2018, out of which 46,520 Mwht came from the geothermal source (6,8%)
- The total geothermal energy delivered at the city level in 2018 is 98,000 Mwht (other public/private clients separate from the DHS)


Geothermal 15 MWt
Main SOURCE
Installed capacities
409 MWt + 70 MWe
Fuel
natural gases
Heat transmission system
86.3 km route
Transgex
146 TS
473 mini-thermal substation
426 km pipes
Heat distribution system
CONSUMERS
- 64.730 apartments and private houses
- 319 public institutions
- 2.371 other consumers

GEOTHERMAL FACTS IN ORADEA

Oradea aquifer: Mesozoic hydro structure developed at the cretaceous, Jurassic, Triassic limestone collectors. The type of aquifer is a pressure aquifer with positive piezometric levels, partly due to the gas-lift and thermolift phenomena.

Oradea geothermal water: sulphate-bicarbonate-calco-magnesian type, without the need for treatment processes to be used in energy installations.

Water temperatures: between 70°C and 106°C.

Pressure at the well head is between 2.5 - 8 bar.

Total wells: 15, out of which 12 are currently in production (total average flow of 65 l/s and an outlet temperature between 30 and 45˚C) and 2 for injection

Estimated geothermal water flow potential: approximately 150 l/s.

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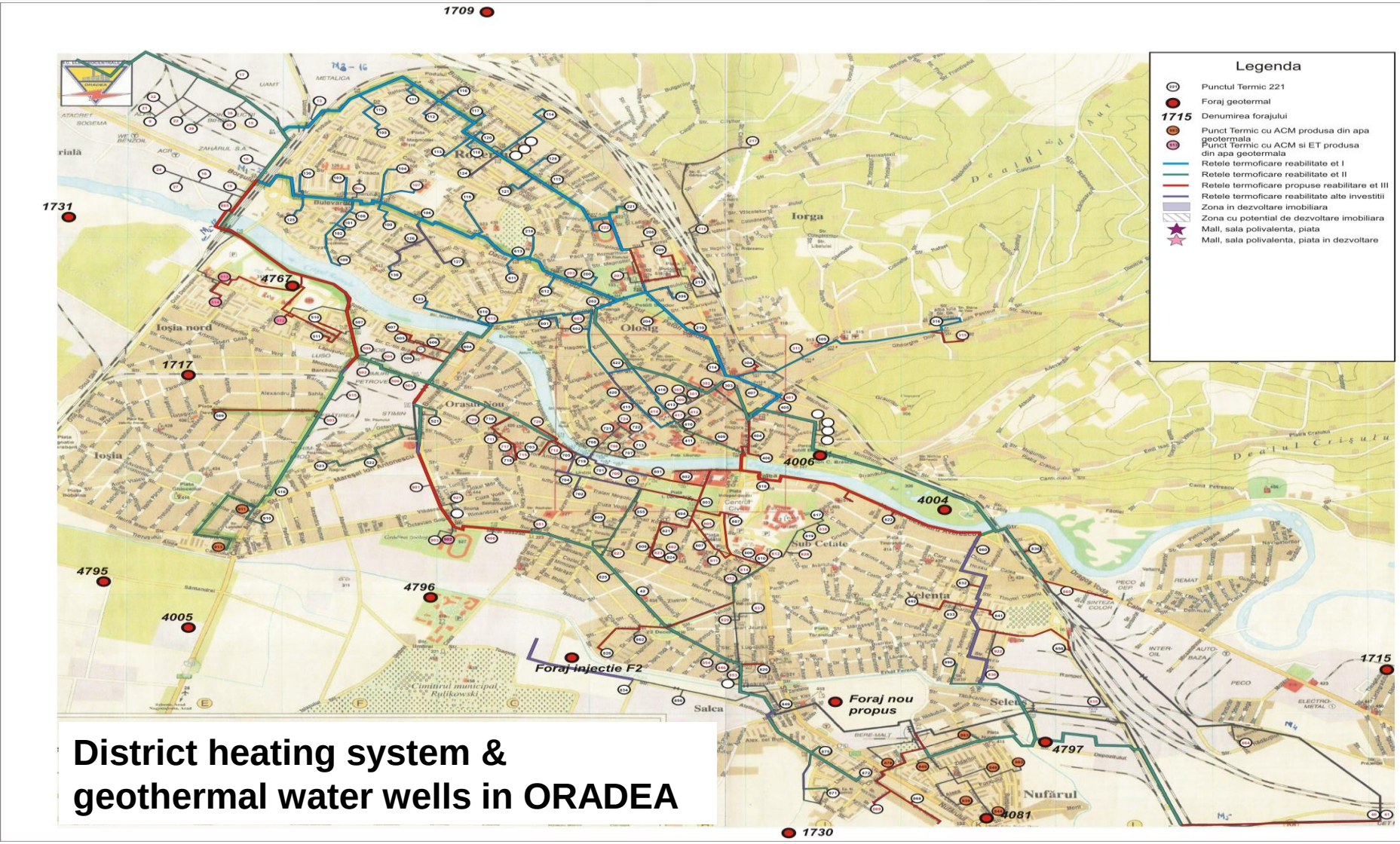


District heating system & geothermal water wells in ORADEA

<u>EEA GRANTS financed Project 1</u>: *"Development of geothermal energy to produce heat for consumers connected at the substation PT 902 and the reinjection of the geothermal water in the reservoir"*

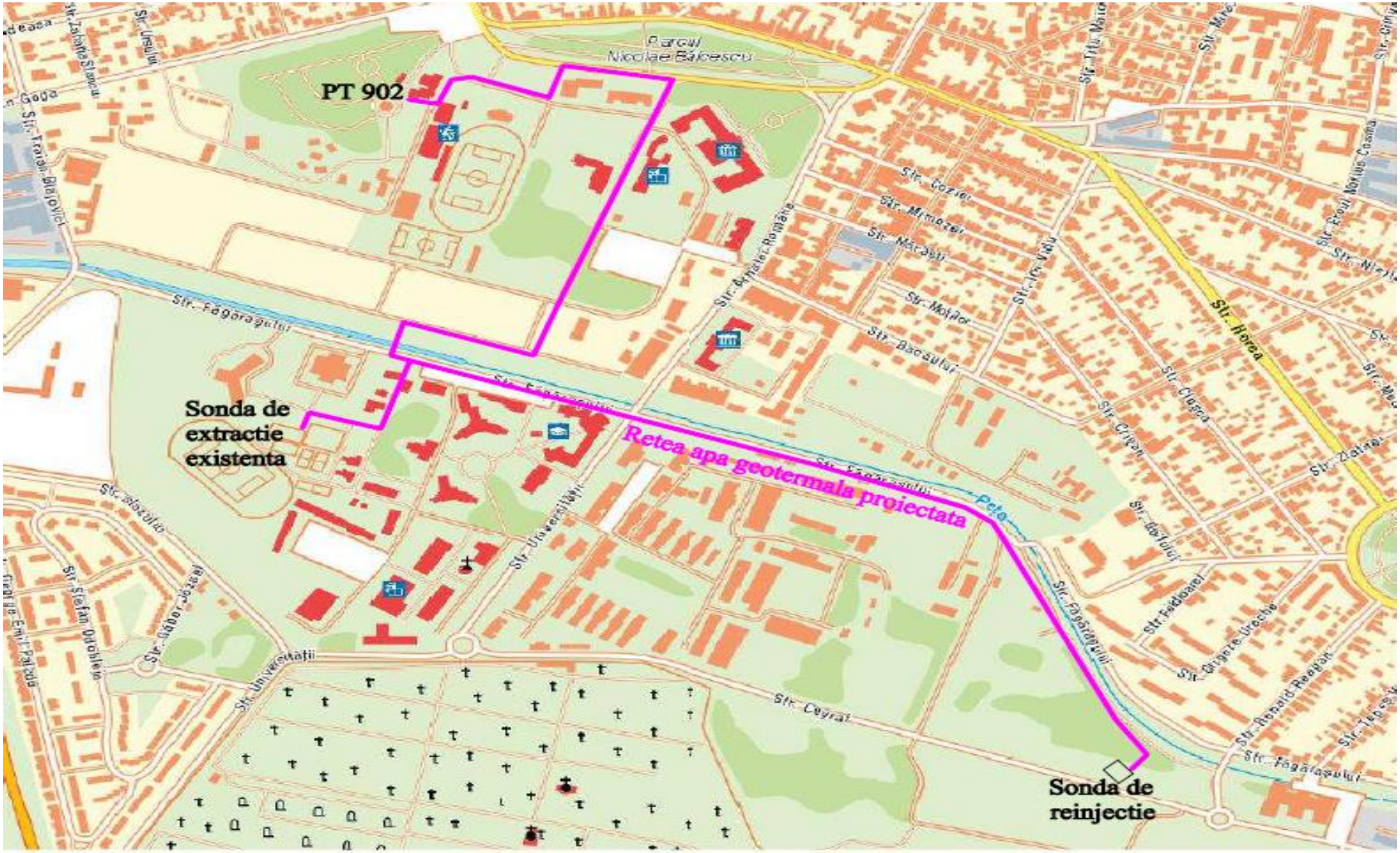
- **Project duration: 2014 - 2017**
- **The total value of the project:** 3,958,001.93 EURO, including VAT
- **Value of the executed works :** 3,553,498.15 EURO, including VAT
- **Program:** RO 06 Renewable Energy (RONDINE)
- **Financial sources:**
  - 85% EEA Grants Donor States: Iceland, Norway, Liechtenstein
  - 15% Public Budget (the Environment Funds)
- **Project partner:** Icelandic Geothermal Engineering Ltd.

The overall objective of the project: is to increase the production of thermal energy from renewable sources in the city of Oradea by supplying the thermal substation 902, during the heating season, with geothermal water.

Specific project objectives:

- Utilization of the geothermal water resource at the 4796 well located at the University of Oradea;
- Modernization of thermal point 902 from Sports High School for its operation and with geothermal water;
- Environmental protection by reducing the pollutant emissions generated by the thermal energy production at CET Oradea;
- Ensure sustainable management of the geothermal water reservoir by executing the reinjection well.

Location: South-western area of Oradea



PROJECT RESULTS

Geothermal water network

- The construction of a geothermal water pipe line from the well 4796 to PT 902 with ND (nominal diameter) 150/250 and of a total length of 1,467 linear meters;
- The construction of a pipe line for the thermally used geothermal water having ND 160/200 - a total length of 2,224 linear meters.

PROJECT RESULTS

PT 902 - technological equipment's

The implementation within PT902 thermal station of 2 fully automatic thermal modules with paralleled operation, on geothermal system and CET primary thermal agent.

- The installed capacity in the thermal station is 5.6 MW = 2 x 2000 kW heating and 2x800 kW of hot water.

- Energy produced from geothermal water (heat + tap water)
  - E=3.663 MWht/Heating season (172 days)
- Energy produced from CET
  - E=290,7 MWht/summer season (tap water: 193 days)

PROJECT RESULTS

Before

After

PROJECT RESULTS

New injection well

- A new reinjection well was constructed on a piece of land belonging to the Oradea Municipality - the entire quantity of extracted geothermal water that should be reinjected - 45 l/s (162 m3/h). The depth of the reinjection well is 2 900 meters;
- The thermally used geothermal water from the exit of PT 902 thermal station is collected and transported by a PEHD DN 160 pipe line to the manhole of the overflow of the thermally used geothermal water in Oradea University's thermal station. From here these waters will be conveyed further to the reinjection well by a PEHD ND 200 pipeline, being able to take over also the flow of used geothermal waters from the local public University.

PROJECT RESULTS

Reinjection station

The reinjection station is located near the new well. The surrounding area is at this moment in full urban development.

The works consisted of:

- Execution of two metal blockhouses of size 4 x 2,5 x 3 m, having the following destinations:
  - well building
  - pumping group building
- The purchase and mounting of a 50 m3 tank;
- The purchase and mounting of a pumping unit Q=162 cubic meter/h, Pressure = 10 bars;
- The enclosure of the reinjection station 15.00 x 15.00 linear meters.

PROJECT RESULTS

Control & automatization system

The parameters of the investment are adjusted automatically, they are tracked from the system operator's dispatch, the data transmission being made by optical fiber.

EEA GRANTS financed Project 2 : *Pre-Feasibility Study - Geothermal District Heating in Oradea, Romania*

- **The total value of the project:** 353,000 EURO
- **Value of the executed works :** 320,236 EURO
- **Program:** RO 06 Renewable Energy (RONDINE)
- **Financial sources:**
  85% EEA Grants Donor States: Iceland, Norway, Liechtenstein
  15% Public Budget (the Environment Funds)
- **Project partner:** The Icelandic National Energy Authority

- **The overall objective of the project:** to promote early stage development, strategy planning, capacity building, networking and awareness of geothermal utilization, to increase possibility of utilization of geothermal resources, energy security, savings and quality of life in Oradea.
- **The specific objectives of the project are:**
- Re-evaluate and update the production potential of the Oradea geothermal resource and update earlier evaluation.
- Increase the awareness of the local authorities, as well as the public, of the potential and benefits of sustainable geothermal utilization in the city and surrounding communities.
- Evaluation of the potential increase of geothermal utilization in the city and surrounding communities.

Project conclusions

- The main recommendation regarding future geothermal utilization in Oradea, is that the **utilization should be increased in steps, from 50 L/sec to about 140 L/s.** A clear benefit from a stepwise approach is that by monitoring carefully the response of wells and the geothermal reservoir to the production increase, associated with the first step, the response to a further increase can be predicted much more accurately than now.
- **Monitoring of production, water-level** (or well-head pressure if a well is artesian), **temperature** and **chemical content** must be **comprehensive** and **accurate**. This will provide basis for future increase in utilization.
- **Reinjection should be increased hand-in-hand with increased utilization** and pressure drawdown. Increased reinjection should be accompanied with extensive reinjection research, in particular tracer testing, which can be used to evaluate the cooling danger for specific production wells.

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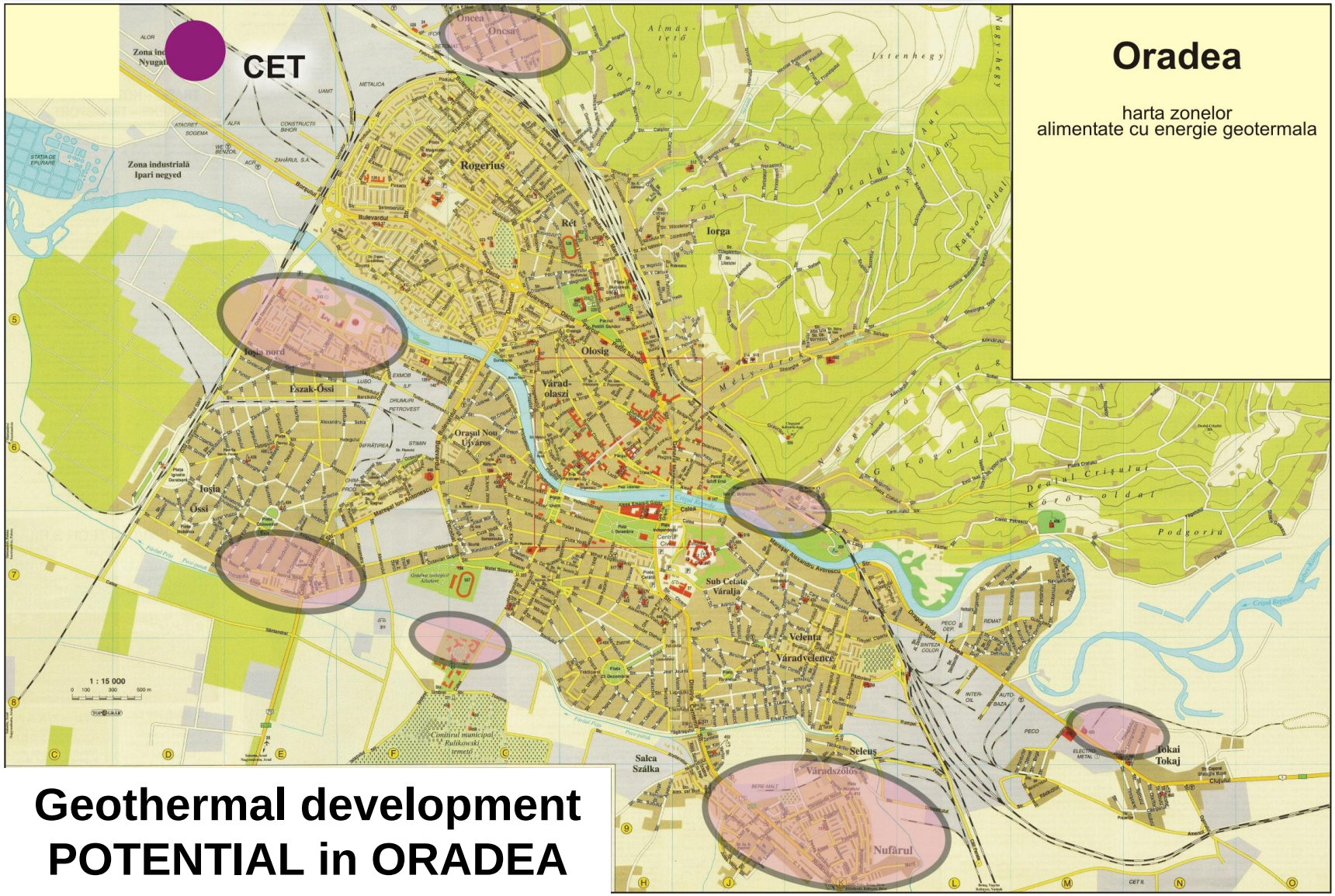
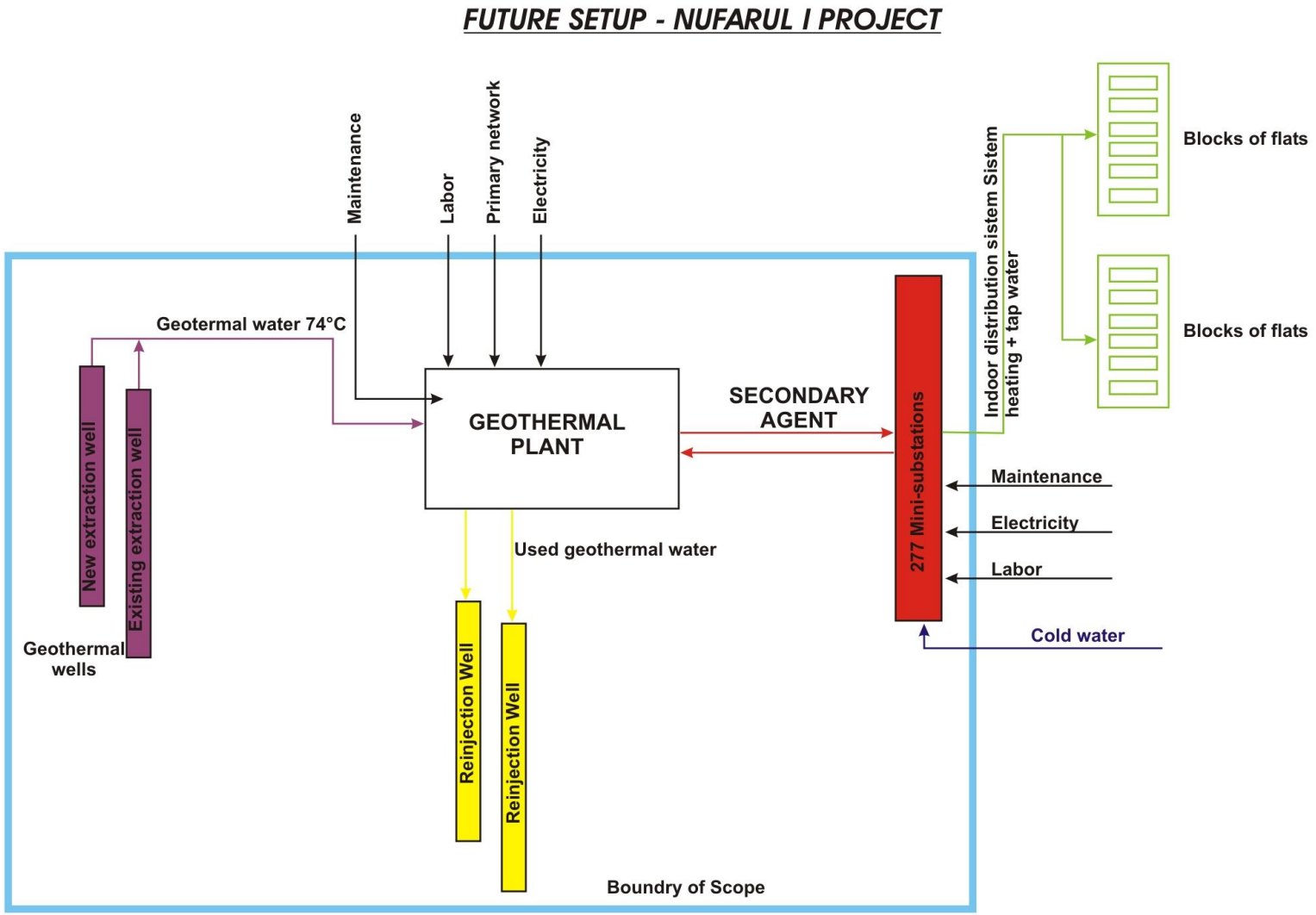


Geothermal development POTENTIAL in ORADEA



Project submitted for financing – currently under evaluation (RO)

https://www.youtube.com/watch?v=uZ9rjLnGI58

Thank you for your attention!

ORADEA MUNICIPALITY (Romania)