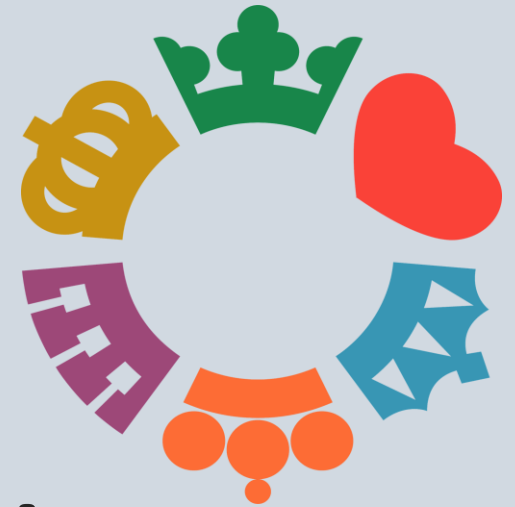


# Oradea Municipality Sustainable Development - the role of Geothermal Energy

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IOAN MAGHIAR

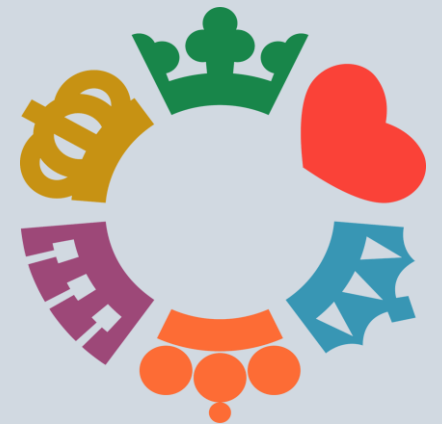
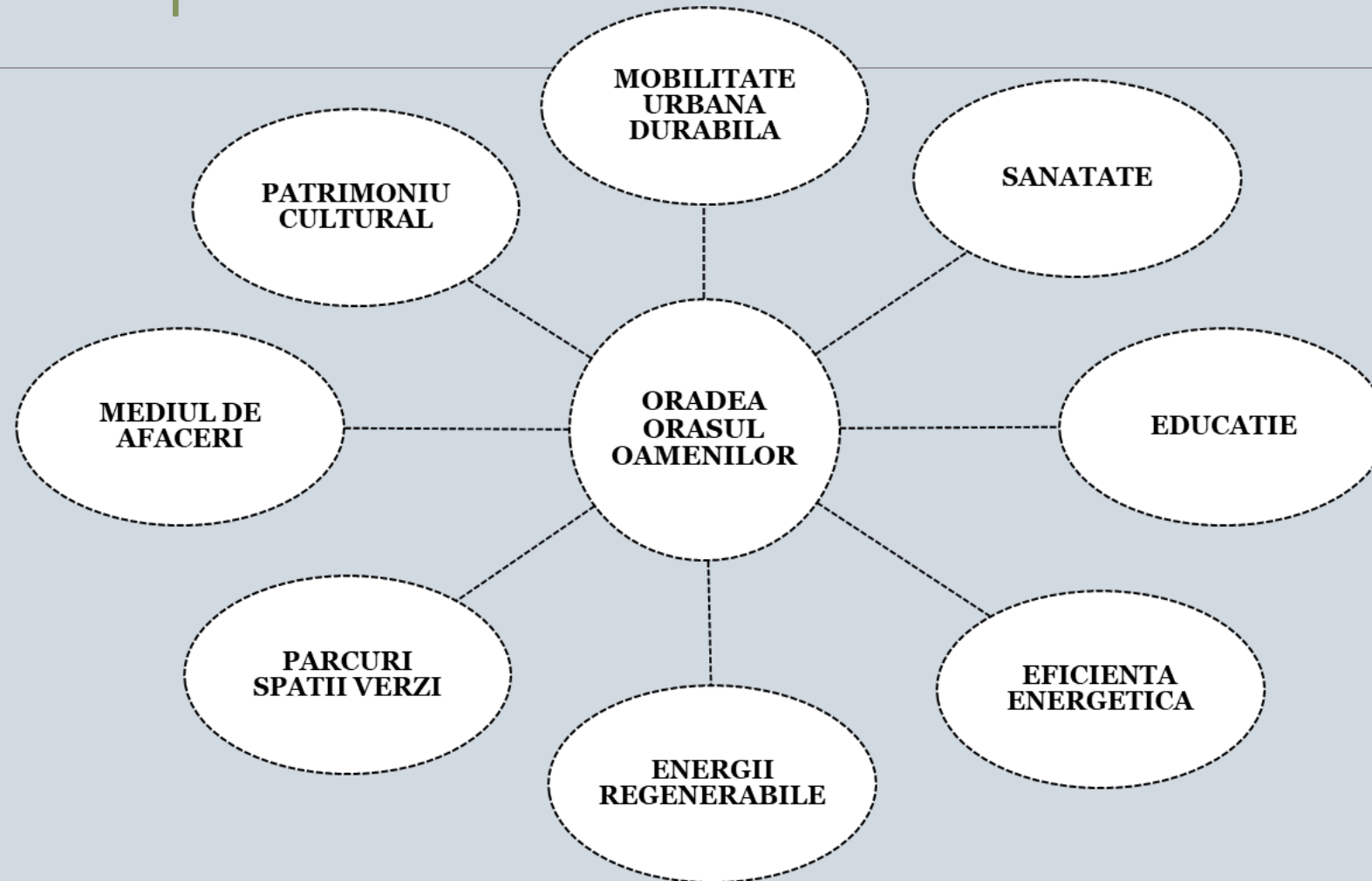
COUNSELOR

ORADEA MUNICIPALITY

DIRECȚIA MANAGEMENT PROIECTE

CU FINANȚARE INTERNAȚIONALĂ

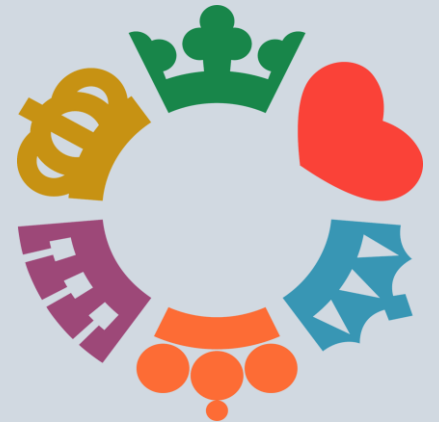
# European funds – the main pillar of the city's development



Investments made in 15 years with  
support from european funds  
= investments made in 30 years from  
local budget

**Overall investments  
value of more than 1.5  
bil euro**

**3 financing cycles:**  
**2007 – 2013**  
**2014 – 2020**  
**2021 - 2025**



**Vision**

**Planning**

**Maturity of projects -  
Assuming  
responsibility**

**Integrated  
approach**

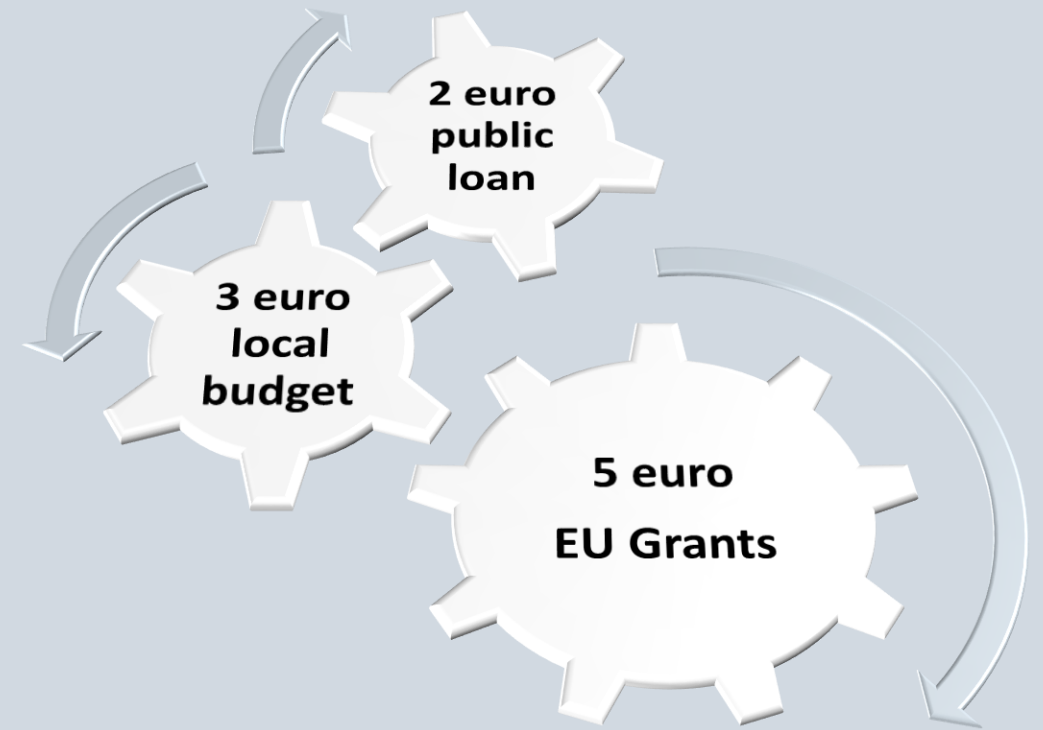
**Team**

**“By failing to plan, you are preparing to fail!” (Benjamin Franklin)**



# Multiplier effect for every 10 euro invested

- Starting projects in areas that bring **added value** and **development** (energy, business infrastructure, tourism)
- Projects started and supported through loans and then applied and reimbursed from European funds
- There is a partnership with the EIB that finances a project portfolio of the Municipality of Oradea and the projects that receive European funding are replaced by other projects in this portfolio





# Energy

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Considering the size of Oradea (213.000 inhabitants), its energy demand, as well as the local/global energy context, **the proper management of energy** issues at the local level is **one of the biggest challenges facing the municipality.**

**More than 70% of the city's population is connected to the centralized heat energy supply system.**

The Centralized Thermal Energy Supply System in the Municipality of Oradea is 100% public property, being operated by SC Termoficare Oradea SA (company owned by the Municipality of Oradea).





# A little bit of history ...

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'60 – in the context **of forced industrialization** and development of the cities (promoted by the communists) a new industrial site on the western part of Oradea was planned, consisting of large industrial installation: alumina production plant from bauxite ore, chemical synthesis products and by-products, a woodworking plant, a sugar factory, etc.

**All these installations needed electricity, heat and steam for the production processes...** Thus, a new Combined Heat and Power plant (working on lignite and heavy fuel oil) was built, and in 1966 the first MW was sent to the grid

Until 1987, 6 steam boilers and 5 steam turbines were installed – a total of 546 MWt and 205 MWe. It became part of the national electricity system. To have an idea, in 1988 were delivered 1 434,8 GWh of electricity and 2 475,3 Tcal of heat produced from 3,22 mil tone of coal + 46,5 thousand tone of HFO

The local pipe network was developed in time, in 1966 were put in function 68 Thermal Stations within the city, connected with the plant through the first 20 km of network

A second power plant consisting of 3 SB + 3 turbines x 50 MWe was built in the southern part of the city (aiming to serve a new industrial site never built) - It functioned from 1987 to 2000.



In 2002 the DH infrastructure (including the plant) was transferred from the state property to the local administration

The first 3 boilers were shifted on natural gas in 2003 (for economical reasons – price of gas compared with lignite + HFO)

Insufficient resources of financing for maintenance programs and new investments into DH system between 1990 and 2008 took DH to the edge:

**High operating time** – over 200,000 hours

**Operation:** capacities were properly exploited, but:

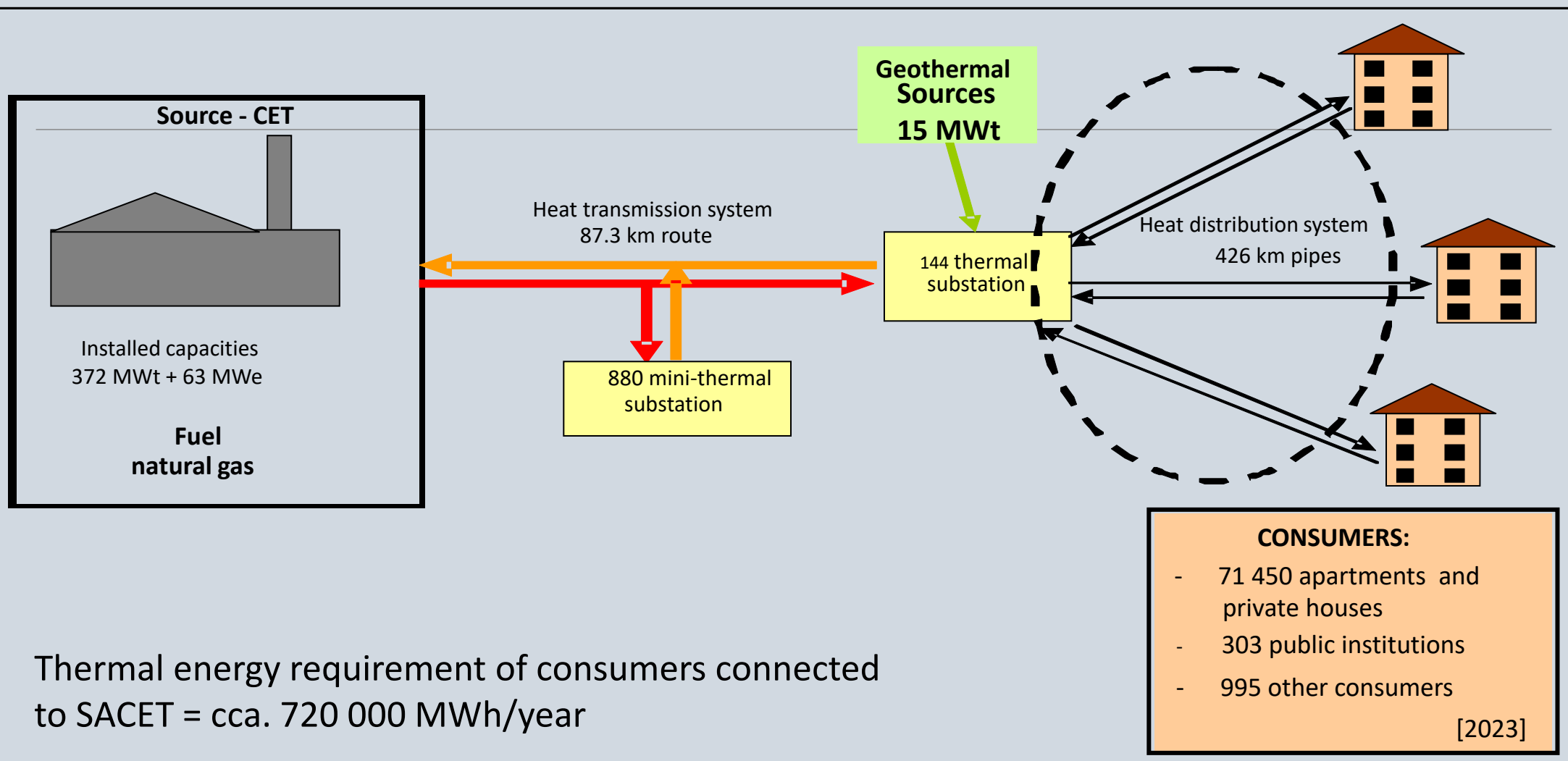
- 1969-1980 technological level
- have not received major upgrading works due to lack of funds

**Oversized capacity comparing** to current heat demand

**High specific consumption** of fuel and energy

**High level of pollution** (CO<sub>2</sub>, SO<sub>2</sub>, NO<sub>x</sub>, particles, ash and dust)









# The main energy source



## A new plant in cogeneration (2016)

- 1 GT-RB + 2 HoB + 2 SB + heat accumulator of 9500 mc
- A 56 mil euro investment from european funds through Sectorial Operational Programme Environment 2007-2013



# Heat networks and Thermal Stations

## Investments in network rehabilitation

- Stage I – 11 mil Euro – SOP Environment (2015) - 17,5 km
- Stage II – 20,6 mil Euro – POIM (2019) – 20,7 km
- Etapa III – 24,4 mil euro – POIM (2024) – 23 km

Modernization of 31 Thermal Stations – 13,9 mil euro "Heat and Comfort" Program (2015-2017) + Rondine + ROP

Modernization of 10 Thermal Stations and secondary networks - 11.1 million euros "Heat and Comfort" Program (2021-2023)

5500 new heat meters (2018) – 4 mil euro from local budget through Termoficare Oradea SA

About 85% of primary network + about 30% of secondary network **upgraded.**





# Geothermal energy



- the Oradea geothermal field was identified in 1963-1964
- 1965-1988: 12 geothermal wells located on the administrative territory of the municipality
- 16 wells at present (13 exploitation – 3 reinjection) – 2 drilled by the municipality of Oradea
- depth of 2500-3400 m.
- water temperature between 70 °C in the eastern part of the city and 105 °C in the west.
- the artesian flow of wells varies between 5 and 30 l/s depending on local geological conditions, but higher flows (between 20-50 l/s) can be obtained by pumping.

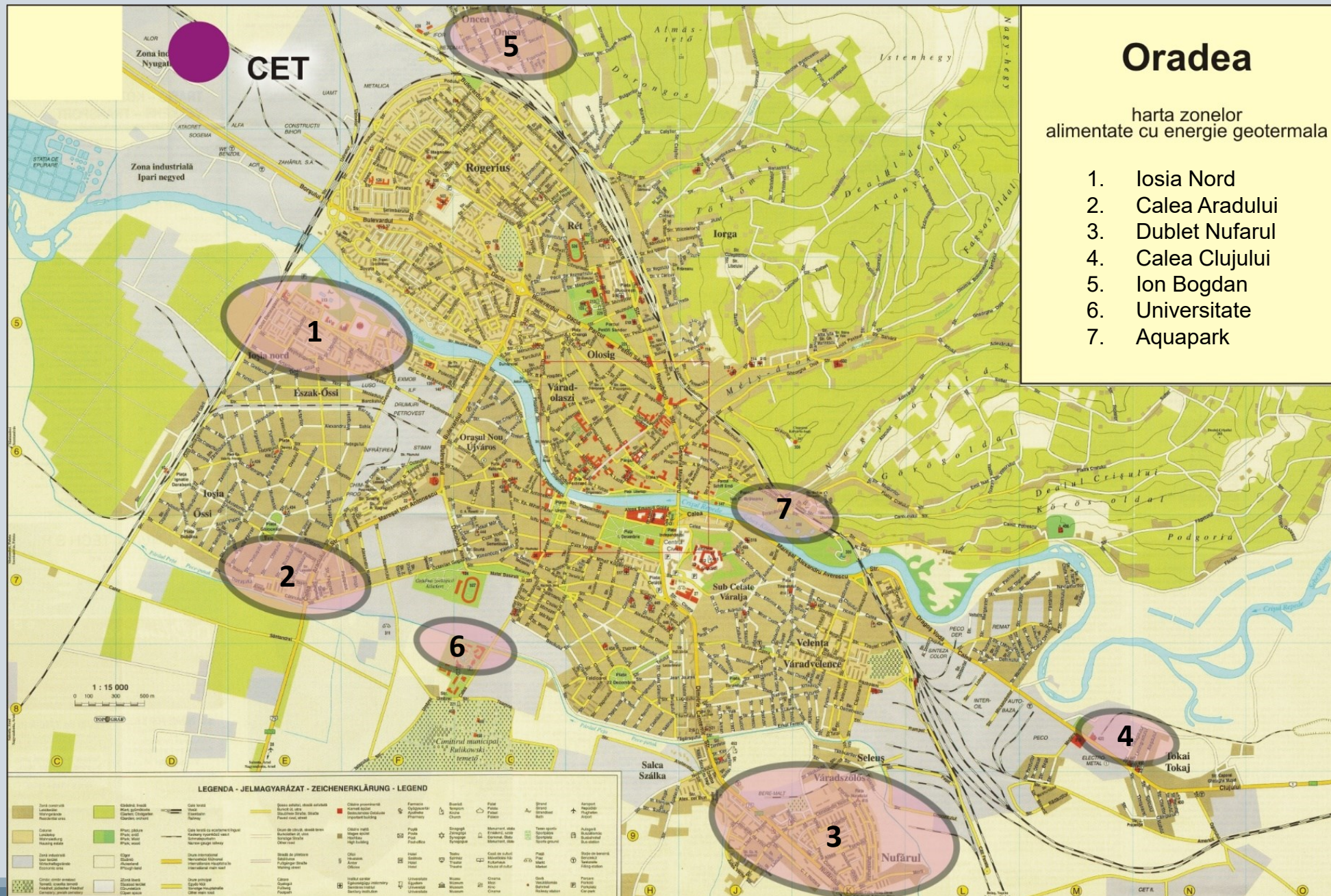




## Oradea

## harta zonelor alimentate cu energie geotermala

1. Iosia Nord
2. Calea Aradului
3. Dublet Nufarul
4. Calea Clujului
5. Ion Bogdan
6. Universitate
7. Aquapark





# Investments in geothermal energy



**2015-2017: 2,8 MWt**  
*Reinjection well +  
Geothermal Station*  
4 mil euro  
120 apartments and  
Sports High School

**2022-2023: 8 MWt**  
*Oradea Arena  
Geothermal Station*  
3,9 mil euro  
1.600 apartments +  
Oradea Arena

**2023-2024: 9,5 MWt**  
*Ioșia South Geothermal  
Station + Geothermal  
water transport pipe from  
Santandrei*  
5,5 mil euro  
1.853 apartments

**2022-2024: 16 MWt**  
*Nufarul 1 Geothermal  
Station + network + new  
extraction well + 277 mini  
thermal stations at each  
block of flats + 11 km of  
network*  
25 mil euro  
6.217 apartments

**15%  
2025**

**~ 50%  
2030**

**5%**

# Energy from geothermal water

## Stage 1: Heat exchangers

- Geothermal energy is taken over with the help of heat exchangers

## Stage 2: Heat pumps

- The thermal energy existing in the cooled geothermal water in stage 1 will be further used to obtain a complementary heating agent using heat pumps.

## Stage 3: Pipe connection to the centralized system

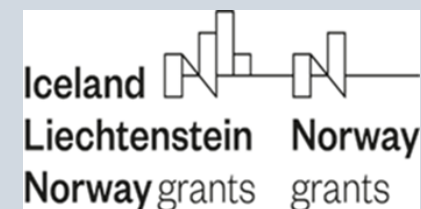
- For summer, peak hours and for cases of force majeure, the necessary heat will be provided from the SACET transport network, using primary agent produced by high-efficiency cogeneration in the city's plant.



**The major element of energy efficiency is given by the use of heat pumps that recover an additional percentage of approx. 40% of geothermal water heat**

# “Best usage of geothermal water with primary heating agent in order to produce heating agent and hot water in the Sports and Events Hall area” Project – Code 2019/107401

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**The total value of the project: 3,837,804.22 (EURO)**

**Value of the grant: 1,700,000.00 (EURO) - 46%**

**The applicant's contribution (ineligible expenses): 2,137,804.22 (EURO)**

**Program:** “Energy Programme in Romania” financed by the EEA and  
Norwegian Financial Mechanisms 2014-2021

**Project partner: Mannvit HF**

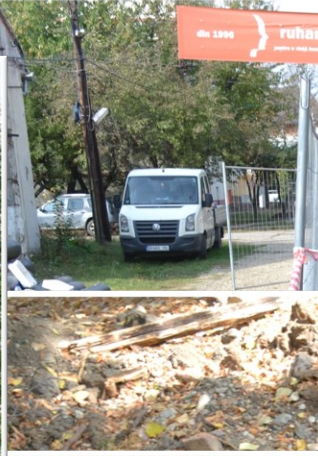


Website: <https://energieverdeoradea.ro/>

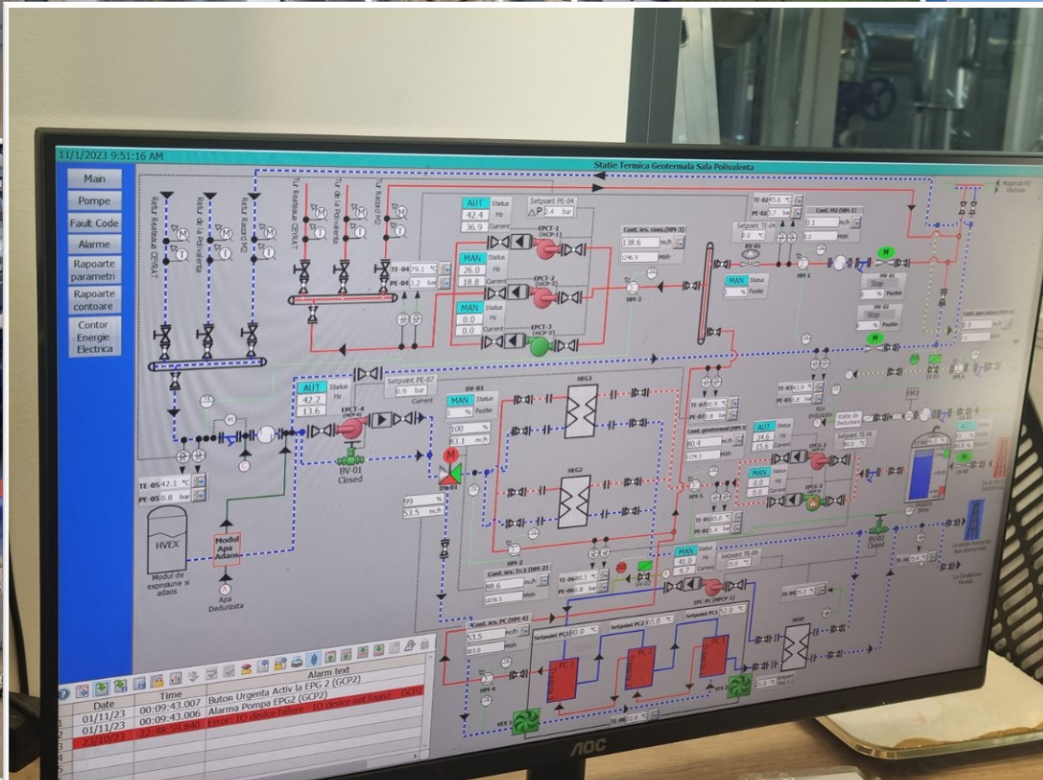
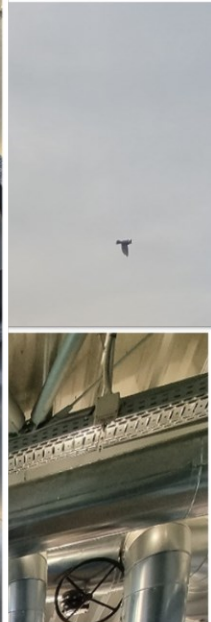


- A new building for STG was erected and new equipments were installed: heat pumps (Carrier x3), heat exchangers, pumping system, new thermo-mechanical system (pipes, valves, etc), monitoring and control devices (thermometers and manometers, sensors, etc) , power equipments and connections
- A new preinsulated steel pipe network (2x DN 200 mm) was built from the STG location to the consumers in Ceyrat Street: L= 1 560 m
- A new thermal network connecting the STG to the extraction well no.4796 was build, L= 365 m 1 x DN 200mm
- A new preinsulated pipe network connecting the STG and the 2 district heating main has been installed in place L = 1 100 m, 2 x DN 200mm
- The works were done by SC Igna Construct SRL Oradea, SC Avril SRL Negresti-Oas & SC Crito Prod SRL Oradea, and were supervised by Tirla Concept Consulting SRL and by employees of Termoficare Oradea (DH operator). Design – SC Mecatron SRL Timisoara and technical support Mannvit

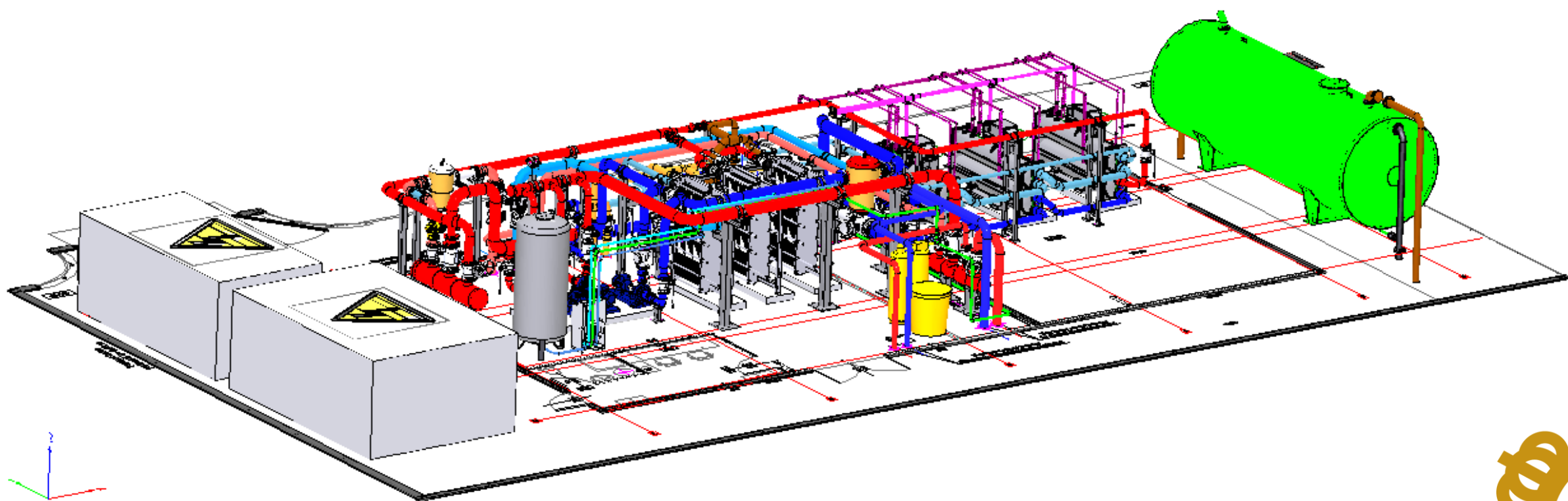












# Technical concept

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Geothermal water from existing 4796 well, temp 84°C

Stage 1 – Heat exchangers (3 pieces) 83°C - 42°C resulting a 80 °C secondary agent

Stage 2 – Heat pumps in series (3 pieces) 42°C – approx. 20°C producing a 80 °C secondary agent. Refrigerant used R1234ze(E). In total 3 MW power.

- The cooled water is reinjected

Stage 3 – for peak hours during winter + tap water in summer - energy from DH system

Total installed thermal power 25.4 MW

Consumers: existing new 974 flats + Oradea Arena (5000 places) + additional cca 600 flats to be built





## Production since commissioning (October 2023):

Geothermal water from well:

total quantity = 493 579 m<sup>3</sup> / energy = 26 791 MWh

Total delivered to consumers = 1 342 557 m<sup>3</sup> /

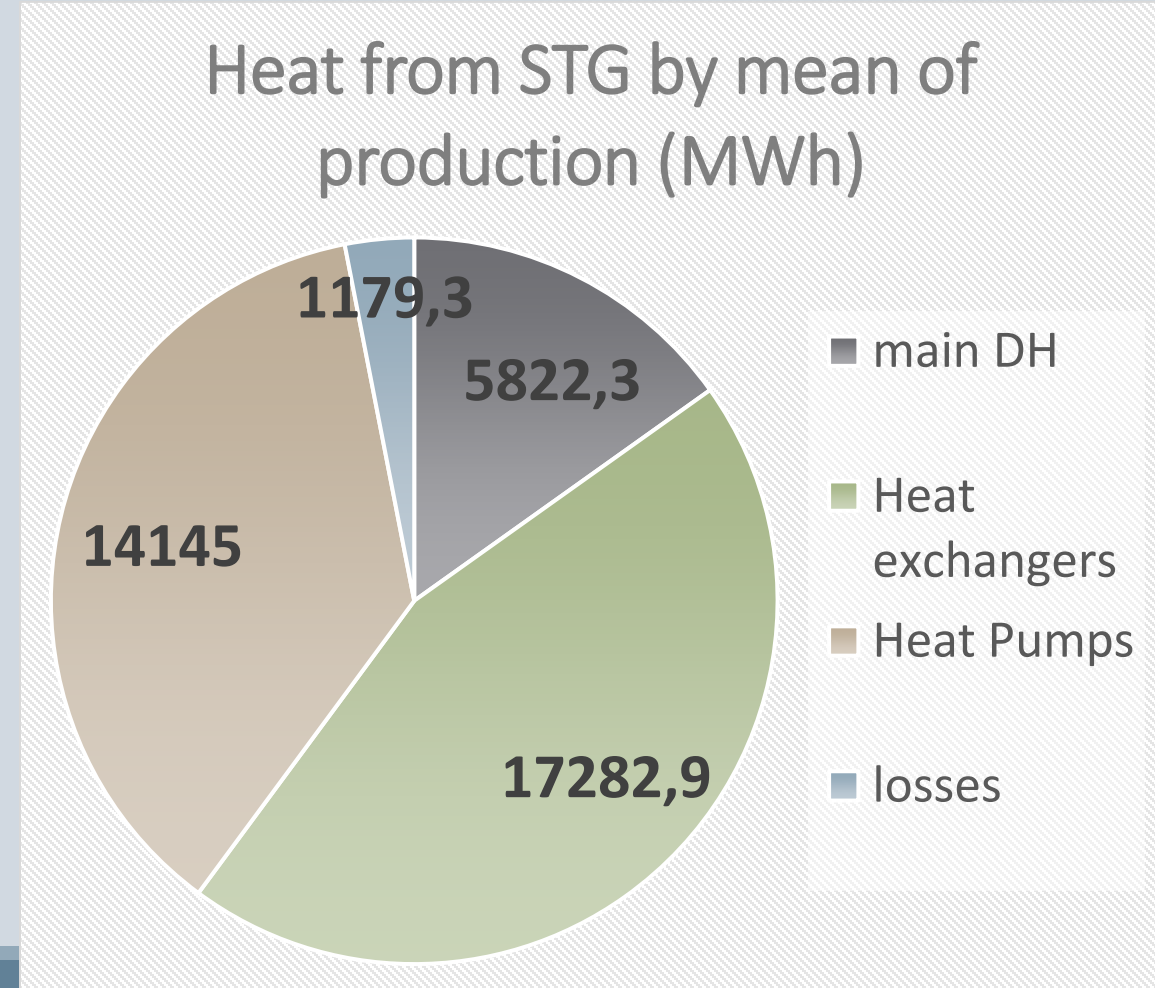
**Energy 36 070 MWh**

Electricity from grid = 3018 MWh

Average COP      HP1 – 4.65

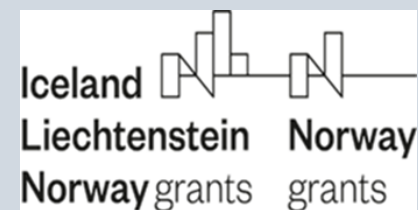
HP2 – 3.67

HP3 – 3.32



# “Best usage of geothermal water in Iosia-South neighborhood” Project – Code 2021/332038

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**The total value of the project: 5,526,218.00 (EURO)**

**Value of the grant: 1,997,000.00 (EURO)**



**The applicant's contribution (ineligible expenses): 3,529,218.00 (EURO)**

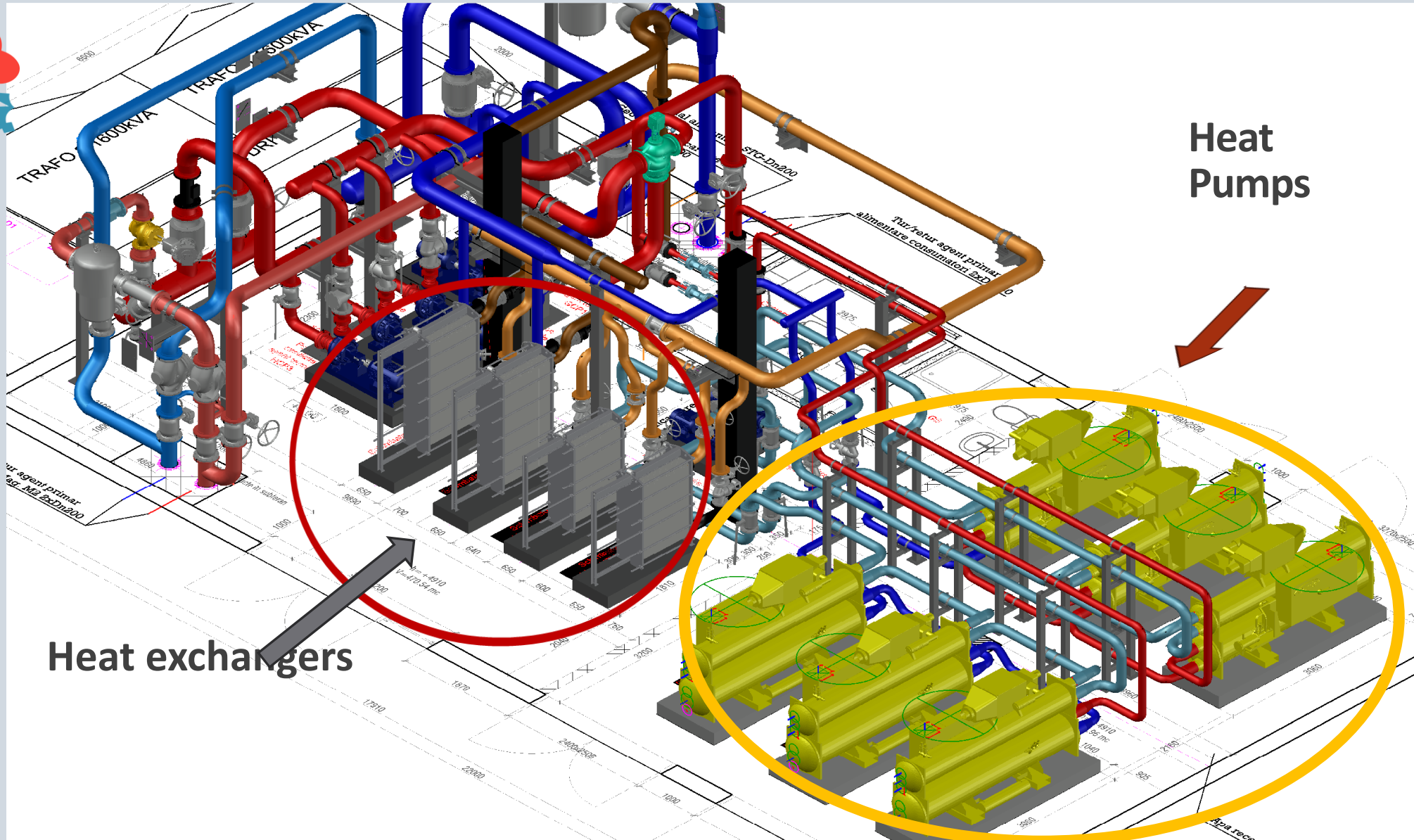
**Program:** “Energy Programme in Romania” financed by the EEA and Norwegian Financial Mechanisms 2014-2021



Website: <https://energieverdeoradea.ro/>



- An existing building was renewed for STG and new equipments were installed: heat pumps (Carrier x 6), heat exchangers, pumping system, new thermo-mechanical system (pipes, valves, etc), monitoring and control devices (thermometers and manometers, sensors, etc) , power equipments and connections
- A new preinsulated steel pipe network (1 x DN 200 mm) was built from the STG location to PT913 L= 1 320 m
- **A new preinsulated steel pipe network connecting the STG to the extraction well no.4005 and well no.1720 in Santandrei was build, L= 3100 m 1 x DN 200mm**
- A new preinsulated pipe network connecting the STG and the district heating main has been installed in place L = 155 m, 2 x DN 200mm
- The works were done by SC Igna Construct SRL Oradea & SC Crito Prod SRL Oradea, and were supervised by Uricani Construct SRL Miroslava and by employees of Termoficare Oradea (DH operator). Design – SC Mecatron SRL Timisoara.









**Representatives from AFM, specialists in geothermal field of activity, professors from Bucharest Technical University and Oradea University + students, local press, etc. already visited both sites**



# Investments under preparation

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- Geothermal on Clujului Bd. (1.3 MWt): construction of a geothermal water network with a length of 1.5 km + construction of a geothermal station with a capacity of 1.3 MWt + 4 mini thermal stations
  - Estimated Value: 1.3 million euro
  - Beneficiaries: a primary school, a kindergarten, a social assistance
- Geothermal in Ioșia Nord (15 MWt): construction of a Geothermal Station
  - Estimated Value: 7 million euro
  - Beneficiaries: 3 500 apartments + a high school + a multi-purpose hall with a capacity of 2 500 seats
- Geothermal drilling in CET (45 MWt): Construction of two doublets (2 production wells / 2 reinjection wells and auxiliary equipment and a Geothermal Station
  - Estimated Value: 55 million euros
  - Beneficiary: SACET ORADEA



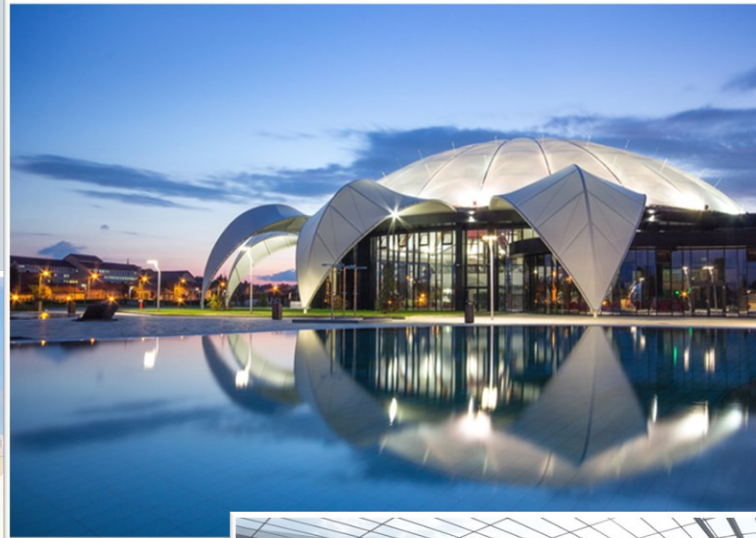


But geothermal waters means also:

**NYMPHAEA AQUAPARK**

**COST - 20 mil. euro**

**PROFIT - 7 mil. euro in the first 5 years**



**GEOTHEMAL GARDEN IOSIA**  
**43 mil. euro**

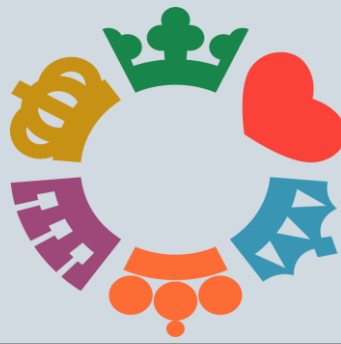
**NUFARUL URBAN GARDEN**  
**25 mil. euro**

**under implementation**



And Energy means also:





# Conclusions

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Starting from 2009, the Municipality of Oradea entered into an intense process of supporting the centralized thermal energy supply system, creating the conditions for **better, modern energy supply services, at fair costs and bearable** by consumers

**Structural funds are essential for supporting local development.** Without the contribution of structural funds, the local public authority would not have been able to start the investment program in the heating system from the local budget, a fact that could have had the negative consequences of the actual collapse of the centralized system, with major effects including on the social level. All these investments represent the way in which **Oradea supports European policies on energy management and contributes to the reduction of polluting emissions and the reduction of fossil fuel consumption**

By increasing the amount of thermal energy from **geothermal resources** that is supplied to consumers through the centralized system, the interest of the local authority towards **increasing the percentage of use of green energy in the local energy mix** is manifested

Measures are implemented to promote the **sustainable and responsible use** and management of renewable resources

All other investments carried out by the local authority must also contain **energy efficiency measures** with a **positive impact** on the community.





# SUPERCROWN



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