



# Geothermal Resources of Romania

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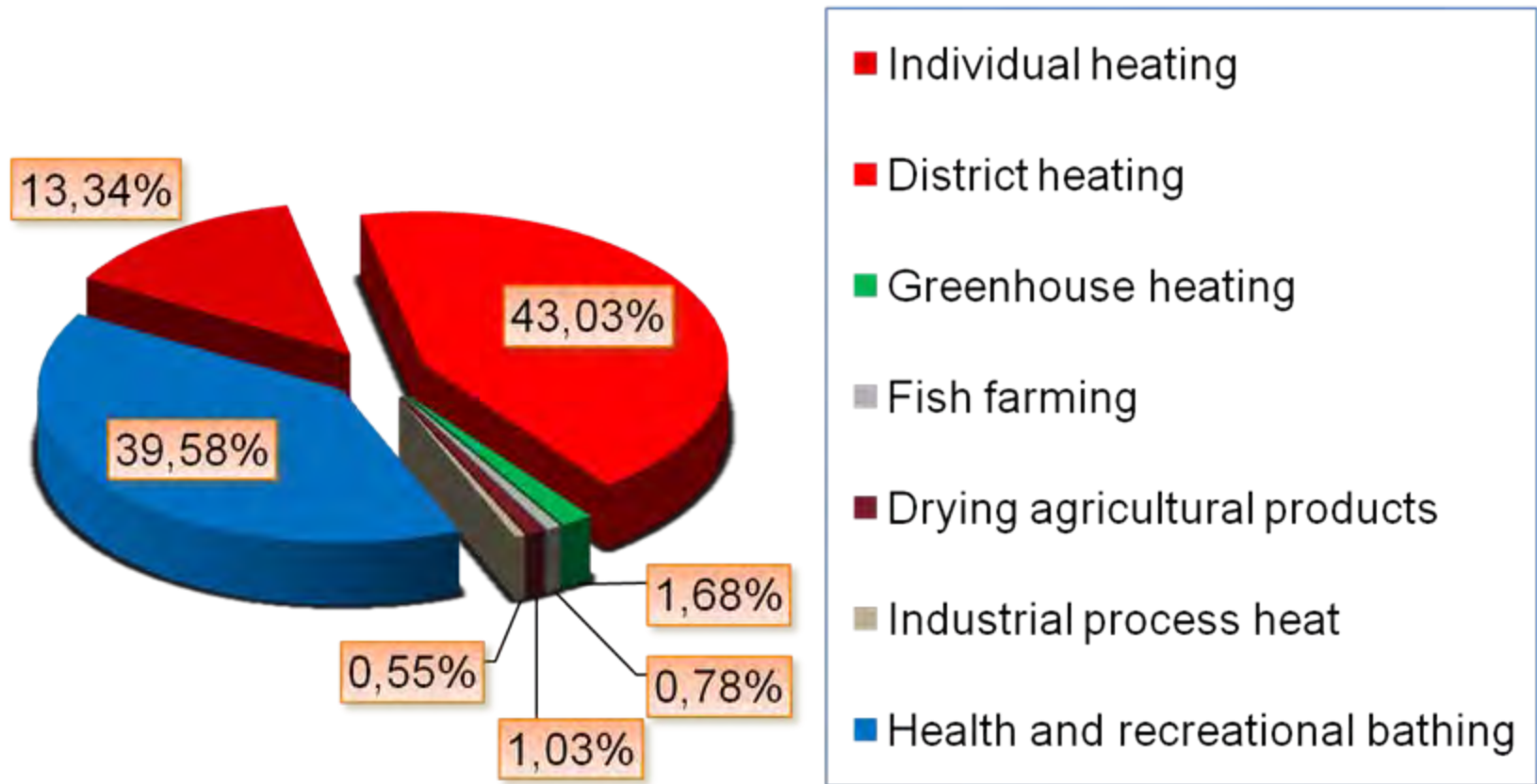


## Introduction

- Geothermal water already used in Romania during the Roman Empire time
- First well drilled in late 19<sup>th</sup> Century
- Exploration drilling started in the 1960's
- Exploration wells completed as producers
- Total: 250 wells  $\Rightarrow$  450 MW<sub>th</sub>
- Used at present: 80 wells  $\Rightarrow$  180 MW<sub>th</sub>
- Temperature: 40 – 120°C
- Annual production: 1,235 TJ
- Average load factor: 22% (for wells in use!)
- 7 new wells drilled during 2005 - 2010

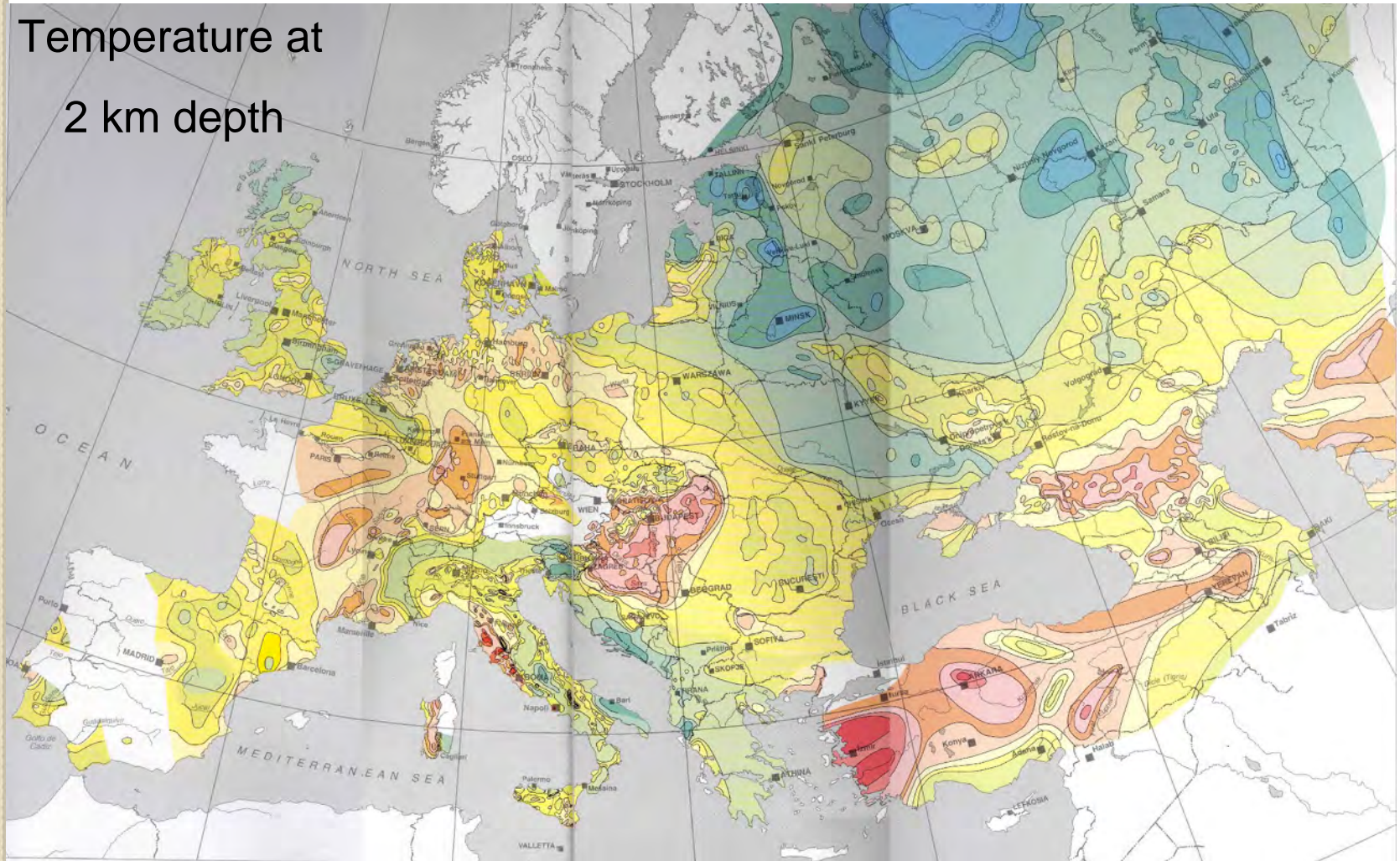
## Introduction

### Main uses of geothermal energy

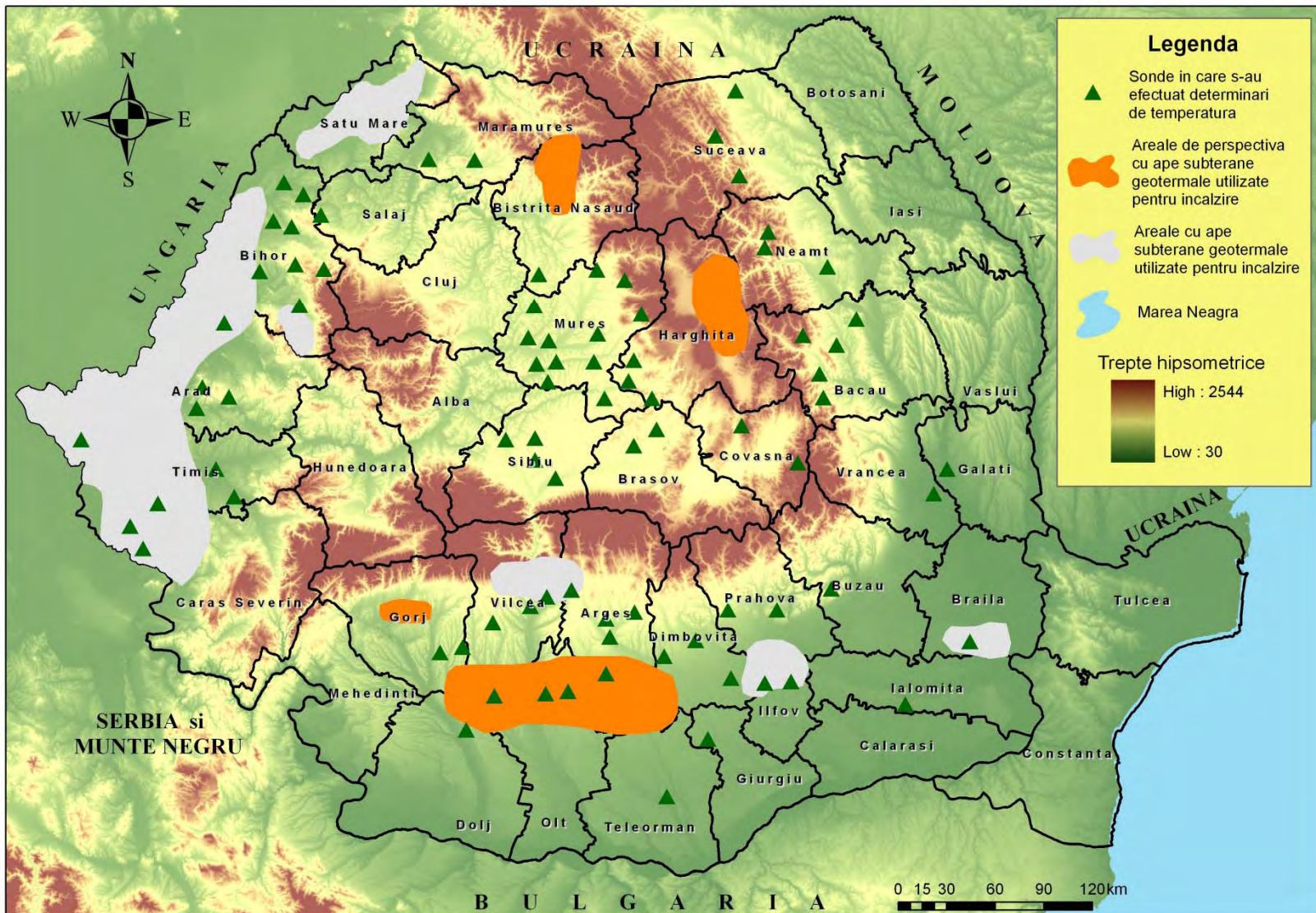


## Hydrothermal Resources

Temperature at  
2 km depth



## Hydrothermal Resources





## Hydrothermal Resources



## Hydrothermal Resources

### Western Romania

#### Pannonian aquifer

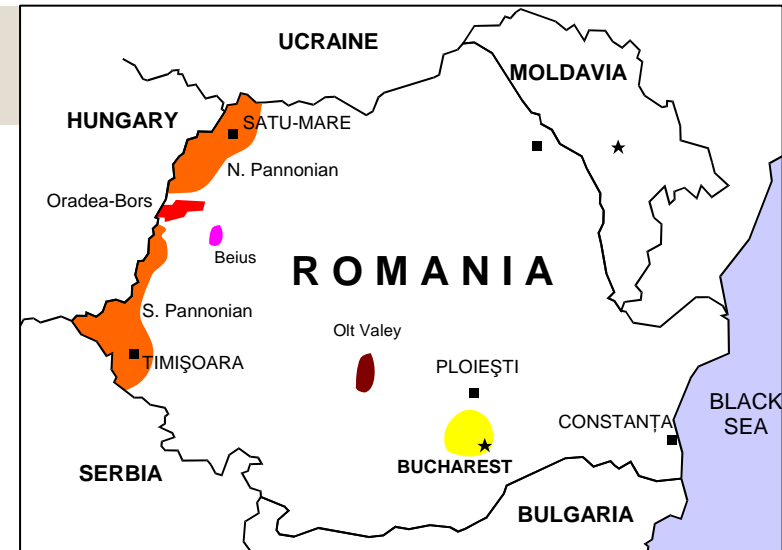
- 2500 km<sup>2</sup>
- basement Neocene sandstone
- 800 – 2400 m depth
- 50-85°C
- TDS 4-5 g/l, carbonate scale, CH<sub>4</sub>

#### Oradea reservoir (310 l/s recharge)

- 75 km<sup>2</sup>
- Triassic limestone & dolomites
- 2200 – 3200 m depth
- 70-105°C
- TDS 0.9-1.2 g/l

#### Bors confined reservoir

- 12 km<sup>2</sup>
- Triassic limestone & dolomites
- 2500 m depth
- >120°C
- TDS 13 g/l
- 5 Nm<sup>3</sup>/m<sup>3</sup> gas content (70% CO<sub>2</sub>, 30% CH<sub>4</sub>)
- very high scaling potential



#### Beius reservoir

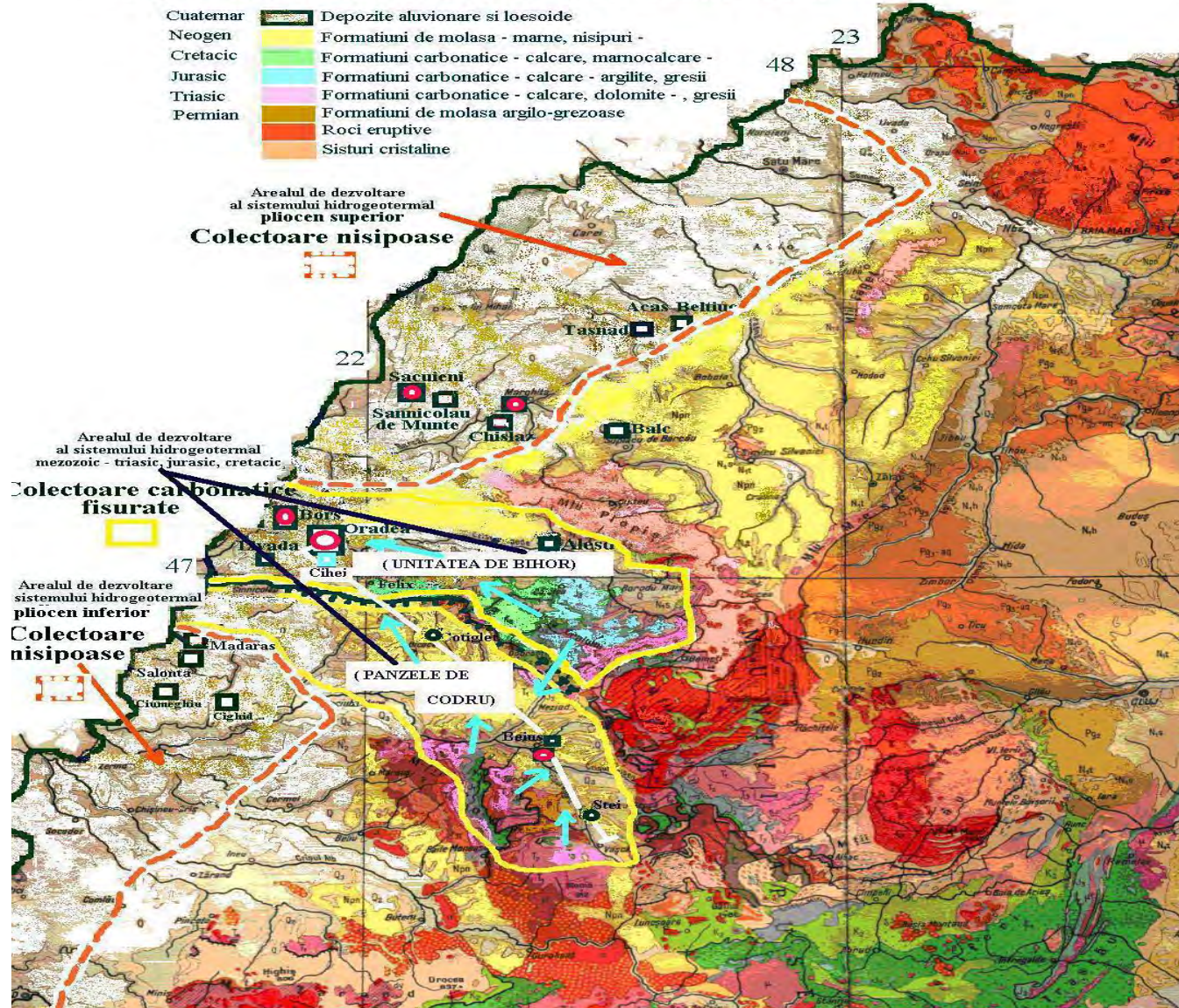
- 47 km<sup>2</sup>
- Triassic calcite & dolomite
- 1870 – 2370 m depth
- 84°C
- TDS 0.5 g/l, CO<sub>2</sub>, H<sub>2</sub>S traces
- Depth: 2.5 – 3 km

#### Ciuneghiu reservoir

- 5 MW<sub>th</sub> potential
- gritstone
- 2200 m depth
- 105°C
- TDS 5-6 g/l, 3 Nm<sup>3</sup>/m<sup>3</sup> CH<sub>4</sub>

## Hydrothermal Resources

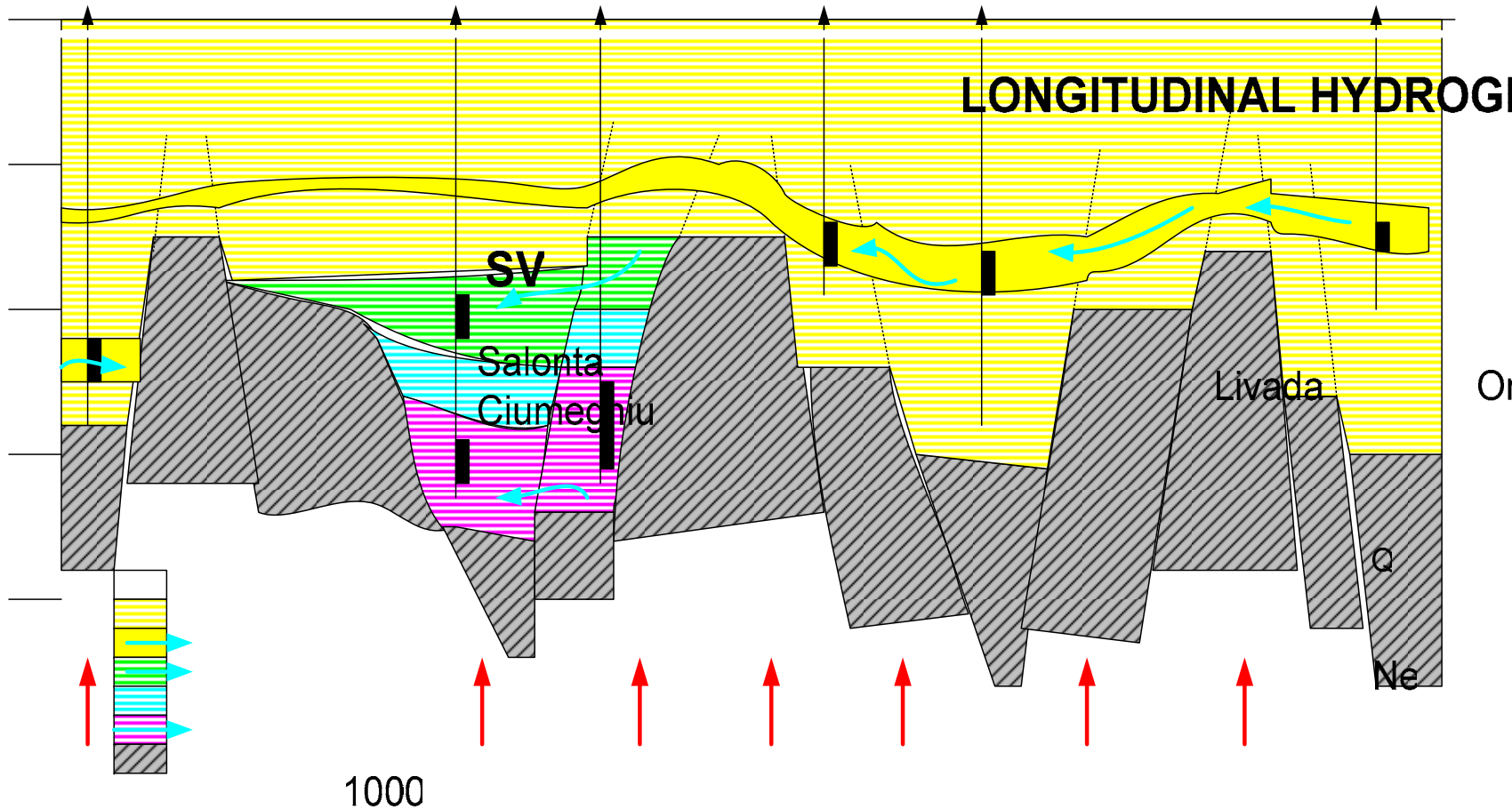
### HARTA GEOLOGICA REGIONALA - CAMPIA DE VEST -



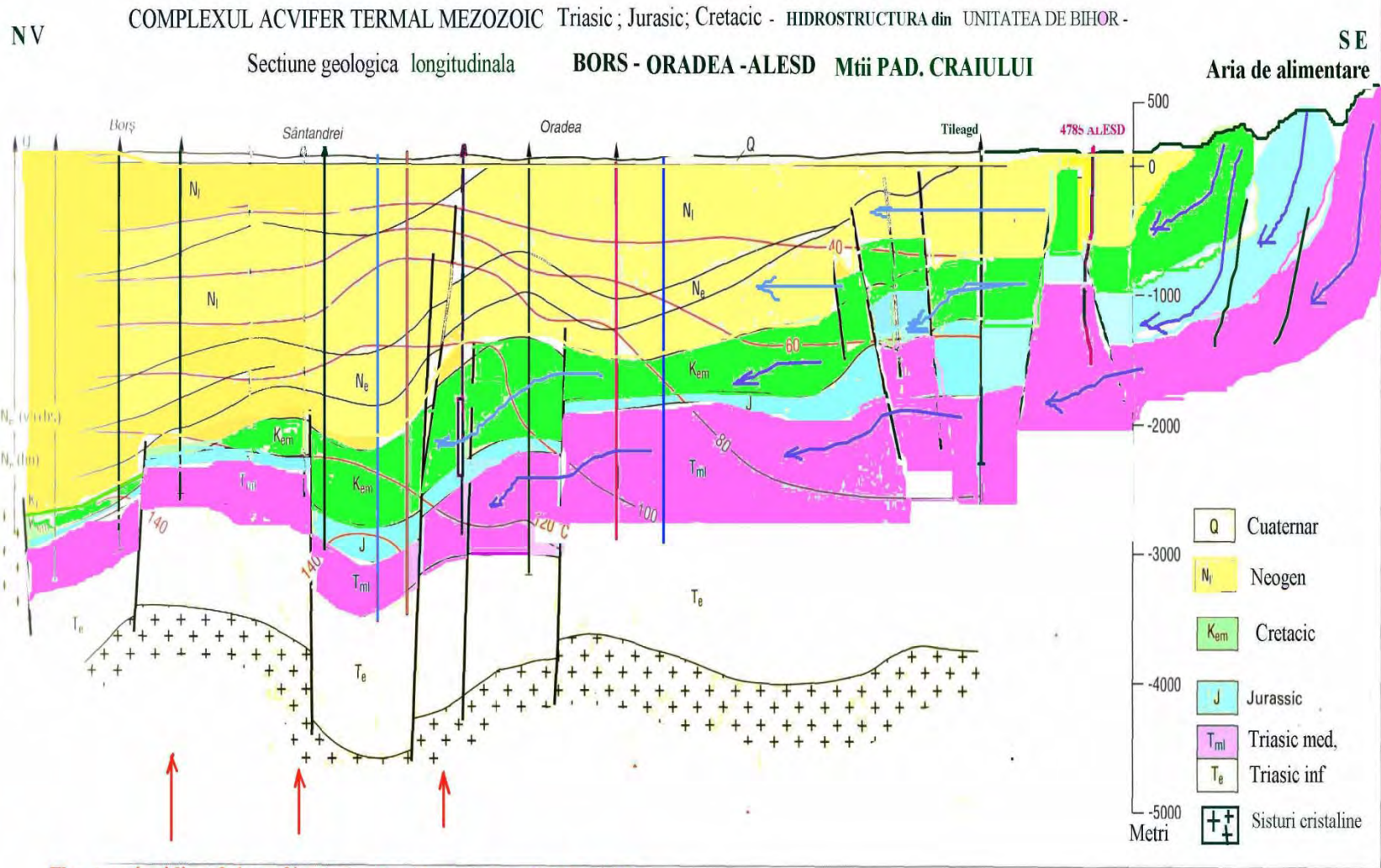




## Hydrothermal Resources



## Hydrothermal Resources



## Hydrothermal Resources

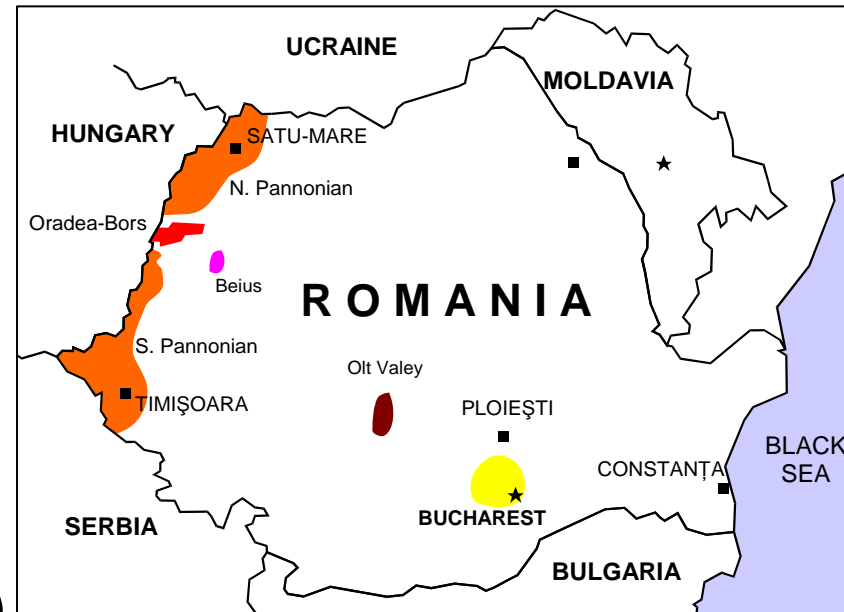
### South & central Romania

#### Cozia-Calimanesti reservoir

- 28 km<sup>2</sup>
- Senonian siltstones
- 2700 – 3250 m depth
- 70-95°C
- TDS 15.7 g/l
- 1-2 Nm<sup>3</sup>/m<sup>3</sup> CH<sub>4</sub>

#### Otopeni reservoir (North Bucharest)

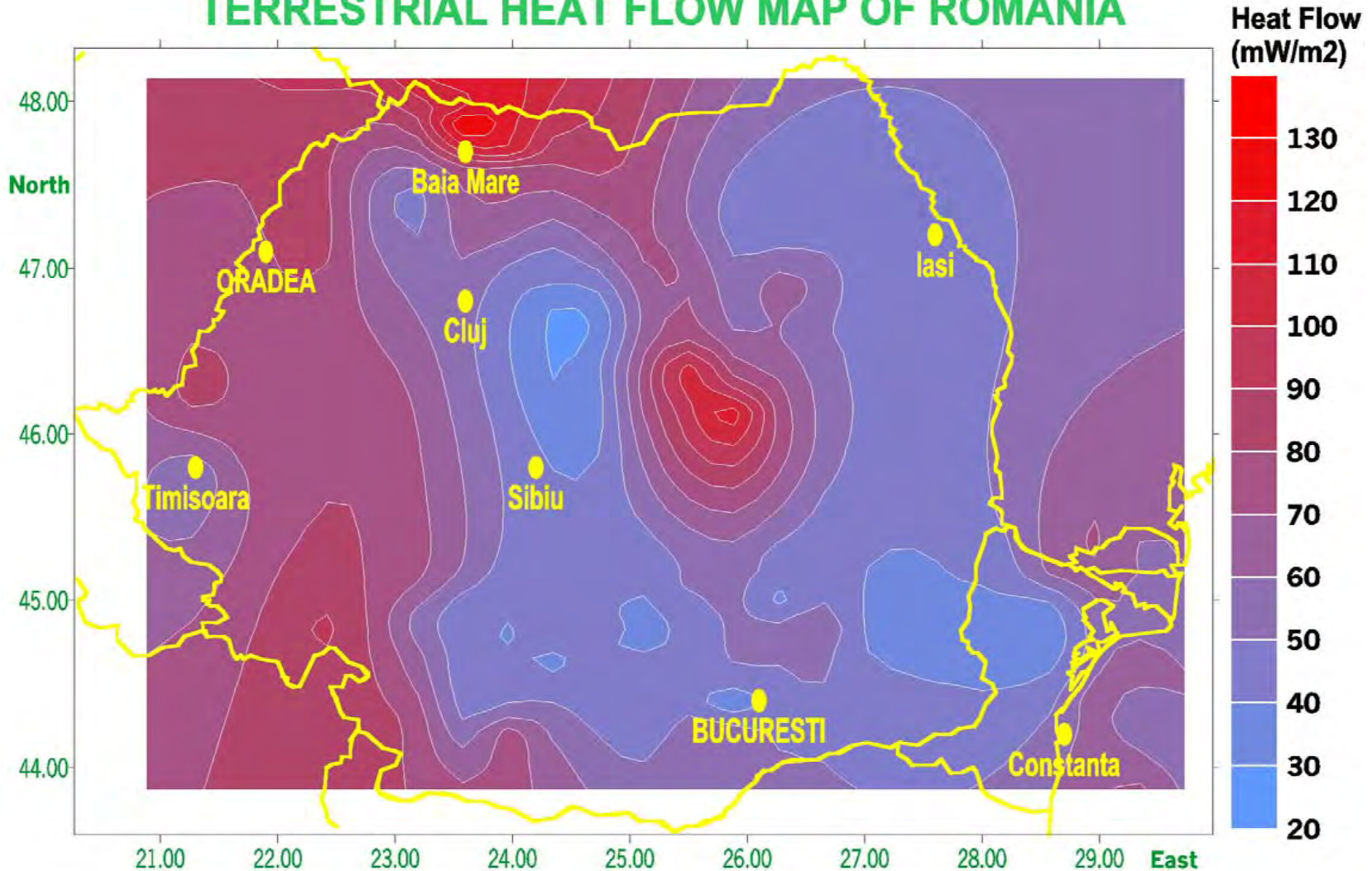
- 300 km<sup>2</sup>
- Limestone & dolomites
- 2000 – 3200 m depth
- 58-84°C
- TDS 1.5-2.2 g/l
- 30 ppm H<sub>2</sub>S



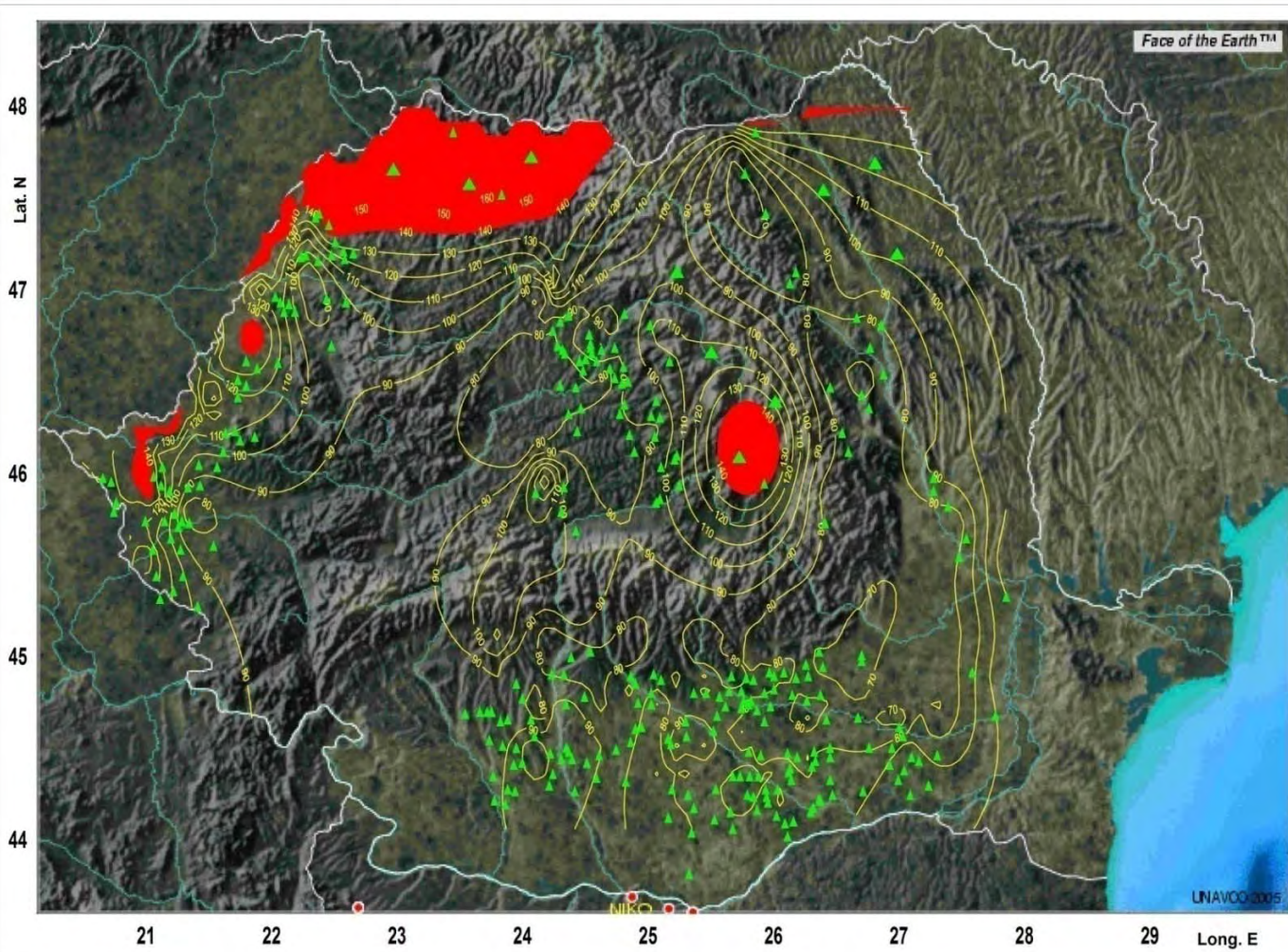


# Potential EGS Locations




## TERRESTRIAL HEAT FLOW MAP OF ROMANIA



## Potential EGS Locations



### LEGEND

-  Wells with thermal logs
-  Geo-isotherm at 3 km depth
-  Areas with temperature exceeding 140°C at 3 km depth



## Concluding Remarks

- Electric energy sales:
  - TRANSELECTRICA has to buy all green power;
  - “Price for the next day” fixed by the Romanian Authority for Energy Regulation (ANRE);
  - Green certificates (2 certificates for each MWh) can be sold on the free or regulated market (exchange).
  
- Thermal energy sales:
  - For a private companies, price fixed by the contract (can be negotiated);
  - For public companies, price has to be approved by the ANRE;
  - For population (district heating – public utility), the price has to be approved by the Local Council, the ANRE, and also by the National Agency for Local Administration Regulation.



## Concluding Remarks

- Romania is rich in proven geothermal resources of up to 120°C temperature, defined by 250 production wells.
- Reliable information on the resources and reasonable technical expertise are locally available in Romania (more than 40 years experience).
- Current legal framework provides incentives to investments for geothermal energy utilization, but it is rather complicated.
- A rather small part of the geothermal potential of Romania is used, mainly for district heating, greenhouse heating and spas.
- Further geothermal development is technically and economically feasible in Romania (mainly for existing wells), even more at present, with the New Green Certificates Law in force, the “Green House” program extended to private persons, and new programs financial support programs for large scale renewable energy systems, geothermal being specifically mentioned.



**Thank you for your attention!**

