



LIFE and ENERGY in Hungary

Future of the Geothermal Energy in Europe

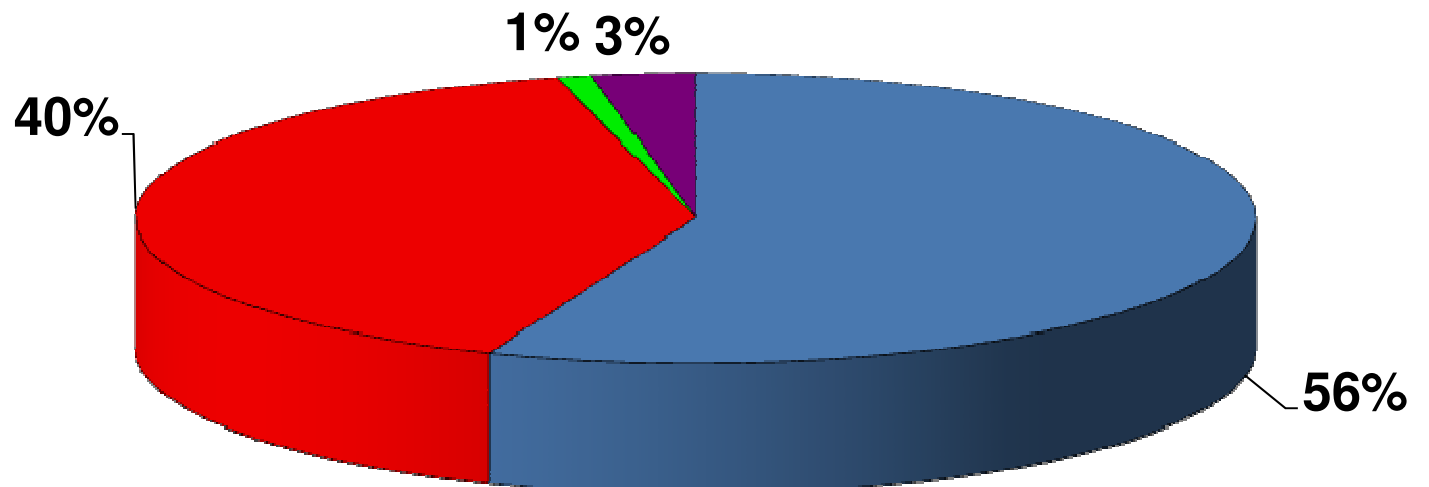
**The Hungarian Example: opportunity, challenges, problems,
solutions**



ENGINE
Final Conference
Vilnius, Lithuania
12-15 February, 2008.

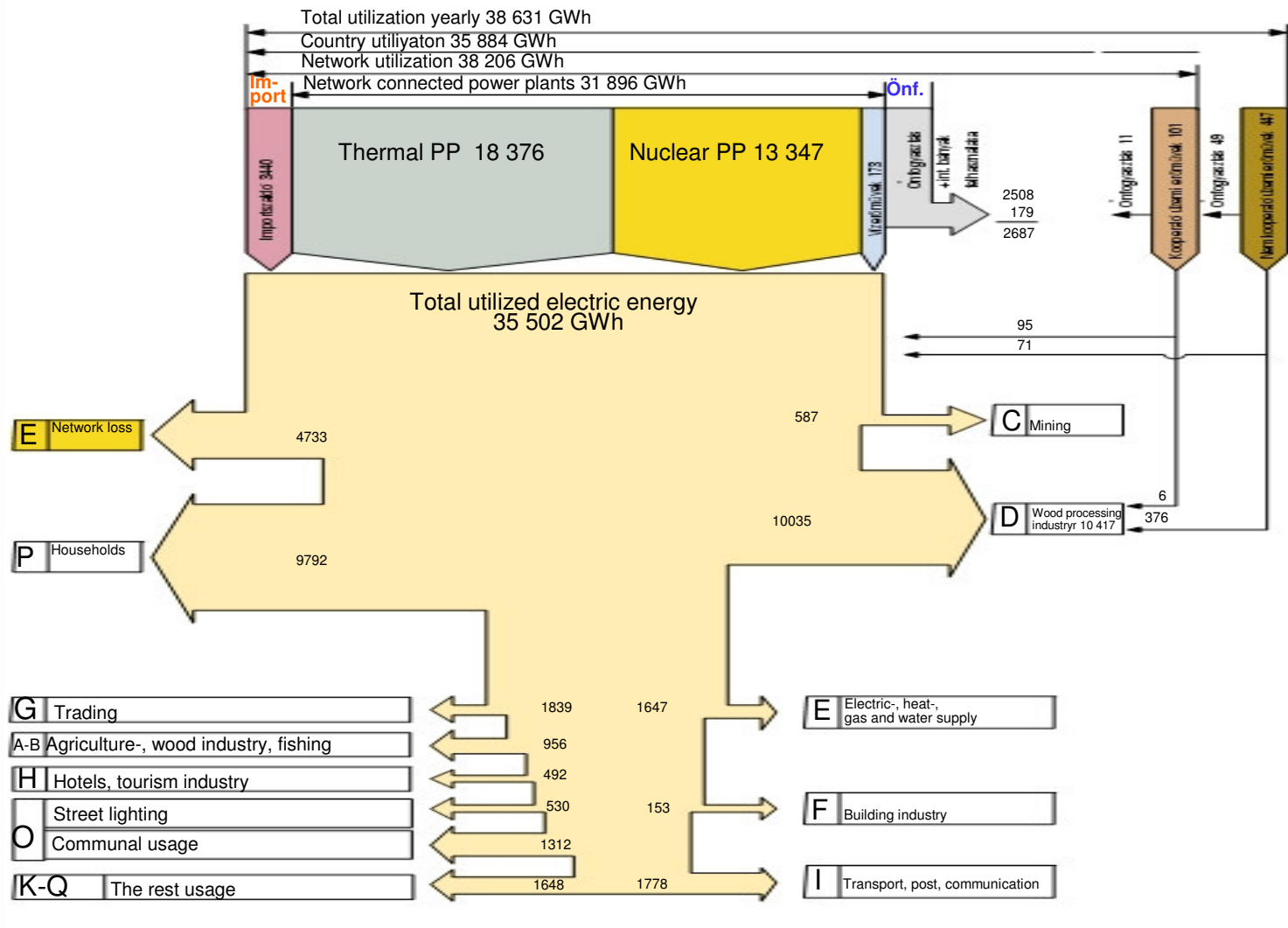


The primer Energy Cake of Hungary





The Electricity generation and utilization segments





The features of the electricity generation



Main problems of the Hungarian Electricity System:

- very low base load capacity reserves
- weak cross-border capacity
- old technology power generation units are in phase out

Electricity Market is controlled by the Electricity Act (“VET”).





The heat generation and the segments of its utilization



Hungary has two major segments of the heat utilization:

- **Industrial heat** that is used by different technologies on the fields of steel, food, agricultural, plastics...etc.

Main, common feature of these utilization examples is: **BURNING GAS AND OIL**

- **Communal heat** that is used for heating the towns and some villages.

Main, common feature of these utilization examples is: **BURNING GAS AND OIL**

About 60 communal environments are using district heating, in the smallest case 210 flats, in the largest case 241 486 flats are supplied by district heating.

Total number of the flats in Hungary utilizing district heating are 645 000.

Heat market is “Local Market” controlled by the municipality Local Governments.





Energy supply of the local governments. (villages, town)

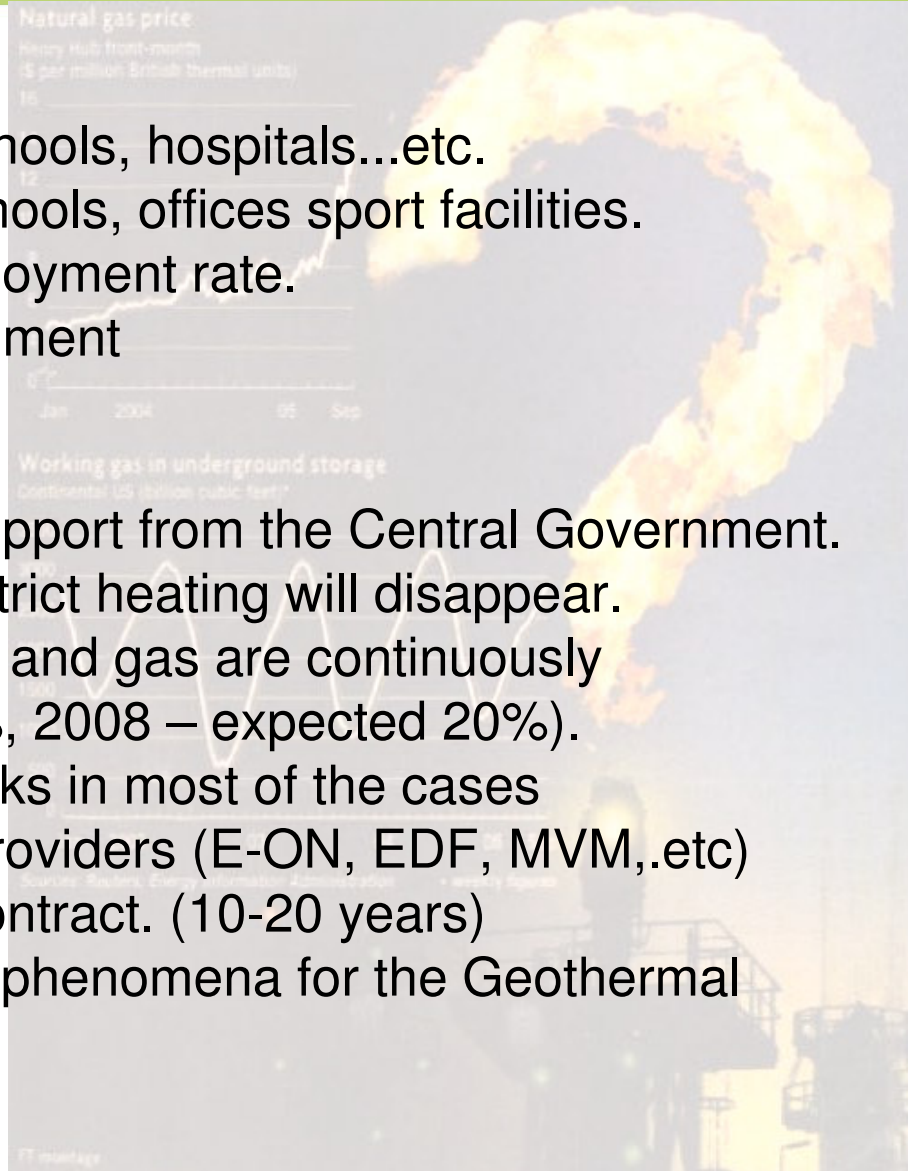


Obligations:

- Lighting streets, offices, schools, hospitals...etc.
- Heating flats, hospitals, schools, offices sport facilities.
- Creating manageable employment rate.
- Handling the social environment

Economics:

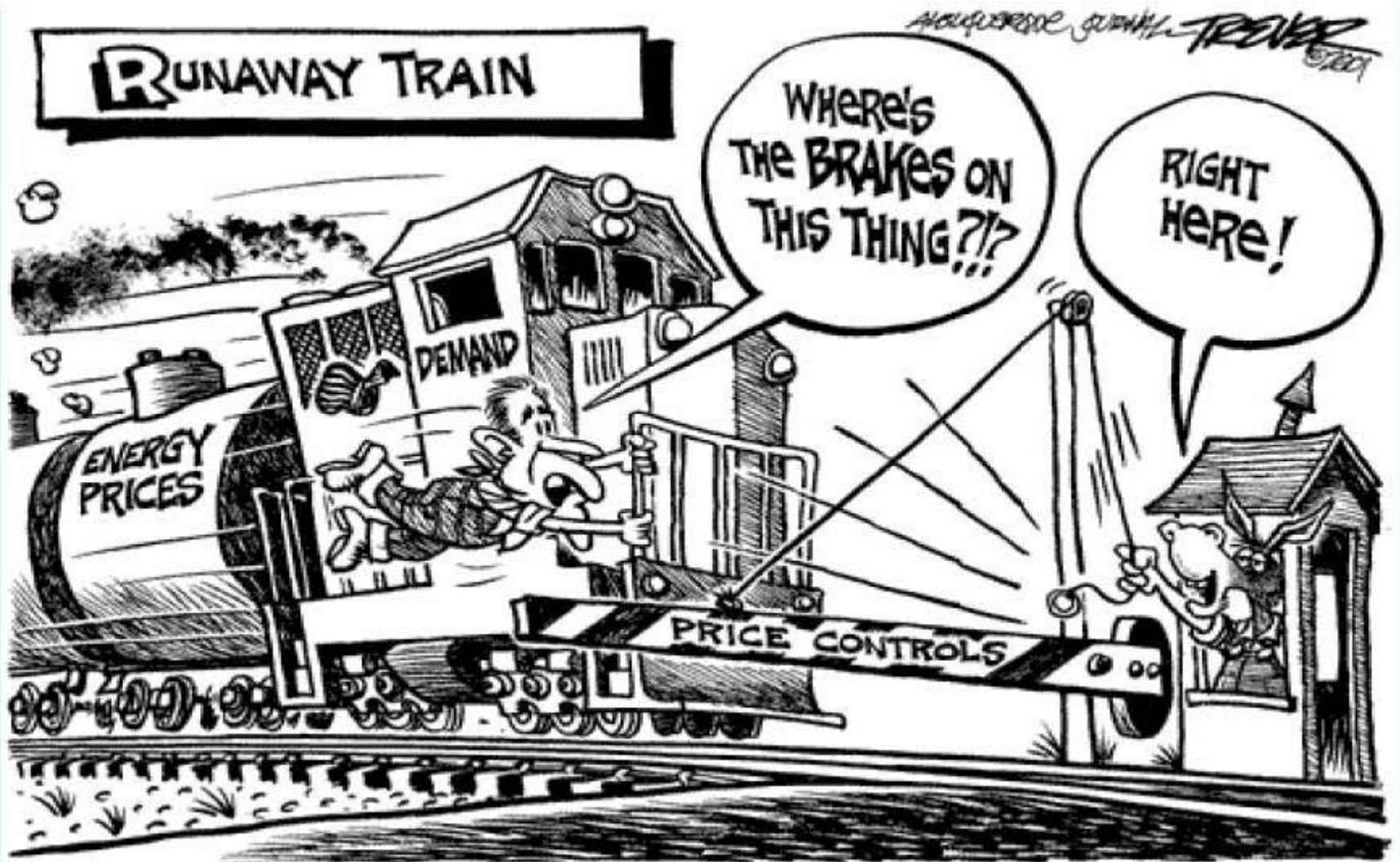
- Dramatically decreasing support from the Central Government. The social support of the district heating will disappear.
- The prices of the electricity and gas are continuously increasing (2007 – ave. 60%, 2008 – expected 20%).
- Non tempting industrial parks in most of the cases
- Dependency on the heat providers (E-ON, EDF, MVM,.etc)
- Danger on the long term contract. (10-20 years)
(This is the most dangerous phenomena for the Geothermal Projects!!!)





Energy supply of the local governments.
(villages, town)

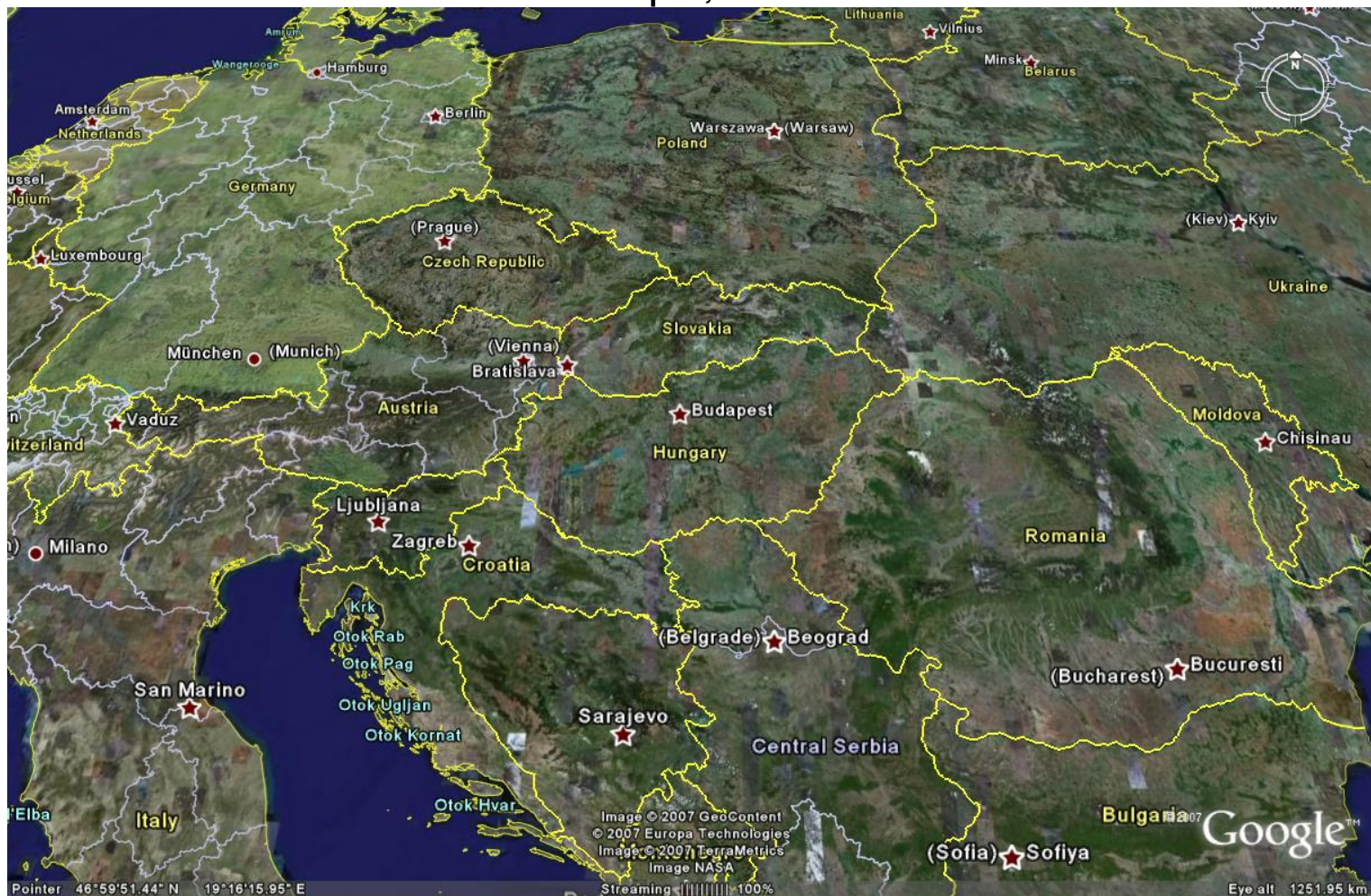
PANNERGY





Hungary

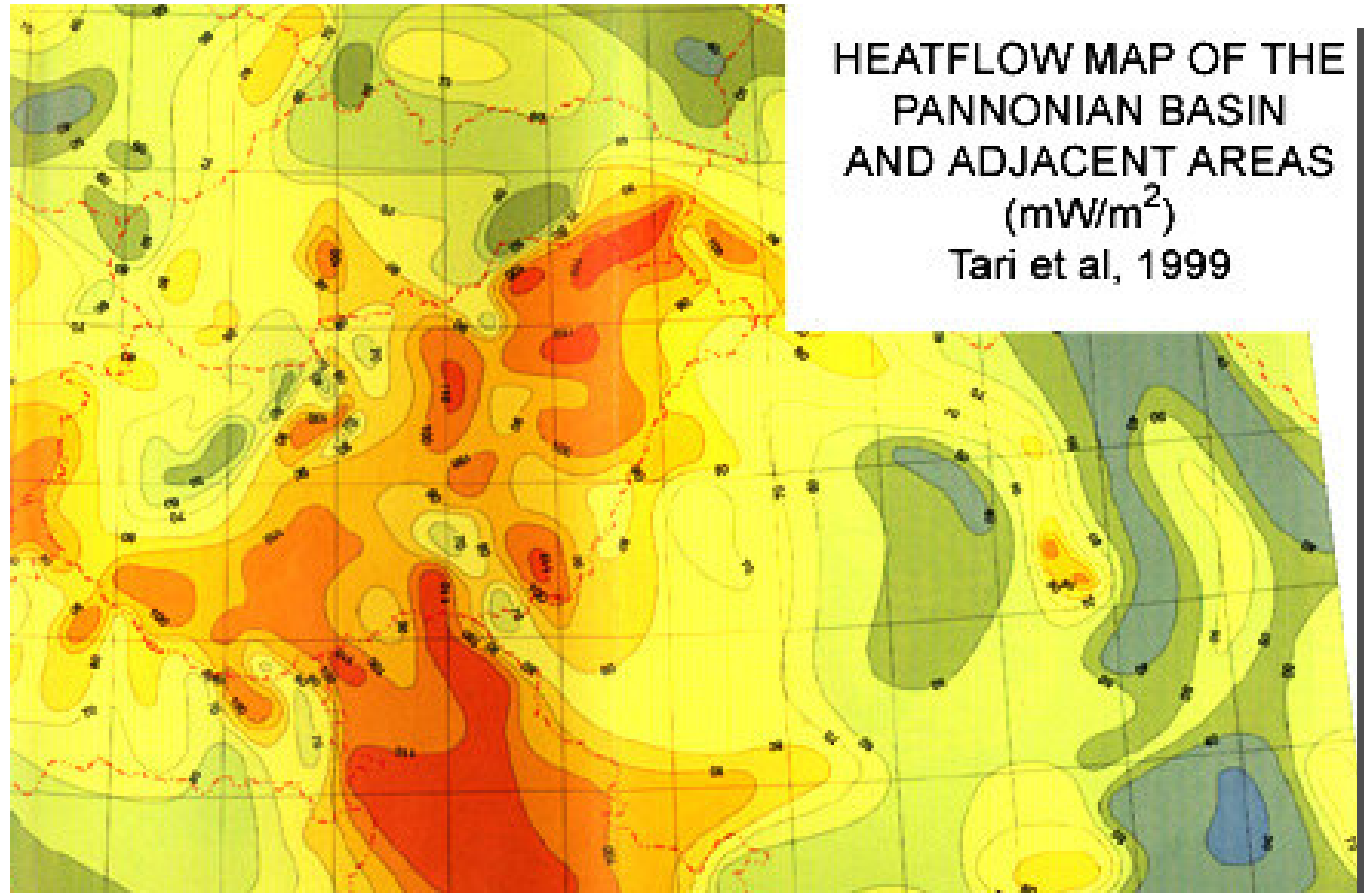
Located in Central Europe, within the Pannonian Basin.





Favourable geological conditions

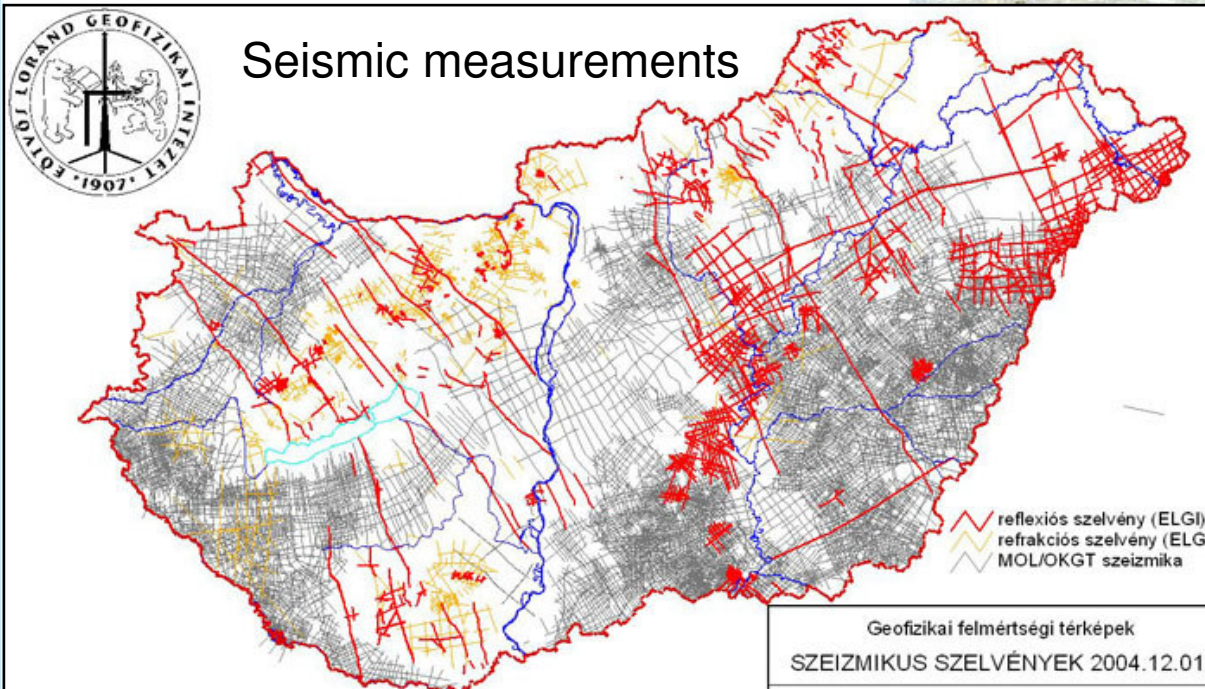
The Earth crust within the Pannonian Basin is relatively thin (25-35 km thick) – so the heatflow is higher.





Numerous existing

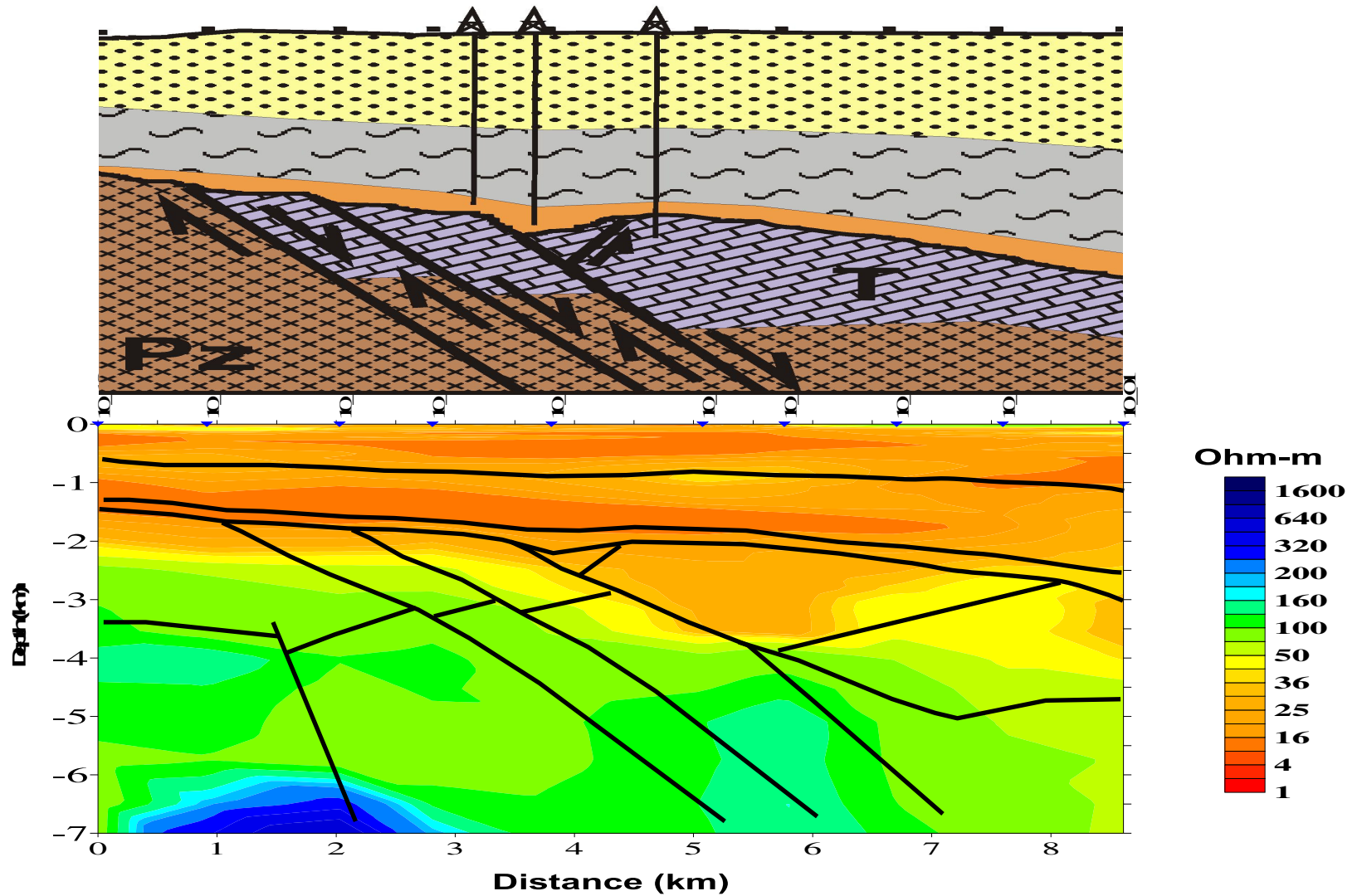
Due to the hydrocarbon exploitation the Pannonian Basin is relatively well-explored area.



Thousands of useful boreholes for geological assessment

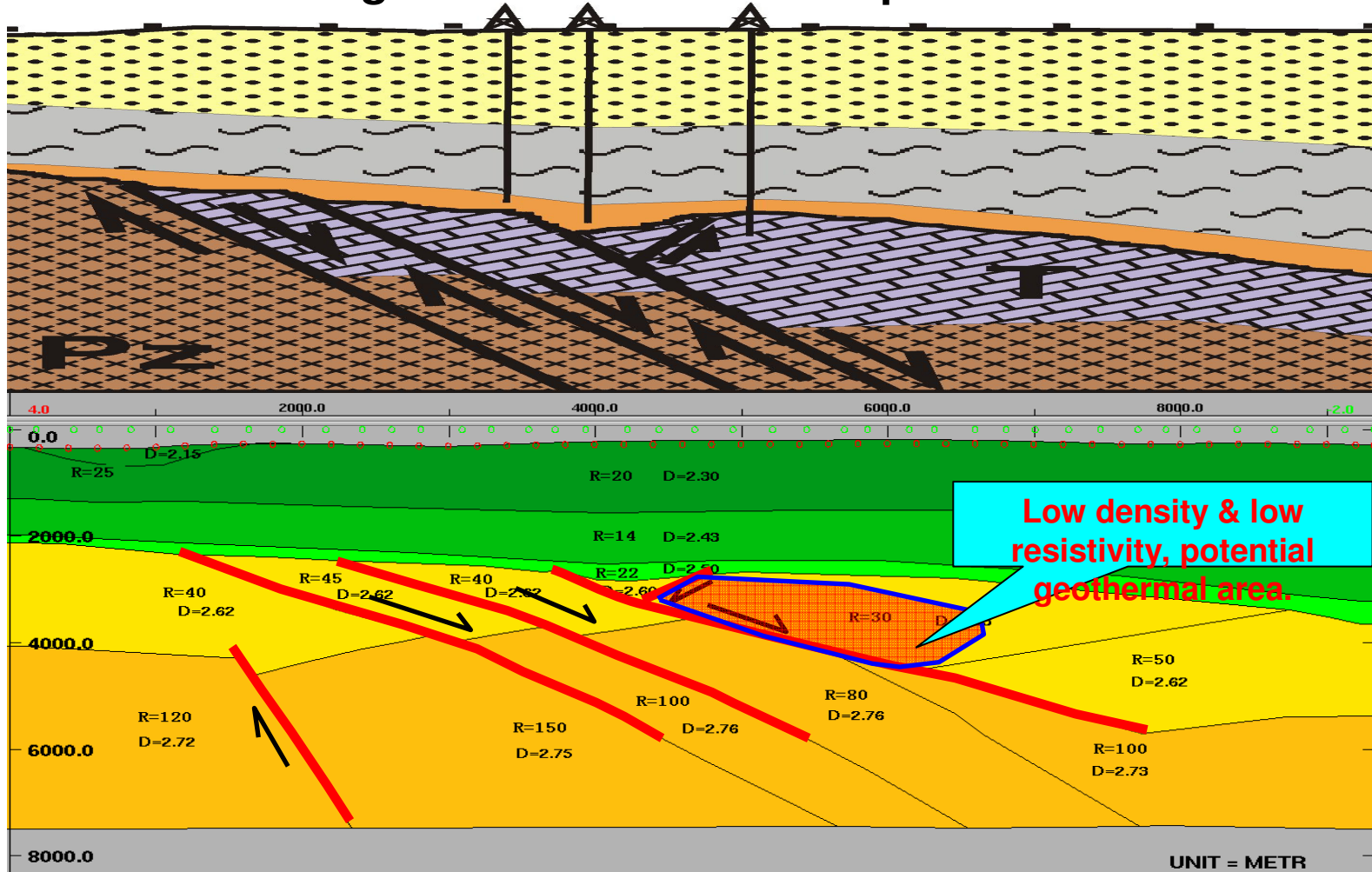


2-D MT inversion & interpretation





Integrated inversion & interpretation



Base on LCT inversion result of MT & gravity, & local geology, we obtained basement resistivity & density. Then interpreted basement fault system.



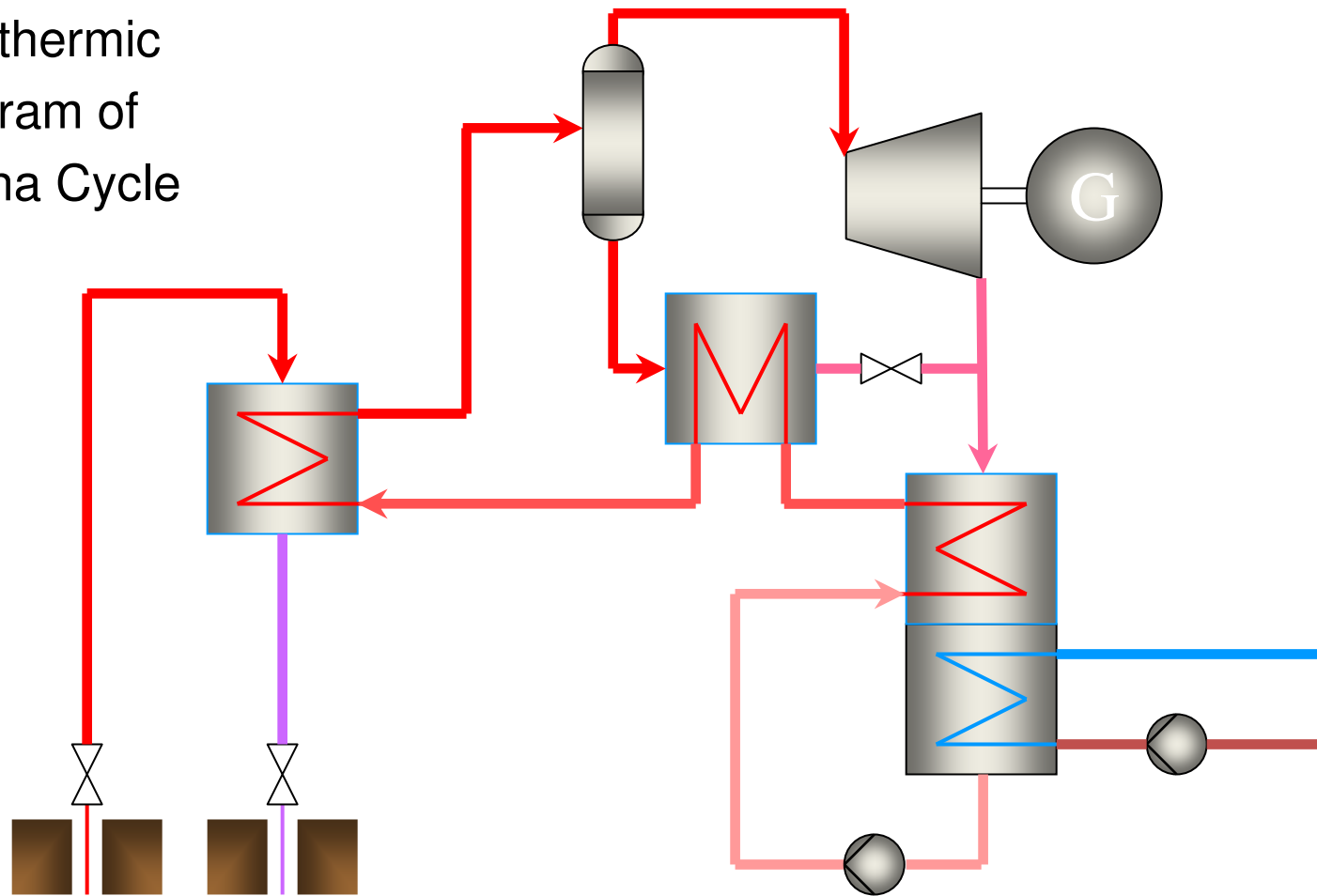
Kalina Cycle

- Working fluid is a mix of Water and Ammonia
- Closed Circuit
- Feasible for very low Temperatures
 - ~110+ °C
- Working fluid is known from cooling industry



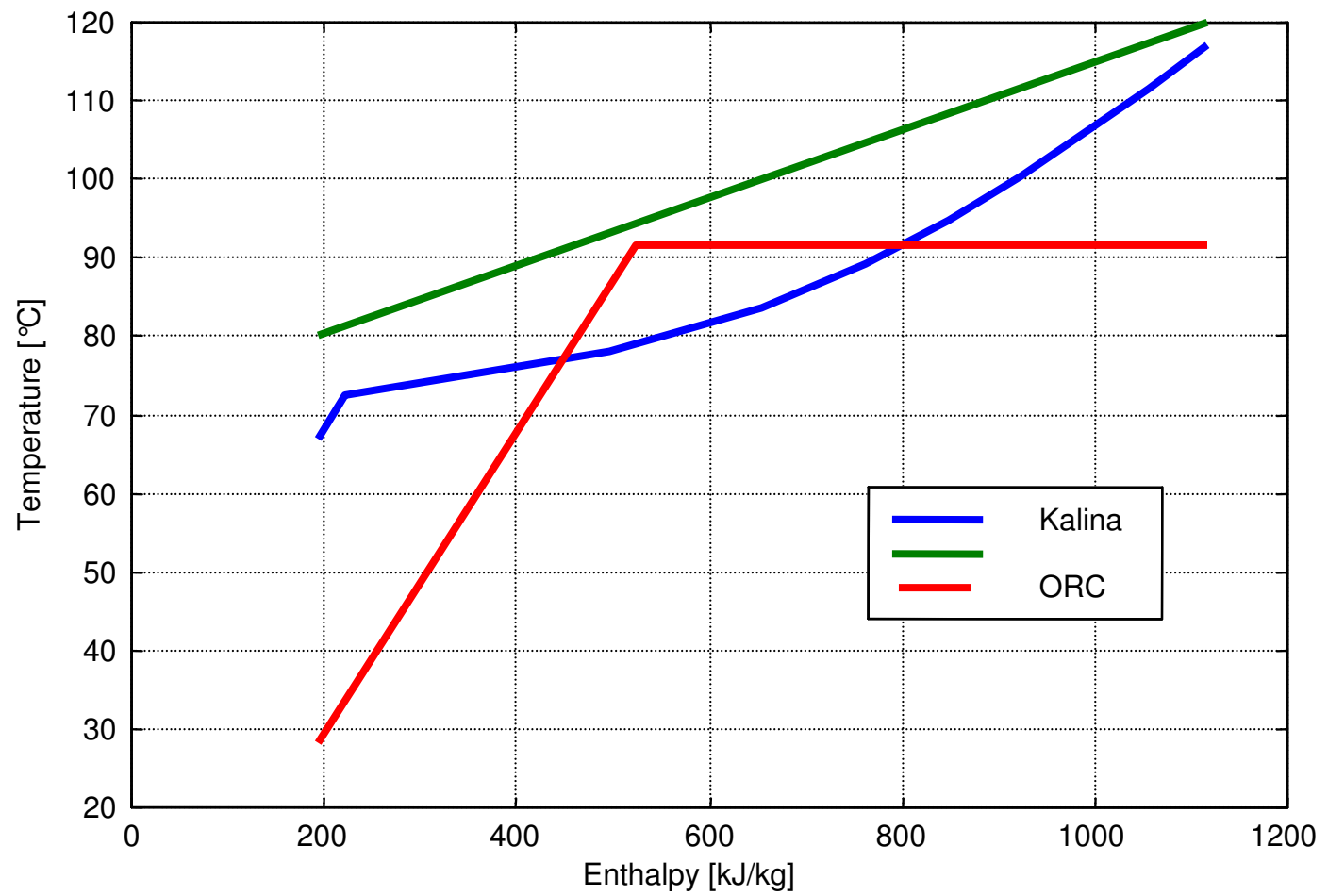
Kalina Cycle

- Geothermic diagram of Kalina Cycle



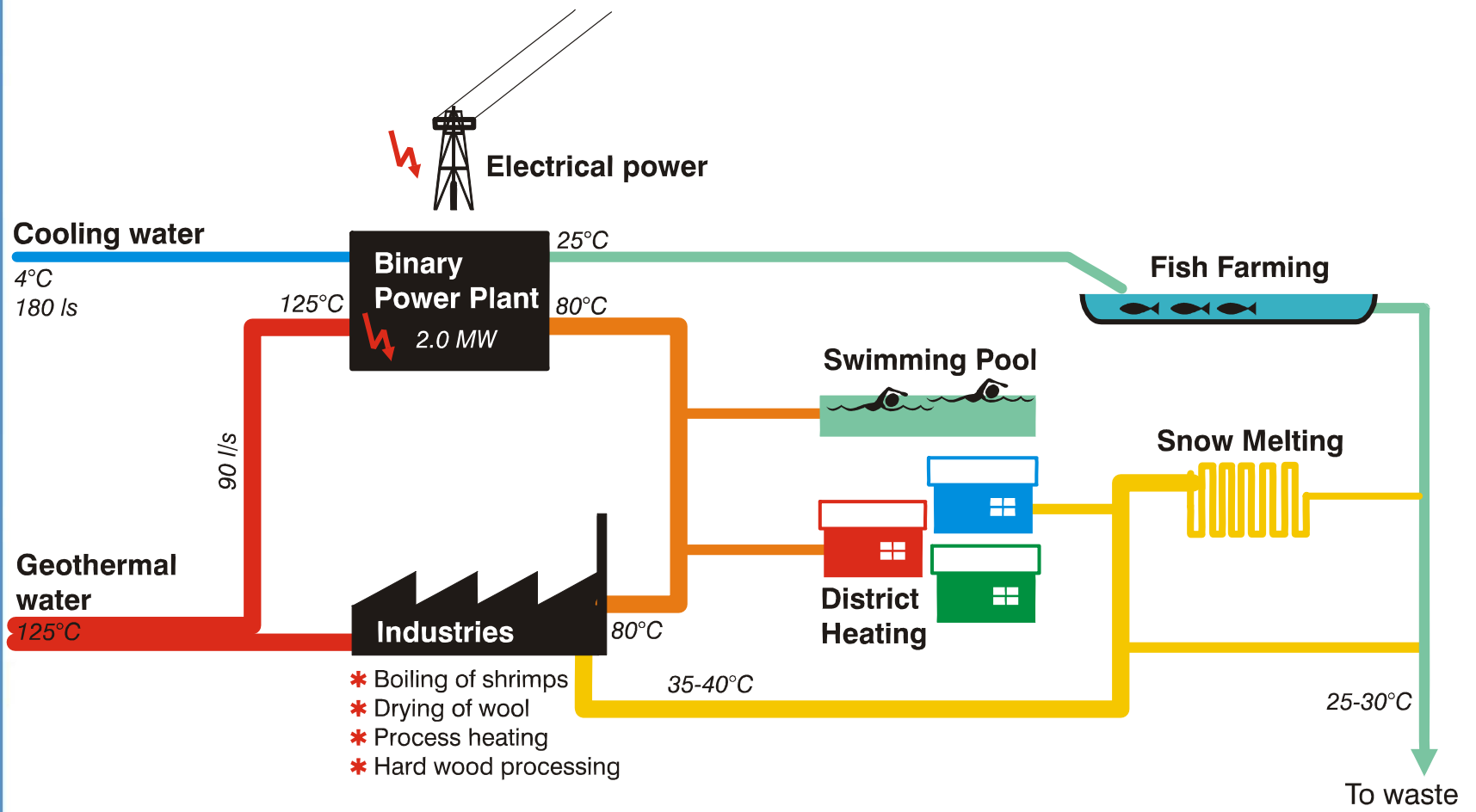


Difference





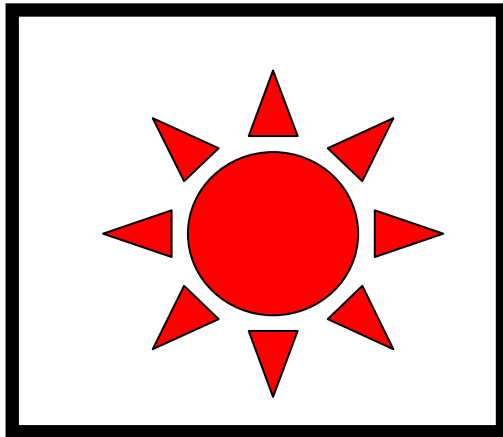
Binary Multi Use





PRIMARY USE

HEATING



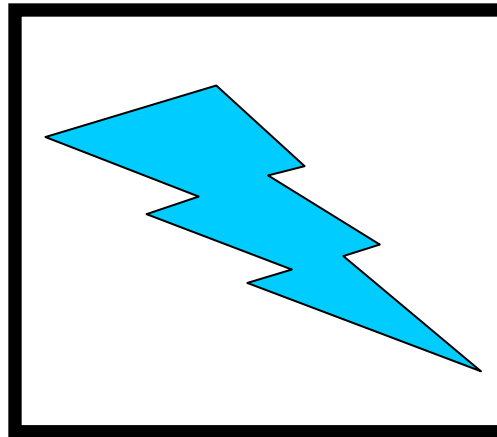
1,500 – 50,000 HOUSEHOLD
EQUIVALENCE



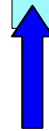
3,000



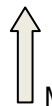
ELECTRIC POWER GENERATION



3.0 – 11.0 MW POWER



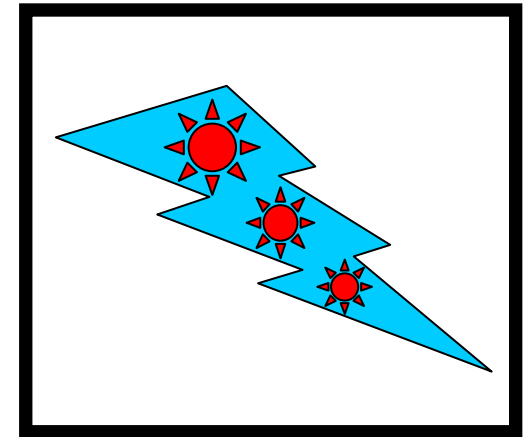
3.2



MODEL



HEAT AND ELECTRIC POWER
CO-GENERATION



1,500 – 50,000 HOUSEHOLDS
2.0 – 11.0 MW POWER



3,000 / 3.2



AVER. OPERAT.



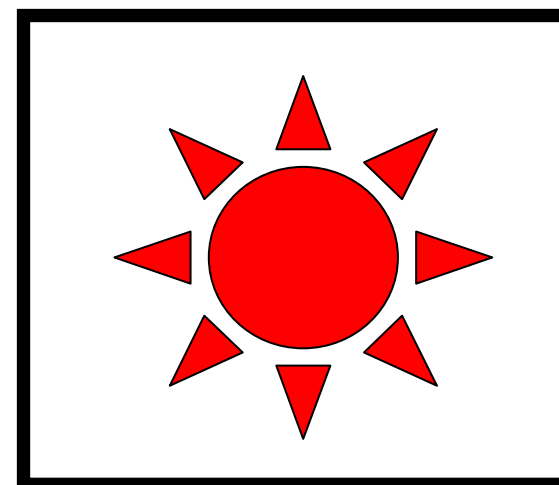
HEAT SUPPLY 3,000 household equivalence (for industrial use)

Data in EUR

Investment demand of the project	5 152 200
Own sources / Equity	1 030 440

P&L and cash flow data Year 5 Year 10

Net sales	1 821 020	2 226 279
Material costs	-127 471	-155 840
Personnel costs	-54 631	-66 788
Depreciation	-304 883	-327 550
Other income	0	0
Other expenditures	-36 420	-44 526
Operating profit (EBIT)	1 297 615	1 631 576
<i>EBITDA</i>	<i>1 602 498</i>	<i>1 959 126</i>
Income from financial transactions	58 863	284 949
Expenditures on financial transactions	-166 927	-102 002
Profit on ordinary activities	1 189 551	1 814 522
Extraordinary profit	0	0
Profit before taxes	1 189 551	1 814 522
Taxes	-237 910	-362 904
Profit after taxes	951 641	1 451 618
Dividends, profit-sharing	0	0
Retained profit	951 641	1 451 618
Changes in fixed assets (-)	-191 820	-195 838
Changes in loans	-234 997	-299 922
Cash Flow	908 464	1 347 534



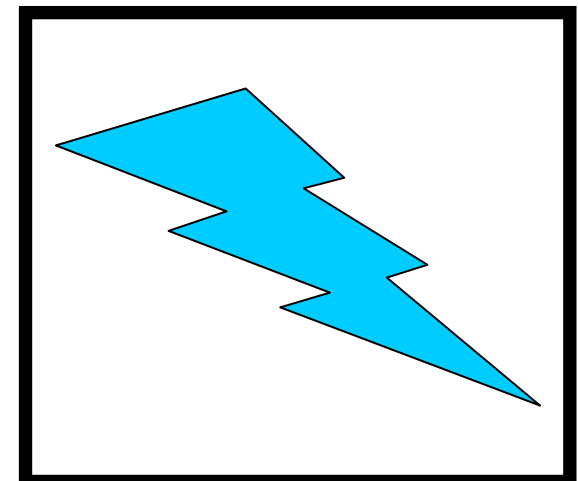


ELECTRIC POWER GENERATION 3.2 MW

Data in EUR

Investment demand of the project	17 316 622
Own sources / Equity	3 463 324

<u>P&L and cash flow data</u>	<u>Year 5</u>	<u>Year 10</u>
Net sales	3 222 763	3 939 973
Material costs	-225 593	- 275 798
Personnel costs	-96 683	-118 199
Depreciation	-797 605	-820 272
Other income	0	0
Other expenditures	-96 683	-118 199
Operating profit (EBIT)	2 006 199	2 607 504
<i>EBITDA</i>	<i>2 803 804</i>	<i>3 427 776</i>
Income from financial transactions	15 548	289 047
Expenditures on financial transactions	-585 128	-359 013
Profit on ordinary activities	1 436 619	2 537 539
Extraordinary profit	0	0
Profit before taxes	1 436 619	2 537 539
Taxes	-287 324	-507 508
Profit after taxes	1 149 295	2 030 031
Dividends, profit-sharing	0	0
Retained profit	1 149 295	2 030 031
Changes in fixed assets (-)	-684 542	-688 560
Changes in loans	-783 810	-1 009 926
Cash Flow	1 050 027	1 708 665





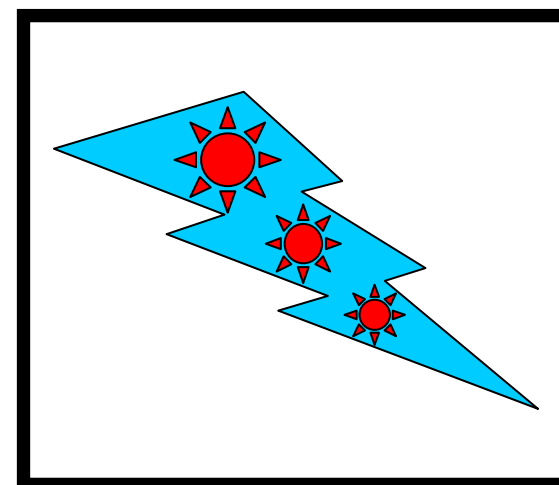
HEAT AND ELECTRIC POWER CO-GENERATION

3,000 / 3.2 MW

Data in EUR

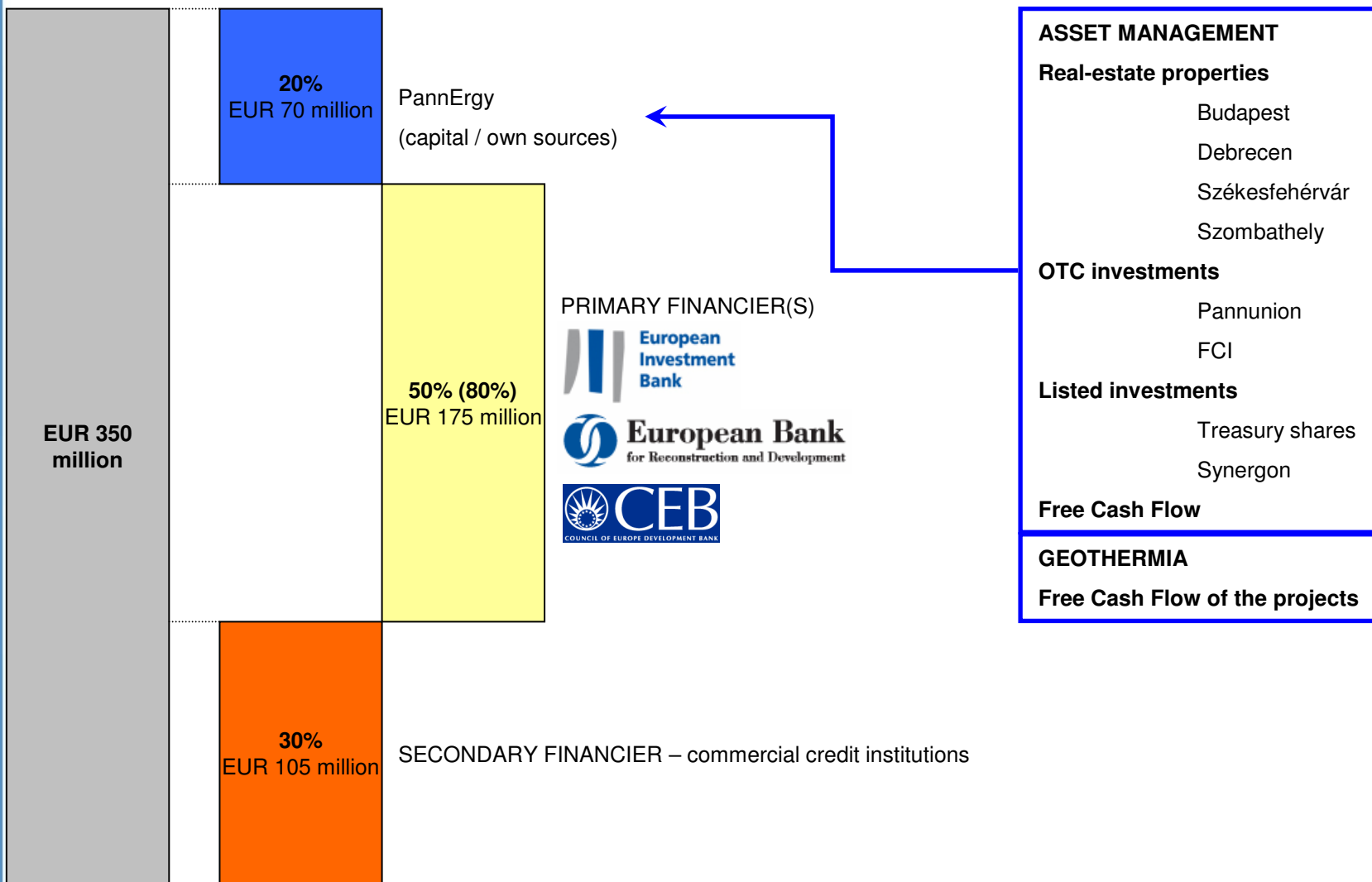
Investment demand of the project	19 041 335
Own sources / Equity	3 808 267

<u>P&L and cash flow data</u>	<u>Year 5</u>	<u>Year 10</u>
Net sales	4 038 284	4 936 984
Material costs	-282 680	-345 589
Personnel costs	-121 149	-148 110
Depreciation	-953 613	-976 280
Other income	0	0
Other expenditures	-201 914	-246 849
Operating profit (EBIT)	2 478 928	3 220 156
<i>EBITDA</i>	<i>3 432 541</i>	<i>4 196 436</i>
Income from financial transactions	33 227	414 769
Expenditures on financial transactions	-635 803	-390 105
Profit on ordinary activities	1 876 352	3 244 821
Extraordinary profit	0	0
Profit before taxes	1 876 352	3 244 821
Taxes	-375 270	-648 964
Profit after taxes	1 501 082	2 595 857
Dividends, profit-sharing	0	0
Retained profit	1 501 082	2 595 857
Changes in fixed assets (-)	-840 550	-844 568
Changes in loans	-851 692	-1 097 390
Cash Flow	1 489 940	2 343 034





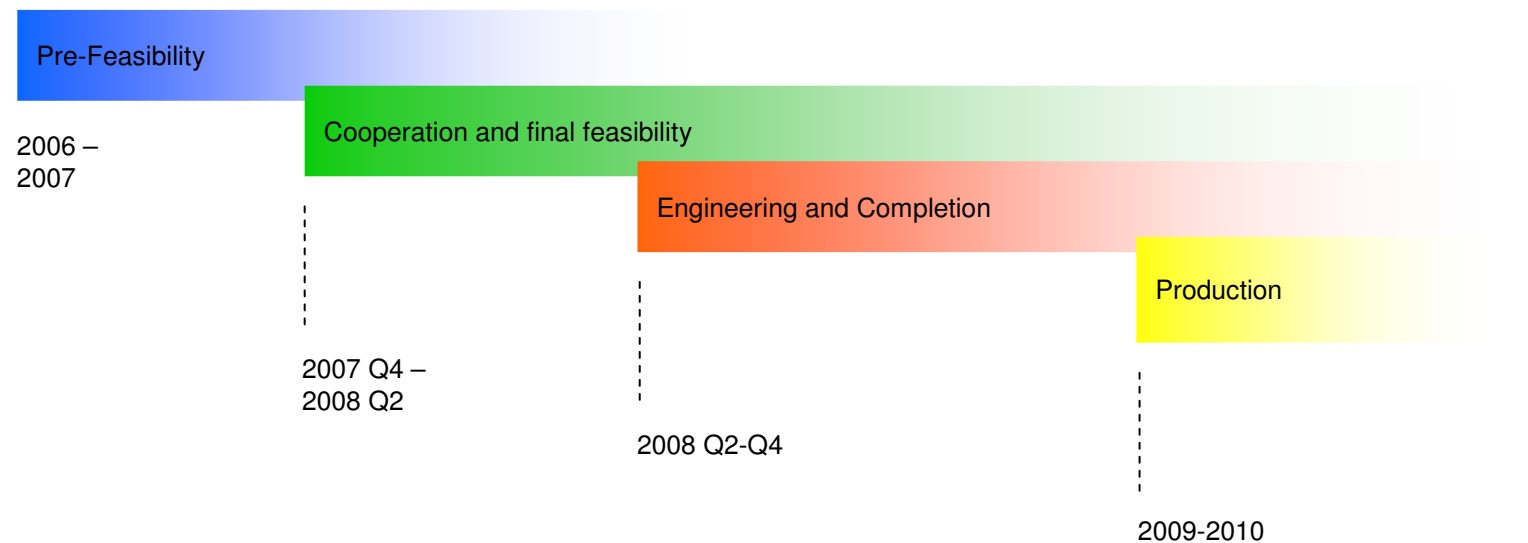
FINANCING





COMPLETION

- Min. 60 MW
by max. 20 plants
- First drilling between April - June, 2008
- First operating plant in Q4, 2009





The Business Model and its Impacts



- **PannErgy** and **Local Government** or its Heating Company found a Private Company, with an asset of 400.000 €. Share ratio is 90% PannErgy and 10% Local Government. Share of Local Government is financed on loan base by PannErgy. This loan will be redeemed after the start of the Power Plant operation from the business result on the 10% asset.

This is a profit generating asset for the Local Government for long term!

- **PannErgy** and **Local Government** are working together to identify and bid for the direct and indirect EU funds, the EEA Grants.
- **PannErgy** and the **Local Government** are working together to develop existing District Heating systems or to start the engineering planning and implementation of new District Heating Networks.



The Business Model and its Impacts



- **Local Governments** will get low and predictable price for the flat heating and hot water providing. That is applicable for the hospitals, offices, education buildings, sport facilities, under the control of Local Governments.
- **Local Governments** will have new opportunities to increase the “Temptation “ of their Industrial Parks.
- **Local Governments** in agricultural environments, with low and predictable priced heat, can launch Greenhouse Projects for Bio cultivation.
- New, direct and indirect employment opportunities will change the current living standards.
- Showroom in the Power Plant!



Where the needs are...





Environmental aspect



Implementation all of the possible projects in relevant municipalities would result elimination of burning

cca. 1.000.000.000 m³ gas /year

Total number of 217.000 flats, high number of hospitals and schools could be, hopefully will be impacted and 150-200 MW green electricity will be generated.





Thank You very much for your attention

György Horuczi

Tel.: +36-20/4724858

Email.: gyorgy.horuczi@pannergy.com

www.PannErgy.com

**IMPORTANT
Disclaimer**

Although PannErgy Nyrt devotes considerable efforts to maintain its presentations and to provide accurate and up-to-date data, the Company shall not guarantee the correctness or up-to-date validity of information content included in this presentation. PannErgy Nyrt. shall be immune from all liability regarding the content and functions of this presentation.