

STUDY OF GEOTHERMAL POTENTIAL FOR THE

GREENHOUSE

sector in Poland



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AIM OF STUDY

The aim of this study is to verify the geothermal potential for the Polish greenhouse sector.

The study has been performed in consortium of the following four parties:

- ▶ Blue Fifty (BF) – initiator of the consortium
- ▶ Wageningen University (WUR)
- ▶ Agricultural University in Cracow (UR)
- ▶ University of Science and Technology (AGH)



HEAT CONSUMPTION IN POLISH GREENHOUSE SECTOR



The horticulture industry in Poland is a large consumer of heat

In Poland there are >2.000 ha of greenhouses with a total demand of >4.000 MW of heat



Coal is the main fuel used for the production of heat

In total more than 1 mln ton of coal is used per year to heat the Polish greenhouses



The usage of coal however has an unfavorable ecological footprint

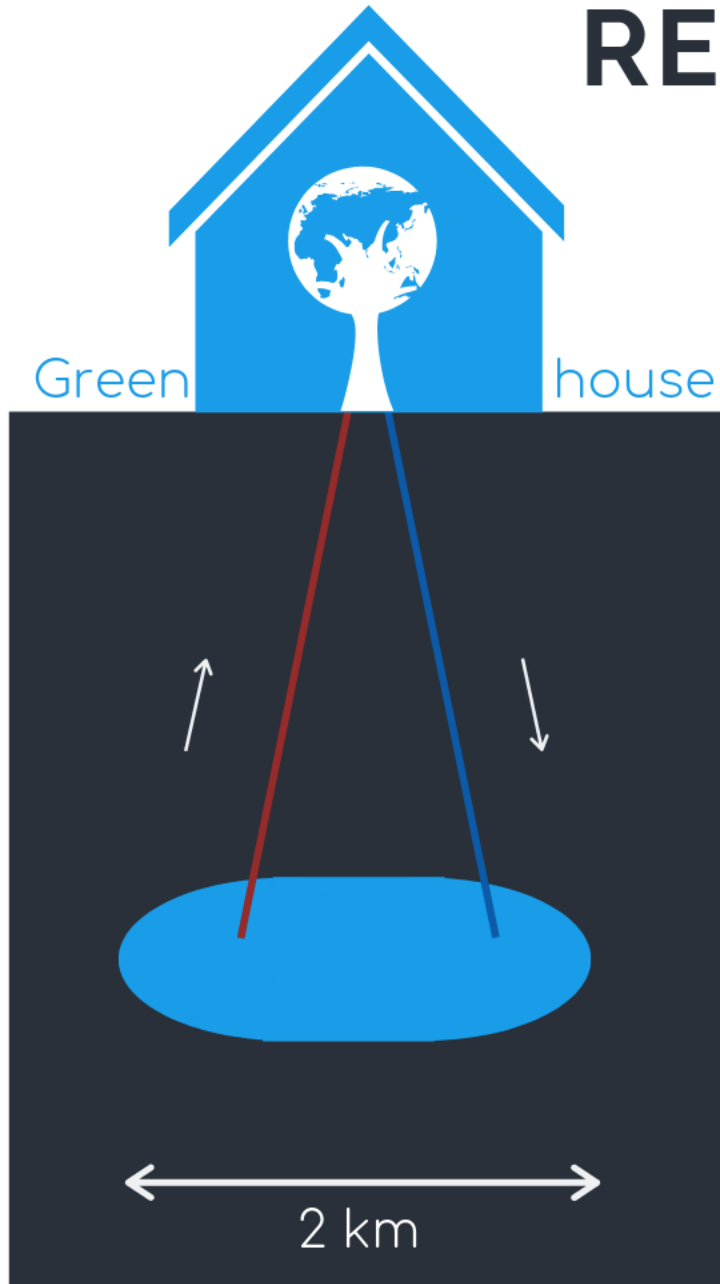
and although the greenhouse sector is also a large consumer of CO₂, the CO₂ produced by the coal boiler can not be cleaned sufficiently to be used by the grower



For the long-term viability of the sector

it is important to evaluate alternative sources of energy for the sustainable delivery of heat

RENEWABLE HEAT THROUGH GEOTHERMAL ENERGY



- Geothermal energy has proven to be an excellent source of renewable heat for greenhouses and has several advantages:
 - It is a renewable source of energy
 - Geothermal energy can be used directly
 - It is not dependent on the weather conditions.
- After usage the water is returned through a second well

EXPERIENCE IN DUTCH

geothermal sector



Geothermal energy has been proven in The Netherlands as a reliable and sustainable source of energy for the greenhouse sector



More than a dozen geothermal installations in greenhouses were built in the Netherlands



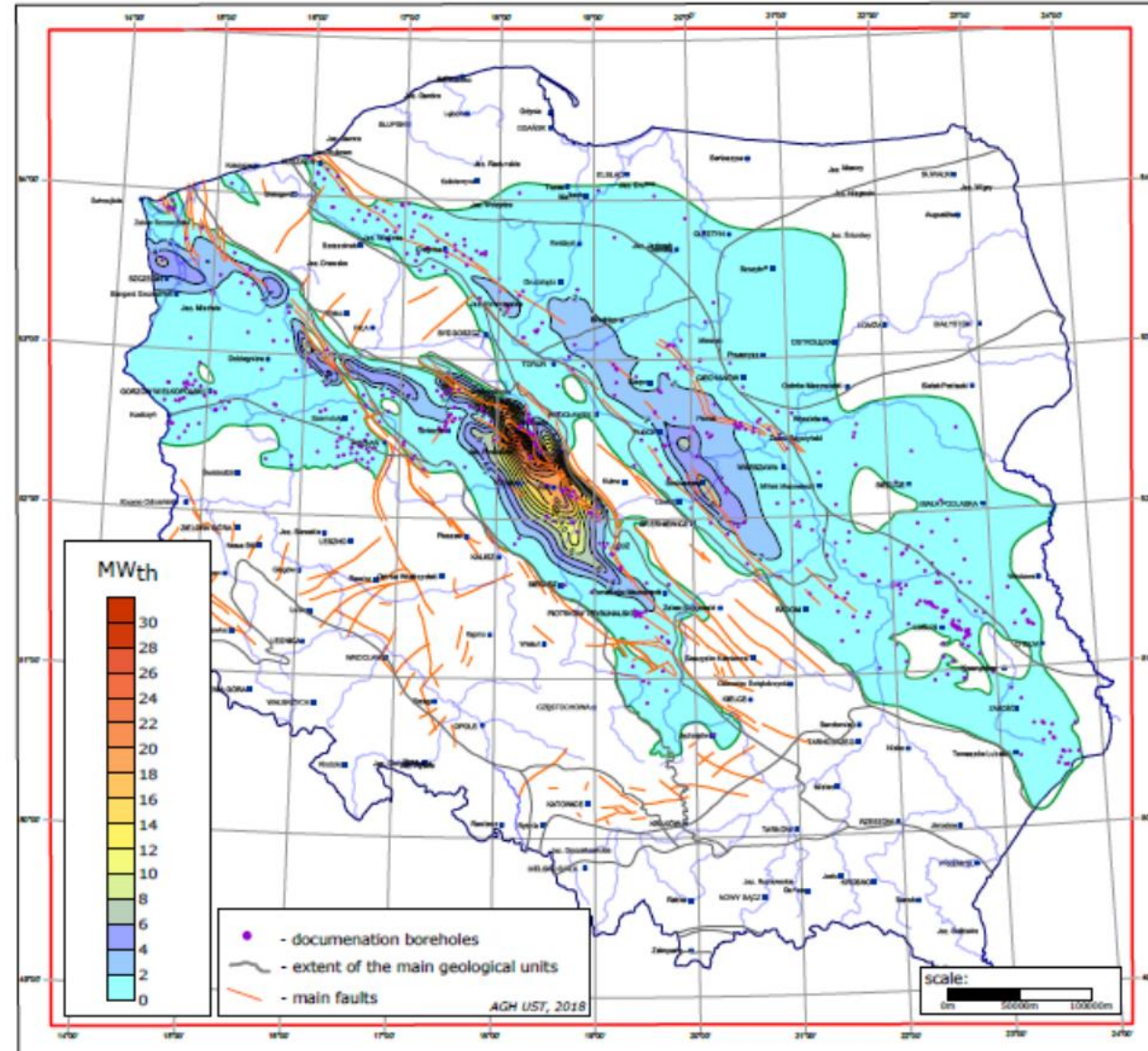
All technical problems have been verified and solved.



Knowledge and experience can be transferred to polish geothermal sector

RESULTS PHASE 1 - general geothermal conditions

Geothermal capacity of a doublets within the Lower Cretaceous aquifer



RESULTS PHASE 1 - general geothermal conditions

Geothermal capacity of a doublets within the Lower Jurassic aquifer

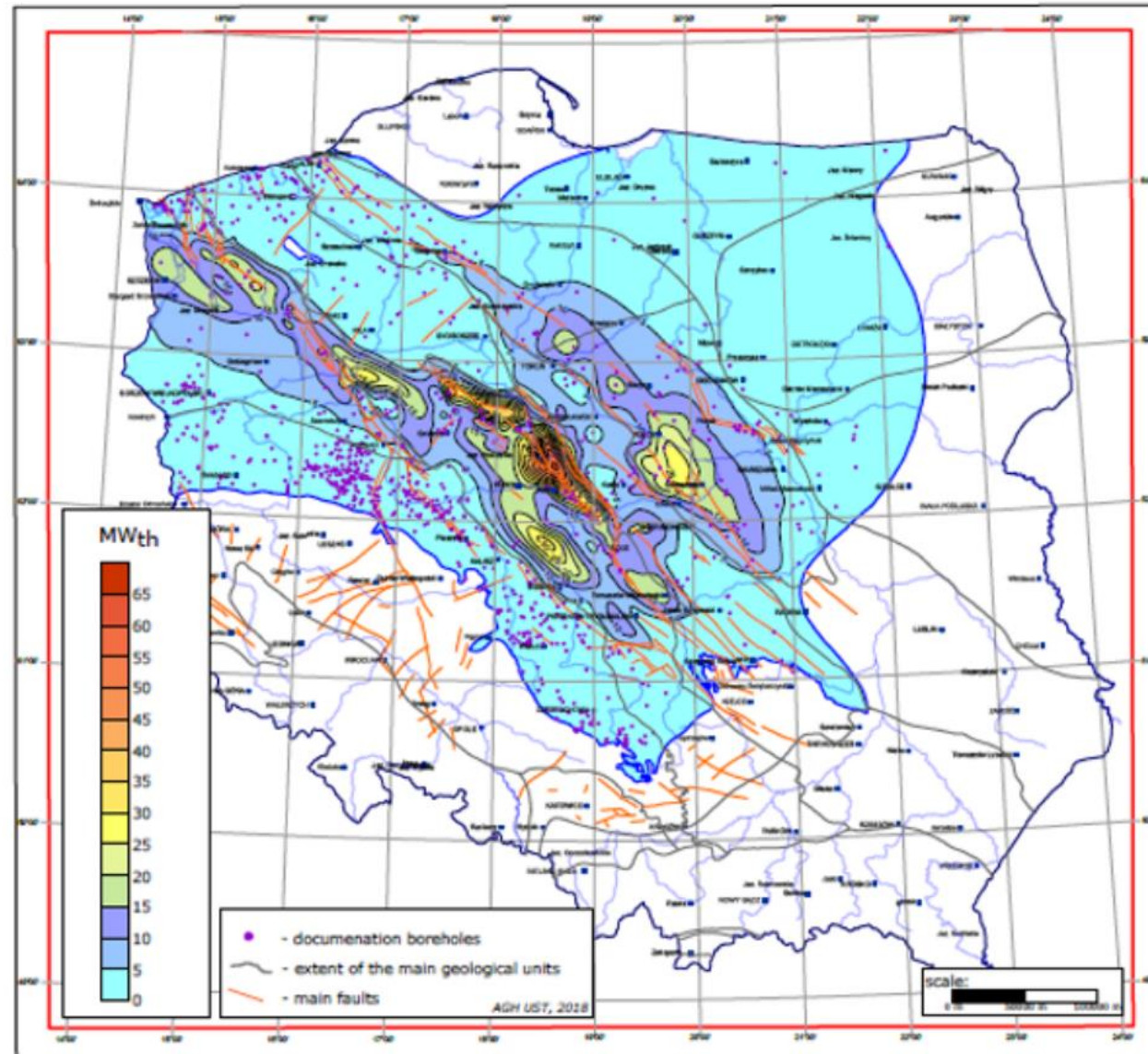


Table 1. Base greenhouses location in selected clusters

No.	Voivodship	Powiat	Location of the nearest village	Total area [ha]	Number of objects [pcs.]			
1	mazowieckie	otwocki	Śniadków Górny	11.06	1			
			Dziecinów	20.49	5			
			Sobienie-Biskupie	21.74	15			
			Warszawice	2.1	2			
			Piotrowice	36.2	9			
			Sobielesk	4.53	5			
			Całowanie	3.73	1			
2	kujawsko-pomorskie	inowrocławski	Janów	27.22	31			
żniński		Stanomir	2.1	2				
	3		Podgórzyn	1.9	2			
Stary Łabiszyn	2.5		1					
4	wielkopolskie	kaliski	Stara Nowa Kąkawa	2.2	8			
			Godziesze Małe	2.2	1			
			Głowczyn	5.2	7			
			Kamienna Wieś	1.4	2			
			Szczytniki	17.2	21			
			Szulec	15.77	2			
			Radliczyce	6.8	1			
			Oszczeklin	12.02	6			
			Koźminek	5.7	1			
			Stary Karolew	2.1	2			
			Nowy Nakwasiń	5.5	1			
			Bogdanów	4.7	6			
			Józefina	3.7	1			
			Podzborów	8.77	1			
			Długa Wieś Trzecia	4.7	1			
			Brudzew	3.3	1			
			Rychnów	29.8	16			
			5		koninowski	Wieruszew (closed)	13.8	1
			6		Kalisz miasto	Piwowonice-Zachód	2.1	2
Szosa Turecka	1.9	5						
Warszówka	9.74	4						
Majków	2.1	2						
7		pleszewski	Kuchary	10.91	3			
			Pacanowice	6.4	6			
			Kowalew	9.34	2			
			Prokopów	3.2	4			
8	dolnośląskie	zgorzelecki	Dłużyna Górna	6.3	1			
9	lubuskie	gorzowski	Bogatynia	10.74	1			
10	łódzkie	sieradzki	Rozanki	12.03	1			
			Mroczy Małe	8.58	4			
11	śląskie	pszczyński	Sędzimirowice	12.21	1			
11			Pszczyna	13.09	1			
12	warmińsko-mazurskie	olsztyński	Lęgajny	17.05	1			



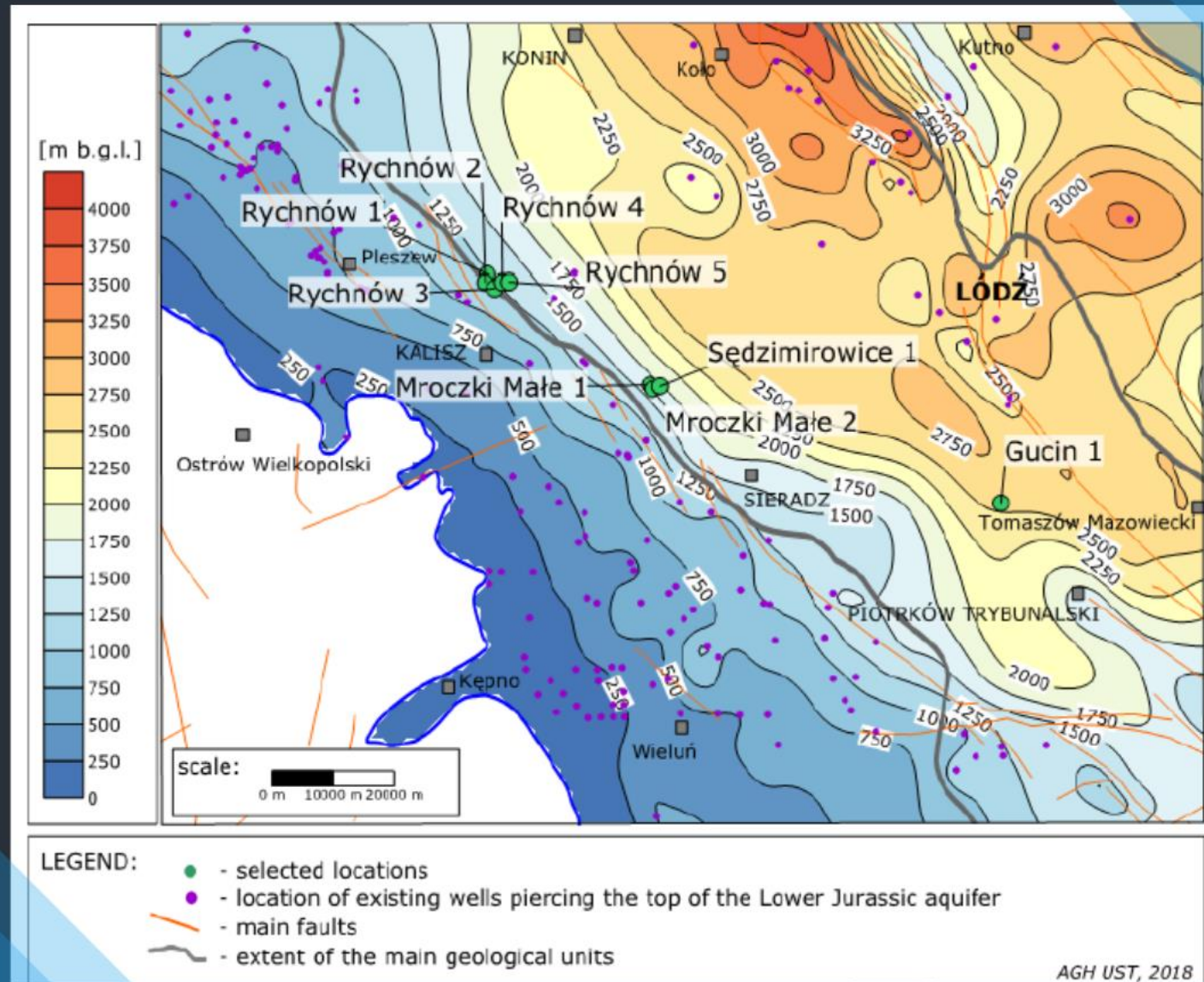
Results phase 1

selected locations

- In regions with geothermal potential all greenhouses were mapped.
- Afterwards 3 locations were selected with the best geothermal conditions and at least 15 ha of greenhouses in a cluster:
 - Mroczy Małe/Sędzimirowice
 - Rychnów
 - Gucin (new project)

RESULTS PHASE 1

SELECTED LOCATION (2)



RESULTS PHASE 1 – LOCATION 1

Mroccki Małe/Sędzimirowice:

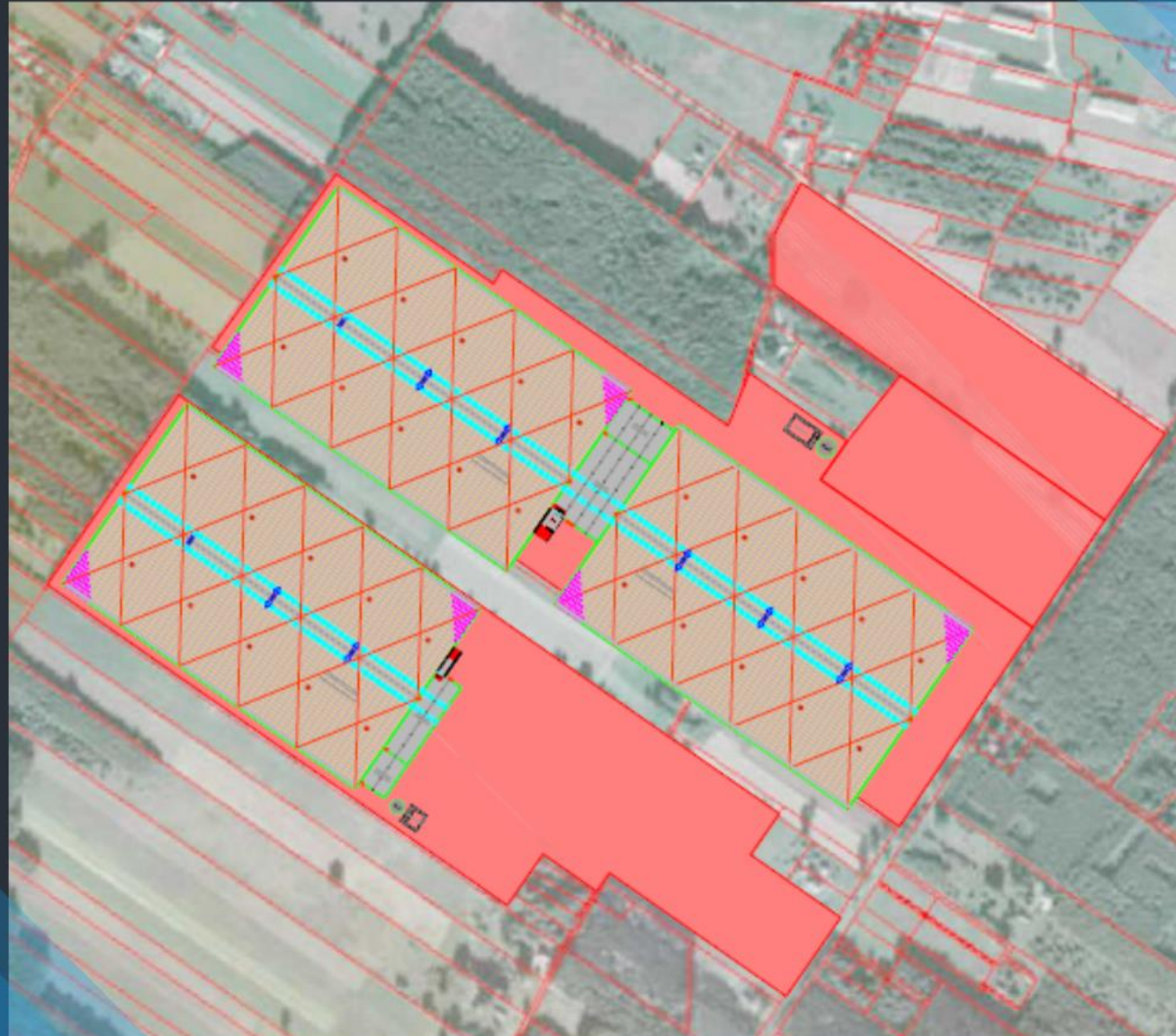
- Area: around 30 ha
- Crop: tomato
- Current energy source: hard coal



RESULTS PHASE 1 – LOCATION 3

Gucin:

- Area 30 ha
- Crop: tomato
- Renewable energy concept



RESULTS PHASE 2

DEEPER GEOTHERMAL ANALYSIS

1. Mroczi Małe/ Sędzimirowice

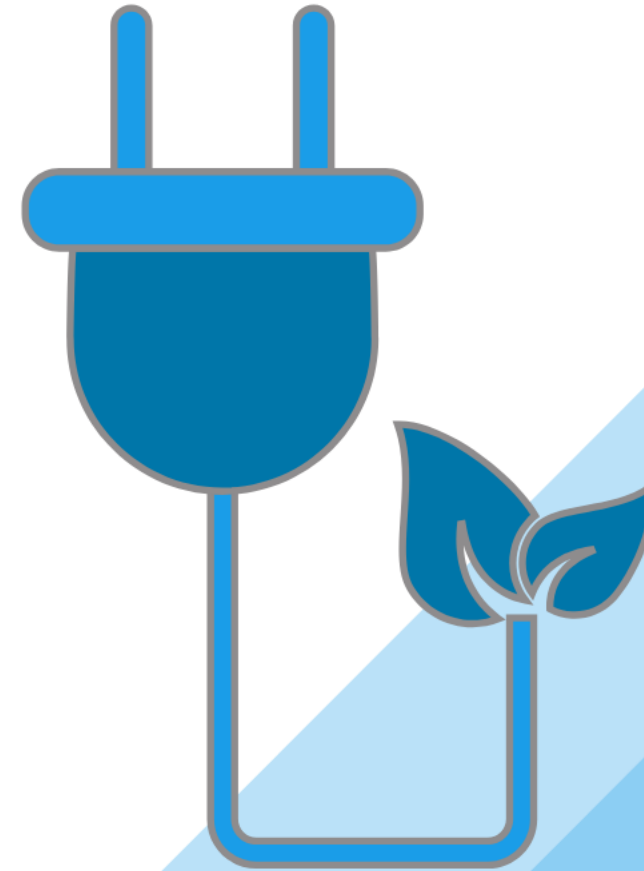
- ▶ depth of drilling wells 1644 m
- ▶ flow of geothermal water 233 m³/h
- ▶ temperature of geothermal water 51 °C
- ▶ mineralization of geothermal water 19 g/dm³

2. Rychnów

- ▶ depth of drilling wells 1323 m
- ▶ flow of geothermal water 194 m³/h
- ▶ temperature of geothermal water 41 °C
- ▶ mineralization of geothermal water 22 g/dm³

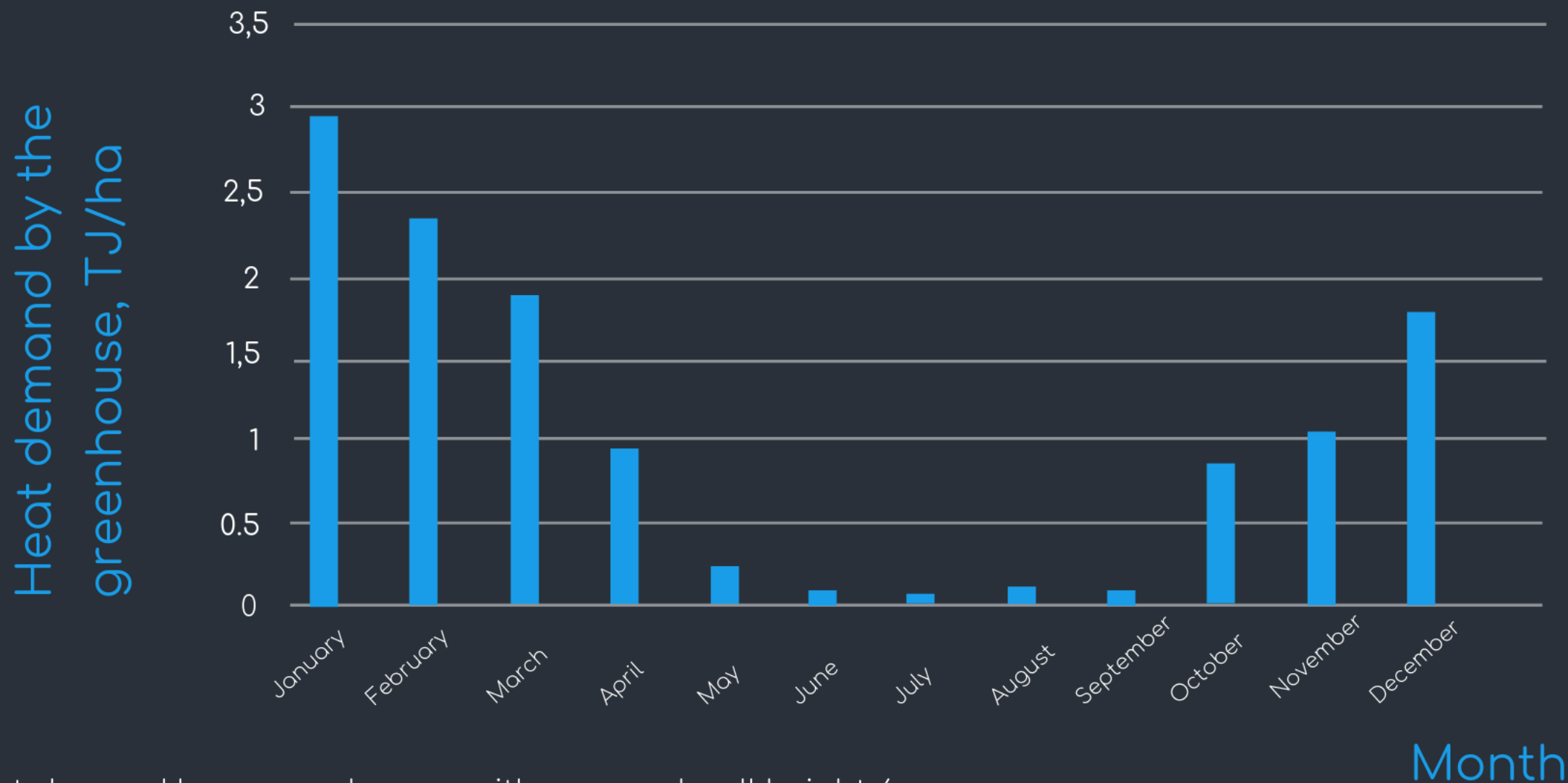
3. Gucin (new project)

- ▶ depth of drilling wells 2560 m
- ▶ flow of geothermal water 120 m³/h
- ▶ temperature of geothermal water 78 °C
- ▶ mineralization of geothermal water 76 g/dm³



HEAT DEMAND PROFILE

polish greenhouses



Heat demand by a greenhouses with an equal wall height 6 m

RESULTS PHASE 2



- Total investment and operational cost have been determined for geothermal installation including connection with existing greenhouses.

	Total cost [PLN]	Operational costs [PLN/year]	Total cost [EUR]	Operational costs [EUR/year]
Mroczi Małe / Sędzimirowice	26 284 985	1 051 399	6 141 351	245 654
Rychnów	23 281 495	931 259	5 439 601	217 584
Gucin	34 306 275	1 372 251	8 015 484	320 619

Thank you for attention





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