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Hungary: Survey of low-temperature geothermal energy

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HUNGARY: Survey of Low-Temperature Geothermal Energy

Geography

Area 93,030 km^2

Population 10,625,000 (1976)

Information

The questionnaire was sent to I.Boldizsár and J.Balogh. It was stated by Boldizsár that no central geothermal authority existed in Hungary but by the end of 1980 it will be established. He sent a reprint of a paper published in 1979 that gives data on geothermal energy production in 1976. Boldizsár stated that the situation had not change much since then and that the data could be used to-day with confidence. The paper gives estimates of geothermal resources in Hungary and indicates future plans. It is similar to a paper by Boldizsár in Geothermics in 1975, except in the 1979 paper there is information on geoheat utilization. Balogh sent a table showing the utilization of geothermal energy in Hungary to-day with information about the boreholes, type and size of users, and the amount of thermal waters available and utilized. Balogh enclosed several small maps that indicated the amount of "exploitable, opened up and used" geothermal waters in Hungary. Balogh sent also a copy of a lecture on "Discovery and Utilization of Geothermal Energy in Hungary".

Utilization

The information from Balogh shows that 33×10^6 m^3/year of thermal waters are used in Hungary. The thermal energy of this water above 50°C corresponds to about 1485 TJ/year. This water is used to heat 1.9×10^6 m^2 of agricultural area (0.7×10^6 m^2 greenhouses and 1.2×10^6 m^2 plastic covered), 3400 flats and 21 industrial facilities, 135 baths (for 224,000 people), 90 water supply installations and 41 animal (and similar) shelters. Balogh stated that the total

quantity of thermal waters available to-day (opened up) amounts to 166 x 10^6 m^3/year such that 20% are used.

Boldizsár (1979) shows the utilization of geothermal energy in Hungary in two tables with different reference teperatures: Thermal wells that produce water above 60°C in one table and above 40°C in the other . In both tables the reference temperature is 15°C. Knowing the total flowrate of the 343 boreholes (343.3 m^3/min) producing waters above 40°C, and knowing the nominal thermal power (1166.34 MW) above 15°C, it is possible to estimate the average temperature of this flow - here calculated as 64°C. From this data it is possible to estimate the thermal power above other reference temperatures. Table 1 shows the installed thermal power in Hungary and the thermal energy used in 1976. It is not clear how Boldizsár obtained his values for thermal energy used ("yearly actual heat consumption"). However, it appears his values are based on 15°C reference temperature. If that is the case the load factors are 19.6%, 51.4%, 61.2% and 31.9% for agriculture, district heating, industry and baths, respectively. A load factor of 51.4% for district heating is what would be expected. The overall load factor for geothermal energy utilization in Hungary is 24.9%. It should be noted that Balogh states that 1485 TJ/year are used above 50°C, which is much less than given by Boldizsár.

At the end of 1975 there were 1.7 x 10^6 m^2 of greenhouses in Hungary, 8 district heating systems (3500 flats with 710,000 m^3 heated space), 134 baths and various other uses (Boldizsár 1979). About 40% of Hungarian territory is suitable for economic hot water production for space heating and other purposes. In the next few years there are plans to increase the use of geothermal energy in Hungary. However, the situation has not changed much in recent years as stated by Bolizsár. In the replies from Balogh and Boldizsár no special mention was made of exploration projects.

Assessment

Maps sent by Balogh showed that 6.05 km^3/year of thermal waters are "exploitable" in Hungary, of which 0.166 km^3/year have been "opend up"

and 0.0336 km^3/year presently used. The corresponding thermal values were given as 47 x 10^{12} kcal/year (197,000 TJ/year), 15 x 10^{12} kcal/year (63,000 TJ/year) and 0.36 x 10^{12} kcal/year (1500 TJ/year). The table sent by Balogh, however, showed the "opened up" thermal energy as 1542 x 10^9 kcal/year (6456 TJ/year), which is an order of magnitude less than on the map. In the table the reference temperature was 50°C.

Boldizsár (1975,1979) has made an assessment of geothermal energy resources of Hungary. The geothermal waters are found in the Pannonian sedimentary basin. The heat stored in the sediments down to a depth of 3 km was estimated as 12,600 x 10^{18} cal (53 x 10^{21} J). The thermal waters produced to-day are taken from below 1000 m in the Upper-Pannonian with temperatures 50-100°C. This reservoir stores 768 x 10^{18} cal (3.2 x 10^{21} J) of heat of which 7.42 x 10^{18} cal (31 x 10^{18} J) are considered recoveable. The overall recoverable geothermal energy in Hungary is about 15 x 10^{18} cal (62 x 10^{18} J). Geothermal energy is available on 40,000 km^2 of the country or 43% of it's area. The above values given by Boldizsár are based on reference temperature 15°C.

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TABLE 1

Geothermal energy production and use in Hungary in 1976

Application	Number of wells	Flow-rate m^3/min	Installed thermal power MW			Thermal energy used[x]	
			0°C	15°C	40°C	TJ	%
Agriculture	77	117.0	699.35	535.44	316.89	3311	36.2
District heating	8	11.7	76.25	58.39	34.56	946	10.3
Industry	13	14.0	32.00	24.50	14.50	473	5.2
Baths	194	165.3	574.00	439.47	260.09	4415	48.3
Not used	51	34.3	141.40	108.27	64.08	-	-
Total	343	342.3	1523.00	1166.34	690.12	9145	100.0

x Probably based on 15°C reference temperature.