



High-temperature geothermal areas in Iceland

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Greinargerð JSG-GVJ-HeTo-80/02

High-Temperature Geothermal Areas in Iceland

There are 19 known high-temperature geothermal areas in Iceland and 7 potential areas. Each area may have more than one field. The name and location of the high-temperature areas are shown on the attached map of Iceland. A high-temperature field is where temperatures in excess of 180°C have been measured.

Six high-temperature geothermal fields in Iceland have been investigated by drilling. In the Hengill area boreholes have been drilled in two fields: Hveragerdi (or Ölfusdalur) and Nesjavellir. At Námafjall boreholes have been drilled in the Bjarnarflag field. Table 1 shows the high-temperature fields that have been developed in Iceland. Based on the nominal flowrate and enthalpy of the boreholes that can be used today the proven capacity in MW-thermal was estimated. In this estimate the reference temperature was taken as 0°C and therefore the usable thermal power is much less. Within a given geothermal field the boreholes have different enthalpy so the representative values in Table 1 should be used with caution, particularly for the Nesjavellir, Bjarnarflag and Krafla fields. The installed capacity shows the situation at January 1980.

At Svartsengi the geothermal brine is used for heating fresh water for space heating purposes in the region. The high-pressure saturated steam (155°C) is used for power generation and then condensed for heating. The Svartsengi field is presently being developed and the number of boreholes will double in the immediate future. The Ölfusdalur (or Hveragerdi) field is used for space heating (residential and agricultural) purposes only. The Bjarnarflag field at Námafjall is used for supplying steam to the diatomite plant at Lake Mývatn and for space heating of the local community. At Krafla the available steam is used for power production in a turbine with 30 MW-electrical name plate capacity.

The energy available in the high-temperature geothermal areas in Iceland has been estimated and is shown in Table 2. The following explanations apply:

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A. Size of area km^2 . Based on surface manifestations and resistivity surveys.

B. Energy content $\times 10^{-18} \text{J}$. The estimated energy content of rock and water above 130°C down to a depth of 3 km. Temperature gradient assumed to be 80% of boiling curve. At Reykjanes e.g. the geothermal reservoir is estimated to contain $2.4 \times 10^{18} \text{J}$ of thermal energy.

C. Accessibility of geothermal area/field as judged from topography and general features of surroundings.

D. Available energy $\times 10^{-18} \text{J}$. It is assumed that 20% of the energy content (see B above) can be recovered, the accessibility then applied.

E. Available power MW. The thermal power estimated to be available for 50 years.

The first 19 geothermal areas in Table 2 are known high-temperature areas, the others (20-26) are potential high-temperature areas. The estimated thermal power available from the known high-temperature areas is about 40,000 MW-thermal for 50 years. The corresponding value for the potential high-temperature areas is about 6,000 MW-thermal.

The high-temperature geothermal areas (known and potential) have been investigated in various detail. Boreholes have been drilled in 6 of the areas and 4 areas are being used today. Scientific investigations have been carried out in these and other high-temperature areas in Iceland. Table 3 shows what investigations have been done:

- A. Geological mapping
- B. Resistivity surveys
- C. Magnetic surveys
- D. Chemical analysis
- E. Gravity surveys
- F. Infrared reconnaissance

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Note
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- G. Seismic studies
- H. Microseismic studies

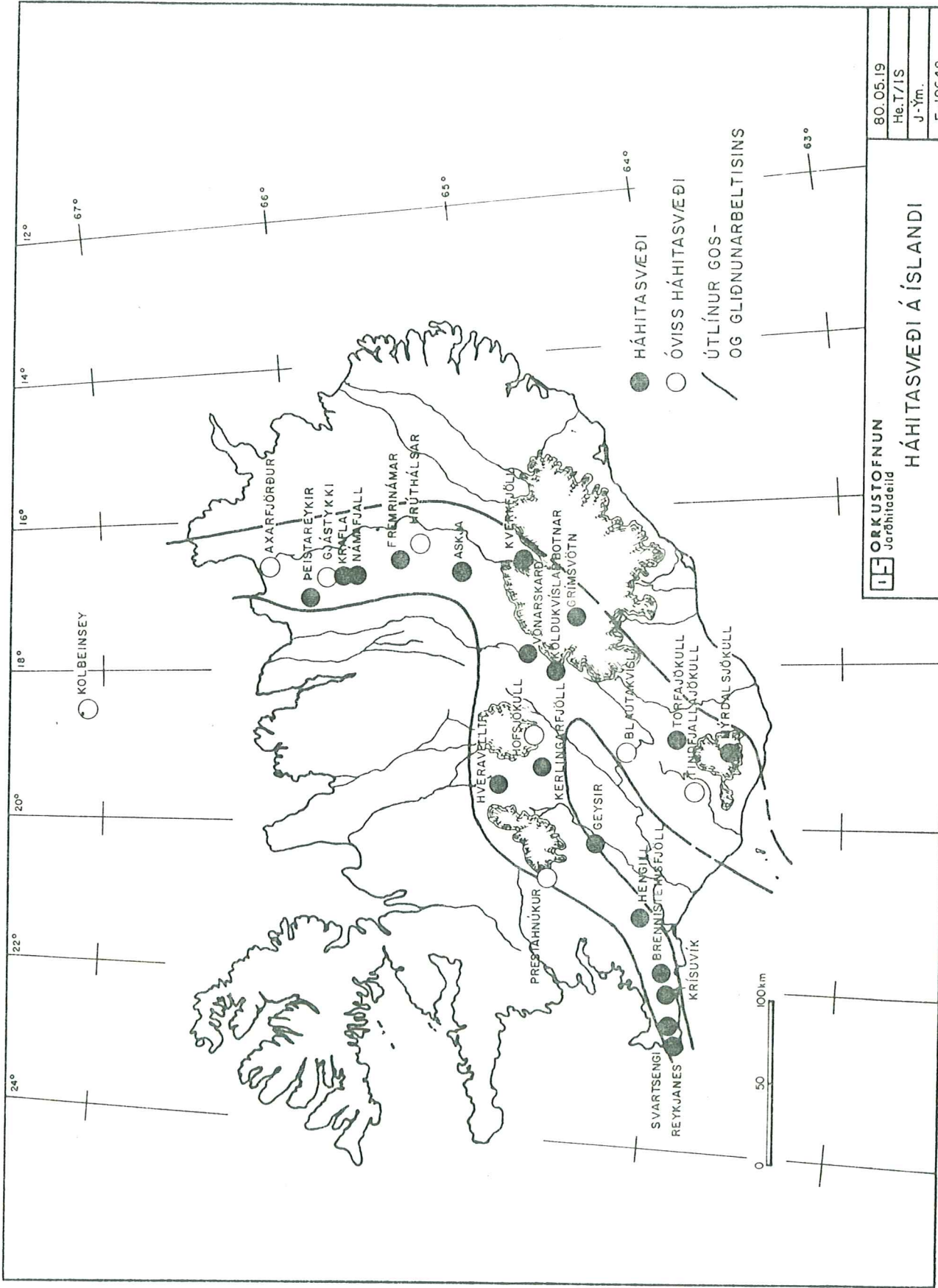
These investigations have been carried out over a great number of years and are always being added to and improved.

22. May 1980

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	F-19648

TABLE 1

High-temperature geothermal fields in Iceland investigated by drilling

High-temperature fields	Representative enthalpy kJ/kg	Number of boreholes		Proven capacity MW-thermal	Installed capacity		Scheduled capacity 1990/2000	
		Drilled	Production		MW-electrical	MW-thermal	MW-electrical	MW-thermal
Reykjanes	~ 1200	8	1	70	0	0	0/0	0/0
Svartsengi	~ 1000	6	5	310	2	50	8/8	150/200
Krísuvík	~ 900	8	0	0	0	0	0/0	0/0
Ölfusdalur	~ 900	8	6	350	0	15	0/0	15/15
Nesjavellir	~ 1400	5	1	30	0	0	0/0	0/0
Bjarnarflag	~ 1200	11	4	140	0	35	0/0	35/35
Krafla	~ 1400	12	7	130	6	0	30/60	0/0

TABLE 2

Assessment of high-temperature geothermal areas in Iceland.

For explanations see text

NAME	A	B	C	D	E
1. Reykjanes	2	2.4	1.0	0.48	300
2. Svartsengi	11	10.7	1.0	2.14	1,360
3. Krísuvík	60	42.6	0.8	6.82	4,330
4. Brennisteinsfjöll	2	1.9	0.6	0.23	150
5. Hengill	100	97.0	0.7	13.58	8,610
6. Geysir	3	2.9	0.9	0.52	330
7. Kerlingarfjöll	11	10.7	0.7	1.50	950
8. Hveravellir	1	1.0	0.9	0.18	110
9. Mýrdalsjökull	10	9.7	0.0	0.00	0
10. Torfajökull	140	135.8	0.7	19.01	12,060
11. Grímsvötn	64	62.1	0.0	0.00	0
12. Köldukvíslarbotnar	8	7.8	0.8	1.25	790
13. Vonarskarð	11	10.7	0.6	1.28	810
14. Kverkfjöll	24	23.3	0.2	0.93	590
15. Askja	26	25.2	0.3	1.51	960
16. Fremrinámar	4	3.9	0.9	0.70	440
17. Námafjall	7	8.5	0.9	1.53	970
18. Krafla	38	46.4	0.9	8.35	5,300
19. Þeistareykir	19	18.4	0.8	2.94	1,860
20. Prestahnúkur	1	1.0	0.5	0.10	60
21. Hofsjökull	6	5.8	0.1	0.11	70
22. Tindfjallajökull	1	1.0	0.1	0.02	10
23. Blautakvísl	7	6.8	0.7	0.95	600
24. Hróthálsar	7	6.8	0.9	1.22	770
25. Gjástykki	7	6.8	1.0	1.36	860
26. Axarfjörður	30	29.1	0.9	5.24	3,320
	600	578.3	-	71.95	45,610

TABLE 3

Scientific investigations of high-temperature areas in Iceland.

For explanations see text.

NAME	A	B	C	D	E	F	G	H
1. Reykjanes	X	X	X	X	X	X	X	X
2. Svartsengi	X	X	X	X	X			
3. Krísuvík	X	X	X	X	X	X	X	X
4. Brennisteinsfjöll	X		X			X		
5. Hengill	X	X	X	X	X	X		X
6. Geysir	X	X		X				
7. Kerlingarfjöll	X			X		X		
8. Hveravellir				X				
9. Mýrdalsjökull						X		
10. Torfajökull	X	X		X		X		
11. Grímsvötn						X		
12. Köldukvíslarbotnar						X		
13. Vonarskarð						X		
14. Kverkfjöll						X		
15. Askja	X			X		X		
16. Fremrinámar								
17. Námafjall	X	X	X	X	X	X	X	X
18. Krafla	X	X	X	X	X	X	X	X
19. Þeistareykir	X	X	X	X		X		

20. Prestahnúkur	X							
21. Hofsjökull								
22. Tindfjallajökull	X							
23. Blautakvísl								
24. Hróthálsar								
25. Gjástykki	X			X				
26. Axarfjörður		X		X				