

ORKUSTOFNUN  
Jarðhitadeild

FINAL REPORT ON GEOTHERMAL SEMINAR AND  
GEOTHERMAL FIELD STUDIES

by

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TO: The Supervising Agency  
Mr. Jakob Gislason, The Director of the National  
Energy Authority (Orkustofnun). Reykjavik-Iceland.  
FROM: Hayri M. Uysalli, UN Geothermal fellowship Turkey.  
SUBJECT: Final report on Geothermal Seminar and Geothermal  
field studies.

HOST COUNTRIES: Italy September 17- October 17, 1970.  
Iceland October 19- November 19, 1970.

Acknowledgements:

First of all I am indebted to various individuals of the United Nations for giving me the chance for attending to the United Nations Symposium on the Development and Utilization of Geothermal Resources, and to see different geothermal fields.

I am also to thank to Dr. Aldo Rutty and Dr. Begani (INIP-Rome) for their great help. At Larderello I am thankful to the staff of ENEL, especially Dr. Ceron, Dr. Burgassi, for giving me the possibility of seeing their geothermal fields, and also I want to thank Mr. G. Stefani, Chief geologist, Mr. F. Carmassi, Geologist, for giving me their time and their great help.

I am thankful to the staff of NEA (National Energy Authority, Reykjavik - Iceland), especially the Director of the NEA Mr. Jakob Gislason, Head of Department of Natural Heat Mr. G. Palmason, for their great helps, their warm hospitality and for giving me all the possibility of seeing their high and low temperature areas. In particular I would like to express my gratitude to Messrs. K. Sæmundsson, J. Tomasson, S. Arnórsson, Sverrisson, T. Thorsteinsson for their great helps.

Mr. K. Sæmundsson was very kind to answer my questions by giving his time to me, in the field or in the office.

Lastly I am very thankful to Mr. Howard Daniel (UN Chief Technical Assistance Office - Geneve) who organised everything.

Autobiography:

I have been working for Mineral Research and Exploration Institute of Turkey (M.T.A. Ankara) for twenty years as a geologist. The last four years of my work is to direct and supervise the field geothermal exploration in different areas of Turkey, and the development of the recently geothermal field of Kizildere. This geothermal energy project in west Anatolia is going on under the assistance of UNDP.

My government nominated me for a United Nations fellowship, in order to see different geothermal fields, and to collect information on the different geological conditions existing in these fields.

Programme and explanations:

- Sept. 17, 1970. Departure from Ankara and arriving to Roma.  
" 18, 1970. Conversation with UN coordinators.  
" 21, 1970. Departure from Roma and arriving to Pisa.  
" 22-Oct.1 Attendance to United Nations Symposium on the Development and Utilization of Geothermal Resources, held in Pisa- Italy.  
Sept. 22, 1970. The first day of symposium- Opening ceremony and United Nations Activities in the Field of Geothermal Development.  
Sept. 23 Geothermal Systems and The Status of Geothermal Development are presented by Mr. E. Tongiorgi and by Mr. G. Facca in very good order.  
Sept. 24 With all attendants of symposium have gone to Larderello as a guest of ENEL, for to see the geothermal power plants.  
Sept. 25 Mr. McNitt presented The Geologic Environment of Geothermal Fields as a Guide to Exploration, and Mr. G.J. Banwell presented Geophysical Techniques. Mr. Cataldy and Mr. Healy have presented very good ideas in this section.

- Sept. 26 Mr. D.E. White presented the subject of Gechemistry Applied to the Discovery, Evaluation and Exploitation of Geothermal Energy Resources.
- Sept. 28 Drilling Technology have been presented by Mr. A. Giovannoni, and Reservoirs Physics by Mr. R. James.
- Sept. 29 Collection and Transmission of Geothermal Fluids, By Mr. James.  
Special session = The decisions and prospects for the development of Geothermal Resources in Developing Countries are presented by Dr. S. Alpan in a very good order.
- Sept. 30 Utilization of Steam and High Enthalpy Water for electric power presented by Mr. H.C.H. Armstead. Utilization of low Enthalpy Water for Space Heating, Industrial, Agricultural and Other Uses have been presented by Mr. S.S. Einarsson.
- Oct. 1 Mr. J.J.C. Bradbury presented The Economics of Geothermal Power. Mr. T. Leardini, Mr. J.H. Smith presented very good ideas. In the closing section of Symposium Mr. Barnea presented The Possibility of the Multipurpose Utilization of Geothermal Resources in geothermic plants.
- In my opinion this symposium was the most successful one for geothermic field of study. I have been interested in all sections of the symposium, especially Geothermal system, the geologic environment of geothermal fields for to exploration. Utilization high and low enthalpy water. I have been provided a good opportunity and relevant methods in this symposium.
- Oct. 5, 1970. Departure from Pisa to Larderello.
- Oct. 6, " Conversation with Mr. G. Stefani, chief of Larderello, and Mr. F. Carnassi, geologist. I learned the general geology of Larderello area from Mr. Stefani.

- Oct. 7. I took a field trip to Montecastelli, Trasvare, Castelnuova with Mr. F. Carmassi.
- Oct. 8. I went on a field trip to Serrazzano, Lagoni, Monterotondo, Sasso with Mr. Carmassi. Thermal alteration - diaspar - between Sasso and Mouterotonto was most interesting.
- Oct. 9. Field trip to the Monte Amiato- Mr. Carmassi showed me all the detailed geology around of central volcano.
- Oct. 10. A field trip around of Larderello, for to see locations of the steam wells.
- Oct. 13. Larderello - Pisa.
- Oct. 14. Pisa - Roma.
- Oct. 17. Roma - Copenhagen.
- Oct. 19. Departure from Copenhagen and arriving to Reykjavik - Iceland.
- Oct. 20. I visited Mr. J. Gislason, the Director of NEA, Mr. G. Palmason, Head of Department of Natural Heat, and Mr. K. Samundsson, Mr. J. Tomasson and Mr. Sverrisson. Mr. K. Samundsson explained geology of Iceland.
- Oct. 21. Mr. Tomasson and I went a field trip to Hengill high temperature area, which it is the largest thermal area of Iceland. Hengill area is built up of volcanic rocks (basalt flows, hyaloclastites and rhyolites) of Quaternary age.
- Oct. 27. Field trip to Reykjanes high temperature area. In this area an important brine issues from hot springs and origin of the thermal fluid is sea water, according chemical analysis.
- Oct. 30. Field trip to Reykir, Ellidaár, Laugarnes and Seltjarnarnes low temperature areas. Reykjavik receives hot water from these areas for house heating.
- Nov. 2. Field trip to Krisuvik high temperature area.
- Nov. 4-6. Field trip Northeast of Iceland (Nanafjall - Husavik). At Nanafjall, there is a 3.5 MW geothermal power station and a big diatomite plant nearby drillholes.
- Nov. 11. Visit University of Iceland, for to see natural tritium in groundwater studied and hydrogen isotope studies. In Iceland, the deuterium content and tritium have been measured for eight years, in order

to know feeding surface of underground waters and other hydrological conditions.


- Nov. 13. A trip in the city of Reykjavik, for to see natural heating system of Reykjavik.
- Nov. 15. Field trip to Snafellsnes ( northwest of Iceland) low temperature area.
- Nov. 17. Field trip to Hveragerdi, Selfoss, Geysir thermal areas. In this part of Iceland, hot water is using for greenhouse farming.

**Conclusion:**

I have learned the ideas and the workings in different countries at the UN symposium. Also I have seen different geothermal fields in Italy and Iceland. This trip led me a valuable experience.

I believe that the application of these new ideas and knowledges will give a great development in geothermal fields in Turkey.

19 November 1970.

  
Hayri Uysalli