

Geothermal Energy
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COORDINATION OF GEOTHERMAL RESEARCH

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Crustal Studies
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In the period under review the Geothermal Energy Programme has continued to sponsor a reduced range of earth-science activities and to promote the examination of feasibility of utilisation at specific locations or for specific purposes.

Edmonton, 10 June 1985

On 10 June the Coordinator visited the University of Edmonton. Prof Jones was absent, in Oxford, and contact was with J. Majorowicz. Analysis of temperature data under the current contract was progressing smoothly.

The report on conductivity of samples from the Kindersley well had been sent to Ottawa, but had not been received before the Coordinator left. The University had converted their operations under our contracts to use cells having metal tops and bottoms, since the Coordinator had demonstrated conclusively that plastic cells give an unacceptable level of experimental uncertainty. Since many of the samples were very small, the measurements had to be made in shallow cells. A comparison has been made of the results from cells of the two types, and it has been concluded that, owing to the inherent shortcomings in the method, a cell of depth of 10 mm is preferred.

Edson, Alberta, 11 June 1985

On 11 June 1985 the Coordinator and B.Larkin visited Edson to attend a meeting, called by the Town of Edson to discuss the report on the feasibility of geothermal development in the Town. Also present were D. Lagore, Town Manager and chairman of the meeting, G Doyle, Councillor, D Phelpps and B. Grieco, of Underwood McLellan Ltd., and a representative of CREO, St. Albert. The results of the feasibility study provided two main options to the town, neither of which seemed clearly favourable to economic development. The Belly River formation, at depths of 1250 to 1500 m, gives evidence of a large water production potential. Temperatures would be 35 to 50 C, depending on depth, and salinities would be low. Heat pumps would be required but the costs of drilling would be relatively low. Alternatively, the Beaverhill Lake formation is expected to produce water from about 3500 m at 95 to 105 C and high salinity. Unfortunately, the information about the Beaverhill Lake formation is sparse, as few wells have been drilled to that depth in the area around Edson. Heat pumps would not be required, but the costs of drilling would be high, and the risks of finding poor reservoir pressure or poor production potential are significant. It was concluded that the results of the study do not justify the Town in proceeding immediately to the next stage. Instead it was agreed that the Town should investigate the possibility of cooperating with one of the hydrocarbon resource companies, either to obtain the use of a "dry" hole or in some other way.

Ottawa, 7 August 1985

On 7 August 1985 representatives of the Town of Springhill, Nova Scotia, visited the offices of the Earth Physics Branch, accompanied briefly by their Member of Parliament, Hon. R.C. Coates. The visitors had previously sent copies of a report entitled "Town of Springhill geothermal project". Federal personnel meeting with them were Brian Larkin, NRC, Monique Carpentier, RED/EMR, John Legg, OERD, Malcolm Drury and the Coordinator, both of EPB.

The visitors were W. Gilbert, Hospital Administrator, Ralph Ross, engineer, and Douglas Maddison, Town Treasurer, all of Springhill, accompanied by John Booth, consulting engineer of Halifax.

The Springhill plan comprises the production and reinjection of water from the flooded mine-workings, for the extraction of heat by means of heat-pumps. There is a very large quantity of water in the mines, but it is not known exactly how much. The water reaches to within 10 m of the surface, and has been found to be at a temperature of 20-22 C. The water is continually stirred, and is thought to be entering in the deepest parts of the mines and circulating through the tunnels to escape at or near the surface. Some escape is visible, and has been observed to remain warm at all seasons. Given this dynamic water system, it seems probable that water could be produced for heat recovery indefinitely. The temperature of the water is more than adequate for a heat-pump operation.

The visitors were seeking advice on sources of funding to continue the their project, to complete the research and to initiate a demonstration project, and technical advice on the configuration of the water source and its possible uses. After some discussion on the reasons for the anomalously high temperature of the water, the means of bringing it to the surface, the use of heat pumps and possible loads, the visitors were advised to have a feasibility study done, in which the economic analysis of five or more selected applications would be analysed and presented, as has been done at Moose Jaw. The funds for this study could come from the Geothermal Energy R and D Programme, in order to collect the facts necessary to support an application for demonstration funds.

The visitors were advised that EMR has a demonstration programme. The Province of Nova Scotia has expressed interest in a general way, and it was agreed that the Provincial Government would be kept informed of all activities. The visitors were provided with copies of recent reports on "Low temperature geothermal energy applications", "Summary of regulatory and commercial aspects of geothermal energy development in Canada", and "Moose Jaw geothermal study", all by Acres International Ltd. under contract to the Geothermal Energy Programme.

The visitors agreed to develop a proposal for a feasibility study that EPB could take to DSS as the basis for a contract, and EPB agreed to consult DSS on the best way to put the contract in place for completion during the current financial year. This has been done, and a contract has been let to the Town in a similar manner to the contract to the Town of Edson.

Halifax, Nova Scotia, 18 September 1985

M.J Drury visited Novacorp Ltd on 18 September. The company has been developing an "Unsolicited Proposal", for submission to DSS on the subject of utilisation of low-enthalpy geothermal resources in the Pictou Basin, New Glasgow - Stellarton area, of Nova Scotia. A similar proposal to EPB in the previous financial year was withdrawn when it became apparent that the work could not be completed by 31 March 1985. Because of the large budget reduction in the Geothermal Energy Programme, Novacorp have decided to

approach DSS directly for funding from its own budget. The present proposal is for a market survey in the area and is designed to be the first of several phases, each of which has a logical break-point at which a decision to continue can be made. It was indicated that limited funding from the Geothermal Energy Programme could be provided in the current year if DSS seeks co-sponsors. This would permit input from the federal geothermal community.

Springhill, Nova Scotia, 19 September 1985

Drury visited the Town of Springhill on 19 September 1985 and met with the Minewater Geothermal Committee at the Town Hall. He was accompanied by John Leslie of John Leslie and Assoc. Ltd., of Bedford, Nova Scotia, who have a contract with EPB for collection of geophysical data. The Committee had drawn up a proposal for a project to cost approximately k\$40 to assess the feasibility of using water at 20 C that would be obtained from abandoned mine workings. Following advice given to the Town in August, the Town was seeking funds from the Geothermal Energy Programme of EMR, which they could use to obtain the services of technical advisers under contract. A requisition had already been sent to DSS, seeking to let a contract to the Town to carry out this work, which is regarded as highly promising.

Calgary, 20 November 1985

A joint meeting of the Canadian Geothermal Energy Association (CGEA) and the Sedimentary Panel On Geothermal Energy (SPONGE) was held at the Institute of Sedimentary and Petroleum Geology, Calgary, on 20 November 1985, by kind permission of Dr. W.W. Nassichuk, Director of the Institute. SPONGE has been holding meetings for several years, one of which was an open information meeting for members of the hydrocarbon industry. CGEA now intends to organise regular information meetings in both the cordilleran and sedimentary geothermal provinces, thus filling the need that SPONGE has filled since its formation. Regular participants in SPONGE assisted in the organisation of this meeting, and it is hoped that they will continue to do so.

The programme was arranged by Prof. F.W. Jones of Univ. of Alberta and Brian Fairbank of Nevin, Sadlier-Brown, Goodbrand Ltd., Vancouver. A copy of the programme is attached as Appendix 1. The morning session was designed to include generally earth-science aspects and the afternoon session was made up of engineering and utilisation topics.

Of particular interest were the talks by two visitors from the United States. C Nicholson, of Boise, Idaho, described the use of geothermal water in the town. The first home was connected to geothermal heat in 1892, and at the peak of the old system in the 1930s about 400 business premises were heated. A new system was opened in 1983. The two systems work at different distribution pressures and are not connected. Water is produced from the wells at a temperature of about 77 C from depths of 270 to 610 m, and is discharged at about 52 C. Water quality meets drinking water standards except for the level of flouride, and the total content of dissolved solids is 250 ppm. Corrosion of pipes has been observed due to the action of

heated soil on the outside of the pipes, but not due to the water on the inside. Use of geothermal heat is economically more attractive than gas for customers if they reduce the temperature of the water by 20 C or more.

The geological situation is particularly favourable for the extraction of geothermal energy. The temperature is unusually high, water quality is very good, and the flow rate is ample for present needs. This combination of conditions is unusual.

S. Wegman, of the South Dakota Office of Energy Policy, described geothermal applications in the State. Water is derived from the Madison and Dakota formations, at temperatures of 38 to 88 C, depending on depth, and is generally hotter towards the west side of the State. Around the town of Philip water is produced at 65 to 71 C, and a school and nine business premises are connected to the geothermal system.

Opportunities in South Dakota depend on the formations of the Williston Basin, which has its centre in North Dakota and extends into Saskatchewan. Geological conditions are thus similar to those encountered in Regina, Moose Jaw, and throughout the southern part of the Province.

Henning Lies of Page Petroleum, Calgary, reported on the water-flood project in the Dodsland Field. A well to produce hot water from the Deadwood formation was completed in December 1983 and logged for temperature by EPB in January 1984, as reported earlier (Jessop and Drury, Internal Report 84-3). The original plan to inject hot water into a higher formation for secondary oil recovery has been modified. The highly saline Deadwood water is needed to avoid the reaction of the clays and shales that would occur with fresh water, but it has proved uneconomic to keep the water hot until it reaches the injection wells. Water is produced at 60 C, but the distribution pipes are too long for insulation, and the time spent in the holding tank and in the pipes allows the water to cool. It is now proposed to add a 1.2 MW plate heat-exchanger to the producing well, for heating the oil-water mixture in preparation for passing through the separator. This will displace about 0.5 Mcf of gas per day. The heat exchanger is to be installed before 1 March 1986 and will provide the first known industrial utilisation of geothermal heat on the Canadian prairies.

It is anticipated that the CGEA will hold its next technical meeting in British Columbia, Vancouver or Victoria, at the time of the Annual General Meeting in April 1986. It is hoped that CGEA will continue a pattern of two technical meetings per year, one with an emphasis on volcanic and cordilleran resources and high-temperature utilisation in April, and the other with emphasis on sedimentary and low-temperature aspects in Calgary in the autumn.

CGEA/SPONGE

Symposium on

GEOTHERMAL ENERGY FROM SEDIMENTARY BASINS

INSTITUTE OF SEDIMENTARY AND PETROLEUM GEOLOGY
3303 - 33rd St. N.W. Calgary, Alberta
November 20, 1985

PROGRAM

09:00-09:05	Welcome. Walter Nassichuk	I.S.P.G., Calgary
09:05-09:30	Brief overview. Alan Jessop	E.P.B., Ottawa
<u>Session A</u> <u>The Resource</u>		
	Chairman: Roger MacQueen	I.S.P.G., Calgary
09:30-10:00	The temperature field in the Prairies Basin	Jacek Majorowicz, U.Alta., Edmonton
10:00-10:30	Fluid flow analysis in a sedimentary basin with application to the Swan Hills area, Alberta	Claude Sauveplane A.R.C., Edmonton
10:30-11:00	COFFEE	
11:00-11:30	Analysis of the geothermal regime in a sedimentary basin with application to the Cold Lake area, Alberta	Stephan Bachu, A.R.C., Edmonton
11:30-11:45	Geothermal energy prospects in the Maritimes, Canada	Malcolm Drury, E.P.B., Ottawa
11:45-12:00	Geothermal studies in New Brunswick	Jim Chandra, N.B. Government, Fredericton
12:00-13:30	LUNCH	
<u>Session B</u> <u>Applications</u>		
	Chairman: Brian Larkin	N.R.C., Ottawa
13:30-14:00	City of Boise geothermal district heating system	Chuck Nicholson, City Engineer Boise, Idaho
14:00-14:30	Heat exchangers	Robert Parsons, Alfa-Laval, Calgary
14:30-15:00	Heat pumps	Lorne Wilson, Reid Crowther Edmonton
15:00-15:30	COFFEE	
15:30-16:00	Practical applications of deep basin geothermal resources in South Dakota	Steve Wegman, Pierre, South Dakota
16:00-16:30	The Moose Jaw geothermal project	Herb Taylor, City of Moose Jaw Saskatchewan
16:30-17:00	The Page Deadwood water well	Henning Lies, Page Petroleum, Calgary
17:00	Summary and discussion	Brian Larkin, N.R.C., Ottawa