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DIRECT UTILIZATION OF GEOTHERMAL ENERGY FROM  
A MUNICIPAL VIEWPOINT

Lee Post

Boise City Energy Task Force Energy Coordinator

Non-electrical geothermal energy has been in existence in Boise since 1890 when four enterprising young men drilled a 6" well to a depth of 400 feet, resulting in a natural hot water artesian flow site. Later they drilled another well with the same dimensions, and still later increased the original 6" dimension to 16" on both wells. The temperature of these wells was 172 degrees F. and stabilized at 170 degrees F. in the early 1900's. At first, wooden pipelines were laid approximately one mile to the city center, but these were proven unreliable and were replaced by iron pipe in 1892.

By the 1930's, water from these wells was heating approximately 400 residences and commercial businesses. The advent of low cost natural gas and electricity caused that number to diminish to the present 180 residences. Recent shortages of natural gas and hydro-power, as well as other energy sources, have caused the number of homes served by hot water to increase slowly. Warm Springs Water District, a non-profit corporation of local homeowners in the area, has been making plans for major expansion of this system for near future use by commercial and residential buildings.

Another major geothermal energy project was initiated by the State of Idaho in 1975 to study the heating requirements for 10 individual state buildings, and to begin an exploratory well drilling program on the Boise Barracks property owned by the Bureau of Land Management. This project was completed by the Idaho National Engineering Laboratory and Boise State University. The conclusion of this study was that heating these 10 buildings was economically and technically feasible. The State of Idaho Energy Department began its study with a demonstration project using the State Health Laboratory located near Warm Springs Water District wells. Geothermal water has been taken from District wells to heat the 33,000 square foot state structure. Waste waters from the Health Lab are cooled in a spray pond, then piped into the Boise River, where extensive monitoring and testing is being done. Other on-going private projects in the community are small scale, including greenhouses, swimming pools and individual domestic heating units.

In 1976, Boise City created an Energy Office to pursue the unique opportunity to study legal

and institutional questions of the geothermal resources in the area. This office proposed and created a preliminary plan ultimately funded by the Department of Energy in the amount of \$71,000. Boise City then proceeded with geothermal energy planning in two phases, since information available at the start of the project was incomplete. The first phase of the project resulted in the preliminary plan for the Boise area, a conclusion of which strongly suggested the desirability of proceeding to plan for and to implement a geothermal heating utility for Boise City's community.

In essence, the preliminary plan is a set of decisions in the public arena leading to the formation of organizational entities or institutions charged with the responsibility of management and planning for implementation and development and approval of budgets needed to support managing or planning institutions. The following seven different alternatives for this type of organization are being considered:

1. Development by Individual Users
2. City-owned Utility or Enterprise Fund
3. Non-profit Corporation
4. Boise and a Private Developer
5. Joint Powers Authority
6. Locally-owned Public Utility
7. Nationally-owned Public Utility

At present, a Joint Powers Authority seems to be the best alternative, but it is not the only one. A JPA could include such entities as Boise City, Warm Springs water District, State of Idaho and possibly Intermountain Gas Company, a local public utility. Public ownership, of course, would clarify many questions, such as public rights-of-way, and lower cost capital financing.

Boise City's preliminary plan describes implementation in stages with the ultimate goal of serving the largest market within the limits of the hot water resource available:

STAGE 1. The first wells will be drilled, the main transmission line laid and disposal return lines laid. Sizing for this portion of the system must be sufficiently large to both supply initial service to building space downtown and to permit extension of service to contiguous private, institutional and other commercial office space

outside the downtown area.

STAGE 2. At this stage the design is intended to provide hot water for space heating to the largest aggregated market segment lying closest to the resource. The system will connect city, state and federal buildings first.

STAGE 3. At this stage service will be extended to other major buildings downtown.

STAGE 4. Extension of service to all residential, commercial and institutional buildings in close proximity to the original pipeline route will be completed in this stage. Further, it is possible that the system will be connected to the Warm Springs Water District System to supplement service already being provided by the District's wells, a connection requiring ongoing negotiation with the District concerning financial, organizational, management, operational and legal aspects.

STAGE 5. This stage will initiate the second major phase of pipeline and well development as it begins to service Boise State University campus, as well as motels, hotels and other small businesses in the area.

The second phase of Boise City's geothermal project began in October, 1977 and was funded by the Department of Energy in the amount of \$142,000. Boise City and Boise City Community Development funds from the Federal Housing and Urban Development Department add another \$98,000 to the funding. In actuality, this second phase is a continuation of the preliminary plan and represents the final step before implementation of the resource in the area. It also includes detailed criteria needed to develop the geothermal resource to service the largest number of customers (private and public) first. Therefore, to minimize potential for litigation over the resource and to maximize participation by local individuals and corporations in the total geothermal utility system, the project has incorporated the following items to be completed before large scale implementation can take place:

- **POOL RESOURCE AGREEMENTS:** Unitizing the resource places all public and private resource owners in a cooperative setting for the purpose of hot water production.

- **DRILLING DEVELOPMENT AGREEMENT:** Based upon extensive experience in the oil and gas drilling business, this agreement makes possible the use of risk capital for production drilling with limited liability, the opportunity for local investor participation, a possible high return on investment, investor tax advantages, and use of qualified drilling contractors.

- **ARRANGE FINANCING FOR THE TOTAL SYSTEM:** Initial capital requirements of \$5-7 million dollars for a Boise geothermal project would not pose a major difficulty for most of the organizational alternatives. This funding could be sup-

plied by bonds, federal and/or general funds in some combination. These figures include modifying private commercial buildings, residences and/or institutions. Studies completed to date in the western area clearly indicate that there are economies of scale.

- **SELECT DISTRIBUTION SYSTEM OPERATIONS MANAGER:** It would be most desirable to choose an organization with the widest range of experience in managing a system such as this and then franchise the organization to operate the system for a fee.

Much is known about the Boise geothermal potential, but like all projects, there are many unanswered questions, particularly concerning the extent of the resource and specific legal ramifications involving regulations and law at the state and federal levels. The project has drawn the following substantial conclusions and/or assumptions:

1. The system is environmentally clean; water chemistry of the resource is extremely pure, and the fluoride count is the only major concern.

2. The total resource is sufficiently extensive to support systematic large-scale development.

3. It is economically, legally and technically feasible to use the resource for large-scale space heating and possible for space cooling.

Boise City has taken the unique opportunity to explore geothermal energy for the community as the most viable and readily available energy alternative for conservation of fossil fuels and hydro-power. Cooperation and involvement on the part of all levels of government and from commercial and residential sectors has demonstrated the community's willingness to use the environmentally clean geothermal resource in the near future. Boise City's geothermal project, funded by the Federal Department of Energy, has been of national concern; its implementation program will assist Idaho cities and the rest of the nation in obtaining information concerning utilization of this resource for non-electrical purposes.