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DIRECT APPLICATIONS DEMONSTRATION PROJECTS

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The early commercialization of geothermal energy is being aided by the implementation of demonstration projects that are funded on a cost sharing basis by the Department of Energy. A total of twenty-two projects designed to demonstrate the technical and economic feasibility of the direct application of geothermal fluids are presently underway in the United States. The types and locations of these projects are shown on the attached viewgraphs.

A typical project scenario will be presented. In addition, the various environmental, institutional, engineering and economic factors that should be considered in the development of direct applications projects will be discussed. These factors will be related to actual project experience.

As a result of these demonstration projects, private firms and organizations are gaining experience, and public awareness of geothermal energy is being increased. Concurrently, valuable environmental, technical, operational, and economic information is being generated that will assist in the future commercial development of geothermal energy.

DEMONSTRATIONS

WHAT DO THEY ACCOMPLISH?

- FEASIBILITY OF CONCEPTS
- TECHNOLOGY TRANSFER
- OPTIMIZATION OF DESIGNS
- VISIBILITY
- ACCEPTANCE BY PUBLIC
- DEMONSTRATE GOVERNMENTAL DETERMINATION
- DEVELOPMENT OF HARDWARE

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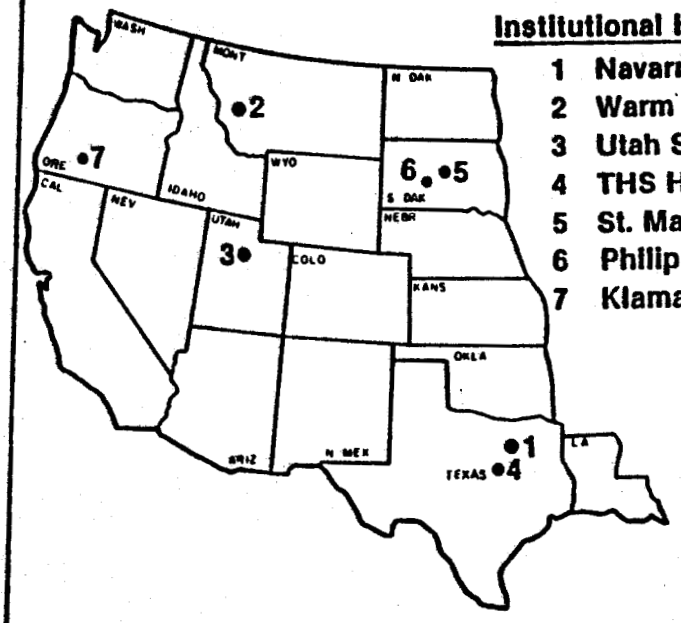

Institutional Heating Systems

1. Navarro College & Hospital Corsicana, Texas
2. Warm Springs Hospital, Montana
3. Utah State Prison, Utah
4. THS Hospital, Marlin, Texas
5. St. Mary's Hospital, Pierre, South Dakota
6. Philip School, South Dakota
7. Klamath Falls, Oregon, YMCA

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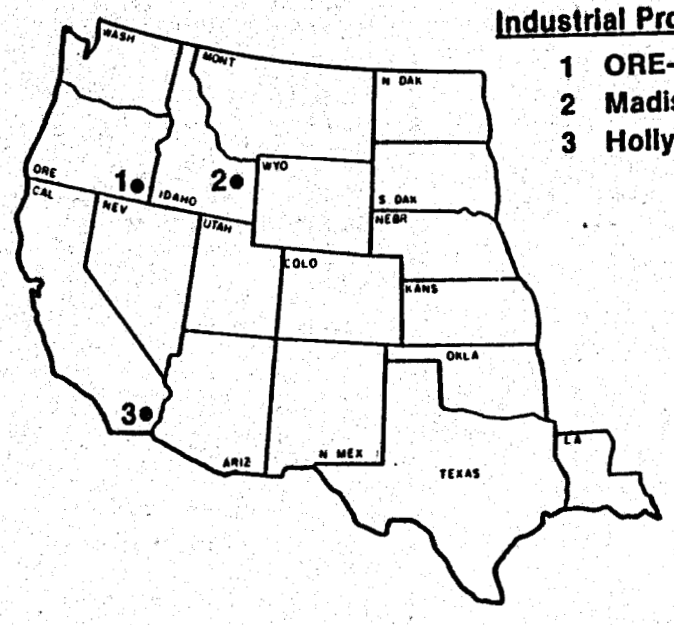

Industrial Process Sites

1 ORE-IDA — Ontario, Oregon
2 Madison County — Rexburg, Idaho
3 Holly Sugar — Brawley, California

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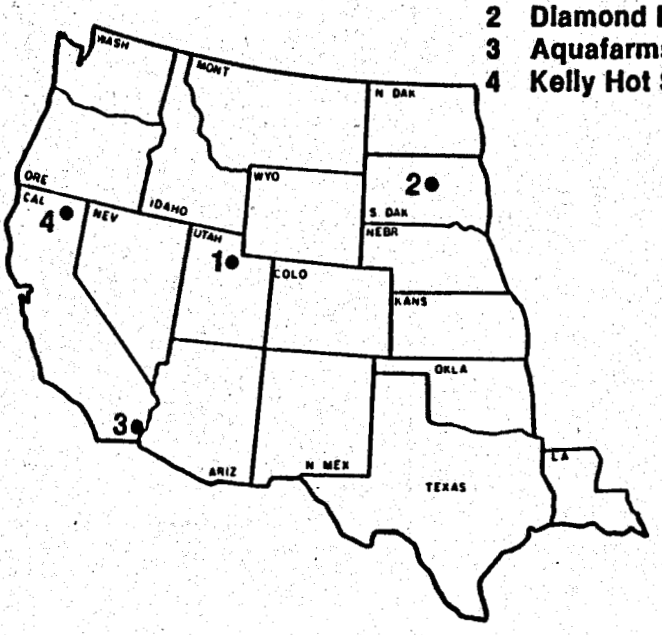

Agribusiness

1 Utah Roses — Sandy, Utah
2 Diamond Ring Ranch — South Dakota
3 Aquafarms International — Mecca, Calif.
4 Kelly Hot Springs — Novato, California

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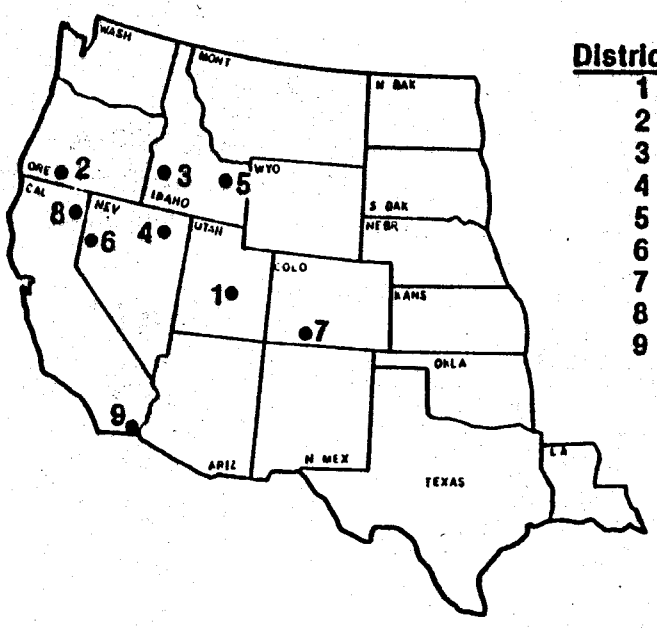

District Heating Systems

1. Monroe City, Utah
2. Klamath Falls, Oregon
3. Boise, Idaho
4. Elko, Nevada
5. Madison County, Idaho
6. Reno, Nevada
7. Pagosa Springs, Colorado
8. Susanville, California
9. El Centro, California

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DOE Hydrothermal Applications Projects Annual Energy Savings

Category	No. Projects	BTU/Year
District Heating	9	$3,478 \times 10^9$
Unit Space Heating	7	238×10^9
Agriculture/Aquaculture	4	490×10^9
Industrial Process Heating	2	$1,635 \times 10^9$
		$5,841 \times 10^9$*

*Equivalent to ≈ 1 million barrels of crude oil/year

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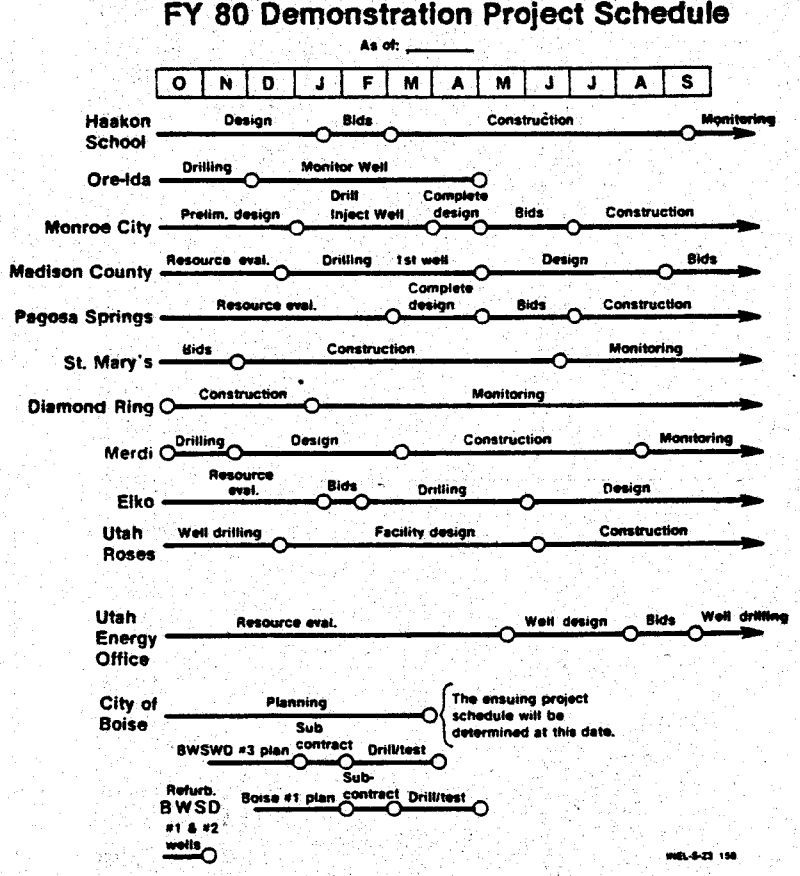

Geothermal Direct Applications Considerations

- Environmental
- Institutional
- Resource
- Well drilling
- Engineering
- Disposal
- Economic

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Direct Heat Economic Factors

- Resource depth
- Geophysics
- Utilization factor
- ΔT available
- Pumping costs
- Disposal
- Distance
- Quality
- Heat exchanger
- Investment capital
- Tax position

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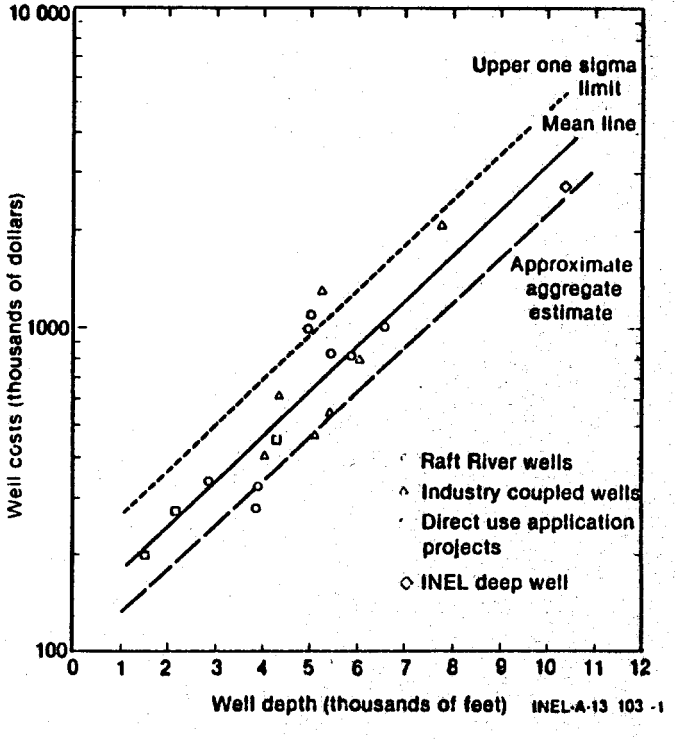
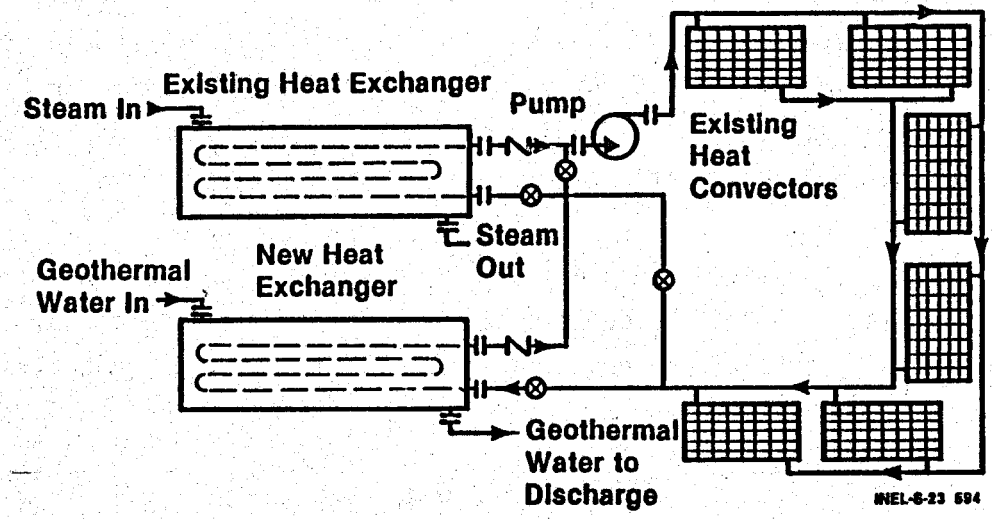
Well Cost vs Depth (1978 Dollars)



Hot Water Heating



Force Air Heating