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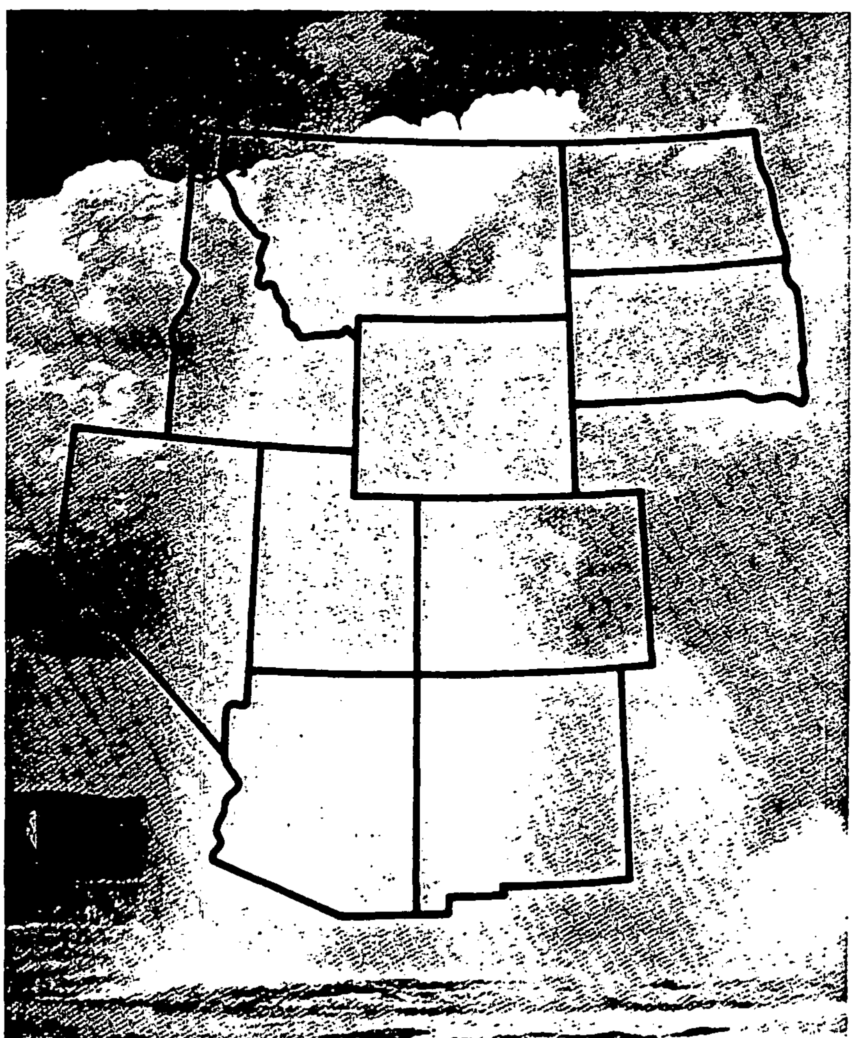
APPENDICES

RMB&R REGIONAL HYDROTHERMAL MARKET PENETRATION ANALYSIS

OCTOBER 31, 1978

Department of Energy



EG&G Idaho, Inc.

Earth Science Laboratory
UURI

D R A F T

APPENDIX A

HYDROTHERMAL USES

IN

INDUSTRIAL PROCESSES

OCTOBER 31, 1978

APPENDIX A

HYDROTHERMAL USES IN INDUSTRIAL PROCESSES

Hydrothermal heat is generally available in the RMB&R Region as either hot water or steam in a temperature range of 25°C to 274°C and a purity range of <300 ppm to >40,000 ppm. Most of the hydrothermal resources would be used in industrial processes having temperature needs of 90°C to 150°C, although certain processes (meat packing, ready mix concrete, etc.) could use resources with temperatures as low as 40°C. Certain processes can benefit from temperatures as high as 275°C, the assumed upper limit for hydrothermal direct heat applications.

Industrial operations which use temperatures of 90°C to 150°C are evaporating, heating, drying, cooking, and washing. Many of these processes could be converted directly to hydrothermal heat (perhaps with heat exchangers if the water quality is unacceptable), but other operations may require process or operation changes to use hydrothermal heat. The evaporation and drying processes currently may use high temperatures and short times but a change to lower temperatures over a longer time will enable greater use of hydrothermal heat.

It is expected that larger industries with high heat requirements in the form of low temperature applications will convert to hydrothermal energy faster since their economic incentive to do so is greater. Industries converting to hydrothermal process heat may, at the same time, decide to space heat with either waste heat or hydrothermal heat, increasing hydrothermal utilization. Once a hydrothermal resource has been "proved" for an industrial usage, residential space heating and other industrial applications will follow. Not all industrial operations can be converted to hydrothermal heat - notably open flame applications (singeing, smoking, etc.) and high temperature applications (calcining, refining, etc.).

A survey of industrial processes emphasizing the kinds and amount of heat used was conducted by Intertechnology Corporation in 1977.[1] By using this data and applying hydrothermal and regional guidelines, this Appendix shows some of the most likely industrial applications of hydrothermal heat.

APPENDIX A (Cont'd)

The following guidelines were used in compiling the industrial data of this appendix.

1. The lower and upper temperature limits for processes compatible with hydrothermal energy are 40°C and 275°C respectively.

2. Hydrothermal energy can be supplied as hot water, steam, or hot air, depending on process needs, and may assume the use of intermediate heat exchangers, if necessary.

3. Total process energy requirements need not be met, to consider an industry as a candidate.

4. Only industries within standard industry classification (SIC) 4-digit categories are considered, to assure availability of supporting data.

5. In general, all significant industries found in the RMB&R region for which we had data are listed.

APPENDIX A

LIST OF INDUSTRIAL PROCESS HEAT

APPLICATIONS AND TEMPERATURE REQUIREMENTS (1974)

From Survey Conducted by Intertechnology Corporation[1]

Industry - S.I.C. Group	Application Temperature Requirement °C	Comments
1. Copper Concentrate - 1021		Copper ore is concentrated at the mine by a froth flotation process. The copper concentrate is then dried for shipment. The drying process could use geothermal energy where available.
Drying	121	
2. Bituminous Coal-1211		
Drying (including lignite)	66 - 104	No geothermal use is expected for coal drying due to phase out of coal drying and the current use of coal product for fuel.
3. Potash-1474		
Drying Filter Cake	121	Heat is used to dry slurry after beneficiation of the ore. Drying temperatures are flexible and geothermal energy could be used.
4. Phosphate Rock-1475		
Calcining	760 - 871	Exothermic reaction with waste heat used for drying.
Drying	232	Geothermal drying not likely.
5. Sulfur-1477		Frasch mining requires pumping large amounts of hot water into a sulfur well to melt and extract the sulfur. Where sulfur deposits and geothermal areas occur in proximity, the Frasch process could be economical.
Frasch Mining	163-171	
6. Meat Packing-2011		
Scalding, Carcass Wash, and Cleanup	60	Meat packing requires large amounts of hot water which could be supplied by geothermal heat. The rendering could be done at lower temperatures. An alternate source of energy would be needed for singeing.
Singeing Flame	260	
Edible Rendering	93	
Sausages and Prepared Meats-2013		
Smoking	32 - 79	Smoking would require an alternate source of heat. However, curing and canning could use geothermal heat.
Can Filling	100	
Exhausting	70	
Retort	116	

Industry - S.I.C. Group	Application Temperature Requirement °C	Comments
7. Poultry Dressing-2016		
Scalding	60	Scalding requires hot water for feather removal at a constant rate. Geothermal heat could supply both heat for scalding and refrigeration units.
Refrigeration		
8. Natural Cheese-2022		
Pasteurization	77	Cheese making requires either hot water or jacketed steam for most processes, both of which could be supplied by geothermal heat. An alternate source might be needed for spray drying although the spray drying process might be adaptable to geothermal heat.
Starter Vat	57	
Make Vat	41	
Finish Vat	36	
Whey Condensing	71 - 93	
Whey Drying	49	
Process Cheese Blending	74	
9. Condensed & Evaporated Milk-2023		
Stabilization	93 - 100	Geothermal heat might be usable for all steps except spray drying. See comment above.
Evaporation	71	
Spray Drying	177 - 204	
Sterilization	121	
10. Fluid Milk-2026		Pasteurization uses indirect heat, making geothermal heat very applicable. Although not much heat is added per pound of product (24 Btu/lb) due to energy conservation, the large amounts of milk processed make geothermal use feasible.
Pasteurization	72 - 77	
11. Canned Specialities-2032		
Beans		
Precook (Blanch)	82 - 100	Canned specialities (baked beans, chili, etc.) use steam for cooking sterilization and canning. Geothermal heat could be used for all of these processes.
Simmer Blend	77 - 100	
Sauce Heating	88	
Processing	121	

APPENDIX A (Cont'd)

Industry - S.I.C. Group	Application Temperature Requirement °C	Comments
12. Canned Fruits and Vegetables-2033		
Blanching/Peeling	82 - 100	A central steam facility is needed for many canning processes and geothermal could be easily retrofitted to the plant facility. Hot water is also needed for peeling, blanching and cleanup.
Pasteurization	93	
Brine Syrup Heating	93	
Commerical Sterilization	100 - 121	
Sauce Concentration	100	
13. Dehydrated Fruits and Vegetables-2034		Drying is currently either solar or gas fired. Driers could use geothermal heat.
Fruit and Vegetable Drying	74 - 85	
Potatoes		
Peeling	100	Potato processing could use geothermal heat in many of its processes. Although drying requires higher temperatures currently, it could be adapted to longer, slower geothermal drying.
Precook	71	
Cook	100	
Flake Dryer	177	
Granule Flash Dryer	288	
14. Frozen Fruits and Vegetables-2037		
Juice Concentration	88	Concentration of juices requires close temperature control in which geothermal heat would be applicable. Other operations could use geothermal heat also.
Juice Pasteurization	93	
Blanching	82 - 100	
Cooking	77 - 100	
15. Wet Corn Milling-2046 Steeping		
Steep Water Evaporator	177	Wet corn milling's process heats are generally heating, evaporation or drying loads, all of which can be supplied by geothermal heat.
Starch Dryer	49	
Germ Dryer	177	
Fiber Dryer	538	
Gluten Dryer	177	
Steepwater Heater	49	
Sugar Hydrolysis	132	
Sugar Evaporator	121	
Sugar Dryer	49	

APPENDIX A (Cont'd)

Industry - S.I.C. Group	Application Temperature Requirement °C	Comments
16. Prepared Feeds-2048		Pellet conditioning heat could be supplied by geothermal heat. Alfalfa drying could perhaps be accomplished by geothermal heat by using a longer period of drying.
Pellet Conditioning	82 - 88	
Alfalfa Drying	204	
17. Bread & Baked Goods-2051		
Proofing	38	Bread proofing requires a warmed controlled environment which could be supplied by geothermal heat. Baking would require an alternate source of heat.
Baking	216 - 238	
18. Beet Sugar-2063		
Extraction	60 - 85	Cascading of heat is used with all steam from boilers being used in the evaporators. Geothermal heat would be applicable.
Thin Juice Heating	85	
Lime Calcining	538	
Thin Syrup Heating	100	Lime calcining would need to be done by an alternate source. Depending on geothermal temperature involved, geothermal steam could also be used to generate electricity.
Evaporation	76 - 138	
Granulator	66 - 93	
Pulp Dryer	110 - 138	
19. Soybean Oil Mills-2075		
Bean Drying	71	Steam is used in most operations along with a solvent for oil extraction. The toaster solventizer must reach 102°C, but all other operations are not temperature dependent. Geothermal heat could be easily used.
Toaster Desolventizer	102	
Meal Dryer	177	
Evaporator	107	
Stripper	100	

Industry - S.I.C. Group	Application Temperature Requirement °C	Comments
20. Animal and Marine Fats-2077		Rendering could use geothermal heat if it were in the range 150°C - 180°C. The process also may be adaptable to normal (90°C - 150°C) geothermal temperatures.
Continuous Rendering of Inedible Fat	166 - 177	
21. Shortening and Cooking Oil-2079		
Oil Heater	71 - 82	Low temperature operations are used to purify and stabilize the oil. All operations can be performed with heat delivery at 149°C making geothermal use applicable.
Wash Water	71 - 82	
Dryer Preheat	93 - 132	
Cooking Oil Reheat	93	
Hydrogenation Preheat	149	
Vacuum Deodorizer	149 - 204	
22. Malt Beverages-2082		
Cooker	100	Large amounts of process heat requiring careful temperature control in variable amounts are used in breweries. Central steam facilities could be retrofitted to geothermal steam. Grain drying could be adapted to a longer, slower temperature process.
Water Heater	82	
Mash Tub	77	
Grain Dryer	204	
Brew Kettle	100	
Bottle Wash, Fill & Sterilize	60 - 72	

Industry - S.I.C. Group	Application Temperature Requirement °C	Comments
23. Soft Drinks-2086	77	Soft drink bottling facilities require hot water for bottle washing, warming bottles/ cans, and heating of cans. All of the process hot water could be supplied by geothermal heat. Since soft drink bottling also uses large quantities of warehousing space, space heat by geothermal is important too.
Bulk Container Washing	77	
Returnable Bottle Washing	24 - 29	
Nonreturnable Bottle Warming	24 - 29	
Can Warming		
24. Finishing Plants, Cotton-2261		
Washing	94	Steam for processing is supplied by a central facility making geothermal substitution easy.
Dyeing	94	
Drying	135	
25. Finishing Plants, Synthetic-2262		
Washing	94	Steam for processing is supplied by a central facility. Temperature requirements vary depending on fabric. Geothermal should be usable.
Dyeing	100	
Drying and Heat Setting	<135	
26. Sawmills & Planing Mills-2421		Kiln drying of lumber uses different temperatures depending on type and moisture of the wood. Wood wastes currently used for drying. Geothermal use possible if slower drying used.
Kiln Drying of Lumber	149	
27. Plywood -2435		
Plywood Drying	121	Drying could use geothermal heat.

APPENDIX A (Cont'd)

Industry - S.I.C. Group	Application Temperature Requirement °C	Comments
28. Veneer-2436		Uses steam to dry veneer and reduce fungus. Geothermal steam could be used.
Veneer Drying	100	
29. Wooden Furniture-2511		Furniture making uses a complete change every 3 to 5 minutes in removing sawdust and fumes from the vicinity of the worker. Significant amounts of space heat are thus used which could be supplied by geothermal heat. Kiln drying could also be done by geothermal heat although it is currently being done by wood wastes.
Makeup Air and Ventilation	21	
Kiln Dryer and Drying Oven		
30. Upholstered Furniture-2512		
Makeup Air and Ventilation	21	
Kiln Dryer and Drying Oven	66	
31. Pulp Mills-2611		These industries all have similar operations such as digestion, pulp refining, drying, etc. which require process heat in which geothermal energy could be used. Currently process wastes supply some of the process heat, but since chemical recovery cannot be done with geothermal heat, the wastes might be considered for that application.
Paper Mills-2621		
Paperboard Mills-2631		
Building Paper-2661		
Pulp Digestion	188	
Pulp Refining	66	
Black Liquor Treatment	138	
Chemicals Recovery-Calcining	1038	
Pulp and Paper Drying	143	
32. Solid and Corrugated Fiber Boxes-2653		
Corrugating and Glue Setting	149 - 177	Steam is used for corrugating boxes. While current temperatures are too high for most geothermal wells, the process could probably be adapted to use geothermal heat.
33. Alumina-28195		
Digesting, Drying, Heating	138	Currently steam is generated, used to make electricity and then used for digesting, drying, and heating. Higher temperature geothermal wells could be used in this cycle. However, calcining would have to be done by an alternate fuel.
Calcining	1204	

APPENDIX A (Cont'd)

LIST OF INDUSTRIAL PROCESS HEAT APPLICATIONS AND ANNUAL REQUIREMENTS (1974) FOUND FROM SURVEY

Industry - S.I.C. Group	Application Temperature Requirement °C	Comments
34. Plastic Materials and Resins-2821		
Polystyrene, suspension process		
Polymerizer Preheat	93-102	Polymerization is exothermic and molds are heated by pressure. Very little external heat is needed although the heat required is in the range spanned by geothermal.
Heating Wash Water	88-93	
Drying	93	
35. Synthetic Rubber-2822		
Cold SBR Latex Crumb		
Bulk Storage	27-38	Possible geothermal heat applications are in preheat of monomers and drying of latex. Bulk storage and hot air drying could also employ geothermal.
Emulsification	27-38	
Blowdown Vessels	54-63	
Monomer Recovery by Flashing & Stripping	49-60	
Dryer Air Temperature	66-93	
Cold SBR, Oil-Carbon Black Masterbatch		
Dryer Air Temperature	66-93	
Oil Emulsion Holding Tank	27-38	
Carbon Black Grinder		
Cold SBR, Oil Masterbatch		
Dryer Air Temperature	66-93	
Oil Emulsion Holding Tank	27-38	
36. Cellulosic Man-made Fibers-2823		Nylon and polyesters require high temperatures for spinning which would need to be supplied by an alternate heat source. Other process heat might be able to be supplied by geothermal.
Polyester	< 288	
Nylon	< 279	
Acrylic	< 121	
Polypropylene	< 282	
37. Noncellulosic Fibers-2824		
Rayon	< 100	Typically spinning and drying use relative low grade heat which can be supplied by geothermal.
Acetate	< 100	

APPENDIX A (Cont'd)

LIST OF INDUSTRIAL PROCESS HEAT APPLICATIONS AND ANNUAL REQUIREMENTS (1974) FOUND FROM SURVEY

Industry - S.I.C. Group	Application Temperature Requirement °C	Comments
36. Pharmaceutical Preparations-2834		The industry is essentially a fabricating and processing industry using steam for equipment cleanup and sterilization, product sterilization, capsule and tablet drying and wet capsule formation. Geothermal steam could be used for these purposes.
Autoclaving & Cleanup	121	
Tablet & Dry-capsule Drying	121	
Wet Capsule Formation	66	
39. Soaps and Detergents-2841		The soap industry has many small manufacturers who use batch processes which could possibly use geothermal heat. However, most of the plants are large using on-site boilers for electricity and process steam. In regions where hot enough geothermal steam is available for electricity generation, it could be used directly in this type of plant.
Soaps:		
Various Processes in Soap Manufacture	82	
High-temperature Processes	254	
Spray Drying	260	
Detergents:		
Various Low-temperature Processes	82	
High-temperature Processes	260	
Drum-Dried Detergents	177	
Spray-Dried Detergents	260	
40. Organic Chemicals, N.E.C.-2869		
Ethanol	93-121	Some process heat could be supplied by geothermal heat, however, it may not be economical to retrofit since often high temperature operations are also involved.
Isopropanol	93-177	
Cumene	121	
Vinyl Chloride Monomer	121-177	
41. Urea-2873		Due to the exothermic reactions, little process heat could be supplied by geothermal heat.
High Pressure Steam-Heated Stripper	191	
Low-Pressure Steam-Heated Stripper	143	

APPENDIX A (Cont'd)

LIST OF INDUSTRIAL PROCESS HEAT APPLICATIONS AND ANNUAL REQUIREMENTS (1974) FOUND FROM SURVEY

Industry - S.I.C. Group	Application Temperature Requirement °C	Comments
42. Explosives-2892		An explosives plant normally has a boiler with electric generating capacity. Where geothermal can be utilized in this manner, it would be applicable to explosives manufacture.
Dope (inert Ingredients)		
Drying	149	
Wax Melting	93	
Nitric Acid Cencentrator	121	
Sulfuric Acid Concentrator	93	
Nitric Acid Plant	93	
Blasting Cap Manufacture	93	
43. Petroleum Refining-2911		Primary heat usage in petroleum refineries is at very high temperatures (538°C). Lower temperature process heat is supplied from waste heat. Therefore, there is very little market for geothermal heat in petroleum refining.
Crude distillation		
Atmospheric topping	343	
Vacuum distillation	227-427	
Thermal operations	291-543	
Catalytic cracking	607	
Delayed coking	482	
Hydrocracking	268-432	
Catalytic reforming	496	
Catalytic hydrorefining	371	
Hydrotreating	371	
Alkylation	7-171	
Hydrogen plant	871	
Olefins and aromatics	649	
Lubricants	--	
Asphalt	--	
Butadiene	121-177	
44. Paving Mixtures-2951		Geothermal could only be used in permanant plants, but there could supply all the heat needed. The higher temperatures are required for fast drying. Again longer, low temperature drying could be substituted.
Aggregate Drying	135-163	
Heating Asphalt	163	

LIST OF INDUSTRIAL PROCESS HEAT APPLICATIONS AND ANNUAL REQUIREMENTS (1974) FOUND FROM SURVEY

Industry - S.I.C. Group	Application Temperature Requirement °C	Comments
45. Asphalt Felts & Coatings-2952		
Saturator	204-260	Some temperature requirements might have to be satisfied by alternate means or by process redesign. Geothermal heat would be applicable elsewhere
Asphalt Coating	149-204	
Drying (Steam)	177	
Sealant	149-204	
46. Tires and Inner Tubes-3011		
Vulcanization	121-171	Vulcanization uses steam which could be supplied by geothermal heat. Warehousing also could use geothermal space heat.
47. Plastics Products-3079		
Blow-molded Bottles	149-316	Process heat is supplied as steam. Where high temperature geothermal steam exists it could be used. Redesign of process could change requirements.
High-Density Polyethylene	218	
48. Leather Tanning and Finishing-3111		
Bating	32	Tanning uses low temperature heat in the form of low pressure steam or hot water. A good prospect for geothermal.
Chrome Tanning	29-54	
Retan, Dyeing, Fat Liquor	49-60	
Wash	49	
Drying	43	
Finishing Drying	43	

APPENDIX A (Cont'd)

LIST OF INDUSTRIAL PROCESS HEAT APPLICATIONS AND ANNUAL REQUIREMENTS (1974) FOUND FROM SURVEY

Industry - S.I.C. Group	Application Temperature Requirement °C	Comments
49. Concrete Block-3271		
Low-Pressure Curing	74	Low pressure curing requires low pressure steam which could easily be supplied by geothermal heat. Autoclaving is a different process which requires high pressures and high temperatures. The higher temperatures and pressures could be available from geothermal in some areas.
Autoclaving	182	
50. Ready-Mix Concrete-3273		
Hot Water for Mixing Concrete	49-88	Ready mix concrete requires large quantities of hot water for cleaning, mixing and storage. It is a good condidate for geothermal heat usage.
51. Gypsum-3275		
Kettle Calcining	166	Process redesign might be needed to use geothermal energy in both calcination and drying applications. Since gypsum is found and processed near geothermal areas, this process is worth looking into.
Wallboard Drying	149	
52. Treated Minerals-3295		
Expanded Clay & Shale		
Bloating Process	982	All of these processes use high temperature heat which geothermal is unable to supply.
Fuller's Earth		
Drying & Calcining	593	
Kaolin		
Calcining	1040	
Drying	110	
Expanded Perlite		
Drying	71	
Expansion Process	871	

LIST OF INDUSTRIAL PROCESS HEAT APPLICATIONS AND ANNUAL REQUIREMENTS (1974) FOUND FROM SURVEY

Industry - S.I.C. Group	Application Temperature Requirement °C	Comments
53. Treated Minerals-3295 (con'd.)		
Barium		
Drying	110	Barite beneficiation is by froth flotation and needs then to be dried. Geothermal heat might be able to be used.
54. Galvanizing-3479		
Cleaning, Pickling	54-88	Melting zinc requires high temperatures. Although the cleaning, pickling operations could use geothermal heat, more likely waste heat would be used first.
Galvanizing (melting zinc)	454	
55. Motors and Generators-3621		
Drying and Preheat	66	Manufacture of some electrical components (notably insulating, windings on armatures and coils) have low temperature processes which could use geothermal heat. Other processes require operations with higher heat making further study of the economics important.
Baking	177	
Oxide Coat Laminations	816-927	
Annealing	816	

REFERENCE

[1] "Analysis of the Economic Potential of Solar Thermal Energy to Provide Industrial Process Heat," Final report, Volumes II and III, prepared for the United States Department of Energy Research and Development Administration, by Intertechnology Corporation, Warrenton, Virginia.

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APPENDIX B

POTENTIAL DIRECT HEAT MARKET FOR HYDROTHERMAL ENERGY USE IN THE ROCKY MOUNTAIN BASIN & RANGE REGION

OCTOBER 31, 1978

APPENDIX B FIGURES

APPENDIX B TABLES

APPENDIX B TABLES

APPENDIX B

POTENTIAL DIRECT HEAT MARKET FOR HYDROTHERMAL ENERGY USE IN THE ROCKY MOUNTAIN BASIN AND RANGE REGION

The hydrothermal energy potential market base and growth projections described herein represent an estimate of the RMB&R regional market specifically suited to hydrothermal energy direct heat applications. That is, the market segment which is colocated with hydrothermal resources, and having the processes which are matched with the probable reservoir temperatures. It is considered as a potential, rather than actual, market since the region is not currently utilizing hydrothermal energy to any significant extent.

This appendix also includes the basis for developing an estimate of the rate and likely extent of penetrating this potential market. Values resulting from this approach are contained in associated tables.

Present DOE encouragement of hydrothermal use is the basis for assuming that retrofit of the 1975 baseline potential hydrothermal market will commence in 1980, at a rate equivalent to 1% per year, and continue until a maximum of 25% of the existing baseline market has converted to hydrothermal energy.

For the growth portions of the industrial market sectors uniquely suited to hydrothermal energy use, a linear increase in market capture is assumed between 1980 and 1985, reaching 80% capture of the applicable industrial growth, and remaining constant at 80% thereafter. The residential/commercial hydrothermal market sectors are treated in the same manner except that a 70% maximum capture of growth is used. Table B-1 lists the industry, the Standard Industrial Classification (SIC) number and the percent of the process heat used, in 20° increments from 40°C to 200°C and 275°C. 275°C is assumed to be the temperature upper limit value for available hydrothermal heat in the region, based on estimates provided by the University of Utah Research Institute.

Using Table B-I data, counties overlying hydrothermal resources in the region (Figures B1 through B10) were assessed to determine how many manufacturers currently operate in each county that could use the available hydrothermal energy as industrial process heat. Using the counties identified by UURI to have hydrothermal potential [2] and the assumed resource temperatures, a list of potential hydrothermal use industries is compiled from the manufacturer's directory for each state.[3-12] The number of employees per manufacturer is taken to be the midpoint of the range listed for the manufacturer. Each SIC category is aggregated within the county and a BTU use for each manufacturer is determined using "energy intensity coefficients" developed by Rocket Research Company.[13]

These coefficients are listed in Table B-II for each SIC code. Since these coefficients are given as product used per employee, the coefficients are multiplied by 2.0 in order to account for energy used by the plant but which is not accounted for in the product (waste heat, space heat, etc., i.e., 50% cycle efficiency). The factor of 2.0 has been compared with other process studies which calculated all energy used in the plant and was found to correlate.

Residential/commercial (R/C) space conditioning energy use, as given in Tables B-V, IX, XIII, etc., through XXXXI for each county, is computed as:

$$\text{county R/C space conditioning} = \frac{\text{county population}}{\text{state population}} \times \text{state R/C energy use in 1975} \times .9$$

where the county and state populations are taken from the 1970 census, and the residential/commercial figures are computed from the percentages and total energy use per state[14]. The .9 is a factor used to calculate space conditioning from total energy use in residences and commercial establishments, which includes uses not replaceable by hydrothermal energy (cooking, etc.). This number is reasonable from comparing other states residential/commercial energy use with their space conditioning use. The total for 1975 space conditioning is used to begin Tables B-VIII, B-XII, B-XVI, etc. through B-XXXXIV.

The 1975 energy use for the Growth Projection Calculations of B-VI, B-X, B-XIV, etc. through B-XXXXII, were compiled by summing the energy use per SIC from the county lists.

The growth rate is derived from Table B-II. Using the compound interest formula $A = P\ (1 + i)^n$ where:

A = amount at the end of the period
i = growth rate
P = present energy use, and
n = number of years,

the energy growth extrapolation for the industry is computed. After the energy extrapolation per SIC is determined for the years 1985, 2000, and 2020, the columns are summed to give expected industrial hydrothermal use. This information is then carried onto the Industrial Process Heat Tables (B-VII, B-XI, B-XV, etc., through B-XXXIV) for 1975, 1985, 2000 and 2020.

All counties were not analyzed, so an engineering judgment was made for each state, in which unanalyzed counties known to have hydrothermal potential were assigned a probability of use factor (based on population, terrain, etc.), and ratioed to the total replaceable use for the analyzed counties. Hydrothermal resources can be expected to be discovered in counties where no resource now is known and an additional discovery percentage is applied to the expected 1985 hydrothermal use and added to the 2000 potential use. New discoveries are expected to grow with the economy so they are assigned a growth rate of 2.8% (the federal energy growth rate) and compounded to the year 2020.

Energy planners have long recognized a continued increase in per capita energy consumption as automation, new appliances and convenience devices develop. In a similar manner, as hydrothermal energy becomes available, new ways to use it are expected to be devised (i.e., using the "used" hydrothermal heating water to melt snow from driveways and sidewalks). Per capita energy consumption has historically grown at a 3.0% rate.[16] This rate is applied to new uses in the residential/ commercial and industrial sectors.

A 5% industrial growth stimulation (based on the 1975 hydrothermal potential) attributed to spinoff and associated industries is calculated for 1985, 2000 and 2020. This expectation of stimulated growth is considered justified since a variety of new equipment and service companies will be necessary to provide the unique products and services required for effective use of hydrothermal heat by the major process firms.

Table B-III (the regional summary) shows the totals from the Industrial Process Heat and Residential/Commercial Forecast tables for each state, as well as for the region. It also shows the total energy use and the total energy projection for each state using the state energy growth rate. The state growth rate is determined from the Bureau of the Census value added data in the following manner, which in effect eliminates inflation influence and shows actual growth only.

$$\text{state energy growth rate} = \frac{\text{state value added}}{\text{national value added}} \times \text{federal energy growth rate}$$

This procedure gives state growth rates between 3.4% to 5%, and a regional average growth rate of 4%. The state growth rates are shown next to the state name in Table B-III.

For comparison purposes, Table B-III also gives the state industrial energy use in 1975 and the residential/commercial use as derived from the circle charts of the commercialization plan[14] and the calculated 1985, 2000 and 2020 values.

The Baseline growth factors considers only those industries currently colocated with resources and their allied supplier/services firms. An additional regional growth factor is appropriate to account for industries which will choose relocation to a hydrothermal resource area and/or process modification to fit hydrothermal applications. This factor is developed as follows:

Process steam accounts for approximately 40% of industrial energy consumption on a national basis, and direct process heat uses about 28%, for a total of 68%, while electricity and non-heat based processes make up the remainder. In a broad sense, 68% of the region's total industrial energy consumption is candidate for being served by hydrothermal energy sources. Only the growth sector is considered, since markets directly colocated with resources have already been accounted for by other factors.

Growth of the industrial sector not considered is taken as representative of the composite of industries electing to relocate to hydrothermal resource areas, industries able to convert processes to hydrothermal utilization, and new related service industries which select hydrothermal heat for their subtier processes. It is assumed that about 40% of this portion of the regional market will ultimately choose to utilize hydrothermal energy. This is believed conservative, since the industries relocating to hydrothermal resources will obviously be generally committed to that resource.

Table B-IV is a list of the 20 top 1975 industries (in potential for hydrothermal energy use) in the region, their predicted 2020 energy use, the current growth rate, and the number of states in which they currently exist. This table is constructed to show the ranking of current potential hydrothermal industries, as well as future trends.

A map for each state of the region is included to identify county boundaries, county seats, areas of low and moderate temperature potential areas, hot spring locations and the counties that have been considered, as well as those evaluated in detail. The counties classified as "considered" are those which were not studied in detail. The counties classified as "evaluated" were studied in sufficient depth to identify all listed businesses by SIC classification and size of establishment.

TABLE B-1

PERCENT PROCESS HEAT IN TEMPERATURE RANGES

INDUSTRY	SIC Number	40°C-60°C	60°C-80°C	80°C-100°C	100°C-120°C	120°C-140°C	140°C-160°C	160°C-180°C	180°C 200°C	200°C	275°C
Copper concentrate	1021	NA	NA	NA	100%						
Potash	1474	NA	NA	NA	100%						
Sulfur	1477	NA	NA	NA	NA	NA	NA	100%			
Meat packing	2011	NA	99%	100%							
Prepared meats	2013	NA	46.2%	61.5%	100%						
Poultry dressing	2016	100%									
Natural Cheese	2022	23%	100%								
Condensed milk	2023	NA	63%		93%	100%					
Dried Milk	2023	NA	NA	42.4%	66.4%	70.8%			100%		
Fluid milk	2026	NA	NA	100%							
Canned specialities	2032	NA	NA	16.4%	68.9%	100%					
Canned fruits and vegetables	2033	NA	NA	22.7%	67.6%	100%					
Dehydrated fruits and vegetables	2034	NA	100%								
Potato dehydration	2034										
granules		NA	19.9%		53%					100%	
flakes		NA	19.9%		53%				100%		
Frozen fruits and vegetables	2037	NA	NA	30%	100%						
Wet corn milling	2046	21.5%			36.4%	46.6%		84.1%		100%	
Prepared feeds	2048										
pellet conditioning		NA	NA	100%							
alfalfa drying		NA	NA	NA	NA	NA	NA	NA	NA	100%	

TABLE B-1

PERCENT PROCESS HEAT IN TEMPERATURE RANGES

INDUSTRY	SIC Number	40°C-60°C	60°C-80°C	80°C-100°C	100°C-120°C	120°C-140°C	140°C-160°C	160°C-180°C	180°C-200°C	200°C-	275°C
Fiber boxes	2653	NA	NA	NA	NA	NA	NA	100%			
Alumina	2819	NA	NA	NA	NA	76.2%					100%
Plastic materials	2821	NA	NA	51.0%	100%						
Synthetic rubber	2822	3.6%	50.4%	100%							
Cellulosic fibers	2823	NA	NA	NA	NA	NA	NA	NA	NA	100%	
Noncellulosic fibers	2824	NA	NA	NA	100%						
Pharmaceutical	2834	NA	.3%			100%					
Soaps	2841	NA	NA	.6%						100%	
Detergents	2841	NA	NA	52.2%				99.9%		100%	
Organic chemicals- Ethanol	2869	NA	NA	NA	NA	100%					
Isopropanol		NA	NA	NA	NA	NA	NA	100%			
Cumene		NA	NA	NA	NA	100%					
Vinyl Chloride Monomer		NA	NA	NA	NA	NA	NA	100%			
Urea	2873	NA	NA	NA	NA	NA	85.1%		100%		
Explosives	2892	NA	NA	83.5%		98.7%	100%				
Petroleum	2911	NA	NA	NA	NA	NA	NA	5%			100%
Paving	2951	NA	NA	NA	NA	NA	NA	100%			
Asphalt Felts	2952	NA	NA	NA	NA	NA	77.1%			100%	
Tires	3011	NA	NA	NA	NA	NA	NA	100%			

TABLE i (cont'd)

PERCENT PROCESS HEAT IN TEMPERATURE RANGES

INDUSTRY	SIC Number	40°C-60°C	60°C-80°C	80°C-100°C	100°C-120°C	120°C-140°C	140°C-160°C	160°C-180°C	180°C-200°C	200°C	275°C
Bread & baked goods	2051	11.6%								100%	
Beet sugar	2063	NA	7.4%	22.4%		95.4%					100%
Soybean oil mills	2075	NA	24.7%	26.5%	73.4%			100%			
Animal and marine fats	2077	NA	NA	NA	NA	NA	NA	NA	100%		
Shortening and cooking oils	2079	NA	33.9%	46.8%		71.0%	85.9%			100%	
Malt beverages	2082	NA	3.8%	7.1%	42.0%					100%	
Soft Drinks	2086	60.9%	100%								
Finishing plants											
Cotton	2261	NA	NA	47.3%		100%					
Synthetics	2262	NA	NA	68.8%		100%					
Sawmills and planing mills	2421	NA	NA	NA	NA	NA	100%				
Plywood drying	2435	NA	NA	NA	NA	100%					
Veneer drying	2436	NA	NA	NA	100%						
Wooden furniture	2511	60%	100%								
Upholstered furniture	2512	60.9%	100%								
Pulp mills	2611	NA	16.3%			31.7%	67.4%		91.0%		100%
Paper mills	2621	NA	16.3%			31.7%	67.4%		91.0%		100%
Paperboard mills	2631	NA	16.3%			31.7%	67.4%		91.0%		100%
Building paper	2661	NA	16.3%			31.7%	67.4%		91.0%		100%

TABLE B-1 (cont'd)

PERCENT PROCESS HEAT IN TEMPERATURE RANGES

INDUSTRY	SIC Number	40°C - 60°C	60°C- 80°C	80°C- 100°C	100°C- 120°C	120°C- 140°C	140°C- 160°C	160°C- 180°C	180°C- 200°C	200°C	275°C-
Plastic products	3079									100%	
Leather Tanning	3111	100%									
Concrete block	3271										
low pressure		NA	100%								
autoclaving		NA	NA	NA	NA	NA	NA	NA	100%		
Ready Mix	3273	100%									
Gypsum	3275	NA	NA	NA	NA	NA	52.8%	100%			
Treated minerals	3295										
clay & shale		NA	NA	NA	NA	NA	NA	NA	NA	NA	100%
fuller's earth		NA	NA	NA	NA	NA	NA	NA	NA	NA	100%
kaolin		NA	NA	NA	90%						100%
perlite		NA	11.15%								100%
barium		NA	NA	NA	100%						
Galvanizing	3479	NA	NA	NA	NA	44%					100%
Motors & Generators	3621	NA	2.7%					11.2%			100%

TABLE B-II.

INDUSTRIAL FACTORS FOR MARKET GROWTH &
HYDROTHERMAL APPLICATION PROJECTIONS

SIC	Process	Growth Rate	Growth Rate Reference(1)	Energy Intensity Coeff.(2)	Process Use Factor(3)
2011	Meat Packing	1.4%	A	.59	.85
2013	Prepared Meats	1.4%	A	.59	.80
2016	Poultry Dressing	2.2%	C	.59	.75
2021	Creamery Butter	2.0%	D	.52	.65
2022	Natural Cheese	2.0%	C	.52	.70
2023	Condensed/Evap. Milk	-3.0%	C	.52	.80
2024	Ice Cream	2.0%	D	.52	.85
2026	Fluid Milk	0.3%	C	.52	.65
2033	Canned Fruits/Vegetables	1.5%	A	.45	.70
2034	Dried Fruits/Vegetables	1.5%	A	.80	.75
2037	Frozen Fruits/Vegetables	1.5%	A	.90	.75
2046	Wet Corn Milling	3.3%	A	.45	.60
2048	Prepared Feeds	3.3%	A	.80	.60
2063	Beet Sugar Refining	2.8%	C	.80	.65
2074	Cotton Seed Mills	2.5%	D	.45	.60
2075	Soybean Oil Mills	2.5%	C	.45	.60
2077	Animal & Marine Fats	1.8%	C	.45	.80
2086	Soft Drinks	3.0%	C	.56	.75
2262	Finishing Plants, Synthetics	4.0%	B	.90	.50
2421	Saw Mills/Planing Mills	1.0%	B	.40	.10
2435	Plywood	1.0%	B	1.20	.50
2436	Veneers	1.0%	B	1.20	.40
2511	Wood Furniture	5.2%	B	.18	.60
2512	Upholstered Furniture	5.2%	B	.18	.60
2653	Corrugated Boxes	3.6%	B	1.50	.50
2819	Alumina	6.8%	A	2.0	.70
2821	Plastics & Resins	8.9%	A	2.84	.75
2334	Pharmaceuticals	8.5%	B	2.0	.65
2841	Soaps & Detergents	8.5%	B	2.8	.70
2842	Specialty Cleaning Products	8.5%	B	2.8	.70

TABLE B-II (Cont'd)

INDUSTRIAL FACTORS FOR MARKET GROWTH & HYDROTHERMAL APPLICATION PROJECTIONS

SIC	Process	Growth Rate	Growth Rate Reference(1)	Energy Intensity Coeff.(2)	Process Use Factor(3)
2892	Explosives	8.5%	D	2.0	.60
3271	Concrete Block & Brick	5.0%	A	1.6	.75
3273	Ready-mix Concrete	3.4%	A	0.5	.20
3275	Gypsum	8.0%	B	0.5	.70
3295	Treated Minerals	8.0%	B	1.6	.65

(1) Growth Rate References

A. "Energy Consumption in Manufacturing"

B. "Analysis of Economic Potential of Solar Thermal Energy to Provide Industrial Heat"

C. Derived from data in (B) above

D. Estimated from two-digit SIC code comparisons

(2) Energy Intensity Coefficient

Energy used by SIC code in 10^9 x Btu per year per employee. Coefficients from Reference 13.

(3) Process Use Factor

Factor applied to correct total process energy use data to that percentage assumed to be consumed as heat. Mechanical work steps, such as crushing, grinding, pumping, conveying, screening, bottling, canning, packing, and other sizing/handling operations, are thereby excluded.

TABLE B-III

REGIONAL HYDROTHERMAL FORECAST BY STATE

	1975 Btu/yr x 10^{12}		1985 Btu/yr x 10^{12}			2000 Btu/yr x 10^{12}			2020 Btu/yr x 10^{12}		
	State Energy Use	Potential Geothermal Use	State Energy Use	Potential Geothermal Use	Forecast Geothermal Use	State Energy Use	Potential Geothermal Use	Forecast Energy Use	State Energy Use	Potential Geothermal Use	Forecast Geothermal Use
ARIZONA (5%)	625.6		1035.58			2205.54			6043.49		
Industrial	131.38	19.42	217.48	52.48	20.81	463.18	154.62	85.89	1269.17	569.77	336.98
R/C	137.63	73.39	203.73	119.59	61.89	366.90	230.49	92.31	803.92	517.30	219.12
Total	269.01	92.81	421.21	172.07	82.70	830.08	385.11	178.20	2073.09	1087.07	556.10
COLORADO (3.4%)	839.2		1177.63			1957.60			3854.88		
Industrial	193.02	3.72	270.86	8.64	3.14	450.26	24.23	13.21	886.54	62.42	31.48
R/C	260.15	17.21	385.09	31.40	8.31	693.52	69.41	27.55	1519.58	158.72	63.70
Total	453.17	20.93	655.95	40.04	11.45	1143.78	93.64	40.76	2406.22	221.14	95.18
IDAHO (3.4%)	314.7		441.61			734.10			1445.58		
Industrial	78.68	28.03	110.41	60.21	20.71	183.54	146.65	74.76	361.42	373.22	233.58
R/C	91.26	33.99	135.09	62.00	16.41	243.29	130.89	55.02	533.08	299.88	126.79
Total	169.94	62.02	245.50	122.21	37.12	426.83	277.54	129.78	894.50	673.10	360.37
MONTANA (3.9%)	350.4		513.71			911.91			1960.04		
Industrial	98.11	2.72	143.84	5.15	1.50	255.34	17.62	10.52	548.81	51.67	27.92
R/C	80.59	22.43	119.30	40.92	9.83	214.85	92.51	40.60	470.75	211.34	88.79
Total	178.70	25.15	263.14	46.07	11.33	470.19	110.13	51.12	1019.56	263.01	116.71
NEVADA (3.7%)	268.6		386.27			666.15			1377.69		
Industrial	34.92	3.67	50.22	8.41	2.84	86.60	20.55	10.44	179.10	53.41	27.21
R/C	51.03	25.59	75.54	46.68	12.35	136.05	98.20	41.18	298.10	225.81	95.73
Total	85.95	29.26	125.76	55.09	15.19	222.65	118.75	51.62	477.20	279.22	122.94
NEW MEXICO (3.9%)	537.80		788.45			1399.62			3008.30		
Industrial	155.96	1.70	228.65	3.95	1.44	405.89	6.57	2.44	872.41	28.75	22.61
R/C	86.05	21.24	127.37	38.75	10.25	229.39	87.61	38.45	502.62	200.14	84.08
Total	242.01	22.94	356.02	42.70	11.69	635.28	94.18	40.89	1375.03	228.89	106.69

TABLE B-III (Cont'd)

REGIONAL HYDROTHERMAL FORECAST BY STATE

	1975 Btu/yr x 10^{12}		1985 Btu/yr x 10^{12}			2000 Btu/yr x 10^{12}			2020 Btu/yr x 10^{12}		
	State Energy Use	Potential Geothermal Use	State Energy Use	Potential Geothermal Use	Forecast Geothermal Use	State Energy Use	Potential Geothermal Use	Forecast Energy Use	State Energy Use	Potential Geothermal Use	Forecast Geothermal Use
NORTH DAKOTA (3.4%)	226.0		315.73			521.34			1017.50		
Industrial	40.68	.66	56.83	1.60	.59	93.84	4.33	2.31	183.15	11.78	6.13
R/C	72.32	9.26	107.05	16.89	4.47	192.79	38.20	16.77	422.43	87.25	36.66
Total	113.00	9.92	163.88	18.49	5.06	286.63	42.53	19.08	605.58	99.03	42.79
SOUTH DAKOTA (3%)	171.0		229.81			358.04			646.65		
Industrial	11.97	1.28	16.09	3.08	1.14	25.06	8.36	4.48	45.27	22.47	11.61
R/C	51.30	8.63	75.94	15.74	4.16	136.76	35.60	15.63	299.65	81.32	34.16
Total	63.27	9.91	92.03	18.82	5.30	161.82	43.96	20.11	344.92	103.79	45.77
UTAH (3.9%)	472.1		692.13			1228.63			2640.79		
Industrial	193.56	12.40	283.77	31.71	12.21	503.74	91.38	50.22	1082.72	289.57	161.55
R/C	113.30	60.17	167.72	109.76	29.04	302.05	248.16	108.91	661.83	566.93	238.18
Total	306.86	72.57	451.49	141.47	41.25	805.79	339.54	159.13	1744.55	856.50	399.73
WYOMING (4.3%)	325.8		496.36			933.38			2166.43		
Industrial	120.55	.74	183.65	1.73	.63	345.35	4.69	2.52	801.58	12.97	6.81
R/C	55.39	16.58	81.99	30.24	8.00	147.65	68.38	30.02	323.52	156.22	65.64
Total	175.94	17.32	265.64	31.97	8.63	493.00	73.07	32.54	1125.10	169.19	72.45
REGIONAL	4131.2		6115.19			11013.10			24131.07		
Industrial	1058.83	74.34	1561.80	176.96	65.01	2812.80	479.00	256.79	6230.27	1476.03	865.88
R/C	999.02	288.49	1478.82	511.97	164.71	2663.25	1099.45	466.44	5835.48	2504.91	1052.85
Total	2057.85	362.83	3040.62	688.93	229.72	5476.05	1578.45	723.23	12065.75	3980.94	1918.73
Industry Relocating within region to geothermal areas				240.82	-0-		553.64	221.46		1340.52	536.21
Totals	2057.85	362.83	3040.62	929.75	229.72	5476.05	2132.09	944.69	12065.75	5321.46	2454.94

TABLE B-IV

TOP 20 INDUSTRIES USES FOR HYDROTHERMAL
DIRECT HEAT IN THE RMB&R REGION

Rank 1975	S.I.C.	Industry	1975 Btu/yr	Consumption Forecasts, Yr, 2020	Current Growth Rate	Number of States Reporting
1	2034	Dried fruits and veg.	11.88	23.22	1.5%	6
2	3271	Concrete block	7.10	155.78	8.9%	9
3	2037	Frozen fruits and veg.	5.24	11.36	1.5%	3
4	2016	Poultry dressing	4.82	18.22	3.0%	3
5	2011	Meat packing	4.45	8.38	1.4%	10
6	2048	Prepared feeds	3.65	15.28	3.3%	9
7	2821	Plastic materials	3.63	168.33	8.9%	4
8	2086	Soft drinks	2.91	19.28	3.0%	10
9	2026	Milk	1.37	2.41	.3%	10
10	2022	Cheese	1.32	25.37	2.0%	6
11	2841	Soaps	1.24	46.36	8.5%	3
12	2819	Inorganic chemicals	1.06	26.83	6.8%	3
13	3273	Ready mix concrete	.98	4.40	3.4%	9
14	3275	Gypsum	.97	8.94	8.0%	2
15	2033	Canned fuits and veg.	.97	1.59	1.5%	3
16	2063	Beet sugar	.82	2.84	2.8%	1
17	3295	Treated minerals	.69	22.03	8.0%	2
18	2074	Cotton seed oil mills	.34	1.53	2.5%	1
19	2834	Pharmaceuticals	.25	9.82	8.5%	1
20	2511	Wooden furniture	.21	1.18	5.2%	5

ENERGY CONSUMPTION PROJECTIONS FOR THE RMB&R REGION

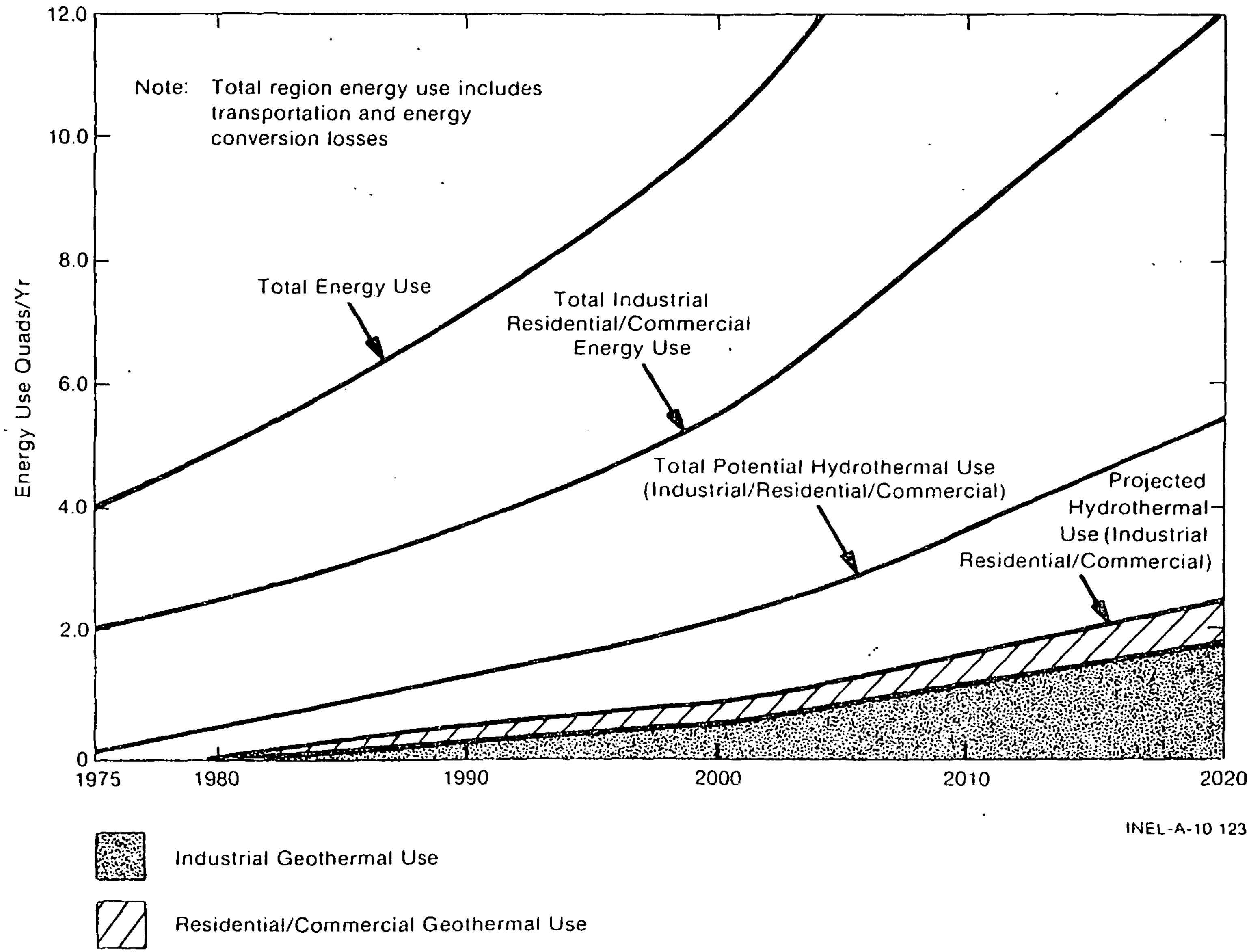

Fig. B-1 RMB&R Regional Energy Consumption Projections.

Number	County
1	Mohave
2	Coconino
3	Navajo
4	Apache
5	Yavapai
6	Maricopa
7	Gila
8	Greenlee
9	Pinal
10	Graham
11	Yuma
12	Pima
13	Santa Cruz
14	Cochise

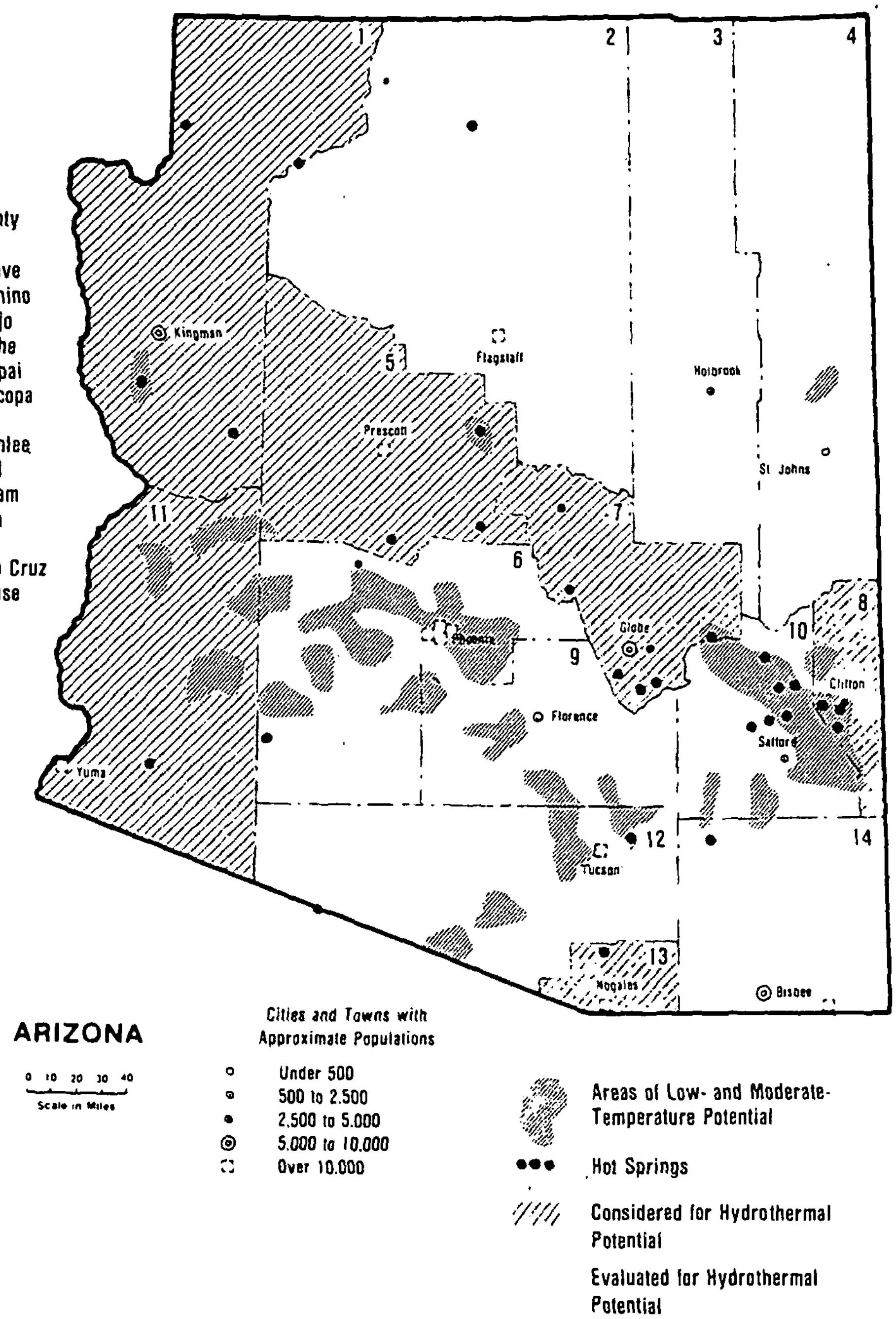

Fig. B-2 Arizona Counties and Hydrothermal Resources

TABLE B-V

ARIZONA ENERGY USE BY COUNTY

COUNTY ARIZONA	AVE. RES. TEMP. °C	INDUSTRIAL Standard Industrial Code (SIC)	INDUSTRIAL Btu's used x 10^{12}	RESIDENTIAL/COMMERCIAL Btu's used x 10^{12} Total	RESIDENTIAL/COMMERCIAL Btu's x 10^{12} (space conditioning & water heating)
APACHE	90°	3273	.01	.1	.05
COCHISE	76°	2011	.01	.19	.10
		3273	.01		
			.02		.10
CONCONINO	90°	2026	.02	1.97	.98
		2034	.21		
		3273	.05		
			.28		.98
GRAHAM	86°			.38	.19
MARICOPA	177°	2011	1.05	59.8	29.9
		2016	.21		
		2021	.27		
		2026	.61		
		2034	.68		
		2048	2.15		
		2074	.56		
		2075	.14		
		2077	.03		
		2086	1.08		
		2421	1.21		
		2435	.31		
		2511	.07		
		2819	.18		
		2821	1.12		
		2834	.39		
		2841	.42		
		2842	.04		
		3271	4.00		
		3273	2.60		
Total			17.12		29.9

TABLE B-V (cont'd)

COUNTY	AVE. RES. TEMP. °C	INDUSTRIAL		RESIDENTIAL/COMMERCIAL	
ARIZONA		Standard Industrial Code (SIC)	Btu's used x 10^{12}	Btu's used x 10^{12} Total	Btu's x 10^{12} (space conditioning & water heating)
PINAL	78°	NO MATCH		.33	.16
PIMA	64°	2011	.03	20.3	10.15
		2013	.03		
		2022	.27		
		2086	.37		
		2511	.20		
		3271	.94		
		3273	.73		
			2.57		10.15

TABLE VI.

GROWTH PROJECTION CALCULATIONS

State	SIC	1975 Btu x 10^{12}/yr	Growth Rate (%/yr)	1985 Btu x 10^{12}	2000 Btu x 10^{12}	2020 Btu x 10^{12}
ARIZONA						
	2011	.93	1.4%	1.07	1.32	1.74
	2013	.02	1.4%	.02	.03	.04
	2016	.16	3.0%	.22	.34	.61
	2021	.19	.3%	.20	.21	.22
	2022	.19	2.7%	.25	.37	.63
	2026	.41	.3%	.42	.44	.47
	2034	.67	1.5%	.78	.97	1.31
	2048	1.29	3.3%	1.79	2.91	5.56
	2074	.34	3.4%	.48	.78	1.53
	2075	.08	3.4%	.11	.19	.36
	2077	.02	2.2%	.03	.03	.05
	2086	1.09	4.4%	1.68	3.20	7.57
	2421	.12	1.0%	.13	.15	.19
	2435	.16	1.0%	.18	.21	.25
	2511	.04	5.2%	.07	.14	.39
	2819	.13	6.8%	.25	.67	2.51
	2821	.84	8.9%	1.97	7.08	38.95
	2834	.25	8.5%	.57	1.92	9.82
	2841	.29	8.5%	.66	2.23	11.40
	2842	.03	8.5%	.07	.23	1.18
	3271	3.70	8.0%	7.99	25.34	118.11
	3273	.16	3.4%	.22	.37	.72
Process Heat Base		10.96		18.96	49.13	203.61

TABLE B-VII

INDUSTRIAL PROCESS HEAT

ARIZONA	1975 Btu/yr x 10^{12}	1985 Btu/yr x 10^{12}		2000 Btu/yr x 10^{12}		2020 Btu/yr x 10^{12}	
GEOTHERMAL POTENTIAL							
7 counties of 14	10.96	18.96		49.13		203.61	
6 potential	8.46	14.63		37.90		157.07	
factor = (6/7 x .9)							
5% new industry		12.21		46.35		155.07	
3% per capita increase use		6.68		21.24		54.02	
New Discovery factor = 0							
GEOTHERMAL POTENTIAL TOTAL	19.42	52.48		154.62		569.77	
GEOTHERMAL CAPTURE							
1% retrofit to 25% of 1975 base			.97		3.88		4.86
80% new growth capture (from 1980 on)			19.84		81.71		332.12
GEOTHERMAL CAPTURE TOTAL			20.81		85.89		336.98

TABLE B-VIII

RESIDENTIAL/COMMERCIAL SPACE CONDITIONING

ARIZONA	1975 Btu/yr x 10^{12}	1985 Btu/yr x 10^{12}		2000 Btu/yr x 10^{12}		2020 Btu/yr x 10^{12}	
GEOTHERMAL POTENTIAL							
7 counties of 14 potential counties	41.53	61.47		110.71		242.58	
factor = (6/7 x .9)	31.86	47.16		84.93		186.10	
3% per capita increase use		10.96		34.85		88.62	
New Discovery factor = 0							
GEOTHERMAL POTENTIAL TOTAL	73.39	119.59		230.49		517.30	
GEOTHERMAL CAPTURE							
1% retrofit to 25% of 1975 base			3.67		14.68		18.35
70% new growth capture (from 1980 on)			58.22		77.63		200.77
GEOTHERMAL CAPTURE TOTAL			61.89		92.31		219.12

Number	County	Number	County	Number	County	Number	County	Number	County	Number	County
1	Moffat	11	Rio Blanco	21	Clear Creek	31	Gunnison	42	Pueblo	53	Bent
2	Routt	12	Grand	22	Jefferson	32	Lake	43	Crowley	54	Prowers
3	Jackson	13	Boulder	23	Douglas	33	Park	44	Kiowa	55	Dolores
4	Larimer	14	Gilpin	24	Elbert	34	Chaffee	45	San Miguel	56	Montezuma
5	Weld	15	Adams	25	Lincoln	35	Teller	46	San Juan	57	La Plata
6	Logan	16	Arapahoe	26	Kit Carson	36	El Paso	47	Hinsdale	58	Archuleta
7	Sedgwick	17	Washington	27	Cheyenne	37	Montrose	48	Mineral	59	Conejos
8	Morgan	18	Garfield	28	Mesa	38	Ouray	49	Rio Grande	60	Costilla
9	Phillips	19	Eagle	29	Delta	39	Saguache	50	Alamosa	61	Las Animas
10	Yuma	20	Summit	30	Pitkin	40	Fremont	51	Huerfano	62	Baca
						41	Custer	52	Otero	63	Denver

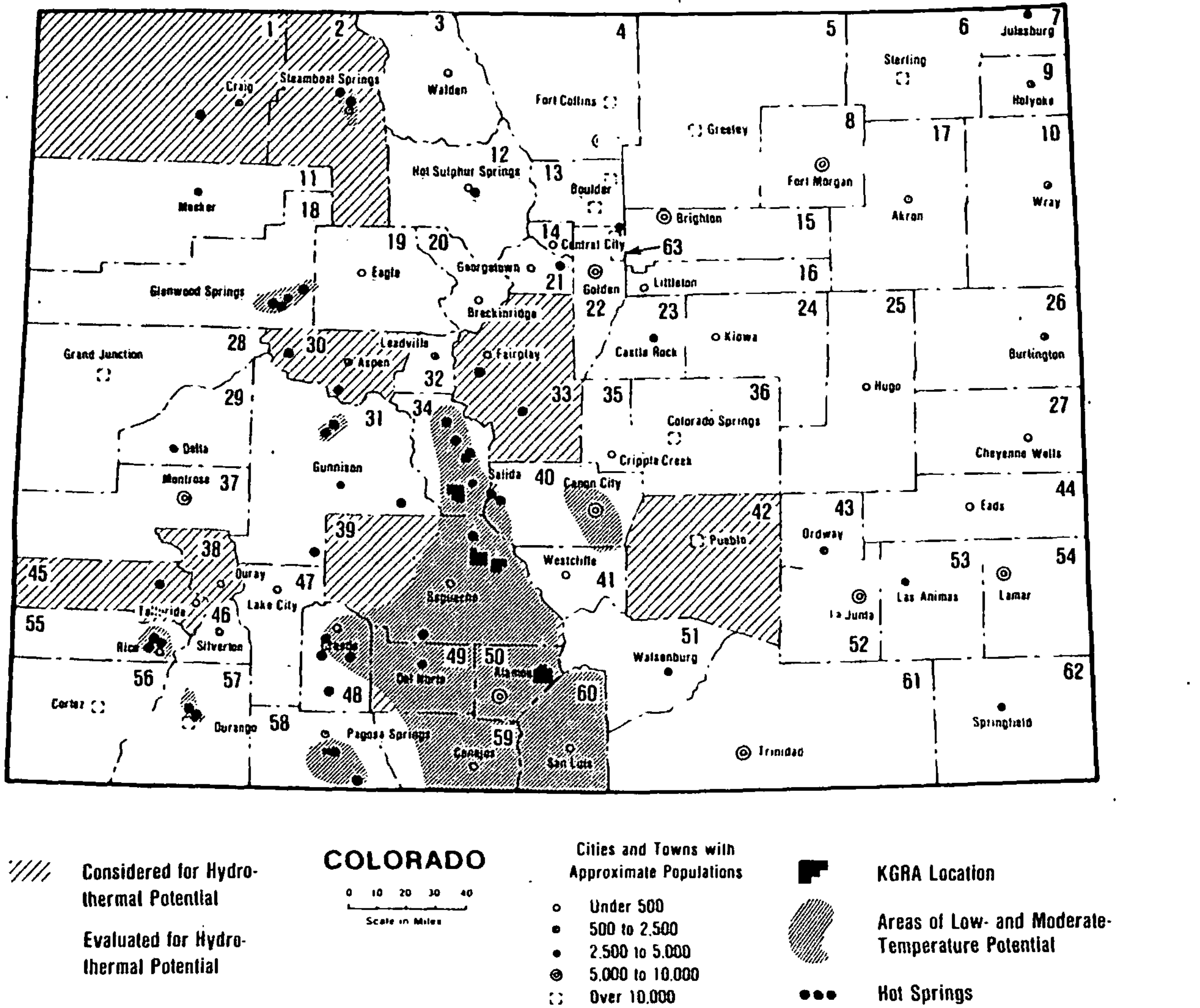

Fig. B-3 Colorado Counties and Hydrothermal Resources.

TABLE 3-IX

COLORADO ENERGY USE BY COUNTY

COUNTY COLORADO	AVE. RES. TEMP. °C	INDUSTRIAL Standard Industrial Code (SIC)	Btu's used x 10^{12}	RESIDENTIAL/COMMERCIAL Btu's used x 10^{12} Total	Btu's x 10^{12} (space conditioning & heating)
ALAMOSA	90°	2013	.01	.8	.56
		2086	.01		
			.02		.56
ARCHULETA	89°	3273	.01	.16	.1
BOULDER	90°	2011	.10	12.3	8.6
		2013	.05		
		2016	3.00		
		2026	.06		
		2048	.06		
		2436	.18		
		2511	.01		
		2821	.03		
		3273	.29		
			3.48		8.6
CLEAR CREEK					
CHAFFEE	109°			.75	.53
		2026	.01		
		2086	.01		
			.02		.53
CONEJOS	90°	2011	.01	.4	.28
COSTILLA	90°	3273	.01	.1	.07

TABLE B-IX (cont'd)

COUNTY	AVE. RES. TEMP. °C	INDUSTRIAL Standard Industrial Code (SIC)	INDUSTRIAL Btu's used x 10^{12}	RESIDENTIAL/COMMERCIAL Btu's used x 10^{12} Total	RESIDENTIAL/COMMERCIAL Btu's x 10^{12} (space conditioning & water heating)
COLORADO					
DELTA	90°	2013	.01	.7	.5
		3273	.05		
			.06		.5
DELORES	164°				
EAGLE	90°				
FREMONT	90°	2011	.01	1.4	1.0
		2026	.02		
		2037	.01		
		2048	.04		
		3271	.04		
			.12		1.0
GARFIELD	90°	2021	.01	.8	.56
		2048	.03		
		2086	.01		
		3273	.04		
			.09		.56
GRAND	90°	3273	.04	.17	.11
GUNNISON	137°	2024	.02	.6	.42
		2421	.01		
		3273	.01		
			.04		.42

TABLE B-IX (cont'd)

COUNTY	AVE. RES. TEMP. °C	INDUSTRIAL Standard Industrial Code (SIC)	Btu's used x 10^{12}	RESIDENTIAL/COMMERCIAL Btu's used x 10^{12} Total	Btu's x 10^{12} (space conditioning & water heating)
COLORADO					
JACKSON	90°				
LA PLATA	90°	2011	.01	1.25	.88
		2033	.01		
		2048	.04		
		2086	.04		
		3271	.02		
		3273	.04		
			.16		.88
MINERAL					

TABLE B-[illegible]

GROWTH PROJECTION CALCULATIONS

State	SIC	1975 Btu x 10^{12}/yr	Growth Rate (%/yr)	1985 Btu x 10^{12}	2000 Btu x 10^{12}	2020 Btu x 10^{12}
COLORADO						
	2011	.11	1.4%	.13	.16	.21
	2013	.06	1.4%	.07	.09	.11
	2016	2.25	3.0%	3.02	4.71	8.50
	2021	.01	.3%	.01	.01	.01
	2024	.01	.3%	.01	.01	.01
	2026	.07	.3%	.07	.08	.08
	2033	.01	1.1%	.01	.01	.02
	2037	.01	8.5%	.02	.08	.39
	2048	.10	3.3%	.14	.23	.43
	2086	.06	4.4%	.09	.18	.42
	2421	.01	1.0%	.01	.01	.02
	2436	.07	1.0%	.08	.09	.11
	2511	.01	5.2%	.02	.04	.10
	2821	.02	8.9%	.05	.17	.93
	3271	.05	8.0%	.11	.34	1.60
	3273	.09	3.4%	.13	.21	.41
Total Process Heat		2.94		3.97	6.47	13.35

TABLE B-XI

INDUSTRIAL PROCESS HEAT

COLORADO	1975 Btu/yr x 10^{12}	1985 Btu/yr x 10^{12}		2000 Btu/yr x 10^{12}		2020 Btu/yr x 10^{12}	
GEOTHERMAL POTENTIAL							
17 counties of 59	2.94	3.97		6.42		13.35	
9 potential	.78	1.05		1.70		3.53	
factor = (9/17 x .5)							
5% new industry		2.34		8.88		29.70	
3% per capita increase use		1.28		4.07		10.35	
New Discovery factor = 15%				3.16		5.49	
GEOTHERMAL POTENTIAL TOTAL	3.72	8.64		24.23		62.42	
GEOTHERMAL CAPTURE							
1% retrofit to 25% of 1975 base			.19		.74		.93
80% new growth capture (from 1980 on)			2.95		12.47		30.55
GEOTHERMAL CAPTURE TOTAL			3.14		13.21		31.48

TABLE B-XII

RESIDENTIAL/COMMERCIAL SPACE CONDITIONING

COLORADO	1975 Btu/yr x 10^{12}	1985 Btu/yr x 10^{12}		2000 Btu/yr x 10^{12}		2020 Btu/yr x 10^{12}	
GEOTHERMAL POTENTIAL							
17counties of 59	13.61	20.15		36.28		79.50	
9potential counties	3.60	5.33		9.60		21.03	
factor = (9/17x .5)							
3% per capita increase use		5.92		18.82		47.87	
New Discovery factor = 15%				4.71		10.32	
GEOTHERMAL POTENTIAL TOTAL	17.21	31.40		69.41		158.72	
GEOTHERMAL CAPTURE							
1% retrofit to 25% of 1975 base			.86		.94		1.18
70% new growth capture (from 1980 on)			7.45		26.61		62.52
GEOTHERMAL CAPTURE TOTAL			8.31		27.55		63.70

Number	County
1	Boundary
2	Bonner
3	Kootenai
4	Benewah
5	Shoshone
6	Latah
7	Clearwater
8	Nez Perce
9	Lewis
10	Idaho
11	Adams
12	Valley
13	Lemhi
14	Washington
15	Custer
16	Clark
17	Fremont
18	Payette
19	Gem
20	Boise
21	Butte
22	Jefferson
23	Madison
24	Teton
25	Canyon
26	Ada
27	Elmore
28	Camas
29	Blaine
30	Bingham
31	Bonneville
32	Owyhee
33	Gooding
34	Lincoln
35	Minidoka
36	Power
37	Bannock
38	Caribou
39	Jerome
40	Twin Falls
41	Cassia
42	Oneida
43	Franklin
44	Bear Lake

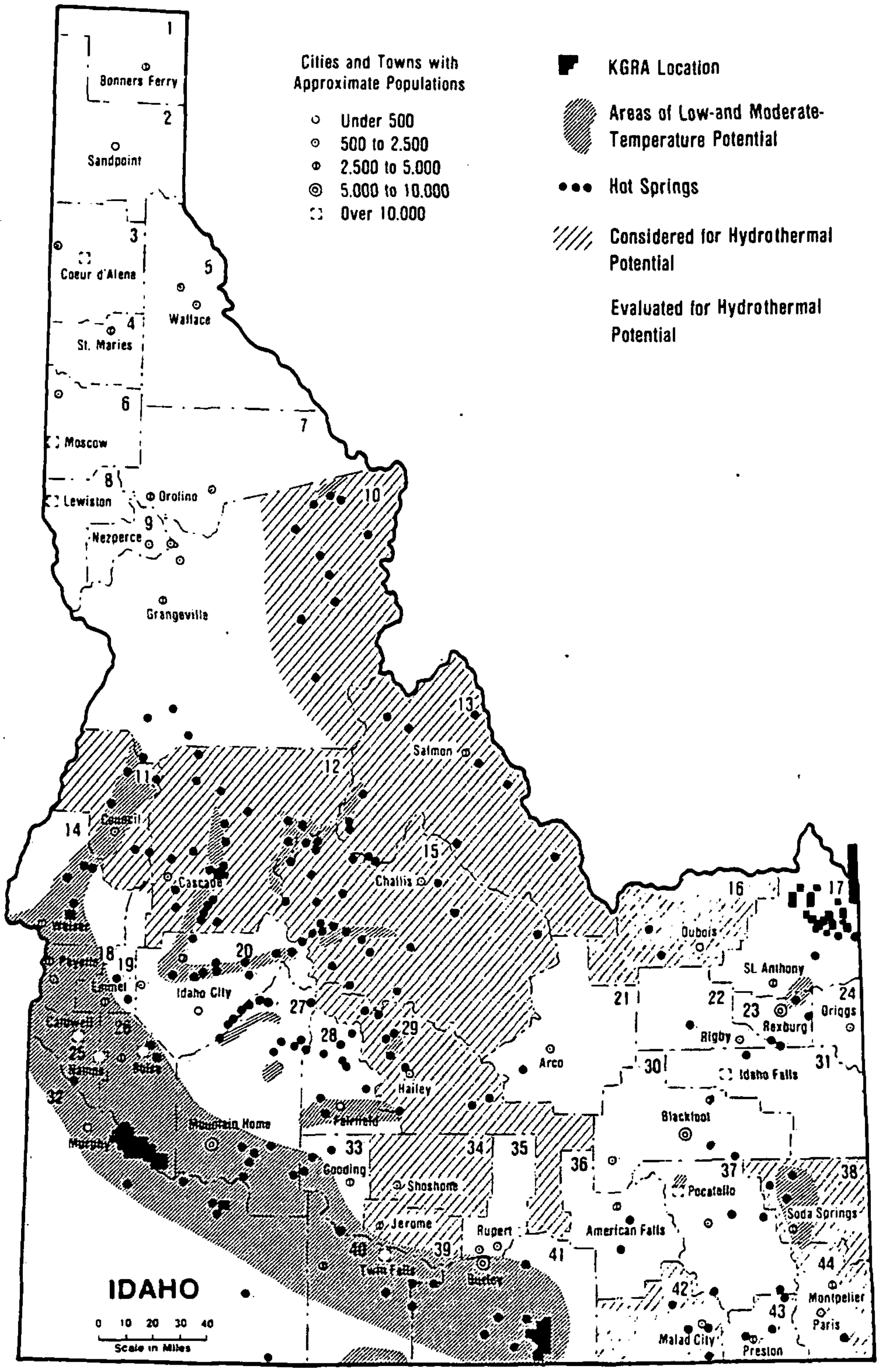

Fig. B-4 Idaho Counties and Hydrothermal Resources.

TABLE B-XIII

IDAHO ENERGY USE BY COUNTY

COUNTY	AVE. RES. TEMP. °C	INDUSTRIAL Standard Industrial Code (SIC)	INDUSTRIAL Btu's used x 10^{12}	RESIDENTIAL/COMMERCIAL Btu's used x 10^{12} Total	RESIDENTIAL/COMMERCIAL Btu's x 10^{12} (space conditioning & water heating)
IDAHO					
ADA	90°	2011	.11	10.0	9.0
		2013	.01		
		2037	.11		
		2048	.01		
		2086	.10		
		3273	.22		
			1.56		9.0
BANNOCK	90°				
		2011	.18	3.5	3.2
		2022	.04		
		2026	.04		
		2086	.04		
		3273	.13		
			.43		3.2
BINGHAM	90°	2011	.01	1.6	1.4
		2034	2.03		
		2048	.03		
		3273	.02		
			2.09		1.4
BOISE	110°			0.1	0.1
BONNEVILLE	90°	2011	.06	3.1	2.8
		2026	.04		
		2034	3.20		
		2046	.06		
		2063	.21		
		2086	.14		
		3273	.26		
			3.97		2.8

TABLE B-XIII (cont'd)

COUNTY IDAHO	AVE. RES. TEMP. °C	INDUSTRIAL Standard Industrial Code (SIC)	Btu's used x 10^{12}	RESIDENTIAL/COMMERCIAL Btu's used x 10^{12} Total	Btu's x 10^{12} (space conditioning & water heating)
BUTTE	90°			0.2	0.18
CANYON	90°	2011	.39	2.8	2.5
		2026	.08		
		2034	3.32		
		2037	.40		
		2048	1.26		
		3273	.19		
			5.64		2.5
CASSIA	147°	2011	.02	0.7	0.6
		2026	.02		
		2033	.67		
		2034	.20		
		2037	4.32		
		2048	.03		
		3273	.04		
			5.30		0.6
ELMORE	107°		NO MATCH	0.5	0.45
FREMONT	92°	2022	.02	0.2	0.18
		3273	.01		
	Total		.03		0.18
GEM	119°	3273	.02	0.3	0.27
GOODING	103°	2011	.09	0.2	0.18

TABLE B-XIII (cont'd)

COUNTY	AVE. RES. TEMP. °C	INDUSTRIAL Standard Industrial Code (SIC)	Btu's used x 10^{12}	RESIDENTIAL/COMMERCIAL Btu's used x 10^{12} Total	Btu's x 10^{12} (space conditioning & water heating)
IDAHO					
JEFFERSON	90°	2011	.1	0.21	0.18
		2034	1.20		
			1.30		0.18
MADISON	90°	2022	.02	0.7	0.6
		2034	.64		
		3273	.03		
			.69		0.6
MINIDOKA	90°	2011	.01	0.5	0.45
		2013	.02		
		2022	.08		
		2034	3.60		
		3273	.02		
			3.73		0.45
OWYHEE	90°				
PAYETTE	90°	2011	.09	0.6	0.54
		2048	.01		
		2086	.04		
			.14		0.54
POWER	90°	2037	1.4	0.4	0.36
TWIN FALLS	107°	2011	.09	2.0	1.8
		2022	.08		
		2023	.08		
		2026	.08		
		2033	.89		
		2034	.25		
		2037	.72		
		2048	.18		
		2063	1.05		
		2086	.07		
		3273	.06		
			3.35		1.8

TABLE B-XIII (cont'd)

COUNTY	AVE. RES. TEMP. °C	INDUSTRIAL		RESIDENTIAL/COMMERCIAL	
IDAHO		Standard Industrial Code (SIC)	Btu's used x 10^{12}	Btu's used x 10^{12} Total	Btu's x 10^{12} (space conditioning & water heating)
WASHINGTON	163°			0.1	0.1

TABLE B-[illegible]IV

GROWTH PROJECTION CALCULATIONS

State	SIC	1975 Btu x 10^{12}/yr	Growth Rate (%/yr)	1985 Btu x 10^{12}	2000 Btu x 10^{12}	2020 Btu x 10^{12}
IDAHO						
	2011	.98	1.4%	1.13	1.39	1.83
	2013	.02	1.4%	.02	.03	.04
	2022	.19	.3%	.20	.21	.22
	2023	.06	.3%	.06	.07	.07
	2026	.17	.3%	.18	.18	.20
	2033	.95	1.1%	1.06	1.25	1.55
	2034	10.83	1.5%	12.57	15.71	21.16
	2037	5.21	1.5%	6.05	7.56	10.18
	2048	.94	3.3%	1.30	2.12	4.05
	2063	.82	2.8%	1.08	1.64	2.84
	2086	.29	3.0%	.39	.61	1.10
	3273	.02	3.4%	.03	.05	.09
Total Process Heat		20.48		24.07	30.82	43.33

TABLE B-XV

INDUSTRIAL PROCESS HEAT

IDAHO	1975 Btu/yr x 10^{12}	1985 Btu/yr x 10^{12}		2000 Btu/yr x 10^{12}		2020 Btu/yr x 10^{12}	
GEOTHERMAL POTENTIAL							
19 counties of 44	20.48	24.07		30.82		43.33	
14 potential	7.55	8.87		11.35		15.96	
factor = (14/19x .5)							
5% new industry		17.63		66.89		223.82	
3% per capita increase use		9.64		30.66		77.97	
New Discovery factor = 5%				6.99		12.14	
GEOTHERMAL POTENTIAL TOTAL	28.03	60.21		146.65		373.22	
GEOTHERMAL CAPTURE							
1% retrofit to 25% of 1975 base			1.40		5.61		7.01
80% new growth capture (from 1980 on)			19.31		69.15		226.57
GEOTHERMAL CAPTURE TOTAL			20.71		74.76		233.58

TABLE B-XVI

RESIDENTIAL/COMMERCIAL SPACE CONDITIONING

IDAHO	1975 Btu/yr x 10^{12}	1985 Btu/yr x 10^{12}		2000 Btu/yr x 10^{12}		2020 Btu/yr x 10^{12}	
<u>GEOTHERMAL POTENTIAL</u>							
19 counties of 44	24.84	36.77		66.22		145.09	
14 potential counties factor = (14/19 x .5)	9.15	13.54		24.39		53.45	
3% per capita increase use		11.69		37.18		94.55	
New Discovery factor = 5%				3.10		6.79	
GEOTHERMAL POTENTIAL TOTAL	33.99	62.00		130.89		299.88	
<u>GEOTHERMAL CAPTURE</u>							
1% retrofit to 25% of 1975 base			1.70		6.80		8.50
70% new growth capture (from 1980 on)			14.71		48.22		118.29
GEOTHERMAL CAPTURE TOTAL			16.41		55.02		126.79

Number	County	Number	County	Number	County	Number	County	Number	County
1	Lincoln	12	Sheridan	23	Cascade	34	Golden Valley	45	Ravalli
2	Flathead	13	Roosevelt	24	Judith Basin	35	Musselshell	46	Deer Lodge
3	Glacier	14	Sanders	25	Fergus	36	Rosebud	47	Silver Bow
4	Pondera	15	Lake	26	Petroleum	37	Prairie	48	Gallatin
5	Toole	16	Teton	27	Garfield	38	Custer	49	Beaverhead
6	Liberty	17	Chouteau	28	McCone	39	Fallon	50	Madison
7	Hill	18	Richland	29	Dawson	40	Granite	51	Park
8	Blaine	19	Mineral	30	Wibaux	41	Jefferson	52	Stillwater
9	Phillips	20	Missoula	31	Meagher	42	Sweetgrass	53	Carbon
10	Valley	21	Powell	32	Broadwater	43	Yellowstone	54	Big Horn
11	Daniels	22	Lewis and Clark	33	Wheatland	44	Treasure	55	Powder River
								56	Carter

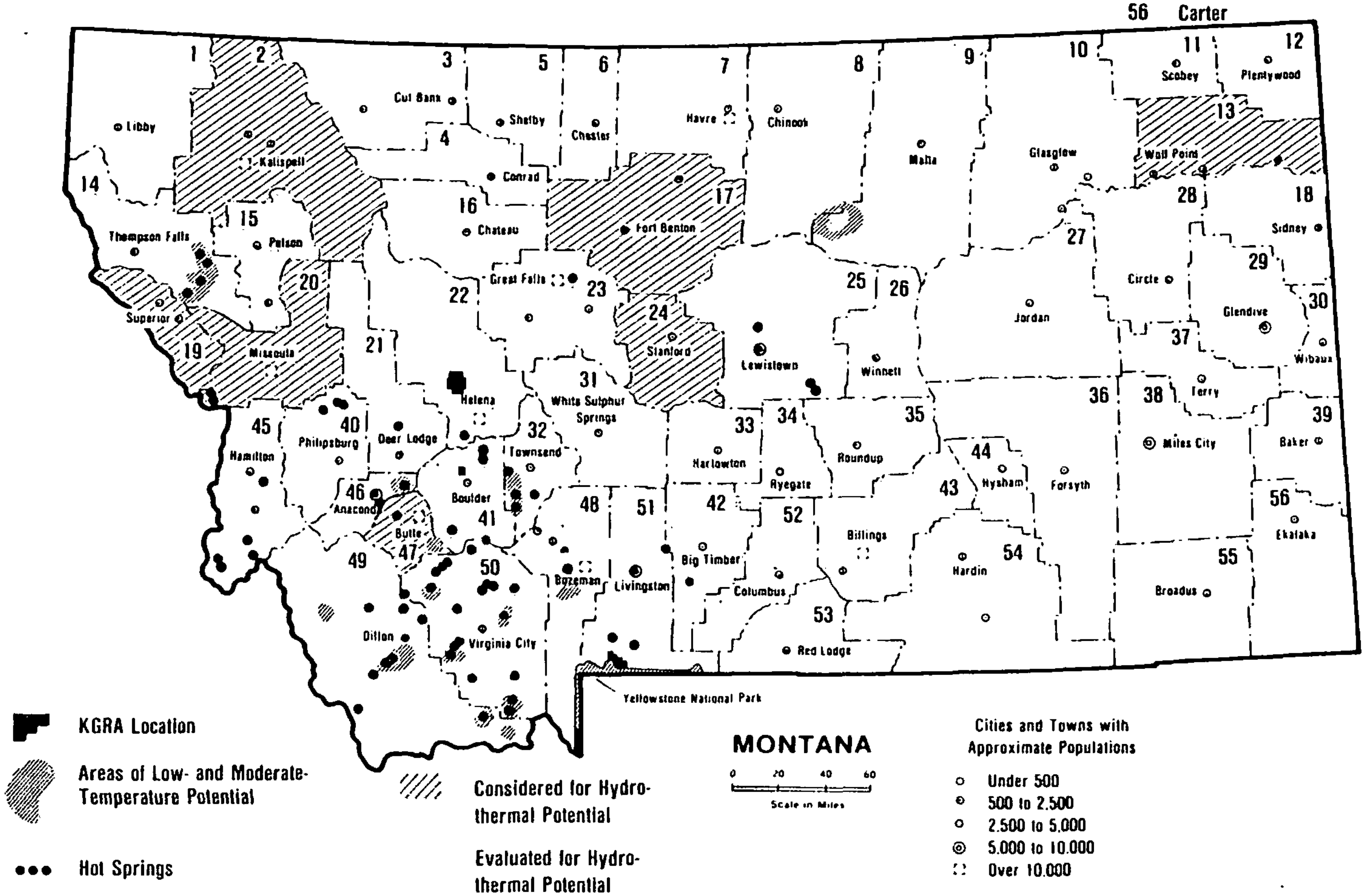

Fig. B-5 Montana Counties and Hydrothermal Resources.

TABLE B-XVII

MONTANA ENERGY USE BY COUNTIES

COUNTY MONTANA	AVE. RES. TEMP. °C	INDUSTRIAL Standard Industrial Code (SIC)	INDUSTRIAL Btu's used x 10^{12}	RESIDENTIAL/COMMERCIAL Btu's used x 10^{12} Total	RESIDENTIAL/COMMERCIAL Btu's x 10^{12} (space conditioning & water heating)
BEAVER HEAD	68°	2011	.01	.5	.45
		2048	.01		
		3273	.01		
			.03		.45
BLAINE	90°			.21	.2
BROADWATER	115°	NO MATCH		.15	.13
CASCADE	90°	2011	.04	6.5	5.8
		2021	.01		
		2048	.16		
		2086	.04		
		3271	.13		
		3273	.01		
			.39		5.8
DEER LODGE	90°	2013	.01	1.1	1.0
		2021	.01		
		3273	.01		
			.03		1.0
FERGUS	90°	2021	.01	.64	.58
		2048	.05		
		2086	.01		
		3273	.03		
			.10		.58
GALLATIN	90°	2011	.01	3.2	2.9
		2026	.01		
		2048	.04		
		2086	.04		
			.10		2.9

TABLE B-XVII (cont'd)

COUNTY	AVE. RES. TEMP. °C	INDUSTRIAL Standard Industrial Code (SIC)	INDUSTRIAL Btu's used x 10^{12}	RESIDENTIAL/COMMERCIAL Btu's used x 10^{12} Total	RESIDENTIAL/COMMERCIAL Btu's x 10^{12} (space conditioning & water heating)
MONTANA					
GRANITE	90°				
JEFFERSON	136°	2021 2411	.01 .01	.2	.18
			.02		.18
LAKE	90°	3273	.01	.6	.54
LEWIS & CLARK	119°	2024 2026 2086 2411 2421 2434 2819 2841 3273	.01 .03 .01 .04 .01 .03 .30 .02 .09	2.7	2.4
			.34		2.4
MADISON	129°				
MEAGHER	68°				
MISSOULA	90°	2011 2026 2048 2086 3271	.09 .06 .04 .07 .05	3.4	3.1
			.31		3.1

TABLE B-XVII (cont'd)

COUNTY MONTANA	AVE. RES. TEMP. °C	INDUSTRIAL Standard Industrial Code (SIC)	 Btu's used x 10^{12}	RESIDENTIAL/COMMERCIAL Btu's used x 10^{12} Total	 Btu's x 10^{12} (space conditioning & water heating)
PARK	90°	2011 2024	.01 .03	.75	.68
			.04		.68
PHILLIPS	90°				
POWELL	90°	2048 3273	.01 .01	.5	.45
			.02		.45
RAVALLI	77°	2021 2033 2048 3273	.01 .01 .01 .01	.33	.3
			.04		.3
SANDERS	90°	NO MATCH		.26	.23
SWEETGRASS	90°	2011 2021	.01 .01	.17	.15
			.02		.15

TABLE B-XVIII

GROWTH PROJECTION CALCULATIONS

State	SIC	1975 Btu x 10^{12}/yr	Growth Rate (%/yr)	1985 Btu x 10^{12}	2000 Btu x 10^{12}	2020 Btu x 10^{12}
MONTANA						
	2011	.13	1.4%	.15	.18	.24
	2013	.01	1.4%	.01	.01	.02
	2021	.39	0.3%	.40	.42	.45
	2024	.03	0.3%	.03	.03	.03
	2026	.07	0.3%	.07	.08	.08
	2033	.01	1.1%	.01	.01	.02
	2048	.19	3.3%	.26	.43	.82
	2086	.13	4.4%	.20	.38	.90
	2421	.01	1.0%	.01	.01	.02
	2819	.21	6.8%	.41	1.09	4.05
	2841	.01	8.5%	.02	.08	.39
	3271	.24	8.0%	.52	1.64	7.66
	3273	.03	3.4%	.04	.07	.14
Total Process Heat		1.46		2.13	4.43	14.71

TABLE B-XIX

INDUSTRIAL PROCESS HEAT

MONTANA	1975 Btu/yr x 10^{12}	1985 Btu/yr x 10^{12}		2000 Btu/yr x 10^{12}		2020 Btu/yr x 10^{12}	
<u>GEOTHERMAL POTENTIAL</u>							
20 counties of 58 7 potential factor = (7/20 x .5)	1.46 .26	2.13 .37		4.43 .78		14.71 2.57	
5% new industry		1.71		6.49		21.72	
3% per capita increase use		.94		2.98		7.57	
New Discovery factor = 20%				2.94		5.10	
GEOTHERMAL POTENTIAL TOTAL	2.72	5.15		17.62		51.67	
<u>GEOTHERMAL CAPTURE</u>							
1% retrofit to 25% of 1975 base 80% new growth capture (from 1980 on)			.14 1.46		.54 9.98		.68 27.24
GEOTHERMAL CAPTURE TOTAL			1.50		10.52		27.92

TABLE B-XX

RESIDENTIAL/COMMERCIAL SPACE CONDITIONING

MONTANA	1975 Btu/yr x 10^{12}	1985 Btu/yr x 10^{12}		2000 Btu/yr x 10^{12}		2020 Btu/yr x 10^{12}	
GEOTHERMAL POTENTIAL							
20 counties of 58	19.09	28.26		50.89		111.51	
7 potential counties	3.34	4.95		8.91		19.51	
factor = (7/20x .5)							
3% per capita increase use		7.71		24.53		62.39	
New Discovery factor = 20%				8.18		17.93	
GEOTHERMAL POTENTIAL TOTAL	22.43	40.92		92.51		211.34	
GEOTHERMAL CAPTURE							
1% retrofit to 25% of 1975 base			.12		4.49		5.61
70% new growth capture (from 1980 on)			9.71		36.11		83.18
GEOTHERMAL CAPTURE TOTAL			9.83		40.60		88.79

Number	County
1	Washoe
2	Humboldt
3	Elko
4	Pershing
5	Lander
6	Eureka
7	Storey
8	Lyon
9	Churchill
10	White Pine
11	Douglas
12	Mineral
13	Nye
14	Esmeralda
15	Lincoln
16	Clark
17	Carson City

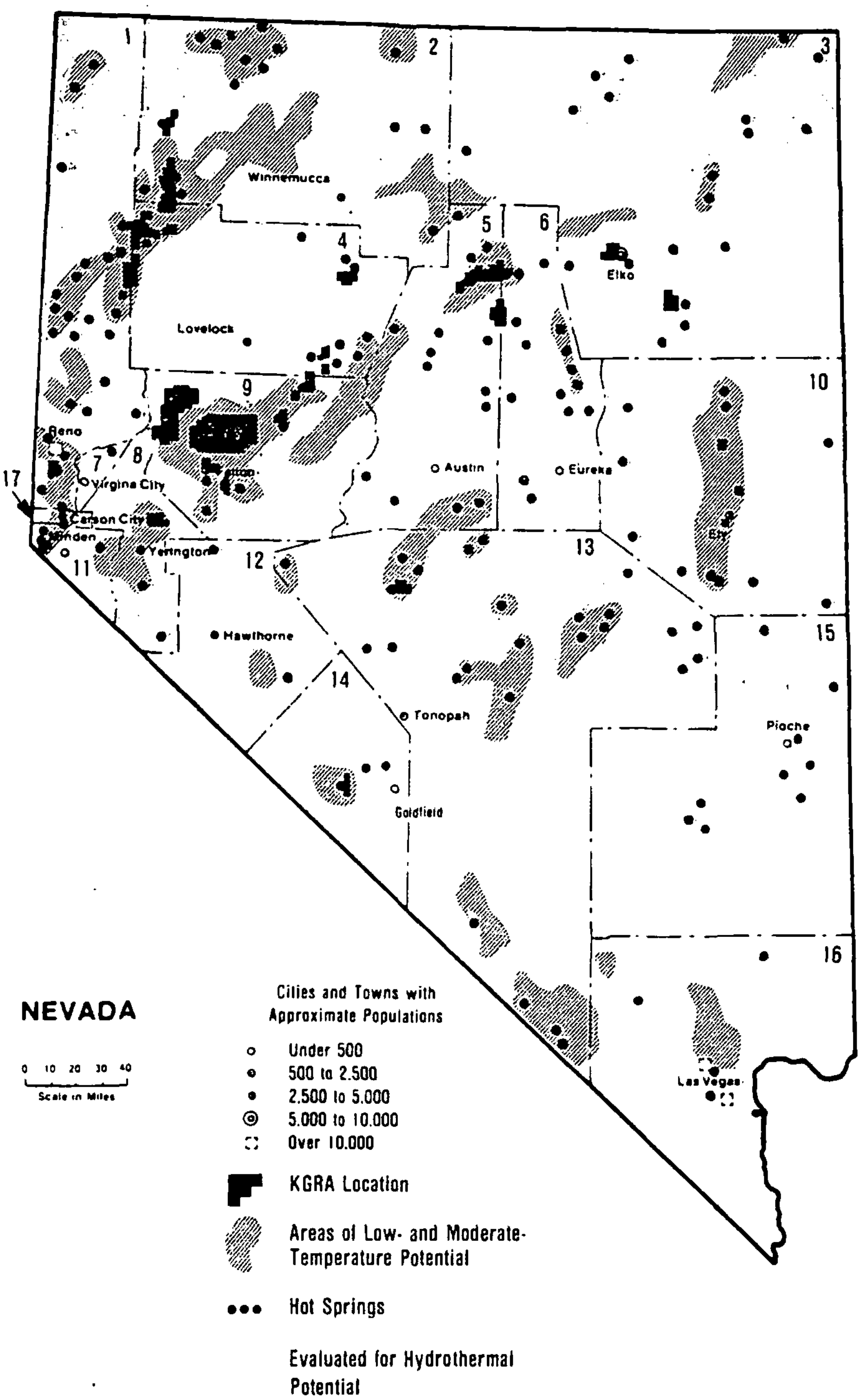

Fig. B-6 Nevada Counties and Hydrothermal Resources.

TABLE B-XXI

NEVADA ENERGY USE BY COUNTY

COUNTY NEVADA	AVE. RES. TEMP. °C	INDUSTRIAL Standard Industrial Code (SIC)	INDUSTRIAL Btu's used x 10^{12}	RESIDENTIAL/COMMERCIAL Btu's used x 10^{12} Total	RESIDENTIAL/COMMERCIAL Btu's x 10^{12} (space conditioning & water heating)
CHURCHILL	217°	2421 2821 3271	.01 .01 .02	.3	.27
			.04		.27
CLARK	90°	2011 2026 2034 2086 2511 2821 3273	.01 .20 .12 .20 .02 2.74 1.46	15.5	13.95
			3.75		13.95
DOUGLAS	74°	2011 2034 3273	.01 .01 .01	.13	.1
			.03		.1
ELKO	178°	2011 2086 3273	.01 .01 .01	.77	.7
			.03		.7
ESMERALDA	90°				
EUREKA	227°			.13	.1
HUMBOLT	160°	2034 3273	.01 .01	.36	.32
			.02		.32

TABLE 8-XXI (cont'd)

COUNTY	AVE. RES. TEMP. °C	INDUSTRIAL		RESIDENTIAL/COMMERCIAL	
NEVADA		Standard Industrial Code (SIC)	Btu's used x 10^{12}	Btu's used x 10^{12} Total	Btu's x 10^{12} (space conditioning & water heating)
LANDER	138°			.19	.17
LYON	164°	2011	.04	.20	.18
		2026	.02		
		3273	.02		
Total			.08		.18
LINCOLN	90°				
MINERAL	90°			.52	.46
NYE	132°				
PERSHING	181°			.16	.14
WASHOE	201°	2011	.02	10.2	9.2
		2026	.12		
		2034	.10		
		2086	.16		
		2421	.09		
		2511	.05		
		2821	.83		
		3273	.09		
		3275	.32		
			1.78		9.2
WHITE PINE	90°				

TABLE B-XXII

GROWTH PROJECTION CALCULATIONS

State	SIC	1975 Btu x 10^{12}/yr	Growth Rate (%/yr)	1985 Btu x 10^{12}	2000 Btu x 10^{12}	2020 Btu x 10^{12}
NEVADA						
	2011	.08	1.4%	.09	.11	.15
	2026	.08	.3%	.08	.09	.09
	2034	.18	1.5%	.21	.26	.35
	2086	.28	4.4%	.43	.82	1.94
	2421	.01	1.0%	.01	.01	.02
	2511	.04	5.2%	.07	.14	.39
	2821	2.69	8.9%	6.31	22.67	124.74
	3271	.02	8.0%	.04	.14	.64
	3273	.07	3.4%	.10	.16	.32
	3275	.22	8.0%	.47	1.51	7.02
Total Process Heat		3.67		7.81	25.91	135.662

TABLE B-XXIII
INDUSTRIAL PROCESS HEAT

NEVADA	1975 Btu/yr x 10^{12}	1985 Btu/yr x 10^{12}		2000 Btu/yr x 10^{12}		2020 Btu/yr x 10^{12}	
GEOTHERMAL POTENTIAL							
14 counties of 17 0 potential factor = (x)	3.67	4.84		7.32		12.72	
5% new industry		2.31		8.76		29.30	
3% per capita increase use		1.26		4.01		10.21	
New Discovery factor = (1% growth rate based on 1985 use)				.46		1.18	
GEOTHERMAL POTENTIAL TOTAL	3.67	8.41		20.55		53.41	
GEOTHERMAL CAPTURE							
1% retrofit to 25% of 1975 base			.18		.73		.92
80% new growth capture (from 1980 on)			6.83		9.71		26.29
GEOTHERMAL CAPTURE TOTAL			2.84		10.44		27.21

TABLE B-XXIV

RESIDENTIAL/COMMERCIAL SPACE CONDITIONING

NEVADA	1975 Btu/yr x 10^{12}	1985 Btu/yr x 10^{12}		2000 Btu/yr x 10^{12}		2020 Btu/yr x 10^{12}	
GEOTHERMAL POTENTIAL							
14 counties of 17 0 potential counties factor = (/ x)	25.59	37.88		68.22		149.48	
3% per capita increase use		8.80		27.99		71.18	
New Discovery factor =(1% growth rate on 1985 geothermal use)				1.99		5.15	
GEOTHERMAL POTENTIAL TOTAL	25.59	46.68		98.20		225.81	
GEOTHERMAL CAPTURE							
1% retrofit to 25% of 1975 base			1.28		5.12		6.40
70% new growth capture (from 1980 on)			11.07		36.06		89.33
GEOTHERMAL CAPTURE TOTAL			12.35		41.18		95.73

Number	County
1	San Juan
2	Rio Arriba
3	Taos
4	Colfax
5	Union
6	McKinley
7	Sandoval
8	Sante Fe
9	Mora
10	Harding
11	San Miguel
12	Valencia
13	Bernalillo
14	Torrance
15	Guadalupe
16	Quay
17	Catron
18	Socorro
19	Lincoln
20	De Baca
21	Curry
22	Roosevelt
23	Grant
24	Sierra
25	Otero
26	Chaves
27	Eddy
28	Lea
29	Hidalgo
30	Luna
31	Dona Ana
32	Los Alamos

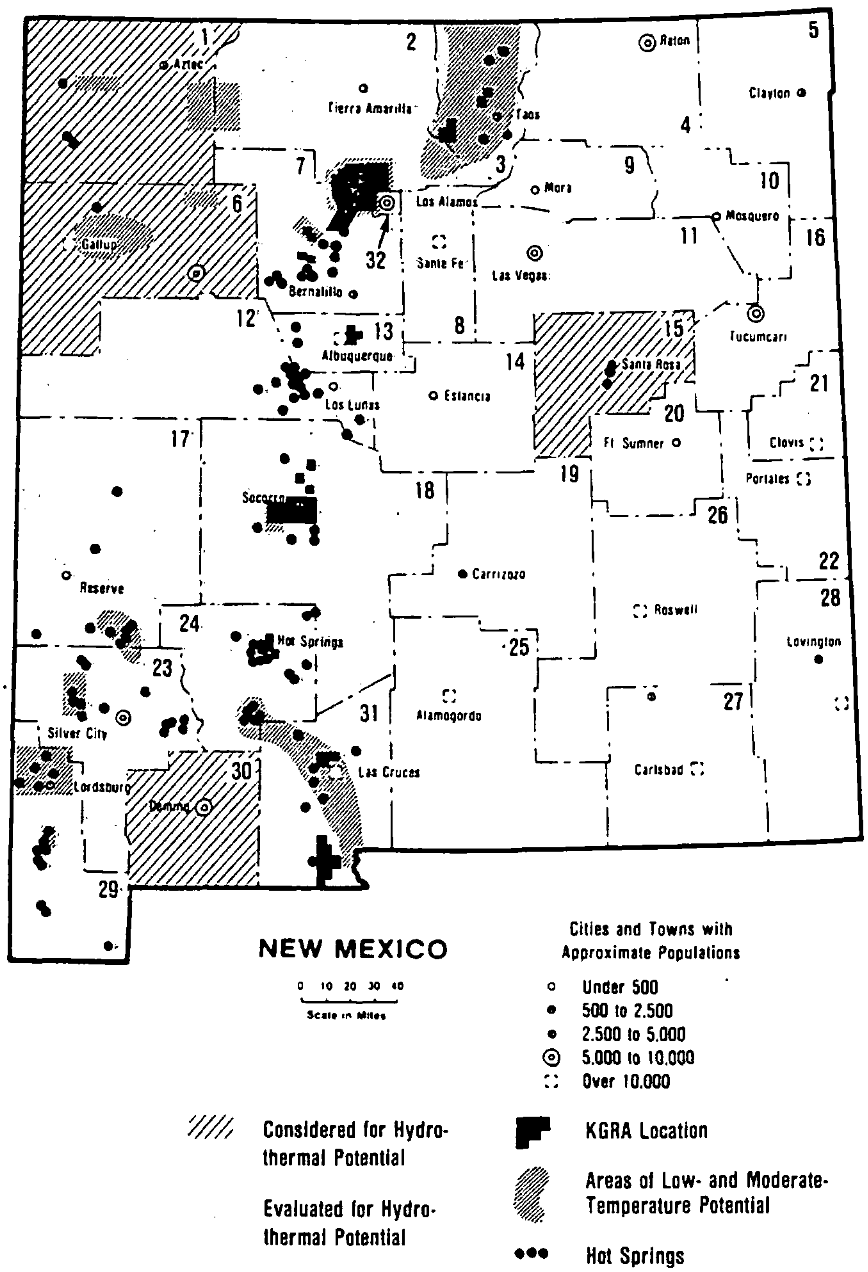

Fig. B-7 New Mexico Counties and Hydrothermal Resources.

TABLE B-XXV

NEW MEXICO ENERGY USE BY COUNTY

COUNTY NEW MEXICO	AVE. RES. TEMP. °C	INDUSTRIAL Standard Industrial Code (SIC)	INDUSTRIAL Btu's used x 10^{12}	RESIDENTIAL/COMMERCIAL Btu's used x 10^{12} Total	RESIDENTIAL/COMMERCIAL Btu's x 10^{12} (space conditioning & water heating)
BERNALILLO	90°	2011	.47	21.7	10.8
		2013	.12		
		2026	.01		
		2048	.05		
		2086	.22		
		2262	.04		
		2511	.03		
		2512	.03		
		3271	.30		
		3273	.36		
			1.63		10.8
CATRON	108°				
GRANT	80°			.4	.2
HILDALGO	148°	3273	.08	.3	.15
LOS ALAMOS	90°			1.3	.65
RIO ARRIBA	90°	3273	.04	.43	.22
SANDOVAL	273°			.5	.25
SAN MIGUEL	90°	2026	.04	1.2	.6
		2048	.05		
		3273	.04		
			.13		.6

TABLE B-XXV (cont'd)

COUNTY	AVE. RES. TEMP. °C	INDUSTRIAL Standard Industrial Code (SIC)	INDUSTRIAL Btu's used x 10^{12}	RESIDENTIAL/COMMERCIAL Btu's used x 10^{12} Total	RESIDENTIAL/COMMERCIAL Btu's x 10^{12} (space conditioning & water heating)
NEW MEXICO					
SANTA FE	90°	2086	.06	3.5	1.75
		3273	.08		
		3295	.06		
			.20		1.75
SIERRA	90°			.4	.2
SOCORRO	90°			.4	.2
TAOS	90°	3273	.03	.36	.18
DONA ANA	90°	2011	.07	3.5	1.75
		2034	.04		
		2086	.04		
		3271	.20		
		3273	.04		
			.33		1.75
VALENCIA	90°	3273	.04	0.68	0.34

TABLE B-XXVI

GROWTH PROJECTION CALCULATIONS

State	SIC	1975 Btu x 10^{12}/yr	Growth Rate (%/yr)	1985 Btu x 10^{12}	2000 Btu x 10^{12}	2020 Btu x 10^{12}
NEW MEXICO						
	2011	.41	1.4%	.47	.58	.77
	2013	.03	1.4%	.03	.04	.06
	2026	.03	.3%	.03	.03	.03
	2034	.08	1.5%	.09	.12	.16
	2048	.19	3.3%	.22	.28	.37
	2086	.03	4.4%	.05	.09	.21
	2262	.02	4.0%	.03	.05	.12
	2511	.02	5.2%	.03	.07	.20
	2512	.02	5.2%	.03	.07	.20
	3271	.38	5.0%	.62	1.29	3.41
	3273	.13	3.4%	.18	.30	.59
	3295	.04	8.0%	.09	.27	1.28
Total Process Heat		1.38		1.87	3.19	7.39

TABLE B-X[illegible]I

INDUSTRIAL PROCESS HEAT

NEW MEXICO	1975 Btu/yr x 10^{12}	1985 Btu/yr x 10^{12}		2000 Btu/yr x 10^{12}		2020 Btu/yr x 10^{12}	
GEOTHERMAL POTENTIAL							
14 counties of 32	1.38	1.87		3.19		7.39	
4 potential factor = (4/14 x .8)	.32	.43		.73		1.69	
5% new industry		1.07		4.06		13.57	
3% per capita increase use		.58		1.86		4.73	
New Discovery factor = 20%				.79		1.37	
GEOTHERMAL POTENTIAL TOTAL	1.70	3.95		6.57		28.75	
GEOTHERMAL CAPTURE							
1% retrofit to 25% of 1975 base			.09		.34		.43
80% new growth capture (from 1980 on)			1.35		2.10		22.18
GEOTHERMAL CAPTURE TOTAL			1.44		2.44		22.61

TABLE B-XX[illegible]I

RESIDENTIAL/COMMERCIAL SPACE CONDITIONING

NEW MEXICO	1975 Btu/yr x 10^{12}	1985 Btu/yr x 10^{12}		2000 Btu/yr x 10^{12}		2020 Btu/yr x 10^{12}	
GEOTHERMAL POTENTIAL							
14 counties of 32	17.29	25.59		46.09		100.99	
potential counties	3.95	5.85		10.54		23.08	
factor = (4/14x .8)							
3% per capita increase use		7.31		23.23		59.09	
New Discovery factor = 20%				7.75		16.98	
GEOTHERMAL POTENTIAL TOTAL	21.24	38.75		87.61		200.14	
GEOTHERMAL CAPTURE							
1% retrofit to 25% of 1975 base			1.06		4.25		5.31
70% new growth capture (from 1980 on)			9.19		34.20		78.77
GEOTHERMAL CAPTURE TOTAL			10.25		38.45		84.08

Number	County	Number	County	Number	County	Number	County	Number	County
1	Divide	11	Ward	21	Eddy	32	Oliver	43	Sioux
2	Burke	12	McHenry	22	Foster	33	Burleigh	44	Emmons
3	Renville	13	Pierce	23	Nelson	34	Kidder	45	Logan
4	Bottineau	14	Benson	24	Grand Forks	35	Stutsman	46	La Moure
5	Rolette	15	Ramsey	25	Griggs	36	Barnes	47	Ransom
6	Towner	16	Walsh	26	Steele	37	Cass	48	Richland
7	Cavalier	17	McKenzie	27	Traill	38	Stark	49	Bowman
8	Pembina	18	McLean	28	Golden Valley	39	Morton	50	Adams
9	Williams	19	Sheridan	29	Billings	40	Slope	51	McIntosh
10	Mountrail	20	Wells	30	Dunn	41	Hettinger	52	Dickey
				31	Mercer	42	Grant	53	Sargent

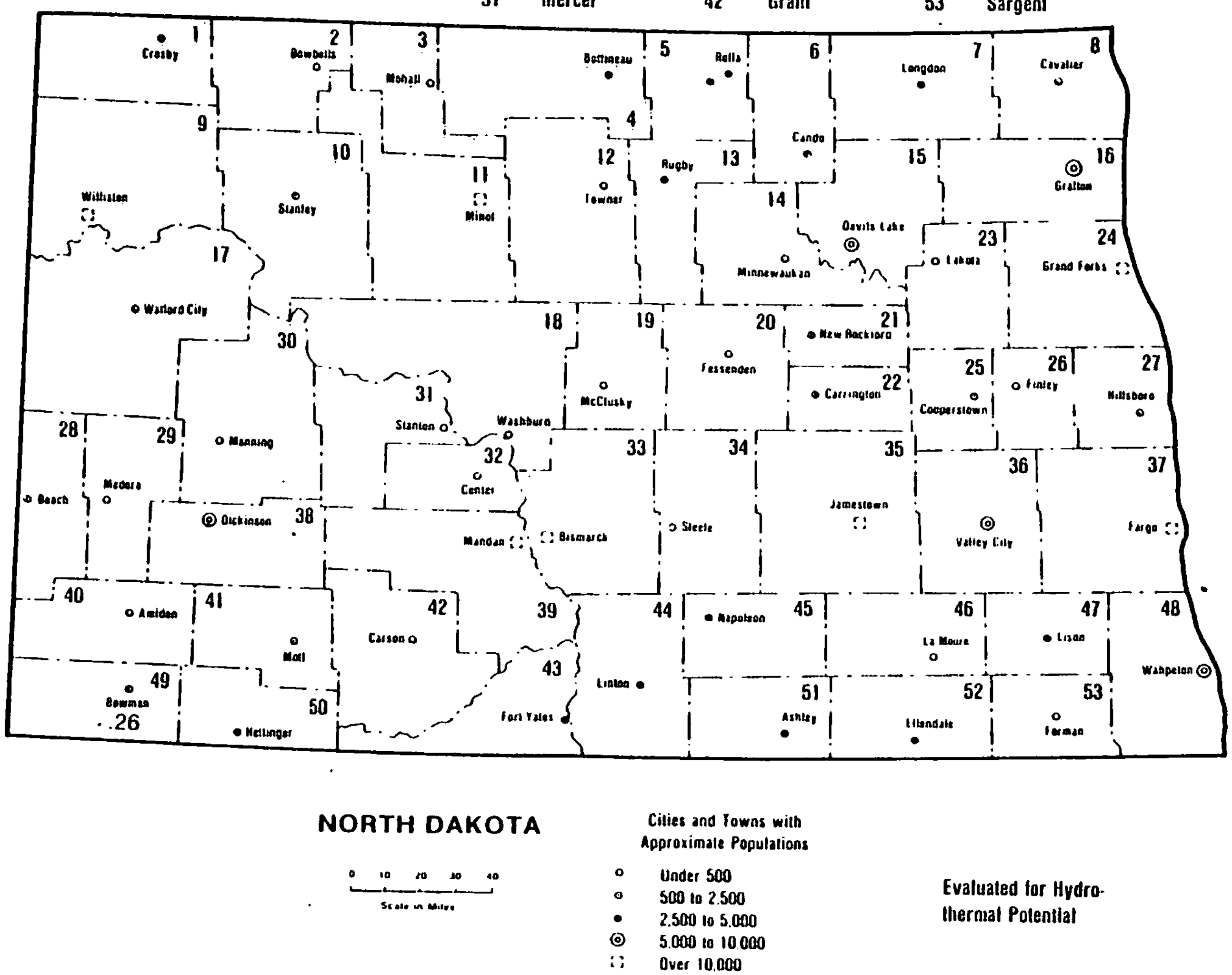

Fig. B-8 North Dakota Counties and Hydrothermal Resources.

TABLE B-XXIX

NORTH DAKOTA ENERGY USE BY COUNTIES

COUNTY	AVE. RES. TEMP. °C	INDUSTRIAL Standard Industrial Code (SIC)	INDUSTRIAL Btu's used x 10^{12}	RESIDENTIAL/COMMERCIAL Btu's used x 10^{12} Total	RESIDENTIAL/COMMERCIAL Btu's x 10^{12} (space conditioning & water heating)
NORTH DAKOTA					
ADAMS	90°	2011	.04	.19	.18
		2026	.01		
		2086	.01		
		3273	.01		
			.07		.18
BILLINGS					
BOTTINEAU	90°	2011	.02	.38	.34
		2024	.01		
			.03		.34
BOWMAN	90°	2011	.01	.23	.21
		2024	.01		
		3037	.01		
		3271	.02		
			.05		.21
BURKE	90°	2011	.01	.16	.14
DIVIDE					
DUNN	90°	2011	.02	.12	.1
EMMONS	90°	2011	.02	.27	.24
		2022	.02		
		3273	.01		
			.05		.24

TABLE B-XXIX (cont'd)

COUNTY NORTH DAKOTA	AVE. RES. TEMP. °C	INDUSTRIAL Standard Industrial Code (SIC)	INDUSTRIAL Btu's used x 10^{12}	RESIDENTIAL/COMMERCIAL Btu's used x 10^{12} Total	RESIDENTIAL/COMMERCIAL Btu's x 10^{12} (space conditioning & water heating)
GOLDEN VALLEY	90°	2011	.01	.16	.14
		2024	.01		
		3273	.01		
			.03		.14
GRANT	90°	2011	.02	.19	.17
HETTINGER	90°	2011	.01	.26	.23
		2026	.02		
			.03		.23
MCKENZIE	90°	2011	.01	.23	.21
		3271	.02		
			.03		.21
MCLEAN	90°	2011	.01	.43	.38
		2048	.02		
			.03		.38
MOUNTRAIL	90°	2011	.03	.48	.43
		2026	.02		
		3273	.01		
			.06		.43
RENVILLE	90°				
SLOPE	90°				

TABLE XXIX (cont'd)

COUNTY NORTH DAKOTA	AVE. RES. TEMP. °C	INDUSTRIAL Standard Industrial Code (SIC)	 Btu's used x 10^{12}	RESIDENTIAL/COMMERCIAL Btu's used x 10^{12} Total	 Btu's x 10^{12} (space conditioning & water heating)
STARK	90°	2011	.03	1.64	1.48
		2026	.05		
		2037	.02		
		3273	.02		
			.12		1.48
WARD	90°	2011	.06	3.91	3.52
		2026	.08		
		2086	.01		
		2034	.07		
		3273	.03		
			.25		3.52
WILLIAMS	90°	2011	.08	1.65	1.49
		2034	.02		
		2086	.02		
		3271	.02		
		3273	.03		
			.17		1.49

TABLE B-. A

GROWTH PROJECTION CALCULATIONS

State	SIC	1975 Btu x 10^{12}/yr	Growth Rate (%/yr)	1985 Btu x 10^{12}	2000 Btu x 10^{12}	2020 Btu x 10^{12}
NORTH DAKOTA						
	2011	.32	1.4%	.37	.45	.60
	2022	.01	2.7%	.01	.02	.03
	2024	.01	.3%	.01	.01	.01
	2026	.12	.3%	.12	.13	.14
	2034	.07	1.5%	.08	.10	.14
	2037	.02	8.5%	.05	.15	.79
	2048	.01	3.3%	.01	.02	.04
	2086	.03	4.4%	.05	.09	.21
	3271	.05	5.0%	.08	.17	.45
	3273	.02	3.4%	.03	.05	.09
Total Process Heat		.66		.81	1.19	2.50

TABLE 5-XXXI

INDUSTRIAL PROCESS HEAT

NORTH DAKOTA	1975 Btu/yr x 10^{12}	1985 Btu/yr x 10^{12}		2000 Btu/yr x 10^{12}		2020 Btu/yr x 10^{12}	
GEOTHERMAL POTENTIAL							
19 counties of 54 0 potential factor = (x)	.66	.81		1.19		2.50	
5% new industry		.51		1.93		6.47	
3% per capita increase use		.28		.89		2.25	
New Discovery factor = 20%				.32		.56	
GEOTHERMAL POTENTIAL TOTAL	.66	1.60		4.33		11.78	
GEOTHERMAL CAPTURE							
1% retrofit to 25% of 1975 base			.03		.13		.17
80% new growth capture (from 1980 on)			.56		2.18		5.96
GEOTHERMAL CAPTURE TOTAL			.59		2.31		6.13

TABLE B-XXXII

RESIDENTIAL/COMMERCIAL SPACE CONDITIONING

NORTH DAKOTA	1975 Btu/yr x 10^{12}	1985 Btu/yr x 10^{12}		2000 Btu/yr x 10^{12}		2020 Btu/yr x 10^{12}	
GEOTHERMAL POTENTIAL							
19 counties of 54 0 potential counties factor = (/ x)	9.26	13.71		24.69		54.09	
3% per capita increase use		3.18		10.13		25.76	
New Discovery factor = 20%				3.38		7.40	
GEOTHERMAL POTENTIAL TOTAL	9.26	16.89		38.20		87.25	
GEOTHERMAL CAPTURE							
1% retrofit to 25% of 1975 base			.46		1.85		2.32
70% new growth capture (from 1980 on)			4.01		14.92		34.34
GEOTHERMAL CAPTURE TOTAL			4.47		16.77		36.66

Number	County
1	Harding
2	Perkins
3	Corson
4	Campbell
5	McPherson
6	Brown
7	Marshall
8	Roberts
9	Butte
10	Ziebach
11	Dewey
12	Walworth
13	Edmunds
14	Day
15	Grant
16	Lawrence
17	Meade
18	Haakon
19	Stanley
20	Potter
21	Faulk
22	Spink
23	Codington
24	Sully
25	Hyde
26	Clark
27	Hamlin
28	Deuel
29	Beadle
30	Kingsbury
31	Brookings
32	Hughes
33	Hand
34	Pennington
35	Jackson
36	Jones
37	Lyman
38	Buffalo
39	Jerauld
40	Sanborn
41	Miner
42	Lake
43	Moody
44	Custer
45	Washabaugh
46	Mellette
47	Brule
48	Aurora
49	Davison
50	Hanson
51	McCook
52	Minnehaha
53	Fall River
54	Shannon
55	Bennett
56	Todd
57	Tripp
58	Gregory
59	Charles Mix
60	Douglas
61	Hutchinson
62	Turner
63	Lincoln
64	Bon Homme
65	Yankton
66	Clay
67	Union

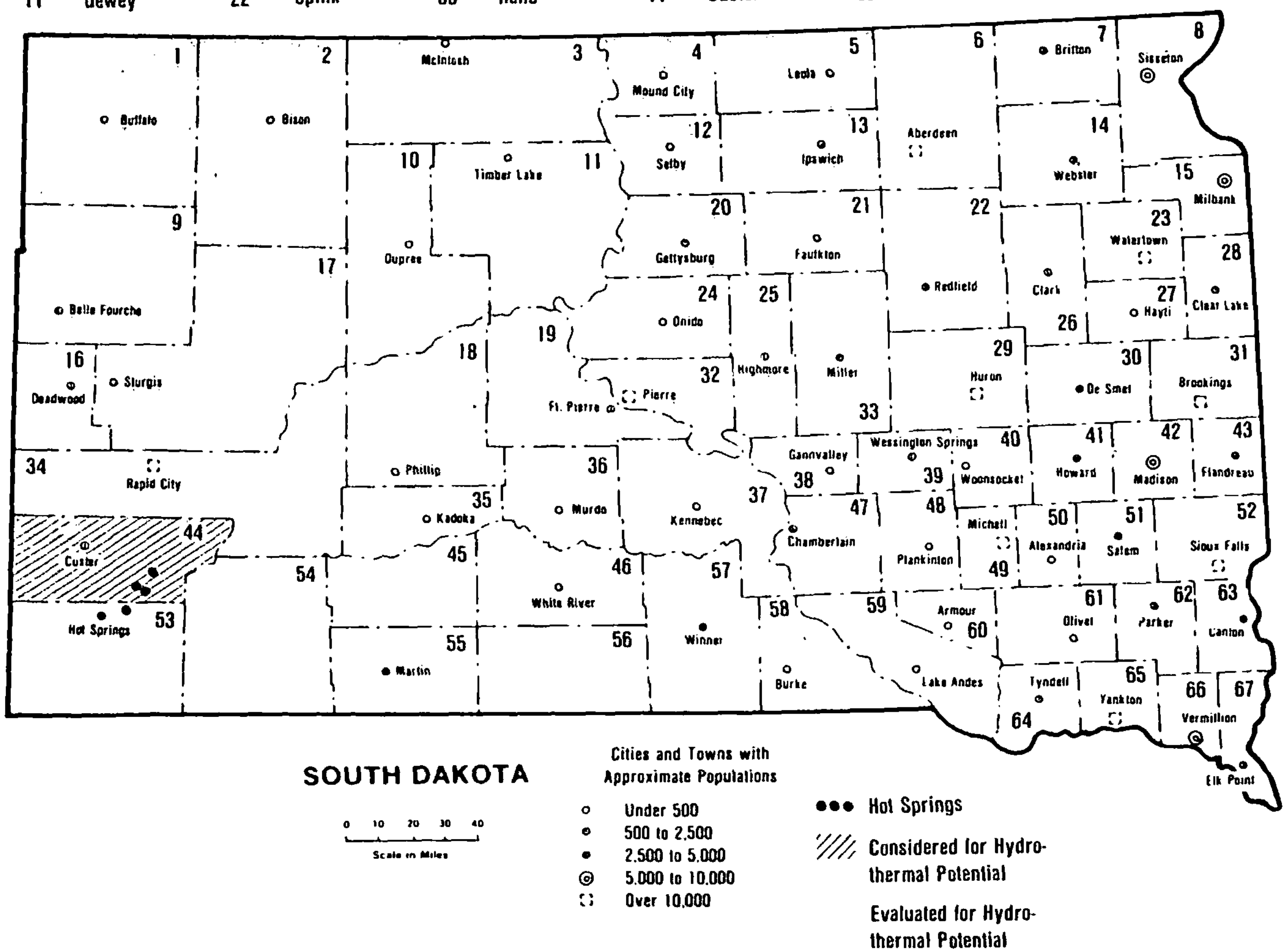

Fig. B-9 South Dakota Counties and Hydrothermal Resources

TABLE B-XXXIII

SOUTH DAKOTA ENERGY USE BY COUNTIES

COUNTY	AVE. RES. TEMP. °C	INDUSTRIAL		RESIDENTIAL/COMMERCIAL	
SOUTH DAKOTA		Standard Industrial Code (SIC)	Btu's used x 10^{12}	Btu's used x 10^{12} Total	Btu's x 10^{12} (space conditioning & water heating)
BUTTE	90°	2048 3271	.02 .05	.51	.45
Total			.07		.45
CAMPELL	90°	3271	.05	.06	.05
CARSON	90°	NO MATCH		.09	.08
DEWEY	90°			.065	.055
EDMUNDS	90°			.12	.1
FALL RIVER	90°	2011 2048	.01 .02	.6	.54
			.03		.54
HAAKON	90°			.1	.09
HARDING	90°				
JACKSON	90°				

TABLE B-XXXIII (cont'd)

COUNTY	AVE. RES. TEMP. °C	INDUSTRIAL Standard Industrial Code (SIC)	INDUSTRIAL Btu's used x 10^{12}	RESIDENTIAL/COMMERCIAL Btu's used x 10^{12} Total	RESIDENTIAL/COMMERCIAL Btu's x 10^{12} (space conditioning & water heating)
SOUTH DAKOTA					
JONES	90°				
LAWRENCE	90°			.56	.5
MCPHERSON	90°	2022 2048	.01 .08	.24	.22
			.09		.22
MEADE	90°	2022 3271	.02 .05	.47	.42
			.07		.42
HUGHES	90°	2086 3271	.02 .30	1.0	.9
			.32		.9
MELLETTE	90°	NO MATCH		.06	.05
PERKINS	90°			.2	.18

TABLE B-XXXIII (cont'd)

COUNTY	AVE. RES. TEMP. °C	INDUSTRIAL		RESIDENTIAL/COMMERCIAL	
SOUTH DAKOTA		Standard Industrial Code (SIC)	Btu's used x 10^{12}	Btu's used x 10^{12} Total	Btu's x 10^{12} (space conditioning & water heating)
PENNINGTON	90°	2011 2026 2046 2086 3271	.19 .21 .23 .10 .31	4.56	4.1
			1.04		4.1
POTTER	90°			.20	.18
STANLEY	90°	2011	.01	.15	.11
SULLEY	90°				
WALWORTH	90°	2021 2022 2026 3271	.01 .01 .02 .05	.64	.6
			.09		.6

TABLE B-X[illegible]IV

GROWTH PROJECTION CALCULATIONS

State	SIC	1975 Btu x 10^{12}/yr	Growth Rate (%/yr)	1985 Btu x 10^{12}	2000 Btu x 10^{12}	2020 Btu x 10^{12}
SOUTH DAKOTA						
	2011	.18	1.4%	.21	.26	.34
	2021	.01	0.3%	.01	.01	.01
	2022	.03	2.7%	.04	.06	.10
	2026	.15	0.3%	.16	.16	.17
	2046	.14	3.3%	.19	.32	.60
	2048	.07	3.3%	.10	.16	.30
	2086	.09	4.4%	.14	.26	.62
	3271	.61	5.0%	.99	2.06	5.48
Total- Process Heat		1.28		1.84	3.29	7.62

TABLE B-X

INDUSTRIAL PROCESS HEAT

SOUTH DAKOTA	1975 Btu/yr x 10^{12}	1985 Btu/yr x 10^{12}		2000 Btu/yr x 10^{12}		2020 Btu/yr x 10^{12}	
GEOTHERMAL POTENTIAL							
20 counties of 68 0 potential factor = .(x)	1.28	1.84		3.29		7.62	
5% new industry		.80		3.05		10.22	
3% per capita increase use		.44		1.40		3.56	
New Discovery factor = 20%				.62		1.07	
GEOTHERMAL POTENTIAL TOTAL	1.28	3.08		8.36		22.47	
GEOTHERMAL CAPTURE							
1% retrofit to 25% of 1975 base			.06		.26		.32
80% new growth capture (from 1980 on)			1.08		4.22		11.29
GEOTHERMAL CAPTURE TOTAL			1.14		4.48		11.61

TABLE B-XXX.

RESIDENTIAL/COMMERCIAL SPACE CONDITIONING

SOUTH DAKOTA	1975 Btu/yr x 10^{12}	1985 Btu/yr x 10^{12}		2000 Btu/yr x 10^{12}		2020 Btu/yr x 10^{12}	
GEOTHERMAL POTENTIAL							
20 counties of 68 0 potential counties factor = (/ x)	8.63	12.77		23.01		50.41	
3% per capita increase use		2.97		9.44		24.01	
New Discovery factor =				3.15		6.90	
GEOTHERMAL POTENTIAL TOTAL	8.63	15.74		35.60		81.32	
GEOTHERMAL CAPTURE							
1% retrofit to 25% of 1975 base			.43		1.73		2.16
70% new growth capture (from 1980 on)			3.73		13.90		32.00
GEOTHERMAL CAPTURE TOTAL			4.16		15.63		34.16

Number	County
1	Box Elder
2	Cache
3	Rich
4	Weber
5	Morgan
6	Tooele
7	Davis
8	Summit
9	Daggett
10	Salt Lake
11	Utah
12	Wasatch
13	Duchesne
14	Uintah
15	Juab
16	Sanpete
17	Carbon
18	Millard
19	Emery
20	Grand
21	Sevier
22	Beaver
23	Piute
24	Wayne
25	San Juan
26	Iron
27	Garfield
28	Washington
29	Kane

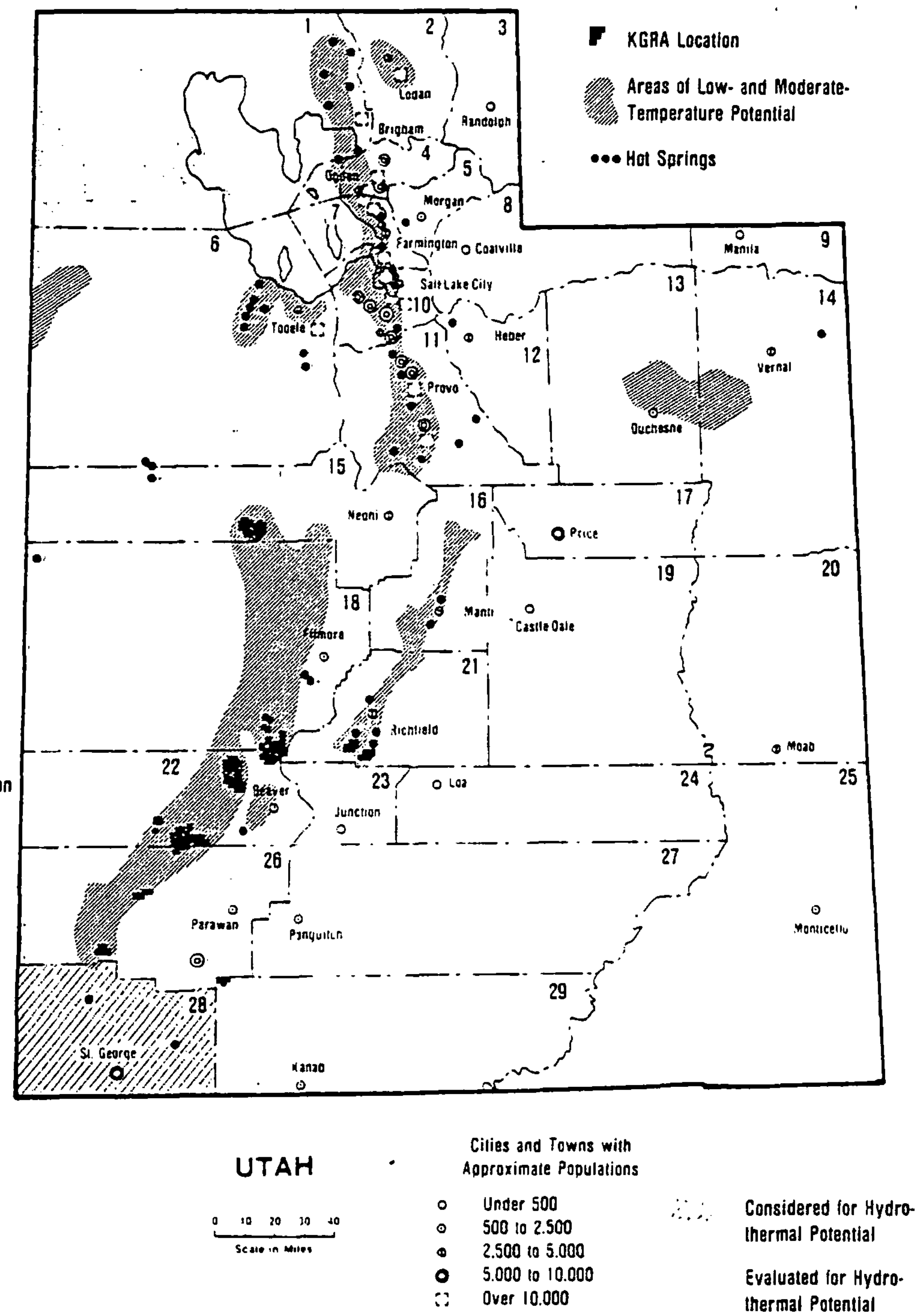

Fig. B-10 Utah Counties and Hydrothermal Resources

TABLE B-XXXVII

UTAH ENERGY USE BY COUNTY

COUNTY UTAH	AVE. RES. TEMP. °C	INDUSTRIAL Standard Industrial Code (SIC)	Btu's used x 10^{12}	RESIDENTIAL/COMMERCIAL Btu's used x 10^{12} Total	Btu's x 10^{12} (space conditioning & water heating)
BEAVER	274°	2026	.02	.3	.24
		3273	.02		
			.04		.24
BOX ELDER	90°	2011	.04	2.0	1.6
		2048	.01		
		2086	.04		
		3273	.17		
			.26		1.6
CACHE	90°	2011	.37	3.6	2.9
		2013	.02		
		2022	1.14		
		2026	.10		
		2048	.11		
		2086	.02		
		3273	.18		
			1.94		2.9
DAVIS	78°	2011	.01	13.7	10.9
		2026	.01		
		3271	.63		
		3273	.03		
			.68		10.9
DUCHESNE	90°	2011	.02	.425	.34
		2022	.01		
		3273	.03		
			.06		.34
IRON	131°	2011	.02	.11	.09
		2026	.02		
		2086	.04		
		3273	.01		
			.09		.09

TABLE B-XXXVII (cont'd)

COUNTY UTAH	AVE. RES. TEMP. °C	INDUSTRIAL Standard Industrial Code (SIC)	INDUSTRIAL Btu's used x 10^{12}	RESIDENTIAL/COMMERCIAL Btu's used x 10^{12} Total	RESIDENTIAL/COMMERCIAL Btu's x 10^{12} (space conditioning & water heating)
JUAB	98°	2011	.02	.28	.22
KANE	90°			.15	.12
MILLARD	78°	2011	.01	.42	.34
		2022	.01		
		2048	.05		
		3271	.02		
		3273	.01		
Total			.10		.34
MORGAN	90°			.33	.27
SALT LAKE	81°	2011	.50	26.0	20.8
		2013	14		
		2016	.09		
		2022	.04		
		2023	.02		
		2024	.13		
		2026	1.14		
		2048	.13		
		2086	.58		
		2436	.01		
		2512	.20		
		2653	.45		
		2819	1.40		
		2841	1.32		
		3271	.40		
		3273	.95		
		3295	1.00		
			8.50		20.8

TABLE B-XXXVII (cont'd)

COUNTY UTAH	AVE. RES. TEMP. °C	INDUSTRIAL Standard Industrial Code (SIC)	Btu's used x 10^{12}	RESIDENTIAL/COMMERCIAL Btu's used x 10^{12} Total	Btu's x 10^{12} (space conditioning & water heating)
SANPETE	90°	2011	.01	.86	.69
		2016	1.80		
		2018	.85		
		3273	.06		
			1.87		.69
SEVIER	104°	2011	.02	.8	.64
		2016	.15		
		2026	.04		
		2048	.02		
		2086	.02		
		3271	.02		
		3273	.01		
			.28		.64
TOOELE	90°	2011	.02	.5	.4
		2026	.01		
		2821	.10		
		3273	.05		
			.18		.4
UINTAH	90°	2011	.01	.10	.08
		2026	.01		
		2086	.02		
		2511	.02		
		3273	.01		
			.07		.08
UTAH	90°	2011	.11	13.7	11.0
		2013	.05		
		2016	.17		
		2026	.07		
		2034	.06		
		2046	.04		
		2086	.17		
		2892	.76		
		3271	.22		
		3273	.52		
			2.13		11.0

TABLE B-XXXVII (cont'd)

COUNTY UTAH	AVE. RES. TEMP. °C	INDUSTRIAL Standard Industrial Code (SIC)	 Btu's used x 10^{12}	RESIDENTIAL/COMMERCIAL Btu's used x 10^{12} Total	 Btu's x 10^{12} (space conditioning & water heating)
WASATCH	90°	2048	.02	.43	.34
		3273	.01		
			.03		.34
WEBER	90°	2011	.28	11.5	9.2
		2013	.02		
		2016	1.00		
		2026	.31		
		2048	.10		
		2036	.21		
		2512	.01		
		3271	1.35		
		3273	.05		
			3.34		9.2

TABLE B-. /III

GROWTH PROJECTION CALCULATIONS

State	SIC	1975 Btu x 10^{12}/yr	Growth Rate (%/yr)	1985 Btu x 10^{12}	2000 Btu x 10^{12}	2020 Btu x 10^{12}
UTAH						
	2011	1.13	1.4%	1.30	1.60	2.11
	2013	.18	1.4%	.21	.26	.34
	2016	2.41	3.0%	3.24	5.05	9.11
	2022	.84	2.7%	1.10	1.64	2.79
	2023	.02	0.0%	.02	.02	.02
	2024	.11	.3%	.11	.12	.13
	2026	.11	.3%	.11	.12	.13
	2034	.05	1.5%	.06	.07	.10
	2048	.80	313%	1.11	1.80	3.45
	2086	.83	4.4%	1.28	1.32	5.76
			1.0%			
	2511	.01	5.2%	.02	.04	.10
	2512	.13	5.2%	.22	.46	1.27
	2653	.23	3.6%	.33	.56	1.13
	2819	1.05	6.8%	2.03	5.44	20.27
	2821	.08	8.9%	.19	.67	3.71
	2841	.92	8.5%	2.08	7.07	36.15
	2892	.46	8.5%	1.04	3.54	18.08
	3271	1.98	.0%	3.23	6.71	17.80
	3273	.41	3.4%	.57	.95	1.85
	3295	.65	8.0%	1.40	4.45	20.75
		13.40		19.65	41.89	145.05

TABLE XXIX

INDUSTRIAL PROCESS HEAT

UTAH	1975 Btu/yr x 10^{12}	1985 Btu/yr x 10^{12}		2000 Btu/yr x 10^{12}		2020 Btu/yr x 10^{12}	
GEOTHERMAL POTENTIAL							
18 counties of 29 0 potential factor = (x)	12.40	19.65		41.89		145.05	
5% new industry		7.80		29.59		99.01	
3% per capita increase use		4.26		13.56		34.49	
New Discovery factor = 20%				6.34		11.02	
GEOTHERMAL POTENTIAL TOTAL	12.40	31.71		91.38		289.57	
GEOTHERMAL CAPTURE							
1% retrofit to 25% of 1975 base			.62		2.48		3.10
80% new growth capture (from 1980 on)			11.59		47.74		158.55
GEOTHERMAL CAPTURE TOTAL			12.21		50.22		161.55

TABLE B-XXX

RESIDENTIAL/COMMERCIAL SPACE CONDITIONING

UTAH	1975 Btu/yr x 10^{12}	1985 Btu/yr x 10^{12}		2000 Btu/yr x 10^{12}		2020 Btu/yr x 10^{12}	
GEOTHERMAL POTENTIAL							
18 counties of 29 0 potential counties factor = (/ x)	60.17	89.07		160.40		351.46	
3% per capita increase use		20.69		65.81		167.37	
New Discovery factor = 20%				21.95		48.10	
GEOTHERMAL POTENTIAL TOTAL	60.17	109.76		248.16		566.93	
GEOTHERMAL CAPTURE							
1% retrofit to 25% of 1975 base			3.01		12.03		15.04
70% new growth capture (from 1980 on)			26.03		96.88		223.14
GEOTHERMAL CAPTURE TOTAL			29.04		108.91		238.18

Number	County
1	Park
2	Big Horn
3	Sheridan
4	Campbell
5	Crook
6	Teton
7	Hot Springs
8	Washakie
9	Johnson
10	Weston
11	Fremont
12	Natrona
13	Converse
14	Niobrara
15	Sublette
16	Lincoln
17	Sweetwater
18	Carbon
19	Albany
20	Platte
21	Goshen
22	Uinta
23	Laramie

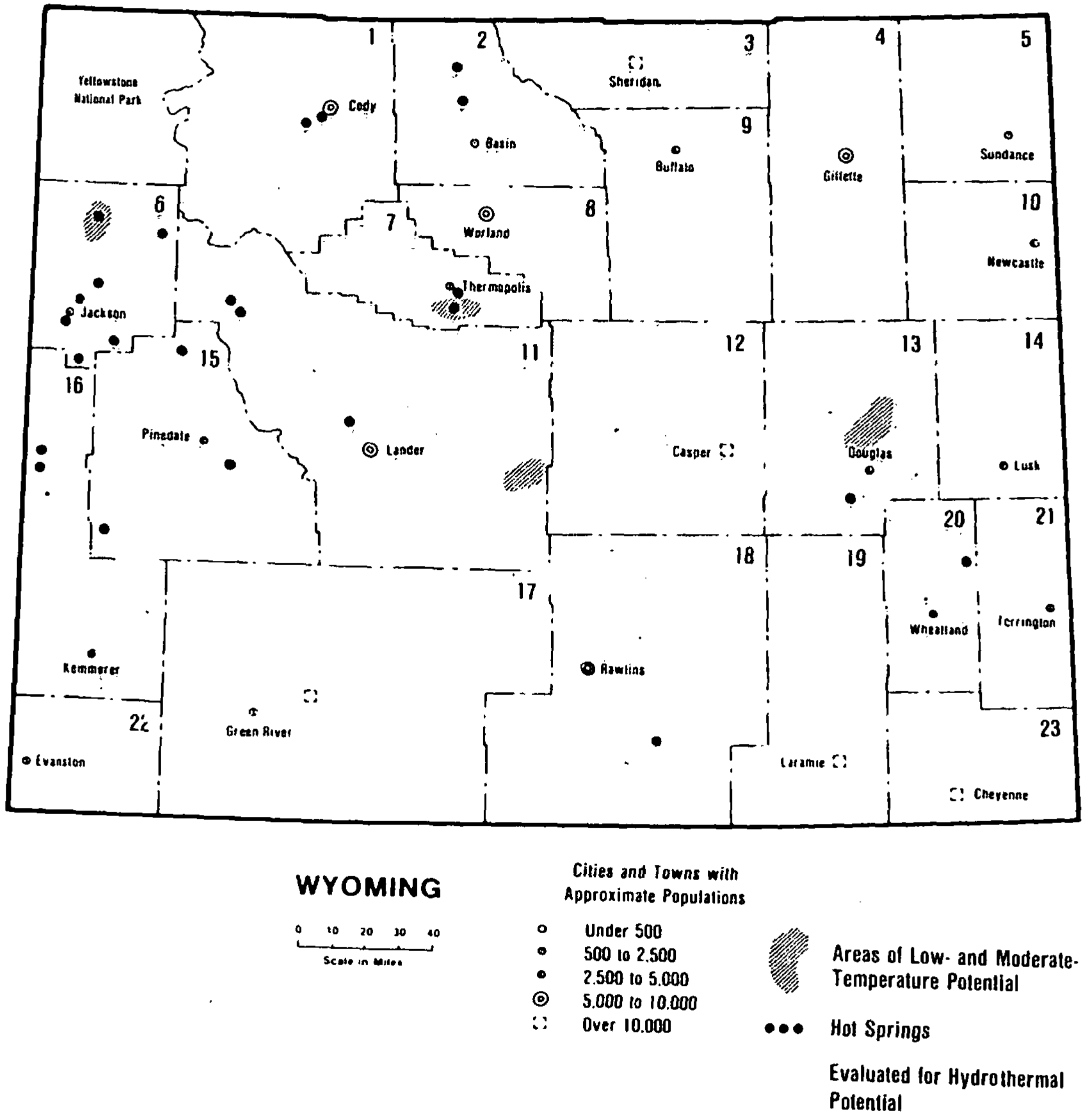

Fig. 11 Wyoming Counties and Hydrothermal Resources

TABLE B-XXXXI

WYOMING ENERGY USE BY COUNTIES

COUNTY WYOMING	AVE. RES. TEMP. °C	INDUSTRIAL Standard Industrial Code (SIC)	INDUSTRIAL Btu's used x 10^{12}	RESIDENTIAL/COMMERCIAL Btu's used x 10^{12} Total	RESIDENTIAL/COMMERCIAL Btu's x $10^{6?}$ (space conditioning & water heating)
BIG HORN	90°	2011	.10	3.00	2.25
		2026	.20		
		2048	.07		
		3271	.02		
		3273	.12		
			.51		2.25
CARBON	90°	2011	.02	2.7	2.0
		2048	.01		
		3273	.02		
			.05		2.0
CONVERSE	90°	2011	.01	1.3	.99
		3271	.07		
			.08		.99
FREMONT	90°	2011	.02	3.00	2.25
		2026	.03		
		2048	.02		
		3273	.02		
			.09		2.25
HOT SPRINGS	58°				
LINCOLN	82°	2011	.01	1.97	1.48
		2022	.08		
		3275	.09		
			.18		1.48

TABLE B-XXXXI (cont'd)

COUNTY	AVE. RES. TEMP. °C	INDUSTRIAL Standard Industrial Code (SIC)	Btu's used x 10^{12}	RESIDENTIAL/COMMERCIAL Btu's used x 10^{12} Total	Btu's x 10^{12} (space conditioning & water heating)
WYOMING					
NATRONA	55°	2086	.06	7.4	5.55
		3273	.08		
			.14		5.55
PARK	90°	2011	.01	1.2	.9
		2026	.01		
		2086	.02		
		3273	.01		
			.05		.9
PLATTE	90°			.690	.5
		NO MATCH			
SUBLETTE	90°				
SHERIDAN	90°	2011	.05	.21	.16
TETON	138°	2013	.02	.68	.5
		2086	.02		
		2421	.02		
		3273	.04		
			.10		.5

TABLE B XXII

GROWTH PROJECTION CALCULATIONS

State	SIC	1975 Btu x 10^{12}/yr	Growth Rate (%/yr)	Btu x 10^{12}	Btu x 10^{12}	Btu x 10^{12}
WYOMING						
	2011	.18	1.4%	.24	.30	.39
	2013	.02	1.4%	.02	.03	.04
	2022	.06	2.7%	.08	.12	.20
	2026	.16	0.3%	.16	.17	.18
	2048	.06	3.3%	.08	.14	.20
	2086	.08	4.4%	.12	.23	.55
	2421		1.0%			
	3271	.07	5.0%	.11	.24	.63
	3273	.05	3.4%	.07	.12	.23
	3275	.06	8.0%	.12	.41	1.92
		.74		1.01	1.76	4.40

TABLE B-. III

INDUSTRIAL PROCESS HEAT

WYOMING	1975 Btu/yr x 10^{12}	1985 Btu/yr x 10^{12}		2000 Btu/yr x 10^{12}		2020 Btu/yr x 10^{12}	
GEOTHERMAL POTENTIAL							
12 counties of 23 0 potential factor = (x)	.74	1.01		1.76		4.40	
5% new industry		.47		1.77		5.91	
3% per capita increase use		.25		.81		2.06	
New Discovery factor = 20%				.35		.60	
GEOTHERMAL POTENTIAL TOTAL	.74	1.73		4.69		12.97	
GEOTHERMAL CAPTURE							
1% retrofit to 25% of 1975 base			.04		.15		.19
80% new growth capture (from 1980 on)			.59		2.37		6.62
GEOTHERMAL CAPTURE TOTAL			.63		2.52		6.81

TABLE B-XXXIV

RESIDENTIAL/COMMERCIAL SPACE CONDITIONING

WYOMING	1975 Btu/yr x 10^{12}	1985 Btu/yr x 10^{12}		2000 Btu/yr x 10^{12}		2020 Btu/yr x 10^{12}	
GEOTHERMAL POTENTIAL							
12 counties of 23 0 potential counties factor = (/ x)	16.58	24.54		44.20		96.85	
3% per capita increase use		5.70		18.13		46.12	
New Discovery factor = 20%				6.05		13.25	
GEOTHERMAL POTENTIAL TOTAL	16.58	30.24		68.38		156.22	
GEOTHERMAL CAPTURE							
1% retrofit to 25% of 1975 base			.83		3.32		4.15
70% new growth capture (from 1980 on)			7.17		26.70		61.49
GEOTHERMAL CAPTURE TOTAL			8.00		30.02		65.64

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