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Geothermal Direct Heat Use: Market Potential/Penetration Analysis for Federal Region IX
(Arizona, California, Hawaii, Nevada)

Edited by
William Powell
Kenneth Tang

May 1980

Prepared for
U.S. Department of Energy
Office of the Regional Representative, Region IX
and the San Francisco Operations Office

Through an agreement with
National Aeronautics and Space Administration
by
Jet Propulsion Laboratory
California Institute of Technology
Pasadena, California
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ABSTRACT

A preliminary study was made of the potential for geothermal direct heat use in Arizona, California, Hawaii, and Nevada (Federal Region IX). The analysis for each state was performed by a different team, located in that state. For each state, the study team was asked to:

1. Define the resource, based on the latest available data.
2. Assess the potential market growth for geothermal energy.
3. Estimate the market penetration, projected to 2020.

Each of the four states of interest in this study is unique in its own way. Rather than impose the same assumptions as to growth rates, capture rates, etc. on all of the study teams, each team was asked to use the most appropriate set of assumptions for its state. The results, therefore, should reflect the currently accepted views within each state.

The four state reports comprise the main portion of this document. A brief regional overview section was prepared by the Jet Propulsion Laboratory, following completion of the state reports.
FOREWORD

The work documented by this report was performed by a team of analysts from each of the four states in Region IX. The principal contributors are listed below, as well as the agencies which provided much of the data. The work was coordinated by the Energy Systems Analysis Group, Jet Propulsion Laboratory, California Institute of Technology, for the Office of the Regional Representative, Region IX, and the San Francisco Operations Office, Department of Energy. Overall direction of the work was the responsibility of Sharon Sillars of the Department of Energy. The regional summary section was prepared by William Powell and Ken Tang of the Jet Propulsion Laboratory.
ACKNOWLEDGEMENT

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Major Sources of Information

U.S. Geological Survey
California Energy Commission
Solar Energy Research Institute
Lawrence Berkeley Laboratory
Department of Planning and Economic Development, Hawaii
New Mexico Energy Institute
Nevada Department of Energy
California Division of Mines and Geology
U.S. Naval Weapons Center, China Lake, California
Sierra Pacific Power Company
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<th>Title</th>
<th>Page</th>
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</thead>
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SECTION I
EXECUTIVE SUMMARY

A preliminary study was made of the potential for geothermal direct heat use in Arizona, California, Hawaii, and Nevada (Federal Region IX). The analysis for each state was performed by a different team, located in that state. For each state, the study team was asked to:

(1) Define the resource, based on the latest available data.
(2) Assess the potential market growth for geothermal energy.
(3) Estimate the market penetration, projected to 2020.

Each of the four states of interest in this study is unique in its own way. Rather than impose the same assumptions as to growth rates, capture rates, etc. on all of the study teams, each team was asked to use the most appropriate set of assumptions for its state. The results, therefore, should reflect the currently accepted views within each state.

The four state reports comprise the main portion of this document. A brief regional overview section was prepared by the Jet Propulsion Laboratory, following completion of the state reports.

At DOE's direction, the document entitled Regional Hydrothermal Market Penetration Analysis - Rocky Mountain, and Basin and Range Region, by EG&G Idaho, Inc., was used as a baseline for this work.

The findings of this preliminary study are summarized below:

(1) Potentially economical hydrothermal resources exist in all four states of the Region; however, the resource database is largely incomplete, particularly for low-to-moderate temperature resources.

(2) Existing industrial and population concentrations are co-located with identified hydrothermal resources only in some cases, such as Maricopa and Pima Counties in Arizona, San Diego and Imperial Counties in California, Clark and
Washoe Counties in Nevada, and Honolulu and Hawaii Counties in Hawaii, for example.

(3) Where co-location does not occur at present, future market penetration will depend upon economic and other factors which may motivate redistribution of the existing concentrations of industry and population. If this occurs, the impact on geothermal market penetration may be very significant.

(4) In terms of beneficial heat, the total hydrothermal resource identified so far for the four states is on the order of 43 Quads, including an estimated 34 Quads of high temperature (T > 150°C) resources which are suitable for direct as well as electrical applications.

(5) Based on assumptions which are unique to each state report, the estimated market penetration (or capture) of direct applications of geothermal energy in the Region may be on the order of 0.02 Quad in 1985, 0.19 Quad in 2000, and 0.45 Quad in 2020.*

(6) In California, Hawaii, and Nevada, the industrial market sector has somewhat greater potential for penetration than the residential/commercial sector. In Arizona, however, the situation is reversed, due to the co-location of two major metropolitan areas (Phoenix and Tucson) with potential geothermal resources.

The role of the Jet Propulsion Laboratory in this preliminary study was that of coordination and compilation. Responsibility for the projections contained in this report rests with the state study teams. It is recommended that a more comprehensive treatment be given to the method and assumptions to be used in any future regional market penetration study.

*As a point of reference, the total industrial, residential, and commercial energy use in 1975 for Arizona was 0.402 Quad.
SECTION II
INTRODUCTION

The development of domestic energy sources to decrease dependence on foreign gas and petroleum is a current American policy goal. Geothermal energy resources are an attractive alternative because they are readily available in many parts of the country, their application can efficiently replace fuel consumption, their development appears less environmentally objectionable than other energy sources, and the current state of technology is sufficient for development. As a part of its effort toward the national goal, the Division of the Geothermal Resource Manager (DGRM) of the U.S. Department of Energy has undertaken a program to stimulate commercial development of geothermal energy. This report presents an assessment of the market for direct heat (nonelectric) applications of geothermal energy in DOE Region IX, consisting of Arizona, California, Hawaii, and Nevada. This work supports the DOE commercialization program by identifying the market sectors best suited to geothermal direct heat use and by providing a baseline for more detailed or site-specific market studies to follow.

SCOPE

The purpose of this preliminary study is to indicate the potential of geothermal direct heat applications in DOE Region IX for regional planning purposes and to provide a current assessment of resources and markets for direct heat applications. Independent teams were responsible for the analysis within each of the states. The scope of the state efforts differed somewhat because the Arizona and Nevada studies basically updated previous work published by the New Mexico Energy Institute and EG&G Idaho, while the work in Hawaii and California was more of an initial effort.
This study encompasses the following tasks:

(1) **Resource Definition**: Identification of resource sites suitable for geothermal direct heat applications and estimation of the beneficial heat available, where possible.

(2) **Market Potential**: The amount of energy used as heat rather than mechanical work which could be supplied by geothermal resources, assuming suitable resource temperatures. The consumers of this thermal energy — industries with process heat requirements and heated or cooled buildings — constitute a market where geothermal energy can be sold. The consumption of thermal energy is expected to increase with time, as with population, so the growth of the potential market is projected to the year 2020.

(3) **Market Penetration**: The amount of energy which will be supplied to the potential market of thermal energy consumers from the geothermal resource base. This is also projected to the year 2020. Penetration estimates are intended to reflect which energy consumers are likely to use geothermal heat in the near term, which in the long term, and which are unlikely to use geothermal heat. Penetration depends on the prices and stability of supply of competing energy sources such as fuels, and on the costs of developing geothermal systems.

The market of heat consumers is divided into two sectors — the residential/commercial sector which requires heat for space conditioning and hot water, and the industrial sector which uses process heat. The contribution of individual industries within the sector is also included. Agricultural heat use was included as a separate sector in the California study. It was originally proposed to include military reservations, with their space conditioning and water heating needs, as a sector. Data on the thermal energy consumption at military facilities was not readily available, however. For reference, military facilities which are located near prospective geothermal sites are listed in Table 2-1. The four state reports are included in the present document for ease of reference.
### Table 2-1. Military Facilities Near Possible Resource Sites

<table>
<thead>
<tr>
<th>State</th>
<th>Facilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arizona</td>
<td>Davis-Monthan Air Force Base</td>
</tr>
<tr>
<td></td>
<td>Luke Air Force Base</td>
</tr>
<tr>
<td></td>
<td>Willcox Bombing Range</td>
</tr>
<tr>
<td></td>
<td>Williams Air Force Base</td>
</tr>
<tr>
<td></td>
<td>Yuma Proving Ground</td>
</tr>
<tr>
<td>California</td>
<td>China Lake Naval Weapons Center</td>
</tr>
<tr>
<td></td>
<td>El Centro Naval Air Station</td>
</tr>
<tr>
<td></td>
<td>Marine Corps Air Station (Imperial County)</td>
</tr>
<tr>
<td></td>
<td>Fort Bidwell</td>
</tr>
<tr>
<td></td>
<td>National Parachute Test Range</td>
</tr>
<tr>
<td></td>
<td>Norton Air Force Base</td>
</tr>
<tr>
<td></td>
<td>Twenty-nine Palms Marine Corps Base</td>
</tr>
<tr>
<td>Hawaii</td>
<td>Pearl Harbor facilities</td>
</tr>
<tr>
<td>Nevada</td>
<td>Fallon Naval Air Station</td>
</tr>
<tr>
<td></td>
<td>Nellis Air Force Base</td>
</tr>
<tr>
<td></td>
<td>Naval Ammunition Depot at Babbitt</td>
</tr>
<tr>
<td></td>
<td>Mercury, Nevada Test Site</td>
</tr>
</tbody>
</table>
SECTION III
REGIONAL OVERVIEW

A. RESOURCE OVERVIEW

The latest USGS national summary (Circular 790) of hydrothermal convection systems with temperatures greater than 90°C shows a total identified resource of approximately 400 ± 60 Quads. When converted to beneficial heat, the total would be about 92 ± 20 Quads (50 ± 7 Quads from hot water over 150°C and 42 ± 13 Quads from hot water between 90°C and 150°C). For the four states in Region IX, Table 3-1 shows a total beneficial heat of approximately 38 Quads, based on the same data source.

The results of this preliminary study are shown in Table 3-2, based on the individual state reports. The total beneficial heat is approximately 43 Quads, or 5 Quads higher than the previous table. Higher values reported for Arizona and Nevada account for the difference. A significant amount of energy from the under-90°C resources was reported for these two states, whereas no quantitative data for this temperature range was available from USGS Circular 790. As noted, the estimates for Arizona could be increased by another 5 to 6 Quads if the assumption regarding zero recharge were to be modified (see discussion in Arizona Report, Part A).

Table 3-1. Beneficial Heat* - Based on USGS Circular 790 Data (1978)

<table>
<thead>
<tr>
<th>°C</th>
<th>AZ</th>
<th>CA</th>
<th>HI</th>
<th>NV</th>
<th>Region</th>
</tr>
</thead>
<tbody>
<tr>
<td>T &gt; 150</td>
<td>0.06</td>
<td>26.53</td>
<td>0.45</td>
<td>6.48</td>
<td>33.52</td>
</tr>
<tr>
<td>90 - 150</td>
<td>0.21</td>
<td>1.92</td>
<td>-</td>
<td>2.03</td>
<td>4.16</td>
</tr>
<tr>
<td>T &lt; 90</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Total Quads</td>
<td>0.27</td>
<td>28.45</td>
<td>0.45</td>
<td>8.51</td>
<td>37.68</td>
</tr>
</tbody>
</table>

*Beneficial heat = energy at wellhead x utilization factor (0.24)
(Ref. USGS Circular 790)
Table 3-2. Beneficial Heat - Based on State Reports

<table>
<thead>
<tr>
<th>°C</th>
<th>AZ*</th>
<th>CA</th>
<th>HI</th>
<th>NV</th>
<th>Σ Region</th>
</tr>
</thead>
<tbody>
<tr>
<td>T &gt; 150</td>
<td>0.05</td>
<td>26.53</td>
<td>0.45</td>
<td>6.97</td>
<td>34.00</td>
</tr>
<tr>
<td>90 - 150</td>
<td>0.49</td>
<td>2.11</td>
<td>-</td>
<td>3.77</td>
<td>6.37</td>
</tr>
<tr>
<td>T &lt; 90</td>
<td>0.97</td>
<td>-</td>
<td>-</td>
<td>1.38</td>
<td>2.35</td>
</tr>
<tr>
<td>Total Quads</td>
<td>1.51</td>
<td>28.64</td>
<td>0.45</td>
<td>12.12</td>
<td>42.72</td>
</tr>
</tbody>
</table>

*Estimates for Arizona based on zero recharge. With recharge, total for Arizona could be increased to approximately 7 Quads.

Since no data was reported for under-90°C resources in California and Hawaii, and also for 90-150°C resources in Hawaii, it seems reasonable to expect that the total for Region IX could be even higher than shown, as more data become available.

Resources in the over-150°C range are usually considered only for electrical generation. However, we have included such resources in the above tabulations because they are also suitable for direct heat applications.

B. MARKET OVERVIEW

A summary of the estimated market penetration in each of the four states is given in Table 3-3 for 1985, 2000, and 2020. Market sectors consist of residential/commercial (space conditioning and water heating) and industrial (process heat). The agricultural sector was included for California only.

Within each state, a few key counties have the major share of the total estimated market capture. Table 3-4 shows the estimates for three key counties in each state. These 12 counties represent some (but not all) of the most likely areas for the commercial development of hydrothermal energy in the Region, based on the matching of resource and demand projections.
<table>
<thead>
<tr>
<th>State</th>
<th>1985</th>
<th>2000</th>
<th>2020</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arizona</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Resid./Comm.</td>
<td>16.0</td>
<td>104.3</td>
<td>253.0</td>
</tr>
<tr>
<td>Industrial</td>
<td>0.6</td>
<td>3.1</td>
<td>8.7</td>
</tr>
<tr>
<td>Total</td>
<td>16.6</td>
<td>107.4</td>
<td>261.7</td>
</tr>
<tr>
<td>California</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Resid./Comm.</td>
<td>1.4</td>
<td>18.8</td>
<td>34.6</td>
</tr>
<tr>
<td>Industrial</td>
<td>1.6</td>
<td>23.4</td>
<td>63.5</td>
</tr>
<tr>
<td>Agricultural</td>
<td>0.1</td>
<td>0.9</td>
<td>2.2</td>
</tr>
<tr>
<td>Total</td>
<td>3.1</td>
<td>43.1</td>
<td>100.3</td>
</tr>
<tr>
<td>Hawaii</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Resid./Comm.</td>
<td>0</td>
<td>5.3</td>
<td>19.3</td>
</tr>
<tr>
<td>Industrial</td>
<td>1.5</td>
<td>14.2</td>
<td>21.6</td>
</tr>
<tr>
<td>Total</td>
<td>1.5</td>
<td>19.5</td>
<td>40.9</td>
</tr>
<tr>
<td>Nevada</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Resid./Comm.</td>
<td>0.4</td>
<td>2.6</td>
<td>25.6</td>
</tr>
<tr>
<td>Industrial</td>
<td>1.5</td>
<td>18.9</td>
<td>25.5</td>
</tr>
<tr>
<td>Total</td>
<td>1.9</td>
<td>21.5</td>
<td>51.1</td>
</tr>
<tr>
<td>Regional</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Resid./Comm.</td>
<td>17.8</td>
<td>131.0</td>
<td>332.5</td>
</tr>
<tr>
<td>Industrial</td>
<td>5.3</td>
<td>60.5</td>
<td>121.5</td>
</tr>
<tr>
<td>Total</td>
<td>23.1</td>
<td>191.5</td>
<td>454.0</td>
</tr>
</tbody>
</table>
Table 3-4. Estimated Hydrothermal Market Capture In 12 Counties Of Region IX (Btu x 10^{12}/Year)

<table>
<thead>
<tr>
<th>State</th>
<th>County</th>
<th>1985 R/C</th>
<th>1985 Total</th>
<th>2000 Total</th>
<th>2020 Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arizona</td>
<td>Maricopa</td>
<td>8.8</td>
<td>9.1</td>
<td>58.9</td>
<td>138.4</td>
</tr>
<tr>
<td></td>
<td>Pima</td>
<td>3.2</td>
<td>3.3</td>
<td>21.0</td>
<td>21.4</td>
</tr>
<tr>
<td></td>
<td>Pinal</td>
<td>0.6</td>
<td>0.7</td>
<td>4.0</td>
<td>4.7</td>
</tr>
<tr>
<td>California</td>
<td>San Diego</td>
<td>0.42</td>
<td>0.54</td>
<td>11.1</td>
<td>16.1</td>
</tr>
<tr>
<td></td>
<td>Imperial</td>
<td>0.08</td>
<td>0.54</td>
<td>0.61</td>
<td>6.5</td>
</tr>
<tr>
<td></td>
<td>San Bernardino</td>
<td>0.07</td>
<td>0.44</td>
<td>0.52</td>
<td>4.6</td>
</tr>
<tr>
<td>Hawaii</td>
<td>Honolulu</td>
<td>0</td>
<td>0</td>
<td>4.2</td>
<td>7.8</td>
</tr>
<tr>
<td></td>
<td>Hawaii</td>
<td>0</td>
<td>1.51</td>
<td>0.54</td>
<td>7.2</td>
</tr>
<tr>
<td></td>
<td>Maui</td>
<td>0</td>
<td>0</td>
<td>0.56</td>
<td>4.5</td>
</tr>
<tr>
<td>Nevada</td>
<td>Clark</td>
<td>0.13</td>
<td>0.56</td>
<td>0.82</td>
<td>6.2</td>
</tr>
<tr>
<td></td>
<td>Washoe</td>
<td>0.20</td>
<td>0.50</td>
<td>1.33</td>
<td>5.1</td>
</tr>
<tr>
<td></td>
<td>Carson City</td>
<td>0.03</td>
<td>0.09</td>
<td>0.20</td>
<td>1.06</td>
</tr>
</tbody>
</table>

The estimates contained in Tables 3-3 and 3-4 were taken directly from the state reports. The values for Arizona shown in Table 3-4 were computed by the study team. It may be noted that the Arizona estimates for the residential/commercial (R/C) sector are considerably larger than the other states. The explanation for this is that Arizona is the only western state where two major metropolitan areas and two potential geothermal resources are contiguous. Key assumptions for Arizona include a 4 percent per year compounded growth rate for population as well as for energy use in the residential/commercial sector. Market penetration for process heat is assumed to be 30 percent of new growth, and for the residential/commercial market, 20 percent of new growth. Excluded from the industrial energy demand are the mining industry's process energy requirements and industrial demand for space conditioning.
Potential agricultural and aquacultural applications were also omitted. It was assumed that space cooling is feasible with moderate temperature geothermal heat. Retrofit of existing industrial facilities for process heat was assumed to occur at a rate of one percent per year beginning in 1980, not to exceed 25 percent of the 1980 market. For the space conditioning market, retrofit was assumed to occur at a rate of one percent per year beginning in 1983, not to exceed 25 percent of the 1983 market.

In contrast to Arizona, the industrial sectors in the other three states generally exceed the residential/commercial sectors in terms of the total estimated market capture, as is shown in Table 3-3. Some of the more important assumptions made for the other states are highlighted below.

1. California - Residential/Commercial Sector

Three major factors affect the rate and timing of market penetration within the residential and commercial sectors:

(1) Temperature of resource.

(2) Dependency on LPG.

(3) Density of the population.

The temperature of a resource within a county was used as proxy for estimating the start of commercialization. That is, if a county has any high- or medium-temperature (i.e., greater than 90°C), penetration was assumed to begin in 1980 because this date reflects existing exploration, development, and production activities that are normally associated with these resources and that can affect a higher probability of early commercialization. If a county has low-temperature resources (i.e., less than 90°C) only, commercialization and penetration were assumed not to begin until 1985.

One quarter of the counties with geothermal-resource potential have no natural gas service and must depend on LPG. If the residential and commercial establishments within a county depend on LPG, it was assumed that geothermal energy would not replace these existing energy sources because the use of LPG implies population density insufficient
to support an economic steam-distribution system. Consequently, geothermal energy will probably not be competitive in the residential/commercial sector in these counties.

The density of population in a county was used to determine the near-term possibilities for district heating and the speed which knowledge, acceptance, and use of the geothermal energy would occur.* It was assumed that counties having high population densities will experience a development phase lasting 5 years and a rapid-growth phase lasting 10 years. Contrastingly, counties having low-population densities will experience a development phase lasting 8 years and a rapid-growth period lasting 15 years. The remaining years until 2020 will be in the mature-growth phase. Annual penetration rates were the same for all counties: one percent per year for the development phase, two percent per year for the rapid-growth phase, and one percent per year for the remaining period.**

2. California - Industrial Sector

Penetration of the industrial sector was assumed to begin in either 1980 or 1985, depending on the temperature characteristics of the resources in a county. The development phase for industry was assumed to be 8 years, a duration of time reflecting the concerns of industry executives about the technical and economic feasibility of using geothermal energy. For example, uncertainties over the purity and reliability of the fluid will need to be clarified.

The annual penetration rates during this time period was assumed to be two percent. Annual penetration rates during an estimated 15-year rapid-growth phase will be 4 percent, an assumption which reflects

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* Average population density of the 20 counties (i.e., 54.4 people per square mile) was used as the determining factor.

**In forecasting demand, major gas and electric utilities use one percent per year as the average projected growth in housing stock during the 1976-1998 time period.
estimates of the percentage of annual turnover of capital equipment used for fuel-burning equipment and of the percentage of retrofit applications. Penetration during the mature-growth phase will be two percent per year.

3. Nevada - Residential/Commercial Sector

To obtain the estimates of the amount of energy captured by geothermal development in the various communities, a "Capture Fraction" was used. The numerical values assigned to these fractions were developed logically, but not without a considerable amount of considered judgement applied to insure reasonable results. The fractions used are shown in Table 3-5.

To develop these fractions, optimistic but realistic values for 1985 were estimated. The 1985 fractions were then used to compute the fractions for 2000 and 2020 by assuming 10 percent annual growth in the capture rates through 2020.

The capture fractions were used as multipliers to convert the estimates of potential geothermal space and water heating (Table III of the Nevada Report) into estimates of expected geothermal energy use.

Table 3-5. Capture Fractions (%) For Nevada

<table>
<thead>
<tr>
<th>Geothermal Potential</th>
<th>1975 (^{(a)})</th>
<th>1985</th>
<th>2000</th>
<th>2020</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nil</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Low</td>
<td>0</td>
<td>0.50</td>
<td>2.09</td>
<td>14.05</td>
</tr>
<tr>
<td>Moderate</td>
<td>0</td>
<td>1.00</td>
<td>4.18</td>
<td>28.10</td>
</tr>
<tr>
<td>High</td>
<td>0</td>
<td>1.50</td>
<td>6.27</td>
<td>42.43</td>
</tr>
</tbody>
</table>

\(^{(a)}\) In 1975, very little geothermal energy was utilized outside of the Truckee Meadows (Reno/Sparks) which had a captive fraction of approximately 1/8 of 1 percent (for Reno).
A subjective judgement was made to determine which communities could expect high, moderate, low or negligible geothermal development. The factors considered in arriving at this determination include: the temperature, size and depth to resource and proximity to the resource. Thus, a city such as Reno received a high rating because of its proximity to a hot, large, shallow geothermal resource (Steamboat-Huffaker and Moana). A town such as Searchlight in southern Nevada, which is 14 kilometers from a well with 31°C water, was assigned a negligible (Zero) captive fraction.

Table VIII of the Nevada Report lists the estimated geothermal penetration of the residential and commercial sectors for the counties and communities.

4. Nevada - Industrial Sector

Residential and commercial growth are projected to be largely in existing communities. On the other hand, industrial growth will be in communities where existing (1975) industry is located, and secondly, where significant savings can be realized right at a geothermal resource site.

The basic assumptions for the estimates of the industrial market penetration analysis are:

- The bulk of the new high energy-use industry, between 1985 and 2020, will be attracted by, and locate in close proximity to, high and intermediate temperature geothermal resources.

- Light industry will continue to locate near population centers, but will favor those communities offering geothermal energy.
Specifically, it was assumed for this study that:

(1) Geothermal energy use penetration was nil in 1975 for all counties, but statewide it is projected to be:

<table>
<thead>
<tr>
<th>Year</th>
<th>Percentage Penetration</th>
<th>$10^{12}$ Btu</th>
</tr>
</thead>
<tbody>
<tr>
<td>1985</td>
<td>5%</td>
<td>1.533</td>
</tr>
<tr>
<td>2000</td>
<td>20%</td>
<td>18.857</td>
</tr>
<tr>
<td>2020</td>
<td>50%</td>
<td>25.517</td>
</tr>
</tbody>
</table>

(2) Fifty percent of the geothermal capture is assumed to be in the cities and larger communities presently existing, regardless of geothermal use potential. Estimated capture by county is assumed to be in proportion to population.

(3) Fifty percent of the geothermal capture is assumed to be in those counties where the geothermal resources presently exhibit the greatest potential. The geothermal resource potential is based on the weighted potential of the high, intermediate and low temperature resources in each county.

5. Hawaii - Industrial Sector

Potential market growth was derived through a combination of forecasting projection based on the state of Hawaii's Department of Planning and Economic Development projections for energy demands, population, and tourism and industry surveys.

Industrial growth rates were developed for each of the SIC categories from company interviews, industry projections, and state projections. Growth projections were made on an annual compounded rate for the periods 1985-2000 and 2000-2020. These figures were not adjusted for efficiencies that might occur due to rapidly rising energy costs.

The sugar factories were not expected to show growth. Foreign competition has depressed the price of sugar and many companies are looking for alternative uses of the land. Historical data indicates
that the industry is consolidating and that a number of smaller inefficient factories have been shut down. Countering these trends is the increasing value of sugar by-products such as electricity generation.

The other two large energy SIC categories, refinery and cement, were given growth rates based on company projections. Food processors and agriculture processors, other than sugar, were given growth rates equal to population projections. In construction related industries, growth rates were based on projected construction activity in the housing and tourism industries.

The potential geothermal market growth was projected to be lower than the general growth for industry. This reflects the no-growth trend of the sugar factories' energy consumption. Where the sugar factories were subtracted out of the data, the potential geothermal growth rate is higher than the growth rate for industry in general. This can be expected as new industries locate near geothermal resources. It was assumed that in-place industries would not relocate to geothermal resources. Also assumed was a continuation of Hawaii's pattern of attracting smaller scale industrial processes rather than large manufacturers.

It should be noted that if the State is successful in attracting an energy intensive process such as manganese nodules or aluminum refinery that the industrial energy growth rates and geothermal growth rates would change dramatically. For example, a three product manganese nodule plant requires 150 MW capacity and a four product plant or aluminum refinery requires a 300 MW capability. However, as previously stated, it was assumed that these industries would not locate in Hawaii for a number of non-energy reasons.

The market capture potential estimates were developed on a county basis. Present plans indicate that the earliest possible direct application of geothermal to be 1983. All co-located sugar plants are projected to convert to geothermal by year 2000. Other major retrofit applications were projected to start in 1985 in Honolulu at the Campbell Industrial Park. By the year 2000, a 20 percent retrofit is estimated. All other retrofit is projected at a rate of 1 percent per year until
the year 2020. Kauai County's retrofit is not projected to start until year 2000, because of the current size of its population and commercial/industrial base. However, for Hawaii, Honolulu, and Maui, geothermal is projected to capture 50 percent of new growth beginning in the year 1985 and starting in 2000 for Kauai. These rates were assumed constant through year 2020.

6. Hawaii - Residential/Commercial Sector

Growth rates for R/C were based on energy use projections by the State Department of Planning and Economic Development based on per capita consumption, population growth, and tourism growth. Over time, these rates decline. Population growth for the State declines from a high of 1.87 average annual percentage growth in the 1977 to 1980 period to a low of 1.05 percent in the 2000 to 2005 period. This growth rate was assumed to continue through year 2020. These forecasts assume a middle fertility level of 2.1 births per woman. The State's economy, growth rate, and commercial activity is very dependent on the tourism industry. State projections for tourism growth starting at 7 percent per annum in the 1977 to 1979 time frame and declining to 1 percent in the 1996 to 2000 period.

The State's projections assume a constant growth rate of 4 percent for electricity generation. This rate includes a growth in per capita energy consumption. The projections also assumed a continuing dependence on petroleum products and did not consider the importance of alternative energy sources.

New discovery factors were not applied to potential geothermal growth since all major population, commercial, and industrial areas of the State are located within potential geothermal market areas. Several sugar factories are not in these areas and new discoveries within this area (which cannot be predicted at this time) would increase the potential growth.

Potential capture for R/C was based on an assumed 1 percent per year retrofit rate for all counties beginning in 1990 for Hawaii, Honolulu, and Maui, and 2005 for Kauai. Starting in 1985, step increases
for new growth in Hawaii, Honolulu, and Maui were estimated to a maximum of 30 percent of the new growth by 2000, Kauai's capture of new growth is assumed to start in 2000 up to a maximum of 30 percent by 2015.

C. PREVIOUS WORK

This section describes previous geothermal resource and market assessment studies. Included are studies which have influenced the current effort or which address related topics. The section is organized into the following subsections: Regional Market Assessment, Resource Assessment, and Direct Heat Applications and Development.

No attempt has been made to present a comprehensive bibliography. Studies of geothermal energy have been undertaken by Federal, State, local, and private entities, but the resulting information is often not widely distributed nor easily available. Undoubtedly, reports and research projects related to the work at hand have not been included; however, a thorough search of the available information was beyond the scope of this project.

1. Regional Market Assessment

Two studies have estimated the geothermal resource and market potential for multi-state regions which include two DOE Region IX states: Arizona and Nevada. An overview of the market potential in a 10 state region was prepared by EG&G Idaho, Inc. and the Earth Science Laboratory of the University of Utah Research Institute (UURI). More detailed market and resource assessments for parts of the region have been produced from the continuing Regional Geothermal Operations Research Program of the New Mexico Energy Institute (NMEI) of the New Mexico State University. The EG&G Idaho/UURI work served as a starting point and a pattern for the present effort.

The EG&G/UURI report, titled Rocky Mountain, Basin and Range Regional Hydrothermal Market Penetration Analysis, included both electric and direct heat applications but treated each distinctly. Two heat-consuming sectors were considered: the residential/commercial
sector with heat used primarily for space conditioning and water heating, and the industrial sector, with requirements for process heat. The growth in heat consumption by these two sectors was projected to the year 2020. Finally, the quantity of heat expected to be supplied by commercial geothermal development was computed for the period from the present to 2070, based on several regional assumptions.

Some of the assumptions and methods used in the R.M.B.R. Analysis are worth mention here because they profoundly affect the results of that study. Information was presented at the county level of detail, but the R.M.B.R. report did not consider individual sites and markets; colocation was assumed in any county having both resources and heat consumers. State directories of manufacturers were cited as the source for identifying heat-consuming industries, but such directories are often far from complete. Energy use by heat consuming industries was computed from a set of coefficients derived by Rocket Research, Inc. These coefficients, however, were developed from studies of facilities in the Northwest, and may not accurately reflect energy use by industries in Southwestern states Arizona and Nevada. The market projections for both consumer sectors include a 3 percent annual increase in energy consumption by each consumer, and the market growth in the industrial sector includes an increase of 5 percent of the market per year which is assumed to represent growth stimulation due to geothermal development. A single set of assumptions was used to estimate market penetration by geothermal energy, so differences in the availability of various energy sources within each state were not considered.

The assumptions used in the R.M.B.R. Analysis are described here for reference. A maximum of 25 percent of the initial market was assumed to retrofit to geothermal energy at a rate of 1 percent per year for a period of 25 years. A constant fraction (80 percent for industrial, 70 percent for residential and commercial) of new facilities constructed after 1985 is assumed to use geothermal heat. These fractions are assumed to increase from zero linearly with time during the period 1980 to 1985.

The Regional Geothermal Operations Research Program of the New Mexico Energy Institute is an ongoing effort of several years duration.
The NMEI work is therefore somewhat more refined and thorough than the EG&G Idaho/UUIRI report. The program includes technical, economic, legal, and institutional analysis of geothermal development. The NMEI maintains a database with resource sites and characteristics, population centers, industries, fuel prices and growth rates, and the NMEI has developed computer algorithms for estimating the internal rate of return of geothermal developments, identifying colocated resources and population centers, and projecting future market size. For an overview of the organization and scope of the program, see the Final Technical Report of the Regional Operations Research Program (January 1979).

The resource database is described in a report by Patrick O'Dea and others (February 1979, NMEI 10-3), listing sites, locations, and reservoir volumes and temperatures. The information in this report is not as current as that in USGS Circular 790 (described in the next section). An NMEI presentation on geothermal energy (May 1979, NMEI 10-4) includes estimates of beneficial heat available at temperatures greater than 60°C for counties in the region. For Arizona, the estimate is 5.23 Quad and for Nevada, 46.50 Quad.

The population center database is described in a report by O'Dea and others (May 1979, NMEI 10-5), listing towns, locations, populations, and space heating requirements. Colocated resource sites and towns in the region, and the energy used for space heating in those towns are listed in a report by R.A. Cunniff and others (June 1979, NMEI 10-6). Detailed energy consumption and population growth projections are within the capabilities of the existing NMEI system, but were not available at the time of this writing.1

A study by W.V. Toth and F.C. Paddison, of the Johns Hopkins University Applied Physics Laboratory, estimates the market potential for geothermal direct heat in parts of several Atlantic Coast States. A significant result of this study is the identification of military facilities as a major market for direct heat applications. This might also be the case in DOE Region IX because of the large number of military reservations in the region.

1 Space cooling requirements are not included in the NMEI database, however.
2. Resource Assessment

The best overall assessment of geothermal resources in the region is U.S. Geological Survey Circular 790, *Assessment of Geothermal Resources of the United States -- 1978*. This circular completely documents the USGS methods and assumptions for estimating reservoir volumes and the beneficial heat which could actually be used in direct applications. With exceptions as noted, the USGS method has generally been followed by the present work.

Circular 790 tabulates information on specific resource sites in the western U.S. For reservoirs with temperatures higher than 90°C, reservoir volumes are estimated and the available thermal energy is computed. Excluding resources within National Parks, the beneficial heat from resources with temperatures higher than 90°C is shown in Table 3-1. A list of sites with potential for resources with temperatures below 90°C is included, but no estimates of volume and beneficial heat are made.

The status of resource definition in Region IX is outlined below. The four states form a fairly diverse region, both in the nature of the resource base and in the level of assessment work undertaken.

a. Arizona. Most of the resource in Arizona appears to be low temperature. A preliminary identification of favorable prospects based on chemical geothermometry was reported by Swanberg and others (1977, NMEI 6-1). This information and other data were collected and compiled into a preliminary map of Arizona's geothermal prospects by W.R. Hahman, Sr., and others (1978) for planning purposes. The Geothermal Group of the Arizona Bureau of Geology and Mineral Technology is currently engaged in an exploration program to locate and characterize the geothermal resources of the state (e.g., W.R. Hahman, Sr., March 1979). To date, this work has concentrated in southern Arizona.

b. California. California is rich in hydrothermal resources and commercial exploration and development activities have been extensive. However, this activity has stressed electricity generation, and the sites suitable for it. These sites are well described in USGS
Circular 790. Many low temperature sites have been identified, but little exploration to define their nature or extent has occurred so far.

c. Hawaii. The geothermal resource base of the state of Hawaii is somewhat mysterious. The big island of Hawaii, notable for its active volcanism, has been the subject of some geophysical exploration by the University of Hawaii (J. W. Shupe and others, 1975) and is the location of the high temperature Puna geothermal test well. A more recent University of Hawaii appraisal study indicated sites with favorable indications of undiscovered geothermal resources, but exploration and resource assessment have been limited.

d. Nevada. The situation in Nevada is much like that in California. Resources are widespread, and commercial exploration has concentrated on high temperature resources suited to power generation.

3. Direct Heat Applications and Development

One source of information on potential applications of geothermal direct heat worth special mention is the rapidly growing literature on solar thermal energy. Applications for heated fluids are the same whether the initial source of heat is solar or geothermal. The EG&G Idaho/UURI regional market study cited a solar thermal study by Intertechnology Corp. as the source of data on industrial process heat. For the California section of the present report, information on agricultural process heat was obtained from a solar thermal study of California (JPL, 1978).

Site-specific studies of geothermal direct heat applications in Region IX are described below. Some applications which have been widely examined throughout the nation are as follows: district space heating or cooling, greenhouse heating, crop or lumber drying, livestock pen heating and livestock processing, dairy operations, aquaculture (fish farming), solution mining, and generator or boiler preheating.

a. Arizona. Virtually all the applications listed above have been included in scenarios for Arizona development (Arizona Solar
Energy Research Commission, January 1979). Space cooling is a particularly large energy consuming activity in southern Arizona, and could be a large user of geothermal heat if sufficient moderate-temperature resources are available. Williams Air Force Base, located in an area with indications of moderate temperature waters, might economically use up to 10^6 Btu/year of geothermal heat for space cooling (Gertsch and others, June 1979). Copper mining by leaching is also a large potential market for geothermal heat. Existing mines in Pima County could use 0.05 quad/year of low temperature resources (Arizona Solar Energy Commission, June 1979) and copper deposits elsewhere in the state could also be amenable to this application.

b. California. Potential applications studied include a sugar plant in the Imperial Valley and meat processing or greenhouse operations in Susanville. Potential low temperature applications, such as aquaculture, car washes, district heating, greenhouse heating, etc. were analyzed for Desert Hot Springs by Christiansen (1978).

c. Hawaii. A study by Science Applications, Inc. (January 1979) indicates that the largest potential users of geothermal heat in Hawaii are existing sugar mills and aquaculture farms. Amaar, Inc. has studied the possibility of using geothermal steam at its sugar mill and generator in the Puna area.

d. Nevada. There are two existing manufacturers using geothermal process heat. Mendive (1976) mentions an explosives plant in Washoe County, and a food dehydration plant was recently built in Church County.

D. DIRECT HEAT APPLICATIONS

Direct heat applications employ the geothermal fluid as a source of useful heat rather than for conversion to electrical or mechanical work. Such uses include space heating, space cooling, water heating, and various industrial and agricultural processes. Development of resources for geothermal direct heat has not occurred to any significant extent in the United States. Aside from natural spas and hot mineral
baths, the only direct heat geothermal developments in DOE Region IX are spaceheating in Nevada, greenhouse heat in Nevada and northern California, an explosives manufacturer in Nevada, and a food processing plant in Nevada which was constructed recently with financing through the Geothermal Loan Guarantee Program. Although most commercial interest in geothermal energy has been directed toward the generation of electricity, an analysis by E.F. Wahl (1977, pp. 247-8, 278-93) indicates that direct heat applications are the most thermodynamically and economically efficient use of geothermal fluids and that even the waste heat from a geothermal power plant can be a valuable resource.

Exploration efforts to date have emphasized the geothermal resources suited to power generation. Unfortunately, since power generation requires fluid temperatures higher than 150°C, suitable resources are rare and often occur in geologically unique settings (e.g., the Geysers, CA, or the Puna area, HI). Depending upon the specific application, temperature requirements for direct heat are more flexible. Very high temperature resources can be used for process steam or absorption chilling, but some heating applications can use fluids with temperatures just a few degrees above the ambient air temperature. Lower temperature resources are believed to be more widely distributed than high temperature resources; low enthalpy geothermal systems may represent a substantial energy resource.

Two major factors determine whether a heat consumer has potential for geothermal direct heat application: temperature and location of resource. Many processes require that heat be supplied at a specific temperature; to be applicable to such a process, a geothermal resource must generally produce a higher temperature. Transmission of geothermal fluids over long distances is technically feasible, but is economically possible only when the energy use is quite high.* It is unlikely that a market exists for geothermal energy large enough to merit long-distance

*The Reykjavik Municipal District Heating System currently incorporates a 16 km pipeline carrying fluid at 86°C. However, the energy consumed and the duty cycle of the system are both high because spaceheating in Iceland occurs year round.
transmission, so colocation of users and resources will be a primary constraint on development in the near term. The decision by a heat consumer to actually use geothermal energy will be based on economic considerations - the costs of special equipment or a plant relocation to use a geothermal resource, and the perceived reliability of the geothermal energy supply, will be compared with the costs and perceived reliability of other energy sources.

Given a market for heat and a technically and economically suitable resource, the two must be connected by a developer who installs the wells and pipeworks. In the parlance of microeconomics, the developer is a producer, using land, labor, and capital to produce an output (in this case, heated fluid). The producer may take several forms: a private firm may lease land and sell fluid to consumers in a competitive market, as at the Geysers; a government or utility may produce the fluid to sell in a competitive or a captive market, as in Reykjavik, Iceland; or the producer and consumer may be within a single firm - for example, a factory may use its own on-site geothermal wells. In any form, the producer must choose whether or not to invest in the production of geothermal fluid. The decision will be based upon a comparison of the capital costs and expected return of a geothermal development with those of other investment opportunities, and upon the producer's perceptions of resource reliability and the market for his product.

The consumer's or developer's cost and risk are the factors to be manipulated in the DGRM program to stimulate commercial geothermal development. The costs incurred by a firm undertaking geothermal development can be reduced by tax incentives or credits and by direct aid such as the Geothermal Loan Guarantee Program or shared-cost development. The developer's risk can be reduced by increasing knowledge of the resource characteristics and by identifying the potential consumers of geothermal fluids. Owing to variations in the characteristics of different reservoirs and the dependence on reservoir characteristics of the cost and risk of development, only very detailed, site-specific
resource and market studies can significantly affect a geothermal investment decision by a developer. The degree of detail necessary for a specific development decision lies beyond the scope of this regional study, but this study may help to highlight areas which deserve further scrutiny.
SECTION IV
RECOMMENDATIONS

Based on the results of this preliminary effort, the following recommendations are offered for consideration:

(1) Resource definition work, particularly in the moderate to low temperature resource areas of the Region, needs to be expanded. As shown by the Arizona and Nevada data on hydrothermal resources below 90°C, significant amounts of beneficial heat may be expected to exist at the lower, but still useful, temperatures. Such resources would be particularly valuable if they are found in proximity to existing concentrations of population or industries.

(2) The use of geothermal fluids with temperatures above 150°C for applications other than pure electrical generation should be encouraged. Future studies should focus on the feasibility of combined electric/non-electric, as well as all nonelectric, utilization of high temperature resources where appropriate. Over 75 percent of the available beneficial heat in identified resources in the Region is in the 150°C or higher range.

(3) Further work is clearly needed in the market penetration analysis area. The lack of time and resources in this effort made it necessary for the four state study groups to resort to many simplifying assumptions. The net result was a lack of consistency in the various penetration analyses. It is recommended that a more comprehensive treatment be given to the method and assumptions to be used in any future regional market penetration study.

(4) Several market areas were not analyzed in this preliminary study. These include the copper mining industry and industrial space conditioning in Arizona, the high temperature resource applications in California, the potential aluminum and manganese industries in Hawaii, and agriculture/aquaculture in all the states except California. These and other market segments such as military reservations should be examined in future studies in Region IX.
REFERENCES


EG&G Idaho, Inc., and University of Utah Research Institute, 1979, "Rocky Mountain, Basin and Range Regional Hydrothermal Market Penetration Analysis."


ARIZONA REPORT - PART A

PROVEN, POTENTIAL AND INFERRED GEOTHERMAL RESOURCES OF ARIZONA AND THEIR HEAT CONTENTS

J. C. Witcher

September, 1979

BUREAU OF GEOLOGY AND MINERAL TECHNOLOGY GEOLOGICAL SURVEY BRANCH GEOTHERMAL GROUP

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Reference to a company or product name, or the exclusion of others that may be operative or suitable, does not imply approval, disapproval or recommendation of the product by the Bureau of Geology and Mineral Technology or the U. S. Department of Energy and the U. S. Department of the Interior.
Map of Proven and Potential Low Temperature (<90°C) Geothermal Resources of Arizona - Northern Portion
State of Arizona

- Well or spring >30°C
- Area with numerous wells and springs >30°C

Compiled by Witcher, J.C.

Arizona Bureau of Geology and Mineral Technology
Proven and potential geothermal resources are shown by the outlined areas on the 1:1,000,000 map of Arizona. The areas are numbered by county. They outline known hot wells and springs and appropriate geologic setting. Approximately 85% to 90% of the known geothermal occurrences are listed in the computer printout. All of the areas except Greenlee 1 occur in sediment-filled basins. Isolated single occurrences of hot water (>30°C) are shown on the map as dots.

The definitions of proved, potential and inferred geothermal resources are:

Proven sites are (1) those which are in an advanced stage of development or commercialization by a private company or by government for specific applications, or demonstrations, or (2) those which possess favorable quantitative data on the measured subsurface temperatures, volume and water flows.

Potential sites are (1) those sites on which there is exploration/development activity, or (2) sites possessing some favorable quantitative subsurface data which has been estimated or measured.

Inferred sites or areas are those identified by (1) surface manifestations, such as wells or springs, (2) chemical thermometry, or (3) proximity to potential or proven sites.

A-9
The low temperature resources (<90°C) are assessed for depths less than 4,000 feet (1.2 km). Table (1) contains pertinent information on the low temperature geothermal resources. Drill hole data and gravity data show that most sediment-filled structural basins in southern Arizona are filled with from 2,000 feet (0.6 km) to 4,000 feet (1.2 km) of clastic sediment and/or volcanics. Therefore, the geothermal reservoirs in all areas are assumed to be in clastic sediment and/or volcanics with an average specific yield or storage coefficient of 5%. This is a conservative figure when compared with data presented by Rantz, S. E., and Eakin, T. E., 1971, on p. 76. The data Table is reproduced below:

<table>
<thead>
<tr>
<th>Material</th>
<th>Specific yield (percent)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gravel, sand and gravel and related coarse gravelly deposits</td>
<td>25</td>
</tr>
<tr>
<td>Sand, medium- to coarse-grained, loose, well-sorted</td>
<td>25</td>
</tr>
<tr>
<td>Fine sand, tight sand, tight gravel and related deposits</td>
<td>10</td>
</tr>
<tr>
<td>Silt, gravelly clay, sandy clay, sandstone, conglomerate and related deposits</td>
<td>5</td>
</tr>
<tr>
<td>Clay and related very fine-grained deposits</td>
<td>3</td>
</tr>
<tr>
<td>Crystalline bedrock (fresh)</td>
<td>0</td>
</tr>
</tbody>
</table>

The specific yield or storage coefficient is defined as the percent volume of water to total volume of reservoir that would be obtained if the reservoir were pumped dry.
without recharge. In all cases, the reservoirs are assumed to be 1,000 feet (.3 km) thick at depths of 2,500 feet (.75 km) to 4,000 feet (1.2 km). Average reservoir temperatures are estimated by chalcedony geothermometers unless otherwise stated. The chalcedony geothermometer appears to be the best for most low temperature reservoirs (<90°C) (Arnorsson, S., 1975). Chalcedony-predicted temperatures in Arizona basins agree very well with temperatures predicted for the assumed reservoir depths using the average temperature gradient. The average temperature gradient of Arizona basins is about 40°C/km. This is a normal gradient in an area with high heat flow (80 m Wm⁻²) and low heat conductive rocks.

The heat content of the reservoirs is calculated using the following formula:

\[
Q_r = \left[ (1-\sigma) (Hsr) + (\sigma) (Hsw) \right] V (Tr-Tmat) = Qr
\]

\[
= \left[ (.85) (Hst) + (.15) (Hsw) \right] V (Tr-Tmat) = Qr
\]

\[
= (.85) (.20) (2.69) + (.15) (1) .05 V (Tr-Tmat) = Qr
\]

\[
.03 V (Tr-Tmat) = Qr
\]

\[
s = \text{Porosity}-.15 (15\%)
\]

\[
Hsr = \text{Average specific heat of rock}-.20 \text{ cal/gm}^o\text{C}
\]

\[
f = \text{Average density of rock}-.20 \text{ gm/cm}^3
\]

\[
Hsw = \text{Specific heat of water}-.1 \text{ cal/cm}^3^o\text{C}
\]

\[
f = \text{Average specific yield or storage coefficient}-.05 (5\%)
\]

\[
V = \text{Volume of geothermal reservoir}-.cm^3 x 10^{15}
\]

\[
Tr = \text{Average temperature of reservoir}^o\text{C}
\]

\[
Tmat = \text{Mean annual temperature at the surface}-.17-21^o\text{C}
\]

\[
Q_r = \text{Extractable heat energy from geothermal reservoir calories}-.x 10^{15}
\]
The method is similar to the one used in U.S.G.S. Circular 790 except that in these calculations no recharge is assumed. This is because Arizona has an arid climate. Since the heat is transported to the surface by water, it is necessary to calculate the water volume which can be obtained from the reservoir. Therefore, the storage coefficient or specific yield is used in the calculation. These calculations quantify minimum extractable heat contents. Artificial recharge through reinjection may be necessary to prevent subsidence. Also, natural recharge from cooler overlying aquifers is possible; consequently, additional parameters, although not considered in these calculations, may be added to account for the resulting increase in extractable heat.

Table 2 is a list of areas showing inferred intermediate to high temperature (>90°C) reservoirs in Arizona. Wells have not been drilled in these areas. The temperatures, permeability and reservoir size are not known with a great degree of accuracy. In many cases, the subsurface temperatures are the best known quantity. Most of the data on these areas are based on geothermometry, adjacent deep well tests or on geologic structure as determined by geophysical methods like gravity surveys and available heat flow or temperature gradient data. Until more is known of these areas, the reservoir volumes are assumed to be 2.5 km³. The U. S. Geological Survey WATSTORE water quality file provided a large portion of the data used in this assessment.
Table 1

PROVEN AND POTENTIAL GEOTHERMAL RESERVOIRS LESS THAN 1.2 km DEPTH

<table>
<thead>
<tr>
<th>County/Area</th>
<th>Area km²</th>
<th>Location</th>
<th>Volume km³</th>
<th>Measured Temperature °C</th>
<th>Depth (Feet)</th>
<th>TDS (Mg/l)</th>
<th>Tr °C</th>
<th>Tr-Tmat °C</th>
<th>Calories x 10¹⁵</th>
<th>Qu</th>
<th>Method</th>
<th>Source (See References)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Greenlee 1</td>
<td>61.9</td>
<td>T4S, R30E</td>
<td>18.6</td>
<td>30 - 67</td>
<td>Surface &gt;8000</td>
<td>80</td>
<td>62</td>
<td>34.59</td>
<td></td>
<td>7</td>
<td>Quartz Mixing model, Na-K-Ca/mg corr.</td>
<td>7</td>
</tr>
<tr>
<td>Greenlee 2</td>
<td>61.9</td>
<td>T5S, R30E</td>
<td>18.6</td>
<td>30 - 63</td>
<td>Surface &lt;500</td>
<td>80</td>
<td>62</td>
<td>34.59</td>
<td></td>
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<td>T19-20S, R31E</td>
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<tr>
<th>Area</th>
<th>Geothermometry Temperature °C</th>
<th>Method</th>
<th>Source (See References)</th>
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<tbody>
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<td>Greenlee 1</td>
<td>130 - 180</td>
<td>Quartz Mixing model, Na-K-Ca/mg corr.</td>
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<td>Cochise 4</td>
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<td>Quartz, Na-K-Ca</td>
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<td>Pima 1</td>
<td>50 - 65</td>
<td>Chalcedony, Na-K-Ca</td>
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<td>Pima 2</td>
<td>30 - 60</td>
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<td>50 - 60</td>
<td>Chalcedony</td>
<td>10</td>
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<td>Pima 4</td>
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<td>Chalcedony</td>
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Tr - Average temperature of the reservoir
Tmat - Surface mean annual temperature

Qu - Extractable heat content of the reservoir
Table 1 (cont.)  PROVEN AND POTENTIAL GEOTHERMAL RESERVOIRS LESS THAN 1.2 km DEPTH

<table>
<thead>
<tr>
<th>County/Area</th>
<th>Area km²</th>
<th>Location</th>
<th>Volume km³</th>
<th>Measured Temperature (°C)</th>
<th>Depth (Feet)</th>
<th>TDS (mg/l)</th>
<th>Tr-°C</th>
<th>Tr-Tmat°C</th>
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<tbody>
<tr>
<td>Pinal 1</td>
<td>423.1</td>
<td>T5-8S, R7-9E</td>
<td>126.9</td>
<td>30 - 45</td>
<td>&lt;2500</td>
<td>&lt;3000</td>
<td>55</td>
<td>35</td>
</tr>
<tr>
<td>Pinal 2</td>
<td>206.4</td>
<td>T8-10S, R16-18E</td>
<td>61.9</td>
<td>30 - 45</td>
<td>&lt;1000</td>
<td>&lt;1000</td>
<td>60</td>
<td>40</td>
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<tr>
<td>Pinal 3</td>
<td>268.3</td>
<td>T8-9S, R6-8E</td>
<td>80.5</td>
<td>30 - 45</td>
<td>&lt;2500</td>
<td>&lt;3000</td>
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<tr>
<td>Pinal 4</td>
<td>547.0</td>
<td>T4-7S, R2-4E</td>
<td>164.1</td>
<td>30 - 40</td>
<td>&lt;1500</td>
<td>-</td>
<td>55</td>
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<td>Yuma 1</td>
<td>10.3</td>
<td>T8-9S, R19W</td>
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<td>T7-8S, R11-12W</td>
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<td>&lt;700</td>
<td>&lt;3000</td>
<td>65</td>
<td>44</td>
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<td>Yuma 3</td>
<td>495.4</td>
<td>T4-6S, R10-12W</td>
<td>148.6</td>
<td>30 - 45</td>
<td>&lt;1500</td>
<td>&lt;3000</td>
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<td>278.6</td>
<td>T3-6N, R14-16W</td>
<td>83.6</td>
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<td>&lt;2000</td>
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<td>Yuma 5</td>
<td>412.8</td>
<td>T5-6N, R11W-13W</td>
<td>123.8</td>
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<td>T17N, R17W</td>
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<td>-</td>
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<thead>
<tr>
<th>County/Area</th>
<th>Calories x 10¹⁵</th>
<th>Geothermometry Temperature</th>
<th>Method</th>
<th>Source (See References)</th>
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<tbody>
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<td>Pinal 1</td>
<td>133.25</td>
<td>40 - 80</td>
<td>Chalcedony</td>
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<td>Pinal 3</td>
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Tr - Average Temperature of the Reservoir
Tmat - Surface Mean Annual Temperature
Qr - Extractable Heat Content of the Reservoir
### Table 1 (cont.) PROVEN AND POTENTIAL GEOTHERMAL RESERVOIRS LESS THAN 1.2 km DEPTH

<table>
<thead>
<tr>
<th>County/Area</th>
<th>Area km²</th>
<th>Location</th>
<th>Volume km³</th>
<th>Measured °C Temperature</th>
<th>Depth (Feet)</th>
<th>TDS mg/l</th>
<th>Tr-°C</th>
<th>Tr-Tmat°C</th>
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<td>T2-3N, R3-5E</td>
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<td>30 - 45</td>
<td>&lt;1500</td>
<td>&lt;1500</td>
<td>60</td>
<td>40</td>
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<td>T2-3N, R1-2E</td>
<td>55.7</td>
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<td>T1-4N, R1-2W</td>
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<td>123.8</td>
<td>T1N, T1S, R3-4W</td>
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<td>T1S, T1-2N, R8-10W</td>
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<td>Maricopa 11</td>
<td>247.7</td>
<td>T2-3S, R1-2W</td>
<td>74.3</td>
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<td>Maricopa 12</td>
<td>412.8</td>
<td>T2-3S, R5-8E</td>
<td>123.8</td>
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<td>T6-7N, R8-10W</td>
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<th>County/Area</th>
<th>Qr Calories x 10¹⁵</th>
<th>Geothermometer Temperature °C</th>
<th>Method</th>
<th>Source (See References)</th>
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<td>Maricopa 1</td>
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<td>81.72</td>
<td>30 - 60</td>
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<td>Maricopa 7</td>
<td>81.68</td>
<td>45 - 85</td>
<td>Quartz, Na-K-Ca/mg corr. Jones, pers., comm.</td>
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<td>200.61</td>
<td>30 - 110</td>
<td>Chalcedony</td>
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<td>30 - 70</td>
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<td>64.99</td>
<td>30 - 40</td>
<td>Chalcedony</td>
<td>10</td>
</tr>
</tbody>
</table>

**Tr** - Average Temperature of the Reservoir  
**Tmat** - Surface Mean Annual Temperature  
**Qr** - Extractable Heat Content of the Reservoir
Table 2  INFERRED INTERMEDIATE TO HIGH TEMPERATURE (>90°C) GEOTHERMAL RESERVOIRS LESS THEN 2.5 km

<table>
<thead>
<tr>
<th>Name</th>
<th>County</th>
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<th>Depth km</th>
<th>Volume km³</th>
<th>Tr °C</th>
<th>Inferences based on</th>
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<td>Greenlee</td>
<td>T4S, R30E</td>
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<td>Greenlee</td>
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<td>Greenlee</td>
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(1) Geothermometry  
(2) Deep well tests  
(3) Geophysics/Heat flow  
(4) Young Volcanism  
(5) Structure

Tr - Average Reservoir Temperature
REFERENCES


The latitude and longitude locates the northwest corner of the township.
| CRANE 1A | LATITUDE=32.9374 LONGITUDE=109.7270 TOWNSHIP/RANGE=0062600 | AREA IN KMS= 6.4 VOLUME IN KMS= 61.9 |
| CRANE 1B | LATITUDE=32.9372 LONGITUDE=109.6910 TOWNSHIP/RANGE=0062700 |
| CRANE 1C | LATITUDE=32.9711 LONGITUDE=109.5615 TOWNSHIP/RANGE=0062800 |
| CRANE 1D | LATITUDE=32.8906 LONGITUDE=109.7277 TOWNSHIP/RANGE=0072600 |
| CRANE 1E | LATITUDE=32.8504 LONGITUDE=109.6199 TOWNSHIP/RANGE=0072700 |

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| CRANE 1I | LATITUDE=32.8504 LONGITUDE=109.6181 TOWNSHIP/RANGE=0072800 | (NULL) |

| CRANE 1J | LATITUDE=32.8504 LONGITUDE=109.6181 TOWNSHIP/RANGE=0072800 | (NULL) |
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LONGITUDE = 109.9290
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VOLUME IN KCSF = 11.5

GRAHAM 2B
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TOWNSHIP/RANGE = 007/2400

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TOWNSHIP/RANGE = 007/2600

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LONGITUDE = 109.9307
TOWNSHIP/RANGE = 008/2400

GRAHAM 2E
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LONGITUDE = 109.8756
TOWNSHIP/RANGE = 008/2500

GRAHAM 2F
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LONGITUDE = 109.7227
TOWNSHIP/RANGE = 008/2600

GRAHAM 2G
LATITUDE = 32.6809
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TOWNSHIP/RANGE = 009/2400

GRAHAM 2H
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GRAHAM 2J
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**PIMA 6C**

| No. | LATITUDE  | LONGITUDE | T/R LOC    | ISP_SLP | SIDES_INCHES | SHALEDEND | DEPTH_FT | INS_INDEX |
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**VELOC in KN**² = 40.3

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### PIMA 4B

**LATITUDE = 31.7996**
**LONGITUDE = 112.3095**
**TOWNSHIP/RANGE = 0200100**

- No DATA in Township

### PIMA 4C

**LATITUDE = 32.2549**
**LONGITUDE = 111.6626**
**TOWNSHIP/RANGE = 0070500**

### PIMA 4J

**LATITUDE = 32.2458**
**LONGITUDE = 111.6671**
**TOWNSHIP/RANGE = 0080700**

---

*Note: The table contains coordinates and elevation data for various locations in PIMA 4A, 4B, 4C, and 4J.*
<p>| Pinal 2A | Latitude: 32.7661 Longitude: 110.7470 Township/Range: D001600 Area in Kms²: 6.4 Volume in Kms³: 41.4 |
| Pinal 2B | Latitude: 32.7667 Longitude: 110.8464 Township/Range: D001700 Sub-Loc: 1 LPI: 151 Size (Low): 19.0 Size (Total): 38.0 Scale: 100.0 Depth: 19.0 |
| Pinal 2C | Latitude: 32.7666 Longitude: 110.5439 Township/Range: D001800 Sub-Loc: 1 LPI: 151 Size (Low): 19.0 Size (Total): 38.0 Scale: 100.0 Depth: 19.0 |
| Pinal 2D | Latitude: 32.6792 Longitude: 110.7483 Township/Range: D001900 Sub-Loc: 1 LPI: 151 Size (Low): 19.0 Size (Total): 38.0 Scale: 100.0 Depth: 19.0 |
| Pinal 2E | Latitude: 32.6266 Longitude: 110.6454 Township/Range: D002000 Sub-Loc: 1 LPI: 151 Size (Low): 19.0 Size (Total): 38.0 Scale: 100.0 Depth: 19.0 |
| Pinal 2F | Latitude: 32.6676 Longitude: 110.5476 Township/Range: D002100 Sub-Loc: 1 LPI: 151 Size (Low): 19.0 Size (Total): 38.0 Scale: 100.0 Depth: 19.0 |
| Pinal 2G | Latitude: 32.5945 Longitude: 110.7483 Township/Range: D002200 Sub-Loc: 1 LPI: 151 Size (Low): 19.0 Size (Total): 38.0 Scale: 100.0 Depth: 19.0 |
| Pinal 2H | Latitude: 32.5941 Longitude: 110.6454 Township/Range: D002300 Sub-Loc: 1 LPI: 151 Size (Low): 19.0 Size (Total): 38.0 Scale: 100.0 Depth: 19.0 |
| Pinal 2I | Latitude: 32.5944 Longitude: 110.8470 Township/Range: D002400 Sub-Loc: 1 LPI: 151 Size (Low): 19.0 Size (Total): 38.0 Scale: 100.0 Depth: 19.0 |</p>
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*Note: Some parcels are not digitized.*
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- **Latitude**: 33° 54' 74"  
- **Longitude**: 112° 29' 85"  
- **Township/Range**: AQ0200  
- **Area in Acres**: 85.8  
- **Volume in KWhr**: 55.7

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- **Longitude**: 112° 19' 49"  
- **Township/Range**: AQ02020C

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### MARICOPA 3C
- **Latitude**: 33° 63' 46"  
- **Longitude**: 112° 29' 98"  
- **Township/Range**: AQ030100

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**MARICOPA 4H**

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| MARICOPA 7C | LATITUDE=33.4560  LONGITUDE=112.9114  TOWNSHIP/RANGE=8020000 |
|-------------|-------------------------------------------------|----------------|----------------|----------------|

<p>| MARICOPA 7D | LATITUDE=33.4562  LONGITUDE=113.0145  TOWNSHIP/RANGE=8020000 |
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MARICOPA B1  LATITUDE=33.5412  LONGITUDE=113.2211  TOWNSHIP/RANGE=002000  AREA IN RM^2= 95.4  VOLUME IN RM^3= 48.6
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ARICOPA 9A Latitude=33.1100 Longitude=113.0222 Township/Range=C040700 Area in Acres=47.7 Volume in Cubic Feet=74.3

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ARICOPA 9B Latitude=33.1075 Longitude=113.1250 Township/Range=C040800

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ARICOPA 9E Latitude=33.0211 Longitude=113.1259 Township/Range=C050800

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| MARICOPA 10I | LATITUDE=33.1152 LONGITUDE=112.6076 TOWNSHIP/RANGE=CO40300 |

| MARICOPA 10J | LATITUDE=33.1144 LONGITUDE=112.7109 TOWNSHIP/RANGE=CO40400 |

| MARICOPA 10K | LATITUDE=33.1133 LONGITUDE=112.8146 TOWNSHIP/RANGE=CO40500 |

| MARICOPA 10L | LATITUDE=33.1121 LONGITUDE=112.9197 TOWNSHIP/RANGE=CO40600 |

| MARICOPA 10M | LATITUDE=33.0285 LONGITUDE=112.6064 TOWNSHIP/RANGE=CO50700 |

| MARICOPA 10N | LATITUDE=33.0285 LONGITUDE=112.6064 TOWNSHIP/RANGE=CO50700 |

| MARICOPA 10O | LATITUDE=33.0285 LONGITUDE=112.6064 TOWNSHIP/RANGE=CO50700 |

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### MARICOPA 13D

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ARIZONA REPORT - PART B

GEOTHERMAL DIRECT HEAT USE
MARKET POTENTIAL/PENETRATION ANALYSIS
ARIZONA

Larry A. Goldstone

October 1979

University of Arizona
Tucson, Arizona
GEOTHERMAL DIRECT HEAT USE MARKET POTENTIAL/PENETRATION ANALYSIS

ARIZONA

Introduction

The following analysis represents a preliminary attempt to define the potential market for geothermal energy within Arizona. The tables presented summarize total 1975 energy consumption and energy use by the State's industrial and residential/commercial sectors. Projected energy use is shown for selected years until 2020 for these sectors. For each of these years, the total possible potential market capture for geothermal energy is defined for the industrial and residential/commercial sectors as well as a forecast capture of these markets. The reader should be given an idea of the impact geothermal energy could have under certain special conditions.

The assumptions used in compiling this information will be outlined in the remainder of this report. Modelling methods for the category "Forecast Geothermal Capture" have not been refined to reflect Arizona's unique energy situation. The mining industry was not considered as a potential market nor was industrial space conditioning. Each of these sectors currently consume substantial amounts of energy within the State; clearly they are important markets for geothermal applications.

Methodology and assumptions

In any study where the objective is to model future activity, certain assumptions must be made about the future. A lack of assumptions is usually desirable, but to present results a minimum number of assumptions is required. Thus this section attempts to define all the assumptions used in formulating the following tables. The techniques employed reflect a simple methodology, rather than a sophisticated computer modeling.

Tables 1 through 5 provide a capsulated view of Arizona's energy situation as well as an estimate of geothermal market penetration between 1975 and 2020. The markets considered are limited to 1) the demand for industrial process heat, and 2) residential/commercial demand for space conditioning and hot water.

Table 1 presents a one page summary of results of this study. Shown in the table is growth in total energy consumption plus growth in the industrial and residential/commercial sectors over the next 45 years.

The basis of the energy projections is population growth. Population has been assumed to grow at a compound rate of four percent per year between 1975 and 2020. Many demographers within the state predict Arizona's future population growth to range somewhere between two percent and three percent, whereas the historical rate has been
over five percent per year. Consequently, a midpoint value of four percent has been selected.

The energy consumption data for 1975 and 1985 were taken from a study by Dr. Helmut Frank of the Division of Economic and Business Research, University of Arizona (1). The 1975 values represent preliminary figures for that year. The values given for the industrial and residential/commercial sectors are net of energy consumption used for transportation. The 1985 values, also from Dr. Frank's study, represent conservation case values. When generating the remaining state energy use values, compound annual growth rate between 1975 and 1985 was assumed to continue to 2020. These rates are four percent, four percent and 4.55 percent for residential/commercial, industrial and total use, respectively. It should be noted that the values for the years 2000 and 2020 compare favorably with other long range energy use forecasts for Arizona, though the methodology is less sophisticated.

The remaining values for "Potential Geothermal Capture" and "Forecast Geothermal Capture" were taken from other tables which follow the "Regional Hydrothermal Forecast" table. Methods used to derive these numbers will be described shortly.

Table 2, "Arizona Energy Use by County for 1975", is referred to as a bottom-up approach to energy use by the industrial and residential/commercial sectors. In each county (except for Gila, Navajo and Yavapai) an estimate was made of how much industrial process heat could be supplied by geothermal energy, given the assumed average reservoir temperature in each county. These data were developed using the employment data reported in the Arizona Directory of Manufacturers for 1979 (2) and data from the Solar Energy Research Institute (3), which provided estimates of annual energy consumption by four digit SIC code and the process temperatures needed by these industries (4). This procedure enabled the locations of potential industrial users and geothermal resources to be matched. The industrial section of Table 2 is a list of the matching industries and an estimate of their annual process heat energy consumption.

As a qualification, it must be noted that the mining industry's process energy requirements are not included, even though copper mining accounts for fifty percent of industrial energy consumption. Moreover, it has been shown that low-to-moderate temperature geothermal energy may be integrated in the solution mining process, resulting in a fossil fuel savings over conventional solution mining techniques. Industrial demand for space conditioning is also excluded from this analysis, even though twenty-eight percent of industrial energy consumption, net of transportation needs, is used for space conditioning. These two points are significant in that the use of a geothermal resource requires a large initial capital investment only economical for large users of energy who can afford such an investment.

Referring back to Table 2, a discussion of the estimates of residential/commercial energy use and space conditioning demand is required. Again, it was necessary to make some simplifying assumptions
which may not be universally true. For example, it was assumed that the percentage of heating and cooling required was the same for all counties in Arizona. However, Southern Arizona's demand for space cooling is much greater than that for Northern Arizona. The reverse is true for space heating. It should also be noted that space cooling requires electricity, whereas space heating requires petroleum products and natural gas. No attempt has been made to assess the relative merits of electricity savings versus natural gas savings. However, the electricity generation cycle is only thirty-five percent to forty percent efficient, while home furnaces have been shown to be sixty-five percent efficient (5).

In deriving estimates for residential/commercial total energy use and space conditioning, the following procedure was used. First, it was necessary to estimate the number of households in each county in Arizona. This was accomplished by using the Arizona Department of Economic Security's county population estimates for 1975. It was assumed that there are 2.8 persons per household, thus we can compute the number of households in each county. By knowing total residential energy consumption in Arizona net of transportation, an average annual consumption value for each household was computed. This value was found to be 150 million Btu per year. Multiplying this value times the number of households in a given county gives a total residential energy use estimate for that county. However, this only generates an estimate for residential consumption. Thus, it also becomes necessary to estimate total commercial energy consumption. This was accomplished by computing a statewide ratio of residential consumption to commercial consumption. The 1975 ratio is assumed to hold for all counties until 2020. Thus, commercial consumption for any county is defined as:

\[
E_C = \frac{E_R}{.85}
\]

where \( E_C \) = estimated commercial consumption

\( E_R \) = estimated residential consumption

Again, both of these values are net of transportation. The sum of the two values \( E_C + E_R \) is therefore the estimated residential/commercial energy consumption for counties.

A subset of total energy consumption is energy consumption for space conditioning and water heating. It was found that the residential sector consumed a larger percentage of its total energy for space conditioning and water heating than did the commercial sector. In fact, the following relations were found: For the residential sector, thirty-five percent of total energy consumed was for space heating, twenty percent was for space cooling and twenty-eight percent for water heating (6). Thus, eighty-three percent of residential energy consumption net of transportation was consumed for space comfort and hot water. In the commercial sector, a similar total relationship was found, but the component parts were quite different. Commercial consumption for space heat accounted for fifty-eight percent of the total while space cooling was nine percent and water heating required six percent (7).
Thus seventy-three percent of total commercial energy consumption was used for space conditioning and water heating. By applying these percentages to respective total energy use, an estimate of space conditioning and water heating energy consumption for each county was derived. These values appear in Table 2 in aggregate form.

The 1975 values presented in the Growth Projection Calculation Table (Table 3) are a compilation of the industrial section of the County Energy Use Table. The basic underlying assumption is that increased employment results directly in increased energy consumption. The growth rates shown are taken from employment projections done by the Arizona Department of Economic Security (8), and represent projections at the two digit SIC level. Where growth rates were not provided, one percent per year was assumed. Therefore, the projected growth does not fully reflect new growth within the industrial sector of the economy. However, the table does conservatively project growth in demand for process heat which could be supplied by geothermal energy.

These projections, therefore, represent the total potential market penetration that could be attained by geothermal energy. Two shortcomings must be pointed out. First, the potential market for geothermal energy is not as limited as this study may indicate. No mention has been made of potential agricultural or aquacultural applications, and as has been mentioned, mining and industrial space conditioning markets have not been quantitatively defined. Second, it has been assumed that moderate temperature geothermal energy can be used to space cool. Further, it would be prohibitively costly for an individual home-owner to tap a geothermal resource for private use, even if space cooling technology were available.

With these shortcomings in mind, Tables 4 and 5 attempt to model geothermal market penetration over the next forty-five years. It is assumed that retrofit of existing industrial facilities in the process heat market will occur at a rate of one percent per year beginning in 1980, not to exceed 25% of the 1980 market. In the space conditioning market, it is assumed that retrofit will occur at a rate of 1% per year beginning in 1983, not to exceed 25% of the 1983 market. Market penetration for process heat is assumed to be 30% of new growth while market penetration in the residential/commercial market is assumed to be 20% of new growth.

Many factors will be involved in the eventual market penetration of geothermal energy in Arizona. Not all of these factors have been accounted for within this study. It is known that geothermal resources are present in Arizona, but temperature and depth data are lacking.

However, the successful demonstration of geothermal utilization could increase the rate of market penetration in the years ahead. Thus, the Arizona Geothermal Planning Team will pursue its goal of commercialization of geothermal energy. Such planning will be helpful in eventual development plans.
FOOTNOTES


(4) Some of these calculations were provided by New Mexico Energy Institute. See table for information provided by them.


(7) Ibid.

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A-85
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** Process heat demand information provided by NMEI.

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<td>0% New discovery</td>
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<td>TOTAL</td>
<td>199.69</td>
<td>295.59</td>
<td>532.34</td>
<td>1166.42</td>
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</table>

Forecast Geoth. Capture

| Retrofit                | 0                     | 5.466                 | 46.459                | 68.323                |
| New Growth              | 0                     | 10.528                | 57.878                | 184.694               |
| TOTAL                   | 0                     | 15.994                | 104.337               | 253.017               |

* Growth projected at 4% compounded annually
## Contents

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Exhibits

Note: Exhibits are placed at the end of each chapter in order of their exhibit number.

| CHAPTER 1 | 1.a | Counties with Resource Potential |
|           | 1.b | Resource Potential by County by Temperature Range |
|           | 1.c | Target Industries in Counties having Major Market Potential |
|           | 1.d | Major Military Installations Co-located with Geothermal Resources |
|           | 2.b | Estimated Market Potential by County |
|           | 2.c | Estimated Market Demand and Market Potential for End-Use Sector |
|           | 2.d | Decision Tree for Determining Applicable Penetration Rate |
|           | 2.e | Market Penetration Curves 1-6 |
| APPENDIX A | A.1 | Industries Forming the Industrial Sector by Four-Digit SIC Code |
Introduction

As part of the Department of Energy's continuing assessment of energy resources, the Division of Geothermal Resource Manager (DGRM) is refining estimates of the market potential for direct-heat use of geothermal energy in a four-state region. Although the geothermal resource potential in the four states (Arizona, California, Hawaii, and Nevada) is significant, the price of geothermal energy and the associated technical and institutional factors affect the rate of commercial use of this energy source. Resource Planning Associates, Inc. (RPA) was asked to estimate the market potential and the market penetration rate for direct-heat use of geothermal energy in California. Our analysis covers the period from 1976 to 2020.

California has approximately 50 percent of the estimated geothermal resource potential for nonelectric applications in the four-state region being examined by DGRM. The United States Geological Survey (USGS) estimates that approximately two quadrillion Btus of medium-temperature hydrothermal resources have been identified within the state. These resources are concentrated in 20 out of 58 California counties and, potentially, could be used for direct-heat applications such as space conditioning and industrial process heating. In addition to these medium-temperature reservoirs, numerous areas of low-temperature surface waters have been identified, and these reservoirs could also be used to meet California's direct-heat energy requirements. However, no estimates have been made of the total available energy from these low-temperature, hydrothermal resources.*

* California also has the 13 major high-temperature systems that comprise nearly 85 percent of the four-state region's high-temperature resources, with estimated electrical potential of 12,200 MWe for 30 years.
we determined the proportion of the total geothermal resources which could be used in California by estimating the technically-suitable market which is comprised of four end-use sectors: residential and commercial, industrial, agricultural, and military. We estimate that the total technically-suitable market for direct-heat use of geothermal in the 20 identified counties is approximately 83 trillion Btus in 1980, increasing to 143 trillion Btus in 2020. This demand would require only seven percent of total available resources in 2020. The residential/commercial and the industrial sectors each account for nearly half of this demand, which is concentrated in southern counties such as San Diego, Imperial, San Bernardino, Riverside and Ventura. However, with the exception of Imperial County, most of the state's geothermal resources are concentrated in northern counties such as Lake, Lassen, Modoc and Plumas.

Penetration of this technically-suitable market by cost-competitive geothermal energy will not occur immediately upon commercialization of the energy source and the associated technology. Rather, the use of geothermal energy will increase slowly over time as its deliverability is proven and it gains consumer acceptance. Consequently, the estimated market potential of geothermal energy in the state is 436 billion Btus in 1980, increasing to 43.135 billion Btus in 2000 and 100.16 billion Btus in 2020. Geothermal energy will capture less than one percent of the technically-suitable market in 1980 increasing to seventy percent in 2020.

We calculated the market potential for direct-heat use of geothermal energy in California by analyzing the geothermal resource base and, for those counties believed to have geothermal resources, estimating the total technically-suitable market demand. These demand estimates are an initial attempt at determining the realistic size of the direct-heat market in California. Next, we made estimates of the proportion of this market that will be captured by geothermal energy.

We discuss our estimates of the market demand for geothermal energy in non-electric applications in Chapter 1 and present our estimates of the market potential for geothermal energy in Chapter 2.

In Appendix A, we describe our methodology for estimating demand and in Appendix B, we show our county-by-county estimates of resource potential, market demand and market potential.
1 TECHNICALLY-SUITABLE
MARKET POTENTIAL

The market for direct-heat use of geothermal energy in California appears to be constrained by demand rather than by resource. That is, the extensive geothermal resources of the state are located primarily in remote, mountainous, or desert areas and are often within national and state parks and forests. Because the efficient and economic use of this energy requires that it be consumed within a 20-to-50 kilometer (i.e., 10-to-30 mile) radius, the technically-suitable market in 1980 is less than one percent of the current total demand for energy in California.

The technically-suitable market potential for direct-heat use of geothermal energy in California is that portion of total demand which is co-located with the geothermal resources and which can be met by medium- and low-temperature geothermal resources. To estimate this potential, we identified resource potential by county and projected demand in these counties co-located with the resource.

RESOURCE POTENTIAL

California has abundant geothermal resources, nearly 75 percent of the total identified resources in the four-state region. These resources are found in the Coast Range Mountains, in the volcanic mountains of northern California, along the eastern slope of the Sierra Nevada, and throughout the deserts of southern California. Twenty of California's fifty-eight counties have some identified geothermal resources with estimated temperatures ranging from 30°C to well over 250°C (Exhibit 1.a shows those counties having geothermal resource potential).
Current United States Geological Survey (USGS) estimates show that California has nearly 12,200 MWe for 30-year potential for electric applications (or 26.53 quadrillion Btus of beneficial heat for direct-heat use) from the 13 identified high-temperature (i.e., greater than 150°C) reservoirs. The USGS has not made detailed estimates of available work from low-temperature (i.e., 90°C) surface waters, but believes the resource potential at this temperature is substantial.

Generally, high temperature resources are considered sources for generating electricity and medium- and low-temperature resources are judged more appropriate for nonelectric (direct-heat) applications.* However, high-temperature resources may be used economically for specific industrial direct-heat purposes. Nearly three quarters of the estimated low- and medium-temperature resource potential available for direct-heat use (i.e., 2,100 trillion Btus) is located in Imperial, Lake, Lassen, Modoc, Plumas, and Mono Counties;** further, geologists believe low-temperature geothermal resources exist in all six counties (see Exhibit 1.b for the total estimated resource potential by county. Appendix B provides site-specific resource information for each county).

The actual usable potential from these reservoirs will depend on the:

- Flow rates which can be sustained over time
- Salinity of the resource and its corrosive and scaling effect on the extraction and production equipment
- Temperature of the resource over time
- Location of the field (i.e., is the resource located on national park or forest service land which would inhibit its development; what is its proximity to demand).

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* Nonelectric or direct applications include such activities as space conditioning for residential, commercial, and industrial buildings; crop drying, daily water heating, and industrial-process uses such as steam raising, product drying, providing direct heat or hot water.

** Imperial, Mono, Modoc, and Lake Counties also have the greatest high temperature resource potential.
TECHNICALLY-SUITABLE MARKET POTENTIAL

To determine the ultimate economic potential of a particular resource, these four characteristics must be evaluated during the exploration and development of any field. However, only more exploratory drilling will lessen the high uncertainty associated with estimating resource potential.

The exploration and development of these resources has increased substantially over the last decade, much of it in Imperial County. Specifically, six high-temperature sites, three medium-temperature sites, and numerous low-temperature areas have been identified; at these sites, over 60 wells have been drilled to depths of 0.7 to 2.6 kilometers. Additionally, Lake and Lassen Counties have high levels of exploration activity.

DEMAND FOR DIRECT-HEAT USE OF GEOTHERMAL ENERGY

The market for the direct-heat use of geothermal energy in California will be located in those 20 counties which we identified as having or being adjacent to counties with resources. We estimate that total potential demand for geothermal energy within these 20 counties will be 84.5 trillion Btus in 1980 increasing to 103.5 trillion Btus in 2000 and 141.2 trillion Btus in 2020. However, these amounts account in 1980 for less than one percent of California's total 1976 demand for energy. Estimated demand in each of these 20 counties is significantly less than available resource potential in each county. Therefore, we did not adjust demand for any lack of available resource. Additionally, if in 2020 all of this demand for geothermal energy were met by California resources, it would use less than seven percent of the estimated available beneficial heat from medium-temperature resources alone.
For each of the 20 California counties, we estimated total market demand that can be met by geothermal energy (i.e., direct-heat use of hydrothermal resources) during the 1976-2020 time period for the residential/commercial, industrial, agricultural, and military end-use sectors. We based our estimate of demand on four steps:

Step 1: Estimate base demand
Step 2: Identify co-located demand
Step 3: Determine technically-suitable demand

Appendix A details our methodology and Appendix B presents these estimates for each of the twenty California counties.

We briefly discuss below major characteristics of these estimates and their underlying assumptions for each end-use sector.

Residential/Commercial Sector

By 2020, the residential and commercial sectors will comprise 47 percent of the total technically-suitable market. Most of this demand is concentrated in the populous San Diego, Sonoma, Napa and Lake counties. Major direct-heat use applications in these sectors are space heating, space cooling and hot water heating.* These applications are especially promising for these areas where the resource and population centers are co-located because co-location facilitates economies of district heating. However, the location of geothermal resources within California limits the widespread use of district heat. Specifically, Inyo, Mono, Lassen and Siskiyou Counties are rural and rely heavily on liquefied petroleum gas (LPG) for heating and cooking purposes while those counties with the largest residential and commercial demand, San Diego, Ventura and Riverside, have low-temperature waters rather than the more readily exploitable medium-temperature resources.

* We assumed that these applications comprise the demand in these sectors.
The demand estimates for the residential and commercial sectors do not include areas served by LPG because counties using LPG do not have the population density to justify the installation of a steam distribution system.

**Industrial Sector**

About 49 percent of the estimated technically-suitable market for direct-heat use of geothermal energy in 2020 is for the industrial sector; of this, two-thirds are located in three counties: San Diego, Imperial, and San Bernardino. Of the 31 four-digit SIC codes which form the industrial sector, 24 are in these three major counties (see Exhibit 1.c). The major potential industrial users of geothermal energy are:

- Food and kindred products (SIC-20) and chemicals and allied products (SIC 28) in southern California
- Lumber and wood products (SIC 24) and paper and allied products (SIC 26) in northern California.

We estimated base-year demand for the approximately 30 four-digit industries with process heat requirements that could be met by geothermal energy and adjusted the estimated total industrial demand to reflect only that portion of demand used for direct-heat use applications. Typically, applications in the major industries include steam for curing and canning food products, raising hot water for process use, alfalfa drying, lumber drying, and space heating.

After estimating base-year demand, we forecasted the total technically-suitable market using three assumptions: first, all industrial demand is co-located with the geothermal resource, second, all industrial process-temperature requirements can be met by these resources; and third, relocation of industries to counties with geothermal resources will not occur. That is:

- Because we could not precisely identify current industrial location, we could not estimate that portion of demand which is co-located with demand, therefore we assumed co-location for all demand.
- Because current estimates of size, available work, and temperature of identified geothermal resources are imprecise and likely to change over the next few decades, we did not change demand estimates based on these data.

(RPA)
Because we could not examine the numerous factors which affect industrial relocation decisions (e.g., energy costs and reliability of energy supply, availability of raw materials, and costs of transportation-to-market) for all the target industries, we did not adjust demand estimates to reflect relocation of industries from non-geothermal to geothermal counties (relocation could affect demand, for example, in southern California where industries currently in Los Angeles and Orange counties might relocate to Riverside or San Bernardino counties, however, this possible growth in demand due to relocation is captured by our current estimates through our assumptions about growth rate and co-location).

Agricultural Sector
Agricultural use of geothermal energy represents only 3 percent (i.e., 3.8 trillion Btus) of the total technically-suitable market in 2020. About 60 percent of this market is concentrated in Kern, San Bernardino, and Monterey Counties.

We estimated base-year agricultural demand for 20 California counties. However, the bulk of California's agricultural activity occurs in the Central Valley, e.g., in Sacramento, San Joaquin, and Fresno Counties, whose location is not within economic steam-transmission distances from identified geothermal systems. Additionally, thermal energy requirements in this sector constitute only 20 percent of total demand for energy and is limited to energy used, for example, for crop drying, animal husbandry, and space heating of agricultural buildings, particularly chicken coops. For each county, we assumed all agricultural demand is co-located with geothermal resources although this may not be accurate for some of the large counties (e.g., San Bernardino, Kern, and Inyo).

Military
We did not estimate the total potential for direct-heat use of geothermal energy by the various military facilities because estimates of potential demand for total and direct-heat energy for military facilities are currently unavailable. However, it is known that several opportunities for direct-heat and electric applications do exist in military installations throughout California; most notable of these is the Naval development of Coso Hot Springs in Inyo County for use by the China
Lake Naval Weapons Center. Currently, the Navy plans to have 75 MW of capacity on line by 1985 and 350 MW by 1995 and development of other Naval lands, especially in the Imperial Valley, will probably occur in the next twenty-five years (see Exhibit 1.d for a list of major military installations which we believe are co-located with geothermal resources). San Diego and Monterey counties, have some of the heaviest concentration of military facilities in the state but do not offer much potential for military use because of the location of their low-temperature resources.
Exhibit 1.a
COUNTIES WITH RESOURCE POTENTIAL
(Shaded)
Exhibit 1.b

RESOURCE POTENTIAL BY COUNTY BY TEMPERATURE RANGE

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TOTAL 2,105.01 12,206

* Counties are ranked in descending order according to amount of available work.
** Generally, resources in this range are used in nonelectric applications. Counties with favorable areas only.
*** Generally, resources in this range are used in electric applications. Total is 26.53 Quad for beneficial heat, excluding the Geysers.
† Resource shared among Lassen, Plumas and Shasta counties.
‡‡ Resource shared between San Bernardino and Kern counties.
‡‡‡ Estimate includes Geysers KGRA which are currently dedicated to generating electricity.
Exhibit 1.c

TARGET INDUSTRIES IN COUNTIES HAVING MAJOR MARKET POTENTIAL

<table>
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<tr>
<th>Industry</th>
<th>2011</th>
<th>San Diego</th>
<th>Imperial</th>
<th>San Bernardino</th>
<th>Kern</th>
<th>Riverside</th>
<th>Ventura</th>
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<td>Meat Packing</td>
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<td>Poultry Dressing</td>
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<td>Prepared Foods</td>
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<td>Sawmills &amp; Planning Mills</td>
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<td>Solid &amp; Corrugated Fiber Board</td>
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We estimate the market potential for direct-heat use of geothermal energy in California will be 436 billion Btus in 1980, increasing to 43,135 billion Btus in 2000 and 100,126 billion Btus in 2020 (see Exhibit 2.a).* Twenty counties have market potential for direct-heat use of geothermal energy (see Exhibit 2.b), 70 percent of which potential will be in San Diego, Imperial, San Bernardino, Kern, Riverside, and Ventura Counties. The industrial sector is the end-use sector with the largest market potential, constituting nearly two thirds of the total potential (see Exhibit 2.c; Appendix B presents market potential estimates by end-use sector for the 20 counties examined). Geothermal energy used in nonelectric applications is assumed to be cost-competitive with traditional fuels, such as natural gas and electricity, and most nontraditional energy sources such as solar, wind and biomass.** However even if we assume consumers will base investment decisions on cost-competitiveness of the product, we cannot conclude that acceptance of geothermal energy and investments in equipment to utilize this energy will occur immediately. Rather, to estimate the true market potential of direct use of geothermal energy, we must estimate the rate of market penetration.

* Market potential is defined as that portion of the technically-suitable market which is captured by geothermal energy.

** However, the estimated dates for when geothermal energy will achieve competitiveness and the uniformity of costs throughout California are uncertain; consequently, market penetration estimates are also uncertain.
Market penetration rates usually reflect assumptions about market acceptance of a new technology or product. History indicates that market acceptance and use of a new technology, product, or fuel does not occur immediately upon introduction and does not follow a linear pattern. The process by which products or technologies do come into use is called diffusion and, typically, can be divided into three distinct phases: a demonstration period of a few years, during which penetration is slow; a period of rapid growth which indicates more widespread acceptance and often continues until the appropriate market is nearly saturated; and a mature growth period of relatively constant penetration rates. These distinct phases of market penetration reflect the interaction of several consumer-related factors; major factors include the slow spread of information and awareness concerning the existence and performance of the new product or technology, uncertainty about the benefits of the product or technology, consumer desire to wait for products to become cheaper or better, and recent consumer investment in a competing product.

To estimate the geothermal market potential in California, we developed six market penetration rates (or curves) that approximate this diffusion process for geothermal energy. We then applied these rates to the technically-suitable market estimates to obtain the estimated market potential. Each curve reflects a different set of assumptions about the start of commercialization, the length of development and rapid-growth phases, and the annual rates of penetration during these periods.

We determined the applicable curve for estimating the percentage of technically-suitable demand captured by geothermal energy for each end-use sector within a county by applying a set of decision rules which reflect the major factors that will influence the rate of penetration in each end-use sector (in Exhibit 2.d we present the decision tree for applying these rules). We briefly describe the major factors influencing penetration and assumptions about penetration for each end-use sector below.
MARKET PENETRATION ESTIMATES

RESIDENTIAL/COMMERCIAL SECTOR

We estimate that geothermal energy will capture approximately 55 percent of the technically-suitable market in the residential and commercial sectors by 2020. Market potential for these sectors comprises 35 percent of total California potential or 34.6 trillion Btus in 2020. With 75 percent of the total market potential, San Diego, Ventura, Sonoma, and Napa Counties have the greatest potential for residential and commercial use of geothermal energy. Three major factors will affect the rate and timing of market penetration within the residential and commercial sectors:

- Temperature of resource
- Dependency on LPG
- Density of the population.

We used the temperature of a resource within a county as a proxy for estimating the start of commercialization. That is, if a county has any high- or medium-temperature (i.e., greater than 90°C), we assumed penetration will begin in 1980 because this date reflects existing exploration, development, and production activities that are normally associated with these resources and that can effect a higher probability of early commercialization. If a county has low-temperature resources (i.e., less than 90°C) low-temperature resources only, we assumed commercialization and penetration will not begin until 1985.

One quarter of the counties with geothermal-resource potential have no natural gas service and must depend on LPG. If the residential and commercial establishments within a county depend on LPG, we assumed that geothermal energy would not replace these existing energy sources because the use of LPG implies population density insufficient to support an economic steam-distribution system. Consequently, we assume geothermal energy will not be competitive in the residential/commercial sector in these counties.

We used density of population in a county to determine the near-term possibilities for district heating and the speed with which knowledge, acceptance, and use of the
geothermal energy would occur.* We assumed counties having high-population densities will experience a development phase lasting five years and a rapid-growth phase lasting ten years. Contrastingly, we assumed counties having low-population densities will experience a development phase lasting 8 years and a rapid-growth period lasting 15 years. We assumed the remaining years until 2020 will be in the mature-growth phase. Annual penetration rates were the same for all counties: one percent per year for the development phase, two percent per year for the rapid-growth phase, and one percent per year for the remaining period.* Market Penetration curves 1, 2, 3, and 4 of Exhibit 2.e reflect these assumptions.

INDUSTRIAL SECTOR

We estimate that geothermal energy will capture 90 percent of the industrial demand for energy (63.5 trillion Btus) by 2020. This sector comprises nearly two-thirds of total state-wide potential and is concentrated in San Diego, Imperial, San Bernardino, Santa Barbara, and Riverside Counties. Together, these counties make up nearly 80 percent of California's potential demand by industries.

We assumed penetration of the industrial sector will begin in either 1980 or 1985, depending on the temperature characteristics of the resources in a county. We assumed the development phase for industry will be eight years, a duration of time reflecting the concerns of industry executives about the technical and economic feasibility of using geothermal energy. For example, uncertainties over the purity and reliability of the steam will need to be clarified.

* Average population density of the 20 counties (i.e., 54.4 people per square mile) was used as the determining factor.

** In forecasting demand, major gas and electric utilities use one percent per year as the average projected growth in housing stock during the 1976-1998 time period.
We assumed annual penetration rates during this time period will be two percent. Annual penetration rates during an estimated 15-year rapid-growth phase will be 4 percent, an assumption which reflects estimates of the percentage of annual turnover of capital equipment used for fuel-burning equipment and of the percentage of retrofit applications. We assumed penetration during the mature-growth phase will be two percent per year. Market penetration curves 5 and 6 of Exhibit 2.e reflect these assumptions.

AGRICULTURAL SECTOR

We estimate that about 55 percent (2.1 trillion Btus) of the agricultural demand for energy will be captured by geothermal energy in 2020. However, this sector accounts for only two percent of total statewide potential. Most of this potential (57 percent) is located in Kern, San Bernardino, and Mendocino Counties.

The two main factors influencing the timing of geothermal penetration in the agricultural sector are the temperature of the resource in the county and the percentage of land in the county which is dedicated to farming. As was true for the other sectors, penetration will begin either in 1980 or 1985, depending on the temperature of resources within the county. We used density of farmland as a proxy for estimating size and sophistication of farms and their capability for using geothermal energy cost-effectively.*

Annual penetration rate and length of diffusion-phase assumptions for the high and low density agricultural counties are the same as for high- and low-density population counties (see Market Penetration Curves 1, 2, 3, and 4 of Exhibit 2.e).

* We used average density of farmland for the 20 counties (i.e., 26.2 percent of total county acreage) as the determining factor.
MARKET PENETRATION ESTIMATES

MILITARY SECTOR

We could not make comprehensive market potential estimates for the military sector because of the lack of resource and demand estimates for resources and facilities owned by the military. Market potential estimates can be made once these estimates are available.

We do not expect the penetration of the military market by geothermal energy to follow the traditional diffusion process. Rather, because of the captive nature of demand and the tendency of federal policy to encourage energy conservation and use of nontraditional fuels, we assumed penetration will be 100 percent when the resource becomes available for use.
Exhibit 2a

Estimated market potential for direct-heat use of geothermal energy in California: 1980 to 2020

Total technically-suitable market

Agricultural

Residential/Commercial

Industrial

YEAR
## Exhibit 2.5

### ESTIMATED MARKET POTENTIAL
**BY COUNTY (billions of Btu)**

<table>
<thead>
<tr>
<th></th>
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<td>541.45</td>
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<td>8,580.35</td>
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<td>34.55</td>
<td>55.87</td>
<td>77.76</td>
</tr>
<tr>
<td>Mono</td>
<td>.64</td>
<td>.20</td>
<td>.57</td>
<td>1.05</td>
<td>1.73</td>
<td>2.92</td>
<td>4.24</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>436.35</td>
<td>3,013.21</td>
<td>12,402.98</td>
<td>24,493.52</td>
<td>48,134.68</td>
<td>72,696.30</td>
<td>100,211.19</td>
</tr>
</tbody>
</table>

* Counties are ranked in descending order according to market potential.
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential/Commercial</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Market Demand</td>
<td>65,660.70</td>
<td>65,271.38</td>
<td>65,056.42</td>
<td>64,942.36</td>
<td>64,973.29</td>
<td>66,763.86</td>
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<td>Market Potential</td>
<td>192.01</td>
<td>1,444.87</td>
<td>5,125.24</td>
<td>11,983.93</td>
<td>18,745.70</td>
<td>34,593.04</td>
</tr>
<tr>
<td>Industria</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Market Demand</td>
<td>18,373.68</td>
<td>21,584.77</td>
<td>25,442.38</td>
<td>30,044.16</td>
<td>35,525.99</td>
<td>70,549.17</td>
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<tr>
<td>Market Potential</td>
<td>226.92</td>
<td>1,547.32</td>
<td>4,907.79</td>
<td>11,886.34</td>
<td>23,438.99</td>
<td>63,493.38</td>
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<tr>
<td>Agricultural</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Market Demand</td>
<td>2,382.31</td>
<td>2,524.40</td>
<td>2,676.73</td>
<td>2,840.48</td>
<td>3,016.47</td>
<td>1,851.80</td>
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<tr>
<td>Market Potential</td>
<td>17.42</td>
<td>100.87</td>
<td>398.95</td>
<td>623.25</td>
<td>949.99</td>
<td>2,174.83</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Market Demand</td>
<td>84,416.69</td>
<td>89,380.54</td>
<td>93,175.53</td>
<td>97,827.00</td>
<td>103,515.75</td>
<td>141,176.83</td>
</tr>
<tr>
<td>Market Potential</td>
<td>436.35</td>
<td>1,093.16</td>
<td>10,402.98</td>
<td>24,293.52</td>
<td>43,134.68</td>
<td>100,261.25</td>
</tr>
</tbody>
</table>

* The current projection for the 1995 market potential in the military end-use sector is for Cove Hot Springs, Inyo County: 350 MWe for electric applications. The Navy projects that other bases which are co-located with geothermal resources in Southern California will use geothermally-generated electricity; however, the Navy could not provide estimates of market demand at this time.
Exhibit 2.e

MARKET PENETRATION CURVE NUMBER 1
(High temperature, residential/commercial or agricultural, low LPG dependency, high population density or high farmland density)
Exhibit 2.e (continued)

MARKET PENETRATION CURVE
NUMBER 2 (High temperature, residential/commercial or agricultural, low LPG dependency, low population density or low farmland density)
MARKET PENETRATION CURVE NUMBER 3
(Low temperature, residential/commercial or agricultural, low LPG dependency, high population density or high farmland density)
Exhibit 2.e (continued)

MARKET PENETRATION CURVE NUMBER 4
(low temperature, residential/commercial or agricultural, low LPG dependency, low population density or low farmland density)
MARKET PENETRATION
CURVE NUMBER 5
(High temperature)
Exhibit 2.e (continued)

MARKET PENETRATION CURVE NUMBER 6
(low temperature)
Appendix A

METHODOLOGY FOR ESTIMATING
TECHNICALLY-SUITABLE MARKET
POTENTIAL FOR DIRECT-HEAT
USE OF GEOTHERMAL ENERGY
DEMAND METHODOLOGY

We estimated the technically-suitable market potential for direct-heat use of geothermal energy by end-use sector for each of the 20 California counties having geothermal-resource potential. Within each county, we examined the residential and commercial, industrial, agricultural, and military end-use sectors and estimated the technically-suitable market potential in four steps:

Step 1: Estimate base-year demand
Step 2: Identify proportion of demand co-located with geothermal resource
Step 3: Determine proportion of technically-suitable demand (i.e., demand which can be provided by geothermal energy in a specific location)
Step 4: Project growth in demand for 1976-2020 time period

In this appendix, we discuss our assumptions, information sources, and the procedures used for each end-use sector.

RESIDENTIAL/COMMERCIAL SECTOR

Base-Year (1976) Demand

The residential and commercial sectors primarily consume natural gas and electricity. Several of the more rural and inaccessible counties use liquefied petroleum gas (LPG) in place of natural gas because gas distribution systems do not exist in these remote areas.

We used sales data reported by electric and gas utilities* to the Federal Energy and Regulatory Commission (FERC) in Forms 1 and 2 and Uniform Statistical Reports of individual companies to estimate base-year (1976) demand in the residential/commercial sectors. We allocated

* Six major electric companies serve the 20 counties: Pacific Gas & Electric Company (PG&E), San Diego Gas & Electric Company (SDG&E), Southern California Edison Company (SCE), Pacific Power and Light Company, CP National Corporation, and Sierra Pacific Power Company; additionally, several municipal utilities offer service within these counties (e.g., Imperial Irrigation District and Riverside Department of Public Utilities). Southern California Gas Company, Southwest Gas Corporation, PG&E, and SDG&E provide gas service.
total sales of gas and electricity for each utility to a given county based on the percentage of the utility service area's population that was accounted for by each county. Where two or more utilities serviced the same county, we adjusted the base county population to avoid double counting. Similarly, for those utilities which include agricultural consumption in their commercial accounts, we reduced total commercial sales by the amount of agricultural consumption. This allocation procedure resulted in base-year residential and commercial demand for each county.

Co-Located Demand

Only a portion of the base-year demand in each county lies within a physically-feasible and economic transmission distance from the geothermal resources. Therefore, we adjusted base year-demand to reflect that portion of total demand which could feasibly be served by geothermal energy. We used 20 kilometers* as the maximum delivery radius for geothermal steam distribution and matched this transmission distance to county-specific population densities to estimate the proportion of population co-located with the potential service area of the identified resources. These proportions also reflected market areas which cross over county lines; however, we did not include demand which could be met by geothermal resources in neighboring states or Mexico.

Technically-Suitable Demand

It is not always technically possible for a geothermal resource to serve a co-located demand. For example, in the residential and commercial sectors, a significant portion of the demand for electricity (i.e., electricity used for refrigeration, lighting, and running appliances) cannot readily be replaced by direct-heat uses of geothermal energy. Therefore, we assumed that geothermal energy could replace energy used for space heating and cooling and hot-water heating in these two sectors. Specifically, we assumed that 94 percent of the natural gas and 48 percent of the

* Currently, this is the maximum distance for economic transmission of geothermal energy in Iceland.
electricity requirements could be displaced by geothermal energy in the residential sector; similarly, we assumed that geothermal energy could displace 100 percent of the natural gas and 42 percent of the electricity in the commercial sector.\footnote{1} Our adjusted estimates of co-located demand reflect these assumptions.

Demand Projections

After adjusting the base-year total demand to account for location and technical requirements, we used forecasts by the California Energy Commission to estimate demand for the 1976-2020 period. The growth rates for demand specified below vary by sector and by fuel type.

\[
\begin{array}{|c|c|c|}
\hline
\text{ANNUAL GROWTH RATE} & \text{Electricity} & \text{Natural Gas} \\
\text{IN DEMAND: 1977-1998?} & (\text{percent}) \\
\hline
\text{Residential Sector} & 2.9 & .5 \\
\text{Commercial Sector} & 1.7 & .17 \\
\hline
\end{array}
\]

We have assumed above growth rates also apply to 1998-2020.

INDUSTRIAL SECTOR

Base-Year Demand

Generally, the industrial sector is defined as those industries with Standard Industrial Classification (SIC) codes between 20 and 39. Using data from a previous study

DEMAND METHODOLOGY

which identified 55 four-digit (SIC) codes with process-heat requirements which could probably be met by solar energy, we assumed that geothermal energy could, with few exceptions, meet these same requirements. Accordingly, we identified industries located within the target counties. These industries, form the industrial sector (see Exhibit A.1).

To estimate base-year demand for the industrial sector by county we performed three steps. First, we estimated the number of employees by SIC code in each county. Next, we estimated average fuel use per employee by SIC code in California. Because only fuel use by three-digit code is available at the state level, we apportioned total fuel used at the three-digit level in California among the relevant four-digit industries using national averages. Finally, we estimated fuel use at a county level for each four-digit SIC code by multiplying fuel use per employee by the number of employees in a given county.

Co-Located Demand

We assumed that all of the estimated industrial demand within a county is co-located with geothermal resources in that county.

Not all of the industrial demand for energy can be met by medium-temperature geothermal energy, especially that portion of energy required for electric drive. Because estimates for each four-digit SIC code of the portion of total energy which


can be provided by geothermal energy were not readily available, we aggregated fuel use by four-digit SIC codes to a two-digit level and used the percentage estimates shown below to estimate a technically-suitable industrial demand for each county.

Demand Projections
Estimates of annual growth in value-added by two-digit SIC codes for California industries formed the basis of our industrial demand projections. We believe that growth in energy requirements will more closely parallel value-added growth than employment growth.

ASSUMPTIONS ABOUT INDUSTRIAL DEMAND

<table>
<thead>
<tr>
<th>SIC Code</th>
<th>Proportion of Thermal Energy (%)</th>
<th>Annual Growth Rate (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>0.72</td>
<td>2.68</td>
</tr>
<tr>
<td>22</td>
<td>0.89</td>
<td>3.41</td>
</tr>
<tr>
<td>23</td>
<td>0.48</td>
<td>4.54</td>
</tr>
<tr>
<td>24</td>
<td>0.67</td>
<td>3.22</td>
</tr>
<tr>
<td>25</td>
<td>0.75</td>
<td>3.97</td>
</tr>
<tr>
<td>26</td>
<td>0.75</td>
<td>3.22</td>
</tr>
<tr>
<td>28</td>
<td>0.82</td>
<td>4.23</td>
</tr>
<tr>
<td>32</td>
<td>0.98</td>
<td>3.16</td>
</tr>
<tr>
<td>33</td>
<td>0.79</td>
<td>0.98</td>
</tr>
<tr>
<td>34</td>
<td>0.89</td>
<td>3.74</td>
</tr>
<tr>
<td>36</td>
<td>0.89</td>
<td>3.09</td>
</tr>
</tbody>
</table>

DEMAND METHODOLOGY

AGRICULTURAL SECTOR

Base-Year Demand
The agricultural sector primarily consumes natural gas and electricity.* We used sales data reported to FERC by gas and electric utilities in Forms 1 and 2 as well as in the Uniform Statistical Reports of those companies to estimate base-year demand. We allocated sales data for each utility among counties in that utility's service area according to the percentage of total farmland served by the utility within a given county and adjusted our estimates if two or more utilities served a particular county.

Co-Located Demand
We assumed that all of the estimated agricultural demand within a county is co-located with geothermal resources in that county.

Technically-Suitable Demand
In California, a large amount of (approximately 79 percent) of agricultural requirements for energy are for irrigation, and geothermal energy is not thought to be able to displace the energy required for these and similar electricity-requiring activities. Therefore, we assumed that the remaining (i.e., 21 percent) agricultural requirements for energy can be met by geothermal energy1, and adjusted base-year demand to reflect this assumption.


* The same gas and electric utilities which serve the residential and commercial sectors serve the agricultural sectors.
Demand Projections
Many estimates of growth in agricultural consumption of energy in California have been made in recent years. However, many of these are on a crop-by-crop basis, rather than by county or by fuel category. Therefore, we have used CEC estimates of 1.7 percent per year growth in electricity use and .6 percent per year growth in natural gas use. We have assumed, as in the case for the residential and commercial sectors, that these annual growth rates also apply to the period 1998 to 2020.

MILITARY SECTOR

The military sector includes major Naval, Army, and Air Force installations within California. Estimates of base-year demand for these facilities are not available at this time. However, we were able to identify those facilities which are co-located with geothermal resources. Therefore, the demand from these facilities should be considered part of the technically-suitable market potential when estimates become available.

## Exhibit A.1

### INDUSTRIES FORMING

#### THE INDUSTRIAL SECTOR

#### BY FOUR-DIGIT SIC CODE

<table>
<thead>
<tr>
<th>SIC Code</th>
<th>Industry</th>
<th>Applicable Counties</th>
</tr>
</thead>
<tbody>
<tr>
<td>2011</td>
<td>Meat Packing Plants</td>
<td>Kern, Kern County, San Bernardino, San Luis Obispo, San Diego</td>
</tr>
<tr>
<td>2016</td>
<td>Poultry Dressing Plants</td>
<td>Riverside, San Diego, Sonoma</td>
</tr>
<tr>
<td>2024</td>
<td>Fluid Milk</td>
<td>Kern, Riverside, San Bernardino, San Diego, Shasta, Sonoma</td>
</tr>
<tr>
<td>2033</td>
<td>Canned Fruits and Vegetables</td>
<td>Riverside, Sonoma, Ventura</td>
</tr>
<tr>
<td>2034</td>
<td>Dehydrated Fruits and Vegetables</td>
<td>San Bernardino, Santa Barbara, Ventura</td>
</tr>
<tr>
<td>2037</td>
<td>Frozen Fruits and Vegetables</td>
<td>San Diego, San Bernardino, Riverside, Kern, Imperial</td>
</tr>
<tr>
<td>2041</td>
<td>Prepared Feeds, NEC</td>
<td>Imperial, Inyo, San Bernardino, Santa Barbara, San Diego, Sonoma</td>
</tr>
<tr>
<td>2051</td>
<td>Bread, Cake, Related Products</td>
<td>Santa Barbara, Imperial</td>
</tr>
<tr>
<td>2063</td>
<td>Fruit Sugar</td>
<td>Ventura</td>
</tr>
<tr>
<td>3077</td>
<td>Animal and Marine Fats and Oils</td>
<td>Riverside, San Bernardino, Santa Barbara, San Diego, Shasta, Ventura</td>
</tr>
<tr>
<td>2086</td>
<td>Bottled and Canned Soft Drinks</td>
<td>Sonoma, Siskiyou, Shasta, San Luis Obispo, San Bernardino, Plumas,</td>
</tr>
<tr>
<td>2421</td>
<td>Saw Mills, Planning Mills, General</td>
<td>Monterey, Modoc, Mendocino, Kern, Lake, Lassen, Kern</td>
</tr>
<tr>
<td>2435</td>
<td>Hardwood, Veneer, and Plywood</td>
<td>Shasta, San Luis Obispo, San Bernardino, Monterey, Lake</td>
</tr>
<tr>
<td>2436</td>
<td>Softwood, Veneer, and Plywood</td>
<td>Mendocino, Shasta, Siskiyou, Sonoma</td>
</tr>
<tr>
<td>2511</td>
<td>Wood Household Furniture</td>
<td>Mendocino, Monterey, Riverside, San Diego</td>
</tr>
<tr>
<td>2512</td>
<td>Upholstered Household Furniture</td>
<td>Monterey, San Bernardino, San Diego</td>
</tr>
<tr>
<td>2653</td>
<td>Corrugated, Solid Fiber Boxes</td>
<td>Monterey, Riverside, San Bernardino, San Diego</td>
</tr>
<tr>
<td>2819</td>
<td>Industrial Inorganic Chemicals, NEC</td>
<td>Kern, Monterey</td>
</tr>
<tr>
<td>2824</td>
<td>Organic Fibers, Noncellulosic</td>
<td>San Bernardino, San Diego</td>
</tr>
<tr>
<td>2841</td>
<td>Soap and Other Detergents</td>
<td>Kern, Monterey</td>
</tr>
<tr>
<td>2855</td>
<td>Cyclic Crudes and Intermediates</td>
<td>San Diego</td>
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<tr>
<td>2869</td>
<td>Industrial Organic Chemicals, NEC</td>
<td>Monterey, Imperial</td>
</tr>
<tr>
<td>2873</td>
<td>Nitrogenous Fertilizers</td>
<td>Monterey, Napa, Riverside, San Bernardino, San Diego</td>
</tr>
<tr>
<td>2899</td>
<td>Chemical Preparations, NEC</td>
<td>San Bernardino, San Diego</td>
</tr>
<tr>
<td>3271</td>
<td>Concrete Block and Brick</td>
<td>Kern, Monterey, Riverside, San Bernardino, San Diego, Sonoma, Ventura</td>
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<tr>
<td>3273</td>
<td>Ready Mix Concrete</td>
<td>Imperial</td>
</tr>
<tr>
<td>3275</td>
<td>Gypsum Products</td>
<td>Monterey, Riverside, San Bernardino, San Diego</td>
</tr>
<tr>
<td>3295</td>
<td>Minerals, Ground or Treated</td>
<td>San Bernardino, San Diego</td>
</tr>
<tr>
<td>3312</td>
<td>Blast Furnaces &amp; Steel Mills</td>
<td>Monterey, San Bernardino, San Diego</td>
</tr>
<tr>
<td>3479</td>
<td>Metal Coating, Allied Services</td>
<td>Santa Barbara, San Diego</td>
</tr>
<tr>
<td>3621</td>
<td>Motors and Generators</td>
<td></td>
</tr>
</tbody>
</table>
Appendix B

SUMMARY OF RESOURCE AND MARKET POTENTIAL BY COUNTY
# IMPERIAL COUNTY

## Summary of Resource Potential

<table>
<thead>
<tr>
<th>Resources</th>
<th>Average Temperature (°C)</th>
<th>Depth of Wells (m)</th>
<th>Number of Wells</th>
<th>Average Volume (km³)</th>
<th>Resource Potential 50°C</th>
<th>Resource Potential 150°C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Salton Sea</td>
<td>123 ± 8</td>
<td>700 - 2600</td>
<td>&gt;20</td>
<td>116.0 ± 34.0</td>
<td>3400</td>
<td></td>
</tr>
<tr>
<td>Westmoreland</td>
<td>217 ± 7</td>
<td>up to 2600</td>
<td>6</td>
<td>123.0 ± 35.0</td>
<td>1710</td>
<td></td>
</tr>
<tr>
<td>Brawley</td>
<td>251 ± 10</td>
<td>up to 4000</td>
<td>6</td>
<td>34.0 ± 8.0</td>
<td>640</td>
<td></td>
</tr>
<tr>
<td>East Numa</td>
<td>182 ± 7</td>
<td>900 - 2800</td>
<td>&gt;20</td>
<td>36.0 ± 7.0</td>
<td>340</td>
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</tr>
<tr>
<td>Border</td>
<td>160 ± 4</td>
<td>NA</td>
<td>NA</td>
<td>4.0 ± 0.6</td>
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<td></td>
</tr>
<tr>
<td>Weber</td>
<td>175 ± 5</td>
<td>900 - 3300</td>
<td>11</td>
<td>71.0 ± 14.0</td>
<td>650</td>
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<tr>
<td>Glamis (East Brawley)</td>
<td>132 ± 14</td>
<td>NA</td>
<td>NA</td>
<td>3.3 ± 0.9</td>
<td>59.72</td>
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<tr>
<td>Glamis East</td>
<td>132 ± 14</td>
<td>NA</td>
<td>NA</td>
<td>5.0 ± 2.7</td>
<td>89.11</td>
<td></td>
</tr>
<tr>
<td>Dunes</td>
<td>132 ± 14</td>
<td>612</td>
<td>1</td>
<td>8.9 ± 2.4</td>
<td>159.26</td>
<td></td>
</tr>
<tr>
<td>Imperial - Coachella Valleys</td>
<td>39 - 98</td>
<td>&lt;150</td>
<td>14</td>
<td>NA</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Ocotillo Hot Springs</td>
<td>31 - 39</td>
<td>45 - 365</td>
<td>8</td>
<td>NA</td>
<td>Yes</td>
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</tr>
</tbody>
</table>

* Resource Potential for 90°-150°C resources is estimated beneficial heat as calculated by the USGS.

## Summary of Market Potential

### PD-USE SECTOR

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>Residential/Commercial</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Market Demand</td>
<td>3,421.25</td>
<td>1,450.81</td>
<td>1,513.03</td>
<td>1,576.29</td>
<td>1,649.75</td>
<td>1,734.72</td>
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</tr>
<tr>
<td>Market Potential (2)*</td>
<td>0</td>
<td>14.59</td>
<td>77.16</td>
<td>194.36</td>
<td>382.07</td>
<td>609.13</td>
<td>1,162.14</td>
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<tr>
<td>Industrial</td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Market Demand</td>
<td>3,193.02</td>
<td>3,679.94</td>
<td>4,398.69</td>
<td>5,263.41</td>
<td>6,304.91</td>
<td>7,560.42</td>
<td>15,790.56</td>
</tr>
<tr>
<td>Market Potential (5)*</td>
<td>0</td>
<td>73.60</td>
<td>457.81</td>
<td>1,333.22</td>
<td>3,074.27</td>
<td>5,841.94</td>
<td>14,211.46</td>
</tr>
<tr>
<td>Agricultural</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Market Demand</td>
<td>109.97</td>
<td>115.13</td>
<td>122.01</td>
<td>129.40</td>
<td>137.33</td>
<td>345.86</td>
<td>186.36</td>
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<td>Market Potential (1)*</td>
<td>0</td>
<td>1.15</td>
<td>6.22</td>
<td>15.96</td>
<td>31.80</td>
<td>51.22</td>
<td>114.14</td>
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<tr>
<td>Total</td>
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<tr>
<td>Market Demand</td>
<td>4,724.24</td>
<td>5,253.98</td>
<td>6,033.69</td>
<td>6,969.11</td>
<td>8,091.89</td>
<td>9,441.00</td>
<td>18,200.76</td>
</tr>
<tr>
<td>Market Potential</td>
<td>0</td>
<td>89.34</td>
<td>541.19</td>
<td>1,543.56</td>
<td>3,688.14</td>
<td>6,502.29</td>
<td>15,488.9</td>
</tr>
</tbody>
</table>

* Number in parentheses refers to the specific market penetration curve used in the end-use sector in this county.

A-136
INYO COUNTY

Summary of Resource Potential

<table>
<thead>
<tr>
<th>Resource</th>
<th>Average Temperature (°C)</th>
<th>Depth of Wells (m)</th>
<th>Number of Wells</th>
<th>Average Volume (m³)</th>
<th>Resource Potential 90°C</th>
<th>Resource Potential 90-150°C</th>
<th>Resource Potential 150°C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tepee Hot Springs</td>
<td>62 ± 14</td>
<td>1477</td>
<td>NA</td>
<td>44.0 ± 12.8</td>
<td>650</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tepee Hot Springs</td>
<td>62 ± 14</td>
<td>NA</td>
<td>NA</td>
<td>3.3 ± 0.9</td>
<td>54.88</td>
<td></td>
<td></td>
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<tr>
<td>Tepee Hot Springs</td>
<td>62 ± 14</td>
<td>123</td>
<td>1</td>
<td>NA</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Tepee Hot Springs</td>
<td>62 ± 14</td>
<td>93 - 182</td>
<td>4</td>
<td>NA</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Resource Potential for 90°-150°C resources is estimated beneficial heat as calculated by the U.S.G.

Summary of Market Potential

<table>
<thead>
<tr>
<th></th>
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<th></th>
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</thead>
<tbody>
<tr>
<td>Residential/Commercial</td>
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</tr>
<tr>
<td>• Market Demand</td>
<td>17.63</td>
<td>19.30</td>
<td>21.64</td>
<td>24.28</td>
<td>27.26</td>
<td>30.63</td>
<td>49.2%</td>
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<tr>
<td>• Market Potential (θ)*</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Industrial</td>
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</tr>
<tr>
<td>• Market Demand</td>
<td>9.83</td>
<td>10.92</td>
<td>12.47</td>
<td>14.23</td>
<td>16.24</td>
<td>18.54</td>
<td>31.4%</td>
</tr>
<tr>
<td>• Market Potential (5)*</td>
<td>0</td>
<td>0.22</td>
<td>1.30</td>
<td>3.60</td>
<td>7.92</td>
<td>14.33</td>
<td>28.1%</td>
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<tr>
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</tr>
<tr>
<td>• Market Demand</td>
<td>20.42</td>
<td>41.09</td>
<td>44.71</td>
<td>48.64</td>
<td>52.92</td>
<td>57.17</td>
<td>80.4%</td>
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<tr>
<td>• Market Potential (2)*</td>
<td>0</td>
<td>0.41</td>
<td>2.28</td>
<td>6.00</td>
<td>12.26</td>
<td>20.22</td>
<td>44.4%</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Market Demand</td>
<td>65.88</td>
<td>71.31</td>
<td>78.82</td>
<td>87.15</td>
<td>96.42</td>
<td>106.74</td>
<td>161.4%</td>
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<tr>
<td>• Market Potential</td>
<td>0</td>
<td>0.63</td>
<td>3.58</td>
<td>9.60</td>
<td>20.18</td>
<td>34.5%</td>
<td>77.7%</td>
</tr>
</tbody>
</table>

* Number in parentheses refers to the specific market penetration curve used in the end-use sector in this county.
# Kern County

## Summary of Resource Potential

<table>
<thead>
<tr>
<th>Resource</th>
<th>Average Temperature (°C)</th>
<th>Depth of Wells (m)</th>
<th>Number of Wells</th>
<th>Average Volume (km³)</th>
<th>Resource Potential 90°C</th>
<th>Resource Potential 90-150°C</th>
<th>Resource Potential 150°C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Natural Gas</td>
<td>172 ± 29</td>
<td>2.15</td>
<td>NA</td>
<td>9.4 ± 2.3</td>
<td>84</td>
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<td></td>
</tr>
<tr>
<td>Geo-Heat Hot Springs</td>
<td>106 ± 7</td>
<td>NA</td>
<td>NA</td>
<td>3.3 ± 0.9</td>
<td>46.45</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Resource Potential for 90°C - 150°C resources is estimated beneficial heat as calculated by the USGS.

## Summary of Market Potential

### End-Use Sector

<table>
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<tr>
<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential/Commercial</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Market Demand</td>
<td>2,355.00</td>
<td>2,362.91</td>
<td>2,378.63</td>
<td>2,401.51</td>
<td>2,422.38</td>
<td>2,452.21 &amp; 2,746.44</td>
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</tr>
<tr>
<td>Market Potential (2)*</td>
<td>0</td>
<td>121.31</td>
<td>296.31</td>
<td>563.31</td>
<td>866.09 &amp; 1,601.3</td>
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<td></td>
</tr>
<tr>
<td>Industrial</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Market Demand</td>
<td>804.90</td>
<td>796.35</td>
<td>959.75</td>
<td>1,155.35</td>
<td>1,399.53 &amp; 1,682.26</td>
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<td></td>
</tr>
<tr>
<td>Market Potential (5)*</td>
<td>5</td>
<td>15.93</td>
<td>99.79</td>
<td>292.65 &amp; 682.41</td>
<td>1,299.88 &amp; 3,021.8</td>
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<tr>
<td>Agricultural</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Market Demand</td>
<td>600.34</td>
<td>626.98</td>
<td>662.52</td>
<td>700.32</td>
<td>740.97 &amp; 784.55</td>
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<td></td>
</tr>
<tr>
<td>Market Potential (1)*</td>
<td>0</td>
<td>6.27</td>
<td>33.79</td>
<td>108.61</td>
<td>199.99 &amp; 253.77</td>
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<td></td>
</tr>
<tr>
<td>Total</td>
<td>3,642.24</td>
<td>3,786.22</td>
<td>3,959.90</td>
<td>4,257.18 &amp; 4,572.88</td>
<td>4,939.02 &amp; 7,341.8</td>
<td></td>
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</tr>
</tbody>
</table>

* Number in parentheses refers to the specific market penetration curve used in the end-use sector in this county.
LAKE COUNTY

Summary of Resource Potential

<table>
<thead>
<tr>
<th>Resource</th>
<th>Average Temperature (°C)</th>
<th>Depth of Wells (m)</th>
<th>Number of Wells</th>
<th>Average Volume (km³)</th>
<th>Resource Potential 90°-155°C (10⁶ Btu)</th>
<th>150°C (Btu)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Geysera</td>
<td>217 ± 8</td>
<td>NA</td>
<td>200</td>
<td>116.0 ± 39.0</td>
<td>14.10</td>
<td></td>
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<tr>
<td>Sulphur bank Mine (Hot Potental)</td>
<td>164 ± 6</td>
<td>400-1,000</td>
<td>4</td>
<td>6.7 ± 1.9</td>
<td>7%</td>
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<tr>
<td>Clear Lake Volcanic Field Area</td>
<td>190 ± 9</td>
<td>up to 3000</td>
<td>NA</td>
<td>83.0 ± 35.0</td>
<td>400</td>
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<tr>
<td>Wilbur Springs Area</td>
<td>144 ± 2</td>
<td>up to 1132</td>
<td>2</td>
<td>12.5 ± 4.0</td>
<td>246.48</td>
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</tr>
<tr>
<td>Chalk Mountain Area</td>
<td>113 ± 5</td>
<td>NA</td>
<td>NA</td>
<td>3.3 ± 0.9</td>
<td>50.24</td>
<td></td>
</tr>
</tbody>
</table>

* Resource Potential for 90°-155°C resources is estimated beneficial heat as calculated by the USGS.

Summary of Market Potential

**END-USE SECTOR**

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<tr>
<th></th>
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<th></th>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>Residential/Commercial</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Market Demand</td>
<td>712.14</td>
<td>715.74</td>
<td>730.56</td>
<td>727.53</td>
<td>736.50</td>
<td>747.70</td>
<td>820.7</td>
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<td>Market Potential (2)*</td>
<td>0</td>
<td>7.15</td>
<td>36.75</td>
<td>69.70</td>
<td>170.57</td>
<td>262.55</td>
<td>503.14</td>
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</tr>
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<td>Market Demand</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Market Potential (5)*</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
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<tr>
<td>Agricultural</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Market Demand</td>
<td>28.10</td>
<td>29.83</td>
<td>32.15</td>
<td>34.67</td>
<td>37.40</td>
<td>40.37</td>
<td>54.9%</td>
</tr>
<tr>
<td>Market Potential (2)*</td>
<td>0</td>
<td>0.10</td>
<td>1.46</td>
<td>4.27</td>
<td>8.66</td>
<td>14.18</td>
<td>31.4%</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Market Demand</td>
<td>740.44</td>
<td>745.17</td>
<td>752.69</td>
<td>762.20</td>
<td>772.90</td>
<td>788.07</td>
<td>825.7</td>
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<tr>
<td>Market Potential</td>
<td>0</td>
<td>7.45</td>
<td>38.39</td>
<td>93.97</td>
<td>179.23</td>
<td>276.73</td>
<td>536.8</td>
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</table>

* Number in parentheses refers to the specific market penetration curve used in the end-use sector in this county.
LASSEN COUNTY

Summary of Resource Potential

<table>
<thead>
<tr>
<th>Resource</th>
<th>Average Temperature (°C)</th>
<th>Depth of Wells (m)</th>
<th>Number of Wells</th>
<th>Average Volume (km³)</th>
<th>Resource Potential 90°C (10⁶ Btu)</th>
<th>90-150°C (10⁶ Btu)</th>
<th>150°C (10⁶ Btu)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Morgan Springs - Growler Springs (Plumas, Shasta)</td>
<td>237 ± 15</td>
<td>NA</td>
<td>NA</td>
<td>8.3 ± 2.6</td>
<td>116</td>
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<tr>
<td>West Valley Reservoir Pot Springs (Modoc)</td>
<td>143 ± 3</td>
<td>NA</td>
<td>NA</td>
<td>3.3 ± 0.9</td>
<td>65.61</td>
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<td></td>
</tr>
<tr>
<td>Bassett Hot Springs (Modoc)</td>
<td>90 ± 7</td>
<td>NA</td>
<td>NA</td>
<td>1.3 ± 0.9</td>
<td>41.71</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wendel-Awdam Area</td>
<td>126 ± 7</td>
<td>58 - 1538</td>
<td>6</td>
<td>10.6 ± 3.0</td>
<td>180.12</td>
<td></td>
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<tr>
<td>Susanville</td>
<td>36 - 49</td>
<td>90 - 180</td>
<td>2</td>
<td>NA</td>
<td>Yes</td>
<td></td>
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</tr>
</tbody>
</table>

* Resource Potential for 90°C - 150°C resources is estimated beneficial heat as calculated by the USGS.

Summary of Market Potential

<table>
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</thead>
<tbody>
<tr>
<td>Residential/Commercial</td>
<td></td>
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<tr>
<td>• Market Demand</td>
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<td>40.60</td>
<td>44.65</td>
<td>50.32</td>
<td>56.75</td>
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</tr>
<tr>
<td>• Market Demand</td>
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<td>90.05</td>
<td>102.22</td>
<td>119.77</td>
<td>140.74</td>
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<td>• Market Potential (5)*</td>
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<td>2.04</td>
<td>12.47</td>
<td>35.55</td>
<td>80.18</td>
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<tr>
<td>Agricultural</td>
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<tr>
<td>• Market Demand</td>
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<td>.85</td>
<td>.90</td>
<td>.98</td>
<td>1.07</td>
<td>1.16</td>
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<td>• Market Potential (2)*</td>
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<td>.05</td>
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<td>.27</td>
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<td>147.77</td>
<td>171.07</td>
<td>198.16</td>
<td>229.45</td>
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<td>2.05</td>
<td>12.57</td>
<td>35.68</td>
<td>80.45</td>
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* Number in parentheses refers to the specific market penetration curve used in the end-use sector in this county.
MENDOCINO COUNTY

Summary of Resource Potential

<table>
<thead>
<tr>
<th>Resource</th>
<th>Average Temperature (°C)</th>
<th>Depth of Wells (m)</th>
<th>Number of Wells</th>
<th>Average Volume (Lm³)</th>
<th>Resource Potential 90°C</th>
<th>80-150°C (10⁶ Btu)</th>
<th>150°C (10⁷ Btu)</th>
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<tbody>
<tr>
<td>Low Temperature Thermal Water</td>
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* Resource Potential for 90° - 150°C resources is estimated beneficial heat as calculated by the USGS.

Summary of Market Potential

<table>
<thead>
<tr>
<th></th>
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<tbody>
<tr>
<td>Residential/Commercial</td>
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<td></td>
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</tr>
<tr>
<td>- Market Demand</td>
<td>401.02</td>
<td>400.75</td>
<td>401.33</td>
<td>401.94</td>
<td>402.55</td>
<td>403.16</td>
</tr>
<tr>
<td>- Market Potential (%)</td>
<td>0.04</td>
<td>0.03</td>
<td>0.02</td>
<td>0.01</td>
<td>0.00</td>
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</tr>
<tr>
<td>Industrial</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>- Market Demand</td>
<td>169.17</td>
<td>170.02</td>
<td>171.87</td>
<td>173.72</td>
<td>175.58</td>
<td>177.44</td>
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<tr>
<td>- Market Potential (%)</td>
<td>0.03</td>
<td>0.03</td>
<td>0.03</td>
<td>0.03</td>
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<tr>
<td>Agricultural</td>
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<td></td>
</tr>
<tr>
<td>- Market Demand</td>
<td>118.48</td>
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<td>120.21</td>
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<td>- Market Potential (%)</td>
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<td>0.03</td>
<td>0.03</td>
<td>0.03</td>
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<td>Total</td>
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<td>711.76</td>
<td>722.00</td>
<td>732.23</td>
</tr>
<tr>
<td>- Market Demand</td>
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<td>0.03</td>
<td>0.03</td>
<td>0.03</td>
<td>0.03</td>
<td>0.03</td>
</tr>
<tr>
<td>- Market Potential (%)</td>
<td>6.64</td>
<td>6.96</td>
<td>7.28</td>
<td>7.60</td>
<td>7.93</td>
<td>8.26</td>
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</table>

* Number in parentheses refers to the specific market penetration curve used in the end-use sector in this county.

A-141
MODOC COUNTY

Summary of Resource Potential

<table>
<thead>
<tr>
<th>Resource</th>
<th>Average Temperature (°C)</th>
<th>Depth of Wells (m)</th>
<th>Number of Wells</th>
<th>Average Volume (k$m^3$)</th>
<th>Resource Potential 90°C</th>
<th>Resource Potential 90-150°C</th>
<th>Resource Potential 150°C</th>
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</thead>
<tbody>
<tr>
<td>Surprise Valley</td>
<td>152 ± 12</td>
<td>1100 - 2000</td>
<td>8</td>
<td>210.0 ± 90.0</td>
<td>61.62</td>
<td>61.62</td>
<td>1490</td>
</tr>
<tr>
<td>Fort Bidwell</td>
<td>135 ± 17</td>
<td>NA</td>
<td>NA</td>
<td>3.3 ± 0.9</td>
<td>65.41</td>
<td></td>
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<tr>
<td>West Valley Reservoir Hot Springs (Lassen)</td>
<td>143 ± 3</td>
<td>NA</td>
<td>NA</td>
<td>3.3 ± 0.9</td>
<td>65.41</td>
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<tr>
<td>Kelley Hot Spring</td>
<td>118 ± 10</td>
<td>978 - 1035</td>
<td>2</td>
<td>3.3 ± 0.9</td>
<td>53.09</td>
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<tr>
<td>Bassett Hot Spring (Lassen)</td>
<td>98 ± 7</td>
<td>NA</td>
<td>NA</td>
<td>3.3 ± 0.9</td>
<td>41.71</td>
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<td>Surprise Valley</td>
<td>40 -119</td>
<td>60 - 655</td>
<td>4</td>
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* Resource Potential for 90°C - 150°C resources is estimated beneficial heat as calculated by the USGS.

Summary of Market Potential

<table>
<thead>
<tr>
<th>END-USE SECTOR</th>
<th>Residential/Commercial</th>
<th>Industrial</th>
<th>Agricultural</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential/Commercial</td>
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<td>Market Demand</td>
<td>14.52</td>
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<td>16.90</td>
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<tr>
<td>Industrial</td>
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<td>Market Demand</td>
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<td>Market Potential (5)*</td>
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<td>.80</td>
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<td>Market Demand</td>
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<td>.003</td>
<td>.004</td>
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<td>Market Potential (2)*</td>
<td>†</td>
<td>†</td>
<td>†</td>
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<tr>
<td>Total</td>
<td>49.643</td>
<td>55.393</td>
<td>63.613</td>
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<tr>
<td>Market Potential</td>
<td>0</td>
<td>.803</td>
<td>4.86</td>
<td>13.86</td>
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* Number in parentheses refers to the specific market penetration curve used in the end-use sector in this county.
† Potential is negligible.

A-142
MONO COUNTY

Summary of Resource Potential

<table>
<thead>
<tr>
<th>Resource</th>
<th>Average Temperature (°C)</th>
<th>Depth of Wells (m)</th>
<th>Number of Wells</th>
<th>Average Volume (m³)</th>
<th>Resource Potential 90°C</th>
<th>Resource Potential 150°C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Long Valley Caldera</td>
<td>227 ± 10</td>
<td>up to 2100</td>
<td>&gt; 1</td>
<td>3.3 ± 0.9</td>
<td>51.61</td>
<td>58.88</td>
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<tr>
<td>North Shore Mono Lake</td>
<td>126 ± 6</td>
<td>3000</td>
<td>&gt; 1</td>
<td>3.3 ± 0.9</td>
<td>52.14</td>
<td>44.61</td>
</tr>
<tr>
<td>Grover Hot Springs</td>
<td>116 ± 6</td>
<td>NA</td>
<td>NA</td>
<td>3.3 ± 0.9</td>
<td>Yes</td>
<td>42.61</td>
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<tr>
<td>Fallon Hot Springs</td>
<td>116 ± 6</td>
<td>32</td>
<td>1</td>
<td>3.3 ± 0.9</td>
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<tr>
<td>Bridgeport</td>
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<td>290</td>
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<td>Mono Lake</td>
<td>56</td>
<td>245 - 743</td>
<td>2</td>
<td>NA</td>
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<td></td>
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<tr>
<td>Buckeye Hot Springs</td>
<td>101 ± 6</td>
<td>NA</td>
<td>NA</td>
<td>3.3 ± 0.9</td>
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<td>44.61</td>
</tr>
<tr>
<td>Travertine Hot Springs A</td>
<td>113 ± 10</td>
<td>300</td>
<td>1</td>
<td>3.3 ± 0.9</td>
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</tr>
</tbody>
</table>

* Resource Potential for 90°C - 150°C resources is estimated beneficial heat as calculated by the USGS.

Summary of Market Potential

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</table>

* Number in parentheses refers to the specific market penetration curve used in the end-use sector in this county.

A-143
MONTEREY COUNTY

Summary of Resource Potential

<table>
<thead>
<tr>
<th>Resource</th>
<th>Average Temperature (°F)</th>
<th>Depth of Wells (m)</th>
<th>Number of Wells</th>
<th>Average Volume (m³)</th>
<th>Resource Potential 90°C (10⁶ Btu)</th>
<th>Resource Potential 150°C (10⁶ Btu)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low Temperature Thermal Water</td>
<td></td>
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<td></td>
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</table>

*R Resource Potential for 90°C - 150°C resources is estimated beneficial heat as calculated by the USGS.

Summary of Market Potential

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<thead>
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</tr>
</thead>
<tbody>
<tr>
<td>Residential/Commercial</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Market Demand</td>
<td>1,963.71</td>
<td>1,969.93</td>
<td>1,981.42</td>
<td>1,997.50</td>
<td>2,018.17</td>
<td>2,064.54</td>
<td>2,225.14</td>
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<td>0</td>
<td>0</td>
<td>13.81</td>
<td>101.87</td>
<td>248.84</td>
<td>552.09</td>
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<td>Industrial</td>
<td>470.76</td>
<td>533.25</td>
<td>623.14</td>
<td>728.15</td>
<td>850.95</td>
<td>994.41</td>
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<td>Market Demand</td>
<td>0</td>
<td>0</td>
<td>12.46</td>
<td>75.79</td>
<td>215.55</td>
<td>485.12</td>
<td>1,668.96</td>
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<tr>
<td>Market Potential (6)*</td>
<td>0</td>
<td>0</td>
<td>12.46</td>
<td>75.79</td>
<td>215.55</td>
<td>485.12</td>
<td>1,668.96</td>
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<tr>
<td>Agricultural</td>
<td>228.61</td>
<td>242.72</td>
<td>261.64</td>
<td>282.16</td>
<td>304.41</td>
<td>328.53</td>
<td>447.31</td>
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<tr>
<td>Market Demand</td>
<td>0</td>
<td>0</td>
<td>2.62</td>
<td>14.39</td>
<td>37.53</td>
<td>88.67</td>
<td>219.22</td>
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<tr>
<td>Market Potential (3)*</td>
<td>0</td>
<td>0</td>
<td>2.62</td>
<td>14.39</td>
<td>37.53</td>
<td>88.67</td>
<td>219.22</td>
</tr>
<tr>
<td>Total</td>
<td>2,663.08</td>
<td>2,745.90</td>
<td>2,866.20</td>
<td>3,007.85</td>
<td>3,173.53</td>
<td>3,368.48</td>
<td>4,527.09</td>
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<tr>
<td>Market Demand</td>
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<td>0</td>
<td>34.89</td>
<td>192.05</td>
<td>501.92</td>
<td>1,125.88</td>
<td>2,978.83</td>
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<tr>
<td>Market Potential</td>
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</tbody>
</table>

* Number in parentheses refers to the specific market penetration curve used in the end-use sector in this county.
NAPA COUNTY

Summary of Resource Potential

<table>
<thead>
<tr>
<th>Resource</th>
<th>Average Temperature (°C)</th>
<th>Depth of Wells (m)</th>
<th>Number of Wells</th>
<th>Average Volume (km³)</th>
<th>Resource Potential 90°C (10⁶ Btu)</th>
<th>90-150°C (10⁶ Btu)</th>
<th>150°C (10⁶ Btu)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calistoga Hot Springs</td>
<td>144 ± 3</td>
<td>610</td>
<td>NA</td>
<td>6.9 ± 1.9</td>
<td>137.46</td>
<td></td>
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</tr>
</tbody>
</table>

* Resource Potential for 90°C - 150°C resources is estimated beneficial heat as calculated by the USGS.

Summary of Market Potential

<table>
<thead>
<tr>
<th></th>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>Residential/Commercial</td>
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<tr>
<td>• Market Demand</td>
<td>2,724.59</td>
<td>2,733.21</td>
<td>2,745.18</td>
<td>2,771.48</td>
<td>2,800.85</td>
<td>2,838.12</td>
<td>3,087.50</td>
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<tr>
<td>• Market Potential (1)*</td>
<td>0</td>
<td>27.33</td>
<td>140.21</td>
<td>429.80</td>
<td>755.95</td>
<td>910.78</td>
<td>1,705.14</td>
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<td>Industrial</td>
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<td></td>
<td></td>
<td></td>
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<tr>
<td>• Market Demand</td>
<td>24.54</td>
<td>28.97</td>
<td>35.62</td>
<td>43.80</td>
<td>53.92</td>
<td>66.34</td>
<td>151.91</td>
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<tr>
<td>• Market Potential (5)*</td>
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<td>11.09</td>
<td>26.29</td>
<td>51.26</td>
<td>136.71</td>
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<tr>
<td>Agricultural</td>
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<tr>
<td>• Market Demand</td>
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<td>38.52</td>
<td>41.53</td>
<td>44.78</td>
<td>48.31</td>
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<tr>
<td>• Market Potential (1)*</td>
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<td>6.94</td>
<td>13.04</td>
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<tr>
<td>• Market Demand</td>
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<td>2,826.31</td>
<td>2,860.06</td>
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<td>2,956.60</td>
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<td>146.04</td>
<td>447.83</td>
<td>795.78</td>
<td>918.77</td>
<td>1,881.27</td>
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</table>

* Number in parentheses refers to the specific market penetration curve used in the end-use sector in this county.

A-145
PLUMAS COUNTY

Summary of Resource Potential

<table>
<thead>
<tr>
<th>Resource</th>
<th>Average Temperature (°C)</th>
<th>Depth of Wells (m)</th>
<th>Number of Wells</th>
<th>Average Volume (km³)</th>
<th>Resource Potential 90°C (10³ Btu)</th>
<th>Resource Potential 90-150°C (10³ Btu)</th>
<th>Resource Potential 150°C (10³ Btu)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Morgan-Growler Springs (Lassen)</td>
<td>217 ± 15</td>
<td>NA</td>
<td>NA</td>
<td>8.3 ± 2.6</td>
<td>Yes</td>
<td>116</td>
<td></td>
</tr>
<tr>
<td>Sierra Valley</td>
<td>125 ± 6</td>
<td>680</td>
<td>1</td>
<td>10.8 ± 3.2</td>
<td>169.49</td>
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<tr>
<td>Susanville (Lassen)</td>
<td>36 - 49</td>
<td>90 - 180</td>
<td>2</td>
<td>NA</td>
<td>Yes</td>
<td></td>
<td></td>
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</tbody>
</table>

* Resource Potential for 90° - 150°C resources is estimated beneficial heat as calculated by the USGS.

Summary of Market Potential

END-USE SECTOR

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<th></th>
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</thead>
<tbody>
<tr>
<td>Residential/Commercial</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Market Demand</td>
<td>132.17</td>
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<td>135.35</td>
<td>137.19</td>
<td>139.49</td>
<td>154.4</td>
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<td>Market Potential (2)*</td>
<td>0</td>
<td>1.33</td>
<td>0.83</td>
<td>0.69</td>
<td>3.77</td>
<td>48.98</td>
<td>94.4</td>
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* Number in parentheses refers to the specific market penetration curve used in the end-use sector in this county.

A-146
## Riverside County

### Summary of Resource Potential

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<th>Average Temperature (°C)</th>
<th>Depth of Wells (m)</th>
<th>Number of Wells</th>
<th>Average Volume (km³)</th>
<th>Resource Potential 80°C (10⁷ Btu)</th>
<th>Resource Potential 90-150°C (10⁷ Btu)</th>
<th>Resource Potential 150°C (10⁷ Btu)</th>
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</thead>
<tbody>
<tr>
<td>Pilgrims Hot Springs</td>
<td>90 ± 7</td>
<td>92</td>
<td>1</td>
<td>3.3 ± 0.9</td>
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<tr>
<td>Coachella Hot Springs (Imperial)</td>
<td>39 - 98</td>
<td>&gt;150</td>
<td>14</td>
<td>NA</td>
<td>Yes</td>
<td></td>
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* Resource Potential for 90°-150°C resources is estimated beneficial heat as calculated by the USGS.

### Summary of Market Potential

#### End-Use Sector

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<tbody>
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<tr>
<td>Market Demand</td>
<td>2,103.61</td>
<td>2,116.54</td>
<td>2,138.60</td>
<td>2,168.00</td>
<td>2,205.60</td>
</tr>
<tr>
<td>Market Potential (1)*</td>
<td>0</td>
<td>21.17</td>
<td>109.07</td>
<td>336.21</td>
<td>595.29</td>
</tr>
<tr>
<td><strong>Industrial</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Market Demand</td>
<td>1,042.09</td>
<td>1,177.81</td>
<td>1,373.25</td>
<td>1,602.03</td>
<td>1,870.04</td>
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<tr>
<td>Market Potential (5)*</td>
<td>0</td>
<td>23.56</td>
<td>142.93</td>
<td>405.79</td>
<td>911.83</td>
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<tr>
<td><strong>Agricultural</strong></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Market Demand</td>
<td>105.82</td>
<td>110.50</td>
<td>116.71</td>
<td>123.36</td>
<td>130.48</td>
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<tr>
<td>Market Potential (2)*</td>
<td>0</td>
<td>1.11</td>
<td>5.95</td>
<td>15.21</td>
<td>30.22</td>
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<tr>
<td><strong>Total</strong></td>
<td>3,251.54</td>
<td>3,404.85</td>
<td>3,628.56</td>
<td>3,893.39</td>
<td>4,206.12</td>
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<tr>
<td>Market Demand</td>
<td>0</td>
<td>45.84</td>
<td>257.95</td>
<td>757.21</td>
<td>1,537.34</td>
</tr>
</tbody>
</table>

* Number in parentheses refers to the specific market penetration curve used in the end-use sector in this county.
SAN BERNARDINO COUNTY

Summary of Resource Potential

<table>
<thead>
<tr>
<th>Resource</th>
<th>Average Temperature (°C)</th>
<th>Depth of Wells (m)</th>
<th>Number of Wells</th>
<th>Average Volume (m³)</th>
<th>Resource Potential</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sandsburg (Kern)</td>
<td>172 ± 29</td>
<td>235</td>
<td>1</td>
<td>9.4 ± 2.3</td>
<td>84</td>
</tr>
<tr>
<td>Arrowhead Hot Springs</td>
<td>132 ± 8</td>
<td>NA</td>
<td>NA</td>
<td>3.3 ± 0.9</td>
<td>60.67</td>
</tr>
<tr>
<td>Tecopa Hot Springs (Inyo)</td>
<td>126 ± 10</td>
<td>NA</td>
<td>NA</td>
<td>3.3 ± 0.9</td>
<td>56.88</td>
</tr>
<tr>
<td>Tecopa Hot Springs (Inyo)</td>
<td>30 - 58</td>
<td>92 - 182</td>
<td>4</td>
<td>NA</td>
<td>Yes</td>
</tr>
<tr>
<td>Tecopa Hot Springs (Inyo)</td>
<td>27 - 48</td>
<td>122</td>
<td>1</td>
<td>NA</td>
<td>Yes</td>
</tr>
</tbody>
</table>

* Resource Potential for 90° - 150°C resources is estimated beneficial heat as calculated by the USGS.

Summary of Market Potential

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential/Commercial</td>
<td>Market Demand</td>
<td>1,390.72</td>
<td>1,397.89</td>
<td>1,410.55</td>
<td>1,437.75</td>
<td>1,450.03</td>
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<td>Market Potential (2)*</td>
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<td>13.9</td>
<td>71.94</td>
<td>177.27</td>
<td>335.81</td>
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<tr>
<td>Industrial</td>
<td>Market Demand</td>
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<td>2,873.44</td>
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<td>Market Potential (5)*</td>
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<td>956.20</td>
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<td>Agricultural</td>
<td>Market Demand</td>
<td>468.34</td>
<td>489.11</td>
<td>516.63</td>
<td>544.10</td>
<td>577.70</td>
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<td>Market Potential (2)*</td>
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<td>4.89</td>
<td>26.35</td>
<td>67.33</td>
<td>133.79</td>
</tr>
<tr>
<td>Total</td>
<td>Market Demand</td>
<td>3,153.40</td>
<td>4,710.44</td>
<td>5,215.89</td>
<td>5,758.04</td>
<td>6,373.26</td>
</tr>
<tr>
<td>Total</td>
<td>Market Potential</td>
<td>0</td>
<td>76.34</td>
<td>440.53</td>
<td>1,200.80</td>
<td>2,588.48</td>
</tr>
</tbody>
</table>

* Number in parentheses refers to the specific market penetration curve used in the end-use sector in this county.

A-148
SAN DIEGO COUNTY

Summary of Resource Potential

<table>
<thead>
<tr>
<th>Resource</th>
<th>Average Temperature (°C)</th>
<th>Depth of Wells (m)</th>
<th>Number of Wells</th>
<th>Average Volume (km³)</th>
<th>Resource Potential 90°C (10^3 Btu/hr)</th>
<th>Resource Potential 80-150°C (10^3 Btu/hr)</th>
<th>Resource Potential 150°C (10^3 Btu/hr)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low Temperature Thermal Water</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Resource Potential for 90°C - 150°C resources is estimated beneficial heat as calculated by the USGS.

Summary of Market Potential

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential/Commercial</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Market Demand</td>
<td>43,595.61</td>
<td>41,104.24</td>
<td>47,522.91</td>
<td>41,979.65</td>
<td>41,476.66</td>
<td>41,014.28</td>
</tr>
<tr>
<td>• Market Potential (3)*</td>
<td>0</td>
<td>0</td>
<td>425.23</td>
<td>2,140.96</td>
<td>6,432.20</td>
<td>11,670.29</td>
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<td>Industrial</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Market Demand</td>
<td>4,107.06</td>
<td>4,710.00</td>
<td>5,757.95</td>
<td>6,959.17</td>
<td>8,420.60</td>
<td>10,199.75</td>
</tr>
<tr>
<td>• Market Potential (6)*</td>
<td>0</td>
<td>0</td>
<td>115.16</td>
<td>724.31</td>
<td>2,132.94</td>
<td>4,973.40</td>
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<td>Agricultural</td>
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<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Market Demand</td>
<td>91.86</td>
<td>97.72</td>
<td>105.58</td>
<td>114.12</td>
<td>123.38</td>
<td>131.43</td>
</tr>
<tr>
<td>• Market Potential (4)*</td>
<td>0</td>
<td>0</td>
<td>1.06</td>
<td>5.82</td>
<td>15.21</td>
<td>30.90</td>
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<td>47,971.95</td>
<td>48,386.44</td>
<td>49,052.98</td>
<td>50,020.64</td>
<td>51,249.45</td>
</tr>
<tr>
<td>• Market Potential</td>
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<td>0</td>
<td>541.45</td>
<td>2,871.09</td>
<td>8,580.35</td>
<td>16,074.59</td>
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</tbody>
</table>

* Number in parentheses refers to the specific market penetration curve used in the end-use sector in this county.
SAN LUIS OBISPO COUNTY

Summary of Resource Potential

<table>
<thead>
<tr>
<th>Resource</th>
<th>Average Temperature (°C)</th>
<th>Depth of Wells (m)</th>
<th>Number of Wells</th>
<th>Average Volume (m³)</th>
<th>Resource Potential 90°C (GJ/yr)</th>
<th>Resource Potential 105-150°C (GJ/yr)</th>
<th>Resource Potential 150°C (GJ/yr)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low Temperature Thermal Water</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Resource Potential for 90° - 150°C resources is estimated beneficial heat as calculated by the USGS.

Summary of Market Potential

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential/Commercial</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Market Demand</td>
<td>293.66</td>
<td>301.97</td>
<td>313.93</td>
<td>327.82</td>
<td>343.91</td>
<td>362.50</td>
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<td>Market Potential</td>
<td>0</td>
<td>0</td>
<td>3.14</td>
<td>16.72</td>
<td>42.40</td>
<td>83.95</td>
</tr>
<tr>
<td>Industrial</td>
<td>32.88</td>
<td>36.54</td>
<td>41.71</td>
<td>47.41</td>
<td>54.34</td>
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<tr>
<td>Market Demand</td>
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<td>30.26</td>
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<td>Market Potential</td>
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<td>0</td>
<td>0</td>
<td>0</td>
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<td>0</td>
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<tr>
<td>Agricultural</td>
<td>190.54</td>
<td>195.65</td>
<td>202.25</td>
<td>209.11</td>
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<td>223.68</td>
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<td>Market Demand</td>
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<td>0</td>
<td>2.02</td>
<td>10.66</td>
<td>33.54</td>
<td>60.37</td>
</tr>
<tr>
<td>Market Potential</td>
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<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>467.08</td>
<td>534.16</td>
<td>557.89</td>
<td>584.54</td>
<td>614.50</td>
<td>648.24</td>
</tr>
</tbody>
</table>

* Number in parentheses refers to the specific market penetration curve used in the end-use sector in this county.

A-150
SANTA BARBARA COUNTY

Summary of Resource Potential

<table>
<thead>
<tr>
<th>Resource</th>
<th>Average Temperature (°C)</th>
<th>Depth of Wells (m)</th>
<th>Number of Wells</th>
<th>Average Volume (m³)</th>
<th>Resource Potential 90°C</th>
<th>90-150°C</th>
<th>150°C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low Temperature Thermal Water</td>
<td></td>
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<td></td>
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</tbody>
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* Resource Potential for 90° - 150°C resources is estimated beneficial heat as calculated by the U.S. Geological Survey.

Summary of Market Potential

**END-USE SECTOR**

<table>
<thead>
<tr>
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<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>Residential/Commercial</td>
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<td>986.85</td>
<td>997.78</td>
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<td>1,028.73</td>
<td>1,050.61</td>
<td>1,192.4</td>
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<td>0</td>
<td>9.57</td>
<td>51.57</td>
<td>159.54</td>
<td>283.56</td>
<td>584.5</td>
</tr>
<tr>
<td>Industrial</td>
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<td>1,658.68</td>
<td>1,893.47</td>
<td>2,161.50</td>
<td>2,667.48</td>
<td>2,816.77</td>
<td>4,205.2*</td>
</tr>
<tr>
<td>Market Potential (6)*</td>
<td>0</td>
<td>0</td>
<td>37.87</td>
<td>224.87</td>
<td>625.01</td>
<td>1,373.46</td>
<td>4,305.2*</td>
</tr>
<tr>
<td>Agricultural</td>
<td>102.72</td>
<td>105.19</td>
<td>108.34</td>
<td>111.59</td>
<td>114.94</td>
<td>118.39</td>
<td>133.7*</td>
</tr>
<tr>
<td>Market Potential (3)*</td>
<td>0</td>
<td>0</td>
<td>1.69</td>
<td>9.69</td>
<td>14.17</td>
<td>27.42</td>
<td>74.0*</td>
</tr>
<tr>
<td>Total</td>
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<td>2,750.72</td>
<td>2,999.09</td>
<td>3,284.21</td>
<td>3,611.15</td>
<td>3,985.77</td>
<td>6,109.54</td>
</tr>
<tr>
<td>Market Potential</td>
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<td>0</td>
<td>48.92</td>
<td>282.23</td>
<td>798.72</td>
<td>1,684.44</td>
<td>4,963.81</td>
</tr>
</tbody>
</table>

* Number in parentheses refers to the specific market penetration curve used in the end-use sector in this county.
SHASTA COUNTY

Summary of Resource Potential

<table>
<thead>
<tr>
<th>Resource</th>
<th>Average Temperature (°C)</th>
<th>Depth of Wells (m)</th>
<th>Number of Wells</th>
<th>Average Volume (km³)</th>
<th>Resource Potential 90°C (10³ Btu) (MWe)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Morgan-Growler Springs (Lar. /Plumas)</td>
<td>217 ± 15</td>
<td>NA</td>
<td>NA</td>
<td>8.3 ± 2.6</td>
<td>116</td>
</tr>
<tr>
<td>119 Bend Hot Springs</td>
<td>116 ± 9</td>
<td>NA</td>
<td>NA</td>
<td>3.3 ± 0.9</td>
<td>52.14</td>
</tr>
</tbody>
</table>

* Resource Potential for 90°C - 150°C resources is estimated beneficial heat as calculated by the USGS.

Summary of Market Potential

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential/Commercial</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Market Demand</td>
<td>491.69</td>
<td>495.82</td>
<td>493.09</td>
<td>495.27</td>
<td>498.47</td>
<td>502.78</td>
</tr>
<tr>
<td>Market Potential (2)*</td>
<td>0</td>
<td>4.92</td>
<td>25.15</td>
<td>61.07</td>
<td>115.44</td>
<td>176.55</td>
</tr>
<tr>
<td>Industrial</td>
<td>499.03</td>
<td>565.85</td>
<td>662.36</td>
<td>774.82</td>
<td>906.70</td>
<td>1,061.06</td>
</tr>
<tr>
<td>Market Demand (5)*</td>
<td>0</td>
<td>11.32</td>
<td>68.54</td>
<td>196.26</td>
<td>442.11</td>
<td>819.88</td>
</tr>
<tr>
<td>Agricultural</td>
<td>10.93</td>
<td>11.19</td>
<td>11.52</td>
<td>11.87</td>
<td>12.23</td>
<td>12.59</td>
</tr>
<tr>
<td>Market Demand (2)*</td>
<td>0</td>
<td>0.11</td>
<td>0.59</td>
<td>1.46</td>
<td>2.83</td>
<td>4.42</td>
</tr>
<tr>
<td>Total</td>
<td>1,001.65</td>
<td>1,068.86</td>
<td>1,166.97</td>
<td>1,281.96</td>
<td>1,417.40</td>
<td>1,576.43</td>
</tr>
<tr>
<td>Market Potential</td>
<td>0</td>
<td>16.35</td>
<td>94.68</td>
<td>258.79</td>
<td>546.38</td>
<td>1,009.85</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential/Commercial</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Market Demand</td>
<td>491.69</td>
<td>495.82</td>
<td>493.09</td>
<td>495.27</td>
<td>498.47</td>
<td>502.78</td>
</tr>
<tr>
<td>Market Potential (2)*</td>
<td>0</td>
<td>4.92</td>
<td>25.15</td>
<td>61.07</td>
<td>115.44</td>
<td>176.55</td>
</tr>
<tr>
<td>Industrial</td>
<td>499.03</td>
<td>565.85</td>
<td>662.36</td>
<td>774.82</td>
<td>906.70</td>
<td>1,061.06</td>
</tr>
<tr>
<td>Market Demand (5)*</td>
<td>0</td>
<td>11.32</td>
<td>68.54</td>
<td>196.26</td>
<td>442.11</td>
<td>819.88</td>
</tr>
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<td>Agricultural</td>
<td>10.93</td>
<td>11.19</td>
<td>11.52</td>
<td>11.87</td>
<td>12.23</td>
<td>12.59</td>
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<tr>
<td>Market Demand (2)*</td>
<td>0</td>
<td>0.11</td>
<td>0.59</td>
<td>1.46</td>
<td>2.83</td>
<td>4.42</td>
</tr>
<tr>
<td>Total</td>
<td>1,001.65</td>
<td>1,068.86</td>
<td>1,166.97</td>
<td>1,281.96</td>
<td>1,417.40</td>
<td>1,576.43</td>
</tr>
<tr>
<td>Market Potential</td>
<td>0</td>
<td>16.35</td>
<td>94.68</td>
<td>258.79</td>
<td>546.38</td>
<td>1,009.85</td>
</tr>
</tbody>
</table>

* Number in parentheses refers to the specific market penetration curve used in the end-use sector in this county.

A-152
## SISKIYO COUNTY

### Summary of Resource Potential

<table>
<thead>
<tr>
<th>Resource</th>
<th>Average Temperature (°C)</th>
<th>Depth of Wells (m)</th>
<th>Number of Wells</th>
<th>Average Volume (ft³)</th>
<th>Resource Potential 90°C</th>
<th>90-150°C</th>
<th>150°C+</th>
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</thead>
<tbody>
<tr>
<td>Big Bend Hot Spring (Dieves)</td>
<td>116 / 9</td>
<td>NA</td>
<td>NA</td>
<td>3.3 ± 0.9</td>
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</table>

* Resource Potential for 90°C - 150°C resources is estimated beneficial heat as calculated by the USGS.

### Summary of Market Potential

#### END-USE SECTOR

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<tr>
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#### Industrial

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</thead>
<tbody>
<tr>
<td></td>
<td>Market Potential (5)*</td>
<td>0</td>
<td>9.12</td>
<td>55.63</td>
<td>158.63</td>
<td>357.79</td>
<td>664.34</td>
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#### Agricultural

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<tbody>
<tr>
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<td>Market Potential (2)*</td>
<td>0</td>
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<td>55.63</td>
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#### Total

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<td>Market Potential</td>
<td>0</td>
<td>9.12</td>
<td>55.63</td>
<td>158.63</td>
<td>357.79</td>
<td>664.34</td>
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* Number in parentheses refers to the specific market penetration curve used in the end-use sector in this county.

+ Potential is negligible.
SONOMA COUNTY

Summary of Resource Potential

<table>
<thead>
<tr>
<th>Resource</th>
<th>Average Temperature (°C)</th>
<th>Depth of Wells (m)</th>
<th>Number of Wells</th>
<th>Average Volume (l/s)</th>
<th>Resource Potential 90°C - 150°C (10³ l/s day)</th>
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<tr>
<td>Seque Hot Springs</td>
<td>113 ± 13</td>
<td>NA</td>
<td>NA</td>
<td>6.9 ± 1.9</td>
<td>50.24</td>
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* Resource Potential for 90° - 150°C resources is estimated beneficial heat as calculated by the USGS.

Summary of Market Potential

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<td>Residential/Commercial</td>
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<td></td>
<td></td>
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<tr>
<td>Market Demand</td>
<td>2,782.04</td>
<td>2,790.28</td>
<td>2,805.79</td>
<td>2,827.69</td>
<td>2,846.69</td>
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<td>143.76</td>
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<td>771.02</td>
<td>978.57</td>
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<td>710.78</td>
<td>824.97</td>
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<td>612.51</td>
<td>710.78</td>
<td>824.97</td>
<td>957.63</td>
</tr>
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<td>118.17</td>
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<td>137.58</td>
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<td>101.66</td>
<td>109.58</td>
<td>118.17</td>
<td>127.48</td>
<td>137.58</td>
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<tr>
<td>Total</td>
<td>3,346.55</td>
<td>3,413.84</td>
<td>3,527.88</td>
<td>3,656.64</td>
<td>3,805.14</td>
<td>3,959.84</td>
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<tr>
<td>Market Demand</td>
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<td>39.48</td>
<td>212.44</td>
<td>636.84</td>
<td>1,207.69</td>
<td>1,712.68</td>
</tr>
<tr>
<td>Market Potential</td>
<td>0</td>
<td>39.48</td>
<td>212.44</td>
<td>636.84</td>
<td>1,207.69</td>
<td>1,712.68</td>
</tr>
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</table>

* Number in parentheses refers to the specific market penetration curve used in the end-use sector in this county.

A-154
VENTURA COUNTY

Summary of Resource Potential

<table>
<thead>
<tr>
<th>Resource</th>
<th>Average Temperature (°C)</th>
<th>Depth of Wells (m)</th>
<th>Number of Wells</th>
<th>Average Volume (km³)</th>
<th>Resource Potential 90-150°C (10¹⁰ Btu)</th>
<th>150°C (MWa)</th>
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<tbody>
<tr>
<td>Sespe Hot Springs</td>
<td>131 ± 0</td>
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<td>NA</td>
<td>3.3 ± 0.5</td>
<td>58.78</td>
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</table>

* Resource Potential for 90° - 150°C resources is estimated beneficial heat as calculated by the USGS.

Summary of Market Potential

END-USE SECTOR

<table>
<thead>
<tr>
<th></th>
<th></th>
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<th></th>
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</thead>
<tbody>
<tr>
<td>Residential/Commercial</td>
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<td>Market Demand</td>
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<td>4,597.31</td>
<td>4,596.66</td>
<td>4,665.49</td>
<td>4,753.37</td>
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<td>3,061.75</td>
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<tr>
<td>Market Demand</td>
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<td>730.30</td>
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<td>1,245.44</td>
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<td>241.56</td>
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<td>Agricultural</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Market Demand</td>
<td>33.02</td>
<td>33.81</td>
<td>34.82</td>
<td>35.87</td>
<td>36.94</td>
<td>38.05</td>
<td>42.91</td>
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<tr>
<td>Market Potential (2)*</td>
<td>0</td>
<td>.34</td>
<td>1.78</td>
<td>4.42</td>
<td>8.55</td>
<td>13.36</td>
<td>26.24</td>
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<td>Total</td>
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<td>5,466.01</td>
<td>5,655.41</td>
<td>5,877.97</td>
<td>6,144.87</td>
<td>7,713.71</td>
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</table>

* Number in parentheses refers to the specific market penetration curve used in the end-use sector in this county.
HAWAII REPORT

HAWAI'I HYDROTHERMAL MARKET
PENETRATION ANALYSIS

Prepared for
Department of Energy
Region IX
San Francisco, California

By
Action Resources Inc.
1077 Bishop Street, Suite 442
Honolulu, Hawaii 96813

October 1979
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Appendix C - Energy Use By Sugar Factories
Appendix D - County Maps

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EXECUTIVE SUMMARY

Introduction

- Over 90% of Hawaii's energy needs are supplied by foreign imports of fossil fuels.
- The State's governments and businesses are aggressively seeking alternatives to the dependence on foreign supplies.
- Over the past year and still continuing, a number of research projects on geothermal resource locations, economic and engineering feasibility of electricity generating and direct applications of hydrothermal fluids have been taking place.
- Based on potential resources and need, Hawaii is a prime candidate for direct applications of hydrothermal fluids in industrial and agricultural processing.
- The State's limited heavy industrial activity, the climatic conditions, and its island formations are considered to be limiting factors associated with the commercialization of direct application.

Key Assumption

- Geothermal reservoirs were assumed to be at great depths (over 5,000 feet) and high temperature (greater than 150°C).
- High exploration and development costs and the costs of transmission, royalties, and other infrastructure costs combined with retrofit and backup system costs will prevent geothermal energy from being dramatically cheaper than other energy sources.
- Institutional, legal, political, environmental, and ownership barriers will be overcome.
- Private industry will have the primary responsibility for the commercialization of industrial direct applications.
- Potential users will connect to available hydrothermal fluid resources if made available.
- Electricity generation will be the primary force behind development of geothermal reservoirs and direct applications will follow.
Hawaii's location, present economic base and water shortage concerns will tend to dissuade new, large energy intensive industrial operations from locating Hawaii.

(Comment: This is a controversial assumption, but is derived from a consensus of opinion by industry and government persons interviewed.)

- Hawaii's sugar factories will utilize geothermal for both direct applications and electricity generation.
- Alternative energy sources will eventually compete with each other and may slow development.

(Comment: The State is currently conducting research projects in solar, OTEC, biomass, wind, and geothermal energy resources.)

**Methodology**

- Baseline data was developed for all non-transportation and non-military energy consumption in 1975 by County and by SIC classification.
- Direct industrial heating and water heating energy consumption were considered the potential market for geothermal direct application.
- Space conditioning was not considered a primary potential due to the lack of space heating and the availability of data on air conditioning consumption.

(Comment: Air conditioning is generally confined to office buildings, retail outlets, hotels, and high rise condominiums.)

- The 20 potential sites identified by the Hawaii Institute of Geophysics were used as the State's reservoir basis.
- Growth estimates for potential geothermal applications were based on the State's energy, population, and tourism projections and a survey of industry. (The estimates were made by County and by resource.)
- Market penetration projections were derived by assigning a rate of retrofit activity and new market penetration. The rates vary by County and in some cases, by industry.
Conclusion

- Tables A and B summarize the estimates for potential geothermal use and the projected geothermal capture. (The formulas for deriving the forecast are attached to the tables.)
- All four of Hawaii's counties have potential geothermal resources.
- Over 80% of State's population, commerce and industry are within potential geothermal markets.
- By 2020, 40% of the industrial energy requirements could be provided by geothermal.
- Geothermal estimated captures is 10% of the State's forecasted total non-electric energy usage excluding transportation and electricity generation.
## Table A

**Industrial Process Heat**

**Hawaii**

<table>
<thead>
<tr>
<th>POTENTIAL GEOTHERMAL USE</th>
<th>1975 Energy Use $\times 10^{12}$/yr</th>
<th>1985 Energy Use $\times 10^{12}$/yr</th>
<th>2000 Energy Use $\times 10^{12}$/yr</th>
<th>2020 Energy Use $\times 10^{12}$/yr</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 counties evaluated</td>
<td>45.015</td>
<td>51.179</td>
<td>69.232</td>
<td>101.762</td>
</tr>
<tr>
<td>(of 4 counties total)</td>
<td>'A'</td>
<td>'D'</td>
<td>'D'</td>
<td>'D'</td>
</tr>
<tr>
<td>Total</td>
<td>45.015</td>
<td>51.179</td>
<td>69.232</td>
<td>101.762</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>FORECAST GEOTHERMAL CAPTURE</th>
<th>1975 Energy Use $\times 10^{12}$/yr</th>
<th>1985 Energy Use $\times 10^{12}$/yr</th>
<th>2000 Energy Use $\times 10^{12}$/yr</th>
<th>2020 Energy Use $\times 10^{12}$/yr</th>
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<td>Retrofit 'B'</td>
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<td>New Growth Capture 'C'</td>
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<td>-0-</td>
<td>1.527 'C'</td>
<td>4.319 'C'</td>
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<td>Total</td>
<td>-0-</td>
<td>1.506</td>
<td>14.170</td>
<td>21.551</td>
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</tbody>
</table>
TABLE A

'A' Energy Use in Hawaii. County and consumption by end user data.

'B' Energy from expected retrofit of co-located sugar companies plus:

Honolulu - 20% retrofit beginning in 1985 of Campbell Industrial Park by 2000. 1% per year of all other potential retrofit starting in 1985 through 2020.

Hawaii - 1% per year beginning in 1985 through 2020.

Kauai - 1% per year beginning in 2000 through 2020.

'C' 50% of new growth beginning in 1985 for Honolulu, Hawaii, and starting in 2000 for Kauai.

'D' 1975 x growth factors.
### TABLE B

**RESIDENTIAL/COMMERCIAL WATER HEATING**

**HAwAIi**

<table>
<thead>
<tr>
<th></th>
<th>1975 Energy Use BTU x 10^{12}/yr</th>
<th>1985 Energy Use BTU x 10^{12}/yr</th>
<th>2000 Energy Use BTU x 10^{12}/yr</th>
<th>2020 Energy Use BTU x 10^{12}/yr</th>
</tr>
</thead>
<tbody>
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<td><strong>Potential Geothermal Use</strong></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>4 counties evaluated</td>
<td>60.63</td>
<td>88.59</td>
<td>158.93</td>
<td>293.23</td>
</tr>
<tr>
<td>(of 4 counties considered)</td>
<td>'a'</td>
<td>'b'</td>
<td>'b'</td>
<td>'b'</td>
</tr>
<tr>
<td><strong>Total</strong></td>
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<td></td>
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</tr>
<tr>
<td></td>
<td>60.63</td>
<td>88.59</td>
<td>158.93</td>
<td>293.23</td>
</tr>
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<td>5.339</td>
<td>19.309</td>
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</table>
Table B

'a' Energy Use in Hawaii. County and consumption by end user data.

'b' Growth rates taken from projections by the Hawaiian Electric Company and State population projections.

'c' 1% per year retrofit rate for all counties beginning in 1990 except Kauai which starts in 2005 at a 1% retrofit rate.

'd' Step increases for all counties except Kauai, starting in 1985, to a maximum of 30% of the new growth by 2000. Kauai begins in 2000 up to a maximum of 30% by 2015.
I. INTRODUCTION

Ever since the OPEC embargo of 1973, Hawaii's governments, businesses, and residents have been very concerned about the State's vulnerability to foreign fossil fuels. The State legislature, the administration, the local governments, the University and businesses have been very aggressive in their efforts to achieve energy self-sufficiency. Currently, the State is actively promoting a state-wide energy conservation program, conducting research on various types of alternative energy resources and reviewing legal, political, and institutional barriers to the development of commercialization of various alternative energy resources. With the support of the federal government, Hawaii is rapidly gaining a great deal of expertise in alternative energy development.

Of the several alternative energy resources suited to Hawaii's climate, location, and geology, geothermal development has been viewed as one of the most promising and feasible alternatives. The successful drilling of Hawaii's first geothermal well, and the quality of the resource, have encouraged government and business to attempt to accelerate the development of this resource. The State has an active Geothermal Advisory Committee comprised of State government personnel, researchers, potential users, and community leaders who are seeking to find ways to promote geothermal development and overcome barriers. Appendix A contains a list of recommendations composed by this body to be presented to the State legislature for consideration.

To date, most of the research in Hawaii for measuring geothermal potential as an alternative energy resource has been focused on resource location and electricity generation. This study focuses on the potential for geothermal in
Hawaii as a direct energy source. The results are intended to provide a
benchmark and guide for future studies and development of a Regional Plan by
DOE to accelerate commercialization of hydrothermal resources in the State.

The primary purpose of this study has been to estimate the potential
eexisting and future markets for direct applications of hydrothermal resources
in Hawaii on a county level. Both industrial process applications and water
heating applications for residential and commercial sectors were considered.
Hydrothermal applications were factored out of total energy demand and annual
growth estimates were developed for both existing and future energy demand.
Estimated market penetration factors were developed on a county level and in
some cases, by industry.

Several key assumptions were made during the development of the growth
and penetration estimates. It was assumed that the geothermal resources in
Hawaii would share many of the characteristics of Hawaii's only geothermal
well, HGP-A at Puna, Hawaii. This resource has a very high temperature (572°F)
and is considered highly suitable for electricity generation. The well is
6,450 feet deep and required new state-of-the-art drilling and casing tech­
nology. It is not known at this time whether all geothermal reservoirs are as
high temperature or as deep as HGP-A. It would be beneficial to the commer­
cialization of geothermal reservoirs in Hawaii if future wells prove to be
shallower. The costs of exploration and development would decline apprecia­
tively. Also, for the purposes of direct heat applications, low and interme­
diate temperature wells would be suitable for a large percentage of the poten­
tial users. However, due to the expected depth of the wells, the geological
formations to be drilled through, and the exploration costs, it was assumed
that the development costs would be quite high. As a consequence of these
high capital costs, and the added costs of pipelines, royalties, and other infrastructure costs, the assumption was made that geothermal will not be dramatically cheaper than other alternative energy resources.

If the benefit to the overall community dictates, it was assumed that institutional, legal, political, environmental, and ownership barriers would be overcome. The potential impact that these barriers would have on the commercialization of geothermal cannot be underestimated.

For the purposes of estimating the potential geothermal market and forecasting the market penetration, it was assumed that private industry would have the major responsibility of commercializing geothermal. If government assumes the major role for commercialization, the forecasts presented in this report would most likely change.

A recent study conducted by the Hawaii Institute of Geophysics, "Hawaii Geothermal Resource Assessment Program," was used as the basis for geothermal resource location. The report list 20 sites that have anomalies indicating a probability of geothermal reservoirs. As the report states, this listing is not exhaustive of all potential geothermal sites, but rather, is the first priority for additional testing and investigating.

Potential market growth was derived through a combination of forecasting projection based on the state of Hawaii's Department of Planning and Economic Development projections for energy demands, population, and tourism and industry surveys.

The potential for space conditioning was not included in the market penetration estimates for future use of hydrothermal fluids. Hawaii's climate exempts the need for space heating and eliminates the need for residential air conditioning except in high rise residential buildings. Many of these high rise units have unit air conditioners. Commercial establishments such as
hotels, restaurants, retailers, and office buildings are heavier users of central air conditioning. In recent years, improved efficiency and operating improvements have been instituted. As a result, accurate data on air conditioning energy consumption is not readily available at this time. A valid assumption to make is that if hydrothermal fluids were available and absorption air conditioning technology was available for economical applications, that new commercial establishments would use the resources. However, it was not possible within the scope of this survey to develop the necessary data to forecast potential usages for air conditioning.

For industrial applications, geothermal potential was based on steam and preheat applications. Excluded from the potential was energy consumed in the form of electricity for industrial motors, lighting, etc., and energy required for direct electricity generation.

Market penetration by geothermal energy was estimated separately for industrial applications and residential/commercial application. It was assumed that because of existing plans, geothermal penetration would not begin until 1985. Estimates were developed on a county and resource location basis. Penetration factors for retrofit and new growth were developed based on the assumption that if hydrofluids were made available to potential users, these users would retrofit or design accordingly.

The penetration of geothermal sources presented in this report reflects the consensus of the business and government persons interviewed. Judgmentally, it is a realistic view of Hawaii's potential, but does not set either upper or lower limits on the potential development. It assumes that Hawaii will not experience a dramatic change in its economic activity. Hawaii has never been an industrial state, and its distance from markets, lack of raw materials, industrial infrastructure, and the cost of living all strongly suggest that Hawaii will not have a substantial growth in industrial activities.
Hawaii has, and is being evaluated as an industrial site by several energy intensive industries, but the feeling among government and business leaders contacted is that the probability of large energy users locating in Hawaii is relatively low. Most reason that the same conditions and factors that have kept large industry away from Hawaii will prevail in the future. Additionally, the major attraction of a dependable, inexpensive energy source is associated with a relatively high risk geological area. The sites being considered for these industries are near the Puna Geothermal Reservoir and, are active geological areas and the plants would be subject to risks such as lava flows, landslides, earthquakes, and other hazards associated with volcanic areas. Specifically, the prospects of a magnesium nodules processing plant and/or an aluminum refinery are considered to be less than fifty percent.

Industry growth considered in this survey will be in those segments where the major consumers are located in Hawaii or the raw materials are locally available in Hawaii. Examples for the former growth market are food and feed processes and for the latter, sugar factories and canneries.

In summary, Hawaii's geothermal resources appear to be substantial and suitable for direct heat hydrothermal applications. Its vulnerability to embargoes, shipping strikes and other uncontrollable factors, makes the development of geothermal very desirable for the community at large. Also, the prospects of a dependable, cheaper than fossil fuels alternative have aroused the interest of Hawaii's businesses. Hawaii's lack of energy intensive industry, its low probability of attracting new major industry, and the cost of exploration, development, and transmission may retard the commercialization of geothermal. However, on a selective basis, in the industrial park areas, and agriculture processing factories, there appears to be a relatively high potential for the commercialization of direct geothermal use.
Hawaii's sugar factories account for almost 27% of the State's total non-transportation energy consumption. Their industrial process energy consumption is 38% of the State's industrial non-electrical energy use. As an industry, they offer one of the best potential for geothermal commercialization and a recent study by Puna Sugar Company indicates that it is economically feasible for a company to drill its own well and transport the hydrofluids via pipeline. However, the economic model included the production of electricity for sale to the local utility on a firm power basis and the value of extracted sulfur dioxide.

The estimates for the State's potential geothermal market show that by the year 2020, 40% of the State's industrial energy consumption could be provided by geothermal. Penetration by geothermal in the industrial sector is projected to be 50% of the potential. This is based on the assumption that geothermal colocated sugar factories will use geothermal for their industrial energy needs.

In the residential/commercial sectors, potential geothermal applications are projected to be 25% of the State's R/C usage. Penetration is expected to be 25% of the total potential. The competition from other alternative energy sources is expected to be greater in the residential/commercial sectors and penetration is very dependent on state and local government's involvement.

By the year 2020, geothermal is projected to supply Hawaii with 10% of the total non-transportation energy usage, under the assumptions that resources are developed, barriers are overcome, and that geothermal's cost is competitive with other energy sources.
II. METHODOLOGY AND ASSUMPTIONS

A. Baseline Market Size Demand

The State's total gross BTU consumption for 1975 was determined. The consumption was then segmented by county. Exhibit I illustrates the segmentation for non-transportation usage. Roughly 58% of the State's non-transportation BTU consumption is in the form of electricity. The remaining consumption is either petroleum products such as residual oil or diesel fuel and biomass created steam. Several assumptions were made in deriving this data. First, all residual fuel not being used for electricity generation was allocated to industrial usage. All non-transportation diesel fuel was allocated to the commercial sectors such as construction and agricultural field operations. Appendix B shows a breakdown of petroleum consumption by use and by county. An analysis of the sugar factories energy consumption was then conducted. Appendix C shows the energy source mix and energy consumption by sugar factories in each of the counties. The sugar factories for the most part are not dependent on utility electricity, and in fact, are net sellers of electricity. Sugar factories consume approximately 40% of their total BTU usage for electricity generation. A portion of this electricity is put into the various counties' electrical grids and used by utility customers.

The above analysis resulted in a breakdown of gross BTU consumption by residential, commercial and industrial sectors for each county. Residential and commercial consumption were then combined and industrial treated separately.

The 20 potential geothermal sites identified by the Hawaii Institute of Geophysics were used as the resource base. These potential reservoir sites were located on county maps. 12-mile radius circles were drawn around each of the sites and the enclosed areas were considered potential geothermal market.
### Exhibit I
**Energy Consumption Breakdown**
**Hawaii, 1975**

#### Residential

<table>
<thead>
<tr>
<th>Location</th>
<th>Energy Use</th>
<th>Hot Water</th>
</tr>
</thead>
<tbody>
<tr>
<td>Honolulu</td>
<td>1,678 BTU's</td>
<td>1.671</td>
</tr>
<tr>
<td>Maui</td>
<td>28,248 BTU's</td>
<td>11.492</td>
</tr>
<tr>
<td>Kauai</td>
<td>1,316 BTU's</td>
<td>0.401</td>
</tr>
<tr>
<td>Total</td>
<td>32,539 BTU's</td>
<td>13.009</td>
</tr>
</tbody>
</table>

#### Commercial

<table>
<thead>
<tr>
<th>Location</th>
<th>Energy Use</th>
<th>Hot Water</th>
</tr>
</thead>
<tbody>
<tr>
<td>Honolulu</td>
<td>17,037 BTU's</td>
<td>0.894</td>
</tr>
<tr>
<td>Maui</td>
<td>1,091 BTU's</td>
<td>0.273</td>
</tr>
<tr>
<td>Kauai</td>
<td>523 BTU's</td>
<td>0.120</td>
</tr>
<tr>
<td>Total</td>
<td>21,031 BTU's</td>
<td>1.404</td>
</tr>
</tbody>
</table>

#### Industrial

<table>
<thead>
<tr>
<th>Location</th>
<th>Energy Use</th>
<th>Hot Water</th>
</tr>
</thead>
<tbody>
<tr>
<td>Honolulu</td>
<td>5,531 BTU's</td>
<td>0.516</td>
</tr>
<tr>
<td>Maui</td>
<td>5,761 BTU's</td>
<td>0.545</td>
</tr>
<tr>
<td>Kauai</td>
<td>5,266 BTU's</td>
<td>0.366</td>
</tr>
<tr>
<td>Total</td>
<td>16,562 BTU's</td>
<td>1.263</td>
</tr>
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</table>

#### Industrial/Sugar

<table>
<thead>
<tr>
<th>Location</th>
<th>Energy Use</th>
<th>Hot Water</th>
</tr>
</thead>
<tbody>
<tr>
<td>Honolulu</td>
<td>17,816 BTU's</td>
<td>0.404</td>
</tr>
<tr>
<td>Maui</td>
<td>4,061 BTU's</td>
<td>0.520</td>
</tr>
<tr>
<td>Kauai</td>
<td>5,718 BTU's</td>
<td>0.318</td>
</tr>
<tr>
<td>Total</td>
<td>27,595 BTU's</td>
<td>1.265</td>
</tr>
</tbody>
</table>

#### Biomass and Petroleum

<table>
<thead>
<tr>
<th>Energy Use</th>
<th>Hot Water</th>
</tr>
</thead>
</table>

#### Non-Sugar

<table>
<thead>
<tr>
<th>Location</th>
<th>Energy Use</th>
<th>Hot Water</th>
</tr>
</thead>
<tbody>
<tr>
<td>Honolulu</td>
<td>700 BTU's</td>
<td></td>
</tr>
<tr>
<td>Maui</td>
<td>596 BTU's</td>
<td></td>
</tr>
<tr>
<td>Kauai</td>
<td>483 BTU's</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>1,779 BTU's</td>
<td></td>
</tr>
</tbody>
</table>

#### Total Energy Use

- **Transportation:** 112.25
- **Electricity:** 110,645
- **Non-Transportation:** 7,932
- **Total:** 217,695
areas. Major physical barriers such as high mountain ranges and the ocean were located and the potential market areas adjusted. Next, the latest published land use, zoning, and state plan information was applied to the areas to determine what future development might take place in the various potential geothermal market areas. The county maps in Appendix D show the present designated land use for each of the counties. It was taken under consideration that land use and zoning status are subject to change.

Each of the 4 counties were surveyed for industrial plants. Over 600 companies were identified as industrial establishments, according to the Standard Industrial Classification, (SIC). However, only 125 of these companies had 50 or more total employment and the average number of employees was 38.

From the list of 125 companies, those having industrial processes that require direct heat applications or preheat requirements were selected. The resulting 79 companies were classified by SIC and location. 64 of the companies were co-located with the 20 potential geothermal resource sites. 48 of the companies, including at least 1 from each SIC, were contacted to obtain data on energy consumption, company and industrial growth estimates and attitudes, perceptions, and understanding of and about hydrothermal usage in industrial processes. Several of the companies declined to give information for a number of reasons, but representative data was obtained for all industries.

The data acquired through the survey was measured against data available through the State's Department of Planning and Economic Development, the electrical utilities, and previous energy studies. In most cases, the data had a high correlation. Where large discrepancies existed, industrial sources were reinterviewed to determine which data was in error.

For companies where specific data was not available, factors for industrial process BTU consumption were developed. These factors were based on employee
counts and the energy intensity of respective product mixes.

37% of the State's industrial energy consumption was identified by company. The remaining 13% was allocated to smaller companies and secondary usages. Also, an error factor of 20% was applied to industry data because of the translation of source consumption into gross BTU consumption.

The resulting baseline data was then tabulated by county. A similar analysis was conducted to determine gross BTU consumption by the residential/commercial sector. Through data provided by the electrical utilities and Hawaii's Department of Planning and Economic Development, per capita energy consumption factors was determined and multiplied by the various county populations to determine residential consumptions. To convert KWH into gross BTU's, a factor of 11,150 BTU's was used. This is the State's average level of efficiency.

The commercial sector was difficult to break down by type of usage. Energy consumption for hotels (one of Hawaii's major business segments), office space and retailing space were identified. This accounts for less than 60% of the total energy consumed by the commercial sectors. However, electrical and gas utility data confirmed the size of the commercial market. The potential market for geothermal applications was determined to be primarily water heating. Space conditioning was considered, but excluded from the potential market. There is practically no space heating in the State and a high percentage of the central air conditioning units are located in the heavy urban areas and would require a great deal of disruptive activity to get hydrothermal fluids piped to them. Also, because the larger systems are used year round, most operators have invested in equipment and engineering to gain operating efficiencies and several have retrofit heat exchangers to provide hot water.

Baseline data for industrial consumption by county and site and residential and commercial consumption by county are shown in Exhibit II.
EXHIBIT II

1975 GEOTHERMAL POTENTIAL BY RESOURCE LOCATION

<table>
<thead>
<tr>
<th>County</th>
<th>Industrial</th>
<th>Residential/Commercial</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Standard Industrial Code (SIC)</td>
<td>Energy Use (BTU/yr x 10^12)</td>
</tr>
<tr>
<td></td>
<td>201</td>
<td>.007</td>
</tr>
<tr>
<td></td>
<td>2061</td>
<td>1.506</td>
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<tr>
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<td>2065</td>
<td>.049</td>
</tr>
<tr>
<td></td>
<td>209</td>
<td>.004</td>
</tr>
<tr>
<td></td>
<td>2061</td>
<td>1.430</td>
</tr>
<tr>
<td></td>
<td>209</td>
<td>.009</td>
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<tr>
<td></td>
<td>327</td>
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</tr>
<tr>
<td></td>
<td>201</td>
<td>.003</td>
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<td></td>
<td>327</td>
<td>.002</td>
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<tr>
<td></td>
<td>201</td>
<td>.004</td>
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<tr>
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<tr>
<td></td>
<td>203</td>
<td>.010</td>
</tr>
<tr>
<td></td>
<td>204</td>
<td>.006</td>
</tr>
<tr>
<td></td>
<td>2061</td>
<td>3.347</td>
</tr>
<tr>
<td></td>
<td>287</td>
<td>.007</td>
</tr>
<tr>
<td></td>
<td>327</td>
<td>.015</td>
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<tr>
<td></td>
<td>329</td>
<td>.015</td>
</tr>
<tr>
<td></td>
<td>Subtotal</td>
<td>6.426</td>
</tr>
</tbody>
</table>

*Locations correspond to the sites identified in "Hawaii Geothermal Resource Assessment Program."*
EXHIBIT II  
(cont'd)

1975 HAWAII ENERGY USE BY COUNTY

<table>
<thead>
<tr>
<th>County Resource Location</th>
<th>Industrial Standard Industrial Code (SIC)</th>
<th>Energy Use (BTU/yr x 10^{12})</th>
<th>Residential/Commercial Total Energy Used (BTU/yr x 10^{12})</th>
<th>Energy Used For Space Conditioning And Water Heating (BTU/yr x 10^{12})</th>
</tr>
</thead>
<tbody>
<tr>
<td>Honolulu (cont'd.)</td>
<td>2062</td>
<td>.228</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2065</td>
<td>.001</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>209</td>
<td>.025</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>265</td>
<td>.080</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>307</td>
<td>.024</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>327</td>
<td>.002</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Subtotal</strong></td>
<td></td>
<td>9.003</td>
<td>32.25</td>
<td>17.302</td>
</tr>
<tr>
<td>Kauai</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20. Post Erosional Volcanic Series</td>
<td>205</td>
<td>.001</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2061</td>
<td>1.688</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>287</td>
<td>.001</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>327</td>
<td>.013</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Subtotal</strong></td>
<td></td>
<td>1.703</td>
<td>1.49</td>
<td>.625</td>
</tr>
<tr>
<td>Maui</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. Pauwela</td>
<td>203</td>
<td>.120</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2061</td>
<td>3.370</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>327</td>
<td>.002</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11. Lahaina</td>
<td>2061</td>
<td>.970</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Subtotal</strong></td>
<td></td>
<td>4.362</td>
<td>3.07</td>
<td>1.298</td>
</tr>
<tr>
<td><strong>State Total</strong></td>
<td></td>
<td>21.496</td>
<td>21.309</td>
<td></td>
</tr>
</tbody>
</table>
B. Market Growth Projection Development

Potential market growth was derived through a combination of forecasting projection based on the state of Hawaii's Department of Planning and Economic Development projections for energy demands, population, and tourism and industry surveys. A summary is given in Exhibit III.

Industrial growth rates were developed for each of the SIC categories from company interviews, industry projections, and state projections. Growth projections were made on an annual compounded rate for the periods 1985-2000 and 2000-2020. These figures were not adjusted for efficiencies that might occur due to rapidly rising energy costs.

The sugar factories were not expected to show growth. Foreign competition has suppressed the price of sugar and many companies are looking for alternative uses of the land. Historical data indicates that the industry is consolidating and that a number of smaller inefficient factories have been shut down. Countering these trends is the increasing value of sugar by-products such as electricity generation.

The other two large energy SIC categories, refinery and cement, were given growth rates based on company projections. Food processors and agriculture processors, other than sugar, were given growth rates equal to population projections. In construction related industries, growth rates were based on projected construction activity in the housing and tourism industries.

The potential geothermal market growth was projected to be lower than the general growth for industry. This reflects the no-growth trend of the sugar factories' energy consumption. Where the sugar factories were subtracted out of the data, the potential geothermal growth rate is higher than the growth rate for industry in general. This can be expected as new industries locate near geothermal resources. It was assumed that in-place industries would not
### Exhibit III

**Hawaii Growth Projection Calculations**

<table>
<thead>
<tr>
<th>Standard Industrial Code (SIC)</th>
<th>Growth Rate (%/Year)</th>
<th>1975 Energy Use (BTU/yr x 10^12)</th>
<th>1985 Energy Use (BTU/yr x 10^12)</th>
<th>2000 Energy Use (BTU/yr x 10^12)</th>
<th>2020 Energy Use (BTU/yr x 10^12)</th>
</tr>
</thead>
<tbody>
<tr>
<td>201</td>
<td>Based on population growth</td>
<td>0.034</td>
<td>0.080</td>
<td>0.195</td>
<td>0.339</td>
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<tr>
<td>202</td>
<td>&quot;</td>
<td>0.018</td>
<td>0.045</td>
<td>0.117</td>
<td>0.226</td>
</tr>
<tr>
<td>203</td>
<td>&quot;</td>
<td>0.708</td>
<td>1.666</td>
<td>3.975</td>
<td>4.861</td>
</tr>
<tr>
<td>204</td>
<td>&quot;</td>
<td>0.034</td>
<td>0.084</td>
<td>0.224</td>
<td>0.421</td>
</tr>
<tr>
<td>205</td>
<td>&quot;</td>
<td>0.008</td>
<td>0.019</td>
<td>0.045</td>
<td>0.091</td>
</tr>
<tr>
<td>2061</td>
<td>No growth</td>
<td>15.294</td>
<td>15.294</td>
<td>15.294</td>
<td>15.294</td>
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<tr>
<td>2062</td>
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<td>.228</td>
<td>.228</td>
<td>.228</td>
<td>.228</td>
</tr>
<tr>
<td>2065</td>
<td>Based on population growth</td>
<td>.051</td>
<td>.070</td>
<td>.095</td>
<td>.134</td>
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<tr>
<td>209</td>
<td>&quot;</td>
<td>.038</td>
<td>.095</td>
<td>.201</td>
<td>.379</td>
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<tr>
<td>249</td>
<td>Construction projections</td>
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<td>.001</td>
<td>.013</td>
<td>.026</td>
</tr>
<tr>
<td>255</td>
<td>Population</td>
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<td>.088</td>
<td>.110</td>
<td>.134</td>
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<tr>
<td>281</td>
<td>Industry sources</td>
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<td>.300</td>
<td>.434</td>
<td>.875</td>
</tr>
<tr>
<td>287</td>
<td>Agriculture projections</td>
<td>.032</td>
<td>.040</td>
<td>.055</td>
<td>.067</td>
</tr>
<tr>
<td>291</td>
<td>Industry sources</td>
<td>.721</td>
<td>.793</td>
<td>.793</td>
<td>.793</td>
</tr>
<tr>
<td>307</td>
<td>Industry sources</td>
<td>.024</td>
<td>.012</td>
<td>.024</td>
<td>.048</td>
</tr>
<tr>
<td>124</td>
<td>Construction projections</td>
<td>1.612</td>
<td>1.612</td>
<td>4.516</td>
<td>6.711</td>
</tr>
<tr>
<td>127</td>
<td>&quot;</td>
<td>.076</td>
<td>.162</td>
<td>.253</td>
<td>.312</td>
</tr>
<tr>
<td>129</td>
<td>Industry sources</td>
<td>.015</td>
<td>.040</td>
<td>.039</td>
<td>.052</td>
</tr>
<tr>
<td>131</td>
<td>&quot;</td>
<td>.291</td>
<td>.355</td>
<td>.355</td>
<td>.675</td>
</tr>
</tbody>
</table>
relocate to geothermal resources. Also assumed was a continuation of Hawaii's pattern of attracting smaller scale industrial processes rather than large manufacturers.

It should be noted that if the State if successful in attracting an energy intensive process such as manganese nodules or aluminum refinery that the industrial energy growth rates and geothermal growth rates would change dramatically. For example, a three product manganese nodule plant requires 150 MW capacity and a four product plant or aluminum refinery requires a 300 MW capability. However, as previously stated, it was assumed that these industries would not locate in Hawaii for a number of non-energy reasons.

Growth rates for R/C were based on energy use projections by the State Department of Planning and Economic Development based on per capita consumption, population growth, and tourism growth. Over time, these rates decline. Population growth for the State declines from a high of 1.87 average annual percentage growth in the 1977 to 1980 period to a low of 1.05% in the 2000 to 2005 period. This growth rate was assumed to continue through year 2020. These forecasts assume a middle fertility level of 2.1 births per woman. The State's economy, growth rate, and commercial activity is very dependent on the tourism industry State projections for tourism growth starting at 7% per annum in the 1977 to 1979 time frame and declining to 1% in the 1996 to 2000 period.

The State's projections assume a constant growth rate of 4% for electricity generation. This rate includes a growth in per capita energy consumption. The projections also assumed a continuing dependence on petroleum products and did not consider the importance of alternative energy sources.

New discovery factors were not applied to potential geothermal growth since all major population, commercial, and industrial areas of the State are
located within potential geothermal market areas. Several sugar factories are not in these areas and new discoveries within this area (which cannot be predicted at this time) would increase the potential growth.
C. Market Capture Potential Estimate Development

The market capture potential estimates were developed on a county basis. Present plans indicate that the earliest possible direct application of geothermal to be 1983. All co-located sugar plants are projected to convert to geothermal by year 2000. Other major retrofit applications were projected to start in 1985 in Honolulu at the Campbell Industrial Park. By the year 2000, a 20% retrofit is estimated. All other retrofit is projected at a rate of 1% per year until the year 2020. Kauai County's retrofit is not projected to start until year 2000, because of the current size of its population and commercial/industrial base. However, for Hawaii, Honolulu, and Maui, geothermal is projected to capture 50% of new growth beginning in the year 1985 and starting in 2000 for Kauai. These rates were assumed constant through year 2020.

Potential capture for R/C was based on an assumed 1% per year retrofit rate for all counties beginning in 1990 for Hawaii, Honolulu, and Maui, and 2005 for Kauai. Starting in 1985, step increases for new growth in Hawaii, Honolulu, and Maui were estimated to a maximum of 30% of the new growth by 2000. Kauai's capture of new growth is assumed to start in 2000 up to a maximum of 30% by 2015.

Exhibit IV summarizes by county the baseline data, market potential projections, and the forecasted geothermal capture.
## Hydrothermal Forecast for Hawaii

<table>
<thead>
<tr>
<th>County</th>
<th>1975 (BTU/Yr x 10^{12})</th>
<th>1985 (BTU/Yr x 10^{12})</th>
<th>2000 (BTU/Yr x 10^{12})</th>
<th>2020 (BTU/Yr x 10^{12})</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hawaii</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Residential/Commercial</td>
<td>3.82</td>
<td>1.484</td>
<td>6.39</td>
<td>2.456</td>
</tr>
<tr>
<td>Honolulu</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Residential/Commercial</td>
<td>52.25</td>
<td>17.907</td>
<td>71.75</td>
<td>24.076</td>
</tr>
<tr>
<td>TOTAL</td>
<td>69.671</td>
<td>28.578</td>
<td>93.134</td>
<td>36.101</td>
</tr>
<tr>
<td>Kauai</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Industrial</td>
<td>6.560</td>
<td>4.860</td>
<td>6.918</td>
<td>4.864</td>
</tr>
<tr>
<td>Residential/Commercial</td>
<td>1.49</td>
<td>.625</td>
<td>2.72</td>
<td>1.084</td>
</tr>
<tr>
<td>TOTAL</td>
<td>8.058</td>
<td>5.485</td>
<td>9.638</td>
<td>5.948</td>
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<td>Maui</td>
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<tr>
<td>Residential/Commercial</td>
<td>3.07</td>
<td>1.298</td>
<td>7.73</td>
<td>2.528</td>
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<tr>
<td>TOTAL</td>
<td>10.850</td>
<td>6.261</td>
<td>16.95</td>
<td>7.549</td>
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<tr>
<td>State</td>
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</tr>
<tr>
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<td>60.63</td>
<td>21.309</td>
<td>80.59</td>
<td>30.144</td>
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<tr>
<td>TOTAL</td>
<td>105.684</td>
<td>51.751</td>
<td>131.769</td>
<td>62.034</td>
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</table>
III. RESOURCE OVERVIEW - DIRECT HEAT

The State of Hawaii consists of a chain of five major islands and several minor islands. The islands were formed by volcanic activity and are relatively young land masses. The island of Hawaii still has an active volcano which erupted as recently as 1977. The geological and hydrological conditions of Hawaii are substantially different from those found on the Mainland.

An assessment of potential geothermal resource areas in the state of Hawaii was recently completed by the Hawaii Institute of Geophysics. This evaluation was based on geological, geophysical, geochemical data. The report appraises the probability of low temperature and high temperature resources. The appraisals were based on surface tests. More intensive site investigation is planned for the future.

Unlike many geothermal resources around the world, it is believed that Hawaii's resources are at a great depth. The cost of reaching these resources may prevent individual companies from drilling their own wells for direct heat applications in the near and intermediate future.

It was assumed for purposes of estimating market potential that direct heat applications would be a secondary application after electricity generation. In other words, it is not anticipated that the geothermal resources will be developed unless the primary objective is to generate electricity.
IV. MARKET OVERVIEW - DIRECT HEAT

Most of the publicity on geothermal development in Hawaii has been on its potential for generating electricity. The consensus of the business executives surveyed was that they had not even considered the possibility of applying hydrothermal fluids to their companies' direct heat needs. Most stated that their companies did not have plans for researching the feasibility of hydrothermal usage. However, most allowed that this could change if geothermal resources and quality were known to be located near their plants.

Hawaii's island economy, unique climate, and geological formation limits the potential of hydrothermal energy as a substitute for fossil fuel generated direct heat. The lack of space heating needs, the size of the economy and its various participants lessen the probability of widespread usage by individual companies or communities unless it is developed and distributed by a utility.

The present development of geothermal has been confined to one site on the island of Hawaii in an agricultural area. This area is subject to volcanic activity and there are a number of risks associated with this activity. Concurrent to the development of geothermal as an alternative energy resource, Hawaii is actively pursuing the development of other alternative energy resources.

A pilot Ocean Thermal Energy Conversion (OTEC) project was recently launched and results to date appear promising. The State's major utility recently announced plans to apply to the U.S. government for a grant to build an OTEC generating plant off the island of Oahu. They have also announced plans to build a windmill farm.

Hawaii's proximity to the equator makes it a high potential candidate for
solar energy resources. Already, many homeowners are using solar for their water heating and the market is growing. Several hotels have recently installed solar collectors to meet a portion of their hot water requirements and plans for future homes, condominiums and hotels often include solar.

When and if solar cell technology makes direct conversion from solar to electricity economically competitive, it is likely that this technology will gain widespread use in Hawaii.

In the meantime, other technologies and resources are being investigated by Hawaii's businesses. One of the major cement factories recently announced that it was converting to coal. A pre-stressed concrete manufacturer is seriously considering converting from steam curing to chemical curing and indicated that it will most likely be an industry-wide change.

The impact that the development of other alternative energy sources and the activities of businesses to decrease their consumption of petroleum products will have on geothermal development is impossible to measure at this time because of unknown economics. But business and government leaders throughout the State have indicated that geothermal's major potential will be in electricity generation, rather than direct heat. These attitudes are not firm, and additional insights into direct heat applications, the economics involved, and the time frame for development could have a positive effect.

At this time, the largest potential user of hydrothermal fluids appear to be the sugar factories. They have both process heat requirements and electricity generation capabilities, and many are located in potential geothermal resource areas. Other strong potentials exist at Campbell Industrial Park and Puna area in Hawaii County. Most of Hawaii's heavy non-sugar industry are located in or near the Campbell Industrial Park. If the Laulaulie reservoirs (owned by the Department of Defense) is developed and made available to commercial users via a utility pipeline, new industry may be attracted to that.
location because of the availability of hydrothermal fluids.

The Dillingham Company, one of Hawaii's leading companies and a major developer is conducting "An Engineering and Economics Studies for Direct Application of Geothermal Energy in an Industrial Park at Pahoa, Hawaii."

This study is being sponsored by the DOE. The results of this study and the development efforts by Dillingham may accelerate the industrialization of Hawaii County faster than this study has estimated.
Dear John:

The chairman of the Geothermal Advisory Committee has asked me to furnish you our legislative recommendations for the forthcoming session of the State Legislature. The Legislative Subcommittee's recommendation to the full committee listed the issues related to the commercialization of Geothermal Energy as follows:

<table>
<thead>
<tr>
<th>Issue</th>
<th>Priority</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Incentives</td>
<td>high</td>
</tr>
<tr>
<td>2. Community, Social, Environment</td>
<td>high to medium</td>
</tr>
<tr>
<td>3. Resource Assessment</td>
<td>medium to high</td>
</tr>
<tr>
<td>4. Risk Insurance</td>
<td>medium to high</td>
</tr>
<tr>
<td>5. Barrier Removal</td>
<td>medium</td>
</tr>
<tr>
<td>6. Resource Ownership</td>
<td>medium to low</td>
</tr>
<tr>
<td>7. Technical, Scientific</td>
<td>low</td>
</tr>
</tbody>
</table>
Within the context of these issues, the several legislative proposals which have been discussed and endorsed by the committee and recommended for consideration by the committee are:

1. "Forgive state royalty payments for first ten years production of wells and provide gradual reduction and elimination through sunset provision."

Discussion: The need for additional wells to prove the extent of Hawaii's geothermal resource is of prime importance. In order to attract the necessary investment to undertake the drilling and development of future wells with application for both electric and non-electric commercial ventures the forgiving of state royalty payments can be a key incentive. We doubt that investors will act without this incentive and we do not believe the state will lose any direct benefit. Certainly, without the development there could be no royalty payment and after ten years the royalty payments and other direct benefits will flow from producing wells.

However, the legislature may wish to differentiate between an exploratory well and a producing well. We believe the greatest incentive in Hawaii at this time is needed to encourage and support the drilling of "exploratory" wells. Therefore, we believe the full ten years forgiveness is necessary to get these wells drilled and developed. Then, after several exploratory wells have been placed in operation the Legislature may determine that the succeeding "production wells" drilled in that reservoir could have a reduced period of time for forgiveness of the royalty payments.
2. "Pass a resolution instructing the PUC to permit public utilities to make a higher rate of return on investments in non-fossil fuel generating facilities."

Discussion: Because Hawaii government and private interests probably will benefit from the avoidance of sending money out of the state for every barrel of oil that is replaced by alternative energy generating facilities, the public utilities should be encouraged with proper incentives to invest in these alternative facilities. It is recommended that the Legislature consider a "higher rate of return on investment", that is, markedly higher reflecting the long range benefit to the rate payers of the state that may result from the development of these alternative resources.

3. "Establish a 3 mills per kwh tax credit for generation of electricity for all new or improved plants using 'alternate' forms of energy."

Discussion: Whereas the cost of imported fuel oil has drastically increased in cost approximately 60% since January 1969, the best interests of the State of Hawaii and its residents can be served by the early development of alternative electricity generating facilities using non-fossil fuel energy including geothermal, ocean thermal and bio-mass energy. To encourage private and public utility investment, the recommended 3 mills per kwh tax credit is believed to be necessary. Existing state funds will not be expended and neither will future funds be reduced because the new and improved alternate energy generating plants may not be constructed without such an inducement as the 3 mills per kwh tax credit.
4. "Pass a resolution to the Department of Land and Natural Resources to provide for a reduced royalty payment for the direct use of geothermal energy applications such as the production of ethanol, sugar, etc."

Discussion: Direct use application of geothermal energy can enhance the development of Hawaii's geothermal resource. Acceptance of the use of geothermal energy by residents and others can be facilitated through diverse direct uses in commercial processes which are currently being studied. Because of the many unknowns associated with such a new business venture, extra incentives will be necessary. Furthermore, any "direct use" business would be an additional business activity which would not require payment of existing funds.

5. "Provide 15% differential to increase geothermal loan guarantee from federal support of 75% to a full 90% support."

Discussion: Geothermal loan guarantees have proven very valuable in the mainland western states for geothermal developments. However, the 75% level has also proven an inadequate amount for many businesses that are unable to provide the 25% required funding. Thus, the additional 15% state supported geothermal loan guarantee will reduce the risk of businesses investing in the exploration, drilling and end use applications of Hawaii's geothermal resource.

However, one way DOE assesses a geothermal loan guaranty application is based on the amount of the borrower's investment. With a 25% investment by the borrower, DOE
considers that his risk will be sufficient to encourage him to do his utmost to assure success of the development. With a reduction to 10% there may be some hesitancy by DOE. Even so, we believe that in Hawaii there is a need for this additional 15% loan guarantee assistance to make the geothermal development attractive.

It is noted that there would be no reduction in the Federal Loan Guarantee of 75% with the State's provision for an additional 15%.

6. "Provide funds for 'affected' communities, such as the Puna District, to do socio-economic research that can develop and protect the interests of residents in an objective and realistic manner."

Discussion: The cooperation of near-by residents of any commercial development should be encouraged. The amount of funds required to provide for reimbursement of costs of the residents representatives to follow activities such as hearings, conferences and meetings can be considered a modest investment not only for the awareness of the people of Hawaii directly involved, but also to assure acceptance of a project before sizeable funds are committed.

It is contemplated that socio-economic research would be conducted by representatives of the community in conjunction with some assistance by professionals from industry or academia. Also representatives of the community at some stage of development would expect to participate in critical decision making by the businesses.
7. "Forgive for a period of five years after commercial production commences, state sales taxes on all construction and equipment purchased for geothermal exploration and development until a positive revenue flow for the project is attained."

Discussion: This is an incentive to attract investors so that geothermal energy can be developed. Once the 'positive revenue flow' is established, the State will realize an income from the development of a geothermal industry.

8. "Provide general support in a resolution for federal geothermal energy omnibus legislation."

Discussion: In July, Dr. Eugene Grabbe participated with other state government representatives in a review of two proposed bills in the U.S. Senate. The list of recommendations of that group are attached.

Two additional items, which are considered to be of high priority relate to 'Risk Insurance'. They will be handled separately as an administrative manner. They are:

1. Alleviate uncertainties of risks associated with volcanic, seismic and 'acts of God' activities by providing state risk insurance at early date pending provisions by Federal legislation at level's required to stimulate electric and non-electric applications of geothermal energy.
2. Provide early depletion reservoir insurance to compensate geothermal production companies investing in direct use applications in the event of premature failure of the geothermal supply.

If there is additional information you may require, please do not hesitate to call me.

Very truly yours,

W. Lloyd Jones
Manager, Energy Projects

Attachment as indicated
All parties present agreed:

1. That the program establishing direct forgivable loans for exploratory drilling, which is a part of S1388, would be extremely beneficial and should be strongly supported.

2. That a limit be established in the legislation to preclude a single company from obtaining a large percentage of the loans issued under the exploratory drilling loan program.

3. That the limitation on the size of the loan for a single well currently in S1388 be increased from three million to ten million.

4. That the reservoir insurance in S1330 should be implemented provided that this does not preclude adequate funding for loans supporting reservoir exploration.

   a. That S1330 Sec 1149 Sub Sec (B) Paragraph 3 (pg. 36) should be amended to read:

      
      . . . . . risk means a hazard that a reservoir of geothermal resources will cease to provide sufficient quantities of geothermal resource shown to exist at the time of application at minimum conditions required to maintain an economically (or technically) viable operation for utilization of the geothermal resource.

   b. That the regulations covering reservoir insurance should include risks associated with:

      seismic risks
      volcanic risks
      other acts of God

   c. That S1330 Sec 1149 Sub Sec (F), be amended to include the sentence:

      The insurance shall be for a period not to exceed the expected life of the project or 30 years, whichever is less.
5. That the legislation should add provisions which are not currently incorporated in either S1330 or S1388, to eliminate the royalties charged under the Geothermal Steam Act for applications utilizing resources not exceeding 150 degrees centigrade or any non-electric applications.

6. That it is important for Congress to set a time limit within which applications under the Geothermal Loan Guarantee Act must be processed. Such a time limit is currently in S1330.

7. That the Geothermal Loan Guarantee program for municipals, cooperatives, and small businesses should be increased to 90%.

8. That an increase in the acreage limit should be made along with increased diligence requirements. Both of these are important and it may be advantageous to combine them to assure that companies holding larger lease areas will not tie up the resources in a particular area.

9. That the 90% forgivable loans for feasibility studies and the 75% construction loans currently in S1330 should not be included in the final Omnibus legislation.

10. That the SBA, HUD, REA and Fm HA should be encouraged to support geothermal loans. No consensus was reached whether the Geothermal Loan Guarantee Program is the best mechanism for accomplishing this.

11. That the definition of geothermal reservoir in S1388 needs to be changed. The definitions under Title III of S1330 would be acceptable.

12. That the economic incentive portions of the Omnibus legislation have a sunset clause similar to what is currently in Section 104 of Title 1 of S1388.
<table>
<thead>
<tr>
<th>Description</th>
<th>Hawaii</th>
<th>Honolulu</th>
<th>Kauai</th>
<th>Maui</th>
<th>Total</th>
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<tr>
<td>Electric Utilities</td>
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<td>2.2</td>
<td>3.9</td>
<td>61.4</td>
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<tr>
<td>Cement</td>
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<td></td>
<td></td>
<td>1.5</td>
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<td>Other Non-commercial</td>
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<td>1.1</td>
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<td>.2</td>
<td>.3</td>
<td>4.6</td>
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<td>Agriculture &amp; Ag. Processing</td>
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<td>.1</td>
<td>2.5</td>
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<td>3.7</td>
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<td><strong>Total</strong></td>
<td>7.8</td>
<td>69.0</td>
<td>2.4</td>
<td>5.7</td>
<td>84.9</td>
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APPENDIX B
## APPENDIX B

**SUGAR FACTORIES**

ENERGY PRODUCED FOR FACTORY PROCESSING AND ELECTRICITY GENERATION

1975

<table>
<thead>
<tr>
<th>County</th>
<th>Biomass BTU/yr. x 10^{12}</th>
<th>Fuel Oil BTU/yr. x 10^{12}</th>
<th>Hydro</th>
<th>Total BTU/yr. x 10^{12}</th>
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<tr>
<td>Hawaii</td>
<td>9.912</td>
<td>2.084</td>
<td>.02</td>
<td>12.016</td>
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<tr>
<td>Honolulu</td>
<td>3.840</td>
<td>.221</td>
<td></td>
<td>4.061</td>
</tr>
<tr>
<td>Kauai</td>
<td>5.170</td>
<td>.088</td>
<td>.46</td>
<td>5.718</td>
</tr>
<tr>
<td>Maui</td>
<td>4.873</td>
<td>1.427</td>
<td>.22</td>
<td>6.520</td>
</tr>
<tr>
<td>State</td>
<td>23.795</td>
<td>3.826</td>
<td>.7</td>
<td>28.315</td>
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</table>
APPENDIX C
### APPENDIX C
ENERGY USE - SUGAR FACTORIES
1975

<table>
<thead>
<tr>
<th>County</th>
<th>Industrial Process BTU/yr. $\times 10^{12}$</th>
<th>Electricity Generation BTU/yr. $\times 10^{12}$</th>
<th>Total BTU/yr. $\times 10^{12}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hawaii</td>
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<td>4.122</td>
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<tr>
<td>Honolulu</td>
<td>2.176</td>
<td>1.885</td>
<td>4.061</td>
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<tr>
<td>Kauai</td>
<td>3.650</td>
<td>2.068</td>
<td>5.718</td>
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<tr>
<td>Maui</td>
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<td>3.404</td>
<td>6.526</td>
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<tr>
<td>State</td>
<td>16.831</td>
<td>11.484</td>
<td>28.315</td>
</tr>
</tbody>
</table>
APPENDIX D

KEY TO LOCATION OF GEOTHERMAL SITES

Location

Hawaii
1. Puna
2. Ka'u
3. South Point
4. Hualalai-North Kona
5. Kawaihae
6. Keaau
7. Kohala

Maui
8. Haleakala-Southwest Rift
9. Haleakala- East Rift
10. Pauwela
11. Lahaina
12. Olowalu- Ukumehame
13. Honokawai

Oahu
14. Waimanalo
15. Lualualei
16. Honolulu Volcanic Series
17. Haleiwa
18. Laie
19. Pearl Harbor

Kauai
20. Post erosional Volcanic Series
BIBLIOGRAPHY


Eckbo, Dean, Austin & Williams, State of Hawaii Land Use Districts and Regulations Review, August, 1969.


Hawaii Institute of Geophysics, Western State Cooperative Direct Heat Resource Assessment, Phase I.


Department of Planning and Economic Development, Hawaii County Interindustry Study, June, 1975.


NEVADA REPORT

GEOTHERMAL DIRECT HEAT USE MARKET

POTENTIAL/PENETRATION ANALYSIS FOR

NEVADA, DOE REGION IX

Submitted By

GEOTHERMAL DEVELOPMENT ASSOCIATES
4275 Hackamore Drive
Reno, Nevada 89509
(702) 747-7207

For

U.S. Department of Energy
111 Pine Street
San Francisco, CA 94111

Contract No. DE-AP-03-79-SF-10690

September 30, 1979
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<th>Page</th>
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</tr>
<tr>
<td>2.0 TASKS</td>
<td>1</td>
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<td>3.0 RESOURCE ASSESSMENT &amp; METHODOLOGY</td>
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<td>3.2 Hot-Water Convection Systems</td>
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<td>4.3 Industrial</td>
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<td>4.3.2 Total Industrial Energy Consumption by Nevada</td>
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<td>5.1 Residential/Commercial Market Penetration</td>
<td>11</td>
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<tr>
<td>5.2 Industrial Market Penetration</td>
<td>13</td>
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<tr>
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<td>14</td>
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<td>6.0 SELECTED REFERENCES</td>
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TABLES

<table>
<thead>
<tr>
<th>TABLE</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>TABLE I</td>
<td>ESTIMATED TOTAL BENEFICIAL HEAT AVAILABLE (10^{12} Btu) BY COUNTY FOR THE STATE OF NEVADA</td>
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</tr>
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<td>TABLE II</td>
<td>COUNTY HOT-WATER CONVECTION SYSTEMS and Footnotes to Table II [in Appendix]</td>
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<td>TABLE III</td>
<td>POPULATION AND RESIDENTIAL/COMMERCIAL ENERGY USE FOR 1975, 1985, 2000, and 2020 (TOTAL ENERGY USE AND POTENTIAL GEOTHERMAL SPACE AND WATER HEATING) [in Appendix]</td>
<td>B-1</td>
</tr>
<tr>
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<td>CO-LOCATION OF CITY/ENERGY USE SITES AND GEOTHERMAL SITES, BY COUNTY, NEVADA [in Appendix]</td>
<td>C-1</td>
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<tr>
<td>TABLE V</td>
<td>ENERGY USE BY CITY/ENERGY USE SITE FOR INDUSTRIAL SECTOR and Footnotes to Table V [in Appendix]</td>
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<td>TABLE VI</td>
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<td>10</td>
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<tr>
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<td>12</td>
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<td>B-1</td>
</tr>
<tr>
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<td>15</td>
</tr>
<tr>
<td>TABLE X</td>
<td>WEIGHTED GEOTHERMAL RESOURCE POTENTIAL AS UTILIZED IN CALCULATING PARTIAL PENETRATION OF THE INDUSTRIAL SECTOR, BY COUNTY</td>
<td>16</td>
</tr>
<tr>
<td>TABLE XI</td>
<td>INDUSTRIAL ENERGY USE AND GEOTHERMAL MARKET PENETRATION BY COUNTY FOR 1985, 2000, and 2020 (10^{12} Btu)</td>
<td>19</td>
</tr>
</tbody>
</table>
1.0 **STATEMENT**

At the direction of the Department of Energy, the document entitled, *Regional Hydrothermal Market Penetration Analysis*, by EG&G Idaho, Inc. has been used as a baseline for this study. The general content and format of this study follows the preliminary outline presented in Jet Propulsion Laboratory Interoffice Memo 311.3-207, of July 13, 1979.

2.0 **TASKS**

The tasks accomplished to completion from August 1 to September 30, 1979 are:

1. **Assessment of the geothermal resources at a county level**, defining the available energy at individual sites.

2. **Locating within each county the residential, commercial, and industrial energy use sites**. Define the space heating, water heating, and industrial process heat requirements which are compatible with the geothermal resource in the area.

3. **Model the energy demand requirements** which could be supplied by the geothermal resources in 1985, 2000, and 2020, using 1975 as the baseline year.

4. **Estimate the amount of energy** which will be supplied to the residential, commercial, and industrial sec-
tors by geothermal resources in the years 1985, 2000, and 2020. Penetration possibilities include retro-fit of the current (1975) energy market, new facilities designed to utilize geothermal direct heat, and growth inducement following commercial development of geothermal energy.

3.0 RESOURCE ASSESSMENT & METHODOLOGY

A total of 280 known geothermal sites have been defined throughout all seventeen Nevada counties. A preponderant number of the high (>150°C) and intermediate (90°F to 150°F) temperature resource sites are located in the northern half of Nevada. The many low temperature (<90°F) sites are rather evenly distributed geographically, but are an unknown energy quantity. This is largely due to the fact that resource assessment by both the private and the public sectors has been almost wholly concerned with the higher temperature reservoirs. There are no readily available reservoir geothermometry and volume data for these sites. This is particularly significant in Nevada, because the State's largest population center in the Greater Las Vegas Area, is co-located with a potentially large, but very low-temperature resource.

3.1 Beneficial Heat Available

A list of each county and the estimated beneficial heat available (10^{12} Btu) for each is given below in Table 1:
TABLE I. Estimated Total Beneficial Heat Available
(10^{12} Btu) by County for the State of Nevada

<table>
<thead>
<tr>
<th>COUNTY</th>
<th>BENEFICIAL HEAT AVAILABLE (10^{12} Btu)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carson City</td>
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</tr>
<tr>
<td>Churchill</td>
<td>4,546</td>
</tr>
<tr>
<td>Clark</td>
<td>60</td>
</tr>
<tr>
<td>Douglas</td>
<td>49</td>
</tr>
<tr>
<td>Elko</td>
<td>806</td>
</tr>
<tr>
<td>Esmeralda</td>
<td>71</td>
</tr>
<tr>
<td>Eureka</td>
<td>551</td>
</tr>
<tr>
<td>Humboldt</td>
<td>1,219</td>
</tr>
<tr>
<td>Lander</td>
<td>450</td>
</tr>
<tr>
<td>Lincoln</td>
<td>63</td>
</tr>
<tr>
<td>Lyon</td>
<td>472</td>
</tr>
<tr>
<td>Mineral</td>
<td>132</td>
</tr>
<tr>
<td>Nye</td>
<td>879</td>
</tr>
<tr>
<td>Pershing</td>
<td>1,494</td>
</tr>
<tr>
<td>Storey</td>
<td>42</td>
</tr>
<tr>
<td>Washoe</td>
<td>1,383</td>
</tr>
<tr>
<td>White Pine</td>
<td>183</td>
</tr>
<tr>
<td>TOTAL</td>
<td>12,427</td>
</tr>
</tbody>
</table>

The total of 12.427 quads of beneficial heat available is a very conservative number. Fully 9.914 quads, or 80% of the total, comes from 46 recognized high and intermediate temperature sites — only 16% of the total 280 geothermal sites in this study.

The geothermal sites reported by the Geological Survey as having large energy reserves, are only those which have been partially delineated by drilling. This fraction of the total is still very small. As more prospects are drilled, the reserves may be expected to multiply many times. A good proportion of the present high temperature energy reserves, and those which
will be found in the future, will be applied to electrical power generation, with probable direct thermal co-use at many sites.

3.2 Hot-Water Convection Systems

The known geothermal sites are tabulated in Table II, County Hot-Water Convection Systems. Each site has a unique number. The first two digits refer to one of the seventeen counties (in alphabetical order) and the last two digits correspond to a particular resource site within that county. Geographic locations are given by section, township, and range. The thermal water temperatures, reservoir assumptions, and the energy potential for each site are also listed. Further explanation to Table II is outlined in the Footnotes to Table II.

4.0 MARKET DEFINITION METHODOLOGY

4.1 Residential and Commercial

Estimates of the amount of energy used in the residential and commercial sectors at the local level were developed using population data to apportion total Nevada energy consumption. The population data used was obtained from the Office of the State Planning Coordinator. The SPC uses U.S. Bureau of Census figures for historical estimates of population between census years, and performs in-house projections of population by county. These projections, in 1 year increments to 1985
and 5 year increments to 2000, were used to obtain projections of population in the year 2020. Linear regression was the statistical tool used to relate population to time. In all counties but one, the regression explained 95% or more of the variance in population with time. In White Pine County the population has fluctuated severely in recent years due to economic difficulties in the copper industry. Still, a coefficient of determination of slightly better than 90% was obtained.

Data describing the total consumption of energy in each class — residential, commercial, and industrial, was obtained from a study performed for the Nevada Department of Energy, entitled, Energy in Nevada, Second Edition, to be published later this year.

Energy in Nevada includes forecasts of future energy consumption both by major sectors and by major energy form. These forecasts are given through 1985 in 1 year increments, and through 2000 in 5 year increments. Linear regression was again used to obtain projections for 2020, using the projections in Energy in Nevada as 'Historical' data.

The energy consumption estimates for the residential and commercial sectors were obtained for each county by apportioning the total energy used in the two sectors on the basis of population. Local population estimates were obtained from U.S. Bureau of
Consensus data and used to further reduce the county estimates, again by apportioning on the basis of population. In arriving at the local estimates, some of the smaller communities which have little chance of growing, were held at the 1975 level through 2020. All other communities were assumed to grow in direct proportion to their respective counties.

To estimate the fraction of residential and commercial energy use that is directly attributable to space heating and water heating, an analysis of the fuels used in these sectors was performed. This work indicated that about 30% of the electrical energy used in these sectors is for space or water heating. About 95% of the natural gas and LPG, and virtually all of the kerosene, #2 oil, #6 oil, and coal used in these sectors is for space heating or water heating. These fractions were each weighted according to the total contribution of each and a weight average of approximately 70% resulted. This figure was then applied to all of the estimates of local residential and commercial energy requirements to obtain the estimates for potential geothermal energy use.

In 1975 Nevada had an estimated population of 590,300 persons. Table III lists 117 communities which had a combined population of 564,025.

The major centers of residential, commercial and industrial energy use in 1975 are in:
<table>
<thead>
<tr>
<th>CITY</th>
<th>POPULATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carson City</td>
<td>25,300</td>
</tr>
<tr>
<td>Greater Las Vegas Area</td>
<td>323,200</td>
</tr>
<tr>
<td>Henderson</td>
<td>19,400</td>
</tr>
<tr>
<td>Boulder City</td>
<td>7,785</td>
</tr>
<tr>
<td>Elko</td>
<td>8,299</td>
</tr>
<tr>
<td>Reno/Sparks</td>
<td>116,234</td>
</tr>
</tbody>
</table>

4.1.1 Co-Location of Residential and Commercial Energy Use Sites and Geothermal Resource Sites

Table IV, Co-Location of City/Energy Use Sites and Geothermal Sites by County, Nevada, lists the Table III communities and the estimated beneficial heat available ($10^{12}$ Btu) for the nearest resource sites. Other resource sites listed in Table II could also be beneficially used by a number of these communities. It is probable that the higher temperature reservoirs — even those in presently remote areas — will attract new industries and the attendant new residential and commercial growth.

The 1975 communities with a population of at least 1,000, which are (or potentially are) favorably co-located with one or more resource sites, are:

- Fallon
- Fallon N.A.S.
- Gardnerville
- Narlin
- Elko
- Wells
- Winnemucca
- Battle Mountain
- Fernley
Yerington
Lovelock
New Washoe City
Greater Reno/Sparks Area

Somewhat more questionable are the lower temperature resources co-located with:

Boulder City
Henderson
Greater Las Vegas Area
Overton
Babbitt
Hawthorne
Tonopah
Ely/East Ely
McGill

Examples of communities of less than 1,000 persons which are favorably located for geothermal energy use are:

Minden
Jackpot
Silver Peak
Golconda
Caliente
Wabuska
Beatty
Gabbs
Virginia City
Gerlach

4.3 Industrial

4.3.1 Nevada Industry by SIC Code.

The industrial sector of Nevada includes manufacturing, mining and milling, and large scale warehousing. The manufacturing for Standard Industrial Classification Code categories 20 through 39
are tabulated in Table V. Energy Use by City/Energy Use Site for Industrial Sector (by County). An explanation of Table and detailed methodology are set out in the accompanying Footnotes section.

This data provides a good cross section of the manufacturing. Table VI, Comparison of the Listed Number of Establishments and Employees in Industrial Directories and the Nevada Department of Employment Security, is a summary of Table V. For the State as a whole, calculations give a figure of $6.705 \times 10^{12}$ Btu of energy used per year for the manufacturing sector. However, the industrial directories are incomplete. They list only 37% of the firms, and 43% of the employees listed by the Nevada Department of Employment Security. Although valuable for future planning purposes, the SIC data has not been used directly in the final industrial energy use and market penetration projections.

### 4.3.2 Total Industrial Energy Consumption by Nevada

Based on data and projections given in the 2nd edition of *Energy in Nevada*, the total industrial energy consumption for manufacturing, mining, milling and warehousing in Nevada is estimated to be (excluding losses in electrical generation):

<table>
<thead>
<tr>
<th>Year</th>
<th>$10^{12}$ Btu</th>
</tr>
</thead>
<tbody>
<tr>
<td>1975</td>
<td>21.764</td>
</tr>
<tr>
<td>1985</td>
<td>30.056</td>
</tr>
<tr>
<td>2000</td>
<td>37.714</td>
</tr>
<tr>
<td>2020</td>
<td>51.033</td>
</tr>
<tr>
<td>COUNTY Name</td>
<td>Industrial Directories</td>
</tr>
<tr>
<td>-------------</td>
<td>------------------------</td>
</tr>
<tr>
<td></td>
<td>No. of Firms</td>
</tr>
<tr>
<td>Carson City</td>
<td>22</td>
</tr>
<tr>
<td>Churchill</td>
<td>7</td>
</tr>
<tr>
<td>Clark</td>
<td>119</td>
</tr>
<tr>
<td>Douglas</td>
<td>3</td>
</tr>
<tr>
<td>Elko</td>
<td>5</td>
</tr>
<tr>
<td>Esmeralda</td>
<td>-</td>
</tr>
<tr>
<td>Eureka</td>
<td>-</td>
</tr>
<tr>
<td>Humboldt</td>
<td>4</td>
</tr>
<tr>
<td>Lander</td>
<td>-</td>
</tr>
<tr>
<td>Lincoln</td>
<td>1</td>
</tr>
<tr>
<td>Lyon</td>
<td>1</td>
</tr>
<tr>
<td>Mineral</td>
<td>-</td>
</tr>
<tr>
<td>Nye</td>
<td>-</td>
</tr>
<tr>
<td>Pershing</td>
<td>-</td>
</tr>
<tr>
<td>Storey</td>
<td>-</td>
</tr>
<tr>
<td>Washoe</td>
<td>112</td>
</tr>
<tr>
<td>White Pine</td>
<td>1</td>
</tr>
<tr>
<td>Multi-County</td>
<td>-</td>
</tr>
<tr>
<td>TOTAL</td>
<td>275</td>
</tr>
</tbody>
</table>
4.3.3 Total Industrial Energy Consumption by County

Estimates of the amount of energy used by industrial customers in each county were obtained in a manner similar to that used for the residential and commercial sectors. That is, county population projections were used to apportion (Table IIII) the total industrial energy demand, as projected in the 2nd edition of *Energy in Nevada*.

Industrial energy use sites are situated in the cities, mining and milling communities, as well as in isolated localities. There are 114 mineral resource mills in sixteen counties on record with the State Inspector of Mines office.

5.0 GEOTHERMAL MARKET PENETRATION METHODOLOGY

5.1 Residential/Commercial Market Penetration

To obtain estimates of the amount of energy captured by geothermal development in the various communities, a "Capture Fraction" was used. The numerical values assigned to these fractions were developed logically, but not without a considerable amount of considered judgement applied to insure reasonable results. The fractions used are shown in Table VII.

To develop these fractions, optimistic but realistic values for 1985 were estimated. The 1985 fractions were then used to com-
pute the fractions for 2000 and 2020 by assuming 10% annual growth in the capture rates through 2020.

<table>
<thead>
<tr>
<th>GEOTHERMAL POTENTIAL</th>
<th>1975(a)</th>
<th>1985</th>
<th>2000</th>
<th>2020</th>
</tr>
</thead>
<tbody>
<tr>
<td>NIL</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>LOW</td>
<td>0</td>
<td>0.50</td>
<td>2.09</td>
<td>14.05</td>
</tr>
<tr>
<td>MODERATE</td>
<td>0</td>
<td>1.00</td>
<td>4.18</td>
<td>28.10</td>
</tr>
<tr>
<td>HIGH</td>
<td>0</td>
<td>1.50</td>
<td>6.27</td>
<td>42.43</td>
</tr>
</tbody>
</table>

(a) In 1975, very little geothermal energy was utilized outside of the Truckee Meadows (Reno-Sparks) which had a capture fraction of approximately 1/8 of 1 percent (for Reno).

The capture fractions were used as multipliers to convert the estimates of potential geothermal space and water heating (Table III) into estimates of expected geothermal energy use.

A subjective judgement was made to determine which communities could expect high, moderate, low or negligible geothermal development. The factors considered in arriving at this determination include: the temperature, size and depth to resource and proximity to the resource. Thus, a city such as Reno received a high rating because of its proximity to a hot, large, shallow geothermal resource (Steamboat-Huffaker and Mouana). A town such as Search-
light in southern Nevada, which is 14 kilometers from a well with 31°C water, was assigned a negligible (Zero) captive fraction.

Table VIII lists the estimated geothermal penetration of the residential and commercial sectors for the counties and communities.

5.2 Industrial Market Penetration

Residential and commercial growth are projected to be largely in existing communities. On the other hand, industrial growth will be in communities where existing (1975) industry is located, and secondly, where significant savings can be realized right at a geothermal resource site.

The basic assumptions for the estimates of the industrial market penetration analysis are:

1. The bulk of the new high energy-use industry, between 1985 and 2020, will be attracted by, and locate in close proximity to, high and intermediate temperature geothermal resources.

2. Light industry will continue to locate near population centers, but will favor those communities offering geothermal energy.
5.2.1 Penetration Based on County Population Fractions and Geothermal Resource Distribution

Total industrial energy use (in $10^{12}$ Btu's) for the entire State is projected to be 30.656 in 1985, 37.714 in 2000, and 51.033 in 2020. It is assumed for this study that:

1. Geothermal energy use penetration was nil in 1975 for all counties, but statewide it is projected to be:

<table>
<thead>
<tr>
<th>YEAR</th>
<th>PERCENTAGE PENETRATION</th>
<th>$10^{12}$ Btu</th>
</tr>
</thead>
<tbody>
<tr>
<td>1985</td>
<td>5%</td>
<td>1.533</td>
</tr>
<tr>
<td>2000</td>
<td>20%</td>
<td>18.857</td>
</tr>
<tr>
<td>2020</td>
<td>50%</td>
<td>25.517</td>
</tr>
</tbody>
</table>

2. 50% of the geothermal capture is assumed to be in the cities and larger communities presently existing, regardless of geothermal use potential. Estimated capture by county is assumed to be in proportion to population (Table IX).

3. 50% of the geothermal capture is assumed to be in those counties where the geothermal resources presently exhibit the greatest potential. The geothermal resource potential is based on the weighted potential of the high, intermediate and low temperature resources in each county.

Table X lists the number of high and intermediate temperature resources for each county as listed in U.S. Geologic...
# TABLE IX INDUSTRIAL ENERGY USE BY COUNTY
APPORTIONED BY POPULATION (10¹² Btu)

<table>
<thead>
<tr>
<th>COUNTY</th>
<th>1975</th>
<th>1985</th>
<th>2000</th>
<th>2020</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carson</td>
<td>0.934</td>
<td>1.738</td>
<td>2.485</td>
<td>3.628</td>
</tr>
<tr>
<td>Churchill</td>
<td>0.442</td>
<td>0.469</td>
<td>0.445</td>
<td>0.505</td>
</tr>
<tr>
<td>Clark</td>
<td>12.192</td>
<td>16.625</td>
<td>20.618</td>
<td>28.150</td>
</tr>
<tr>
<td>Douglas</td>
<td>0.409</td>
<td>0.622</td>
<td>0.683</td>
<td>0.862</td>
</tr>
<tr>
<td>Elko</td>
<td>0.559</td>
<td>0.653</td>
<td>0.690</td>
<td>0.847</td>
</tr>
<tr>
<td>Esmeralda</td>
<td>0.026</td>
<td>0.031</td>
<td>0.030</td>
<td>0.036</td>
</tr>
<tr>
<td>Eureka</td>
<td>0.041</td>
<td>0.043</td>
<td>0.041</td>
<td>0.046</td>
</tr>
<tr>
<td>Humboldt</td>
<td>0.261</td>
<td>0.319</td>
<td>0.351</td>
<td>0.439</td>
</tr>
<tr>
<td>Lander</td>
<td>0.111</td>
<td>0.110</td>
<td>0.098</td>
<td>0.097</td>
</tr>
<tr>
<td>Lincoln</td>
<td>0.100</td>
<td>0.110</td>
<td>0.121</td>
<td>0.148</td>
</tr>
<tr>
<td>Lyon</td>
<td>0.383</td>
<td>0.254</td>
<td>0.215</td>
<td>0.219</td>
</tr>
<tr>
<td>Mineral</td>
<td>0.244</td>
<td>0.239</td>
<td>0.215</td>
<td>0.230</td>
</tr>
<tr>
<td>Nye</td>
<td>0.207</td>
<td>0.224</td>
<td>0.223</td>
<td>0.255</td>
</tr>
<tr>
<td>Pershing</td>
<td>0.100</td>
<td>0.110</td>
<td>0.109</td>
<td>0.128</td>
</tr>
<tr>
<td>Storey</td>
<td>0.037</td>
<td>0.046</td>
<td>0.049</td>
<td>0.061</td>
</tr>
<tr>
<td>Washoe</td>
<td>5.345</td>
<td>8.765</td>
<td>11.137</td>
<td>15.213</td>
</tr>
<tr>
<td>White Pine</td>
<td>0.372</td>
<td>0.297</td>
<td>0.204</td>
<td>0.168</td>
</tr>
<tr>
<td>TOTAL</td>
<td>21.764</td>
<td>30.656</td>
<td>37.714</td>
<td>51.033</td>
</tr>
<tr>
<td>County</td>
<td>Number of U.S.G.S. High &amp; Intermediate Temperature Reservoirs</td>
<td>Weighted Rating Number</td>
<td>Weighted Rating Percentage</td>
<td></td>
</tr>
<tr>
<td>---------------</td>
<td>--------------------------------------------------------------</td>
<td>-------------------------</td>
<td>---------------------------</td>
<td></td>
</tr>
<tr>
<td>Carson City</td>
<td>0</td>
<td>1</td>
<td>2.5</td>
<td></td>
</tr>
<tr>
<td>Churchill</td>
<td>6</td>
<td>4</td>
<td>10.0</td>
<td></td>
</tr>
<tr>
<td>Clark</td>
<td>0</td>
<td>1</td>
<td>2.5</td>
<td></td>
</tr>
<tr>
<td>Douglas</td>
<td>1</td>
<td>1</td>
<td>2.5</td>
<td></td>
</tr>
<tr>
<td>Elko</td>
<td>7</td>
<td>4</td>
<td>10.0</td>
<td></td>
</tr>
<tr>
<td>Esmeralda</td>
<td>0</td>
<td>1</td>
<td>2.5</td>
<td></td>
</tr>
<tr>
<td>Eureka</td>
<td>4</td>
<td>3</td>
<td>7.5</td>
<td></td>
</tr>
<tr>
<td>Humboldt</td>
<td>11</td>
<td>6</td>
<td>15.0</td>
<td></td>
</tr>
<tr>
<td>Lander</td>
<td>3</td>
<td>2</td>
<td>5.0</td>
<td></td>
</tr>
<tr>
<td>Lincoln</td>
<td>0</td>
<td>1</td>
<td>2.5</td>
<td></td>
</tr>
<tr>
<td>Lyon</td>
<td>3</td>
<td>2</td>
<td>5.0</td>
<td></td>
</tr>
<tr>
<td>Mineral</td>
<td>0</td>
<td>1</td>
<td>2.5</td>
<td></td>
</tr>
<tr>
<td>Nye</td>
<td>2</td>
<td>2</td>
<td>5.0</td>
<td></td>
</tr>
<tr>
<td>Pershing</td>
<td>8</td>
<td>5</td>
<td>12.5</td>
<td></td>
</tr>
<tr>
<td>Storey</td>
<td>0</td>
<td>1</td>
<td>2.5</td>
<td></td>
</tr>
<tr>
<td>Washoe</td>
<td>6</td>
<td>4</td>
<td>10.0</td>
<td></td>
</tr>
<tr>
<td>White Pine</td>
<td>1</td>
<td>1</td>
<td>2.5</td>
<td></td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td></td>
<td><strong>40</strong></td>
<td><strong>100.0</strong></td>
<td></td>
</tr>
</tbody>
</table>
The weighted rating numbers total 40. Elko County, for example has 4 out of 40, or 10% of the total for all the counties.

The capture fraction for a county in $10^{12}$ Btu's is the product of the weighted rating percentage, the 50% penetration based on geothermal resource distribution, and the estimated geothermal use penetration statewide for a given year. For example, the geothermal energy capture for Elko County in the year 2000 would be:

$$0.10 \times 0.50 \times 18.857 \times 10^{12} \text{ Btu} = 943 \times 10^{12} \text{ Btu}$$
Table XI lists the penetration based on geothermal resource distribution (50% of the total) and penetration based on county population fractions (50% of the total). The three columns to the right give the sum of the two, or total geothermal market penetration.
### TABLE XI INDUSTRIAL ENERGY USE AND GEOTHERMAL MARKET

**Penetration by County for 1985, 2000, and 2020 (TJ)**

<table>
<thead>
<tr>
<th>COUNTY</th>
<th>Penetration based on County Population Fractions</th>
<th>Penetration Based on Geothermal Resource Distribution</th>
<th>Total Geothermal Market Penetration</th>
</tr>
</thead>
<tbody>
<tr>
<td>CARSON CITY</td>
<td>0.043</td>
<td>0.621</td>
<td>0.907</td>
</tr>
<tr>
<td>CHURCHILL</td>
<td>0.012</td>
<td>0.111</td>
<td>0.126</td>
</tr>
<tr>
<td>CLARK</td>
<td>0.416</td>
<td>5.154</td>
<td>7.017</td>
</tr>
<tr>
<td>DOUGLAS</td>
<td>0.016</td>
<td>0.171</td>
<td>0.216</td>
</tr>
<tr>
<td>ELKO</td>
<td>0.016</td>
<td>0.172</td>
<td>0.212</td>
</tr>
<tr>
<td>ESMEERALDIA</td>
<td>0.001</td>
<td>0.007</td>
<td>0.009</td>
</tr>
<tr>
<td>EUREKA</td>
<td>0.061</td>
<td>0.010</td>
<td>0.011</td>
</tr>
<tr>
<td>HUMBOLDT</td>
<td>0.006</td>
<td>0.008</td>
<td>0.110</td>
</tr>
<tr>
<td>LANDER</td>
<td>0.003</td>
<td>0.024</td>
<td>0.024</td>
</tr>
<tr>
<td>LINCOLN</td>
<td>0.003</td>
<td>0.030</td>
<td>0.037</td>
</tr>
<tr>
<td>LYON</td>
<td>0.006</td>
<td>0.054</td>
<td>0.055</td>
</tr>
<tr>
<td>MINERAL</td>
<td>0.006</td>
<td>0.054</td>
<td>0.058</td>
</tr>
<tr>
<td>Nye</td>
<td>0.006</td>
<td>0.056</td>
<td>0.064</td>
</tr>
<tr>
<td>PERSHING</td>
<td>0.003</td>
<td>0.027</td>
<td>0.032</td>
</tr>
<tr>
<td>STORL</td>
<td>0.001</td>
<td>0.012</td>
<td>0.015</td>
</tr>
<tr>
<td>WASHOE</td>
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6.0 SELECTED REFERENCES


Carson City Chamber of Commerce (1979) Manufacturing in Carson City


Greater Reno Chamber of Commerce (1978) List of National Firms in Reno/Sparks for Distribution, Manufacturing, and Assembly


Solar Energy Research Institute (undated) Industrial Process Heat Data Base (IPHDB), unpublished


-------- (1979) Demographic and Economic Impact Stimulation Model, Demographic and Economic Projections, Nevada, by County
State Planning Coordinator's Office and Department of Economic Development (1976) County Datafiles, Nevada

U.S. Bureau of Census (1972) Directory of Manufacturers
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Footnotes 1 thru 7 - See Explanation Page
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Footnotes 1 thru 7 - See Explanation Page A-5
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Footnotes 1 thru 7 - See Explanation Page
## TABLE II  ESMERALDA COUNTY HOT-WATER CONVECTION SYSTEMS

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<td>Southern Big Smoke V.</td>
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<td>Big Divide Mine</td>
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<td>Pearl Hot Springs</td>
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<td>Alkali Springs</td>
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Footnotes 1 thru 7 - See Explanation Page A-7
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Footnotes 1 thru 7 - See Explanation Page
## Table II. Humboldt County Hot-Water Convection Systems

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Footnotes 1 thru 7 - See Explanation Page

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Footnotes 1 thru 7 - See Explanation Page A-10
## TABLE II  LANDER COUNTY HOT-WATER CONVECTION SYSTEMS

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<th>Wellhead thermal energy, (10$^{-3}$)</th>
<th>Beneficial Heat, (10$^{-3}$)</th>
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*Footnotes 1 thru 7 - See Explanation Page*
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Footnotes 1 thru 7 - See Explanation Page
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Footnotes 1 thru 7 - See Explanation Page
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<td>Gabbs</td>
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<td>Duchesne</td>
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**TABLE II** | **NYE COUNTY HOT-WATER CONVECTION SYSTEMS**

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Footnotes: 1 thru 7 - See Explanation Page
Footnotes to TABLE II. County Hot-Water Convection Systems

(1) This is the maximum reported temperature from a spring (S); drill hole or well (W); or mine working (MW). Deep exploratory geothermal and petroleum well temperatures are reported as bottom hole temperatures (BHT) in column six.

(2) All geochemical temperatures are those of the U.S. Geological Survey, as published in Circulars 726 and 790. For those sites where three temperatures are given, the first is the minimum likely value, the second is the most likely value, and the third is the maximum value. Letters indicate the method used to estimate the temperature:

A. Quartz
B. Quartz conductive, pH-corrected
C. Quartz adiabatic
D. Chalcedony
E. Chalcedony, pH-corrected
F. Cristobalite
G. Amorphous silica
H. Na-K
I. Na-K-Ca
J. Na-K-Ca, Mg-corrected
K. Sulfate-water isotope
L. Surface
M. Reported well
N. Mixing
O. Renner, 1976
P. Assumes saturation of SiO₂ with respect to quartz.

(3) The mean reservoir temperatures are those calculated by the U. S. Geological Survey (Brook et al., 1979). The bottom hole temperature (BHT) has been taken as the reservoir temperature, only for deep geothermal or petroleum exploratory tests.
Most of the geothermal sites are in the low to moderate temperature range, well below that which is presently necessary for electrical power generation. Reservoir data (temperature and volume) is not available for any of these sites. In order to provide an estimated reservoir thermal energy for each site, a planning temperature (PT) was calculated for each site which does not have a U.S.G.S. mean temperature or a bottom hole temperature. A planning temperature was calculated by increasing the surface temperature by a multiple of 1.5 (e.g., surface temperature of 45°C x 1.5 = 69°C PT), for each county with the exception of Clark. In Clark County, where the surface water temperatures are all very low, and the mean annual air surface temperature is high, a multiple of 1.25 was used.

(4) The U.S. Geological Survey reservoir volumes have been utilized for those sites which show a geochemical reservoir temperature. For those sites which do not have a U.S.G.S. estimate of volume, an estimate has been made using the parameters established by the Survey for minimum volumes. That is, "Where the only evidence of a reservoir of hot water is a single spring or well or group of springs in a small area, a minimum area of 1 km² and a maximum of 3 km² with a most likely area of 2 km² are assumed...Because the estimates in this assessment involve thermal energy only to a depth of 3 km below the surface, the bottom of a reservoir is normally assumed to be at 3 km unless there is evidence to suggest a shallower depth...Otherwise, a minimum depth of 0.5 km, a maximum of 2.0 km, and a most likely depth of 1.5 km to the top of the reservoir
are assumed." (Smith and Shaw 1979)

Closely following the aforementioned assumptions and those stated in more detail in the original text, the present study assumes a 1 km$^3$ minimum reservoir volume, and a maximum 3 km$^3$ reservoir volume for smaller sites. The minimum volume is usually taken for those sites with surface water temperatures below 90°C, especially in areas where high temperature reservoirs are not now known.

(5) Estimation of the reservoir thermal energy is derived from the product of assumed reservoir temperature (minus 15°C), the assumed reservoir volume, and the constant, 2.7 J/cm$^3$/°C. (See Brook, et al., 1979, p. 20).

(6) Determination of hot-water geothermal resources involves the definition of a geothermal recovery factor, which is the ratio of geothermal energy recovered at the wellhead to the geothermal energy originally in the reservoir. This factor is 25% for all hot-water reservoirs.

(7) "Following the methodology of Nathenson and Muffler (1975), the amount of the resource that could be directly applied to non-electric uses is calculated for systems of 90° to 150°C. This amount of thermal energy is called beneficial heat..." (See Brook, et al., 1979, p. 26). Beneficial heat is the product
of the wellhead thermal energy and the beneficial heat utilization factor of 0.24.

This calculation may be used to obtain beneficial heat for reservoirs above 150°C as well. According to Nathenson (personal communication, 1979) this formula might be used for low temperature reservoirs, but with questionable results below about 40°C. In the absence of a better method this formula was applied to all geothermal reservoirs in this study.
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(a) Industries of unknown site location; assume 85% to Elko and 15% to Wells

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(a) Industry of unknown site location; assume 100% to Battle Mountain

Footnotes 1 thru 6—see Explanation Page
## Table V. Energy Use by City/Energy Use Site for Industrial Sector

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(a) Industries of unknown site location; assume 50% to Pioche and 50% to Caliente.

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(a) Industries of unknown site location; assume 50% to Fernley and 50% to Yerington.

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(a) Industries of unknown site location: assume 50% Hawthorne, 25% Mins, and 25% Euning.
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(a) Industries of unknown site location; assume 100% to Tonopah.

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(a) Industries of unknown site location; assume 100% to Lovelock.

Footnotes 1 thru 6—see Explanation Page 13

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(a) Industries of unknown site location; assume 100% to Virginia City.

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(a) Industrial sites of unknown location; 100% to Reno/Sparks.

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TOTAL $10^{13}$ J/yr 8.038

$= 10^{12}$ Mha/yr 8.000

Footnotes 1 thru 6—see Explanation Page

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(a) City/Energy Use Sites of unknown location; 100% to Ely/East Ely.
Footnotes 1 thru 6—see Explanation Page D-21.
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**Total** 10^10 KJ/yr. 2.153

- 10^12 MWh/yr. 0.020

(a) City/Energy Use Sites of Unknown County Location
Footnotes to TABLE V Energy Use By City/Energy Use Site For Industrial Sector

(1) City/Energy Use Site for the purposes of this study is the county or a community within the county for which there is a record of the presence of industry for SIC categories 20 through 39.

(2) The Standard Industrial Classification Code categories covered in this study are major groups 20 through 39:

- 20 Food and kindred products
- 22 Textile mill products
- 23 Apparel and other finished products made from fabrics and similar materials
- 24 Lumber and wood products, except furniture
- 25 Furniture and fixtures
- 26 Paper and allied products
- 27 Printing, publishing, and allied industries
- 28 Chemicals and allied industries
- 29 Petroleum refining and related industries
- 30 Rubber and miscellaneous plastics products
- 31 Leather and leather products
- 32 Stone, clay, glass and concrete products
- 33 Primary metal industries
- 34 Fabricated metal products, except machinery and transportation equipment
- 35 Machinery, except electrical
- 36 Electrical and electronic machinery, equipment, and supplies
- 37 Transportation equipment
- 38 Measuring, analyzing, and controlling instruments; photographic, medical and optical goods; watches and clocks
- 39 Miscellaneous manufacturing industries

Major groups of particular interest in Nevada, but not specifically isolated, are:

- 10 Metal mining
- 14 Mining and quarrying of nonmetallic minerals, except fuels
- 42 Motor freight transportation and warehousing
- 50 Wholesale trade - durable goods
- 51 Wholesale trade - nondurable goods
(3) Wherever possible 4-digit SIC numbers were obtained from industrial directories for the State of Nevada, the Greater Las Vegas Area, Reno/Sparks, and Carson City. Except for geographically isolated mining and milling operations which are present in all counties, nearly all industrial activity is located in the aforementioned metropolitan areas.

The industrial directories are complete, only to the extent of each individual firm's response to a mailed questionnaire. A total of 131 4-digit industrial categories has been recorded for Nevada.

(4) A list of the total number of firms and the aggregate total number of employees for each 2-digit SIC category establishes a realistic county by county tabulation of the industrial sector. Statewide the directories list only 37% of the establishments and 42% of the employees (see Table VI Comparison of Listed Number of Establishments and Employees in Industrial Directories and the Records of the Nevada Department of Employment Security).

The proprietary nature of this data did not allow the Nevada Department of Employment Security to release data on a 4-digit level. Nor was the 2-digit data available on a community or site specific basis.
(5) The Standard Annual Energy Use (SAE) in $10^{10}$ KJ/year, is the quantity of energy used by an average size establishment of a specific 4-digit SIC industry (S.E.R.I. data provided by Western Energy Planners, Ltd.). An average size establishment was calculated for each 2-digit SIC major group (rather than 4-digit) from statistics published in the U.S. Department of Commerce, Census of Manufacturers (1972), volume 1, Subject and Special Statistics. SAE values were available for 78% of the 4-digit SIC categories.

(6) A methodology was developed which incorporated the incomplete 4-digit and 2-digit SIC employee, establishment, and energy statistics, to provide industrial energy use data for specific city/energy use sites. In declining order of preference, the SAE (in $10^{10}$ KJ/year) for each 2-digit major group for a site was established as follows:

(a) Industry at the site had a listed 4-digit SIC number and a corresponding SAE value.

(b) When 4-digit SIC numbers were lacking or partially lacking for industry at a site, a weighted average of all 4-digit industries which were known for the site were taken. The corresponding weighted SAE value was used. If no other 4-digit SIC numbers were known for the site, then a weighted SAE value was calculated from corresponding data within that county, the State, or lastly the National level.

(c) With an SAE value for each 2-digit major group established, that energy value is multiplied times the ratio of the actual number of employees within this major group at the site, to the number of employees for the average establishment in the major group. The product is the energy used at the site in $10^{10}$ KJ/year.
### TABLE VIII GEOTHERMAL PENETRATION OF RESIDENTIAL/COMMERCIAL
BY COUNTY AND CITY FOR
1975, 1985, 2000, and 2020 (10¹² Btu)

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1. CAPTURE FRACTIONS (%)

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(a) In 1975, very little geothermal energy was utilized outside of the Truckee Meadows (Reno/Sparks) which had a capture fraction of approximately 1/8 of 1 percent (for Reno).