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GEOTHERMAL ELECTRIC POWER PRODUCTION IN THE UNITED STATES: A SURVEY AND UPDATE FOR 1995-1999

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ABSTRACT
This survey summarizes geothermal development activity in the United States during the years 1995 - 1999. Geothermal power production in this country is first compared to other sources. State-by-state reviews of geothermal power production are presented. These indicate the continuing dominance of California and Nevada in geothermal power production. Other producing states include Hawaii and Utah. Growth in development has slowed considerably from 18 percent between1980 and 1989 to less than one half percent for the period 1990-1999. By the year 2000, the United States installed capacity is forecast to be at slightly less than 2,400 MW of operating capacity.

1. INTRODUCTION

The United States continues to lead the world in installed geothermal power capacity as well as in electrical generation.

Geothermal energy is a small contributor to the electric power capacity and generation in the United States. In 1998, geothermal plants constituted about 0.25 percent of the total operable power capacity. In 1998, those plants contributed 0.38 percent of the total generation and, for the first two months in 1999, it stands at 0.38 percent.

On a state level, geothermal is a major player in California and Nevada. It is a minor source of power in Hawaii and Utah. Further, it has the potential to become significant on the Big Island of Hawaii and perhaps, in the future, the Pacific Northwest.

The most impressive geothermal growth in the United States occurred during the 1980s, with an average annual increase in capacity of about 11 percent. In contrast, from 1990-1998, it has averaged only 0.14 percent due to a leveling off of new plant construction. This recent period also saw a reduction at The Geysers in California to an operating capacity of about 1,140 MW, down from a total installed capacity of 1,875 MW in 1990. Contributing to the capacity stagnation is the retirement and shut down of six units at The Geysers in California. These include the four original units (78 MW), both the Central California Power Agency (CCPA) units (130 MW), and the 55 MW Bottle Rock plant.

Table 1 shows the historical development of geothermal capacity installed in the United States from 1960-2005 broken out by state.

2. TOTAL PRODUCTION OF ELECTRICITY: ALL SOURCES

Table 2 presents operable electric production capacity and power generation in the United States from all sources for 1995-2005. For 1999 only, data for January to June were available at the time of writing. All data in this table, except those footnoted, came from the USDOE Energy Information Administration (website: www.eia.doe.gov).

Geothermal power production fell from 1995 to 1999, but the steepness of the decline has been slowed by reinjection activities at The Geysers. This is discussed further below.

It should be noted that EIA data for geothermal energy are conservatively estimated. We use our own estimates of operable geothermal capacity, and they are higher than EIA data. Much of any discrepancy can be traced to load factors that vary each year for many of the plants. Capacity variations are due to both contract and resource conditions.

Geothermal capacity for all years was calculated using the data compiled for this paper. We project year 2005 values based on gaining all of the California planned capacity additions.

3. GEOTHERMAL DEVELOPMENTS BY STATE

3.1 California

California accounts for over 90 percent of the installed geothermal power capacity in the country. The major areas of development are The Geysers, Imperial Valley, and Coso. Other areas with geothermal plants are Casa Diablo (Mono-Long Valley or Mammoth) and the Honey Lake Valley including Wendel and Amedee. Glass Mountain is scheduled for development. The locations of all of these areas are shown in Figure 1.

The Geysers

There have been no new plants installed since 1989 when the 2x10 MW J.W. Aidlin plant came on-line. The four original PG&E units were officially retired in 1992; all surface equipment for Units 1 through 4 has been dismantled. Supply wells have been redirected to other units. Unit 1 was designated a National Historic Mechanical Engineering Landmark in 1985 by the American Society of Mechanical Engineers. Other plants no longer in service include PG&E Unit 15 (59 MW, retired in 1989), DWR Bottle Rock plant (55 MW, closed in 1990), and the CCPA Units 1&2 (130 MW, retired in 1996).

Figure 2 shows the power plant locations at The Geysers. Table 3 gives data on the plants, including the rating and the actual output for the years 1996, 1997, and 1998 (CDOG, 1997, 1998). Owing to a shortfall of steam, the difference between rated and actual power capacity is significant, e.g., 1,137 MW in 1998. However, this shortfall is being reversed in several units by the southeast Geysers effluent recycling system discussed below.

What has changed in the last five years at The Geysers is ownership: Calpine Corp. now owns over 800 MW of steam reserves and power plants in The Geysers. Calpine first expanded its ownership there in 1998 with the purchase of the 72 MW SMUD No. 1 plant for $13 million (GRC, 1998a). Up to 50 MW of off-peak power from the renamed Sonoma plant is sold to SMUD, terminating in 2001. In addition, SMUD has the option to purchase up to an additional 10 MW of peak power production through 2005. Calpine markets the excess electricity into the California power market.

PG&E and Unocal Corp., for different reasons, put their respective assets at The Geysers up for sale. On May 10, 1999, Calpine acquired 2 PG&E plants in Lake County, and 12 plants in Sonoma County for $212.8 million (GRC, 1999c). The 14 geothermal facilities have a combined capacity of 699 MW.

Calpine purchased the steam fields supplying the Sonoma County plants from Unocal Corp. on March 19, 1999, for $101 million (GRC, 1999b). The company already owned the steam fields supplying the Lake County plants.

The latest development at The Geysers is injecting recycled wastewater into the reservoir. Two projects are underway, with the first system operational. The Southeast Geysers Effluent Recycling project is the world's first wastewater-to-electricity system (www.geysers-pipeline.org). It transports treated wastewater effluent from the California communities of Clearlake, Lower Lake, and Middletown to The Geysers geothermal steamfield for injection and recovery as steam for power generation. In Phase 1 of that system, a 30 mile (48 km) pipeline transports 5,400 gpm (20,500 L/min) of effluent to The Geysers. Power generation has increased 39 MW between January 1998 and January 1999. Plans are underway for Phase 2 of that system.

In addition, the city of Santa Rosa plans to send its treated wastewater 41 mi. (66km) to The Geysers (GRC, 1999d). The $163 million project is slated to go on-line in 2002, providing routing issues can be settled. Together, these two projects are expected to make The Geysers production sustainable and provide local cities with wastewater disposal solutions.

<u>Imperial Valley</u>
The Imperial Valley consists of facilities in the Salton Sea, Heber, and East Mesa Known Geothermal Resource Areas (KGRA) in southern California. Development of Imperial Valley geothermal resources slowed during 1995-1999. One plant was expanded in 1996 and another plant added at Salton Sea. Site maps and plant data for these two areas plus the East Mesa area are given in Figures 3-5 and Table 4.

The Salton Sea Unit 1 was expanded through the addition of a 20-MW unit, (originally called Unit 1 Expansion), and came on-line in 1996. The steam gathering system incorporates the pH-control method to alleviate scaling.

Salton Sea Unit V is a 49-MW (net) geothermal power plant located at CalEnergy's Imperial Valley operations. A modification of the current technology will be used at Unit V, and additional energy will be extracted from brine already brought to the surface. Salton Sea Unit V will provide the power needed to operate CalEnergy's Zinc Recovery Project (GRC, 1999b). The project should be operating by the time of this Congress.

The CE Turbo LLC project is a new 10-MW (net) geothermal plant located at CalEnergy's Imperial Valley plants (www.midamerican.com/calenergy). This plant is designed to optimize the conversion of geothermal energy into electrical energy.

<u>Honey Lake Valley</u>
There has been no new activity in this area since 1989 when the 30-MW hybrid geothermal-wood products plant went into operation (DiPippo, 1995). Geothermal hot water is used for its direct heat value to augment the efficiency of the wood-waste-fueled unit and contributes about 1.5 MWe of the total plant output. See Figure 6 and Table 5 for more details.

<u>Coso</u>
Power plants at Coso were sold by CalEnergy (operator and minority owner) to Caithness Energy LLC for $277 million in January 1999 (GRC, 1999a). See Figure 7 and Table 6 for more details. The plants were rerated to higher capacity levels due to operational efficiencies.

<u>Planned Additions</u>
New plants are under development at Glass Mountain. Both CalEnergy and Calpine are proposing plants at this site in northeastern California (Table 7) (www.calpine.com, www.midamerican.com/calenergy). Each of these plants is proposed for 49.9 MWe capacity.

3.2 Hawaii
A 25-MW hybrid, single-flash/binary plant was commissioned in 1993 at Puna in the Kilauea East Rift Zone on the Big Island of Hawaii (DiPippo, 1995). The plant is located at the easternmost point of the island, about 5.6 km (3.5 mi) west of the Kapoho crater and the same distance southeast of the town of Pahoa.

3.3 Nevada
As of 1999, there were power plants operating at ten different sites in Nevada with a total power capacity of 195.7 MW. Four plants have come on-line this decade: Soda Lake II (15 MW, 1990), Steamboat 2 (12 MW, 1992), and Brady Hot Springs (24 MW, 1992). The plants in Nevada include flash and binary energy conversion systems. Figure 8 and Table 8 have more details.

One change in the last five years in Nevada has also been ownership. U.S. Energy Systems, Inc. in July 1999, acquired Far West Capital subsidiary Steamboat Development Corp. of Reno, Nevada, which includes the 40-MW Steamboat 2 and 3 geothermal power plants and rights to the 600 acres of underlying geothermal resource fields. The Steamboat 2 and 3 plants are adjacent to the smaller Steamboat 1 and 1A power plants already owned by U.S. Energy Systems.

In a related agreement, Trigen-Cinergy Solutions will operate the four Steamboat plants under contract. Additionally, Trigen-Cinergy will acquire other energy assets of Reno-based geothermal companies including the development rights to the Reno Energy Geothermal District heating project and Western Power Investments. Western Power holds a license for utilizing the Kalina Cycle in geothermal power applications.

Plans to develop power projects at Fish Lake Valley, Rye Patch, and Sulfur Hot Springs have not materialized. The absence of commercial resources and favorable power sales agreements continues to discourage development.

3.4 Utah
In the 1990s, the Bud L. Bonnett power plant came on-line at the Sulphurdale/Cove Fort geothermal field (DiPippo, 1995). The unit is rated at 7 MW, and is the latest addition to the power complex at that site. There are also a 2-MW backpressure steam turbine and four binary units (with a total rating of 2 MW) that are located downstream of the steam turbine. Figure 9 and Table 9 give more details.

3.5 Other Plants Planned for the United States
<u>Oregon</u>
Plans to develop plants at Vale and Newberry Volcano were both cancelled during the 1990s due to unsuccessful reservoir confirmation projects.

4. GEOTHERMAL WELL DRILLING
The drilling of wells to support geothermal power generation has tapered off since the 1980s and early 1990s.

4.1 California
The vast majority of geothermal power wells in the United States are in California. For the period 1995-1999 (for which complete data exist), the number of exploration, production, injection, and observation wells drilled fell from 38 in 1990 to 26 in 1995. During the period 1996-1998, only 20 new wells were drilled in all of California's many fields. This includes 13 productions wells and 7 injection wells (Hodgson, 1998; Thomas, 1999; Johnson, 1999). The Salton Sea and Cosa are currently the most actively-drilled areas in the state. Table 10 gives more information on geothermal wells drilled in California.

4.2 Nevada
Geothermal well drilling in Nevada peaked in 1992 when 31 wells of all types were completed. Over the period 1995-1999, a total of 28 production wells were drilled (Wells, 1999).

4.3 Hawaii
The primary drilling activity in Hawaii occurred in the early 1990s in support of the 25-MW Puna geothermal Venture power plant. All drilling has been confined to the active Kilauea East Rift zone where very high temperatures have been encountered. Unfortunately, permeability in the high temperature part of the reservoir has been unpredictable and not always sufficient to yield commercial productivity. Only one well has been drilled in Hawaii since 1995 (Tanaka, 1999; Hawaii Dept. of Land and Natural Resources).

4.4 Other States
There were few wells drilled in the other states that might have high-grade geothermal prospects.

<u>Alaska</u>
The only site under serious consideration is Unalaska Island in the Aleutians, but there was no drilling from 1995-1999. There were plans to drill five wells to support the proposed 15-MW power plant—three for production and two for injection, but the project never materialized (Liss, 1994; Schochet, 1994).

<u>Idaho</u>
The field at Raft River has been idle since the 5-MW pilot binary plant was shut down in 1982 (Bliem and Walrath, 1983). No drilling took place from 1995-1999, although some attempts were made to market the site.

<u>New Mexico</u>
No drilling was done from 1995-1999 at either the Valles Caldera or the Fenton Hill site. Both areas had been actively developed starting in the mid 1970s; the former area was abandoned due to low well productivity (poor permeability) and the latter area was used as a test facility for Hot Dry Rock technology. Flow tests were carried out at the HDR site during the early 1990s (Brown, 1993). The project was terminated in 1997.

<u>Oregon</u>
No new deep wells were drilled during 1995-1999 (Olmstead, 1999). Several wells that had been drilled in the early 1990s were plugged and abandoned during this period.

<u>Utah</u>
Only one well was drilled from 1995-1999, a production well at the Sulphurdale/Cove Fort area by Mother Earth Industries in 1996 (Blackett, 1999).

5. GEOTHERMAL LOCALITIES
The U.S. Geological Survey published an extensive compendium of the geothermal resources in the United States in 1978 (Muffler, 1978). This document, U.S.G.S. circular 790, remains the accepted reference work on this subject.

The state of Nevada has recently revised and reclassified its geothermal prospects (DOE, 1993; Hoops, 1994). The following four areas have been newly designated as KGRAs for the purpose of competitive bidding for leases on federal lands:

Fish Lake Valley (Esmeralda County)
New York Canyon (Pershing County)
Round Mountain (Nye County)
Salt Wells (Churchill County).

The following four areas have been reclassified as individual KGRAs; the upper pair were originally grouped together as were the lower pair:

Brady	Hazen
Soda Lake	Stillwater

The following six areas remain as KGRAs:

Beowawe	Rye Patch
Dixie Valley	San Emidio Desert
Gerlach	Steamboat Springs

Although Circular 790 lists additional areas in Nevada not mentioned above, those areas have failed to attract any interest and may be considered unattractive for development at this time.

6. PROFESSIONAL GEOTHERMAL PERSONNEL
There are certainly many more individuals working on geothermal projects than those who belong to the Geothermal Resources Council (GRC), but we can use the GRC membership as a conservative measure of those engaged in geothermal work of all kinds. This would include scientists, engineers, technicians, drillers, managers, analysts, etc.

Data on GRC membership for the last five years is given in Table 11 (Smith, 1999). The membership varies cyclically, with peaks correlated with the quinquennial international meetings. The average U.S. membership for the period 1995-1999 is 661, the average non-U.S. membership is 128, and the average total is 790. This shows a considerable down turn in GRC membership and reflects, to a large extent, the low level of activity in the industry as well as the numbers of active geothermists due to the large number of mergers that have significantly reduced the number of companies involved in geothermal and thus employment. The fall-off in membership in the years following an international meeting does not necessarily indicate a loss of jobs in the geothermal industry, but more likely is caused by the natural tendency of people to lose touch with their professional societies' affiliation. If this hypotheses is correct, one would expect another surge in membership associated with the 2000 World Geothermal Congress.

Assuming that there could be as many as two or three people working on geothermal projects for each one who belongs to the GRC, then there could be as many as 3,000-4,000 people in the U.S. doing work related to geothermal energy.

7. OUTLOOK AND CONCLUSIONS

If all the planned new capacity comes on-line during the next five years, the installed geothermal electric power capacity would increase by 578 MW and reach a total of 3,395 MW. This would represent an average annual growth rate of about 42.5 percent. Most of the growth will be in the states of California and Nevada. For more details, see Table 12 (values have been rounded to the nearest megawatt).

A more realistic assessment, based on the current actual capacity and assuming that only half of the planned additions appear over the next five years, would lead to the prediction of about 3,106 MW of operable geothermal capacity in the year 2005.

It will be interesting to see how the industry will fare when some of the power sales agreements that were negotiated in times of relatively high avoided costs go out of existence. Several of these apply to plants in the Imperial Valley and are scheduled to change during the next four years. The price paid for the energy will become the then-current avoided cost, a much lower value than that paid during the early stage of the contract.

When the present excess capacity in the western states begins to disappear, and when the present low price of fossil fuel, particularly natural gas, begins to increase, geothermal energy can be expected to resume its once strong growth.

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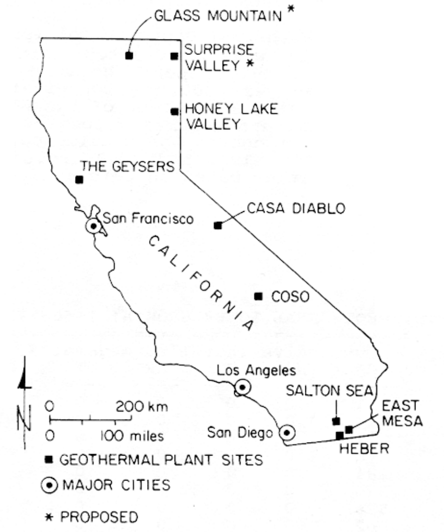

FIG. 1
GEOTHERMAL POWER PLANT AREAS IN CALIFORNIA

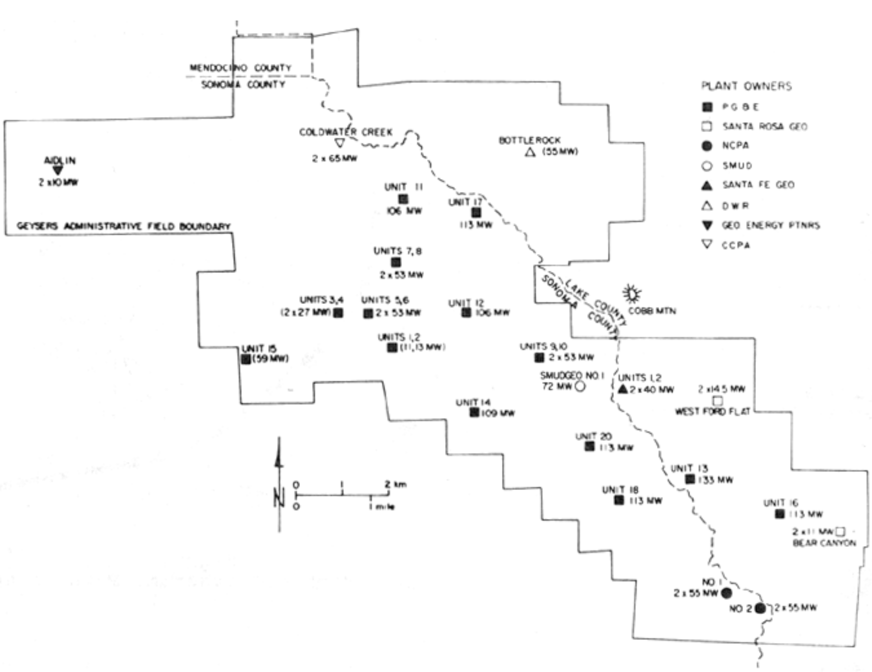

FIG. 2
THE GEYSERS POWER PLANTS

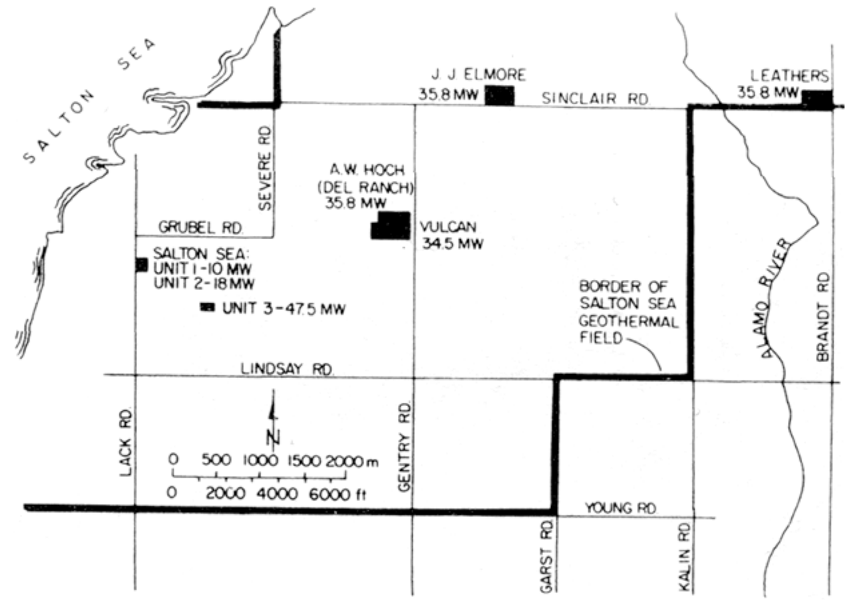

FIG. 3
SALTON SEA GEOTHERMAL POWER PLANTS

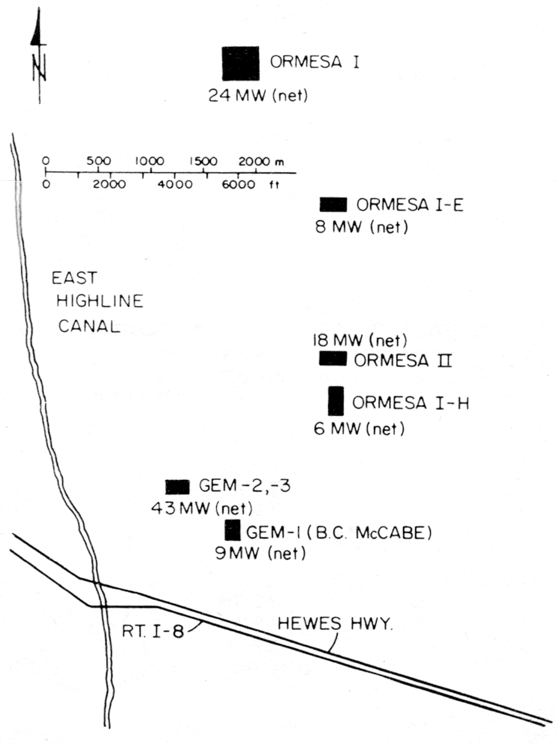

FIG. 4
EAST MESA GEOTHERMAL POWER PLANTS

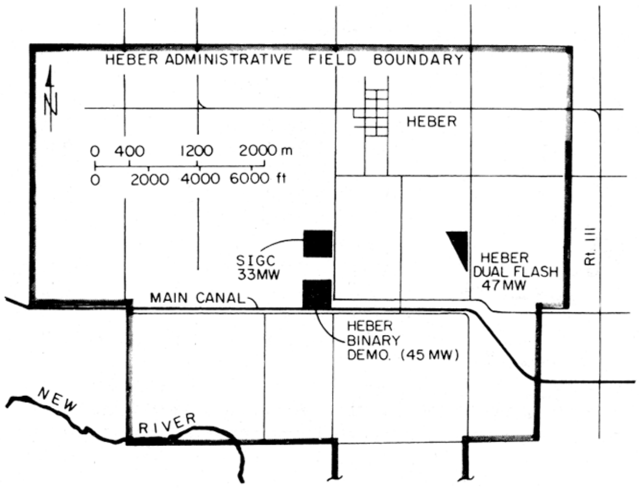

FIG. 5
HEBER GEOTHERMAL POWER PLANTS

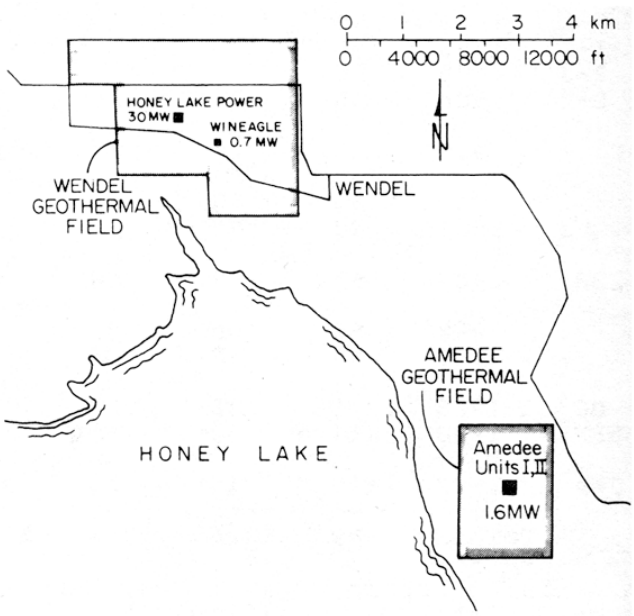

FIG. 6
HONEY LAKE VALLEY GEOTHERMAL POWER PLANTS

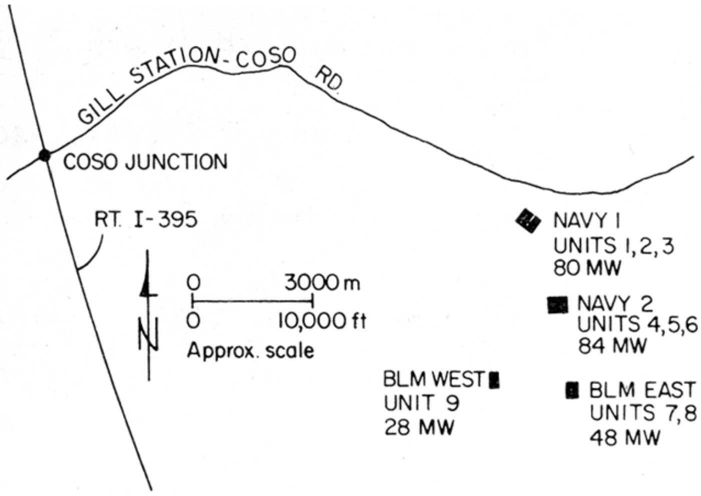

FIG. 7
COSO GEOTHERMAL POWER PLANTS

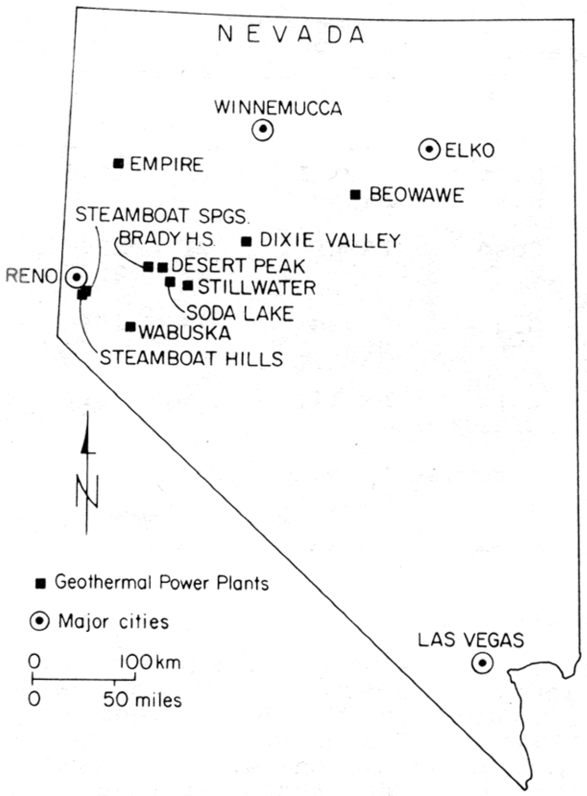

FIG. 8
GEOTHERMAL POWER PLANT AREAS IN NEVADA

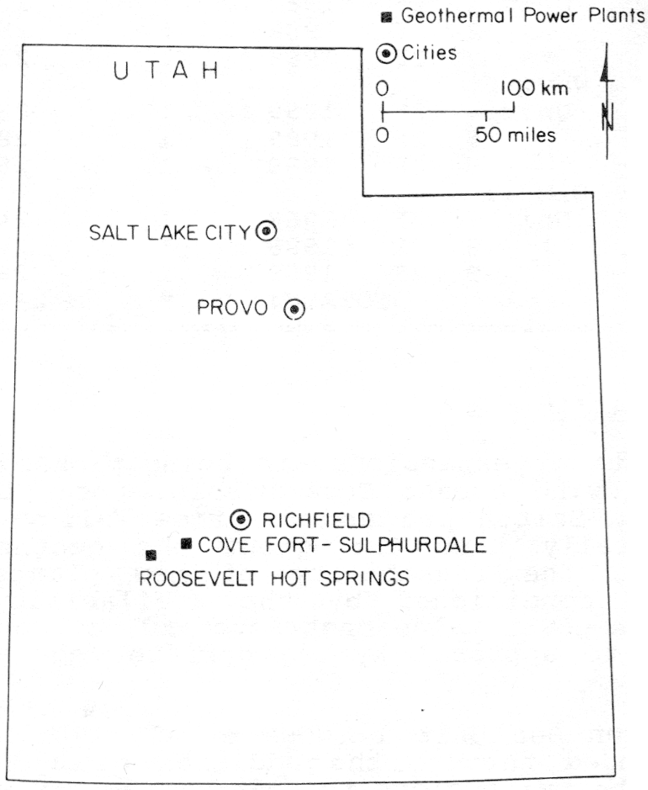

FIG. 9
GEOTHERMAL POWER PLANT AREAS IN UTAH

TABLE 1 - U.S. GEOTHERMAL POWER GROWTH: 1995-2005

Cumulative Installed Megawatts, MW

Year	CA	Hi	NV	OR	UT	Total	
1995	2,369	25	196	-	31	2,621	
1996	2,343	25	196	-	31	2,595	
1997	2,314	25	196	-	31	2,566	
1998	2,284	25	196	-	31	2,536	
1999	2,293	25	196	-	31	2,545	
2000	2,294	25	196	-	31	2,546	est
2005	2,295	25	196	-	31	2,547	est
	90%	1%	8%	0%	1%	100%	

TABLE 2 - PRESENT AND PLANNED PRODUCTION OF ELECTRICITY

	Geothermal		Fossil Fuels		Hydro		Nuclear		Other Renewables		Totals	
Year	MW	GWh	MW	GWh	MW	GWh	MW	GWh	MW	GWh	MW	GWh
1995	2369	14	533,385	2,298	72,201	311	103,981	673	13,210	3,357	726,940	3,357
1996	2343	15	545,003	2,348	80,661	347	104,186	674	13,413	3,446	746,325	3,446
1997	2314	15	564,469	2,434	79,947	359	99,716	628	13,097	3,495	759,543	3,496
1998	3384	15	565,060	2,546	79,661	329	97,070	673	12,966	3,621	757,041	3,622
1999	2293	16	543,240	2,340	75,519	325	152,989	659	13,256	3,029	789,574	3,401
2000	2294	16	550,205	2,370	74,763	322	199,420	859	13,653	3,320	842,638	3,630
2005	2392	17	617,762	2,661	74,016	319	192,688	830	14,063	3,291	903,383	6,891
		0.38%		70.31%		9.07%		18.60%		100%		100%

Sources: Energy Information Administration, USDOE Annual Energy Review 1998
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TABLE 3 - THE GEYSERS DRY STEAM POWER PLANTS

Owner	Unit	Year	Rating MW	Actual 1996	Output 1997	MW 1998
PG&E	1	1960	11	S	R	R
	2	1963	13	8	R	R
	3	1967	27	S	R	R
	4	1968	27	S	4	R
	5	1971	53	42	50	44
	6	1971	53	48	49	46
	7	1972	53	31	D	39
	8	1972	53	37	49	39
	9	1973	53	44	38	36
	10	1973	53	44	39	37
	11	1975	106	70	75	70
	12	1979	106	81	43	45
	13	1980	133	109	99	98
	14	1980	109	64	61	69
	15	1979	59	R	R	R
	16	1985	113	98	89	80
	17	1982	113	51	49	43
	18	1983	113	82	71	73
	20	1985	113	84	76	63
NCPA	1-1	1983	55			
	1-2	1983	55	75[1]	75[1]	75[1]
	2-3	1985	55			
	2-4	1986	55	75[1]	75[1]	75[1]
SMUD	No. 1	1983	72	78	78	62
SFG	1	1984	40	40	40	40
	2	1984	40	40	40	40
DWR	BR[2]	1985	55	R	R	R
CCPA	1 (R)	1988	65	55	55	56
	2 (R)	1988	65	S	W	S
SRGC	BC[3]	1988	2x11	22	22	22
	WFF[4]	1988	2x14.5	30	30	30
GEP/CGP	JWA[5]	1989	2x10	18	18	20
		TOTALS	**1,989**	**1,271**	**1,166**	**1,137**

[1] Both units; [2] Bottle Rock; [3] Bear Canyon; [4] West Ford Flat; [5] J.W. Aidlin.

S Standby; R Retired; D Down.

Source: Annual Report of the State Oil & Gas Supervisor 1991 & 1992, CADOC, DOGGER.

TABLE 4 - IMPERIAL VALLEY GEOTHERMAL POWER PLANTS

Owner	Plant	Type[1]	Year	No. of Units[2]	Rating MW
• EAST MESA					
GEO/Mission	GEM 1	B	1979	1	13.4
	2	2F	1989	1	18.5
	3	2F	1989	1	18.5
OESI	ORMESA I	B	1987	26	24
	II	B	1988	20	16.5
	IE	B	1989	10	8
	IH	B	1989	12	6.5
		Sub-Totals:		71	105.4
• HEBER					
SDG&E	Binary Demo.	B	1985	1	R
Calpine/ERC	Dual-Flash	B	1985	1	47
SIGC	Second Imperial Project	B	1993	12	33
			Sub-Totals	14	80
SALTON SEA					
Magma	S.S. 1	1F	1982	1	10
	2	2F	1990	3	18
	3	2F	1989	1	47.5
	Vulcan	2F	1985	2	34.5
	A.W. Hoch (Del Ranch)	2F	1989	1	35.8
	J.J. Elmore	2F	1989	1	35.8
	J.M. Leathers	2F	1989	1	35.8
	4	2F	1996		49.9
			Sub-Totals	10	267.3
		TOTALS		**95**	**452.7**

[1] B Binary, 1F Single-Flash, 2F Double-Flash.
[2] A "Unit" has one turbine-generator set.

TABLE 5 - HONEY LAKE VALLEY GEOTHERMAL POWER PLANTS

Owner	Plant	Type	Year	No. of Units	Rating MW
Wineagle Development	Wineagle	B	1985	2	0.7
TG/USEC	Amedee	B	1988	2	1.6
HL Power Company	Honey Lake	H[1]	1989	1	30[2]
		TOTALS		**5**	**32.3**

[1] H Hybrid: Wood waste/geothermal hot water.
[2] Geothermal contribution is about 6 MW.

TABLE 6 - COSO GEOTHERMAL POWER PLANTS

Owner	Plant	Type	Year	No. of Units	Rating MW
CECI	Navy 1				
	Unit 1	2F	1987	1	34
	2	2F	1988	1	28
	3	2F	1988	1	28
	Navy 2				
	Unit 4	2F	1989	1	30
	5	2F	1989		30
	6	2F	1989	1	30
	BLM 1				25
	Unit 7	2F	1988	1	
	8	2F	1988	1	25
	9	2F	1989	1	30
		TOTALS		**9**	**260**

TABLE 7 - GEOTHERMAL PLANTS PLANNED FOR CALIFORNIA

Owner	Site	Plant	Type	Year	Rating MW
CECI	Glass Mtn.	Telephone Flat	2F	2001	49
Calpine	Glass Mtn.	4 Mile Hill	2F	2002	49
				TOTAL	**98**

TABLE 8 - GEOTHERMAL POWER PLANTS IN NEVADA

Owner	Plant	Type	Year	No. of Units	Rating MW
CECI/CVG	Beowawe	2F	1985	1	16.0
BPP	Brady Hot Springs	2F	1992	3	21.1
CECI	Desert Peak	2F	1985	2[1]	8.7
Oxbow	Dixie Valley	2F	1988	1	66.0
Empire Geothermal	Empire	B	1987	4	3.6
OESI	Soda Lake 1	B	1987	3	3.6
	2	B	1991	6	13.0
Far West	Steamboat I	B	1986	7	6.0
	IA	B	1988	2	1.1
	2	B	1992	2	14.0
	3	B	1992	2	14.0
OESI/CON	SW[2]I	B	1989	14	13.0
Tad's	Wabuska I	B	1984	1	0.5
	II	B	1987	1	0.7
Caithness/ Sequa	SBH3	1F	1988	1	14.4
			TOTALS	**50**	**195.7**

[1] A Biphase Total-Flow expander nstalled along with a dual-pressure steam turbine.

[2] Stillwater.

[3] Steamboat Hills - Yankee/Caithness.

TABLE 9 - GEOTHERMAL POWER PLANTS IN UTAH

Owner	Plant	Type	Year	No. of Units	Rating MW
UPD	Blundell I	1F	1984	1	20
City of Provo	CF[1] No. 1	B	1985	4	2
	CF Steam	DS[2]	1988	1	2
	Bonnett	DS	1990	1	7
			TOTALS	**7**	**31**

[1] Cove Fort. [2] Dry steam.

TABLE 10 - GEOTHERMAL WELLS DRILLED FOR PRODUCTION AND INJECTION AT CALIFORNIA PLANT SITES: 1996-1999

Plant Site	1995	1996	1997	1998	1999
Amedee	0	0	0	0	0
Casa Diablo	0	0	0	0	0
Coso	0	1	3	3	na
East Mesa	0	0	0	0	0
The Geysers	2	1	1	1	0
Heber	0	0	0	0	0
Salton Sea	3	2	2	2	1
Wendel	0	0	0	0	0
TOTALS	**5**	**4**	**6**	**5**	**1**

TABLE 11 - GEOTHERMAL RESOURCES COUNCIL MEMBERSHIP

Year	U. S.	Non-U.S.	Total
1995	743	95	838
1996	714	106	820
1997	647	131	778
1998	576	153	729
1999	627	157	784

TABLE 12
OUTLOOK FOR U.S. GEOTHERMAL POWER DEVELOPMENT
(Installed megawatts, by state)

Year	AK	CA	HI	NM	NV	OR	UT	Total
1994	0	2565	25	0	196	0	31	2817
Incr.	15	242	55	1	205	60	0	578
2000	15	2807	80	1	401	60	31	3395