The meeting was called to order at 1:40 p.m. in Room 213.

Senator Wilson in the Chair.

Present: Chairman Wilson
Senator Blakemore
Senator Don Ashworth
Senator Close
Senator Hernstadt
Senator McCorkle
Senator Young

See attached guest list.

Senator Wilson announced that the purpose of this meeting is an overview hearing on energy policy to inform this Committee and the Legislature in hopes of establishing a Nevada State Energy Policy.

Noel A. Clark, Director of the Nevada Department of Energy, presented a prepared document of his testimony and research that the Department has done on the subject of this hearing (see Exhibit "A"). Senator Wilson asked Mr. Clark to define "vanpooling", (see page 11). Mr. Clark explained that vanpooling is when the company furnishes the vehicle, pays all of the expense, then assesses each rider an equal amount which is presumed to be equal to the operating expense.

When discussing safety, operation and bonding regulations regarding the nuclear operations within the State, Mr. Clark stated that Nevada could be on the horizon of a number of mining and milling operations of uranium.

Senator Wilson asked Mr. Clark if he had suggestions as to what the criteria should be that the Public Service Commission would consider. He asked if there is an area that requires some discussion on whether Nevada should consider requiring some kind of recapture or other provisions for the retention of capacity in a new facility to supply its own needs as its own demands for energy increase over the years - for example, as petroleum becomes more expensive and its shortages become more pronounced. He stated that there will be more and more siting projects, most of which will be designed for export, and if California doesn't site any more projects, Nevada will be a target for that kind of analysis.

Mr. Clark answered that the socio-economic implications which could involve the increased requirement for housing, sewers and all the costs that go with a new power plant, would have to be considered. He posed the question: Are our resources best used for agricultural production and other such uses within the State rather than if they were used for power generation for export of that energy, primarily to California? He stated that the residue from power plants may have a substantial impact on agriculture.

Senator Wilson stated that there is present legislation vesting the Public Service Commission with jurisdiction of issuing siting permits and judging whether power plants should be sited and one of the criteria

is whether the plant is going to yield and provide a supply of energy for consumption in Nevada.

Mr. Clark stated that since 1973, there has been a decline in electric usage in Clark County per capita. He stated that water could be exported by wire, but that the State would have to decide whether it wanted to export and if so, whether it would be an allotment by law and what arrangements could be made for retrieval for use in Nevada.

Senator Young asked Mr. Clark for suggestions that could pare down the large amount of legislative proposals in this testimony, possibly giving priorities.

Mr. Clark replied that all of the different departments could get together and arrive at some priority policies. In response to Senator Hernstadt's question about development of geothermal energy, Mr. Clark stated that the federal government has cut back on demonstration funds but that the D.O.E. has on overview of the geothermal capacity in Nevada. He said that in order to develop an energy policy, Nevada is going to need more federal funds for demonstration which would stimulate private industry.

Senator Hernstadt asked Mr. Clark about the desirability of having power lines run all over the State for exportation of energy. Mr. Clark answered that he was very enthusiastic about the White Pine Project for the purpose of building a north-south transmission line to tie together the national thread which surrounds Nevada but basically does not tie it together, which would give the State much more flexibility than some of the plants that have been proposed for building.

Senator Blakemore stated that he would much rather have the power plants in Nevada so that the State could get its benefit rather than having the plants in some other state with the power line crossing Nevada and as a result receiving only a small amount of revenue from the in-transit tax.

Senator Wilson asked Mr. Clark if he thought federal regulation of geothermal development on federal land promotes the development of that resource.

Mr. Clark replied that in his opinion, federal control is not beneficial to Nevada and that any leasing of geothermal resources be based on the requirement that certain developments go forward immediately.

There was discussion as to whether geothermal energy is mineral or water. Senator Wilson stated that mineral is owned as a property and water is considered public domain, the use of which is permitted. He asked which theoretical alternative would most promote the development of that resource.

Mr. Clark replied that he would lean to the water side but that if that were the course taken, there would be a suit involving the federal government and Nevada for definition.

Senator Hernstadt suggested that if legislative controls were lifted, private industry would move in and do the developing.

Mr. Clark answered that federal funds would act as a stimulus for incentive for private industry to become involved in development of the resources.

Kelly Jackson, Deputy Director of the Nevada Department of Energy, stated that the Department has funded a study which the Public Works Board is presently implementing that would result in a life cycle costing system that could be applied to all new buildings, and part of that life cycle cost analysis would be to determine whether or not solar, geothermal or other renewable resources are most economical over the life of the building.

He stated that Nevada is fossil fuel poor and renewable resources rich. Mr. Jackson clarified that there have been three basic approaches in geothermal resource definition that are as follows: The first would be the water resource route; the second would be some kind of pro rata distribution of the resource at the start of the development; and the third would be to define geothermal resource as something independent of but related to water.

Duane D. Sudweeks, Administrator of the Division of Colorado River Resources, Nevada, presented an outline of activities of the Division (see Exhibit "B"). Mr. Sudweeks stated that the Division is empowered, by statute, to receive, protect, safeguard and hold in trust hot water and water rights and other rights, interests or benefits in the water of the Colorado River, and to the power generated thereon as it may accrue to the State of Nevada. He added that, additionally, the Division has authority to contract for power generated thereon as a connect route in the State. Additionally, the Division has the authority to contract for power generated elsewhere within the Colorado stream system or from any private or federal power development upon other rivers in the Western United States for use in Nevada.

Dr. Lloyd P. Smith, President of the Desert Research Institute, introduced Dr. Jerry Bradley, Energy Systems Center, DRI, and Dr. David L. Kock, Executive Director, Bioresources Center, DRI.

Dr. Kock stated that a solar energy facility has been built in Boulder City that is preferably named an energy systems center because geothermal, wind and solar are all included. Dr. Kock recommended that a policy be established to use sewage as a state resource. He stressed that energy development efforts should be encouraged by the state, not necessarily funded since federal aid could be obtained. Dr. Kock stated that a study had been underway to discover how to use energy to the benefit of the state but that the Executive Department had stopped it.

Dr. Bradley stated that Nevada has unlimited resources that could be developed, and that both Nevada and the federal government have the power to accelerate this development for space heating, heating water or power production through incentive legislation. He stated that in other states reduction of personal income taxes has been offered people who use solar equipment.

Senator Young asked Dr. Bradley to propose some kind of reasonable time schedule for goals that could be achieved over the shortest period of time. Dr. Bradley agreed to submit such a schedule.

Discussion revealed that other parts of the world have been using solar energy for years but that it is relatively new to the United States.

Donald L. Paff, General Manager, Las Vegas Valley Water District and former Administrator of the Division of Colorado River Resources, presented a prepared statement to contribute toward the Committee's deliberations on the subject of energy policy (see Exhibit "C").

Mr. Paff stated that conservation within the State alone will not solve its energy problems in the future and that there will have to be additional acquisition of electrical energy. He stated that the Division of Colorado River Resources has special privileges with the federal government to acquire energy in the name of Nevada that should be assisted and exploited whenever possible.

Senator Hernstadt expressed concern over pollution from power plants. Mr. Paff stated that having the plants in Nevada would be more economical than importing the energy.

George Vargas, legislative representative for the major oil companies in Nevada, presented a letter that he had sent to the Assembly Taxation Committee requesting that oil and natural gas be included in exemption from taxes in Assembly Bill 144, and a proposed amendment to the bill (see Exhibits "D" and "E").

Bob Warren, Executive Secretary, Nevada Mining Association, offered a priority that the Legislature attempt to identify all of the sites that may be available and usable for heavy industry in Nevada. Mr. Warren explained that this is a major priority because in the future the federal government will give prior consideration to those states, cities and counties that have identified in their master plans the proper sites and have identified the water, air and other resources that are necessary for them.

Robert McKee, Professor of Mechanical Engineering, University of Nevada, Reno, stated that the great amount of construction going on in Nevada does not use solar energy and that much more could be done to conserve the energy that these buildings will be using. He stated that Nevada's climate is unique in that there is an extremely high range of temperature from day to night that could be used toward energy conservation.

John W. Arlidge, Manager of Special Projects, Nevada Power Company, presented a prepared statement (see Exhibit "F"). In reply to Senator Wilson's question about load management, Mr. Arlidge explained that there are load management programs throughout the nation that are satisfactory and unsatisfactory; the question is how much should be invested to load manage the existing load to break even in building new plants.

Senator Close asked Mr. Arlidge for an estimate of cost for the production of energy between oil, natural gas, solar energy and geothermal

energy. Mr. Arlidge answered that oil goes at approximately 46 mils per kilowatt hour, natural gas at 25 mils per kilowatt hour, coal at 15 mils per kilowatt hour and geothermal somewhat greater than coal but less than oil. He explained that the cost of constructing a power plant today would be about $1,000 per kilowatt hour based on a 2,000 magawatt plant and that as the size of the plant goes down, the cost goes up.

Joe L. Gremban, President, Sierra Pacific Power Company, testified that seven or eight years ago, the company tried to form a group of utilities to construct a nuclear plant in northern Nevada, but couldn't find a satisfactory site, and that at present, Sierra Pacific is not interested in becoming involved with a nuclear plant. He said that the company has been involved in geothermal energy development for a long time and that in 1973 an effort was made to construct a five megawatt plant near Brady Hot Springs, but the cost of steam would have been ten percent below fossil fuel and at that time the cost of fossil fuel quadrupled and the cost of steam would have quadrupled also.

Dick Richards, representing Sierra Pacific Power Company, stated that the company currently has three geothermal activities in progress. Mr. Richards said that the first is a five megawatt plant at Steamboat Hot Springs and that the company has agreed to purchase the electrical energy from a geothermal generating facility that would be a demonstration of a new technology in conversion. He said a second project is a 20 megawatt plant near Reno in which they are purchasing the electrical energy also. Thirdly, he continued, is that a number of utilities have gathered together to explore the feasibility of a selection of a resource and to do a conceptual plant design, and to offer a feasibility report as to whether or not to build an additional 20 megawatt plant.

Mr. Gremban added that the cost of building power plants is great and that there is no guarantee that the resources will last.

Senator Hernstadt asked Mr. Gremban what arrangements have been made to deduct the costs of research. Mr. Gremban stated that there are none now, but it would be a good incentive if a plant failed if the remaining costs could be charged off over a period of time.

Mr. Gremban explained that a private company can purchase power from a facility that is investor owned up to 25 percent of the total output, according to the Internal Revenue Service. There was discussion as to whether the 25 percent amount of purchase was correct. Mr. Gremban agreed to provide that information.

Harvey W. Young, Jr., representing White Pine County, stated that the bond counsel said that any sale to investor-owned utilities over 25 percent puts the project in the position of losing its tax exempt status with the exception of sales to individual purchasers of less than three precent.

Mr. Gremban stated that efforts at solar energy development have not been economically feasible.

With regard to exporting power, Mr. Gremban stated that the company has a transmission line that runs from Utah to Reno and is also interconnected to California over the Sierras and is currently constructing a transmission line that will run from Idaho to Reno. He said that the company is presently generating close to 70 percent of its own requirements. He added that the company imports power from Pacific Gas and Electric Company in California and Utah Power and Light, and will be purchasing more from Idaho and the Northwest.

Senator Blakemore asked Mr. Gremban the cost of producing power. Mr. Gremban replied that oil and gas are about 20 mils per kilowatt hour and coal is about 15 or 20 mils per kilowatt hour.

Mr. Richards recommended that any streamlining of permitting a utilization of the resource for power generation and subsequent siting will preserve some of the tight economics for the benefit of the consumer.

Janet MacDonald, representing the Public Service Commission, stated that the Commission has to issue permits for the building of facilities and in considering these permits the Commission must determine the need for the facility.

Senator Wilson stated that the PSC has jurisdiction over siting, approving a joint venture and the issuance of a site permit where electrical energy is to be exported from Nevada. He asked if the various departments have a working relationship with each other.

Heber P. Hardy, Chairman of the PSC, stated that there is no formal policy where the different departments get together but that they do meet. He said that the Environmental Protection Act has provided that anyone with an interest can appear and make a presentation.

Senator Hernstadt suggested that the various departments meet and study the possibility of vanpooling.

Mr. Clark added that Nevada cannot stand alone against the other states. He said that the states are going to have to cooperate with each other in the area of importation and exportation of energy. He added, for the record, that the testimony that he had presented was prepared by his staff.

There being no further business, the meeting was adjourned at 4:50 p.m.

RESPECTFULLY SUBMITTED,

Betty L Kalicki

Betty L. Kalicki, Secretary

APPROVED:

Thomas R. C. Wilson II, Chairman

SENATE Commerce and Labor COMMITTEE

GUEST LIST

ENERGY HEARING Room 131 DATE: February 7, 1979

NAME	AGENCY OR ORGANIZATION
Keith Tierney	Governor's Office of Planning Coordination
Steve Bradley	Paine McBride Jackson & Curtis
Tom Flynn	Nevada Bureau of Mines and Geology
Brian Koenig	Nevada Bureau of Mines and Geology
Mike Bourn	White Pine County Development Corp.
Norman Nichols	Los Angeles Dept Water & Power
Hal Smith	Burrows, Smith & Co. of Nevada
R. M. Bruce	White Pine County
Doug Hawkins	White Pine County Commissioner
Clark J. Guild Jr	Southwest Gas Corp.
Heber P. Hardy	P.S.C.
Donald L. Paff	Las Vegas Valley Water District
Kelly Jackson	Nv D.O.E.
Tom Young	New Environmental Action Trust
Jonathan Abbell	P.S.C.
Janet MacDonald	Public Service Commission
Gordon Harding	Central Data Processing
Ed Greer	Clark Co. School Dist.
John W. Arlidge	Nevada Power Company
Bob Forest	Phillips Petroleum Co.
Roland D Westergard	Conservation & Natural Resources
Jack Cardinalli	Nevada Division of Water Resources
Harvey W Young Jr	White Pine County
Chuck McMorris	KOLO TV & radio
Josh Rice	AP

SENATE Commerce and Labor COMMITTEE

GUEST LIST

ENERGY HEARING Room 131 DATE: February 7, 1979

NAME	AGENCY OR ORGANIZATION
R. G. Hardman	New Dept of Energy
Duane D. Sudweeks	Division of Colorado River Resources - Nev.
E.B. "Bud" Stolle	" " "
David L. Medive	Nv. Dept. of Energy
David W. Hagen	City of Los Angeles
W. H. Winn	Nevada Mining Ass
Bob Warren	Nev Mining Assn
[illegible]	[illegible]
Jerry Bradley	Energy Systems Center Desert Research Institute
Lloyd P. Smith	Desert Research Institute.
C. N. Stoddard	Self.
[illegible]	[illegible]

EXHIBIT A

Presentation

by

The

NEVADA DEPARTMENT OF ENERGY

before

the

Senate Commerce and Labor Committee

Noel A. Clark

Director

February 7, 1979

Summary

The Nevada Department of Energy (Department) has compiled this report in response to the request of the Senate Commerce and Labor Committee. The report is intended to provide a brief summary of the Nevada energy situation, potential energy policy issues and The Department's past activities.

Section I Nevada: An Energy Perspective

Section II: Nevada: An Overview of Energy Policy Issues

Section III: Nevada: An Overview of Department of Energy Activities

I. NEVADA: AN ENERGY PERSPECTIVE

Since the turn of the century, Nevada has been a net energy importer. Virtually all of the coal, oil, and natural gas consumed in the state is derived from sources outside of the state. Our economy is highly dependent upon these imports, and is therefore highly vulnerable to actions taken outside Nevada's sphere of influence. Because of our sensitivity to external factors which impact energy prices and availability, it is essential for us to understand the energy situation in Nevada. Without that understanding, meaningful decisions regarding future energy supply and demand are likely to be misdirected. Therefore, a brief summary of past, present, and future energy trends will be presented.

Much of the information contained herein is based upon data compiled during a study of Nevada's energy markets, undertaken in 1976. The results of that study were published in a document entitled Energy in Nevada. The Department is presently updating and expanding that report. The revised edition is expected to be completed by May of this year.

A. Coal

Coal consumption in Nevada has been increasing rapidly in recent years, largely because of the uncertainty regarding the price and availability of oil and natural gas. Coal is used to generate electricity, provide industrial process heat, and to a limited extent, for residential/commercial space heating. The generation of electricity accounts for over 97% of the coal consumed in Nevada. Furthermore, all presently planned baseload generating facilities in Nevada are expected to be coal-fired. Sierra Pacific is building the first of two 250 megawatt coal-fired units near Valmy in northern Nevada. Nevada Power Company is planning four 500 megawatt coal-fired units, comprising the Harry Allen Project, for construction near Arrow Canyon in southern Nevada. More recently, officials in White Pine County have announced interest in the possibility of locating a large coal-fired powerplant near Ely. Taken together, these projects represent an increase in coal consumption of nearly five-fold over present consumption rates.

Coal for industrial process heat was historically limited to copper smelting at Kennecott's McGill Plant. In recent years however, coal has become more attractive to other industrial users, such as Nevada Cement Company near Fernley, which switched from gas-fired to coal-fired kiln drying in 1976. The following year, U. S. Lime Corporation at Apex converted from gas to coal. As gas and oil prices continue to rise, other industrial users may look to coal for process heat.

Nevada's coal supplies are obtained from neighboring states, primarily Utah and Arizona, via truck, rail, and slurry pipeline. None of the coal is produced in Nevada, although there are limited deposits of coal within the state.

B. Petroleum

Petroleum products are also imported. Except for a small amount of product from Nevada sources, most of the petroleum consumed in Nevada is obtained from California and Utah refining centers. The Reno/Sparks area is served by northern California refineries, and the Las Vegas area is served by southern California refineries. These areas receive product via pipeline, truck, and rail. Areas in eastern Nevada receive product from refineries in Salt Lake City via truck and rail.

Crude oil has been produced in Nevada since 1954. Two oil fields are now producing in Railroad Valley, northeastern Nye County. The newer of these has boosted Nevada's crude oil production significantly in the last two years. A portion of the Nevada crude oil is trucked to a small refinery near Tonopah which produces diesel fuel and residual oil. The residual is trucked to the Fort Churchill Powerplant near Wabuska for use as boiler fuel. The remaining Nevada crude is refined near Salt Lake City. Yet, even with the recent increases in production, Nevada must import approximately 97% of its petroleum products.

The transportation sector is the primary consumer of petroleum products in Nevada. Approximately 80% of the petroleum imported is in the form of gasoline, diesel oil, and jet fuel. Furthermore, the transportation sector is the largest single demand sector in the state, accounting for nearly 40% of the total energy consumed. The greatest part of the transportation demand is for gasoline. Approximately 65% of the energy consumed in the transportation sector is sold in the form of gasoline. Thus, the automobile is a prime target for potential energy savings.

Powerplant use of petroleum products, primarily residual oil, has been increasing rapidly in the past few years. This is due to the declining availability of natural gas for boiler fuel, in concert with high gas prices. Although this trend will quite likely reverse itself as new coal-fired generating capacity comes on-line, powerplant use of residual oil will remain high, perhaps reaching 18% of the total petroleum market in the early 1980's.

The use of petroleum products for residential and commercial space heating, water heating, and cooking amounts to about 5% of the total petroleum demand. Most of this is in the form of heating oil and liquified petroleum gases.

C. Natural Gas

Natural Gas is presently distributed in Nevada by three utilities: (1) Southwest Gas Corporation, (2) Sierra Pacific Power Company, and (3) C.P. National Utilities Company. However, all natural gas used in Nevada is purchased by Southwest Gas from sources outside Nevada. Hence, 100% of Nevada's gas sales are dependent upon Southwest's ability to secure adequate supplies and maintain adequate transmission, distribution, and storage facilities.

Gas entering northern Nevada is supplied by Northwest Pipeline, a corporation whose sources include a significant amount (2/3) of gas imported from Canada. Southern Nevada is supplied by the El Paso Natural Gas Company, whose sources are located throughout the southern United States. Because gas imported from Canada is more costly than that obtained from domestic sources, the price of gas in northern Nevada is about one-and-a-half times that in southern Nevada.

Although most of the large population centers are now served with natural gas, much of eastern Nevada is still without gas service. The areas not presently served cannot reasonably expect to receive service in the near future, given the uncertainty prevailing in natural gas supplies and distance from existing pipelines.

Industrial uses, including powerplants, presently comprise the greatest demand for natural gas in Nevada. Prior to 1974, powerplants consumed over 50% of the natural gas used in the state. Not only was gas an economic boiler fuel during that period, it was also the most acceptable fuel from an environmental standpoint. Since that time, natural gas for powerplants has been curtailed during the winter months when residential and commercial demands are highest. Yet, powerplant demands still exceed 40% of the total natural gas market in Nevada.

Residential and commercial use of natural gas increased very rapidly in the sixties and early seventies but has slowed somewhat in recent years. Probably the greatest reason for the declining growth rate is high prices. Gas prices have escalated at the average annual rate of 32% in northern Nevada and 23% in southern Nevada. These price increases have signaled residential customers to conserve such that the average residential gas consumption has dropped from over 100 MCF/year to about 90 MCF/yr.

The future of natural gas for powerplants is not bright. The Powerplant and Industrial Fuel Use Act of 1978 includes a general prohibition against the use of natural gas for any new generating facility. It further restricts the use of natural gas in existing facilities through 1990, at which time further gas consumption will be prohibited. Unless exemptions are obtained from the U. S. Department of Energy, many powerplants and other industrial users will be faced with the expense of converting to alternative fuels. In contrast to the problems facing industrial natural gas users, residential users have a somewhat more optimistic future. A recent announcement by Energy Secretary James Schlesinger to all state utility commissions favored the elimination of all policies and/or rates which restrict the use of natural gas by residential customers.

D. Electrical Energy

Electrical Energy is supplied by a number of public and privately owned utilities in the state. The majority of these utilities are relatively small operations in comparison to the two major companies: The majors, Nevada Power Company in the south and Sierra Pacific Power Company in the north, serve approximately 95% of the state's total population.

Electrical energy demands are met through a combination of out-of-state purchased power and in-state generation. Purchases supply approximately 37% of the total demand and are obtained from all neighboring states. In-state generation accounts for the remainder of Nevada's electrical demand. Present steam-electric generating capacity in the state totals about 2700 megawatts. Of this amount, approximately 1407 MW is owned by Southern California Edison Company. All of the capacity additions up to 1965 were natural gas or oil-fired. In 1965, Nevada Power Company began operating the first coal-fired generating unit in the state at Reid Gardner Station near Moapa.

Since 1965, all of Nevada Power Company's steam-electric capacity additions have been coal-fired. Sierra Pacific Power Company, on the other hand, continued to add gas and oil-fired capacity completing the third unit at Tracy in 1974. As previously indicated, all planned future baseload additions are expected to be coal-fired.

Present and planned capacity additions are more than adequate to supply Nevada's projected electrical demand well into the future. In fact, if the planned additions are built as scheduled, Nevada will be exporting more electrical energy than is sold to Nevada customers through the year 2000.

As in the case of natural gas, electrical energy sales to residential and commercial customers have roughly paralleled each other historically and are expected to follow the same trend in the future. Of particular interest in the residential sector is the difference between average consumption in the south and that in the north. Average residential use in the south has historically been over twice that in the north. Since 1973 however, average residential use in the south has dropped faster than in the north. The trend toward decreasing average use is expected to continue as prices increase and more consumers adopt energy conservative attitudes.

E. Supply Alternatives

Present forecasts of future energy demand assume that the state's population and economy will continue to expand as in the past. Although the mix of fuels used to supply future demands is expected to change, the baseline forecast indicates that conventional fossil fuels will continue to be imported in over increasing volume. The end result of such a scenario is ever increasing dependence on the energy resources of others.

Alternatives to the baseline scenario include conservation and utilization of energy resources native to Nevada. Conservation efforts have already provided a measurable reduction in per capita energy usage. Conservation efforts, whether voluntary or mandatory, are expected to continue to provide some relief in the future.

Increased utilization of native resources, such as Nevada crude oil, geothermal energy, and solar energy, all have tremendous potential as far as improving the states energy balance sheet. Yet each of these options are presently underdeveloped.

The benefits of developing indigenous resources are manifold. Not only will such development lesson our dependence on others by decreasing the need for imports, it will further strengthen the economy of the state by providing new industry and new jobs which would not have otherwise located in Nevada.

Oil exploration in the state is primarily concentrated in eastern Nevada. Since the Trap Springs Oilfield find in 1976, crude oil production in Nevada has increased five-fold. In 1975, Nevada produced about 1 barrel of oil per 150 barrels consumed. By 1977, that ratio had improved to 1 barrel produced per 30 consumed.

Geothermal exploration has been accelerating in recent years, and several good prospects have been located. No longer is industry idly watching these resources. Industry is now taking geothermal energy more seriously, as evidenced by the construction of a large, geothermally heated, food dehydration plant near Brady's Hot Springs. Other uses of these resources include agribusiness, district space heating, and the generation of electrical power. Each of these uses is presently receiving serious consideration at sites located throughout the state.

Nevada's potential for solar energy development is also great. Solar energy availability compares favorably to other southwestern states where solar energy has already begun to make an impact. As conventional energy forms increase in price, more and more Nevadan's will at least begin to use solar energy to supplement low-to-medium temperature energy demands.

TOTAL ENERGY DEMAND BY SECTOR
(Billion British Thermal Units/Compound Growth Rates)

Year	Commercial		Industrial		Transportation			Total	
65	21,551		19,737		22,666	44,173		108,127	
		8.3%		9.7%	9.4%		7.2%		8.4%
70	32,107		31,343		35,572	62,558		161,580	
		7.0		7.2	-0.4		4.9		4.7
75	44,975		44,284		34,873	79,315		203,397	
		6.3		6.7	5.8		6.4		6.4
80	60,969		61,286		46,195	108,403		276,853	
		3.5		4.1	0.8		3.6		3.2
85	72,426		75,059		48,050	129,158		324,693	
		3.1		4.0	4.1		3.3		3.1
90	84,485		91,159		50,863	151,950		378,457	

TOTAL ENERGY DEMAND BY SECTOR
(Percentages)

65	19.9%	18.3%	21.0%	40.8%	100.0%
70	19.9	19.4	22.0	38.7	100.0
75	22.1	21.8	17.1	39.0	100.0
80	22.0	22.1	16.7	39.2	100.0
85	22.3	23.1	14.8	39.8	100.0
90	22.3	24.1	13.5	40.1	100.0

CONTRIBUTION TO TOTAL SUPPLY BY FUEL TYPE **EXHIBIT A**

	Coal		Petroleum		Natural Gas		Total
Year	Elec.	Non-Elec.	Elec.	Non-Elec.	Elec.	Non-Elec	
65	7.0%	2.5%	0.3%	58.4%	15.4%	16.4%	100.0%
75	41.7	0.5	3.0	32.6	9.9	12.3	100.0
85	56.2	0.8	4.1	27.9	1.1	9.9	100.0
95	61.9	0.6	2.5	25.9	0.6	8.5	100.0

II. NEVADA: AN OVERVIEW OF ENERGY POLICY ISSUES

A. Introduction

The Department has not drafted a comprehensive state energy plan, and it is anticipated that it will be another six to twelve months before such a plan sees the light of day. The delay in preparing such a document stems from the facts that energy issues are intertwined with a variety of political, philosophical, economic, environmental, social, and water issues, and care must be taken to insure that proposed cures are going to cure not contaminate.

However, the Department has operated on the assumption that certain energy policies flow naturally from the energy picture that was painted in Section I and from the Department's legislative mandate.

1. Nevada must get the maximum benefit out of the energy supplies it is able to obtain;

2. Nevada must take aggressive steps to promote development of available renewable energy resources; and

3. Nevada must initiate programs to accomodate production, utilization, and conversion of available fossil fuels in a timely and environmentally acceptable manner.

B. Preliminary Policy Issues and Legislative Recommendations

1. Conservation: as an energy importer, one of the most important steps that Nevada can take is to encourage conservation. Energy waste in the public and private sectors must be minimized. Conservation will enable Nevada to get the most out of available supplies and will in turn help reduce the impact of increasing energy costs. This is particularly important for low and fixed income citizens. For instance, reducing overall energy consumption by 10% would provide for nearly two additional years of growth and would reduce statewide energy expenditures by $40,000,000 - $50,000,000.

It should be added, however, that all conservation programs should be carefully scrutinized to insure that they do not produce a "boomerang effect".

a. Conservation Policy Issues.

i Promote programs directed at reducing energy consumption in the transportation sector.

Legislative Options

- Adopt legislation that will deregulate vanpooling operations;
- Adopt legislation that authorizes regional transportation agencies to implement mass transit programs;
- Adopt legislation which provides financial or technical assistance for local traffic management projects; and
- Adopt legislation which will provide financial incentives for common carriers to utilize conservation devices.

ii. Promote efficient energy utilization in the public sector.

Legislative Options

- Adopt legislation which requires energy based life cycle costing of new and renovated state and local facilities, including analysis of the use of renewable resources;
- Adopt legislation which requires local governmental entities to review and consider energy issues in relationship to land use, subdivision approval and other planning issues;
- Adopt legislation which requires state and local governmental entities to consider energy efficiency in the purchasing process; and
- Adopt legislation which establishes a fund to provide money to modify existing state facilities to improve energy efficiency. An appropriation of $250,000 could be established

for such purposes. Projects would be recommended by the Department and the Public Works Board based upon federally funded energy audits of state facilities. Expenditures would be approved by the Board of Examiners.

iii Promote efficient energy utilization in the private sector.

Legislative Options

- Adopt legislation which authorizes application of of the energy standards for new building construction to renovated structures;
- Adopt legislation which prohibits the sale of most appliances with standing pilot lights;
- Adopt legislation which exempts energy conservation devices and materials from sales taxation;
- Adopt legislation which authorizes the Department to participate in federally authorized programs and to promulgate rules and regulations necessary therefore; and
- Adopt legislation which requires sellers of motor oils to provide facilities to which waste oil can be returned.

2. Renewable Resource Development - Nevada is vested with substantial geothermal and solar resources. For example, estimates have been made that the potential electrical generation capacity of Nevada's geothermal resources ranges from 1,000 to 10,000 megawatts. Even at the lower estimate, geothermal could make a significant contribution to our needs and to the economic development of the state since the present level of in-state generation capacity dedicated for our use is only about 1,500

megawatts. Geothermal energy can also be used for a variety of direct thermal applications including space heating, industrial processes, and agricultural applications. This is not to say that geothermal is the panacea, but there is no doubt that appropriately stimulated it can make a significant contribution. Nevada's solar potential is relatively well known and need not be repeated here.

a. Renewable Resource Policy Option

i Promote use of geothermal energy for electric and non-electric applications.

Legislative Options

- Adopt legislation which authorizes General Improvement Districts to provide district space heating services;
- Adopt legislation which exempts non-producing geothermal leasehold interests from property taxation;
- Adopt legislation which requires that utility companies analyze geothermal electrical generation potential when filing applications to construct electrical generation facilities;
- Adopt legislation which authorizes utility companies to include the "construction work in the progress" for geothermal electrical generation facilities on an incremental basis during the construction of the facility;
- Adopt legislation which defines geothermal resources and requires that the State Water Engineer and the State Environmental Commission initiate rulemaking procedures to clearly clarify issues surrounding the development and use of geothermal resources;
- Adopt legislation which memorializes Congress to implement a geothermal omnibus bill and to appropriate funding

for geothermal demonstration and required assessment projects; and

- Adopt regulation which establishes a geothermal resource development and demonstration fund for direct thermal applications.

ii Promote use of solar energy in all of its forms - solar radiation, wind, biomass, etc.

- Adopt legislation which provides for solar easements;
- Adopt legislation which requires the Department to establish guidelines for marketing solar components and systems;
- Adopt legislation which expands the renewable resource property tax allowances to commercial and industrial complexes and to hot water heating systems;
- Adopt legislation requiring incorporation of solar passive designs and the use, where economically feasible, of active solar space conditioning and water heating systems on new state and local projects; and
- Adopt legislation which establishes a solar research, development, and demonstration fund for solar projects;

3. Development, utilization, and conversion of other energy resources: Nevada must continue to promote development of available and necessary energy resources and energy facilities within the state.

a. Petroleum products: one of the most critical energy issues that faces the State of Nevada is the development and implementation of policies and programs to insure adequate supplies of liquid fuels. The Department has projected that the demand for petroleum products will increase approximately 110% between 1978 and the year 2000. Given the already overtaxed transportation and storage facilities

that service this state, paramount importance should be placed on analyzing and resolving current and potential problems. This issue is particularly critical because of the fact that petroleum suppliers and pipeline companies do not have the same legal responsibilities and financial commitments to Nevada, and their activities are not subject to the same level of scrutiny as are the actions of electric and natural gas utility companies. Furthermore, Nevada's independent petroleum suppliers do not generally have the ability to significantly influence decisions made by their suppliers. For these reasons, immediate steps should be taken to:

i Promote exploration for, and development of, petroleum resources in Nevada;

ii Promote development of oil refinery facilities in Nevada as those facilities become warrented by production;

iii Promote development of sufficient transportation facilities to insure adequate supplies of petroleum products from adjacent refinery centers;

iv Promote development of sufficient petroleum storage facilities to provide safeguards against temporary interruptions in supply;

v Promote development of sufficient alternative liquid fuels through biomass conversion processes;

vi Place high emphasis on programs that will encourage conservation in the transportation sector.

b. Natural Gas

i Promote development of natural gas facilities to handle present and projected demands;

ii Promote the utilization of natural gas for high cost/benefit uses like residential and commercial applications; and

iii Place high emphasis on programs to conserve natural gas.

c. Exportation and Energy Facilities Siting.

There is an increasing awareness that Nevada has potential to to serve as a regional electrical generation center, utilizing either fossil fuel, geothermal resources, or possibly nuclear fuels. Energy exportation entails the exportation of water and other natural resources via wire. Programs must be instituted to assess the potential for export and to analyze the social-economic consequences of that activity in relationship to competing uses of those resources. In addition, steps should be taken to insure that decisions regarding the construction of facilities for export include consideration of appropriate socio-economic and political factors in addition to those factors already enunciated in the Utility Environmental Protection Act (UEPA).

Legislative Options

- Amend UEPA by expanding criteria that the Public Service Commission must consider in reaching decisions on facilities that are proposed primarily or exclusively for export, ie.: socio-economic implications, evaluation of the use of required resources for competing uses; local support for the project; relationship to established state goals, etc.
- Repeal UEPA and adopt legislation which establishes an energy facilities siting council to issue construction permits for significant energy facilities (electric, natural gas, oil, nuclear, etc.);
- Adopt legislation appointing an interim committee to review export and siting issues and to report its findings to the 61st Session of the Nevada Legislature.

d. Nuclear Energy: Nevada is faced with various issues regarding nuclear energy, including: electrical generation, waste isolation, and nuclear material mining, milling, and processing.

i Legislative guidance should be provided regarding Nevada's willingness to allow or encourage nuclear generation, waste isolation, or processing; and

ii The Department of Human Resources should be directed to enact safety, operation, and bonding regulations regarding the nuclear operations within the state.

C. Conclusion:

Nevada is and will be faced with a variety of energy issues which must be resolved. How and by whom these issues are resolved will depend in no small part on the role which the legislature believes state government should play in energy planning, development, and production matters. The foregoing observations have been provided to help stimulate discussion and resolution of that issue, along with the individual substantive issues that were presented.

III. THE NEVADA DEPARTMENT OF ENERGY

A. Background

The Department was established by the 59th session of the Nevada Legislature to perform the following functions: acquire and analyze information relating to energy; review, evaluate and forecast the energy situation in the state; study means of reducing waste, inefficiency, and uneconomical uses of energy; utilize all available public and private means to provide energy information to the public; make recommendations to the appropriate entities concerning energy conservation; develop a state energy conservation plan; review present state policies concerning energy; encourage the development of alternative energy sources; prepare a petroleum allocation and rationing program for possible contingencies; and administer state participation in federal energy programs.

The Department consists of three divisions - the Division of Colorado River Resources, the Division of Energy Conservation and Planning, and the Division of Energy Research and Development - and the Nevada State Energy Resources Advisory Board. However, funding was only authorized for the Director's Office of the Department of Energy and the Division of Colorado River Resources. Therefore, the activities that would normally fall within the purview of the Conservation and Planning Division and the Research and Development Division were initiated through the Director's Office.

The Nevada State Energy Resources Advisory Board consists of 15 members who are appointed by the Governor. The Board advises the Governor, the Department, and other state agencies on energy matters. The members represent the petroleum industry, the Public Service Commission of Nevada, utilities, utility consumers, the hotel and resort industry, agriculture, the consuming public, mining, organized labor, municipal government, and the general public.

B. Goal

Promote the availability and wise utilization of reliable economical supplies of energy, taking into consideration state, regional and local plans for land use, urban expansion, transportation systems, environmental protection and economic development.

C. Department Activities

1. Conservation: The Department has implemented the Nevada State Energy Conservation Plan (SECP). The SECP was developed and is being implemented with federal grant funding. In addition, the Department has also received a federal grant to design a state energy extension service. The following activities have and/or are being implemented as part of the Nevada SECP.

a. Funded development and implementation of state energy conservation standards for new building construction;

b. Develop energy-based life cycle cost programs for use by the State Purchasing Division;

c. Funded development and implementation of a computer carpooling program in Clark County;

d. Implemented an energy education program for elementary and secondary school teachers (approximately 2,000 teachers have received in-service training and materials);

e. Implemented a pilot energy audit program for public and private hospital facilities;

f. Funded development of a design phase life cycle cost analysis program for state facilities;

g. Funded an energy analysis of the renovation of the state capitol to determine the energy efficiency thereof and to identify potential

options to save energy.

h. Funded a review of Sierra Pacific Company's rate structure to determine if time-of-day or other rate structures should be adopted;

i. Developed and implemented a driver education conservation program including use of flow scan meters and vacuum gauges;

k. Developed and implemented a state public awareness program including brochures, radio spots, television spots, press releases, information stands, and publication of a newsletter;

l. Developed and implemented do-it-yourself and computerized energy audit programs for residential customers;

m. Developed and conducted energy management seminars for local governmental officials;

n. Sponsoring the implementation of an infrared flyover campaign of Clark County in conjunction with the Clark County Junior Academy of Sciences, USDOE, and EG&G, Inc.

2. Renewable Resource Development

a. Conducted six solar seminars for financiers, designer, developers, and public decision makers (with the assistance of $10,000 grant from Lawrence Livermore Laboratories);

b. Administered Nevada's participation in a federal pilot "appropriate technology" program through which 11 Nevadans received grants totalling $188,000 to implement conservation and renewable resource projects;

c. Presently administering the second phase of the aforesaid appropriate technology program through which grant funding will be made available to another group of Nevadans to demonstrate conservation and renewable resource utilization;

d. Participated in the development of the Western Solar Utilization Network (WSUN), a regional organization which will assist in efforts to commercialize solar energy;

e. Participated in the development and implementation of Nevada's Sun Day activities;

f. Completed an assessment of Nevada's geothermal resources including an initial projection of the electric and non-electric potential thereof (funded through a $42,000 grant from USDOE and The Four Corners Regional Commission);

g. Obtained funding commitments of approximately $100,000 to implement a geothermal technical assistance and commercialization program during 1979-80; and

h. Assisted interested individuals and entities in pursuing development of alternative energy resources.

3. Development of Information Necessary to Draft a State Energy Plan

a. Collected historical energy supply and demand information to update and expand information included in the publication Energy In Nevada;

b. Initiated second round of energy supply and demand forecasts (scheduled for completion in April-May, 1979);

c. Initiated general review of energy conservation activities that should be promoted by the State of Nevada;

d. Initiated review of geothermal policy options in conjunction with the geothermal resource assessment program.

4. Petroleum Allocation and Rationing Program

a. Initiated development of a state petroleum allocation and rationing program (scheduled for completion in June-July, 1979);

b. Continued Nevada's participation in the existing federal petroleum allocation program in order to provide assistance to Nevada end users and resellers who need assistance.

5. Other Regional and National Activities of the Director

a. The Director was actively involved in the development and reconstitution of the Western Interstate Energy Board and presently serves as chairman of that organization;

b. The Director serves as one of Nevada's two delegates to WSUN;

c. The Director is responsible for coordinating Nevada's participation in the Regional Commuter Air Study and for promoting the development of adequate commuter air service;

d. The Director is a past member of the National Geothermal Advisory Committee;

e. The Director serves as Nevada's official liaison with the Nuclear Regulatory Agency on state, regional and national nuclear facilities siting and waste isolation issues.

EXHIBIT B

STATE OF NEVADA

DEPARTMENT OF ENERGY

DIVISION OF COLORADO RIVER RESOURCES

BRIEF

OUTLINE OF ACTIVITIES

FEBRUARY 1, 1979

A BRIEF OUTLINE OF THE DIVISION OF COLORADO RIVER RESOURCES ACTIVITIES

* * * * * * * *

The basic law establishing the Division of Colorado River Resources (formerly the Colorado River Commission) empowers it to:

(a) receive, protect and safeguard and hold in trust and administer for the State of Nevada all water and water rights, and all other rights, interests or benefits in and to the waters of the Colorado River and to the power generated thereon now or which hereafter may accrue to the State of Nevada under and by virtue of any Act of the Congress of the United States or any compacts or treaties between States to which the State of Nevada may become a party, or otherwise,

(b) collect and arrange all data and information connected with the Colorado River and its tributaries which may affect or be of interest to the State of Nevada,

(c) represent the State of Nevada in such interstate or other conferences or conventions as may be called for the consideration of the development of reclamation and power projects connected with the Colorado River

or its tributaries, or in connection with Hoover Dam or other Federally operated dams,

(d) render the friendly cooperation of the State of Nevada to such constructive enterprises as look to the conservation of the waters of the Colorado River and its tributaries and the development of power thereon,

(e) negotiate with representatives of other States and the United States in an endeavor to settle equitably and define the rights of the States and of the United States in the waters of the Colorado River and its tributaries,

(f) make and enter into agreements, compacts or treaties between the State of Nevada and the States of Arizona, California, Colorado, New Mexico, Utah, Washington, Oregon, Idaho and Wyoming, with ratification and approval by the Legislature and Governor of the State of Nevada,

(g) report to the Governor such measures and legislative action as may be deemed necessary to secure to the people of Nevada all possible benefits from the water of the Colorado River allocated to or contracted by the State to be generated at Hoover Dam or elsewhere within the Colorado River stream system or from any private or Federal power development upon other rivers in the Western United States for use in the State of Nevada,

(h) cooperate with and establish, conduct and maintain, in conjunction with other States or Federal agencies, power, water and irrigation projects,

(i) hold and administer all rights and benefits pertaining to the distribution of power and water mentioned in NRS 538.040 to 538.260, inclusive, for the State and is empowered to lease, sublease, let, sublet, contract or sell the same on such terms as the Division shall determine.

POWER AND ENERGY

In implementing its responsibilities regarding power, the Division has entered into contracts with the United States and with power users for all of Nevada's power entitlement generated from the Colorado River. This entitlement includes approximately 17.6 percent of the total energy generated at Hoover Dam, 25% of that generated at Parker and Davis Dams, and 15% of the Lower Colorado Region share of the Colorado River Storage Project generation. The total energy purchased by the Division in 1978 under these entitlements, together with contracts with Nevada Power Company and Public Service Company of New Mexico, amounted to 1.2 billion kilowatt-hours. The cost of this energy was almost $10.5-million. To this cost the Division adds an administrative charge of approximately 14 one-hundredth mills per kilowatt-hour to defray the administrative expenses of the Division. Customers for the Division's power are in the Basic Industries in Henderson, the Nevada Power Company, CP National

Utilities Company, three electric cooperatives and one municipal in Southern Nevada.

WATER

The Division has entered into contracts with a number of small water users along the Colorado River and with the local water-using entities, these being Boulder City, Henderson, Las Vegas Valley Water District, North Las Vegas, and Nellis Air Force Base. The water rights to the Colorado River for the State of Nevada are established as a result of the Supreme Court Decree of 1964 and are administered by the Division. During 1978, the Division sold in excess of 103,000 feet of water from its entitlement. Water other than from the Southern Nevada Water Project is sold at rates to cover administrative costs and the 50 cent per acre-foot charge which must be paid to the United States for the water diverted from Lake Mead and the Colorado River. The first stage of the Southern Nevada Water Project went on the line in June of 1971 at a cost of $53-million and gave immediate relief to the overdrafted groundwater basin in the Las Vegas area. In addition, $8.9-million in General Obligation Bonds as authorized by the State Legislature and a $1.5-million Federal grant financed the construction of the Alfred Merritt Smith Water Treatment Facility to treat all of the water delivered through the Southern Nevada Water Project. This facility cost approximately $10-million for the first stage. The second stage of the Southern Nevada Water Project and the expansion of the Alfred Merritt Smith Water Treatment Facility is presently scheduled to be completed by

September, 1981. These facilities will double the capacity and capability of the first stage. When the second stage is completed, Nevada will soon be utilizing almost all of its consumptive use entitlement from the River, which consists of 300,000 acre-feet per year.

LAND

In 1957 and 1959, the State Legislature passed two Acts, which were companion acts to Congressional Acts, authorizing the Colorado River Commission to acquire two tracts of land from the Federal Government for the State - Fort Mohave Development Area and Eldorado Valley.

In the case of Fort Mohave, a land purchase contract was entered into in 1966. The basis of acquiring this land from the United States is to pay for land with the monies received from the purchasers. There is no appropriation from the Legislature for this purpose. The first sale, which put in motion the contract in the Fort Mohave area, was to Southern California Edison Company. This allowed the Commission to purchase land in addition to that sold to Edison. The Commission has sold two other parcels of land. Revenues received from these sales allowed for purchase of 2,500 acres for public use purposes -- approximately five miles of River front, for development of a State park without cost to the taxpayers.

The Eldorado Valley area consists of approximately 105,000 acres adjacent to Boulder City. Many proposals have been submitted, but none have been acceptable to the Eldorado Valley Advisory Group and the Division. As part of the development

of Eldorado Valley, the Division has right-of-way agreements for two large electrical substations in the valley - Southern California Edison Company and the City of Los Angeles. The terminus of the Pacific Northwest-Pacific Southwest Intertie is in Eldorado Valley.

GENERAL

The Division staff represents the State in many organizations and committees in matters concerning power and water which involve other State and Federal agencies.

The Division's staff consists of 14 people. The staff is deliberately kept small to keep down costs and to make it as responsive and flexible as possible. Funds for payment of all the activities of the Division are obtained from an administrative charge made on the cost of water and power sold by the Division.

EXHIBIT C

TESTIMONY OF

DONALD L. PAFF

BEFORE THE

SENATE, COMMERCE AND LABOR COMMITTEE

February 7, 1979

ENERGY POLICY

I am Don Paff, General Manager of the Las Vegas Valley Water District, formerly Administrator of the Division of Colorado River Resources.

My comments and observations today are not representation of the Las Vegas Valley Water District but towards, hopefully, a contribution to the subject of energy policy.

I believe it is no news to you or the people of this state that Nevada has abundant unexploited energy sources, unfortunately these sources, geothermal and solar, are limited as to their availability to use by technology and economics. On the other hand, current conventional sources of energy, such as oil, natural gas, coal are in very limited sources within the state, as clearly indicated by Mr. Noel Clark in his testimony before you.

Thus, currently, the state imports almost all of its basic energy, it however is, in the overview, an exporter of electrical energy. It should be noted here that the portion exported is not available for the state's use since it is completely owned by the party to whom it is exported. The probability of recapture of this exported power for Nevada's use is, for all practical purposes, non-existent.

On the surface, this fact may appear to be contradictory but it is not when you consider that the state performs a function of conversion or translation of energy from one form: i.e., coal to another form, electricity. In doing so, the state does contribute its natural resources to energy production in the form of water, land areas and air.

EXHIBIT C

Reports that I have read generally indicate an increasing incentive, primarily from economic pressures, to step up dependence on electrical energy, not only in Nevada but in the entire nation, to avoid further demands on oil and natural gas. If this approach is realized, it could place extraordinary demands on electrical energy and pricing within the state.

To a degree, the State of Nevada lies in a rather unique position in the western states in that to the east lies rather abundant basic fossil fuel sources in the form of coal and oil shales and to the west basic consumptive markets. This might lead to a conclusion that, because of this circumstance, it might be fairly easy to acquire electrical energy. In my opinion, this is not entirely true because the state is not a direct participant in the production and/or transmission functions, indeed, as you may be aware, Nevada appears to be the "hole in the donut" as far as major electrical transmission facilities are concerned.

Lacking basic conventional energy resources, the state could contribute and thus have a direct role in and participation in future electrical energy sources by considering a contribution of other necessary resources such as land, water and air. If this contribution were considered and included within the state's energy policy, it would appear to me that the state could have a major influence and participation in electrical energy sources and, as a result, induce the potential of interconnected intra and inter-state transmission systems.

From my personal viewpoint, there will be a near future need to acquire additional energy for the state. I do not believe that increased conservation and management practices can alone solve future state energy needs. These acquisitions are necessary to bridge and meet the demands of our state until the technological and economical problems are solved regarding our own geothermal and solar energy resources and these sources can be placed in the category of conventional sources. Implicit in this observation is that the state will continue to grow in population and development and continue increasing its

demands for all types of energy.

Some of the items I would suggest you consider in addressing the state's energy policy are:

1. Continued encouragement of energy conservation and management practices.

2. Continued encouragement and establishment of incentives for energy source development within the state.

3. Enhancement and assistance of programs toward acquisition of energy particularly electrical energy - i.e., state preference for federal hydro acquisitions.

4. Enhancement and assistance in research and development of the state's geothermal, solar, and land, water and air resources that could be devoted to energy conservation.

EXHIBIT D

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LOUIS MEAD DIXON
ROBERT W. MARSHALL
JAMES P. LOGAN
JOHN C. RENSHAW
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JEFFREY L. ESKIN
DAVID D. JOHNSON

January 30, 1979

Honorable Robert E. Price, Chairman
Assembly Taxation Committee
Nevada State Legislature Building
Room 240
Carson City, Nevada 89701

Dear Mr. Price:

As registered representative of the following major oil companies:

Atlantic Richfield Company,
Chevron, U.S.A.,
Exxon Company, U.S.A.,
Gulf Oil Corporation,
Shell Oil Company,
Texaco Inc., and
Union Oil Company of California,

and as counsel for Northwest Exploration Company, as well as on behalf of Mr. William Pennington, Sr., and Mr. Peter Hummel, both of Reno, Nevada, I am requesting that your committee give favorable consideration to amending Assembly Bill 144 in accordance with the enclosed requested amendment.

I hope that notice of the hearing on this bill will be given sufficiently ahead of time so that both Mr. Pennington and Mr. Hummel will have the opportunity to appear before your committee and explain why the adoption of this amendment is in the best interest of the state.

All of the reasons and arguments which are set forth in the report of the Legislative Commission's Oversight Committee For the Study of Assessment and Taxation of Geothermal Resources in Nevada are equally applicable to the assessment, taxation and development of oil and natural gas resources in this state.

Paraphrasing the four general conclusions which are set forth in the report summary of the geothermal study, Page 3, it might be noted:

(1) That the shortage of oil and natural gas resources is of major economic concern, not only to the State of Nevada, but to the country as a whole and that public policy should encourage in every way possible the expenditure of private capital in the discovery and development of oil and natural gas.

(2) With reference to oil and natural gas, Nevada is a net importer of energy and places great reliance on other states for its energy needs.

(3) A history of the attempts of private enterprise to locate and develop oil and natural gas in Nevada will clearly demonstrate that these efforts have in the past suffered, and continue to suffer, from extreme financial risk due to the great difficulties experienced in attempting to discover oil and natural gas in this state and also due to large capital requirements. This history will further demonstrate that, as the committee stated with reference to geothermal resources, long time lags between discovery and production have certainly occurred in connection with oil and natural gas resources and further, this history will demonstrate that while there is a minimal discovery situation in Nevada, the production has been so small as to require long haul to out-of-state refineries and production shutdowns even in such minimal production. Finally, that all of these circumstances make investment capital difficult to obtain. I am sure you will find that through testimony of Mr. Pennington and Mr. Hummel, this last assertion will be adequtely sustained.

(4) Finally, the fourth conclusion of the geothermal report states that substantial institutional and technological barriers and disincentives to geothermal development exists which threatens the success of the industry. Again, I am sure you will learn through testimony of the gentlemen mentioned above, that technological barriers equally exist with reference to locating oil and natural gas in this state.

The geothermal summary further states "The Oversight Committee concluded that the economic and social welfare of Nevadans may depend to a large degree on the state's ability to solve its energy problems." With the current situation in Iran, and with some of my clients finding it necessary by reason of this situation and by reason of the great complexity and confusion of federal regulation to institute gasoline allocation programs, the economic and social welfare of Nevadans may, in addition, depend to a substantial degree on the discovery of Nevada oil and natural gas.

Therefore, as is stated in the geothermal summary, and again to paraphrase, if oil and gas are to be successfully developed in the shortest possible time, the state should institute a tax policy which encourages and supports such development. Such a tax policy should recognize the inherent risk in oil and natural gas exploration in this state and the potential benefits for the state if large energy resources are discovered.

The current tax on federal oil and gas leases is diametrically opposed to such a desirable policy and if anything, tends to discourage the expenditure of funds in this state in the further and intensive effort to discover oil and natural gas.

It is ironic to contemplate at some time shortly prior to the original Eagle Springs, Nye County oil discovery, the legislature had placed on the books a law providing for a bonus of $25,000 to the first successful producer of petroleum resources. Of course, the state's treasury was not as large in those days and perhaps it is fortunate for the state that this bonus was repealed prior to the original discovery. Nevertheless, and without regard to the rather insignificant results of the taxation imposed on federal oil and natural gas leases, the state receives substantial benefits from the continuing effort to develop petroleum resources on public lands in Nevada.

In this respect, Senators Cannon and Laxalt recently announced that Nevada's share of federal mineral leasing revenue is continuing to climb due to increased

oil exploration in Nye County and other locations. The Senators noted that Nevada's share of lease revenues for the last half of fiscal 1978 (emphasis added) was $2.9 million constituting a $900,000 increase over the amount received for the first half of 1978 and nearly triple the amount received early in 1977 before recent drilling began.

It can be readily seen that the more encouragement given by the state for the continued expenditures in this area, the more the revenue to the state will increase. It would therefore seem to necessarily follow that state policy should offer every encouragement to continued and expanded exploration. From this source, the state receives 50 percent of all bonuses, royalties and rentals paid to the U. S. Bureau of Land Managment for mineral leases.

As is suggested in the geotheramal resources report with reference to sale of steam, production of oil and natural gas is taxed under the Net Proceeds of Mines Statute.

My office, as counsel for Standard Oil Company of California, unsuccessfuly undertook a test of the constitutionality of that portion of N.R.S. 361.175 which imposes the tax on federal oil and gas leases. Unfortunately, the decision of the Nevada Supreme Court in this case left the entire situation in a most confused state and one which is certainly not designed to clarify the difficulties, confusion and perhaps discouragement of exploration in the field of oil and natural gas.

The case is that of Standard Oil Company of California v. Pastorino, No. 9202, 94 Nev., Advance Opinion 84, decided June 7, 1978. Shortly prior to this decision, our Supreme Court held that oil and gas are minerals. Standard Oil contended in this case that oil wells and leases are in effect unpatended "mines" or "mining claims" which are exempt from property taxation pursuant to article 10, § 1 of the Nevada Constitution. The court stated, commencing at the bottom of Page 4 of the Opinion, "We need not decide this issue as proffered, however, because the sole question before this court is whether oil leases (emphasis supplied by the court) should be exempt from property taxation." This in itself is a very confusing

statement when the court notes immediately ahead of this statement "Appellant next contends oil ... leases are unpatented 'mines' or 'mining claims'." In spite of this, the court says it need not decide this issue because the sole question before the court is whether oil leases should be exempt.

The court then defines a "mine" as contained in the legislative definition N.R.S. 512.006 of the 1975 Legislature. Then the court concludes "Thus, at least until 'mines' are created through an actual exploration or extraction, the interests in question would be taxable as any other leasehold interest. Therefore, we conclude such totally undeveloped oil leases are not exempted from property taxation within the meaning of article 10, § 1 of the Nevada Constitution."

The very confusing and anomalous situation which thus results can be readily perceived through a total lack of explanation as to what constitutes "exploration." Our Supreme Court has said that prior to "exploration" these federal leases are taxable. That immediately upon actual "exploration" they apparently become exempt from ad valorem taxation. There is, of course, "exploration" involved even in the locating of land subject to federal oil and gas leasing. It is obvious that money is not expended simply in rushing out and seeking mineral leases willy-nilly. Hence, it can well be argued that once a federal oil and gas lease is brought into existence, there has been exploration and hence, it is not subject to ad valorem taxes. The real point is - at what point does "exploration" begin so as to change the nature of the lease and hence, the nature of the tax? No one can answer this question under the current state of the law. For that reason, this has left the situation in a more muddled and confusing state than ever.

Should anything happen to gaming and its related tourism revenues, substantial discoveries of petroleum deposits in Nevada are, for the very best, and probably the only real solution, to Nevada's economic problems. Hence, it is respectfully submitted that the current nuisance tax

on federal oil and gas leases should be repealed. I enclose herewith a copy of the above-referenced decision.

Sincerely,

George L. Vargas

GLV:mn

Enc.

cc: All Members, Assembly
Taxation Committee
William V. Pennington, Sr.
Peter Hummel
M. K. Worley
B. G. Warren
W. B. May
M. L. Pitcher
G. E. Meske
R. L. Lindauer
R. W. Curtis
J. H. Augustine

EXHIBIT D

REQUESTED AMENDMENT TO ASSEMBLY BILL 144

Amend Assembly Bill 144 to add after the words "geothermal resources," Line 15, Page 2, the following words: "oil or natural gas."

EXHIBIT F

NEVADA POWER COMPANY STATEMENT BEFORE THE
SENATE COMMITTEE FOR COMMERCE AND LABOR
NEVADA LEGISLATURE SENATE
FEBRUARY 7, 1979

My name is John Arlidge. I am Manager of Special Projects at Nevada Power Company and involved primarily in resource planning for electric generation and transmission facilities.

In my remarks I will cover the following:

1. The potential contributions of geothermal and solar energy in meeting the expanding needs of Southern Nevada over the next twenty-five years.
2. The potential contributions of energy conservation and load management programs in lowering energy consumption and demand in Southern Nevada over this time period.
3. The potential of nuclear energy.
4. The potential of coal in this overall picture.

And finally, some barriers, as we see them, to the orderly development of these various energy sources.

Following my remarks, I will be pleased to answer any questions you may have.

Before discussing these various topics, I think it worthwhile to point out that Nevada Power Company is one of the fastest growing electric utilities in the country in terms of new customers. As a matter of fact, in two of the last five years, the Company ranked first in this category among the nation's 100 largest

utilities. Since all economic indicators point to continued growth in our service area, and since growth of the order we are experiencing places extremely heavy demands on Nevada Power for the construction of new facilities -- the subject matter of this hearing is one of great importance to my Company. We are pleased with the opportunity to participate in these deliberations.

In the interest of keeping my remarks brief, I am attaching to this presentation two papers which I have delivered in recent years. The first is entitled "Geothermal Resources" and it deals with the potential of this energy source in Nevada and the Western United States. The second paper is a presentation made to the Nevada Press Association and covers solar energy's potential in Nevada and the West. It includes discussions on solar power generation, solar applications for individual structures and wind energy.

Although the papers date back a few years, I believe their stated conclusions are valid today. The conclusions are these:

Geothermal Geothermal resources are available in the Western United States. However, it will require extensive exploration to determine how many commercially valuable deposits are available.

In my view, geothermal energy may very well provide a source of energy in the future to meet part of the growing energy needs in Nevada. However, for a number of technological and economic rea-

sons, Nevada Power is not including this resource in its planning over the next 25 years.

Solar Generating electricity from solar energy has great potential, especially here in the Southwest. But it does not appear possible that an economic application of solar for this purpose will be available in the next 25 years. There are many technological and economic problems that must be overcome and these require time. While the effort to develop this resource for power generation has been steadily increasing in the past few years, my personal view is that solar cannot play a major role in meeting electric energy needs in the Southwest during this century.

Insofar as applications for individual buildings, solar energy is sure to increase in importance. Today in our service area, there are more than 600 installations of solar equipment on single and multi-family residences and commercial buildings. While most of these are for water heating, there is a growing number of space heating and even some cooling applications. The latter, in general, are not yet economical. However, the technology is rapidly developing and as it does, we see this market enlarging. Even so, these single structure installations will not significantly alter the growing demand for electric energy.

In one of the attached papers, the subject of wind energy is reviewed. We do not see this resource contributing to generation needs since Nevada is not blessed with wind characteristics re-

quired for reliable power generation.

Turning to conservation and local management ... we have not attempted to quantify at this time the potential contributions energy conservation or load management programs may be able to make in lowering consumption and demands for electricity. We have not made this attempt because, frankly, we believe it is still too early for meaningful forecasts. Nonetheless, Nevada Power has been very active both in carrying out productive energy conservation projects and in developing load management data.

A few specific examples:
In the last two years our energy management group has conducted more than 2,500 surveys of individual homes and commercial structures. The typical survey for a residence takes about two hours and results in a written analysis of ways the customer can reduce power consumption.

Our attic insulation program offers customers a free inspection by a Nevada Power specialist; a recommendation for added insulation, if merited; our handling arrangements for a qualified contractor to do the work, if requested; company financing at a low interest rate and a Company pledge of customer satisfaction. To date, this program has resulted in approximately 1,000 "sales".

We recently conducted a two-month program selling water heater insulating jackets. More than 1,500 "sales" were made during this brief period. We expect this program to be continued in the

future.

As for load management, we are currently entering the final stage of a two-year study project to ascertain the potential of a radio-controlled program that would reduce demands on the system during peak hours. This summer there will be a test conducted on 200 homes that will permit the shedding of air conditioning loads during peaks.

This study will provide essential data and will be a decision base in determining the merits of expanding such a program on our system. While there are numerous problems involved here -- customer acceptance, primarily -- such a program has promise because it may relieve both customers and the Company of construction of new facilities.

Programs such as these, along with the pressures of higher bills, have caused our residential customers to reduce consumption dramatically during the last five years. Whereas average usage annually for residential consumers exceeded 18,000 KWH in 1974, today that figure has dropped to approximately 15,000.

During this same period, however, because of the great growth in customers, our peak demand has leaped from 945 mega watts to 1,254 last summer.

Thus, conservation and load management, while desirable and which will be actively pursued by the Company, are not likely to make

significant contribution to resolving energy problems out ahead in Southern Nevada.

The real options we have center on nuclear and coal resources. Presently the company is exploring participation in a nuclear power plant. However, continuing opposition to such plants make future nuclear options questionable.

That leaves coal. Fortunately, Nevada Power is a coal-based utility. Last year approximately 85% of the electricity we generated came from coal plants.

I termed this fact as fortunate because we have substantial experience with this fuel. I might add it is fortunate, too, for our customers since coal generation is less expensive than either oil or natural gas.

At the outset, I mentioned certain barriers as we see them to the development of various energy resources. I would like to close by mentioning a few of the more formidable:

There is, first and importantly, the institutional barriers to constructing new generating and transmission facilities which have sprung up in the last ten to fifteen years. Since the late 1960's, the construction time required for a coal-fired generating unit at a new site has increased from less than four years to about ten years. Five years of this increase is a direct result of new regulatory requirements resulting from such laws as the

National Environmental Policy Act, Clean Air and Water Acts, OSHA, and a host of others.

I want to make it clear that Nevada Power does not argue with the aims of such legislation. It is, after all, for society to set standards for such matters -- not the utility. However, the regulation that has sprung up to carry out these laws has reached such boggling proportions that it now takes a longer period of time to secure permission to build a plant than it does to actually build it. These delays and ever more stringent regulations increase costs tremendously, and in our view sometimes needlessly and thus constitute a genuine barrier to the construction of needed coal facilities.

A second major barrier to this task is the Company's uncertain ability to finance these very costly coal facilities. This matter, of course, has been a continuing one since 1973 and is not altogether pertinent here except as it may intrude on our ability to meet our service area's demands for power. Given the barriers, the threat is twofold:

1. In the extreme, they could preclude altogether the construction of coal-based power plants, or
2. They could force a utility to opt for lower first-cost and faster construction oil burning conbustion turbines. (In this connection, I have also attached a recent news item telling of DOE's possible intervention in rate cases ... to indicate that this possibility of a move to oil is genuine.)

Respectfully, Nevada Power urges this Committee to exert whatever influence it may have to streamline and speed up federal licensing process for new facilities.

At the same time, and with equal respect, we would urge the Committee to understand that these delays materially increase the cost of electricity to consumers.

Thank you. I would be pleased now to answer any questions I can.

GEOTHERMAL RESOURCES

by

John W. Arlidge

There has been much discussion in the past few years about geothermal energy and its utilization for the production of electric power. Geothermal literally means, 'earth's heat'. However, for the purpose of this paper, geothermal resources will refer only to natural occurrences of steam, hot water, and hot brine within the earth's crust.

The use of geothermal energy is probably as old as man himself. Early records show a widespread use of natural steam and hot waters for heating, health baths, agriculture, mineral production and recovery, etc. However, as old as its use is, geothermal energy is not fully understood.

The majority of known geothermal areas lie in a ring around the Pacific Ocean. In the United States, they are found primarily in the West where the crest of the East Pacific Rise intersects the North American continent. The crest intersects the Continent along the Gulf of California and proceeds into the Imperial-Coachella Valley northward toward the Oregon-California stateline.

A cross-section of the East Pacific Rise shows that it is a bulge in the earth's crust. The crust in this area is thinned by an upheaval of magma or molten rock. The magma is rising under the crust, creating

tension. The tension thins the crust and breaks it into ridges and troughs which allows the magma to flow close to the surface.

A small section of the crust in the region of the East Pacific Rise should hold an ideal geothermal model. The model consists of three parts -- a heat source, a reservoir, and a cap rock. The heat source is magma which has been forced into the upper part of the earth's crust. This intrusion should have taken place within the last 100,000 years so that the magma is still hot. The reservoir may consist of porous volcanic ash, fractured rocks, or sedimentary sands and gravels, which hold the geothermal hot water, hot brine, or steam. Of necessity, the reservoir must underlie a nonporous cap rock. The cap rock is required to prevent the heat from dissipating into the atmosphere.

Knowing what the ideal geothermal model consists of, it is possible to establish the means for exploration of geothermal deposits. Exploration today begins with a search for young cinder cones, lava flows, volcanic ash, or other signs of recent volcanic activities combined with hot springs or fumaroles. This exploration technique is much like the technique used by the oil industry at the turn of the century when oil wells were located by finding surface oil seeps. More sophisticated exploration methods are also used. These methods include measurements of the earth's resistivity, gravity, and magnetic fields; geochemical analysis; infrared photography; measuresments of heat gradient and heat flow; water isotopes, etc. However, the best tool is the exploratory well drilled to depths where geothermal fluids are expected to exist or, as some old-timers call it, the "iron geologists".

A good example of the "iron geologists" at work is Mono Lake in California, where prospects for geothermal development diminished with the drilling and abandonment of two wells in the late part of 1971. These wells were drilled by Geothermal Resources International, Inc. and Getty Oil Company, with funds contributed by the Southern California Edison Company. The Los Angeles Department of Water and Power participated in the funding of the first well drilled by G. R. I. Both wells encountered basement rock with low temperatures and thermal gradients.

Another example of the "iron geologists" at work are the wells drilled at the Casa Diablo area near Mammoth, California. A number of holes were drilled to depths ranging from 400 to 800 feet. The temperatures in these test holes range from 270 degrees Fahrenheit to 360 degrees Fahrenheit, with steam production up to 70,000 pounds per hour and water production up to 470,000 pounds per hour. These shallow wells certainly indicate that the area has some geothermal potential; however, they are not considered an adequate test of the full geothermal potential of the area.

The ultimate hope of the wildcat geothermal explorer is a development such as that found at The Geysers area in Northern California. At present, the installed electrical capacity at The Geysers is 502 megawatts. Geologists believe that the field's ultimate capacity will be in excess of 2,000 megawatts.

The drilling of a geothermal exploratory well or production well is similar to the drilling of oil and gas wells, with the added problems of higher temperatures and pressures. The drilling of a geothermal well is generally accomplished by a drilling rig capable of depths of 10,000 feet. Blow-out prevention equipment is installed at ground level to protect the

hole and to prevent damage to the surrounding area. A string of casing or pipe is run into the hole to approximately 500 feet and is cemented into place. Further drilling is done until temperature and pressure indicate the necessity of another string of pipe. This procedure will vary from area-to-area. Most states have established regulations and requirements for the drilling of such wells.

The choice of equipment for a geothermal power plant is dependent upon the temperature, pressure, and quality of geothermal fluid in the well. To date, two types of fluids have been used for electric power generation. They are steam (ranging from wet to superheated) and hot water.

The Geysers is a superheated steam field and is the most desirable from the standpoint of electric power generation. The principal differences between the live-steam cycle used at The Geysers and a conventional steam power plant cycle are:

(1) There is no boiler and the condensed steam is not recycled but used for cooling water makeup;

(2) The steam pressures range from 80 to 100 psig compared to a range of 900 to 3,500 psig for nuclear and fossil-fueled plants;

(3) Temperatures of the steam range from 350 degrees Fahrenheit to 400 degrees Fahrenheit, compared to conventional plant temperatures of 1,000 degrees Fahrenheit; and

(4) Steam from the wells is passed through separators and strainers to remove moisture and solid impurities and is expanded through a conventional steam-turbine exhausting into a barometric condenser. The condensate mixes with the cooling water and is pumped into a cooling tower.

If the field produces hot water, such as the Wairakei Field in New Zealand and the Cerro Prieto Field in Mexico, then two work cycles can be utilized. The first is a flashing steam cycle where part of the hot water is flashed to steam by reducing pressure. From that point on, the cycle is identical to that utilized at The Geysers and explained above. In the second, heat from the hot water is transferred to a working fluid, such as isobutane or freon which vaporizes at a low temperature. The resulting gas is used to drive the turbine. A freon plant is now in operation in Paratunka, USSR. Also, San Diego Gas & Electric, in cooperation with Magma Power Company, is constructing a pilot installation of an electric power generating plant using isobutane as the working fluid.

This paper would not be complete without a physical description of a geothermal power plant. Based on a yield of five megawatts per well, a 100-megawatt power plant would require a well field of 520 acres. The plant itself would consist of two 50-megawatt units or one 100-megawatt unit and would be totally enclosed. The building would be approximately 200 by 50 feet and approximately 60 feet high. Cooling towers would be of standard design and, considering forced draft cooling towers, would be approximately 60 by 180 feet. The total area for the plant itself would be

one acre. The field development, based on the assumption that each well would be centered on a 20-acre plot and would produce five megawatts, would require 25 wells. This would allow 20 percent of the wells to be down for maintenance, at any one time, without affecting the power plant output. One reinjection well for injection of unwanted effluents would be on the periphery of the field.

There is a possibility that the above field development could be modified by use of directional drilling. In directional drilling, the well-hole bore is stepped out from the drilling site approximately one to two miles. This procedure is presently being utilized for oil and gas well drilling. If it can be developed for geothermal well drilling, it would result in fewer steam pipelines and more aesthetically acceptable development.

As you can see, development and use of geothermal resources are not quite the same as the development and use of other primary energy sources. Energy from geothermal resources must be utilized where found. Therefore, utilization of this energy will, for the most part, require that it be converted into electrical energy. Until recently, however, neither state nor Federal law recognized any difference between the development of geothermal resources and other resources.

Prior to 1967, in the State of California, geothermal fluids were considered as any other mineral on State lands. A person who located a commercially valuable geothermal resource had to relinquish all lands on his permit outside of 160 acres. This requirement, and the then existing scale of royalty (20 percent of gross profit) were unrealistic, due to the nature of this development.

In 1967, the State of California passed its Geothermal Resources Act which provided for geothermal prospecting permits and leases on State lands. It increased the acreage limitation on individual leases from 160 acres to 25,600 acres and provided for royalties of 10 percent on the sale of geothermal resources and 2 percent on the sale of minerals recovered from the geothermal fluids.

Some states have since developed similar regulations. However, other states such as Nevada and Utah have declared geothermal fluids to be water and are therefore subject to existing water regulations and controls.

Prior to the enactment of the Geothermal Steam Act of 1970, Federal laws did not provide for the geothermal leasing or exploration of Federal lands; and geothermal resources could not be classified under any existing act. The 1970 Act charges the Secretary of the Interior with the responsibility for the development of geothermal leasing and operating regulations. To accomplish this, the Secretary has published for comment regulations for exploration, development, and production of geothermal resource, and a final environmental impact statement. Actual leasing began in late 1974 and has not progressed very rapidly.

It would be appropriate, at this time, to discuss some of the current activities.

The United States Bureau of Reclamation is funding the University of California at Riverside in a detailed investigation of the East Mesa area of the Imperial Valley. This investigation includes the drilling of several 8,000-foot exploratory wells. In cooperation with this effort,

the California State Department of Water Resources drilled a 2,000-foot exploratory well in the Dunes area of the Imperial Valley.

Chevron Oil Company and Magma Power Company, in a joint venture with San Diego Gas & Electric Company, have drilled a number of wells in the Heber area of the Imperial Valley. The companies plan to evaluate the geothermal potential of the area. Magma and San Diego hope to develop sufficient geothermal fluid for a 400-megawatt power plant using the Magmamax Process. In the Magmamax Process, heat from the geothermal fluid will be transferred to isobutane which will vaporize at a low temperature. The resulting gas will be used to drive a turbine.

The Naval Weapons Center at China Lake, California, has obtained funding for a program on geothermal research. As part of that program, naval geologists have begun an in-depth geophysical study of the Coso Thermal area located within the boundaries of the Naval Weapons Center.

The United States Geological Survey is making an in-depth geological study of several geothermal areas throughout the country.

Phillips Petroleum, Southern Pacific, and the Southern California Edison Company have joined together in an attempt to develop some of the geothermal potential in Imperial Valley. Edison is also working with Chevron Oil Company in reservior evaluation near the Salton Sea.

Union Oil Company recently entered into contracts for geothermal development of Jemez Caldera in New Mexico. Geology and preliminary wells indicate that this area could be a dry-stream field of immense proportions. Union Oil also has obtained the right to develop geothermal resources on private lands in the Long Valley area.

Numerous exploratory wells have been drilled in the states of Nevada, Utah, Arizona, Idaho, Oregon, New Mexico, and Hawaii. The Federal Government and the Electric Power Research Institute have both started major research and development programs.

A new organization called the Geothermal Resources Council was formed by industry several years ago. The primary purpose of the Council is to encourage geothermal development and to encourage that development in a way that is compatible with the natural environment.

State and Federal regulations on leasing and operations provide for minimizing the unavoidable environmental effect associated with geothermal exploration, test drilling, development, and operations. However, the opposition to geothermal development is rapidly growing. The Geysers area has encountered major set backs in schedules in the last two years.

The use of heavy equipment, capable of drilling several thousand feet, requires improvement of existing roads or the construction of new roads for access of equipment and supplies to the drilling sites. This constitutes an unavoidable environmental impact. Significant noise levels could be reached during operations and release of harmful fluids to the environment could accidentally occur. In all cases, the operations will be conducted in compliance with state and Federal regulations and standards. Should releases of unacceptable amounts of harmful fluids or gases occur, the operating regulations require immediate remedial action under penalty of suspension of operation and could result in heavy fines and a cancellation of drilling permits.

The power plant, the steam lines, and the electric transmission lines will have some effect on the natural environment.

During full-scale operation, land subsidence could occur. One means of alleviating the subsidence problem, and at the same time disposing of unwanted waste, is through pressure maintenance by reinjection of wastes into the producing zone of the reservoir.

Although it is not entirely free of its own adverse effects on the environment, geothermal development can reduce the need for other resources which have greater adverse environmental effects.

In summary, geothermal resources are available in the Western United States. The question as to how many commercially valuable deposits are available cannot be answered without extensive exploration. Since the majority of the known potential sites are in the public domain, exploration will not accelerate over its present pace until the almost two million Federal acres of Known Geothermal Resources Areas have been opened for prospecting.

Geothermal energy could well provide a source of energy to meet part of our growing needs. The power utilities are greatly interested in this resource and in its effects on the community and on the environment.

EXHIBIT F

Presentation to Nevada Press Association
Lovelock, Nevada
April 24, 1976

Thank you for inviting us to discuss energy resources for the future. When I talk about solar energy, I always like to begin by telling of a friend who is a sailplane pilot. He told of one day when he was flying his glider along the coastline off San Clemente, California, he observed a seagull who was soaring beside his glider and decided to follow the seagull's example and soared in the same thermal as the seagull. He proceeded to do this and enjoyed himself immensely for two-to-three hours. At about that time he realized he was five miles out to sea and the seagull began flapping his wings flying back to the coastline. As my friend landed in the water, he realized that wind and solar energy were not always reliable.

Solar energy is an intriguing and promising alternative to supplement the nation's energy for several reasons. It is virtually inexhaustible. It is widely distributed and in most cases it is not expected to introduce major environmental problems.

Man has used solar energy transmitted by windmills, water wheels, skylights, firewood, etc., since his beginning. Why did man give up relying on solar energy? Because, as our glider pilot knows, solar energy isn't always there when you need it, and because fossil fuels (a form of stored solar energy) were plentiful and available at a relatively low cost. By the use of fossil fuels, farmers could pump water at any time, nations could industrialize easily, and man was released from a life of simply trying to fill his stomach, to a life with some freedom to enjoy his environs.

Now that fossil fuels are becoming expensive and less plentiful, man is again looking at the sun as a direct source of energy.

What forms of solar energy systems are available? What are the problems of using them?

Modern industries, commercial centers, and homes depend on the availability of energy 24 hours-a-day. The sun is a part time performer. It only delivers usable energy less than 40 percent of the time. It is so diffused that collecting and concentrating it presents major economical and technical problems.

There is, however, a worldwide effort to develop methods of collecting and storing solar energy. The power utility industry has scheduled in excess of $20 million for programs in solar energy research over the next five years. Other industries are making similar efforts and last but not least the federal government will spend in excess of $90 million on solar research and development this year.

What are some of the solar energy utilization alternatives, their key issues, and their projected potential?

Experimental investigation on solar heating and cooling of buildings has been proceeding for over 40 years. Nearly all concepts are based on "flat-plate-collectors" to convert solar energy to thermal energy (flat plate collector is a box with a flat-black absorber inside and a transparent cover plate. A fluid passes through the box and picks up the heat). Basic cost of these collectors today is between $10 to $20 per square foot. To be competitive, installed costs must be in the $2.00 to $4.00 per foot range and the unit must have a life in excess of 15 years. Available analysis shows that the most economical system would supply only 50 percent of the energy requirements for a single building. This is because of collector surface size requirements and energy storage requirements.

Of growing interest is the solar-assisted heat pump system for heating and cooling. With this system, a heat pump is installed in conjunction with an insulated storage tank and a flat plate collector. Heat or cold can be stored from

either electricity during off-peak hours, or solar energy when available.

Solar thermal conversion is one technological mechanism for generating electric power. In a solar thermal system, energy is concentrated to produce steam or hot gas to drive a turbine.

The federal government will be requesting candidate sites for a 10-MW experimental plant within the next three weeks to two months. This plant, assuming good solar conditions, will operate from direct solar radiation for six hours and from stored solar energy for six hours, or a total daily operation of about 12 hours. Thus the plant will be used for intermittant peak load periods and not for the baseload period such as coal or nuclear plants. Estimated cost of the plant is around $4000.00 per kilowatt or about five times the conventional coal plant cost. The plant will be scheduled for in-service in 1980.

The solar thermal conversion concept has a number of associated problems, not least among them are environmental considerations. A 100-MW plant would require in excess of 26,000 mirrors 20 feet across, covering a field one and a-half miles on a side, with an 80-story tower in the middle.

Generating electric power directly from solar radiation can be done by photovoltaic conversion, i.e., solar cells. These devices were invented in the 1950s and since then have proven themselves in space by providing energy for spacecraft and interrestrial applications such as remote beacons, floating buoys, etc. A major problem is cost. Costs are some 100 to 200 times that of conventional plants. Solar cells however have many advantages. They convert solar energy directly to electric energy. Once installed, they need relatively little maintenance. They can use diffused radiation. Currently, the major effort is to reduce costs by manufacturing techniques. One approach is the development of thin film cells made by spraying cadium sulfide or other photo-sensitive materials on a substrate. One of the problems which must be overcome is energy consumption in production. A single crystal silicon cell will take two years of continuous cell output of electricity to pay back the energy

used in its construction.

Another method of generation of electric power with solar energy are wind machines. The federal government has recently installed a 100-kilowatt wind machine at Sandusky, Ohio. The basic problem with the use of wind, however, is that it either blows too hard or not at all. To be technically feasible, the site for a wind machine must have a mean wind speed of approximately 18 miles per hour in an area that very seldom would have wind speeds in excess of 60 miles per hour or less than 10 miles per hour. In other words, to be technically feasible, the area must have an almost constant wind of around 18 miles per hour.

According to federal data, Nevada has a very low wind potential.

Other long-term possibilities for generating energy are available--the so-called bio-mass or photosynthesis where a fibrous material or other biosystem will be grown specifically for conversion to fuel, and also generation by ocean thermal gradients, chemical conversion, and others.

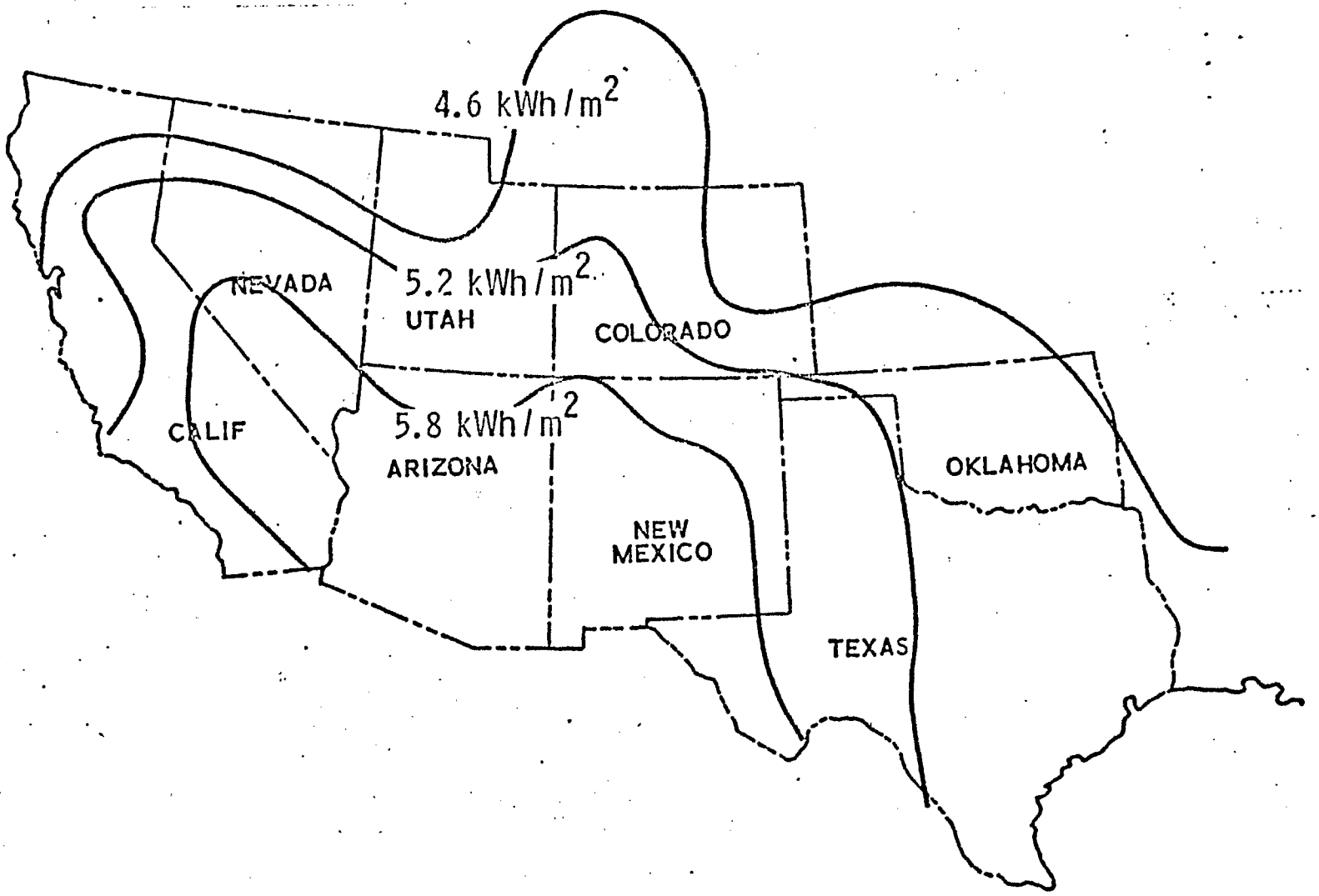
Estimating the potential of solar energy as a future energy supply for the nation would be much easier if the sun were available 24 hours a day. One answer is to find ways of storing energy for use during the night and during cloudy days. A major research effort has been ongoing to devise efficient methods of storage. However, none has really provided a proper answer. The first solar stations will have to use insulated storage tanks to hold hot fluids, liquid metals, or molten salt. Batteries have not proven a good method of storage but extensive research is continuing in this area.

The problem of reliability is a fundamental issue in the use of solar energy. Capacity displacement or availability around the clock of energy up to the full rating of the system is required. Even if economical solar conversion methods are found, the need for expensive storage to carry you through the

night and over cloudy, stormy hours will prevent solar energy from deeply penetrating into the nation's total energy needs.

Estimates have been given that solar energy could possibly supply from 5 to 30% of our energy needs by the year 2000. Certainly with major effort, solar energy should be able to furnish some of our energy requirements by that year, but it will take a major effort to develop the technology necessary. Not only must the engineering technologies be considered but also the social and institutional problems involved. Solar energy is considered to be the earth's ultimate energy source. By the last half of the next century it should be supplying the majority of our energy needs but there is a lot of hard work between now and then.

EXHIBIT F



MEAN ANNUAL DAILY INSOLATION

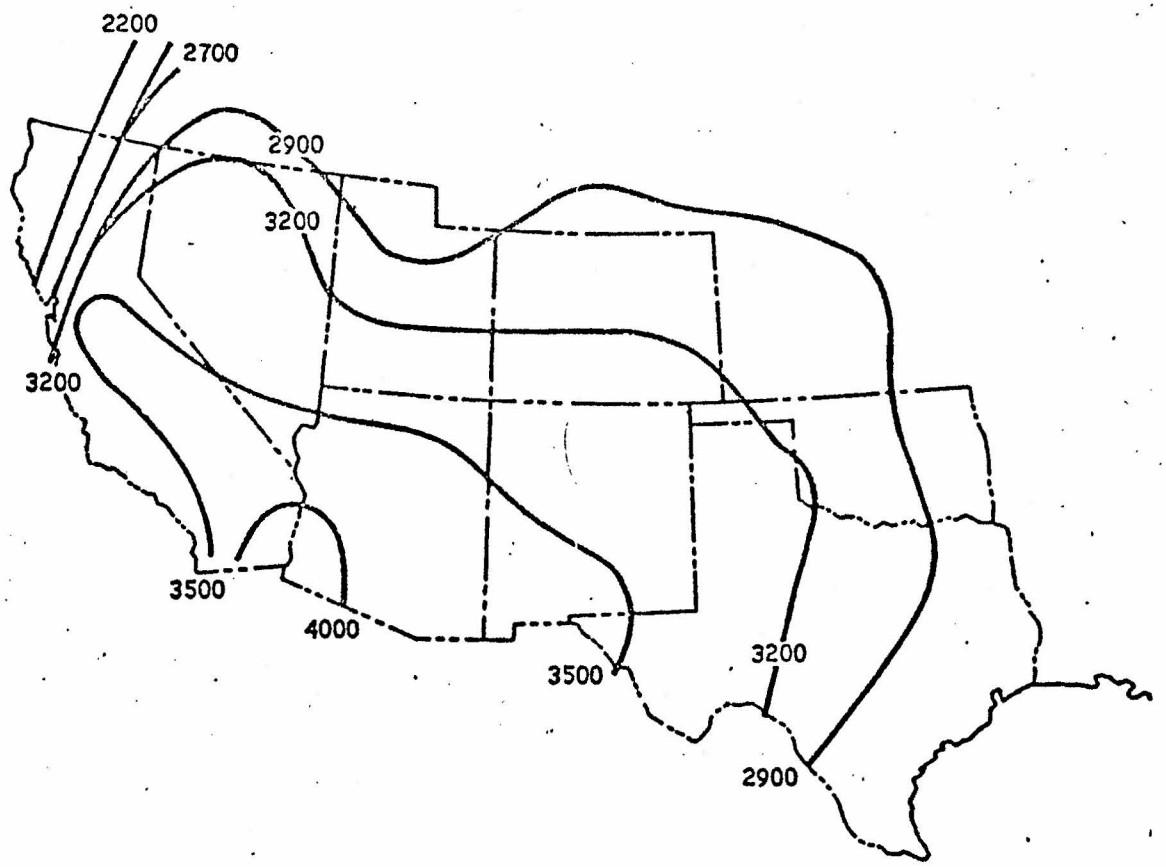


Figure B-2. MEAN TOTAL ANNUAL HOURS OF SUNSHINE

EXHIBIT F

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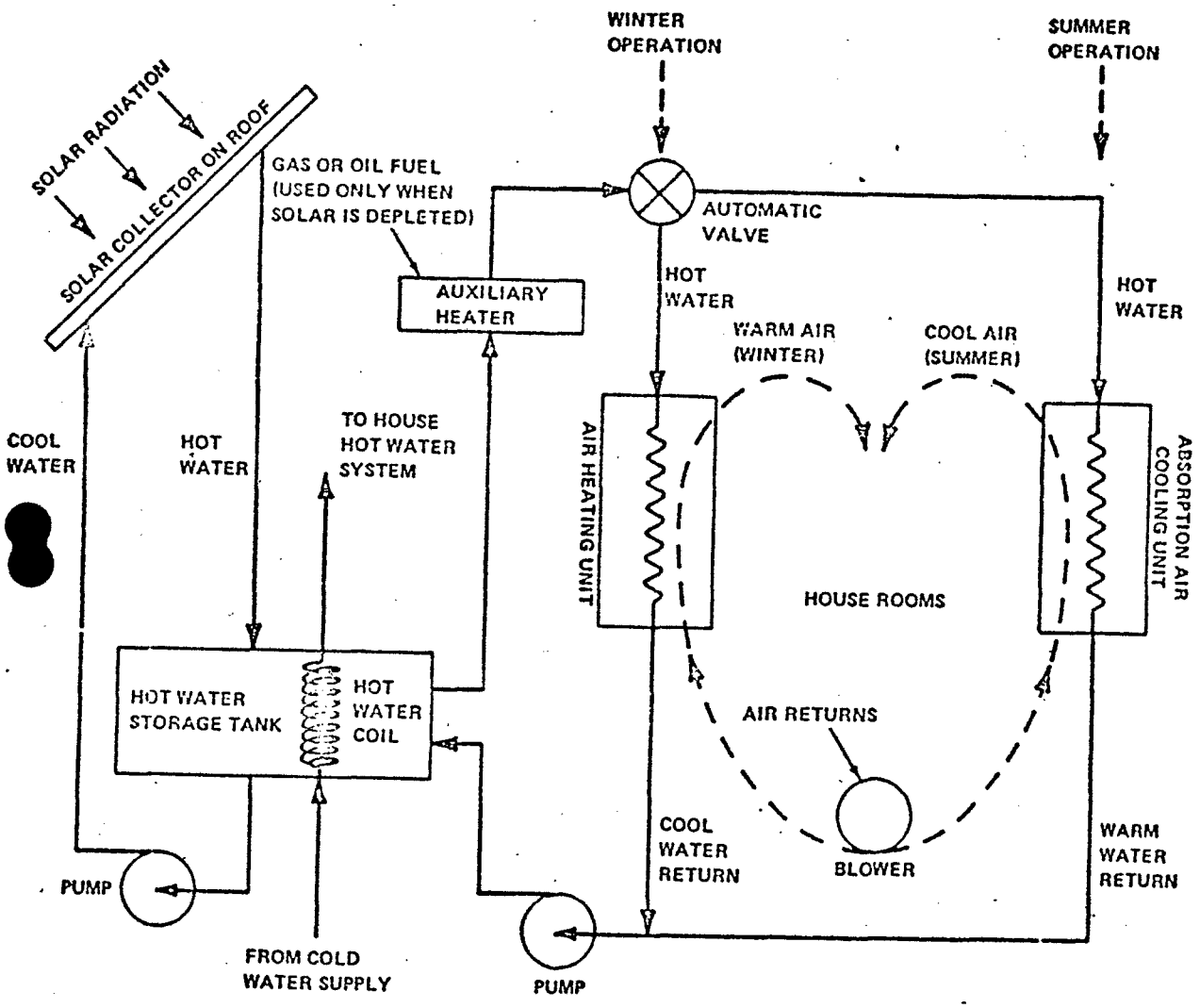
Present Status of Solar Utilization Techniques

Application	Status					
	Research	Development	Systems test	Pilot plant demonstration	Prototype plant	Commercial readiness
Thermal energy for buildings						
Water heating	X	X	X	X	X	X
Building heating	X	X	X			
Building cooling	X	X				
Combined system	X	X				
Renewable clean fuel sources						
Combustion of organic matter	X	X	X	X		
Bioconversion of organic materials to methane	X	X	X	X		
Pyrolysis of organic materials to gas, liquid, and solid fuels	X	X	X	X	X	
Chemical reduction of organic materials to oil	X	X	X			
Electric power generation						
Thermal conversion	X					
Photovoltaic						
Residential/commercial	X					
Ground central station	X					
Space central station	X					
Wind energy conversion	X	X	X			
Ocean thermal difference	X	X	X			

X indicates effort is underway but not necessarily comp[illegible]



RESIDENTIAL HEATING AND COOLING WITH SOLAR ENERGY: SCHEMATIC DIAGRAM OF ONE ALTERNATIVE

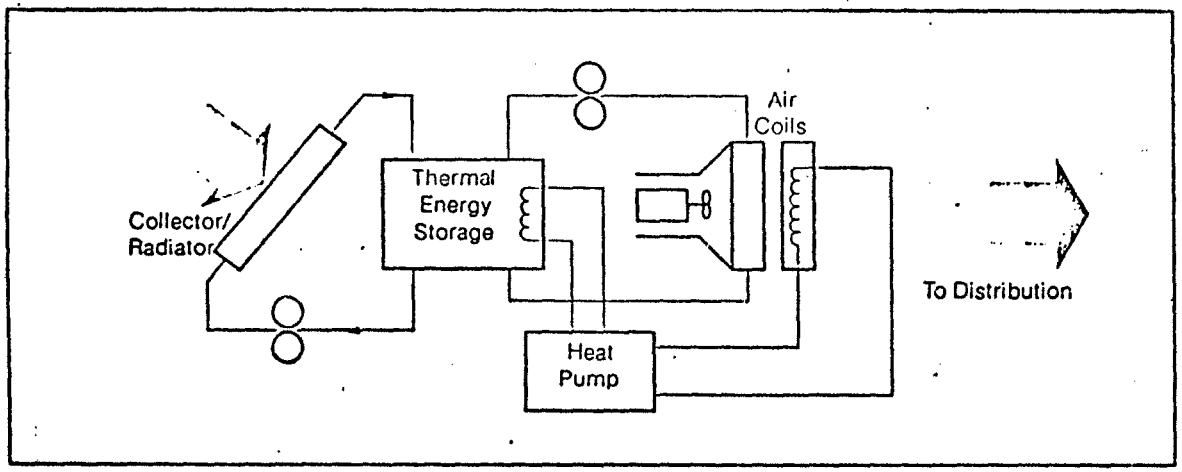
EXHIBIT F

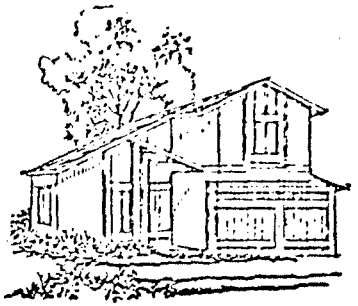
241

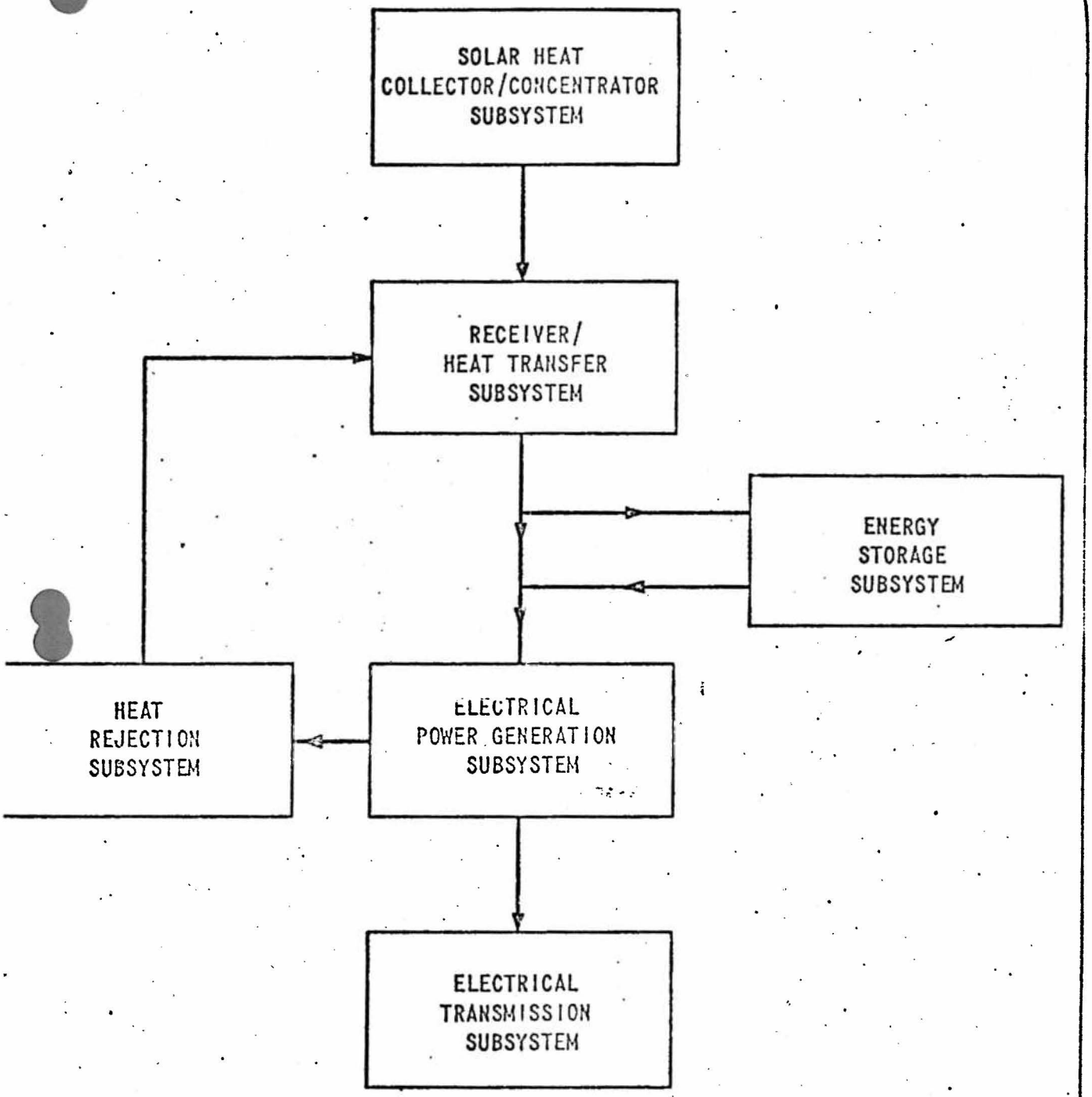
HEATING AND COOLING OF BUILDINGS
PRINCIPAL PROBLEMS

- **TECHNICAL**
  - SYSTEM OPTIMIZATION
  - MASS PRODUCTION
- **ECONOMIC**
  - UNIT PRICE REDUCTION
  - INITIAL VS. LIFE-CYCLE COSTS
- **ENVIRONMENTAL**
  - GLARE
  - HEAT REJECTION
  - TOXIC SUBSTANCES
- **SOCIOLOGICAL**
  - AESTHETICS
  - ACCEPTANCE
  - VANDALISM
- **INSTITUTIONAL**
  - INDUSTRY CONSERVATION
  - FINANCING PROBLEMS
  - BUILDING CODES
  - 3-D ZONING

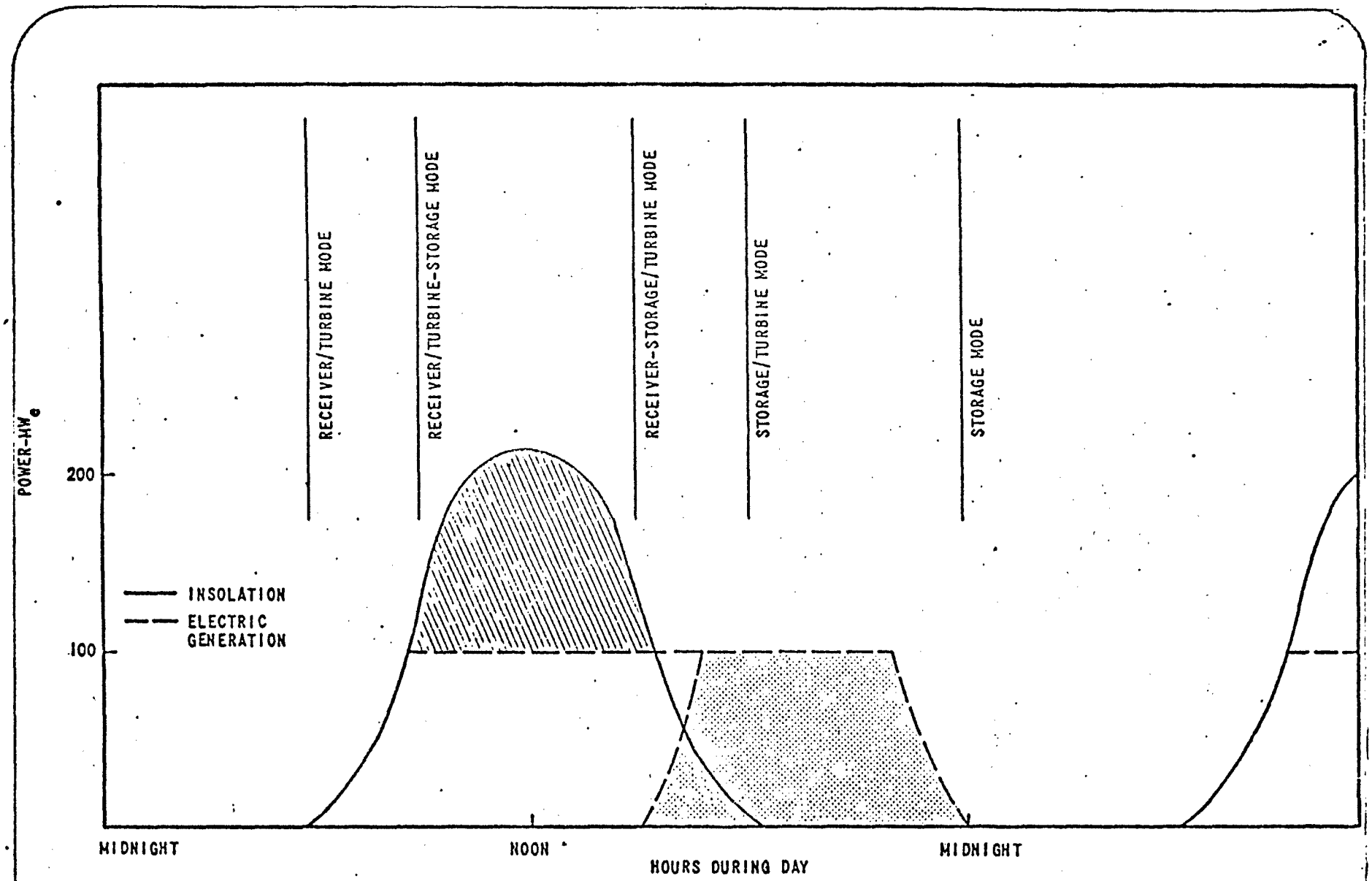
Schematic of a solar-assisted heat pump system. The heat pump draws energy from water in the storage tank when the outside temperature is low. Since a heat pump can function with relatively low-temperature water, an inexpensive collector system suffices and the collector area on roof is minimal.







GENERAL BLOCK DIAGRAM OF WATER/STEAM SOLAR THERMAL REFERENCE SYSTEMS



NOTE: RECEIVER/STORAGE MODE NOT ILLUSTRATED.

DAILY OPERATION SHOWING INSOLATION AND ELECTRIC GENERATION FROM D[redacted]CT AND STORED SOLAR ENERGY

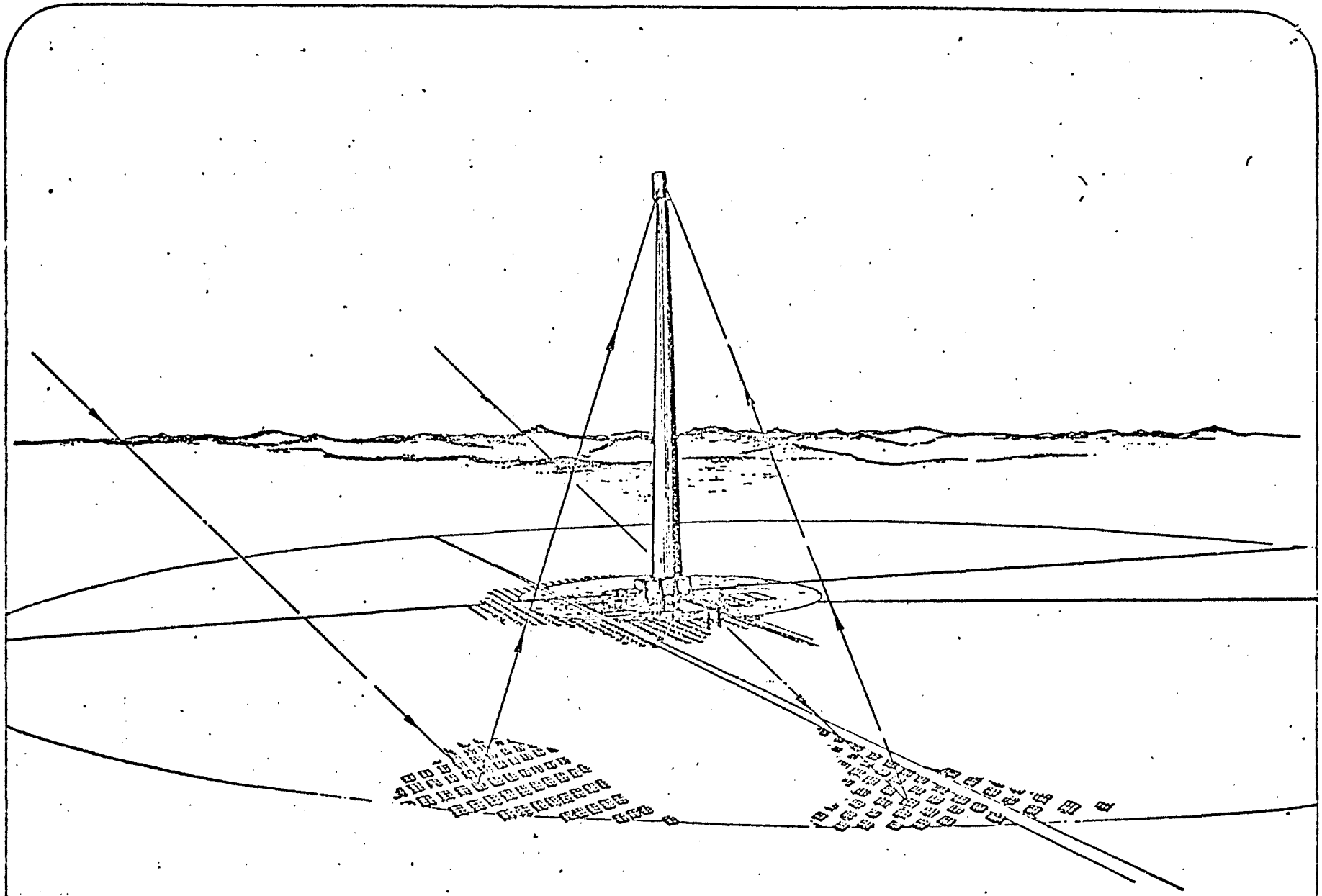
EXHIBIT F

THERMAL-ELECTRIC PRINCIPAL PROBLEMS

- **TECHNICAL**
  - A/E OPTIMIZATION
  - COLLECTOR DESIGN
  - POWER-CYCLE DESIGN
  - STORAGE DEVELOPMENT
  - NETWORK MATCHING
- **ECONOMIC**
  - FABRICATION-EMPLACEMENT COSTS
  - LAND REQUIREMENTS
  - OPERATION AND MAINTENANCE
  - BASELOAD-PEAKING CONSIDERATIONS
  - SIZE VS. COST TRADEOFFS
  - SITE RELATIVE TO LOAD
- **ENVIRONMENTAL**
  - IMPACT OF SHADING
  - HEAT REJECTION
  - INTERFACE WITH LAND USES
  - WATER CONSUMPTION
  - TRANSMISSION LINES
- **SOCIOLOGICAL**
  - AESTHETICS
  - PUBLIC ACCEPTANCE
  - SAFETY
  - IMPACT ON LOCAL ECONOMY
- **INSTITUTIONAL**
  - OWNERSHIP
  - INSURANCE
  - LAND AND WATER RIGHTS
  - LICENSING
  - UTILITY ACCEPTANCE

EXHIBIT F

246 10



CONCEPTUAL VIEW OF CENTRAL RECEIVER SOLAR ELECTRIC GENERATING FACILITY

EXHIBIT F

50 MW_E PHOTOVOLTAIC STANDARD PLANTS COLLECTOR FIELD PARAMETERS

	SILICON		CADMIUM SULFIDE		GALLIUM ARSENIDE	
CELL EFFICIENCY	0.10	0.20	0.05	0.10	0.15	0.20
FIELD SHAPE	RECTANGULAR		RECTANGULAR		SQUARE	
ARRAY AREA KM^2	0.64	0.33	1.16	0.58	0.11	0.08
ARRAY/FIELD RATIO	0.56	0.51	0.30	0.29	0.31	0.27
FIELD AREA KM^2	1.15	0.65	3.85	1.99	0.35	0.30

PHOTOVOLTAIC -- PRINCIPAL PROBLEMS

- TECHNICAL
  - CELL TYPES AND TECHNOLOGY
  - MASS PRODUCTION
  - SYSTEM OPTIMIZATION
  - CONVERSION, TRANSMISSION, STORAGE
  - INTERFACING WITH NETWORKS
- ECONOMIC
  - 50/1 TO 75/1 COST REDUCTION
  - AVAILABILITY OF MATERIALS
  - LIFE-CYCLE COSTS OF ELEMENTS
  - SITING VS. LOAD CENTERS
  - SYSTEM UNCERTAINTIES AND RISKS
- ENVIRONMENTAL
  - IMPACT OF SHADING
  - HEAT REJECTION
  - WATER CONSUMPTION (H_2)
  - TRANSMISSION LINES
- SOCIOLOGICAL
  - COMPETING LAND USAGE
  - PUBLIC ACCEPTANCE
  - SAFETY
- INSTITUTIONAL
  - LAND-USAGE CONSTRAINTS
  - LAND AND WATER RIGHTS
  - OWNERSHIP
  - CODES
  - IMPACT ON UTILITIES

EXHIBIT F

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100 KW
EXPERIMENTAL
WIND TURBINE
GENERATOR

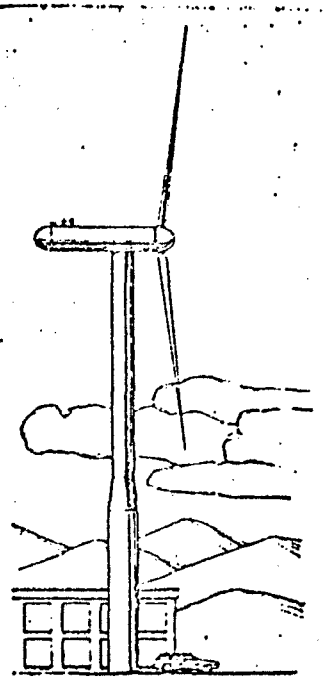
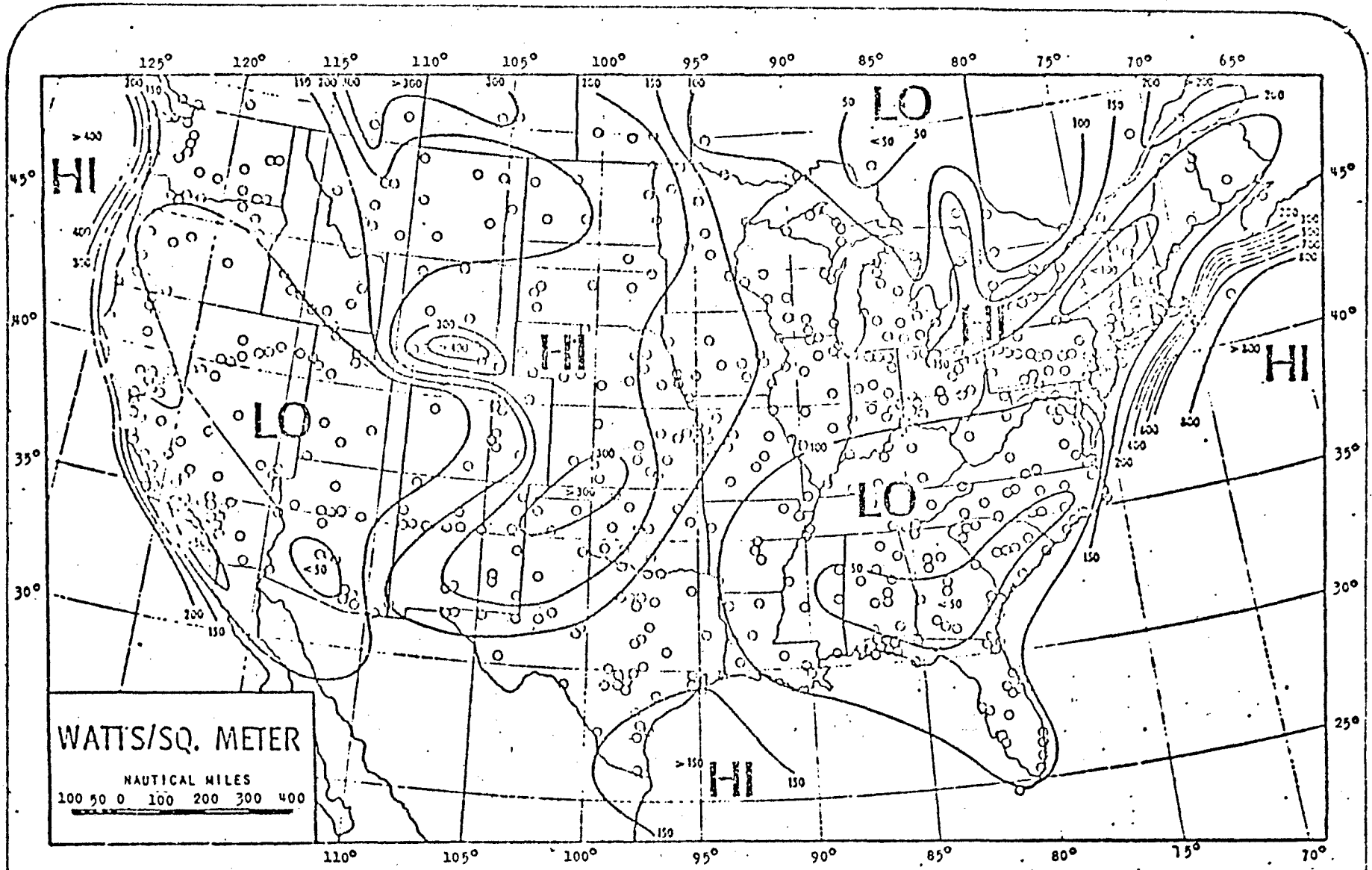


EXHIBIT F

WIND -- PRINCIPAL PROBLEMS

- TECHNICAL
  - DESIGN OPTIMIZATION
  - RELIABILITY
  - SYSTEM INTEGRATION
  - MASS PRODUCTION
  - WIND ENERGY DATA
  - SITING CONSIDERATIONS
- ECONOMIC
  - PRICE REDUCTION THRU MASS PRODUCTION
  - MATERIALS AVAILABILITY
  - LIFE-CYCLE COSTS
  - SYSTEM REVENUES VS. TIME
  - SITING RELATIVE TO LOAD
  - LAND REQUIRED
- ENVIRONMENTAL
  - METEOROLOGICAL IMPACT
  - IMPACT OF TRANSMISSION LINES
  - THERMAL POLLUTION
- SOCIOLOGICAL
  - AESTHETICS
  - PUBLIC ACCEPTANCE
  - SAFETY
  - SECURITY
- INSTITUTIONAL
  - CODES
  - OWNERSHIP
  - WIND RIGHTS
  - LAND AND WATER RIGHTS
  - INTERFACE WITH UTILITIES

EXHIBIT F

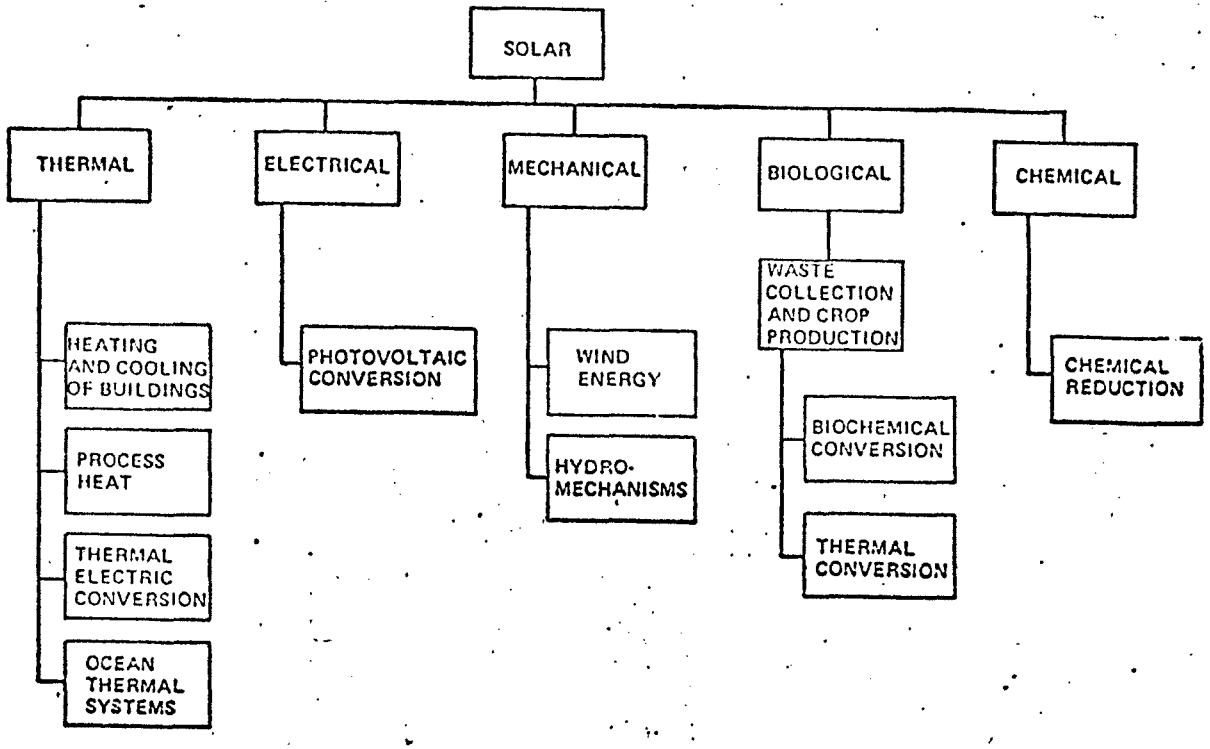


AVAILABLE WIND POWER - ANNUAL AVERAGE

Final Pattern. J.W. Reed, Div 5644, Sandia Laboratories, Nov. 8, 1974.
From: WEATHERWISE 27 6 Dec 1974

EXHIBIT F

GENERAL PROGRAM STRUCTURE FOR SOLAR ENERGY



Impact of Solar Energy Applications on the Reference Energy System[1]

System	Year	Annual consumption[2] (10^{15} BTU)	Percent of total energy consumption in USA	Estimated percent of market captured	$10^6 Annual savings in fossil fuel @ $1.00/ 10^6 BTU	Significance[6] of impact on reference energy system by 2020
Thermal energy for buildings	1985	[3]17	15	<1		Major on building industry
	2000	[3]21	12	10	2,100	Minor on total energy
	2020	[3]30	10	35	10,500	consumption
Conversion of organic materials to fuels or energy						
Combustion of organic matter	1985	37	32			Major on electric utility
	2000	76	43	1	760	Modest on total energy
	2020	160	53	10	16,000	consumption
Bioconversion to methane	1985	[4]27	23	1	270	Major on gas consumption
	2000	[4]31	18	10	3,100	Minor on total energy
	2020	[4]41	14	30	12,300	consumption
Pyrolysis to liquid fuels	1985	[5]50	44			Major on oil consumption
	2000	[5]63	36	1	630	Minor on total energy
	2020	[5]80	27	10	8,000	consumption
Chemical reduction to liquid fuels	1985	[5]50	43			Major on oil consumption
	2000	[5]63	36	1	630	Minor on total energy
	2020	[5]80	27	10	8,000	consumption
Electric power generation						
Thermal conversion	1985	37	32			Modest on electric utility
	2000	76	43	1	760	industry
	2020	160	52	5	8,000	Modest on total energy consumption
Photovoltaic						
Systems on buildings	1985	[3]9	9			Major on building industry
	2000	[3]15	9	5	750	Minor on total energy
	2020	[3]21	6	50	10,500	consumption
Ground stations	1985	37	32			Major on electric utility
	2000	76	43	1		industry
	2020	160	52	10	16,000	Modest on total energy consumption
Space stations	1985	37	32			Major on electric utility
	2000	76	43	1	760	industry
	2020	160	52	10	16,000	Modest on total energy consumption
Wind energy conversion	1985	37	32			Major on electric utility
	2000	76	43	1	760	industry
	2020	160	52	10	16,000	Modest on total energy consumption
Ocean thermal difference	1985	37	32			Major on electric utility
	2000	76	43	1	760	industry
	2020	160	52	10	16,000	Modest on total energy consumption

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EXHIBIT E

ELECTRICAL WEEK
THE ELECTRIC UTILITY INDUSTRY NEWSLETTER / A McGRAW-HILL PUBLICATION

INSIDE THIS ISSUE

January 29, 1979

DOE EYES POSSIBLE RATE INTERVENTIONS IN BID TO SPUR PLANT CONSTRUCTION

The Dept. of Energy may eventually intervene in utility rate-relief cases to argue for adequate rate levels for utilities with lagging nuclear and coal-fired construction programs. Such interventions, before state regulatory commissions, would be staged where utility financial difficulties are seen as the cause of the stalled plant construction. DOE's concern is that behind-schedule construction of nuclear and coal-fired generation is boosting oil consumption.

While no policy decision has been made, DOE sources say, discussions among top-level department officials have indicated that interventions ultimately will be likely. The timing is uncertain because DOE currently lacks the staff resources to develop detailed positions in individual rate cases. Thus, as a starting point, DOE sources say, DOE will communicate to selected state commissions – perhaps by letter – the department's concern over stalled plant construction and the implications for national oil-reduction policy. A number of utilities, most recently Alabama Power, have approached DOE on revenue-adequacy problems they're having with state commissions. DOE officials feel that a half-dozen or so utilities face severe financial barriers to completing nuclear or coal-fired construction – among them: Alabama Power, Northeast Utilities and Public Service of New Hampshire.

DOE is already planning "rate-structure" interventions under the Public Utility Regulatory Policies Act (PURPA), but "rate level" is another issue (one that DOE has never tackled in an evidentiary hearing), and interventions on that question would probably be staged separately, sources say. If it chose to, however, DOE could address rate level in a PURPA proceeding because fuel conservation (particularly oil savings) is one of PURPA's objectives. In any rate-relief interventions, DOE would argue that oil displacement aids ratepayers as well as the national interest. In discussing possible interventions, DOE officials now are weighing what kind of showing the department would have to make, the types of analyses required and the types of issues that would have to be addressed.

In a related effort, DOE is looking for ways to speed up decision-making by federal agencies whose procedures may be adding to nuclear and coal-fired construction lag. (Officially this is a role of the energy coordinating committee, an interagency group headed by Energy Secretary James Schlesinger.) But although DOE officials say that some bureaucratic lag can be cut from the federal-agency system without affronting the agencies' independence, the gains would be slight without corrective legislation.

One thing frustrating DOE is that utility oil consumption is rising despite the fact that few new baseload oil-fired units are being built. It was with that in mind that David Bardin, head of DOE's Economic Regulatory Administration, told an American Public Power Assn. meeting in Washington last week that attacking the lag in utility construction is "one of our most critical problems in the next 10 years." Commenting on the peaking exemption for oil-fired combustion-turbines in the Fuel Use Act, Bardin said: "The danger is that . . . we'll have peakers all over the place." – *Mel Ray, Washington Editor*

POWER BROKERING SAVED FLORIDA $10-MILLION – 'POOR MAN'S ECONOMIC DISPATCH'

With a firm nudge from the Florida Public Service Commission staff, some 13 electric utilities stepped up and formalized their power brokering activities last year to save a cool $10-million. With a relatively simple computer application beginning Thursday (Feb. 1), these utilities hope to wring another million or two out of their spinning reserve. And by the middle of the year, they will be ready to call for a few plant shutdowns or start-ups to get even more economies from their generating resources.

An insider describes the Florida power exchange practice as "the poor-man's economic dispatch." A Florida Electric Power Coordinating Group (FCG) source says it was patterned on "the way the New York Power Pool works when its computer is out of order." Even its most ardent boosters acknowledge that it lacks