Utility-Financing of Energy Conservation: A Short-Term Approach to Hawaii's Oil Dependency

Charlotte A. Carter-Yamauchi
Researcher

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Legislative Reference Bureau
State Capitol
Honolulu, Hawaii 96813

FOREWORD

This study on utility-sponsored energy conservation programs was undertaken in response to House Resolution No. 14, H.D. 1, adopted during the 1987 legislative session. House Resolution No. 14, H.D. 1, requested the Legislative Reference Bureau and the Public Utilities Commission to recommend legislation or rules to authorize the Commission to require that utilities provide financing mechanisms for consumers and producers to establish alternate energy and conservation technologies in Hawaii.

Accepting the premise that energy conservation is an immediately, viable means of increasing energy self-sufficiency, the report examines the structure and elements of utility-sponsored energy conservation programs, with findings and proposed legislation for a pilot project to evaluate the benefit of similar programs in Hawaii.

The Bureau extends its sincere appreciation to the following individuals whose cooperation in providing information, assistance, and guidance in the preparation of this study was invaluable: Gerald Lesperance, Lynn Y. S. Zane, Bud Barlow, James Leonard, and Carilyn Shon of the Energy Division, Department of Business and Economic Development; William Milks, Executive Director of the Consumer Advocacy Division, Department of Commerce and Consumer Affairs; George Iwahiro, Ann Yamamoto, and Alan Lloyd of the Hawaiian Electric Company, Inc.; Richard Neill of the Hawaii Natural Energy Institute; Norman Lee of the Public Utilities Commission; Deborah Bernau of the National Conference of State Legislatures; Paul Markowitz of the Energy Conservation Coalition, Paul Storms, Investigator, Utilities Division of the Arizona Corporation Commission; Dave Schunke, Supervisor, Engineering Section of the Idaho Public Utilities Commission; Jeffery M. Fang, Director, Energy Conservation Programs, Illinois Commerce Commission; Dawn M. Vance, Public Information, Utilities Division, Iowa State Utilities Board; Elizabeth Paine, Director of Finance, Maine Public Utilities Commission; Thomas Henderson, Senior Analyst, Nevada Public Service Commission; Sam Swanson, Chief, Energy Conservation and Environmental Analysis, Office of Energy Conservation and Environment, New York State Department of Public Service; Steven Schue, Economist, Oregon Public Utilities Commission; and to each person listed in Appendix A.

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Samuel B. K. Chang
Director

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Chapter 1

INTRODUCTION

The 1986 revision of the Hawaii State Plan identifies, as one of its primary goals, achieving increased energy self-sufficiency through alternative energy development and energy conservation. Presumably with that goal in mind, the Fourteenth Legislature, 1987 Regular Session, adopted House Resolution No. 14, H.D. 1 (see Exhibit 1), requesting the Legislative Reference Bureau and the Public Utilities Commission to study and recommend necessary legislation and/or rules for the Public Utilities Commission to require electric utilities to initiate programs that would provide financing mechanisms for individual consumers and producers to establish alternate energy and conservation technologies in Hawaii.

Salient Points of House Resolution No. 14, H.D. 1

House Resolution No. 14, H.D. 1, sets forth the following principal assumptions and concerns:

(1) Reductions in the cost of electricity have not kept pace with oil price reductions in recent years. Development of the State's alternate energy industry has not progressed as rapidly as anticipated, partly because of the perception that the industry lacks economic viability. Nevertheless, alternate energy technologies present the only alternatives for achieving independence from nonrenewable sources of energy.

(2) Energy utilities possess both the technical expertise and large amounts of capital to invest in alternate energy ventures and conservation improvements. Moreover, in some areas of the country, utilities have become the major source of financing for these activities.

(3) Utility financing programs generally fall into three broad categories: direct loans, loan guarantees, and rebates. The majority of the programs offered are direct loans with interest rates ranging from zero to current market rates. The following have sponsored successful financing programs: Portland General Electric Co., Pacific Gas and Electric Co., Tennessee Valley Authority, Bonneville Power Administration, and utilities operating in New York State.

(4) Utility financing programs are economically simplistic and provide important benefits. Nevertheless, important issues must be addressed prior to developing utility financing programs.

The resolution requested the Bureau and the Commission to:

(1) Study utility financing programs and to recommend legislation or rules authorizing the Commission to require that utilities develop similar programs in Hawaii, and

(2) Enlist the assistance of the Energy Division, Department of Business and Economic Development, the Consumer Advocate, and the local electric utilities.

Methodology

Staff from the Bureau and the Commission met initially to formulate an approach to the study and assign various tasks to be accomplished. It was agreed that the Bureau would undertake the majority of the report drafting, with the Commission providing input and technical assistance for subject areas within its expertise. Additionally, commission staff drafted several subsections of the report; these are identified and authorship is acknowledged where appropriate. Bureau and commission staff shared data gathering activities and jointly met with each party or a representative thereof, as requested in the resolution, for discussion and information gathering.

To obtain data from on-going utility financing programs, the Commission sent letters requesting information to nineteen state public utilities commissions as well as Tennessee Valley Authority and Bonneville Power Administration. These jurisdictions are listed in Appendix A. All but one jurisdiction responded, and most responses included a wealth of information on utility-sponsored energy conservation programs. Other data gathering activities included contacting the United States Department of Energy and various energy conservation organizations and reviewing a multitude of written material on alternate energy and energy conservation. To a lesser extent, background review was conducted of materials on petroleum supply and pricing, the utility ratemaking process, and traditional energy technologies and supply.

Based upon the interviews and research on alternate energy technologies, it became apparent that the stumbling blocks to immediate, large-scale alternate energy development are too complex to be alleviated by the type of utility financing programs envisioned by House Resolution No. 14, H.D. 1. Nonfossil fuel sources clearly provide the long-term answer to Hawaii's energy supply problem. But large-scale development of these alternate energy sources requires the commitment of resources on a level considerably higher than what can be achieved through utility financing programs. Furthermore, information obtained on these programs revealed that, with the exception of solar technologies, they concern financing for energy conservation measures. Accordingly, it was determined to focus the remainder of the study and recommended legislation on utility-sponsored energy conservation programs.

Organization of the Report

The report consists of the following:

Chapter 1 is the introduction.

Chapter 2 reviews the problem with continued reliance on imported oil.

Chapter 3 discusses the potential that alternative energy sources and energy conservation have for reducing the State's oil dependency.

Chapter 4 presents an overview of utility-sponsored energy conservation programs.

Chapter 5 discusses elements that should be considered in developing a utility-sponsored conservation program.

Chapter 6 contains findings and recommendations, including proposed legislation, and is followed by various exhibits and appendices.

Chapter 2

STATEMENT OF THE PROBLEM

The Oil Supply Dilemma

Although the energy crisis generated by the 1973 OPEC oil embargo is but a distant memory for many, energy experts warn that overdependence on this rapidly diminishing source of energy leaves us in a perilous position.[1] The United States accounts for nearly 35 per cent of the total free world's oil consumption (see Appendices B and C), while holding only 4 per cent of the world's oil reserves[2] (see Appendix D). Further, the vast majority of oil wells in the United States are nearing the end of their productive lives. Domestic production of oil peaked in the early 1970's and has been declining ever since. Proven oil reserves are down to approximately 27 billion barrels of oil, which is projected to last 9 years at current production rates or 5 years at present consumption rates.[3]

When the bottom fell out of the oil market in 1986, the price of a barrel of crude oil fell to less than one-third of what it was 5 years earlier: at the start of 1986, prices stood at $26 per barrel; by mid-1986, they had slipped below $10. The immediate effect of the price drop was a huge slump in domestic exploration and drilling, followed by a sharp decrease in domestic production.[4] As a result of the domestic oil slump, oil imports to the United States have increased dramatically from 27 per cent of total United States supply less than 2 years ago to nearly 40 per cent today.[5] Worse, United States dependency on oil imports is expected to increase if oil prices remain low. In fact, a recent United States Department of Energy report estimates that the United States will be importing 50 per cent of its oil needs by the mid-1990's.[6]

Increased United States reliance on imported oil heightens the importance of the politically volatile Persian Gulf region where two-thirds of the free world's reserves are located[7] (see Appendices D and E). The almost daily

appearance of news articles concerning mounting tension in the Persian Gulf reminds us that a disruption in the flow of oil or a sharp price escalation in the world oil market could have a crippling impact on our economic and societal well-being. Indeed, recent political events already have created price swings, with the oil market "rising and falling in direct relation to the amount of tension in the Gulf at any given moment."[8]

Hawaii's Oil Dependency

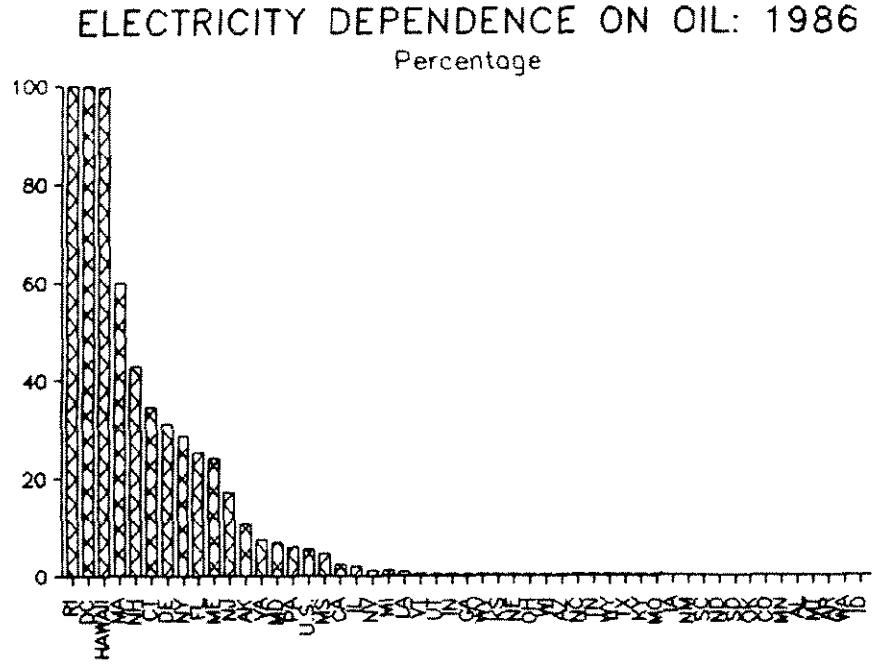
The outlook is even more bleak for Hawaii where oil plays a major role in the State's economy. As a result of their volcanic origins, the Hawaiian Islands have no indigenous fossil fuels such as oil, coal, or natural gas. Accordingly, the State must rely upon imported fuel for most of its energy needs. Unlike most of the other 50 states, however, Hawaii depends upon oil for over 90 per cent of its total energy needs (see Figure 1). This reliance on oil is twice the national average (see Appendix F and Figure 2). Furthermore, oil is the source of almost 90 per cent of Hawaii's electricity. This is in dramatic comparison to the rest of the nation, where the majority of electricity is generated by coal, followed by nuclear power, natural gas, and hydroelectricity. Oil, on the other hand, generates only 4 per cent of the electricity (see Figure 3).

In 1985, Hawaii spent approximately 10 per cent of the gross state product or over $1 billion to import oil.[9] Last year, over half of the imported oil came from foreign countries, including those in the Middle East (see Figure 4). Consequently, Hawaii is extremely vulnerable to possible oil supply disruptions or price increases threatened by current political instability in the Middle East. Moreover, the combination of the net outflow of dollars for oil, Hawaii's near-total dependence on imported oil, and the political unrest of major oil producing nations threaten the State's economic stability and cast doubt on its ability to meet future energy needs.[10]

Recognizing Hawaii's vulnerability, the Hawaii State Plan, in establishing priority guidelines to address areas of statewide concern, has identified the

objective of increasing energy self-sufficiency by pursuing a policy of reducing dependence on oil while providing an adequate and dependable supply of energy at reasonable cost. The plan envisions achieving this goal through the development and commercialization of alternative energy sources and the conservation of energy.[11]

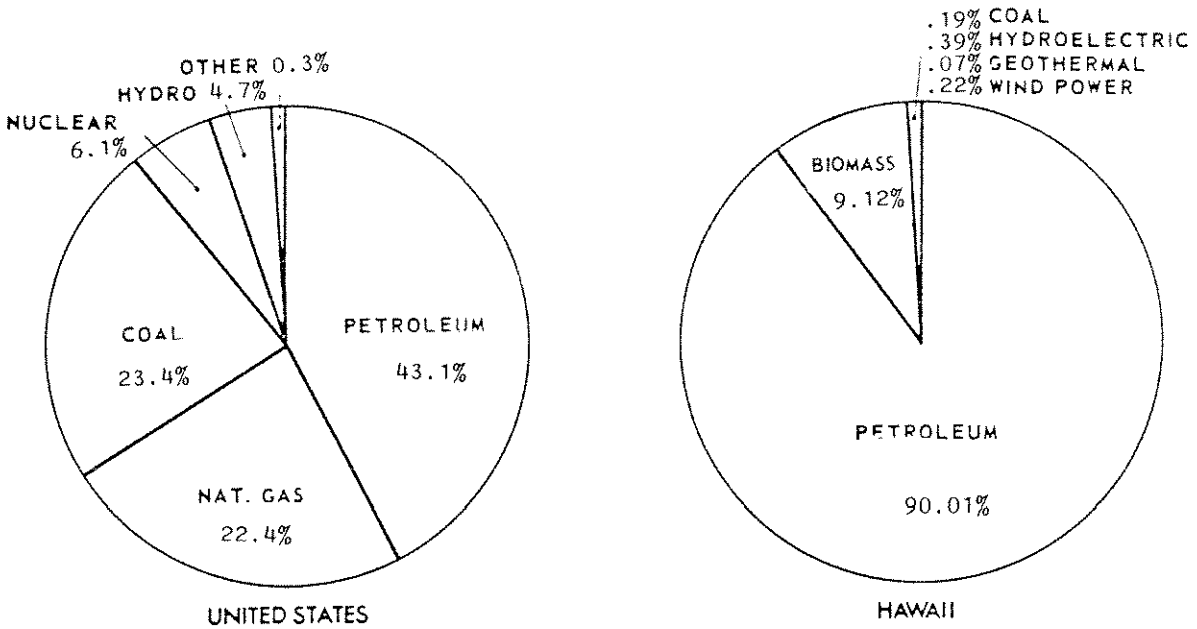
Figure 1



Source: Data obtained from Department of Business and Economic Development, Energy Data Services.

Figure 2

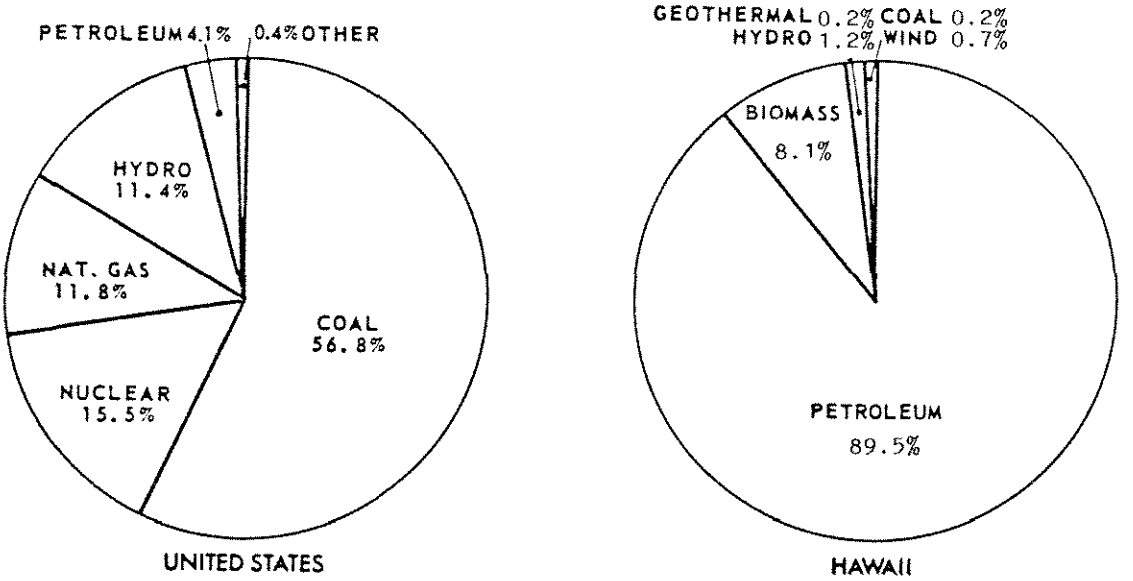
ENERGY USE BY SOURCE, U.S. & HAWAII: 1986



Source: Data obtained from Department of Business and Economic Development, Energy Data Services.

Figure 3

ELECTRICITY BY SOURCE, U.S. & HAWAII: 1986



Source: Data obtained from Department of Business and Economic Development, Energy Data Services.

Figure 4

HAWAII NET PETROLEUM IMPORTS
(Thousand barrels per day)

Year	Total amount	Domestic Amount	Domestic Percent	Foreign Amount	Foreign Percent
1982	151.7347	46	41	65.0	59
1983	155.3027	47	42	66.0	58
1984	171.4266	63	53	55.3	47
1985	169.5067	65	58	46.9	42
1986	170.7720	55	44	71.7	56

Source: Department of Business and Economic Development, records.

Chapter 3

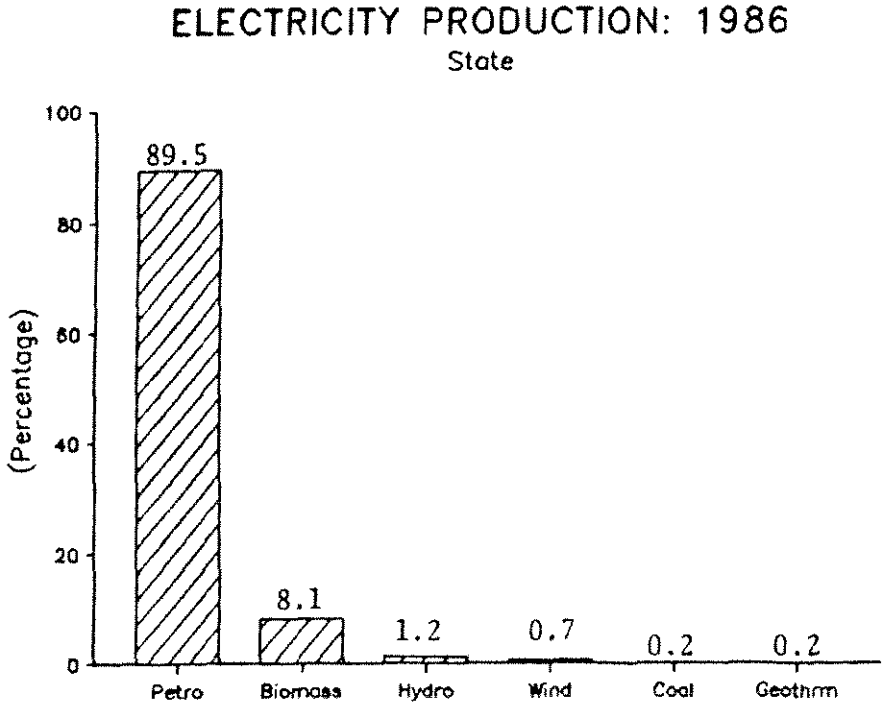
SOLVING HAWAII'S ENERGY PROBLEMS

Part I. Developing Alternative Energy Sources: A Supply-side Option

Although lacking in fossil fuels, the Hawaiian Islands are blessed with an abundant supply of indigenous energy resources which ultimately are expected to replace oil in satisfying the State's energy requirements. These "alternative" resources already satisfy over 10 per cent of the State's electricity production; the rest is generated by oil (see Figure 5). Despite this progress, Hawaii's alternative energy industries appear to be at various stages of development: some are in the experimental stages; others are technologically feasible, but do not yet appear to be sufficiently cost-effective for widespread commercialization. Moreover, most of the progress toward energy self-sufficiency has been on the neighbor islands, not Oahu where approximately 80 per cent of the State's population[1] consume 82 per cent of the electricity produced statewide.[2] Figure 6 graphically illustrates the considerable progress of the Neighbor Islands, especially the Big Island and Kauai, compared to Oahu where oil is needed for nearly 98 per cent of the electricity generated. This statistic is even more compelling in terms of Oahu's energy needs, considering that electricity production accounts for nearly 32 per cent of the State's total energy use (see Figure 7).

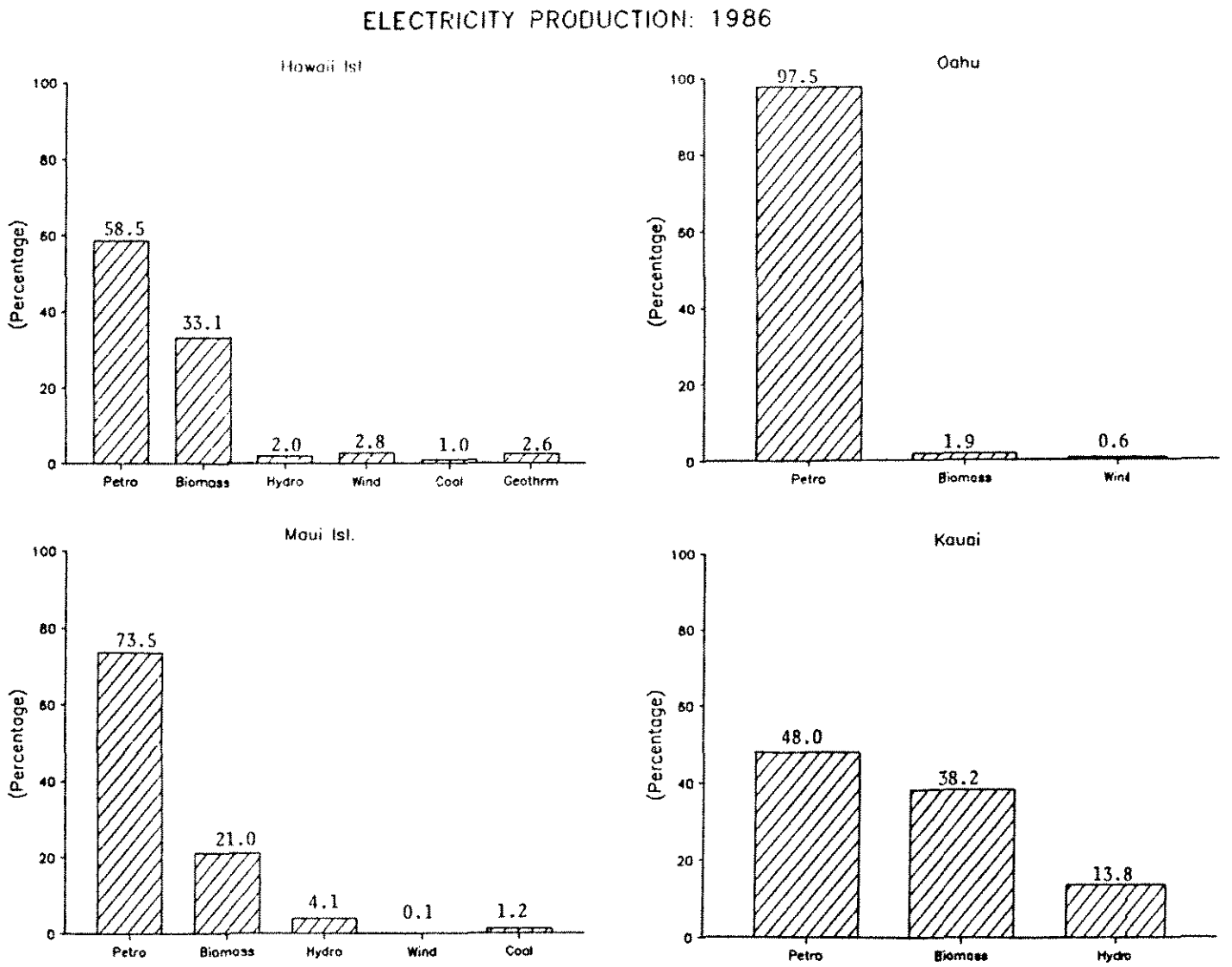
The development and potential of Hawaii's alternative energy resources is discussed in the remainder of Part I.

Figure 5



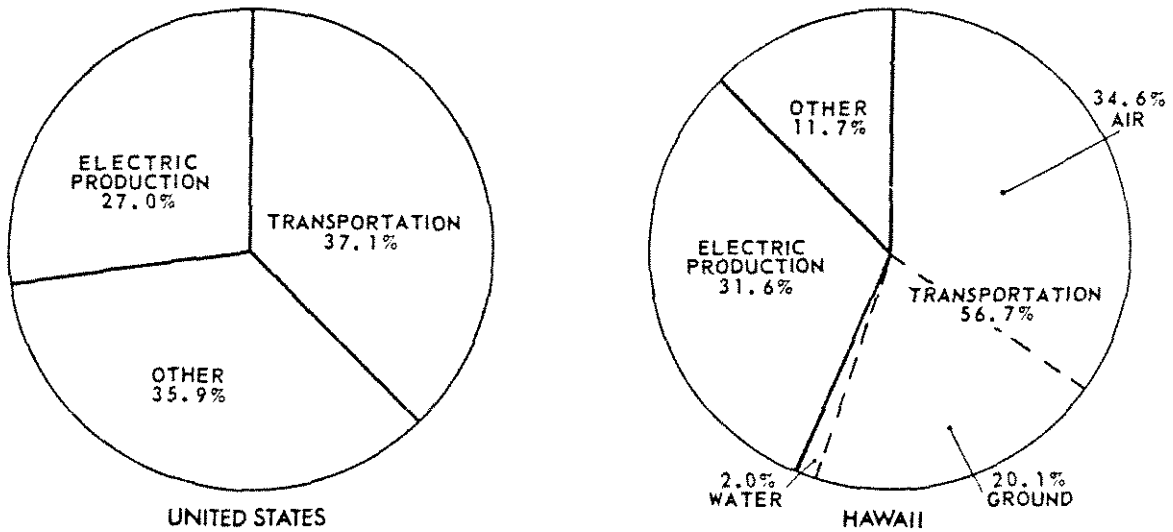
Source: Data obtained from Department of Business and Economic Development Energy Data Service

Figure 6



Source: Data obtained from Department of Business and Economic Development, Energy Data Service.

Figure 7
ENERGY USE BY SECTOR, U.S. & HAWAII: 1985



Source: Data obtained from Department of Business and Economic Development Energy Data Service

Geothermal

The brightest hope for a locally available alternative energy source is geothermal energy produced from the earth's internal heat. Superheated steam released from volcanically heated groundwater is piped through turbine generators, resulting in electricity. Studies have led to estimates that the Big Island alone is capable of producing between 1,000 and 3,000 megawatts of energy.[3] To put the potential of geothermal energy in perspective, the average power consumption of the entire State is approximately 800 megawatts.[4] Currently, geothermal supplies only .07 per cent of the State's energy needs (see Figure 2); this energy generates .2 per cent of the electricity produced statewide and 2.6 per cent of the Big Island's electricity (see Figures 5 and 6). However, one developer is expected to provide 25 megawatts of geothermal power to Big Island residents by the end of 1993. Also, the Hawaii Supreme Court recently cleared the way for a second

developer to begin exploration and development of 100 megawatts of geothermal resources on the Big Island.[5]

Further commercial development of geothermal energy will depend upon the price of oil[6] and the ability to transmit up to 500 megawatts of geothermal energy to Oahu.[7] This ability hinges on the development of a $450 million deep-water transmission cable between Oahu and the Big Island and the development of geothermal steam fields and construction of power plants that would cost an estimated $1.3 billion.[8] But even if the cable system proves technically feasible, several other issues concerning financing, construction, operation, ownership, and regulation will have to be resolved before the cable could be installed.[9]

OTEC

Another local possibility for producing very large quantities of energy lies in Hawaii's territorial waters.[10] Ocean thermal energy conversion or "OTEC" uses the temperature difference between warm surface ocean water and deep cold ocean water as a source to produce energy. Two major types of OTEC heat engines have been under study,[11] but commercial application is many years away. Further research is needed to identify and solve remaining technical and environmental problems and improve economic viability.[12]

Biomass

Biomass (a contraction for "biological mass") presents Hawaii's most versatile renewable energy resource, producing electricity as well as liquid and gaseous fuels for a variety of end uses.[13] Biomass is converted into energy through processes such as direct combustion, gasification, liquefication, and biochemical conversion. Although biomass includes agricultural crops, grasses, trees, algae, and animal wastes, it is most often associated with island sugar mills, which generate electricity by burning bagasse, a by-product of sugarcane processing, and sell the excess to island

electric companies. In 1986, biomass energy provided 38.2 per cent of the gross electricity produced on Kauai, followed by 33.1 per cent, 21 per cent, and 1.9 per cent on the Big Island, Maui, and Oahu, respectively (see Figure 6), and accounted for 9.12 per cent of the total energy used and 8.1 per cent of the electricity produced statewide (see Figures 2 and 3). Furthermore, restoration of Molokai's long-idle biomass plant, which is capable of providing 60 to 70 per cent of that island's electricity, reportedly is under consideration.

Hydropower

Hydropower, which converts the potential energy in rapid water flow into electricity, accounts for a significant portion of the electricity produced on the neighbor islands. In 1986, hydropower generated 9 megawatts or 13.8 per cent of Kauai's electricity, 6 megawatts or 4.1 per cent of Maui's electricity, and 4 megawatts or 2 per cent of the Big Island's electricity (see Figure 6). Oahu has little hydroelectric potential because the island's topography presents few suitable sites for its development. Seven additional hydropower installations are under consideration on the Big Island, Kauai, and Maui that could boost the State's hydroelectric capacity from 20 to 50 megawatts.[14]

Wind

Wind machines, or wind energy conversion systems (WECS), employ the kinetic energy of the wind to turn the aerodynamically shaped turbine blades to power a water pump or rotate magnets in a generator or alternator to produce electrical energy. Among the 50 states, Hawaii is second only to California in the supply of wind-generated electricity.[15] Almost 500 wind turbines supplied about 30 megawatts of power and 79 million kilowatt hours of electricity annually--nearly 1 per cent of the State's demand (see Figure 5).[16] The State's electricity requirement could be supplied many times over if wind energy potential alone is taken into account.[17] The islands'

prevailing northwest tradewinds and mountain ranges present excellent conditions for wind-generated electricity, especially on the Big Island (see Figure 6). But because the fluctuating nature of wind makes it unpredictable and, therefore, not a firm energy source, utilities estimate they can depend upon a wind penetration level of only 10 to 20 per cent of their total generating capacity.[18] Accordingly, long-term operating data and further research are needed to help solve reliability problems and improve the level of economic risk.[19]

Direct Solar

The sun provides about 14,000 times more energy than the amount of fossil energy consumed in one year.[20] Harnessing solar energy directly, however, is challenging because of sunlight's diffusion and variability. Consequently, unless it can be stored in sufficient amounts, it also presents reliability problems for electrical utilities in terms of reducing their peak power load requirements.[21] The most common means of utilizing solar energy is by collecting it in the form of heat and using the heat directly for heating water or for space heating or cooling. Solar hot water heaters are commonplace in Hawaiian homes, with over 40,000 installed.[22] It may be sometime, however, before the more exotic solar applications for converting sunlight into electricity, such as photovoltaic cells or solar ponds, will be in large scale commercial use.[23] For example, the technology behind photovoltaic systems, which use solar cells to collect and convert sunlight directly into electricity, requires large areas of land to produce substantial amounts of electricity and thus may be too expensive for large scale commercialization.[24] And solar ponds, which collect solar radiation and store it as heat for conversion to electricity, while attractive, are still in developmental stages.[25]

The Effect of PURPA

In addition to the constraints discussed in the preceding sections, the effect of oil prices on large-scale private development of alternative energy industries must be understood. The 1978 federal Public Utilities Regulatory Policies Act (PURPA) attempted to assist the alternative energy industry by requiring electrical utilities to buy alternative power when it is offered at the same price it would cost the utilities to produce the same amount of electricity in their own oil-fired generators.[26] This amount is known as the "avoided cost." When the price of oil was over $30 per barrel, PURPA helped spur alternative energy development.[27] At the moment, however, the industry is still suffering from the 1986 oil glut. The low cost of oil has had a discouraging impact on alternative energy investment because it results in reducing the amount utility companies must pay under PURPA to purchase electricity from alternative energy developers.[28] For example, when oil prices plunged from $32 a barrel of oil to under $20 a barrel in 1986, Hawaiian Electric's avoided cost dropped from almost 7 cents a kilowatt-hour to less than 4 cents.[29]

The current avoided cost is not sufficiently attractive to encourage large investment in alternative energy development. In fact, it has been estimated that further progress in developing alternative energy industries will not be financially attractive until the price per barrel rises well over $20; and it will have to rise higher than $30 per barrel to make it attractive to pursue bringing geothermal electricity to Oahu.[30]

Summary

Although considerable progress has been made toward achieving energy self-sufficiency through alternative energy resources on the neighbor islands, there has been comparatively little advancement on Oahu. And, Hawaii cannot achieve energy self-sufficiency through alternative energy resources unless that energy reaches Oahu. This is unlikely to happen until various technical, environmental, and financial constraints on alternative energy

development can be overcome or alternative energy produced on neighbor islands can be transmitted to Oahu.[31] Accordingly, the statewide transition from an oil-based to an alternative energy economy appears to be years away.

Thus, absent considerable improvements in market conditions and technology or additional, substantial subsidies, alternative energy does not provide the immediate solution to Hawaii's energy problem. Given the State's extreme vulnerability and need to ensure future energy supply, it is critical to reduce the State's dependency on oil as rapidly as possible.[32] Hawaii cannot sit idle, waiting for market conditions to improve and technology to be developed, while other energy options exist that are immediately available. Energy conservation is one option that should not be overlooked as an interim approach to reducing dependency on imported oil.

Part II. Conserving Energy: A Demand-side Strategy

Traditionally, energy needs have been met by increasing available supplies; i.e., a supply-side strategy. Energy conservation, on the other hand, is a demand-side strategy that stretches current supplies by increasing the efficiency of energy use. Instead of concentrating on efforts to match the energy supply with demand, conservation focuses on efforts to bring the demand for energy in line with probable supply. Energy conservation offers a demand-side alternative to traditional supply-side strategies for meeting energy needs. Consequently, its proponents contend it should be viewed as a resource on equal grounds with traditional sources of energy supply, such as oil, coal, gas, and nuclear power.[33] The rationale for viewing large-scale, efficient energy use as a resource has been explained by one commentator as follows:[34]

> For purposes of meeting new system needs for power, a kilowatt-hour preserved from waste is indistinguishable from a kilowatt-hour delivered to consumers by a new power plant.

The possible benefits of energy conservation are immense. Of the potential energy resources, energy conservation is the only one that can be employed immediately by all consumers using existing technology, with minimal cost, and causing little or no environmental disruption.[35] Studies show that consumers nationwide can conserve between 20 per cent and 40 per cent of current energy use without significant inconvenience.[36] These savings over a fifteen-year period would surpass the energy available from all of Alaska's economically recoverable oil and natural gas.[37] In Hawaii, energy conservation measures already have resulted in a 20 per cent overall reduction of oil consumption.[38] Moreover, many energy experts view conservation as a means of reducing Hawaii's dependency on oil during the time required to complete the transition to nonpetroleum fuels.[39]

Additionally, conservation could result in increasing the State's economic competitiveness. Expenditures on conservation generally create more regional employment opportunities than power plant construction.[40] Reasons contributing to this are that conservation programs tend to be more labor intensive and are less dependent on imports from other regions as compared to power plant construction.[41] Furthermore, to the extent that the cost of investing in conservation is less than traditional energy facilities, it frees up capital for investment outside the energy sector. Investments in other areas of the economy are almost certain to create more jobs than investments in energy.[42]

For the immediate future, then, energy conservation appears to offer a cost-effective, readily available, and environmentally benign strategy for meeting the State's energy needs.

Chapter 4

DESCRIPTIVE SUMMARY OF UTILITY-SPONSORED ENERGY CONSERVATION PROGRAMS

As primary producers and suppliers of energy, utility companies have become, in many instances, major promoters of energy conservation. The reasons why and the ways in which utilities promote conservation are the subject of this chapter.

Impetus for Utility Involvement in Energy Conservation

One of the many wide-ranging effects of the 1973 Arab oil embargo was to spur utilities into an earnest search for methods to promote energy conservation. As climbing fuel costs drove up utility rates, legislators and regulatory commissions, in response to rising consumer protests, sought ways to cut utility bills. As a result, regulatory commissions began to direct utilities to pursue conservation as a less expensive means of recapturing energy.[1] Widespread utility involvement in energy conservation occurred largely as a result of the National Energy Conservation Policy Act of 1978, which required all major gas and electric utilities to offer on-site energy audits to residential customers.[2] The audit programs instituted as a result became known as Residential Conservation Service (RCS) programs.

Since the late 1970's, most utilities have expanded their activity to include promotion of conservation through education and a variety of financial incentives. The motivation spurring on this activity on the part of utilities generally includes any one or more of the following: compliance with state statutory or regulatory requirements; a sense of public service obligation; a public relations strategy; and a realization of the need to stretch resources to maintain a long-term balance between supply and demand.[3]

Furthermore, it is not unusual for a utility to begin a program for one reason, but continue it for an entirely different reason after its original goal has been met. For example, when Pacific Gas and Electric Co. (PG&E) began its Residential Conservation Financing Program in 1981, it considered conservation an important part of its energy supply strategy. By 1986, PG&E had achieved excess capacity, but continued to offer the program for public relations purposes and to comply with Public Utility Commission requirements.[4] Likewise, Portland General Electric Co. (PGE) determined in 1977 that conservation was necessary to extend their energy supply. PGE presently has sufficient excess supply to last several years, but continues to encourage participation in its Weatherization Financing Program for the physical comfort of and the lower utility cost to its customers.[5] Finally with respect to utility motivation, it should be noted that experience appears to indicate that aggressive action by regulatory commissions in promoting conservation has played a key role in producing utility-sponsored programs that achieve impressive results.[6]

Today utility involvement in energy conservation is commonplace. Several hundred of the larger gas and electric utilities are involved actively in energy conservation, and the number of conservation programs they sponsor is substantial. For example, a 1983 survey of utility end-use projects identified 351 energy conservation programs being sponsored by the 298 electric utilities responding.[7] This figure undoubtedly has increased considerably over the last four years, especially given that two New York State utilities were responsible for operating at least 40 conservation programs for the residential, agricultural, commercial, and industrial sectors in 1986 alone.[8] Moreover, a 1985 survey of state regulatory commissions indicated utilities in 34 of the 50 states offer financial incentives to encourage customers to participate in energy conservation programs.[9]

Information has been gathered on as many of these utility sponsored conservation programs as possible, focusing particularly on those that include financial incentives. Given the number of these programs and the substantial amount of information obtained, it is not possible to describe each program individually. Instead, an attempt has been made to identify and summarize

major program aspects in a way that indicates the range of similarities and differences existing among programs. This overview is presented below. For more specific information on various program aspects, the reader is referred to Appendix G which contains descriptions for selected utility-sponsored programs.

General Program Description

The most common element of utility-sponsored energy conservation programs is some form of an on-site energy audit for residential customers. Without doubt, this is because of federal legislation that required utilities to offer audits to their residential customers.[10] In addition or as an alternative to energy audits, many utilities began offering financial incentives to encourage customers to install conservation measures. It is these "incentive" programs that are the primary focus of this report.

The typical financial incentive program began on the mainland in the late 1970's and focused on the weatherization or insulation of single-family dwellings, with particular emphasis on reducing energy consumption and high heating costs during the winter months.[11] Although still called "weatherization" programs in some cases, the majority of these programs now include other conservation measures, such as heat pumps, high efficiency air conditioning systems, solar systems, and more efficient appliances and hot water heating systems.

In addition, utilities began to develop programs targeted to special markets, such as low-income customers, owners and renters of multi-family dwellings, commercial establishments, and institutional buildings. In fact, regulatory commissions in several states, including Minnesota, New York, and Wisconsin, have directed their utilities to develop programs specifically targeted towards the low-income, elderly, or multi-family occupant households.[12] This action is based, in part, on the recognition that these groups: represent a substantial portion of the general population; are the most likely to benefit from conservation programs because their dwellings are,

on the average, older, inadequately insulated, in poorer condition and contain less efficient appliances and heating and cooling equipment; and are the least likely to invest in conservation without financial assistance.[13]

Another reason some utilities are focusing on other markets is that they have saturated the single-family market.[14] With that in mind, the New York Public Service Commission has directed utilities to conduct market studies to determine the extent of existing conservation measures in the state's housing stock, the remaining market segments that have the greatest conservation needs, and the most effective methods for reaching those segments.[15]

Audits

As originally operated, RCS audit programs apparently had little effect on reducing energy consumption. Evaluations conducted in the Pacific Northwest, California, Wisconsin, Minnesota, Michigan, and Connecticut indicate the typical RCS audit resulted in only 3 to 5 per cent reduction in annual consumption and was barely cost-effective.[16] The consensus indicates that audit programs alone are insufficient because they lack any real incentive to induce the customer to invest in energy conservation (i.e., install conservation measures). Studies show that financial incentive programs, although more costly than audit programs, are also more effective in encouraging customers to install conservation measures and may result in savings of 2 to 3 times more energy than RCS audit programs.[17]

Florida Power and Light Co. (FPL) recognized this in the early 1980's when their audit program failed to achieve Commission mandated reductions in energy-demand growth. In response to the problem, FPL substituted less expensive walk-through audits that served as gateways to a set of incentive programs intended to encourage implementation of energy conservation measures. Since this change, levels of participation in FPL's five incentive programs have increased substantially.[18]

This is not to say that audits are irrelevant to energy conservation. On the contrary, financial incentives unaccompanied by audits probably would make little sense. Together, however, they complement one another and have the potential for achieving substantial energy savings. Energy audits, if performed correctly, play an essential and meaningful role in energy conservation by identifying significant opportunities to conserve energy in a cost-effective manner. Once the most effective conservation measures are identified, financial incentives encourage and assist customers to implement them.

Moreover, some utilities view audits as a unique and valuable opportunity to make face-to-face contact, under positive circumstances, with those parties most essential to their existence. Michigan Consolidated Gas Co., for example, considers its on-site audit program to be the key component of its three basic energy conservation services. (The two other programs are below market rate or zero-interest loans for various conservation measures and low-income weatherization.) In addition, this opportunity to meet personally with someone trained in energy conservation "ensures a better customer understanding of the concepts, principles, and benefits of energy conservation."[19]

Presumably having recognized the advantages of combining energy audits and financial incentives, the majority of utility-sponsored energy conservation programs appears to include both. Under these programs, the audit typically is a preliminary step in the participation process, although its level of sophistication often varies considerably among programs.[20]

For energy audits to achieve their full potential, the auditors must be knowledgeable in energy conservation methodology. Realizing the importance of trained auditors to the success of a program, several states' regulatory commissions, including Iowa[21] and New York, have set minimum qualification requirements for auditors. For example, auditor candidates for New York's SAVINGPOWER Program must possess a basic knowledge of electrical, mechanical, building science, and/or construction technology obtained through either work experience or a relevant associate degree program. They also

must attend a two week initial training session, followed by two weeks of on-the-job, field training. Both training sessions must include instruction on principles of construction, heating system operation, fundamentals of heat loss, indoor air quality, communications skills, and all SAVINGPOWER Program measures and features. Staff from the department of public service monitor the training programs and conduct actual surveys to ensure compliance with these standards.[22]

An interesting variation in the use of audits is found in Eugene Water and Electric Board's (EWEB) Buyback Weatherization Program where post-audit follow-ups are conducted to encourage audit participants to install or complete the recommended conservation measures. Since the program started in 1982, over 23,000 of the 40,000 eligible customers have requested audits. As of September 1986, EWEB had completed 20,000 audits and had installed conservation measures in over 11,000 homes, which is more than a 50 per cent participation rate.[23]

Effect of Incentives on Customer Participation

The degree of a utility's involvement in conservation programs ranges generally from providing customers with educational information, to providing technical assistance through audits, to providing financial incentives. The first two categories are relatively easy and inexpensive for the utility to implement. But they have relatively little effect on energy consumption levels because they provide little incentive for the consumer to invest in energy conservation. Unsurprisingly, participation will depend in large measure upon the extent to which customers must make out-of-pocket capital expenditures.[24] As noted previously, customer participation levels tend to be lower in the absence of some type of financial incentive. On the other hand, the addition or expansion of financial incentives, tends to increase customer participation and thus is more effective in reducing consumption levels and obtaining energy savings.[25]

The experience of two utilities illustrates this relationship between financial incentives and participation rates. The City of Austin Electric Utility's Residential Audit and Loan Program experienced extremely low participation rates (4.7 per cent) during its first two years of operation as a result of restrictions on program eligibility and the requirement that customers pay 50 per cent of the purchase and installation costs for conservation measures. To increase participation, the utility relaxed the qualifying criteria in 1984 and began offering complete financing with zero-interest loans. Utility officials expect energy savings to increase over the next several years now that approximately 84 per cent of those customers participating in audits are eligible for loans. Another modification officials reportedly are considering to increase participation levels is to allow customers a choice between loans or rebates.[26] The rationale for this modification is found in the increased participation rates California utilities have experienced after a similar change.[27]

PGE experienced the relationship between incentives and participation from the opposite perspective. PGE discovered that when incentives are reduced, participation levels can be expected to fall. PGE's Weatherization Financing Program experienced a participation rate of over 30 per cent between 1978 and 1981 when the program allowed zero-interest loan payments to be deferred until the weatherized property changed hands. Customer response rates dropped in 1981, however, when new financing arrangements went into effect that reduced the amount of subsidy and required that loan repayments begin immediately.[28]

Utility-Provided Financial Incentives

Financial Incentives Generally

The typical financial incentive program of the late 1970's offered zero-interest loans (ZIP loans) or low-interest loans for weatherization of single-family dwellings. After several years, many of these programs were converted to or supplemented with a direct cash payment option that usually

amounted to more than half of the conservation investment cost.[29] Utilities initiated this change primarily because they found that direct one-time payments are more attractive to most customers, thus encouraging participation, and reduce utility record keeping difficulties and administrative costs.[30]

Recognizing these benefits, the Idaho Public Utilities Commission has permitted utilities to replace zero-interest loan programs with a direct grant program having a 70 per cent ceiling. In adopting this change, which was supported unanimously by the utilities, the commission noted the utilities had demonstrated sufficiently that: (1) the zero-interest loan program ultimately was extremely costly to ratepayers[31] as a result of high interest rates incurred by the utilities and low housing turnovers which triggered repayment and (2) the requirement that a loan be secured by a lien made the program expensive to administer and also alienated some potential participants.[32]

A similar experience led to a change in Bonneville Power Administration's (BPA) residential weatherization program, which began in 1980 with 11 public utilities participating and was expanded in 1982 to include all Pacific Northwest utilities. BPA found that the use of zero-interest loans complicated administration of the program for both BPA and the participating utilities. BPA also desired to achieve increased energy savings through greater reductions in energy consumption. Therefore, to ease administration and increase savings, BPA replaced the loans with a "buyback" concept whereby BPA, in effect, "purchases" the energy saved through conservation from participating households. The payment is based on the estimated savings that will result from the installation of conservation methods and is the lesser of: 85 per cent of the actual cost of the conservation investment or 32 cents multiplied by the projected first year kilowatt-hour savings.[33]

Additionally, at least one state's regulatory commission has disapproved a proposed loan program because of the high administrative costs that would have been incurred by the utility and passed on to the ratepayers through the general utility rates. The commission has indicated approval will be

granted only in cases where it is shown that administrative costs can be minimized.[34]

The Maine Public Utilities Commission also reports generally poor experience with direct loan programs presumably to low-income groups. The reasons cited differ from those discussed above and are worth noting here:

> Low-income loans at zero interest have not been at all successful, primarily for two reasons. The first is that low income people usually rent and therefore do not want to make improvements to their landlord's property. Secondly, low-income people usually can not afford to repay the principle [sic] on the loans, let alone the interest.[35]

Many utilities consider the answer to providing flexibility and encouraging widespread participation as one of offering their customers a choice of financial incentives, such as loans at zero or low interest, rebates, and grants. PGE's Weatherization Financing Program provides an example of the range of options offered by some utilities. Customers may choose one of three financing options: (1) loans of up to $5,000 with interest rates of 6.5 per cent for cost-effective measures and 13.25 per cent for measures in excess of the cost-effective amounts; (2) cash payments of 25 per cent of the installed cost of the conservation measures up to $350; (3) zero-interest loans with a minimum principal of $200 and a maximum of $5,000. To qualify for a zero-interest loan, the household owner must have approved credit, hold legal title, and allow the utility to take a security interest or a mortgage in the owner's real or personal property. The loans are payable in minimum monthly payments of $15 or more over a period not to exceed 10 years.[36]

A final, general observation is that the types of financial incentives offered frequently vary according to the particular customer group targeted by a program. Public Service Electric and Gas Co.'s (PSE&G) Energy Conservation Loan Program, for example, offers loans and rebates for average and above average income groups and zero-interest loans for low-income groups. Thus, households with incomes of less than $30,000 are eligible for

zero-interest loans, and those with incomes between $30,000 and $50,000 are eligible for loans at one-half the current consumer interest rate.[37] Performance contracting generally is offered to commercial or industrial customers.[38]

Loans

Generally, loans are provided directly by the utility, but sometimes utilities are permitted to contract with financial or lending institutions to provide loans to eligible customers. The respective regulatory commissions usually establish a minimum and maximum loan amount, a maximum repayment period, and, in some cases, the rate of interest that may be charged. Funds are either paid to the customer as reimbursement or paid directly to the contractor or supplier. Many programs condition payment upon the utility's inspection of the work to ensure quality and satisfaction.[39] In most instances, the utility or financial institution and the customer enter into a security agreement, in addition to the financing contract, that creates a lien on the conservation measure until the loan is paid.

Loan repayment typically is handled through charges set out separately on the customer's periodic utility bill, although the program may provide for separate billing procedures. Several utility programs, such as Puget Sound Power and Light's Home Energy Checkup and Weatherization Financing and Seattle City Light's Home Energy Loan Program, include a prepayment discount for customers who repay loans early.[40]

Loan Guarantees

Some incentive programs include a loan guarantee requirement. In New York, for example, the Public Service Commission may require a utility that has contracted with a financial institution to provide energy conservation loans to guarantee all loans made pursuant to that contract.[41] A variation on the loan guarantee is found in Florida. The Florida Energy Efficiency and Conservation Act (FEECA) authorizes the Florida Public Service Commission (FPSC) to use up to $5,000,000 of Regulatory Trust Fund Monies to guarantee

loans for the purchase and installation of approved cost-effective energy conservation measures.[42] The utilities may apply to the FPSC for the guarantee of these loans and are responsible for the proper servicing and collection of loans. A description of servicing and collection practices must be included in the application for the loan guarantee. The utilities also may contract with a lending institution to make loans to eligible customers and to handle loan servicing and collection functions. Subcontracted lending institutions that participate receive from the FPSC a 4 per cent interest subsidy and a guarantee of all loans made under the program.[43] To ensure sufficient funds, the FPSC is required to maintain reserves equal to 5 per cent of the outstanding principal loan balances.

Rebates

As noted earlier, cash rebates are considered by many to provide a greater incentive to customers to invest in energy conservation. Rebates usually vary in amount according to the specific measure installed and the customer group targeted. When rebates are offered in connection with efficient appliances, the amount also may vary according to the size of the appliance and its efficiency rating. Generally, the amount of the rebate is calculated based either upon the estimated energy savings realized during the lifetime of the measure or upon a percentage of the estimated installed cost of each measure.

Southern California Gas Co. uses the former calculation to determine the rebate amount under its Weatherization Financing and Credits Program. Examples of the maximum rebate amounts offered for single-family or multi-family dwellings, respectively, are as follows: attic insulation, $302 and $136; caulking and weatherstripping, $19 and $9; water heater blanket, $8 and $5; and duct wrap, $106 and $85. The average rebate paid is $356. To qualify for these rebates, customers must install at least three of the six basic weatherization improvements.[44]

Southern California Edison Co., which offers several rebate programs, relies upon both calculation methods. Under the Basic Loan and Cash Rebate

Program, which finances improvements in single-family homes, mobile homes, and the dwelling area of multi-family complexes, the rebate is based upon a percentage of the estimated cost of each conservation measure. The actual amount paid varies according to the measure installed and whether the dwelling is single-family or multi-family. Under the Common Area Rebate Program, which applies to the common areas of multi-family buildings, rebates equal 30 per cent of the installed costs, up to a maximum of $50,000 per complex. The Energy Efficient Refrigerator Program offers two incentive rebate options based upon size and efficiency: $50 rebates are offered for models that are 12 cubic feet or larger and 25 per cent more efficient than the applicable state appliance efficiency standards; and $75 rebates are offered for models that are 20 cubic feet or larger and are 30 per cent more efficient than state standards.[45]

Although rebates commonly are targeted for residential customers, a few utilities have developed rebate programs for commercial and industrial customers, too. For example, the electrical division of Northern States Power Co. offers six commercial and industrial rebate programs to encourage the purchase and installation of energy efficient devices. These include: chiller air conditioners; rooftop and condensing unit air conditioning systems; well water chiller systems (which use cold ground water to upgrade chiller system efficiencies); cool storage air conditioning systems (which chill ice or water during off-peak periods to enable building owners to reduce their electric demand charges); electric motors (to replace or retrofit existing inefficient motors); and efficient lighting systems, ballasts, and lamps.[46]

Incentive Options Targeted to Commercial and Industrial Customers

For the most part, the financial incentives discussed thus far have been directed to residential customers. It appears, with some exceptions, that what operates as an incentive to residential customers is not necessarily sufficient to induce commercial and industrial customers to invest in energy conservation. This is not surprising given that the upfront costs and attendant technical and financial risks of such investments are substantially higher for commercial and industrial customers.[47] Recognizing this

difference, several utilities offer these customers financial incentives that transfer the technical and financial risk of energy conservation investment partly or wholly from the customer onto another party. These incentive options, which deserve a brief discussion here, include performance contracting, leasing, and some forms of third-party syndication.

Performance Contracting

In performance contracting, most of the technical and financial risks of energy efficiency investments are shifted to a professional energy specialist. The three basic models of performance contracting are shared savings, guaranteed savings, and micro-utilities. In a shared savings arrangement, an outside energy service company (ESCo)[48] is hired to make cost-effective energy efficiency investments in a building that shows significant energy savings potential. The ESCo owns the equipment installed, usually realizing any tax credits or depreciation that might be associated with the equipment, and is responsible for its maintenance and repair. The building owner and the ESCo share the energy savings realized for an agreed period of years. Although the sharing may be equal, it is not unusual for the ESCo to realize 75 to 90 per cent of the savings during this period. At the end of the designated period, ownership of the equipment passes to the building owner either by grant or by payment of the fair market value. The building owner is then entitled to 100 per cent of any energy savings resulting from the investment.

A guaranteed savings arrangement is similar to the shared savings, except it is designed to provide greater assurance of benefits to the building owner, while providing greater reward to the ESCo if it can realize large energy savings. The major difference between the two arrangements is that, with the former, the ESCo guarantees the building owner will incur a fixed lower utility cost after the efficiency measures are installed, regardless of whether the measure succeeds in saving energy. The amount guaranteed, however, may be less than the savings the owner would actually realize under a shared savings arrangement.

With performance contracting options, the contract between a building owner and the ESCo should identify and address a variety of issues including responsibility for maintaining and replacing the equipment, ownership of the equipment, responsibility for obtaining insurance and paying utility bills, and contingencies in the event of changes in tax laws or local codes.

Performance contracting options present several advantages and disadvantages for the building owner. The advantages include the following: efficiency investments are financed without affecting the credit, balance sheets, or cashflow of the building owner; technical and financial risks of the investment, as well as maintenance and repair responsibilities, are shifted from the building owner to the private energy specialist; and the building owner experiences an immediate positive cash flow.

Some of the potential disadvantages are that: the owner, locked into a long-term contract with one ESCo, is dependent upon that company's judgment and expertise regarding investment, repair, and maintenance decisions; the building owner sacrifices some of the potential financial return from energy savings to shift the risk to a third party; the ESCo must have strong and stable credit to enable it to raise financing; and the building owner must screen prospective ESCos carefully because the industry is still young and track records have yet to be firmly established.[49]

Several utilities have discovered the advantages of performance contract financing. General Public Utilities' (GPU) Residential Energy Conservation Action Program (RECAP) began as part of a demonstration program of the shared savings concept sponsored by the U.S. Department of Energy. After completion and evaluation of the pilot project, GPU decided to offer the program through its three operating companies (Metropolitan Edison Company, Jersey Central Power and Light, and Pennsylvania Electric Company). Under RECAP, participating customers receive free conservation measures, which are installed by ESCos with whom the utilities have contracted. The ESCos are reimbursed for the equipment and installation by the utility based on actual measured savings (i.e., the value of the marginal avoided cost for each kilowatt hour saved).[50]

Under this reallocation of risk, the ESCo profits from greater than anticipated savings, but suffers a loss when savings are less than anticipated. Consequently, the ESCo has a strong incentive to install measures that are clearly cost-effective in buildings that have a high potential for savings. Furthermore, because payments to the ESCo are made over a period of several years, based upon a monitoring of actual electricity consumption, the ESCo maintains a continuing interest in the conservation efforts of each participating customer. [51] The cities of Spokane and Yakima, Washington, have also engaged in performance contracting,[52] and a few utilities, such as Northern States Power in Minnesota, have developed successful conservation programs for multi-family complexes based on a shared savings concept.[53]

Leasing

The incentive provided by leasing energy conservation equipment is that the lease operates to transfer tax benefits and responsibilities between parties to the lease. Several types of leases can be used.[54] A true lease, also known as an operating lease, is the most common. The lessor of the equipment maintains ownership of the equipment, usually realizes any tax benefits associated with it, and repossesses it at the end of the lease period. A financing lease functions in a manner similar to an installment sales contract, and, at the end of the lease, the building owner may obtain the equipment either without payment or for a small remaining sum. A tax-exempt lease allows government agencies to use low-cost borrowed funds, generated by the issuance of tax-exempt bonds, to make monthly payments for leased energy efficiency equipment.

Lease financing has several advantages for the building owner: it allows payment to be spread out over time, thereby improving the owner's chances of positive cashflow; the risk of failure or of equipment obsolescence remains with the lessor; leasing often is available to those who have difficulty qualifying directly for a conventional loan; and the lease arrangement may be terminated any time without additional obligation. Potential disadvantages of a leasing arrangement are that: the ultimate cost of leasing usually is higher

than that of purchasing equipment outright; the owner may be forced to purchase equipment at the end of the lease to retain it in the building; and certain tax benefits may not be available to the building owner.

Equity Financing

Equity financing, or third party syndication as it is sometimes called, refers to an arrangement by which the contributor of financing participates in the risk of profit or loss from the venture.[55] Typically, equity financing is obtained from investment bankers, manufacturers of energy efficiency equipment, or development corporations. Equity investments frequently are syndicated, and any tax benefits of ownership usually are realized by the syndicate members in proportion to their respective ownership shares. This type of financing normally is appropriate only when the investment will result in profit or cashflow, and usually involves a renewable energy, cogeneration, or small power production project rather than an energy conservation project. For example, several small scale hydroelectric and cogeneration projects in the Northwest have employed equity syndication to raise initial financing costs.[56]

Traditional Debt Financing

Other options for financing energy efficiency equipment in large commercial or institutional buildings include tax-exempt bonds and conventional debt financing. Because government bond financing involves significant administrative and legal costs, it is feasible only for programs of significant magnitude.[57] Conventional lenders are only moderately active in financing energy conservation projects. Primarily, this is because the amount of capital required generally is small and the measures financed usually are not considered good security for debt since they would have little value if removed and reused.[58]

Caveat: The federal Tax Reform Act of 1986 may have implications for these various financing options, any discussion of which is beyond the scope of this study.

Who Pays the Program Costs?[59]

The cost of conservation programs incurred by utility companies vary in amounts and treatment from jurisdiction to jurisdiction. Generally, the treatment of these costs is either mandated by statute or left to the discretion of the respective public utility commissions. Many jurisdictions treat these costs as normal operating expenses which, under principles of utility ratemaking, are passed through to the general ratepayers in the form of higher rates.

Alternatively, several jurisdictions permit utilities to include the program costs in their rate base.[60] A utility company's rate base is depreciated/amortized over the lives of the respective assets, as approved by the commission, and included in the company's operating expenses. These operating expenses are passed through to the ratepayers through the utility rates. In addition, general ratemaking principles allow utility companies to earn a fair rate of return[61] on their rate base. The rate of return is intended to allow the company's owners (i.e., shareholders) to earn a fair return on capital invested in assets used to provide the utility service. The rate of return is set by each public utility commission and once determined is also included in the general utility rates.

Finally, the commission could prohibit the inclusion of some or all of the conservation program costs in the company's operating expenses and/or rate base. Such prohibition would result in the costs being absorbed by the company's owners. The absorption of costs by the owners may, in turn, impact upon the company's ability to attract capital, at reasonable cost, for future investments in assets used to provide the utility service.

Promoting Energy Conservation

One of the most important components of energy conservation programs is the manner in which the program is marketed. Spreading the word to eligible customers and obtaining their interest in conservation is a major

factor, along with financial incentives, in increasing program participation and, ultimately, in ensuring program success. The common range of marketing methods employed by various programs include: word-of-mouth; direct mail; bill stuffers; advertising via newspaper, radio, or television; press releases; assistance of community organizations; and workshops. Interestingly, at least one program has managed to achieve a 35 per cent participation level through door-to-door canvassing,[62] and another reports that door-to-door canvassing has been its most successful method of generating program participation.[63] Most programs rely upon a combination of these methods; and some utilities have been particularly aggressive in devising comprehensive marketing approaches. One example of such an approach is Puget Sound Power and Light, which uses a multi-media approach that includes advertising, video presentations, exhibits at home shows and fairs, workshops, pamphlets, and maintenance of a speaker's bureau.[64]

The New York State Public Service Commission has reported similar highly effective promotional efforts initiated by several utilities participating in the state's SAVINGPOWER Program.[65] During a drought emergency in 1985, Con Edison offered free watersaver kits, with low flow shower heads, to customers requesting an energy conservation survey. As a result, requests for surveys more than tripled to 3,600 a month during the summer and fall.[66] Niagara Mohawk's offer of free energy-efficient light blubs sparked nearly 10,000 requests for surveys between July and November 1985, and its offer of free plastic storm window kits in 1986 met with equally successful results.[67] Since 1984, Central Hudson has conducted a telemarketing program whereby a postcard is sent to all eligible customers in a particular area explaining the SAVINGPOWER Program and informing customers to expect a follow-up telephone call to answer questions and schedule an initial energy audit survey. As a result of this marketing approach, Central Hudson had one of the fastest growing conservation programs in the state in 1985.[68]

Michigan Consolidated Gas Co. has recognized the important role marketing plays in the success of its conservation programs and credits the effectiveness of these programs to active and aggressive promotion.[69] One of Consolidated's most successful strategies has been the use of direct telephone

marketing, which has had a 25 per cent positive response rate and has allowed the company better control over the geographic distribution and rate of energy audit requests.[70] The company also markets its programs through radio, television, newspapers, billboard advertising, customer billing inserts, and special contests.

Several utilities rely heavily on contractors and dealers to market their conservation programs (see Appendix H, column 3). For example, independent contractors marketing PG&E zero-interest loan program produce about 90 per cent of the sales. Consequently, PG&E has discontinued its own marketing of the program.[71] Southern California Edison Co.'s various financial incentive programs are marketed primarily by the insulation industry, trade associations, contractors, and dealers; and its energy-efficient refrigerator (EER) program includes in-store publicity as well as special sales on qualifying models.[72] Similarly, New Jersey's PSE&G, which also uses advertising, bill inserts, and direct mail to market its Energy Conservation Loan Program, reports that contractors are its best salesmen.[73] And, FPL awards installation jobs to contractors who solicit participants for FPL's Home Energy Loss Prevention Program as an incentive to encourage them to promote the program. Unsolicited jobs are awarded to contractors from an approved list on a rotating basis.[74]

Programs targeted to specific customer groups may require special marketing. New York's experience serves as a good example. In an extensive campaign to reach multi-family building owners and managers in New York City, the state Department of Public Service placed notices and information about the Apartment Building Conservation Service (ABCS) in trade publications with large circulations and convinced the real estate board and various realty associations to publicize the program in their newsletters.[75] Also, community groups, working with New York's utilities and the Department of Public Service in a grass roots campaign to attract the participation of hard to reach residents, have helped promote conservation programs for single- and multi-family dwellings through a variety of measures including: translating brochures into Chinese; producing cable TV shows; arranging for inserts to be distributed with paychecks from local employers;

and distributing literature at various locations such as shopping malls, senior citizen nutrition sites, surplus food distribution sites, local schools, libraries, hardware stores, and the Staten Island ferry terminal.[76]

Identifying Successful Incentive Programs

Judging from a review of the subjective literature, these utility-sponsored programs generally are considered to be successful in promoting energy conservation. The subject over which there appears to be little unanimity is how to define or quantitatively measure "success." The literature has referred to success in various terms, including cost-effectiveness, participation rates, and energy savings. The comparison of programs using different quantitative criteria of success would seem misleading. In fact, one study, whose purpose it was to describe successful residential incentive progams, has gone so far as to conclude that it is nearly impossible to compare the successfulness of programs.[77]

One of the primary reasons noted is that the sheer number of utility programs in operation make it difficult to identify and rank them in any systematic order according to any quantitative criteria of success.[78] Of the various criteria used to define success, the study's researchers suggested that cost-effectiveness is the most useful measure. The problem indicated with this criterion, however, is that few utilities appear to have evaluated empirically their program's cost effectiveness and those that have done so, have rarely used the same assumptions and methods. Consequently, the evaluation results are not truly comparable with those of other programs.[79] Given these problems, the researchers settled on an approach for identifying successful programs to include in their study based upon nominations from experts on residential energy conservation.[80] Appendix I contains a list of these programs.

Probably the most common criterion of success reflected in the literature is the level of customer participation (see Appendix G and Appendix H, column 4). Although this information is useful to a point, it may not present

a fully accurate picture. The problem is that "participation" may mean different things, depending upon the program. For example, it may mean the number of customers receiving an energy audit, or it may mean the number of customers actually installing recommended conservation measures. Obviously, the latter number would seem the more useful indication of program success in terms of amount of energy saved.

But even this number may not tell the whole story, however, because many program statistics may not take into account those customers who, after participating in the initial audit, installed recommended conservation measures on their own without program assistance. These statistics are particularly important in places such as New York where only about 4 per cent of SAVINGPOWER participants opt for and receive program loans.[81] Recognizing the significance of any conservation action possibly taken by the remaining 96 per cent participants, the New York Department of Public Service developed methodology to determine the extent to which conservation measures were installed by survey participants without loan assistance through the program. This new methodology revealed that about 43 per cent of those receiving a SAVINGPOWER energy survey went on to install recommended conservation measures without program financing.[82] Thus, program comparisons based upon participation levels also may be misleading because of possible differences and inaccuracies in arriving at participation level figures.

The Molokai Experience[83]

The island of Molokai has historically experienced the highest electricity cost per kilowatt hour and the lowest per capita income in the State. Beginning in 1982, the Comprehensive Conservation Pilot Program was initiated on the island of Molokai by the predecessor to the Department of Business and Economic Development (DBED), State of Hawaii. As initially instituted, Molokai Electric Company provided interest-free loans to qualified low-income households for the purchase and installation of electrical energy savings devices (solar water heater and heat pumps). Interest payments were made to Molokai Electric by the program. Repayment of loans were

generally structured in a way that payments approximated the savings experienced from the installation of the device.

During 1986, the administration of the program was shifted to the Molokai Community Federal Credit Union. The program was also revised and made available to all Molokai residents provided they met the loan requirements of the credit union.

The East West Research Institute conducted a survey sponsored by DBED. The Institute issued a report dated January, 1987 and titled Molokai Solar and Heat Pump Water Heater Survey. The survey was conducted to determine the effectiveness of DBED's promotional program to stimulate the use of alternate energy devices on the island of Molokai during 1985 and 1986. Specifically, the survey sought to determine the extent to which Molokai families had purchased solar or heat pump water heating systems and why other Molokai residents did not. The survey utilized two sample groups. The first group included 118 families identified by Molokai Electric as having purchased and installed solar water heaters and heat pumps during 1985 and 1986. The second group included 336 Molokai families randomly contacted by the Institute.

The results of the survey revealed that nearly a third of the families on Molokai had installed either a solar water heater or heat pump. The first sample group of 118 families indicated that Molokai Electric Company was their major source of financing. This result may be attributable to the fact that Molokai Electric played a major part in obtaining purchasers during the period. In comparison, the families included in the random sample reflected a preference for independent purchaser financing for the purchase of solar water heaters and heat pumps. These families also stated that the purchase and installation of these devices was low on their list of priorities.

The survey concluded that the promotional program sponsored by DBED was highly successful. The number of low-income families installing alternate energy devices attested to the success of the promotional program. In general, no change to the program was recommended, although, the addition

of a substitute financial incentive to replace the no longer available federal income tax credit was suggested.

DBED also performed a random and limited sampling of energy savings by participants in the loan program. The sample reflected reductions in electricity consumption between 23 per cent and 58 per cent for solar water heating and 19 per cent to 35 per cent for heat pumps.

The Molokai Pilot Program has apparently been successful in encouraging low-income households to install energy savings devices with a view towards energy conservation. The program has been helpful in reducing electricity consumption by participating families. The no-interest loans incorporated with repayment schedules tied in with energy cost-savings apparently offered adequate financial incentives to encourage these households to install the devices. However, the program has been only marginally effective with households with more than $20,000 income per annum. Apparently, other incentives are needed to generate the desired levels of participation by these households and alternatives should be reviewed.

Chapter 5

CREATING A SUCCESSFUL ENERGY CONSERVATION PROGRAM

What makes up a successful utility-sponsored energy conservation program? Some necessary program elements have been discussed previously and should come immediately to mind, especially financial incentives and effective marketing strategies that ensure sufficient participation levels and energy audits that identify those conservation measures with the most energy savings potential. Several other factors beyond program structure exist that may significantly influence the outcome of a program. These factors should be considered in developing any utility-sponsored conservation program and are discussed briefly in the material that follows.

Cooperation and Commitment

As with any undertaking, the attitude of the various parties involved plays an extremely important role in determining the outcome. Customer participation has been discussed previously, but other equally important parties include utility companies, regulatory commissions, and various state agencies. The degree of interaction and cooperation among these parties is likely to be a deciding factor in the success of any conservation program. Support for and commitment to energy conservation from government agencies is frequently a necessary catalyst for utility-sponsored programs. As indicated previously, aggressive support on the part of regulatory bodies, in particular, has contributed immensely to achieving impressive results in energy savings.[1] It also is critical that the various agencies involved cooperate with one another and with the utilities to achieve a common goal. But perhaps most important of all to the success of a utility-sponsored conservation program is commitment on the part of top level utility officials. Little is likely to be accomplished unless they are willing to assist in designing and implementing conservation programs to achieve the most energy savings possible and to ensure, through financial incentives and effective

marketing, program participation levels sufficient to realize the savings potential.

The experience of Michigan's Residential Conservation Service (RCS) presents an excellent example of what joint efforts and commitment can achieve. Michigan's RCS program reportedly is one of the most successful programs of its type, with more than a half million RCS audits conducted in less than three years.[2] The program has experienced positive reaction from the public, the utilities, and the state government. At the program's inception, state and utility officials held a press conference in Detroit at which they announced their collective support for the program and encouraged customer participation. Three more press conferences were held subsequently in other areas around the state. The resulting public perception was that government and utility companies were working cooperatively to promote a legitimate and desirable customer service.[3] Moreover, as the program has progressed, the participating organizations have continued to demonstrate a high degree of cooperation and genuine commitment to implementing and promoting an effective program. It is contended that this attitude has been the single most important factor contributing to the program's success.[4]

Recovery of Energy Conservation Program Costs

Related to the discussion of a utility's commitment and support for energy conservation programs is the cost of the program to the utility. The amount utility owners (i.e., shareholders) spend out-of-pocket on conservation undoubtedly will affect the degree of their support for such programs.

But, before discussing how the costs of energy conservation programs are treated, some background information concerning public utility regulation and the relationship between the cost of providing traditional energy service and the utility ratemaking process is necessary. Regulated utilities are granted what amounts to monopoly status. In exchange, they must provide

reliable service on demand.[5] To meet this requirement, utilities incur significant capital costs in building generating plants or acquiring sufficient oil or gas supplies. In the unregulated sector, the price or rates for services are determined according to the competitive market. Because these competitive forces have little effect on regulated utilities, their rates for service are set by a regulatory commission.

The particular rate level is determined according to each utility's revenue requirements.[6] Put very simply, this means utility rates must be set at a level that will cover the utility's operating expenses and provide an opportunity for the utility to earn a reasonable or fair rate of return on the property devoted to the utility business.[7] Operating costs comprise the largest percentage of a utility's total revenue requirement and include all types of operating expenses (e.g., wages, salaries, fuel, maintenance, advertising, research, and charitable contributions) as well as annual charges for depreciation and operating taxes. Out of the amount spent by a utility for operating purposes, the regulatory body determines the allowable expenditures for ratemaking purposes. Any expenses disallowed are borne by a utility's stockholders instead of the ratepayers.[8]

The rate of return usually is expressed as a percentage of a utility's net value or investment in its property[9] or rate base. Whatever rate of return is allowed, it must be sufficient so as to be fair to shareholders and to preserve the utility's credit standing to enable it to attract new capital to maintain, improve, and expand its services in response to consumer demand.[10] If utilities are unable to attract sufficient capital investment, they may not have enough revenue to meet their requirement to provide reliable service.

What does all of this have to do with recovery of conservation program costs? It has been suggested previously that conservation should be viewed as an alternative energy supply.[11] If that is the case, then, should each investment, whether for traditional energy supply or conservation, be treated equally for purposes of cost recovery? That is, should utilities be allowed both to recover their operating costs and earn a rate of return with respect to conservation programs?

To date, the answer has been mixed. In view of the need to assure a utility's revenue requirements to attract capital investment, it is unlikely that regulatory bodies will require the utilities to bear the full costs of conservation programs. Accordingly, most public utilities commissions permit utilities to recover reasonable program costs by treating them as allowable operating expenses which are passed on to the ratepayer through the general utility rates.

Some commissions have adopted an alternative approach to cost recovery for conservation programs, on the basis that the traditional rate base method of "expensing" costs is insufficient to provide an incentive for utilities to invest in the optimum level of efficiency.[12] This alternative method, known as "rate basing," permits utilities to include the costs of conservation programs in their rate base. Since the rate base is used to determine the regulated rate of return, this method allows utilities a financial return on their investment and recovery of program costs spread over time.

Proponents of rate basing suggest that it makes conservation programs more attractive to utilities and leads to an expansion of conservation efforts.[13] Texas, Washington, and Wisconsin allow ratebasing of conservation programs and the California PUC is considering it.[14] The Washington commission adds a 2 per cent bonus on conservation investments and even permits "soft" investments, such as advertising, to be included.[15]

Finally, a few commissions, including Florida[16] and Kansas,[17] apparently have recognized the need for incentives beyond the traditional rate base expensing method, but reject straight rate basing as the appropriate incentive. Instead, incentives are tied to performance to encourage utilities to maximize profits by implementing the most efficient conservation measures; thus utilities are "rewarded or penalized according to their progress in achieving certain efficiency goals, rather than a strict rate-of-return on total assets."[18] The way this would work in Nevada, if a rule proposed earlier this year is adopted by the Public Service Commission, is that utilities, in addition to being allowed to recover actual expenses, would also be allowed a

return on conservation investments based upon the amount of energy actually saved by a particular program.[19]

The Alliance to Save Energy is currently studying whether it is appropriate for utilities to earn a return on their investments in conservation and what effects rate basing may have on utilities and their customers. The results of that study may significantly affect the current practice with respect to cost recovery of conservation programs.

One related point concerning cost recovery is that it appears the expeditious selection of a cost recovery method is nearly as important to utilities as determining which method is used. A case in point is cited by Michigan Consolidated Gas Company which credits the Michigan Public Service Commission (MPSC) with having removed a critical roadblock many utilities face when considering conservation programs and provided a solid foundation for program support within the company by establishing a cost recovery system at the outset of the program.[20] This system reportedly has allowed all participating utilities to proceed aggressively with conservation programs without competing for funds from other aspects of their company's operation and has ensured the timely recovery of all legitimate expenses associated with the program.[21]

Impact of Conservation on Utility Rates and Measures of Cost-Effectiveness

From the foregoing it is apparent that ratepayers ultimately bear the cost of conservation programs, just as they do the cost of traditional energy service. But what is the impact of conservation on rates and ratepayers: that is, does conservation cost more or less to the individual ratepayer than traditional energy supply?

To fully appreciate this issue, one must realize that conservation efforts result in a utility selling fewer units of energy from which to recover the investment capital and operating costs needed to provide the basic service to its customers. With fewer units of energy over which to spread a utility's

fixed costs, commissions might have to raise the cost per unit in order to meet a utility's revenue requirements. Accordingly, conservation may result *in higher utility rates, even though it results in lower utility bills for those* who reduce their energy use.[22]

On the other hand, conservation proponents emphasize that even nonparticipants may benefit through the absence of pass-through costs which utilities avoid by not having to build new generating plants or acquire new natural gas supplies as a result of reduced energy consumption. That benefit is realized if the net, direct costs of the conservation program are equal to or less than the net costs of providing energy (i.e., adding an additional therm of natural gas supply or kilowatt of electrical capacity).[23]

The potential effect of a given set of conservation programs on ratepayers and rates, i.e., whether conservation will result in reduced or equal costs or in increased rates, is a major issue facing regulatory bodies when approving energy conservation programs. Although there may be some truth to the argument that conservation is necessary regardless of costs, most proponents of conservation agree that only "cost-effective" programs should be implemented. The difficulty, however, is in deciding what measure should be used to determine cost-effectiveness. Several tests have been developed to measure cost-effectiveness, depending upon different perspectives (e.g., equity versus economic efficiency) and goals (e.g., achieving maximum investment in conservation or ensuring that revenue requirements do not rise).[24] Also, whether a particular program is cost-effective under a particular test may depend upon utility-specific factors such as current capacity, projected demand, costs of alternative supply sources, expected fuel cost increases, and fixed versus variable cost ratios.

The issue appears to have generated a considerable amount of discussion, and little unanimity apparently exists concerning which test best measures cost-effectiveness. At the least, this extremely complicated issue will require considerable thought based on utility specific factors and program goals and objectives desired. Some of the predominant tests are described here briefly just to provide an indication of the options available.

The "no-losers test" adopts the perspective of the nonparticipant ratepayer and emphasizes equity among customers over economic efficiency.[25] Under this test, a conservation program may be implemented as long as it does not cause the average utility rates to rise above what they would have been in the absence of the program. The no-losers test appears to have lost ground in recent years out of recognition that it assigns an infinitely high weight to the potential losses of nonparticipants and precludes the adoption of conservation programs that clearly are economically efficient with a net benefit to ratepayers overall.[26] In fact, some opponents of the test have argued successfully that it is really a "hardly any winners test" because it forces investments in more costly supplies and produces a higher than necessary societal energy bill.[27]

The "marginal cost test" adopts the perspective of the interests of ratepayers as a single body, emphasizing economic efficiency. It would permit any conservation program to be implemented as long as the utility's revenue requirements do not rise over what they would have been in the absence of the program.[28]

The "cost/benefit" test adopts the perspective of the collective interests of ratepayers and the utility.[29] This permits programs to be implemented only when they cause incremental economic gains to exceed incremental costs, that is, when the net economic benefit of a program, including direct costs and lost revenues, is positive.[30]

The "all ratepayers test" is similar, focusing on the economic efficiency of the use of ratepayer resources to produce energy. A program passes this test if program costs per unit of electricity saved are less than the cost per unit of power supply avoided or if the net present value of a program's benefits exceeds the net present value of the program's costs.[31]

The "societal test" emphasizes the economic efficiency of the use of society's resources. A program may be adopted under this test if its total cost to society is less than the total value of the resources saved by avoiding

electricity production. (Costs and benefits include those both internal and external).[32]

Program Planning

The primary goal of energy conservation programs is to conserve energy supplies by reducing energy consumption. The degree to which consumption is reduced and the goal achieved depends largely upon the energy savings potential of the particular conservation measures involved and the extent to which customers actually adopt and implement these conservation measures. Ideally then, conservation programs should promote installation of all cost-effective measures, not only the cheapest or easiest. Nevertheless, at least one study has suggested that many utility programs, especially those that emphasize existing residential building shells, exclude "well over half of most systems' end use consumption, including but not limited to residential and street lighting, commercial sector buildings and appliances, and industrial processes--not to mention the new buildings...."[33] Whereas such programs undoubtedly achieve some energy savings, they unfortunately do not come close to realizing their full potential for conserving energy.

To avoid this problem, comprehensive planning is needed at the outset to identify the most energy efficient conservation measures and to develop the most effective incentives for adopting those measures. One of the first steps in this planning process should be to develop a forecast tied more directly to the actual sources of demand: that is, the existing and anticipated end uses of electricity. Planners also must determine the limits of achieveable savings for these major end uses.[34] From this process it can be determined which conservation improvements are worth pursuing and which conservation measures will be most efficient in achieving those improvements.

To understand the importance of this information in designing an effective program, it may be useful to review briefly energy consumption patterns in Hawaii. Unlike the mainland, residential energy use accounts for less than 9 per cent of Hawaii's total energy consumption.[35] Water heating is

the largest consumer of residential energy, accounting for 40 per cent, followed by home refrigerators and freezers which consume 20 per cent (see Appendix K). In comparison, Hawaii's industrial, commercial, and transportation activities account for about two-thirds of the State's energy consumption, with transportation being the single largest user of energy, consuming nearly 57 per cent of the State's total energy use (see Figure 7 in chapter 3).[36] Business offices and commercial establishments together consume about 30 per cent of the State's energy supply. Most of this energy is used for lighting, air conditioning, cooking, and water heating.[37] It has been suggested that lighting efficiency measures in particular could offer vast potential for energy savings, given that most commercial buildings interiors are lit at least ten times more brightly during the day than most homes are during the evening.[38] Moreover, these measures could have energy savings implications for street lighting and space cooling needs.[39] Accordingly, the most effective programs should focus on areas where energy consumption is high and on measures that can be implemented to reduce consumption in these areas.

But determining how much conservation (i.e., how much savings) can be achieved is a different issue from deciding how much should be paid to realize that amount of savings. Thus, as indicated earlier, planners also must address what method should be used to determine cost-effectiveness and which conservation measures are cost-effective. Finally, even though the amount of conservation that is achievable and worth buying has been identified, it must be acknowledged that a program's energy savings goal will not be fully realized unless the amount of conservation identified is actually obtained. Accordingly, planners should design programs keeping in mind how potential savings can best be realized and should develop incentives and regulatory requirements likely to elicit the highest level of participation and compliance.

Program Evaluation

An important part of the planning process and a crucial component of any conservation program is a fair, accurate, and useful evaluation. It is recognized that what works elsewhere may not be appropriate for Hawaii and that what may be appropriate for Oahu may not be appropriate for all neighbor islands. A careful and reasoned approach to evaluating utility-sponsored conservation programs allows for comprehensive testing of the efficacy of all aspects of a conservation program and ensures that funds will not be spent foolishly and irresponsibly. Through serious monitoring and follow-up, evaluators can suggest that programs be refined, improved, or, if necessary, eliminated to ensure program objectives are being met and programs are being responsive to the needs of utilities and their customers.

To carry out an effective evaluation, there must be sufficient, qualified staff and adequate financial and technical resources to conduct a thorough examination. Evaluation may be conducted in-house if there are qualified personnel or by an independent contractor. Either way, care should be taken to avoid what one study has pointed out occurs far too frequently: that is, increasing responsibilities without providing the necessary resources to conduct a thorough evaluation.[40] Additionally, it is helpful to plan evaluation methods and activities at the beginning of a program and for evaluators to develop a close working relationship with the respective regulatory bodies and utilities.

Educating the Public About Energy Conservation

Based on the literature detailing the experience of conservation programs, it is apparent that educating the energy consuming public is a crucial factor in determining a program's success. Quite simply, this is because no energy conservation program can be successful unless consumers actually participate in saving energy. Studies have suggested that, despite the many advantages of conservation, investment in conservation by energy users is impeded by the lack of knowledge about the most appropriate,

efficient, and cost-effective conservation measures and, in some cases, the absence of financial incentives to motivate investment.[41] Economists and psychologists differ as to whether participation is tied more closely to the level of financial incentives or to non-economic features such as marketing techniques and convenience of participating. One review of residential direct load control programs has concluded that marketing is more important than financial incentives in increasing participation.[42]

Some support for that position may be found in a 1985 study by Maine Central Power (MCP), which revealed that public acceptance of MCP's conservation programs was impeded by customers' lack of understanding of why the company was promoting energy management. In response, MCP successfully initiated a campaign via television and newspapers aimed at educating customers about the role of energy management in controlling electricity costs, the importance of active customer participation, and MCP's commitment to helping customers achieve energy management goals.[43]

Regardless of which factor has the greatest impact on participation levels, it would seem indisputable that the public's ability and willingness to understand and attempt to capture the benefits of investing in energy conservation are crucial to a program's success. The results of failing to gain public understanding and acceptance for conservation programs is clearly illustrated by the fate of a 1985 law in Iowa, known as S. F. 450. The law involved low or no-interest loans by Iowa's utility companies for various conservation measures and authorized utilities to recover their costs through utility rates. These costs, which varied among the 18 pilot programs, showed up as a separate surcharge, ranging from 20 cents to $2, on customers' bills.[44] Despite the nominal amounts, customers, reacted strongly to the surcharge, reportedly feeling "they were being forced to 'pay for their neighbor's new furnace.'"[45] As a result of consumer pressure, the law was repealed during the 1986 legislative session.[46]

Thus, programs must not only be directed at those energy consuming activities that have high savings potential, they also must be designed and delivered so as to gain maximum customer acceptance and adoption.[47] To

accomplish this, conservation programs should have clearly defined goals, have easily understood benefits for customers, be easy for the customer to participate in, and be effectively marketed.

Chapter 6

FINDINGS AND RECOMMENDATIONS

House Resolution No. 14, H.D. 1, requested the Legislative Reference Bureau and the Public Utilities Commission to study and recommend necessary legislation or rules authorizing the Commission to require the electric utilities to initiate programs that would provide for financing mechanisms to assist individual consumers and producers to develop alternative energy programs and conservation technologies in Hawaii. Staff from the Bureau and the Commission met individually and informally with representatives of the Energy Division of the Department of Business and Economic Development and Hawaiian Electric Company, Inc. and with the Consumer Advocate to discuss the resolution and to solicit information and ideas. Staff also received and reviewed a wealth of information from other jurisdictions and energy-related organizations concerning alternative energy, energy conservation, and utility involvement in energy conservation.

Findings

The Bureau makes the following findings:

1. Hawaii's dependence on imported oil for 90 per cent of its energy requirements places it in a highly vulnerable position in view of possible disruptions in supply and escalating costs. Accordingly, the State has committed itself to achieving energy self-sufficiency through the conservation of energy and the development and commercialization of alternative energy sources.

2. The State has an abundant supply of indigenous alternative energy resources that ultimately may replace oil in satisfying the State's energy requirements, but this possibility appears to be some years away. Although strides have been made in the development of alternative energy on neighbor

islands, the real supply problem is on Oahu where approximately 80 per cent of the State's population accounts for a majority of the State's energy consumption and where serious technical and economic barriers currently exist to alternative energy development in an amount sufficient to meet the island's needs.

3. Energy conservation, on the other hand, presents an immediate, viable response to the energy supply problem. But widespread energy conservation by energy users appears to be impeded by the lack of knowledge about the most appropriate, energy efficient, and cost-effective conservation measures and, in some cases, the unavailability of financial assistance to encourage energy users to implement these measures.

4. Energy utilities provide a valuable source of knowledge and technical expertise with respect to energy conservation. Furthermore, as major suppliers of energy, they are appropriate and necessary participants in energy conservation.

5. Energy utilities across the country have played a major role in promoting energy conservation through public education, technical assistance, and financial incentive programs. Although the initial impetus for much of the utility involvement in energy conservation was legislative, many utilities now view energy conservation as an integral part of their supply strategy.

6. Utility-sponsored energy conservation programs vary in terms of specific programmatic elements, often depending upon the customer group targeted (i.e., residential, single family, low-income, commercial, or industrial). For example, conservation measures and financial incentives appropriate for commercial customers may not be appropriate for residential customers.

7. The goal of an energy conservation program should be to conserve energy supplies through reduced energy consumption. The real impact of any conservation program, then, depends largely upon the energy savings potential of the particular conservation measures involved, the end uses to

which they are directed, and the extent to which customers actually participate in adopting and implementing these conservation measures.

8. A myriad of factors influence a program's success in saving energy. One of the most important of these concerns the cost-effectiveness of energy conservation measures (i.e., whether the energy savings derived from a particular conservation measure is worth the cost of its purchase and installation). Another important factor involves the role of financial incentives. Although it seems certain that financial incentives do encourage some customer participation, the extent of that encouragement depends upon whether customers consider the incentive sufficient to justify their investment. What constitutes a sufficient incentive will vary depending upon several factors, including but not limited to: the amount of incentive, how it is structured, the specific target group, customer income level within that target group, the type of conservation measures involved, and the total cost to the customer.

9. The subjective literature indicates that utility-sponsored conservation programs generally are considered to be successful in promoting energy conservation. The degree of this success is uncertain because the sheer number of programs and the different criteria used to define success make it difficult to rank programs in any systematic order. Moreover, even where the same criterion is involved, the underlying methods and assumptions used frequently are different, making any comparisons misleading.

10. Those utility-sponsored energy conservation programs that were considered to be the most successful had the following in common:

(A) A genuine commitment to energy conservation on the part of and a high degree of cooperation among participating organizations, especially government and energy utility officials;

(B) Strong marketing techniques designed to achieve widespread conservation education and program participation and support; and

(C) Site specific energy audits designed to determine the most energy efficient and cost-effective conservation measures for a particular premise combined with some type of financial incentive to encourage implementation of these measures.

11. Other generally positive program aspects include: use of trained and qualified auditors; post-installation inspections; and strong planning and evaluation components.

12. Most utility-sponsored energy conservation programs no longer appear to be strictly "weatherization" programs. Although weatherization and insulation measures that would be inappropriate for Hawaii are included in many of these programs, other measures beneficial in tropical climates also are included, such as efficient air conditioners and refrigerators, heat pumps, hot water heating insulation, efficient lighting systems, solar hot water heating systems, and heat reflecting window treatments. Study and evaluation are necessary to determine which energy conservation measures will be most feasible, energy efficient, and cost-effective for Hawaii's unique climate and lifestyle.

13. Although utilities may front the capital for energy conservation programs, the utilities' ratepayers generally are the ones who bear most of the program costs. Methods by which utilities are permitted to recover the costs of these programs vary. The majority of jurisdictions permit program costs to be treated as operating expenses which are passed through to the ratepayer. A growing trend is to provide an incentive to utilities to invest in the optimal level of efficiency by allowing utilities to earn a return on their investment in conservation. Typically, this is done by including program costs in the rate base or by tying the rate of return to performance.

14. The Department of Business and Economic Development, through its Energy Division, has considerable experience and expertise in energy conservation and has been involved in a multitude of energy conservation activities, including the Comprehensive Conservation Pilot Program on Molokai.

Recommendations

Experience in other jurisdictions indicates that utility-sponsored energy conservation programs, if properly structured, can have a positive impact on reducing energy consumption. Indeed, the State's previous efforts show that conservation can result in impressive gains in efficient energy use. And given the State's mandate to achieve energy self-sufficiency, all avenues leading toward that goal should be explored. Moreover, these types of programs present an opportunity to establish a cooperative effort between those groups most concerned with energy use policy and to promote energy conservation on a more widespread and comprehensive basis.

One of the major arguments raised against widespread adoption of utility-sponsored energy conservation programs in Hawaii is that they are, in effect, "weatherization" programs and, consequently, not appropriate for our climate and lifestyle. It should be noted, however, that many, if not most, of these so-called weatherization programs involve a wide range of conservation measures, many of which could have application in this State.

Therefore, the Bureau recommends the Legislature consider adopting a two-year pilot project involving utility-sponsored energy conservation programs. The Bureau believes an experimental period will allow time to investigate, develop, and perhaps more importantly, evaluate what type of energy conservation program will be most appropriate for the State. To that end, a draft of proposed legislation concerning utility-sponsored conservation programs is presented at the end of this chapter.

The recommended legislation includes the following characteristics:

1. Primary responsibility for establishing experimental utility-sponsored energy conservation programs is given to the Public Utilities Commission. This is considered appropriate and desirable because of the Commission's existing regulatory and supervisory power over the energy utilities.

2. An appropriations provision for the Public Utilities Commission is included out of recognition that a considerable amount of work will be involved in developing, implementing, and administering these programs. This extra responsibility undoubtedly will require an increase in the Public Utilities Commission staff and may entail hiring or consulting with energy experts.

3. All energy utilities whose gross revenues exceed $2,000,000 are required to submit plans proposing an experimental program. Because the Bureau believes that all avenues for energy conservation must be examined, it recommends the inclusion of gas as well as electrical utilities in this experimental program.

4. The legislation is drafted to give the Public Utilities Commission broad discretion in structuring the precise form, scope, and content of each utility program, keeping in mind the legislation's stated purpose. The Bureau recognizes that this experiment will best be served by allowing for the evaluation of a variety of conservation programs targeted at different customer groups and involving different conservation measures and financial incentives. Furthermore, different conservation strategies may be necessary to meet unique needs of a utility's customers and service area. The approach taken allows for flexibility while giving the Commission full authority over all aspects of the experimental programs.

5. Each utility plan will be required to include energy audits and financial incentives. This requirement is included out of recognition that the program must focus on customer groups and end uses that will achieve the most significant energy savings while providing sufficient incentives to induce widespread participation by members of the customer group.

6. A strong planning and evaluation component is a necessary ingredient if this experiment is to be worthwhile. Because the Energy Division of the Department of Business and Economic Development has experience and expertise in the energy conservation field, it is the logical and appropriate agency to provide technical assistance to the public utilities commission in developing program specifics and designing and conducting a thorough evaluation of each utility program.

Recommended Legislation

SECTION 1. Declaration of legislative findings and purposes. The legislature hereby finds that:

(1) The State of Hawaii is severely disadvantaged by its lack of indigenous fossil fuel. The State's near total dependence on imported fuel as an energy source makes Hawaii highly vulnerable to future world oil supply interruptions and escalating fuel costs. Current national energy policies do not preclude the recurrence of serious problems arising from this dependence during oil shortages.

(2) Energy use is critically important to the overall welfare and development of our society and has a profound effect upon the economy and environment of the State, particularly in its technological development, resource utilization, industrial well-being, and social advancement.

(3) One of Hawaii's major goals as outlined in the Hawaii State Plan and the State Energy Functional Plan is to achieve energy self-sufficiency by reducing dependency on oil while providing adequate and dependable energy supplies at reasonable cost. The underlying policies and implementing actions required to achieve this goal focus on the development and commercialization of renewable energy sources and the encouragement of energy conserving technology.

(4) These policies also contribute directly to the economic growth and development of the State through the creation of job opportunities, the stimulation of local industries, and the expansion of the tax base which allows for increased services to residents of the State.

(5) The development and commercialization of renewable energy sources sufficient to achieve energy self-sufficiency remains some years away. In the meantime, conservation presents an immediate, effective, and prudent means of ensuring a dependable source of energy for the future. Accordingly, there exists an urgent and continuing need for every person and business in the State to conserve energy.

(6) The potential for meeting future energy needs through conservation will not be realized without a concerted effort involving the cooperation of government, private industry, and the public. Furthermore, no energy conservation effort can be successful without the widespread participation and commitment of energy users. Many energy users cannot easily afford the initial cost of purchasing and installing energy conservation measures. It is critical, therefore, that every available avenue be explored using all practical means and measures, including financial and technical assistance, to encourage, implement, and maintain energy conservation measures.

(7) Energy utilities provide a valuable source of knowledge and technical expertise with respect to energy conservation; many utilities have played a major role in promoting energy conservation through public education, technical assistance, and financial incentives. Energy utilities in Hawaii are involved already in alternate energy development and conservation, and an expansion of their role is desirable and should be encouraged; but study and evaluation are necessary to determine the most efficient and effective energy conservation technologies and programs for Hawaii's unique climate and lifestyle.

(8) The public utilities commission, with its supervisory and regulatory power over the energy utilities, is the logical and appropriate agency to take the lead in establishing utility-sponsored energy conservation programs. The energy division of the department of business and economic development also has considerable experience and expertise in energy conservation. It is, therefore, appropriate and desirable that the department work in close cooperation with the commission and provide whatever technical assistance the commission requests to effectuate fully this chapter.

(9) It therefore is declared that energy conservation is essential to the preservation and enhancement of the health, prosperity, and general welfare of all the people of Hawaii and, accordingly, the State has a compelling interest in promoting and encouraging energy conservation in residential, commercial, and industrial buildings. The legislature further declares that it is necessary and it is the purpose of this chapter to promote energy conservation by authorizing the Hawaii public utilities commission to adopt goals relating to the conservation of electric energy and natural gas usage and to require each utility to develop a pilot program, subject to the approval of the commission, for increasing energy efficiency and conservation within its service area. The legislature further finds and declares that this chapter is to be liberally construed to allow for full experimentation and evaluation of energy conservation measures and technology.

SECTION 2. The Hawaii Revised Statutes is amended by adding a new chapter to be appropriately designated and to read as follows:

"CHAPTER
UTILITY FINANCED ENERGY CONSERVATION PROGRAMS

§ -1 **Definitions.** The following words or terms as used in this part shall have the following meanings unless a different meaning clearly appears from the context:

"Commercial lending institution" means any bank, mortgage banking company, trust company, savings bank, savings and loan association, credit union, national banking association, or federal credit union maintaining an office in the State.

"Commission" means the public utilities commission of the State.

"Customer" means the owner or renter of any residential, commercial, or industrial building in the State for which there is purchased gas or electricity from a utility.

"Department" means the department of business and economic development.

"Energy conservation measure" means any device, method, or material that increases efficiency in the use of electricity or natural gas including, but not limited to:

(1) Awnings;

(2) Heat pumps;

(3) Hot water heater insulation;

(4) Load management devices;

(5) Solar and wind energy systems;

(6) Waste heat recovery systems;

(7) Window treatment to absorb or reflect heat; and

(8) Any other measures that the commission shall specify.

"Financial assistance" means utility provided incentives intended to encourage customers to purchase and install energy conservation measures and includes direct financing through loans, loan guarantees, subsidies, rebates, performance contracting, or any other financial incentive approved by the commission.

"Residential" means real or personal property within the State inhabited as the principal dwelling place of an owner or tenant and includes a single housing unit in a multiple-unit building.

"Utility" means an electric or gas utility regulated by the public utilities commission under chapter 269 and whose gross revenues for the preceding calendar or fiscal year exceeded $2,000,000.

§ -2 **Authority to require experimental utility-sponsored conservation programs.** (a) The commission shall order each utility to develop and submit, within ninety days after the effective date of this chapter for approval by the commission, a plan proposing a two-year pilot energy conservation program designed to meet the needs of customers within its service territory. The proposed programs may target a portion or all of any class of customers of any utility as the commission may determine is appropriate to carry out the purposes of this chapter. The commission shall approve the precise form, scope, and contents of each program and may order any other energy conservation measures, programs, and technologies relating to electric and gas public utility service that, in the commission's judgment, are practicable, just, cost-effective, and reasonably related to fulfilling the purposes of this chapter.

(b) After public notice, the commission shall hold public hearings on the filed plans to which each utility, the consumer advocate, and the department shall be parties. These parties shall file testimony regarding the consistency of each proposed plan with the goals and objectives of the commission, this chapter, and the state energy functional plan. Other parties may intervene, and all parties may file other relevant testimony as provided by commission rules.

(c) At the conclusion of the hearings, the commission shall issue an order adopting a pilot energy conservation program for each utility, which shall be implemented within thirty days of the order. If the commission determines that a utility's proposed program inhibits conservation or if a utility fails to file or implement a plan or is not in substantial compliance with an approved plan, the commission, with the assistance of the department, shall make whatever revisions or adopt programs and policies as are necessary to ensure compliance with this chapter and shall order their implementation by the utility.

(d) In ordering any action relating to implementing energy conservation measures or programs, the commission shall consider and assure the revenue requirements of the utility.

(e) The commission shall establish rules, pursuant to chapter 91, necessary to implement this chapter.

§ -3 **Requirements.** (a) A plan proposing an energy conservation program shall meet the requirements specified in this chapter and shall provide for the performance of energy audits and financial assistance for the purchase and installation of approved energy conservation measures.

(b) The plan shall comply with any other requirements imposed by the commission.

§ -4 **Qualified applicants.** Utility customers within a customer group targeted by the utility's proposed plan may apply to the utility to participate under this program if they are:

(1) Current in their utility payments; and

(2) Owners or mortgagors of the property to be improved by the conservation measure; or

(3) Tenants who have secured written consent for the installation of conservation measures from the owner of the property to be improved.

§ -5 **Approval of conservation measures.** The commission shall approve the inclusion of specific conservation measures in proposed plans. In granting approval, the commission shall consider each conservation measure on the basis of its:

(1) Potential for conserving gas or electricity;

(2) Cost-effectiveness;

(3) Safety;

(4) Reliability; and

(5) Applicability to the premises of the customers targeted by the plan.

§ -6 **Financial assistance.** (a) The commission shall approve the specific means of financial assistance proposed under each utility plan and shall set whatever minimum and maximum dollar amounts, terms, and other requirements necessary, in the commission's judgment, to constitute sufficient incentive to encourage conservation under each plan. The commission also shall set maximum aggregate amounts to be available for financial assistance by the utility in each year of its plan.

(b) Participation in and completion of an energy audit shall be a condition of customer eligibility for any financial assistance under this chapter. Financial assistance shall be available only for the purchase and installation of those energy conservation measures recommended by the energy audit.

(c) In the event an eligible customer receives both electric and gas service from different utilities, the customer may choose to participate in the

program offered by either the electric or the gas utility, but shall not participate in both programs.

§ -7 **Utility loans.** (a) Where any proposed plan includes direct loan financing by a utility, the commission shall adopt rules concerning the maximum rate of interest chargeable by the utility on any amounts financed, requirements and limitations as to adjustments of terms and conditions of repayment, and any other requirements considered necessary to carry out this section. Each utility may establish qualifications for customer credit approval as may be reasonable and as approved by the commission. Loan repayment shall be through charges separately set forth on the customer's periodic bill from the financing utility or through separate billing as provided in the proposed plan. Any loan program shall provide for a discount, in an amount to be determined by the commission, in the event of prepayment of the loan balance.

(b) If a loan is made to a customer who does not have an ownership interest in the property to be improved by the conservation measure, the owner of the property shall be required to sign as guarantor on the note evidencing the loan.

(c) Loans made pursuant to an energy conservation program may be secured by a statement of lien or other security interest.

(d) Upon default on a loan by a customer, the financing utility, after expending reasonable efforts to collect, may treat the entire unpaid contract amount as due; provided that services to the customer shall not be terminated as a result of default. For purposes of this chapter, default occurs when any amount due a utility under a loan agreement entered into pursuant to this chapter is not paid within sixty days of the due date.

(e) Any customer obtaining a loan pursuant to this section shall use the funds only to accomplish the purposes agreed upon at the time of the loan. If the customer uses the funds in a manner or for a purpose not authorized

by this section, the total amount of the loan shall immediately become due and payable.

(f) If any plan approved by the commission involves loans, the collection of loans, or similar banking functions by a utility, the utility shall be authorized to perform these functions notwithstanding any other provision of the law.

(g) Upon the approval of the commission, a utility may satisfy its obligation to provide financial assistance to eligible customers by concluding financial arrangements with two or more commercial lending institutions to provide loans to customers for energy conservation measures approved under the utility's proposed plan; provided that the loans shall be made under terms and conditions consistent with this section. Approval of the customer's credit shall be at the option of the lending institution. The utility shall guarantee these loans if so required by the commission and may provide for payment of the loan balance by the customer through its regular bill for utility services.

§ -8 **Energy audits.** (a) Upon the request of an eligible customer, each utility shall conduct an energy audit of the customer's premises. A customer shall be eligible only for one audit per premise. Unless an alternative method is authorized by commission order upon good cause shown, the auditor shall make recommendations concerning which energy conservation measures should be installed and provide the audit results to the customer personally and in writing upon completion of the audit.

(b) The audit results shall provide the customer with:

(1) A clear description and explanation of recommended energy conservation measures;

(2) The estimated energy and overall cost-savings that would likely result from each applicable energy conservation measure;

(3) An estimate of the total installation cost for each conservation measure recommended;

(4) The annual ordinary maintenance cost, if any, for each conservation measure;

(5) The estimated time of payback of the customer's cost of purchasing and installing each conservation measure;

(6) An indication of the total energy cost-savings from the installation of more than one energy conservation measure compared to the energy cost-savings if each conservation measure were installed individually and separately; and

(7) A sample calculation of the effect of any federal or state tax benefits, if applicable, on the cost to the customer of installing each energy conservation measure.

(c) No charge shall be made for audits of residential premises; in the case of commercial or industrial buildings, the commission shall set fair and reasonable audit fees.

§ -9 **Training and qualifications of auditors.** The commission shall establish minimum training and qualification requirements for energy auditors used by each utility. These qualifications shall be sufficient to ensure the auditors are familiar with energy conservation technology and approved energy conservation measures.

§ -10 **Installation and inspection.** (a) Once a customer decides to participate in an energy conservation program and upon completion of the energy audit and approval of any necessary applications, the utility shall arrange for the installation of the energy conservation measures agreed upon by the customer through the services of a contractor or supplier from a list of qualified contractors and suppliers. The commission shall establish a process by which contractors and suppliers are selected from these lists.

(b) The utility shall arrange for post installation inspection, when required by the commission, to verify that the agreed upon energy conservation measures have been installed and that the installation has been performed in a professional manner and with materials that satisfy prevailing industry standards.

(c) The consumer advocacy division of the department of commerce and consumer affairs shall be the agency responsible for preparing and maintaining, in a nondiscriminatory manner, a list or lists, for each utility's service area, of contractors and suppliers who:

(1) Meet necessary state or county licensing or certification requirements;

(2) Maintain insurance coverage as prescribed by law; and

(3) Enter into a contract, in a form authorized by the commission, that contains, among other things, a full warranty of work performed and materials furnished.

The division shall update the lists systematically and shall remove from any list any contractor or supplier who has been disciplined for a work related matter by any state agency or who otherwise has exhibited a pattern of unsatisfactory work or any person who requests removal from a list. The department of commerce and consumer affairs is authorized to adopt rules pursuant to chapter 91 to implement this section.

§ -11 **Program promotion.** Each proposed utility plan shall include a description of procedures that will be used to promote wide public awareness of the details and benefits of the energy conservation program, including the availability of financial assistance.

§ -12 **Recovery of costs.** A utility shall be allowed to recover as normal operating expenses through rate adjustments those expenses related to the implementation and administration of any program approved under this

chapter that are determined by the commission, after public hearing, to be prudent and reasonable and that are not already reflected in existing rates. Costs arising from an approved energy conservation program shall not be continued in the rate structure once they have been recovered. The commission shall disapprove any advertising or promotional expense that it finds is not reasonably designed to promote the success of the program.

§ -13 **Performance standards; rate of return.** The commission shall establish energy efficiency performance standards for each proposed energy conservation program. These standards shall take into account the amount of energy savings that is achievable under a given plan and the overall cost savings that is possible. The commission may consider allowing those utilities whose programs meet the performance standard to earn a return on their investment in the particular energy conservation program; provided that utilities failing to meet their program's performance standards shall not be allowed to earn a return in connection with these energy conservation programs.

§ -14 **Reporting requirements.** (a) Each utility shall submit periodic reports to the commission setting forth information deemed relevant by the commission to monitor and evaluate the progress of each program.

(b) The commission shall report to the governor and the legislature twenty days prior to the convening of the regular session of 1989 and annually thereafter with regard to the progress of these experimental programs, including their effect on the conservation of fuel and energy, cost-savings to customers, expense to ratepayers, environmental benefits, and estimated effects on the economy. The reports also shall detail any problems encountered in the administration and implementation of the experimental programs and shall include recommendations for their improvement and possible extension.

§ -15 **Responsibility of the department.** The department shall consult with and provide technical assistance relating to energy use and conservation as requested by the commission to carry out this chapter. The department

also shall be primarily responsible for designing and conducting an evaluation of each experimental program and shall submit periodic reports to the commission."

SECTION 3. There is appropriated out of the general revenues of the State of Hawaii the sum of $, or so much thereof as may be necessary for fiscal year 1988-1989, to carry out the purposes of this Act, including the hiring of necessary staff. The sum appropriated shall be expended by the public utilities commission.

SECTION 4. This Act shall take effect on July 1, 1988.

FOOTNOTES

Chapter 2

1. E.g., Donald Hodel, "Kicking the Foreign Oil Habit," State Legislatures, September 1987, p. 30; David Nemtzow, "Energy Conservation: Are The States' Responding?" State Legislatures, July/August 1980, p. 14; Takeshi Yoshihara, "Hawaii's Continued Energy Vulnerability," 23 Wiliki O Hawaii, July 1987, p. 1; Energy Division of the Department of Planning and Economic Development, Hawaii And Energy (Honolulu: 1985), p. 3. Some studies have even suggested U.S. national security is at risk. See, "OPEC in a Few Years is Likely to Reassert Control of Oil Markets," Wall Street Journal, August 21, 1987, p. 1.

2. Yoshihara, supra note 1, at 1.

3. Id.

4. In 1981, the number of drilling rigs for oil and gas stood at a high of 3,970; by mid-July 1986, the number had dropped to a 46-year low of under 700 rigs. Domestic production fell almost 800,000 barrels per day. Joseph A. Davis, "Oil Slump: Bad for Exxon or Bad for Everyone?" Congressional Quarterly, May 30, 1987, p. 1115.

5. "U.S. Dependence on Oil Imports Is Shooting Up But Congress, White House Fumble With Policy," Wall Street Journal, June 19, 1987, p. 44.

6. Id.

7. Yoshihara, supra.

8. "Oil Prices Down in Nervous Trading," The Honolulu Advertiser, August 5, 1987; accord, "Iraqi Stand Could Undermine OPEC," The Honolulu Advertiser, July 14, 1987, p. C-7 ("Oil prices seesawed on world markets as suspected Iranian gunboats attacked French vessel in volatile Persian Gulf").

9. Hawaii, Department of Planning and Economic Development, State Energy Resources Coordinator 1985/86 Annual Report (Honolulu: 1985/86), p. 6.

10. Hawaii, Department of Planning and Economic Development, State Energy Functional Plan (Honolulu: 1984), p. 15.

11. See Hawaii Rev. Stat., sec. 226-18(a) & (b) and sec. 226-103(f).

Chapter 3

1. Hawaii, Department of Planning and Economic Development, The State of Hawaii Data Book, 1986 (Honolulu: 1986), p. 15.

2. "Energy," The Honolulu Advertiser, October 15, 1987, section D (Supplement), at D-6.

3. See, First Hawaiian Bank, "Geothermal Power in Hawaii," Economic Indicators, Sept./Oct. 1987, p. 1 (conservative estimates--over 1,000 megawatts). At least one source has indicated that the Kilauea East Rift Zone alone has sufficient geothermal fluids to provide up to 3,000 megawatts of electricity for approximately one century. Hawaii Natural Energy Institute (HNEI) 1984 Annual Report (Honolulu: 1984) p. 33 [hereinafter cited as (HNEI)].

4. First Hawaiian Bank, supra note 3, at 1.

5. The Court ruled that approval of the area for geothermal energy development does not violate the constitutional rights of native Hawaiians to worship the volcano goddess Pele when it is undisputed the claimants' have never used the land for religious purposes and presented no objective evidence of harm to their religious practices. Dedman v. Board of Land and Natural Resources, No. 11126, slip. op. at 7-8 (Hawaii, July 14, 1987), 740 P.2d 28 (1987).

6. See notes 26-30 and accompanying text.

7. Hawaii, Department of Planning and Economic Development, State Energy Resources Coordinator 1985/86 Annual Report, (Honolulu: 1985), p. 10 [hereinafter cited as Resources Coordinator].

8. "Undersea Power Cable Study Due," The Honolulu Advertiser, September 1, 1987, p. A-7 (the transmission system would require about 138 miles of underwater cable to be installed at depths up to 6,300 feet).

9. Id.

10. Estimates of potential energy range from 10 to 15 quads of OTEC energy per year; this is more energy than provided by annual oil imports to the entire United States. HNEI, supra note 3, at 49.

11. For a discussion of the closed cycle and open cycle OTEC systems, see id. p. 41.

12. Id. p. 42; cf. Resources Coordinator, supra note 7, at 30 (economic viability of OTEC system currently strained because of high capital cost of plant).

13. It should be noted that although the conversion process to liquid fuels is technically feasible to varying degrees, it is not yet economically attractive. HNEI, supra note 3, at 23.

14. Resources Coordinator, supra note 7, at 28.

15. Id. at 25.

16. "Energy," supra note 2, at D-5.

17. HNEI, supra note 3, at 62.

18. Id.

19. Id. at 67.

20. Id. at 51.

21. Hawaiian Electric Industries (HEI), Alternate Energy Development Efforts, (Honolulu: 1984), p. 22.

22. "Energy," supra note 2, at D-7.

23. HNEI, supra note 3, at 60.

24. Id.; HEI, supra note 21, at 22.

25. HNEI, supra note 3, at 60.

26. Pub. L. No. 95-617, 92 Stat. 3117 (1978) (codified, as amended, in scattered sections of 15, 16, 30, 42, & 43 U.S.C.). A similar requirement exists in state law. See, Hawaii Rev. Stat., sec. 269-27.1.

27. A. A. Smyser, "Developing Alternate Energy is Too Costly," Honolulu Star-Bulletin, September 1, 1987, p. A-14.

28. Id.

29. "Law Causing Higher Electric Rates," Pacific Business News, July 27, 1987, pp. 1 and 6.

30. Smyser, supra note 27, at sec. 14.

31. "Large-scale alternate energy development in Hawaii is not considered economically feasible unless the energy produced from resources on the Neighbor Islands, especially geothermal on the Island of Hawaii, can be transmitted to the State's major population center on Oahu." Resources Coordinator, supra note 7, at 16.

32. Takeshi Yoshihara, "Hawaii's Continued Energy Vulnerability," 23 Wiliki O Hawaii, July 1987, 1, at 2.

33. Illinois Commerce Commission, Energy Conservation: A Demand-Side Alternative for Meeting Future Energy Needs, Sunset Monograph Series No. 4 (Springfield: 1985), p. 1.

34. Ralph Cavanagh, "Least-Cost Planning Imperatives for Electric Utilities and Their Regulators," 19 Harv. Envt'l L. Rev. 299, 314 (1986).

35. Id. at 309 (conservation is conceded by most to be the cheapest and least environmentally destructive source of new electricity supply).

36. David Nemtzow, "Energy Conservation: Are the States' Responding?", State Legislatures, July/August 1980, p. 14.

37. Id.

38. Resources Coordinator, supra note 7, at 8.

39. See, e.g., id.; Yosihara, supra note 32, at 1.

40. Cavanagh, supra note 34, at 320-21 & nn. 61-67. See also Rick Counihan, "Conservation: A Source of Energy--and Jobs," State Legislatures, July/August 1980, p. 17.

41. Cavanagh, supra note 34, at 320 & n. 62.

42. Id. at 321 & nn. 65 & 66; Counihan, supra note 40, at 17.

Chapter 4

1. See, Printed Remarks by Nola Barnett, Regulatory Analyst, California Public Utilities Commission, Workshop on "Marketing Your Services to Utilities," (July 28-29, 1987) (The Holiday Inn, San Francisco, California).

2. Pub. L. 95-619.

3. See generally, Linda Berry, Marjie Hubbard and Dennis White, A Review Of Financial Incentive, Low-Income, Elderly and Multifamily Residential Conservation Programs pp. 27-57 passim (Washington: U.S. Department of Energy, Office of Conservation and Renewable Energy, 1986).

4. Id. at 44.

5. Id. at 46.

6. Id. at 14.

7. Id. at 5.

8. See generally State of New York Department of Public Service, No. 28223, (February 10,1987). (Recommendations of the Office of Energy Conservation and Environment Concerning Evaluation Of Utility Electric Conservation Program Compliance Plans in Case 28223: Long Island Lighting Co. & New York State Electric and Gas Corp.)

9. Berry, supra note 3, at 5.

10. See note 2 supra and accompanying text.

11. Berry, supra note 3, at 9.

12. Id. at 15.

13. Id. at 3-4.

14. Id. at 3. This particularly has been a problem for utilities that have been involved in conservation for a number of years, such as those in California. By way of illustration: Southern California Gas Co.'s single family component of its Weatherization, Financing, and Credits program ended in November 1985, with approximately 90% of the dwellings that could install conservation measures having done so. Id. at 54-55.

15. Home Insulation & Energy Conservation Act Program (HIECA) 1985 Annual Report, New York

State Public Service Commission (Albany: 1985), p. 8 [hereinafter cited as HIECA Annual Report].

16. Berry, supra note 3, at 1.

17. Id. at 2.

18. Id. at 37. The Florida Public Service Commission rules allow for an alternative (walk-through) audit which is defined as: "an energy analysis of a residence in which a qualified auditor walks through the residence making extensive observations as to the physical structure and components; performs simplified heat gain and heat loss computations, and advises the customer of what energy conservation practices and measures would be feasible to implement." Florida Administration Code, sec. 25-17.051(8).

19. Geoffrey C. Crandall, Devere L. Elgas and Martin G. Kushler, "Making Residential Conservation Service Work: A Trilogy Of Perspectives," reprinted from Public Utilities Fortnightly, January 10, 1985, p. 6.

20. For an example of comprehensive audit requirements, see Florida Administrative Code, sec. 25-17.057, Rules of the Florida Public Service Commission. Exhibit 2.

21. Iowa's Save America's Vital Energy Program sets comprehensive minimum auditor qualification requirements. Iowa Administrative Code, sec. 199-27.6(2), Rules of the Iowa State Utilities Board. Exhibit 3.

22. HIECA Annual Report, supra note 15 at 11.

23. Berry, supra note 3, at 31.

24. Cf Ralph Cavanagh, "Least-Cost Planning Imperatives For Electric Utilities And Their Regulators," 19 Harv. Envt'l L. Rev. 299, 338 and n.118 (1986).

25. Berry, supra note 3, at 2.

26. Id. at 29.

27. Id. at 43. See, notes 29-35 infra and accompanying text.

28. Id. at 45.

29. See Appendix H, column 2.

30. Berry, supra note 3, at 12.

31. The costs incurred by utilities for conservation programs generally are passed on to the utility's ratepayers; see notes 59-61 infra and accompanying text.

32. Residential Weatherization Measures And Other Programs, Idaho Public Utilities Commission, Order No. 17638 (October 13, 1982), at p. 2.

33. Berry, supra note 3, at 27.

34. Letter from Barbara Beerhalter, Chair of the Minnesota Public Utilities Commission, to Hideto Kono, Chairman of the Hawaii Public Utilities Commission, July 29, 1987.

35. Letter from Elizabeth Paine, Director of Finance, Maine Public Utilities Commission, to Hideto Kono, Chairman of the Hawaii Public Utilities Commission, September 25, 1987.

36. Berry, supra note 3, at 45.

37. Id. at 47.

38. See notes 47-53 infra and accompanying text.

39. Some utilities, such as Portland General Electric Co. and Public Electric Service and Gas Co. inspect 100% of the premises, see Berry, supra note 3, at 45 and 47; others inspect only a representative sample of each contractor's or supplier's work.

40. See, id. at 48 and 50.

41. See, N.Y. Pub. Serv. Law, sec. 135-1.

42. Annual Report to the Governor's Energy Office 1986, Florida Public Service Commission (Tallahassee: 1986) p. 10.

43. Id. at 11-12.

44. Berry, supra note 3, at 54.

45. Id. at 52.

46. Memorandum from Mark Swartz, Intern, Minnesota Public Utilities Commission to Paul Schweizer, Principal Rates Analyst, Minnesota Public Utilities Commission, August 28, 1986 (Summary of Conservation Improvement Programs approved by the Minnesota Public Utilities Commission for 1986-87).

47. The technical and financing risks or practicalities are critical concerns in any energy conservation investment. Technical risk refers to the probability the conservation measure will be installed correctly and maintained properly and will actually achieve its projected energy savings. The financing risk refers to the availability of upfront capital to pay for the installation and to the realization of sufficient energy savings to provide an attractive return on the investment. U.S. Department of Energy, Bonneville Power Administration, Financing Energy Efficiency (January 1986), p. 1.

48. Energy service companies typically are either private companies, public nonprofit companies, subsidiaries of regulated utilities, or manufactures of energy conservation equipment. Id. at 3.

49. Material for discussion on performance contracting is taken from id.

50. Berry, supra note 3, at 39.

51. Id. at 39-40.

52. Financing Energy Efficiency, supra note 47, at 4.

53. Berry, supra note 3, at 93.

54. Material for discussion on leases is taken from Financing Energy Efficiency, supra note 47, at 4-5.

55. Material for discussion on equity financing is taken from id. at 6-7.

56. Id. at 7. Cogeneration involves the simultaneous production of electrical or mechanical power and useful heat, such as steam, from a common source. The heat, which otherwise would be wasted, is put to work as energy in a subsequent process, such as heating water.

57. Id. at 6.

58. Id. at 5.

59. This subsection of the study was prepared by Gary Ige, formerly with the Hawaii Public Utilities Commission.

60. Rate Base--Generally, the amount of property used and useful in providing the regulated utility services. This amount may represent cost, replacement cost, or other amount permitted in the jurisdiction.

61. Rate of Return--Generally, the amount of money in excess of the utility company's total operating expenses which is earned by the utility.

62. The City of Santa Monica contracted with Southern California Gas Co. and Southern California Edison Co. for the operation of an RCS program and to test innovative program marketing techniques designed to increase participation rates and energy savings for both average and target group customers (i.e., senior citizens, low-income, and renters of multi-family housing). The program operated between May 1984 and May 1985, during which time services were offered to every household through door-to-door canvasing, with residents having received at least two notifications beforehand. Approximately 35% of all households in the city participated, and the participation rates achieved for multi-family, renter, low-income, elderly, and minority households came close to their representation in the city's general population. Berry, supra note 3, at 33-34.

63. HIECA Annual Report, supra note 15, at 7.

64. See, Berry, supra note 3, at 48.

65. The SAVINGPOWER Program is one of two components initiated by New York's Home Insulation and Energy Conservation Act. SAVINGPOWER consists of a free home energy conservation survey and an associated low-interest loan program for residences of one to four dwelling units. The other component is the Apartment Building Conservation Service (ABCS), which is an energy conservation survey program for multi-family buildings of five units or more. HIECA Annual Report, supra note 15, at 1.

66. Id. at 6.

67. Id.

68. Id.

69. See, Crandall, supra note 19, at 4-5.

70. Id. at 5.

71. Berry, supra note 3, at 44.

72. Id. at 53.

73. Id. at 47.

74. Id. at 37.

75. HIECA Annual Report, supra note 15, at 7. See, note 65 supra for description of ABCS program.

76. Id. at 7.

77. See, Berry, supra note 3, at 4-6.

78. Id. at 5; see notes 7-9 supra and accompanying text.

79. The researchers point out that the test for measuring cost effectiveness for a particular program will vary according to the perspective taken and will depend upon utility-specific factors such as current capacity, projected demand, costs of alternative supply sources, expected fuel cost increases, and fixed vs. variable cost ratios. Id. at 4. For discussion of various cost-effective tests, see Chapter 5, notes 24-32 infra and accompanying text.

80. Id. at 5.

81. See id. at 6-9 for discussion of this selection process.

81. HIECA Annual Report, supra note 15, at 12.

82. Id.

83. This subsection of the study was prepared by Gary Ige, formerly with the Hawaii Public Utilities Commission.

Chapter 5

1. See Chapter 4, note 6 supra and accompanying text.

2. Geoffrey C. Crandall, Devere L. Elgas and Martin G. Kushler, "Making Residential Conservation Service Work: A Trilogy of Perspectives," reprinted in Public Utilities Fortnightly, January 10, 1985, p. 3.

3. Id. at 4.

4. Id. at 7.

5. Illinois Commerce Commission, Energy Conservation: A Demand-Side Alternative for Meeting Future Energy Needs, Sunset Monograph Series No. 4 (Springfield: 1985), pp. 7-8 (fundamental requirement of utility's certificate of public convenience and necessity).

6. Formula for determining revenue requirements is set out in Appendix J.

7. Hawaii's public utilities are entitled to a fair return on property used for public utility purposes. Haw. Rev. Stat., sec. 269-16(b).

8. Charles E. Phillips, Jr., The Regulation of Public Utilities: Theory and Practice (Arlington: Public Utilities Reports, Inc., 1984), p. 158.

9. This net investment is the depreciated value of both tangible and intangible property used and useful in providing a particular utility's services. Id.

10. Id. at 159-60.

11. See discussion in Chapter 3, notes 33-34 supra and accompanying text.

12. See A Proposed Rulemaking to Amend G.O. 43 and a Portion of G.O. 32, Public Service Commission of Nevada, No. 87-151 (March 2, 1987), p. 3 [hereinafter cited as Nev. PSC No. 87-151].

13. See generally, id. at 3-5.

14. Id. at 5. In authorizing Wisconsin Electric Power Co. to rate base demand-side programs, the Wisconsin PSC concluded that: "[I]t is important to treat direct utility investment in conservation in a manner similar to other utility assets." Id.

15. Id. See, Wash. Rev. Code, sec. 80.28.025.

16. Fla. Stat. Ann., sec. 366.82(4).

17. Kan. Stat., sec. 66-117(a).

18. Paul Markowitz, "Is Your State Charting a Least-Cost Electrical Strategy?", reprinted from Public Citizen, 224, 226 (August 1986).

19. Nev. PSC No. 87-151, supra note 12, at 7.

20. Crandall, supra note 2, at 7.

21. Id.

22. See, Illinois Commerce Commission, supra note 5, at 9-10.

23. Id. at 10.

24. See Alliance to Save Energy, Utility Promotion of Investment in Energy Efficiency: Engineering, Legal and Economic Analyses (Washington, D.C.: 1983), pp. 33-42.

25. Illinois Commerce Commission, supra note 5, at 16. For example, authorities in the Pacific Northwest officially have repudiated the no losers test. Ralph Cavanagh, "Least-Cost Planning Imperatives for Electric Utilities and Their Regulators," 10 Harv. Envt'l L. Rev. 299, 326 n 73.

27. See, Cavanagh, supra note 26, at 325-26 and n. 73.

28. Alliance to Save Energy, supra note 24, at 34.

29. Illinois Commerce Commission, supra note 5, at 15.

30. Id. at 12.

31. Order Adopting Rule Concerning Cost-Effectiveness of Utility Energy Efficiency Investments and Programs, Maine Public Utilities Commission, No. 86-81 (March 10, 1987), (see attachment: Chapter 38, II-H. at p. 2).

33. Cavanagh, supra note 26, at 329-30. The term "end use" refers to the final product or services of energy, such as light, space heat, water heat, or refrigeration.

34. Numerous aids are available to assist in identifying potential efficiency improvements for important end use categories of applicances. See id. at 313 table 1 and 332 n. 100.

35. Hawaii, Energy Division, Department of Planning and Economic Development, Hawaii and Energy (Honolulu: 1985), p. 10.

36. Id. at 14.

37. Id. at 19.

38. Cavanagh, supra note 26, at 331 and n. 97. Commercial lighting accounts for approximately 25% of U.S. peak power requirements. Id. at 331 n. 96.

39. Id. at 332 & n. 99.

40. Paul Markowitz, Joseph Krusberg, "Least Cost Electrical Planning: Is There Really A State Movement?" (Washington, D.C: Public Citizens Critical Mass Energy Project, 1985), p. 7.

41. See, Illinois Commerce Commission, supra note 5, at 9.

42. See, Eric Hirst, "Planning Utility Demand Side Programs: Data and Analytical Needs," Oak Ridge National Laboratory (Oak Ridge: 1986), p. 152.

43. Central Maine Power, 1986 Energy Management Report (Augusta: 1986), p. 24.

44. "Senate Votes to Repeal Utility Loan Pilot Program," The Des Moines Register, March 4, 1986.

45. Letter from Dawn M. Vance, Public Information, Iowa Utilities Division to Hideto Kono, Chairman, Hawaii Public Utilities Commission, July 23, 1987 (attachment).

46. Id.

47. See, Illinois Commerce Commission, supra note 5, at 4.

Exhibit 1

HOUSE OF REPRESENTATIVES
FOURTEENTH LEGISLATURE, 1987
STATE OF HAWAII

H.R. NO. 14 H.D. 1

HOUSE RESOLUTION

REQUESTING THE LEGISLATIVE REFERENCE BUREAU AND THE PUBLIC UTILITIES COMMISSION TO FORMULATE RECOMMENDATIONS TO THE LEGISLATURE AND THE PUBLIC UTILITIES COMMISSION TOWARD THE DEVELOPMENT OF LEGISLATION AND RULES WHICH WOULD REQUIRE THE LOCAL ELECTRIC UTILITIES TO INITIATE PROGRAMS WHICH WOULD PROVIDE THE FINANCING MECHANISMS NECESSARY FOR INDIVIDUAL CONSUMERS AND PRODUCERS TO ESTABLISH ALTERNATE ENERGY AND CONSERVATION TECHNOLOGIES IN HAWAII.

WHEREAS, while there have been reductions in the prices of oil and petroleum products in recent years, corresponding reductions in the cost of electricity to the consumer have not kept pace with the price reductions of these fuels; and

WHEREAS, inasmuch as the State of Hawaii is almost totally dependent upon imported oil and petroleum products to provide for its energy needs, the Hawaii State Plan establishes, as one of its major priorities, the goal of energy self-sufficiency for the State of Hawaii; and

WHEREAS, despite the State's goal of attaining increased energy self-sufficiency, progress in the establishment of an alternate energy industry in Hawaii has not proceeded as rapidly as anticipated; and

WHEREAS, a major barrier to the expansion of the alternate energy industry in Hawaii has been the perception that the industry lacks economic viability; and

WHEREAS, while alternate industry ventures may often appear to lack immediate or short term feasibility, alternate energy technologies are the only alternatives available to the State which will relieve it of its dependence on nonrenewable sources of energy and will therefore prove to be beneficial to the State in the long run; and

HRO/1881m

WHEREAS, alternate energy financing programs in other states have logically involved the active participation of local energy utilities which possess the appropriate technical expertise as well as large amounts of capital available toward the financing of alternate industry initiatives and ventures; and

WHEREAS, in some areas of the United States, electric utilities have become the major source of alternate energy and conservation improvements financing, making loans available for energy efficiency improvements as well as for solar energy installations; and

WHEREAS, utility financing programs generally fall into three broad categories: direct loans, loan guarantees, and rebates; and

WHEREAS, among the majority of the investor-owned utilities providing conservation and alternate energy financing, the majority offer direct loans which provide interest rates which range from zero to current market rates; and

WHEREAS, successful utility direct loan programs have been established in states and cities such as: Oregon, where the Portland General Electric Company provides low interest, long-term loans for conservation measures determined to be cost-effective through an audit; and San Francisco, where the Pacific Gas and Electric Company provides five-year, $500 loans which have been taken out by more than 50,000 customers; and

WHEREAS, the State of New York currently requires utilities to provide loan guarantees to homeowners who borrow money from banks for conservation and alternate energy investments; and

WHEREAS, successful direct rebate programs have been established by utilities such as the Tennessee Valley Authority, the Bonneville Power Administration and the Pacific Gas and Electric Company of California; and

WHEREAS, despite its economic simplicity and the obvious benefits these programs afford the industry and the public, many important issues must be addressed and explored prior to developing these utility financing programs; now, therefore,

BE IT RESOLVED by the House of Representatives of the Fourteenth Legislature of the State of Hawaii, Regular Session of 1987, that the Legislative Reference Bureau and the State Public Utilities Commission is requested to enlist the assistance of the State Department of Planning and Economic Development's Energy Division, the State Consumer Advocate, and the local electric utilities to study and recommend the necessary legislation and/or rules for the Public Utilities Commission to require the electric utilities to initiate programs which would provide the financing mechanisms necessary for individual consumers and producers to develop alternate energy programs and technologies in Hawaii; and

BE IT FURTHER RESOLVED that the Legislative Reference Bureau submit a report of its findings and recommendations to the Legislature twenty days prior to the convening of the Regular Session of 1988; and

BE IT FURTHER RESOLVED that certified copies of this Resolution be sent to the State Department of Planning and Economic Development's Energy Division, the State Public Utilities Commission, the State Consumer Advocate, the Legislative Reference Bureau and the electric utilities of the State.

(1) To ensure quality control, and upon notification by the eligible customer that an audit recommended installation has occurred, the utility shall perform random inspections of conservation measures installed as a result of the utility's recommendation.

(2) Prior to performing any inspection under this rule, the utility shall submit to Commission staff:

(a) Assurance that all persons performing post-installation inspections have received training and are qualified to determine whether the installation is in compliance with the standards prescribed in subsection (6); and

(b) The procedure it intends to use to ensure randomness. Procedures not rejected by the Commission staff within two weeks of submission shall be deemed approved.

(3) The utility shall inspect four of each contractor's first ten installations of ceiling insulation, wall insulation, floor insulation, and domestic solar water heating systems. The utility shall inspect at least one installation of each contractor of conservation measures.

(4) The utility shall inspect ten precent of all energy conservation measures that are installed as a result of the utility's recommendation. Inspections performed pursuant to subsection (3) shall be included to meet the requirement imposed by this subsection.

(5) All post-installation inspections will be conducted by a qualified inspector with no financial interest in the contractor who installed the measure unless the contractor is the utility.

(6) The inspector will investigate to determine if the installation was accomplished in conformance with the applicable installation standards published in the Federal Register under Subpart I of the RCS Final Rule (10 CFR Part 456, 44FR64602, November 7, 1979), or, in the case of domestic solar hot water and domestic solar pool heating systems, in accordance with the Florida Standard Practices for Design and Installation of Solar Domestic Hot Water and Pool Heating Systems, promulgated by the Florida Solar Energy Center effective March 1, 1981.

(7) The utility shall provide a reinspection if a violation of materials or installation standards is found.

(8) The utility shall report the results of the inspection to the eligible customer, the installer and DACS within two weeks of the inspection. The report shall contain any customer complaint concerning the installation.

Specific Authority: §366.05(1), 366.82(1), (5), F.S.
Law Implemented: 366.82, F.S.
History: New 5/4/80, Amended 12/16/80, Transferred from 25-6.116, Amended 10/28/82, formerly 25-17.56.

25-17.057 Energy Conservation Audit Results.

(1) Unless an alternative method is authorized by Commission order upon good cause shown, the auditor shall make recommendations and provide the audit results and any recommendations to the customer, on site, in writing, and in person, upon completion of the audit, unless the customer is not present at the time of the audit or otherwise declines in-person presentations.

(2) The auditor shall provide the customer with:

(a) The estimated energy and overall cost savings that would likely result from each applicable energy conservation measure, in accordance with or except as provided in subsection (3) of this rule;

(b) An estimation of the total installation cost for each conservation measure, as provided in subsection (4) of this rule;

(c) The annual ordinary maintenance cost, if any, for each conservation measure;

(d) The first year's energy savings in dollars or a range of dollars for each conservation measure;

(e) The expected time of payback as provided in subsection (5) of this rule;

(f) A clear indication via sample calculations or disclosure, that the total energy cost savings from the installation of more than one energy conservation measure could be less than the sum of energy cost savings of each conservation measure installed individually;

(g) An explanation of the availability, if any, of innovative energy conservation rate structures or load management techniques offered by the utility;

(h) A sample calculation of the effect of federal and/or state tax benefits on the cost to the customer of installing at least one applicable energy conservation measure and, where possible, one or more renewable resource measure.

(3)(a) Except as provided in this paragraph, the auditor may not provide cost and savings estimations for furnace efficiency modifications described in Rule 25-17.051(10)(a) and (k), unless the furnace uses primarily a source of energy supplied by the utility performing the audit. Absent such use, the auditor shall provide cost and savings estimations for furnace efficiency modifications if the customer requests them and if the customer agrees to sign the following statement: "If your home is heated by a source of fuel other than (state the type of fuel supplied by the utility), only the supplier of your fuel may audit your furnace unless you specifically request us to do so. Federal law requires that such a request be in writing. If you want us to audit your furnace, although we do not supply the fuel it uses, please sign below."

(b) With regard to the conservation measure listed in Rule 25-17.051(10)(a) and (k), the auditor shall base any cost and savings estimations on an evaluation of the seasonal efficiency of the boiler or furnace. Seasonal efficiency shall be based on estimated peak (tuned up) steady state efficiency corrected for cycling losses. Steady state efficiency shall be derived from manufacturer's design data and observation of the furnace components or, alternatively, by a flue gas analysis of measured flue gas temperature and carbon dioxide content, or by procedures set forth by DOE in "Final Energy Conservation Test Procedures," 43 Federal Register, 20128, 20147.

(4)(a) Except as provided in paragraph (b), the auditor shall provide an estimation of the total installation cost for each conservation measure which reflects the customer's installing it himself or herself and which reflects the cost to the customer of having the measure installed by a contractor.

(b) For ceiling insulation, the auditor shall calculate the payback period for at least one increased level of insulation either to or above R.19 or, for residences with resistance heat systems in regions having 1,000 or more heating degree days per year, to or above R-22. Such calculations shall be in increments of R-11. The auditor may calculate payback periods for other levels of insulation if the customer so requests or if the utility believes higher levels would be cost effective. Auditors shall express recommendations in terms of R values and not in inches.

(5) The auditor shall provide to the customer an estimation of the expected time for payback of the customer's cost of purchasing and installing any conservation measure.

(a) Except as provided by Commission order, all payback computations shall be based on a percentage change in energy bills as formulated by the Commission and noted in Rule 25-17.055(1)(c). The Commission will provide the utilities with the applicable rate for each succeeding year by January 31st of that year.
Specific Authority: 366.05(1), 366.82, F.S.
Law Implemented: 366.82, F.S.
History:* *New 5/4/80, Amended 12/16/80, Transferred from 25-6.117, Amended 10/28/82, formerly 25-17.57.

25-17.058 Reserved.

25-17.059 Energy Conservation Audit Charges, Disclosures, and Disclaimers.
(1) Charges.
(a) The utility may charge the eligible customer for the Energy Conservation Audit. If any charge is made, it shall not exceed $15.00 and the amount to be charged shall first be filed with the Commission as part of the utility's tariff. The utility shall allow the customer the option of: paying by personal check, money order, or cash at the time of the audit; or being charged the audit cost on his or her utility bill.
(b) The utility may not charge for performance of the customer assisted audit.
(c) The utility may charge for an alternative (walk-through) audit. However, any charge imposed by a utility for performance of a walk-through audit shall first be filed with the Commission as a part of the utility's tariff. The charge shall not exceed $5 per audit. The utility shall submit their procedure for conducting a walk-through audit to the Commission for approval prior to conducting these audits.
(2) Disclosures.
(a) Each energy conservation audit result sheet shall include a statement to the following effect: "The procedures used to make these estimates are consistent with U.S. Department of Energy criteria for residential energy audits and have been or will be evaluated by the department for accuracy. However, the actual installation costs you incur and energy savings you realize from installing these measures may be different from the estimates contained in this audit report. Although the estimates are based on measurements of your house, they are also based on assumptions which may not be totally *correct for your household due to energy use patterns.*"
(b) The auditor shall provide the eligible customer with a written statement of any interest which the auditor or the utility has directly or indirectly in the sale or installation of any energy conservation measure. However, if the utility supplies, *installs or finances the sale of any energy conservation measure, this subsection* shall not operate to prohibit the auditor from advising the eligible customer of that fact.
(c) Upon request of the customer, the auditor shall disclose the results of any prior energy conservation audit of the customer's residence for which records are still available.
(3) The results of the energy conservation audit shall contain the following or a similar disclaimer: "The utility does not warrant or guarantee the audit findings or recommendations nor is the utility liable as a result of the audit for the acts or omissions of any person who implements or attempts to implement those conservation measures found and recommended as cost effective by the auditor."
Specific Authority: 366.05(1), 366.82(1), F.S.
Law Implemented: 366.82, F.S.
History: New 5/4/80, Amended 12/16/80, Transferred from 25-6.119, Amended 10/28/82, formerly 25-17.59.

Source: Florida Administrative Code, sec. 25-17.057, Rules of the Florida Public Service Commission.

199—27.6(476) Program auditors, installers and inspectors.

27.6(1) *Qualification of auditors.* Each person who performs a program audit pursuant to this plan shall:

a. Be qualified according to the applicable procedures in 27.6(2).

b. Be under contract or subcontract to, be an employee of, or be an employee of a contractor or subcontractor to, a covered utility.

27.6(2) *Minimum auditor qualification requirements.* A qualified auditor shall:

a. Complete a board-approved training course for residential auditors that provides:

(1) General understanding of the three types of heat transfer and the effects of temperature and humidity on heat transfer.

(2) General understanding of residential or commercial building construction terminology and components.

(3) General knowledge of the operation of the heating and cooling systems used in residential or commercial buildings.

(4) General knowledge of the different types of each applicable energy conservation measure; of the advantages, disadvantages, and applications of each; and of any installation standards prescribed for the I-SAVE program.

(5) Capacity to conduct the audit according to the procedures described in rule 27.5(476) including: familiarity with energy conserving practices prescribed in these rules; capability of determining applicable energy conservation measures, and proficiency in audit procedures for each applicable measure.

(6) Where a furnace efficiency modification is an applicable energy conservation measure, and the source of fuel for the existing furnace or boiler is either gas or oil, a working ability to calculate the steady state efficiency of the furnace or boiler as required by 27.5(2)"*c*"(4).

b. Complete a utilities board-approved training course that provides that commercial energy auditors shall possess the following qualifications:

(1) Auditors shall have a general understanding of commercial and apartment building construction, particularly a knowledge of the heating and cooling systems, heat transfer and related environmental effects, the different types and applications of program measures and any relevant state installation standards.

(2) Auditors shall possess the capability to conduct the audit including:

1. A familiarity with the program operations and maintenance procedures;
2. The capability to determine the applicability of the program measures; and
3. A proficiency in pertinent auditing procedures for each applicable program measure.

(3) Auditors shall have general knowledge of the nature of solar energy and its applications.

(4) Auditors shall have general knowledge of utility rates.

(5) Specifically, the audit work force shall have:

1. A working ability to calculate or determine the steady state efficiency of a furnace or boiler;
2. A general knowledge of pneumatic, electrical and hydronic control systems and their applicability to automatic energy control systems;
3. An understanding of the interrelationship between the various loads in the eligible building population including the ability to anticipate the corresponding effect on one load of changes to the other;
4. A general knowledge of lamps and lighting systems used in commercial and multifamily buildings;
5. A general knowledge of the functions and operating characteristics of steam systems in commercial and apartment buildings, as well as the various types and symptoms of steam system failure; and
6. An understanding of automatic energy control systems and the relationships among the occupants, the structure, and the mechanical and lighting systems (energized systems).

c. Successfully demonstrate qualifications in appropriate written or practical examinations to be administered by the training organization approved by the board.

Upon successful completion of the training and examination requirements, the candidate shall be provided with a letter of qualification by the board which shall be valid for two (2) years as a board-approved energy auditor.

The board shall review and approve or disapprove proposed auditor training and testing programs by covered utilities or other auditing service organizations within thirty (30) days after submission. If the program is disapproved, the utilities or other auditing organizations will have thirty (30) days within which to amend and resubmit the proposed program. Board-approved auditor training and testing programs shall be submitted for review and approval every two (2) years after initial approval.

Utility employees, contractors, or subcontractors, or employees of contractors or subcontractors who have successfully completed training and examination and have been qualified as board-approved energy auditors, shall be certified as I-SAVE energy auditors.

27.6(3) *Recertification.* Individuals who desire recertification must submit their application to the board no later than sixty (60) days prior to the expiration date of their current certificate. Such application shall detail the applicant's professional experience as an energy auditor for, at a minimum, the preceding two (2)-year period. Upon review of the application by the board, the applicant shall be notified as to the time, date, and place of the written or practical examinations necessary for recertification.

27.6(4) *Reciprocity of auditors.* An auditor certified in another state may be authorized to conduct program audits in Iowa provided the auditor demonstrates qualifications.

Source: Iowa Administrative Code, sec. 199-27.6(2), Rules of the Iowa State Utilities Board.

Appendix A

List of Sources From Whom Information Was Requested on Alternate Energy Utility Financing Programs

Responded

Arizona Corporation Commission
1200 W. Washington Street
Phoenix, Arizona 85007

Marcia G. Weeks
Chairman

Bonneville Power Adminstration
Box 3621
1002 N.E. Holladay Street
Portland, Oregon 97208

Peter T. Johnson
Administrator

California P.U.C.
505 Van Ness Street
San Francisco, California 94102-3298

Stanley W. Hulett
President

Colorado P.U.C.
Logan Tower
Office Level 2
1580 Logan Street
Denver, Colorado 80203

Arnold H. Cook
Chairman

Florida Public Service Commission
101 East Gaines Street
Fletcher Bldg.
Talahassee, Florida 32301-8153

Katie Nichols
Chairman

Georgia Public Service Commission
244 Washington Street, S.W.
Atlanta, Georgia 30334

Robert C. Pafford
Chairman

Idaho PUC
Statehouse
Boise, Idaho 83720

Perry Swisher
President

Illinois Commerce Commission
Leland Bldg.
527 East Capitol Avenue
Springfield, Illinois 62706

Mary B. Bushnell
Chairman

Iowa State Utilities Board
Lucas State Office Building
De Moines, Iowa 50319

Andrew Varley
Chairman

Maine Public Utilities Commission
242 State Street
State House, Station 18
Augusta, Maine 04333-0018

Peter Bradford
Chairman

Michigan Public Service Commission Merchantile Bldg. 6545 Merchantile Way P. O. Box 30221 Lansing, Michigan 48909	William E. Long Chairman
Minnesota PUC 780 American Center Bldg. 160 East Kellog Blvd. St. Paul, Minnesota 55101	Barbara Beerhalter Chair
Missouri Public Service P. O. Box 360 Truman State Office Bldg. Jefferson City, Missouri 65102	William D. Steinmeir Chairman
New York Public Service Commission Empire State Plaza Albany, New York 12223	Anne F. Mead Chairman
Nevada Public Service Commission 505 East King Street Carson City, Nevada 89710	Scott M. Craigie Chairman
Oregon PUC 300 Labor and Industries Bldg. Salem, Oregon 97310	Charles Davis Chairman
Tennessee Valley Authority Knoxville, Tennessee 37902	Charles H. Dean, Jr. Chairman
Texas PUC 7800 Shoal Creek Blvd. Suite 400N Austin, Texas 78757	Dennis L. Thomas Chairman
Washington Utilities and Transportation Commission Chandler Plaza Bldg. 1300 South Evergreen Park Dr., S.W. Olympia, Washington 98504	Sharon L. Nelson Chairman
Wisconsin Public Service Commission 477 Hill Farms State Office Bldg. P. O. Box 7854 Madison, Wisconsin 53707	Charles H. Thompson Chairman

Did Not Respond

Kansas State Corporation Commission
State Office Bldg.
Topeka, Kansas 66612

Keith R. Hanley
Chairman

Appendix B

PROPORTION OF WORLD ENERGY USE BY COUNTRY 1985
(Percent)

Country or region	Total	Petroleum	Natural gas	Coal	Nuclear & other
United States	35.9	32.5	47.1	40.7	25.7
Canada	4.7	3.2	5.5	2.8	11.3
Japan	7.6	9.3	4.2	6.7	8.0
Europe	28.1	27.7	23.7	27.2	36.3
Developing countries & OPEC ...	23.6	27.4	19.5	22.6	18.7
Total	100.0	100.0	100.0	100.0	100.0

Source: U.S. Dept. of Energy, "International Energy Outlook 1986, Projections to 2000"

Appendix C

PROJECTED "FREE WORLD" OIL CONSUMPTION
(Millions of barrels per day)

Region or country	1985	1995 High price case	1995 Low price case	Average annual compounded rate of growth 1985 to 1995 High case	Low case
United States	16.0	16.7	18.0	.43	1.18
Canada	1.5	1.6	1.8	.65	1.84
Japan	4.3	4.4	4.8	.23	1.11
Europe	11.7	12.0	13.1	.25	1.14
Other	9.6	10.3	11.0	.71	1.37
OPEC	3.4	4.2	4.2	2.14	2.14
Total	46.5	49.2	52.9	.57	1.30

Note: "Free World" or Market Economies are defined as all countries other than the centrally planned economies of Eastern Europe, Soviet Union, Peoples' Republic of China, Kampuchea, North Korea, Laos, Mongolia and Vietnam.

Source: U.S. Department of Energy, "Energy Security", March 1987.

Appendix D

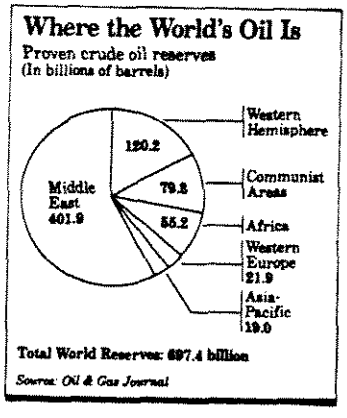
CRUDE OIL RESERVES, MARKET ECONOMIES: 1986
(Billions of barrels)

Country or region	Crude oil reserves	Percent of total
North America	86.1	13.9
Canada	6.9	1.1
Mexico	54.7	8.8
United States	24.6	4.0
Central & South America	34.1	5.5
West. Europe, incld. North Sea fields	21.9	3.5
Middle East	401.9	65.0
Iran	48.8	7.9
Iraq	47.1	7.6
Kuwait	94.5	15.3
Saudi Arabia	169.2	27.4
United Arab Emerates & Qatar	36.3	5.9
Africa	55.2	8.9
Libia	21.3	3.4
Nigeria	16.0	2.6
Other	17.9	2.9
Far East, Oceania, Australia, Indonesia	19.0	3.1
Total OPEC	477.5	77.2
Total Market Economies	618.2	100.0

Source: "Oil & Gas Journal", Dec. 26, 1986, also published in U.S. Department of Energy, Energy Information Administration, "International Energy Outlook 1986, Projections to 2000", April 1987.

Appendix E

LOCATION OF WORLD CRUDE OIL RESERVES



Source: Wall Street Journal, August 21, 1987, p. 1.

Appendix F

HAWAII PRIMARY ENERGY USE: 1985 And 1986
(Billion Btu)

Source	1985	Percent	1986	Percent
Petroleum	238,532	90.36	236,816	90.01
Biomass	23,143	8.77	23,999	9.12
Hydroelectricity	980	.37	1,021	.39
Coal	956	.36	495	.19
Wind	171	.06	582	.22
Geothermal	188	.07	180	.07
Total	263,970	100.00	263,093	100.00

Note: Data for 1986 are preliminary.
Source: Department of Planning and Economic Development, records.

PRIMARY ENERGY USE UNITED STATES: 1985 And 1986
(Quadrillion Btu)

Source	1985	Percent	1986	Percent
Petroleum	30.922	41.8	31.887	43.1
Coal	17.479	23.6	17.271	23.4
Natural gas	17.851	24.1	16.531	22.4
Nuclear	4.147	5.6	4.475	6.1
Hydroelectricity	3.363	4.6	3.495	4.7
Other *	.199	.3	.215	.3
Total	73.962	100.0	73.873	100.0

* Includes biomass, wind, geothermal, PV and other sources.
Source: U.S. Department of Energy, "Monthly Energy Review" Feb. 1987.

Appendix G

SELECTED UTILITY ENERGY CONSERVATION PROGRAMS

Jurisdiction	Programs	Motivation	Specifications	Target Groups	Participaption	Evaluation
Arizona	1) Energy Control Credits	1) Not provided	1) Credit on bills for installation of specified measures	1) General residential	1) Not provided	1) Not provided
	2) Zero Interest Plan	2) Not provided	2) Not provided	2) Not provided		
Bonneville Power Adm.	1) Buyback	1) Statutory	1) Installation of conservation measures-- --insulation, storm windows, water heater wrap, weatherization, --buyback lesser of: a) 85% of actual cost of weatherization b) 32 cents X projected first kwh savings	1) General residential	1) Not provided	1) Not provided
California	1) Low interest loan	1) Statutory	1) Install six weatherization measures --insulation, caulking duct wrap, etc. --8%/$2,000 maximum --single and multi units	1) General residential	1) As of 1985, almost 600,000 eligible customers participated	1) Annual oil saved 1,600,000 barrels --cost of program $129,580,200
	2) Cash rebates	2) Statutory	2) Rebate based on energy saved --install 3 of 6 measures	2) General residential	2) As of 1985, almost 600,000 eligible customers participated	2) Annual oil saved 1,600,000 barrels --cost of program $129,580,200
	3) Zero interst plan (ZIP)	3) Statutory	3) Install all 6 measures --0% interest --$3,500 maximum --100 month payoff	3) General residential	3) As of 1985, almost 600,000 eligible customers participated	3) Annual oil saved 1,600,000 barrels --cost of program $129,580,200
Florida	1) Conservation cooling and heating	1) Statutory	1) Installation of energy efficient air and heating equipment --$600 maximum recovery	1) General residential	1) Not provided	1) Not provided
	2) Conservation water heating	2) Statutory	2) 3 Alternatives to water heater --solar heater- $400 maximum --heat pump- $186 maximum --heat recovery- $177 maximum	2) General residential	2) Not provided	2) Not provided
	3) Ceiling insulation	3) Statutory	3) Encourage ceiling insulation	3) General residential	3) Not provided	3) Not provided
	4) Residential window treatment	4) Statutory	4) Cost sharing/ reimbursement --solar film --solar screen --awnings and shutters	4) General residential	4) Not provided	4) Not provided
	5) Home energy loss prevention	5) Statutory	5) Cost sharing/ reimbursement for installation of 15 low cost measures (e.g. caulking, weather stripping)	5) General residential	5) Not provided	5) Not provided

Jurisdiction	Programs	Motivation	Specifications	Target Groups	Participation	Evaluation
Idaho	1) Zero interest program	1) Not provided	1) 0% interest --Qualified measures .Insulation .Weatherization --$100 minimum cost	1) General residential	1) Not provided	1) Not provided
	2) Cash grants	2) Not provided	2) Up to 70% of cost savings not to exceed cost of measure installed --minimum $70	2) General residential	2) Not provided	2) Not provided
	3) Heater rebate	3) Not provided	3) Installation of energy efficient water heater--$50	3) General residential & commercial	3) Not provided	3) Not provided
Illinois	1) Low interest financing	1) Statutory	1) Qualified measures --maximum $3,000 single family to $8,000/4 unit	1) General residental	1) Pilot program	1) Evaluation pending (1987-1988)
	2) Energy weatherization	2) Statutory	2) Qualified measures --free installation	2) Low income/ senior citizens	2) Pilot program	2) Evaluation pending (1987-1988)
	3) Heater rebate	3) Statutory	3) Qualified heating equipment --$100 credit on bill	3) General residental	3) Pilot program	3) Evaluation pending (1987-1988)
Iowa	1) Low/no interest financing	1) Statutory (Repealed after 1 year)	1) Installation of conservation measures --Interest varies with measure installed --payback 2-4 years --up to $7,500 loan	1) General residential	1) Repealed	1) Repealed--negative public response to added cost
Maine	1) Low interest loan	1) Statutory	1) Installation of energy conservation improvements --6% interest --$250-$2,000 loans --measures include installation, solar heating, etc.	1) General residential	1) Low participation	1) Poor response with direct loans
	2) No interest loans	2) Statutory	2) Energy conservation improvements --up to $750 loans --same measures as low interest	2) Low income residential	2) Low participation	2) Poor response with direct loans
	3) Hot water conservation	3) Statutory	3) Installation of low cost energy saving devices --heater insulation --low flow shower --faucet aerators	3) General residential	3) High	3) Most successful program --savings over $3,000,000 a year
	4) Appliance rebate	4) Statutory	4) Replacement with energy efficient appliances --$10-$50	4) General residential	4) Pilot program	4) Report pending
Michigan	1) Low interest loans	1) Statutory	1) Install conservation measures --insulation, storm windows and doors --interest = 8-12% --3-5 year payoff --$300 to no limit	1) General residential	1) As of 1983, over 9,200 loans	1) Current evaluation pending --as of 1983, savings of $957,000/year
	2) Zero interest loans	2) Statutory	2) Insulation and conservation devices --gas customers --5 year payoff	2) General residential	2) As of 1983, $14 million in loans	2) Current evaluation pending --as of 1983, savings of $4.2 million/year

Jurisdiction	Programs	Motivation	Specifications	Target Groups	Participation	Evaluation
Minnesota	1) Appliance rebate	1) Statutory	1) Qualified appliances --central air conditioner --room air --refrigerator/freezer --electric water heater --$10-$400	1) General residential	1) Not provided	1) Estimated cost effective for participant and utility
	2) Low/no interest loans	2) Statutory	2) Not available	2) General residential	2) Not provided	2) Not provided
Missouri	1) Weatherization loan program	1) Not available	1) $2,000-$6,000 --qualified measures a) storm doors, windows b) insulation c) treatment for air leakage --interest rate based on household income and dependents --1% reduction for workshop participants	1) General residential	1) 693 loans since inception	1) Not provided
New Jersey	1) Zero interest payment	1) Regulatory requirement	1) Weatherization measures --household income below $30,000	1) General residential	1) 5,000 participants as of 1986	1) Not completed
	2) Low interest loans	2) Regulatory requirement	2) Weatherization measures --household income below $50,000 --7% interest	2) General residential		2) Not completed
	3) Shared savings	3) Regulatory requirement	3) Weatherization measures installed by private company --customer pays installation --utility pays company for savings	3) General residential		3) Not completed
New York	1) Consumer conservation	1) Statutory	1) Plan adopted by PUC for each utility --cost financed by utility or bank --cost recoverable over 7 years from savings --interest set by commission --$2,500-$6,000 loan maximum	1) All eligible consumers	1) From 1982-85, 35,000 loans for $70,000,000 worth of of conservation measures	1) 1982-85, estimated $255 million savings to customers --6 million barrels of oil

Jurisdiction	Programs	Motivation	Specifications	Target Groups	Participation	Evaluation
Oregon	1) Zero interest payment	1) Voluntary	1) Installation of weatherization measures --insulation, weatherstripping, storm windows, etc. --$4-$5,000 loan	1) General residential	1) Over 80,000 homes weatherized under the 3 programs	1) Not provided
	2) Cash rebates	2) Statutory	2) Installation of weatherization measures --25% of cost up to $350	2) General residential	2) Over 80,000 homes weatherized under the 3 programs	2) Not provided
	3) Low interest loans	3) Statutory	3) Installation of weatherization measures --$5,000 maximum --6-1/2 to 13-1/4% interest based on effectiveness --10 year payoff	3) General residential	3) Over 80,000 homes weatherized under the 3 programs	3) Not provided
	4) Energy buyback	4) Voluntary	4) Installation of weatherization measures --buyback based on estimated first year savings --buyback lesser of 85% of cost of measure or 32 cents per kwh saved	4) General residential	4) 11,000 of 40,000 customers have been weatherized	4) Not provided
Texas	1) Zero interest loans	1) Statute	1) Install conservation measures --insulation, caulking weatherstripping, heat pumps, solarscreen, efficient air conditioner, etc. --$4,000 maximum --7 year payback	1) General residential	1) Low due to eligibility requirements. Made easier since 1984	1) Not provided
Tennessee Valley Authority	1) Zero interest loan	1) TVA initiated	1) Installation of weatherization and conservation measures --weatherization --heat pump, solar water heating, sun-screens, etc. --maximum-$1,200 loan --7 year payoff --post installation inspection	1) General residential	1) Over 585,000 homes weatherized --over 50,000 heat pumps installed	1) Excellent
	2) Low interest loan	2) TVA initiated	2) Install same as zero interest --Maximum-$3,800 --10 year payoff	2) General residential	2) Over 585,000 homes weatherized --over 50,000 heat pumps installed	2) Excellent
	3) Cycle and save	3) TVA initiated	3) $2-$5 credit per month for cycling of power	3) General residential	3) Over 65,000 air condition cycling --Over 61,000 water heater cycling	3) Excellent

Jurisdiction	Programs	Motivation	Specifications	Target Groups	Participation	Evaluation
Washington	1) Zero interest loans	1) City mandate	1) Installation of weatherization measures --insulation, pipe wrap, caulking, storm windows, etc. --10 year loan, no payment first 5 year	1) General residential	1) Not provided	1) Not provided
	2) Cash grants	2) City mandate	2) Installation of weatherization measures --same as ZIP --grant up to 71.8% of cost effective work	2) General residential	2) 33% of eligible participated --70% chose cash grant	2) Not provided

Prepared by Gary Ige, formerly on staff with the Public Utilities Commission. The information provided has been compiled from materials received from other jurisdictions, which are listed in Appendix A.

Appendix H

Table 3. Characteristics of Financial Incentive Programs for General Markets

	Only electrically-heated or air conditioned homes eligible	Program began by offering loans, then added or changed to rebates	Contractor marketing	Penetration of market (%)
Bonneville Power Administration	Yes	Yes	No	30
City of Austin	Yes	Loan only	No	<10
City of Santa Monica	No	No, some free measures are installed	Yes	35
Eugene Water and Electric Board	Yes	Yes	No	50
Florida Power and Light	Yes	Rebates only	Yes	<10
General Public Utilities	Yes	Contractor paid for savings; free to customer	Yes	N/A*
Pacific Gas and Electric	No	Yes	Yes	90
Portland General Electric	Yes	Yes	No	40
Public Service Electric and Gas Co.	No	Loans only, interest rate varies by income	No	<1
Puget Sound Power and Light	Yes	Yes	No	55
Seattle City Light	Yes	No	No	
Southern California Gas Co.	No	Yes	Yes	90
Southern California Edison	Yes	Yes	Yes	90
Tennessee Valley Authority	Yes	Loans only	No	30

*Program is only offered to selected households in selected locations.

Source: Linda Berry, Marjie Hubbard, Dennis White, A Review of Financial Incentive, Low-Income, Elderly and Multifamily Residential Conservation Programs (Washington, D.C.: U.S. Department of Energy, Office of Conservation and Renewable Energy, 1986).

Appendix I

Table 1. Programs nominated most frequently by trade associations and researchers, by type

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Financial Incentive and Low Income

California
- City of Santa Monica
- Pacific Gas and Electric
- Southern California Gas*
- Southern California Edison*

Pacific Northwest
- Bonneville Power Administration*
- Puget Sound Power and Light*
- Seattle City Light*

Other locations
- City of Austin, Texas
- Tennessee Valley Authority*

Elderly

- Georgia Power
- Puget Sound Power and Light

Multifamily

All major investor-owned California utilities have multifamily programs.

Pacific Gas and Electric was named as one of the most successful.

City of Palo Alto, California

Northern States Power and the Energy Resource Center, St. Paul

Minnegasco and the Minneapolis Energy Office

Citizens Conservation Corporation, Boston.

Source: Linda Berry, Marjie Hubbard, Dennis White, A Review of Financial Incentive, Low-Income, Elderly and Multifamily Residential Conservation Programs (Washington, D.C.: U.S. Department of Energy, Office of Conservation and Renewable Energy, 1986).

Appendix J

Formula for Determining a Utility's Revenue Requirement

$$R = O + (V - D)r$$

where:

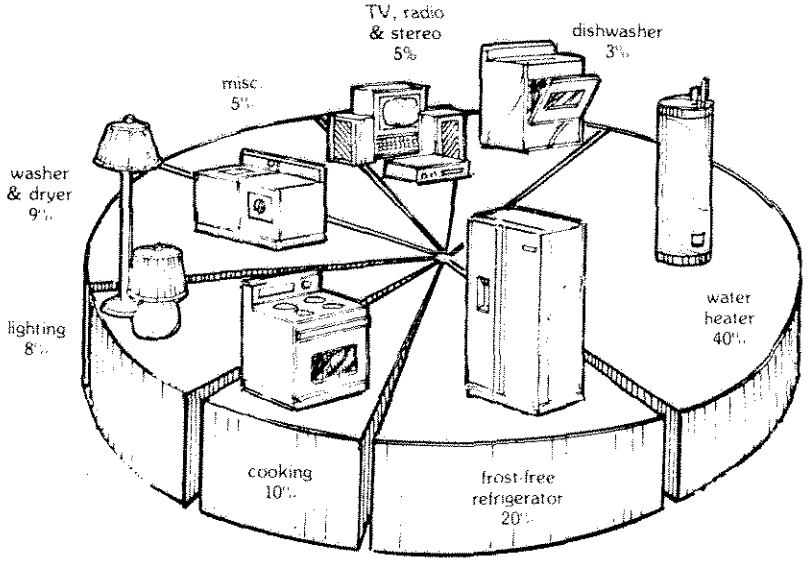
- R is the total revenue required,
- O is the operating costs,
- V is the gross value of the tangible and intangible property,
- D is the accrued depreciation of the tangible and reproducible property,
- (V - D) is the net value or investment and is referred to as the rate base, and
- r is the allowed rate of return.

Source: Charles E. Phillips, Jr. The Regulation of Public Utilities: Theory and Practice, (Arlington: Public Utilities Reports, Inc., 1984).

Appendix K

Appliance Sense

This graphic illustration shows how different household activities use energy, in a typical family of four. Note the very large share of total energy represented by hot water heating.



Source: Hawaii Department of Planning and Economic Development, Saving Energy and Dollars in the Home (Honolulu: 1985).

Appendix L

COMMENTS TO THE PRELIMINARY DRAFT REPORT OF THIS STUDY

Samuel B. K. Chang
Director

LEGISLATIVE REFERENCE BUREAU
State of Hawaii
State Capitol
Honolulu, Hawaii 96813
Phone (808) 548-6237

December 31, 1987

3734-A

Mr. Hideto Kono, Chairman
Hawaii Public Utilities Commission
465 South King St.
Honolulu, Hawaii 96813

Dear Hideto Kono:

I am enclosing an advance, courtesy copy of the final draft of the Bureau's report on utility financing programs for energy conservation, prepared in response to House Resolution No. 14, H.D. 1 which was adopted during the 1987 legislative session. Your review and comments would be greatly appreciated. I believe your staff liaison to the study received an earlier draft of certain chapters as well as a copy of the proposed legislation which has been made part of Chapter 6. The final version of the proposed legislation remains essentially unchanged except for the addition of a section (currently numbered as section -13) that would authorize the Commission to allow utilities to earn a rate of return on their investment in energy conservation programs that achieve certain energy efficiency performance goals.

As I am sure you are aware, we are on a tight schedule to submit a final, printed version of the study to the Legislature prior to the convening of the Regular Session of 1988. Accordingly, I would appreciate receiving any comments you may have by January 11, 1988.

On behalf of myself and all of us at the Bureau, thank you very much for your assistance, and best wishes for the New Year.

Sincerely

Samuel B. K. Chang
Director

SBKC:ctn
Enclosure

JOHN WAIHEE
GOVERNOR

HIDETO KONO
CHAIRMAN

ALBERT Q. Y. TOM
COMMISSIONER

CLYDE S. DUPONT
COMMISSIONER

STATE OF HAWAII
PUBLIC UTILITIES COMMISSION
DEPARTMENT OF BUDGET AND FINANCE
465 S. KING STREET
KEKUANAOA BUILDING, FIRST FLOOR
HONOLULU, HAWAII 96813

January 11, 1988

Mr. Samuel B.K. Chang, Director
Legislative Reference Bureau
State of Hawaii
State Capitol, Room 004
Honolulu, Hawaii 96813

Dear Mr. Chang:

Subject: Utility Financing of Energy Conservation

We have reviewed your Bureau's report on utility financing programs for energy conservation in response to House Resolution No. 14, H.D. 1 adopted in the 1987 Legislative session.

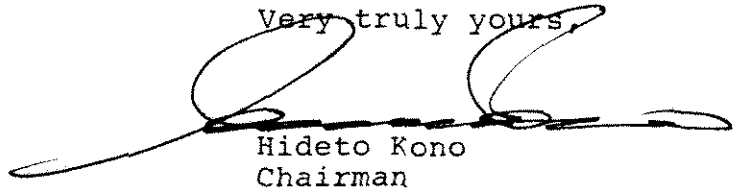
In the 1987 Legislative session, House Resolution No. 375 relating to Integrated Resource Planning (IRP) was also adopted. IRP includes two new factors (conservation and load management) which may not have been considered in the past planning processes and should be considered.

In our response to H.R. No. 375 we have established a task force which will be engaged in the development and implementation of an IRP which will require considerable amount of effort, time and money. We are also in the process of retaining a consultant to assess and scope a plan specifically for Hawaii rather than relying solely on the Mainland's experience. Our recommendation to the 1988 Legislature is that no additional legislation is required at this time and that a report prepared by the task force be submitted to the 1989 Legislature.

Inasmuch as IRP includes conservation as only one part of the overall planning process, we believe that legislation relating to utility financing of energy conservation at this time is premature pending the task force final development and implementation of IRP. We believe that conservation will be discussed in the overall IRP. Accordingly, we suggest that there be included as part of the final report, a mention of the task force's pending assessment of IRP.

Although we had been preparing a report on H.R. No. 375 for the past several months, the final recommendations were formulated in mid-December, 1987. We apologize for not bringing this to your attention earlier.

Very truly yours,



Hideto Kono
Chairman

HK:LY:eh

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Guide to Government in Hawaii. Eighth Edition. 186 p. $3.00
Hawaii Legislative Drafting Manual. Seventh Edition. 112 p.

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