INCENTIVES FOR ENERGY CONSERVATION

JOINT HEARING

BEFORE THE

SUBCOMMITTEE ON OVERSIGHT AND INVESTIGATIONS

OF THE

COMMITTEE ON INTERSTATE AND FOREIGN COMMERCE U.S. HOUSE OF REPRESENTATIVES

AND THE

SUBCOMMITTEE ON THE CITY

OF THE

COMMITTEE ON BANKING, FINANCE AND URBAN AFFAIRS

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INCENTIVES FOR ENERGY CONSERVATION

FRIDAY, OCTOBER 26, 1979

HOUSE OF REPRESENTATIVES, SUBCOMMITTEE ON OVERSIGHT AND INVESTIGATIONS, COMMITTEE ON INTERSTATE AND FOREIGN COMMERCE, AND SUBCOMMITTEE ON THE CITY, COMMITTEE ON BANKING, FINANCE AND URBAN AFFAIRS,

Washington, D.C.

The subcommittees met, pursuant to notice, at 10 a.m., in room 2322, Rayburn House Office Building, Hon. Albert Gore, Jr., Subcommittee on Oversight and Investigations, presiding (Hon. Bob Eckhardt, chairman).

Mr. GORE. Both subcommittees will come to order.

Today's hearing continues the joint inquiry by the Subcommittee on the City of the House Banking Committee and the Subcommittee on Oversight and Investigations of the House Interstate and Foreign Commerce Committee on how to make our homes and workplaces more energy efficient.

The need for across-the-board energy savings is obvious. The average price of world crude oil has risen to about $21 per barrel, an increase of about 60 percent this year, and further price hikes are imminent.

With the price of certain categories of decontrolled volumes of domestic oil approaching $30 per barrel, energy directly contributes about half of the current double-digit inflation. For an increasing number of Americans, conservation has become a necessity rather than an option.

The Office of Technology Assessment estimates that about 17 percent of the population—some 37 million households—exist on incomes at or below 125 percent of the poverty level.

These families routinely spend 15 to 30 percent of their disposable income on utility bills, and during the heating season it is not unusual for the outlay to rise to 50 percent. And energy prices are increasing.

Congress considered yesterday spending over $1 billion just to help lower income people pay their heating bills this winter. It would be so much more cost effective to spend this money to weatherize homes and apartments, but it is too late for the current heating season.

The proposed subsidy is, among other things, a testament to the failure of existing Government conservation programs. For example, the current tax credit for conservation measures and solar installations has favored the affluent and discriminated against the poor, who are generally believed to live in the oldest and least energy efficient houses.

IRS data for the 1978 tax year indicate that 11 percent of the households with adjusted gross incomes of more than $15,000 made significant conservation investments compared to less than 3 percent of the households with incomes of under $15,000.

Moreover, the tax credit is almost completely ineffective in reaching rental units, which constitute about one-third of the 75 million residential dwellings in this country, and does not apply at all to other commercial properties.

We must devise an effective mechanism to reach all of the residential energy users in this country, and we must stimulate conservation in the commercial and industrial sectors, too.

The potential savings are enormous. Together, owner and tenant occupied dwelling units account for about 15 percent of the country's total energy consumption just for heating, cooling, and to provide hot water.

The Department of Energy estimates that savings of up to 2 million barrels of oil equivalent per day can be achieved in the residential sector alone.

This morning we will hear from a panel of experts representing utilities from several areas of the country and a State utility commission. Each witness brings a different set of experiences as to how to induce conservation in our homes and workplaces.

Before proceeding, I would like to recognize my colleague, Mr. Lent, for any statements that he might have.

Mr. LENT. Thank you very much, Mr. Chairman.

Few headlines will be produced from the work that we do here today. But I do regard this hearing as vitally important to Congress in carrying out our duties as we struggle daily with the task of shaping a rational energy policy for the United States.

This is essentially an opportunity to learn about what is being done in our Nation in one important area of energy concern—residential energy conservation.

The fruits of conservation can be savored in estimates that a flourishing program would greatly limit or even end our dependence on foreign oil. Unfortunately, we do not have a flourishing program, and that is one of the reasons we have gathered today.

Energy conservation is an idea whose time came in 1973, when the Arab oil embargo abolished our notions of cheap energy. Since that time, prices have risen dramatically, Presidents have spoken out loudly, and Congress has legislated interminably.

Our particular concern is the adequacy of congressional initiatives. The Ford Foundation in its widely respected study, "Energy: The Next Twenty Years," noted that the combined congressional energy effort known collectively as the National Energy Act constitutes a "* * * disjointed, ill-coordinated set of regulatory and educational programs to encourage energy conservation."

That judgment is borne out in a combination of a key element of the National Energy Act, the tax credit program for residential investment and energy conserving measures: insulation, storm windows, caulking, and the like.

According to one estimate that I have seen, only 5 million of 50 million Americans who filed 1978 tax returns took a tax credit for conservation. The Nation's poor have little or no taxable income

and, therefore, cannot avail themselves of the tax credit. They also live in some of the most underinsulated homes.

Clearly we have to find a better approach.

Today we will talk about a range of other programs and financial incentives with emphasis on the role utilities should properly play in the national scheme. Should we increase the tax credit percentages? Should we subsidize low interest loans? Should we emulate the Canadian system and establish a program of direct grants to homeowners?

I am pleased to see that the pioneering program adopted by the New York State Legislature, in which I once served, will be explored in depth today. Perhaps it can serve as a model for other States which have not moved as aggressively into the conservation field.

As we weigh all the alternatives, I think we must show definitely what I call a godfather energy policy. In other words, we must give the American people an offer they can't refuse.

Before concluding, I want to throw one note of caution into our discussion. It would be foolhardy, in my judgment, to think that an energy conservation program can displace totally our reliance on existing energy systems.

While I support measures to exploit the actual potential of energy conservation, I favor the continued production of domestic energy—oil and gas—and the development of safe, reliable nuclear power.

Still, energy conservation presents the prospect for a quick and permanent response to our national energy crisis. I agree with the authors of the acclaimed Harvard Business School report entitled "Energy Future":

> The United States can use 30 to 40 percent less energy than it does with virtually no penalty for the way Americans live, save that millions of dollars will be spared, save that the environment will be less strained, the air less polluted, and the dollar under less pressure, save that the growing and a large dependence on OPEC will be reduced and western society will be less likely to suffer internal and international tension. These are benefits Americans should be only too happy to accept.

Thank you, Mr. Chairman.

Mr. GORE. Thank you, Mr. Lent.

We are going to ask our witnesses to testify as a panel. We will hold all questions until each of the witnesses has completed his statement.

I would like to begin with Mr. Joel Linsider, executive assistant to the chairman, New York State Department of Public Service.

STATEMENTS OF JOEL A. LINSIDER, EXECUTIVE ASSISTANT TO THE CHAIRMAN, NEW YORK STATE PUBLIC SERVICE COMMISSION; CARL ERTLER, MANAGER OF WEATHERIZATION SERVICES, PACIFIC POWER & LIGHT CO.; GERARD J. KORDECKI, MANAGER, ECONOMIC RESEARCH, TAMPA ELECTRIC CO.; AND DONALD PETKUS, MANAGER, COMMUNITY RELATIONS, COMMONWEALTH EDISON CO.

Mr. LINSIDER. Thank you, Mr. Chairman.

I am Joel Linsider, executive assistant to the chairman of the New York State Public Service Commission.

Mr. GORE. Mr. Linsider, without objection the full text of your prepared statement will be inserted in the record. [See p. 9.]

I would also like to ask unanimous consent that the record be held open for a statement from the Tennessee Valley Authority. Without objection, it will be. [See p. 210.]

Mr. LINSIDER. Thank you, Mr. Chairman.

As Representative Lent has already pointed out, the events of the 6 years since the Arab oil embargo have shown us that the cheap, abundant energy on which the mid-20th century American economy was based is a thing of the past.

While it is now clear to most people that energy conservation and increased efficiency in the use of energy are extremely important ways to deal with the problems that are confronting our country today, the best means for achieving that efficiency and conservation are by no means clear.

This is so even in the relatively circumscribed area of residential use, which will be the area to which I am going to direct most of my comments this morning.

We in New York have one scheme to help achieve better energy conservation in houses. This is embodied in the State's Home Insulation and Energy Conservation Act. Another scheme is embodied in last year's National Energy Conservation Policy Act, and still others are now pending before Congress.

What I should like to do today is first describe New York's program and the particular needs it was intended to serve, then discuss its accomplishments thus far, and, finally, conclude with some general observations on the principles that should guide government as it devises its plans to promote conservation.

New York's Home Insulation and Energy Conservation Act was enacted in 1977 as article 7(a) of the State's public service law. It requires the State's nine major gas and electric utilities to offer energy audits to their customers and to arrange for the financing of energy conservation measures.

The home energy audit includes ceiling or attic insulation, wall insulation, floor and foundation insulation, hot water heater insulation, caulking and weatherstripping, storm windows, storm doors, clock thermostats and, by arrangement with oil heat dealers, replacement oil burners.

The audit results are given to the customer in terms of the number of years it would take each measure, if installed, to pay for itself. This estimate is based on the current cost of the fuel used for heating in the home.

There is a $10 fee for a full audit, called a type A audit, performed by a representative of the company; a $3 fee for a type B audit, where the company will process data gathered by the customer in accordance with its instructions and supply results similar to those yielded by the full audit.

Information on how to conduct a third type of audit, type C, performed entirely by the customer in accordance with a workbook, is available at no charge.

In addition, the utility gives the customer a list of approved contractors in the area who can install the various conservation measures.

The requirements for approval include at least 1 year's experience in working with the measures to be installed, good standing with the Better Business Bureau or its equivalent, a satisfactory credit rating, adequate comprehensive insurance, and possession of any required license. In addition, a 1-year guarantee on workmanship and materials must be offered.

Each utility has made arrangements with at least two banks in its territory to make loans to customers for energy conservation improvements. The interest rate on these loans is no more than the utility's overall rate of return—generally between 9 and 10 percent.

Loans can be written for up to 7 years, subject to a minimum monthly payment of $10. They are available only for energy conservation improvements having a payback period of 7 years or less; that is, for improvements able to pay for themselves through energy savings within that period.

A customer may borrow up to $1,500 for a one-family house, $2,500 for a two-family house, and $3,000 for a three-family house. Various proposals have recently been made to increase these limits.

There are some variations in the utilities' arrangements with the banks which make these loans. Some banks are requiring the utilities to make up the difference between the maximum interest rate on the loan and the interest rate that the banks would otherwise charge.

I understand this policy is now requiring some of the utilities to make up the difference between their rates of return and an interest rate of 13 percent.

Our program in part grew out of a survey conducted in 1977 by the public service commission, the State energy office, and the New York Power Pool, which is an organization of the seven major electric companies in New York State.

The survey examined existing insulation levels and attitudes about insulation and showed somewhat surprisingly that most homes in New York State were rather well insulated. Over 80 percent had insulation in the attic or ceiling.

There are approximately 3.3 million one-, two-, and three-family homes in New York State. But given the existing insulation levels the target group for a program promoting insulation would be limited to about 20 or 30 percent of those buildings.

The survey also disclosed that only about 1 percent of the homeowners in the State had failed to install conservation measures because of a lack of financing.

This result is consistent with some of the results of our program, which I will discuss in a moment, which show that the audits have played a substantially greater role in encouraging people to install insulation and conservation measures than has the loan program itself.

The program began throughout the State in June of 1978. It got off to a slow start in part because the utilities were afraid that if they advertised it aggressively at the outset they would be deluged with audit requests they would be unable to handle.

Interest in it did pick up, however, and by July 1979, which is the most recent date for which we have published and fully ana-

lyzed data, 109,000 customers, representing more than 10 percent of the likely target group, had participated in some aspect of the program.

Most of these customers—over 90,000—had requested a type C do-it-yourself audit. But over 15,000 customers had a utility representative come to their homes to perform a type A audit.

Of the customers who received the type A or type B audit, 40 to 50 percent proceeded to make some energy conservation improvements and preliminary estimates by our State energy office suggest that about one-third of the customers who had received energy audit workbooks from sources other than utility companies also proceeded to install conservation measures.

By last July, some 500 participants had financed energy conservation measures through the program. These customers had borrowed a total of approximately $800,000.

We used a number of measures of the effectiveness of the program. We first compared its cost with the value of the energy it was estimated to have saved. In order to avoid skewing the results by including high one-time startup costs, we analyzed the 6-month period from October 1978 to March 1979 and found that total program costs came to 1½ times the total resulting energy savings.

It is important to bear in mind, however, that the expenses of the program and the cost of installing the devices, occur but once, while the savings recur each year. Keeping that in mind, the 1½ to 1 ratio of costs to savings can be considered to represent a payback period of only 1½ years. Seen in this way, the program results are quite encouraging.

I should add that the methodology by which our staff estimated program savings is set forth in our first annual report under the program, which preceded the interim report which is attached to my statement. [See p. 20.]

Copies of that first annual report are available from the commission, and I would be happy to make one available for the committee.

Our supply of energy can be effectively increased either by obtaining new sources or by having customers reduce the heat losses from their homes. In this way, they would use less fuel to heat the same space, and the conservation fuel produced in this fashion can also be used by other customers.

We therefore considered it informative to look at the cost of the conservation fuel made available through the efforts of the customers participating in the program. This analysis, which is also detailed in our report, shows that even if all program costs were written off in 1 year, the price of gas saved through the program would be $4.20 an mcf, which compares with the current marginal cost of gas of approximately $3.50 an mcf.

The price for each gallon of oil saved would be 77 cents, compared with the current price of oil of approximately 75 to 85 cents a gallon. Here, too, though, it must be remembered that the program costs which are reflected in the costs of the conservation fuel occur but once, while the savings recur for as long as the house is occupied.

One of the things we learned from our program is the need for adequate information. We found interest in the program picked up

only after vigorous advertising, much of which was undertaken by the companies at the request of the commission.

Even newspaper advertisements, we found, were not good enough alone. One of the most effective utility advertising campaigns employed a combination of bill inserts, newspaper, radio, and television advertisements, and talks to groups of consumers.

Another utility with a largely metropolitan service territory had a very successful direct mail campaign. Other companies are cooperating with neighborhood groups and are successfully reaching inner-city customers to interest them in the program. The key to advertising appears to be diversity and flexibility.

Information is important on another level. I have already cited figures showing the rather limited use made of the program's financing provisions and these data suggest that for most people, at least in New York, the energy audit which gives information about particular conservation measures is more important than the availability of financing.

This appears to be the case even though financing can be had under our program on terms more favorable than those otherwise available through the banks.

Of course, it is important to remember that under our program the audits themselves are financed. Our experience has shown that a type A audit, including a house call, costs the utility about $90. The maximum fee under our statute, however, is $10.

If the price of an audit reflected its full cost, fewer houses might be audited. But under the present arrangements, all ratepayers, including those already taking steps to conserve, are subsidizing those who choose to have an audit done by the utility.

This subsidy, of course, is not necessarily unwarranted, for the resulting conservation, if great enough, can keep rates down by permitting the company over the long run to reduce its level of new construction.

It must also be recognized, however, that free or nearly free audits by utilities may inhibit potentially useful competition by other auditing companies. An answer to the latter problem might be to subsidize, with tax dollars, the audits offered by nonutility auditing companies as well.

Tax revenues may also be the best source of subsidies to help poor people, a group for whom financing will be particularly important. It is likely that many poor people who could benefit from energy conservation measures would find even extremely favorable loan repayment terms too onerous.

This group could be reached by outright grants financed with tax revenues, a less regressive source of funds than utility rates.

Any program of grants must confront, of course, the questions of equity presented by taxing people who have already installed energy conservation measures in order to subsidize those who have not. It is for that reason that a grant program should, perhaps, be limited to helping poor people.

Let me conclude with some general observations that I think ought to guide the Congress in considering the various energy conservation plans that are now before us.

First, it is tremendously important that conservation programs be tailored to meet the particular needs and conditions of individu-

al States. The best way to do this is to allow the States considerable flexibility in designing their own programs.

Federal requirements that are overly prescriptive can lead to confusion, delays, duplication of services, high overhead, and wasted resources.

It may be, I recognize, necessary for the Federal Government to prepare specific, carefully tailored plans for those States that show themselves unable or unwilling to design or administer a conservation program on their own.

But States like New York, which have an effective residential energy conservation program in place, and are prepared to improve it on the basis of experience, should not be penalized for having taken the initiative several years ago and begun their own programs.

Second, while it is desirable to have gas and electric utilities involved in conservation programs, they should not be viewed as an unlimited source of financing and expertise on energy conservation and renewable resource matters.

Because conservation may be a cheaper way of meeting our energy needs than building new generating plants or producing synthetic gas from coal, it makes sense to involve utilities in many aspects of energy conservation.

But, on the other hand, many utilities already find it difficult to raise money to carry out their normal functions and these difficulties might be exacerbated by any Federal program that required them to reduce their dependence on oil.

Moreover, utilities have no particular expertise in some of the alternative energy technologies and may find their products in direct competition with some alternative energy sources.

Utilities should therefore not be prohibited from participating in energy conservation programs, but neither should they be given an unfair advantage over other companies that may wish to provide these types of services.

Third, an energy conservation program should be easy to administer. It must not be forgotten that the dollars spent on the administration of a program are dollars that will not be spent on the materials that actually cause the conservation.

For this reason, any conservation program should be designed so that it can be administered fairly simply in all of the States.

Thank you very much for this opportunity to comment. I will be happy to answer any questions after my colleagues on the panel have presented their statements.

Mr. GORE. Thank you very much.

[Testimony resumes on p. 138.]

[Mr. Linsider's prepared statement and attachments follow:]

Before the
SUBCOMMITTEE ON OVERSIGHT AND INVESTIGATIONS
of the
COMMITTEE ON INTERSTATE AND FOREIGN COMMERCE
UNITED STATES HOUSE OF REPRESENTATIVES

STATEMENT OF
JOEL A. LINSIDER
EXECUTIVE ASSISTANT TO THE CHAIRMAN
NEW YORK STATE PUBLIC SERVICE COMMISSION

NEW YORK STATE'S HOME INSULATION AND ENERGY CONSERVATION PROGRAM

Washington, D.C.
October 26, 1979

Late in 1973, the Arab governments imposed an embargo on oil exports to the United States. The ensuing state of affairs was widely termed an "energy crisis," and all sorts of schemes were devised to deal with it. A crisis, however, is by definition a short-term event, and the gasoline lines of 1979 demonstrated anew how wrong it was to consider the situation in 1973 to be temporary or extraordinary.

In point of fact, the events of the past six years have shown us that the cheap, abundant energy on which the mid-twentieth century American economy was based is a thing of the past. Most informed people have learned this lesson, and we are now seeking long-term means of assuring ourselves adequate supplies of reasonably priced energy. An obvious and important contribution to that goal can be made by using the energy we have more efficiently. But while the need for efficiency is obvious, the best means for achieving it is less so, even in the relatively

circumscribed area of residential use.1/ We in New York have one scheme to help achieve better energy conservation in houses; another is embodied in last year's National Energy Conservation Policy Act (NECPA); and others are now pending before the Congress. The variety of proposed solutions demonstrates not only the extent of interest in the problem but also its complexity.

What I should like to do today is describe our program and the particular needs it was intended to serve, discuss its accomplishments thus far, and conclude with some general observations on the principles that should guide government as it devises plans to promote conservation. A detailed description of New York's plan is contained in a report we recently issued; a copy is appended.

The New York Program

Description. New York's Home Insulation and Energy Conservation Act, enacted in 1977 as Article VII-A of the Public Service Law, requires the State's nine major gas and electric utilities to offer energy audits to their customers and to arrange for financing of energy conservation measures. The home energy audit includes ceiling or attic insulation, wall insulation, floor and foundation insulation, hot water heater insulation, caulking and weatherstripping, storm windows, storm doors, clock thermostats, and, by arrangement with oil heat dealers, replacement oil burners. The audit results are given to the customer in terms of the number of years it would take each measure, if installed, to pay for itself. This estimate is based on the current cost of

1/ The letter inviting me to appear today asked me to address myself to commercial and industrial conservation as well. Although the Commission has no formal program to encourage conservation in these areas, the utilities in New York have trained personnel who can counsel industrial and commercial customers on energy conservation and load management measures. Moreover, by setting rates that reflect the cost of serving various classes of customers, we have sought to give them the price signals they need to evaluate conservation measures intelligently.

the fuel used for heating in the home. Estimates of the cost of installation are also provided. There is a $10 fee for full audits performed by a representative of the company; for a $3 fee the company will process data gathered by the customer in accordance with its instructions and supply results similar to those yielded by the full audit. Information on how to conduct a third type of audit, performed entirely by the customer, is available at no charge.

In addition, the utility gives the customer a list of approved contractors in the area who can install the various conservation measures. The requirements for approval include at least one year's experience in working with the measures to be installed, good standing with the Better Business Bureau or its equivalent, a satisfactory credit rating, adequate comprehensive insurance, and possession of any required license. In addition, a one-year guarantee on workmanship and materials must be offered.

Each utility has made arrangements with at least two banks in its territory to make loans to customers for energy conservation improvements. The interest rate on these loans is no more than the utility's overall rate of return -- generally between nine and ten percent. Loans can be written for up to seven years, subject to a minimum monthly payment of $10. They are available only for energy conservation improvements having a payback period of seven years or less; that is, for improvements able to pay for themselves through energy savings within that period. The energy conservation measures may be installed on a "do-it-yourself" basis or by a contractor.

A customer may borrow up to $1,500 for a one-family house, $2,500 for a two-family house, and $3,000 for a

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three-family house. (Various proposals have recently been made to increase these limits and to extend the program to cover four-family houses.) There are some variations in the utilities' arrangements with the banks who make these loans. Some banks are willing to grant loans directly to customers at an interest rate equal to the utility's rate of return; others require the utility to guarantee all the loans as a condition of granting them at the utility's rate of return. Three utilities are also required by the banks to make up the difference between their rates of return and the interest rates at which the banks are willing to make loans.

Background. In January 1977, the Public Service Commission, the State Energy Office, and the New York Power Pool cooperated in conducting a survey of existing insulation levels and attitudes about insulation in New York State.1/ The survey showed that homes in New York State were surprisingly well insulated: over 80 percent of the homes had insulation in the attic or ceiling; over 60 percent had wall insulation; over 80 percent had storm windows on all windows; and some 75 percent had storm doors on all doors. An additional 16 percent of the homes had some storm windows and an additional 17 percent had some storm doors. While there are approximately 3.3 million one, two, and three-family homes in New York State, the target group for a program promoting insulation would thus be limited to 20 to 30 percent of these buildings.

The survey also showed that about 30 percent of the State's homeowners already planned to reinsulate during 1977. And some houses simply cannot be reinsulated because of structural features, such as a lack of wall

1/ New York State Residential Insulation Survey, published in September 1977.

or ceiling cavities for insulation, or because of such factors as historic preservation rules. It appeared, therefore, that something less than one million homes could benefit from the program. And even fewer were likely to benefit from the availability of financing: the survey disclosed that only 1 percent of homeowners had failed to install conservation measures because of a lack of financing. The number of potential beneficiaries was large enough to make the effort worthwhile, but the relatively small percentage of homes it represents must be kept in mind in evaluating the program's results.

Results. The program began in the nine utility service territories in June 1978. Although it got underway slowly as utilities sought to protect themselves from being deluged with audit requests, interest in it has increased rapidly, as shown in our recent report. By July 1979, the most recent date for which we have published data, 109,000 customers -- over 10 percent of the likely target group -- had participated in some aspect of the program. Over 15,000 customers had had a utility representative come to their homes to perform a Type A audit. Another 3,000 customers had collected the data themselves and had asked the utility to perform the analysis for a Type B audit. Over 90,000 customers had requested the Type C do-it-yourself audit.

Forty to fifty percent of the customers who received a Type A or Type B audit proceeded to make some energy conservation improvements. It is harder to measure the number of Type C audits that result in installing energy conservation measures, but preliminary

studies by our State Energy Office suggest that about one-third of the customers who received energy audit workbooks from sources other than the utility companies proceeded to install conservation measures. By last July over 500 of the participants had financed the installation of energy conservation measures through the utility program; these customers had borrowed a total of approximately $800,000.

Nearly half the homes in New York State (49%) are heated with fuel oil; natural gas has nearly the same penetration of the heating fuel market (48%). Only about 3 percent of New York homes are heated with electricity. The majority of the customers (68%) who requested a utility audit are gas heat customers, 28 percent heat with oil, and four percent are electric heat customers.

To measure the effectiveness of the program, we compared its cost with the value of the energy it was estimated to have saved. In order to avoid skewing the results by including one-time start-up costs, we analyzed the six-month period from October 1978 to March 1979. During that period, total program costs came to $953,222, about 1.5 times the total resulting savings of $620,365. The expenses, of course, occur but once, while the savings recur each year. In a sense, the 1.5 to 1 ratio of costs to savings can be considered to represent a payback period of one and one-half years: the costs pay for themselves in energy savings in that time. Seen this way, the results are quite encouraging.

Our supply of energy can be effectively increased either by obtaining new sources or by customers' reducing the heat losses from their homes, thus using less fuel to heat the same space. The conservation fuel "produced" in this manner can also be used by other customers. It is

therefore informative to look at the cost of the "conservation fuel" made available through the efforts of the customers participating in this program. This analysis, detailed in our report, shows that even if all program costs were written off in one year, the price of gas saved through the program would be $4.20 and the price for each gallon of oil saved would be $.77. These prices can be compared with today's marginal costs for these fuels of approximately $3.50 an Mcf for natural gas 1/ and $.75 to $.85 a gallon for oil. Here, too, it must be remembered that the program costs occur but once, while the savings recur for as long as the house is occupied.

The figures I've presented here, and the analyses set forth in detail in our report, suggest strongly that the program is proving a success. And there is reason to hope the program will be even more successful in the future as start-up problems continue to be worked out and the rate of participation continues to increase. It is, of course, possible that these expectations will be unrealized if the companies have already reached their most interested customers and participation in succeeding years falls off. But there is no way to predict these trends, and there is ample cause for optimism.

Lessons. One thing we learned from our program is the need for adequate information. A bill insert describing the program was of little use, and only after vigorous advertising did interest in the program pick up. Even newspaper advertisements alone were not good enough. One of the most effective utility advertising campaigns employed bill inserts; newspaper, radio, and television advertisements; and talks to groups of customers. Another utility with a largely metropolitan area service territory has a very successful direct mail campaign.

1/ If synthetic natural gas were used, the marginal cost would be approximately $5.50 an Mcf.

Other companies are cooperating with neighborhood groups and are successfully reaching inner city customers. The key to advertising is diversity and flexibility. We initially found the utilities reluctant to advertise, for fear of being swamped with audit requests, but our Chairman prodded them to augment their advertising, and they did so with good results.

Information is important on another level. I have already cited figures showing the rather limited use made of the program's financing provisions. These data suggest that, for most people, at least in New York, the energy audit, which gives information about the particular conservation measures that would be useful for each customer, is more important than the availability of financing through the utility. This appears to be the case even though financing under our program can be had on terms more favorable than those otherwise available through the banks. Of course, this result is less surprising in light of the limited interest in loans disclosed by the 1977 survey I previously described.

While financing thus does not appear to be as effective a part of our program as auditing, it is important to remember that the audits themselves are financed. Our experience has shown that the Type A audit, including a "house call," costs a utility about $90; the fee, however, is set at $10. If the price of an audit reflected its full cost, fewer houses might be audited. Under the present arrangements, however, all ratepayers, including those who have already taken steps to conserve, are subsidizing those who choose to have an audit done by the utility.

This subsidy, of course, is not necessarily unwarranted, for the resulting conservation, if great enough, can keep rates down by permitting the company over the long run to reduce its level of new construction. It must also be recognized, however, that free or nearly free audits by utilities may inhibit potentially useful competition by other auditing companies. An answer to the latter problem might be to subsidize, with tax dollars, the audits offered by non-utility auditing companies as well.

Tax revenues may also be the best source of subsidies to help poor people, a group for whom financing will be particularly important. It is likely that many poor people who could benefit from energy conservation measures would find even extremely favorable loan repayment terms too onerous. This group could be reached by outright grants financed with tax revenues, a less regressive source of funds than utility rates. Any program of grants must confront, of course, the questions of equity presented by taxing people who have already installed energy conservation measures in order to subsidize those who have not. It is for that reason that a grant program should be limited to helping poor people who are not likely to be able to afford -- or to have been able to afford previously -- an investment in conservation.

General Observations

Because the Congress has before it a variety of bills pertaining to energy conservation, I should like to conclude by listing a number of principles that ought to guide any evaluation of the many plans being considered.

First, conservation programs should be tailored to meet the particular needs and conditions of individual

states. The best way to do this is to allow the states considerable flexibility in designing their own programs. Federal requirements that are overly prescriptive can lead to confusion, delays, duplication of services, high overhead, and wasted resources. Unfortunately, the Department of Energy's proposed rules for implementing NECPA suffer from just this flaw. They cover more than 250 pages in the Federal Register; but they do not, for instance, adequately recognize in setting suitable insulation standards the vast differences around the country in such relevant areas as utility rates, cost of fuels, and climate. In addition, DOE declared that it "will not add measures which would save energy in houses in some areas of the country, but would increase energy use if [also] installed in houses in other areas." This lack of flexibility has led it to exclude from its proposed program potentially valuable energy conservation measures. It may be necessary, I recognize, for the Federal government to prepare specific, carefully tailored plans for those states that show themselves unable or unwilling to design or administer a conservation program on their own. But states like New York, which have an effective residential energy conservation program in place, and are prepared to improve it on the basis of experience, should not be penalized for having taken the initiative several years ago and now be told to go back to the drawing board to accommodate an inflexible program that offers no clear advantage over the one already in place.

Second, while it is desirable to have gas and electric utilities involved in conservation programs, they should not be viewed as an unlimited source of financing

and expertise on energy conservation and renewable resource matters. Because conservation may be a cheaper way of meeting our energy needs than building new generating plants or producing synthetic gas from coal, it makes sense to involve utilities in many aspects of energy conservation. On the other hand, many utilities already find it difficult to raise money to carry out their normal functions and these difficulties might be exacerbated by any Federal program that required them to reduce their dependence on oil. Moreover, utilities have no particular expertise in some of the alternative energy technologies and may find their products in direct competition with some alternative energy sources. Utilities should therefore not be prohibited from participating in energy conservation programs, but neither should they be given an unfair advantage over other companies that may wish to provide these types of service.

Third, an energy conservation program should be easy to administer. It must not be forgotten that the dollars spent on the administration of a program are dollars that will not be spent on the materials that actually cause the conservation.

Finally, a conservation program should carefully balance long-term goals and short-run responses to immediate problems. I believe that the long-term solution to much of our energy problem lies in rational economic decision-making by all of us, as individuals. Government incentives that encourage people to begin to get used to making those decisions are, therefore, more important to long-term success in solving our energy problem than programs which rigidly dictate changes in behavior that cannot possibly survive in a free society over the long run.

Thank you for the opportunity to comment. I shall be happy to answer any questions.

New York State Home Insulation and Energy Conservation Act Program: Interim Report

INTRODUCTION

New York State is a leader among the states in establishing a program to help consumers cope with the rising cost of home heating. The Home Insulation and Energy Conservation Act (HIECA) requires the nine major electric and gas utilities[1/] to offer a program of energy audits to their customers and to arrange for financing for the installation of energy conservation measures. These programs began in the various utility franchise territories in June 1978. The first Annual Report on the implementation of the Act was made to the Governor and the Legislature on January 31, 1979; it summarized program results through September 30, 1978, and key program elements through December 1978. We now have the program's results for a complete heating season, and, in response to widespread interest in those results, we are issuing this special interim report.

The New York State Legislature reflected its keen interest in these programs when it passed a resolution asking for an interim report to be issued before the next annual report is published in January, 1980. But the interest in these

1/ The nine utilities are: Central Hudson Gas & Electric Corporation, Consolidated Edison Company of New York, Inc., Long Island Lighting Company, New York State Electric & Gas Corporation, Niagara Mohawk Power Corporation, Orange and Rockland Utilities, Inc., Rochester Gas and Electric Corporation, Brooklyn Union Gas Company, National Fuel Gas Distribution Corporation.

programs extends beyond the borders of New York State. The National Energy Conservation Policy Act, enacted in November 1978, requires investor-owned utilities in every state to establish residential conservation service programs similar to those ongoing in New York State. Other states and the United States Department of Energy are therefore looking for guidance based on New York's experience.

PROGRAM CHARACTERISTICS

The HIECA program is available to every utility customer who receives electric or gas service on a residential service classification and who resides in a one-family, two-family or three-family house. It is offered to both homeowners and renters, although few tenants have participated thus far. Family income does not affect participation, except that the audit fee is waived for poor persons.

A customer is offered three classes of home energy audit under the program. If the customer chooses the Type A audit, a trained utility representative visits the customer's home and visually inspects and takes measurements of significant items. This information is fed into a computer and analyzed according to technical criteria set forth by the Public Service Commission. The results are provided to the customer immediately in most cases. This audit takes an average of two hours to perform and the customer is charged $10.

For a Type B audit, the customer collects the data according to instructions provided by the utility. The company processes the information and returns the results to the customer. The processing cost is limited by Commission order to no more than $3.

There is no charge for the Type C audit. The customer receives Energy Workbooks, which include detailed, pictorial instructions for auditing his or her home and directions for calculating energy savings. The Energy Workbooks were prepared jointly by the State Energy Office, the Public Service Commission and the utilities. The calculations lead the customer to the same audit results as provided in the Type A or Type B audit.

The home energy audit includes ceiling or attic insulation, wall insulation, floor and foundation insulation, hot water heater insulation, caulking and weatherstripping, storm windows, storm doors, clock thermostats and, recently, replacement oil burners. The audit results are given to the customer in terms of the number of years it would take each measure, if installed, to pay for itself in energy (dollar) savings. This estimate is based on the current cost of the fuel used for heating in the home. Estimates of the cost of installation for do-it-yourself and for contractor-installed installations are also provided.

In addition, the utility gives the customer a list of contractors in the local area who can install the various measures. These contractors have signed an agreement with the utility to be listed as approved contractors. The requirements for approval include: at least one year of experience in working with the measures to be installed, good standing with the Better Business Bureau or its equivalent, satisfactory credit rating, adequate comprehensive insurance, any required license. In addition, a one-year guarantee on workmanship and materials must be offered.

The Public Service Commission granted Orange and Rockland Utilities, Inc., (O&R) special permission to sub-contract its home audit service program under the Act. O&R contracts with DMC Energy, Inc., to provide a one-stop service for its customers. DMC Energy performs the Type A audit and also arranges for a contractor to perform the work on the customer's house. O&R is the smallest utility participating in the program, with slightly over 100,000 customers in 1, 2 or 3-family homes. Sub-contracting the audit work means O&R does not have to cover the cost of hiring and training auditors.

Each utility has also made arrangements with at least two banks in its territory to make loans to customers for energy conservation improvements. The interest rate on these loans is no more than the utility's overall rate of return -- generally between nine and ten percent. Loans can be written for up to seven years, subject to a minimum monthly payment of $10.00. They

are available only for energy conservation improvements having a payback period of seven years or less; that is, for improvements able to pay for themselves through energy (dollar) savings within that period.[1/] The energy conservation measures may be installed on a do-it-yourself basis or by a contractor.

A customer may borrow up to $1,500 for a one-family house, $2,500 for a two-family house, and $3,000 for a three-family house. When the bank makes the loan, it makes out a two-party check that must be endorsed by both the customer and the contractor. This ensures the energy conservation measures are installed and that the customer receives a satisfactory job.

There are certain variations among the utilities' arrangements with the banks. Some banks were willing to grant loans directly to customers at an interest rate equal to the utility's rate of return; others required the utility to guarantee all the loans as a condition of granting them at the utility's rate of return. Three utilities are also required to make up the difference between their rates of return and the interest rates at which the banks were willing to make loans.

PROGRAM IMPROVEMENTS SINCE THE FIRST ANNUAL REPORT

The First Annual Report described the period from the start of the program in June 1978 through September 30, 1978. The program was introduced slowly in each utility territory, and by September, the participation in the program

1/ The Commission found that the statutory 7-year payback would likely be met if the equation adopted yielded a result of 8 years or less.

still was limited. But the situation had changed markedly by March 1979.

A. Improved Advertising

In October 1978, Public Service Commission Chairman Zielinski wrote to the Chief Executive Officer of each of the companies, expressing his concern over the low levels of participation in the program. He directed the utilities to file with the Commission within 45 days a plan for an effective advertising campaign for their programs. The advertising plans submitted reflected the diversity and complexity of the various utility franchise areas. Once these advertising campaigns were implemented, participation improved greatly. The following discussion highlights some of the utility advertising campaigns.

1. Direct Mail Brochures

Although Consolidated Edison has approximately 2.4 million residential customers, only some 800,000 live in 1, 2 or 3-family homes and are eligible to participate in the program. Con Edison determined that a direct mail campaign was the best way of reaching these customers with an offer of a home energy audit. The company designed an eye-catching leaflet which makes the point that energy conservation improvements pay for themselves. Each month it mails the brochure to 40,000-60,000 of its customers. About six percent of these customers respond by requesting an audit. Direct mail advertising is rather expensive -- for example, Con Ed spent about $53,000 on advertising

through March 1979. But, other advertising media (newspapers, radio, television) are also very expensive in the New York metropolitan area, and direct mail ensures that only eligible customers are informed about the program.

Con Edison has also used aerial infra-red thermography in selected areas of its territory to encourage customers to make energy conservation improvements. In a program called "Operation Thermo Scan," a thermogram is made by an airplane flying at an altitude of 1,600 feet and carrying a special infrared camera. It flies over an area on a clear night when the temperature is below 40 degrees Fahrenheit. A special scanner measures the heat radiated from structures such as homes and garages. The scanning creates an electrical signal which powers a light source and scans photographic film, from which black and white prints are made.

Customers whose homes were photographed were invited to come to Con Edison offices, where company representatives explained how the extent of heat losses from a home can be seen on the thermograph. They also discuss with customers possible methods of reducing heat loss. After viewing the thermal picture, the customer decides whether to increase the insulation in the home.

2. Multi-Media Advertising

Niagara Mohawk's franchise territory stretches across the width of the State and includes all or part of 42 counties.

In order to publicize its Home Insulation Act program, Niagara Mohawk hired a public relations firm to design a program that would reach its customers. Every customer received an enclosure with his or her bill outlining the program. At the same time a multi-media campaign was mounted using newspaper, radio, and television advertising. The television spots were scheduled for prime time and during newscasts. The advertisements announced the program and extolled its benefits. The repetition was effective. Niagara Mohawk conducted approximately 1,800 Type A audits during the six month period from October 1978 to March 1979, and over 10,000 customers received other types of audits.

3. Neighborhood Outreach Efforts

Both Rochester Gas and Electric (RG&E) and National Fuel Gas Distribution Corp. (NFGD) are participating with neighborhood groups to get the energy conservation message across to customers. A neighborhood group in the 19th Ward in the city of Rochester is canvassing door-to-door, informing customers of the home audit and asking if they want to participate. A neighborhood person suggesting participation in the program may overcome doubts in people's minds regarding the sincerity of a utility offering to help them save energy and reduce their utility bills.

In the city of Buffalo, the New York State Energy Research and Development Authority (NYS ERDA) has funded the

New York Public Interest Research Group (NYPIRG) to serve as a coordinating point for various energy conservation-related programs. One thing NYPIRG does is to counsel customers to get a home energy audit from NFGD and to get a loan to make the energy conservation improvements. NFGD has arranged loans for a greater proportion of its eligible customers than has any of the other companies.

B. Inclusion of Replacement Oil Burners

The utilities' Home Insulation Act programs launched in June 1978 included most, but not all, of the measures specified in the Act. Replacement oil burners were not included at that time because of delays in arranging cooperation between the utilities and the oil heat industry regarding their installation.

In May 1979, the last of a series of Commission orders was issued on the subject of including replacement oil burners in the program. Briefly, the arrangement is as follows: A customer who desires an audit of his or her oil furnace contacts his or her usual oil dealer. The dealer dispatches a certified auditor to inspect the furnace. If the resulting efficiency check shows that a replacement burner is warranted, the customer can finance its installation by an oil dealer on the utility's list of contractors.

The Empire State Petroleum Association (ESPA) composed, and the PSC approved, a curriculum for training auditors of oil

furnaces. ESPA is also sponsoring training sessions using the curriculum in various areas throughout the State. The names of graduates of this training program are provided to the utilities. When a utility receives an audit form signed by one of these auditors, the utility is assured the audit has been properly conducted. Oil dealers who install the replacement oil burners must meet the same qualifications as contractors who install other energy conservation measures.

The new high speed, flame retention head replacement oil burners have an efficiency of at least 80 percent. Their potential for energy conservation is high. An average oil heat customer whose oil furnace has an efficiency of 73 percent and who uses an average of 1,200 gallons of oil a year can save an average of 200 gallons a year by replacing his or her oil burner (assuming proper maintenance to keep burner efficiency at 80 percent). With home heating oil prices currently averaging from 70 to 80 cents per gallon, a customer would save between $140 and $160 annually. Since the burners cost about $350, the average customer would recover the investment in two to three years at current oil prices -- sooner if oil prices increase.

Approximately 50 percent of the homes in New York State (about 1.8 million homes) are heated with oil. Replacement oil burners have the potential not only to save energy but also to reduce our Nation's dependence on imported oil.

PROGRAM RESULTS

In analyzing the results of the Home Insulation Act programs thus far, it is important to consider the amount of insulation in homes at the start of the program. Any home built after April 1, 1977, was required to meet minimum insulation standards promulgated by the Public Service Commission as a condition for utility service. These standards require the equivalent of 6" of fiberglass insulation in the ceiling, 3 1/2" of insulation in the walls, foundation or slab insulation, storm windows and storm doors. The new State Energy Conservation Construction Code, promulgated by the State Energy Office effective January 1, 1979, requires these same minimum insulation levels.

In January 1977, the Public Service Commission, State Energy Office and the New York Power Pool cooperated in conducting a survey[1/] of existing insulation levels and attitudes about insulation in New York State. The survey findings show that homes in New York State were fairly well insulated. Over 80 percent of the homes have insulation in the attic or ceiling, over 60 percent have wall insulation, over 80 percent have storm windows on all windows and 75 percent have storm doors on on all doors. Additionally, 16 percent of the homes have some storm windows and 17 percent of the homes have some storm doors.

1/ New York State Residential Insulation Survey, published September 1977.

There are approximately 3.3 million 1, 2 and 3-family homes in New York State. But the target group for which this program would be helpful is only 20 to 30 percent of such homes.

This survey also showed that 30 percent of the customers planned to re-insulate during 1977. We also know that some houses are unable to be re-insulated because of structural difficulties, such as flat roofs, or because of such factors as historic preservation rules. Taking all of this together, something less than one million homes are the target of this program. Since 82,000 customers received some level of home energy audit during the period June 1978 to March 1979, we have about a 10 to 12 percent participation rate on an annual basis. Over the 5 years of the program a continuation of the current interest would result in a 50-60% voluntary participation of the target group.

It should be mentioned that the annual reporting period for Home Insulation Act programs ends on September 30 of each year. The First Annual Report covered the period from the beginning of the program (June 1978) through September 30, 1978. The Commission Staff requested the nine utilities to submit a semi-annual report covering the six month period from October 1, 1978 through March 31, 1979. The present report formally covers program activity through March 1979 but also includes key program elements through July 1979.

A. Growth in Program Participation

There is a marked contrast between program participation during the June to September period, covered in the First Annual Report, and during the October to March period. All key program

elements show a 300 percent to 400 percent increase. Since this is a comparison of a six-month to a three-month period some increase would be expected even with a constant participation rate; however, we believe the increase in participation is much greater than it would have been without the emphasis placed on the programs by the utilities in their advertising. In addition, the programs were available throughout the service territories for the first time during this period.1/

A total of 5,830 Type A audits were conducted by the utilities during the October to March period, representing a 385 percent increase over the 1,202 Type A audits conducted from June to September 1978. The Type B audit, where the customer takes the measurements and sends them to the utility for processing, is not so popular as the Type A audit, but the increase in participation in this aspect of the program shows a similar large increase. There were 843 Type B audits conducted in the October to March period, a 317 percent increase over the 202 Type B audits during June through September 1978.

The Type C audit is the most popular audit offered by the utilities. Over 60,000 customers requested the Energy Workbooks for a do-it-yourself audit during the period from October to March -- a 362 percent increase compared to the over 13,000 Workbooks requested from the utilities during the earlier reporting period. Even more Energy Workbooks were actually

1/ The Commission allowed the utilities 6 months to phase in the program across their territories, and the process was not completed in most cases until January 1979.

distributed -- they were available in banks, at fairs, and from counter displays in utility offices, for example. The 73,000 customers who are counted as having received a Type C audit are those who expressly requested it when given a choice of the three types of audits.

A total of 245 loans were granted for the installation of energy conservation measures during the period October 1978 to March 1979. This represents a 370 percent increase over the 52 loans granted to customers during the period June to September 1978. The 245 customers received loans totalling $337,443 in the October to March period. The 52 customers who requested loans during the earlier period received a total of $80,347. The Residential Insulation Survey referred to above also investigated why customers did not reinsulate. Only one percent of the respondents gave "unable to obtain financing" as a reason for not adding insulation. The interest in the financing aspects of the Home Insulation Act program is, thus, at about the expected level.

A comparison of these key program elements for each of the nine companies during the June 1978 to September 1978 period and the October 1978 to March 1979 period is presented in Table 1 and Table 2 on pages 26 and 27.

B. Customer Participation

From October 1978 through March 1979, a total of 5,830 customers requested and received a Type A audit and 843 customers received a Type B audit. Another 60,471 customers received a Type C audit; however, we know very little

else about these customers unless they went on to finance the installation of energy conservation measures.

Of the 6,673 customers who received either a Type A or a Type B audit, 67 percent are gas heat customers, 28 percent heat with oil, four percent are electric heat customers and the remaining one percent use some other fuel for heat (i.e., propane gas, coal, wood, etc.). Over 98 percent of those customers requesting an audit own their own home; 81 tenants requested an audit of their home. These 81 tenants represent slightly more than one percent of all customers requesting either a Type A or a Type B audit.

From October 1978 to March 1979, a total of 245 customers requested and received loans for the installation of energy conservation measures which were economic to install in their homes. A breakdown of these 245 customers by type of fuel used for heating shows nearly the same characteristics as customers requesting audits. About 67 percent of the customers requesting loans use gas heat, 30 percent use oil heat and three percent are electric heat customers.

Of the 245 customers who requested loans, 156 customers (64 percent) did so following a Type A audit, 66 customers (27 percent) following a Type B audit, 5 customers (2 percent) following a Type C audit and 18 customers (7 percent) following a contractor-performed audit. The five customers who had a Type C audit and the 18 customers who had a contractor-performed audit

before they requested a loan for the installation of energy conservation measures were all customers of Rochester Gas and Electric Corporation.

The 156 customers who had a Type A audit and went on to finance energy conservation measures represent 2.7 percent of all customers who had a Type A audit. This ratio varies considerably, however, among the companies. New York State Electric and Gas had 30 percent of its customers who received a Type A audit go on to finance the installation of energy conservation measures through the program; the corresponding figure for National Fuel Gas was 22 percent. For the other seven companies this ratio ranged from 2.5 percent to 0.7 percent.

Only four companies had customers who took out a loan for energy conservation measures through the company after a Type B audit; these 66 customers represent 7.8 percent of all customers who had a Type B audit. New York State Electric and Gas had 68 percent of its customers who completed a Type B audit go on to finance the installation of energy conservation measures through the company program. For National Fuel Gas this ratio is 29 percent, for Niagara Mohawk it is 6 percent and for Central Hudson it is 0.6 percent. It seems clear that NYSEG's and NFG's advertising material, and the information provided by their representatives in the context of the energy audit, have a great deal to do with encouraging their customers to take out loans to finance the installation of energy conservation measures.

Of the 245 customers who received loans, 240 (98 percent) owned their homes. Five tenants borrowed money through the utility for energy conservation measures -- three of them customers of New York State Electric and Gas and two of them customers of Rochester Gas and Electric. Improvements to a one-family house accounted for 193 loans (78 percent); 38 loans (16 percent) were for a two-family house; and 14 loans (6 percent) were for a three-family house. Contractor-installed energy conservation measures accounted for 198 loans (81 percent); and 18 loans (7 percent) were made for do-it-yourself energy conservation measures. Another 29 loans (12 percent) were made for a combination of do-it-yourself and contractor-installed measures.

The average amount loaned to a customer for the installation of energy conservation measures was $1,377. On the average, a customer will recover the amount of the loan in energy costs avoided in 4.4 years. This payback period varies slightly by type of fuel used for home heating. The average gas heat customer financed energy conservation measures with a payback period of 5.1 years; the average oil heat customer, 3.6 years; and the average electric heat customer, 3.0 years. These differences in payback period by type of fuel used for heating are largely a function of the relative costs of heating with the various fuels during the reporting period (October 1978 to March 1979).

C. Additional Energy Conservation Benefits

Many customers who had a home energy audit did not choose to take advantage of the financing terms available under this program but, nonetheless, went on to install energy conservation measures. Each utility performed a survey of its customers in this category to determine the amount of reinsulation taking place as a result of the audit program.

The results show that approximately 2,631 customers installed conservation measures after having had a Type A or Type B audit but without borrowing money under this program. These customers are estimated to have conserved 126,187 Mcf of gas annually and 324,815 gallons of oil annually. This represents a total of $541,954 in energy costs avoided annually, at the price of fuel in effect when the audit was conducted. These results also indicate that a total of about 40 to 50 percent of the customers in New York State who have a Type A or Type B audit proceed to install some energy conservation measures either with financing through the utility company or independently. An analysis of the steps taken by customers who request a Type C audit is beyond the scope of this report at this time.

The energy savings of these customers, both natural gas and home heating oil, are permanent savings which will continue not only for the five year life of the program but as long as the house continues to be occupied.

D. Analysis of Costs and Benefits

A comparison of the costs and benefits of the Home Insulation and Energy Conservation Act programs would be skewed

if it reflected the earlier stages of the program. During the first months, one-time start up costs were incurred, and the program, which was phased in gradually in the various utility service territories, was not available to all customers. But, the reporting period from October 1978 to March 1979 is relatively free of these factors and thus lends itself well to study; moreover, sufficient information is available to make a detailed analysis possible. A summary of the program results for the October 1978 to March 1979 period is included as Table 3 on page 28.

The utilities' participation in the program during this period cost their ratepayers a total of $953,233. The largest program category is expenses related to audits, amounting to $627,614, offset by revenues of $59,413. Program advertising expenses totaled $173,999, including $44,892 for bill inserts, $76,496 for newspaper advertising, $13,491 for radio/television advertising and $39,120 for other advertising expenses (such as direct mailings to customers). Other utility expenses included: inspection expenses, $1,741; reporting expenses, $2,708; interest differential expenses, $1,944; and other miscellaneous expenses, $145,227.

A breakdown of the expenses related to audits by type of audit shows that the average cost of performing a Type A audit is $92 per audit. Since this is offset by the $10 fee charged to the customer, the net cost per Type A audit is $82. The average cost for a utility to perform a Type B audit is $65. The companies are allowed to charge up to $3 for processing the Type B audit. Some companies charge less and four companies

will process a Type B audit at no charge. Taking this revenue into account, the net cost of a Type B audit averages $63. The average cost of the Type C audit is $.61. This represents essentially the cost of postage to mail the Energy Workbooks to customers who request them.

The total program cost of $953,233 was about 1.5 times the program savings of $620,365 over the October 1978 to March 1979 time period. However, these costs generate savings which continue to occur every year in the future. In a sense the 1.5 ratio can be considered a 1.5 year payback period. Viewed in this way, the Home Insulation Act and its current method of implementation is a very successful program. Nevertheless, it is difficult to predict whether the program will have greater or less success in the future. On one hand, expenses should drop as start-up problems are worked out and the rate of participation continues to increase. On the other hand, the companies may have reached most of their customers who would be interested in the program and participation in succeeding years may fall off.

It is also interesting to look at the cost of the "conservation fuel"[1/] made available to other customers through the conservation efforts of the customers participating in this program. One way of looking at this is to apportion the net

1/ The supply of fossil fuel can be increased either by drilling for new sources or by customers' reducing the heat losses from their homes, thus using less fuel to heat the same space. The conservation fuel "produced" in this manner also can be used by additional customers.

program cost on a heating fuel basis and then divide by the fuel savings (energy costs avoided) of customers heating with each type of fuel. Doing so yields a program cost of $4.20 for each Mcf of gas saved in the program and $.77 for each gallon of oil saved. These costs can be compared with today's marginal costs for these fuels of approximately $3.50 per Mcf for natural gas[1/] and $.75 to $.85 per gallon for oil. However, it must be remembered these program costs are "onetime" program costs that yield annual savings of fuel each year the house is occupied.

E. Cumulative Program Results

In addition to the formal reports provided by the utilities under this program, Staff of the Office of Research regularly monitors the key program elements: the number of Type A, B and C audits and the number and amount of loans requested. Participation from the beginning of the program through July 31, 1979 is summarized in Table 4 on page 29.

The results show 15,215 customers have requested a Type A audit, 3,224 customers have requested a Type B audit and 90,091 customers have requested Energy Workbooks 1 and 2. In all a total of 108,530 customers have participated in the program. Of these, a total of 536 have taken out a loan through the program to finance the installation of energy conservation measures. The total amount loaned thus far under the program is $809,377.

1/ If synthetic natural gas were used, the marginal cost would be approximately $5.25 per Mcf.

Of particular significance is the large increase in program activity at three companies. Brooklyn Union Gas (BUG) recently made some internal organizational changes regarding the Home Insulation Act program. It hired retired company personnel to conduct the on-site audits. These changes are evident in the number of participants. In the first ten months of the program, Brooklyn Union conducted only 18 Type A audits. In the last four months, 150 requests for a Type A audit have been received. Type B audit requests have also jumped from 146 in ten months to 108 in the last four months.

Long Island Lighting Company also has seen a significant increase in program activity. Faced with a backlog of audit requests, LILCO hired a sub-contractor to assist in filling the audit requests. This proved successful and LILCO is now receiving bids for a contract to perform all of its on-site audits. This is advantageous to the company, for it frees company personnel, who would otherwise be performing audits, to work full time on gas conversions. LILCO has also embarked on an advertising campaign using bill inserts and local newspaper advertising. Over a period of several months the campaign will reach all areas of LILCO's territory. Taken together, these two factors have produced a large increase in participation in the program: LILCO had conducted only 689 Type A audits during the first ten months of the program, but in the last four months alone, 2,038 Type A audits have been requested. Type B audits are up from 44 in ten months to 752 in the last four months. And loan requests are correspondingly higher. In contrast to the 14 loans (amounting

to $15,683) extended in the first ten months of the program, LILCO has granted 42 loans (amount to $73,317) in the last four months.

Although Consolidated Edison is continuing its direct mail campaign to inform customers about its Home Insulation Act program, program participation is substantially greater in the last four months than it had been previously. Con Ed had conducted 1,613 Type A audits in the first ten months of the program; it has received requests for 4,088 Type A audits and 335 Type B audits in the last four months. It has also granted 13 loan requests ($11,194) in four months, compared with the preceding ten month period when 11 customers had requested loans (amounting to $11,500).

Probably not all of the increased program activity should be attributed to renewed company efforts on the part of BUG, LILCO and Con Ed. The severe gasoline shortage, which resulted in long lines at gas stations and odd-even day rationing, caused residents of the New York metropolitan area to be concerned with all aspects of energy conservation, not just gasoline. Company advertising of the Home Insulation Act programs hit customers at a time when they may have been predisposed to take advantage of the offer to do something about their consumption of energy.

THE FUTURE OF THE PROGRAM

The National Energy Conservation Policy Act[1] (NECPA) requires regulated utilities to establish Residential Conservation Service (RCS) programs in accordance with rules to be established by the Department of Energy (DOE). The purpose of the RCS program is nearly the same as that of the Home Insulation Act program, although some details differ.

As proposed in the Federal Register of March 19, 1979, the RCS program would require utilities to include solar and wind energy systems in their home energy audit. The RCS program also includes four-family houses, requires utilities to audit oil furnaces, and requires the State lead agency to keep an up-to-date list of all approved contractors. In addition to the nine utilities included under the New York State Home Insulation and Energy Conservation Act (HIECA), the RCS program would also include Columbia Gas of New York, Inc.[2] The proposed rules would require New York State to substantially revise the Home Insulation Act program and develop a new RCS program.

The Public Service Commission has been designated by Governor Carey the lead agency for the RCS program in New York State. Commissioner Edward P. Larkin testified before the

1/ Public Law 95-619, 92 Stat. 3206 (1978).

2/ The RCS program proposals include in any calendar year a public utility which during the second preceding calendar year had sales of natural gas, for purposes other than resale, exceeding 10 billion cubic feet. Columbia Gas falls within this definition.

the Department of Energy in Washington on April 25, 1979, regarding the proposed rules for the RCS program. The Department also filed formal written comments with the Department of Energy on June 11, 1979. Both the testimony and the written comments protested the lack of flexibility in the DOE proposed rules and recommended that New York be allowed to keep the HIECA program virtually intact.

The Department of Energy is considering all of the testimony and comments it received on its proposed rules. It expects that it will issue the Final Rules for the RCS program in October 1979. It is possible that some legislative changes to the Home Insulation and Energy Conservation Act may be necessary to conform to the Final Rules for the RCS program. But it would be premature to consider any such changes until DOE promulgates its Final Rules in October. At that time we shall inform the Legislature of any amendments to Article VII-A that may be required.

Table 1

Audits Conducted
(June 1978 to September 1978 Compared to October 1978 to March 1979)

Utility	Type A Audits			Type B Audits			Type C Audits		
	June to September	October to March	Total	June to September	October to March	Total	June to September	October to March	Total
Brooklyn Union	7	11	18	47	99	146	952	200	1,152
Central Hudson	65	240	305	52	346	398	500	6,484	6,984
Con Edison	82	1,531	1,613	0	0	0	0	20,000	20,000
LILCO	54	635	689	0	44	44	8	931	939
NFGD	153	230	383	51	108	159	0	7,250	7,250
NYSE&G	43	91	134	11	38	49	9,466	9,796	19,262
Niagara Mohawk	332	1,782	2,114	27	125	152	1,200	10,656	11,856
Orange & Rockland	363	863	1,226	12	39	51	511	2,889	3,400
Rochester G&E	103	447	550	2	44	46	567	2,265	2,832
Total	1,202	5,830	7,032	202	843	1,045	13,204	60,471	73,675

Table 2

Customers Who Financed Energy Conservation Measures Through the HIECA
(June 1978 to September 1978 Compared to October 1978 to March 1979)

Utility	June 1978 to September 1978		October 1978 to March 1979		Cumulative Total	
	Number	Amount	Number	Amount	Number	Amount
Brooklyn Union	0	$ 0	2	$ 2,092	2	$ 2,092
Central Hudson	0	0	2	2,797	2	2,797
Con Edison	0	0	11	11,500	11	11,500
LILCO	0	0	14	15,683	14	15,683
NFGD	20	35,930	83	110,617	103	146,547
NYSE&G	8	11,935	54	74,747	62	86,682
Niagara Mohawk	1	1,036	30	52,376	31	53,412
Orange & Rockland	9	7,471	15	12,452	24	19,923
Rochester G&E	14	23,975	34	55,179	48	79,154
Total	52	$80,347	245	$337,443	297	$417,790

Table 3

Summary of Results of Home Insulation and
Energy Conservation Act Programs
(October 1, 1978 to March 31, 1979)

I. EFFECT OF THE PROGRAM ON CONSERVATION OF FUEL AND ENERGY

Installations Financed through Utilities' Programs	
Annual Savings of Gas	15,248 Mcf/Yr.
Annual Savings of Oil	57,465 Gal/Yr.
Annual Savings of Electricity	46,275 kWh/Yr.
Installations Not Financed through Utilities' Programs	
Annual Savings of Gas	126,187 Mcf/Yr.
Annual Savings of Oil	324,815 Gal/Yr.
Total Annual Savings	
Annual Savings of Gas	141,435 Mcf/Yr.
Annual Savings of Oil	382,280 Gal/Yr.
Annual Savings of Electricity	46,275 kWh/Yr.

II. COST SAVINGS TO PARTICIPATING CUSTOMERS

Installations Financed through Utilities' Programs	
Gas Heat Customers	$ 44,314/Yr.
Oil Heat Customers	30,892/Yr.
Electric Heat Customers	3,205/Yr.
Installations Not Financed through Utilities' Programs	
Gas Heat Customers	367,204/Yr.
Oil Heat Customers	174,750/Yr.
Total Cost Savings to Participating Customers	$620,365/Yr.

III. EXPENSE TO RATEPAYERS

Expenses Related to Audits	$627,614
Inspection Expenses	1,741
Program Advertising Expenses	173,999
Reporting Expenses	2,708
Interest Differential Expenses	1,944
Miscellaneous Administrative Expenses	145,227
Total	$953,233

IV. REVENUES RELATED TO AUDITS

Type A Audits	$ 57,985
Type B Audits	1,428
Total	$ 59,413

Table 4

Key Program Elements Under the
Home Insulation and Energy Conservation Act
June 1978 through July 1979

Utility	Audit Requests			Loan Requests	
	Type A	Type B	Type C	Number	Amount
Brooklyn Union	168	254	1,265	2	$ 2,092
Central Hudson	354	433	8,796	2	2,797
Con Edison	5,701	335	24,000	24	22,694
LILCO	2,727	796	6,314	56	89,000
NFGD	507	232	10,750	159	242,537
NYSE&G	174	72	19,371	95	129,945
Niagara Mohawk	3,106	295	12,367	98	176,412
Orange & Rockland	1,550	690	3,641	27	27,129
Rochester G&E	928	117	3,587	73	116,761
TOTAL	15,215	3,224	90,091	536	$809,377

NEW YORK STATE
PUBLIC SERVICE COMMISSION

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FIRST ANNUAL REPORT ON IMPLEMENTATION OF THE NEW YORK STATE HOME INSULATION AND ENERGY CONSERVATION ACT

JANUARY 31, 1979

This report is submitted to fulfill requirements of Public Service Law Article VII-A, Section 135-k; Chapter 858, Laws of 1977.

First Annual Report on Implementation of the
New York State
Home Insulation and Energy Conservation Act

INTRODUCTION

The Home Insulation and Energy Conservation Act, signed into Law in August, 1977, (Appendix A), required the nine major electric and gas utilities in New York State[1/] to offer energy audits to their customers and to arrange for financing to eligible customers for the installation of energy conservation measures. The Act further directed the New York State Public Service Commission to administer the programs and report to the Governor and the Legislature on January 31 of each year summarizing the results of the programs. This is the first report pursuant to the Act.

IMPLEMENTATION OF THE PROGRAM

The legislation established the parameters of the utilities' programs; however, it left to the Public Service Commission the detailed tasks of putting the program into effect. These were to be undertaken after the conduct of public hearings. Public Service Commission Case 27230 - Proceeding on Motion of the Commission as to the Implementation of the Home Insulation and Energy Conservation Act (Article VII-A) was opened to facilitate these efforts.

1/ The nine utilities are: Central Hudson Gas and Electric Corp., Consolidated Edison Company of New York, Inc., Long Island Lighting Company, New York State Electric and Gas Corp., Niagara Mohawk Power Corp., Orange and Rockland Utilities, Inc., Rochester Gas and Electric Corp., The Brooklyn Union Gas Company, and National Fuel Gas Distribution Corp.

The first task was to establish energy conservation criteria for each of the energy conservation measures identified in the Act. A working group of technical experts from the several utilities, the Staff of the Public Service Commission, and the State Energy Office drew up draft criteria. On October 17, 1977, the Public Service Commission instituted a rule-making proceeding and called for comments on the draft criteria. It reviewed the comments it received and, on January 13, 1978, promulgated the final criteria. The criteria are based upon standards, or proposed standards, where available, of nationally recognized authorities. They include algorithms for calculating the energy savings from the installation of each of the measures listed in the statute. (See Appendix B.)

The Act directed the utilities to file with the Commission, by November 10, 1977, their proposed programs for carrying out the Act. It provided further that the Commission, after public hearings, should approve, modify or reject the utilities' plans. In order to assure that effective conservation programs adequate to carry out the intent of the legislation were established by the utilities, as soon as feasible, the Commission developed Guidelines (Appendix C) for the utilities' plans. These Guidelines, issued October 18, 1977, were not intended to be binding on the Commission or the parties; but were issued to facilitate the development and review of the utility programs required by the Act.

Devising plans for the audit part of the program did not prove very difficult, for the utilities already had

personnel with the background and technical skills necessary to perform the audits. But plans for financing the measures were much harder to design. In earlier Commission hearings on the draft legislation, it had been brought out that it is cheaper to have banks do the financing than for the utility itself to finance the installation of energy conservation measures. This is largely because of the high cost of capital for utilities. Every utility was required, therefore, to negotiate with at least two banks in its service territory. The banks would provide financing to utility customers who qualified for loans under the criteria established by the Public Service Commission. Some companies were able to find banks willing to lend money at the utility's rate of return; others had to make up the differential between their rates of return and the bank's lending rate.

Arrangements also had to be made with suppliers of energy conservation measures (for do-it-yourselfers) and insulation contractors. These contractors and suppliers had to be evaluated by the utilities in their respective service territories and could then be listed by the utilities as approved contractors. The requirements for approval were established through the formal hearing process.

The utilities filed their plans, as required, on November 10, 1977. Hearings were held on the plans on eleven days during November and December, 1977, and January, 1978, in Albany, New York City, and Buffalo. Thirty witnesses testified, representing the nine utility companies, Commission staff, insulation dealers, entrepreneurs of conservation devices, and

the Public Utility Law Project. Briefs were submitted by the Consumer Protection Board and the Oil Heat Institute of Long Island, as well as by the parties who testified. On March 13, 1978, the presiding Administrative Law Judge issued a 165 page recommended decision. Briefs on exceptions were filed. On April 28, 1978, the Commission issued its Opinion and Order adopting, with modifications, the Judge's recommended decision regarding the utilities' plans. The utilities filed revised plans, in accordance with the Commission's Order.

To help the Commission carry out the statutory direction that it report to the Governor and the Legislature annually on January 31 regarding the effect of the program on the conservation of fuel and energy, cost savings to customers, expense to ratepayers, environmental benefits and estimated effects on the State's economy, staff proposed, and the Commission adopted, reporting requirements for the utilities. (See Appendix D.) By November 30 of each year of the program, each company must submit a report setting out specified data pertaining to the twelve-month period ending on the preceding September 30.

After the Home Insulation program began in New York State, the National Energy Conservation Policy Act was enacted. Among other things, it requires utilities across the country to establish a program that closely parallels New York's. Our efforts in successfully carrying out the program in New York State will benefit not only the New York State consumers who conserve energy, but should also help customers in other states, where the programs can be adopted following our lead.

PROGRAM RESULTS: JUNE 15 THROUGH SEPTEMBER 30, 1978

This first formal evaluation of the utilities' programs under the Home Insulation Act is more limited in scope than future annual reports will be because it pertains to a period during which the programs were available to customers on a limited basis. Because customers' reactions to the programs were extremely difficult to predict, the program was introduced slowly in each utility territory. And since the rate of introduction varied from one company to another, partly because of the different characteristics of each franchise territory, valid inter-company comparisons of the program's effectiveness cannot be made on the basis of the data now available to us. We have therefore limited discussion in this report to the total level of Statewide activity.

It is also too early to measure the cost effectiveness of the program, for the high cost of starting up the program clouds any direct comparisons of benefits and costs. In future reports, however, we shall analyze the program along these lines, taking into consideration such information as the administrative cost per energy audit, the total cost per installation, the ratio of program costs to energy costs avoided each year, the number of loans and the number of installations in relation to the projected saturation figures for each, and any other benefits or costs that may prove important as the program unfolds.

The programs began in each of the nine utility service territories on June 15, 1978. To make it less likely that the companies would be deluged with a volume of requests they would

find impossible to handle, the Commission permitted them to phase-in the program gradually throughout their service territories over a six-month period.

Each utility has submitted a formal report covering the period from the initiation of the program (June 15, 1978) through September 30, 1978, and what follows is a composite of the results obtained. In examining the results, it must be borne in mind that they may not accurately measure the effectiveness of the program. For one thing, they describe the start-up phase of a five-year effort. Moreover, the reports cover three months in the summer, when weatherization of their houses is not a pressing concern of most consumers. Finally, the six-month phase-in period permitted the participating utilities a great deal of discretion in the phasing-in of the program throughout their service territories. Thus, each company's results may not be indicative of its effectiveness or aggressiveness in implementing the Act.

Audits

Three different energy audits are available to customers under this program. The most comprehensive is the Type A audit -- where a utility representative inspects a customer's home and takes measurements. This information is fed into a computer and analyzed according to technical criteria set forth by the Public Service Commission. The results are given to the customer in terms of the number of years it would take each measure, if installed, to pay for itself in energy (dollar) savings. (Appendix B.)

Estimates of the cost of installation for the do-it-yourselfer and for contractor installed installations are also provided. This audit takes an average of 2.5 to 3 hours to perform and the customer is charged $10. The fee is waived if the customer's income is below Federal poverty guidelines. A total of 1,202 customers had this type of audit performed.

If, for some reason, a customer prefers to perform the audit himself, he may do so and give the data to the utility. The company then processes the information and provides the customer with the same payback and cost information. This is known as a Type B audit, and costs the customer no more than $3 for processing. A total of 202 customers had this Type B audit performed.

The utilities are also distributing, without charge, the Energy Workbooks, prepared jointly by the State Energy Office, the Public Service Commission, and the utilities. Over 13,000 Workbooks were distributed under this program through September 30, 1978. The Workbooks give a customer instructions for auditing the home and directions for calculating energy savings and payback. A customer's use of the Workbook and computation of his or her savings and payback is termed a Type C audit.

Of the 1,357 customers who had either an A or B audit, about 70% are gas heating customers, 25% heat with oil, 5% use electric heat, and 1% use some other fuel for heating. Over 98% of the customers who received an A or B audit own their own homes, but 22 tenants requested and received an audit under this program.

A survey[2/] has shown that four percent of the 1, 2 and 3-family homes in New York State are occupied by tenants, and it is therefore not surprising that only two percent of those customers requesting A or B audits were tenants.

Loans

Although the home energy audit portion of the program reached over 14,000 customers, only 52 customers have financed the installation of energy conservation measures under the plan. A "typical" customer participant was a homeowner (51 participants) of a 1-family house (41 participants) with gas heat (44 participants) who had a contractor do the installation (50 participants). About two percent (30 participants) of those customers who had an A audit and two percent (13 participants) of those who had a B audit went on to finance the installation of energy conservation measures. And four customers (out of 13,000) who had a C audit and 5 customers who had a contractor perform the home audit financed the installation of energy conservation measures. There were seven customers whose income fell below Federal poverty guidelines, for whom the audit fee was therefore waived, and who went on to finance the installation of energy conservation measures.

Although 1-family homes were the most commonly involved in the program, energy conservation measures were installed in ten 2-family homes and one 3-family home. And improvements were

2/ New York State Residential Insulation Survey, Final Report, September 1977. Prepared jointly by New York State Public Service Commission, New York State Energy Office and New York Power Pool.

financed and installed at eight oil heated homes as well as the 44 gas heat homes mentioned above.

Currently, the measures that can be financed and installed under this program include: ceiling (attic) insulation, wall insulation, foundation and floor insulation, caulking and weatherstripping, storm windows, storm doors, hot water heater insulation, and clock thermostats. Every one of these items was installed in some gas heated homes. The most frequently installed measure was ceiling insulation, of which 35 installations were made in gas heated homes for an estimated annual gas savings of 1,539 Mcf. (See Appendix B for the method used to calculate energy savings.) Wall insulation was installed in 32 such homes for an estimated annual gas savings of 1,875 Mcf. A total of 101 energy conservation measures were installed in gas heated homes, for a total of 4,288 Mcf of gas saved per year. This is equivalent to savings of $11,903 a year to customers.

In order to be eligible for this program, a customer's conservation measures must pay for themselves in energy savings within eight years. The overall average payback period for energy saving measures installed in gas heated homes was 4.8 years. This is calculated by dividing the cost of installation to the customer by the annual dollar value of gas savings.

Of the eight oil heated homes where energy conservation measures were financed and installed, wall insulation was installed in all eight, ceiling insulation in six, and foundation and floor insulation and storm windows in one each. A total of 5,462 gallons of oil a year were estimated to be saved by the

installation of these measures, equivalent to savings of $2,698 a year to customers. The overall average payback period for energy saving measures installed in oil heated homes was 3.7 years.

Loans guaranteed by utilities under their plans were made by banks to 32 customers (including one tenant) and came to $52,084 in total. In addition, banks made 20 loans, totaling $28,262, that did not require utility guarantees. Because each utility made its own arrangements with the banks, the actual conditions for the program differ somewhat from company to company. Some utilities were able to get banks to agree to make loans to otherwise eligible borrowers at the utility's rate of return, without the utility having to guarantee every loan. Other utilities were able to make arrangements for banks to provide financing at the utility's rate of return only by agreeing to guarantee every loan. The average amount lent was $1,545.

No eligible customer was denied financing by a utility under this program. But one customer who showed an interest in financing was unable to obtain it because the payback period for the measures in which he was interested exceeded the statutory maximum; and another customer was interested in financing measures whose cost came to less than $200, the statutory minimum amount that may be financed.

PROGRAM COSTS AND BENEFITS

The utilities' participation in the program cost their ratepayers a total of $614,351. The largest program category is audits, amounting to $204,515, offset by revenues of $7,222. Fifteen percent of the total cost ($92,540) was spent on

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advertising the program. Miscellaneous administrative expenses totaled $312,791. The cost to the utilities of making up the difference between the utility rate of return and the interest rates charged by the banks totaled $445. There have been no expenses thus far due to customers defaulting on their loans.

Results from the initial few months of the program give some indication of the benefits to be obtained. The total cost of the program is offset by the direct benefit of the energy saved -- 4,200 Mcf of gas and 5,500 gallons of oil a year -- through the installation of energy conservation measures. We are beginning to see other benefits as well.

Environmental Benefits

It has been calculated that, during the phasing-in portion of the program, emissions of SO_2 from oil burning home furnaces were reduced by 534 pounds a year thanks to the energy conservation measures installed. Similarly, particulate emissions are estimated to have been reduced by 19 pounds. Although this secondary effect of energy conservation is beneficial, we do not expect this rather minute reduction in emissions to result in any measurable improvement in ambient air concentrations. But these reductions in emissions will continue to accrue as less oil is burned to heat homes.

Employment Effects

A total of eight additional employee-years were reported for utility employees and DMC Energy, Inc., the contractor hired by Orange and Rockland Utilities, Inc. to perform the home audits.

We were unable to ascertain whether any new employees were hired by insulation contractors due to this program. It appears, however, that the program will have at most a very small impact on the State's labor force.

Additional Energy Conservation Benefits

Many customers who had a home energy audit did not choose to take advantage of the financing terms available under this program but, nonetheless, went on to install energy conservation measures. The Commission directed the utilities to take a survey of customers in this category and to estimate the energy they saved.

Results to date show that at least 131 customers installed conservation measures following an audit but without borrowing money under this program. This figure includes two customers who qualified for a free audit. These customers are estimated to conserve a total of 6,283 Mcf of gas and 16,157 gallons of oil a year, equivalent to a total saving of $85,905 annually on their home heating bills.

Although we cannot be sure that having the home audit caused these customers to install energy conservation measures, we can be reasonably certain it influenced their decision to do so; hence, these savings are legitimately a part of this report.

PROGRAM RESULTS: OCTOBER THROUGH DECEMBER, 1978

Data on program activity through September 30, 1978, are all thathave been formally reported to us. They cannot be considered conclusive, for they depict a program that had been

in operation for, at most, only three months. And more recent informal reports from the utilities suggest program activity is increasing. By mid-December, 1978, about 5,000 Type A and Type B audits had been conducted and 160 loans for the installation of energy conservation measures had been granted. Although energy savings data have not yet been collected for all these installations, it appears that savings through mid-December, 1978, are about three times those achieved through September 30, 1978. Data on key program elements through December are shown in Table 2 on a company by company basis.

THE FUTURE OF THE PROGRAM

Participation

At the direction of the Commission, the utilities are stepping up their efforts to encourage participation in the program. Various approaches are being taken. In some instances, the utility is directing attention to particular groups of customers; in other cases, it is conducting a multi-media campaign using a combination of bill inserts, newspaper ads, and television and radio announcements. While it is still too early to project the 1979 levels of participation in the program, we expect these efforts will raise them substantially.

Inclusion of Additional Energy Conservation Measures

At the present time, there are measures identified in the Act that are not yet included in the utilities' programs. Our intention is to include them in the coming years, once certain institutional barriers and safety questions have been resolved.

These additional measures include: oil burner replacement, electronic ignition devices to replace gas pilot lights, automatic vent dampers, and de-rating of the heating and vent systems.

We have been especially active recently in trying to bring oil burner replacements under the program. On April 28, 1978, we directed the utilities to make arrangements with oil heating dealers in their territories for including the measure, but no satisfactory plan was agreed upon. On August 11, therefore, the Commission issued for comment a staff proposal for incorporating oil burner replacements in the program. The proposal included suggestions that oil dealers perform the audit of the oil furnace and provide to the utility only enough information to determine whether the measure met the statutory payback criterion for financing. Staff's proposal also suggested a training program for oil furnace auditors. On December 14, the Commission adopted most of the provisions of the staff proposal but called for additional comments on a requirement for listing oil dealers equipped to perform audits. After these additional comments are reviewed and evaluated -- they are due January 29, 1979 -- the Commission will issue its ruling on the inclusion of oil burner replacements in the program.

A different sort of difficulty precludes the immediate inclusion of electronic ignition devices, automatic vent dampers, and the de-rating of gas furnaces in the program. There are nationally recognized standards for the retrofit installation of only one of these devices (automatic vent dampers) so safety considerations must be satisfied before these measures can be incorporated into the program.

We are now concluding a federally-funded demonstration project, in conjunction with Brooklyn Union Gas Company, to test the potential energy savings from the replacement of standing gas pilots with electronic ignition devices. During the summer of 1976 these devices were installed on 1,700 single-family home furnaces in Brooklyn Union's franchise territory. No safety or reliability problems have been encountered. We may be able to extrapolate the results Statewide and include the ignition devices in the program during the coming year.

Including automatic vent dampers and the de-rating of gas furnaces in the program will be a longer term effort. A joint project of the New York State Energy Research and Development Authority, the New York Gas Group and the Public Service Commission, called SAFTECON, is now underway to test the safety and energy saving potential of a variety of devices. Those which looked promising in laboratory testing are now being field tested by utilities. Calspan Corp., a nationally recognized independent research and development company that conducts scientific and engineering programs for government and industry, will develop proposed installation guidelines for the devices. The guidelines will be submitted to the American National Standards Institute to serve as a basis for national standards. Until national standards are adopted, the guidelines may be used on an interim basis in New York State.

SUMMARY AND CONCLUSIONS

During the first three month phase-in stage of the program, a total of 1,357 utility customers asked for and

received Type A or B energy audits. Another 13,000 customers received Energy Workbooks constituting a Type C audit. During the same period, loans were granted to 52 participants in the program. By mid-December, 1978, Type A and B audits numbered 5,000, and a total of 160 loans were outstanding.

Fuel savings as a direct result of customer participation during the phase-in period of the program amounted to 4,200 Mcf of gas and 5,500 gallons of oil a year, an estimated fuel cost savings to the customers of $14,600 per year.

In addition, we have identified 131 customers who installed energy conservation measures following an A or B audit, but who chose not to avail themselves of utility assisted financing. The estimated fuel savings by these customers was 6,300 Mcf of gas and 16,000 gallons of oil per year and the estimated fuel cost savings were $26,000.

Customers financing the installation of energy conservation measures have chosen measures that provide an early return on their investment. The overall average payback period for energy saving measures was 4.6 years, a figure significantly less than the required eight year payback.

Since most utilities were able to find banks in their territories willing to loan money for the installation of energy conservation measures at the utility's rate of return, the $445 total interest differential expense is quite small. But the utilities have only a one year agreement with the banks. This cost may rise significantly, depending on prevailing interest rates, if the banks renegotiate their agreements with the utilities.

Thus far, there has been a relatively small positive effect from this program on the environment and the economy of the state. But while the gains in these areas are likely to continue to be small, they are permanent benefits once achieved.

The advent of colder weather, coupled with increased promotional efforts have produced greater interest in the program. We must recognize, however, that a substantial number of homeowners in New York State are not likely to participate in the program. A survey of 1, 2 and 3-family homes in New York State taken in January 1977[3/] showed that one-third of the homeowners had already added insulation in the past three years, and that another one-third planned to add insulation in the next year. The survey further showed that only one percent of the homeowners had refrained from adding insulation because they had been unable to obtain financing. Customers may not perceive the opportunity to finance at the utility's rate of return to be sufficiently attractive for them to finance the installation of energy conservation measures under the program and may prefer to continue to rely on their own resources for their conservation efforts.

Overall, we have in place a working home insulation and energy conservation program that has begun to reap benefits for the State and its consumers. Participation in the program

3/ New York State Residential Insulation Survey, Final Report, September 1977. Prepared jointly by New York State Public Service Commission, New York State Energy Office and New York Power Pool.

is accelerating. But it would be premature at this point either to judge the net effectiveness and efficiency of the program or to project future participation. We look forward optimistically to the continued growth of the program, and we plan to pursue with vigor those actions that will help assure that growth.

TABLE 1

Summary of Results of Home Insulation and
Energy Conservation Act Programs

June 15, 1978 to September 30, 1978

I. EFFECT OF THE PROGRAM ON CONSERVATION OF FUEL AND ENERGY

Installations Financed through Utilities' Programs

Annual Savings of Gas	4,227 Mcf/Yr
Annual Savings of Oil	5,462 Gallons/Yr

Installations Not Financed through Utilities' Programs

Annual Savings of Gas	6,283 Mcf/Yr
Annual Savings of Oil	16,157 Gallons/Yr

Total Annual Savings

Annual Savings of Gas	10,510 Mcf/Yr
Annual Savings of Oil	21,619 Gallons/Yr

II. COST SAVINGS TO PARTICIPATING CUSTOMERS

Installations Financed through Utilities' Programs

Gas Heat Customers	$ 11,903/Yr
Oil Heat Customers	$ 2,698/Yr

Installations Not Financed through Utilities' Programs

Gas Heat Customers	$ 17,693/Yr
Oil Heat Customers	$ 7,981/Yr

Total Cost Savings to Participating Customers	$ 40,275/Yr

III. CAPITAL COST TO PARTICIPATING CUSTOMERS FOR INSTALLATIONS

Installations Financed through Utilities' Programs

Gas Heat Customers	$ 56,911
Oil Heat Customers	$ 10,035

Installations Not Financed through Utilities' Programs

Gas Heat Customers	$ 61,012
Oil Heat Customers	$ 24,893

Total Capital Cost for Installations	$152,851

Table 1 (continued)

IV. EXPENSE TO RATEPAYERS

Expenses Related to Audits	$204,515
Inspection Expenses	$ 731
Program Advertising Expenses	$ 92,540
Reporting Expenses	$ 3,329
Interest Differential Expenses	$ 445
Miscellaneous Administrative Expenses	$312,791
Total	$614,351

V. ENVIRONMENTAL BENEFITS

Estimated Reduction in Emissions of SO_2	534 lbs/yr
Estimated Reduction in Emission Particulates	19 lbs/yr

VI. ESTIMATED EFFECTS ON STATE's ECONOMY

Additional Utility Employee-years	6.4
Additional Sub-contractor Employee-years	1.6
Total	8.0

TABLE 2

Key Program Elements
Under the Home Insulation and Energy Conservation Act
Mid-June through Mid-December, 1978[1]

Utility	1,2,3-family Residences[2]	Audit Requests			Loans Requested
		Type A	Type B	Type C	
Brooklyn Union	600,000	81	288	1,108	0
Central Hudson	176,000	110	125	5,300	1
Con Edison	760,000	1,068	-	6,068	5
Long Island Lighting	690,000	429	57	1,000	5
National Fuel Gas	600,000	268	241	5,000	61
New York State E&G	533,000	86	26	14,577	27
Niagara Mohawk	1,236,000	451	355	3,000	14
Orange & Rockland	116,000	659	382	2,636	15
Rochester G&E	184,000	331	83	1,292	32
TOTAL		3,483	1557	39,983	160

1/ Based on informal reports from the nine utility companies.
2/ Source: Staff testimony in Case 27230.

Appendix A

STATE OF NEW YORK

S. 549-B
Cal. No. 1359

A. 7904-B
Cal. No. 1296

1977-1978 Regular Sessions

SENATE-ASSEMBLY

(Prefiled)

January 5, 1977

IN SENATE—Introduced by Sens. PISANI, McFARLAND, PADAVAN, BABBUSH, BARTOSIEWICZ, BEATTY, BELLAMY, BURSTEIN, GOLD, LEICHTER, TAURIELLO, WINIKOW, GAZZARA, GRIFFIN, DONOVAN, DUNNE, BLOOM, LEWIS, GALIBER, GARCIA, McCALL—read twice and ordered printed, and when printed to be committed to the Committee on Corporations, Authorities and Public Utilities—reported favorably from said committee, ordered to first and second report, ordered to a third reading, amended and ordered reprinted, retaining its place in the order of third reading, again amended and ordered reprinted, retaining its place in the order of third reading

IN ASSEMBLY—Introduced by M. of A. LANDES, DURYEA, ORAZIO, GRABER, E. F. X. RYAN—Multi-Sponsored by—M. of A. ABRAMSON, AMATUCCI, BIANCHI, BOYLAND, BREWER, BURNS, BUSH, CINCOTTA, COCHRANE, CONNERS, CONNOR, COOPERMAN, CULHANE, D'ANDREA, DEARIE, DELLI BOVI, DelTORO, DeSALVIO, DIGGS, ENGEL, EVE, FARRELL, FERRIS, FIELD, FINK, FINNERAN, FLANAGAN, FORTUNE, FREMMING, FREY, FRIEDMAN, GOLDSTEIN, GORSKI, GOTTFRIED, GRANNIS, GRECO, GREENBERG, GRIFFITH, GULOTTA, HARENBERG, HARRIS, HAWLEY, HENDERSON, HEVESI, HINCHEY, HOCHBRUECKNER, HOYT, HURLEY, KEANE, KIDDER, KOPPELL, KREMER, LAFAYETTE, LANE, LASHER, LEE, LENTOL, LEVY, LEWIS, LIPSCHUTZ, MARCHISELLI, McGEE, McGRATH, McINERNEY, G. W. MILLER, M. H. MILLER, MIRTO, MOLINARI, MONTANO, M. J. MURPHY, NADLER, NICOLOSI, NINE, NORTZ, PASSANNANTE, PESCE, POSNER, PROUD, RIFORD, ROSS, SCHIMMINGER, SCHMIDT, SCHUMER, SERRANO, SIEGEL, SILVER, STAVISKY, STEIN, STEINGUT, STEPHENS, P. M. SULLIVAN, VIRGILIO, WALSH, WEPRIN, WERTZ, WILSON, YEVOLI, ZAGAME, ZIMMER—read once and referred to the Committee on Corporations, Authorities and Commissions—

EXPLANATION—Matter in *italics* is new; matter in brackets [ ] is old law to be omitted.

reported from committee, advanced to a third reading, amended and ordered reprinted, retaining its place on the order of third reading, passed by Assembly and delivered to the Senate, recalled, vote reconsidered, restored to third reading, amended and ordered reprinted, retaining its place in the order of third reading

AN ACT to amend the public service law and the real property tax law, in relation to implementation of a program of home energy conservation in cooperation with regulated public utilities and making an exemption relating thereto

The People of the State of New York, represented in Senate and Assembly, do enact as follows:

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

1. The nation and the state are faced with a continuing energy crisis, in which the demand for fuels has threatened to outstrip available supplies. The federal government has established energy conservation as a national goal of high priority and has called on all Americans to participate in attaining that goal. In the state of New York, which consumes, to an overwhelming degree, far more energy than it produces, the need for energy conservation is of particular importance.

2. The state faces shortages of all forms of energy which may harm industry, require industry and consumers to turn to more expensive and less efficient energy sources, and further aggravate the spiralling cost of living and of doing business in the state.

3. Many homes in New York state lack any insulation or other conservation devices, and only a small percentage of all homes in the state are adequately insulated to current energy efficient standards. This leads to the waste of large amounts of energy, resulting in greater dependence on imported supplies, both of which are contrary to the energy policy of this state and nation.

4. The state's unemployment rate, which is at the highest level since the depression of the nineteen thirties is particularly acute in the construction and building trades industry.

5. Full insulation of homes in the state and the installation of other energy conservation measures, could save a significant portion of all energy consumed annually for heating purposes. Savings to homeowners would be in terms of millions of dollars per year; jobs would be created; and energy supplies would be saved for wiser use.

6. Many homeowners and other residential heating consumers who stand to benefit frequently cannot afford the initial cost of energy conservation measures and their installation.

7. The savings of energy by any one homeowner accrues to the benefit of all energy users and consumers in this state, since demand for highly priced incremental sources of energy will be reduced.

8. The legislature further finds that energy conservation measures will reduce energy consumption through reduced cooling requirements as well as reduced heating requirements, and for these and other reasons, a program of home energy conservation should be available to all homeowners, regardless of type of fuel or energy used for space or water heating or cooling.

9. The legislature declares that the common denominator among homes in this state is the receipt of energy from the gas and electric utilities of this state, and that this mechanism should be used for the financing of a home energy conservation program.

§ 2. The public service law is hereby amended by adding thereto a new article, to be article seven-A, to read as follows:

ARTICLE VII-A

HOME INSULATION AND CONSERVATION

§ 135-a. Short title. This article shall be known as the "home insulation and energy conservation act".

§ 135-b. Definitions. As used in this article, the following terms shall have the following meanings:

1. "Commission" means the public service commission of the state of New York.

2. "Utility" means an investor-owned gas or electrical corporation regulated by the commission whose gross revenues for the preceding calendar year exceeded one hundred million dollars.

3. "Eligible customer" means any person who:

(a) holds legal title to a one, two or three family home constructed prior to the effective date of this article which receives electric or gas service from a utility under residential rate structures approved by the commission, or

(b) is in rightful possession under a lawful lease of a one, two or three family home constructed prior to the effective date of this article who (i) receives at such home and pays for electric or gas services, from a utility under residential rate schedules approved by the commission, (ii) has the written permission of the holder of legal title to such home to enter into a financing contract and security agreement pursuant to this article, and has the consent of such holder for the financing utility to obtain a security interest in and lien upon the premises, (iii) if the financing utility so requests, provides security of a type and in an amount approved by the commission, and (iv) does not present an undue credit risk as determined in accordance with rules and regulations promulgated for this purpose by the commission.

4. "Energy conservation measures" means:

(a) caulking and weatherstripping of all exterior doors and windows;

(b) furnace efficiency modifications including but not limited to:

(i) replacement burners designed to reduce the firing rate or to achieve a reduction in the amount of fuel consumed as a result of increased combustion efficiency;

(ii) devices for modifying flue openings which will increase the efficiency of the heating system, and

(iii) electrical or mechanical furnace ignition systems which replace standing gas pilot lights;

(c) clock thermostats;

(d) ceiling, attic, wall, foundation and floor insulation;

(e) hot water heater insulation;

(f) storm windows and storm doors; and

(g) such other measures that the commission shall specify.

5. "Home conservation plan" means the general program administered and established by each utility pursuant to this article, which sets forth the framework for individual home energy conservation programs for eligible customers.

§ 135-c. Home conservation plans; eligibility; approval by the commission. 1. After hearing upon reasonable notice, the commission shall establish home conservation plans for each utility in accordance with the provisions of this article. Such plans shall be open to participation by all eligible customers otherwise meeting the criteria set forth in this article. Such eligibility shall cease September first, nineteen hundred eighty-two.

2. Participation shall be open to all eligible customers, regardless of type of fuel or energy used for space or water heating or cooling.

3. Participation shall be limited to individual projects wherein the amount to be financed is in excess of two hundred dollars. In addition, the estimated cost of such projects must be recovered within seven years from the savings generated by reduced energy consumption resulting from such projects.

§ 135-d. Scope of plan. 1. Each utility shall adopt and implement a home conservation plan as approved by the commission, and shall offer participation to its customers. The availability of the plan shall be publicized by the utility to encourage customer participation.

2. The commission may provide that any such plan shall provide participating customers with the opportunity to enter into a financing contract and security agreement with the sponsoring utility for the amount financed. If such an agreement is entered into, the commission shall require the payment of interest by each participant on the amount financed by such participant in accordance with the provisions of this article.

3. Each plan shall provide for the installation and financing of one or more types of energy conservation measures and provide for the performance of energy audits.

4. Where any plan includes financing by a utility, any such plan shall include the maximum rate of interest chargeable by the utility on any amounts financed hereunder; allowable repayment periods; probable sources of and methods by which the utility will raise funds to carry out the plan; and such other information and matters as the commission deems necessary and appropriate to effectuate the purposes of this article.

§ 135-e. Energy conservation criteria. 1. Participation shall be denied to any eligible customer whose proposed installation of energy conservation measures fails to meet minimum criteria established by the commission for purposes of home conservation plans, provided, however, that until such time as the commission shall adopt criteria in accordance with the procedure set forth herein, the applicable minimum, interim criteria shall be proposed standard 100.1 P of the American Society of Heating, Refrigerating, and Air Conditioning Engineers, Inc. set forth in the document entitled "Energy Conservation Existing Buildings—Low Rise Residentials", dated March sixteenth, nineteen hundred seventy-seven. The commission shall establish criteria for each energy conservation measure not later than sixty days after the effective date hereof, after a public hearing upon notice, and after consultation with the New York State Energy Office and the New York State Building Code Council. The criteria adopted by the commission shall be no less stringent than the applicable minimum, interim criteria established hereby, unless the commission determines that the public interest would be served by adoption of less stringent criteria.

2. The commission may upon its own motion or upon request of an eligible customer grant an exception to such a customer from any such criteria upon a showing that compliance is not technically feasible or would result in severe economic hardship.

§ 135-f. Energy audits. 1. Upon the request of an eligible customer, each utility shall conduct an energy audit of such customer's residential premises and promptly provide the results of the audit to such customer in a manner prescribed by the commission. The commission may require that a charge not exceeding ten dollars be imposed on any such customer for such audit. A customer shall only be eligible for one audit under this section.

2. Each audit shall include:

(a) estimates of the energy conservation measures, if any, needed to comply with applicable minimum criteria;

(b) estimates of available options for meeting such criteria, together with their relative costs and pay-back periods, and relative potential energy and cost savings, and a comparison of initial cost and pay-back periods for customer installation and for contractor installation.

§ 135-g. Financing. 1. Where any home conservation plan is approved by the commission and requires utility financing, any such plan shall provide that upon entering into a financing contract and security agreement with an eligible customer, the utility shall reimburse such eligible customer, or pay directly to an authorized contractor and/or supplier a sum of money to cover the costs of installing energy conservation measures, subject to the maximum amount set forth in subdivision four hereof. Such sum shall be referred to as "the amount financed".

2. Any such home conservation plan shall contain several options for period of repayment; provided, however, the maximum repayment period shall be seven years.

3. Each participant shall repay to the utility the total amount financed plus allowable interest charges on such amounts, through charges separately set forth and identified, on such participant's periodic bill for gas or electric service from the financing utility, or may be separately billed as provided in the plan.

4. The total amount financed by a participant shall not exceed one thousand five hundred dollars in the case of a single family home, two thousand five hundred dollars in the case of a two family home, and three thousand dollars in the case of a three family home.

5. In the event an eligible customer takes both electric service and gas service from different utilities, the customer may choose to participate in one plan offered by either the gas company or the electric company, but not both. The total amount financed shall become an added portion of the bill from the one utility in whose plan the customer participates and shall become a debt due such utility.

6. Any financing utility shall be entitled to receive interest from each participating, eligible customer on the amount financed by that customer at a maximum rate to be determined by the commission in approving the utility's home conservation plan. In determining the maximum rate of interest, the commission shall consider the cost of borrowing to the utility from all available sources, the cost of financing generally available to potential participating customers from other sources, the maximum use of funds available to a utility, efforts by the utility to minimize interest costs, and shall endeavor to set the rate in a manner which will assist customers in installing energy conservation measures at the lowest possible cost. In no event shall the interest rate exceed the overall rate of return awarded to the utility in its last general rate case. The commission and any financing utility shall develop and adopt means for minimizing the cost to utilities for providing financing under this article.

7. In adopting any such home conservation plan the commission shall set maximum aggregate amounts to be available for financing by the utility in each year of its plan.

§ 135-h. Installation. 1. A utility shall afford each participant in its home conservation plan the option of installing energy conservation measures either (a) by performing the work on a "do-it-yourself" basis, where deemed safe and feasible by

the commission, under guidelines set by the commission for assuring quality and conformance with applicable criteria; (b) through the use of services provided by the utility itself, if the utility decides to offer such services provided, however, that in offering such services, the utility shall contract, through the use of prevailing competitive bidding processes, with persons, firms and corporations not owned or operated by such utility for the installation of energy conservation measures; or, (c) through the use of the services of a contractor and/or supplier of the customer's choice, whose name appears on a list of qualified contractors and/or suppliers maintained and periodically updated by the utility.

2. In implementing paragraph (a) of subdivision one of this section, the utilities, in consultation with the commission, shall prepare a "do-it-yourself" manual for the customers it serves, detailing the materials capable of being used, their manner of effective installation, and the criteria used in inspection to determine the degree of effectiveness. With reference to all installations to be made pursuant to paragraphs (a) and (c) of subdivision one of this section, the utility shall prepare and maintain a list of qualified and participating suppliers and contractors in a non-discriminatory manner. The decision as to which option, supplier, or contractor to use is the choice of the customer.

§ 135-i. Default. In the event that a participating customer defaults in respect to payment under a financing agreement and security contract entered into pursuant to this article, the utility shall employ reasonable efforts to collect all amounts due from the customer.

§ 135-j. Administration by public service commission; application by utilities; approval. 1. The commission shall issue such orders, rules and regulations as may be necessary or appropriate for interpretations, implementation or administration of this article.

2. Within ninety days of the effective date hereof, every utility shall submit its proposed home conservation plan in accordance with the terms of this act to the commission for approval by the commission. Within sixty days thereafter, the commission shall approve, approve with modifications, or reject each such submission.

§ 135-k. Reports; miscellaneous. 1. During the first three years of operation of an approved home conservation plan, each utility shall submit to the commission annually a summary report setting forth such information as the commission may deem relevant to monitor and evaluate the progress of the program.

2. On or before the thirty-first day of January of the year next succeeding the effective date of this article, and annually on that day thereafter up to and including January thirty-first, nineteen hundred eighty-three, the commission shall report to the governor and the legislature with regard to the progress of the program regarding the effect of the program on conservation of fuel and energy, cost savings to customers, expense to rate payers, environmental benefits, and estimated effects on the state's economy. The reports further, shall detail any problems encountered in administration of the program and its implementation and shall include recommendations for its improvement and possible extension.

3. It is the purpose of this article, to the maximum extent permitted, to incorporate into the home conservation program established by this article any advantages to be secured by integration of federal and state home conservation programs, to secure maximum federal assistance to the program, when and if available, for such purposes, and to the customers and utilities participating therein.

§ 135-l. Alternate financing method. Notwithstanding the provisions of sections one hundred thirty-five-d and one hundred thirty-five-g of this article, a utility may satisfy its obligation to provide financing to eligible customers by concluding financial arrangements with two or more lending institutions in this state engaged in making home improvement loans to provide loans to eligible customers for home

conservation programs pursuant to this article, provided that such loans shall be under such terms and conditions as are consistent with the terms and conditions of section one hundred thirty-five-g. The utility may guarantee such loans where the commission determines that such action is in furtherance of the public interest.

§ 135-m. Applicability to prior installations. In the event any eligible customer installs energy conservation measures subsequent to the effective date of this act, but prior to the adoption of a home conservation plan by his gas or electric utility, and the work performed or obtained by such eligible customer would qualify for financing under a subsequently adopted plan, such eligible customer shall be eligible for retroactive financing and participation in the plan adopted by his utility in accordance with the provisions of this article.

§ 135-n. Recovery of costs. A utility shall be allowed to recover as normal operating expenses through rates the just and reasonable costs of carrying out its responsibilities and home conservation plan under this article, as determined by the commission after public hearing upon reasonable notice.

§ 3. The real property tax law is hereby amended by adding thereto a new section, to be section four hundred eighty-seven, to read as follows:

§ 487. Exemption from taxation of conservation improvements to certain residential premises. Insultation and other energy conservation measures hereafter added to one, two or three family homes, which qualify for (a) financing under a home conservation plan pursuant to article VII-A of the public service law, or (b) any conservation related state or federal tax credit or deduction heretofore or hereafter enacted, shall be exempt from real property taxation and special ad valorem levies to the extent of any increase in value of such homes by reason of such addition for a period of fifteen years, after the effective date of this section.

§ 4. Severability. If any provision of this act, or the application thereof to any person or circumstance, is held invalid, the validity of the remainder of such act and the application of such provision to other persons and circumstances shall not be affected thereby.

§ 5. This act shall take effect immediately.

APPENDIX B

Methodology for Calculating Energy Savings from the Installation of Energy Conservation Measures

CRITERIA

FOR

ENERGY CONSERVATION MEASURES

PURSUANT TO THE

HOME INSULATION AND ENERGY CONSERVATION ACT

(Pages 1 through 32)

Established by the

New York State Public Service Commission

January 13, 1978

I. INTRODUCTORY STATEMENT

The energy conservation criteria established by the Commission are intended to provide a sound technical basis for the energy conservation measures included by New York State's utilities in their Home Conservation Plans under the Home Insulation and Energy Conservation Act. The criteria describe those characteristics which, when complied with by the listed energy conservation devices, and measures, will provide present and continuing utility, durability, desirability, economy of maintenance, and a safe and healthful environment. An effort has been made to present the material in a manner that will define a minimum level of acceptability and allow consistent interpretation by its users. Where practical, requirements have been stated and are intended to be applied in performance terms in order to permit flexibility.

II. GENERAL CRITERIA

The minimum energy conservation criteria established herein are intended for buildings containing one, two or three living units. The criteria are based upon standards, or proposed standards, of the American National Standards Institute, and the Department of Housing and Urban Development and upon other nationally recognized standards, where available.

In addition, it is intended that materials and devices shall be installed in accordance with the manufacturer's instructions and all applicable codes. Compliance with any military specifications included in the referenced standards is not required.

The references cited in the criteria are presented in the attached appendices for convenience. The appendices contain the latest revisions of the referenced standards at the time of issuance of the Energy Conservation Criteria. Although the appendices are intended to be updated periodically to reflect any changes in the referenced standards, at any given time the reference material contained therein may not be up-to-date and must be checked against its sources.

III. SPECIFIC CRITERIA

A. Caulking of Exterior Doors and Windows

Caulking is an adhering non-hardening material used to fill gaps or spaces between materials of construction. Caulking materials shall meet the requirements set forth in Housing and Urban Development Standards 4900.1, 4910.1,

4930.1, 1973 Edition, as revised. (See Chapter 5, Division 6, Section 507-6 (pp. 5-7-5, 5-7-6) and Appendix C, paragraph 507-6 (pp. C-7 and 8) of Standard 4900.1).

Caulking may be performed by homeowner, tenant or qualified contractor.

See Appendix A for reference material.

B. Weatherstripping of Exterior Doors and Windows

Weatherstripping is the assembly or combination of metallic or non-metallic materials designed to reduce air infiltration through the edges of doors and windows. Weatherstripping shall meet the requirements as set forth in Housing and Urban Development Standards 4900.1, 4910.1, 4930.1, 1973 Edition, as revised. (See Chapter 5, Division 8, Section 608-2.2 and 608-4.2, (pp. 6-8-1, 6-8-2) of Standard 4900.1).

Weatherstripping may be applied by the homeowner, tenant, or qualified contractor.

See Appendix B for reference material.

C. Insulation

Insulation is any material having a relatively high resistance to heat flow, which is used principally to retard the flow of heat.

The maximum coefficient of heat transmission through building sections adjacent to heated space after the installation of insulation shall be:

Building Section*	Maximum U-Value*
ceiling (roof)	0.05
exterior walls	0.07
foundation walls	0.15
floors over unheated crawl spaces	0.08
floors over areas exposed to outside or unheated garages	0.05

Insulating materials shall meet the requirements set forth in Housing and Urban Development Standards 4900.1, 4910.1, 4930.1, 1973 Edition as revised. (See Chapter 5, Division 7, Sections 507-3 (pp. 5-7-1, 5-7-2) and Appendix C, paragraph 507-3 (p. C-7) of Standard 4900.1). When practical, the requirements for vapor protection contained in Chapter 5, Division 7, Section 507-2 (p. 5-7-1) and Appendix C, paragraph 507-2 (p. C-6) of Standard 4900.1 shall apply.

Attic ventilation shall be provided for the purpose of moisture dissipation and shall be furnished in accordance with the requirements set forth in Housing and Urban Development Standards 4900.1, 4910.1, 4930.1, Chapter 4, Section 403.3.

Installation shall be by a qualified contractor except that installation in accessible areas may be by a homeowner or tenant.

See Appendix C for reference material.

*These terms are defined in NYS Public Service Commission (Opinion No. 76-16(C), issued May 16, 1977)

D. Storm Windows

Storm windows are supplementary windows, mounted inside or outside the primary windows, for the purpose of reducing the heat loss and air infiltration through the windows. Aluminum storm windows shall comply with the ANSI/AAMA 1002.9-77 Standard,* latest edition.

Storm windows may be installed by the homeowner, tenant or a qualified contractor.

See Appendix D for reference material.

E. Storm Doors

Storm doors are supplementary doors, mounted outside the primary door, for the purpose of reducing the heat loss and air infiltration through the door. Aluminum storm doors shall comply with the requirements set forth in the ANSI/AAMA 1102.7-77 Standard,** latest edition. Wood storm doors shall comply with the National Woodwork Manufacturers Association Standard IS-5, latest edition.

Storm doors may be installed by the homeowner, tenant, or a qualified contractor.

See Appendix E for reference material.

F. Hot Water Heater Insulation

Hot water heater insulation is a fibrous or cellular insulation with an integral outer layer (skin) of vinyl, polyethylene, or equivalent material intended for mounting external to

*Formerly American National Standards Institute Standard A134.3
**Formerly American National Standards Institute Standard A134.4

the tank to reduce heat loss. The insulation materials shall meet the requirements set forth in Housing and Urban Development Standards 4900.1, 4910.1, 4930.1, 1973 Edition, as revised. (See Chapter 5, Division 7, Sections 507-3 [pp. 5-7-1, 5-7-2] and Appendix C, paragraph 507-3 [p. C-71] of Standard 4900.1).

Hot water heater insulation may be installed by the homeowner, tenant, or a qualified contractor.

See Appendix F for reference material.

G. Clock Thermostats (Temperature Selection Thermostats)

For the purposes of this Section a thermostat is defined as a temperature sensitive device that controls the operation of heating and cooling equipment. A clock thermostat shall have the capability to be set at the user's option for alternate temperature levels and for variable periods of time and may operate either automatically or semi-automatically.

Clock thermostats installed under the provisions of the Home Insulation and Energy Conservation Act must be listed by Underwriters' Laboratories (UL). They must be installed by a qualified contractor except when the manufacturer explicitly states that professional installation is not needed.

See Appendix G for reference material.

H. Electrical or Mechanical Furnace Ignition Systems

Electrical or mechanical furnace ignition systems are devices replacing standing gas pilot lights and associated energy using equipment as a means to eliminate the use of gas during

the off-cycle periods of the main burner. Furnace ignition systems shall comply with American National Standards Institute (ANSI) Standard Z21.20-1975 and Z21.20a-1977, as amended, entitled "Automatic Gas Ignition System and Components." Systems installed must be listed by Underwriters' Laboratories (UL). Installations must be made by a qualified contractor.

See Appendix H for reference material.

I. Modifications to Existing Gas Central Heating Appliance Installations

Modifications to existing gas central heating appliances shall be devices capable of reducing the amount of fuel consumed.

The modifications shall be limited to derating the heating appliances by means of replacing existing orifice(s) in the main burner(s) by smaller orifice(s), accompanied by the installation of a fixed restrictor in the vent connector. Derating shall be performed by a qualified contractor. Modifications shall be performed in accordance with the proposed July 22, 1977 revisions to American National Standards Institute (ANSI) Standard Z223.1-1974 (Sections 1.7.2, 1.7.3, and Appendices 1-E, 1-F, and 1-G).

See Appendix I for reference material.

J. Modifications to Existing Oil Central Heating Appliance Installations

The modifications to existing oil central heating appliances shall be limited to the replacement of burners and components

by burners and components designed to reduce the firing rate or to achieve a reduction in the amount of fuel consumed as a result of increased combustion efficiency. Oil burners and components must be listed by Underwriters' Laboratories (UL) and be in compliance with UL Standard 296.

Listed equipment shall be installed in accordance with the National Fire Protection Association (NFPA) Standard 31 (American National Standards Institute Z95.1) for the installation of oil burning equipment.

Replacement oil burners shall carry certification of the manufacturer that the burner can attain at least an 80% steady state combustion efficiency, with no more than a No. 1 smoke measurement and no less than a 10% CO_2 reading as tested in a new furnace or boiler. The installer shall certify to the owner that the replacement burner has been installed in accordance with the manufacturer's instructions and meets all State and local code requirements, including permits. The installer shall also certify to the owner that he has performed an efficiency test of the replacement burner as installed and that it does operate with at least 80% steady-state combustion efficiency. Readings of CO_2, stack temperature, smoke number and draft measurements will be noted on the certification statement. The statement shall be affixed to the equipment in a visible location.

See Appendix J for reference material.

CAULKING OF EXTERIOR DOORS AND WINDOWS
METHODOLOGY FOR ESTIMATING ENERGY SAVINGS

The energy savings associated with caulking shall be estimated using the following formulae:

(A) $ES_C = HS_C + CS_C$

Where:

ES_C = Energy Savings for Caulking (CCF-gas,gal-oil,kWh-elect.)

HS_C = Heating Savings for Caulking (CCF-gas,gal-oil,kWh-elect.)

CS_C = Cooling Savings for Caulking (kWh-elect.)

(B) $HS_C = M_H \times SF_C$

$CS_C = M_C \times SF_C$

Where:

M_H = Heating Multiplier (See Supplement K)

M_C = Cooling Multiplier (See Supplement K)

SF_C = Savings Factor for Caulking (See below)

Savings Factor for Caulking

Number of windows with fair caulking x 0.3 =

Number of windows with poor caulking x 0.9 =

Number of doors with fair caulking x 0.3 =

Number of doors with poor caulking x 0.9 = _____

Sum of above = SF_C =

Fair Caulking - Caulking and putty are old and cracked, or missing in places; minor drafts.

Poor Caulking - There is no caulking at all, the putty is in poor condition; noticeable drafts.

Notes:

SF_C = 0.018 (Fair CCL) + 0.054 (Poor CCL)*

CCL = Caulking Crack Length

Window CCL = 2 (height + width)*

Door CCL = width + 2 height*

Windows = 36 inches x 60 inches

Doors = 36 inches x 80 inches

*Cost Effective Methods to Reduce the Heating and Cooling Requirements of Existing Single Family Residences, Report No. AA1-75-19, Abt Associates Inc., February, 1975, Sect. 3.1 and 3.2.

WEATHERSTRIPPING OF EXTERIOR DOORS AND WINDOWS
METHODOLOGY FOR ESTIMATING ENERGY SAVINGS

The energy savings associated with weatherstripping shall be estimated using the following formulae:

(A) $ES_W = HS_W + CS_W$

Where:

ES_W = Energy Savings for Weatherstripping (CCF-gas, gal-oil, kWh-elect.)

HS_W = Heating Savings for Weatherstripping (CCF-gas, gal-oil, kWh-elect.)

CS_W = Cooling Savings for Weatherstripping (kWh-elect.)

(B) $HS_W = M_H \times SF_W$

$CS_W = M_C \times SF_W$

Where:

M_H = Heating Multiplier (See Supplement K)

M_C = Cooling Multiplier (See Supplement K)

SF_W = Savings Factor for Weatherstripping (See below)

Savings Factor for Weatherstripping

Number of windows with fair weatherstripping x 1.0 =

Number of windows with poor weatherstripping x 8.0 =

Number of doors with fair weatherstripping x 2.0 =

Number of doors with poor weatherstripping x 16.3 =_____

Sum of above = SF_W =

Fair Weatherstripping - Weatherstripping damaged or missing in places; minor drafts.

Poor Weatherstripping - No weatherstripping at all; noticeable drafts.

Notes:

Windows

$SF_W = 0.05$ (Fair WSCL) + 0.42 (Poor WSCL)*

Doors

$SF_D = 0.10$ (Fair WSCL) + 0.84 (Poor WSCL)*

Assumes the existence of storm windows and storm doors. The savings for weatherstripping would be greater if the windows and doors do not have storm protection.

WSCL = Weatherstripping Crack Length

Window WSCL = 2 (height) + 3 (width)*

Door WSCL = 2 (height + width)*

Windows = 36 inches x 60 inches

Doors = 36 inches x 80 inches

*Cost Effective Methods to Reduce the Heating and Cooling Requirements of Existing Single Family Residences, Report No. AA1-75-19, Abt Associates Inc., February, 1975, Section 3.1 and 3.3.

INSULATION
METHODOLOGY FOR ESTIMATING ENERGY SAVINGS

The energy savings associated with adding insulation shall be estimated using the following formulae:

(A) $ES_I = HS_I + CS_I$

Where:

ES_I = Energy Savings for Insulation (CCF-gas, gal-oil, kWh-elect.)

HS_I = Heating Savings for Insulation (CCF-gas, gal-oil, kWh-elect.)

CS_I = Cooling Savings for Insulation (kWh-elect.)

(B) $HS_I = M_H \times SF_I$

$CS_I = M_C \times SF_I$

Where:

M_H = Heating Multiplier (See Supplement K)

M_C = Cooling Multiplier (See Supplement K)

SF_I = Savings Factor for Insulation (See below)

Savings Factor for Insulation

The savings factor for the addition of insulation is equal to the product of the change in U-value and the area insulated:

$$SF_I = (U_{initial} - U_{final}) \text{ Area}$$

In calculating the change in U-value, the effect of framing members shall be considered.

The change in U-value for the addition of insulation to ceilings and walls may be determined from the following tables:

Change in U-Value for Insulating Walls

Insulating Material	Situation A	Situation B	Situation C
glass fiber	0.13	0.20	0.15
rock wool	0.14	0.22	0.16
cellulosic fiber	0.15	0.23	0.18
urea-formaldehyde foam	0.16	0.24	0.18

Situation A: Insulated sheathing present beneath outside facing of wall. Values based on initially uninsulated cavity, U = 0.218, R_{cavity} = 4.40, $R_{framing}$ = 7.06, Framing Area = 10%

Situation B: No insulated sheathing present beneath outside facing of wall. Values based on initially uninsulated cavity, U = 0.305, R_{cavity} = 3.11, $R_{framing}$ = 6.64, Framing Area = 10%

Situation C: No information re insulated sheathing beneath outside facing. Values based on initially uninsulated cavity, U = 0.247, R_{cavity} = 3.87, $R_{framing}$ = 6.53, Framing Area = 10%.

Change in U-Value for Insulating Ceilings
(Based on uninsulated cavity R 1.67
$R_{framing}$ = 7.17, Framing Area = 10%)

		R Added					
		11	19	22	30	38	44
	0	.23	.25	.25	.26	.26	.26
R	5	.084	.10	.10	.11	.12	.12
Existing	11	.033	.042	.045	.050	.053	
	19	.014	.032	.034	.037		

Change in U-Value for Insulating Floors
(Based on initially uninsulated cavity;
R_{cavity} - 3.04, $R_{framing}$ - 12.54, Framing Area - 10%)

Insulation Added	Change in U-Value
R-11	0.23
R-13	0.24
R-19	0.26
R-22	0.26

Foundation Walls

In estimating the energy savings associated with adding insulation to foundation walls, only heating energy savings shall be considered. The savings determined herein are based on maintaining a basement temperature of approximately 65°F. The energy savings may be determined most readily by considering the above grade and below grade portions of the foundation wall separately.

Above grade, the heat savings for insulation is equal to the product of the heating multiplier and the savings factor.

$$HS_I = M_H \times SF_I$$

Below grade, this equation is not valid because the temperature difference across the foundation wall is equal to the design temperature difference. The average temperature difference that will actually exist across the below grade foundation wall at the design point will depend upon climatic area and soil conditions. For the purpose of this criteria, it shall be assumed that the average below grade temperature difference is 1/3 the above grade temperature difference, which should approximate reasonably well actual conditions. Therefore, the below grade heating savings for insulation is 1/3 the product of the heating multiplier and the savings factor.

$$HS_I = 1/3\ M_H \times SF_I$$

STORM WINDOWS
METHODOLOGY FOR ESTIMATING ENERGY SAVINGS

The energy savings associated with adding storm windows shall be estimated using the following formulae:

(A) $ES_{SW} = HS_{SW} + CS_{SW}$

Where:

ES_{SW} = Energy Savings for Storm Windows (CCF-gas, gal-oil, kWh-elect.)

HS_{SW} = Heating Savings for Storm Windows (CCF-gas, gal-oil, kWh-elect.)

CS_{SW} = Cooling Savings for Storm Windows (kWh-elect.)

(B) $HS_{SW} = M_H \times SF_{SW}$

$CS_{SW} = M_C \times SF_{SW}$

Where:

M_H = Heating Multiplier (See Supplement K)

M_C = Cooling Multiplier (See Supplement K)

SF_{SW} = Savings Factor for Storm Windows (See below)

Savings Factor for Storm Windows

Number of Windows with good weatherstripping x 9.7 =

Number of Windows with fair weatherstripping x 10.1 =

Number of Windows with poor weatherstripping x 13.2 = _____

Sum of above = SF_{SW} =

Notes:

$SF_{SW} = 0.07$ (Good WSCL) + 0.09 (Fair WSCL) + 0.25 (Poor WSCL) + ΔUA*

WSCL = Weatherstripping Crack Length = 2 (height) + 3 (width)*

$\Delta U = 0.56$ Btu/HR-Sq. Ft.-°F

A = Window area = 36 inches x 60 inches = 15 Sq. Ft.

*Cost Effective Methods to Reduce the Heating and Cooling Requirements of Existing Single Family Residences, Report No. AA1-75-19, Abt Associates Inc., February, 1975, Section 3.1 and 3.3.

STORM DOORS
METHODOLOGY FOR ESTIMATING ENERGY SAVINGS

The energy savings associated with adding storm doors shall be estimated using the following formulae:

(A) $ES_{SD} = HS_{SD} + CS_{SD}$

Where:

ES_{SD} = Energy Savings for Storm Doors (CCF-gas, gal-oil, kWh-elect.)

HS_{SD} = Heating Savings for Storm Doors (CCF-gas, gal-oil, kWh-elect.)

CS_{SD} = Cooling Savings for Storm Doors (kWh-elect.)

(B) $HS_{SD} = M_H \times SF_{SD}$

$CS_{SD} = M_C \times SF_{SD}$

Where:

M_H = Heating Multiplier (See Supplement K)

M_C = Cooling Multiplier (See Supplement K)

SF_{SD} = Savings Factor for Storm Doors (See below)

Savings Factor for Storm Doors

Number of Doors with good weatherstripping x 6.7 =

Number of Doors with fair weatherstripping x 7.5 =

Number of Doors with poor weatherstripping x 13.7 = _____

Sum of above = SF_{SD} =

Notes:

$SF_{SD} = 0.14$ (Good WSCL) + 0.18 (Fair WSCL) + 0.50 (Poor WSCL) + ΔUA*

WSCL = Weatherstripping Crack Length = 2 (height + width)*

ΔU = 0.2 Btu/HR-Sq. Ft.-°F*

A = Door Area = 36 inches x 80 inches = 20 Sq. Ft.*

*Cost Effective Methods to Reduce the Heating and Cooling Requirements of Existing Single Family Residences, Report No. AA1-75-19, Abt Associates, Inc., February, 1975, Sect. 3.1 and 3.3.

HOT WATER HEATER INSULATION
METHODOLOGY FOR ESTIMATING ENERGY SAVINGS

A hot water heater insulation blanket will reduce the standby heat loss of a gas or electric water heater. The energy savings for insulation blankets meeting the requirements set forth in Criterion III-F shall be estimated as follows:

Type of Hot Water Heater		Annual Energy Savings*
Electric	40 gal	360kWh
Electric	52 gal	440kWh
Gas	40/50 gal	36CCF

*Insulation Refit Kit for Domestic Water Heaters, Energy Research and Development Administration, Report No. TID-27674, Johns-Manville Sales Corp., March 1977.

CLOCK THERMOSTATS (TEMPERATURE SELECTION THERMOSTATS) METHODOLOGY FOR ESTIMATING ENERGY SAVINGS

Clock thermostats are used to set back house or apartment temperatures for specified periods of time. The amount of savings that can be achieved through the use of this device depends upon many factors such as the number of degrees of temperature setback, the duration of setback, the specific temperature settings, the climatic conditions and the living habits of the inhabitants. In this criteria it shall be assumed that the clock thermostat will be used to implement a 5°F temperature setback for an eight hour period (10 PM to 6 AM) unless otherwise specified by the customer. The customer may specify a setback in the 5°F to 10°F temperature range. It shall further be assumed that the heating system is controlled by a single thermostat and that prior to the installation of this measure the thermostat was not set back manually.

The energy savings for clock thermostats used, as specified above, shall be estimated at:

Degree Days	% Energy Savings for an 8-Hour Temperature Setback of:					
	5°F	6°F	7°F	8°F	9°F	10°F
5,000	8.1	8.9	9.7	10.5	11.3	12.1
6,000	7.2	7.9	8.6	9.4	10.1	10.8
7,000	6.1	6.8	7.5	8.2	8.9	9.6
8,000	5.2	5.9	6.5	7.2	7.8	8.5
8,500	4.6	5.2	5.9	6.5	7.2	7.8

The annual fuel consumption for space heating shall be estimated based on the historic consumption of the customer except when a clock thermostat is installed in conjunction with other energy conservation measures. In this case the percent savings would apply to the projected consumption after the other measures are implemented. The historic consumption may be based on either customer or company records.

Where the consumption recorded is for space heating in combination with other uses, the space heating consumption may be estimated as a percent of total consumption in accordance with the following table:

Energy Form	Percent of Total Consumption Used for Space Heating
gas	70
electric	60
oil	70
coal	70

In lieu of the above, the utility may estimate space heating consumption based on analyses of billing dates, heat loss surveys of customer premises or other valid techniques.

ELECTRICAL OR MECHANICAL FURNACE IGNITION SYSTEMS
METHODOLOGY FOR ESTIMATING ENERGY SAVINGS

Gas space heaters are equipped with pilots that consume approximately 800 Btuh or 0.8 CF (cubic foot) per hour. In the course of a year (8760 hours) a gas pilot in a space heater consumes 70.1 CCF (Hundred Cubic Feet). Of this amount, it is estimated that between 46.4 CCF and 54.1 CCF are wasted.* In this criterion it shall be assumed that an average value of 50 CCF (5 MCF) shall be conserved by the installation of electrical or mechanical ignition systems.

*The Potential Application of Electronic Ignition Systems for Gas Appliances in New York State, New York State Department of Public Service, O.R. Report 75-10 September, 1975.

MODIFICATIONS TO EXISTING GAS CENTRAL HEATING APPLIANCE INSTALLATIONS METHODOLOGY FOR ESTIMATING ENERGY SAVINGS

The gas savings associated with derating a gas heating system to match the heating requirements of a home are a function of the extent to which the heating system is oversized with respect to the heating requirements. Although existing data indicate that the gas savings achievable from derating are significant, the relationship between gas savings achievable and the percent that the heating system is oversized can not be precisely defined at this time. Therefore, the following practices shall apply until sufficient data are available for updating this criterion:

1. This criterion shall be limited to gas heating systems that are oversized by a minimum of 50%.
2. The gas savings achievable by derating shall be estimated at 15% of the gas consumed annually for space heating.
3. The percent oversizing shall be determined by equations (A) and (B).

(A) $$\text{Percent Oversizing} = \frac{N - R}{R}$$

where:

N = Heating system input rating in Btu/hr

R = Heating system input requirements in Btu/hr as determined from (B)

(B) $$R = \left[\frac{X/D_X - (Y\ 1.25/D_Y)}{24}\right]\left[\frac{(B - C)\ D_X\ \times 10^5}{Z}\right]$$

where:

X = CCF for a winter billing period
D_X = days in winter billing period
Y = CCF for summer billing period
D_Y = days in summer billing period
B = 65 (degree day base)
C = design temperature
Z = degree days in winter billing period

MODIFICATIONS TO EXISTING OIL CENTRAL
HEATING APPLIANCE INSTALLATIONS
METHODOLOGY FOR ESTIMATING ENERGY SAVINGS

The energy savings (S_O) associated with the replacement of existing oil burners with burners of higher efficiency shall be estimated using the following formula:

$$ES_{RB} = EI \times G$$

Where:

ES_{RB} = Annual Oil Savings in gallons

EI = Efficiency Improvement = $[1-E_B/E_A]$

E_B = Steady-state combustion efficiency before burner replacement

E_A = Steady-state combustion efficiency after burner replacement

G = Annual oil consumption for space heating before burner replacement in gallons.

Where oil is used both for space heating and for domestic hot water, the amount of oil used for space heating shall be estimated at 70 percent of total annual consumption.

Heating and Cooling Multipliers*
For Various Cities in New York State

City	Heating Multiplier				Cooling Multiplier
	Gas	Oil	Elect.	Coal	Elect.
Albany	1.63	1.35	29.91	20.6	2.24
Auburn	1.72	1.42	31.49	21.7	1.80
Batavia	1.83	1.51	33.45	23.2	1.48
Binghamton	1.72	1.42	31.49	21.7	1.27
Brewster	1.56	1.28	28.47	19.7	2.74
Buffalo	1.81	1.50	33.22	23.0	1.50
Canton	1.72	1.42	31.51	21.6	1.27
Dobbs Ferry	1.46	1.21	26.80	18.6	3.02
Elmira	1.74	1.43	31.79	22.0	1.77
Geneva	1.72	1.42	31.49	21.7	1.89
Glens Falls	1.55	1.28	28.45	19.8	1.80
Hudson	1.43	1.18	26.21	18.1	2.49
Huntington	1.50	1.24	27.45	19.0	2.74
Ithaca	1.72	1.42	31.49	21.7	1.32
Massena	1.81	1.49	33.06	23.0	1.18
Mineola	1.43	1.18	26.20	18.2	2.99
Newburgh	1.43	1.18	26.10	18.1	2.81
New York City	1.32	1.09	24.20	16.8	3.66
Ogdensburg	1.69	1.40	30.95	21.5	1.43
Olean	1.81	1.50	33.22	23.0	1.72
Oneonta	1.66	1.37	30.42	21.3	1.78
Oswego	1.77	1.46	32.33	22.3	1.49
Plattsburgh	1.85	1.52	33.80	23.7	1.29
Poughkeepsie	1.52	1.26	27.89	19.3	2.77
Riverhead	1.57	1.29	28.70	19.9	2.46
Rochester	1.75	1.44	32.03	22.2	1.82
Schenectady	1.63	1.35	29.92	20.7	2.20
Spring Valley	1.52	1.26	27.89	19.3	2.83
Syracuse	1.64	1.35	30.03	20.7	1.89
Ticonderoga	1.71	1.41	31.26	21.7	1.54
Utica	1.66	1.37	30.37	21.0	2.06
Watertown	1.61	1.33	29.55	20.5	1.58

*The methodology for estimating energy savings and the development of the equations for the heating and cooling multipliers follow in the remainder of this supplement.

Methodology for Estimating Energy Savings

The general equation for calculating the probable heating energy consumption by the modified degree day method is:

$$(1) \quad E = \left(\frac{H_L \times D \times 24}{\Delta T \times \eta \times V}\right) (C_D) \quad (C_F) \qquad *$$

Where:

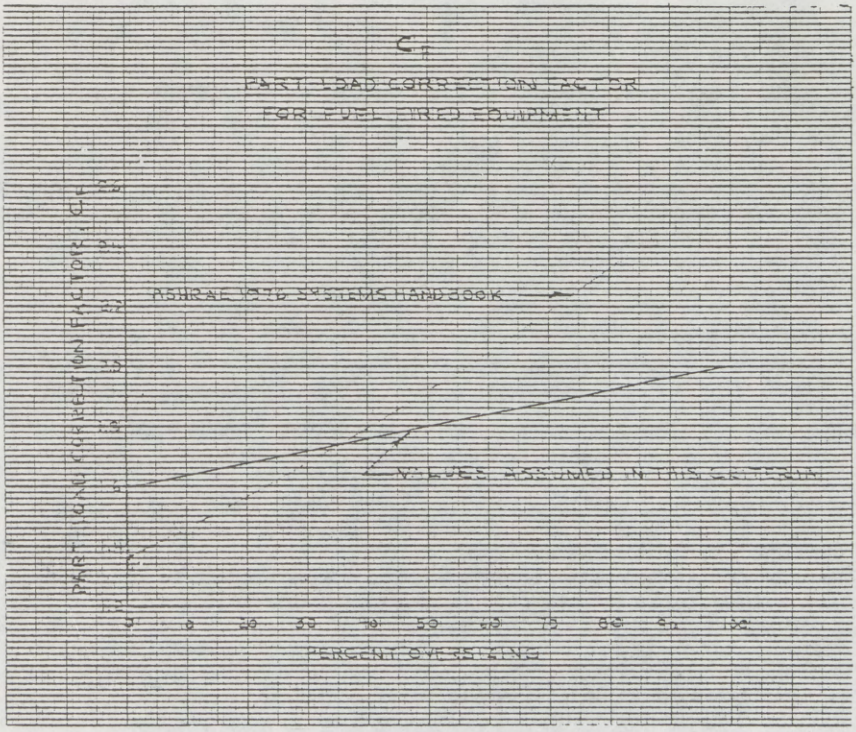
- E = fuel or energy consumed for estimate period.
- H_L = design heat loss, including infiltration, Btu per hour.
- D = number of 65 degree days for the estimate period.
- ΔT = design temperature difference, degrees Fahrenheit.
- η = rated full load efficiency, decimal.
- V = heating value of fuel, consistent with H_L and E.
- C_D = interim correction factor for heating effect vs degree days.
- C_F = interim part load correction factor for fueled systems only; equals 1.0 for electric resistance heating.

C_D is specified in the following table:

Outdoor Design Temp., °F	-20	-10	0	+10	+20
Factor C_D	0.57	0.64	0.71	0.79	0.89

The values assumed for C_F in this Criteria are shown in the figure below. Also shown in this figure are interim values specified in the ASHRAE 1976 Systems Handbook. The assumed values shown in this figure shall be used in this Criteria until sufficient data is available under this program to more precisely define this factor.

* American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc., 1976 Systems Handbook, Chapter 43.



As shown above, C_F is a function of the percent oversizing of the heating system which is the ratio of the capacity of the heating system to the design heat loss (H_L) of the house. Hence, C_F increases with the implementation of an energy conservation measure that reduces H_L. The energy savings ΔE associated with such a measure may be derived from equation 1.

$$(2)\quad \Delta E = \frac{D\ C_D\ 24}{\Delta T\ \eta\ V}\left[H_{Li}\ C_{Fi} - H_{Lf}\ C_{ff}\right]$$

where: subscripts i and f refer to the initial and final configurations.

Also,

$$(3)\quad H_L = UA\Delta T$$

where: U = Coefficient of Heat Transmission
Btu/Hour - Square Foot - °F

A = Area of Heat Transmission - Square Feet.

Hence:

$$(4)\quad \Delta E = \frac{D\ C_D\ 24}{\eta\ V}\ A\left[U_i\ C_{Fi} - U_f\ C_{Ff}\right]$$

In this criteria we shall assume that

$U_i\ C_{Fi} - U_f\ C_{Ff}$ can be represented by "C_F" $(U_i - U_f)$

or

$$(5)\quad \text{"}C_F\text{"} = \frac{U_i\ C_{Fi} - U_f\ C_{Ff}}{U_i - U_f}$$

To evaluate "C_F" we shall examine two cases:

Case 1

20% Reduction in design heat loss
% Oversizing increases from 25% to 56.3% (See Figure for C_F)

$$\text{"}C_F\text{"} = \frac{U_i\ (1.70) - .8\ U_i\ (1.82)}{U_i - .8\ U_i} = \frac{1.70 - .8\ (1.82)}{.2}$$

$$\text{"}C_F\text{"} = 1.22$$

Case 2

5% Reduction in design heat loss
% Oversizing increases from 25% to 31.6% (See Figure C_F)

$$"C_F" = \frac{U_i\ (1.70) - .95\ U_i\ (1.72)}{U_i - .95\ U_i} = \frac{1.70 - .95\ (1.72)}{.05}$$

$$"C_F" = 1.32$$

"C_F" is found to be reasonably constant over the range of anticipated conditions. For simplicity "C_F" will be assumed constant at 1.28 from which it follows that:

$$(6) \quad U_i C_{Fi} - U_f C_{Ff} = 1.28\ (U_i - U_f) = 1.28\ \Delta U$$

Combining equations (4) and (6) yields:

$$(7) \quad \Delta E = \frac{1.28\ D\ C_D\ 24}{\eta\ V} \quad \Delta U \cdot A$$

In accordance with the presentation of "In the Bank or Up the Chimney", prepared by Abt Associates Inc. of Cambridge, Massachusetts for the U.S. Department of Housing and Urban Development, the following nomenclature shall be adopted:

SF = Savings Factor $\Delta U \cdot A$
M_H = Heating Multiplier = $1.28\ D\ C_D\ 24/\eta V$
$\Delta E = M_H \times S_F$

The heating degree days, and the design temperature for determining C_D are shown in Table II for various cities in New York State.

The following heating efficiencies and heating values of fuel shall be used in this analysis:

Fuel or Energy	Efficiency	Heating Value
gas	80%*	10^5 Btu/CCf
electricity	100%	3413 Btu/kwh
oil	70%*	138,500 Btu/gal.
coal	45%	14,940 Btu/lb.

The energy consumption for air conditioning may be estimated in a manner similar to that employed for estimating the energy consumption for heating. When used to estimate air conditioning energy consumption, equation 1 takes the following form:

$$(2) \quad E = \left(\frac{H_G \ DDC \times 24}{\Delta T \ \eta \times V} \right)$$

Where:

H_G = design heat gain, Btu per hour
DDC = cooling degree days
ΔT = summer design temperature difference, degrees Fahrenheit

The change in design heat gain ΔH_G for the addition of insulation is:

$$\Delta H_G = \Delta U \ A \ \Delta T$$

ηV for cooling is the EER = Btu/HR - Watt.

* These efficiencies are approximations and the efficiency of any given furnace can deviate materially depending upon a variety of conditions.

$$\Delta E = \left(\frac{DDC \times 24}{EER \times 1000}\right) \quad \Delta UA$$

The savings factor = SF = ΔUA

The Cooling Multiplier = $M_c = \left(\frac{DDC \times 24}{EER \times 1000}\right)$

$$\Delta E = M_c \times SF$$

The cooling degree days for the various cities in NYS are shown in Table II.

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Table II

Heating Design Temperature,

Heating Degree Days,

and Cooling Degree Days

City	Heating		Cooling
	Design Temp.	Heating Degree Days (1)	Cooling Degree Days (2)
Albany	-10	6,648	654
Auburn	-10	7,000	526
Batavia	- 5	7,050	432
Binghampton	-10	7,000	369 (3)
Brewster	- 5	6,000	800 (3)
Buffalo	- 5	7,000	437
Canton	-25	8,300	369
Dobbs Ferry	0	5,370	880 (3)
Elmira	- 5	6,700	517
Geneva	-10	7,000	552
Glens Falls	-20	7,100	525 (3)
Hudson	-10	5,825	725 (3)
Huntington	0	5,500	800 (3)
Ithaca	-10	7,000	384
Massena	-20	8,250	343
Mineola	0	5,250	873
Newburgh	- 5	5,500	820 (3)
New York City	0	4,848	1,068
Ogdensburg	-20	7,725	417 (3)
Olean	- 5	7,000	500 (3)
Oneonta	-15	7,200	520 (3)
Oswego	-10	7,186	435
Plattsburgh	-15	8,000	375 (3)
Poughkeepsie	- 5	5,878	809
Riverhead	0	5,750	717
Rochester	- 5	6,750	531
Schenectady	-10	6,650	642
Spring Valley	- 5	5,878	825 (3)
Syracuse	-10	6,675	551
Ticonderoga	-20	7,800	450 (3)
Utica	-10	6,750	600 (3)
Watertown	-20	7,375	461

(1) Heating degree days obtained from New York State Utilities.

(2) Climatography of the United States No. 81 (New York), U.S. Department of Commerce, National Climatic Center Asherville, NC, August 1973.

(3) Values estimated from measured values for nearest localities.

APPENDIX C

Guidelines for Implementation of

the Home Insulation and Energy Conservation Act

At a session of the Public Service Commission held in the City of Albany on October 18, 1977

COMMISSIONER PRESENT:

Charles A. Zielinski, Acting Chairman

Case 27230 - Proceeding on motion of the Commission as to the Implementation of the Home Insulation and Energy Conservation Act - Article VII-A.

The Home Insulation and Energy Conservation Act, signed into law on August 12, 1977, requires that the major gas and electric utilities[1/] establish programs for financing various energy conservation measures. The legislation recognizes that the inefficient use of gas, electricity and oil in residences imposes substantial cost burdens on the people of New York State. The Legislature found that many homes in the State lack adequate insulation and other conservation devices, and that many of the people who would benefit most from these energy saving measures often cannot afford the initial cost. On the basis of these findings, the Legislature developed the Home Insulation and Energy Conservation Act.

[1/] Central Hudson Gas and Electric Company, Consolidated Edison Company of New York, Long Island Lighting Company, New York State Electric and Gas Corporation, Niagara Mohawk Power Corporation, Orange and Rockland Utilities, Inc., Rochester Gas and Electric Corporation, the Brooklyn Union Gas Company and National Fuel Gas Distribution Corporation.

The Act directs the utilities to file their proposed programs with the Commission by November 10, 1977. It provides further that the Commission, after public hearings, should approve, modify or reject the utilities' plans by January 9, 1978.2/

In our review, we will have to determine whether the utilities' programs are adequate to carry out the intent of the legislation. In order to expedite the review procedure and assure that effective conservation programs are established as soon as feasible, we believe it would be useful at this time to outline in the attached Guidelines our preliminary conclusions concerning the implementation of the Act.

The Guidelines are not intended to be binding on the Commission or the parties; rather, they are being issued to facilitate the development and review of the utility programs required by the Home Insulation and Energy Conservation Act. We suggest, however, that the proposed programs to be submitted by November 10 follow the format indicated in the Guidelines.

The Commission orders:

1. The following utilities: Central Hudson Gas and Electric Company, Consolidated Edison Company of New York, Long Island Lighting Company, New York State Electric and Gas Corporation, Niagara Mohawk Power Corporation, Orange and Rockland Utilities, Inc., Rochester Gas and Electric Corporation, the Brooklyn Union Gas Company, and National Fuel Gas Distribution Corporation shall

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2/ The Act also directs the Commission to promulgate energy conservation criteria for the measures that will be used in the program. We have instituted a rulemaking proceeding on these criteria by Order issued October 17, 1977. Insofar as uncertainty about the final criteria may affect the conservation programs to be submitted by November 10, the utilities may assume solely for purposes of that submission that the proposed criteria issued for comments on October 17 will be adopted without modification.

submit proposed energy conservation plans on or before November 10, 1977 pursuant to the Home Insulation and Energy Conservation Act.

2. The above mentioned utility companies shall consult with the Commission Staff and other interested parties in developing their proposed Home Conservation Plans.

3. This proceeding is continued.

Charles A. Zielinski
Acting Chairman

APPENDIX

GUIDELINES FOR IMPLEMENTATION OF
PUBLIC SERVICE LAW VII -A

I. ELIGIBILITY: Only one loan per family home.

A. Homeowners - to include seasonal and factory built homes.

1. One, two and three family residences constructed prior to August 12, 1977, shall be eligible if other minimum criteria are met.

2. Seasonal Homes

a. Eligibility will depend on meeting minimum pay back criteria calculated on the basis of the actual use of the structure.

b. In the event any utility cannot meet customer requests under the program for any reason, full time residences shall be given priority.

3. Mobile Homes and Factory Built Homes - Participation shall be limited to those conservation devices approved by the Commission and applicable to these residences.

B. Tenants.

1. No tenant shall be eligible for participation in the program unless:

a. The tenant receives and pays for electric or natural gas service under residential tariffs; and

b. The owner of the residence gives written permission for the installation of qualifying devices and for the imposition of a lien against the property.

2. Undue Credit Risk

a. The utility must provide financing for any tenant if the tenant does not currently maintain a security deposit for the provision of utility service according to the tariff of the utility.

b. The utility may deny financing to any tenant who has outstanding judgments against his personal property, which judgments are not being legally contested by the tenant.

c. In any event, no tenant shall be denied financing because he represents an undue credit risk if the owner of the residence becomes personally liable as a guarantor of collectibility on the financing contract.

C. Pay Back.

1. All residences otherwise qualifying under these guidelines shall be eligible for financing of qualifying conservation devices after an on-site energy audit if the estimated energy savings from the installation of one or more measures over a seven year period is equal to or greater than an estimate of the cost of the installation. A customer may elect to exceed the established minimum energy conservation criteria and remain eligible for financing only if the pay back remains at seven years or less.

2. Estimates

a. A reasonable and firm estimate of the cost of installing qualified energy conservation measures shall be provided to the customer by the utility where it subcontracts the installations or by a contractor on the utility's recommended contractor list after an on-site energy audit is made. This estimate shall be used as the basis for determining customer eligibility for financing.

b. If an on-site audit cannot be performed within a reasonable period of time or the customer does not desire an audit, an estimate from a participating contractor containing sufficient information to calculate pay back may be used by the utility to determine eligibility.

c. No customer shall be liable for any installation or material charges exceeding the utility estimate where the utility subcontracts the installations.

d. Where the utility does not sub-contract the actual installation but only maintains a list of qualified contractors, it shall provide the customer with the utility's best estimate of costs. This estimate shall not be the basis for determining eligibility.

e. An estimate of cost for do-it-yourself installations shall be provided by the utility (cost of materials only).

3. Energy Savings

a. Energy savings shall be based on the current cost of energy in each service territory.

[1] In the case of oil heat, the cost of fuel oil including applicable taxes shall be based on the prices set forth in the Journal of Commerce.

[2] For residences with existing central air conditioning, energy savings resulting from reduced cooling shall be included.

b. Methodology - Energy savings shall be calculated according to the methodology contained in the conservation criteria established by the Commission.

D. Energy Conservation Measures.

1. The following energy conservation measures shall be included in each utility program:

a. Caulking and weatherstripping.

b. Attic, ceiling, wall, foundation and hot water heater insulation.

c. Storm windows and doors.

d. Clock thermostats.

e. Electrical or mechanical furnace ignition systems.

f. Modifications to flue openings on gas central heating systems.

g. Replacement burners for oil furnaces.

2. Except for the purposes of retroactive financing, no conservation measure shall be offered under any utility program unless the Public Service Commission has duly promulgated criteria applicable to the particular conservation measure to assure safety and quality.

3. In order to qualify for financing each conservation measure installed must meet the minimum installation criteria established by the Commission. Retroactive financing eligibility for projects completed prior to the adoption of these criteria shall be determined on the basis of ASHRAE 100.1 P.

4. A utility may request that any of the above measures be excluded from their program if such exclusion is in the public interest.

5. A utility may request other measures to be included in their program upon a showing that such measures are cost effective energy conservation measures, except that in no event shall replacement appliances or a conversion to alternate heating systems be included in the program.

6. If as a result of the energy audit, it is the opinion of the utility that any measure or measures can not be paid back within seven years because of the condition of the property or appliance to be retrofitted, financing shall be denied by the utility. Any customer may request the Commission to review such a determination.

E. Do-It-Yourself Installations.

1. Financing shall be provided for do-it-yourself installations if the requirements of these guidelines are otherwise met; except that such financing shall be provided only for the installation of the following devices:

   a. Caulking and weatherstripping.

   b. Insulation of attics, ceilings, foundations and hot water heaters.

   c. Storm windows and doors.

   d. Clock thermostats where the manufacturer specifies that it may be a do-it-yourself item.

2. Each program shall provide for the distribution of a do-it-yourself manual approved by the Commission which describes installation techniques for all those do-it-yourself devices included in the utility program.

F. Retroactive Eligibility - Eligibility for the financing of conservation device installations completed prior to the Commission's approval of a utility's program shall be determined after an on-site energy audit is performed and in the same manner as eligibility is determined pursuant to the utility's approved plan so long as the customer has a dated proof of purchase.

II. INSTALLATIONS.

A. The utility program should contain specific procedures to assure that contractor and utility installations are performed in a safe and acceptable manner consistent with the energy criteria established by the Commission. Any contractual safeguards contemplated should be specifically set forth in the program proposal.

1. In the event that the utility desires to subcontract the installations, the program should set forth in detail the competitive bidding procedures that will be used to choose the subcontractors. The utility, if it utilizes a subcontractor shall warranty to the customer both the device and the workmanship.

2. The utility shall maintain a list of qualified contractors to perform installations. The program shall set forth in detail the financial, applicable insurance, experience and training of the contractors, and the guarantees of materials and workmanship to be provided by the contractor to the customer, which the utility intends to use in establishing such a list of contractors. The utility should set forth the conditions under which a contractor may be removed from a qualifying list.

3. In the case of any furnace modifications, the program proposal shall set forth in detail any special training or other requirements the utility will demand of any contractor before he is qualified to perform such modifications.

4. Regardless of the method of installation, the program shall provide for post-installation spot checks by the utility to assure conformance with appropriate quality installation procedures and quality standards for the devices.

III. ENERGY AUDITS.

A. Mandatory Audits.

1. The program shall offer every eligible residence an on-site (Type A) energy audit upon request and the utility shall charge ten (10) dollars for each such audit, except that no charge will be imposed if the customer's family falls below federal poverty guidelines. Audits will be kept on file by the utility for future reference.

   a. In the case of a two or three family residence the utility should make every reasonable effort to persuade the tenants and/or owner to allow one comprehensive audit of the entire structure.

   b. Only one on-site audit per family per dwelling unit will be allowed.

2. The on-site audit shall provide the customer with at least the following information:

   a. Whether the residence meets the minimum criteria for each of the conservation devices included in the program.

   b. The cost and energy savings that could be expected for the installation of each conservation measure.

   c. The cost and energy savings to be expected for any combination of devices desired by the customer.

   d. The availability and terms of financing including:

      [1] The annual percentage rate (APR) of interest charged and any other information required for installment loans by State and Federal statutes and regulations;

      [2] The minimum monthly payment and other repayment options available; and

      [3] The total finance charges the customer will be charged for the repayment option chosen.

e. The availability of financial assistance under federally funded programs.

3. With each on-site audit a do-it-yourself installation manual shall be offered without charge.

4. The on-site auditor shall not provide the customer as the result of any audit with any information concerning the conversion to an alternate heating fuel or heating system. Should the customer specifically request such information the auditor shall only provide the name and telephone number of a utility employee who can assist the customer.

B. Other Audits - the program may provide for the provision of lesser audits than above described at a cost to the customer less than ten (10) dollars or at no cost. If such audits are desired they should be fully described in each program submission.

IV. FINANCIAL.

A. Interest Rate - The interest rate charged under any utility program shall not exceed the overall rate of return last awarded the utility. In the event differing rates of return are awarded within six months for different divisions of a combination company, a weighted average shall constitute the maximum chargeable rate. When new rate of return is awarded, the new rate will only apply to financing contracts entered into after the date of that order.

B. Aggregate Amount Limit.

1. No utility shall directly loan nor shall it guarantee any loan under this program if the total outstanding capital from direct loans plus the total outstanding capital of all guaranteed loans exceeds 1% of the utility's annual gross revenues less fuel costs and purchased power. Based on the 12 month period ending 3/31/77 the aggregate amount (rounded) by utility would be established as follows: Brooklyn Union Gas - $2,153,000; Central Hudson - $953,000; Consolidated Edison - $21,343,000; Long Island Lighting - $4,477,000; National Fuel $1,314,000; New York State Gas & Electric - $2,547,000; Niagara Mohawk - $6,884,000; Orange & Rockland - $1,035,000; and Rochester Gas & Electric - $2,158,000.

2. A lesser maximum amount will be permitted only upon a showing that the 1% limit will adversely affect the financing or operating requirements of the utility.

3. In the event any utility should be unable to continue financing loans for any reason, the Secretary of the Commission should be immediately notified.

4. The aggregate amount available for financing for each utility shall be annually reviewed by the Commission.

C. Repayment Options.

1. Seven years shall be the maximum repayment period offered under any program.

2. Several repayment options, including immediate cash payment and a seven year term option, shall be offered under all programs subject to a ten (10) dollar minimum monthly payment.

3. Monthly or bi-monthly billings for financed conservation devices shall be provided on bills separate from the bill rendered for utility service.

D. Cost Recovery - The initial costs of the program not otherwise provided for in rates should be deferred until the next filed rate proceeding. Amortization of these deferred amounts will begin after the rate case.

E. Alternate Financing.

1. Any utility may conclude alternate financing arrangements with at least two banking institutions as long as the terms and conditions of such financing conform to the requirements of direct utility financing.

2. Any utility may guarantee the loans of its customers to a banking institution if it is shown to be in the public interest.

3. All the terms, conditions, and costs to the utility, if any, of concluding such financing arrangements should be set forth in each program proposal.

V. Misc.

A. Advertising.

1. Cost recovery for advertising pursuant to §135-n shall only be allowed if the advertising is specifically directed toward participation in the program.

2. All advertising costs for which direct recovery is permitted shall not be considered advertising costs for the purpose of the Commission's general policy on advertising.

3. The program shall specify the particulars of the advertising plan proposed.

B. Reporting.

1. Each utility shall provide the Commission with annual reports on its program on or before November 30.

a. The annual period to be covered in the reports shall extend from October 1 - September 30.

b. The reports shall contain adequate and sufficient information to allow the Commission to review the progress and any difficulties encountered with the programs and sufficient information to allow the Commission to report to the Governor and Legislature as required by Article VII-A.

2. The utility annual reports shall address at least the following program effects:

a. Conservation of fuel and energy;

b. Cost savings to customers;

c. Expense to ratepayers;

d. Environmental benefits; and

e. State economy impacts.

Appendix D

REPORTING INSTRUCTIONS

HOME INSULATION AND ENERGY CONSERVATION ACT (ARTICLE VII-A)

GENERAL REQUIREMENTS

Reporting Period: October 1 through September 30

Reports are due: On or before November 30

First report due: November 30, 1978

Unless otherwise specified, the information requested refers to the current reporting period.

SPECIFIC REQUIREMENTS

Form 1: Information is requested pertaining to customers who received an energy audit and who financed the installation of energy conservation measures through the utility program.

The following is an explanation of the items to be included on Form 1:

1. **Audits conducted:** The total number of audits conducted under this program, broken out by type of audit (Type A or Type B), by type of heat used in the home (gas, electric, oil, other), and by owner or tenant status.

1a. **Type C audit forms:** Total number of Type C audit forms distributed.

2. **Customers who financed energy conservation measures:** The total number of customers who financed some energy conservation measure under this program, broken out by the type of audit conducted, by type of home heat, by whether the house is a 1-, 2-, or 3-family house, by whether the customer owns the house or is a tenant, and by whether the job is contractor installed or a do-it-yourself project. Count separately any projects that are partly contractor-installed and partly do-it-yourself. "With Contractor Audit" means those customers for whom a contractor provides the utility with the information necessary to calculate the payback.

3. **Energy conservation measures:** For those customers in 2 above who financed energy conservation measures, enter the total number of each measure installed. (Example: Customer A (gas heat) installed wall and ceiling insulation, caulking and weatherstripping and a clock thermostat. Each measure is counted once on the appropriate line.) Also include the energy estimated to be saved by the

installation of each energy conservation measure as calculated according to the methodology for energy savings contained in the criteria issued by the Public Service Commission. The total of these energy savings should also be included.

4. **Dollar value of fuel savings:** Enter the product of the total of each type of energy saved from question 3 and the cost (average end block charge) of that fuel to the customer for home heating. This should be the current price of fuel at the time the payback period was calculated.

5. **Cost of installation to customers (excluding finance charges):** The total of the amount the customer is obligated to pay for the energy conservation measures installed (excluding finance charges to the customer), broken out by type of heating fuel and by whether the customer is a homeowner or a tenant.

6. **Environmental benefits:** Air Quality Maintenance Areas (AQMA) are identified in the State's Air Quality Implementation Plan (SIE). For <u>each</u> AQMA, or fraction thereof, in the utility service territory, include the total gallons of oil saved by customers in the AQMA who financed the installation of energy conservation measures through this program and estimate the annual reduction of sulfur dioxide (SO_2) and particulate emissions from this reduction in the amount of oil burned.

7. **Loans:** The number of loans made and the total amount loaned (including finance charges) to customers under this program in the reporting period. Loans that are guaranteed by the utility and those not guaranteed should be separately identified. Within these two categories specify the number of loans and the amount loaned, to owners, to tenants, and the total of both.

8. **Outstanding loan guarantees:** Enter the cumulative number of outstanding loan guarantees, the cumulative balance of outstanding loan guarantees, and the greatest balance of outstanding loan guarantees experienced at the end of any monthly period within the reporting period.

9. **Customers denied financing:** Total number of customers who were excluded from financing due to their answers to the six-question test. Ordinarily, only tenants would be included.

10. **Reasons why otherwise eligible customers did not obtain financing:** The total number of homeowners and tenants who are credit worthy but who are not able to receive financing because the requested loan amount is under $200, or exceeds the statutory maximum loan amount, or the project payback period exceeds the statutory maximum payback period, or the landlord (in the case of the tenants) did not permit a lien on the property.

11. **Additional program employee-years during reporting period:** The total number of employee-years the utility has been required to add because of this program. If, as an example, a utility has reassigned five Customer Service Representatives as Home Auditors and four new Customer Service Representatives are hired to replace them, then there have been four employees added as a result of this program. An employee-year for an employee is that fraction of a year the employee has been employed only on provisions of the Home Insulation Act. The sum of employee-years for all employees is to be reported. Any persons hired to work on this program directly should also, of course, be counted.

12. **Additional utility subcontractor employee-years during reporting period:** The total number of employee-years a utility's subcontractor (for those utilities to which this applies) has been required to add as a result of this program.

13. **Additional employee-years for contractors on utility list of contractors:** The total number of employee-years the contractors, on the utility's list of contractors, have added as a direct result of this program.

14. **Revenues related to audits:** The total of the revenues obtained by the utility from the conduct of audits under this program broken out by type of audit.

15. **Expenses related to audits:** The total of the direct expenses to the utility of conducting the audits under this program, broken out by type of audit. Reasonable utility methods of employee cost allocation among the types of audits are acceptable.

16. **Post installation inspection:** Total number of inspections and total expenses incurred from random inspection of installations and from inspections conducted because of customer complaints.

17. **Advertising expenses:** The total advertising expenses related to this program, identified by amount spent for bill inserts, radio/TV, newspapers and other. Specify on Form 3 what is included in "other."

18. **Expenses relating to reporting:** The expense to the utility of meeting the reporting requirements of this program.

19. **Interest differential expenses:** For those utilities whose arrangements with banks require them to make up the difference between the utility's allowed rate of return and the bank's interest rate, enter the total amount of this expense.

20. **Loan defaults:** Of the loans guaranteed by the utility in the reporting period indicate the number of loan defaults and the total amount defaulted, for owners, tenants, and the total of the two.

21. **Miscellaneous expenses not included above:** The total of the expenses to the utility under this program not included in items 16 through 20.

22. **Total expense:** Total expenses to the utility of conducting this program.

23. **Utility subcontracted installations:** Only utilities that act as prime contractors are required to respond to this item. Enter the total amount billed to the customer by the utility for subcontracted installations, not including finance charges; the total cost to the utility of the subcontracted installations; and the gross profit from subcontracted installations.

24. **Schedule of the total incremental costs of the program by PSC Account number.**

Form 2: Information is requested relating to customers who have had either a Type A or B audit and who have installed one or more energy conservation measures but have NOT financed such installations through this program. Since the utility's only contact with such customers is at the time of the audit, the questions may be answered based on a sample of those customers who had an audit but did not choose to finance the installation of energy conservation measures through the utility program. It is recognized that the reliability of such estimates will vary depending on the type of audit.

The following is an explanation of the items to be included on Form 2:

1. **Customers who installed energy conservation measures:** An estimate of the total number of customers who installed energy conservation measures following a Type A or B audit. Do not include customers who financed the installation of such measures through the utility program. Estimate also the number of customers who installed measures following a free audit.

2. **Energy conservation measures:** From those customers in 1 who installed energy conservation measures, estimate the total number of each measure installed for the group of customers. Also include an estimate based on the sample of the energy estimated to be saved by the installation of each energy conservation measure and the total of these energy savings.

3. **Cost of installation to customers (excluding financing):** An estimate of the total of the amount the customers paid for the energy conservation measures installed (excluding finance charges to the customer), broken out by type of heating fuel and by homeowner or tenant status.

Form 3: Include any comments on problems or suggestions for improvement.
Include any explanations for entries on Form 1 or Form 2 which are desired.

REPORTING FORM
HOME INSULATION AND ENERGY CONSERVATION ACT
(ARTICLE VII-A)

1. Audits conducted:

Type A	_____	Gas Heat	_____	Owner	_____
Type B	_____	Electric Heat	_____	Tenant	_____
		Oil Heat	_____		
Total	_____	Other Heat	_____		

1a. Type C Audits forms _____

Note: Beginning with question 2, the information requested relates to utility customers who financed the installation of energy conservation measures through the Utility Home Insulation Plan.

2. Customers who financed energy conservation measures:

Following a Type A Audit	_____	Owners	_____	Do-it-yourself	_____	Gas Heat	_____
Following a Type B Audit	_____	Tenants	_____	Contractor-installed	_____	Electric Heat	_____
Following a Type C Audit	_____			Joint Contractor & Do-it-yourself	_____	Oil Heat	_____
With Contractor Audit	_____	1–Family	_____			Other Heat	_____
		2–Family	_____				
Following a free A or B Audit	_____	3–Family	_____				

3. Energy Conservation Measures

	Gas Heat		Electric Heat		Oil Heat		Other Heat	
	Number Installations	Mcf Saved	Number Installations	kWh Saved	Number Installations	Gallons Saved	Number Installations	Btu Saved
Ceiling (attic) insulation								
Wall insulation								
Foundation & floor insulation								
Caulking & weatherstripping								
Storm windows								
Storm doors								
Clock thermostats								
Hot water heater insulation								
Electrical ignition			x x x x	x x	x x x x	x x	x x x x	x x
Derating gas systems			x x x x	x x	x x x x	x x	x x x x	x x
Oil burner replacement	x x x x	x x	x x x x	x x			x x x x	x x
TOTAL	x x x x		x x x x		x x x x		x x x x	
kWh Savings for central air conditioning								

4. Dollar value of fuel savings:

Gas Heat	$ _____
Electric Heat	$ _____
Oil Heat	$ _____
Other Heat	$ _____
Total	$ _____

5. Cost of installation to customer:

Gas Heat	$ _____		
Electric Heat	$ _____	Cost to owners	$ _____
Oil Heat	$ _____	Cost to tenants	$ _____
Other Heat	$ _____		
Total	$ _____		

6. Environmental benefits:

_____ AQMA

Gallons of Heating Oil Saved _____

Estimated Reduction in Emission of SO_2 _____ tons/year

Estimated Reduction in Emission of Particulates _____ tons/year

7. Loans:

	Guaranteed Number	Guaranteed Amount
Owner	_____	$ _____
Tenant	_____	$ _____
Total	_____	$ _____

	Not Guaranteed Number	Not Guaranteed Amount
Owner	_____	$ _____
Tenant	_____	$ _____
Total	_____	$ _____

8. Outstanding loan guarantees:

Cumulative number	_____
Cumulative balance	$ _____
Greatest balance experienced (at end of any monthly period)	$ _____

9. Customers denied financing: Total _____

10. Reasons why otherwise eligible customers did not obtain financing:

	Homeowners	Tenants
Payback period exceeds maximum	_____	_____
Amount under $200	_____	_____
Amount exceeds maximum	_____	_____
Landlord refused to allow a lien	XXXX	_____

11. Additional Employee-years During Reporting Period: _____

12. Additional Utility Subcontractor Employee-years During Reporting Period _____

13. Additional Employee-years During Reporting Period for Contractors on Utility Lists of Contractors: _____

14. Revenues related to audits:

Type A	$	_____
Type B	$	_____
Total	$	_____

15. Expenses related to audits:

Type A	$	_____
Type B	$	_____
Type C	$	_____
Total	$	_____

16. Post installation inspection:

Number of Inspections		_____
Expenses	$	_____

17. Advertising expenses:

Bill inserts	$	_____
Newspaper	$	_____
Radio/TV	$	_____
Other (specify)	$	_____
Total	$	_____

18. Expenses relating to reporting: $ _____

19. Interest differential expenses $ _____

20. Loan defaults:

	Number	Amount
Owner	_____	$ _____
Tenant	_____	$ _____
Total	_____	$ _____

21. Miscellaneous expenses not included above: $ _____

22. Total expenses: $ _____

23. Utility subcontracted installations:

Total amount billed to customers:	$	_____
Total utility cost of installations	$	_____
Gross profit from subcontracted installations	$	_____

OR-2 (9/78)

FORM 1
Page 6 of 6 pages

TOTAL INCREMENTAL COST OF PROGRAM UNDER THE
HOME INSULATION AND ENERGY CONSERVATION ACT (ARTICLE VII-A)

24. Report below for the current fiscal year ending on September 30, the total incremental costs incurred by the utility during this period in implementing its program under the above stated Act. Show all amounts by the account charged to expense or deferred on the balance sheet. Also give a brief description of the types of costs or expenses included in each amount.

Account Number and Title	Description	Amount
		$

HOME INSULATION AND ENERGY CONSERVATION ACT
(ARTICLE VII-A)

REPORT

Note: The information requested in the following questions relates to utility customers who have had either a Type A or B audit and who have installed one or more energy conservation measures but have NOT financed such installations through this program.

1. Customers who installed energy conservation measures:

Following a Type A audit _____

Following a Type B audit _____

Total A and B audits _____

Following a free audit _____

2. Energy Conservation Measures

	Gas Heat		Electric Heat		Oil Heat		Other Heat	
	Number Installations	Mcf Saved	Number Installations	kWh Saved	Number Installations	Gallons Saved	Number Installations	Btu Saved
Ceiling (attic) insulation								
Wall insulation								
Foundation & floor insulation								
Caulking & weatherstripping								
Storm windows								
Storm doors								
Clock thermostats								
Hot water heater insulation								
Electrical ignition			x x x x	x x	x x x x	x x	x x x x	x x
Derating gas systems			x x x x	x x	x x x x	x x	x x x x	x x
Oil burner replacement	x x x x	x x	x x x x	x x			x x x x	x x
TOTAL	x x x x		x x x x		x x x x		x x x x	

3. Cost of installation to customers:

Gas Heat $ _____

Electric Heat $ _____

Oil Heat $ _____

Other Heat $ _____

Total $ _____

Total Cost to Owners $ _____

Total Cost to Tenants $ _____

HOME INSULATION AND ENERGY CONSERVATION ACT

(ARTICLE VII-A)

REPORT

(Attach additional sheets if needed)

1. Comment on any problems encountered in the administration of the programs and its implementation.

2. Comment on any recommendations for the improvement and possible extension of the program.

3. Include any explanations of entries made on Form 1 or Form 2.

Mr. GORE. I would like to call now on Mr. Carl Ertler.

STATEMENT OF CARL ERTLER

Mr. ERTLER. Thank you, Mr. Chairman.

I would like, if I could, to have my prepared testimony entered into the record and pick the salient points out of it to discuss here today. [See p. 142.]

Mr. GORE. Without objection, so ordered. Please feel free to present it as you wish.

Mr. ERTLER. Thank you.

My name is Carl Ertler and I am the manager of weatherization services for Pacific Power & Light Co., Portland, Oreg.

Pacific Power & Light Co. has implemented over the past several years conservation programs to assist our customers and service communities throughout our six-State service territory in saving energy and dollars.

The conservation programs in effect this year are summarized in the "Encon '79" handbook, included with this statement as attachment No. 1.[1]

They basically include the home energy analysis and other programs associated with home energy savings, the commercial and industrial energy analysis, education programs, and conservation publications.

Since 1973 Pacific Power & Light Co. has supported, promoted and urged conservation as being in the best interest of the public. In 1977, the Oregon Legislature enacted a residential energy conservation program, which provides that homeowners may finance needed insulation and weatherization on favorable terms.

In addition, the Oregon Legislature has provided additional incentives to Oregonians by allowing them tax credits to help defray the cost of installing insulation and weatherization materials.

Despite economic incentives, it appeared most electric customers were not convinced of the long-run cost effectiveness of investing in insulation and weatherization.

Despite their incentives, too many of the company's customers choose to devote their disposable income to other needs. The company believed that some further action was demanded.

In order to provide an incentive for our customers to actively participate in implementing conservation recommendations, the company established a program that provides zero interest financing of certain prescribed weatherization measures for qualified residential customers.

The program proposal was filed with the Oregon Public Utility Commissioner in April of 1978. My company believed that this action not only carried out the spirit in which the Oregon legislation was enacted but was deemed to be in the best economic interest of all our customers. The plan was approved effective August 1, 1978.

The terms of the program provide that a company representative, upon request of a customer occupying a qualified single-family residence of duplex, will conduct a home energy analysis to deter-

[1] The handbook, "Encon '79: Turning Ideas Into Energy," published by Pacific Power & Light Co., may be found in subcommittee files.

mine the cost effectiveness of installing additional insulation or weatherization materials.

If the analysis indicates that additional insulation or weatherization materials would be cost effective to the company, as compared to the marginal cost of the new energy resources, the available options, and their associated costs and benefits, are explained to the homeowner.

If the homeowner consents, the company will arrange and pay for all labor and materials associated with installing the cost effective insulation or weatherization materials in the dwelling.

The homeowner's only financial obligation is to repay the company, without interest, the cost of installed insulation or weatherization materials, prior to or at such time as ownership of the dwelling is transferred for consideration.

The contract is a mortgage agreement which is recorded in the real property records of the county in which the dwelling is located, and a lien attaches in favor of Pacific 1 day prior to any transfer of the property. Approved weatherization measures included as part of the program are described in attachment No. 3. [See p. 155.]

All insulation and weatherization work is done by independent insulation and weatherization contractors. The contractors selected for each individual job are based on competitive bids.

All contractors participating in the program have entered into a contractual agreement with Pacific which requires them to warrant both materials and workmanship to Pacific and the homeowner.

The agreement also requires, among other items, that the contractor provide a $3,000 performance bond and carry liability insurance in the amount of $300,000 as well as workmen's compensation's insurance, if appropriate, and comply with EEO requirements.

The company has developed a set of specifications for all work done under the program. Basically, the specifications reflect approved materials and installations consistent with prevailing industry standards.

Prior to contractor payment for the work, each installation is inspected by company personnel to verify that insulation and other weatherization materials have been installed in accordance with specifications.

At the heart of Pacific's program is the notion that if kilowatthours are saved through insulation and weatherization at a cost less than the cost of new generation, the company should proceed to invest in insulation and weatherization, just as it would choose a more efficient powerplant.

I should mention here that the special energy supply economics of the Pacific Northwest and my company in particular provide the opportunity for developing conservation energy as a resource, as a cost effective supplement to required conventional generating facilities.

These economics reflect the company's tradition from a historical, relatively inexpensive hydrobased resource mix to one where additional increments of electrical generation are much higher cost thermal installations.

55-634 O - 80 - 10

My company's marginal resource development costs now represent a revenue requirement per unit of production of almost twice that of our historical imbedded plant.

After approval of the zero interest weatherization program in Oregon, similar program proposals were filed in Washington, Idaho and Montana and approved in those States with a stipulation in the State of Washington, however, that all loan amounts be repaid when the participating customers' homes are sold, or 10 years, whichever is earlier.

This stipulation has affected somewhat the impact of the program in Washington, where 20 percent of the customers who originally indicated a desire to participate but subsequently did not cited the 10-year payback provision as the reason for not participating.

To date, in the four States where the program is operational, over 13,600 electric space heat customers have requested participation in our program. This figure is about 13 percent of those single family dwellings with electric space heat served by the company who could qualify for the program.

To date, 9,300 audits have been performed with 5,100 homes either partially or totally weatherized and another 1,600 are out for bid.

Since Pacific operates its zero interest weatherization program in four States, the average estimated energy savings per customer varies due to the average area temperature differences and the extent of weatherization services provided.

In Oregon, for example, the estimated savings per dwelling, on the initial 1,822 weatherized dwellings is over 5,200 kWh's annually. The savings is somewhat greater in the other States—from 6,000 kWh's per customer annually in Montana to over 7,000 kWh's per customer in Washington and Idaho.

If the company weatherizes its projected market of space heated dwellings, the estimated annual savings is in excess of 400 million kWh's.

The actual financed amount of installed energy saving materials is currently running at about $1,360 per dwelling in Oregon, a little higher in Washington and between $600 and $700 per dwelling in Idaho and Montana where the climate is colder and dwellings typically are better insulated.

With the total average administration costs currently at about 2.5 mills per kWh, the total program costs in Oregon are slightly under 15 mills per kWh saved. This compares most favorably to our marginal costs of energy of 56 mills.

The actual provisions of Pacific's zero interest weatherization program have not changed since the program startup in the fall of 1978. However, the administration of the program has changed. Although not substantial, continual changes were and are being made in the actual mechanics of providing weatherization services for our customers.

New positions were established to handle the required paperwork and job inspections in order to provide greater standardization throughout the process. Form revisions were made to simplify the handling, providing further efficiency.

Although the company has placed a strong emphasis on the zero interest program, other company conservation programs have provided a valuable tool in assisting all classes of customers in meeting important conservation goals.

Providing incentives to stimulate customer participation in energy conservation programs is a momentous task. There are no simple answers, as we all recognize. Even with substantial incentives such as our zero interest program, it is necessary to provide the motivation for individual customer participation.

This is in part a marketing function, but it is also a function of simple economics and whether or not the economics as perceived by the customers are sufficient to cause their involvement.

Although we believe that interest in our zero interest program is good, more interest will be stimulated as we further promote the program, as energy costs increase, and our customers realize energy is truly in short supply.

I appreciate the opportunity to be here today and shall be glad to answer any questions you may have.

[Testimony resumes on p. 157.]

[Mr. Ertler's prepared statement and attachments follow:]

Subcommittee On Oversight & Investigations
of the
Committee On Interstate and Foreign Commerce
House of Representatives
United States Congress
Washington, D.C. - October 26, 1979

Statement
on Behalf of
Pacific Power & Light Company

My name is Carl Ertler and I am the Manager of Weatherization Services for Pacific Power & Light Company in Portland, Oregon. Pacific supplies electric service as a utility in parts of the states of Oregon, Washington, California, Idaho, Montana and Wyoming to over 630,000 customers including 535,000 residential customers.

Pacific Power & Light Company has implemented over the past several years conservation programs to assist our customers and service communities throughout our six state service territory in saving energy and dollars. The conservation programs in effect this year are summarized in the "Encon 79 Handbook" included with this statement as Attachment No. 1. They basically include the Home Energy Analysis and other programs associated with home energy savings, the Commercial and Industrial Energy Analysis, education programs, and conservation publications.

Since 1973, Pacific Power & Light Company has supported, promoted, and urged conservation as being in the best interest of the public. In 1977, the Oregon Legislature enacted a Residential Energy Conservation Program, (H.B. 2157, Attachment No. 2) which provides that

homeowners may finance needed insulation and weatherization on favorable terms. In addition, the Oregon Legislature has provided additional incentives to Oregonians by allowing them tax credits to help defray the cost of installing insulation and weatherization materials. Despite economic incentives, it appeared most electric customers were not convinced of the long-run cost effectiveness of investing in insulation and weatherization. Despite the incentives, too many of the Company's customers choose to devote their disposable income to other needs. The Company believed that some further action was demanded.

In order to provide an incentive for our customers to actively participate in implementing conservation recommendations, the Company established a program that provides zero-interest financing of certain prescribed weatherization measures for qualified residential customers.

The program proposal was filed with the Oregon Public Utility Commissioner in April of 1978. My Company believed that this action not only carried out the spirit in which the Oregon legislation was enacted but was deemed to be in the best economic interest of all our customers. The plan was approved effective August 1, 1978.

The terms of the program provide that a Company representative, upon request of a customer occupying a qualified single-family residence or duplex, will conduct a Home Energy Analysis to determine the cost-effectiveness of installing additional insulation or weatherization materials. If the analysis indicates that additional insulation or weatherization materials would be cost-effective to the Company, as compared to the marginal cost of new energy resources, the available options, and their associated costs and benefits, are explained to the

homeowner. If the homeowner consents, the Company will arrange and pay for all labor and materials associated with installing the cost-effective insulation or weatherization materials in the dwelling. The homeowner's only financial obligation is to repay the Company, without interest, the cost of installed insulation or weatherization materials, prior to or at such time as ownership of the dwelling is transferred for consideration. The contract is a mortgage agreement which is recorded in the real property records of the county in which the dwelling is located, and a lien attaches in favor of Pacific one day prior to any transfer of the property. Approved weatherization measures included as part of the program are described in Attachment No. 3.

All insulation and weatherization work is done by independent insulation and weatherization contractors. The contractors selected for each individual job are based on competitive bids.

All contractors participating in the program have entered into a contractual agreement with Pacific which requires them to warrant both materials and workmanship to Pacific and the homeowner. The agreement also requires among other items, that the contractor provide a $3,000 performance bond and carry liability insurance in the amount of $300,000 as well as Workmen's Compensation insurance if appropriate, and comply with EEO requirements.

The Company has developed a set of specifications for all work done under the program. Basically, the specifications reflect approved materials and installations consistent with prevailing industry standards.

Prior to contractor payment for the work, each installation is inspected by Company personnel to verify that insulation and other weatherization materials have been installed in accordance with specifications.

At the heart of Pacific's program, is the notion that if kilowatt-hours are saved through insulation and weatherization at a cost less than the cost of new generation, the Company should proceed to invest in insulation and weatherization, just as it would choose a more efficient power plant.

I should mention here that the special energy supply economics of the Pacific Northwest and my Company in particular provide the opportunity for developing conservation energy as a resource, as a cost-effective supplement to required conventional generating facilities. These economics reflect the Company's tradition from a historical, relatively inexpensive hydro-based resource mix to one where additional increments of electrical generation are much higher cost thermal installations. My Company's marginal resource development costs now represent a revenue requirement per unit of production of almost twice that of our historical, imbedded plant.

After approval of the zero-interest weatherization program in Oregon, similar program proposals were filed in Washington, Idaho and Montana and approved in those states with a stipulation in the State of Washington, however, that all loan amounts be repaid when the participating customers' homes are sold, or 10 years, whichever is earlier. This stipulation has affected somewhat the impact of the program in Washington, where 20% of the customers who originally indicated a desire to participate

but subsequently did not, cited the 10 year payback provision as the reason for not participating.

To date, in the four states where the program is operational, over 13,600 electric space heat customers have requested participation in our program. This figure is about 13% of those single family dwellings with electric space heat served by the Company who could qualify for the program. To date, 9,300 audits have been performed with 5,100 homes either partially or totally weatherized and another 1,600 are out for bid.

Since Pacific operates its zero-interest weatherization program in four states, the average estimated energy savings per customer varies due to the average area temperature differences and the extent of weatherization services provided. In Oregon for example, see Attachment No. 4 (Cost Benefit Summary) the estimated savings per dwelling, on the initial 1,822 weatherized dwellings is over 5,200 kwh's annually. The savings is somewhat greater in the other states; from 6,000 kwhs per customer annually in Montana to over 7,000 kwhs per customer in Washington and Idaho.

If the Company weatherizes its projected market of space heated dwellings, the estimated annual savings is in excess of 400 million kwh's.

The actual financed amount of installed energy saving materials is currently running at about $1,360 per dwelling in Oregon, a little higher in Washington and between $600 - $700 per dwelling in Idaho and Montana where the climate is colder and dwellings typically are better insulated. With the total average administration costs currently at about 2.5 mills per kwh, the total program costs in Oregon are slightly under 15 mills per kwh saved. This compares most favorably to our marginal costs of energy of 56 mills.

The actual provisions of Pacific's zero-interest weatherization program have not changed since the program startup in the fall of 1978. However, the administration of the program has changed. Although not substantial, continual changes were and are being made in the actual mechanics of providing weatherization services for our customers. New positions were established to handle the required paper work and job inspections in order to provide greater standardization throughout the process. Form revisions were made to simplify the handling, providing further efficiency.

Although the Company has placed a strong emphasis on the zero-interest program, other Company conservation programs have provided a valuable tool in assisting all classes of customers in meeting important conservation goals.

The Home Energy Analysis (HEA) which I mentioned, is included as part of the zero-interest program, but any residential customer served by Pacific may request and receive at no cost the HEA. The Company's HEA program, which was implemented in 1977, is not only helpful in aiding customers reduce their energy consumption but has provided the Company with a growing data base of residential usage characteristics. The process includes inspection and evaluation of electric heating systems and related structural heat loss, electric water heating systems, major electrical appliances and other miscellaneous electric usage.

In Oregon, as a result of the previously mentioned H.B. 2157, a 6 1/2 percent financing program is available to those customers with single family space heated dwellings who do not qualify for the zero-interest program. In addition to single family space heated dwellings, multi family

dwellings qualify under the 6 1/2 percent program. The program has not however, provided the needed incentive for customers to get weatherization work done. In the past year only 28 such jobs have been completed. With the growing public concern for conservation, we do anticipate greater participation in 1980.

Other programs aimed at residential energy savings are the Energy Wise Home and Energy Saver Home programs. The former seeks to certify homes that have accomplished certain weatherization improvements and is conducted in cooperation with the "National Energy Watch" program sponsored by the Edison Electric Institute. The Energy Saver Home program encourages strict conservation standards in new residential construction. Basically, the program offers local builders with media promotional assistance if certain weatherization/conservation standards are met.

Another program implemented in 1978 and more aggressively pursued during 1979, is the Commercial/Industrial Energy Analysis. The Company provides an advisory function and does not at this point, have financing available to this class of customers for conservation measures.

The program offers an on-site survey of all lighting, heating, air conditioning, cooking, water heating, motor and other uses of electricity. Written recommendations for improved energy utilization and potential electric energy savings are prepared upon the completion of each audit. Although we are not yet in a position to fully monitor and analyze the effects of the entire program, an example of one such customer, a hospital in our California service area was able to reduce electric usage by 32%. This savings, along with another 22% reduction in heating oil, was brought about by a cooperative effort between a Pacific Power Energy Consultant, the hospital management and the support of hospital personnel.

In the six states where the Company provides service, 385 commercial audits and 25 industrial audits have been completed.

Aside from incentives and other conservation programs offered by the Company, two of the states in which we provide our zero-interest program, Oregon and Montana, do have tax credits or deductions in addition to the Federal Tax Credit for conservation measures. In Oregon the residential tax credit is 25% up to $125.00. In Montana the tax deduction is 100% of the first $1,000, 50% of next $1,000, 20% of the next $1,000 and 10% of the next $1,000. The Oregon Attorney General has issued an opinion, however, that individuals who take advantage of "other" incentives such as utility programs, do not qualify for the state tax credit. Such an opinion has not been given in Montana. Tax incentives for commercial/industrial uses are being examined in Oregon. At this time, we do not have any significant data to indicate the effects of tax credits on conservation activity.

The Company is currently planning a market survey to determine among other things what impact the Federal tax credits are having in our service areas. We feel that our programs as well as other utility programs have created a genuine awareness and concern for conservation and weatherization. Through the use of this survey we hope to determine what type of independent measures our customers are taking toward this important conservation goal.

Providing incentives to stimulate customer participation in energy conservation programs is a momentous task. There are no simple answers, as we all recognize. Even with substantial incentives such as our zero-interest program, it is necessary to provide the motivation for

individual customer participation. This is, in part a marketing function, but is also a function of simple economics and whether or not the economics as perceived by the customers are sufficient to cause their involvement. Although we believe that interest in our zero-interest program is good, more interest will be stimulated as we further promote the program, as energy costs increase, and our customers realize energy is truly in short supply.

I appreciate the opportunity to be here today and shall be glad to answer any questions you may have.

Attachment No. 2
(4 pages)

OREGON LEGISLATIVE ASSEMBLY–1977 Regular Session

Enrolled

House Bill 2157

By order of the Speaker

CHAPTER 889

AN ACT

Relating to energy conservation; and declaring an emergency.

Be It Enacted by the People of the State of Oregon:

SECTION 1. Sections 2 to 15 of this Act are added to and made a part of ORS chapter 757.

SECTION 2. The Legislative Assembly finds and declares that:

(1) There is an urgent and continuing need for all Oregonians to conserve energy;

(2) Many of the homes in Oregon are in need of additional insulation and other weatherization measures to make them more energy efficient;

(3) Insulation and other weatherization measures in many cases can conserve energy and make it available for other uses at less cost than energy from new sources; and

(4) Expenditure by energy suppliers on conservation programs is in many cases a prudent and cost-effective means of gaining new supplies for energy consumers.

SECTION 3. As used in this 1977 Act:

(1) "Commercial lending institutions" means any bank, mortgage banking company, trust company, savings bank, savings and loan association, credit union, national banking association, federal savings and loan association or federal credit union maintaining an office in this state.

(2) "Dwelling" means real property within the state inhabited as the principal residence of an owner or renter and which is occupied at the time weatherization services are requested. "Dwelling" does not mean a mobile home as defined in ORS 446.003.

(3) "Public utility" has the meaning given that term in ORS 757.005.

(4) "Weatherization services" means providing and installing items primarily designed to improve the efficiency of space heating and energy utilization of a dwelling. Such items include, but are not limited to, caulking, weatherstripping and other infiltration preventative materials, ceiling and wall insulation, crawl space insulation, vapor barrier materials, timed thermostats, insulation of heating ducts and hot water pipes and water heaters in unheated spaces, storm doors and windows, double glazed windows and dehumidifiers.

SECTION 4. Within 90 days after the effective date of this 1977 Act, each public utility providing gas or electric service shall present for approval by the Public Utility Commissioner a residential energy conservation program which, to the satisfaction of the commissioner:

(1) Makes available to all residential customers of the public utility, upon request, information about weatherization and other means of saving energy;

(2) Provides to all residential customers of the utility desiring such service assistance and technical advice concerning advantages and disadvantages of various methods of saving energy in that customer's dwelling unit, including but not limited to an estimate of the cost to the customer of the weatherization services provided under the program;

(3) Provides weatherization services upon request of the owner of a dwelling unit served by the utility. The utility shall not be required to provide weatherization services costing greater than $1,500 except in the case when storm windows are installed together with other weatherization services, and then in an amount no greater than $2,000;

(4) Provides that weatherization services performed under the program are performed in such a workmanlike manner and with such materials as to be in accordance with the prevailing standards of the industry;

(5) Allows the residential customer, with approved credit, to pay for the weatherization services performed under the program over a reasonable period of time, in no case greater than 10 years, and at an interest rate paid by the customer not in excess of that determined by the commissioner; and

(6) Sets a reasonable time schedule for effective implementation of the elements set forth in subsections (1) to (5) of this section in the service areas of the utility.

SECTION 5. No public utility shall be required to provide the services described in subsections (2) and (3) of section 4 of this 1977 Act to a residential customer unless that public utility is the primary provider of space heating energy for that customer.

SECTION 6. (1) In arranging financing for residential customers for weatherization services pursuant to subsection (5) of section 4 of this 1977 Act, the public utility may either use its own funds for loans to customers or arrange for financing for customers through one or more commercial lending institutions.

(2) If financing is arranged through a commercial lending institution pursuant to this section, the public utility shall:

(a) Act on behalf of the customer in arranging financing, in order that the residential customer need not deal directly with the lending institution to obtain financing for weatherization services;

(b) Reimburse the commercial lending institution for any difference between the rate charged by the lender and the rate allowed by the commissioner pursuant to subsection (5) of section 4 of this 1977 Act; and

(c) Guarantee the payment of the principal portion of the loan from the commercial lending institution.

SECTION 6a. If House Bill 3265 (1977) becomes law, section 6 of this 1977 Act is repealed and section 6b is enacted in lieu thereof.

SECTION 6b. (1) In arranging financing for residential customers for weatherization services pursuant to subsection (5) of section 4 of this 1977 Act, the public utility may either use its own funds for loans to customers or arrange for financing for customers through one or more commercial lending institutions.

(2) If financing is arranged through a commercial lending institution pursuant to this section, the public utility shall:

(a) Act on behalf of the customer in arranging financing, in order that the residential customer need not deal directly with the lending institution to obtain financing for weatherization services;

(b) Reimburse the commercial lending institution for any amount by which the rate allowed by the commissioner pursuant to subsection (5) of section 4 of this 1977 Act is below six and one-half percent; and

(c) Guarantee the payment of the principal portion of the loan from the commercial lending institution.

SECTION 7. Before approving a utility program pursuant to section 4 of this 1977 Act, the commissioner shall consult with the Department of Energy.

SECTION 8. The commissioner may require as part of a utility residential weatherization program that, for customers with approved credit, the utility add to the periodic utility bill for the owner-occupied dwelling unit for which weatherization services have been provided pursuant to this 1977 Act an amount agreed to between the owner of the dwelling unit and the utility.

SECTION 9. For dwelling units not occupied by the owner and for which utility service is separately metered and billed to the occupant, permission for the performance of weatherization services must be obtained from the owner of the dwelling unit and financing for the weatherization services will be arranged through the owner. Payment for weatherization services performed under the program will be the responsibility of the owner of the dwelling unit. Contracts for weatherization with an owner of more than one single family or multiple family dwelling unit shall not exceed $10,000 outstanding at any one time.

SECTION 10. (1) The cost of weatherization services provided pursuant to this 1977 Act shall be a personal obligation of the owner of the dwelling unit who requests weatherization services.

(2) Any amount due that public utility or commercial lending institution under the program and not paid in full within 30 days after completion of the weatherization services shall become a lien on the property on which the weatherization services were performed. The lien shall have the same priority as a mortgage. A notice of the lien may be filed with the recording officer of the county or counties in which the services were performed. The notice shall set forth:

(a) The amount of the remaining balance due at the time of the filing of the notice; and

(b) The amount, if any, that will appear as a charge on the periodic utility bill for that dwelling unit until the remaining balance is paid.

SECTION 11. The recording officer of the county shall record the notice described in subsection (2) of section 10 of this 1977 Act in a manner designed to appear in the mortgage records of the county.

SECTION 12. The provision of weatherization services to a dwelling unit shall be considered part of the utility service rendered by the public utility.

SECTION 13. In order to avoid duplication of efforts by the commissioner and the Director of the Department of Energy and to provide consistency in weatherization services for all residential energy consumers, the commissioner shall coordinate weatherization programs pursuant to this 1977 Act with any other weatherization programs approved by the Director of the Department of Energy.

SECTION 13a. If House Bill 3255 (1977) becomes law, section 13 of this Act is repealed and section 13b is enacted in lieu thereof.

SECTION 13b. In order to avoid duplication of efforts by the commissioner and the Director of the Department of Energy and to provide consistency in weatherization services for all residential energy consumers, the commissioner shall coordinate weatherization programs pursuant to this 1977 Act with weatherization programs approved by the Director of the Department of Energy pursuant to chapter 887, Oregon Laws 1977 (Enrolled House Bill 3265).

SECTION 14. The commissioner shall adopt by rule a formula by which the public utility shall charge all customers to recover:

(1) The cost to the utility of the services required to be provided under subsections (1) and (2) of section 4 of this 1977 Act;

(2) The interest or other carrying charges or a part thereof that would normally be charged to those customers making payments over a period of time for the services provided under subsection (3) of section 4 of this 1977 Act;

(3) Any bad debt costs, including casualty losses, attributable to the services performed under section 4 of this 1977 Act or to the loan guarantees required by paragraph (c) of subsection (2) of section 6 of this 1977 Act; and

(4) The administrative costs of the residential energy conservation program described in section 4 of this 1977 Act.

SECTION 15. The commissioner shall approve:

(1) The weatherization services to be provided by the utility pursuant to subsection (3) of section 4 of this 1977 Act;

(2) The time periods for customer payment for weatherization services under subsection (5) of section 4 of this 1977 Act; and

(3) The interest rates to be charged for extended payments for weatherization services pursuant to subsection (5) of section 4 of this 1977 Act, which the commissioner finds shall act to conserve energy at a cost less than the cost of energy from new energy sources.

SECTION 16. Sections 1 to 15 of this Act expire and stand repealed on January 1, 1982.

SECTION 17. This Act being necessary for the immediate preservation of the public peace, health and safety, an emergency is declared to exist, and this Act takes effect on its passage.

Approved by the Governor July 28, 1977.
Filed in the office of Secretary of State July 28, 1977.

Attachment No. 3

Pacific Power & Light Company
Zero-Interest Weatherization Program
Approved Weatherization Measures

1. Ceiling insulation up to an R-38, as well as, when deemed necessary, proper ventilation.

2. Floor insulation over unheated spaces up to an R-19 and ground covers in crawl spaces. Water pipes in unheated spaces will be wrapped as necessary to prevent freezing.

3. Storm doors and windows or double glazing of such, as well as weather stripping and caulking as deemed necessary.

4. Duct wrapping when associated with unheated space and forced air electric heating systems.

5. Timed thermostats on forced air electrical systems when other weatherization services, as listed above, are also provided (not applicable in Washington).

6. Water heater insulation blanket in an unheated space. [1]

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1. Provided at no charge to any customer who has an electric water heater located in an unheated space.

Attachment No. 4

ZERO INTEREST WEATHERIZATION PROGRAM
COST BENEFIT SUMMARY
OREGON

	NO. OF INSTALLATIONS	CALC KWH ANNUAL SAVINGS	CALC MWH TOTAL LIFE SAVINGS	TOTAL DIRECT (FINANCED) COST($)	AVERAGE COST PER INSTALLATION($)	MILLS/KWH @ RATEPAYER COST
CEILING	1382	2266958	56674	515015	372	9.72
FLOOR	1387	3293836	82346	897984	647	11.66
WINDOWS	1250	1905069	47627	750154	600	16.85
DOORS	1228	1515048	19097	281817	229	15.79
DUCTS	177	552483	13812	36631	206	2.83
TOTAL		9533394	219556	$ 2,481,601		12.09

SUMMARY OF ABOVE INSTALLATIONS BY INDIVIDUAL HOME

COMPONENT MIX	NO. CUST.	DIRECT COST	AVG. COST/CUST.
WINDOWS, DOORS, CEILING, FLOOR, DUCTS	64	131491	2054
WINDOWS, DOORS, CEILING, FLOOR	573	1059868	1849
WINDOWS, CEILING, FLOOR	113	177783	1573
CEILING, FLOOR, DOORS	97	113657	1171
WINDOWS, FLOOR, DOORS	132	191786	1452
WINDOWS, CEILING, DOORS	159	192546	1210
CEILING, FLOOR	160	162283	1014
CEILING ONLY	68	26405	388
FLOOR ONLY	92	56312	612
WINDOWS ONLY	28	22890	817
ALL OTHER MIXES	336	346580	1031
TOTAL	1822	$ 2,481,601	$ 1,362

NUMBER OF DWELLINGS IMPROVED = 1822

AVERAGE COST PER DWELLING = $ 1,362

AVERAGE COST PER KWH SAVED @ RATEPAYER COST = 12.09 mills/kwh

TIME THERMOSTATS NO. 12 TOTAL $ 930

CAULKING NO. 40 TOTAL $ 1729

WATER HEATER WRAPS NO. 2452

AVERAGE ENERGY SAVED ANNUALLY PER DWELLING = 5232 kwh's

Mr. GORE. Thank you very much, Mr. Ertler.

We will now call on Mr. Gerard J. Kordecki, manager for economic research, Tampa Electric in Tampa, Fla.

STATEMENT OF GERARD J. KORDECKI

Mr. KORDECKI. My name is Gerard J. Kordecki, manager of economic research for Tampa Electric Co. My prime functions are load research and the initiation and evaluation of various types of conservation programs.

Tampa Electric Co. has distinctly different operating conditions in winter and summer. Short duration winter peaks and sustained summer peaks have meant that our approaches to conservation activities among our customers have been based on ways to reduce both peak demands and energy.

Industrial customers can be expected to take the most economic approaches to energy conservation. Often their conservation alternatives are better known to them than to us.

Commercial customers are similar to industrial in terms of weighing different alternative capital investments. Our people must work on a one-to-one basis with these customers because their problems and solutions may vary radically.

Residential conservation is the area which has the greatest potential for Tampa Electric Co. to help affect energy use reductions. New residential construction probably has the best potential for savings due to the high residential growth rate we experience in Florida.

Existing residential programs have evolved from a basic informational format to our home energy analysis, our version of residential energy audits. Our audit program began in mid-1978.

The use of the energy audit format for existing housing was adopted because we believed that the customer needed to know what he or she could feasibly accomplish in reducing utility costs, what the conservation measures would cost and some relationship like simple payback.

Lists of participating contractors, suppliers, and lenders are distributed at the time of the audit. No financing or followup inspections are offered. To date we have completed approximately 2,000 onsite audits with five full-time people. The response of these persons who have had an audit has been very favorable.

The overall response at first glance seems relatively low—1 percent. Unless a customer uses significant amounts of energy for heating and cooling there may be little value in having an audit performed.

The target energy user group is about 25 percent of the total customers. Almost all of the audits performed to date have come from this high use group. The 1-percent initial response rate now is more like 4 percent.

Our audit program presently costs about $70 to $75 per completed audit. This includes all administrative costs and excludes advertising. A charge of $15 is levied on the customer. This charge is used primarily to deter inquiry by persons who are not really interested.

Second, if a customer cannot afford the charge, it is doubtful that he or she will be able to purchase the necessary conservation

measures. In the case of the indigent and the poor, there is underway a process from which our audit may be performed through an appropriate community or governmental agency.

No attempts have been made to estimate the overall energy impacts. The audited energy estimates may be adequate, but the very important powerplant capacity effects are impossible without going into extensive pre- and post-installation testing.

We have made two separate sample surveys to see which conservation measures the audited customers have installed, are planning to install, or are not interested in implementing.

Without going into great detail, the customers are adding the lower cost and do-it-yourself items in reasonably high rates. First cost is the primary deterrent no matter if the economic payback is favorable.

A second, less explainable element is present apathy. "Haven't gotten around to it yet," is a common answer.

One surprise to us was both the lack of knowledge and interest in the tax credits for the installation of the various measures. We had expected a surge of audit requests with the advent of these credits. We are not sure what level of incentive it will take to motivate people to install measures in large scale.

Tampa Electric Co. has attempted through these surveys to evaluate some of the why's. A data summary is attached to this statement. Surprisingly, the heating and cooling usage is lower than might be expected.

The levels of usage obviously would temper the effectiveness of many conservation measures. In concert with this cost structure, an analysis of the economic index of each of the measures shows that generally the higher first cost items are not financially as attractive as many of the lower cost items.

In the brief questioning with various customers, we found that the first cost considerations were paramount. Customers did not worry about being able to find suitable contractors or suppliers and also were not concerned with availability of lenders since they were not interested in financing.

There are no significant local or State conservation incentives or tax credits for installation of conservation items. If done locally, this approach would have to fall on ad valorem taxes since Florida has no personal State income tax.

Tampa Electric Co. has and is looking at various additional approaches to existing customers. Our thrust is to attain equity—savings to the customer who adds measures; savings to those persons who already have energy efficient structures; and savings to the balance of customers who may have to pay rates to support such efforts.

The so-called Oregon program has received much national attention. I would like to stress at this point that because of widely different conditions between Florida and the Pacific Northwest that this program does not have the same attractiveness in our area as in Oregon.

The difference is that the primary source of electric power generation in the Pacific Northwest is hydroelectric.

As I understand it, if energy can be saved through home insulation and weatherization, this avoids costly oil-fired energy produc-

tion and increase the portion of all energy requirements that come from hydroelectric. Therefore, utilities in that area are interested in saving energy or kilowatt hours.

When homes are insulated, there may be very little savings of capacity. All customers of a utility located in a hydroelectric area save as a result of energy or kilowatt hour savings.

In an area like Florida, where all energy is produced from fuels, all customers benefit primarily through capacity savings. Of course, when capacity is saved, energy is also saved.

Therefore, it is our strong feeling that the money and effort associated with conservation plans would be better directed toward programs that result in capacity savings in a State like Florida.

In other words, conservation programs based on saving capacity, as well as energy in Florida would be far more productive and cost effective than the Oregon program in which there is only a small savings of capacity. Tampa Electric Co. is now working diligently on developing programs aimed at capacity savings which I stress again will also result in substantial energy savings.

A recent scenario was done on financing of conservation measures by our company. Since we presently operate below our allowed rate of return, we remain strapped for funds. Financing of conservation measures in this financial position could only be done at the prevailing lender rates.

For us to take more into the rate base or expenses through financing would lead to a lower rate of return with a potential higher rate increase in the offing. Without almost guaranteed future plant facility reductions to offset these shortfalls, the scenario becomes unacceptable.

Laundry list type financing, loan guarantees and so forth will not guarantee these necessary plant reductions.

It is impossible to design or legislate a single conservation program that will meet the needs for each customer or even a region of the country. Simple straightforward programs that maximize conservation and minimize costs to utility customers and taxpayers are what we all hope to achieve.

In closing, Tampa Electric Co. hopes that our statement and enclosures may be helpful to you in evaluating various approaches to effective residential conservation programs.

I would be happy to respond to any questions.

[Testimony resumes on p. 185.]

[Attachments to Mr. Kordecki's prepared statement follow:]

SERVICE AREA AND SYSTEM DESCRIPTION

Tampa Electric Company serves an area of 1,900 square miles of primarily urban development. We have 305,000 customers, with 270,000 being residential. The generation mix is approximately 75 percent coal and 25 percent oil. Residential customers use about 35 percent of the annual sales; Commercial 21 percent; Industrial 39 percent; Government and Other 7 percent. One industry -- phosphate fertilizer -- accounts for 75 percent of the industrial use. Our system peak of 2,000 megawatts occurrs in the winter due to our high saturation (60 percent Residential; 90 percent applicable Commercial) of electric heat. The summer peak is slightly greater than 1,800 megawatts. Our winter peak may be somewhat misleading. Last year only 17 hours during the winter had peak demands above the following summer peak. This short duration winter peak is incrementally served with peaking units, or intermediate oil units, or purchased power, or industrial interruptions. These interruptible industrial customers constitute about eight to ten percent (150 to 200 megawatts) of our system peak. The summer peaks are primarily served with base load coal units due to the long sustained daily loads (10 hours) caused by our large air conditioning use (85 percent saturation Residential; 100 percent saturation applicable Commercial).

Our experience with conservation can best be portrayed with the use of Average Consumption Figures between 1973 and September, 1979: the annual use per residential customer declined 4.6 percent (12,852 kilowatt-hours to 12,267 kilowatt-hours). This decline occurred while the level of ownership of electrical appliances in new living units was almost 100 percent. The Commercial Customer's average use increased by 3.2 percent while both equipment ownership and new square footage increased significantly. Industrial cannot be viewed in the same manner because of economic conditions which distort patterns. Reasons for these levels of consumption may be attributed to pure conservation, structural conservation, and pricing responses. Tampa Electric Company believes that pricing has been the largest contributor.

RESIDENTIAL CONSERVATION--NEW CONSTRUCTION

The residential market must be segmented into new and existing. The new housing area constitutes the largest and quickest possible energy reduction return. Growth areas such as Florida, Arizona, California, and other Sun Belt States are experiencing significant residential construction. In our service area alone, approximately 65 percent of all housing units have been added since 1960. We expect to add absolutely the same or more units by the year 2000.

Our initial conservation program (1975) was an Energy Efficiency Building Award Program. Our goals at that time were to affect moderate changes in thermal and mechanical efficiency among a large number of developers and builders. To date, our success has been significant (40 percent of all living units). This approach was taken because of the difficulties of motivating an industry which is made up of small businessmen who are relatively set in their ways. We are about to make major changes to that program, which, if done, would realize large energy savings for the ultimate customers. Though many contractors agree with our intent, they have a certain amount of reluctance. Common responses involve the added costs which may eliminate eligible buyers from qualifying, or the need for some type of payback for the homeowner, and so forth. The powers and enforcement capabilities to require more efficient construction already exists in codes at various governmental levels. Another major stumbling block in all these new home programs has been with financing. In our area there has been no consistant policy among lenders in recognizing that utility costs are major elements in housing (whether owned or rented). The trade-off of increased initial housing costs due to additional conservation measures with lower overall owning and operating costs has not been adequately addressed at local, state, and federal levels.

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ENERGY SURVEY

REPORT FORM

Prepared especially for _____

Address _____ City _____

State _____ Zip _____ Phone _____

CONTRACTOR INSTALLATION

PRODUCT DESCRIPTION	PRIORITY FOR INSTALLATION a	ESTIMATED INSTALLED COSTS b	PAYBACK YEARS c	ESTIMATED 1ST YEAR ENERGY SAVINGS d
1) ATTIC INSULATION – ADD		$		$
2) WALL INSULATION – ADD		$		$
3) FLOOR INSULATION – ADD e		$		$
4) STORM WINDOWS &/OR INSULATED SLIDING GLASS DOORS		$		$
5) CAULKING OF WINDOWS & DOORS f		$		$
6) WEATHER STRIPPING OF WINDOWS & DOORS f		$		$
7) SHADING OF SUN EXPOSED GLASS AREA		$		$
8) WATER HEATER INSULATION WRAP f		$		$
9) WASTE HEAT RECOVERY SYSTEM		$		$
10) DUCT TAPING		$		$
11) VENTILATION		$		$
12)		$		$

PACKAGE EVALUATION

PACKAGE DESCRIPTION	ESTIMATED INSTALLED COSTS b	PAYBACK YEARS c	ESTIMATED 1ST YEAR ENERGY SAVINGS d
INCLUDES ALL ITEMS WHICH HAVE BEEN EVALUATED AND ASSIGNED A PRIORITY RANK g	$		$

Notes a through g are listed on the back of this form.

Analysis # _____

Technician _____

Date _____

Customer _____

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Enercom® is a service of Tampa Electric Company

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NOTES

(a) Priority for installation is a function of the payback years. The item with the quickest return on invested dollars will have the number "ONE" priority ranking. The item with the second quickest payback will have a priority ranking of "TWO", etc. A "ZERO" designation means that this product already meets recommended standards or cannot be installed in your home.

(b) Estimated installed costs are based on average market prices of acceptable products in your community. The prices may vary depending on your selection of contractors and/or the particular product you choose to install. Costs do not include modifications or unique adaptations to your particular home such as adding duct work or special odd-shaped glass.

(c) Payback years are calculated by dividing the estimated costs by the estimated annual savings. The estimated annual savings take into account projected energy cost inflation rate. The actual payback period may vary depending on your selection of products and contractors as well as your peronal life style and energy usage habits. A designation of "25+" indicates that the payback exceeds 25 years. If you wish to only install some of the products, then the lower the payback years, the higher the priority for installation.

(d) Estimated first-year energy savings are based on the data recorded about your home and its energy consumption patterns. These savings will increase each year as utility rates rise. Your actual savings may vary depending upon your personal life style and energy usage habits.

(e) In conjunction with floor insulation, the home should have both proper ventiliation and a ground cover vapor barrier.

(f) Costs for these items are based on do-it-yourself installation only.

(g) The package evaluation includes all items which have been evaluated and assigned a priority rank. The savings figures shown reflect the "NET" savings possible when all of these products are installed.

Note: Tampa Electric Company does not guarantee either the performance of contractors, installers, or products or the availability of financing from any lending institutions.

CODED INPUT SHEET

Identification Code _____

Wherever the question is not applicable or the information is not available, enter a zero.

1 [4385] Analysis number

2 [ ] Customer's estimated annual **cooling** bill for 12-month period (rounded to the nearest dollar)

3 [ ] Customer's estimated annual **heating** bill for 12-month period (rounded to the nearest dollar)

4 [ ] The customer's monthly **base usage** utility bill (rounded to the nearest dollar)

5 [ ] Number of adults living in residence (19 years and over)

6 [ ] Number of children living in residence (18 years and under)

7 [ ] Location of residence:
1. Incorporated area 2. Unincorporated area

8 [ ] Does the water heater need an insulation wrap or should it be equipped with a waste heat recovery system?
1. Insulation Wrap 3. Both
2. Waste Heat Recovery System 4. Neither

9 [ ] Type of water heater:
1. Electric—smaller than 52 gallons
2. Electric—52 or more gallons
3. Natural gas—smaller than 52 gallons
4. Natural gas—52 or more gallons
5. Bottled gas—smaller than 52 gallons
6. Bottled gas—52 or more gallons

10 [ ] Main type of **cooling** system in home:
1. None
2. Electric central system
3. Window/wall units (entire house)
4. Window/wall units (part of house)

11 [ ] Main type of **heating** system in home:
1. Electrical resistance 4. Oil
2. Heat pump 5. Bottled gas
3. Natural gas 6. None

12 [ ] Total square feet of **living space** in the home

13 [ ] Square feet of **ceiling** area separating living space from unheated or uncooled areas

14 [ ] Estimated existing R-value of ceiling area recorded in Question 13

15 [ ] R-value to be achieved by adding ceiling insulation

16 [ ] Square feet of ceiling area which can have insulation added

17 [ ] If Question 15 is a weighted R-value, then enter the R-value of insulation being added in Question 16

18 [ ] Square feet of existing attic ventilation openings

19 [ ] Main type of wall construction:
1. Masonry 2. Frame

20 [ ] Square feet of net **wall** area separating living space from unheated or uncooled areas

21 [ ] Estimated existing R-value of wall area recorded in Question 20

22 [ ] R-value to be achieved by adding wall insulation

23 [ ] Square feet of **open** net wall area which can have insulation added

24 [ ] Square feet of **closed** net wall area which can have insulation added

25 [ ] **Major** floor area of the residence is over: 1. Concrete slab 2. Crawl space

26 [ ] Square feet of **floor** area separating living space from unheated or uncooled areas

27 [ ] Estimated existing R-value of floor area recorded in Question 26

28 [ ] R-value to be achieved by adding floor insulation

29 [ ] Square feet of floor area which can have insulation added

30 [ ] Does duct work require taping?
1. Yes 2. No

31 [ ] Number of doors in the home that lead from living space either to the outside or to unheated areas (count each double-wide wood door as 2 doors, but do not include sliding glass doors)

32 [ ] General condition of **caulking** and **putty** around the doors: 1. Good 2. Fair 3. Poor

33 [ ] General condition of **weather stripping** around the doors: 1. Good 2. Fair 3. Poor

34 [ ] Total square feet of window area in the home (including sliding glass doors)

35 [ ] Total square feet of window area that is equipped with either insulated glass or storm windows

36 [ ] Total square feet of window area to be replaced with storm windows

37 [ ] Total square feet of sliding glass door area to be replaced with sliding insulated glass doors

38 [ ] Total square feet of window area that is direct sun exposed (include sliding glass doors)

39 [ ] Total square feet of window area to be filmed or screened

40 [ ] General condition of **caulking** and **putty** around the windows:
1. Good 2. Fair 3. Poor

41 [ ] General condition of **weather stripping** around the windows:
1. Good 2. Fair 3. Poor

Technician _____ Date _____

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EVALUATION OF AUDITED CUSTOMERS CONSERVATION MEASURES INSTALLED

INTRODUCTION

Suncoast Opinion Surveys was hired by Tampa Electric Company to conduct three surveys. The first was a customer reaction -- the results of which were extremely positive. In fact, the customer enthusiasm was so great that the interviewing was terminated at the suggestion of the interviewing firm.

A second survey was conducted on the same groups of respondents in April of 1979. The objective was to see what measures the audited customers were installing. A third survey was done in September of 1979 to see what further changes had occurred. A comparison group of customers was selected to be interviewed in September to check and validate the reliability of the first sample in terms of measures calculated and installed. The composite results of these interviews are found in Tables One through Six.

RESULTS

The Tampa Electric Company Home Energy Survey covers 11 items at this time. Two of the items have some energy savings but should be considered as maintenance or maintenance protection -- duct taping and ventilation.

On the whole, the customers (both in Sample One and Sample Two) elected to install or purchase the lowest cost items first. The payback to the customer was secondary to the first cost. The installation rate of measures did not change radically after 10 months as compared to 4 months after the audit. This was particularly true of the higher first cost items. The "do-it-yourself" items showed some tendency to be installed over a greater period of time. After 10 months, there were significant numbers of customers who still "planned" to add measures. The reliability of this intention is questionable, particularly in the higher cost measures.

A second sample of customers who were audited 5 months before was also taken for comparative purposes. Again, the same types of results were experienced. Lower cost items were more popular.

A series of cross-tabs were done (Tables 7-16) on the measures installed, planned to be installed, or where the customer does not plan to add the measure. These groupings were compared to the payback years. There have been theorized payback periods which are supposed to be more attractive and should evoke action among the customers. This tendency could not be strongly supported from the samples. First cost and aesthetics appear to be as important or even more important than reasonable payback periods. In fact, the lack of action by customers, particularly in the areas of duct taping and

weatherstripping, is completely without reason except in the cases where people are moving. Apathy and the realization that energy conservation does not have easy answers, is prevalent throughout the respondents.

CONCLUSIONS

A. The number of persons requesting audits has been lower than anticipated. The effects of the conservation tax credits that were passed by Congress never materially improved the response rates. In fact, written information is now left with the customer because so few even knew of the credits. To increase the awareness of the Home Energy Survey, radio, television, and newspaper advertising has been added to the direct mail program. Emphasis in the use of the promotional efforts is to build the audit inventory in the off-peak periods when energy bills are lower.

B. The follow-up surveys show that there has been a highly positive response of those customers receiving a Home Energy Survey. Seventy percent of the respondents have added at least one conservation measure and 50 percent two or more. The overall impact of the measures being installed is lower than was anticipated. Part of this is due to the fact that many of the housing units are already reasonably efficient and/or the customers being audited have relatively moderate energy bills due to lifestyle or through specific conservation efforts. To counter some of the reluctance to add conservation measures and to reinforce the audit, a follow-up mailing -- an energy reminder -- is being instituted.

The primary deterrents to increased measure installations appear to be first cost and apathy to the energy situation. These impediments are going to be difficult to overcome. There may be a number of cost effective scenarios to the economic problems through federal financing, grants, or other types of incentives: however, the "I don't care's" call for massive attitudinal changes.

"SUGGESTED" CONSERVATION MEASURES (SAMPLE 1)

TABLE 1

MEASURE	PERCENTAGE CALCULATED *
Ceiling Insulation	98.9%
Wall Insulation	95.6%
Floor Insulation	0.0%
Storm Windows	54.4%
Caulking	32.2%
Weatherstripping	68.9%
Shading of Glass	88.9%
Water Heater Insulation Wrap	94.4%
Heat Recovery System	58.9%
Duct Taping	25.6%
Ventilation	8.9%

* This percentage relates to those households where measures were calculated. In many cases the measures are not appropriate -- customer already has the measure; physically the measure cannot be installed or the customer is not interested or contemplates another method, etc.

The tables that will follow are broken down into two groups representing the different time periods of the sample interview. Table two represents those households which "added" or "plan to add" the measure as a percentage of only the calculated households. For example, if wall insulation was calculated for 50 percent of the audit, the "added" percentage would represent only those among the 50 percent.

Table three represents the "added" or "plan to add" of all the audited customers. This table gives the overall effects. Both tables are important in their use in the examination of household response of measure addition following the Energy Survey.

TABLE 2

CONSERVATION MEASURES DONE OR PLANNED TO BE DONE
(PERCENTAGES ARE BASED ONLY ON THE CALCULATED MEASURES)

	CUSTOMER ADDED MEASURE		CUSTOMER PLANS TO ADD MEASURE	
EASURE	AFTER 4 MONTHS / AFTER 10 MONTHS		AFTER 4 MONTHS / AFTER 10 MONTHS	
eiling Insulation	21.3%	27.0%	43.8%	39.3%
all Insulation	5.8%	5.8%	8.1%	15.1%
loor Insulation	0.0%	0.0%	0.0%	0.0%
torm Windows*	12.8%	12.8%	23.4%	19.1%
aulking	13.8%	34.5%	41.4%	27.6%
eatherstripping	35.5%	46.8%	46.8%	38.7%
hading of Glass	22.5%	33.8%	47.5%	47.5%
ater Heater Insulation Wrap	28.2%	45.9%	43.5%	37.6%
eat Recovery System	3.8%	3.8%	13.2%	17.0%
uct Taping	65.2%	73.9%	26.1%	17.4%
entilation	37.5%	37.5%	25.0%	12.5%

wenty-one percent of the sample made no additions or changes of intentions from the first interview.

*
here were no actural whole house storm window or sliding glass door replacements. In most cases the added" or "plan to add" represent window replacements. Most are window types which are peculiar to oderate climates -- jalousie, awning and Miami windows.

TABLE 3

CONSERVATION MEASURES DONE OR PLANNED TO BE DONE
(PERCENTAGES ARE BASED ON THE WHOLE SAMPLE)

MEASURE	CUSTOMER ADDED MEASURE		CUSTOMER PLANS TO ADD MEASURE	
	AFTER 4 MONTHS	/ AFTER 10 MONTHS	AFTER 4 MONTHS	/ AFTER 10 MONTH
Ceiling Insulation	21.1%	26.7%	43.3%	38.9%
Wall Insulation	5.6%	5.6%	7.8%	14.4%
Floor Insulation	0.0%	0.0%	0.0%	0.0%
Storm Windows *	6.7%	6.7%	12.2%	10.0%
Caulking	4.4%	11.1%	13.3%	8.9%
Weatherstripping	24.4%	32.2%	31.1%	26.7%
Shading of Glass	20.0%	30.0%	25.6%	42.2%
Water Heater Insulation Wrap	26.7%	43.3%	41.1%	35.6%
Heat Recovery System	2.2%	2.2%	7.8%	10.0%
Duct Taping	16.7%	18.9%	6.7%	4.4%
Ventilation	2.2%	3.3%	2.2%	1.1%

*
There were no actual whole house storm window or sliding glass door replacements. In most cases the "added" or "plan to add' represent window replacements. Most are window types which are peculiar to moderate climates -- jalousie, awning and Miami windows.

TABLE 4

NUMBER OF CONSERVATION MEASURES
ADDED OR COMPLETED BY HOUSEHOLD

	AFTER 4 MONTHS	AFTER 10 MONTHS
0	35.1%	30.8%
1	32.2%	19.1%
2	14.4%	23.4%
3	10.0%	17.0%
4	4.1%	4.3%
5	3.1%	4.3%
6	1.1%	1.1%

The "After 10 Months" survey showed that 9.6% of sample have not or are not planning to add any conservation measures to the residence which was audited. About half of these are people who did nothing and have since moved from the residence, etc.

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COMPARISON SAMPLE

TABLE 5

CONSERVATION MEASURES DONE, PLANNED TO BE DONE

MEASURES	PERCENTAGE CALCULATED	CUSTOMER ADDED MEASURES % OF CALCULATED	CUSTOMER ADDED MEASURES % OF TOTAL SAMPLE	CUSTOMER PLANS TO ADD MEASURES % OF CALCULATIONS	CUSTOMER PLANS TO ADD MEASURES % OF TOTAL SAMPLE
Ceiling Insulation	98.9%	22.3%	22.1%	25.5%	25.3%
Wall Insulation	86.3%	1.2%	1.1%	12.2%	10.5%
Floor Insulation	5.3%	20.0%	1.1%	20.0%	1.1%
Storm Windows *	51.6%	16.3%	8.4%	12.2%	6.3%
Caulking	13.7%	69.2%	9.5%	15.3%	2.1%
Weatherstripping	73.7%	42.9%	31.6%	27.1%	20.0%
Shading of Glass	84.2%	30.0%	25.3%	33.8%	28.4%
Water Heater Insulation Wrap	91.6%	24.1%	22.1%	41.4%	37.9%
Heat Recovery Systems	49.5%	8.5%	4.2%	10.0%	5.3%
Duct Taping	24.2%	65.2%	15.8%	8.7%	2.1%
Ventilation	8.4%	12.5%	1.1%	25.0%	2.1%

* Window replacements only

TABLE 6

NUMBER OF CONSERVATION MEASURES ADDED OR COMPLETED BY HOUSEHOLD

0	1	2	3	4	5	6
24.7%	33.3%	22.6%	12.9%	5.4%	0.0%	1.1%

TABLE 7

CONSERVATION MEASURE Attic Insulation

PAYBACK PERIODS	MEASURE ADDED	MEASURE WILL BE ADDED	MEASURE WILL NOT BE ADDED
0 - 2	0	0	0
2.1 - 4	25.0	12.1	15.4
4.1 - 6	50.0	36.4	34.6
6.1 - 8	20.0	33.3	26.9
8.1 - 10	0.0	6.1	15.5
10.1 - 15	0.0	12.1	3.8
15.1 - 20	5.0	0.0	3.8
20.1 - 25	0.0	0.0	0.0
OVER 25	0.0	0.0	0.0
	100.0	100.0	100.0

Of the number of people with paybacks 6 years or less, 34.1% added insulation.

TABLE 8

CONSERVATION MEASURE Wall Insulation

PAYBACK PERIODS	MEASURE ADDED	MEASURE WILL BE ADDED	MEASURE WILL NOT BE ADDED
0 - 2	0.0	0.0	0.0
2.1 - 4	0.0	0.0	0.0
4.1 - 6	66.7	25.0	15.7
6.1 - 8	33.3	33.3	24.6
8.1 - 10	0.0	16.7	19.3
10.1 - 15	0.0	25.0	28.1
15.1 - 20	0.0	0.0	7.0
20.1 - 25	0.0	0.0	5.3
OVER 25	0.0	0.0	0.0
	100.0	100.0	100.0

Of the number of people with paybacks 6 years or less, 25.0% added the measure.

TABLE 9

CONSERVATION MEASURE Storm Windows

PAYBACK PERIODS	MEASURE ADDED	MEASURE WILL BE ADDED	MEASURE WILL NOT BE ADDED
0 - 2			
2.1 - 4			
4.1 - 6			
6.1 - 8			
8.1 - 10			
10.1 - 15			
15.1 - 20			
20.1 - 25			
OVER 25			

After further checking, none of the Storm Windows were actual installations; each were glass replacements so the evaluations are not appropriate.

TABLE 10

CONSERVATION MEASURE Caulking*

PAYBACK PERIODS	MEASURE ADDED	MEASURE WILL BE ADDED	MEASURE WILL NOT BE ADDED
0 - 2	0.0	0.0	0.0
2.1 - 4	0.0	0.0	0.0
4.1 - 6	0.0	0.0	25.0
6.1 - 8	0.0	0.0	0.0
8.1 - 10	25.0	0.0	50.0
10.1 - 15	37.5	100.0	0.0
15.1 - 20	37.5	0.0	25.0
20.1 - 25	0.0	0.0	0.0
OVER 25	0.0	0.0	0.0
	100.0	100.0	100.0

Of the people with paybacks 6 years or less, none added the measure.

* There were very few cases of caulking "calculations".

TABLE 11

CONSERVATION MEASURE Weatherstripping*

PAYBACK PERIODS	MEASURE ADDED	MEASURE WILL BE ADDED	MEASURE WILL NOT BE ADDED
0 - 2	23.1	31.3	26.7
2.1 - 4	0.0	0.0	0.0
4.1 - 6	19.2	12.5	46.6
6.1 - 8	38.5	25.0	13.3
8.1 - 10	15.4	18.8	6.7
10.1 - 15	3.8	12.4	0.0
15.1 - 20	0.0	0.0	6.7
20.1 - 25	0.0	0.0	0.0
OVER 25	0.0	0.0	0.0
	100.0	100.0	100.0

Of the people with paybacks 6 years or less, 37.9% have added the measure.

*Weatherstripping calculation methods are being changed for the final formats. Payback periods will decrease in the new methodology.

TABLE 12

CONSERVATION MEASURE Shading

PAYBACK PERIODS	MEASURE ADDED	MEASURE WILL BE ADDED	MEASURE WILL NOT BE ADDED
0 - 2	0.0	0.0	3.0
2.1 - 4	64.0	66.7	45.5
4.1 - 6	28.0	33.3	30.3
6.1 - 8	8.0	0.0	15.2
8.1 - 10	0.0	0.0	3.0
10.1 - 15	0.0	0.0	3.0
15.1 - 20	0.0	0.0	0.0
20.1 - 25	0.0	0.0	0.0
OVER 25	0.0	0.0	0.0
	100.0	100.0	100.0

Of the number of people with paybacks 6 years or less 50.0% added the measure.

TABLE 13

CONSERVATION MEASURE Insulation Wrap

PAYBACK PERIODS	MEASURE ADDED	MEASURE WILL BE ADDED	MEASURE WILL NOT BE ADDED
0 - 2	100.0	100.0	95.7
2.1 - 4	0.0	0.0	0.0
4.1 - 6	0.0	0.0	4.3
6.1 - 8	0.0	0.0	0.0
8.1 - 10	0.0	0.0	0.0
10.1 - 15	0.0	0.0	0.0
15.1 - 20	0.0	0.0	0.0
20.1 - 25	0.0	0.0	0.0
OVER 25	0.0	0.0	0.0
	100.0	100.0	100.0

Of those number of people with payback 6 years or less, 43.3% added the measure.

TABLE 14

CONSERVATION MEASURE Waste Heat Recovery

PAYBACK PERIODS	MEASURE ADDED	MEASURE WILL BE ADDED	MEASURE WILL NOT BE ADDED
0 - 2	0.0	0.0	0.0
2.1 - 4	0.0	0.0	0.0
4.1 - 6	50.0	75.0	50.0
6.1 - 8	50.0	25.0	47.5
8.1 - 10	0.0	0.0	0.0
10.1 - 15	0.0	0.0	2.5
15.1 - 20	0.0	0.0	0.0
20.1 - 25	0.0	0.0	0.0
OVER 25	0.0	0.0	0.0
	100.0	100.0	100.0

Of the people with paybacks 6 years or less, 3.7% added the measure.

TABLE 15

CONSERVATION MEASURE Duct Taping

PAYBACK PERIODS	MEASURE ADDED	MEASURE WILL BE ADDED	MEASURE WILL NOT BE ADDED
0 - 2	84.6	100.0	100.0
2.1 - 4	15.4	0.0	0.0
4.1 - 6	0.0	0.0	0.0
6.1 - 8	0.0	0.0	0.0
8.1 - 10	0.0	0.0	0.0
10.1 - 15	0.0	0.0	0.0
15.1 - 20	0.0	0.0	0.0
20.1 - 25	0.0	0.0	0.0
OVER 25	0.0	0.0	0.0
	100.0	100.0	100.0

Of the people with paybacks 6 years or less, 73.9% have added the measure.

TABLE 16

CONSERVATION MEASURE Ventilation*

PAYBACK PERIODS	MEASURE ADDED	MEASURE WILL BE ADDED	MEASURE WILL NOT BE ADDED
0 - 2	0.0	0.0	0.0
2.1 - 4	0.0	0.0	0.0
4.1 - 6	0.0	0.0	0.0
6.1 - 8	0.0	0.0	75.0
8.1 - 10	0.0	100.0	25.0
10.1 - 15	100.0	0.0	0.0
15.1 - 20	0.0	0.0	0.0
20.1 - 25	0.0	0.0	0.0
OVER 25	0.0	0.0	0.0
	100.0	100.0	100.0

There were no people with paybacks of 6 years or less.

* There were very few cases of inadequate ventilation which needed "calculating".

ENERGY COSTS FOR HEATING AND COOLING, AND CONSERVATION MEASURE PAYBACK ANALYSIS

COMMENTS

It was very surprising to see the wide variation in heating and cooling costs. Many of these figures were lower than anticipated. Various reasons can be theorized about price elasticities and conservation efforts and their effects on these costs, but the bottom line is that these variations exist and greatly offset the economic merits of many conservation measures.

The following tables show both the cost variations and conservation measures (frequencies by payback years, both by actual number and cumulative). The most attractive measures in terms of payback years are duct taping, water heating insulation wraps, shading of glass, and weatherstripping (where appropriate); attic insulation and waste heat recovery are economically attractive in many cases, but wall insulation, floor insulation, storm windows and doors, caulking and additional ventilation generally have poor paybacks.

T E C O - CONSUMER AFFAIRS RESEARCH
ENERGY SURVEY CROSSTAB
00/00/00 THROUGH 79/09/30

C E N T S P E R S Q U A R E F O O T

	C O O L I N G			H E A T I N G					
	C.ELECT	ALLW/W	PRTW/W	RESIST	HTPUMP	NATGAS	O I L	BOTGAS	
.000-.019	13	3	5	31	47	7	16	5	.000-.019
.020-.039	12	1	2	71	132	19	42	3	.020-.039
.040-.059	37	4	2	79	146	12	60	6	.040-.059
.060-.079	84	2	3	134	92	9	69	4	.060-.079
.080-.099	100	6	2	167	51	2	47	2	.080-.099
.100-.119	151	5	1	177	46	2	27	8	.100-.119
.120-.139	164	3	3	75	22	3	12	3	.120-.139
.140-.159	186	4	1	60	22	0	4	0	.140-.159
.160-.179	182	3	1	38	6	3	4	1	.160-.179
.180-.199	184	0	3	26	2	0	1	0	.180-.199
.200-.219	203	3	1	13	3	0	0	0	.200-.219
.220-.239	148	6	0	16	0	0	2	0	.220-.239
.240-.259	77	1	0	8	2	0	1	0	.240-.259
.260-.279	56	3	0	4	1	0	0	0	.260-.279
.280-.299	46	3	0	1	1	0	1	0	.280-.299
.300-.319	28	0	0	1	0	0	0	0	.300-.319
.320-.339	20	2	0	2	0	0	0	0	.320-.339
.340-.359	13	2	1	1	0	0	0	0	.340-.359
.360-.379	10	1	0	2	0	0	0	0	.360-.379
.380-.399	12	1	0	0	0	0	0	0	.380-.399
.400-.419	8	0	0	0	1	0	0	0	.400-.419
.420-.439	0	1	0	0	0	0	0	0	.420-.439
.440-.459	1	0	0	0	0	0	0	0	.440-.459
.460-.479	3	1	0	0	0	0	0	0	.460-.479
.480-.499	0	0	0	0	0	0	0	0	.480-.499

CENTS PER SQ.FT. CALCULATIONS FOR COOLING AND HEATING

CENTS/SQ.FT. COOLING--W/# OF OBSERVATIONS PER CATEGORY

CENT.ELECT	OBS	ALL W/WALL	OBS	PART W/WALL	OBS
0.20021	1756.	0.20190	64.	0.12358	25.

CENTS/SQ.FT. HEATING -- W/# OF OBSERVATIONS PER CATEGORY

RESISTANCE	OBS	HEAT PUMP	OBS	NATURALGAS	OBS	OIL	OBS	BOTTLEDGAS	OBS
0.12219	906.	0.08550	574.	0.07544	57.	0.09216	285.	0.09330	32.

T E C O - CONSUMER AFFAIRS RESEARCH

YEARS PAYBACK BY RECOMMENDATION
PRIORITY FOR INSTALLATION---

PRIOPITY-	+ATTICINS		+WALLINS		+FLOORINS		INS W/D		CAULK		WTHRSTRIP		SHADGLAS		WRAP WHTR		HEATRECV		DUCT TAPE		VENTILATI			
0.0- 0.9	6	6	0	0	0	0	0	0	0	0	31	31	0	0	2	2	0	0	122	122	0	0	0	0
1.0- 1.9	48	54	0	0	0	0	0	0	0	0	181	212	35	35	1644	1646	0	0	295	417	2	2	0	0
2.0- 2.9	111	165	7	7	0	0	1	1	4	4	162	374	188	223	1	1647	0	0	31	448	5	7	0	0
3.0- 3.9	201	366	14	21	0	0	0	1	13	17	117	491	655	878	41	1688	13	13	8	456	13	20	0	0
4.0- 4.9	287	653	66	87	0	0	1	2	28	45	87	578	279	1157	3	1691	272	285	31	487	10	30	0	0
5.0- 5.9	315	968	186	273	0	0	5	7	24	69	172	750	166	1323	0	1691	377	662	63	550	12	42	0	0
6.0- 6.9	237	1205	202	475	0	0	7	14	21	90	77	827	75	1398	0	1691	210	872	23	573	25	67	0	0
7.0- 7.9	189	1394	228	703	4	4	27	41	42	132	106	933	40	1438	0	1691	81	953	4	577	30	97	0	0
8.0- 8.9	118	1512	161	864	4	8	53	94	29	161	240	1173	38	1476	0	1691	12	965	3	580	22	119	0	0
9.0- 9.9	81	1593	109	973	5	13	87	181	32	193	27	1200	12	1488	0	1691	5	970	0	580	15	134	0	0
10.0-10.9	46	1639	101	1074	8	21	116	297	42	235	33	1233	9	1497	0	1691	6	976	1	581	0	134	0	0
11.0-11.9	34	1673	83	1157	4	25	118	415	50	285	39	1272	7	1504	0	1691	3	979	0	581	11	145	0	0
12.0-12.9	21	1694	65	1222	4	29	110	525	27	312	2	1274	5	1509	0	1691	2	981	0	581	9	154	0	0
13.0-13.9	20	1714	70	1292	3	32	75	600	23	335	4	1278	2	1511	0	1691	1	982	0	581	1	155	0	0
14.0-14.9	9	1723	56	1348	3	35	72	672	19	354	9	1287	9	1520	0	1691	1	983	0	581	0	155	0	0
15.0-15.9	11	1734	46	1394	1	36	48	720	25	379	5	1292	5	1525	0	1691	0	983	0	581	3	158	0	0
16.0-16.9	5	1739	34	1428	2	38	29	749	10	398	1	1293	2	1527	0	1691	0	983	0	581	1	159	0	0
17.0-17.9	5	1744	32	1460	0	38	26	775	9	407	2	1295	1	1528	0	1691	0	983	0	581	0	159	0	0
18.0-18.9	0	1744	31	1491	2	40	13	788	2	409	2	1297	0	1528	0	1691	0	983	0	581	0	159	0	0
19.0-19.9	5	1749	7	1498	1	41	9	797	6	415	2	1299	0	1528	0	1691	0	983	0	581	6	165	0	0
20.0-20.9	0	1749	9	1507	0	41	10	807	1	416	1	1300	2	1530	0	1691	0	983	0	581	0	165	0	0
21.0-21.9	0	1749	7	1514	0	41	6	813	0	416	0	1300	2	1532	0	1691	0	983	0	581	0	165	0	0
22.0-22.9	0	1749	3	1517	0	41	2	815	1	417	1	1301	1	1533	0	1691	0	983	0	581	0	165	0	0
23.0-23.9	0	1749	6	1523	2	43	1	816	0	417	0	1301	0	1533	0	1691	0	983	0	581	0	165	0	0
24.0-24.9	6	1755	7	1530	7	50	6	822	29	446	12	1313	4	1537	0	1691	7	990	2	583	5	170	0	0

Mr. Gore. Thank you very much.

I will call now on the final member of the panel, Mr. Donald Petkus, manager of community relations, Commonwealth Edison in Chicago.

Welcome.

STATEMENT OF DONALD PETKUS

Mr. PETKUS. Thank you, Mr. Chairman.

My name is Donald Petkus. I am manager of community relations at Commonwealth Edison Co., which provides electricity to 8 million people in the metropolitan Chicago area and northern Illinois.

Since I was unaware of my participation here today until yesterday, I do not have a formal written statement. Rather, I will be essentially talking from notes. However, if you desire more formal comments on any of the subjects I cover, I would be happy to supply it.

Commonwealth Edison has encouraged customers to conserve energy since it began actively seeking wintertime loads such as space heating to improve the company's load factor and consequently keep customer costs as low as possible.

Insulation levels we insisted upon for electrically heated dwellings in the early 1960's are in fact those that are generally accepted today as being standard.

Nearly two decades ago we had field representatives inspecting electrically heated residences, to be sure that the insulation was properly installed and that it was going in, in fact, the way the specifications called for it.

Any variations were called to the attention of the builder, architect, and/or owner. Today this is generally not necessary since opposition to these insulation levels have almost totally disappeared in northern Illinois.

I don't mean to insinuate that there is not room for improvement, just that we believe the 132,620 electrically heated dwellings and other new construction that we serve are energy smart. These customers shouldn't be saddled with the cost of fixing up poorly or uninsulated dwellings.

The other 2.5 million customers we serve, or approximately 95 percent of our customers, heat with other fuels. Natural gas saturation is approximately 90 percent and oil 5 percent. Some of these homes were built with adequate insulation and others have been upgraded at their own initiative.

But it is here where significant savings can be achieved. Specific emphasis needs to be placed on reducing the use of OPEC oil.

Commonwealth Edison cannot justify incurring expenses to upgrade gas in oil heated programs. True, there would be some supplemental reductions in electric usage and consequently reductions in relatively abundant and low cost nuclear and coal-fired generation, but no effect for nearly a decade on capacity costs.

The primary responsibility for upgrading underinsulated dwellings must be the homeowners, the immediate beneficiary. Fuel suppliers, electric, gas, and, most important, oil suppliers, as well as the public sector, must play roles that are supportive but not in lieu of the homeowner's role.

We concur that a practical and fair program is needed. It should be more aggressive and more effective, and we are willing to do our part.

We have several ongoing cost effective conservation activities, and we are interpreting with many others. Unfortunately, verified customer response has been minimal.

Much of the poor response is probably due to the fact that Americans were not and are not inclined to modify lifestyles to save energy. Other needs and costs have higher priorities.

However, most recently rapidly escalating costs have provided a motivation—not to save energy but to save dollars. The most cost effective way we know to encourage conservation is through mass communication, advertising, news releases, and public appearances.

In the past 10 years 36 percent of our advertising expense, or approximately $10 million, has been devoted to conservation messages. Additionally, we have periodically distributed news releases and have written special energy conservation articles.

With approximately 201 newspapers and 72 radio stations in our service territory these forms of communication have generated millions of impressions.

It is extremely difficult to measure whether or not these messages have resulted in physical action. But I can tell you that this brochure, "The Waste Watcher's Guide," written and first printed by us in 1973, has been requested by over 360,000 of our customers.

The guide has been recognized in our service territory as the most comprehensive conservation booklet available.

In May 1977 we initiated an attic insulation financing program. The program made available a $600 loan to a residential customer owning his home for the purchase of ceiling insulation for that home.

The work that had to be done by an insulation contractor, and the new insulation material, had to meet or exceed minimum FHA standards, which is R–19 for the metropolitan Chicago area.

Commonwealth Edison was to pay the contractor up to $600 upon the completion of the work, and the customer was then to pay the company back in equal monthly installments over a period not to exceed 36 months.

Our effective annual interest rate is 12.91 percent. Since the beginning of the program, the company has approved and entered into 81 contracts for financing, from a total of 95 requests; 38 were approved in 1977, 29 in 1978, and 14 so far this year.

We are now proposing to terminate the program because of the low level of customer participation and because it appears to be inconsistent with the general policies set forth in the new National Energy Conservation Policy Act.

The act generally prohibits utilities from supplying or installing residential conservation measures or making loans to residential customers for the purchase or installation of such measures.

Instead, the act contemplates a broader offering of conservation services to residential customers. Although our current financing program might be continued under the grandfather provisions of the act, it is unlikely that it could ever serve as an integral part of a new comprehensive plant that is being developed by the State of Illinois.

Moreover, it would be subject to review and termination by the Department of Energy if it finds after consultation with the FTC that Edison is making loans on unreasonable terms or that its program causes substantial adverse effect upon competition.

In view of the low participation in the current program, we do not believe it is worthwhile pursuing.

We have tried to analyze the poor response. Our interest rate is more attractive than that available through most other financing alternatives. For instance, the gas company serving the same customers we do, outside the city of Chicago, has a greater level of participation even though their annual rate is 15 percent.

Since their program started in 1975, approximately 15,000 of their customers, most of which are also our customers, have added attic insulation. Their much better results are probably due to the fact that they essentially eliminate all effort on the part of the customer.

They make an inspection, they obtain bids from some of their 20 subcontractors, arrange for the work to be done, inspect it, and in effect handle the total installation. Customers probably feel uneasy in dealing with individual insulating contractors.

This unusual big company confidence has also surfaced in our conversations with our customers, since many have indicated preference to us in charging the purchase at Sears or Wards, rather than dealing with independent insulation contractors.

I believe that the publicity of the programs coupled with mass communication messages have resulted in a substantial but unmeasurable upgrading. The majority of our customers are more apt to pay on a cash basis due to the relatively low total cost. The average amount financed by participants in our insulation program was $440.

We are proud of our electric heat pump program, today's only practical conservation machine. In our service territory, a typical dwelling using electric resistance heat uses approximately 28,000 kilowatt hours annually.

Substitution of a heat pump can reduce the energy used for heating by a third. Before inducing a particular heat pump, the manufacturer must subject their equipment to a rigorous 1-year test to meet efficiency and reliability standards.

Of the 17 different brands we have tested not all have passed. Due to the increasing cost of energy, customer interest in northern Illinois in heat pumps is increasing rapidly.

In northern Illinois, its life cycle costs are equal to or slightly better than gas heat, and substantially better than oil.

Therefore, the program now copied by 10 utilities in 7 States is a real service since it allows fuels in short supply to be conserved for more critical uses.

We also provide individual assistance on energy conservation to all our customers, whether they be residential, commercial, or industrial. We have found that our large customers, commercial, industrial, have for the most part formal energy management programs, and more often than not individuals within the company responsible for conservation.

We have actively worked with manufacturers of electric cooling equipment to increase their energy efficiency ratios—or EER—and

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have advised our customers, again mostly through advertising, to insist upon equipment having a high EER.

This and similar programs have encouraged manufacturers to phase out the less efficient equipment. Through impoved EER's we, a summer peaking company, can realize reduced summer demand allowing us to save on new equipment and minimize the use of scarce and expensive fuels usually needed to meet our summertime peakloads.

What are a few of the things we are looking at to promote additional conservation. I mentioned previously that we are assisting in the development and will participate in the State of Illinois, residential conservation service program. Our exact role in the program is as yet undetermined.

We have established and are expanding seasonal rates for all our customers. This may minimize the installation of new high cost generating capacity. We also have mandatory time of day rates which may conserve fuels in short supply. These rates provide for a difference in charges, depending on whether the use is an on-peak or off-peak period.

About 700 customers using over 30 percent of the company's total kilowatt hour sales are participating in this program.

Early experience under the industrial rate shows a slight increase in the proportion of offpeak to onpeak use, but the increase is too small to draw any conclusions.

With respect to the company's residential time of day experiment, any judgment of effects on customers must be still more tentative, principally because it is too early to have any substantial quantities of data.

It should also be noted that to some extent response to time of day rates may be long run, and the full effects may not occur for many years.

We soon will launch an energy smart campaign designed to encourage our customers to upgrade their home energy efficiency through the installation of additional insulation and the purchase of energy-efficient appliances. This campaign is somewhat redundant as it was done in the past; but it puts it in a new package.

In summary, we cannot tell precisely what energy savings have been achieved through our activities, nor can we accurately calculate total costs, but every program is, before adoption, subject to an extensive cost and effect analysis. Those that are, in our opinion, not cost effective are not implemented.

Some examples of programs not adopted are an infrared flyover program. Research showed that less than 5 percent of the owners of buildings photographed cared enough to examine the photographs, and of those that did, less than 1 percent took any action.

The State of Illinois' project conserve program was found to be cost-effective; however, very few customers took any action after getting recommendations and payback information.

We are also unaware of any city, town, or village having any conservation incentive that has had better results than our efforts. Although it's impossible to measure the effects of public sector programs, including the Federal tax credit, we believe they have had only a minimal effect in northern Illinois.

As I said before, we would participate in a well-thought out program but, speaking from the electricity perspective, we encourage you not to increase our capital requirements.

We are already a serious capital-short industry, and any mandated programs requiring utility grants or expenses would have to be funded by either increased borrowing at very unfavorable rates much higher than the 13 percent mentioned here this morning.

As a sidelight, we cannot even borrow the money we need to carry out our construction program and, as a result, we have had to cancel temporarily the construction of our Braidwood nuclear plant which resulted in the laying off of approximately 2,000 individuals, or the money will have to be raised from our customers in the form of higher rates.

Programs should be federally instituted and funded similar to that which is done in an attempt to rectify other national problems, perhaps through direct grants, tax credits or interest free loans. Whatever burdens ultimately do fall on the energy suppliers, they should be shared in proportion to their share of the market.

Any way you look at it, there is a difficult challenge in developing an effective program and in making it work equitably in a fashion acceptable to the general public, and without seriously damaging the financial condition of the utilities.

I hope that I have been able to give you some insight into our experiences and along with my colleagues will be happy to answer any questions you may have.

Thank you.

Mr. GORE. Thank you very much.

Mr. Lent?

Mr. LENT. Thank you, Mr. Chairman.

I have a couple of questions for Mr. Linsider.

I am concerned about a possible "catch-22" in energy conservation. I would appreciate your comments.

Isn't it true that utilities still reward consumption with more favorable rates, and isn't it therefore possible that a homeowner who invests in conservation may find his financial savings offset by falling into a higher rate category which is accorded to those who use less energy?

Mr. LINSIDER. That may be true to some limited extent, depending on the company's rate design. But for quite some time, the commission has had a policy of setting cost-based rates, to the greatest extent feasible, and PURDA, the Public Utilities Regulatory Policy Act, includes among its standards an economic justification for declining block rates.

But to what extent the phenomenon you describe applies with respect to any given company, I cannot say. It would depend on the company's rate design.

Mr. LENT. Isn't it possible that utilities would seek additional rate increases to compensate for any short-term loss of its income to them resulting from an effective conservation program?

Mr. LINSIDER. That is a possibility in the short term. If conservation diminishes consumption, there are really three types of effect, immediate, short term, and long term.

The immediate effect is beneficial to the consumer insofar as he would be using fewer units of energy, fewer kilowatt hours of electricity, and to that extent, he would benefit as his bill declines.

The medium term effect is the possibility of a rate increase, as the utility's fixed costs are spread over a smaller number of kilowatt hours of consumption. In the long run, however, the results of conservation will be favorable if it is great enough to permit the utility to defer new construction, which is one of the factors most responsible for rate increases.

Mr. LENT. I think in your statement you said that 49 percent of all the homeowners in New York heat with oil. I know out in Long Island, my district, in the Nassau-Suffolk region, we have more than 80 percent of homes heated with oil. How does the New York State program reach out to those consumers?

Mr. LINSIDER. Recently we included replacement oil burners within the program. A number of the utilities have taken us to court on that, but except in one service territory—Rochester—the program is in effect with respect to replacement oil burners pending litigation. We are awaiting a decision from the appellate division.

Under the program, somebody who heats with oil can have an audit done by his local oil company. If the result would suggest particular energy conservation measures are suitable and comply with the 7-year payback requirements of the program, financing for them would be then available through the utility.

Mr. LENT. Do you have any trouble with the fairness or equity in having electric and gas rate parties consume the cost of subsidizing more than 90 percent of the cost of an energy audit in an oil-heated home?

Mr. LINSIDER. I have some trouble with the equity in that even if it's a gas-heated home. In an oil-heated home, even if the conservation measures are quite effective, they're not likely to do very much to help utilities or their ratepayers, though they will diminish that particular customer's oil consumption.

Mr. LENT. One thing you said that caught my attention; you indicated that of 190,000 audit requests there were only 536 requests. At face value, that seems to suggest a lack of followthrough by the consumer and might raise questions about the effectiveness of the program.

Mr. LINSIDER. As I think I pointed out in another part of my statement, there is evidence that, of the people who have requested type A or type B audits, some 40 percent proceeded to install conservation measures, and the relatively small number that have had utility financing is consistent with the evidence gathered by the 1977 survey which showed that financing was a problem for only 1 percent of the people.

It may well be that here we are dealing with people who can afford a type A Audit or type B Audit. If somebody is really strapped for funds, he might not use these types of audits at all.

Mr. LENT. Only the more affluent homeowners, your better educated would take advantage of that?

Mr. LINSIDER. Right; though there is also the State energy office evidence that 30 percent of the people who get type C audits also proceed to install conservation devices.

Mr. LENT. If this Congress were to decide to approve a program of Federal grants for home insulation rather than loan subsidies, are the utilities in your opinion capable of and willing to undertake the administration of a grant program acting in effect as a passthrough mechanism to channel the Federal grants to homeowners who apply?

Mr. LINSIDER. I can't speak for the utilities, of course. I take it your suggestion is not that they themselves would make the grants available out of their own funds. They would simply administer the program.

Mr. LENT. The utility companies in a given State, your State, for example, act as the passthrough for the Federal funding?

Mr. LINSIDER. That is something I would have to think about. It certainly seems a reasonable suggestion insofar as the utilities are familiar entities to the people who would be using the funds. It's something that the commission would want to take a look at, and I would hope that something like that would not be mandated on the States generally, but would be an option.

Mr. LENT. You heard Mr. Ertler's testimony on the Oregon plan which is, at least it seems to me, to be more far-reaching than the New York plan where there is no payback required until the house is sold.

Would that kind of a program be feasible in a State like New York where we have so many oil as opposed to electric heat?

Mr. LINSIDER. It's possible that a much longer payback period and no interest loans would increase the use of financing. On the other hand, the conditions in New York do differ from those in Oregon.

We heard some comments about the way in which conditions in Oregon differ from those in Florida; those in New York differ as well.

Mr. LENT. Could New York utilities, just off the top of your head, could New York utilities stand the financial drain of trying to handle a program like the Oregon program where they handle this thing at their own expense, and never saw it recompense until the house was sold?

Mr. LINSIDER. I think it would be difficult. It would be an additional obligation that they would have to recover from their ratepayers generally.

Mr. LENT. In higher rates?

Mr. LINSIDER. Right; and as I pointed out in my statement, in determining the funding for any sort of an arrangement, it's important to recognize that if utility rates are in effect used instead of taxes it's a much more regressive arrangement. The tax system is, more or less, progressive.

Mr. GORE. Will the gentleman yield briefly?

Mr. LENT. Yes.

Mr. GORE. Is it your opinion that the main difference between the Oregon situation and New York's is the ratio of baseload to incremental power or, in other words, most of their current power is hydro and the average unit cost is very low, but the incremental additions will have to be more expensive kinds of power, whereas your baseload and increments are closer together.

Mr. LINSIDER. That is certainly an important part of it. New York has a small amount of hydro, and there is also at this point a reasonable amount of excess capacity around the State, so the beneficial effect of deferring additional construction would take longer to be realized.

Mr. GORE. The word I should use is average cost versus incremental cost. The average cost in Oregon is much lower than your incremental cost; but the differential is much smaller.

Thank you for yielding.

Mr. LENT. Thank you, Mr. Chairman.

If I could just ask Mr. Ertler a couple of questions. How do you feel, Mr. Ertler, about how you deal with the problem of renters who pay the utility but are reluctant to increase in long-term conservation measures that become permanent improvements in a building that they have no equity in?

Mr. ERTLER. Presently the renter situation is a problem. We will provide a home energy audit for renters to identify within their living unit areas that they might save energy, but our zero interest plan, as well as the 6½ percent State legislated plan have to be covered, the mortgage is signed by the owners of the dwellings, and so it's the owner's benefit, and we have to find some way of providing the incentive for the owners to take advantage of the program, and this in some instances can be a problem.

Mr. LENT. It would seem to me if your owner or your landlord does not pay the utility under the terms of his lease, he has no economic incentive really to conserve, even under your Oregon plan, which is so liberal.

Mr. ERTLER. His basic incentives are that his costs and taxes are increasing; and if he can reduce the utility bills of his occupants, he has in fact increased their capability to pay the rent.

He has also increased the value of his property, and that at such time that he does want to turn the property over he can recoup those increased costs because the value of his investment has gone up somewhat, but it has to be looked at by having greater capability for the renters to pay their rent.

Mr. LENT. There are reports that under the Federal tax credit program some taxpayers have attempted to claim these conservation credits for installation of window awnings, the planting of tall trees near the house, and so forth.

How do you go about determining what is and what is not an allowable conservation measure under your program?

Mr. ERTLER. We have written basic items into our program that we will only finance. Basically, it includes ceiling insulation up to the R-value of 38, floor insulation R-value of 19; storm windows, storm doors, weatherstripping, caulking, and if they have a 4-floor stair heating system, we will also include the wrapping of the ducts, the heating ducts for that, but we limit it to that, so that those are the only items that we will finance under the program at this time.

Mr. LENT. Maybe this is unfair, because it seems to me it's a question for the Internal Revenue Service. Let us say you come into my house and do $1,000 worth of work, insulation work, on my house and put a lien on my house for $1,000, and I know I don't have to pay it off until I sell the house.

Am I then permitted in that year to claim that credit or must I wait until I actually pay the credit?

Mr. ERTLER. It's my understanding that you are entitled to take the Federal tax credit at that time.

Mr. LENT. Immediately, so you are not only fixing up my house, but you are giving me what, $150 tax credit?

Mr. ERTLER. Right; in the Federal tax credit, it could be up to $300 itself.

Mr. LENT. I am amazed that the lines don't stretch out into the street.

Mr. ERTLER. I don't know why more people don't take advantage of the tax credit.

As to the tax credits that are available in the State of Oregon, the attorney general of the State of Oregon gave an opinion that any type of incentive program be at the 6½ percent State-legislative program, and our zero interest program does not qualify for the State tax credits.

However, we refer the homeowners to their accountant or to the IRS about the Federal tax credit. The response we get back from them, it's no more different than your financing it on your VISA card, for example. You have deferred payments down the road, but you can in fact take advantage of that expenditure now.

Mr. LENT. One or two questions for Mr. Petkus, who referred earlier to the NECPA law insofar as it discourages utilities from doing the insulation work themselves, and it discourages utilities in providing the financing for insulation.

Do you feel that is a drawback, that that is a good rule to keep the utilities out? Do you think it would be more effective if the utilities were permitted?

Mr. PETKUS. It has been demonstrated here this morning that financing is not really a crucial piece of input to the action decision. Most people—and again mainly in northern Illinois, but it has been said here this morning—have not utilized the financing program, so I don't think the financing program is all that critical to additional conservation measures by customers.

We have looked at whether or not we want to get into the insulation business, and we determined that that was not our mandate and we really should not be in the insulation business, so we totally agree with the act in that utilities should not suppress free enterprise, because again the customers would tend to go to the utilities rather than the insulation contractors.

There is a general distrust, I would say, on the small insulating contractor by our customers.

Mr. LENT. There are some proposals in Congress to extend the energy audit required by NECPA to apartment houses and to commercial buildings. What would this do to the cost of the program to ratepayers and would the energy saved still make the program cost-effective?

Mr. PETKUS. Half of our customers are in Chicago and the other half are in essentially northern Illinois. Apartments are very hard to insulate, whether they be two-flat, two-family residences, or more. This is where your poor primarily reside also in that these buildings were built several decades ago, and they also have in

Chicago traditionally flat roofs, which are very, very difficult to insulate.

You have to essentially strip tar and gravel off and put down a rigid insulating board, so we see as far as apartments not being the primary place to save on energy. They also tend to be a little bit more energy efficient than a single-family residence, because you have several family units under one roof which is your larger source of heat loss.

The gas company in Chicago doesn't even have the plan, because the survey that they did showed that people really could not physically insulate the old dwellings.

Mr. LENT. Thank you.

Mr. GORE. Would it be cost-effective to at least consider putting something down on top of the existing roof and putting a new layer of tar and gravel on?

Mr. PETKUS. It wouldn't be too cost-effective, but it's the only way of doing it, certainly. You really have to strip the tar and gravel off and put a rigid board and reapply your levels of tar paper and tar and gravel.

It's not really too cost-effective, because again you have very few blowing units in the roof. You have a lot of the sandwich apartments.

Mr. GORE. Furnace retrofits would be the best way to go?

Mr. PETKUS. Or windows.

Mr. GORE. I recognize Chairman Reuss.

Mr. REUSS. I thank you very much.

I want to thank all of the witnesses for their excellent testimony and for the public service jobs that their companies are doing, the State of New York is doing, and if some of the questions of this panel, including my own, sound as if we were suddenly roofers, siders, and insulating contractors, it is simply because by our becoming roofers and siders that we learn a little about it and this is going to characterize my questions, too.

Mr. Petkus, in Commonwealth Edison's territory, which is basically Chicago land, your electricity is supplied 40 percent nuclear, 50 percent coal, 10 percent all others or something like that?

Mr. PETKUS. It's 45 percent nuclear; 45 percent coal, and 10 percent others.

Mr. REUSS. Right. Electric heat in Chicago, and I live in Milwaukee, which is similarly favored by nature, not to take anything away from your company, but it's not a very good bit, is it?

Mr. PETKUS. It has been traditionally more expensive. Electric resistance heating is more expensive. The early electricity heat users were primarily people who were looking at oil versus electricity, and that was not too bad. You were able to insulate and show a payback on the insulation by reducing the energy, electrical energy that was required, and you could, by comparing unequals, say that electric heat was essentially identical.

Btu for electric heat is more expensive, but the heat pump, now that we are in the second generation of electric heat pumps, the first generation in our territory was nearly a disaster, because they were designed for warmer climates.

The electric heat pump, as I stated, is now competitive with natural gas in northern Illinois, and I think further improvements

in heat pump technology might actually give electric heat using a heat pump, again in northern Illinois, and it has been a long time since I paid rates in Milwaukee myself, and I think you will see more and more interest.

Electric heat pump sales in northern Illinois are taking off. There is a certain size unit; there are waits of up to 6 to 8 months.

Mr. REUSS. In your Chicago land area, home and office heating is supplied by electricity in relatively small amounts, you can give me the percentage in a minute, and by natural gas; is that not so?

Mr. PETKUS. It's 5 percent electricity in the residential market, 5 percent oil, 90 percent natural gas.

Mr. REUSS. Right. Now, Chicago is blessed with an excellent system of commuter rail, people from Owaneco, Libertyville, everywhere else get in pretty well by rail cars run by seven different railroads and managed by the Regional Transportation Authority.

Those railroad prime movers burn oil, diesel, and then they make electricity. None of that rail is now electrified, is that not so?

Mr. PETKUS. There is one railroad; the Illinois Central.

Mr. REUSS. The others are not?

Mr. PETKUS. The others are diesel.

Mr. REUSS. My question, which is sort of a corporate question to your company, wouldn't you be doing a better service to our oil beleagured Nation if, instead of trying to increase your share of the home and commercial heating market, which is now 5 percent but, you said, growing, you somehow with the aid of Government, business, labor, Chairman Gore and everybody else, tried to sell Chicago on electrifying those rail lines? That works pretty easily now.

You have an overhead dingus instead of a dangerous third rail. That would tend to beat the Arabs, wouldn't it, if you could do that, because you would be ousting oil as a maker of electricity in the diesel cars, and you obviously have got extra electricity to sell or you wouldn't be wanting to get into the heat pump market, which I don't begrudge you, but what about that?

Who puts their minds on that kind of a question?

Mr. PETKUS. We have approached the railroads, and the primary problem there is that the railroads are not rich. Unlike the electric utilities, there is a tremendous shortage of capital, and they look at the investments and they shudder and they keep using the diesel power. They have been cooperative, and we have worked with them where in extremely cold weather, overnight they continually run the diesels so they would start in the morning.

It has now been supplemented by electric, essentially like block heaters, so we are keeping the diesels warm overnight and not running them. Most of those cars now have been electrified because we were generating the electric power. Most of them now during the cleaning periods are plugging in rather than using the self-generated power.

Mr. REUSS. True, but when they are running, they run with friendly Arab oil?

Mr. CORCORAN. Mr. Chairman, would the gentleman yield?

Mr. REUSS. I certainly would yield to someone with considerable experience in midwestern railroads.

Mr. CORCORAN. As the gentleman knows and indicates, prior to coming to the Congress I worked for the Chicago & Northwestern

Railroad, which is doing a lot better these days since I came here. But I would just inject one point, and that is, I think the gentleman from Wisconsin, as he often does, makes a very good suggestion.

One of the difficulties would be that the current status is one where the regional transportation authority contracts out with the railroads and buys the service of the passenger service in the metropolitan area. In the process of doing that, you have both the freight trains and the commuter trains using the same track.

I suspect that if the ownership were changed to the point where the RTA would own its own fleet of commuter trains and could in some way devise a means of getting its own track, then quite possibly the electrical approach, as opposed to the oil approach, might be more feasible.

Mr. REUSS. Yes; a welcome suggestion. I point out that the Northwestern road is still struggling along furnishing pretty good commuter rail for the North Shore. Two of our freight railroads, the Milwaukee and the Rock Island, are belly up and they not only can't afford to electrify but they can't afford to keep their trains on the track half the time.

I also point out that we have something in the world today called a computer, and that is quite a good device for preventing commuter rail trains from zapping freight trains.

They run a lot of trains around Chicago, and they don't seem to hit each other, and that is good to know.

I close this little colloquy by saying that in the Federal Republic of Germany or in Japan, government and industry and labor would not permit this to happen. They would solve these problems. If it's a matter of providing capital, this country has capital running out of its ears for proper purposes.

I strongly suspect that the Arabs and OPEC would be disadvantaged if Chicago land used its available electricity to run the commuter railroads for 40 miles around town; but it takes a lot of organization, and while I wouldn't like to divest Congress of Mr. Corcoran and send him back to his detail, that is really what it takes.

Thank you very much.

Mr. PETKUS. There is interest from the railroads in that 40-mile radius of the city. To pass that long haul, you really have to use the fuel oil.

Mr. REUSS. You have got some extra electricity to sell right now. Haven't the new plants which you have put on line made you fat for a change?

Mr. PETKUS. We have at the present time an adequate reserve capacity and with the decreasing demands we have been experiencing, it has been growing, so in the early 1980's we will have more than what we need as far as reserve margins.

Mr. REUSS. I would love to see your company prosper selling electricity in a way that will oust imported oil.

Thank you, Mr. Chairman.

Mr. GORE. I would ask the indulgence and patience of the witnesses. We have a vote on the floor relating to a rule on the Federal Trade Commission bill which will be followed by a second vote, so we are going to adjourn for approximately 20 minutes,

perhaps 25 minutes, to make those two votes, and I am sorry for any inconvenience, but we will resume the questioning of the panel at that time.

[Brief recess.]

Mr. GORE. The subcommittee will come back to order.

I recognize now Mr. Dannemeyer.

Mr. DANNEMEYER. I would like to ask Mr. Ertler a question.

How long have you been working in utility work?

Mr. ERTLER. I joined them in June of 1965—about 13 years.

Mr. DANNEMEYER. I have travelled a little of Oregon, and I am aware that you get a lot of rain, and it's colder than it is in California.

The homes appear to have been constructed similar to the homes in California. I am curious as to apartment houses in the area of Oregon of which you have knowledge, when those homes were constructed.

Do you have any idea what percentage of them have insulation placed in them as a result of the time when they were built?

Mr. ERTLER. We have run a couple of surveys. In ceilings, typically there is about 4- to 6-inches insulation in the ceiling, and in single-glazed windows, minimal wall insulation.

Mr. DANNEMEYER. What is minimal?

Mr. ERTLER. If any at all, it's about 1 to 2 inches of fiber-glazed material that is in the wall; nothing in the floors.

Mr. DANNEMEYER. They must lay on wood floors or on slabs?

Mr. ERTLER. The majority of the floors are wood floors over ventilated crawl spaces.

Mr. DANNEMEYER. And when they were constructed were they insulated?

Mr. ERTLER. No; they were not. They were uninsulated. The reason the insulation levels in those homes, when they were built, were left that way was primarily because, in the Northwest, of the very, very low electricity costs.

Mr. DANNEMEYER. Primarily electricity?

Mr. ERTLER. The electric rates were very, very low, and there was not really any great incentive. If you could pay your utility bills out of pocket change, there really wasn't any need to spend several hundred dollars when you were constructing a house in order to put in insulation. Consequently, today, as the rates have gone up, there is a larger interest in putting insulation into the homes out there.

Mr. DANNEMEYER. Do I understand that your company is extending interest-free loans to these folks?

Mr. ERTLER. If they have electric space heating.

Mr. DANNEMEYER. What percentage of the homes have electric space heating?

Mr. ERTLER. About 40 percent of our residential customers have electric space heating and, as an aside, I heard one of those persons that testified make a comment about the new construction area.

Our new construction that is going on now, 90 percent of the new residential construction that is going on primarily throughout the State of Oregon is putting in electric resistance heat today, which to me points out the need to have any type of legislation that goes

on to address itself to regional areas, because the thing is so diverse across the country.

Mr. DANNEMEYER. How does the cost of natural gas heating compare to electric heating today?

Mr. ERTLER. About equal. I have not looked at the numbers in recent time, but it is either equal or the electric rates are slightly lower than natural gas. Both the electric and natural gas rates are substantially lower than oil heat.

Mr. DANNEMEYER. Construction costwise, is it not cheaper to put in panelled heating? Is that not cheaper than duct work for natural gas?

Mr. ERTLER. Most of the people tend to be putting in forced air electric systems which requires duct work, and I think the concern is not necessarily the initial cost but the concern tends to be, the services are about the same, and people have the feeling that it is better, and they know it is going to be around for a while. Perhaps natural gas and fuel oil are recognized as limited resources.

Mr. DANNEMEYER. There is a difference between electric fuel duct heating and wire-space heating. I thought you said 90 percent of the new construction work?

Mr. ERTLER. I said electric resistance heating.

Mr. DANNEMEYER. That is where they put the wires in the wall?

Mr. ERTLER. Not necessarily; the energy used for space heating, baseboard system, which is the type of system that is mounted on the exterior walls and normally under windows, the resistance heating in place of ceiling cable heat where they install imbedded wires in the ceiling, and the forced air electric heating systems where you actually take in like a gas furnace and blow air across the electric resistance wire and distribute that heat throughout the house through duct work, all require about the same amount of energy.

Mr. DANNEMEYER. In the State of Oregon are they requiring insulation in ceilings and walls in accordance with new construction laws?

Mr. ERTLER. Yes; in Oregon, a new house being built after January 1, 1979 requires an R-30 worth of insulation in the ceiling, double glazing of the windows. An R-9 in the floor and R-11 worth of insulation in the walls, so that is making it pretty good.

Mr. DANNEMEYER. Do you think it's in the interest of your State for the Federal Government to adopt a program which will tell you, the State of Oregon, what R-rating you are going to have to establish retrofitting for existing residences, and also what R-rating is going to be required for new construction, and specify whether you are going to have electrified space heating or gas-fired space heating?

Do you think that is of interest in your State?

Mr. ERTLER. It's a tough question to answer. I think in Oregon, in the Northwest, we are pretty much doing the job of conserving energy. If proposals were made that address themselves to the particular energy mixes, particular construction areas that occur within your given areas, you will find that it changes probably even within the States, depending on whether you are in coastal climates or in a central plateau desert area. If federally you could

take care of it to take into account all of those things across the country, it's probably not bad.

Mr. DANNEMEYER. Let us examine that thought for a moment. Supposing we wrote a law at the Federal level which would take account for the variations in the States of housing conditions and weather conditions and fuel supplies and labor forces and the political realities of life, and then within each State take into consideration those various differences, by the time we got through writing such a law, would we really have anything that would make any sense anyway?

Wouldn't we be better off leaving those questions to the people such as yourself that live and work in Oregon and make a living than to try to figure out some bureaucrat in Washington who is going to decide all of these questions all over the country?

Mr. ERTLER. How can I argue with your knowledgeable comment?

Mr. DANNEMEYER. Now, how do we pay back this interest-free loan?

Mr. ERTLER. We have the homeowner sign a mortgage. We inspect the work after it is installed.

Mr. DANNEMEYER. Do you record the lien?

Mr. ERTLER. Right; when the house sells for consideration, for dollars.

Mr. DANNEMEYER. Are you contending that it is cost-effective to go in and put insulation in a wall in an existing residence, taking off the wallboard and putting in insulation and put the wallboard back on? Is somebody contending that that is cost-effective?

Mr. ERTLER. I might comment that wall insulation is not included in our program, but there are some relatively easy methods of installing wall insulation.

Mr. DANNEMEYER. Take either the outside or the inside off and replace it.

Mr. ERTLER. Usually the way they install wall insulation, they bore holes about 2 inches in diameter between each stud space at the bottom and at the top, and a blowing device can actually blow the insulation and fill that cavity between each stud with insulation and then they seal off the holes that were originally put in there, and the homeowner, of course, has to repaint the house.

Mr. DANNEMEYER. How do you get by the fire blocks, the diagonal blocking that was put in there as a part of the construction to begin with?

Mr. ERTLER. Depending on the age of the home, some of our homes do not have fire blocks in there; but those older homes that do, you have to bore those holes through.

Mr. DANNEMEYER. There are not very many homes around with walls built with 2 by 4's without diagonal blocking and fire blocking.

Mr. ERTLER. Newer construction.

Mr. DANNEMEYER. If there is, some building inspectors were not doing their job.

Mr. ERTLER. I can't answer that directly. All I know is the homes that I have personally looked at within the past 15 years out there don't have the horizontal fire blocks built into them, that I think the fire protection has been built into the gypsum board.

Mr. DANNEMEYER. Existing homes built on slab floors without insulation, that is cost-effective? It's easy to crawl in there and put the insulation in.

Mr. ERTLER. Yes.

Mr. DANNEMEYER. Similarly, cost-effective on the ceiling?

Mr. ERTLER. True; I might just add to the comment, if I may, the one drawback that we find and why we do not finance wall insulation in our program—the retrofit of wall insulation under our program—is because of the big controversy going on about moisture problems and how you place vapor barriers on retrofitted walls. There are studies going on in Oregon how to identify if you do not install a vapor barrier.

Do you in fact contribute to drywall within the wall by the passage of moisture from within the house to outside?

Mr. DANNEMEYER. What did you say, and I have just about concluded, Mr. Chairman, what did you say the cost was for residences for what footing to establish compliance with R-38 and R-19?

Mr. ERTLER. The addition of ceilings, storm windows and storm doors, floor insulation, the average house we are financing is $1,354.

Mr. DANNEMEYER. By what amount do you say that will result in a reduction of a monthly bill?

Mr. ERTLER. I will give you the annual bill. We say that the energy saving is approximately 5,200 kilowatt hours annually. Our current rate is 2½ cents a kilowatt hour, about $125 a year.

Mr. DANNEMEYER. Thank you very much.

Mr. GORE. I am afraid we have another vote on the floor.

We will stand temporarily adjourned until the next vote.

[Brief recess.]

Mr. WALGREN [presiding]. The hearing will resume, and I want to apologize to the witnesses for the rotating chairmen, but I am sure you understand what we are making here is a record that hopefully will support some new directions in which we should move.

I would like to ask, and I have not been in the room so I don't quite know what you have covered, but I would like to ask the panel generally what you can suggest or would suggest as a method of reaching rental housing units.

I think we are all impressed with what can be saved in terms of drilling for oil in our own homes, but how do you reach people who are renting units and, therefore, really don't have the direct economic interest, and the interest of the landlord is also being washed away by being able to pass on costs in terms of rent.

Can I address that question to Mr. Kordecki directly?

Mr. KORDECKI. I am going to have to describe the position my company is basically in, in terms of the rental market, and probably the bulk of Florida.

We are basically a transitory market in terms of low occupancy time. Not only does the apartment owner have no incentive, neither does the renter in terms of any long-term benefits.

I do not have figures for the average day in the rental housing in our particular area, but the average is less than 1 year, so even

though utility bills may be relatively high, and that is relative, there is no incentive.

The incentive has to be made to the building owner. In most cases lease agreements tend to have provisions which allow most renters not to be able to do anything anyway except for the do-it-yourself type things that they can control, either their esthetic type covenants, so they can't be done.

In terms of how do you get to that type of owner, I guess to oversimply it, and I really believe this, I think about the rest of the residential market. I think, in descending order, you are going to have to first give it away to get the volume.

Second, you are going to have to make it as simple as you can. People have testified here today of all different types of interest programs or subsidies, none of which have been relatively effective.

I don't know how you give it away, but make it as easy as you can, and with the apartment market you will have to deal with the building owner. He has very little incentive.

Neither party has any incentive. I am sure conditions in New York and other areas are significantly different than that.

Mr. WALGREN. Let me broaden the question to you, Mr. Kordecki, just to include the inability of tax credits to reach low income, middle and lower income individuals where we provide an itemized deduction. It doesn't mean anything to people in those brackets, because they either don't think in those terms or they don't file their income taxes in that frame.

Are we faced with the same problem of, as you know, having to give it away to reach those people?

Mr. KORDECKI. Our studies, which are obviously confined to our area and confined to the people we have been dealing with, the tax credits basically were ineffectual no matter what the income brackets were. There was not a particularly strong interest in terms of—there would be much greater interest in first cost considerations.

People were not interested in making loans. They didn't want to encumber themselves in borrowing any money and didn't care what the interest rates were. As far as low- and middle-income people—and again I am going to have to address it to my area—low-income people in the more moderate climates tend to be very low energy users.

We don't have great requirements for heating.

Mr. WALGREN. There is someone here from Albany. Can you tell us about whether the low income people are low energy users in Albany?

Mr. LINSIDER. That is not always the case. Some studies presented to our commission in connection with a proceeding which it ran showed that while there was some correlation between income and energy use, there was not a perfect correlation. A lot of low-income people are high energy users, and a large number of high income people are low energy users.

Mr. WALGERN. It's incredible the House just yesterday, as you know, passed a $1.3 billion transfer to utility companies for, perhaps not just utility but companies supplying heat to the public, and yet we are saying that we don't have any particular approach to the very people that we just provided that transfer payment to.

Do we have to by mandate go in and weatherize these homes in some way?

Mr. LINSIDER. That would certainly be one alternative. For various reasons, renters have been very difficult to reach. Over 90 percent of our program's participants have been homeowners. Only a total of 81 renters have even requested audits. There is a difference to be drawn, though, between a situation in which the tenant pays for heat as part of his rent and one in which he pays for heat himself.

If the tenant pays for heat as part of his rent, which means, in effect, that the landlord is paying the heating bill, then the landlord will have an economic interest in installing conservation measures.

But in a case where the tenant pays directly, only the tenant has as an economic interest in conservation. You then have a very difficult situation, because it may be impossible for the tenant to install conservation devices. I suspect that, in any case, a program for rental units would have to be directed toward landlords rather than tenants.

Mr. WALGREN. Mr. Ertler, would you like to add anything to this problem?

Mr. ERTLER. It is a problem, and I don't know that I have any suggested solution on how to resolve it other than the comment made by the gentleman from New York. Carrots or sticks, I don't know, but I think the programs must be addressed somehow to the landlords in order to get the problems resolved.

Mr. DANNEMEYER. Will the gentleman yield?

Mr. WALGREN. Do you feel a low interest loan would get a response from a landlord?

Mr. ERTLER. In Oregon we do have a low interest loan that is available to multifamily dwellings. It's 6½ percent payable back in monthly installments over a 10-year period of time, and participation has not been that outstanding.

Mr. WALGREN. What about no interest loans?

Mr. ERTLER. Our zero interest program is applicable only up through duplexes, and there are some economic reasons behind that.

If somebody would like to know, I could explain it; but primarily, if a renter of a half a duplex or whatever calls us and expresses an interest on how they can weatherize their home, we make an attempt to directly contact the owner of the rental property.

In most cases we have been able to sell to the owner the need for weatherization of that duplex, and in fact they do go ahead.

Mr. WALGREN. I see.

The Chair recognizes the gentleman from California.

Mr. DANNEMEYER. I thank the chairman for yielding.

Getting back to those figures we were working on, if the cost is $1,354 to retrofit a residence, and that results in an annual savings of $125, it's pretty obvious why you are giving interest-free loans, because the interest on the capital cost of retrofitting is in excess of the annual savings of energy which the consumer has to put out of his or her pocket.

Mr. ERTLER. That is true.

Mr. DANNEMEYER. We are all motivated by self-interest. People figure things out pretty quickly. If the part that the consumer has to pay monthly does not show up as a saving to him, he will have little motivation to try to conserve anything, because it is not in his interest economically to do it.

We can't pass laws that are in people's economic interest. That is against human nature. It strikes me if we are truly sincere about conserving energy by retrofitting existing homes, we will have to devise some programs, and the State or Federal Government will have to assist.

Do you think that is a fair statement?

Mr. ERTLER. I think that is fair. I am not too sure even tax credits or tax grants are the total answer to the problem, and the reason I say that is it still requires some upfront capital by some people in order to get the credit back, and if you have somebody, especially in the low-income area, they might not be able to come up with any upfront capital in order to take advantage of the grant.

Mr. DANNEMEYER. I have a question of the gentleman from Chicagoland as described by Mr. Reuss over there. Most of those houses I have seen in that area are all brick. Is that a fair statement?

Mr. PETKUS. They have been. Now, with the cost of brick escalating, you are seeing more frame homes.

Mr. DANNEMEYER. How do you retrofit a brick house with insulation?

Mr. PETKUS. In the majority of the cases we never recommend touching the walls, and again we don't find that to be usually cost-effective.

If you can open up a wall, you will find, if you don't have a cross brace for a fire protection device, you will find an empty beer can in there or something.

There are too many things that really impeded putting insulation in the walls of existing residences. We have done it and helped people, but it is not one of the things that we consider to be cost-effective.

Mr. DANNEMEYER. How about ceiling?

Mr. PETKUS. Ceilings, the biggest single heat loss is through the roof of a home. That is your single most effective measure.

Mr. DANNEMEYER. Are most homes that exist today, residences, single-family residence in the Chicago area, have they been built with ceiling insulation in the attics?

Mr. PETKUS. When you are in the city itself, the answer is definitely no. When you move to the suburban areas, the answer is more of them have some insulation. When you are in the city, those buildings for the most part are very old and they were built without energy conservation in mind.

There is really nothing there.

Mr. DANNEMEYER. How about floors—slab floors or joist floors?

Mr. PETKUS. That is even less existent than ceiling insulation. The most common insulation you will find in Northern Illinois is in the ceiling or the roof or something. Very seldom will you see insulated crawl spaces or permanent insulation around a home on a slab.

Mr. DANNEMEYER. Has the utility which employs you in Chicago embarked on a program of establishing some incentives for putting insulation in ceilings in existing homes?

Mr. PETKUS. Yes; we call it the attic insulation program, and we do have that loan program. We have it, and the gas company has it, and would serve the same area.

Mr. DANNEMEYER. The interest rate was how much?

Mr. PETKUS. The interest rate is 12.91. We had 81 takers over a period of 3 years.

Mr. DANNEMEYER. That is a mystery as to why you had so few takers.

Mr. PETKUS. We believe the small expenditures. Again, our average expenditure is $440, which people are more apt to pay cash rather than finance it. Again, the people who are interested in energy conservation and insulating the homes tend to be middle class and above, not necessarily the poor. One of the problems when you get into the poor, these older buildings, the biggest thing that is absent in these buildings is controls.

They have typically a boiler, a plant that puts out heat and people control the temperature of their dwelling unit by raising and lowering the windows.

Mr. DANNEMEYER. Do you think the Federal Government should pass a law which would mandate for any single family residence in the United States that they have insulation in the ceiling installed by a certain date?

Mr. PETKUS. I won't comment on whether you should pass the law. It would be the single most important conservation matter that you could adopt, ceiling insulation.

Mr. DANNEMEYER. Thank you.

Mr. WALGREN. Mr. Corcoran?

Mr. CORCORAN. Thank you, Mr. Chairman.

I know that we have covered the ground fairly well, and I certainly appreciate the contribution of the panelists. I understand the staff has a few questions. I would defer to them.

I would like to make a comment. I think that the Congress has up to now been following a financing strategy in order to try to get conservation either through the direct grants as we in the House approved yesterday, or as has previously been done with the tax credits, to reach people in order to encourage conservation.

I think, while your statements indicate that there are a variety of things going on around the country, that if we really want to get at that huge payoff on conservation, we are going to have to rethink our strategy on financing mechanisms.

With that comment, I would yield back to the chairman.

Mr. WALGREN. The Chair would recognize the staff at this point for questions.

Mr. SIMS. Thank you, Mr. Chairman.

This is to the panel generally. Most of the questions this morning have addressed either single family residences or apartment-type buildings, particularly in rental units we are talking apartments.

In rural America, however, the majority of rental units I understand are single-family detached houses. Therefore, they are much easier to retrofit than apartment buildings.

Do you see any reason why a Federal program could not address these particular types of rental units?

Mr. PETKUS. In Northern Illinois there are very few single family rural homes that are rented. I would guess you are looking at a fraction of a percent. Most of the single family homes are owned.

Mr. KORDECKI. With the exception of migrant camps, citrus pickers, the same thing pretty much.

Mr. ERTLER. In our situation I think the majority of the rural homes are owner occupied. But I see no problem if there are some buildings for workers or laborers or so on that are single family type homes, the utility bills are predominantly, at least in our area, being paid by the owner of the farm or ranch or whatever you want to call it.

So, it would be to their economic incentive to insulate those homes for their people. I don't see any problem.

Mr. LINSIDER. I don't know what percentage of homes in New York State are single-family rental units. But I would assume you would have the same difficulties there as you would with multifamily rental units; that is, a question of deciding whether the program should be directed toward the tenants or the landlords.

I am not sure that the problem is any easier in the context of one-family houses.

Mr. SIMS. Is there any disagreement among the panel that to effectively reach the rental market you are going to have to have a very substantial subsidy, either to the dwelling owner or to the renter? Would anyone dispute that that is probably what it is going to take to have a substantial takeup on the part of these people?

Mr. PETKUS. The word "subsidy" I don't think, is necessary to the final solution. I think an interest-free loan for a multiple building owner might work almost as effectively.

Again, in urban areas you are seeing a lot of renovation of older buildings. If you could somehow assist them in lowering their cost of renovation by providing interest free loans for insulation, for double glazing, things like this, you might find that to be quite effective.

You don't necessarily need outright grants, I don't believe.

Mr. KORDECKI. It might be a combination of approaches in terms of if the landlord is basically paying some or part of the utility, I think he has an inherent interest, obviously, in something in the financing area, either low interest rates or no interest would be very attractive.

In the case where the tenant pays all of the utility bill, I think you have the most difficult problem in terms of trying to get some reaction out of the landlord. I think you are just about going to have to give it away.

He has absolutely no incentive whatsoever.

Mr. SIMS. Thank you very much, Mr. Chairman. I have no further questions.

Mr. CORCORAN. Mr. Turner?

Mr. TURNER. Thank you, Mr. Chairman.

Just one question I wanted to ask that hasn't been asked before.

It goes to the question—I think I would direct it to any one of the panelists—I don't think any of your programs calls for or

requires, mandates or otherwise provides for a post installation inspection or an audit. Is that correct?

Mr. ERTLER. Ours does.

Mr. TURNER. OK. I am just wondering about two problems that that presents. One is the additional cost that might detract from the cost-effectiveness of an energy conservation program.

The other one is the possible utility that might be incurred when a utility certifies that the work has been done properly, and that it is presumably effective and in the long run the consumer has problems with the work that has been done. Is it possible that the utility will be held liable?

Mr. ERTLER. We do inspect every home afterwards. But we feel that it is in our best interests to do that because in the mechanism in which we are treating the energy that we are getting by retrofitting, we are treating it as a resource, we are rate basing the dollars that we are financing, just like we would a new power generating facility.

So we feel it very essentialy that we somehow get a handle that we are in fact getting the energy that we are thinking we are getting.

The second area about the utility exposure is that we have a written agreement or a contract with each one of our contractors that do work for us. Our attorneys feel that that contract provides the appropriate protection to us from that happening.

When we inspect, we primarily look that the insulation contracted for is installed to give us the energy that we are after. They feel the way the contract is written, that if the homeowner did have some problem—for example, if the insulation perhaps in the ceiling took on a load of moisture and the ceiling fell in for some reason—that we probably would be named in some type of a lawsuit but the contractual arrangement between us, with the contractor, naming the homeowner as a third party beneficiary, would pretty much take us out of any liability problems.

Mr. TURNER. Well, you have enough of an experience factor to tell me in actual fact, has that problem occurred at all since you instituted your program?

Mr. ERTLER. After 1 year of operation we have not yet had a problem.

Mr. TURNER. Maybe that is too soon.

Mr. ERTLER. Maybe 5 years from now I can answer that better.

Mr. TURNER. Thank you very much. That is all I have.

Mr. LINSIDER. May I add something. The New York program requires spot checks of the contractor's work. It has been our view that spot checking, and the threat to remove the contractor from the approved list, are a reasonable way of assuring that shoddy work is not done.

Our chairman was here earlier this week and in the course of his testimony he pointed out that, in our view, mandatory followup in each case probably would not be worth the cost.

Mr. TURNER. And it would add tremendously to the cost of the programs.

Mr. LINSIDER. Yes.

Mr. TURNER. Not because you would not find the problems but because it would add so much to the cost of the program it would negate the savings.

Mr. LINSIDER. It would add to the cost of the program and would not do that much more than the unannounced spotchecking and the threat of removal from the list.

Mr. DANNEMEYER. In the communities that you gentlemen represent, are you required to have a building permit to put in this insulation from the local city or county office?

Mr. LINSIDER. I am not sure. It might depend on whether or not structural modifications are involved. I cannot say for sure.

Mr. DANNEMEYER. Usually installation of insulation does not involve structural modification.

Mr. LINSIDER. Right. If it is simply putting insulation in the roof, for instance, I would assume——

Mr. DANNEMEYER. Just curious—this matter of audit. Are building inspections or permits required?

Mr. ERTLER. No. In the four States our program is operational, only one State, Idaho, requires any type of permit to install insulation. But then it is not inspected. It is just a collection means.

Mr. DANNEMEYER. Where does the citizen get the intelligence that the insulation that is desired will establish compliance with the R factor that you have specified must be obtained in order to achieve this noninterest loan?

You know, there are a lot of subcontractors floating around that will tell you anything. How does a citizen know what they are getting is going to pass muster?

Mr. ERTLER. Part of the answer, I guess, is faith in the utility, that we are in fact coming out and inspecting. Our inspections do require that all the materials installed meet the appropriate Federal and ASTM tests that are required for the various materials.

Mr. DANNEMEYER. You make that inspection before that contractor gets paid?

Mr. ERTLER. Yes.

Mr. DANNEMEYER. An interesting circumstance.

Mr. ERTLER. We require, for example, them to provide a copy from one of the bags that they have installed, for example, in blown insulation, that gives the appropriate density that has been run through the testing labs.

Our people do check that.

Mr. KORDECKI. We have no permits of any type on retrofit work except in the mechanical areas.

Mr. DANNEMEYER. I don't think you even need insulation in Florida, with all that beautiful sunshine.

Mr. KORDECKI. I was going to make a comment that all you fellows above the Mason-Dixon Line who have been talking about heating all morning. I wish we had had the gentleman from Texas or somebody from the South, if we are going to start talking about cooling.

Yes, we do. We don't need it necessarily in the same equivalents as in more northern climates, but it is needed. The same with a number of the other measures. Some measures are obviously not as appropriate.

Mr. DANNEMEYER. How about in Illinois?

Mr. PETKUS. Generally building permits are not required if you are just blowing in insulation in an attic.

Mr. DANNEMEYER. The reason I ask that, every community in this country essentially has a building department available for insuring that buildings are consistent with the public interest, that they comply with the code.

I think one of the problems we have in this field of retrofitting insulation is that the average citizen is just betwixt and between as to where he can find out whether what is on the market is going to do any good after he gets finished paying for it.

I don't want to have the Federal Government get into the business of trying to precise that because it would take 25 years to develop the appropriate regulations—properly, in the eyes of those doing it.

Local communities would do it. They could establish the R factors fairly quickly. What people really need is a list of contractors, but at that point, local jurisdictions get jumpy because they don't want to be accused of recommending some particular person.

For instance, in your area, do you have a list of subcontractors that you say a citizen can select at their option, that do proper work?

Mr. ERTLER. That is not really the way we select the contractors. Primarily what we do—and this is how we got the contractors to participate in the program—is that all of the work is done on a competitive bid basis, which has by the way helped reduce the cost of the installations.

Mr. DANNEMEYER. Each house is a competitive bid?

Mr. ERTLER. Each house is a competitive bid, bid upon by three of the contractors. We will provide them——

Mr. DANNEMEYER. Who has the authority to let the contract—the utility or the citizen?

Mr. ERTLER. We do. Basically the way it works is if a homeowner agrees they would like bids on their homes, we will send—it is not a random generation thing. My math leaves me. It is a statistical variation table.

If you put contractors to a list and you go 1, 2, 3, 4, 5, 6, through 10, and you just pull off the list, normally you get contractors 1, 2 and 3 always bidding against each other.

So, each time we mix the list. But they can go out to the house and see the house and bid on it, or bid from the energy audit we originally ran to get the measurements. We then present to the homeowner the low bid which determines the amount of dollars we will finance under the program.

If the contractor, when he is there, gives a sales job to the homeowner that they want bronze anodized aluminium storm windows as opposed to mill finish, the homeowner has the right to have those, and the contractor has the capability to sell to the homeowner, but the homeowner must pay the difference between the low bid amount and the materials they select.

Mr. PETKUS. I am building a home. The community in which this home is being built insists on a minimum sized electric service, insists on a disposal, insists on outlets in the walls. But they could care less whether I insulate the home or not.

Mr. DANNEMEYER. That is because of the water in Illinois, I would say.

Mr. PETKUS. We have a lot of water.

Mr. CORCORAN [presiding]. It is because, I will tell the gentleman from California, of many of the benefits of Illinois.

I would say to the members of the panel that we very much appreciated your testimony. It has been constructive and I think you have caused us to at least reconsider some of the things we are doing.

I know that speaking on behalf of all the members of the committee, we very much appreciate your testimony. Thank you very much.

The meeting is adjourned.

[The following letter and attachments were received for the record:]

TENNESSEE VALLEY AUTHORITY
CHATTANOOGA, TENNESSEE 37401

703 Power Building

NOV 16 1979

The Honorable Bob Eckhardt, Chairman
Subcommittee on Oversight
and Investigations
Committee on Interstate and
Foreign Commerce
The House of Representatives
Washington, DC 20515

Dear Mr. Chairman:

I regret that I was not able to personally appear before your subcommittee on October 26 to testify on making homes and workplaces more energy-efficient. However, I am glad to provide the enclosed prepared statement and ask that it and this letter be included in the hearing record. We are excited about the success of TVA's conservation programs, our residential program being the largest in the Nation. The prepared statement explains how these programs work and answers the questions raised in your October 4 letter.

My prepared statement does not cover TVA's various conservation and renewable resource programs which are in the demonstration stage, but these were thoroughly discussed by David Freeman, Chairman of TVA, in his October 16 testimony before your subcommittee. In addition, you may be interested in Chairman Freeman's October 12 testimony on H.R. 5493 before the Subcommittee on Energy and Power. A copy is enclosed for your convenience.

In most cases conservation offers consumers an immediate opportunity to reduce energy usage, resulting in utility bills lower than they otherwise would be. In addition, it is in the best interest of utilities to encourage and finance energy conservation measures, since the released system capacity, which is available to serve other loads, costs much less than building new generating plants. To give just two examples, in our home insulation program we expect to weatherize 400,000 homes for $200 million and thus reduce the demands on system capacity by 1,100 MW. To provide new generating capacity to meet this load would cost approximately $1.5 billion. We expect to reduce the load requirements of 150,000 commercial and industrial consumers by 1,000 MW through energy audits and financing of installed equipment with a similar cost-saving impact. Additional savings are realized in fuel costs by reducing the need for costly peakload generation. As Chairman Freeman indicated, programs to finance wood heaters and solar water heaters are also nearing large-scale development.

TVA is treating conservation as an energy resource, and our studies support the conclusions of many others: meeting energy demands by using conservation and renewable resource programs is considerably less expensive than building new generating capacity.

I am encouraged by the congressional attention now being devoted to conservation and solar energy, and I hope these comments and the enclosed material will be beneficial to the subcommittee. Please let us know if we can be of further assistance.

Very truly yours,

Robert F. Hemphill, Jr.

Robert F. Hemphill, Jr., Director
Division of Energy Conservation & Rates

Enclosures

WRITTEN STATEMENT OF ROBERT F. HEMPHILL, JR.

DIRECTOR OF ENERGY CONSERVATION AND RATES, TVA

Home Insulation Program

TVA's first large scale energy conservation program was the Home Insulation Program, which was begun in March 1977. Under this program TVA, working through its municipal and cooperative power distributors, offers free energy conservation surveys for any residential unit. In the case of a rental unit, the request may come from either the landlord or the tenant. The energy advisor then provides the participant with written suggestions concerning the most cost-effective conservation measures that could be taken for the dwelling.

For consumers with electric heating or air conditioning the distributor will, utilizing funds advanced by TVA, offer the customer interest-free financing for the installation of attic and floor insulation, caulking, weather stripping, storm windows, insulated doors, and water heater insulation. Financing is available for labor and materials if the work is done by a contractor and for the materials alone if the participant wishes to do self-installation.

At the time of the survey the energy advisor provides the consumer with a list of contractors who have agreed to install some or all of these measures according to TVA's material and installation standards. The consumer selects a contractor and has the work done. In every case the energy advisor then conducts a post-installation inspection to ensure compliance before authorizing payment to the contractor.

The consumer then repays the distributor over a period of up to seven years.

Originally participation in the program was available only to those who heated with electricity and attic insulation was the only measure eligible for financing. The initial program was structured in this way because, with no operating experience to go on, we were unable to make a determination that a broader program would be cost-effective for the TVA system as a whole and therefore benefit all ratepayers. But as new data became available, we were able to conclude that although the cost-benefit ratio from including other customers and measures is less favorable than for the original portion of the program, it was still to TVA's benefit (and ultimately to all electricity consumers) to include certain other customers and measures and the program was expanded accordingly.

To date we have completed more than 157,000 energy surveys (about 7 percent of those eligible), and more than 60,000 consumers have taken advantage of the financing option. Actually, the response rate to the survey is higher than this would indicate because many consumers choose to follow the recommendations but finance the work from their own resources. As a result of this program, TVA is now realizing estimated annual savings of over 190 million kWh. The present number of personnel assigned to the program is 265 and total administrative costs since program inception have been about $7 million.

The material and installation standards used by TVA in this program have been developed from those used by other Federal agencies and from various state codes. We are enclosing a set for the Subcommittee's information.

Heat Pump Program

Another conservation initiative aimed at residential customers is the Heat Pump Financing Plan. Under this plan, approved by the Board in September of 1978, any homeowner who is a customer of a participating TVA distributor and who has had a Home Energy Survey may also request a special survey by a Heat Pump Advisor. The Heat Pump Advisor informs the consumer as to whether the installation of a heat pump system would be cost effective for that home and provides the customer with a list of heat pump dealers who have agreed to install the system according to TVA specifications. If the homeowner agrees to install the measures recommended in the Home Energy Survey, TVA, acting through the distributor, offers financing at its own cost of borrowing money (currently 8½ percent), for the installation of the heat pump. We feel that this is near the lowest rate at which we can offer financing for this program and still realize net savings for other ratepayers.

When the installation is completed by the contractor, the heat pump advisor conducts a final, post-installation inspection to determine that it meets TVA standards before releasing the funds to the contractor.

The consumer has up to 10 years to repay the loan, which averages between $2,000 and $4,000, depending on the size of the unit, the amount of duct work needed, and the cost of the labor. We are enclosing a copy of TVA's Heat Pump Installation Specifications for the Subcommittee's use.

To date we have conducted 1,775 heat pump surveys and have completed processing on 460 heat pump loans. We estimate that 1.8 million kWh of energy per year have been saved so far. The total administrative costs of this program to date have been $200,000 with 39 TVA Heat Pump Advisors assigned to it full time.

Commercial and Industrial Program

TVA's conservation initiative in the commercial and industrial field, the Commercial and Industrial Energy Conservation Program, began in January 1979. This program is conducted by TVA directly with its own staff and it offers a free energy conservation survey to any commercial or industrial customer on the TVA system, except that very large customers must contribute some of the labor toward the survey. The customer is then furnished with an Energy Conservation Study which points out opportunities for saving all forms of energy, including an estimated payback period. For profitmaking customers, TVA then offers financing at its own cost of money, plus 1 percent for administrative costs, to implement electrical conservation measures with a payback of greater than 3 years. In order to qualify for this financing the

customer must first install from other financial sources the recommended measures with a payback period of less than 3 years. Not-for-profit customers may finance all electrical conservation measures through TVA.

To date we have conducted over 600 surveys in this program, which includes over 18 million square feet of floor space. Although we have had the resources to audit less than 1 percent of the total number of eligible customers so far, the program has already resulted in savings of 45 million kWh of electrical energy. The cost of the program for the first 9 months of 1979 has been $1.1 million with approximately 65 full-time employees assigned.

Tax Credits

We are not aware that any of the State or local taxing jurisdictions in our region now grant tax credits for the installation of conservation measures although we understand that several states are considering offering them. As far as we can determine, the availability of Federal tax credits for the installation of energy conservation measures has not measurably impacted participation in our programs although we do inform every customer we survey of the availability of these benefits. Tax credits may be useful, but their impact tends to be concentrated on those with sufficient education about the tax system to recognize their importance, and available capital to tolerate the period between expenditure and receipt of the tax benefit. We feel very strongly that a more straight-forward delivery system is necessary if you wish to encourage conservation actions by the majority of individuals.

Effective Incentives

We have found that the most important factors in inducing individuals to install residential energy conservation measures are personal contact with an energy advisor, the availability of free surveys and no-interest or low-interest financing, and the practice of conducting post-installation inspections. In the commercial and industrial area our studies have shown that the free survey is very beneficial even without financing because a surprising percentage of business concerns remain unaware of highly cost-beneficial investments available to them. Offering financing is also important, however, because many businesses have insufficient capital available to permit them to allocate it to projects with paybacks longer than 3 years.

In short, the most effective approach seems to be getting the utilities themselves into the energy conservation business. They already have an infrastructure that puts them into contact with virtually every consumer, avoiding the creation of a costly new bureaucracy. Their personnel are probably the only "strangers" we willingly allow into our homes. And, it should be--and under such bills as H.R. 5493 would be--in each utility's own interest to get into the conservation business.

STATEMENT OF S. DAVID FREEMAN, CHAIRMAN, BOARD OF DIRECTORS,
TENNESSEE VALLEY AUTHORITY

It's a pleasure to appear once again before this Committee to discuss the issue of utility participation in energy conservation, an issue which is important to all the members here, to TVA and to the 7 million citizens of the Tennessee Valley who benefit from our conservation program, and to the Nation. I am especially pleased to make this appearance because I am here to endorse, with almost no reservation, H. R. 5493, the bill introduced by Mr. Ottinger for himself and Chairmen Staggers and Dingell. I believe this is vital legislation to enable the consumers of this Nation to get the most for their money which electric utilities will be investing in the years ahead. And as this Committee well knows it is investments in energy conservation that yield the most benefits for every dollar of investments.

There is certainly no need to restate the energy conservation case to this Committee. But there may well be questions as to the role that electric utilities can play to enable consumers to cash in on the benefits of conservation.

I am convinced of the need for a strong and effective utility role in conservation for the benefit of the consumer. First, whether we like the utilities or not, they reach just about every building in America and thus provide the best potential delivery system for conservation measures that is presently available. Insulating and weatherizing all the Nation's existing homes and buildings is a massive task requiring a comprehensive delivery system, which should include direct personal contact with homeowners, front-end financing, and post-installation

inspections for quality control. This is all necessary to overcome the substantial financial, procedural, informational, and indifference barriers each customer faces. Utilities offer the best bet to get the job done, because:

They are in at least monthly contact with virtually every household in the country.

They have a substantial interest and knowledge in the energy area already and have a positive financial stake in promoting conservation because it can eliminate the need for expensive new capacity. Utilities invest billions of dollars of capital each year. If this capital is not permitted to be used to fund conservation measures it will fund more expensive production and thus result in higher utility bills and more inflation.

They can, because of their personnel and financial resources, provide "one-stop shopping" for customers interested in conservation measures.

They are subject to regulation at the local level to assure that the program is carried out in a fair and reasonable manner.

I am very much aware that utilities are not universally loved, to say the least, and that there is genuine concern that utilities might use their monopoly power unfairly to compete with companies offering weatherization

services. Even so, I believe experience has shown that the Nation cannot afford to pass up the opportunity utilities offer, under proper safeguards, to give our lagging conservation effort a real shot in the arm. Equally important is the changed attitude of many utilities as compared to years ago when they shunned the conservation role. Utilities today find themselves in a difficult position: faced with a growth in the demand for energy services, their options for supplying this demand are severely restricted. The marginal costs of new generating capacity for this capital intensive industry has made energy conservation seem less of a threat and more of a promise of financial salvation.

This serious cost crunch has forced some members of the industry to rethink the role of their systems as one of providing electrical energy services to customers, not just generating electricity in large central power plants. It is of historical interest that Thomas Edison thought the industry should sell "light" and not just kilowatt-hours because no one uses electricity for its own sake; it is used for lighting, heating, cooling, shaft power, and numberous other functions. Once you cross the mental hurdle of thinking beyond the bus bar, conservation and other decentralized energy systems offer utilities a cost-effective option to increasingly expensive centralized generating plants.

We have applied this thinking to all of TVA's conservation and solar programs. TVA is showing that we can, in fact, provide for a substantial portion of new capacity that would otherwise be needed by instead installing insulation, storm windows, wood heaters, and solar water heaters.

And, most importantly, we can obtain this equivalent capacity much more cheaply than we can build central generating plants. And I should point out that TVA builds large power plants as efficiently, and for as low a cost, as anyone in the country. The savings and benefits of these conservation programs are, and will be, returned to all customers in the form of lower rates than would otherwise be the case. The financial incentives to those customers who insulate and solarize are less than the full value of their investments for the TVA system, all customers are better off, even those who do not take advantage of the program.

The attachment to my statement details our existing TVA conservation and solar programs and thus I hope, gives a feel for the success we are experiencing.

If we can meet an 1,100-MW winter peak heating demand by insulating 400,000 homes for $200 million, as we are in the process of doing, rather than by building an additional nuclear unit for $1.5 billion, then TVA would be turning its back on its consumers if it failed to do so.

This is the new yardstick at TVA, and such investments in conservation make just as much sense for investor-owned utilities.

As the sponsors of H. R. 5493 have recognized, the National Energy Conservation Policy Act of 1978, although conceived to stimulate conservation and help utilities take the least-cost path to providing service, has many provisions which work strongly against this goal. H. R. 5493 solves all these problems in the existing legislation. It is an impressive legislative initiative. To be specific:

NECPA prohibits utilities from either financing or installing conservation measures; H. R. 5493 essentially removes these prohibitions except for the independent contractor provision, which we support.

NECPA does not require reinspections of completed work; in our program we have found such inspections to be a critical measure for consumer protection and a way to allow easy entry to contractors--thus not screening out small businesses and minorities--while still guaranteeing quality work. This appears to be particularly important at the beginning of the program. H. R. 5493 requires such reinspections.

NECPA allows all program charges to be levied against participating homeowners. We feel there is no better way to stop the program dead than this, and thus strongly support the requirement in H. R. 5493 for spreading these costs across all ratepayers.

NECPA is essentially silent on broader issues of capacity planning; H. R. 5493 adds three critical provisions which, in our judgment, are essential if investor-owned utilities are to participate in these programs enthusiastically, rather than as a result of brute regulatory force.

First, H. R. 5493 recognizes in Section 216(d)(2)(A) the tremendous importance of opening up the rate-basing option for conservation and renewable resource technologies. Second, in Section 216(d)(2)(B) you have further reinforced the "least-cost" approach to serving new demand. Third, in Section 216(e) you have removed any State laws which stand in the way.

When these provisions are enacted into law, you will have enabled investments by utilities in conservation and solar technologies to make the same profit as central generating facilities and transmission lines. You will have opened up the capital budgets of utilities--billions and billions of dollars--to these cost-effective investments on the same terms as the traditional central station options. And in my view the result will be billions of dollars of savings for consumers if this legislation is enacted.

Let me discuss briefly the second section of H. R. 5493, which amends the EPCA to establish a direct grant program for conservation investments. In the past, such proposals have raised two major questions of administration: fraud and the need for a large bureaucracy. The result has been a reliance on the tax credit and the tax system. And experience shows that in absence of a one-stop delivery system to the consumer the bulk of consumers have not responded.

While I cannot comment on the appropriate size of the program, I do endorse the basic idea and mechanism. You have solved the fraud question in precisely the correct manner: by relying on the results of the energy audit report and the reinspection by the public utility. This will, incidentally, make the energy audit program a good deal more popular.

With regard to the creation of a new grant-making bureaucracy, I suggest that you consider letting the utilities actually administer the program, in accordance with DOE regulations. Utilities already possess sophisticated cash handling and accounting systems; I am less certain that my good friends in the Department of Energy can quickly and efficiently put together the mechanics of processing the millions of grant applications they will receive under this bill. As you no doubt know, the State of Louisiana, at the urging of the Chairman of Gulf States Utilities, has enacted a statute under which the State pays part of the electric bills of elderly indigent consumers. This payment is administered by the utilities and shows up as a credit on electric bills. This is a precedent worth further investigation.

In summary, Mr. Chairman, the Nation is indebted to you and your Committee and your staff for the excellent job of putting together a reasonable, effective conservation proposal. We urge you to favorably report this bill at once, convince your Senate colleagues of its wisdom, and enact it. The Country needs this legislation. There is a big job to be done, and this bill will help get it done. Thank you.

Standards for Application and Installation of Heat Pump Systems

TVA AND POWER DISTRIBUTOR STANDARDS FOR APPLICATION AND INSTALLATION OF HEAT PUMP SYSTEMS

GENERAL

The purpose of these standards is to assist dealers in designing and installing quality heat pump systems that will perform properly and assure customer satisfaction.

These standards cover both residential and small commercial and industrial installations of central type unitary heat pumps up through 135,000 BTUH cooling capacity and designed to use outdoor air as a heat source. All equipment must be UL approved and ARI rated.

The features recommended in this section will aid the heat pump dealer in selecting a reliable heat pump for his customer. However, the absence of one or more of these features does not indicate that a heat pump will not give reliable service.

100 EQUIPMENT RECOMMENDATIONS

100-1 **Compressors used in heat pumps should be designed and approved by the compressor manufacturer for operation as heat pumps at outdoor temperatures from 0° to 105° F.**

100-2 **All heat pump compressors should have an oil sump heater or some other reliable means to keep liquid refrigerant from collecting in the compressor crankcase.**

100-3 **All heat pumps should have a suction line accumulator or some other reliable method of preventing liquid slugging of the compressor.**

100-4 The outdoor sections of split type units should have test valves on the liquid and vapor lines. Integral equipment should have test valves on the suction and discharge lines at the compressor.

100-5 All heat pumps should have a minimum COP of 2.5 at 47° F and 1.5 at 17° F and a minimum EER of 6.8 when rated according to ARI standard rating conditions. All heat pumps installed under the TVA Heat Pump Financing Plan shall have a minimum COP of 2.2 at 47° F and 1.2 at 17° F and a minimum EER of 6.1. All heat pumps installed under the TVA Heat Pump Financing Plan on or after January 1, 1980, shall have a minimum COP of 2.5 at 47° F and 1.5 at 17° F and a minimum EER of 6.8.

100-6 Heat pump manufacturer should offer for optional purchase by homeowner an extended service warranty policy which covers all labor and parts expense incurred in the second thru the fifth year of operation.

101 STRUCTURE CONSIDERATIONS

101-1 All new construction should be insulated to the following minimum standards:

	R-Installed Resistance
Ceilings*	R-19
Walls	R-11
Floors**	R-11

*In no case should gross coverage of ceiling with loose fill or blown insulation exceed 33 square feet per bag. ("Bag" is defined as that standard measure which is generally accepted by the insulation industry.)

**Constructed over crawl spaces and unheated basements. Draped reflective insulation is not recommended. Concrete slab floors should have a minimum of 1" edge insulation.

101-2 Insulating glass (double thickness with an air space) or single glass with storm windows is recommended. The electric power distributor may require insulating glass or storm windows.

101-3 Existing residential housing units should have R-19 in the ceilings and R-11 in the floors if over a crawl space or unheated area.

101-4 The structure owner shall be responsible for the correct selection of insulating materials (including weatherstripping) and proper installation in accordance with the insulation manufacturer's and power distributor's recommendations. The insulation should be installed correctly and effectively by qualified workmen to assure the best performance and continued efficiency of the heat pump system.

101-5 Adequate attic ventilation is the responsibility of the structure owner. For residential attics, it is recommended that a minimum of 1 square foot of low level inlet plus 1 square foot of high level outlet be installed for each 300 square feet of ceiling area.

101-6 Fireplaces in residences should be equipped with tight fitting dampers to reduce infiltration losses when the fireplace is not in use.

101-7 In all applications where the building is constructed over a crawl space, a ground cover of minimum 4-mil polyethelene, or equal, is recommended to prevent moisture migration to the structure. When the ground cover is used, foundation venting can be reduced to 1 sq. ft. of inlet plus 1 sq. ft. of outlet per 1,500 sq. ft. of floor area.

102 EQUIPMENT SELECTION

102-1 Heat pump equipment shall be sized to provide the cooling capacity to meet the requirements of the structure at summer design conditions, and with heating capacity in the compressor alone to meet the heating requirements of the structure down to at least 35° F. dry bulb outdoor temperature. In addition, the supplemental electric heaters shall be installed with adequate capacity to nominally meet 80% of the residential structure's heating requirements at design temperature without operation of the heat pump compressor. Supplemental heaters shall be electric heaters designed for use within the heat pump unit and/or supply air ducts, electric space heaters in each room or a combination of these. For residential applications, the number of complete air recirculations per hour as a result of continuous operation of the indoor fan should not be less than 4 nor more than 8. In equation form, the number of air recirculations per hour is:

$$N = \frac{60 \times \text{CFM of indoor fan}}{\text{Gross volume of conditioned area}}$$

102-2 Heat loss and heat gain calculation methods shall be in accordance with the data and procedure contained in the ASHRAE "Guide and Data Book," National Environmental Systems Contractors Association Manual J, ARI Standard 230, or TVA's *Guide for Calculations of Electric Space Heating and Cooling*. All cooling calculations, however, shall allow for a 3° F. maximum temperature swing. Additional capacity shall also be allowed for the unusually high heat gain conditions occurring when the duct system and air handler is located in an attic space which is constructed for FHA minimum ventilation. (A 5% addition duct gain allowance will usually compensate for this condition.) Recommended design temperatures for residential applications are:

Heating:	Indoor	70° F DB
	Outdoor	0° F DB
Cooling:	Indoor	80° F DB and 50% RH
	Outdoor	95° F DB and 78° F WB

In residential applications where the total system load exceeds a nominal 5 ton requirement, multiple units shall be used to meet the load requirements.

102-3 The total amount of infiltration and/or ventilation air used in heat loss or gain calculations shall be a minimum of 1/2 air change per hour based on the gross volume of the conditioned area of the structure for residential installations. The occupied ventilation rate for commercial and industrial structures should be based on either one air change or the number of occupants, whichever is greater, except where special circumstances require higher ventilation rates. The amount of ventilation air per occupant should be as recommended in the ASHRAE "Guide" or local building code for the specific type of application. The quantity of ventilation air shall not, in any case, be less than the amount drawn from the space by exhaust fans.

102-4 In commercial and industrial structures full allowances should be given to any available internal heat gain. Lights, people, computers, motors, etc., may fall in this category, but unless always available when needed these sources must not be relied upon for winter heating.

103 EQUIPMENT INSTALLATION

All units shall be located so as to provide easy service access for removal of any unit component without removal of any piping, ductwork, or other permanently installed fixtures or components. Easy access to the equipment and adequate working space around it shall be provided in all cases. Manufacturer's specifications and instructions shall be followed in providing minimum service space requirements.

103-2 All indoor units shall be adequately supported from mounting points or placed on a suitable platform, with cushioning as recommended by manufacturer.

103-3 Suitable and permanent means shall be provided to prevent transmission to the structure of objectionable noise or vibration generated by the equipment. This includes integral units as well as indoor and outdoor sections of split units. See also 106-3.

103-4 Two or more units shall not be connected in parallel air flow to a common supply or return air duct system. Any deviation from this requirement must be specifically approved by the heat pump manufacturer and power distributor.

103-5 Units installed within a structure and which have no available external static pressure fan capacity in the outdoor air circuits shall be located adjacent to an exposed wall or roof opening in a manner that will permit unrestricted outdoor air flow. Units shall not be installed where ductwork is necessary to connect the outdoor air circuit to remote wall or roof openings, unless specifically approved by the heat pump manufacturer. See also 109-3.

103-6 It is not generally recommended that integral units be located below grade. However, when such units are so located, such as in basements, they shall have separate intake and discharge areaways or other suitable separate outdoor air passages, constructed and sized in accordance with heat pump manufacturer's instructions. Construction of the intake and discharge areaways shall avoid snow or water accumulation. The pressure drop of the external air passages shall not in any case exceed 0.1 inch of water or the available static pressure capacity of the outdoor fan, whichever is less.

103-7 Outdoor units (integral and split) should have a minimum of 6 feet of unobstructed discharge air flow from the coil. Care should be taken in locating outdoor units to avoid arrangements that might cause restrictions or recirculation in the outdoor air stream. Consideration should be given to nearby structures and the prevailing wind and rain directions to minimize disturbances to free air flow. See also 104-1. Units installed outdoors should be located so that roof or other drainage will not interfere with proper equipment

operation. When units installed outdoors are located so that proper defrosting can be disturbed by winds or rain, a screen or baffle should be installed as a shield, in accordance with heat pump manufacturer's recommendations.

103-8 Units installed indoors shall be located to permit smooth transition between the air ducts and the unit.

103-9 Outdoor units (integral and split) on grade shall be installed in accordance with manufacturer's instructions, except as herein modified. The unit shall be mounted on an adequate, solid, permanent pad (depending on stability of conditions and kind of soil) and should be isolated from the building structure. A raised platform must be used in areas where prevailing water accumulation or snowfall might interfere with proper operation of the unit. Care must be taken in selection of pad location and construction to provide proper drainage and insure against a build-up of water or ice. See also 103-11.

103-10 Location of heat pump units on the roof of residential structures is not usually recommended. When located on the roof, they should be suitably mounted on raised stands or bases to prevent blocking by snow, leaves, water, ice, etc. Attic location of units housing the compressor is not acceptable.

103-11 Where manufacturer has provided for free outdoor coil drainage, mounting bases shall permit unobstructed draining and avoid ice build-up. See also 103-9.

103-12 Linear distance of piping between the two sections of split units measured one way on one line shall not exceed 50 feet or the maximum distance specified in the manufacturer's published literature, whichever is shorter. In no case shall the outdoor section be located more than 20 feet above or below the indoor section.

103-13 Outdoor units located on grade in or near parking areas, alleys, or driveways shall be protected from damage by vehicles and shall be arranged so that vehicles or objects will not block or obstruct outdoor air intake or discharge. See also 104-1.

104 DUCTWORK

104-1 **Air distribution system design and installation shall be such that air flow across the heat pump refrigerant coils shall not be less than that specified in the heat pump manufacturer's literature for A.R.I. (air entering indoor coil: 80° F DB—67° F WB; air entering outdoor coil: 95° F DB).**

104-2 Sheet metal ducts shall be 26 gauge or larger, properly crossbroken, and installed in a workmanlike manner in accordance with acceptable practice given in the ASHRAE "Guide and Data Book" or the "Duct Manual and Sheet Metal Construction for Ventilating and Air Conditioning Systems, Section 1, Low Velocity Systems," as published by Sheet Metal and Air Conditioning Contractors National Association, Inc. (Latest Revision). A system of fibrous glass duct work may be installed in lieu of sheet metal duct work and insulation. This duct work shall be a minimum 1" thick, 3-1/4 pound density bearing Underwriters' Laboratories' approval as a Class I Air Duct. Fabrication and assembly shall be in strict accordance with details listed in the manufacturer's application manual. See also 103-7 and 103-13.

104-3 All seams and joints shall be airtight and smooth fitting. Transitions shall be gradual and not greater than 30° from the direction of air flow. All supply duct turns and plenum takeoffs will be constructed with reasonably low equivalent lengths as determined by comparing the

construction method with NESCA's Manual K equivalent length tables. Lower equivalent lengths are usually attained with properly constructed inside radius turns and throated takeoffs.

104-4 The long cross section duct dimension shall not exceed 4 times the shorter dimension. Where metal ductwork requires additional support to maintain straight sides, it shall be stiffened by standing seams or reinforcing angles installed on the outside. **Ducts 24 inches or wider shall be crossbroken on top and bottom.** See 104-1.

104-5 The inside of ductwork shall be free of unnecessary seams, sheet metal screws or other obstructions.

104-6 Supply ducts should be designed for a static pressure loss of 0.08 inch of water per 100 feet of linear run or equivalent. Return ducts should be designed for a static pressure loss of 0.06 inch of water per 100 feet of linear run or equivalent. **The total duct system shall not exceed the external static pressure capability of the unit fan.**

104-7 Duct velocities shall not exceed the following:

Residential	
Main Ducts	700-900 FPM
Branch Ducts and Risers	600 FPM
Commercial	
Main Ducts	1000-1300 FPM
Branch Ducts and Risers	600- 900 FPM

104-8 Return air inlet registers and grilles shall be of sufficient number and size, and located so as to prevent objectional drafts and provide balanced air circulation. The CFM capacity of return air registers, grilles, and ductwork shall not be less than the design CFM capacity of the supply system. Return air registers and grilles shall be located at low level and sized for a 500 FPM maximum air velocity through free areas. If low velocity filters are to be used, the face velocity should be limited to 300 FPM through the free areas. High level returns are permissible if located in areas that are directly under other conditioned space.

104-9 Flexible woven asbestos or other fireproof fabric flexible connections shall be installed in sheet metal ductwork at the unit in both the supply and return openings. Ductwork shall be properly aligned at flexible connections without offset.

104-10 Branch duct and runout connections should not be made within a distance of 4 feet from either the indoor supply or return air side of the unit or the supplemental electric heater assembly. See also 113-5, 113-6, and 113-7.

104-11 Readily accessible balancing or volume control dampers with outside locking devices shall be provided in supply runout ducts if needed to regulate proper amount of air to each space. Dampers immediately behind supply outlet shall be used only for minor regulation of air flow. Provisions (main trunk line volume control damper in the largest trunk, etc.) shall be made if needed to regulate air flow where the main supply trunk divides into branch trunks.

104-12 Supply air registers and grilles shall be of sufficient number and size, and located so as to prevent objectionable drafts or noise and provide balanced air circulation. Wherever possible, supply air outlets shall be located at the outside perimeter of the space to be

conditioned. Supply registers shall have adjustable dampers easily accessible to the user for making minor regulations of air flow. Supply registers shall be a type which permits proper diffusion of air along the outside permiter. Maximum face velocity of all residential supply registers should not exceed 600 FPM; and 900FPM for commercial installations.

104-13 a. Supply ducts to supply outlets and return ducts from return inlets shall be a minimum size of 5"Ø or equivalent.

b. In residential applications, the maximum size of branch duct to a supply outlet shall be 8" Ø or equivalent.

c. The residential air distribution system design shall be such that the total air carrying capacity of both the supply and return duct systems shall be sized for a minimum of 400 CFM/ton of cooling capacity. See also 104-1.

104-14 Duct work shall be properly supported to prevent sagging by use of metal straps or bands for hangers. Use of galvanized wire for hangers on duct runouts will be permitted if provisions are made to eliminate all possibilities of cutting through vapor barriers.

104-15 Duct systems formerly used with other heating systems that are clean but not installed according to the requirements of these standards will be considered individually for use with heat pumps and must be specifically approved for such use by the power distributor.

105 AIR FILTERS (See ARI 260-67 Section 2.4.3 Filters)

105-1 Air filters shall be installed in the return air system in a location that will be easily accessible to the user for filter servicing, and in a position where all return air and ventilation air (if any) will pass through filters before crossing the indoor refrigerant coils.

105-2 The use of filter back grilles is highly recommended for return air. A good rule-of-thumb method for sizing the grilles for use with throw-away filters is 180 sq. inches of gross grille for each 300 CFM of indoor air flow. Example:

$$\frac{\text{1200 CFM Air Flow}}{\text{300 CFM}} = 4$$

4 x 180 sq. inches/ft. = 720 sq. inch grille required = 24 x 30 or 20 x 36, etc.

105-3 If air filters are not furnished with the unit by the heat pump manufacturer, the installing contractor shall provide one set in the original installation. A good throw-away type is generally preferred if the filter rack is designed for low velocity filters.

105-4 Filter shall be low velocity throw-away or cleanable type, high velocity impingement type, electrostatic, electrostatic-carbon, or other type equally suitable for air filtering.

105-5 Filter frames shall be designed to hold filters with negligible air leakage.

106 NOISE ABATEMENT AND VIBRATION ELIMINATION

106-1 Suitable and permanent means shall be provided to prevent transmission of objectionable noise or vibration generated by equipment.

106-2 Outdoor units shall be located to avoid transmission of objectionable noise to adjacent properties.

106-3 Units should be located away from sleeping areas or other areas where noise would be objectionable. See also 103-3.

107 REFRIGERANT PIPING SYSTEMS (See ARI 260-67 Section 3.4.1-3.4.4)

107-1 Field-assembled refrigerant piping shall be clean, dehydrated, sealed type "K" or "L" seamless copper tubing. Fittings shall be wrought copper.

107-2 Piping shall be clean before assembly and kept clean and capped until connected. Oxide and discoloration shall be removed from all inside surfaces and from the outside surface at all joints to be brazed. Proper cleaning of tubing ends and interior fitting surfaces is of vital importance in making tight leakproof joints. Tubing shall be cut with a sharp tube cutter. Piping shall always be reamed where cut through regardless of the cutting method. Burrs, filings, and all other residue shall be carefully removed from the inside of the piping before brazing.

107-3 Refrigerant piping shall be assembled in accordance with the heat pump manufacturer's recommendations. During the brazing operation, a small amount of dry nitrogen (sufficient to displace any air and prevent oxidation within the lines) shall be continuously bled through the refrigerant piping. The dry nitrogen should be the "oil pumped" grade. (Do not connect a nitrogen cylinder directly to a refrigerant system or to piping. The proper type pressure regulating valve must be properly connected between the nitrogen cylinder and refrigerant system or piping to prevent damage and as a personal safeguard.)

107-4 Manufacturer's instructions shall be followed in sizing and installing the liquid and vapor refrigerant lines. See also 103-12.

107-5 Piping shall be supported properly to prevent excessive sagging, movement, or vibration. Supports shall also limit lateral movement, but permit normal thermal expansion and contraction. Isolation type hangers, or approved equivalent, shall be used to support refrigerant lines from floor joists and other parts of the structure.

107-6 Piping passing through openings in the unit cabinet shall be installed so as to prevent wear or vibration through contact with the cabinet or components within the unit.

107-7 All exposed refrigeration piping, located less than 7 feet above floor or outside grade, shall be protected to prevent damage to piping or injury to persons.

107-8 Liquid lines shall not be allowed to come in contact with vapor lines.

107-9 During evacuation and charging of the refrigerant system, the heat pump manufacturer's recommended procedures must be followed. The amount of refrigerant (and oil, if any) and method of charging shall be in accordance with the heat pump manufacturer's instructions.

107-10 The complete refrigerant system shall be pressure tested (with the same refrigerant as used in the system or with a combination of this refrigerant and dry nitrogen) and checked for leaks with a Halide torch or an electronic leak detector. Factory installed as well as field installed joints shall be checked and any leaks found shall be repaired. (Any combination of nitrogen and refrigerant used for pressure testing for leaks shall be removed from the refrigerant system prior to charging it with the operating charge of refrigerant.) See also 107-3.

108 CONDENSATE PIPING (See ARI 260-67 Section 3.4.5-3.4.7)

108-1 Condensate drain water piping shall comply with local codes and ordinances.

108-2 Suitable means shall be provided for the collection and disposal of condensate from the equipment. Gravity type condensate drains shall be at least 3/4 inch nominal pipe size, or larger if recommended by the heat pump manufacturer, and shall be corrosion-resistant.

108-3 A second, or auxiliary, drain pan with separate 3/4" drain line shall be installed beneath the unit in all cases where damage might result from overflow.

108-4 The drain lines from units installed indoors, and from auxiliary drain pans, shall be run to a floor drain or other suitable drain point. Condensate shall not be permitted to drain into any crawl space area or into toilet or other vent stacks. The unit drain line shall be trapped, and all drain lines shall be pitched in direction of flow and installed so as to prevent back-up and overflow. Condensate drain lines and auxiliary drain pans shall be insulated in all cases where sweating or dripping may cause property damage.

108-5 Flexible connectors shall be installed in the condensate drain line when vibration transmission could be objectionable within the building structure.

108-6 Condensate piping from outdoor coils shall be protected from freezing.

109 INSULATION—DUCTWORK

109-1 **Supply and return duct insulation (minimum thickness, insulating value, and density) shall be installed as follows:**

Attic Space or Crawl Space

External—2 inch, 3/4 pound density (R-7), with vapor seal or
Internal—1 inch, 1.5 pound density (R-4), with vapor seal } **or equivalent insulating value**

109-2 Supply and return air ducts exposed to the elements shall be weather-proofed.

109-3 When the outdoor air circuits are ducted, the intake and discharge air ducts shall be separately insulated and vapor sealed. Insulation on both the intake and discharge ducts shall be a minimum of 1-1/2-inch, 3/4-pound density, glass fiber or equivalent. See also 103-5.

109-4 Ductwork for bringing outdoor ventilation air into the building shall be insulated with a minimum of one-inch, 3/4-pound density, glass fiber or equivalent, and vapor sealed.

109-5 External duct insulation shall be applied smoothly and neatly without sagging and shall consist of rigid boards, resilient flexible sheets, or equivalent. Insulation shall be applied in accordance with recommended procedure of the insulation manufacturer.

109-6 Vapor barriers, such as aluminum foil, or equivalent, shall lap a minimum of 2 inches at all longitudinal and buttjoints and shall be securely sealed and stapled. All punctures and tears or other imperfections in vapor barrier jackets shall be patched with the same material cemented or sealed and stapled in place.

109-7 Ductwork in or below concrete slab floors shall be installed and insulated in accordance with NESCA recommendations.

109-8 Where necessary, provisions shall be made to prevent fastening devices from cutting through or damaging the vapor barrier.

109-9 Insulation shall be neat and present a smooth appearance.

109-10 Internal duct insulation shall consist of flexible, resilient glass fiber board or sheets specially faced on the air stream face to assure a smooth surface and unrestricted air flow. The air stream facing shall have vinyl film coating, or equivalent. Material shall be applied with adhesive to sheet metal, and preferably folded with the metal in a brake when the duct is fabricated. When called for by the insulation manufacturer, welded tabs or pins shall be used in addition to adhesive to secure insulation. Internal duct insulation shall be carefully applied so that voids or gaps will not be left in the finished work. Duct drawings shall specify that the duct dimensions apply to either the net free internal air space or the gross external size of the ducts. Where net free internal air space duct dimensions are specified, the ducts shall be constructed larger to accommodate the insulation thickness. Internal duct insulation shall not be installed within 18 inches of supplemental electric heaters. Where both external and internal duct insulation are used to insulate different portions of a duct system, the insulations shall overlap at least 6 inches.

109-11 All insulating materials used in conjunction with TVA's Certified Heat Pump Installation Program or TVA's Heat Pump Financing Plan shall meet the following specifications or their latest revision:

Material	Federal Specifications	ASTM	UL
Duct liner	HH-I-00545A & B HH-I-00578B MIL-I-22023C	C553-70 C612-70	Std. 181
Duct wrap	HH-I-558B	C-553-70 E-96	Std. 181
Duct board	HH-I-545B. MIL-I-22023C	C553-70 C-612-70	Std. 181

110 INSULATION—PIPING (See ARI 260-67 Section 3.4.3)

110-1 Refrigerant vapor lines shall be insulated. Unless otherwise specified by the heat pump manufacturer, insulation material shall have an integral vapor barrier, a minimum wall thickness of 1/2-inch and be at least the equivalent of 1/2" Armaflex 22.

111 ELECTRICAL

111-1 All electrical wiring shall comply with the manufacturer's recommendations, National Electrical Code, and all local codes and ordinances. Separate, adequately fused circuits shall be provided for each outdoor unit, indoor unit, and supplemental electric heater assembly, as required by Underwriters' Laboratories Standards UL-559 and UL-573 (Latest Revision).

111-2 The service entrance conductors and equipment shall be of a capacity adequate to service the calculated load and shall be in accordance with the National Electrical Code, local codes and power distributor recommendations.

111-3 Flexible electrical conduit or cable shall be provided when vibration transmission could be objectionable within the building structure. See also 111-5.

111-4 In commercial and industrial installations, wherever possible, provision shall be made to close fresh air dampers at night, or during weekends and other regularly scheduled unoccupied periods by means of an automatic time clock damper motor.

111-5 Outdoor wiring shall be enclosed in weatherproof conduit or code-approved equivalent and shall be installed according to National Electrical Code or local codes.

111-6 The installer shall properly ground the heat pump unit and electrical supplemental heaters by use of a pressure type grounding lug or connector. Grounding connections which depend upon solder are not acceptable.

111-7 Low voltage (24 volt) field installed wiring shall be 18 AWG (minimum wire size) solid conductor and shall be color-coded in multi-conductor type thermostat wire cables. Regardless of the number of cables or conductors used, color-coding shall be such that the identity of each conductor can be easily established by visual inspection. Splicing of conductors is not generally acceptable and is not recommended.

111-8 The use of aluminum wire is permissible only if properly sized and connected with lugs UL approved for aluminum and coated with an approved material to eliminate corrosion of the conductor.

112 INDOOR THERMOSTATS (See ARI 260-67 Section 2.4.2)

112-1 Indoor thermostats shall be located on an interior partition, column, etc., in an area that will be approximately the return air temperature. The thermostat location shall be 4-1/2 to 5 feet above floor and shall be free from undue influence of vibration, or heat from lighting, sun, appliances, fireplaces, air supply outlets, or air from entranceways, etc. See also 111-7.

112-2 In residences, thermostats shall not be installed in kitchens, bathrooms, alcoves, or bedrooms (except in multiple-unit installations). In commercial and industrial installations, thermostats shall not be installed in conference rooms (unless unit serves only this room), storage or supply rooms, entranceways or other unrepresentative (temperature-wise) locations.

113 SUPPLEMENTAL ELECTRIC HEATERS

113-1 Supplemental electric heaters shall be sized and installed to nominally meet 80% of the total structure heat loss based on the indoor design temperature as covered under 102-1 and 102-2, and the appropriate outdoor design temperature. In commercial and industrial installations, total heat loss may have allowance for usable, reliable, and continuous internal heat source.

113-2 Supplemental electric heater assemblies shall be the single phase type only. (Prior to installation of the power supply wiring to supplemental heaters for three phase heat pumps, contact the power distributor for wiring instructions.) These assemblies shall be available from the heat pump manufacturer. Supplemental electric heater assemblies shall be a part of the heat pump unit, or shall be installed as an accessory item, either inside the unit cabinet, or fastened outside in the indoor fan discharge air stream in accordance with the heat pump manufacturer's instructions and Underwriters' Laboratories Standards UL-559 and UL-573 (Latest Revisions). Electric heater assemblies from other manufacturers will be acceptable provided they fulfill these requirements and are specifically approved by the heat pump manufacturer and Underwriters' Laboratories for such use with said manufacturer's equipment. Field fabricated heaters are not acceptable. The wattage of supplemental heaters shall not exceed 1-1/2 kW per heater stage per ton of rated cooling capacity, or 10 kW, whichever is larger.

113-3 **During normal heat pump operation, the supplemental electric heaters shall be automatically controlled from the second heating stage of the indoor thermostat. In addition, all heater stages but the first shall be controlled also with an outdoor thermostat (whose setting is manually adjustable within an adequate temperature range) for each heater stage.** Other methods which provide the same operating economy and accomplish the same desired results will be acceptable after satisfactory performance has been proven to the power distributor. In no case for normal heat pump operation are the electric heaters to be wired so they may be energized during cooling. This is not to exclude wiring and controlling a portion of the heaters to operate during cooling for reheat purposes; however, this type application requires specific approval of the power distributor.

113-4 **There shall be provided, in a location easily accessible to the user, a manual selector switch to permit all of the heaters to be electrically energized during the heating season (under control of the indoor thermostat but with the compressor and outdoor thermostats by-passed) when the heat pump compressor or associated refrigeration equipment are inoperative.** See also 111-7.

113-5 Supplemental electric duct heaters shall not be installed in the return air side of the heat pump system. They shall be installed in the supply air side of the system, upstream of all supply outlets.

113-6 Supplemental electric duct heaters shall not be installed within 4 feet of the unit except when specifically approved by the heat pump manufacturer for attachment to the unit.

113-7 Supplemental electric duct heaters shall be installed in a straight piece of supply duct, but not within 4 feet of duct elbows or transitions, branch duct connections (including runouts), dampers, or supply registers or grilles, etc.

114 GUARANTEES

114-1 The heat pump dealer shall guarantee to the purchaser that the heat pump system will perform to give adequate and dependable comfort conditions during heating and cooling operations at the stated design temperatures and loads. This guarantee shall also include assurance of readily available and adequate service, service facilities, and replacement components and parts.

114-2 For a one-year period, running concurrently with the heat pump manufacturer's one-year product warranty, the dealer shall provide without charge replacement parts and service. The dealer shall in all cases assure that the manufacturer's warranty is fully maintained during the entire period of any warranty coverage.

Reference Publications

1. ASHRAE Guide and Data Book (Latest Revision)
   American Society of Heating, Refrigerating and Air Conditioning Engineers.

2. Application Engineering Standard for Air-Conditioning, Standard 530 (Latest Revision)
   Air-Conditioning and Refrigeration Institute.

3. Standard for Application of Year-Round Residential Air-Conditioning, Standard 230 (Latest Revision)
   Air-Conditioning and Refrigeration Institute.

4. Standard for Application, Installation & Servicing of Unitary Systems, Standard 260 (Latest Revision)
   Air-Conditioning and Refrigeration Institute.

5. Duct Manual and Sheet Metal Construction for Ventilating and Air-Conditioning Systems
   Sheet Metal and Air-Conditioning Contractor's National Association, Inc.

6. National Electrical Code (Latest Revision)
   National Fire Protection Association.

7. Standards for Safety, Electric Space-Heating Equipment UL-559 and UL-573 (Latest Revision)
   Underwriters' Laboratories, Inc.

8. Manual J, National Environmental Systems Contractors Association.

9. Manual K, National Environmental Systems Contractors Association.

10. Guide for Calculations of Electric Space Heating and Cooling (Latest Revision), Tennessee Valley Authority.

[Whereupon, at 12:45 p.m. the subcommittees adjourned.]

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