Title

THE EFFECT OF ENERGY CONSERVATION MEASURES ON RESIDENTIAL ELECTRICITY DEMAND AND LOAD SHAPE

Authors

Ruderman, H.
Levine, M.D.
Chan, P.

Publication Date

1986-08-01

Lawrence Berkeley Laboratory

UNIVERSITY OF CALIFORNIA

APPLIED SCIENCE DIVISION

Presented at the ACEEE 1986 Summer Study on
Energy Efficiency in Buildings,
Santa Cruz, CA, August 17–23, 1986

The Effect of Energy Conservation Measures on Residential Electricity Demand and Load Shape

H. Ruderman, M.D. Levine, and P. Chan

August 1986

APPLIED SCIENCE DIVISION

Prepared for the U.S. Department of Energy under Contract Number DE-AC03-76SF00098.

DISCLAIMER

LBL-21099

THE EFFECT OF ENERGY CONSERVATION MEASURES ON RESIDENTIAL ELECTRICITY DEMAND AND LOAD SHAPE

Henry Ruderman, Mark D. Levine and Peter Chan

Applied Science Division
Lawrence Berkeley Laboratory
University of California
Berkeley, California 94720

August 1986

ABSTRACT

We have developed a method for calculating changes in annual electricity consumption and hourly loads in the residential sector resulting from the implementation of one or more energy conservation measures in a utility service area. We used the methodology to evaluate different measures by comparing their impacts in three service areas with differing load characteristics. The measures included improvements to the thermal integrity of the building, increased appliance efficiencies, as well as combinations of these measures. We selected three service areas that differed widely in their climatic conditions, appliance saturations, and other household characteristics. We evaluated the conservation measures by comparing their impacts on electricity sales and on peak summer and winter loads. The measures were ranked on the basis of a figure-of-merit related to their ability to reduce peak loads relative to electricity consumption. These results can be used to determine the financial impact of the measures on electric utilities.

This work was supported by the Assistant Secretary for Conservation and Renewable Energy, Office of Building Energy Research and Development, Building Equipment Division of the U.S. Department of Energy under Contract Number DE-AC03-76SF00098.

THE EFFECT OF ENERGY CONSERVATION MEASURES ON RESIDENTIAL ELECTRICITY DEMAND AND LOAD SHAPE*

Henry Ruderman, Mark D. Levine and Peter Chan
Lawrence Berkeley Laboratory

INTRODUCTION

The role of utilities in supplying electricity is changing rapidly. No longer are utilities required only to deliver kilowatt-hours to the consumer; now they are expected to supply a broad range of energy services. Utilities across the country have offered rebates for more efficient appliances and granted low and even zero-interest loans to weatherize their customer's houses. They have been required to implement federal programs—such as the Residential Conservation Service, which provides energy audits for houses—and a wide variety of demand-side programs initiated by public utility or service commissions. Such programs to reduce demand growth affect utility plans for constructing new generating capacity and influence the financial outlook of many companies.

The purpose of this study is to evaluate a variety of measures to reduce household electricity demand in terms of their impacts on annual consumption and load shapes and to compare them across service areas. Load shape change is an important aspect of the assessment of demand-side programs, and one that has received little attention to date. It is the interplay of these two types of effects, combined with the economics of supply and the structure of rates of the utility, that result in economic impacts on utilities. Because of the lack of peak charges in most residential rates, most utilities sell peak residential power at prices lower than costs. (The loss is made up in sales of baseload power, either in the residential sector or elsewhere.) Thus, residential conservation programs that reduce peak power more than baseload are, in most cases, desirable for utilities. A much more complete characterization of the economic impacts of demand-side programs can be found in another report.[1]

Using different words, the significance of this study is that it looks at the key issue of the load shape impact of utility conservation programs in considerable detail. The absence of such analysis among utilities for many (or most) of their conservation programs has led to an underestimation of the benefits of those programs that have a favorable impact on load shapes (and, conversely, an overestimation of benefits of programs with unfavorable impacts on load shapes). This study is intended to perform the detailed calculations to estimate load shape impacts for a variety of conservation measures in three locations, as a first step to developing an agenda of conservation programs that are well-suited to particular utilities.

METHODOLOGY

We have developed a methodology for calculating changes in annual electricity consumption and hourly loads in the residential sector resulting from the implementation of one or more energy conservation measures in a utility service area. We used the methodology to evaluate different measures in three service areas with differing load characteristics. We evaluated the measures by comparing their impacts on electricity sales and on peak summer and winter loads. The measures were ranked on the basis of a figure-of-merit related to their ability to reduce peak loads relative to electricity consumption.

* This work was supported by the Assistant Secretary for Conservation and Renewable Energy, Office of Buildings Energy Research and Development, Building Systems Division of the U.S. Department of Energy under Contract No. DE-AC03-76SF00098.

An important parameter in utility planning is the system load factor, defined as the ratio of average load to annual peak load for the entire service area. The smaller the load factor, the more load has to be satisfied by expensive fossil-fuel burning peaking generators. The figure of merit we have chosen to rank the conservation measures is the ratio of the change in peak load resulting from the implementation of the measure in all residential buildings in the service area to the change in annual electricity consumption. If the system peak occurs at the same time as the residential peak, there is a direct relationship between our figure of merit and the effect of the conservation measure in the system load factor. In any case, the figure of merit is useful as an indicator of relative effect of the measure on peak and base load.

We considered five measures to improve the thermal integrity of residential structures: (1) increasing ceiling insulation; (2) increasing wall insulation; (3) installing basement and perimeter insulation; (4) triple glazing; and (5) decreasing the air infiltration rate. A second set of measures involved replacing existing appliances with high efficiency models: central air conditioners with a seasonal energy efficiency ratio (SEER) of 14.0, room air conditioners with a energy efficiency ratio (EER) of 11.5, and refrigerators with an energy factor (EF) of 8.7. In addition, we looked at four combinations of measures. One was to bring all houses in the service area up to current (1981) construction practice and current appliance efficiency levels. The others were to convert all houses to passive solar at three different levels of thermal integrity and appliance efficiencies.

To examine the effects of these measures, we chose three utilities that differed widely in their climatic conditions, appliance saturations, and other household characteristics. The Detroit Edison Company (DECO) is representative of utilities located in colder climates with long heating seasons. Normally, DECO is a summer peaking utility because most houses in Detroit use gas heaters. To examine more carefully the effects of conservation measures that affect heating loads, we converted DECO to a winter peaking utility by increasing the saturation of electric space heaters from a few percent to nearly fifty percent. Virginia Electric Power Company (VEPCO) is representative of hot and humid climates with large cooling loads. Sixty-five percent of the households have air conditioners and run them for an average of 2000 hours per year. The climatic conditions in the Pacific Gas and Electric Company (PG&E) service area are less extreme than in the other two. It has a low air conditioner saturation and a relatively short heating season. The characteristics of the three service areas are summarized in Table I.

We determined the effects of an energy conservation program on hourly load shapes in three stages. First, we calculated the changes in heating and cooling loads in an individual building incorporating the conservation measure. Second, we calculated the annual energy consumption by end use for a case in which all homes in the service area incorporate the particular measure. Finally, we disaggregated the annual energy consumption for each end use by hour of the year using hourly load profiles. We compared these results to a base case that did not include the conservation measure. In this way, we were able to determine the percentage changes in annual electricity consumption and winter and summer peak loads.

Hourly and annual heating and cooling loads in a single-family house are calculated using the DOE-2 Building Energy Simulation Model.[2] For those measures that affect building thermal integrity, the changes to the building structure must be specified. Using a weather data tape for one city in the service area obtained from the National Oceanic and Atmospheric Administration, the model calculates the heating and cooling loads in a typical building during each hour of the year. For those measures that affect air conditioner efficiency, DOE-2 runs are not needed because the hourly profile is not changed, only total air conditioner energy demand. Improving refrigerator efficiency decreases the cooling load and increases the heating load on the HVAC system. The DOE-2 model was used to calculate the effect of this measure on the hourly heating and cooling electricity demands.

The LBL Residential Energy Model[3,4] is used to calculate annual electricity consumption in the service area for 12 end uses. The annual heating and cooling loads are prorated to electric space heaters and to room and central air conditioners depending on their saturations and efficiencies. For the other end uses, the annual electricity use depends on the appliance efficiencies and hours of use. Housing stock and appliance saturations for 1981 were used to calculate annual end-use electricity consumption. These data come from utility surveys and other regional data sources.

The projected annual electricity consumption by end use for each year is disaggregated into hourly demands by the LBL Residential Hourly and Peak Demand Model.[5] In the case of temperature-insensitive end uses, the disaggregation is performed using hourly load profiles for the relevant appliance. For air conditioners and space heaters, the electricity demand depends on the outdoor temperature or temperature-humidity index (THI). This dependence is embodied in the model in a set of fraction-in-use matrices which show the fraction of the capacity for each end use that is being used by hour and temperature (or THI). The fraction-in-use matrices are modified when analyzing a conservation measure by scaling them to the hourly heating and cooling loads calculated by the DOE-2 model. Summer and winter peak loads are determined from the hourly demands.

Our results on the changes in annual electricity consumption and in the hourly load shapes on the peak summer and winter days were derived as follows. First, we compared the effects of the conservation measures within a single utility service area. In addition, we ranked the measures according to a figure of merit based on their relative effect on base and peak load. Then we compared the conservation measures across the three service areas, pointing out the the differences in their effectiveness. Tables II, III, and IV summarize the savings in energy and peak power produced by individual and combinations of measures.

IMPACTS ON ELECTRICITY CONSUMPTION AND LOAD SHAPE

Detroit Edison Company

The five measures for improving thermal integrity have a much greater effect on the winter peak load and the annual energy demand than on the summer peak due to the long heating season and low minimum temperatures in the Detroit Edison service area. The magnitude of the reduction in winter peak load is proportional to the assumed electric space heating saturation, but even on a per household basis, the reduction is significantly larger in the winter than in the summer. Houses in Detroit already have double glazing and are fairly well insulated in their ceilings and walls, so improving these measures has relatively little effect. However, reducing air infiltration and heat losses through the basement could significantly reduce peak residential loads during the winter, as well as saving energy throughout the year.

The relative ranking of the thermal integrity improvements in terms of our figure of merit is the same for summer and winter. Decreasing the air infiltration rate is the most effective of these measures in reducing both summer and winter peak loads. Note that the summer peak load savings and hence the figure of merit are negative for basement insulation improvements. Heat loss through the basement serves to keep the house cooler during the summer. Reducing this loss through greater basement insulation thus increases electricity demand for air conditioning.

Improving the efficiency of air conditioners is the most effective method of reducing the DECO summer peak load. For example, if all central air conditioners had an SEER of 14.0, the peak load would be reduced by 15 percent. The effect of air conditioner efficiency improvements on annual electricity consumption is relatively small (one percent or less) because of the short cooling season in Detroit. During the summer, there would be a reduction in base load as air conditioners are run even at night.

Refrigerator efficiency improvements are relatively more effective during the summer than during the winter in reducing peak loads. Their greatest impact is on annual electricity use, however. This results in a figure of merit of less than one, which implies that more efficient refrigerators could lower the utility's load factor.

The major changes in bringing all houses in the DECO service area up to current practice would be to install R-10 basement insulation to a depth of 8 feet and to bring appliance efficiencies up to 1981 levels. There would also be a small increase in ceiling insulation levels. Annual electricity consumption would be reduced by nearly 13 percent. There would be comparable decreases in the peak load during winter, but only a slight decrease during the summer.

Passive solar houses show similar results to current practice. The effects are greatly enhanced if measures to increase thermal integrity and appliance efficiency are also employed. There are considerable savings in annual energy consumption (31 percent in the best available technology case) and in winter peak load (44.5 percent). The best available technology case also shows a sharp reduction in summer peak load, but the other two do not.

Pacific Gas and Electric Company

Each of the thermal integrity measures we consider would result in about a one percent savings in electricity consumption if they were fully implemented in the PG&E service area. However, they differ in their effects on the winter and summer peak loads. Ceiling insulation improvements are twice as effective in the summer as in the winter in reducing peak load. Wall insulation and triple glazing are also more effective during the summer, but to a smaller degree. Increasing the perimeter insulation and lowering the air infiltration rate, on the other hand, have a larger effect on the winter peak.

Air conditioner improvements are the most effective measures for reducing summer peak loads. This is especially true for central air conditioners because their saturation is much higher than that of room air conditioners in the PG&E service area. Doubling the efficiency of central air conditioners results in a savings of more than 13 percent of the utility's residential peak power requirements. Since PG&E's system peak is coincident with the residential summer peak, improving air conditioner efficiency will have a direct impact on the system load factor. Room and central air conditioner improvements have a figure of merit of 9.5, more than three times larger than any other conservation measure.

In terms of saving energy, increasing the efficiency of refrigerators is the most effective of the measures considered. Increasing their efficiency by 75 percent results in reducing electricity consumption by nearly ten percent. Since refrigerators can draw power at any time, these savings are spread out over all hours of the day. In contrast to the case with air conditioners, improvements to refrigerators have a relatively smaller effect on the peak because this end use makes up a smaller proportion of the load during peak hours. The figure of merit for this measure is therefore less than one.

Comparing stock houses with current (1980) practice, we see that residential electricity consumption would be reduced by 6.6 percent if all houses in the PG&E service area were brought up to current thermal integrity and appliance efficiency levels. The improvements in winter and summer peak loads would be 6.6 and 8.8 percent, respectively. Thus, current practice improves the residential load factor during the summer. Night setback of thermostats during the winter has no effect on annual electricity demand and provides only a small peak load reduction. However, night setback has a significant effect on the winter load shape. Like the insulation measures discussed above, bringing all houses in the service area up to current practice would would spread the savings during winter over the full day, whereas during the summer they occur primarily during daylight hours.

Passive solar construction practices can be even more effective than current construction in reducing load factor. In the best available technology case, the summer peak is reduced by 31.5 percent and the winter peak by 19.5 percent. These are accompanied by reductions in electricity demand of 17 percent. The reduction in load occurs throughout the day during the winter, but it is concentrated during daylight hours during the summer.

Virginia Electric Power Company

Increasing thermal integrity in the VEPCO service area decrease the demand fairly uniformly during the winter, whereas they affect mainly the peak hours during the summer. Triple glazing is the most effective in decreasing both energy and peak load. From the figure of merit, we see that additional ceiling insulation would be preferred for reducing the summer peak and that lowering the infiltration rate would be preferred for reducing the winter peak. Insulating basements to R-10 could make the summer load factor worse, and it is the least effective in improving the winter load factor.

Measures that improve the efficiency of central air conditioners will have a dramatic effect on the summer peak. Doubling their efficiency decreases the peak load by more than 19 percent, as well as decreasing annual electricity use by three percent. This leads to a figure of merit of 6.28, far higher than for any other measure. The next best measure, improving room air conditioner efficiency, reduces the summer peak by only 3.6 percent and has an figure of merit of 4.1. In contrast, refrigerators have a figure of merit of 0.5. Because their demand for energy is nearly constant throughout the year, refrigerator efficiency improvements are the most effective measure in reducing annual energy consumption.

Bringing existing houses up to current (1980) practice would result in a savings of more than nine percent in residential electricity use. The effect on peak loads is even greater: a decrease of nearly 14 percent during the summer and about 11 percent during the winter. Night thermostat setback has no effect on overall electricity consumption and decreases the winter peak savings only slightly. The major effect of night setback is to change the load shape between the hours of 5 and 9 AM.

Employing passive solar practice along with increasing thermal integrity and appliance efficiency can make dramatic reductions in electricity demand and peak loads. Electricity demand in the best available technology case declines by nearly 20 percent, as does the winter peak. The reduction in the summer peak is even more striking, nearly 40 percent in this case. The figure of merit for the summer is about two, which indicates this is an effective technique for improving load factor in a summer peaking utility.

In interpreting results, it is important to note the assumptions made in doing the calculations. We are interested in making comparisons of effectiveness among conservation measures and between different service areas. To do this, we have examined a hypothetical case in which the conservation measures are applied to all residential buildings in the service area. Thus, our results can be interpreted as the maximum potential savings resulting from implementing the measure. Our values of percent energy and peak power savings depend on the saturation of the conservation measure. The figure of merit is less dependent of both the appliance saturation and the level of implementation of the conservation measure.

In the case of Detroit Edison, we performed a set of computer simulations in which we increased the saturation of electric space heating to nearly fifty percent to emphasize the effects on winter peak loads. Our results on energy and peak power— for winter cases— therefore apply to a hypothetical utility having a winter peak due to electric space heating rather than to Detroit Edison itself.

INTERUTILITY COMPARISON

An examination of the load shapes for the peak winter day in the three service areas shows that demand is reduced during all hours of the day by the thermal integrity measures. Demand reduction during the summer varies between service areas and among the different measures. Air conditioning in the PG&E service area is a major portion of the residential load between 9 am and 9 pm. In the DECO and VEPCO service areas, the air conditioning load extends well into the night. One might expect that PG&E would show the highest air conditioner figure of merit, but in fact DECO has the highest because its cooling season is the shortest.

PG&E has a smaller space conditioning load than the other two utilities, so it shows the lowest annual energy savings due to the thermal integrity measures. This is also reflected in the fact that refrigerator improvements provide the largest energy savings in its service area. For a winter peaking utility, reducing the air infiltration rate is the best way to reduce load factor. Triple glazing is also effective for DECO and PG&E, while wall and ceiling insulation help for VEPCO. The pattern for the summer peak is less consistent. However, increasing the basement insulation could adversely effect the system load factor in some service areas.

In all three service areas, bringing houses up to current practice would reduce the winter peak load and electricity demand. These effects are largest in the DECO service area. Although night setback changes the daily load shape during the winter, it has no impact on overall electricity demand and very little on the winter peak.

Passive solar construction practices by themselves (e.g., just moving all the windows to the south wall, adding thermal mass, etc.) have relatively small savings. However, combining them with thermal integrity and appliance efficiency improvements results in substantial energy and peak power reductions. It is interesting to note that the effects are roughly linear: if you add the savings due to current practice to those due to passive solar, you get fairly close to the passive solar with current practice savings.

The effects of passive solar construction differ among the service areas. In a winter peaking utility, such as our modified Detroit Edison, the major impact is the reduction of winter peak load. In a utility with a large air conditioning saturation, such as VEPCO, it is summer peak load that shows the largest reduction. Promoting passive solar housing appears to be a good way for a utility to ameliorate its load growth problems.

SUMMARY AND CONCLUSIONS

The results to date can be summarized by the following points:

- Air conditioner efficiency improvements are the most effective measures for increasing summer system load factors.
- Reducing the air infiltration rate is the most effective measure for reducing winter peak loads.
- Bringing all houses in the service areas up to current practice would result in significant savings in energy and winter peak power.
- Refrigerator efficiency improvements are more suitable for reducing base load.
- Adding insulation in the basement can adversely affect summer peak loads.
- Night setback of thermostats during the winter has little effect on overall electricity demand and only a small effect on winter peak power.

The conservation measures we have analyzed have a wide range of effects on residential load shapes. The policy implications for utilities and regulatory agencies depend on the conservation measure and the characteristics of the service area. A utility can choose among these measures to select the ones most appropriate to its energy and load objectives. If it wants to decrease summer peak load growth, it would promote high efficiency air conditioners. Measures to increase basement or perimeter insulation would not be favored. A winter peaking utility wanting to decrease load growth would try to decrease air infiltration in residential buildings. A utility that is interested in reducing growth in both peak load and annual consumption would find that encouraging passive solar construction practices is an effective measure. On the other hand, a regulatory agency mandating efficiency improvements for refrigerators may find that it may be opposed by utilities with excess generating capacity.

Our results on the changes in load shape can form the basis of an analysis of the financial impacts of the conservation measures on electric utilities. Three major factors have to be considered: generating costs, revenues and investments. Generating cost differences can be determined from changes to the load-duration curve, which can easily be calculated from the hourly load shapes. Changes to the load duration curve also determine the investment needed in new generating capacity. Revenue impacts are calculated from differences in sales to various rate classes. Combining these three factors provides an estimate of whether or not the conservation measure is financially beneficial to the utility. More details on these calculations can be found in Reference 1.

REFERENCES

1. Kahn, E., Pignone, C., Eto, J., McMahon, J., and Levine, M., (1985) "The Effect of Conservation Programs on Electric Utility Earnings: Results of Two Case Studies," submitted to *Energy Policy.*

2 DOE-2, Version 2.1: Reference Manual (Part 1 and Part 2) (1979) BDL Summary, Users Guide, and Sample Run Book, prepared by Lawrence Berkeley Laboratory for the U.S. Department of Energy.

3 E. Hirst and J. Carney (1978) "The ORNL Engineering-Economic Model of Residential Energy Use," Oak Ridge National Laboratory, Report ORNL/CON-24, Oak Ridge, Tennessee.

4 J. E. McMahon (1984) "The LBL Residential Energy Model: An Improved Policy Analysis Tool," to be published in *Energy Systems and Policy.*

5 G. Verzhbinsky, H. Ruderman, and M. D. Levine, (1985) "The Residential Hourly and Peak Demand Model: Description and Validation," Lawrence Berkeley Laboratory, Draft Report LBL-18698.

Table I. Characteristics of utility service areas, 1981.

	Utility Service Area		
	DECO	PG&E	VEPCO
Financial			
Median Family Income ($1000)	21.0	21.7	19.9
Electricity Price (1975 $/MMBtu)	$3.56	$3.26	$3.54
Customers			
Residential Customers (1000)	1599	2468	1239
Saturations			
Electric Space Heat (%)	48.6*	12.8	26.3
Central Air Conditioner (%)	21.6	15.1	38.3
Room Air Conditioner (%)	31.0	8.9	26.5
Climate			
Heating Degree Days (65 °F)	6551	3664	4247
Cooling Degree Days (75 °F)	213	526	501
Annual Heating Hours	4810	3912	4515
Annual Cooling Hours	955	1220	1970
Energy and Load			
Residential Sales (GWh)	18,544	14,381	13,478
Summer Peak Load (MW)	3076	3070	3747
Winter Peak Load (MW)	7804	2347	3275

Source: Detroit Edison Company
Pacific Gas and Electric Company
Virginia Electric Power Company

* DECO electric space heating saturation increased to simulate a winter peaking utility.

Table II. Savings from conservation measures.
Detroit Edison Company

Conservation Measure	Percent Annual Energy	Summer Peak Day: Percent Peak Load	Summer Peak Day: Figure of Merit*	Summer Peak Day: Rank	Winter Peak Day: Percent Peak Load	Winter Peak Day: Figure of Merit*	Winter Peak Day: Rank
Ceiling Insulation R-27 to R-38	2.69	1.23	0.46	6	4.33	1.61	3
Wall Insulation R-11 to R-19	2.47	0.75	0.31	7	3.50	1.42	4
Basement Insulation None to R-10	9.50	-1.78	-0.19	8	11.39	1.20	5
Triple Glazing	2.66	1.44	0.54	5	4.29	1.61	2
Low Infiltration 0.7 to 0.4 ACH	7.82	5.43	0.69	4	14.77	1.89	1
Room Air Conditioner EER 6.72 to 11.5	0.56	6.16	11.07	2			
Central Air Conditioner SEER 7.06 to 14.0	1.01	15.09	14.92	1			
Refrigerator EF 4.95 to 8.7	4.45	3.82	0.86	3	0.62	0.14	6
Current Practice	12.94	3.72	0.29		14.03	1.08	
Current Practice with Night Setback	12.75	3.72	0.29		9.26	0.73	
Passive Solar stock practice	5.88	2.28	0.39		6.89	1.17	
Passive Solar current practice	17.78	6.29	0.35		22.37	1.26	
Passive Solar best available	31.09	32.08	1.03		44.54	1.43	

* Ratio of percent peak load savings to percent annual energy savings.

Table III. Savings from conservation measures.
Pacific Gas and Electric Company

Conservation Measure	Percent Annual Energy	Summer Peak Day: Percent Peak Load	Summer Peak Day: Figure of Merit*	Summer Peak Day: Rank	Winter Peak Day: Percent Peak Load	Winter Peak Day: Figure of Merit*	Winter Peak Day: Rank
Ceiling Insulation R-19 to R-38	0.81	1.92	2.37	5	1.05	1.30	5
Wall Insulation R-11 to R-19	1.17	2.83	2.41	4	2.24	1.90	3
Perimeter Insulation None to R-10	1.32	0.51	0.39	8	2.08	1.58	4
Triple Glazing	1.15	3.20	2.78	3	2.55	2.21	2
Low Infiltration 0.7 to 0.4 ACH	0.89	1.81	2.04	6	2.48	2.79	1
Room Air Conditioner EER 6.72 to 11.5	0.30	2.87	9.57	1			
Central Air Conditioner SEER 7.06 to 14.0	1.46	13.70	9.40	2			
Refrigerator EF 4.95 to 8.7	9.93	6.43	0.65	7	7.31	0.74	6
Current Practice	6.62	8.78	1.33		6.69	1.01	
Current Practice with Night Setback	6.60	8.78	1.33		6.61	1.00	
Passive Solar stock practice	2.00	6.20	3.10		4.27	2.14	
Passive Solar current practice	8.58	13.29	1.55		10.71	1.25	
Passive Solar best available	16.99	31.48	1.85		19.45	1.14	

* Ratio of percent peak load savings to percent annual energy savings.

Table IV. Savings from conservation measures.
Virginia Electric Power Company

Conservation Measure	Percent Annual Energy	Summer Peak Day			Winter Peak Day		
		Percent Peak Load	Figure of Merit*	Rank	Percent Peak Load	Figure of Merit*	Rank
Ceiling Insulation R-24 to R-38	1.36	2.88	2.13	3	2.37	1.75	3
Wall Insulation R-12 to R-19	0 97	1.34	1.39	6	1.72	1.78	2
Basement Insulation None to R-10	2.72	1.51	0.55	7	3.98	1.46	5
Triple Glazing	3.12	5.48	1.76	4	5.00	1.60	4
Low Infiltration 0.7 to 0.4 ACH	2.22	3.44	1.55	5	4.86	2.19	1
Room Air Conditioner EER 6.72 to 11.5	0.89	3.61	4.06	2			
Central Air Conditioner SEER 7.06 to 14.0	3.08	19.28	6.26	1			
Refrigerator EF 4.95 to 8.7	5.22	2.68	0.51	8	2.39	0.46	6
Current Practice	9.10	13.65	1.50		11.12	1.22	
Current Practice with Night Setback	9.01	13.65	1.51		10.62	1.18	
Passive Solar stock practice	4.34	8.70	2.00		7.15	1.65	
Passive Solar current practice	11.19	18.94	1.69		13.74	1.23	
Passive Solar best available	19.17	39.66	2.07		20.95	1.09	

* Ratio of percent peak load savings to percent annual energy savings.