THE IMPACT OF RISING ENERGY PRICES ON THE POOR OVER TIME IN THE UNITED STATES

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Policy makers and households are concerned about the impact of rising energy prices on low-income households. In a trend starting in the 1970s, low-income households are spending an increasingly disproportionate share of their income on home energy. The burden on a household imposed by energy prices can be analyzed through four factors: energy price, energy consumption, income level, and level of assistance provided to help with the costs of energy. The combination of these factors indicates that the energy burden is continuing to be disproportionately large for the nation's poor. Therefore, policy makers make further efforts to alleviate this burden by modifying energy pricing regulation.

INTRODUCTION

In recent years, policy makers and low-income households have been increasingly concerned about rising energy prices. Although low-income families[1] consume less energy than any other group of Americans, energy expenditures are rising as a proportion of total expenditures for these families. Energy consumed by low-income families is almost entirely for essentials—space and water heating, cooking, food refrigeration, and lighting. As energy prices rise, the poor[2] are forced to make difficult spending choices (Newman & Day, 1980). In 1992, the federal government removed some market restrictions through the Energy Policy Act[3]. The Act is meant to encourage competition leading to lower prices and providing relief to low income families. However, these laudable goals have not been realized. The energy burden[4] facing low-income households is not improving in the United States.

Energy prices have risen rapidly since 1970s. While all households feel the impact of rising energy prices in their family budgets, the poor suffer proportionately more.

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[1] Low-income households represent those households with annual incomes below 150 percent of the poverty line or 60 percent of median State income.
[2] The definition of the poor takes account of both income and family size.
[3] The Energy Policy Act of 1992 is the policy that improves the nation's energy efficiency and reduces the emission of global warming gases (The Energy Policy Act of 1992, 2002).
[4] Energy burden is a percentage of income that is spent on energy.

Although the Low Income Home Energy Assistance Program (LIHEAP) and the Energy Weatherization Assistance program[5] have focused on assistanting low-income families through rate subsidization and financing home energy efficiency improvements, the data suggest that not enough assistance is being provided.

INCOME LEVELS AND ENERGY EXPENDITURES

Energy consumption in the residential sector includes electricity, natural gas, fuel oil, kerosene, liquefied petroleum gas (propane), coal, wood, and other renewable sources such as solar energy. Table 1 shows households with higher income consume more energy and spend more on average. In general, higher income households live in larger housing units, which require more energy for heating and/or cooling. Lower income households consume less energy; however, there is a certain floor below which energy consumption does not typically fall. Similarly, when income rises, the consumption of energy rises, but more slowly than income does[6].

[5] The Department of Energy Weatherization Assistance program has efficiency investment resources and had planned to improve an additional 200,000 low-income homes by 2001.

[6] As energy consumption increases, the utility of consuming additional units (its marginal utility) declines. As more energy is consumed, the value of additional units declines and fewer are desired.

Table 1

Residential average energy consumption

YEAR	AVERAGE ENERGY CONSUMPTION			
	Electricity (quadrillion Btu.)		Natural gas (quadrillion Btu.)	
	Low-income	Moderate-income	Low-income	Moderate-income
1987	0.39	0.51	0.87	0.77
1990	0.36	0.62	0.70	0.90
1993	0.36	0.65	0.66	0.96
1997	0.33	1.08	0.53	1.65

Resource: U.S. Energy Information Administration, *Household energy consumption and expenditures,* 1997 and prior reports.

Lower income families devote a much larger share of their income to energy expenditures and that share has grown dramatically over time. In 1993, a family with a household income less than $10,000 per year spent about 9.77 percent of its income for household energy expenditures (see table 2). By 1997, a family with an annual income less than $10,000 was spending more than 20 percent of that income for household energy consumption. In contrast, a moderate-income family with an income between $35,000 to $49,999 per year in 1993 devoted about 2.76 percent of its income to energy expenditures. In 1997, the percentage had grown to about 5.34. The reason for the dramatic increase of energy use between 1993 and 1997 is likely related to the boom in demand for new, and larger, single-family housing units. This risk in housing demand coincided with relatively rapid gains in real household income due to a combination of economic prosperity, low inflation, and sustained bull-market that increased household

wealth for many Americans.

Table 2
Energy expenditures comparison between low-income and moderate-income households

YEAR	AVERAGE EXPENDITURES PER HOUSEHOLD (DOLLAR)		ENERGY EXPENDITURE PERCENTAGE OF TOTAL INCOME	
	Low-income (Family income less than $10,000)	Moderate-income (Family income between $35,000 to $49,999)	Low-income (Family income less than $10,000)	Moderate-income (Family income between $35,000 to $49,999)
1987	881	1,257	8.81	2.51
1990	888	1,296	8.88	2.59
1993	977	1,379	9.77	2.76
1997	2,013	2,670	20.13	5.34

Source: U.S. Energy Information Administration, *Household energy consumption and expenditures,* 1997 and prior reports.

As shown in Table 2, both low-income and moderate-income families had experienced a more than doubling of energy expenditures as a percent of income, but the relative burden is particularly for onerous low- income families. Nowadays, poor families consume more energy than before while their income remains largely unchanged. Second, poor families have difficulties conserving energy because they have fewer luxuries to cut back. Third, they lack the resources that are needed to invest in conservation technologies (Cooper et al., 1983). In 1996, income gains were not evenly distributed. After adjusting for inflation, the average income of the poorest fifth of families fell $210 (or 1.8 percent) in 1996. The average income of the middle

fifth of families raised $630 (or 1.5 percent). But the average income of the richest five percent of families climbed $6,440 (or 3.1 percent).

Although there might be some mitigating factors, once adjustments are made for inflation, a family with $10,000 in income in 1997 was poorer than a family with $10,000 in income in 1993. However, since the period of 1993 to 1997 was characterized by low, stable inflation rates (approximately 2 percent per year), the net change in household income is not dramatic. Besides, climate and geography are important issues on energy consumption as well (see appendix A).

RESIDENTIAL ENERGY PRICE

As Table 3 shows, when the utility prices went up from 24.69 to 25.05 dollars per million Btu (1993-1997), low-income families' energy consumption went up as well. During that period of time, the increase in percentage of household expenditure on utilities grew faster than the percentage of energy prices relative to non-low income families (see appendix B). When the electricity price grows up by 14.6 percent from 1993 to 1997, low-income families' utility expenditures went up by 106 percent as high-income families' consumption only increased by 93.5 percent. The situation was the same even in the 70s and 80s (See Appendix C for energy consumption in 70s and 80s).

Table 3
Residential energy prices

	RESIDENDITAL ENERGY PRICES	
YEAR	Electricity ($/mil.Btu)[7]	Natural gas ($/mil.Btu)
1987	22.34	5.41[8]
1990	23.60	5.60
1993	24.69	6.07
1997	25.05	6.78

Source: U.S. Energy Information Administration, *Household energy consumption and expenditures,* 1997 and prior reports.

[7] Btu. Is the most common measure of heat energy in the American heating and cooling industry. It stands for British Thermal Unit and is a small amount of energy, roughly equivalent to the energy given off from burning a wooden match.
[8] Energy price does not adjusted in these years, so the prices were less than it actual value if comparison

During the 1970s, utility decision-makers designed promotional rates to encourage energy consumption. The energy rates were based on consumption level. Prices decreased as consumption rose. Clearly, the price per unit of electricity was higher at lower consumption levels because of the pricing system. The more you consumed, the less you paid per unit. Electricity prices are based on fixed costs plus variable costs. As consumption rise, variable costs rises, but fixed costs remain unchanged. Total average costs decline as consumption rises and rates can be lower. Hence, low-income households (small user) are forced to pay higher prices per unit because they do not consume enough utility for the discount rate. Table 4 shows that during 1972 and 1973, the poor paid $2.38 per million Btu's of electricity which is 13 percent higher than the rate paid by relatively high-income households. Overall, the poor actually paid more per unit for energy consumption than do wealthy families during 1970s (Newman & Day, 1980). Nevertheless, promotional rates are no longer suitable. In a few states, local policy makers believe that a flat rate policy would relieve the inequities and the unnecessary encouragement of consumption of increasing energy shortage. However, there is a doubt that equalizing rates would eliminate this problem.

Table 4

Amount, price, and cost of energy, by energy source and income, 1972-1973

ELECTRICITY	AVERAGE ANNUAL BTU'S (MILLIONS) PER HOUSEHOLD	AVERAGE PRICE PER MILLION BTU'S	AVERAGE ANNUAL COST PER HOUSEHOLD	PERCENT OF AVERAGE INCOME SPENT ON ENERGY
Low-income household	55	2.38	131	5.2
High-income household	124	2.11	261	1.1

Source: Washington Center for Metropolitan Studies' *Lifestyles and Energy Survey.*

According to the Residential Energy Consumption Survey (RECS), site energy consumed by American housing units was 4 percent higher in 1978 than in 1997 (Figure 2). The total amount of site energy consumption was 10.2 quadrillion Btu in 1997 while the total amount of site energy consumption was 10.6 quadrillion Btu in 1978. On a per housing unit basis, site energy consumption was 27 percent higher in 1978 than in 1997 (Figure 3), while the number of U.S. households increased by 33 percent, resulting in no change in total on-site residential energy consumption over that 20-year period. The decrease in per housing energy consumption is all the more remarkable considering that the size of U.S. housing units has increased markedly in the past two decades (EIA reports, 1997).

Figure 2. Total U.S. Residential Site Energy Consumption, 1978-1997

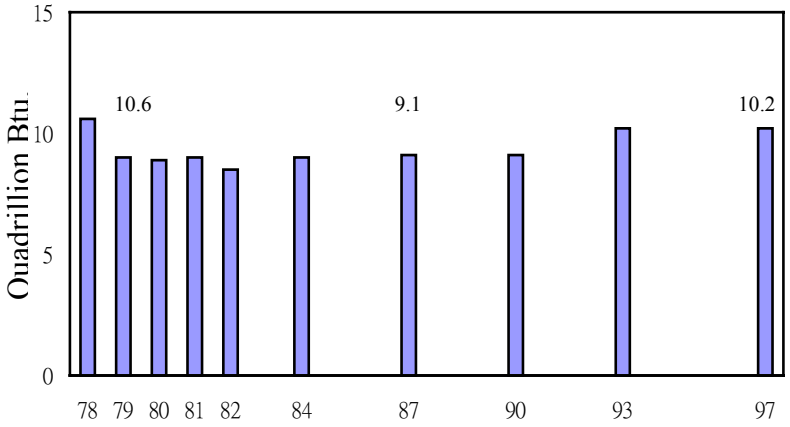
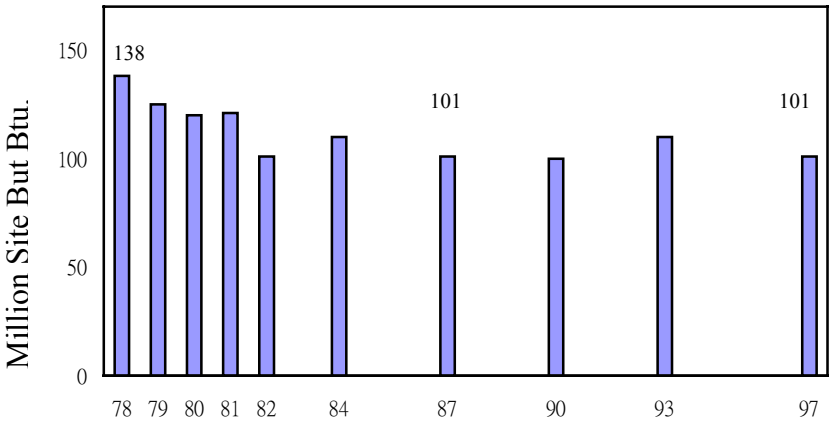


Figure 3. Total Site Energy Consumption per U.S. Housing Unit, 1978-1997



Source: Energy Information Administration; 1978 through 1997 Residential Energy Consumption Surveys.

In the United States, per-capita residential energy consumption fell 5 percent from 67.23 million Btu's to 63.88 million Btu's between 1980 and 1990. Meanwhile, both real per-capita income and real U.S. median household income rose during the same period. Real per-capita income rose 16 percent from $13, 922 to $16,204 (1987 dollars), and real U.S. median household income rose 6.5 percent from $29,309 to $31,203 (1991 dollars). According to Vandegrift et al. (1997), cross-sectional data for 48 states in 1990 show there is a negative correction between per-capita residential energy consumption and median household income. The data show that states with higher median household incomes have lower per-capita residential energy consumption.

LOW INCOME FAMILIES ENERGY ASSISTANCE

The LIHEAP is designed to assist eligible low-income households pay for winter energy services. Families that have incomes at or below 60 percent of the median income of their state are eligible for federal LIHEAP (see table 5). The Low Income Home Energy Assistance Program (LIHEAP) offers emergency assistance to current LIHEAP recipients who are still having difficulty meeting their energy needs. Customers that have a shut-off notice on their utility heating account may be eligible to receive up to an additional $400 in emergency assistance.

In 2000, nearly 27 million households were considered low income (EIA report, 2001). However, most states limit such assistance to the households with very low incomes, sometimes even below the poverty line. Table 6 shows the most vulnerable group of consumers. Most recipients of LIHEAP and Weatherizaton assistance are in this population, but the vast majority of these needy families do not receive any help. Approximately, two-thirds of the families which have incomes of less than $8,000 received energy assistance, there are still one third of poor families not receiving any assistance (Campaign for home energy assistance, 2002).

Table 5 Low income household energy assistance qualification

NUMBER IN HOUSEHOLD	MONTHLY GROSS INCOME
1	$1,253
2	$1,693
3	$2,134
4	$2,574
5	$3,014
6	$3,455
7	$3,895
8	$4,336
9	$4,776
10	$5,217
11	$5,544
12	$5,657

Source: LIHEAP, 2002

Table 6

The very poor: 2000-2001 energy costs and burdens of the 12 million households in poverty

MAIN HEAT FUEL OF HOUSEHOLD	TOTAL: OCT 2000-SPEP 2001	AVERAGE ENERGY BURDEN
Fuel oil	$2,193	37%
Natural gas	$1,897	36%
Electricity	$1,053	18%
Propane	$2,298	32%
Kerosene & other	$1,388	17%

Source: EIA report, 2001

LIHEAP and other federal energy assistance programs provide a one-time benefit to eligible households to be used for energy bills. The amount of payment is determined by income, household size, fuel type, and geographic location. Local agencies offer three types of LIHEAP assistance: 1.Energy Assistance: these one-time payments apply to all income eligible households. If a person is eligible for LIHEAP, a payment will be sent directly to the utility/fuel dealer, and the payment will be credited on the person's bill. In some cases, a check may be mailed to the recipient. 2.Emergency Services: these payments apply to eligible households that are disconnected from their primary or secondary utility, or where the supplier has refused to deliver fuel. 3. Emergency furnace repair/replacement: this category ensures that the home heating system is safely operational (The winter energy outlook for the poor, 2002).

For poor families, incomes are not only low, but also relatively fixed. In this case,

they may have to give up other life necessities due to rising energy costs. Although the federal government tries to provide energy assistance for the poor (LIHEAP)[9], it does not seem to relieve their energy burden. There are several difficulties: 1. Each assistance program has its own eligibility requirements, which causes confusion. 2. Local or federal governments have repeated budget shortages that limit funds for assistance programs. 3. Some people receiving private or federal assistance, or both, are not being reported. In other words, some people may receive double benefits for energy assistance which alleviate more burden (Unmet need for low-income energy assistance, 2002).

Another major low income energy assistance program called lifeline provides assistance to residential customers who qualify for the Home Energy Assistance Program (HEAP). Lifeline assistance reduces an eligible household's monthly rate for local service, and each eligible household receives credit for the Federal Subscriber Line Charge. Lifeline assistance is available to all residential households who meet eligibility requirements (see appendix D). To qualify, households must be involved in

[9] The Low Income Home Energy Assistance Program (LIHEAP) provides financial assistance with fuel costs and restoration of utility services during the winter heating season to eligible low-income households. Assistance to income-eligible homeowners and landlords to repair or replace furnaces to become more energy efficient is also available.

one of the following programs: Medicaid; food stamps; Supplementary Security Income (SSI); federal public housing assistance or Section 8 (a Federal Housing Assistance Program administered by the department of Urban Development); or Low Income Home Energy Assistance Program (LIHEAP). There is one more highly controversial issue for federal assistance. There have been questions raised regarding the eligibility of some recipients of low-income energy assistance. Landsberg and Dukert (1981) state that some recipients of energy assistance programs would not meet eligibility requirements if undocumented income earned in the underground economy[10] were included. The Internal Revenue Service recently estimated that the federal government is losing $195 billion per year in revenue due to the failure of people to report income and pay taxes on it (The Underground Economy, 2002). It reduced federal revenues which exacerbates government budget shortages.

DEREGULATION

In 10years, the federal government began lifting restrictions on generating capacity of plants built by independent power producers. The potential benefits of bringing more competition to the electricity industry—lower prices, reduced production costs, more

[10] It refers to economic activity that is unrecorded in the gross domestic product figures. It consists of

services—will depend on how competition is put into effect. The other new focus is for utilities to concentrate less on generating electricity and more on providing energy services by helping customers find ways to use electricity efficiently (Miller, 1996).

Prices charged by publicly owned utilities and rural cooperatives reflect current and historical subsidies extended to those utilities by the federal government since the 1930s (Table 7). The variation in prices across customer classes reflects differences in the quantity of electricity used and in the available alternatives to buying from the local utility. In general, industrial users consume more electricity than commercial and residential users, and industrial users also pay lower prices for electricity. They have more options if they don't like the price charged by their local utilities. Besides, industrial users may relocate their production facilities to a region with lower electricity rates (Brennan, Palmer, Kopp, Krupnick, Stagliano ,& Burtraw, 1996).

Table 7 Average retail electricity prices by customer class (cents/kilowatt-hour, 1993)

TYPE OF UTILITY	AVERAGE	INDUSTRIAL	COMMERCIAL	RESIDENTIAL
Investor-owned utilities	7.2	5.0	7.9	8.8
State and locally owned utilities	6.1	4.9	6.8	6.6
Rural electric cooperatives	7.0	4.6	7.4	7.7

Source: U.S. Department of Energy, Energy Information Administration, 1993.

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illegal, criminal activities such as drug dealing, as well as unreported income in order to avoid taxation.

From the retail consumer's perspective, opening the market for competition of utility companies may reduce the price variations across regions, customer classes, and utility types. Depending on the type of competition, consumers should be able to choose among alternative power suppliers. Opening utility markets should, theoretically, drive the search for more efficient ways to generate electricity, as well as for new ways to increase the value of electricity to consumers (Brennan, Palmer, Kopp, Krupnick, Stagliano ,& Burtraw, 1996). However, there is criticism that competition actually may not result in affordable rates for low-incomes. It is possible that deregulation could cause low-income families to have fewer electric serving opportunities due to a lack of money, credit, or market power.

Apparently, deregulation is a big challenge to global utilities companies. While some utilities companies have uncertainties about their ability to cope with the unexpected in the new deregulated marketplace, nearly two-thirds of global utilities companies feel deregulation has been a success so far. The utility market, through state legislative actions, are slowly being deregulated and opened to competition. Increased competition is supposed to benefit consumers by lowering prices and increasing services; however, there are some hidden problems. For example, deregulation makes it harder

for utilities to maintain profitability. Even though deregulated systems benefit consumers by offering lower prices and increased choices of new energy products and services, industrial users would believe that lower electric rates should be the result of increased efficiency, innovation and ingenuity, the result is mixed by experimenting deregulation system. In 1999, more than 11 percent of Pennsylvania's consumers had chosen to leave their utility company. However, California's residents weren't so lucky. After the deregulation plan went into affect in that area, the utility demand went up while the power supplies were limited. It caused the electricity shortages and skyrocketing prices and the plan failed. Hence, the results are varied in different areas while the policies applied.

CONCLUSION

Energy is the lifeblood of the economy. In fact, U.S. economic prosperity is closely tied to the availability of affordable energy. Unquestionably, the impact of rising energy prices on specific households will reflect the interaction of several factors, for example, the actual energy consumption patterns of the household, the actual prices they pay, and the ability of the household to maintain its income. The nation's low-income population bears an inordinate energy burden of high energy prices, paying three to seven times more on energy than the non-low income households. In general, people would expect that higher income households consume more energy; however, energy consumption does not grow as fast as income does.

Over time, low-income families will be forced to adjust to high prices for a product or service by modifying their consumption habits accordingly; however, most of low-income households could not go any more further. Even though the federal government releases fund for energy assistance for the poor, the social welfare policy might well concentrate on speeding up adaptations rather than pretending that the price adjustment can be postponed indefinitely (Landsberg & Dukert, 1981).

Rising energy prices is seen as a means of reducing energy consumption; however, it

is not a popular policy for low-income groups of households. The effective ways to handle an energy shortage would be to increase energy supply, or improve energy efficiency. Rising energy prices will put heavier burdens on low-income families since they have to pay a higher proportion of income for household energy than others. Energy, like natural resources, is finite; policy makers must consider distribution and pricing policies that will ensure all income groups have access to affordable energy for basic needs. Energy misallocation will potentially cause future shortages that would be disproportionately felt by the economically vulnerable.

Maximizing energy productivity to strengthen economy and improve living standards would be good for future energy strategy. Getting more out of the energy we use will keep costs of energy services such as light, heat, and mobility at levels that household can afford and at which our businesses can thrive. However, as U.S. and global energy needs grow, we must continue to press for more cost-effective and less polluting ways to produce and use energy and explore new approaches to reduce environmental risks, keep our economy strong.

APPENDICES

APPENDIX A

REGIONAL ENERGY MARKET

Climate obviously has a major impact on energy bills, but the mix of consumer fuels available and the cost of delivering them are also determined by location.

1. Central regional market: This market is the largest in area but is the least populated and produces more natural gas than it consumes, despite having the coldest weather of the regions.
2. Southwest regional market: This region not only produces the most natural gas but also consumes the most. The region has temperate winters and long, hot summer. The residential use of energy remains relatively low in the region, representing only about 11 percent of natural gas consumption in the region, virtually unchanged from the 1990 level.
3. Western regional market: Natural gas consumption in the western region increased at an average annual rate of about 4 percent between 1990 and 1996, whereas overall energy output increased at only a 0.3 percent rate. California dominates the regional natural gas market because of its large population, the highest in the Nation, and because of its relatively high gas use.

APPENDIX B

MATHEMATIC CONDUCTION

1. From 1993 to 1997, the price of natural gas increased by 11.7

percent :(6.78-6.07)/6.07=11.7%.

2. From 1993 to 1997, the price of electricity increased by 1.5 percent :

(25.05-24.69)/24.69=1.5%.

3. From 1993 to 1997, low-income families' energy consumption increased by 106.0

percent : (20.13-9.77)/9.77=106.0%.

4. From 1993 to 1997, moderate-income families' energy consumption increased by 93.5

percent :(5.34-2.76)/2.76=93.5%

APPENDIX C

1970 AND 1980 ENERGY CONSUMPTION

In the early 70s and 80s, as Table 3 shows, the lower income population lost a much larger share of its income to rising energy costs. The low-income households' energy expenditures rose from 11.0 percent of income to 23.2 percent. The lower-middle -income households' energy expenditures rose from 5.2 percent to 9.7 percent. The non-lower income households' expenditures increased from 2.5 to 3.5 percent (Cooper et al., 1983).

Table 3

Home energy expenditures as a percent of income

INCOME CATEGORY	1972-1973	1979-1980	1980-1981
Low Income	11.0	21.1	23.2
Lower Middle Income	5.2	8.9	9.7
Non-Lower Income	2.5	3.5	3.5

Source: U.S. Bureau of Labor Statistics, *Consumer Expenditure Survey: Interview Survey, 1972-1973.*

U.S. Department of Energy, *Residential Energy Consumption Survey, 1979-1980.*

APPENDIX D

RESIDENTIAL ELECTRICITY LIFELINE PROGRAM

Participating customers will receive a flat monthly credit on their electric bill. The customer is responsible for all charges in excess of the flat monthly credit.

The credit amount is determined as follows:

A. For participants with income at or below 75 percent of the federal poverty guidelines:

The percentage of income to be used when calculating the credit amount is 6 percent when the estimated annual usage is 5,000 kwh or less and 11 percent when the estimated annual usage is 14,000 kwh or more. For usages in between, the following formula shall be used:

$$\frac{\text{Estimated annual use in kwh-5000}}{9000} \times 5\%+6\% = \%\text{ of income}$$

For participants with income above 75 percent of the federal poverty guidelines:

The percentage of income to be used when calculating the credit amount is 7.1 percent when the estimated annual usage is 5,000 kwh or less and 12.1% when the estimated annual usage is 14,000 kwh or more. For usages in between in between, the following formula shall be used:

$$\frac{\text{Estimated annual use in kwh –5000}}{9000} \times 5\%+ 7.1\% = \%\text{ of income}$$

Estimated annual use is based on the prior year's usage for the dwelling unit.

B. Annual household income x %income = participant co-payment

The annual participant co-payment shall not be less than twelve times the rate for the first 100 kwh under the Rate A-Residential Service Schedule.

C. Estimated annual bill-participant co-payment = annual credit

The annual credit shall be reduced by any HEAP benefit the participant applies to his or her account, except for supplemental HEAP benefits.

D. Annual credit ÷ 12 = monthly credit
E. If the annual credit is calculated to be less than $50,000, the customer will not be enrolled in the program.
F. The customer's credit amount may be adjusted during the program year under the following conditions:

i) When the customer moves to a new location;
ii) When electrically powered life support equipment is installed at the customer's location; or;
iii) When adults who reside in an ELP household separate;
iv) When it determined that the usage used to calculate the original ELP credit includes non-residential use, the amount of residential use may be determined in accordance with Subsection III, paragraph E above, and the ELP credit may be recalculated accordingly.

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