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How to Determine the Effectiveness of Energy Assistance, and Why It's Important

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Executive Summary

This paper identifies criteria that state public utility commissions can use to assess the effectiveness of programs and other actions, funded by energy utilities and their customers, to facilitate the payment of utility bills by eligible low-income households. It discusses features of energy assistance (EA) actions that are likely to make them either successful or unsuccessful. The paper also points out, in a generic way, weaknesses and strengths of different EA actions. Commissions can refer to these features when judging specific actions taken or proposed in their states.

While recognizing that both government-funded and privately funded assistance plays a major role in helping low-income energy consumers, a premise of this paper is that utility-service affordability for households with the lowest incomes requires some form of utility-funded EA. Assistance encompasses direct subsidies, rate subsidies, energy-efficiency measures, and waivers on certain costs.

The paper emphasizes that state regulatory or legislative policy requiring utilities to provide monetary assistance to low-income households must address such questions as: (1) How much assistance should a utility provide in view of governmental and non-utility private assistance (e.g., the number of dollars offered to eligible households)? (2) Who should pay for this assistance (e.g., residential customers, all customers, utility shareholders)? (3) How should the utility collect the money (e.g., system benefit charge, cost tracker)? (4) What constitutes an appropriate financial effect on subsidizing customers? and (5) How should the utility distribute the assistance to eligible households (e.g., discount rate, lump-sum payment)?

Good regulation aims for a good benefit-cost ratio. Regulators should strive to assure that each dollar expended returns the highest possible dividend, because increasing effectiveness has the same effect as increasing the number of dollars for EA.

Effectiveness depends upon many factors. This paper helps regulators to assess the effectiveness of the EA programs in their states by identifying nine criteria that regulators can use to distinguish between effective and ineffective EA actions. The nine criteria are:

1. Benefits should accrue to only low-income households.
2. The recipients of EA should receive maximum benefits relative to the dollars funded.
3. Consumer information and education should make eligible households aware of available assistance and ways to reduce their energy bills.
4. Benefits to recipients of EA should positively correlate with their actual energy costs or energy burden.
5. EA should avoid large efficiency losses or cross-subsidization.

6. EA should have reasonable administrative and implementation costs.
7. Funding should have a tolerable financial effect on individual subsidizing customers.
8. EA should result in reduced collection costs, service disconnections, arrearages, and debt write-offs.
9. EA should promote equity.

This paper includes a matrix that relates seven individual EA actions to the nine criteria. The matrix provides a checklist for determining whether and to what extent each action satisfies the different criteria. It also allows regulators to compare qualitatively the different actions based on the information compiled for each cell.

This paper identifies questions that regulators should ask to assure effective EA actions. It also lists examples of performance indicators for EA actions. Regulators should require utilities to provide this information for assessing current EA actions.

In conclusion, the paper recommends that regulators review EA actions to determine whether they are achieving the regulatory goal of utility-service affordability: (1) most effectively and (2) with minimal adverse effects on other goals. Outcomes can easily depart from expectations when actions produce less-than-expected benefits to targeted customers and unintended consequences that harm the utility and its other customers. Regulators should, therefore, evaluate EA actions periodically. In serving the public interest, regulators need to be vigilant in assuring that utility-funded EA is performing at the highest level.

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How to Determine the Effectiveness of Energy Assistance, and Why It's Important

I. Introduction and Reason for the Paper

Whether state public utility commissions (“PUCs” or “regulators”) and utilities should assure the affordability of utility service for low-income customers is a question that has occupied regulation since its earliest days. Some analysts have argued that the real problem is inadequate income, not regulatory policy. They contend that state and federal legislatures, or other governmental entities, are better able to address poverty by supplementing the income of poor households and by offering them financial support for energy-efficiency improvements. They argue that these actions are more effective and efficient than subsidizing the prices paid for utility service.

Political pressures and legislative mandates have contributed, however, to regulators and energy utilities’ providing programs that protect low-income households from unaffordable utility bills. What some view as “taxation by regulation” requires slightly higher rates to the majority of customers to pay for energy assistance (EA) that benefits a smaller, target group of customers. The “tariff effect” that makes the majority minimally worse off to make a small minority substantially better off has definite political appeal.¹

State PUCs have long attached importance to utilities’ providing affordable service to all customers, including low-income households. EA’s premise rests on the belief that no household should have to choose between paying its utility bill and paying for other necessities. Many PUCs have encouraged their utilities to actively assist low-income households in various ways, especially in preventing service disconnections and offering discounts on their bills. They have also encouraged utilities to lobby for more assistance from the federal government and the states, which collectively spend substantially less on energy assistance than they do on assistance for food, medical care, and housing. In 2004, for example, of the total governmental spending for income-tested benefits, only 0.4 percent went toward energy assistance. In contrast, 6.7 percent, 8.2 percent, and 55 percent went toward housing, food, and medical assistance, respectively.²

¹ The paper later discusses the possibility and desirable outcome of non-targeted customers being no worse off, and even better off, because of lower collection, disconnection, and other costs that can result from EA. If regulators, as an alternative, require utility shareholders to fund EA, the price of utility service to non-targeted customers would not have to increase. The taxation would then fall upon the utility and its shareholders.

² See Congressional Research Service, *Cash and Noncash Benefits for Persons with Limited Income: Eligibility Rules, Recipient and Expenditure Data, Fiscal Years 2002-2004* (Washington, D.C., 2006).

Some utilities consider EA a good business strategy because it increases net revenues by offering discriminatory prices and other assistance to low-income households. A utility is likely to receive only partial bill payments from some low-income households. In the process of trying to collect unpaid amounts, the utility would incur additional costs. If the unpaid amount becomes uncollectible, the utility would write off this amount as bad debt. The utility might even disconnect the customer. The utility might be able to avoid collection, disconnection, and other costs by discounting the customers' bills. These cost reductions can more than offset the lost revenues from discounting and thereby increase the utility's net revenues. Such a possible outcome probably explains why some public utilities have initiated EA actions to help low-income households. These utilities might find more certainty and ease in recovery of revenue shortfalls with regulatory-sanctioned EA actions.

Unlike the goal of economic efficiency, affordability concerns itself with how regulation affects the economic well-being of individuals or individual groups in market exchanges. Economic efficiency becomes important, however, for determining how regulators and other policymakers are able to achieve the goal of affordability most effectively and at minimum cost. In making utility services more affordable, regulators unavoidably need to deviate from strict cost-based, non-discriminatory pricing; but regulators through their policies and practices should strive to minimize the size of efficiency losses.

A. The need for utility-provided EA

The premise of this paper is that utility-service affordability to households with the lowest incomes requires EA provided by utilities and funded by their customers. The paper focuses on those EA actions funded by energy utilities and their customers. These actions were either initiated by the utility or mandated by the state public utility commission or legislature.

Both government-funded and privately funded assistance play a major role in helping energy consumers. Any regulatory policy requiring utilities to help low-income households cannot ignore this assistance. If a regulator deems this assistance inadequate in satisfying the demands of low-income households, it will then have to address such questions as: (1) How much assistance should a utility provide (e.g., the number of dollars offered to eligible households)? (2) Who should pay for this assistance (e.g., residential customers, all customers, utility shareholders)? (3) How should the utility collect the money (e.g., system benefit charge, base rates, cost tracker)? (4) What constitutes an appropriate financial effect on subsidizing customers? and (5) How should the utility distribute the assistance to eligible households (e.g., discount rate, lump-sum payment)?

B. The overriding goal: affordability with minimal adverse effects on other regulatory objectives

In advancing the public interest, regulators would want to achieve the "affordability" goal with minimal impediment of other goals such as economic efficiency. Efficiency losses can result from: (1) recipients over-consuming energy when the subsidized price lies below the utility's marginal cost, and (2) an "excessive" gap between the actual benefits to targeted

participants and the subsidy cost absorbed by the utility or general ratepayers (e.g., utility customers pay \$10 million to subsidize low-income households, who benefit by only \$7 million).

Wasteful EA actions reduce benefits to targeted utility customers. Excessive cost expenditure in the administration and implementation of EA actions is one source of waste. Another source is non-poor households receiving EA, thereby subtracting from assistance going to the most financially needy households. A non-targeted lifeline rate or a discounted rate with broad eligibility rules that includes non-needy customers are examples of this type of inefficiency. A third source of inefficiency stems from EA not going to the neediest low-income households (e.g., the poorest of the poor). These households are more likely to set their thermostats at an unhealthy level or use their stove or oven for heat. They generally face the most severe unaffordability problems, making debt write-offs and disconnections more imminent.

A study using 1995 U.S. Census data found a statistically significant negative relationship between income levels and the percentage of households who did not fully pay their energy utility bills and whose service was disconnected.³ More recent statistics from the U.S. Census's *Survey of Income and Program Participation* also showed that disconnection rates rise as household income drops. In 2005, for example, the average disconnection rate for all households was 1.7 percent, while it was statistically significantly higher at 5.9 percent for households at or below 50 percent of the poverty line and 3.9 percent for households with incomes between 51 and 100 percent of the poverty line.

Although impeding some regulatory goals (e.g., cost-based prices), expanding energy affordability to a greater number of households conceivably advances other regulatory goals. No-cost weatherization to low-income households, for example, not only makes energy more affordable but also promotes energy efficiency; it can also reduce collection costs, service disconnections, debt write-offs ("uncollectibles"), and arrearages ("past due bills"). Other EA actions can also mitigate collection problems that financially affect utilities and their non-poor customers.

State regulators need to balance various regulatory goals in determining the socially optimal level of affordability. The conflicting nature of some objectives requires a societal judgment when it comes to weighing their tradeoffs. As an illustration, regulators must consider the compromising effects that advancing affordability has on economic efficiency and discriminatory-free rates.

C. Identifying criteria for desirable EA actions

Part V identifies criteria that state commissions can apply to assess the effectiveness of EA actions. Effectiveness has several dimensions, including: (1) the ability to reach the poorest

³ See Kurt Bauman, "Direct Measures of Poverty as Indicators of Economic Need: Evidence from the Survey of Income and Program Participation," U.S. Census Bureau, Population Division, Technical Working Paper no. 30, November 1998.

households, (2) the share of the subsidy that directly benefits the poor, (3) minimal unintended consequences, and (4) reasonable administrative costs.

Good regulation requires that EA actions funded by utilities and their customers provide adequate benefits to the intended targets, namely, eligible low-income households. Because EA actions collectively fall short in adequately meeting the needs of low-income households, regulators should strive to assure that each dollar expended returns the highest possible dividend. Increased effectiveness has the same effect as an increase in the number of dollars for EA.

Effectiveness depends on many factors. This paper identifies those factors to help regulators systematically determine the effectiveness of EA actions in their states. Effectiveness applies to both individual actions and the portfolio of actions taken to address the affordability problem. A utility, for example, might provide rate discounts concurrently with waivers on deposits, arrearages, and reconnection costs. An assessment of EA actions would involve a determination of whether individual actions complement others, or are in fact conflicting, in advancing affordability.

II. The Rationales for Utility-Provided EA

A. Poor households find energy unaffordable

“Affordability”—a term regulators like to use—refers to a state of affairs in which, after paying their energy utility bills, customers have enough money left to pay for other goods and services essential to their livelihood (e.g., housing, telephone service, insurance, transportation, clothing, food, and medical care). Affordability relates to the concept of “equity”; it is unfair to charge customers more for utility service than they can afford. Unfairness, in this context, would result in customers falling so far behind on their utility bills that over time they accumulate an unpaid account that they cannot possibly pay. The inevitable outcome is that those customers have their service disconnected and face obstacles in having service restored.

Regulators do not have direct knowledge of the difficulties low-income households face in paying for non-energy necessities; they do have information on whether customers have trouble paying their utility bills and are consequently delinquent in paying their past bills. For regulators, then, evidence of affordability comes strictly from knowing the number of low-income households in arrears, the dollar amounts of arrearages, debt write-offs, and the number of shutoffs. If low-income households are conscientious in paying their utility bills, regulators as well as utilities have no direct knowledge about whether these households are forgoing non-energy necessities. (They can consult, however, with a social service agency or other entity to obtain information on a customer’s financial situation, but this action may raise a privacy concern.) One perception is that energy is affordable to these households; in reality, however, for whatever reason, they are paying their utility bills but have insufficient income left over to pay for other necessities.

In dealing with an “energy affordability” problem, policymakers can apply one of two broad approaches: (1) increasing the incomes of poor households, and (2) lowering the share of the utility bill for which the customer is responsible for paying. EA actions (i.e., in-kind assistance) focus on the latter, while cash supplements with no strings attached constitute the former. With each approach, energy becomes more affordable, either by increasing a household’s income or by reducing the amount a household has to spend on energy. In either instance, the household spends a lower percentage of its income on energy.

Low-income households spend a much higher share of their incomes on home energy use than other households. Within the low-income category, a high negative correlation exists between income and the percentage of income spent on energy. An Idaho household, for example, that is at 75 to 99 percent of the Federal Poverty Level spends, on average, 13.6 percent of its annual income to pay for home energy. A household below 50 percent of the Federal Poverty Level spends, on average, 47.8 percent of its annual income to pay for home energy bills.⁴ Another source indicates that beneficiaries of the Low-Income Home Energy Assistance

⁴ See Idaho Public Utilities Commission, *In the Matter of the Commission’s Inquiry about Energy Affordability Issues and Workshops*, and Case No. GNR-U-08-01, Staff Report, January 16, 2009.

Program (LIHEAP) as a whole spend about 20 percent of their annual income on home energy bills, which is more than six times the percentage that other households spend.⁵

Studies estimating short-run price elasticities for electricity and natural gas of much lower than one; therefore, when utility rates rise, customers have less income to spend on non-energy goods and services. This consequence is more severe for poor households. Applying the statistics in the previous paragraph, for a given increase in utility rates, the real purchasing power of a poor household's income, in percentage terms, falls by over three times that of other households.

B. Poor households invest little in energy efficiency

Low-income households also find it hard to find money to pay for energy-efficiency investments. They tend to live in older and less energy-inefficient houses than other households; they are also more likely to rent than to own a home. Low-income households, for example, generally have low-energy-efficiency appliances and poorly insulated homes. Over the past several decades, however, the gap between home energy use by the poor and other households has narrowed, largely because the non-poor have able to make more investments in energy efficiency. While federal government statistics show a positive correlation between total home energy use and income, the correlation between energy use per square foot and income is highly negative.⁶ One interpretation of these correlations is that higher-income households consume more energy because they have larger houses and other residences, but their consumption would be substantially higher if they consumed the same energy per square foot as lower-income households.

C. Unaffordability hurts both utilities and non-poor households

A utility incurs lower collection costs if EA results in fewer arrearages and uncollectible accounts. The utility's total cost associated with bill-payment problems would decline, with the general ratepayer benefiting. Accordingly, non-poor households might be better off paying slightly higher rates to assist poor households. Poor households would otherwise accumulate larger arrearages, some of which would become a bad debt that the utility would try to recover from non-poor households. Non-poor customers might also benefit when EA keeps certain customers on the utility system's books, as they would at least be contributing something to the recovery of the utility's fixed costs. The utility might otherwise have disconnected service to these customers if they had had to pay their full bill and not received any financial assistance.

⁵ American Gas Association, *The Increasing Burden of Energy Costs on Low-Income Consumer*, EA 2007-3, September 26, 2007; and David Manning, *Testimony on the Increasing Burden of Energy Costs on Low-Income Consumers*, before the Subcommittee on Healthy Families and Communities, Committee on Education and Labor, U.S. House of Representatives, November 13, 2007.

⁶ See, U.S., Department of Energy, Energy Information Administration, *2005 Residential Energy Consumption Survey*, September 2008.

As an example, assume that a utility provides a household with \$300 of annual assistance paid for by other customers. Because of this assistance, the household is no longer a delinquent customer. The utility then avoids collection, as well as possible debt write-off and disconnection costs. The effect on the utility's net revenues depends upon these cost savings relative to the assistance given to the household, adjusted for the expected shortfall in the household's payments in the absence of assistance. Assume, for example, that the household's annual utility bill is \$1,000 without assistance, but the customer would be expected to pay only \$700. The difference of \$300 is equal to the utility's assistance, so on net the utility collects the same amount from the customer as before, but the customer is now in good standing and the utility incurs no collection costs.

D. Six general questions

If regulators contemplate a review of current utility-funded EA, they must ask themselves a number of broad questions. Answers to these questions would permit regulators to make better decisions regarding the design, administration, and implementation of EA actions.

Regulators can start by asking the following six general questions:

1. *What is the rationale for utilities offering EA to low-income customers?* The combination of outside assistance, such as LIHEAP, fuel fund, and federal and state weatherization programs, could provide adequate support to low-income households. A regulator might find a utility-based program redundant if adequate outside assistance for energy and other essentials is available to low-income households. But the regulator might still require utilities to assume a role, such as educating customers on the availability of this assistance, determining who is eligible, and establishing application procedures.
2. *What primary objectives should EA have?* They should include keeping existing low-income households on the utility system and reconnecting service for others. Affordable utility service to low-income households should mean that those customers are able to enjoy the comforts of space heating and other energy services without the fear of disconnection by the utility.
3. *What should be the dollar amount of assistance?* The answer depends upon the energy burden of poor households, after accounting for outside assistance. The energy burden measures the affordability of energy to households in fully paying their utility bills and having sufficient income left over to pay other necessities. Another question relates to the allocation of a fixed amount of dollars for assistance. Let us assume that funding is inadequate to meet the total needs of low-income households. Should funds go to households on a first-come, first-served basis? Alternatively, should funds go first to those households with seniors, children, or customers with serious medical problems? Should the objective be to maximize the number of eligible households receiving assistance? Should assistance go to fewer households so that each household can have more funds to make energy affordable?

4. *Who should provide the funding?* Alternatives include charging all utility customers and all residential customers. Funding from a broader group of utility customers lessens the cost per customer and may better reflect the general societal benefits of EA initiatives.
5. *What mechanism(s) should fund EA?* A utility can recover costs through a system benefit charge, a cost tracker, or an increase in the customer charge or volumetric rate. A system benefit charge is a fixed monthly fee designed to fund designated social programs such as EA. Mechanisms have varying effects on: (a) energy consumption by low-income households, (b) economic efficiency, (c) the bills of funding customers, and (d) cost-recovery risk for the utility.
6. *What should be the specific assistance actions (or mechanisms), keeping in mind other regulatory objectives?* Options include a change in rate design, a rate discount, a bill cap based on income, a lump-sum payment, a cost waiver, and no-cost weatherization and other forms of energy efficiency. Similarly to the previous discussion on mechanisms, specific assistance actions have varying effects on low-income households, other customers, and the utility. Complimentary EA mechanisms applied individually or in concert with each can provide greater flexibility for meeting specific low-income customers' needs.

III. Types of EA Actions

A. Overview

Funding for EA comes from federal and state taxpayers, utility customers, utility shareholders, members of local charitable and other non-profit organizations (e.g., United Way, Red Cross, church, and synagogue groups). One study noted that:

Evaluations of low-income energy programs generally have found that the programs have been cost effective and successful at reducing the number of households who cannot afford electricity and natural gas services. Several evaluations have suggested, however, that the programs fail to target the poorest of the poor. The evidence appears to suggest that many low-income energy assistance programs have provided a significant societal benefit.⁷

Federal EA programs, including low-income weatherization assistance, are the single largest source of funding, with utility-funded programs the second largest source. The FY 2010 \$5.1 billion appropriated and funded for LIHEAP, for example, is about three times the amount that gas utilities spend on EA to low-income households.⁸ Federal funding for weatherization of low-income households has sharply increased under the American Recovery and Reinvestment Act (aka the Stimulus Bill).

EA also has come in various forms, with differing effects on the recipients, non-targeted utility customers, and utility shareholders, as well as on society in general. Most EA actions reduce energy bills for eligible households either by lowering the effective price of utility service or by reducing energy consumption. In either instance, households have more money available for purchasing other goods and services, some of which are as essential as utility service.

EA also involves the utility giving customers more leniency and flexibility in making payments for overdue accounts. The utility might absolve a customer's arrearages or forgive reconnection charges. Regulatory policy affects both how and when utility customers must pay overdue accounts. Fair and effective policy is critical for preventing some low-income households from having their utility service disconnected.

⁷ See Concentric Energy Advisors, "A Review of Low Income Energy Assistance Measures Adopted in Other Jurisdictions," prepared for the Ontario Energy Board, September 4, 2008, 3.

⁸ American Gas Association, "AGA Applauds Congressional Funding for Low Income Home Energy Assistance Program," News Release, July 24, 2009.

As of 2007, over 85 percent of the funding for utility rate/bill-assistance and weatherization/energy efficiency initiatives came from system benefit charges.⁹ Utilities used over 86 percent of this funding for rate/bill assistance. Utilities add these fixed charges as a separate item on customers' bills. Maryland's electric EA program, for example, requires residential customers to pay a surcharge of 40 cents per month.¹⁰

Appendix A provides examples of EA initiatives in six states in different regions of the country. A natural gas industry survey showed that about 75 percent of utility assistance is in the form of rate discounts or percentage-of-income plans. The remaining portion includes cost waivers (e.g., reconnection charges, arrearages) and weatherization programs.¹¹

Although not addressed in this paper, one area of interest is whether the goals of EA actions differ by region. Northern states may place emphasis on EA actions that prevent disconnections during the winter months, while in southern states actions may center on making electricity affordable during the summer months when air conditioning demands are at their highest. Northern states may also allocate more EA monies to natural gas consumption, for example, by requiring a certain percentage of assistance to be used for weatherization and other energy efficiency measures.

B. Specific EA actions

A discussion of the major EA actions follows. Some utility-funded actions were initiated by utilities, while others were required either by state regulators or legislators. Examples in which the state legislature gave the regulator the authority to approve EA initiatives proposed by a utility are Minnesota and Washington.

Utilities initiating actions ostensibly felt that having general ratepayers and even shareholders funding EA was preferable to dealing with the problem of low-income households continuously falling behind in their utility bills and thereby being vulnerable to service disconnections. Utilities are able to reduce their costs when they have a lower number of delinquent customers, some with severe payment problems.

1. Modified rate designs (MRD)

These rate designs include volumetric rates and lifeline rates. Volumetric residential rates in general consist of a low fixed monthly charge and a high usage charge. This rate

⁹ These charges originated from either state industry restructuring legislation or regulations. See LIHEAP Clearinghouse at <http://liheap.ncat.org/Supplements/2007/supplement07.htm>.

¹⁰ See, for example, the LIHEAP Clearinghouse website at <http://liheap.ncat.org/dereg.htm>.

¹¹ American Gas Association, *The Increasing Burden of Energy Costs on Low-Income Consumer*, EA 2007-3, September 26, 2007.

structure benefits low-income households (as well as other households) when they consume relatively small amounts of energy. Under volumetric rate structures, customers pay above marginal cost for consuming each unit of energy, since the marginal price by definition includes some of the utility's fixed costs in addition to variable costs. The utility faces the risk of under-recovering its fixed costs because it collects those costs from customers through volumetric energy-usage charges. Energy usage is susceptible to volatility because of weather and other factors.

Lifeline rates have been adopted by regulators to encourage energy efficiency and provide customers with lower marginal prices for "essential" electricity and gas use. Lifeline rates are volumetric rates that apply an inverted tiered rate structure in which consumers pay higher marginal prices at higher tiers of energy consumption. An illustration of lifeline rates is when a customer pays 8 cents per kilowatt-hour (kWh) for the first 500 kWhs consumed in a month, and 12 cents for all additional kWhs. These rates provide even greater benefits, when compared with standard volumetric rates, to low-income households when they consume low amounts of energy relative to other customers. Lifeline rates, like volumetric rates, increase the risk that a utility will under-recover its fixed cost, because it disproportionately collects those costs through the higher rate tiers where the greatest amount of usage volatility occurs.

2. Rate discounts (RDI)

An example of a rate discount is the utility giving eligible low-income households a discount of 30 percent off the rates the utility charges other customers. If other customers pay a price of 10 cents for each additional kWh consumed, low-income households would pay 7 cents. One form of rate discounts might involve larger discounts for smaller energy use. A household, for example, receives a discount of 40 percent if it consumes fewer than 500 kWhs per month, while its discount falls to 30 percent if it consumes more than that amount. One real-world example is California's Alternate Rates for Energy program (CARE). This program provides eligible low-income customers with a 20 percent rate discount on their electric and natural gas bills. All other utility customers fund the CARE program through a rate surcharge.

Rate discounts reflect a pricing principle based on customers' "ability to pay." State regulators have frequently approved a form of discriminatory pricing called "value of service" pricing. Under this pricing scheme, prices to different customers depend on the value that each customer places on the service (i.e., on their "willingness to pay.") But if regulators can legally set prices based on "willingness to pay," why can they not then apply the same pricing principle to "ability to pay," since "ability to pay" is really a sub-component of "willingness to pay"? If a utility is able to offer a rate discount to industrial customers who would otherwise bypass the utility if required to pay the full embedded rate, why could it not offer a rate discount to low-income households? The anti-bypass rate would benefit all of the utility's customers as long as the price allows the utility to earn some margin above variable cost and prevent bypass. The discount to low-income households could also benefit all customers if in its absence the utility would have disconnected low-income households or those customers would have accumulated large bad debt or costs associated with re-establishment of service. (It is assumed that other customers would compensate the utility for lost revenues and the bad debt.) Some regulators and

legislatures might, however, perceive a distinction between “willingness to pay” and “ability to pay” that limits their legal capability to implement both.

From the standpoint of economic efficiency, rate discounts are probably the least desirable form of EA. It would be preferable, as an alternative, to give eligible low-income households monetary assistance in the form of a lump sum or in some other form that does not affect the marginal price.

3. Percentage-of-income plans (PIP)

These plans limit the utility bills of eligible low-income households to a predetermined percentage of their income. Their premise is that affordability inversely relates to how much households have to pay for energy relative to their incomes. Such a plan, for example, may require that eligible households pay no more than 15 percent of their income toward natural-gas service during the winter heating season. The benefits to customers would depend upon both their income and their gas bill. Both lower-income customers and customers with higher gas bills benefit the most. This aspect of the mechanism is desirable.

Under PIP recipients would tend to over-consume energy, since they pay nothing for consuming more energy. A variant of this plan could mitigate this problem by requiring customers to pay the standard rate for energy consumed above some benchmark. The benchmark could be the customer’s energy consumption prior to participating in the plan, adjusted for weather and changes in household size. As long as she does not consume beyond the benchmark, the customer pays a flat monthly fee that entitles her to remain on the utility system. The administrative burden associated with this benchmark method is not trivial.

States with PIPs include Illinois, New Hampshire, New Jersey, Ohio, and Pennsylvania. An evaluation of the New Jersey PIP found positive results: (1) the subsidy was about 40 percent of the total energy bill for recipients (i.e., it produce substantial benefits to recipients); (2) it reduced the energy burden of recipients to 6 percent, which coincides with the energy burden of non-poor customers; (3) about 40 percent of recipients had incomes not exceeding \$10,000 (i.e., the program reached the poorest of the poor); (4) after the subsidy, two-thirds of the recipients were able to pay their annual utility bills in full; (5) pre-program arrearages of recipients decreased by about 90 percent; and (6) disconnection rates of recipients decreased below the average rate for LIHEAP customers located in the Northeast.¹²

Illinois enacted legislation in July 2009 that established a percentage-of-income plan. The plan caps the amount low-income households pay for electricity and natural gas at 6 percent. The legislation also expands energy-efficiency programs directed at low-income households and

¹² See Concentric Energy Advisors, “A Review of Low Income Energy Assistance Measures Adopted in Other Jurisdictions,” prepared for the Ontario Energy Board, September 4, 2008, 55-56.

provides for arrearage forgiveness, in which recipients who pay their bills on time will receive credits toward their past due bills. Funding of the plan will come from an increase in the system benefits charge.¹³

4. Bill-assistance programs (BA)

a. LIHEAP

These programs include LIHEAP, fuel funds, and state/local government programs. LIHEAP is the largest source of energy assistance to low-income households. The Federal government established LIHEAP in 1981 in response to continued concerns about the effect of rising energy prices on low-income consumers. LIHEAP distributes funds to state governments in the form of block grants, according to a formula based on each state's weather and low-income population. Geographic areas with higher energy bills disproportionately receive LIHEAP funds. The rationale is that households with higher energy burdens have greater difficulty paying their energy bills and would, therefore, have more incentive to apply for LIHEAP.

The states distribute LIHEAP funds to eligible low-income energy consumers. The states can use LIHEAP money to provide bill-payment assistance, energy-crisis assistance, and weatherization and energy-related home repairs. Households without utility service or facing imminent service disconnection can qualify for "crisis" funds. The President can also release these funds during times of emergencies, such as extreme weather or high fuel prices.

Until the last few years, LIHEAP funds had inexorably declined in real dollars. Between 1985 and 2004, for example, LIHEAP and other Federal energy-assistance funding fell by around 44 percent in real dollars.¹⁴ Even with the large increase in funds last year, LIHEAP funds have not kept pace with the increase in the number of households eligible for the funds. LIHEAP recipients in the country as a whole make up less than a quarter of households who qualify for assistance. During 2002-2004, for example, LIHEAP recipients as a percentage of eligible households were 19.3 percent, 27.3 percent, 23.9 percent, and 26.8 percent in Delaware, Maryland, New Jersey, and Virginia, respectively.¹⁵ A 2009 report prepared for the Idaho Public Utilities Commission calculated that during the 2007/2008 winter heating season 32,843

¹³ See, LIHEAP Clearinghouse, *News Bulletin*, September 2009, at <http://liheap.ncat.org/newslett/enews4.htm>.

¹⁴ See Congressional Research Service, *Cash and Noncash Benefits for Persons with Limited Income: Eligibility Rules, Recipient and Expenditure Data, Fiscal Years 2002-2004* (Washington, D.C., 2006).

¹⁵ See Donnell Butler et al., "Energy Poverty and Household Wellbeing," presentation at the Atlantic City Electric/Delmarva Power Agency Summit, October 5, 2005. The presentation also expressed the concern that high energy-burden households do not receive proportionally higher LIHEAP assistance than other households.

households received LIHEAP funds, totaling \$9.4 million or \$286 per household. Assuming the same benefit per household, an additional \$19.5 million would have been needed to cover all of Idaho's eligible households.¹⁶

Insufficient LIHEAP funding provides a strong rationale for supplemental assistance by utilities. LIHEAP funds have failed to prevent utility disconnections of a large number of low-income households. The allocation of LIHEAP funds also does not depend upon a household's energy consumption or the utility's rate. In a state where two households have the same income and household size, each would receive the same LIHEAP assistance even if one faces much higher utility rates and consumes substantially more energy than the other.

b. Fuel funds

Fuel funds (sometimes called "hardship funds") provide cash assistance to customers who "fall through the cracks" of other EA programs, or to those customers who still have a critical need for assistance after the depletion of the other resources. They provide assistance grants to customers by making payments directly to utilities on behalf of eligible customers. Utilities or non-profit organizations (e.g., Salvation Army, HeatShare Program) typically administer fuel funds by collecting and distributing the money. Alabama, New York, Pennsylvania, and Wyoming are examples of states with hardship funds. In Alabama, through a state-wide program called "Project Share," utility customers can voluntarily contribute one dollar a month to the Project Share fund. The American Red Cross administers the fund, which goes to pay the utility bills of customers in need. Wyoming has a similar program, "Energy Share of Wyoming."

c. BA in general

Bill-assistance programs as a general rule distribute lump-sum cash payments to pay down a customer's utility bill. The income-eligible customer pays the same rates as other residential customers, but receives a discount on his total bill. If a customer's utility bill was \$200, an assistance payment of \$50 would reduce what the customer pays to \$150. Some programs determine the amounts distributed based on a household's income, the number of persons in the household, and a household's utility bill. Because they do not affect a customer's decision to consume energy at the margin, bill-assistance programs tend to minimize distortions in energy usage. They commonly provide a one-time-only benefit, which is inadequate when low-income households have an acute ongoing need.

¹⁶ See Idaho Public Utilities Commission, *In the Matter of the Commission's Inquiry about Energy Affordability Issues and Workshops*, Case No. GNR-U-08-01, Staff Report, January 16, 2009, 3.

5. Weatherization and other energy-efficiency programs (EE)

a. The different programs

These programs include federal, state, and utility low-income weatherization assistance programs, and other utility energy-efficiency initiatives. A number of states mandate supplementary utility-funded no-cost weatherization services to low-income households. In Minnesota, for example, all state-jurisdictional gas utilities must spend at least 0.5 percent of their gross operating revenues on conservation improvement programs, such as energy audits and weatherization, and on rebates toward the purchase of energy efficient appliances. A utility must spend a portion of this money on residential conservation improvement programs for renters and low-income consumers.

Low-income households, whether they own or rent, live in a single-family home, multi-family housing complex, or a mobile home, can apply for federal assistance. Besides weatherization, energy efficiency actions include consumer education on how to save energy, the repair of cooling and heating systems, and the replacement of old, energy-inefficient appliances.

One problem centers on the transient nature of low-income households to frequently move between different rental residences. Landlords would tend to spend little on energy efficiency, causing these households to have high utility bills. Utility or government incentives can induce landlords to invest in energy efficiency; but unless these incentives are substantial, landlords would probably not respond well.

Local community service agencies administer the federal program. Weatherization measures include attic insulation, energy-efficient furnaces, weather-stripping, water heater blankets, and other measures to reduce air infiltration. The American Recovery and Reinvestment Act provides \$5 billion for the federal weatherization program, which is over ten times the previous year's funding. The Act also increases income eligibility from 150 percent of the national poverty level to 200 percent and assistance per dwelling from \$2,500 to \$6,000. Studies have shown that the federal weatherization programs have saved low-income households substantial amounts of energy and are highly cost-effective. One widely-cited study estimates savings in natural gas usage of around 23 percent per household. The study also found these programs to be highly cost-effective.¹⁷

¹⁷ See Oak Ridge National Laboratory, *Estimating the National Effects of the U.S. Department of Energy's Weatherization Assistance Program with State-Level Data: A Metaevaluation Using Studies from 1993 to 2005*, ORNL/CON-493, prepared for the U.S. Department of Energy, September 2005. The study used data for nineteen states during the period 1993-2005.

Other energy-efficiency activities include consumer education, special assistance to mobile homes and rental housing, and the offering of no-cost energy efficient appliances to eligible low-income households. These actions have the objective of reducing a household's long-term utility bills and arrearages. One study showed energy efficiency programs directed at low-income households to be cost-effective and conducive to lower arrearages.¹⁸

b. Rationales for targeted, low-income EE initiatives

Reasons for giving priority to offering weatherization and other energy-efficiency assistance to low-income households include:

1. Marginal dollars spent on energy efficiency are likely to produce higher energy savings when directed at the poor, who generally make few investments in energy efficiency without monetary assistance.
2. The poor are less likely to be “free riders,” i.e., customers who would have made energy-efficiency investments in the absence of assistance.
3. Inertia and other market problems (e.g., inadequate information) tend to affect the poor more than other households.

One presumption is that the most cost-effective actions address serious barriers and problems afflicting low-income households. The “free rider” phenomenon has afflicted many energy-efficiency programs. This problem occurs when participants include those customers who would have taken the same energy efficiency action without the utility inducement. The net effect is no incremental energy savings, but merely a distributional effect benefiting participants and paid for by the utility and its other customers. The premise that low-income households would less likely be free riders stems from the fact that they have less money to spend on energy efficiency. All of these reasons mean that a utility would achieve a higher benefit-cost ratio from its energy-efficiency activities by favoring low-income households.

Weatherization and other energy-efficiency actions that aid low-income households seem to make good economic sense. They would also have a favorable effect on the environment compared to discounted rates or a percentage-of-income plan, both of which would tend to increase energy usage.

c. Does weatherization eliminate the need for long-term EA?

Initially, it seems these households would still require cash assistance to continue receiving service from the utility; it is doubtful whether weatherization would ultimately reduce energy usage enough for low-income households to fully pay their utility bills without any additional assistance. Let us assume that a low-income household spends 20 percent of its

¹⁸ See, for example, Consumer Services Information System Project, Pennsylvania State University, “Long-Term Study of Pennsylvania’s Low Income Usage Reduction Program: Results of Analyses and Discussion,” January 2009.

income on home energy and that weatherization reduces energy usage by 25 percent (similar to the estimate made by the Oak Ridge study in footnote 17). The household's energy burden would then fall to 15 percent. This decline seems inadequate to eliminate the need for all energy assistance to that household. This example suggests that policymakers cannot assume that weatherizing the homes of low-income households, especially the poorest ones, will rule out the need for energy assistance in the form of rate or bill discounts; it would only reduce the assistance needed to reduce the household's energy burden to a tolerable level.

As another example, a household has an income of \$10,000 and pays \$1,500 in annual utility bills. Assume that it receives EA in the amount of \$400, which reduces its annual utility payment to \$1,100. Let us also assume that an "affordability" standard would limit this household's energy burden to 7 percent or \$700 annually. Assuming, as we did above, that weatherization reduces energy usage by around 25 percent, the utility bills would now total \$1,125 [$\$1500 \cdot (1 - 0.25)$]. With \$400 of EA, the household's utility payments would fall to \$725, which is slightly above the "affordable" cap of \$700. The policy implication is that, even with weatherization, assuming EA fell far short in reducing low-income households' energy bills to affordable levels, the absolute dollar amount of needed energy assistance might not decrease.¹⁹

d. Joint application / automatic enrollment

One idea is to require recipients of utility-funded EA to apply for federal weatherization assistance. A joint application in which the customer applies for bill assistance and weatherization at the same time is sensible. The rationale is that low-income households should have the obligation to take full advantage of opportunities to minimize their energy bills as long as they are receiving energy assistance funded by the utility and its non-poor customers.

Another approach would be to enroll low-income customers automatically for utility bill-assistance programs, including no-cost weatherization, when the customer applies for other government assistance programs, including non-energy related programs (e.g., food stamps and other welfare programs). Auto-enrollment would require interaction, with customer consent, between social service agencies (and possibly charitable organizations) and utilities in order to inform the utilities about qualifying customers.

6. Cost waivers (CW)

Cost waivers can help low-income households stay current on their bills and either avoid disconnection by the utility or have utility service restored. These actions include arrearage forgiveness for customers who make timely payments of their utility bill over an extended period and a customer-charge waiver. The customer charge recovers all or a portion of those costs associated with serving customers, irrespective of the amount of electricity or gas usage. These costs include operating and capital costs that vary directly with the number of customers. Customer charges comprise a larger portion of the bills of high-usage customers.

¹⁹ I thank Roger Colton for bringing this point to my attention.

Cost waivers can also apply to service reconnections, late payment charges, and deposits for low-income households who have a poor credit rating or history. A disconnected customer might find it financially impossible to pay all of these costs and have service restored.

A cost waiver could induce a customer to pay off outstanding bills in order to have service restored. It could, for example, lead to customers negotiating in good faith with their utility for a payment plan. It could also substantially lessen the financial obligation on a low-income household. Although these actions seem minor, to some customers they are critical to having service reconnected or continuing with utility service.

On the downside, a cost waiver might make customers less responsible for paying future utility bills (i.e., create moral-hazard incentives). Less responsibility would come from customers who have less incentive for paying their bills on time and in full to avoid service disconnection. A waiver also means that the utility must either absorb the costs or pass them on to the general ratepayers. The regulator will have to judge whether these consequences are small enough relative to the benefits.

7. Bill facilitation (BF)

Billing facilitation helps customers better manage their bill payments. Better management can reduce arrearages and avoid debt write-offs and service disconnections. Bill facilitation includes budget billing, winter moratoria on service disconnection, flexible payment options, prepayment (e.g., customers pay for their energy up front, sometimes at a premium rate), and automatic withdrawal. Flexible payment plans tailored to each customer's unique financial situation, for example, can help to prevent service disconnections and avoid putting customers at risk.

A moratorium allows a customer to continue with utility service without having to make any payments during the winter months. A moratorium reflects a stop-gap policy that defers the inevitable problem of some customers being unable to fully pay their utility bills. After the moratorium lifts, however, customers are obligated to pay their full utility bill in addition to any arrearages that accrued during the moratorium. The payments may be dispersed over several of the non-peak months. Households still face the problem of not being able to afford utility service. When spring arrives, the utility can disconnect their service if they fail to make the required payments. Many of these households might find it difficult to be reconnected. As expressed by one regulatory body:

The moratorium is not a forgiveness of the utility bill. The customer is ultimately responsible for payment of the entire account owed on the electric or natural gas bill, including late fees that may accrue.²⁰

²⁰ The Public Utilities Commission of Ohio, "Winter Heating Disconnection Moratorium Ends March 18," updated March 3, 2008, website correspondence, at <http://www.PUCO.ohio.gov>.

Prepayment, which involves the billing of customers in advance of receiving service or the use of prepaid meters, might enable customers to stay connected. The utility would be less willing to serve customers who have a history of severe payment problems, since the utility would expect those customers not to fully pay their bills in the future. By preventing future arrearages, prepayment would make the utility more inclined to serve those customers.

As another form of bill facilitation, budget billing is a deferral program that can provide limited relief to many low-income households. Utilities can place inserts in the bills they send out to customers explaining how budget billing can avoid extremely high monthly bills by paying the same amount each month. Households are still responsible for paying their full bill. The utility treats them like any other customer who falls behind in paying their bills.

IV. Problems to Avoid

A. A general criticism of in-kind programs

One criticism of in-kind programs such as EA is that they produce lower benefits to low-income households than the benefits from distributing the same amount of dollars to the same households without any strings attached. Let us assume that a household receives \$100 restricted to reducing the utility bill. If, as an alternative, the government gives the same household \$100 to use as it sees fit, economic theory (supported by empirical studies) says that the households would receive higher benefits. Cash subsidies with no string attached, in other words, can increase the benefits to recipients for each dollar funded by utility customers or taxpayers compared with in-kind subsidies such as EA that require the recipient to use the money to pay his or her utility bill. This outcome derives from the premise that households would not use the entire cash assistance to reduce their utility bill. Instead, they would rationally allocate some of the cash to different goods and services so as to maximize their “utility” (measured in “utils”) or economic well-being. In-kind subsidies, in contrast, are paternalistic in nature, requiring recipients to allocate the financial assistance to a designated good or service, such as home energy.

As another illustration of the superiority of unrestricted use of cash payments, assume a household receives \$400 that it can spend at its discretion. Assume also that the household allocates this money to buy more different goods and service, and that its “utils” increase by 20. Now let us assume that the household has to spend all of the \$400 on its utility bills. When it does so, its “utils” grow by less than 20, since the household would have benefitted more by spending less of the \$400 on utility service. Assume that to increase its “utils” by 20, the household would have had to receive \$500 of energy assistance. The waste, in this example, of giving the household in-kind (energy) assistance instead of unrestricted cash would be 20 percent. In other words, society can bestow on the household the same benefit with an unrestricted cash amount (\$400) that is 20 percent less than the amount of energy assistance (\$500).²¹

The argument for unrestricted use of cash payments, however, has little relevance for state regulators. Regulators have no legal authority to take money from some customers and redistribute it to low-income households without directly reducing the recipients’ utility bills. Regulators have authority only over in-kind energy assistance initiatives. Whether low-income households should receive more cash assistance and less energy assistance is a relevant matter for legislative and executive branches of government.

²¹ A theoretical discussion of this outcome is found in Lee S. Friedman, *The Microeconomics of Public Policy Analysis* (Princeton, NJ: Princeton University Press, 2002), 94-98.

Other critics of EA actions oppose additional funding. Instead, they contend that policymakers need to improve the effectiveness of existing programs. One way to achieve that goal is to better coordinate and complement the different actions. Bill-assistance programs, for example, can complement weatherization actions aimed at “permanently” reducing a low-income household’s unsubsidized utility bill. Part VI lists other ways of increasing the benefits or reducing the costs of EA actions.

B. Specific deficiencies

A review of current EA actions reveals deficiencies in a number of areas. Regulators should try to identify problems with the EA programs under their jurisdictions. The specific deficiencies are the following:

1. Recipients of assistance sometimes include the non-needy.

Non-targeted lifeline rates inadvertently can benefit high-income, low-energy-use customers. Any EA initiative should define eligible low-income households. Regulators and utilities might want to consider the definition of “low-income” used by social service agencies. One possible problem with tying eligibility for utility programs to LIHEAP eligibility, however, is that it might exclude those low-income households that regulators (but not the federal government) deem needy.

2. Poor information and other problems can cause low participation rates.

Several reasons exist for why a substantial number of eligible households do not receive EA. They include inadequate outreach, household inertia, small benefits from participation, a time-consuming and complicated enrollment process, and the social stigma of accepting assistance.

Some households do not want to expend any effort or time in finding out whether they are eligible for assistance and, even if they are, to apply for it. These efforts might impose costs such as “hassle,” transportation, and search for the proper documentation. The households, for example, may have to take time off work and pay for bus fare. In other instances, households are not aware that assistance is available. (State regulators recognize the importance of making customers aware of low-income assistance programs.²²) The elderly and physically disabled people may find it too difficult to travel and apply for assistance. Other households may face language barriers and distrust government groups and utility companies. Some EA might also result in insufficient benefits to eligible households to warrant the aggravation of applying or taking other necessary actions. Finally, some customers, such as seniors or recently unemployed households, might attach a stigma to receiving any assistance. The federal government recognized this problem as it pertained to the food stamp program. The government changed the

²² See, for example, National Association of Regulatory Utility Commissioners, “State Regulators Declare ‘Lifeline Awareness Week,’” *Press Release*, September 14, 2009.

official name of the program to the Supplemental Nutrition Assistance Program partially to mitigate the stigma associated with the term “food stamp.” Customer information on the objectives and details of assistance programs can also help improve the public’s perception of them.

3. Some EA recipients fail even to make the obligatory payment on their subsidized bills.

Households might have little incentive, for example, to pay the 10 percent of their income for gas service that a PIP mechanism requires. As long they continue to receive utility service, they suffer no consequences from not paying the required amount. One strategy that could induce recipient to pay is to credit their arrearages whenever they satisfy their portion of the utility bill over a designated period. Another strategy is to threaten utility shut-off of service when recipients fail to make their obligatory payment.

One problem with deficient payments from the recipient is that either other customers or other EA mechanisms will have to pay for any shortfalls. Utilities might be indifferent to what recipients pay if they have a tracker or rider that guarantees them timely recovery of shortfalls in the absence of a rate case. A tracker for bad debt, for example, can affect how the utility responds to customers who are behind in their payments. It can make the utility more lax in its credit policies, which could result in fewer service disconnections and less costs spent on collection agencies. In the absence of a tracker, the utility presumably would intensify its efforts to collect money owed by delinquent customers.²³

4. Inadequate funding makes some eligible households vulnerable to service disconnection.

An effective EA, or a portfolio of EA actions, should provide adequate funding to cover all customers applying for assistance that would allow them to stay on the utility system. Assistance programs that fail to reduce disconnections violate the principle that the poorest of customers should be entitled to essential utility service.

5. Subsidization of low-income households can cause them to over-consume energy.

Any EA should try to minimize distortive performance in individual areas of utility operation. One such area relates to the pricing of utility services. Any utility rate discount or a fixed monthly bill would tend to cause households to consume energy beyond what is economically efficient; that is, they induce recipients to consume beyond the amount where the marginal benefits equal the marginal cost to the utility. This problem stems from the marginal price being less than marginal cost. If a utility charges low-income households 7 cents per kWh at the margin for electricity that costs 10 cents, from the standpoint of an economic efficiency

²³ See Ken Costello, “How Should Regulators View Cost Trackers?” NRRI 09-13, September 2009, at http://nrri.org/pubs/gas/NRRI_cost_trackers_sept09-13.pdf.

perspective those households would over-consume. In the extreme instance where households pay nothing at the margin for consuming additional energy, they will consume to where the marginal value is zero. One example where over-consumption occurs is when an EA mechanism places a cap on how much eligible low-income households pay for utility service. As actual energy consumption increases, the difference between the cap and the actual utility bill widens, with more funding (i.e., subsidies) required from other customers.

6. EA actions can result in intra- or inter-class cross-subsidization.

Low-income households receiving EA might pay less than a utility's variable costs (i.e., costs that vary with the quantity of utility service). This means that other customers would be better off if the utility disconnected those households. The reason is that the utility earns negative returns from EA recipients; with service disconnections, the utility's returns from those households would be zero. Rates to other customers would therefore have to be higher than otherwise to compensate the utility for the negative returns.

7. Poor coordination among the different EA actions and the different entities jointly responsible for them can lead to lower performance.

Bad communications between a utility and local governmental units and nonprofit social services agencies can hinder the public's awareness of EA prior to the winter heating season. Experience shows a high correlation between EA program success and collaboration between regulators, utilities, charitable organizations, and social service agencies. One reason for the success is that social service agencies and charitable organizations can better identify utility customers who are having difficulty paying both their utility bills and bills for other necessities. Utility service representatives and delinquent account specialists typically are not trained as social workers and are ill-equipped to handle these kinds of problems.

Cooperation requires that utilities and social service agencies work together to disseminate valuable information that allows them to better assist needy low-income households. Utilities, for example, need cooperation from social service agencies and charitable organizations to know the specific financial situation of individual households, besides establishing eligibility requirements for assistance. The utility and other entities should exchange information on customers who face imminent service disconnection.

8. Some forms of assistance fall short in addressing the severity of the unaffordability problem.

Budget billing plans, automatic withdrawal, and certain cost waivers do little to help customers who have large arrearages or who spend a large portion of their income on utility services. A household with a \$2,000 arrearage is not discernibly helped by a budget billing plan. The household would still have to cut back on other necessities to pay off its arrearage and avoid falling behind on future utility bills.

This argument should not detract from the value of budget billing to assist customers in making payments during peak energy-use months. By smoothing out monthly payments, for example, a low-income household or a household on a fixed income can more easily make full payments throughout the year.

C. Two examples

1. Non-targeted lifeline rates

Some non-poor customers would likely benefit when lifeline rates do not require that customers receiving the low first-tier rate have low incomes. Under this rate, benefits could accrue randomly across households with much different incomes. Energy usage varies widely across households, not necessarily because of income differences but because of other factors such as household size and consumer preferences. Some higher-income households might consume smaller amounts of energy because of their financial ability to make investments in energy efficiency. On the other hand, one could argue that income and energy consumption have a fairly strong correlation, e.g. wealthier households tend to own larger homes and have more discretionary energy-consuming appliances. The correlation also might substantially differ between electricity and natural gas. Since the early 1980s, national statistics show that the difference in energy consumption between households eligible for federal assistance and other households slightly declined.²⁴

It seems illogical to have an action premised on high income elasticity when the basic problem lies with a nonlinear relationship between income and energy usage. As mentioned earlier, this relationship is the reason why low-income households spend a much higher percentage of their incomes on home energy use.

Lifeline rates violate a tenet of economic inefficiency when rate tiers do not reflect marginal cost. In this instance, they are discriminatory against large users; they also make a utility's earnings more volatile and dependent upon such factors as weather and customers' energy-conservation efforts.

2. Rate discounts

The biggest problem with rate discounts is that they cause rates charged to low-income households to fall below cost and rates charged to other customers to increase above cost. Economic efficiency would diminish and low-income households would tend to consume more energy. The latter effect by itself runs counter to reducing the energy burden of low-income households as well as advancing energy efficiency.

Rate discounts are a form of discriminatory pricing that some regulators might consider illegal or undesirable. Discriminatory pricing almost always raises a question of fairness, especially when a favorable rate falls outside a "zone of reasonableness." When a rate falls short

²⁴ See, for example, U.S. Energy Information Administration, *Residential Energy Consumption Survey*, various issues, at <http://www.eia.doe.gov/emeu/consumption/index.htm>.

of a utility's short-run marginal cost or lies above the price that an unregulated monopolist would charge, a regulator would likely find the rate impermissible. We see examples in unregulated sectors in which a firm offers discounts, say, to seniors and students because of their low incomes. Firms do not favor these groups for altruistic reason; instead, they do it to increase their profits by attracting more customers and sales from existing customers. As long as the price lies above variable costs, firms earn incremental profits from additional sales.

Most regulators allow some forms of price discrimination while preventing other forms (i.e., undue discrimination). They have authorized discriminatory pricing when it serves some public interest, such as economic development, more affordable energy, and the deterrence of uneconomic bypass. One economic and regulatory rationale for these rates is that they increase the utility's earnings compared to when "favored" customers would have to pay the full rate but don't for various reasons (e.g., inadequate income, competitive opportunities). Assume, for example, that the utility by charging the full cost-based rate would recover \$4 million of its fixed costs from certain low-income households when those customers stay on the utility system. But let us assume that they would not be able to pay enough of their bill to avoid disconnection. By discounting their rates, the utility, say, recovers \$2 million from those low-income households. The discount, in this example, benefits the utility, other customers, and the recipients (i.e., achieves a "no-losers" outcome). Even though the discount is discriminatory in not adhering to cost-of-service principles, it produces net benefits that ostensibly promote the public interest. Rate discounts or assistance in other forms to these low-income households can be as high as \$4 million before other customers and the utility become worse off. If, on the other hand, these low-income households would still stay on the utility system with the full rate, the rate discount would not necessarily benefit other customers and the utility. It could, however, to the extent that the discount helps to reduce the utility's costs for dealing with payment problems such as collection costs and debt write-offs.

Subsidizing customers are worse off when they fund a rate discount rather than a lump-sum payment to low-income households where the increase in the economic welfare of low-income households is the same. (Appendix B illustrates this outcome with an example.) A lump-sum payment would: (1) avoid giving low-income households improper price signals that conflict with energy-efficiency objectives and (2) reduce the financial effect on subsidizing customers in funding the assistance.

V. Nine Criteria for Evaluating EA

One can list criteria for identifying both good and bad EA actions. No single EA action comes out favorably in meeting all criteria. Some actions perform superbly in satisfying certain criteria while satisfying others less well.

The following list contains nine criteria for evaluating EA actions. Regulators should consider any action that satisfies the vast majority of these criteria as desirable. They should be wary of actions, on the other hand, that fall short in meeting most of the criteria.

A. Benefits should accrue only to low-income households.

Program “leakage,” in which some of the benefits go to non-targeted customers, has the unintended consequence of distributing money from non-recipient low-income households to customers whose incomes are many times higher. If utilities rely on rates discounts or other special rates, regulators should make sure that only eligible low-income households benefit (e.g., household income \leq 150 percent of the poverty guidelines established by the Department of Health and Human Services).

Within the category of low-income households, more EA should go to the poorest of the poor. These households have less income to pay for energy and, compared to other households, their energy burden is excessively high, making utility service particularly unaffordable. Because of this condition, the poorest customers likely face high unpaid bills and are most susceptible to service disconnections.

Economists and policy analysts have criticized defining poverty in terms of income at the exclusion of a household’s assets. This criticism is especially directed at elderly customers who have low incomes but own substantial assets including their homes. There is also the issue of defining low-income households. Some utility and state programs differ from federal programs in defining the term “low-income;” in addition, definitions change over time. As mentioned in Part III.B.5, the American Recovery and Reinvestment Act loosened eligibility for Federal weatherization funding from 150 percent of the national poverty level to 200 percent.

B. The recipients of EA should receive maximum benefits relative to the dollars spent.

1. Measures of economic benefits

There are at least four different measures of economic benefits. They include:

1. the value recipients place on additional consumption of non-energy goods and services made possible by the effect of EA in reducing their energy bills;
2. the change in the net benefit that recipients receive from consuming energy, what economists call “consumer surplus;”

3. the amount recipients would be willing to pay to stay in an EA program, what economists label “compensating variation;” and
4. the amount recipients would be willing to accept not to participate in an EA program, what economists label “equivalent variation.”

As an illustration of the last measure, a low-income household might be willing to accept \$50 per month in lieu of receiving energy assistance; the \$50 cash subsidy then equals the value the household places on energy assistance. These measures are theoretically sound and they all correlate closely to, but in some instances fall short of, the recipients’ energy-bill savings. The benefits to a recipient include the lowering of her energy bill (which is probably the largest benefit), the security of knowing that service will continue, and less stress from struggling to make payments to avoid large arrearages.

Three common definitions of benefits defined in economic studies are consumer surplus, compensating variation, and equivalent variation. The economist Robert Willig has shown that under most circumstances when the income effect is small, these three measures are roughly equal.²⁵ According to the economic concept the Slutsky equation, the income effect is the product of the income elasticity of energy and the share of income spent on energy. The Slutsky equation expresses the price elasticity of demand as the sum of the substitution effect and the income effect. Compared to other residential customers, low-income households have a lower substitution effect (e.g., poor households are less able to buy energy-efficient appliances when price rises) but a higher income effect, as they spend a larger share of their incomes on home energy. The income effect can be more than minimal when either the income elasticity or the share of energy in a household’s budget is large, as is true for low-income households.²⁶

Consumer surplus measures the difference between the economic value of the assistance received by a low-income household and the “time” and “aggravation” cost in applying for assistance. The economic value is equal to the reduced outlays by the low-income household for the energy consumed prior to assistance plus the net benefit from consuming more energy because of the household’s greater real income (i.e., the income effect) or the lower price of energy (i.e., the substitution effect), or both.

2. Supplemental benefits

One caveat is that, as noted above, recipients would tend to value assistance above the energy-bill savings that comprise the major part of “consumer surplus.” A customer might realize annual bill savings of \$500 from EA, for example, but value the assistance much higher. The customer might feel less stress from the threat of losing utility service or the accumulation of

²⁵ Robert D. Willig, “Consumer’s Surplus without Apology,” *American Economic Review*, Vol. 66 (September 1976): 589-97.

²⁶ See Kenneth W. Costello, “A Welfare Measure of a New Type of Energy Assistance Program,” *The Energy Journal*, Vol. 9 (July 1988): 129-42.

large due unpaid bills. The assistance may cause a household to increase (decrease) indoor temperatures in the winter (summer), or stop using the stove or oven for heat, making the indoor environment safer and healthier. EA also may offer arrearage forgiveness as long as the recipient makes timely payments of current bills. Although most of these benefits are beyond quantification, they represent a real benefit that regulators and other policymakers should take into account in evaluating EA actions.

C. Consumer information and education should make eligible households aware of available assistance and ways to reduce their energy bills.

Any action would inevitably fail if eligible households do not know that they qualify for assistance. Households should also know how they can reduce their energy usage so that over time they can rely less on rate or bill discounts. Outreach should place special emphasis on reaching those low-income households most in need of EA. They include households who: (1) have the largest arrearages, (2) frequently receive collection notices from their utility, or (3) are currently disconnected from utility service.

Good information requires collaboration among the different entities jointly responsible for EA. These entities include the public utility regulator, utilities, social service agencies, charitable groups, and low-income households themselves.

D. Benefits to recipients of EA should positively correlate with their actual energy costs or energy burden.

Eligible households with higher home energy costs, assuming that other factors are the same, should receive more assistance. For these households, energy is more unaffordable, as they spend a higher percentage of their income on energy (i.e., they have a higher energy burden).

E. EA should avoid large efficiency losses or cross-subsidization.

Efficiency losses primarily result from incorrect price signals to recipients, leading to overuse of energy. Losses can also stem from subsidizing customers paying higher prices at the margin to fund recipients. A loose definition of cross-subsidization is: subsidized customers pay less for utility service than the cost of serving them while subsidizing customers pay more.

The goal of controlling efficiency losses gives support to lump-sum payments over rate discounts. The preferable action might be simply to charge cost-based rates to all customers and then to transfer some of the revenues to eligible low-income households; the level of refund can be tied to a specified income-percentage formula (e.g., eligible households should not have to pay more than 10 percent of their monthly income to heat their homes in the winter).

F. EA should have reasonable administrative and implementation costs.

By reducing administrative and other implementation costs, more of the money for EA would go directly to needy recipients. Federal statute restricts the percentage of LIHEAP funds that grantees can use for planning and administration to 10 percent.

Customers should not have to expend inordinate time enrolling in or renewing enrollment for utility assistance. One option is to automatically enroll customers for utility programs if they previously applied for LIHEAP funds. Another alternative is self-certification by households that wish to sign up for a utility program. Households can also save time with “one-stop shopping,” where they are able to go to one entity to enroll in different assistance programs and receive information on how to reduce their energy bills.

G. Funding should have a tolerable financial effect on individual subsidizing customers.

1. “Spreading the burden” and some evidence

The principle of “spreading the burden” among many utility customers has the effect of imposing a small financial cost on each payer. Questions arise as to: (a) which utility customers should fund the subsidies (e.g., all utility customers, non-poor residential customers) and (b) at what point the “subsidy” cost becomes unreasonable. The last question requires regulators to know the tradeoff between adequate funds to assist low-income households and tolerable costs to subsidizing customers. The objective of reducing low-income households’ energy burden to the level of other households, for example, might require an excessive increase in general rates that violates equity and other regulatory goals.

A survey of utility EA actions across states shows that the burden on funding customers is generally, but not always, minimal.²⁷ States that limit the amounts of the “tax” paid to support EA initiatives place a cap that represents a small percentage of customers’ bills or the utility’s revenues. In Wisconsin, legislation requires that surcharges to fund EA actions cannot exceed 3 percent of a customer’s bill. Rate assistance programs in Maine constitute only one-half percent of an electric utility’s annual revenues. Most Pennsylvania energy utilities spend less than one percent of their annual revenues on EA programs. Additional EA programs in Illinois will increase surcharges to residential customers of energy utilities from 40 cents to 48 cents per month. Maryland’s electric EA program requires residential customers to pay a surcharge of 40 cents per month.²⁸

²⁷ See, for example, LIHEAP Clearinghouse, at <http://liheap.ncat.org/dereg.htm>.

²⁸ See the link in the previous footnote.

The financial burden on utility customers in the future, however, could increase substantially as EA programs expand to meet growing demand. Some utility programs have grown dramatically since the beginning of the century, with customers having to absorb most of the additional costs.²⁹ In those areas with a high incidence of poverty, funding for assistance programs is potentially high.

2. Subsidies for different EA actions

Table 1 expresses the subsidies for the seven EA actions presented in Part III. The definition of subsidies used here measures the portion of the EA benefits to low-income recipients paid for by charging above-cost rates to other utility customers. (It is assumed here that other customers, rather than utility shareholders, fund any EA.) Applying this definition, changing the rate design can benefit low-income households without creating a subsidy. To the extent that these changes coincide with cost-causation principles, they help to eliminate any pricing inefficiencies.

For rate discounts and percentage-of-income plans, any increase in energy consumption induced by these actions results in higher subsidies. Energy efficiency actions result in no subsidies when they are cost-effective and pass the Rate Impact Measure (RIM) test. Passage means that energy efficiency does not increase rates to non-recipients. (Increased rates occur when energy efficiency causes a utility to lose revenues at a greater amount than the decline in revenue requirements.) Subsidies for EA actions must adjust for any cost declines that result from mitigated bill-payment problems. The relevant costs include collection costs, debt write-off costs, reconnection costs, and disconnection costs.

H. EA should result in reduced collection costs, service disconnections, arrearages, and debt write-offs.

EA should encourage disconnected customers to pay their arrearages and get reconnected; and delinquent customers to pay their arrearages and stay connected. These outcomes would reduce utility costs and the effect on customers who would otherwise absorb those costs. EA should reduce a utility's debt write-offs. (Write-offs are the total dollars the utility determines are uncollectible and, therefore, deducted from revenue.) One consulting firm's evaluation of EA programs found cost savings to utilities from lower past due amounts and collection costs. It calculated that after the implementation of the Oregon Energy Assistance Program, past due amounts per low-income household declined by \$340 and costs incurred to collect bad debt declined by \$190,000.³⁰

²⁹ See LIHEAP Clearinghouse, at <http://liheap.ncat.org/dereg.htm>.

³⁰ See Quantec LLC, "Draft Utah HELP Evaluation Comments," memo, January 30, 2004.

Some evidence suggests that the collections problem is more severe for gas utilities than for electric and combination utilities. NRRI analysis showed that the most serious problem lies with customers accumulating large arrearages on their gas bills during the winter heating season. Survey responses from state regulators showed that during the winter of 2005-2006 the average arrearage of gas utilities grew by about 50 percent. The same survey showed that arrearage rates (i.e., the portion of residential customers with unpaid due accounts) in some states were as high as 45 percent for electric utilities and over 50 percent for gas utilities. Average arrearages for gas utilities in several states were in the \$600-\$900 range.³¹

I. EA should promote equity.

Equity is an elusive and subjective term. EA makes energy more affordable to a greater number of utility customers by providing help to those households with the lowest incomes or the highest energy burdens. Most people would consider a policy or practice for which the poor benefit at the expense of higher income households to promote equity. This outcome is similar to that from a progressive tax system, which many people consider fair.

To many observers, the situation in which some utility customers pay for the delinquency of other customers constitutes a violation of a basic equity standard. This perception is more true when non-paying customers can afford to pay but do not for other reasons (e.g., they prefer spending their money on entertainment and going out to eat). Knowledge of the “equity” effects requires identifying both the utility customers benefiting from EA and those customers, shareholders, and others providing the funds.

³¹ National Regulatory Research Institute, “Analysis of Responses to Collections Surveys,” NRRI memorandum to the NARUC Staff Subcommittee on Consumer Affairs, March 14, 2007.

Table 1: Subsidies for Different EA Actions

EA Action	Size of Subsidy*
Modified rate design (MRD)	None if MRD is cost-based; otherwise, the difference in the bills of low-income households from a cost-based rate design and from a MRD
Rate discount (RDI)	The difference between the standard rate and the discounted rate times the amount of energy consumed
Percentage-of-income plan (PIP)	The difference between the standard bill and the bill as a percentage of the recipient's income over all seasons
Bill assistance (BA)	The amount of the lump-sum payment
Weatherization and other energy-efficiency actions (EE)	None if cost-effective and passing the Rate Impact Measure (RIM) test; otherwise, non-recipients pay the difference between the utility's lost revenues and the decline in revenue requirements
Cost Waiver (CW)	Waived costs
Billing facilitation (BF)	None if the recipient makes full payment of arrearages and current bills

* For all actions, the calculation of the subsidy should adjust for any reductions in bill-payment problem costs, which include collection costs, debt write-off costs, reconnection costs, and disconnection costs.

VI. What Regulators Can Do to Increase the Effectiveness of EA

A. Regulators have to make tradeoffs

To say that a particular EA action is good or bad depends on the criteria applied to evaluate it. Part V identifies standards for good actions and the deficiencies of bad actions. Because different actions have varying effects, it is difficult to say unequivocally that regulators should impute greater value to some actions than others. Weatherization, for example, is attractive as a long-term remedy for the affordability problem, yet its effect might not help those customers who are in immediate need of assistance to help pay past unpaid bills. Even in the long run, weatherization might not sufficiently reduce the energy bills of low-income households. Those households might, therefore, still require supplemental assistance, although perhaps at a lower level than in the absence of weatherization.

Regulators inevitably have to make tradeoffs between different regulatory goals. A higher participation rate might require more money funded by general ratepayers. Cost waivers might create a moral-hazard incentive: customers who fall behind in paying their utility bills might have less incentive to avoid late and partial payment of their utility bills. This behavior translates into higher costs and lower revenues for the utility, which ultimately falls on the shoulders of other customers or utility shareholders, or both. Customers receiving rate discounts would tend to consume additional energy, which over time might require higher subsidies.

These are only a sampling of how undesirable, and sometimes unintended, consequences, might result from well-intentioned actions designed to make utility service affordable to more customers. Partially for this reason, regulators should periodically assess whether EA actions are producing the intended results and not seriously jeopardizing other goals. The important goals are the advancement of cost-of-service rates, energy efficiency, and equity.

B. What questions should regulators ask?

Appendix C lists questions that regulators can ask about both proposed and existing EA actions. By asking these questions and receiving answers, regulators can: (1) take no action, satisfied that additional action is unwarranted; (2) require utilities to take new actions; or (3) make existing actions more effective in benefiting low-income households and minimizing the adverse effects.

Appendix D lists a number of performance indicators for EA actions. Regulators should require utilities to compile this information as part of a review of current actions. The performance indicators link to the criteria that were identified in Part V.

C. A review of EA actions using the nine criteria

Appendix E provides a matrix that relates seven individual EA actions to the nine criteria presented in Part V. It provides a checklist for determining whether, and to what extent, each action satisfies the different criteria. The matrix also allows regulators to compare qualitatively the different actions based on the information compiled for each cell. It is difficult and not always sensible, though, to place information in all the cells.

The matrix allows regulators to tabulate information about each EA initiative and then use that information to judge which ones are more compatible with promoting overall regulatory goals or the public interest. Regulators can choose those EA actions that score well on those criteria they consider most important.

Regulators can also use the matrix to determine which actions seem to complement others. With regulatory approval, a utility can execute a portfolio of complementary actions to more effectively address the “affordability” problem. If regulators place a high weight on promoting energy efficiency and a permanent solution to the affordability problem, their preference would lean toward weatherization and lifeline rates. If, instead they want a high assurance of affordability in the short term, regulators might favor a percentage-of-income plan or lump-sum bill assistance. With an immediate need for EA, the portfolio might include “crisis” funds. Several energy utilities have a portfolio of EA programs, some of which complement others. Pennsylvania utilities, for example, have the Customer Assistance Program, the Customer Assistance Referral and Evaluation Program, the Low-Income Usage Reduction programs, and Hardship Funds. Unknown is how utilities selected individual actions to compose their overall EA program, but complementarity presumably was a factor.

D. The need to evaluate EA actions

Regulators should review EA actions to determine whether they are achieving the regulatory goal of utility-service affordability: (1) most effectively and (2) with minimal adverse effects on other goals. An important dimension of effectiveness is to maximize the benefits to targeted households given the dollars funded by other utility customers. Minimal adverse effects mean that in funding and executing EA, regulators should mitigate distortions in pricing, energy consumption, and recipient behavior from moral-hazard incentives.

Regulators should evaluate EA actions periodically. Outcomes can easily depart from expectations when actions produce minimal benefits to targeted customers and unintended consequences that harm the utility and its other customers. These outcomes can arise, for example, when energy prices change dramatically or when the economy undergoes a sharp downturn leading to a recession.

In serving the public interest, regulators need to be vigilant in assuring that utility-funded EA is providing adequate benefits to eligible low-income households and, at the same time, minimizing impediments to economic efficiency and other regulatory goals. This paper aims to help state regulators in determining whether EA is meeting those goals.

Appendix A: Examples of EA Actions in Six States

State	Example
Arizona	<ul style="list-style-type: none"> • One utility offers a discount of up to 40 percent off the cost of electricity to customers who meet certain income guidelines. • Customers whose income does not exceed 150 percent of the federal poverty level are eligible for a deduction of up to \$8 off their monthly electric bills and up to \$15 off their natural gas bills. • One program provides energy education and weatherization improvements and repairs to eligible low-income homes.
Colorado	<ul style="list-style-type: none"> • The utility matches employee contributions dollar-for-dollar to support local weatherization efforts, including weather-stripping, caulking and other energy-saving actions. • One initiative provides no-cost energy-efficiency services to income-eligible customers, seniors and disabled; these services include an energy audit, attic, wall and crawlspace insulation, air leakage reduction, and appliance safety inspections.
Georgia	<ul style="list-style-type: none"> • The regulated natural-gas provider program, partially funded by the state’s universal service fund, offers natural gas service to low-income households unable to obtain or maintain natural gas service from another marketer. • Senior citizens who are 65 years of age or older and have a household income of \$14,355 or less are eligible for up to a \$14 monthly discount on their gas base charge.

<p>Massachusetts</p>	<ul style="list-style-type: none"> • Several gas, electric, and combination utilities offer utility rate discounts, totaling nearly \$40 million per year and ranging from 20 percent to 42 percent off the low-income customer bill. • Low-income customers who receive a rate discount may qualify for no-cost energy efficiency services that include energy audits, appliance efficiency services, attic and wall insulation, air sealing, and heating system replacement. • One utility offers a rate discount for customers who receive certain government means-tested benefits or qualify for fuel assistance.
<p>Ohio</p>	<ul style="list-style-type: none"> • Regulated gas and electric utilities participate in the statewide Percentage-of-Income Payment Plan (PIPP). Low-income customers who heat with natural gas pay 10 percent of their monthly income to their gas company and 5 percent to their electric company. • The Electric Partnership Program (EPP) has the objective of reducing electric consumption by households that participate in the state's PIPP.
<p>Washington</p>	<ul style="list-style-type: none"> • One initiative aids customers facing hardships through special payment arrangements and access to referral agencies. • Another initiative provides emergency energy assistance for families. • One utility has a low-income rate assistance program.

Source: LIHEAP Clearinghouse, at <http://liheap.ncat.org/sp.htm> and state commission websites.

Appendix B: Numerical Examples of EA Mechanisms

The following arithmetical expression shows the standard two-part tariff for residential customers of energy utilities:

$$B_i = C + p \cdot q_i,$$

where the total bill for customer i (B_i) equals the sum of the customer charge (C) and the volumetric charge (p) times the amount of gas consumed (q_i). Let us assume that the volumetric charge includes actual purchased gas costs and fuel costs.

Using a numerical example, let us assume the following tariff for a gas utility:

$$B_i = \$5 \text{ per month} + \$6.50 \cdot q_i,$$

If a low-income customer uses 20 Mcf of gas in December, her gas bill would be \$135. Without any EA, the customer would be responsible for paying this amount.

Let us consider different EA mechanisms aimed at lowering the gas bill of a low income household for this gas utility. The mechanisms examined are a: (1) lifeline rate, (2) rate discount, (3) lump-sum assistance payment, (4) percentage-of-income plan, (5) waiver of the customer charge, and (6) weatherization program. We will focus on the above hypothetical customer for the month of December.

The hypothetical EA mechanisms are as follows:

1. Lifeline rate

The utility sets a volumetric charge of \$5 per Mcf for the first 15 Mcf of gas consumed and \$7.50 per Mcf for any additional amount. In our example above, the customer would pay the customer charge of \$5 plus \$75 for the first 15 Mcf of gas consumed and \$37.5 for the last 5 Mcf consumed. The customer's bill would be \$117.50, which is 13 percent below the bill without the lifeline rate. For another low-income household who consumes 40 Mcf, under the lifeline rate its bill would slightly increase from \$265 to \$267.50. Let us assume that the utility offers the lifeline to any residential customer and that a non-poor customer with a highly energy-efficient condominium used as a second home consumes 15 Mcf. His gas bill would decrease by \$22.50 or 22 percent. In this example, the high-income customer benefits the most in terms of the percentage decline in his gas bill.

2. Rate discount

The utility offers a 30 percent reduction in the volumetric charge, which reduces it from \$6.50 to \$4.55. (It is assumed that the discount applies only to eligible low-income households.) Our customer's December gas bill would fall from \$135 to \$96, a reduction of almost 30 percent.

With a substantial decrease in the rate, a customer is likely to consume more natural gas. Assuming a short-run price elasticity of demand of -0.2, a 30 percent decrease in the rate translates into a 6 percent increase in energy usage, or 1.2 Mcf. The household would then consume 21.2 Mcf and his bill after the discount would be \$101.46, still a large reduction from his undiscounted bill. The elasticity effect results in the rate discount requiring a higher subsidy from general ratepayers compared to a lump-sum payment that yields the same benefit to a low-income household. Let us assume, as we did above, that the utility offers a 30-percent rate discount (i.e., the volumetric charge decreases from \$6.50 to \$4.55). The subsidy cost to the utility and non-targeted customers would be \$41.34 $[(\$6.50 - \$4.55) \cdot 21.2]$. If, instead, the utility charges the full rate of \$6.50, the customer would consume 20 Mcf. The decrease in consumer surplus ($-\Delta CS$) to the customer from having to pay the full price instead of the discount rate would equal the sum of: (a) the higher gas bill from consuming 20 Mcf, and (b) the net benefit loss from consuming 20 Mcf instead of 21.2 Mcf. Mathematically, $\Delta CS = (\$6.50 - \$4.55) \cdot 20 + \frac{1}{2}(21.2 - 20) \cdot (\$6.50 - \$4.55) = \40.17 .

This result, where the recipient's economic welfare increases by the same amount, shows a lower subsidy cost from compensating a low-income household with a lump-sum payment of \$40.17 than with offering a rate discount (which costs the utility and the non-targeted customers \$41.34). Although the difference, which reflects what economists call a "deadweight loss," seems small (around 3 percent), it illustrates that two EA mechanisms with the same benefits to recipients can have different "subsidy" costs. Studies have estimated the long-run price elasticity of demand for energy to be much higher than the short-run elasticity—as much as four to five times higher. The "deadweight loss," in our example, could be as high as 15 percent over time. What this outcome means is that the same benefits to low-income households would require a 15-percent higher funding by general ratepayers. This example also illustrates the different effects on economic efficiency: The rate discount induces recipients to over-consume in that the additional benefit to them is less than the incremental cost associated with the higher consumption.

3. Lump-sum, bill-assistance payment

The utility offers an eligible low-income household assistance in the form of a \$50 refund. In our example, this assistance reduces the customer's portion of the bill to \$85. The benefit to the customer corresponds to the subsidy cost incurred by the utility and general ratepayers (assuming no administrative and other implementation costs).

A cash subsidy with no strings attached of less than \$50 would produce the same benefit. Let us assume that a cash subsidy of \$35 produces the same benefits to a recipient as \$50 in energy in-kind money. The waste associated with the energy assistance relative to the cash assistance is then \$15, or 30 percent. It results from customers being allowed under cash assistance to allocate the money to both energy and non-energy goods and services so as to maximize their economic well-being. EA causes households to consume more energy and less of other goods and services compared to a lower-cost cash subsidy yielding the same benefit. One benefit of a lump-sum payment over a rate discount is that it does not give customers price signals encouraging them to over-consume energy.

4. Percentage-of-income plan

With this plan, the eligible low-income customer's gas bill is capped at a specified percentage of his income. In other words, the customer pays a flat amount to the utility that entitles him to continued service. Let us assume that the customer's monthly income is \$800 and that the percentage-of-income plan calls for eligible low-income households not to pay more than 10 percent of their income for natural gas service. In our example, the customer's bill would decrease from \$135 to \$80, a decrease of 40 percent. The benefits to customers would depend upon both their income and gas bill. Both lower-income customers and customers with higher gas bills benefit the most. This aspect of the mechanism is desirable.

One problem with this mechanism is that the customer pays nothing to consume additional natural gas. In our example, the customer could increase his December gas usage from 20 Mcf without incurring any additional cost. One way to eliminate this "waste" would be to calculate a customer's energy usage in the same month for the previous year and then adjust it for changes in weather, household size, and other relevant factors. For consumption beyond the adjusted usage, the utility would require the customer to pay the standard rate (in our example, \$6.50). While this provision might be difficult to administer, it has the benefit of reducing both the cost to subsidizing customers and inefficiency from excessive consumption of energy. Recovery of revenue shortfalls to the utility (i.e., the difference between the energy bill and the bill cap specified by the plan) can come from: (a) other customers, (b) LIHEAP funds and other EA programs, and (c) the revenue surpluses from recipients during off-peak periods (e.g., non-winter periods for gas customers when the percentage-of-income payment exceeds energy bills).

5. Customer-charge waiver

An eligible low-income household would not pay the \$5 customer charge. By itself, this would have only a minimal benefit for customers; the customer would still have a bill of \$130, or a 3.7 percent savings. As some energy utilities have increased substantially their customer charge to residential customers (e.g., from \$5 to \$20), a waiver would have a greater effect on reducing energy bills. Until this practice becomes commonplace, a waiver on the customer charge by itself would have only a minimal effect on helping low-income households.

6. Weatherization program

The utility weatherizes the customer's house at no cost and reduces his energy usage by 30 percent. In our example, gas consumption decreases from 20 Mcf to 14 Mcf. The customer saves \$39 on his December gas bill ($\$6.50 \cdot 6$ Mcf). The lower bill may allow the customer to pay his full bill without additional assistance. What is particularly attractive about weatherization and other energy-efficiency actions is that after a one-time investment the customer continuously receives benefits over several years. These actions can also benefit the utility and general ratepayers by avoiding costs relating to purchased gas, additional capacity, debt write-offs, collection costs, and other costs related to delinquent accounts. One study

showed that the collection cost incurred by a utility for each customer in arrears averages between \$20 and \$28 depending on the type of utility.³²

With the passage of global warming legislation and the inevitable rise in energy prices, weatherization and other energy-efficiency actions will take on greater importance. Many experts consider energy efficiency a low-cost near-term strategy for greenhouse gas mitigation. The commercialization of carbon-constrained technologies such as nuclear power, carbon capture and storage from coal plants, and some forms of renewable energy is not expected for several years. In the interim, energy efficiency can play a key role in meeting carbon dioxide targets, helping low-income households decrease their energy burden, and reducing expenditures for EA funded by utility customers and taxpayers.

³² See American Gas Association, “2002-2004 Credit Collection Data for Energy Utilities,” EA 2006-03, February 27, 2006.

Appendix C: Questions for Regulators to Ask about Energy Assistance

1. Are the utility-funded EA actions performing as expected? What should be the effects of EA actions? What benchmark did the regulator establish?
2. How are the utilities responding to low-income households with bill-payment problems? Specifically, how should they treat customers who make a good-faith effort to pay their utility bill but are financially unable to make full payment?
3. Do existing EA actions maximize the benefits to low-income households given the dollars being spent? If not, what are the major reasons?
4. Would a re-shifting of EA monies from some actions to others produce better results?
5. What goals and objectives should underlie EA?
6. What essential attributes should EA actions have?
7. Who should be eligible for EA? Who should determine eligibility? Should financial assets in addition to income be a determinant of eligibility? If so, how should regulators define and determine total financial assets?
8. How much money should a utility and its customers spend on EA? What is the maximum financial effect that should fall on subsidizing customers and utility shareholders? How can regulators minimize this financial effect, assuming a predetermined level of energy assistance?
9. How should regulators define and measure “energy affordability”? What is its relationship to “energy burden”?
10. What role should utilities have in designing, administering, and funding EA?
11. How should utilities coordinate their activities with other entities, such as local community service agencies and private charities, involved with EA?
12. How does EA affect arrearages, disconnections, reconnections, debt write-offs, and collection costs? To what extent would these effects offset the direct subsidies to low-income households?
13. How should regulators define, conceptualize, and measure EA benefits?

14. How can a utility structure and implement EA actions to minimize the impediments of other regulatory objectives? Examples of these objectives are economic efficiency, no undue price discrimination, equity or fairness, energy efficiency, efficient consumption, and the minimization of waste.
15. What specific EA actions seem most effective in benefiting low-income households?
16. What factors seem to contribute most to poor results?
17. How can a utility structure and implement a portfolio of EA actions to produce the best results?
18. What are the most important factors in getting eligible low-income households to participate in EA programs? Are eligible households, for example, adequately notified of program availability through the dissemination of consumer-education materials?
19. What is the effect of EA on general ratepayers and utility shareholders? How can regulators measure these effects?
20. Do regulators have legal authority to discriminate among customers based on their “ability to pay”?

Appendix D: Examples of Performance Indicators for EA

1. *Participation rate* (e.g., the percentage of eligible households that receive direct bill assistance is 40 percent)
2. *Amount of dollar benefits per EA recipient, by income category* (e.g., the average benefit per recipient for households with an income between \$10,000 and \$20,000 is \$400; between \$20,001 and \$30,000 the average benefit is \$500)
3. *Reduction in the energy burden of recipients, by income category* (e.g., recipients with incomes between \$10,000 and \$20,000, on average, see their energy burden drop from 15 percent to 8 percent)
4. *Estimated reductions in total utility arrearages, collection costs, debt write-offs, and disconnections attributable to EA actions* (e.g., the decrease in the disconnection rate for eligible low-income households falls by 30 percent and total arrearages decrease by 20 percent)
5. *Estimated changes in household energy consumption, adjusted for weather and other quantifiable factors, attributable to EA actions* (e.g., weatherization of low-income households, on average, reduces energy consumption by 25 percent)
6. *Percentage of funds collected for EA disbursed to recipients* (e.g., the utility collects \$5 million from customers, of which \$4.5 million or 90 percent benefits low-income recipients)
7. *Percentage reduction in EA recipients' utility bills* (e.g., the average monthly gas bill of recipients without EA is \$100; with assistance the recipient pays \$40, yielding a 60-percent reduction)
8. *Percentage of EA recipients who make full payments on their subsidized bills* (e.g., 60 percent of PIP recipients fulfill their obligation to pay 10 percent of their incomes toward their electric bill), and *the dollar shortfall of EA recipients* (e.g., the utility collects \$5 million from PIP recipients, which is \$3 million below what they should pay under program rules)
9. *Percentage change in utility bills of funding customers, after adjusting for reduced utility costs from mitigation of recipient bill-payment problems* (e.g., funding for direct bill assistance is \$6 million, reduced costs for bill-payment problems are \$4 million, and the utility's total cost allocated to residential customers is \$100 million; the bills of residential customers would, therefore, increase by 2 percent)

Appendix E: Evaluating Seven EA Actions by the Nine Criteria

Criterion/EA Action	Modified rate design (MRD)	Rate discount (RDI)	Percentage-of-income plan (PIP)	Bill assistance (BA)	Weatherization and other EE actions (EE)	Cost Waiver (CW)	Billing facilitation (BF)
Benefits only to targeted customers							
Adequate benefits to targeted customers per dollar of subsidy							
Good consumer information and education							
Benefits directly related to customers' energy costs							
Small economic-efficiency losses from improper price signals							
Reasonable administrative and enrollment costs							
Tolerable financial cost per subsidizing customer							
Reductions in collection costs, service disconnections, arrearages, and bad debt							
Promotion of equity							