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ALTERNATIVES TO UTILITY SERVICE DISCONNECTION

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EXECUTIVE SUMMARY

Vertically integrated electric and local gas distribution companies are facing competitive pressures to reduce their costs. At the same time, the responsibility for making utility services both available and affordable to low-income customers has been placed in the hands of the utilities and their primary regulators, the state public utility commissions. Currently, federal assistance to low-income energy customers (LIHEAP) is being cut back and the cost of water utility service is increasing due to infrastructure replacement and Safe Drinking Water Act compliance costs. All of these occurrences have placed increased pressure on state commissions to assure that cost-effective programs be in place that provide alternatives to utility service disconnection for low-income customers who cannot pay their bills.

This study enumerates and analyzes programs that provide alternatives to utility service disconnection; and, for energy services, evaluates the effectiveness of those programs. Three general classes of "alternatives to disconnection" programs were identified. The first class of programs is disconnection moratoria and restriction policies, which include prior notice, date-based winter restriction moratoria, temperature-based winter moratoria, prior commission approval, and service limiter policies. The second class is billing and pricing arrangements, which include partial payment, income-based billing, budget billing, deferred billing, arrearage forgiveness, and lifeline rates. The third class of programs is nonprice, preventive customer service programs, which include conservation loans, weatherization, energy audits, budget counseling, referral services, targeted conservation, and financial assistance programs. The criterion used in evaluating the effectiveness of various alternatives to disconnection programs is that commissions should encourage utility actions which minimize disconnections (thus maximizing service) provided that those actions do not unduly increase utility

service arrearage and bad debt. As a part of this study, the authors surveyed the state commissions to identify the various programs. The results of this survey are contained in Tables ES-1 and ES-2 at the end of this executive summary.

For gas utilities, the authors found that a higher level of disconnections is associated with the adoption of target conservation, and a lower level of disconnections is associated with date-based winter moratoria. One logical interpretation is that targeted conservation programs are adopted in response to high levels of disconnection. It seems unlikely that target conservation programs cause higher levels of disconnections. It does seem likely, however, that date-based winter moratoria lead to lower levels of disconnections. For electric utilities, the level of disconnections tends to be lower where there are financial assistance programs in place. For both electric and gas utilities, the level of bad debt tends to be higher with adoption of arrearage forgiveness programs, and tends to be lower with the adoption of income-based billing. This suggests that income-based billing might be a desirable program for low-income customers since it does not unduly harm the utility in the long run. For gas utilities only, a higher level of bad debt is associated with lifeline rates. It is uncertain whether lifeline rates lead to higher bad debt or whether lifeline rate programs are adopted in response to higher levels of bad debt.

The authors also reviewed two reported successful examples of utility disconnection programs. The authors found that the two examples had several characteristics in common: (1) they use an integrated and customer-specific approach to the problem of disconnecting low-income customers; (2) they engage in early identification, intervention, and referral to social service programs; (3) they involve a commitment by the utility to view the various programs that are alternatives to utility service disconnection as being a part of customer service, rather than being a more isolated collection and credit function; (4) they treat each individual customer on the basis of his or her situation by working with that customer to find a tailored solution that matches up one or more programs to fit that customer's needs (one size does not fit all); and (5) utility service

disconnection is considered to be the final option to be used only when all other options fail, except perhaps in the situation where the customer has the ability to pay and is uncooperative and unwilling to work with the utility to solve the problem.

As competitive forces push energy utilities to reduce costs, social programs, such as those that provide alternatives to utility service disconnection for low-income customers, would seem to push energy utilities toward immediately lowering their costs by withdrawing financial and resource support from these programs. The promotion of social goals is not typically understood as being a part of the original social contract with the utility. The changes brought about by competition, however, might lead the commissions and utilities to recognize the social contract is evolving in a way that places the utility in a prominent role to protect and guarantee service for its most captive customers, the low-income residential customer. Because of their unique position of often being among the first receptors (in the form of a missed utility payment) of an indication of social service needs, utilities can, and perhaps should, play a special role in helping to integrate social services. Further, utilities can minimize the number of disconnections with little or no additional arrearage or bad debt, provided they devote financial and human resources to this effort.

The authors suggest that a nonprice-based performance index might be designed to provide a utility with explicit rewards or penalties for levels of residential customer disconnection. Such a regulatory approach would provide the utility with an incentive to design and implement a cost-effective alternative to a disconnection program tailored to individual customer needs.

TABLE ES-1

STATE PSC POLICY ALTERNATIVES TO DISCONNECT: GAS SERVICE

Survey Questions	State PSC Responses											
	AZ	AR	CA	CT	DE	FL	ID	IL	IN	IA	KS	KY
A. Disconnect Practices												
1. Prior notice	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
2. Winter restriction	Y	Y	N	Y	Y	N	Y	Y	Y	Y	Y	Y
3. Date-based restriction	N	Y	N	Y	-	N	Y	N	Y	Y	Y	N
4. Temperature-based restriction	Y	Y	N	Y	Y	N	N	Y	N	Y	Y	N
5. PSC approval required	N	N	N	N	N	N	N	N	-	N	N	N
6. Service limiters	N	N	N	N	N	N	N	N	N	Y	N	N
B. Billing and Pricing Arrangements												
7. Partial payment	N	Y	Y	Y	N	N	Y	Y	N	Y	Y	Y
8. Income-based billing	N	N	N	Y	N	N	N	N	N	N	N	N
9. Budget billing	N	N	Y	Y	N	N	Y	Y	Y	Y	Y	Y
10. Deferred billing	Y	Y	Y	Y	N	N	Y	Y	Y	Y	Y	Y
11. Arrearage forgiveness	N	N	N	Y	-	N	N	N	Y	N	N	N
12. Life-line rates	N	N	Y	N	-	N	N	N	Y	N	N	N
C. Nonprice (Social) Assistance Programs												
13. Conservation loans	N	N	N	N	-	N	N	N	N	Y	N	N
14. Weatherization	N	Y	Y	Y	-	Y	Y	N	Y	Y	N	N
15. Energy audits	N	Y	Y	Y	N	N	Y	N	Y	Y	Y	Y
16. Budget counseling	N	N	N	Y	-	N	Y	N	N	N	N	N
17. Referral service	N	N	N	Y	N	N	Y	Y	N	N	Y	N
18. Targeted conservation	N	N	N	Y	-	N	N	N	Y	N	N	N
19. Financial assistance	N	Y	Y	Y	-	Y	Y	Y	Y	Y	Y	Y

TABLE ES-1--Continued

STATE PSC POLICY ALTERNATIVES TO DISCONNECT: GAS SERVICE

Survey Questions	State PSC Responses													
	ME	MD	MA	MI	MN	MS	MO	MT	NV	NH	NJ	NM	NY	NC
A. Disconnect Practices														
1. Prior notice	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
2. Winter restriction	Y	Y	Y	N	Y	Y	Y	Y	N	Y	Y	Y	Y	Y
3. Date-based restriction	Y	Y	Y	N	N	N	Y	Y	N	Y	Y	N	Y	Y
4. Temperature-based restriction	N	Y	N	N	N	N	Y	Y	N	N	Y	N	N	N
5. PSC approval required	Y[1]	Y	N	Y	N	-	N	Y[1]	N	Y[1]	N	Y	N	N
6. Service limiters	N	N	N	N	N	N	N	N	N	N	N	N	N	N
B. Billing and Pricing Arrangements														
7. Partial payment	Y	Y	Y	Y	N	N	Y	Y	Y	Y	Y	Y	Y	Y
8. Income-based billing	N	Y	N	N	N	N	N	N	N	N	N	N	N	N
9. Budget billing	Y	Y	Y	Y	Y	N	Y	N	Y	Y	Y	Y	Y	Y
10. Deferred billing	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	Y
11. Arrearage forgiveness	N	N	N	N	N	N	N	N	N	N	N	N	Y	N
12. Life-line rates	N	N	Y	N	N	N	N	Y	N	N	N	N	Y	N
C. Nonprice (Social) Assistance Programs														
13. Conservation loans	N	N	N	N	N	N	N	Y	N	N	N	N	Y	N
14. Weatherization	N	N	N	Y	N	Y	Y	Y	N	N	Y	N	Y	N
15. Energy audits	N	Y	Y	Y	N	Y	Y	Y	N	N	Y	Y	Y	N
16. Budget counseling	N	Y	N	N	Y	Y	Y	N	Y	N	N	N	Y	N
17. Referral service	Y	Y	N	Y	N	N	Y	N	Y	N	Y	Y	Y	Y
18. Targeted conservation	N	Y	N	Y	N	N	Y	N	N	N	Y	N	Y	N
19. Financial assistance	N	Y	Y	N	N	N	Y	Y	Y	Y	Y	N	Y	Y

[1] Only during winter months.

TABLE ES-1--Continued

STATE PSC POLICY ALTERNATIVES TO DISCONNECT: GAS SERVICE

Survey Questions	State PSC Responses													
	ND	OH	OK	OR	PA	SD	TN	UT	VT	VA	WA	WV	WI	WY
A. Disconnect Practices														
1. Prior notice	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	Y
2. Winter restriction	N	Y	Y	N	Y	N	N	Y	Y	Y	Y	N	Y	Y
3. Date-based restriction	N	N	N	N	Y	Y	N	Y	Y	N	Y	N	Y	N
4. Temperature-based restriction	N	Y	Y	N	N	N	N	N	Y	N	N	N	N	Y
5. PSC approval required	N	N	N	Y	N	N	N	Y	N	N	N	N	N	N
6. Service limiters	N	N	N	N	N	N	N	N	N	N	N	N	N	N
B. Billing and Pricing Arrangements														
7. Partial payment	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	N	N	Y	Y
8. Income-based billing	N	Y	Y	N	Y	N	N	N	N	N	Y	N	Y	N
9. Budget billing	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
10. Deferred billing	N	Y	Y	Y	Y	Y	N	Y	Y	Y	N	Y	Y	Y
11. Arrearage forgiveness	N	Y	N	N	N	N	N	N	N	N	N	N	Y	N
12. Life-line rates	N	N	N	N	N	N	N	N	N	N	N	Y	N	N
C. Nonprice (Social) Assistance Programs														
13. Conservation loans	N	N	N	Y	N	N	N	N	N	N	N	N	N	N
14. Weatherization	Y	Y	N	N	Y	N	N	N	Y	Y	N	N	Y	N
15. Energy audits	Y	N	N	Y	N	Y	N	Y	Y	Y	N	Y	Y	N
16. Budget counseling	N	N	N	N	Y	Y	N	Y	Y	N	Y	N	Y	N
17. Referral service	Y	Y	Y	N	Y	Y	N	N	Y	Y	Y	N	Y	Y
18. Targeted conservation	N	N	N	N	N	Y	N	N	Y	N	Y	N	Y	N
19. Financial assistance	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y

TABLE ES-2

STATE PSC POLICY ALTERNATIVES TO DISCONNECT: ELECTRICITY SERVICE

Survey Questions	State PSC Responses											
	AZ	AR	CA	CT	DE	FL	ID	IL	IN	IA	KS	KY
A. Disconnect Practices												
1. Prior notice	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
2. Winter restriction	Y	Y	N	Y	Y	N	Y	Y	Y	Y	Y	Y
3. Date-based restriction	N	Y	N	Y	-	N	Y	N	Y	Y	Y	N
4. Temperature-based restriction	Y	Y	N	Y	Y	N	N	Y	N	Y	Y	N
5. PSC approval required	N	N	N	N	N	N	N	N	-	N	N	N
6. Service limiters	N	Y	Y	Y	Y	N	N	N	Y	Y	N	N
B. Billing and Pricing Arrangements												
7. Partial payment	N	Y	Y	Y	Y	N	Y	Y	N	Y	Y	Y
8. Income-based billing	N	N	N	Y	N	N	N	N	N	N	N	N
9. Budget billing	N	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
10. Deferred billing	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	Y
11. Arrearage forgiveness	N	N	N	Y	-	N	N	N	N	N	N	N
12. Life-line rates	N	N	Y	N	-	N	N	N	N	N	N	N
C. Nonprice (Social) Assistance Programs												
13. Conservation loans	N	N	N	N	-	Y	N	N	N	Y	N	N
14. Weatherization	N	Y	Y	Y	-	Y	Y	N	Y	Y	N	N
15. Energy audits	N	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	Y
16. Budget counseling	N	N	N	Y	-	N	Y	N	N	N	N	N
17. Referral service	N	N	N	Y	Y	N	Y	Y	N	N	Y	N
18. Targeted conservation	N	N	N	Y	-	N	N	N	Y	N	N	Y
19. Financial assistance	N	Y	Y	Y	-	Y	Y	Y	Y	Y	Y	Y

TABLE ES-2--Continued

STATE PSC POLICY ALTERNATIVES TO DISCONNECT: ELECTRICITY SERVICE

Survey Questions	State PSC Responses													
	ME	MD	MA	MI	MN	MS	MO	MT	NV	NH	NJ	NM	NY	NC
A. Disconnect Practices														
1. Prior notice	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
2. Winter restriction	Y	Y	Y	N	Y	Y	Y	Y	N	Y	Y	Y	Y	Y
3. Date-based restriction	Y	Y	Y	N	N	N	Y	Y	N	Y	Y	N	Y	Y
4. Temperature-based restriction	Y	Y	N	N	N	N	Y	Y	N	N	Y	N	N	N
5. PSC approval required	Y[1]	Y	N	Y	N	-	N	Y[1]	N	Y[1]	N	Y	N	N
6. Service limiters	N	N	Y	Y	N	N	Y	N	N	N	N	N	Y	N
B. Billing and Pricing Arrangements														
7. Partial payment	Y	Y	Y	Y	N	N	Y	Y	Y	Y	Y	Y	Y	Y
8. Income-based billing	N	Y	N	N	N	N	N	N	N	N	N	N	N	N
9. Budget billing	Y	Y	Y	Y	Y	N	Y	N	Y	Y	Y	Y	Y	Y
10. Deferred billing	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	Y
11. Arrearage forgiveness	N	N	N	N	N	N	N	N	N	N	N	N	N	N
12. Life-line rates	Y	N	Y	N	N	N	N	Y	N	Y	N	N	Y	N
C. Nonprice (Social) Assistance Programs														
13. Conservation loans	N	N	N	N	N	N	N	Y	N	N	N	N	Y	N
14. Weatherization	Y	N	N	Y	N	Y	N	Y	N	N	Y	N	Y	N
15. Energy audits	Y	Y	Y	Y	N	Y	Y	Y	N	Y	Y	Y	Y	N
16. Budget counseling	N	Y	N	N	Y	Y	N	N	Y	N	N	N	Y	N
17. Referral service	Y	Y	N	Y	N	N	Y	N	Y	N	Y	Y	Y	Y
18. Targeted conservation	Y	Y	N	Y	N	N	N	N	N	N	Y	N	Y	N
19. Financial assistance	N	Y	Y	N	N	N	Y	Y	Y	Y	Y	N	Y	Y

[1] Only during winter months.

TABLE ES-2--Continued

STATE PSC POLICY ALTERNATIVES TO DISCONNECT: ELECTRICITY SERVICE

Survey Questions	State PSC Responses													
	ND	OH	OK	OR	PA	SD	TN	UT	VT	VA	WA	WV	WI	WY
A. Disconnect Practices														
1. Prior notice	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	Y
2. Winter restriction	N	Y	Y	N	Y	N	N	Y	Y	Y	Y	N	Y	Y
3. Date-based restriction	N	N	N	N	Y	Y	N	Y	Y	N	Y	N	Y	N
4. Temperature-based restriction	N	Y	Y	N	N	N	N	N	Y	N	N	N	N	Y
5. PSC approval required	N	N	N	Y	N	N	N	Y	N	N	N	N	N	N
6. Service limiters	N	N	Y	N	N	N	N	Y	Y	N	N	N	N	Y
B. Billing and Pricing Arrangements														
7. Partial payment	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	N	N	Y	Y
8. Income-based billing	N	Y	Y	N	Y	N	N	N	N	N	Y	N	N	N
9. Budget billing	Y	Y	N	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	Y
10. Deferred billing	N	Y	Y	Y	Y	Y	N	Y	Y	Y	N	Y	Y	Y
11. Arrearage forgiveness	N	Y	N	N	N	N	N	N	N	N	N	N	N	N
12. Life-line rates	N	N	N	N	N	N	N	N	N	N	N	Y	N	N
C. Nonprice (Social) Assistance Programs														
13. Conservation loans	N	N	N	Y	N	N	N	N	N	N	N	N	N	N
14. Weatherization	Y	N	N	N	Y	N	N	N	Y	Y	N	N	N	N
15. Energy audits	Y	N	Y	Y	N	Y	N	Y	Y	Y	N	Y	N	N
16. Budget counseling	N	N	N	N	Y	Y	N	Y	Y	N	Y	N	Y	N
17. Referral service	Y	Y	Y	N	Y	Y	N	N	Y	Y	Y	N	Y	Y
18. Targeted conservation	N	Y	N	N	N	Y	N	N	Y	N	Y	N	Y	N
19. Financial assistance	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	Y

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FOREWORD

The problem of providing utility service to low-income customers worsened because of increased service costs during the 1980s for gas and electric, and during the 1990s for water. During the 1980s, state commissions developed various alternatives to electric and gas service disconnections to address these problems. Current federal cutbacks in financial assistance and utility cutbacks of social programs due to increased competitive pressures make an examination of the alternatives to service disconnection timely. This report provides a comparative and empirical analysis of the different alternatives, and introduces a positive alternative approach for dealing with disconnection in a more competitive environment.

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CHAPTER ONE

BACKGROUND AND INTRODUCTION

Behind any discussion on whether there are desirable alternatives to utility service disconnection for residential customers who fail to pay their bills is an underlying debate on the proper role of economic regulation of public utilities. The debate includes questions of whether state public utility commissions can or should expand their roles, often without expressed and explicit legislative mandate, beyond that encompassed by traditional ratemaking to accomplish social goals. Some believe that the proper role of a state public service commission does not include the pursuit of social goals, whether those social goals be economic development or preventing social distress to low-income customers. Pricing gas and electricity based on need rather than demand abandons cost-of-service pricing and makes utilities quasi-welfare agencies. Others contend that it is appropriate for state public service commissions to provide or oversee utility provision of certain limited social assistance, such as budget counseling, referral services, and financial assistance, because they are aimed at preventing social distress, such as the disconnection of low-income residential utility service. The outcome of this debate, however, does not require resorting to polar extremes. The fact is that legislatures and commissions believe that the real question is to what extent should the public utility commission provide or encourage the utility to pursue social goals and to what end.

The underlying assumption of this study is that commissions should encourage utility actions that minimize disconnections (thus maximizing service), provided those actions do not unduly adversely affect utility service arrearage and

bad debt. Preference is given to programs that minimize distortion of pricing and billing of services. Preference is also given to programs that minimize the reliance on subsidies and utility class cross-subsidies.

THE OCCASION

This study occurs as traditionally vertically-integrated electric and local gas distribution companies, under the jurisdiction of state public utility commissions, are facing increasing pressures to become more competitive by reducing costs. These competitive pressures come from the more open and competitive wholesale electric and gas markets, where the commodity price of gas now fluctuates at market-driven levels and wholesale power is also becoming more market-driven.

For gas utilities, this increased competitive pressures was facilitated by Federal Energy Regulatory Commission (FERC) Orders 436 and 636, which implement federal policies to provide access to the gas markets at the wellhead. Orders 436 and 636 allow local gas distribution companies and, by state policy in most states, large industrial customers direct access to purchase gas at the wellhead. With the deregulation of gas prices, the existence of a gas supply surplus, and the opening of wellhead access to gas producers, the stage was set for the development of robust gas markets. Allowing large industrial customers to purchase gas at the wellhead helps to expose cross-subsidies that were implicit under traditional cost of service allocations. However, most state commissions take these cross-subsidies into account either by allowing the local distribution company (LDC) (1) to implement "top-down" gas transportation pricing to collect the same fixed costs from a gas transportation customer as it does from gas purchase customers or (2) to enter into a special contract with a customer that may be willing and able to bypass the LDC.

For vertically-integrated electric utilities, the enactment of the Energy Policy Act of 1992 (EPAct) facilitated the development of a more robust and open wholesale power market. EPAct provides for mandatory wheeling of power to

wholesale power customers and allows the development of independent power producers (IPPs) that can meet certain requirements to qualify as exempt wholesale generators (EWGs). Thus, increased supply and demand for wholesale power are possible. There are also many utilities with overcapacity, with power to sell on the wholesale power market. These factors set the stage for the development of a robust power market, under circumstances in many ways similar to those that led to the development of a robust gas commodities market.

However, in the case of vertically-integrated electric utilities, there is no requirement of retail wheeling to the ultimate customer. Indeed, EPAct expressly forbids the Federal Energy Regulatory Commission (FERC) from ordering retail wheeling. Instead, a savings provision of EPAct preserves the authority of state commissions to regulate or not to regulate retail franchise areas.

As presented in Figure 1-1 below, traditional cost-of-service allocations usually result in an allocation of the cost of capital burden that favors residential customers over industrial customers. However, as industrial customers are given choices, they will seek to drive down their cost of capital allocation. As discussed below, they will also seek to escape the burdens of any demand-side management or social service programs that favor other customer classes.

Further, as vertically-integrated electric utilities and local gas distribution companies find themselves under competitive pressures to provide services at the lowest possible costs, they will find it tempting to cut social service, conservation, and demand-side management programs. Those programs do not directly contribute to their ability to deliver their product to the customer at the lowest price. (Even if demand-side management programs can be demonstrated to result in a lower total bill for energy services, competitive pressures result in an effort to provide customers with the services that they want at the *lowest possible price*.) Further, there are allegations by customers with choices (typically industrial) that they have to share in the cost of social service, conservation, and demand-side management programs while realizing very little corresponding benefit. Instead, the major benefits of social service, conservation, and demand-side management

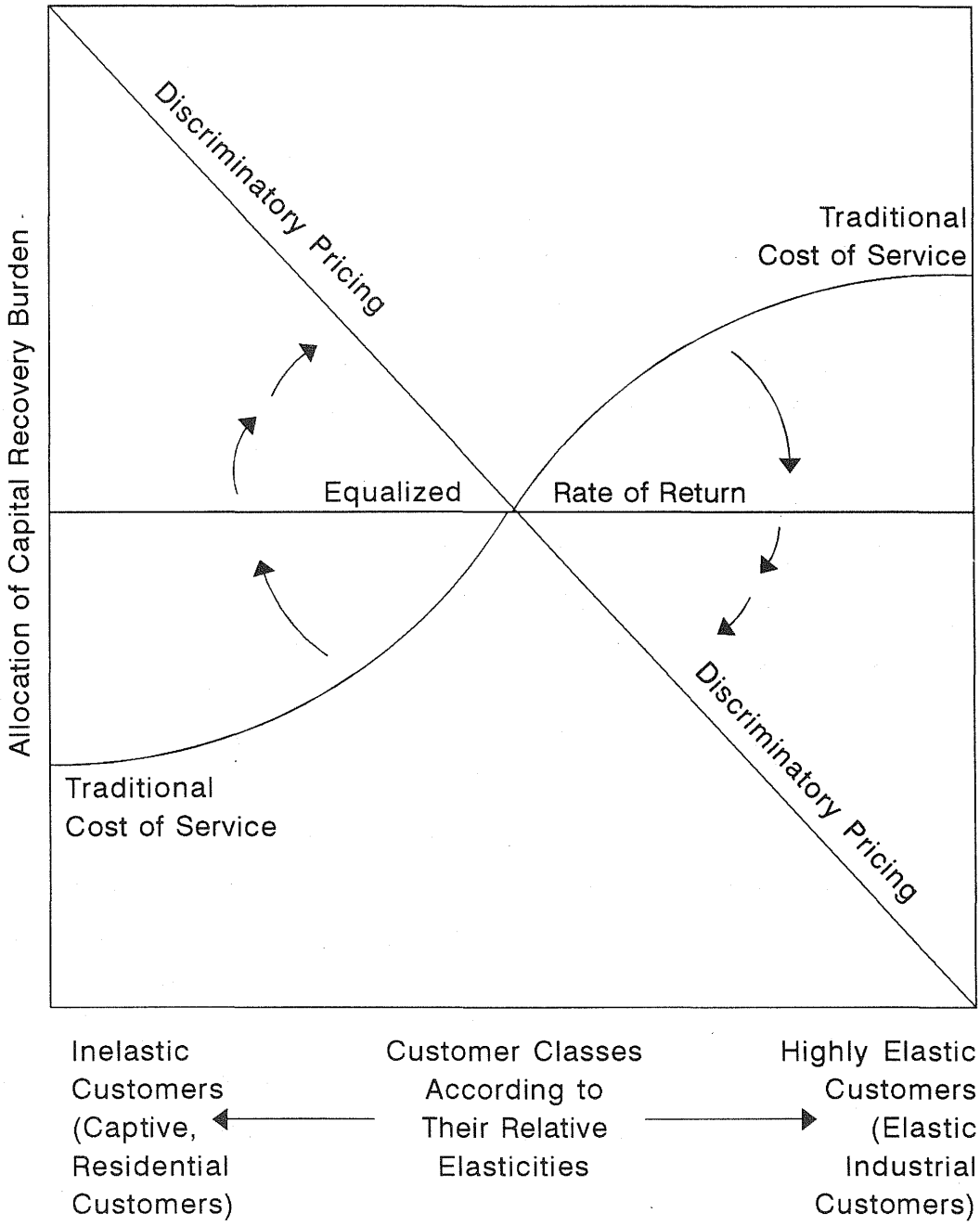

Fig. 1-1. The ongoing shift in the allocation of capital recovery burden from industrial to residential customers. Source: Robert E. Burns, The National Regulatory Research Institute's New Commissioner Tutorial.

programs are alleged to go to residential customers, who are typically thought of as core customers with few choices.

This report is also occasioned by cutbacks in funding of federal social service programs, in particular, the funding of the federal Low-Income Heating Assistance Program (LIHEAP), the principal federal program providing federal funding to provide energy assistance to low-income customers. Indeed, the Clinton Administration proposed to reduce the federal LIHEAP budget from $1.475 billion for Fiscal Year 1994 to $730 million for Fiscal Year 1995. LIHEAP funding provided energy assistance to an estimated 5.2 million households, or 14 million individuals in 1993. The proposed 49 percent cutback of LIHEAP funding would significantly affect the 70 percent of LIHEAP recipients who have an annual income of $8,000 or less, many of whom are elderly or single-parent households. Although opposed in a Resolution of the Executive Committee of the National Association of Regulatory Utility Commissioners at its Winter 1994 Meeting, the proposed cutback on LIHEAP funding was passed by Congress. Further cutbacks in funding of LIHEAP might possibly occur in the future.

Indeed, in late February 1995 the House Appropriations subcommittee cut $1.319 billion for LIHEAP funding for Fiscal Year 1996; and in early March 1995, the full House Appropriations Committee voted to cut the LIHEAP funding for Fiscal Year 1995. The NARUC Executive Committee adopted a resolution at its Winter 1995 meeting, urging Congress to reject any cuts in or recision to LIHEAP funding and to adopt a LIHEAP budget as requested by the Administration for Fiscal Years 1996 and 1997. President Clinton vetoed a recision of current LIHEAP funding. The current House Bill has no specific funding for LIHEAP. Instead, LIHEAP would be rolled-in as a part of a "super grant" to the states. The current Senate Bill will continue LIHEAP as a separately funded block-grant program at $1.3 billion. Many believe that a compromise in the Conference Committee will occur, with the likely result being a cutback in LIHEAP funding.

This report also deals with alternatives to service disconnections for water utilities. Although there is no pressure placed on the water utility industry from

emerging competition, nevertheless, the development of state commission policies that require or encourage alternatives to water service disconnection has recently taken on increased importance. In the past, water utility service has been taken for granted as a low-cost utility service, where service disconnection because of an inability to pay was an issue for only very few customers. However, recent increases in the cost of water utility service, caused primarily by infrastructure replacement and secondarily by the cost of complying with the Safe Drinking Water Act as well as the increased demand of water, have made water utility services (drinking water, storm-water management, and waste-water services) less affordable, particularly for low-income residential customers. No longer can the cost of water service be taken for granted. Increasingly, low-income residential customers are finding it difficult to pay their bills and finding alternatives to disconnecting water service has become desirable.

Organization of the Report

This report deals with alternatives to disconnection for electric, gas, and water utility service. Energy utilities are making a transition into a more competitive environment and these competitive pressures have direct implications on the appropriate regulatory approach to help assure that a utility either institutes or maintains an approach that provides alternatives to disconnection of energy utility services. The realities of emerging competitive pressures may force hard choices and innovative approaches to maintain and enhance alternative measures to utility disconnection for electric and gas utilities.

For water utility service, there is little indication of competition or impending competition. Therefore, a more straightforward discussion of alternatives to disconnection is appropriate.

Figure 1-2 shows which state commission staffs responded to the survey. (As in other NRRI surveys three attempts were made to solicit a response from each state.) In subsequent figures and tables, the reader should keep in mind that

Fig. 1-2. States filling out the NRRI survey.
Source: NRRI survey results.

the figure only shows those state commissions where a particular type of program is known to exist. It does not necessarily mean that there is not such a program in a state that did not respond to the survey. In subsequent figures, state commissions that have a program are shaded; those that do not have a program are left blank; and state commissions that did not respond are crosshatched. In Table 1-1, the alternatives to disconnection to electric and gas utility service are enumerated and described. Chapters 2, 3 and 4 of this report concerns an evaluation of the impact and effectiveness of programs that are alternatives to utility service disconnection for electric and gas service.

The authors review the electric and gas service disconnection policies of the various states in Chapter 2, including prior notice requirements, winter restriction moratoria, date-based moratoria, temperature-based moratoria, prior commission approval requirements, and service limiters. The pros and cons of each policy are presented. In Chapter 3, the authors conduct a similar review of the billing and pricing arrangement policies of the various states that are presented as part of a strategy to create alternatives to electric and gas utility service disconnection. The pros and cons of each policy are discussed. In Chapter 4, the authors review nonprice, preventive, customer service assistance programs that help to create alternatives to electric and gas utility service disconnection. The discussion also includes pros and cons of each policy. Alternatives for utility disconnection for water service are discussed in Chapter 5. In Chapter 6, the authors provide an empirical analysis of the survey results of alternatives to utility service disconnections for electric and gas service. Finally, in Chapter 7, the authors develop and discuss a positive alternative approach on how state commissions might create incentives for their energy utilities to actively pursue alternatives to utility service disconnection in an increasingly competitive environment and a positive approach toward developing alternatives to disconnection of water service in a monopoly environment.

TABLE 1-1

ALTERNATIVES TO SERVICE DISCONNECTION USED IN THE ENERGY SECTOR

Measure	Description
Prior notice	Formal notice given by a utility company to residential customers before terminating service due to nonpayment.
Winter restrictions	Procedures other than prior notice that restrict utility disconnection for nonpayment during the winter months.
Date-based winter moratoria	Policies that prohibit winter service termination between during specified dates.
Temperature-based moratoria	Policies that prohibit service termination when the temperature falls below a certain level.
Commission-approved disconnections	Policies that prohibit disconnections subject to approval of the public utilities commission on a case-by-case basis
Payment arrangements	A utility company arrangement in which payment-troubled customers pay arrearage in future installments in order to avoid disconnection or to reconnect utility service.
Temporary service guarantee	A short-term guarantee of service during the winter months if a payment-troubled customers pays a minimum amount of the monthly bill or a certain percentage of annual household income.
Budget billing	Level payments made throughout the year that allow the customer to defer costs of high energy consumption until later months when energy consumption is lower.
Payment extension	Deferral of a utility payment due date to coincide with a fixed-income customer's receipt of Social Security, pension, or other monthly income.
Arrearage forgiveness	Forgiveness of arrearage for select low-income customers who have demonstrated a good-faith effort to pay their utility bills.
Lifeline rate	A baseline rate that is less than the actual cost of service for the utility.
Service limiter	A device that temporarily restricts a household's normal utility consumption.
Below-market conservation loan	A below-market-rate loan from a utility to a low-income residential customer for financing the installation of conservation measures.
Utility-funded weatherization	The use of utility funds to pay for the weatherization of low-income homes.
Energy audits	Free or very low-cost home energy audits to determine existence and location of home energy leaks.
Budget counseling	Counseling by utility personnel to payment-troubled customers to assist in the reduction or elimination of payment problems through the teaching of money management skills.
Referral	Referral of payment-troubled customers to utility and community-sponsored assistance programs.

Source: U.S. Department of Health and Human Services, *LIHEAP [Low-Income Home Energy Assistance Program] Report to Congress for Fiscal Year 1990* (Washington, DC: U.S. Department of Health and Human Services, 1991), 145.

CHAPTER TWO

DISCONNECTION MORATORIA AND RESTRICTION POLICIES

During the late 1970s and early 1980s, many electric and gas service residential customers faced a dilemma due to the relative increase in the costs of electric and gas utility service compared to their increase in income. Some have dramatically termed this as the "heat or eat" dilemma.[1] In some individual low-income households the problem of having enough money to pay for winter heating (or summer cooling for the elderly or infirm) may indeed actually be a choice between purchasing energy for household heating and purchasing food. Other times, the dilemma takes the form of choosing between needed energy and prescription medicine or other necessities. The problem is that low-income residential customers, many of whom are the working poor, often face difficult choices, particularly in those areas of the country that are subject to long, hard winters. This problem is compounded by the quality of the housing stock available to the poor, typically older housing that lacks weatherization and conservation measures that assure the efficient use of energy. The point is that whatever form

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[1] For example, see Steven Deerwester and Marsha Ryan, "Heat or Eat? — Ohio's Percentage of Income Plan," *Proceedings of the Fifth NARUC Biennial Regulatory Information Conference*, Robert E. Burns, ed. (Columbus, OH: The National Regulatory Research Institute, 1994), 1667. Of course, the problem of poverty is age-old and did not descend on us during the 1980s. Rather, it would be better to say that the "heat or eat" dilemma was exacerbated during those years. The "heat or eat" dilemma rose to the public agenda as a social problem to be addressed during the 1980s.

the so-called "heat or eat" dilemma takes, the financial burden of electric and gas utility service on low-income customers can create social distress.

Since the early 1980s, the "heat or eat" dilemma remains as both a real and potential threat to the health and safety of low-income residential households. As shown in *Energy Policy and the Poor: The Association of Income with Consumption*,[2] the total energy use for low-income households can be as much as 20 percent lower than that of the total population average. And, this holds for a wide range of fuel sources used for heating, including natural gas, oil, and electricity, and for every state except Alaska (where bills are virtually the same regardless of income level). Considering the poorer housing stock inhabited by low-income households, as well as their more inefficient heating systems, it appears likely that the lower energy usage by low-income families is caused by the tendency of low-income households to live in multi-family dwellings that, even if energy inefficient, have a lower square footage to heat and have fewer exposed surfaces due to the character of multi-unit housing.

However, as shown in the 1994 report *On the Brink of Disaster: A State-by-State Analysis of Low-Income Natural Gas Winter Heating Bills*,[3] the natural gas winter heating burden for the average low-income customers, defined here as those qualifying for LIHEAP (typically those households that are living at 150 percent of the poverty level or less), is already significant and will become exacerbated if LIHEAP continues to be cutback or is eliminated.[4] An energy burden is defined as the percentage of income burden of a typical winter heating bill for December, January, and February. If LIHEAP were eliminated, the natural gas winter heating

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[2] Roger Colton, *Energy and the Poor: The Association of Consumption with Income* (Boston: National Consumer Law Center, 1990).

[3] Osterberg & Sheehan, *On the Brink of Disaster: A State-by-State Analysis of Low-Income Natural Gas Winter Heating Bills* (Scappoose, OR: Flying Pencil Publications, 1994).

[4] Unless the assistance provided from the LIHEAP program is somehow replaces by other federal or state assistance programs.

burden for average low-income customers would increase to 28.2 percent in Connecticut, 25.7 percent in Illinois, 23.4 percent in New York, 23.2 percent in Vermont, and 22.7 percent in Maryland. It would remain below 8 percent in only three states: Hawaii, Florida, and California, with the energy burden being much worse for those with lower incomes. Obviously, without alternatives to utility service disconnection for a failure to pay one's bill, the "heat or eat" dilemma will worsen as LIHEAP cutbacks (referred to in Chapter 1) take effect.

However, the problem of utility service disconnection is not new. Indeed, as shown in *Homes Without Heat: A Nationwide Study of Disconnected Natural Gas Users,* approximately 1.8 million households lost utility service in 1984. In the late 1970s and throughout the 1980s state commissions sought to tackle this problem head-on by developing a number of utility disconnection policies meant to limit the number of utility disconnections, particularly during the winter months. State commissions apply several different approaches in their disconnection policies.

Prior Notice

As shown in Figures 2-1 and 2-2, in the thirty-nine (shaded) of forty state jurisdictions responding to the survey, state commissions or their utilities have a policy of providing prior notice before a utility service disconnection. There is no real debate on the wisdom of this policy. Indeed, the primary variation between state commission policies purports to be whether there are people other than the customer who will also receive a notice prior to a utility service disconnection. For example, in some states, social agencies will be notified if a physician certifies that the health of the customer would be jeopardized by a utility service disconnection.

Winter Restriction and Date-Based Moratoria

As shown in Figures 2-3 and 2-4, state commissions or their utilities in thirty-one of the forty jurisdictions responding to the survey have a policy of winter restriction moratoria. For winter restriction moratoria, a utility is prohibited from disconnecting a customer during a set period that coincides with winter. These are

Fig. 2-1. States in which the state commission or its utilities have a prior notice policy for gas utility service disconnection. Source: NRRI survey results.

Fig. 2-2. States in which the state commission or its utilities have a prior notice policy for electric utility service disconnection. Source: NRRI survey results.

Fig. 2-3. States in which the state commission or its utilities have a winter restriction gas disconnection moratorium policy. Source: NRRI survey results.

Fig. 2-4. States in which the state commission or its utilities have a winter restriction electric disconnection moratorium policy. Source: NRRI survey results.

typically date-based moratoria. States in which the state commission or its utilities have a date-based restriction gas disconnection moratorium policy are shown in Figures 2-5 and 2-6.

Winter moratoria on utility bills are an attempt by state legislatures and/or public utility commissions to address a fundamental issue in our society: the availability from regulated utilities of energy for heating for low-income customers. These moratoria began with the first winter moratorium, which was instituted by the Wisconsin Public Service Commission in the winter of 1973-1974. The winter moratoria spread as a result of the section 115(b)(4) and 303(b)(1) standards of the Public Utility Regulatory Policies Act of 1978 (PURPA). They provided that a state commission should consider and determine whether a moratoria on electric and gas service disconnection during a period when a disconnection to a customer would be especially dangerous to the health of the customer and the consumer established an inability to pay for the service, except in installments, served the purposes of PURPA. Although it was not mandatory for the state commissions to adopt the PURPA standard, it did focus state commission attention on service disconnection and winter moratoria. As a result by late 1985, over half the state commission (including the District of Columbia) had winter utility service moratoria in place.[5]

Although widespread, there are some potential problems with winter restriction moratoria. For example, winter restriction moratoria are subject to free-rider abuse. In particular, because date-based winter moratoria are predictable, they can be subject to abusive strategic behavior by free-riders. Winter restriction moratoria merely postpone service disconnections. They do not lend themselves to

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[5] For early discussions of winter moratoria see, Richard Norgaard and Isabel Jensen, "Winter Moratoriums on Utility Bills" *Public Utility Fortnightly* (December 12, 1985); Kathleen Wanda, "Washington's 1985 Moratorium Program," *Proceedings of the Fifth NARUC Biennial Regulatory Information Conference*, Robert E. Burns, ed. (Columbus, OH: The National Regulatory Research Institute, 1994), 1625.

Fig. 2-5. States in which the state commission or its utilties have a date-based restriction gas disconnection moratorium policy. Source: NRRI survey results.

Fig. 2-6. States in which the state commission or its utilities have a date-based restriction electric disconnection moratorium policy. Source: NRRI survey results.

a long-run solution. Without other programs, one would expect winter moratoria to allow low-income customers to continue to take service without paying the full cost of the service, increasing arrearage, and ultimately bad debt. Winter restriction moratoria do nothing to improve consumer usage patterns. They are non-educational and do not improve conservation or efficient behavior, and might in fact discourage budget counseling. Finally, because date-based, winter restriction moratoria are not directly tied to weather patterns, they are not closely related to actual need.

However, dealing with free rider abuse is merely a screening problem. This can be addressed through a tight qualification process. Winter moratoria could be connected or tied to budget counseling, budget billing, and/or referral services.

On the other side, winter restriction moratoria can be argued to provide immediate help and a short-term solution that is essential. They are administratively easy and inexpensive to implement for both the utility and the commission. They are extremely effective in minimizing social distress; that is, the adverse effects to society of a threat to consumer health and safety. And, winter restriction moratoria place a limit on the implicit subsidy that low-income customers receive. When the moratorium is over, service disconnections operate to cut off the subsidy, thus limiting the burden on the utility and/or remaining customers.

TEMPERATURE-BASED MORATORIA

As shown in Figures 2-7 and 2-8, temperature-based moratoria are used in sixteen out of forty jurisdictions as an alternative to disconnection of electric service and in fifteen out of forty jurisdictions as an alternative to disconnection of gas service. The primary difference between temperature-based moratoria and other date-based moratoria is that temperature-based moratoria allow for utility service disconnection when the weather either is above a certain temperature or is forecasted to remain above a certain temperature.

Fig. 2-7. States in which the state commission or its utilities have a temperature-based restriction gas disconnection moratorium policy. Source: NRRI survey results.

Fig. 2-8. States in which the state commission or its utilities have a temperature-based restriction electric disconnection moratorium policy. Source: NRRI survey results.

Most of the pros for implementing temperature-based moratoria are the same as the advantages of keeping date-based, winter moratoria restrictions, that is it is a short-term solution that minimizes social distress. However, it can be argued that temperature-based moratoria are more effective than winter-restriction or date-based moratoria. An additional pro favoring temperature-based moratoria is that it is less subject to free-rider problems because a temperature-based moratoria is more random, that is, customers cannot plan to abuse it. Temperature-based moratoria are also better targeted toward actual need. And, temperature-based moratoria could arguably result in smaller arrearage and bad debt than winter- or date-based moratoria.

However, temperature-based moratoria are administratively more expensive and difficult to implement. Temperature-based moratoria may not minimize social distress if disconnection actually increases; instead, they may increase the number of disconnections around the threshold trigger temperature. Further, temperature-based moratoria do not consider differences in housing quality. Because of the varied quality and age of housing, some houses are more poorly designed and less energy efficient than others. (And, lower-income customers often live in poorer quality, inexpensive housing.) Just as with date-based moratoria, it can be argued that temperature-based moratoria are not a long-term solution.

DISCONNECTS REQUIRE PRIOR COMMISSION APPROVAL

As shown in Figures 2-9 and 2-10, in eight out of thirty-eight jurisdictions, public service commissions require commission prior approval before service disconnection takes place. But requiring commission prior approval is not an outright prohibition against disconnection. Rather, commission approval is required prior to a disconnection taking place.

Several arguments can be made for requiring commission prior approval before allowing a utility service disconnection. First, commission prior approval acts as a double-check that minimizes mistakes and assures that social distress

Fig. 2-9. States in which the state commission or its utilities require PSC approval prior to gas utility service disconnection. Source: NRRI survey results.

Fig. 2-10. States in which the state commission or its utilities require PSC approval prior to electric utility service disconnection. Source: NRRI survey results.

costs are minimized. Direct commission oversight assures compliance with commission disconnection policies. Second, direct commission oversight results in a desirable shared responsibility, which assures the public that social distress costs are properly weighed and considered, and the resulting private-public decision leads to socially preferred actions. Further, it allows the consumer to dispute the disconnection, providing them with due process rights for an essential service. This provides an implicit stay to disconnection. This allows the commission to attempt to find other alternatives to disconnect through an alternative dispute resolution process: mediation, conciliation, or facilitation. Alternatively, commission prior approval allows the commission to screen people to determine which nonprice social service programs are appropriate and then to make appropriate referrals.

However, most commissions already preform a double-check on the utility and assure that the utility complies with commission disconnection policies, but do so ex post. Further, requiring commission approval prior to service disconnections uses up resources of both the commission and the utility. This may be particularly true for high population areas. Indeed, commission prior approval may merely delay dealing with the problem of payment arrearage and potential service disconnection and may also "politicize" the process.

SERVICE LIMITERS

As shown in Figures 2-11 and 2-12, fourteen of thirty-nine jurisdictions have service limiters as an alternative to electric service disconnection. Only one of forty jurisdictions uses service limiters as an alternative to gas service disconnection.

An argument can be made that service limiters should be used as an alternative to disconnection. First, they implicitly reward payers, allowing payers full service while non-payers receive more restricted service. Second, they provide two levels of quality of service, allowing consumer choice and sorting. They

Fig. 2-11. States in which the state commission or its utilities have a gas service limiter policy. Source: NRRI survey results.

Fig. 2-12. States in which the state commission or its utilities have an electricity service limiter policy. Source: NRRI survey results.

diversify product line according to the quality of service. This makes service limiters similar to interruptible and curtailable service contracts. A similar approach could make implementation of service limiters easy.[6] Service limiters can modify customer behavior, forcing customers to conserve and make trade-offs in (prioritizes) usage. They would be particularly useful for customers who can pay, because it would alter their own priorities, eliminating a moral hazard that there is no penalty for a failure to pay. They also force those who can pay to self-budget.

Service limiters can act as a companion to (can be tied to) or can increase the voluntary participation in other programs, such as budget billing, weatherization, and/or conservation loans. They are compatible with nonprice social service programs; and, while the implementation cost of administering service limiters should be lower, the effectiveness should be higher; there should be less social distress, particularly if service limiters are combined with other programs such as weatherization and conservation. Further, service limiters could lower overall system costs through load management by lowering peak usage.

Service limiters could arguably be a substitute for a moratorium that could be used year-round. In theory at least, service limiters should reduce usage by the poor and hence reduce arrearage and bad debt. And, service limiters should increase voluntary participation in other alternative nonprice social service programs, because customers will seek out ways to avoid a lower quality of service. Finally, service limiters share the burden more responsibly between the poor and others assuming that the cost of implementing service limiters is low.

However, service limiters put an upper limit on the flow of energy, which might not be sensitive to actual health and safety needs that vary with weather, particularly for gas usage. Service limiters have higher up-front costs. Moreover, service limiters could penalize those in poorly-designed, energy-leaking homes,

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[6] Hun-Po Chao et al., "Priority Service: Unbundling the Quality Attributes of Electric Power," Report EA-4851 (Palo Alto, CA: Electric Power Research Institute (EPRI), 1986); and Hun-Po Chao et al., "Service Design in the Electric Power Industry," Report P-6543 (Palo Alto, CA: EPRI, 1990).

because the service limiter is likely to be set on the needs and the energy usage of average homes. Service limiters need to be combined with weatherization, conservation loans, and targeted conservation for poorly-designed, energy-inefficient housing. Otherwise, service limiters could lead to inefficient conservation and weatherization. Therefore, a service limiter, unless combined with targeted conservation or weatherization, might penalize those customers with the greatest need who are least able to help themselves.

CHAPTER THREE

BILLING AND PRICING ARRANGEMENTS

Changing billing or pricing arrangements so that the possibility of utility service disconnection is less likely is another set of policies that utilities or state commissions can implement to help mitigate the problem of utility service disconnection. Although these policies do not directly address service disconnection as did the disconnection policies discussed in the last chapter, they are nonetheless valuable tools that can go a long way toward avoiding utility service disconnection problems. One can think of billing or pricing arrangements as a form of financial assistance provided by the utility (and to the extent that the utility is made whole, funded by the ratepayer) that is either reflected in the price charged to the customer or in the customer's bill. This category does not include direct financial assistance, such as LIHEAP or fuel funds. This chapter discusses partial payment approaches, income-based billing approaches (which include percentage-of-income billing), budget billing, deferred billing, arrearage forgiveness, and lifeline rates.

PARTIAL PAYMENT

Partial payment allows a customer to continue to have utility service if some preset minimal partial payment is made on his or her utility bill. As shown in Figure 3-1, partial payment is an alternative to electric service disconnection in thirty-two out of forty jurisdictions. It is an alternative to gas service disconnection in thirty-one out of forty jurisdictions, as shown in Figure 3-2.

Fig. 3-1. States in which the state commission or its gas utilities provide for partial payment in lieu of disconnection. Source: NRRI survey results.

Fig. 3-2. States in which the state commission or its electric utilities provide for partial payment in lieu of disconnection. Source: NRRI survey results.

Although it is a widespread policy, one can argue that partial payment should be eliminated as an alternative to disconnection for several reasons. First, a potential free-rider (abuser) problem exists. Further, because partial payment policies are never used in isolation, their compatibility with other programs is of some concern. Partial payments lessen the incentive to conserve or weatherize. It lessens the incentive to behave efficiently. Partial payments also might increase arrearage and bad debt problems, in part because it offers *de facto* forgiveness by taking away the adverse consequences of not making a full payment. Second, partial payments might tend to undermine lifeline rates in those states with that policy, because with lifeline rates the rates increase with increased usage in order to control usage. Partial maximum payments dampen these price signals. Although it can also be argued that by definition core inelastic customers have very little discretionary income or energy usage so that getting the price signals right should not be that great a concern. Third, partial payments might undermine income-based billing programs, because income-based billing is based on an objective notion that equity requires the poor to pay according to their ability to pay. Partial payment is based on the subjective notion of the individual customer's need and runs counter to this notion of equity. Fourth, partial payments might undermine budget billing, because budget billing is based on making monthly payments that are based on the expected average of the next twelve months usage. Partial payments might undercut this payment schedule. Partial payments might undermine budget counseling, because partial payments would discourage voluntary participation in budget counseling, and because partial payment undermines the fiscal responsibility that budget counseling attempts to engender.

Yet, acceptance of a partial payment might be used as a signal or identifier for other programs. The first sign of financial distress might be a missed or partial payment on a utility bill. Permitting a partial payment, without actively encouraging partial payments, might serve to minimize a customer's financial distress while signalling to the utility and/or commission that early intervention is needed to refer the customer to the appropriate nonprice social service programs. Further, partial payment programs might be formally linked to targeted

conservation, weatherization, energy audits, and budget counseling to encourage their use.

Also, it can be argued that allowing partial payments in lieu of service disconnection is socially responsive because such an arrangement (although it may cause a moral hazard problem) provides flexibility for low-income consumers to adjust to income and expense variations. This practice helps to create and preserve good will between the utility, the public, and the state commission. Also, it can be argued that allowing partial payments minimizes arrearage and disconnections. (Collecting something is better than collecting nothing.) Accepting partial payments in lieu of disconnection is self-implementing and requires little or no additional commission or utility resources. Finally, having a policy of accepting partial payments is socially responsible because it provides short-term help to the destitute, the truly poor, thereby reducing social distress. Although, again, it may be a *de facto* arrearage forgiveness.

Income-Based Billing

Income-based payment plans (such as percentage-of-income plans, percentage-of-bill plans, and related programs) require qualifying customers to pay only a portion of their utility bill to avoid disconnection. Utilities can use a variety of methods to provide such discounts to their customers in need. Unlike general increasing-block rate structures, reduced payment plans are always targeted to customers in need based on affordability. However, these programs can vary in terms of providing customers price signals and incentives. For example, a simple percentage-of-income payment does not vary with usage, while a percentage-of-bill payment does vary according to usage (even though income criteria are used to qualify participants). Some variations of income-based payment plans also make use of a maximum-bill amount.

As shown in Figures 3-3 and 3-4, income-based billing is used in seven out of forty jurisdictions as an alternative to both electric and gas service disconnection. Income-based billing plans have a variety of names, the most

Fig. 3-3. States in which the state commission or its gas utilities provide income-based billing. Source: NRRI survey results.

Fig. 3-4. States in which the state commission or its electric utilities provide income-based billing. Source: NRRI survey results.

common of which is the percentage of income payment plan (PIP). The first income-based billing was the PIP plan put into effect by the Ohio Public Utilities Commission in the winter of 1984. The PIP plan was considered preferable to general disconnection moratoria because it was limited to those at or below 150 percent of the federal poverty level, and it required those who are eligible to pay a percentage of their income toward utility services. Only people with no income were not required to pay. In a 1985 study commissioned by the Ohio Public Utilities Commission, a consultant found that the PIP customer is typically older, not employed, and generally renting his or her dwelling; the PIP customer consumes more gas, but the same amount of electricity as a non-PIP customer; the PIP customer has less insulation in his or her dwelling: and that three of four PIP customers will not be able to pay off arrears by maintaining percentage of income payments through the non-heating period (although a small number of high usage customers might be causing this result.)[1]

It is noteworthy that income-based billing, and in particularly PIP plan approaches, have strong advocates, who point out that if PIP were combined with LIHEAP payments then a balance can be struck between the desire not to increase the utility's arrearage and not disconnect low-income customers. PIP plans would have the desirable effect of having low-income customers pay what they could afford.[2] And, one case study shows that PIP plans have been successful in

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[1] Steven Deerwester and Marsha Ryan, "Heat or Eat -- Ohio's Percentage of Income Plan;" Tracell Inc., *A Study of the Results of the Commission's Procedural Determination of Customer Payment Options Pursuant to the Investigation into the Long-Term Solutions Concerning Disconnect of Gas and Electric Service in Winter Emergencies* (1985).

[2] Roger Colton, "Percentage of Income Payment Plans As An Alternative Distribution of LIHEAP Benefits: Good Business, Good Government, Good Social Policy" (Boston: National Consumer Law Center, 1991); and Roger Colton, "Evaluation of Warwick (Rhode Island) Percentage of Income Payment Plan (PIPP) Demonstration Project" (Boston: National Consumer Law Center, 1988).

reducing the number of disconnections over time for those customers covered by a PIP plan.[3]

There are several arguments in favor of income-based billing. First, income-based billing may be considered more equitable, because it ties financial assistance to ability-to-pay, typically measured by a percentage of income. Also, income-based billing may be considered more equitable because it is not influenced by exogenous factors beyond the customer's control, such as rate increases or weather changes. It can be argued that income-based billing induces better customer payment behavior compared to discounted or lifeline rates, because it is tied to the customer's ability to pay. Second, targeting customers for income-based billing should be easier. Customer income should be obtainable from social service agencies. Third, income-based billing mimics partial payment and budget billing by laying out clear expectations for a customer's payment obligations. Income-based billing mimics budget billing, by producing more levelized payments if income is not highly variable. Income-based billing thus combines concepts of partial payment and budget billing, and constitutes an effective substitute for them. Fourth, some claim it is anti-cyclical and helps the poor during a recession.[4]

On the other hand, one might argue that income-based billing should not be adopted because it is less efficient than billing customers for the full cost of service. Some argue that individual consumption behavior is not affected. For income-based billing customers who face a marginal price of zero, with no billing effect of increasing marginal usage, there may be a tendency to waste. There is also no incentive to weatherize or to voluntarily conserve. However, proponents of PIP plans dismiss this argument as one of "blackboard economics" that has

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[3] See Roger Colton, "Ohio's Percentage of Income Plan: Problems and Potentials (A Response to CG&E's Donald Marshall) (Boston: National Consumer Law Center, 1991).

[4] Ashley C. Brown, "Percentage of Income Payment Plans: Regulation Meets Social Policy," *Public Utilities Fortnightly* (March 19, 1987), 9-12.

insufficient foundation for several reasons: low-income households' demand for energy is relatively price inelastic and therefore does not respond to price signals, low-income households rarely pay their entire bill, and budget billing makes price signals irrelevant.[5] While the first concern that low-income households' demand is relatively price inelastic is significant, the argument that income-based billing is less efficient than billing based on the full cost of service is hard to refute.

Second, there is a moral hazard problem; customers may misrepresent this income status to receive lower-cost service. This can particularly be a problem where income earned in the cash (underground) economy is unreported or underreported. Also, customers may sign up for the program when they have a transitional loss of income and may not leave after the transitional loss period is over. Third, because it is anti-cyclical, it may burden the utility the most during a recession when revenues may already be down. It may also burden other ratepayers who pay an implicit subsidy to support the program. Fourth, some argue that income-based billing can be administratively-expensive because customer income can be variable, which is particularly true for the destitute. Fifth, income-based billing can cause cross-subsidies either between customer classes or within the residential customer class, with the burden of low-income customers shifting to other residential customers. Such cross-subsidies are not sustainable over the long run in more competitive environments.

BUDGET BILLING

As shown in Figures 3-5 and 3-6, budget billing is used in thirty-four out of forty jurisdictions as an alternative to gas and electric service disconnection.

Budget billing plans are used to spread payments evenly over the year, so that higher seasonal costs for winter heating or summer cooling do not disrupt

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[5] Colton, "Percentage of Income Payment Plans As An Alternative Distribution of LIHEAP Benefits," 44-45.

Fig. 3-5. States in which the state commission or its gas utilities provide budget billing. Source: NRRI survey results.

Fig. 3-6. States in which the state commission or its electric utilities provide budget billing. Source: NRRI survey results.

customer budgets. Budget billing makes it easier for customers to budget their monthly utility payments. Nearly everyone agrees that budget billing is good public policy that levelizes bill levels, minimizes bill shock, and hence minimize the number of utility service disconnections. Specifically, budget billing smooths out variations in weather over time, reducing transitory disconnections. Further, because low-income residential customers are relatively inelastic, there is no significant loss of consumption efficiency.[6]

Budget billing is also a desirable program because if has no moral hazard problem. Further, budget billing compliments other nonprice social service programs, particularly conservation and weatherization. Budget billing helps to teach socially responsible planning and budgeting by allowing customers to know and budget their energy consumption in a monthly bill. Without budget billing, utility service bills during unusually cold or hot months become a major source of social distress.

The only down-side argument that can be made against budget billing is an economic one: it might mute price signals sent by seasonal, time-of-use, time-of-day, or real time pricing rates.[7] However, as mentioned, low-income residential customers' demand for energy is relatively price inelastic and would not respond well to these price signals. Few, if any, low-income residential customers are subject to such rate schedules.

DEFERRED BILLING

As shown in Figures 3-7 and 3-8, deferred billing is used in thirty-five out of forty jurisdictions as an alternative to electric service disconnection and in thirty-four out of forty jurisdictions as an alternative to gas service disconnection.

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[6] See Michael Hennessy, " The Evaluation of Lifeline Electricity Rates: Methods and Myths," *Evaluation Review* 8, no.3 (June 1984), 327-46.

[7] This criticism can be found in Karl McDermott, *Budget Billing Plans for Electric and Gas Utilities: An Analysis and Recommendations* (Columbus, OH: The National Regulatory Research Institute, 1979).

Fig. 3-7. States in which the state commission or its gas utilities provide for deferred billing in lieu of disconnection. Source: NRRI survey results.

Fig. 3-8. States in which the state commission or its electric utilities provide for deferred billing in lieu of disconnection. Source: NRRI survey results.

This option is rarely discussed and seems not to be controversial. Indeed, allowing customers to arrange a deferred payment plan with the utility to pay bills is a widely accepted option. Arguments in favor of deferred billing include that deferred billing is good for those with payment problems because of transitional income. Deferred billing creates a self-implementing option that may be preferable to partial payments. Income can be used to screen individuals for deferred billing programs in order to minimize any adverse selection problems. Budget billing and budget counseling can be made available for those who can pay; and deferred billing can be made available only for those customers with temporary, transitory payment problems. Deferred billing can supply useful information for social agency referral and for other available programs, such as conservation and weatherization.

While deferred billing may appear to be a substitute for partial payments or budget billing, they may instead be supplementary options, each better suited for different types of customers.

Arrearage Forgiveness

As shown in Figures 3-9 and 3-10, arrearage forgiveness is used in two out of thirty-nine jurisdiction as an alternative to electric service disconnection and in six out of thirty-nine jurisdictions as an alternative to gas service disconnection.

Arrearage can be forgiven in various ways. Many utilities will provide one-time bill forgiveness to customers in a temporary crisis. Arrearage forgiveness might depend on customer participation in educational and conservation programs. Special arrangements may be necessary to address arrearage for multifamily dwellings that may be especially suitable for conservation retrofits. Partial forgiveness can include waivers of late charges or payment matching by the utility. Under a matching program, customers pay portions of their arrears over time while the utility forgives a matching amount. Thus, arrearage forgiveness can be an incentive for improvement in bill-payment behavior.

Fig. 3-9. States in which the state commission or its gas utilities provide for arrearage forgiveness as an alternative to disconnection. Source: NRRI survey results.

Fig. 3-10. States in which the state commission or its electric utilities provide for arrearage forgiveness as an alternative to disconnection. Source: NRRI survey results.

Arrearage forgiveness programs are not widely used; they would appear to make little sense unless linked to other options, such as partial payment, income-based billing, budget-billing weatherization, energy audits, budget counseling, referral service, and/or targeted conservation.

Those states with partial payment or income-based billing policies may have *de facto* arrearage forgiveness. Arrearage forgiveness itself is not automatic. On the other hand, arrearage forgiveness can be thought of as merely an extreme form of partial payment where the partial payment is set at zero. Therefore, it has advantages and disadvantages similar to partial payment.

LIFELINE RATES

Another approach to discounting utility rates is to change the utility's rate structure and provide low-income customers with a more affordable service price for minimum essential use.[8] For the purpose of this discussion, the concept of lifeline rates captures the idea of an altered rate structure. The use of lifeline rates may or may not be restricted to use by customers with special needs, typically low-income customers. A lifeline rate is a type of increasing-block rate that prices a basic block of service at a low rate, while pricing higher consumption blocks at higher rates. The basic usage block can be priced below the cost of service (depending on perceptions about the true cost of service). In some conceptions of lifeline rates, the basic usage block would vary according to family size or other special circumstances. The merit of this premise is debatable. However, if the premise is accepted, a methodology for determining the appropriate basic level of household usage is required. This adds substantially to administrative costs and the chances for error or abuse.

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[8] For information regarding rate design alternatives, see Janice A. Beecher and Patrick C. Mann with James R. Landers, *Cost Allocation and Rate Design for Water Utilities* (Columbus, OH: The National Regulatory Research Institute, 1990).

As shown in Figures 3-11 and 3-12, lifeline rates are used in seven of thirty-nine jurisdictions as an alternative to utility service disconnection.

Some arguments in favor of adopting lifeline rates are as follows. Lifeline rates can be designed to provide rate relief for low-income customers, to reduce bad debt and arrearage, and to reduce disconnections. This assertion can be empirically tested. Second, because some minimal usage of gas and/or electricity is an "essential service" that provides "essential human needs" (such as lighting, cooling, refrigeration, water heating, and space heating), lifeline rates provide an initial "lifeline" block of low-cost electricity for low-income customers. Third, because low-income customer's essential human needs are price inelastic, lifeline rates do not necessarily lead to consumption inefficiency.[9]

The following arguments can be made against the adoption of lifeline rates. First, the demands of low-income customers are not totally price inelastic and lifeline rates will lead to some foregone efficient consumer behavior. In other words, lifeline rates weaken whatever incentives there are to engage in efficient conservation and energy usage. Sometimes lifeline rates are not targeted for the poor, with the result that middle- and upper-class low-usage customers who can afford to pay the cost of gas or electricity are effectively subsidized by high-usage, low-income customers who cannot. Because many of the working poor, poor seniors, and destitute are master metered and have their utility bills included in their rent, lifeline rates may be ineffective in guaranteeing them low-cost energy for essential service needs. Targeted lifeline rates for low-income customers are discriminatory and could conceivably be argued to be undue price discrimination. Finally, because lifeline rates are not tied to the customer's ability to pay, they are less likely to result in better customer payment behavior than income-based billing.

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[9] Michael Hennessy, "The Evaluation of Lifeline Electricity Rates: Methods and Myths," *Evaluation Review*, Vol. 8, No.3 (June 1984), 327-346.

Fig. 3-11. States in which the state commission or its gas utilities have a policy that provides for gas lifeline rates. Source: NRRI survey results.

Fig. 3-12. States in which the state commission or its electric utilities have a policy that provides for electric lifeline rates. Source: NRRI survey results.

CHAPTER FOUR

NONPRICE, PREVENTIVE, CUSTOMER SERVICE PROGRAMS

A variety of nonprice, preventive, customer service programs can also serve as alternatives to utility service disconnection by lowering energy usage through conservation loans, weatherization, energy audits, or targeted conservation; by providing budget counseling; by providing social service referrals; or by providing financial assistance. Each of these nonprice, customer service programs seeks to prevent service disconnection from arising.

CONSERVATION LOANS

As shown in Figures 4-1 and 4-2, conservation loans are used in five of thirty-nine jurisdictions as an alternative to electric service disconnection and are used in four of thirty-nine jurisdictions as an alternative to gas service disconnection.

A major problem with conservation loans is that they typically have low participation rates. The extremely poor (the destitute) typically do not find them useful. They nevertheless might be useful to the working poor and the elderly who are on fixed incomes.[1]

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[1] Paul Stern et al., "The Effectiveness of Incentives for Residential Energy Conservation," *Evaluation Review* 10, no. 2 (April 1985): 147-76.

Fig. 4-1. States in which the state commission or its gas utilities have a policy that provides for gas conservation loans. Source: NRRI survey results.

Fig. 4-2. States in which the state commission or its electric utilities have a policy that provides for electric conservation loans. Source: NRRI survey results.

Conservation loans are often coupled with weatherization and targeted conservation for both electric and gas utility service. This seems sensible, particularly for the working poor and seniors who are not destitute. By providing conservation loans, utilities avoid free rider problems and provide an incentive to invest in cost effective conservation and weatherization, since the source of the loan payback would be the increased cash flow that results from lower energy bills. Alternately, conservation loan payback could be set at split-the-energy-savings to guarantee that the conservation loan is invested effectively.

WEATHERIZATION

As shown in Figures 4-3 and 4-4, weatherization is used as an alternative to electric service disconnection in seventeen out of thirty-nine jurisdictions and used as an alternative to gas service disconnection in eighteen out of thirty-nine jurisdictions.

An argument can be made that the adoption of weatherization as an alternative to service disconnection should be encouraged. Weatherization is environmentally sound because it reduces fossil fuel use. Weatherization promotes efficient household use of energy, optimizes household use of resources, and (with or without a "snap-back effect") results in a higher quality of life.[2] Weatherization is also a long-term solution, if done correctly. Further, because weatherization

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[2] A "snap-back effect" occurs when a customer consumes more in response to a lower marginal cost. One might expect a customer to be willing to consume more energy service (e.g., more cooling or space heating) if the marginal cost of the energy is lowered due to weatherization. See Kenneth Costello, "Ten Myths of Energy Conservation," *Public Utilities Fortnightly* (March 17, 1987), 19-22.

Fig. 4-3. States in which the state commission or its gas utilities have a policy that provides for weatherization. Source: NRRI survey results.

Fig. 4-4. States in which the state commission or its electric utilities have a policy that provides for weatherization. Source: NRRI survey results.

reduces energy usage,[3] it should lower arrearage and lead to fewer disconnections. Weatherization is incentive compatible,[4] because it lowers bills and helps participants by increasing property values.

Weatherization does not help the destitute (hard-core, renting poor), particularly since many of these are tenants with landlords that may be unwilling to participate. If landlords take part, there is a free-rider problem with landlords effectively receiving a subsidy of increased property and rental value.[5] Also, it can be argued that weatherization is subject to a public-private problem, that is, a public investment is used to try to solve a private problem. Although, others may argue that, if the public benefit from weatherization exceeds the costs, one should not be overly concerned about the public-private problem.

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[3] Peabody, G.A., "Weatherization Program Evaluation," (Washington, D.C.: Energy Information Administration, Office of Energy Markets and Land Use, U.S. Department of Energy, 1984); Marilyn Brown et al., "National Impacts of the Weatherization Assistance Program in Single-Family and Small Multi-Family Dwellings" (Oak Ridge, TN: Oak Ridge National Labs, U.S. Department of Energy, May 1993), 10.18. As previously noted, the Oak Ridge study used a cost-benefit analysis to show program effectiveness. The authors found a program benefit-cost ratio (defined as energy-savings benefits measured against total weatherization costs) of 1.09. However, an issue can be raised whether using an average cost of $6.89 per MBtu (the equivalent of a $39.99 barrel of imported oil) has the appropriate cost to impute the benefits of weatherization, when the average retail price of natural gas was $5.90 per MBtu and the average retail cost of electricity was $.07 per kWh. Using the actual cost of actual avoided resources would have produced more accurate measurement of the benefits of weatherization.

[4] Incentive compatibility is an economic concept that solves the principal-agent problem. By creating the proper incentives, the interests of the principal and agent are properly aligned. In this case, the ratepayer who weatherizes helps himself, the utility, and his fellow ratepayers.

[5] Paul Stern et al., "The Effectiveness of Incentives for Residential Energy Conservation," *Evaluation Review* 10, no. 2 (April 1985). The authors list several reasons for homeowners not investing in energy efficiency: lack of accurate information, consumer confusion, restricted choice due to previous decisions by appliance manufacturers, as well as not having the time and effort needed to properly invest.

Weatherization can be very expensive, particularly if it is done well.[6] For weatherization to be effective it is not enough to weatherstrip and insulate a home. To effectively weatherize, one must find and correct all sources of infiltration and energy loss. This would require the use of a rigorous test, such as a pressurized blower test, and then customized solutions to the energy loss problems of each home. To make cost-effective decisions about weatherization, a neutral objective party must do a sophisticated cost-benefit analysis. Opponents of weatherization contend that this is not to be done. Moreover, it is at least arguable that job creation should not be a consideration in such a cost-benefit analysis because the money spent on weatherization could have been spent elsewhere in the economy also creating jobs.[7] At best weatherization is most properly a long-term solution that lessens the possibility of disconnection for those participating in the program but that does not solve the immediate short-term problem of the larger population.

ENERGY AUDITS

As shown in Figures 4-5 and 4-6, energy audits are used in twenty-nine out of forty jurisdictions to help prevent electric service disconnection and in twenty-five out of forty jurisdictions to help prevent gas service disconnection.

One might argue that energy audits are ineffective and should not be used. In the past, energy audits were imprecise measures that overestimate potential energy savings. The reason that some simplified energy audits overestimate

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[6] For example, an Indiana CAP Director Association stated that its on-site weatherization testing and installation costs averaged $1,250 per household. According to Brown et al., *National Impacts of the Weatherization Assistance Program* (1989) the program-wide average total installation cost per dwelling for weatherization was $1,050 with an average additional $500 per dwelling in overhead and management costs. This brings the average 1989 cost of weatherizing a dwelling to $1,550.

[7] For example, the inclusion of employment, environmental externality and other nonenergy benefits increases the program benefit-cost ratio of 1.09 to 1 to a societal benefit-cost ratio of 1.72 to 1. Ibid.

Fig. 4-5. States in which the state commission or its gas utilities have a policy that provides for gas energy audits. Source: NRRI survey results.

Fig. 4-6. States in which the state commission or its electric utilities have a policy that provides for electric energy audits. Source: NRRI survey results.

potential energy savings is that they cannot capture all sources of energy loss. Energy audits can be expensive, especially if they are thorough.
Energy audits are not a stand-alone activity. They only make sense if combined with targeted conservation and/or weatherization. And, finally energy audits have lower voluntary participation rates, particularly among the destitute (the poorest customers who cannot pay and who are typically not homeowners). Unless it is a voluntary, simplified energy audit, it is also an intrusive process.

Supporters of energy audits contend that energy audits are fairly simple and not very involved. They are less intrusive and less expensive than the data collection necessary for Home Energy Rating Systems. Energy audits, although imprecise, can still "ballpark" the potential energy savings. Energy audits help to determine the severity of the problem. By conducting energy audits, weatherization and low-income conservation programs can be targeted so that they can be cost effective and efficient. Finally, proponents argue that energy audits do tend to result in energy savings, and that inexpensive energy audits produce as much energy savings as more expensive energy audits.[8] Energy audits tend to help homeowners, which tend to include be poor seniors and the working poor.

BUDGET COUNSELING

As shown in Figures 4-7 and 4-8, budget counseling is used in thirteen out of thirty-nine jurisdictions as an alternative to electric service disconnection and in twenty-five out of forty jurisdictions as an alternative to gas service disconnection.

Utilities can offer some customers nonmonetary assistance in the form of budget counseling to help customers budget for their utility and other costs. Counseling may be especially important for customers who must budget on a weekly or monthly basis but pay a quarterly water utility bill. Counseling can be

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[8] Richard S. Ridge, "An Analysis of Various Types of Energy Audits," *Evaluation Review* 10, no. 3 (June 1986): 385-95.

Fig. 4-7. States in which the state commission or its gas utilities have a policy that provides for budget counseling. Source: NRRI survey results.

Fig. 4-8. States in which the state commission or its electric utilities have a policy that provides for budget counseling. Source: NRRI survey results.

used to help utilities convey the importance of timely payments and the potential consequences of nonpayment. Counseling also can be used to improve customer understanding of utility bills, increase awareness of methods for controlling costs, and refer customers to available community-assistance programs.

It would seem that budget counseling should be more widely adopted. Budget counseling is targeted toward consumers who are not destitute. Although they should have enough money to pay their utility bills, prioritizing their expenditures is the problem. It is often tied to budget billing. Budget counseling should lead to fewer and smaller arrearage, because it is an educational solution to the problem. Budget counseling provides an opportunity and means to link people up with budget billing and energy audits, where appropriate. Budget counseling can act as an early link-up to social referral programs, financial assistance, and other non-price assistance programs. By providing an evaluative, diagnostic screen, it can help streamline referral and integrate social services, thus making customer use of social services more efficient.

Further, budget counseling may eliminate the need for other less satisfactory pricing and billing arrangements (such as, partial billing, income-based billing, deferred billing, and arrearage forgiveness). Budget counseling minimizes the overall subsidy and frees up funds for the destitute, the truly poor who cannot pay. Budget counseling also frees up utility funds for targeted conservation and weatherization.

On the other hand, budget counseling has low participation rates, particularly among the destitute. It only works well for senior citizens and the working poor. Indeed, budget counseling may be ineffective for the truly destitute who cannot pay. Budget counseling requires customized assistance and is labor intensive and expensive to implement, particularly if done in person. However, it may be cheaper than utility disconnection, which is also labor intensive and expensive. Budget counseling may also duplicate other available social services that can be provided more effectively and efficiently by social service agencies.

REFERRAL SERVICES

As shown in Figures 4-9 and 4-10, referral services are used in twenty-two out of forty jurisdictions as an alternative to electric service disconnection and in twenty-three of forty jurisdictions as an alternative to gas service disconnection.

Referrals to appropriate agencies can help customers find bill-payment assistance, as well as more general help in managing personal finances. Referrals are especially critical in emergencies and cases of extreme hardship. It can be argued that there should be an increased usage of referral services. Referral services take advantage of the specialized training of social service agencies and personnel. Referral services also help to improve communication and efficiency in the delivery of social services. It helps to reduce the redundancy of services and their administrative costs. This helps to integrate and coordinate social services, reducing "user cycling."

The failure to pay for utility services is often the first signal of a social service need. Therefore, a referral service mitigates social distress. Referral services allow the utility to identify and to assign, at an early stage, helpful utility and social service programs. This mitigates free rider problems. Because of better assignment, there is a more efficient use of social service programs. Referral services tie user participation to specific utility or social service programs. One would expect that early referral services also help to mitigate the problems of service disconnection, arrearage, and bad debt. Early referral services help to avoid the need for more drastic, and more expensive subsidy billing and pricing measures.

However, referral services may simply be passing the buck; that is, an excuse to remove the utility and the commission from the role of problemsolver. Further, referral services may be highly bureaucratic, labor intensive, and expensive. While referral services may best serve the destitute individual because the social agencies are designed to serve those individuals, they may not provide early intervention and service for those with less severe problems. Because there

Fig. 4-9. States in which the state commission or its gas utilities have a policy that provides for referral services. Source: NRRI survey results.

Fig. 4-10. States in which the state commission or its electric utilities have a policy that provides for referral services. Source: NRRI survey results.

is competition for social services, there is selectivity bias, which may or may not be appropriate, to provide the most social services to those with the greatest need. This could lead to a misallocation of social service resources. There is still a need for other utility programs for customers who are not destitute.

TARGETED CONSERVATION

As shown in Figures 4-11 and 4-12, targeted conservation is used in thirteen out of thirty-nine jurisdictions as an alternative to electric service disconnection and in eleven out of thirty-nine jurisdictions as an alternative to gas service disconnection.

Given the current federal budgetary policies and efforts to reduce the federal deficit and to slow the growth of the national debt, there is a scarcity of funds available for non-price social assistance programs. Efficiency demands that they be better utilized by targeting conservation efforts. In targeted conservation programs, the poor are not free riders, assuming that the destitute, receive help first.[9] By specifically targeting the poor, it mitigates user abuse and free-riders: the most needy are served and the wealthier excluded. Because money is targeted, the less needy are pressured to solve their own problems. Thus, it mitigates against the use of public funds for improving private property, arguably a private purpose. Public funds do not crowd out private funds and initiatives.

Alternatively one can argue against targeted conservation. By targeting conservation for the poor, the impact may be minimal: the poor live in poorly designed housing, which might be the most expensive to rehabilitate. Therefore, these expenditures might fail a cost/benefit test in that the marginal cost of the programs might exceed the marginal benefit. Unless it is linked (tied) to other

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[9] For an argument that conservation and DSM programs should be specifically targeted for low-income customers see Nancy Brockway, "The Low-Income Customer As A Non-Participant in DSM: What Is to Be Done?" (Boston: National Consumer Law Center, 1992), 4.

Fig. 4-11. States in which the state commission or its gas utilities have target gas conservation programs. Source: NRRI survey results.

Fig. 4-12. States in which the state commission or its electric utilities have target electric conservation programs. Source: NRRI survey results.

programs, targeted conservation has low participation rates, particularly among the destitute. Targeted conservation is also labor intensive, with high implementation costs. Finally, targeted conservation for the poor creates a selectivity bias because a marginal cost/benefit test is not used to allocate resources.

Nevertheless, targeted conservation may still cost less than disconnection. The selectivity bias also may be appropriate because conservation loans might be a more appropriate alternative for the non-destitute.

FINANCIAL ASSISTANCE

Financial assistance looks to the community (as compared to utility resources) for providing assistance to customers in need. Generally, it involves community-based nonprofit organizations that use donations to fund bill-payment assistance efforts. Financial assistance can be provided through utilities with the use of voluntary programs that rely on customer contributions. Often, utilities can make use of nonprofit service organizations for implementing these programs.

As shown in Figures 4-13 and 4-14, financial assistance is offered in thirty-three of thirty-nine jurisdictions as an alternative to electric service disconnection and in thirty-four of thirty-nine jurisdictions as an alternative to gas service disconnection. (However, we suspect that the number of jurisdictions having financial assistance programs is underreported because sometimes LIHEAP is not reported. Public sources are available for LIHEAP in all jurisdictions.)

There are basically four groupings of financial assistance: loans versus grants, and public versus private sources of funding. Loans were previously discussed under the category of conservation loans. The following discussion focuses on grants. By far the principal (but not only) source of federal funding is LIHEAP funding. Through fiscal year 1994, LIHEAP was funded at approximately $2 billion per year for each of the previous ten years, with at least 10 percent of the funds required to be spent on weatherization. (Actually, about $300 million

Fig. 4-13. States in which the state commission or its gas utilities have financial assistance programs. Source: NRRI survey results.

Fig. 4-14. States in which the state commission or its electric utilities have financial assistance programs. Source: NRRI survey results.

annually was spent on weatherization in recent years.) However, as noted, LIHEAP funding is being severely cut back.

Private funding comes from a variety of sources that are pooled into local fuel funds. According to the National Fuel Funds Network, private funding provides about $72 million in financial assistance per year. Fuel funds are bimodal in their criteria on who receives the funds. About half is designed to supplement LIHEAP funding, with the remaining half designed to complement LIHEAP funding. In other words, about half of the fuel funds go only to those who qualify for LIHEAP funding, and about half go to those who, although poor, do not qualify for LIHEAP funding.

One can contend that there should be more in-kind transfers for low-income customers. One major area of contention, however, is the loan versus grant debate. Loans give the borrower something in return for future performance, which requires greater individual responsibility and performance. Loans must be paid back. Loan expenditures are usually at the discretion of the borrower, providing the consumer with greater discretion and more degrees of freedom. Loans have a fixed time-frame, which can be set to match the loan repayment period to the life-cycle of the investment. One can tie loan interest rates to performance, making a loan incentive compatible. This rewards credit-worthiness (loan repayment) and rewards those who put loaned money to good use. On the other hand, loans require a greater investigation into the credit-worthiness of those receiving them.

Grants may or may not be tied to making a particular expenditure. Grants are not tied to future performance and require no future responsibility. Grants are also called in-kind transfers. They are usually targeted to something specific, which implies less discretion. Grants tend to be more bureaucratic, with more administrative oversight on how the grant will be expended. Grants might be more expensive to implement. As noted, grants are not tied to future performance; instead grants are tied to current need. Grants do not tend to be incentive compatible. There is no incentive to perform well, because there are not penalties

for taking actions inconsistent with an efficient investment. Grants demand more from the grantors since grants are never paid back.

Loans are probably a feasible strategy for the working poor and most seniors. Loans can easily be tied to budget counseling and budget billing. Loans are probably not feasible for more improvident individuals, for whom a loan de facto becomes a grant because it is never paid back. Loans are often called a cash transfer. Note that split-savings plans to encourage DSM and conservation investment are really types of loans.

CHAPTER FIVE

ALTERNATIVES TO SERVICE DISCONNECTION FOR WATER UTILITIES

THE OCCASION

Escalating rates for water and wastewater services are bringing affordability issues to the forefront for these utility sectors. Water supply is increasingly recognized as a rising-cost utility industry.[1] Three key factors are driving the cost of water service upward: the need to comply with the requirements of federal drinking water standards under the Safe Drinking Water Act, the need to replace an aging water supply infrastructure, and the need to meet growing demand for water. All three factors will contribute significantly to the rising cost of water service. Parallel forces can be found to affect the wastewater treatment and stormwater management industries, where costs are driven by the need to comply with the Clean Water Act, the need to upgrade and replace infrastructure, and the need to meet growing demand.

The water utilities that will be hit particularly hard by rising costs are smaller systems that do not enjoy economies of scale. Many small systems also have additional viability problems associated with their size, including rate structures that are inadequate for recovering the cost of service. These systems may need especially substantial rate increases.

The problem of affordability is partly exacerbated by the lack of funding for federally mandated standards for drinking water, wastewater, and stormwater treatment. However, not all water utility costs can be attributed to water

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[1] Janice A. Beecher and Patrick C. Mann with John D. Stanford, *Meeting Water Utility Revenue Requirements: Financing and Ratemaking Alternatives* (Columbus, OH: The National Regulatory Research Institute, 1993).

treatment or regulatory standards for treatment.[2] Therefore, to blame the affordability problem on federal mandates alone is not entirely justifiable.

For some water systems, rates may have been inadequate for meeting revenue requirements even before the impact of additional costs was felt.[3] Interestingly, even the highest tier of rates still is experiencing substantial increases (see Table 5-1). Some analysts project that rising costs will cause water rates for

TABLE 5-1

NATIONAL SURVEY OF MONTHLY WATER CHARGES

Rate	1986	1988	1990	1992	Increase: 1986 to 1992	Percent Change
Lowest	$2.84	$3.02	$3.66	$4.63	+$1.79	+63
Average	9.41	9.95	11.16	12.35	+2.94	+31
Highest	21.95	21.30	22.95	32.17	+10.22	+47

Source: Ellen M. Duke and Angela C. Montoya, "Trends in Water Pricing: Results of Ernst & Young's National Rate Surveys," *American Water Works Association Journal* 85 (May 1993): 56. The monthly charges reported are for residential customers at 1,000 cubic feet (7,480 gallons); the average is based on summer rates where seasonal rates apply.

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[2] Ibid.

[3] Beecher, Mann, and Stanford, *Meeting Water Utility Revenue Requirements*.

the rest of the 1990s to double (at a minimum), with a continued trend toward increasing-block rates, more uniform rates, and more seasonal rates.[4] Although they can be economically justified, these conservation-oriented rate structures can have the appearance of exacerbating the problem of rising water prices. At the same time, some water utilities are considering providing rate discounts and other forms of assistance for the elderly and low-income populations (see Table 5-2).

The growing problem of water affordability has implications for customers in terms of increased arrearage, late payments, disconnection notices, and actual service terminations. Affordability affects utilities in terms of expenses associated with credit, collection, and disconnection activities; revenue stability and working capital needs; and bad debt or uncollectible accounts that other customers must cover.[5] Other ramifications of the affordability issue also are becoming apparent. If customers cannot afford to pay for water service, potential lenders may be concerned about the affordability issue in terms of the utility's financial viability and ability to meet debt obligations.[6] Moreover, disconnections can present a public relations nightmare for utilities, particularly because they involve essential services. However, the larger issue of affordability is primarily a concern with respect to low-income residential consumers.

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[4] David F. Russell and Christopher P.N. Woodcock, "What Will Water Rates be Like in the 1990s," *American Water Works Association Journal* 84 (September 1992): 68-72.

[5] See also Margot Saunders, "Water and Sewer Rates--The Emerging Crisis for the Poor," in *Proceedings of the Biennial Regulatory Information Conference* (Columbus, OH: The National Regulatory Research Institute, 1992), 21-33.

[6] Christopher P.N. Woodcock, "National Trends in Water Pricing," A Paper Presented at the Annual Conference of the American Water Works Association in San Antonio, Texas, June 1993.

TABLE 5-2

SAMPLE OF CITIES WITH WATER DISCOUNTS AND OTHER ASSISTANCE PROGRAMS

City	Program
Albuquerque, New Mexico	Low-income customers can receive a nominal annual monetary allowance.
Allentown, Pennsylvania	Elderly customers can receive a rebate based on a percentage of their income.
Boston, Massachusetts	Elderly or disabled customers can receive a 25 percent discount on their bill.
Cleveland, Ohio	Elderly and low-income customers can receive a separate rate.
Columbus, Ohio	Low-income senior citizens can receive a waiver of the basic water-service charge ($11.64 per quarter).
Los Angeles, California	Elderly customers can receive a $38 allowance and a tax exemption, and low-income and disabled customers can receive a 15 percent discount.
Oakland, California	Low-income customers with a family of three or more can receive an annual allowance of $83 paid for and administered by the Salvation Army.
Philadelphia, Pennsylvania	Elderly customers can receive a 25 percent discount, and low-income customers can receive a 15 percent discount.
Salt Lake City, Utah	The Red Cross administers an assistance program for elderly customers.
San Francisco, California	Elderly customers with gardens can receive a 10 percent reduction of their flow factor.
Springfield, Massachusetts	Elderly customers can receive a $7.50 allowance on each bill.
Toledo, Ohio	Elderly and disabled customers receive a 5 percent discount on the first 2,000 cubic feet of water service only.

Source: Author's construct based on telephone contacts with municipal water departments (1994).

WATER AFFORDABILITY

Mounting evidence suggests that rising water prices exceed both the average growth in income and the general rate of price increases. In a recent analysis of the issue, Scott J. Rubin concluded that affordability would continue to be a problem both for utilities and their customers.[7] For low-income customers, paying more for basic water service means going without less essential and more discretionary products and services. Thus, rising water prices, besides causing arrearage, bad debt, and disconnections, can contribute to a deterioration in the quality of life for low-income utility customers.

Attention is being paid to the affordability of water service, particularly by advocates for the interests of the low-income population, including families receiving public assistance, older Americans on fixed incomes, and persons with health problems or disabilities.[8] Appearances in recent rate proceedings in cities across the nation reflect the growing concern of these advocates for their constituencies. A report issued by the National Consumer Law Center (NCLC) in December 1991 estimated that more than 100,000 households in eastern Massachusetts were unable to afford their water bills.[9] In addition, annual water and wastewater bills were projected to rise to over $1,600 by the year 2000. Should this projection materialize, water and sewer costs would amount to 94

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[7] Scott J. Rubin, "Are Water Rates Becoming Unaffordable?" *American Water Works Association Journal* 86, no. 2 (February 1994): 79.

[8] Saunders, "Water and Sewer Rates," 21-33. See also, *Comments of the National Consumer Law Center, Inc., On Senate Bill 1547--To Reauthorize and Amend the Safe Drinking Water Act Before the Senate Committee on Environment and Public Works,* November 5, 1993.

[9] National Consumer Law Center, *The Impact of Rising Water and Sewer Rates on the Poor: The Case of Eastern Massachusetts* (Boston, MA: National Consumer Law Center) as reported in Saunders, Water and Sewer Rates," 21.

percent of the cost of home heating for the region.[10] While this might be somewhat of a doomsday prediction, the point that water and wastewater rates will have an increasingly significant impact on consumer budgets is well taken. According to Margot Saunders of the NCLC:

> The 1990s have presented a new problem to low-income households: the increasing difficulty [to afford] clean, running water and functioning sewage systems in many areas of the United States. These escalating costs will further burden poor households which have in the past two decades experienced spiraling energy costs without concurrent increases in income. Unless special attention is paid to the dramatic effect that escalating water and sewer rates will have on the budgets of poor households, clean and safe drinking water will be another factor in the spread of homelessness in this nation.[11]

In urban areas, low-income populations generally do not have the expansive lawns and swimming pools that require large quantities of water. However, poor housing conditions can suggest the presence of plumbing fixtures and appliances that waste water, which only adds to the regressive impact of rising utility costs on the low-income population. Low-income households already face difficulty in paying for electricity and natural gas. While not all low-income families must pay their water bills directly, higher utility costs sometimes are reflected in higher rents. Because many renters do not pay their utility bills directly, they may not receive adequate price signals to guide their consumption decisions.

Some low-income advocates have argued that the way to address the affordability problem is through expanded federal funding for meeting federally mandated standards:

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[10] Rising costs for the region could be offset somewhat by federal funding for the clean-up of Boston Harbor.

[11] Saunders, "Water and Sewer Rates," 21.

> How can poor people be protected from the impact of rising water and sewer rates? There are no programs or funds now available on the federal level. . . to address the looming burden on poor families, although the magnitude of the problem is such that only the federal government has the resources to absorb the costs and protect low income families from the impact of higher water and wastewater bills. Thus the first logical step would be to restore the federal funding for meeting Clean Water Act requirements, and begin significant federal funding of investments needed to comply with the federal Safe Drinking Water Act requirements.[12]

Affordability is emerging as an issue for the water sector in much the same way as it did for the energy sector in the 1970s and 1980s. The prospect of disconnecting water service on a large scale is a relatively recent threat that both water utilities and utility regulators are beginning to recognize. Several thousand of the nation's water systems, many of which are the smaller, privately-owned systems, fall under the jurisdiction of the state public utility commissions.[13] Given dramatically rising costs, some commissions may need to revisit their jurisdiction and policies related to water utilities. The potential exists for many regulated water utilities to experience uncollectible accounts and service disconnections for nonpayment on a much larger scale than before. Some of the regulatory rules governing utility practices in this area apply only to state-regulated electric and natural gas utilities (see Table 5-3).[14] Many state commissions, for example, require utilities to provide prior notice to customers before terminating service.

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[12] National Consumer Law Center as reported in National Water Education Council, *Cause for Concern: America's Clean Water Funding Crisis* (Boston, MA: National Water Education Council, 1992), 35.

[13] *1993-1994 NRRI Survey on State Commission Regulation of Water Utilities* reported in Janice A. Beecher, et al., *Water Conservation Pricing and Revenue Issues* (Columbus, OH: The National Regulatory Research Institute, forthcoming in 1995).

[14] NRRI Survey.

TABLE 5-3

SURVEY OF THE STATE PUBLIC UTILITY COMMISSIONS ON WATER UTILITY SERVICE DISCONNECTION POLICIES

Commission Policies (N commissions responding)	N	State Commissions
Disconnection Policies		
Prior notice required for disconnection (40)	36	AZ, AR, CA, CT, DE, FL, ID, IL, IN, IA, KS, KY, ME, MD, MA, MI, MO, MS, MT, NV, NH, NJ, NM, NY, NC, OH, OK, OR, PA, UT, VT, VA, WA, WV, WI, WY
Disconnection restrictions or moratoria (40)	7	AZ, DE, KS, MA, PA, VT, WY
Date moratoria on disconnections (39)	3	KS, PA, VT
Temperature moratoria on disconnections (39)	4	DE, KS, VT, WY
Commission approval for disconnection (38)	4	MD, MI, NM, UT
Payment and Rate Policies		
Partial payments allowed (40)	19	AR, CA, ID, IL, KS, KY, ME, MD, MA, MO, NV, NH, NJ, NM, OR, PA, VT, WI, WY
Income-based payments allowed (40)	0	
Budget billing provided (40)	7	MA, NV, NM, PA, UT, VT, WY
Deferred payments allowed (40)	20	AZ, AR, CA, ID, IL, IN, KY, ME, MA, MO, NV, NJ, NM, OR, PA, UT, VT, WV, WI, WY
Arrearage forgiveness provided (39)	0	
Lifeline rate structures provided (39)	2	CA, NV

TABLE 5-3

SURVEY OF THE STATE PUBLIC UTILITY COMMISSIONS ON WATER UTILITY SERVICE DISCONNECTION POLICIES

Commission Policies (N commissions responding)	N	State Commissions
Service and Assistance Policies		
Service limiters or prepaid meters (40)	0	
Low-cost conservation loans (39)	0	
Utility-funded weatherization (39)	0	
Energy efficiency audits (40)	0	
Budget counseling for customers (39)	1	NV
Tracking and referral service (40)	4	NV, NM, OK, WY
Targeted conservation (39)	0	
Financial assistance (39)	5	IN, NV, PA, WV, WY

Source: *1994 NRRI Survey on Alternatives to Utility Service Disconnection*. Forty of the state public utility commissions responded to the survey; forty-six commissions regulate water utilities.

* Supplemental information from *1993/1994 NRRI Survey on Water Utility Regulation.*

Some regulated water utilities also are affected by disconnection policies to the extent that steam heating systems are dependent on water service. It may become necessary to extend certain disconnection provisions to water utilities and their ratepayers. Some low-income consumer advocates also will want relief for their constituencies in the form of affordability-oriented rate structures, such as lifeline rates.

Thus, water utilities are under increasing pressure to respond to affordability and disconnection problems in their service territories. Many utilities urge a consideration of the effects of affordability responses on utilities, as well as customers. Utilities recognize the need to address the affordability issue. They also express clear preferences for particular solutions:

> Affordability of water is almost always a consideration in determining rates. However, operating decisions that affect the utilities' budget and therefore the utilities' revenue requirement are more frequently based on water quality than affordability. As quality issues and regulatory requirements drive the cost of water service up, greater burden is placed on the rate structure to provide the framework for customer perceived affordability. Is affordability a pricing priority? Based on the rate structures in use by most water utilities and the efforts made by many utilities to provide elderly/low income discounts, affordability is viewed as a pricing priority. Most customers and governing bodies are extremely sensitive to the affordability aspects of pricing. As a result, there is a tendency for affordability to be given a higher priority in pricing policies than revenue stability until the utility reaches a revenue crisis.[15]

As a general proposition, utilities seem to prefer assistance oriented programs, such as "partnering with social agencies to achieve social goals," over

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[15] Michael D. Day, "Is Water Affordability a Pricing Priority?" A paper presented at the Annual Meeting of the American Water Works Association in San Antonio, Texas, June 1993.

rate structure modifications involving difficult tradeoffs.[16] Also, most utilities seem to prefer not to take on too much social responsibility. However, an expanding range of options is available for consideration by utilities and regulators in dealing with the affordability problem.

EMERGING SOLUTIONS

Several alternatives to water service disconnection are emerging, many of which have been used by electricity and natural gas utilities. As water bills rise, more utilities may begin exploring options in this area for the benefit of their customers and themselves. As in the electric and gas sector, the methods available to water utilities can be grouped into categories: counseling and referral, community assistance, monthly billing, arrearage forgiveness, payment discounts, income-based payments, lifeline rates, targeted conservation, disconnection moratoria, and flow restriction. The methods work differently to address affordability. For example, some methods (such as targeted conservation) are designed to lower water usage, while others (such as lifeline rates) are designed to lower utility charges. Many utilities addressing these issues take a multifaceted approach, combining several alternatives in their programs. Each approach is discussed below, followed by a general evaluation of advantages and disadvantages associated with each approach.

COUNSELING AND REFERRAL

Despite the potential uses of counseling and referrals, the social service role of public utilities remains controversial. Some utilities are especially opposed to taking on this function and investing in the personnel and other resources required to be effective. However, effective counseling and referral services can benefit the

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[16] Ibid., 5.

utility in terms of avoiding costly disconnection and collection actions. In general, counseling and referral services should be targeted to customers most at risk of losing service. Utilities must decide whether to aggressively promote these services or wait to be contacted by a customer in need before the process of counseling and referral is initiated.

Community Assistance

Many water utilities are considering using community assistance programs. Given the uncertain fate of federal energy assistance programs in a more fiscally constrained future, a new and comprehensive program in the water sector seems unlikely. Therefore, state and local governments and public utilities (publicly or privately owned) may bear the brunt of responsibility for finding solutions to the water affordability issue. Some water utilities are experimenting with voluntary community-assistance programs, sometimes called hardship programs, to help low-income households pay their utility bills. Typically, water customers are provided an opportunity to include an additional amount with their regular utility payment. The funds are then distributed to customers in need.

Two municipal water systems that have emphasized community assistance programs are Virginia Beach, Virginia and Dallas, Texas.[17] Virginia Beach explicitly rejected implementation of lifeline rates in favor of assistance provided by local social-service agencies and churches. The water department works with customers to develop payment plans on an individual basis. In addition, the local housing department funds a program to help low-income households cover connection (system-development) charges. The city of Dallas employs an increasing-block rate structure but does not provide lifeline rates per se. Customers experiencing temporary difficulties in paying their bills may qualify for pay-out arrangements with the water department. Also, a program known as

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[17] This summary is derived from Day, Ibid., 3-4.

Operation WaterShare is used to solicit voluntary donations for assisting low-income families in paying their water and wastewater bills. Customers of investor-owned utilities can benefit from community-assistance programs as well. Some water utilities, like the Pennsylvania American Water Company, are participating in community-assistance programs originally established by local energy utilities.[18]

Monthly Billing

Some forms of relief involve changes that utilities can implement to make customer bills somewhat more *manageable.* Many water utilities bill their residential customers on a quarterly basis; some use even longer billing cycles. Although it can save utilities administrative costs, quarterly billing has several drawbacks compared with monthly billing. With quarterly billing, the price signal to customers may be too infrequent to influence consumption behavior in a timely way. For example, a customer may use water for landscaping all summer long and not realize the water-bill consequence until autumn. Another drawback to quarterly billing is that rate design choices are constrained. A seasonal or excess-use rate, for example, requires monthly billing to be effective in managing customer loads on the utility system. Finally, from an affordability standpoint, quarterly billing is a problem because customers with low and/or fixed incomes are confronted with a large bill every three months rather than a supposedly more manageable bill every month.

Seasonal peaks also occur for residential water demand. In most areas, summer peaks can be attributed to increased outdoor water use (landscaping, swimming pools, and car washing). Generally, however, these activities are not associated with low-income populations. Thus, budget billing is not necessarily an appropriate solution for water customers having difficulty paying their water bills. Furthermore, changing the billing cycle may not have an impact on customers in

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[18] Correspondence from Scott J. Rubin, July 1994.

buildings where master metering for water service is used and costs are passed along to consumers through housing rental charges.

For some water utilities, monthly billing may provide a method to reduce rate shock to customers in the face of rising costs and prices. In a recent survey, public utility commission staff members in Massachusetts, New York, and Vermont reported that billing cycles were changed for some jurisdictional water utilities for the purpose of mitigating rate shock to customers.[19] Another form of assistance is to adjust actual billing dates so that bill payment can be coordinated with a customer's receipt of public assistance benefits.

Of course, changing the billing cycle does not address the actual cost of water, only how it is recovered from customers. Monthly billing might enhance the utility's revenue stream. However, stepping up the meter-reading and billing cycle also can add substantially to a utility's administrative costs (including personnel, processing, printing, and postage costs). Smaller water systems may lack the resources to implement monthly billing. The potential costs and benefits of billing-cycle changes must be carefully assessed by utilities and regulators prior to implementation.

Arrearage Forgiveness

A key indictor of the affordability problem is customer arrearages, which appear to be growing (see Table 5-4). Arrearage can create lingering bad debt for utilities. Customers accumulating arrearage may develop a sense of hopelessness about the situation, particularly if late charges accumulate along with regular usage charges. Landlords who accrue arrearage can jeopardize utility service to their tenants. Arrearage forgiveness can be used to give payment-troubled customers a

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[19] *1993-1994 NRRI Survey on State Commission Regulation of Water Utilities.*

TABLE 5-4 AVERAGE ARREARAGE IN PENNSYLVANIA WATER UTILITY MEDIATION CASES		
Year	Average Arrearage ($)	Percent Change (%)
1983	$115	---
1984	122	+6
1985	174	+43
1986	144	-17
1987	192	+33
1988	257	+34
1989	301	+17
1990	359	+19
1991	389	+8
1992	443	+14

Source: Data provided by the Bureau of Consumer Services, Pennsylvania Public Utility Commission (handouts dated May 4, 1993).

clean slate and a fresh start in making utility payments. Often, partial or full forgiveness of arrearages is done in conjunction with other kinds of assistance programs. In certain cases, community assistance funds may be available to help retire all or some of a customer's arrearages. However, when a utility writes off bad debt, it usually is at the expense of paying customers. In other words, a subsidization occurs from one group of ratepayers to another.

Payment Discounts

Payment discounts provide customers with a credit toward their utility payment and sometimes a flat amount applies to the fixed charge portion of the bill. Discounts also are used for connection fees and other charges. Discounts sometimes are used for low-income, elderly, or disabled utility customers. For example, Columbus, Ohio offers a discount to elderly customers who meet certain income criteria. The discount amounts to a waiver of the basic water-service charge (see Table 5-5).

Utility discount programs can be relatively simple to administer in comparison to comprehensive assistance programs or full-scale changes in the rate structure. Some payment discounts may be somewhat political in nature and are used to demonstrate some level of symbolic concern for the affordability problem. This may be especially true in the case of certain elderly discounts and other discounts not rigidly linked to actual ability to pay. Like other forms of assistance involving the rate structure, discounts involve a subsidy from regular ratepayers. However, the subsidy is not necessarily substantial. In the case of reducing the fixed charge portion of the bill, discounts do not remove the pricing signal that comes through variable charges.

Income-Based Payments

Under income-based payment plans, the actual cost of utility service generally is not fully covered. The balance of the required payment is covered through a community-assistance program or absorbed into utility costs and covered by other customers. The logic of such programs is that they help customers and utilities avoid disconnection, and the costs associated with it, while bringing some revenues into the utility. A reduced payment is considered better than no payment at all, even if a subsidy is required. Some advocates have attempted to reconcile

TABLE 5-5

COLUMBUS, OHIO'S SENIOR CITIZEN WATER RATE DISCOUNT

Eligibility Requirement

To be eligible for the senior citizen rate schedule for water charges, applicants must meet the following requirements:

1. Be responsible for payment of water service and live at the residence where the rate is to be applied.
2. Live in a single-metered, single-family household.
3. Be age 65 sixty-five or older at the time of application.
4. Total annual household income for the year prior to the application must have been:

Household Size	Maximum Income
1	$10,100
2	$12,800
3	$16,800
4	$21,600
5	$25,500
6	$28,800
7	$32,600
8	$36,500
9 or more	$43,200

5. Eligible applicants must provide acceptable proof of age and income. The Division of Water reserves the right to check the eligibility status of any applicant at any time.

Type of Discount

Eligible applicants receive a flat reduction of $3.88 per month ($11.64 per quarterly billing period), constituting a waiver of the basic water-service charge that normally applies regardless of water usage.

Source: Information provided by the City of Columbus, Ohio, Division of Water (via telefax, January 24, 1994).

income-based payment plans (and other assistance plans) with traditional cost-of-service ratemaking principles by considering the cost savings from avoided collection actions and service terminations, and the improved cash flow to the utility.[20] However, no clear consensus on this matter exists among utility economists or rate analysts.

Implementing income-based utility payment plans can be complicated and administratively costly. As some programs are conceived, needs (or means) tests may be required to establish customer eligibility. This requires utilities to obtain some form of certification from customers that allows use of the rate. In some localities, this information may be available through existing welfare or other assistance programs. However, utilities may be reluctant to serve in a social service agency role in this respect. Also, customers asked to supply eligibility information may be resentful of surrendering their privacy to the utility.

Lifeline Rates

There are some arguments against the use of lifeline rates. For example, if the utility's tariff reflects a price that does not recover the full cost of service, a subsidization to lifeline customers from other utility customers is required. Subsidies violate traditional ratemaking principles and may require special statutory or regulatory policies prior to implementation. Some customers who do not qualify for the rate may be resentful of the subsidy.

A lifeline rate also can help a utility achieve a variety of goals. Customers who can maintain their water usage at a moderately low level will benefit from lifeline rates. Obviously, these rates help keep water rates affordable to customers in need. This reduces the need for disconnection and the costs associated with shutting off service. Some argue (subject to empirical proof) that keeping

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[20] Roger D. Colton, "A Cost-Based Response to Low-Income Energy Problems," *Public Utilities Fortnightly* (March 1, 1991).

customers on the system has positive revenue implications for the utility even if these customers are paying less than the cost of service. Reducing utility bad debt, and the associated collection costs, benefits the utility and all of its ratepayers (who ultimately must pick up these costs). Also, the use of lifeline rates sometimes is linked to the concept of universal service.

Another feature of lifeline rates is that they bear a strong resemblance to conservation-oriented rates (such as seasonal rates, excess-use rates, or indoor-outdoor rates) based on marginal-cost pricing principles. The first block of usage, priced at lower rates, can be considered essential. Additional blocks, priced at higher rates, can be considered discretionary. The cost of water rises with discretionary use. Customers who cause peak demand are allocated the additional costs associated with meeting that demand. Thus, it is conceivable that utilities can use the rate structure to achieve multiple policy goals, such as improved affordability and conservation.

Many utilities object to implementing lifeline rates, as well as conservation-oriented and related rate structures. In general, utilities can be reluctant to take on what they consider to be a societal problem. Utilities are especially opposed to using the rate structure for this purpose. The technical reasons cited are that these rate structures violate traditional cost-of-service principles and add to revenue instability:

> Rate structures designed to meet conservation objectives often have the added benefit of holding down costs for customers with very small usages, the group most often singled out as the focus of "affordable" water. . . . Conservation rates, low customer charges, elderly/low-income discounts, and other measures are implemented in hope of improving the "affordability" of water. Unfortunately, these measures force the utilities to experience much more variability in revenues with changes in consumption, either due to increased customer conservation or due to weather conditions.

> These revenue fluctuations can result in affordability problems for the utility itself.[21]

Competing views about lifeline rates and conservation-oriented rates, however, can be found. A well designed rate that properly determines the lowest usage block based on minimum essential use, combined with eligibility criteria that make customer participation predictable, may not result in substantial revenue problems. According to *AWWA Manual M34*, "Lifeline rates and low-income discounts do not present a major obstacle to revenue stability, though they may be less stable than some other rate alternatives."[22] Moreover, it has been argued that under some circumstances, conservation-oriented rates can enhance revenue stability by shaving peak demands.[23]

Some state legislatures may force consideration of lifeline rates or other pricing mechanisms to address the affordability problem. Massachusetts enacted, but later repealed, a statute requiring communities receiving state revolving loan funds to adopt a pricing structure that "provides for assurance of service to households who by reason of low income are unable to pay the charge for service."[24] The act also required state officials to examine possible extension of benefits to renters. Rising water costs and prices may lead state legislatures to seek other means of encouraging communities to consider affordability policies.

State public utility commission experience with lifeline rates for water utilities is limited. In a recent survey, only two states reportedly had any

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[21] Day, "Is Water Affordability a Pricing Priority?" 3.

[22] American Water Works Association, *Alternative Rates (AWWA Manual M34)* (Denver, CO: American Water Works Association, 1992), 12.

[23] Edward J. Amatetti, "Managing the Financial Condition of a Utility," *American Water Works Association Journal* 86, no. 4 (April 1994), 184.

[24] Chapter 275 of the Massachusetts Acts of 1989, Section 15, as cited in Saunders, "Water Rates and the Poor," 31.

experience with lifeline rates.[25] In California, a lifeline rate policy was in effect for twelve years was discontinued in the middle-1980s. The water utility industry insisted that the policy contained several inequities. The Massachusetts Department of Public Utilities recently directed the Milford Water Company to provide additional information regarding low-income assistance rates for further consideration by the commission (see Table 5-6). The matter is still under review at this time. Should state regulators investigate the use of lifeline rates by water utilities, they also will need to explore subsidization issues, potential revenue effects, and methods to mitigate adverse consequences.

Targeted Conservation

One key source of cost pressure on water and wastewater utilities is the need to meet demand growth. In the 1990s, more water utilities are considering efficiency as a resource option for meeting demand. Conservation or demand-side management can help water utilities manage their utility load factors and consumers manage their utility bills. Water conservation also reduces wastewater treatment needs and associated costs.

Not all water utilities embrace the idea of conservation or utility-sponsored conservation programs.[26] In particular, utilities with plentiful water supplies and delivery capacity do not want to curtail demand because doing so would jeopardize revenues and hence the capability of the utility to cover fixed costs and earn a profit (in the case of investor-owned systems). However, even water utilities that

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[25] *1993 NRRI Survey on State Commission Regulation of Water Utilities.*

[26] Utility customers may choose to implement conservation measures on their own accord, including changes in consumption behavior and renovations reflecting modern water efficiency standards for water-using fixtures and appliances.

TABLE 5-6

EXCERPTS FROM MASSACHUSETTS DEPARTMENT OF PUBLIC UTILITIES ORDER REGARDING DISCOUNTED RATES

1. Introduction

A number of utilities have instituted discounted rates for residential customers receiving some form of income-based assistance from a state or Federal program. This results in a reduced utility bill for the eligible customer. Milford's existing tariffs do not offer a discounted rate, nor had the Company proposed to implement one as part of its filing.

During the hearing held in the Company's service area, a number of customers spoke in favor of creating a discounted rate for specific classes of customers. . . .

In response, the Company stated that while it was unfamiliar with discounted rates, it was willing to explore the issue. Milford stated that besides a lack of basic familiarity with discounted rates, the Company does not maintain records on the age of households or financial hardships of its customers. According to the Company, it is virtually impossible to determined from its billing records which customer potentially would qualify for a discount rate, and it would be difficult to obtain the necessary information. The Company noted that while it could calculate the number of minimum charge bills sent to customers, the information would not identify conclusively which customers receiving minimum bills would be eligible for a discounted rate. Milford further indicated that given the various eligibility criteria offered during hearing in its service area, the Company was uncertain of the most appropriate criteria.

2. Analysis and Findings

On numerous occasions, the Department has approved the implementation of discount rates for discrete groups of residential needs-based customers. . . . The Department had directed utilities to offer discounted rates on the basis of a customer's income, providing that the impact on nonparticipating ratepayers is not excessive. . . .

Regarding the level of discount for a utility's discounted rates, the Department has found that a particular percentage discount from the customer charge and commodity charge of the corresponding non-subsidized rates provide a reasonable means of establishing a subsidized rate. The revenue shortfall associated with the discount is recovered from the utility's remaining customers by allocating the shortfall to the respective rate classes using a rate base allocator. . . .

While there is considerable experience with discounted rates in the gas and electric industry. . . . there is no corresponding experience with discounted rates in the water industry. Therefore, in this case we must determine whether a discount rate is appropriate, and what eligibility and discount level is justified.

In this case, the Company has offered no information on which to establish eligibility or criteria for a discounted rate. Accordingly, the Department shall not require Milford to institute a low-income rate at this time. Nevertheless, the Department finds that further investigation into discounted rates is justified. In order to establish a factual context for review of low-income rates for a water company, the Company is directed to submit within 90 days from the date of this Order a proposal for informational purposes setting forth a proposed discount rate. Using this information, the Company shall propose a low-income rate as part of its next rate case.

In consideration of Milford's lack of experience with discounted rate, and a general lack of experience with discounted water rates, the Department finds it appropriate to provide some guidance to the Company in the creation of a proposed discount rate. The Company's filing shall provide a 20 percent discount over the regular residential rate for customers of record receiving supplemental security income. Milford shall allocate the revenue shortfall associated with the subsidized rates by allocating the revenue shortfall on the basis of the respective class revenues for metered service, public fire protection, and private fire protection. The Department directs the Company to consult with the Department of Public Welfare, the Executive Office for Communities and Development, and the area community action program agency, in order to identify those customers who would be eligible for the proposed residential discount rate.

Source: Massachusetts Department of Public Utilities, Order 92-101, December 14, 1992 (Milford Water Company). Transcript page references and footnotes are omitted.

do not need conservation for load-management purposes may want to consider implementing conservation programs targeted at the low-income population. Grants or other forms of community assistance may be available for targeted conservation efforts. Such programs may be cost effective if they present a viable alternative to disconnecting customers and losing the associated revenues. They also have the added benefit of building positive community relations.

Conservation programs targeted at the low-income population have the potential to yield substantial water savings and help lower customer bills. It can be postulated that many members of the low-income population live in older housing where water leakage in pipes is common and water-use fixtures and appliances are particularly inefficient. Anecdotal evidence supports this assertion. New York's ambitious toilet replacement program, for example, recognizes the need to target low-income housing. Thus, retrofit dollars invested in these premises may be a particularly good investment, getting "the biggest bang for the buck." One can establish the potential savings by conducting water audits of low-income housing properties. Whole-house audits could be used to jointly assess the potential savings from energy and water efficiency improvements. To some extent, this type of assessment already occurs in the evaluation of hot-water usage. The incremental cost of a water audit in addition to an energy audit should not be substantial. Also, audits yield valuable information to both utilities and customers.

Implementing a residential water-conservation program is not necessarily costly. Water conservation generally does not require special capital requirements or financing arrangements, as in the case of weatherization and retrofit programs in the energy sector. Water-use audits, educational materials, and even certain plumbing repairs, can be provided relatively cheaply. Many water-saving devices are inexpensive and easy to install. Consumer education can be used to encourage changes in water-use habits, which can result in substantial water savings. Although the residential sector is the primary target of affordability-oriented conservation efforts, programs also can be designed specifically for commercial and industrial enterprises. Many industries already recognize that conservation practices can help control production costs.

The Philadelphia Water Department initiated a targeted conservation program in 1986 involving several hundred households.[27] The program is specifically designed to reduce the number of low-income households threatened with disconnection from water service because of nonpayment. The city's water department is a self-described revenue-seeking utility, meaning that it seeks to be a self-sustaining enterprise. It is taking an active rather than passive approach to the need for water conservation, with a self-proclaimed "see a leak, fix a leak" posture. Modern plumbing efficiency and waste reduction practices are emphasized, but the consumer orientation of the program is considered user-friendly and unobtrusive. A full service, whole house perspective emphasizes the potential for jointly promoting energy and water efficiency savings. Low-income properties are targeted because of the need to lower bills and the potential savings associated with replacement of substandard fixtures. Success in Philadelphia is attributed to a community-based approach using the existing neighborhood energy centers rather than creating a new service delivery infrastructure. Some program cost savings are realized by using skilled handymen instead of licensed plumbers.

The Philadelphia pilot program was evaluated in 1989 and considered a success (see Table 5-7). Included in the findings are implications for customers' ability to pay. In general, customers whose bills remained steady or declined demonstrated significant improvements in bill-payment behavior.[28] Another finding was that improvements in payment behavior were better for customers with lower total bills. The majority of low-income customers were unable to pay their water bills in full when the total bill went beyond about $300 per year. A reassessment

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[27] Tom Lent, *Philadelphia Water Department Conservation Pilot: Final Evaluation* (Philadelphia, PA: Energy Coordinating Agency of Philadelphia, Inc., February 6, 1989); and telephone interview with Kimlar Satterthwaite, Manager of Assistance Programs, City of Philadelphia Water Department, January 27, 1994.

[28] Ibid., 7.

TABLE 5-7

PHILADELPHIA'S TARGETED CONSERVATION PROGRAM

Background

- The Philadelphia Water Department (PWD) Pilot is a program in which Water Department and Neighborhood Energy Center (NEC) staff identify low-income clients who ar currently payment troubled or in danger of becoming so.
- Participating customers could not have household income exceeding 150 percent of the federal poverty level.
- Participating customers could not have water payment arrearages exceeding $2000.
- NEC crews inspected each house and listed needed repairs on an audit and intake form, which was used to define a preset cost limit for needed repairs.
- NEC crews installed water saving devices (including toilet dams, faucet aerators, and low-flow showerheads), repaired plumbing leaks, and educated homeowners about ways to reduce water use.
- Households needing extensive plumbing repairs to programs sponsored by other federal or local agencies.

Findings

- Approximately two-thirds (62%) of the 390 households evaluated realized significant reductions in daily water consumption.
- Savings for the entire group (savers and losers together) averaged 9.1 cubic feet per day (68 gallons per day or 3.7 thousand cubic feet per year).
- Overall water consumption for the entire study group of 390 households was 25.8% lower in the post-treatment year. The median percentage savings was 19.7% of pretreatment consumption.
- The resulting average reduction in annual billed costs is $50 per household.
- Total contractor program costs averaged $90 per participant in this sample ($53 installation, $30 audit and intake, and $7 education materials), for a simple payback of twenty-two months ($90/$50).
- Average water-heating energy savings are estimated at 4.3 million BTUs, yielding additional possible savings of $80 for gas or $150 for electricity.
- The analysis probably significantly underestimates the total impact of the program measures of water consumption in many of the houses, due to limitations in the available data caused by meter reading practices.
- Although changes in payment behavior could not be fully analyzed, a clear improvement in average payment behavior was observed for customers whose bills actually reflected the effect of conservation improvements.

Conclusions

- The pilot program was considered a success in attaining significant usage reduction in a large number of participating households and was cost-effective.
- Better results can be expected in other neighborhoods.
- Lowered bills can lead to improved bill-payment behavior in most customers. A pilot program is recommended to incorporate budget and bill payment counseling to maximize this improvement.
- More frequent meter readings are necessary, both for a more accurate evaluation and in order to enhance water conserving and bill paying behavior among program participants.
- Follow-up on the households that showed no change or an increase in water consumption after treatment should be done to provide information to further improve the program.

Source: Adapted from Tom Lent, *Philadelphia Water Department Conservation Pilot: Final Evaluation* (Philadelphia, PA: Energy Coordinating Agency of Philadelphia, Inc., February 6, 1989), 1, and related summary materials.

of the program is planned. Program administrators continue to emphasize the goal of increasing customer understanding and satisfaction by various means, including more accessible and readable materials on water conservation. Because of additional savings associated with the learning curve, the program is expected to receive another positive evaluation.

An important issue associated with targeted conservation is designing appropriate incentives for customer participation. Incentives can be especially problematic if rising rates offset savings due to conservation, so that customers see no rewards for their efforts reflected in the utility bill. Targeted conservation programs can be, and often are, linked to other assistance programs. New York City, for example, provides a cap on metered charges based on customer participation in a conservation program that includes inspections, water-use audits, and the low-flow toilet retrofit program (see Table 5-8).

Disconnection Moratoria

A disconnection moratorium can be used to prohibit disconnection altogether. The rationale for a moratorium is generally made on the basis of public health and safety considerations. Many state public utility commissions provide for seasonal moratoria on regulations in place regarding disconnection of energy services may not extend to regulated water utilities. A notable exception is the use of water for winter steam-heating purposes.

For water customers, disconnection rules and practices vary considerably. Municipal systems, for political reasons, may be more likely to prohibit disconnection. New York City, for example, does not have rules that provide for disconnecting water customers for nonpayment. New York also provides for forgiving charges caused by extraordinary leaks and disasters. Some municipal water utilities, including Boston and Philadelphia, have winter disconnection

TABLE 5-8
NEW YORK CITY CAP ON METERED CHARGES AND CONSERVATION PROVISIONS

1. A residential premise receiving metered water and/or sewer service shall be eligible to have its metered water and/or sewer charges limited to a maximum amount, as set forth herein. The maximum metered charge shall apply to all routine domestic use of water and/or sewer service and shall not apply to excessive use of irrigation, commercial processes or recreational activities which shall be billed in accordance with the metered rate set for the in Part II, Section 1 hereof. A metered residential premise shall be eligible to have a maximum metered charge imposed, if it meets the following conditions:

   a. a request is made in writing to BWEC [Bureau of Water and Energy Conservation] within one year of the date of entry on the meter bill;

   b. the property owner agrees to have DEP [Department of Environmental Protection] perform a water survey within six months of application, and if such a survey indicates that a leak or waste condition exists, then the property owner agrees to take all reasonable measures to eliminate such conditions within thirty (30 days);

   c. the property owner permits access to the property for the installation, repair, replacement or inspection of a meter or a remote reading device;

   d. the property owner agrees to participate in the DEP Low-Flow Toilet Retrofit Rebate Program, or at least seventy percent (70%) of the toilets in the premise are low-flow toilets which meet the standards of Local Law 29 (1989) and at least seventy percent (70%) of the showerheads are low-flow devices, and substantially all of the faucets are equipped with faucet aerators and such installations or replacements have been approved by the Commissioner; and

   e. if the premise is a multiple family building, then the building manager or owner agrees to participate in the Water Conservation Seminar sponsored by DEP and the NYC Department of Housing Preservation and Development within six months of application.

2. The maximum metered charge for any residential premise in any billing period shall be equal to the charges imposed for metered consumption of 78.43 cubic feet per day ("CF") for the first dwelling unit in the premise and 52.28 CF per day for each additional dwelling unit, multiplied by the number of days covered by the metered bill and the water and/or sewer rates in effect during such period.

   Maximum Meter Charge Illustration

   For first residential unit (equal to annual water and sewer charge of $750):

   Maximum annual charge = maximum annual CF * rate per CF
   Maximum annual CF = maximum annual charge/rate per CF
   Maximum annual CF = $750/$0.0262 = 28,626 CF
   Maximum CF per day = 28,626/365 days = 78.43 CF per day

   For each additional residential unit (equal to annual water and sewer charge of $500):

   Maximum annual CF = $500/$0.0262 = 19,084
   Maximum CF per day = 19,084/365 days = 52.28 CF per day

3. Notwithstanding the provisions of this Part, section 3, paragraph 1a, that requires an application for a maximum metered charge be made within one year of the date of entry of the metered bill, in the case of residential premises having service lines of less than one-and-one half (1.5") in diameter, the maximum metered charge as set forth herein shall apply to all service provided after July 1, 1988.

Source: New York City Water Board Water and Sewer Rate Schedule, Effective July 1, 1993, 27-29.

moratoria because certain heating systems require water service to function properly.[29] Some utilities have special provisions for rental properties with master metering, so that renters are protected when a landlord becomes delinquent in paying utility bills.

In certain jurisdictions, utility customers with special needs can petition health regulators to prevent service disconnections. Such provisions may be more common in the energy sector because of the reliance on certain life-supporting medical equipment on electricity. However, on a case-by-case basis, qualifying water utility customers may be able to seek protection from service disconnection for health reasons.

Flow Restriction

An unconventional and somewhat controversial alternative to disconnection involves installing a device that restricts the flow of water at a customer's residence. Water flow can be restricted to a fraction of the normal rate, depending on system pressure, as well as pipe and meter sizes. Water pressure to the premises is unaltered and unaffected. Flow restriction is different from flow regulation. Flow-restricting devices allow delivery of enough water for basic drinking and sanitation needs. The water flow allowed through a restrictive device can be too limited for operating many appliances, watering lawns, taking normal showers, or using second-story fixtures. Even for sanitary purposes (bathing and toilet flushing), the low rate of water flow can be very time consuming. The use of more than one water fixture at a time is virtually precluded. In theory, although considerably inconvenient to customers, flow restriction is a humane alternative to complete disconnection. In effect, flow restriction constitutes a sanctioned

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[29] Saunders, "Water and Sewer Rates," 30.

degradation of water service quality comparable to an electricity service limiter.[30] A related approach, also found in the energy sector, is prepaid metered usage where after an allowed amount, service is discontinued until another prepayment is made.

The South Sound Utility Company of Olympia, Washington, which serves 2,200 customers through thirty-six separate water systems, uses a flow restriction device for chronic nonpaying customers with a long history of both bad debt and refusal to cooperate with the utility.[31] The company will work with hardship cases to maintain full water service; flow restriction is reserved for customers considered irresponsible and uncooperative. The device displaces the meter, costs about $25 to $30, and has an adjustable range of flow levels. A one gallon per minute flow rate is used. This compares to an unrestricted flow rate ranging between fifteen and thirty gallons per minute.[32] For the typical household, the device motivates customers to pay and is not in place for very long. Detailed statistics on the use of the device and its effectiveness in prompting bill payment have not been compiled.

Staff members of the Washington Utilities and Transportation Commission initially expressed concern about using flow restriction. However, the company specifically suggested use of this measure as an alternative to disconnection for customers with chronic payment problems. Use of flow restriction was

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[30] Baltimore Gas and Electric Company uses a kilowatt restriction device that triggers a circuit breaker when allowed use is exceeded by electricity customers. Flow restriction is used very infrequently in the natural gas sector because of public safety considerations.

[31] Telephone interviews with Ellie Reynolds, Washington Utilities and Transportation Commission, and John Robischon, system proprietor, in January 1994.

[32] A restricted rate of .5 gallons per minute had been tried, but clogging stopped the flow altogether and resulted in additional service calls. A somewhat unanticipated consequence of the .5 rate, however, was that it facilitated leak detection on the premises. At a severely restricted flow rate, a leak will divert much of the water away from its intended use.

conditionally approved with the provision that it be presented to customers as an option.

Flow restriction as a matter of policy raises a variety of issues, particularly with respect to the limited conditions under which its use may be appropriate.[33] Use of the device may appear to be a rather Orwellian solution: a government-sanctioned and unwelcome intrusion on the common person's well-being. The choice of disconnection versus flow restriction also has the appearance of a "devil's choice" for customers. Flow restriction may be viewed as more humane in relative terms (relative to disconnection) but not necessarily a humane option in absolute terms. Utilities must recover the cost of installing and removing the device either from the restricted customer or other utility customers. Another controversial policy issue raised by flow restriction is the potential application to perceived water wasters for forced conservation, particularly during periods of shortage.

In California, for example, rules regarding the use of flow restriction devices are part of the mandatory rationing plan specified in the Public Utilities Commission's Tariff Schedule Number 14.1 regarding water emergencies. During recent drought experience in the state, the threat of installing the device may have served as a deterrent to some customers who might otherwise have violated rationing provisions.[34] However, no devices actually were installed, in part because of resistance to their use by California water utilities. Generally, existing utility tariffs do not provide for installing flow restrictive devices or for device removal and restoration of full service. For these reasons and others, regulators may want

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[33] See Mitchell Miller et al., *Final Report on the Investigation of Uncollectible Balances, Docket No. I-900002* (Harrisburg, PA: Bureau of Consumer Services, Division of Consumer Research, Pennsylvania Public Utility Commission, 1992).

[34] Telephone interview with Robert Penny, California Public Utilities Commission, in February 1994.

to provide jurisdictional utilities with policy direction on the use of restrictive devices for water and other utilities.

Multifaceted Approaches

The nature of the affordability and disconnection problem generally calls for multifaceted approaches that combine the best of different strategies while mitigating against potential implementation problems. Some water utilities venturing into this policy area seem to recognize the merits of combining approaches and developing programs on a pilot basis. Pilot programs afford utilities the opportunity to analyze results and make necessary adjustments prior to expanding the program's scope or extending the time frame for implementation.

In early 1994, the Philadelphia Suburban Water Company proposed a Pilot Customer Assistance Program (PCAP) targeted to a county where uncollectible accounts are most problematic.[35] A county assistance agency will actually run the program, while the company will provide oversight, control, monitoring, and review functions. As envisioned, the company's program will provide participating customers with (1) a water usage audit, (2) water conservation devices, (3) educational materials, (4) monthly billing and bill counseling, (5) payment agreements including arrearage forgiveness opportunities, and (6) remote meters for consumption monitoring. A monitoring and evaluation process also is planned.

Because some approaches run contrary to traditional cost-of-service and other ratemaking principles, investor-owned utilities and regulators may be reluctant to implement them. Although the state public utility commissions generally have broad discretionary authority, in some instances it may be necessary to seek a change in enabling legislation. In the 1994 legislative session, the Bridgeport Hydraulic Company proposed a law in Connecticut that would give

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[35] Telephone interview with David P. Smeltzer, Philadelphia Suburban Water Company, in February 1994.

regulators the latitude to allow utilities to establish rate discounts, as well as hardship funds (see Table 5-9).[36] The proposal is significant because it was initiated by an investor-owned utility and because it was multifaceted and encompassed a rate discount along with an aggressive consumer-outreach program. The proposal also provides for voluntary donations to a hardship fund from utility customers and for an audit and true-up of accounts during rate proceedings.

[36] Telephone interview with Larry Bingaman, Bridgeport Hydraulic Company, in February 1994.

TABLE 5-9

BRIDGEPORT HYDRAULIC'S PROPOSED LEGISLATIVE POLICIES REGARDING UNCOMPENSATED SERVICES

1. Establish the authority for the [Department of Public Utility Control] to permit investor-owned water companies to develop "lifeline" rates for their customers who are able to pay for some but not all of their water service. A lifeline rate could be a $15 per quarter credit on the bill. This program would include an aggressive outreach effort such as:

   - Intensive communications about reduced rates for eligible customers
   - Eligible customers would be provided with conservation kits and/or educated on their use as necessary.
   - Utility would visit eligible customers to identify leaks as necessary.

2. Establish the appropriate state permission for customers of investor-owned water companies to add one to five dollars to their water bill to help fund "lifeline" rates for those in need. Funds would be put in a separate bank account and a report/audit would be submitted annually to the [Department of Public Utility Control on the results of the program. The account would be "trued up" during a rate case.

Source: *Bridgeport Hydraulic Company/Aquarion 1994 Legislative Program* (handout via telefax, March 18, 1994).

CHAPTER SIX

EVALUATION OF LOW-INCOME ENERGY ASSISTANCE PROGRAMS

INTRODUCTION

Evaluation of a social program is a systematic application of social science research procedures for assessing the conceptualization, design, implementation, efficiency, and impact of social interventions.[1] Evaluations may be conducted for a variety of reasons and purposes. They may be undertaken to serve management and administrative purposes, to assess the appropriateness of program changes, to identify ways to improve the delivery of interventions, or to meet the accountability requirements of funding groups. They may also be undertaken for planning and policy purposes, to test innovative ideas on how to deal with human and community problems, to decide whether to expand or curtail programs, or to support advocacy of one program or another. Finally, they may be undertaken to test a particular social science hypothesis or a principle of professional practice. For all of these purposes, the key goal is to design and implement an evaluation that is reproducible as possible, that is, to provide an assessment that would be unchanged if the evaluation were replicated.

The scope of each evaluation, therefore, depends on the specific purposes for which it is being conducted. In addition, how the evaluation questions are asked and what research procedures are used depend on whether the program is a new intervention, a modification or expansion of an existing effort, or a well-

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[1] Peter H. Rossi and Howard E. Freeman, *Evaluation: A Systematic Approach*, 5th ed. (Newbury Park: Sage, 1993).

established, stable human service activity. The first section of this chapter briefly explores the concepts, meanings, procedures, and suitability of each evaluation phase (program design, program monitoring, program impact and efficiency). The second section presents techniques and summary results of our comparative evaluation of low-income energy assistance programs that were surveyed by NRRI or NARUC.[2] Our comparative evaluation is intended to infer the most successful program elements, policies, or combination of both rather than infer the most successful programs.

Appendix A reviews the application of evaluation techniques related to energy conservation and low income assistance programs and initiatives. Appendix A also examines different evaluation techniques that are suitable for the assessments of low-income assistance programs. The applicability and advantages of each technique are discussed.

EVALUATION PHASES

Evaluation encompasses several related sets of activities. It is useful to distinguish between three major classes of evaluation research: (1) analysis related to the conceptualization and design of interventions; (2) monitoring of program implementation; and (3) assessment of program impacts, effectiveness and efficiency. In some circumstances the evaluation of social programs may need to include all three classes of activities. That type of evaluation is termed "comprehensive evaluations." The focus in much of the rest of this chapter is on impact and efficiency assessment evaluations, since most of the evaluation activities surveyed and reviewed are of that type. The following briefly discusses the three phases of evaluations, and listings for each major questions addressed,

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[2] Paul Rodgers, Michael Foley, and Ann Thompson, *Survey of Electric and Natural Gas Utility Uncollectible Accounts and Service Disconnections For 1990*, (Washington, D.C.: National Association of Regulatory Utility Commissioners, January 1992).

and considers how evaluations must be tailored to a program's stage of development.

Program Design

The concept behind any social program is that a "social problem" has been identified that needs to be fully defined and remedied by taking purposeful and organized action. An evaluator, in this phase, needs to define the problem, assess all available options and alternatives of social interventions, and select a particular strategy that is conceptually suitable to address the perceived social problem. First, in order to define the problem, several techniques are available to perform the task, such as, expert opinion or key informant approaches, community forum, indicators approach, and surveys.[3] Second, in order to select a particular intervention strategy, the evaluators (or planners) have to sort out the various competing alternatives. Some of the analytical tools that can be useful to perform this task are: the multiattribute utility method, forward mapping and backward mapping, and *ex ante* cost-benefit analysis.

Program Monitoring

Several techniques developed for policy evaluation bear directly on the process of implementation. These techniques fall under the heading of administrative monitoring and performance monitoring. The former refers to the compilation of descriptive measures of program activities and costs. Traditionally, much of the monitoring of government programs has taken this form. Performance monitoring, on the other hand, emphasize evaluative measures focusing on outcome measures. Program Evaluation and Review Technique (PERT), Critical

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[3] Rossi and Freeman, *Evaluation: A Systematic Approach*, 5.

Path Method (CPM), and/or systematic data collection are useful techniques in monitoring programs.

Program Impact/Efficiency

The concept of impact assessment implies a set of operationally defined objectives and criteria of success. The objectives may be social-behavioral (for example, lowering illiteracy), community-related (for example, reducing crimes), or physical ones (for example, decreasing water pollution). Impact evaluations are essential when there is an interest either in comparing different programs or in testing the utility's new efforts to ameliorate a particular social problem. To conduct an impact assessment, one needs a plan for collecting data that will persuasively demonstrate that observed changes are a function of the intervention and cannot be accounted for in other ways. Specific impact assessment plans vary considerably. Sometimes it is possible to use classic experimental designs in which control and experimental groups are randomly constructed and receive different treatments. For practical reasons, however, it is often necessary to employ passive statistical approaches rather than true experiments. Thus, nonrandomized quasi-experiments and other nonexperimental methods are commonly employed in impact assessments.

The issue of costs is becoming increasingly relevant because resource allocation presents a constant and growing problem.[4] Choices continually must be made between funding or not funding, continuing or discontinuing, and expanding or contracting one program as opposed to another. At least some of the considerations that go into such choices concern economic issues. The resulting need to take into account the relationship of costs to effectiveness necessitates

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[4] Unless programs have a demonstrable impact, it is hard to defend implementing or maintaining them; hence, the need for impact assessments. But in most cases knowledge of impact alone is insufficient; the results produced by a program must also be judged against its costs.

efficiency assessments. Some programs may not be supported because of their high costs relative to their impact. Estimating impact in comparison with costs can be tricky and arguable because it often requires both making assumptions about the dollar value of program-related activities and imputing monetary value to program benefits. Nevertheless, such estimates are essential for making decisions about the worth of a program.

Is a program producing sufficient benefits in relation to the cost incurred? Is it intended to produce a particular benefit at a lower cost per unit of outcome than other interventions or delivery systems designed to achieve the same goal? The techniques for undertaking evaluations to answer these types of questions are found in two closely related approaches: cost-benefit and cost-effectiveness analysis.

THE NRRI EMPIRICAL ANALYSIS

The goal of this exercise is to analyze the patterns and structure of the states' adoptions of low-income assistance programs. To conduct such an exercise within the constraints of our resources and the limitations of finding specific information, we limited our analysis to evaluation and detection of any association between the decision of adopting low-income assistance policies with other policies and factors. Such factors include: (1) bad debt ratio, (2) arrears, (3) disconnections and reconnections, (4) region, (5) weather, and (6) number of residential customers per utility. In addition to the use of statistical means and correlation coefficients comparisons, we ran a step-wise regression procedure to search for the best fitting combination of associated policies and factors. The details of our data set, analytical models, and results are discussed in the following sections.

DATA

Two sources of data on low-income payment problems, assistance programs, and regional/climate information were available. The first source is the NRRI survey (the results of which are summarized in Tables ES-1 and ES-2), which is the compilation of the responses of state public utility commissions to our questionnaire. From the survey, three groups or categories of policies are depicted involving nineteen specific policies. The information in that source is related to 1993 activities at the state level. The second source of data is a report published by NARUC in 1991,[5] in which a gathering of information at the utility and state levels is compiled. The report, which also is an outcome of a survey, includes observations about levels of bad debts, arrears, disconnections, reconnections, fees, termination notices, alternatives to disconnection policies, and other climatic and regional-specific data. These observations are related to activities and indications before 1990.

Some data manipulations were necessary in order to merge the two sources into a single data set that is ready for computer use. The researchers then divided the data into two sets, one for electric and combined utilities, and the other for gas and combined utilities.

Some important remarks about the two data sets are worth noting since they affected our choices and selection for analytical techniques. First, the data contained in both sets are a cross-sectional observation without a time dimension, which limits our ability to infer any causality relationship between variables. This limitation reflects the possibility that adopting a policy might not have an immediate impact but could have an impact several years later. Hence, the need for several years of observations exists.

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[5] P. Rodgers, M. Foley, and A. Thomson, *Survey of Electric and Natural Gas Utility Uncollectible Accounts and Service Disconnections for 1990* (Washington, D.C., National Association of Regulatory Utility Commissioners, January 1992).

Secondly, observations related to the adoption of policies at the state level are more recent (1993) than the other observations that are related to utility indicators (1990 or before). That condition should allow us to determine whether there is a causality relation between the utility indicators and the state adoption of policies. In other words, one could use a discrete-choice model to see how the level of bad debts, arrears, disconnections, climate, and so on induce and influence the choice of a specific policy or combination of policies. However, such a model requires the use of a specific computer package that involved more time and resources than were available. Thirdly, the data sets contained a large number of policy variables and a small number of indicators, which again makes it harder to detect any causal relationships.

Fourthly, utility data collection and research over the years have revealed the difficulty inherent in obtaining uniform data from utility companies. For example, in the NARUC survey, bad-debt write-offs could be gross or net and could be calculated for the residential class or all rate classes combined. Furthermore, it is possible that recoveries could vary within a given time period depending upon how timely and frequently the utility writes off its bad debt throughout the year.[6] These data constraints may limit the validity of the findings.

With these limitations, the researchers selected the procedure of step-wise regression in order to study the relationships between all the variables without restricting assumption or hypothesis. Table 6-1 depicts the symbols and descriptions of all the variables in the data sets.

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[6] In an independent analysis, the staff of the Pennsylvania Public Utility Commission, upon checking the data often found that NARUC did not receive uniform data. Unfortunately, the data or write-offs for Pennsylvania utilities provided to NARUC was inconsistent with that provided to the Pennsylvania Commission. (Personal correspondence from Wayne Willows, Pennsylvania Public Utility Commission, March 24, 1995.)

TABLE 6-1

DATA SET

Variable	Description
st	state
	0 1 1
x_1	type: c = combination (E&G); E = Elect.; G = Gas
x_2	Region: S = state; M = multi-state
x_3	Region: W = west; NE = northeast; S = south; NC = north central; N = north
x_4	weather: C = cool; M = moderate; W = warm
x_5	total residential charges to bad debt expenses 1990
x_6	total residential customers who received one or more service termination notices 1990
x_7	total residential customers with term (one or more) 1990
x_8	total number of residential customers with one or more service reconnection after service termination 1990
x_9	percent of residential customer service reconnection within 24-hours of termination
x_{10}	reconnection fee required (yes/no)
x_{11}	customer required to pay 100 percent of arrears (yes/no)
x_{12}	percent of customer termination for nonpayment
x_{13}	arrears as percent of residential billings
x_{14}	ratio of operating expenses to residential bills
x_{15}	percent of residential billings that are bad debt
x_{16}	ratio of connections to terminations for nonpayment

TABLE 6-1--Continued

Variable	Description
c_1	prior notice
c_2	winter restriction
c_3	date-based restriction
c_4	temperature restriction
c_5	PSC approval
c_6	partial billing
c_7	income-based billing
c_8	budget billing
c_9	deferred billing
c_{10}	arrearage forgiveness
c_{11}	life-line rate
c_{12}	service limiters
c_{13}	conservation loans
c_{14}	weatherization
c_{15}	energy audits
c_{16}	budget counseling
c_{17}	referral service
c_{18}	targeted conservation
c_{19}	financial assistance

Step-Wise Regression

Step-wise regression is most useful for exploratory analysis because it can give insight into the relationships between the independent variables and the dependent or response variables. It is also most useful when there are many variables and it is necessary to limit the number of variables in a regression analysis. This method, however, does not guarantee to give the best model or to represent real-world processes accurately.

Due to the lack of time variations in our data, the discrepancy between the time that the policy information was gathered and the time that the characteristic or parametric variables were gathered, and the lack of resources to conduct a discrete-choice model, we found that step-wise regression best fit our goal. Our goal was to determine: (1) associations between adopting or implementing a policy, (2) severity of the problems of bad debt, disconnection, arrearage, adoption of other policies, and (3) some other regional and climatic indicators. Our basic assumption was that three categories (groups) of policies exist: disconnection moratoria or restriction practices, pricing policies, and nonpricing preventive assistance programs. Each is associated differently with different indicators.

First, the level of arrearage is assumed to be associated with disconnection practices (see Table 6-1). The disconnection practices are seen here as a means for deterring or discouraging arrears. Second, the level or ratio of bad debt is assumed to associate with pricing arrangement policies. Pricing policies are seen as signals and incentives to encourage troubled-payment customers to get on track in their payments and/or to ration their consumption to match their budget and satisfy their most basic needs. The last category, nonpricing preventive assistance programs, is associated with the level of disconnection. Nonpricing assistance programs are seen as a direct intervention to help low-income customers in order to alleviate or eliminate shut-off of services. Other variables such as region, weather, and types of utilities are added in all models. The equations we needed to test these hypotheses were:

ratio of arrearage $= f$ $c_1 - c_5$ x_4 x_3 x_1 (Eq. A)

x_{13} (disconnect practices; climate; region; type of utility)

ratio of bad debt $= f$ $c_6 - c_{11}$ x_4 x_3 x_1 (Eq. B)

x_{15} (pricing arrangements; climate, region, type of utility)

ratio of disconnect $= f$ $c_{12} - c_{19}$ x_4 x_3 x_1 (Eq. C)

x_{12} (nonpricing assistance programs; climate, region, type of utility)

The step-wise regression, which is a variant of the ordinary least-square (OLS) method, consists of regressing the dependent variable (the left-hand side variable) on each explanatory variable (right-hand side) separately and keeping the regression with the highest R^2. This determines the estimate of the slope coefficient of that regression's explanatory variable. Then the residuals from this regression are used as the dependent variable in a new search using the remaining explanatory variables and the procedure is repeated.

RESULTS

In Appendix A, Table A-3 depicts the statistical means for all variables per national, regional, and climatic level for electric utilities; Table A-4 presents the same for gas utilities. Using the national level as a benchmark, several important points can be noticed. For gas utilities, the ratio of termination (disconnect), bad debt, and arrears are higher in the northeast (cold and moderate states) and in the moderate-climate southern states. Reconnection ratios are also higher in the north (east and central) as well as in the western states. With regard to policy adoptions, the northern (cold and moderate) states have the highest active practices in all policy categories. Western states with moderate climates have their share of adopting pricing arrangement policies. In the electric sector, the picture is almost the same. Northern states and the cold-climate states have higher ratios of

arrears, bad debts, and termination of services. Also, northern states are the most active in experimenting and adopting policies. Other than northern states, southern states are active in disconnection practices, budget and deferred billings, lifeline rates, conservation, and weatherization. Cold-climate western states are more active in adopting budget counseling, financial incentives and date-based restrictions, and conservation loans.

Looking at the column in both tables that represents the means (gas and electric means) at the national level, the following should be noted. Electric utilities tend to adopt prior notices, budget billing, deferred billing, and financial assistance policies. Gas utilities, in addition to this list, are also adopting more winter-based restrictions. Electric utilities tend not to adopt arrearage forgiveness, temperature-based restrictions, income-based billing, energy audits, and conservation loans; gas utilities are not adopting much arrearage forgiveness, service limiters, conservation loans, and PSC-approved policies.

Tables A-5 and A-6 present (for gas and electric, respectively) the statistically significant correlation coefficients between all the relevant variables. Correction coefficients measure the closeness of a linear relationship between two variables. As Table A-5 (gas) depicts, the ratio of terminations is positively correlated with the ratio of bad debt and the adoption of deferred billing, conservation loans, and financial assistance. In other words, the percentage of customers terminated for nonpayment tends to be higher if the bad debt ratio is higher. Also, the percentage of customers terminated for nonpayment tends to be higher where deferred billing, connection terms, and financial assistance programs have been adopted. However, based on the analysis, we cannot discern whether the adoption of the programs actually caused the percentage of customers terminated to increase, or whether the adoption of these programs was caused by (or a reaction to) the higher percentage of customers being terminated because of nonpayment.

The ratio of arrears is positively correlated with the adoption of income-based billing, arrearage forgiveness, and lifeline rates, while negatively correlated

with the reconnection level. In other words, arrears as a percentage of residential bills tends to be higher if any of the following program types are adopted: income-based billing, arrearage forgiveness, or lifeline rates. Arrears as a percentage of residential bills tends to be lower if there is a higher number of residential customers with one or more service reconnections after a service termination. There are several possible explanations. The higher ratio of arrears to residential bills could either be caused by the adoption of income-based billing, arrearage forgiveness, or lifeline rates, or simply be a cause of their adoption. However, logic would tend to support a theory that income-based billing, and/or lifline rates could cause arrears to rise. Each of these three programs results in customers paying less than the cost of service. In the case of income-based billing, arrears can continue to rise while a customer uses more energy than he or she pays for. Unless the customer's income increases at a faster rate than their energy usage times the energy rate, his or her arrears will necessarily increase. A similar argument might be made for lifeline rates, except that for lifeline rates the individual customer's arrears do not continue to mount with continued usage. So long as the lifeline rate is paid, the customer does not have increased arrears. Therefore, it might be possible to argue that lifeline rate programs are adopted in reaction to an existing high percentage of arrears to residential bills.

The level of bad debt is positively correlated to the ratio of termination, the level of reconnection per termination, the adoption of income billing, and service limiters. In other words, the percentage of residential bills that are bad debt increases (1) as the percentage of customers terminated for nonpayment increases, (2) as the ratio of reconnection to termination for nonpayment increases, (3) with the adoption of income-billing programs, and (4) with the adoption of service limiter programs. Unfortunately, it seems logical that as the percentage of customers terminated for nonpayment increases, bad debt should also increase. However, it seems counterintuitive for bad debt to increase as the ratio of reconnection to termination for nonpayment increases, unless what is occurring is that the utilities are cycling customers. Once a customer's arrearage has been written off as bad

debt, the customer is reconnected to the host utility or the customer moves and is connected at a neighboring utility. This might argue for better coordination of billing and credit information between utilities. It seems most logical to argue that the percentage of residential bills that are bad debt increases as income-based billing programs are adopted, because the ultimate effect of the programs is to have customers increase their arrears, which ultimately becomes bad debt. Of course, it could also be argued that income-based billing programs are adopted in response to bad debt problems. It seems most likely that service limiter programs are adopted in response to bad debt and do not cause bad debt.

Weatherization programs and target conservation programs are found to be correlated (positively) to each other and to a host of other programs, such as date-base restrictions, income-based billing, arrears forgiveness, energy audits, conservation loans, and budget counseling. In other words, one would expect to find weatherization and target conservation programs grouped together as part of a portfolio of programs available that create alternatives to disconnection of utility service. Other programs that tend to be part of this portfolio are duty-based moratoria restrictions, income-based billing, arrears forgiveness, energy audits, conservation loans, and budget counseling. Weatherization is also correlated to partial billing, and service limiters, while targeted conservation is correlated to winter-based moratoria restrictions, budget billing, and referral service. So when weatherization is part of a portfolio of programs, one would also expect to find partial billing and service limiter programs. When targeted conservation is part of a portfolio, one would also expect to find winter-based moratoria restrictions, budget billing, and referral services.

For electric utilities, as depicted in Table A-6, termination level is positively correlated to the ratio of bad debt. The level of arrears is positively correlated with the adoption of arrears forgiveness, service limiters, and financial assistance policies, while negatively correlated to the level of reconnection. In other words, as one would expect, as termination levels increase, the percentage of residential bills that are bad debt increases. It would appear that in many situations the utility

writes-off a customer's arrears upon termination of service. Arrears as a percentage of residential bills increases with the adoption of (1) arrears forgiveness programs, (2) service limiters, and (3) financial assistance policies. However, one can argue that these programs are most likely adopted in reaction to high levels of arrears. It is worth noting that arrears as a percentage of residential bills tend to decrease as the level of reconnection increases. This might be interpreted to show that when disconnected customers pay to reconnect, the overall arrearage level is lowered. The problem, of course, remains as to whether the overall cost of disconnection and reconnection of customer service is recouped; and even if it were recouped, might there be more effective ways to avoid or prevent service disconnection.

The level of bad debt is correlated positively to the adoption of temperature-based restrictions, lifeline rates, budget counseling, and the level of arrears, and is negatively correlated to the level of termination. In other words, the percentage of residential billings that are bad debt tends to increase with the adoption of temperature-based moratoria restrictions, lifeline rates, budget counseling, and a higher level of arrears. It is certainly not surprising that bad debt tends to rise with the level of arrears. It is a matter of interpretation as to whether the adoption of temperature-based moratoria restrictions, lifeline rates, and budget counseling lead to higher levels of bad debt or whether these programs were adopted in reaction to higher levels of bad debt. Certainly, it would be difficult to argue that budget counseling causes bad debt. Lifeline rates result in services being offered at less than the cost of service. Unless effective cross-subsidies are created, one would expect bad debt to result. Temperature-based moratoria restrictions could result in increased bad debt if customers "gambled" on the weather, running up arrears during cold weather, without the ability to pay when the moratoria was lifted. Again, it is worth noting that the level of bad debt goes down when the number of terminations goes up. This tends to show that, all else considered, service termination does result in payment of arrears. This is not an endorsement of service termination as a single "one-size fits all" response to the problem of arrears,

however. When other programs can effectively keep customers connected and receiving service without unduly increasing arrears or bad debt, they should be adopted.

Adoption of weatherization policies is positively correlated to the adoption of partial billing, conservation loans, and energy audits, and negatively correlated to the adoption of financial assistance programs. In other words, when weatherization policies are adopted, they tend to be coupled with partial billing, conservation loans, and energy audits, but not with financial assistance. The targeted conservation policies are correlated with the adoption of winter-based moratoria restrictions, date-based moratoria restrictions, income-based billing, budget billing, arrears forgiveness, conservation loans, counseling and referral service. Thus, one would tend to find target conservation programs coupled with a host of programs, including winter-based moratoria restrictions, date-based moratoria restrictions, income-based billing, budget billing, arrears forgiveness, conservation loans, counseling and referral service.

The results of the step-wise regression produce some insightful results. Using the two data sets, the level of disconnection is regressed as a dependent (response) variable with the nonpricing assistance policies (dummy variables or binary variables) and all the other utility indicators. Also, the level of arrears is regressed with disconnection alternative practices, and the level of bad debt is regressed with the pricing arrangements policies (see Equations A, B, and C).

Tables A-7 and A-8 depict the results for both gas utilities and electric utilities, respectively. For gas utilities, the disconnection models best fit has R^2 = 0.366, meaning that the model captures 36.6 percent of the available observations. The F-statistics indicate that the model is statistically significant. The termination (disconnection) level is shown to be positively[7] associated with the adoption of targeted conservation policies and warm weather, and negatively associated with both the adoption of date-based moratoria restriction policy and

[7] We will only report the statistically significant association.

the west region. In other words, for gas utilities, a higher percent of customers are disconnected in areas of the country with warm weather, and a higher percent of customers are disconnected when targeted conservation programs are adopted. There are several possible explanations. For example, warm weather areas tend not to have disconnection moratoria, and therefore, there may be a higher level of disconnection in these areas if low-income customers fall behind on their bills. It seems illogical that targeted conservation will cause a higher level of disconnection. Rather, it is more likely that targeted conservation is being adopted in response to a higher level of disconnection. Also, the level of disconnection tends to be lower in the western region and when date-based moratoria restrictions are adopted. It would seem to be a straightforward conclusion that date-based disconnection moratoria policies tend to result in a lower level of disconnections. However, the finding is significant, because it means that customers who take advantage of the date-based moratoria do not necessarily fall so far behind in paying their bills that they are immediately disconnected in the Spring when the date-based moratoria are lifted. In other words, the level of disconnections actually goes down and is not merely shifted. It is more difficult to explain why there may be lower levels of disconnection in the west. Perhaps, utilities in that region might be doing a better job of tailoring their programs for individual customer needs.

In the case of electric utilities, disconnection levels best model performs somewhat better than in gas (R^2 = 0.468). It is shown to be positively associated with the percentage of reconnections indicator, the number of customers with termination notices and the south region. It is, however, negatively associated with both the adoption of financial assistance programs and the west region. In other words, for electric utilities, a higher percent of customer disconnection for nonpayment is associated with (1) the south region and (2) a higher number of customers receiving termination notices, as well as (3) a higher percentage of reconnection within 24-hours. For electric utilities, a lower percentage of customers disconnected for nonpayment tends to be associated with the adoption of financial assistance programs and the west region. Again, there are several

possible explanations. For example, one might expect a higher percentage of customers to be disconnected for nonpayment when there is a higher number of customers receiving termination notices. It is also not surprising that there is an association with a higher level of reconnections within 24-hours. And, as noted, there tend to be fewer disconnection moratoria in the south, so one might expect to find a higher level of disconnections there. Nor is it surprising that lower levels of disconnection are associated with the adoption of financial assistance programs. These programs assist low-income customers in paying their bills and avoiding disconnection. As noted previously, the lower percentage of disconnection in the west region is hard to explain, unless their utilities as a whole do a better job of tailoring programs to the individual.

The level of arrears best model was not fitted well with both data sets ($R^2_{gas} = 0.32$, $R^2_{elect.} = 0.34$). For gas utilities, the level of arrears is negatively associated with the percentage of reconnection indicator, the reconnection fee policy and in the west and south region. In other words, arrears as a percentage of residential billings tend to be lower when there is a higher percentage of customers reconnected within 24-hours, when there is a clear reconnection fee policy, and in the west and south regions. An explanation might be that arrears do not increase significantly; instead, they tend to decrease if customers who are disconnected for nonpayment tend to reconnect within a 24-hour period and pay a reconnection fee. In other words, for the portion of the customers who are able to pay their bills but simply fail to do so, service disconnection may be an effective policy to discipline these customers to pay in a timely fashion. However, one might expect that such policies will not work well for low-income customers who are unable to pay. For electric utilities, the level of arrears is positively associated in the north region (east and central), and negatively associated with reconnection fee policy and reconnection percentage. In other words, arrears as a percent of residential billings again tend to be lower when there is a reconnection fee policy and when the percentage of customers reconnecting within 24-hours is higher. The explanation here is the same as just discussed for gas utilities. One might expect the level of

arrears to be higher in the north (east and central) because of the cold and the high use of disconnection moratoria that can increase arrears.

In the third model, the bad debt level is fitted far better than the first two models with $R^2_{gas} = 0.58$ and $R^2_{elect.} = 0.52$. The level of bad debt in gas utilities, is positively associated with arrears forgiveness adoption, lifeline rates, and the northeast region. In other words, for gas utilities, the northeast region and the adoption of arrears forgiveness programs and lifeline rates are associated with a higher percent of residential bills being bad debt, while the west and the adoption of income-based billing are associated with a lower percent of residential bills being bad debt. Arrears forgiveness drives up bad debt because that is how the arrears are forgiven. They are written off as bad debt. It is, of course, difficult to know whether lifeline rate programs cause higher levels of bad debt or whether higher levels of bad debt cause lifline rate programs to be adopted. Although, to the extent that lifeline rates provide service below cost and that cost cannot be shifted to other customers, one would expect bad debt to result. It is also negatively associated with income-based billing and the west region. In other words, for gas utilities, income-based billing tends to be associated with lower levels of bad debt. Perhaps this is because income-based billing allows customers to continue to receive service during times of peak usage and to continue to pay toward arrears during times of slack usage. So long as customers make payments on their arrears, there is a tendency not to write them off as bad debt. In the electric section, bad debt is positively associated with the northeast and south regions and arrears forgiveness policies, and negatively associated with income-based billing and percentage of reconnection indicators. In other words, for electricity, the percentage of residential billings that are bad debt increases with the adoption of arrears forgiveness programs. This should not be a surprising result. On the other hand, income-based billing and a high percent of residential customers reconnecting within 24-hours of a disconnection are associated with lower levels of bad debt. The logic of income-based billing is the same as that for gas — by not disconnecting customers and having them make a contribution toward arrears, bad

debt is lowered. And, of course, if customers in arrears reconnect quickly and pay off their arrearage, then the utility has a lower level of bad debt.

In sum, it seems that for both electric and gas sectors, a lower bad debt ratio is associated with income-based billing. It should also be noted that arrears forgiveness and lifeline rates might be associated with or induce a higher bad debt level. The existence of a reconnection fee is consistently shown to lower the arrears level. In gas utilities, a higher disconnection ratio might induce a higher level of adoption of targeted conservation, while in electric utilities a higher disconnection might be associated with lower adoption of financial assistance programs.

CHAPTER SEVEN

POSITIVE ALTERNATIVES

In Chapters Two through Five, we conducted a pro/con analyses of various programs that provide alternatives to utllity disconnection of energy services. In Chapter Six, a step-wise regression was used to attempt to assess the effectiveness of various programs that provide alternatives to utility disconnection of service for low-income customers. Although some significant empirical results were gleaned from the analysis, the data did not lend themselves to producing many statistically significant correlations.[1] One possible (likely) reason for such a result is that there might be as much variation within categories as between categories. By this, we mean that our classification categories required us to group successful and less successful programs together. It may be that a case study approach of successful alternative to disconnection programs would yield more insights than the methodology used in this report. Although no formal case studies were undertaken, the authors present two examples of what appear to be well thought out approaches to alternatives to interconnection.

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[1] Also, it is worth noting that the authors did not conduct a longitudinal study, instead relying on a single year's data. Therefore, no conclusions can be reached as to the effect of having programs as opposed to not having them. Rather, using a step-wise regression method, the authors attempt to determine *which types of programs* are effective and which are not.

TWO CASE STUDIES

First, The Pennsylvania Public Utility Commission's Bureau of Consumer Services conducted a study in 1992 that provides eighty-three detailed and interdependent recommendations concerning alternatives to disconnection programs.[2] Some of the significant results from that study are discussed here. First, utilities should identify low-income customers and identify social services (public, private, or local community) that are available to customers. Second, a utility should inform those customers of available social services, make referrals tailored to meet the individual customers' specific needs, and conduct follow-ups regarding those referrals. Third, utilities should develop a number of consumer education programs, including the benefits of timely payment and the consequences of nonpayment, as well as conservation education, which includes weatherization and demand side management. Fourth, educational efforts should be made to increase the number of customers paying on budget billing plans. Fifth, the utility should actively and aggressively target low-income customers with LIHEAP outreach information and provide LIHEAP intake services, either directly or through community-based organization. (Again, keep in mind that LIHEAP funding is being cut-back.) Sixth, the utility should support and expand its utility company hardship funds. As described in Chapter Four, these funds are a part of the private assistance funds that in turn are part of the national fuels network.

The report recommends the implementation of pilot customer assistance programs that provide for partial payments from low-income customers who are unable to pay. The customer assistance program would require that these customers agree to make monthly payments based on affordability in exchange for continued service. Proponents for utility customer assistance programs would be

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[2] Mitch Miller et al., "Investigation of Uncollectible Balances: Final Report to the Pennsylvania Public Utility Commission" (Harrisburg, PA: PaPUC Bureau of Consumer Services, 1992).

required to have minimum payment levels, conservation incentives, consumption limits, provisions for high usage treatment, and billing deficiency limits. Strictly speaking they are not meant to be pure percentage of income plans, but rather would include a somewhat unique percentage of bill elements that partially ties the customer's utility payments to household usage.

Perhaps most importantly, a customer "CARES" program should be implemented to assist selected special needs of customers through an individual casework approach. The CARES program would have the following seven elements: (1) staff training in communication skills, (2) staff training regarding the program design, (3) in most cases, at least one home visit and an energy audit for CARES recipients, (4) intensive tracking and referral services, (5) maintenance of confidential case files, (6) expansion and maintenance of the customer services network, and (7) a job description criteria for a CARES representative, which would require personnel with a social services background (or an equivalent combination of experience and education that includes listening and communication skills and a compassionate and caring attitude towards the needs of the low income utility customers).

Another, example of a self-described successful alternative to utility disconnection programs is that of the Wisconsin Public Service Company.[3] The Wisconsin Public Service Company's general approach is to treat credit and collection as a form of customer service. In other words, they treat collection and credit as part of the total value package to the customer. The total value package to the customer has three components: customer service, quality, and price. The customer service component requires friendly, caring employees whose objective is to solve problems on behalf of the customer. The policies and practices of the utility are designed to be customer-friendly. They attempt to offer the customer

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[3] The following description of Wisconsin Public Service Company's program is based on a presentation made at the Eighth Annual National Low-Income Energy Conference in Indianapolis, Indiana, June 1994.

options that give the customer a sense of control in collection situations. They attempt to assess the customer's specific needs and design the solutions accordingly. Their goal is to collect without disconnecting service, while at the same time minimize arrearage and bad debts. The utility now views utility disconnection as a lose-lose proposition. Not only does the customer lose utility service, but the utility loses a customer who may have at least covered the utility's out-of-pocket costs of providing utility service and may have made some positive contribution to capital.

Second, the Wisconsin Public Service Commission did a survey to try to understand why customers do not pay their bills.[4] Their survey found that most customers have a desire to pay their bills, appreciate early intervention by the utility when they miss a payment, appreciate personal contact with well-trained utility representatives, appreciate a flexible response, and appreciate the involvement of the utility company in trying to solve their financial problem. The survey found that customers who were regularly in arrears on their bills were not homogeneous. Rather, they fit into four clusters. Two of the four clusters barely had enough income to survive. Another cluster had less than average income. Only one cluster appeared to have the means to catch up on their arrears but chose not to either deliberately or because of poor money management. Different strategies were suggested for customers within each cluster, with disconnection being considered a viable collection strategy only for those customers who have the ability to pay but deliberately (as opposed to because of poor money management) fail to do so. In other words, whenever it is practicable, disconnection is reserved for those abusers with an ability to pay, and even then litigation is considered as another option.

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[4] The survey is summarized in Michael Kiefer and Ronald Grosse, "Why Utility Customers Don't Pay Their Bills," *Public Utilities Fortnightly* (June 21, 1984), 41-44.

For all other customers, including those with an ability to pay who fail to do so because of poor money management, the utility provides a Customer Assistance Advisor Program staffed with customer service representatives who have social service training. They attempt to make their services available as soon as payment problems are identified. They also provide outreach to coordinate assistance programs between the customer, the utility, and social service agencies, whether public, private, or local community. They also make appropriate referrals to those programs. These include referrals to LIHEAP programs and fuel funds, as well as job training placement, medical assistance, and food stamp programs. In many situations where the customer suffers from poor money management, the utility provides budget counseling and encourages budget billing. When appropriate they encourage low-income weatherization. Although the program does not always succeed in identifying customers needing assistance before disconnection occurs, it seems to lower disconnection rates while having little or no adverse affect on arrearage and bad debt.

These two examples have several common elements. First, both examples use an integrated approach to the problem of disconnecting low-income residential customers; nearly all of the alternatives to disconnection programs are examined as possible alternatives to be used when appropriate. Second, they engage in early identification, intervention, and referral to social service programs. Third, they involve a commitment on the part of the utility to view the various programs that are alternatives to utility service disconnection as being a part of customer service, rather than being a more isolated collection and credit function. Fourth, they treat each individual customer on the basis of his or her situation and attempt to work with that customer to find a solution; they match up one or more alternatives that fit that specific customer's needs. In other words, one size does not fit all. Fifth, utility service disconnection is considered to be the final option to be used when other options do not work, except perhaps in the situation where a customer has the ability to pay but is uncooperative and unwilling to utilize any of the other alternatives to disconnect programs.

Although there are useful lessons that can be learned and generalized from these two examples just discussed, examining disconnection programs and their alternatives for energy utility services without taking into account the possible (and even likely) effects that increased competition will have on these programs cannot provide much useful guidance for regulatory policy-making. Such research would not provide any useful insights on how commissions might adapt their programs to not only survive the transition into a more competitive future environment, but to be consistent with forms of regulation in that are likely to emerge in the more competitive environment.

A Positive Alternative in the Face of Increasing Competition

Ideally, the funds for support of social goals, such as assuring that utility service is available and affordable to low-income customers, would be collected as a tax by state and federal governments. However, more often than not, only a portion (and sometimes a small portion) of the funds for the support of such goals is raised from local, state, and federal taxes. Given recent events, it would appear that cut-backs of federal funds to help low-income customers with essential heating and cooling needs are likely to continue. Currently the responsibility for making energy utility service both available and affordable to low-income customers has been placed in the hands of the electric and gas industries and their primary regulators, the state public utility commissions.

However, as set out in Chapter One, a more competitive electric power and gas industry creates pressure for lower prices and lower costs. Lower prices could result in less profit for the regulated utilities, while lower costs imply that the regulated utilities have to become more efficient in the production, transmission and transportation, and distribution of energy, whether it be natural gas or electric power. An immediate way for a utility to reduce its costs is to withdraw its financial support and resources from public assistance programs, such as those

that provide alternatives to utility service disconnection for low-income customers. The competitive prospects of lower prices and profits would seem to push energy (electric and gas) utilities to follow this path to find ways to lower costs. (Similar pressures do not currently exist on water utilities.)

Commissions must realize that the fundamental social contract underlying utility service continues to evolve with increased competition. The promotion of social goals is not typically understood as being a part of the original social contract with the utility. Nevertheless, even with the changes brought about by competition, the host utility would still have the guarantee of an exclusive franchise to provide electric transmission and electric and gas distribution service for their residential customers in exchange for an opportunity to earn a reasonable rate of return on their prudently incurred distribution and transmission investments. This would be true whether through traditional rate-of-return, price-cap, or performance-based incentive regulation. To the extent that the host utility buys energy for its residential customers, it needs an incentive to purchase the lowest cost gas or power. It is also imperative for the utility to recognize that so long as it enjoys a monopoly on any segment (including distribution) of the emerging market that part of its evolving social contract requires the utility to protect and guarantee service for its most captive and inelastic customers, the low-income residential customers. Indeed, because the utility is in the unique position of often being the first true indicator of social service need, it can and perhaps should play a special role, helping to integrate social services by making social service referrals (to both public, private, and community-based social service programs).

As demonstrated in earlier chapters, utilities have numerous alternative methods for dealing with late or nonpaying low-income customers. These alternatives to disconnecting customers, if approached with the proper commitment, can minimize the number of utility customer disconnections while having a minimal (perhaps no effect) on utility arrearage and bad debt. Nonetheless, unless utilities are provided with an incentive to devote financial and human resources to this effort, these programs are likely to be cut back or

abandoned in a more competitive environment. The authors suggest that a nonprice-based performance index might be designed to provide a utility with explicit rewards or penalties for levels of residential customer disconnection.[5] Regulators could set rewards and penalties for minimizing the number of low-income customers disconnected so that the utility implicitly trades-off the rewards of program administration against the cost of program administration, as well as the level of bad debt and arrears it incurs. Such a regulatory approach would provide the utility with an incentive to design and implement a comprehensive and integrated program that is properly tailored to individual low-income customer needs in a manner that maximizes the cost effectiveness of the programs. The utility would have an incentive to properly tailor its program to the needs of individual customers and to run it cost-effectively; that is, the incentive payment that the utility would receive for having programs that provide alternatives to disconnection would be tied to the actual disconnection rate, as well as to level of arrears and/or bad debt. The utility would combine and tailor programs so that they would effectively lower the number of low-income customer disconnections, while holding steady (or perhaps even reducing) the level of arrears and/or bad debt. This would not only provide the utility with an incentive to design effective programs, as measured by the level of disconnection, but also to design cost-effective programs at the lowest cost of administration.

Further, a nonprice incentive-based approach is preferable to other approaches that might simply assign these costs to transmission or distribution services on the theory that such services are unavoidable. State commissions cannot attempt to recover such charges from pipeline transmission or unbundled

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[5] Perhaps, the best example of such nonprice performance-indexed indicators are the employee safety, the customer satisfaction, and service reliability bench marks of quality of service contained in "Performance-Based Ratemaking at San Diego Gas & Electric Company," presented at the NARUC Staff Subcommittee on Management Analysis' Seminar on Performance-Based Regulation in San Antonio, Texas on January 23, 1995.

electric transmission service, because the rates, terms, and conditions of pipeline and unbundled electric transmission service is within the jurisdiction of the FERC.[6] Instead, commissions can affirmatively take the lead in designing incentive-based mechanisms that provide the utility with an incentive to sort through the variety of alternatives to disconnect programs and to match the appropriate programs to the appropriate customers in the most cost effective manner. Then, the cost of this incentive-based mechanism could be assigned to that part of the distribution system that is unavoidable. Putting a small surcharge on distribution to achieve the social goal of cost-effective low-income programs would slightly raise the price of monopoly services without affecting the price of competitive services.

The following provides an illustrative example of how such an incentive-based mechanism might work. First, a benchmark would be set either by using the utility's past performance as an index or by using an external index of similarly situated utilities within the state or the region. If an internal benchmark is used, that is, the utility's own past performance, then the state commission would reward or penalize the utility according to its current performance as measured against its past performance. The internal benchmark would at first be set so that the utility would be compensated for the historic cost of administering past programs. The utility would be rewarded for achieving a lower number of disconnections and penalized for a higher number of disconnections, while being compensated for the historic cost of running programs. This would create an incentive for the utility to run cost effective programs that also perform well. The utility would trade off the additional cost of administering programs and any additional bad debt that they would incur against the reward. As part of the incentive mechanism, the commission would freeze the utilities bad debt recovery for nonpayment due to disconnection at historical levels. An external benchmark

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[6] For further discussion of this point, see Kenneth Costello, Robert Burns, and Youssef Hegazy, *Overview of Issues Relating to the Retail Wheeling of Electricity* (Columbus, OH: The National Regulatory Research Institute, 1994) 47-49.

would be similarly constructed, except that the number of disconnections, the cost of administration and the level of bad debt would be determined from a group of similarly situated state or regional utilities. Table 7-1 shows a simplified illustrative example of what such a nonprice performance incentive might look like. The actual design of such a nonprice performance incentive would require more detailed analysis on a utility-by-utility basis of the costs and benefits of programs that are alternatives service disconnection.

Similar nonprice, performance-based incentive, if properly constructed can also deal with other social goals, such as utility employee safety, reliability, quality of service, customer satisfaction, environmental externalities, and implementation of demand-side management. Two particular strengths of such nonprice performance incentives are that they make explicit the monetary amount that the commission is willing to trade-off in revenues collected through distribution charges for achieving the social goal. If the nonprice performance-based incentive is well designed, it can provide the utility with an incentive to properly tailor its programs to achieve the designated social goal at the lowest cost, resulting in the achievement of the social goals at rates that are lower for the customer than they would be under more traditional approaches while providing a means by which social goals can be pursued in increasingly more competitive environments.

A Positive Alterative for a Monopoly Environment

Unlike energy services, water utilities in the near term will continue to operate in a monopoly environment. Many of the regulatory approaches developed for dealing with energy service disconnections can, therefore, be extended and adapted to water service disconnections. As shown in Table 7-2, each of the ten basic approaches to the problems of affordability and service disconnection has general advantages and disadvantages. Water utilities and regulators will need to develop appropriate evaluation criteria for each alternative. Evaluation criteria can be used to screen potential measures in terms of feasibility and effectiveness.

TABLE 7-1

AN ILLUSTRATION OF A NONPRICE, PERFORMANCE-BASED INDICATOR FOR OPTIMALLY MINIMIZING CUSTOMER DISCONNECTIONS

Percentage of Residential Customers Disconnected (Percentage)	Reward or Penalty +	Historic Cost of Administering Previous Programs +	Historic Level of Bad Debt
1.0	$ 1 M	+ $100 K	
1.1	900 M	+ $100 K	
1.2	800 M	+ $100 K	
1.3	700 M	+ $100 K	
1.4	600 M	+ $100 K	
1.5	500 M	+ $100 K	
1.6	400 M	+ $100 K	
1.7	300 M	+ $100 K	
1.8	200 M	+ $100 K	
1.9	100 M	+ $100 K	
2.0 (Benchmark)	0 M	+ $100 K	Frozen at 2% of revenues as bad debt
2.1	-100 K	+ $100 K	
2.2	-200 K	+ $100 K	
and so on			

Source: Authors' construct.

TABLE 7-2
EVALUATION OF ALTERNATIVES TO SERVICE DISCONNECTION FOR UTILITIES

Alternative	General Advantages	General Disadvantages
Counseling and referral	· Can improve customers' bill-payment behavior. · Helps customers get in touch with appropriate assistance agencies. · Improves utility understanding of special needs. · Builds good community and customer relations.	· May require special staff training and other resources. · May not address underlying affordability issues.
Community assistance	· Can be implemented on a voluntary basis. · Enhances utility revenues.	· Insufficient to help all customers. · Voluntary nature makes it unpredictable.
Monthly billing	· Lowers payment amounts. · Helps customers budget their utility bills.	· Only a superficial solution to the issue of affordability.
Arrearage forgiveness	· Gives customers in need a chance to catch up and get a fresh start. · Helps utilities phase-in other assistance mechanisms.	· Requires a write-off of bad debt. · Does not address the affordability of future bills. · Can be perceived as inequitable by paying customers.
Payment discounts	· Provides general assistance to groups of customers. · Does not alter rate design for all customers. · Usage-based pricing signals can be maintained.	· Requires some form of subsidization from other customers. · Discounts can be minor and symbolic.
Income-based payments	· Targets assistance to customers in need. · Does not alter utility rate design for all customers. · Utilities receive some revenues rather than none.	· Requires some form of subsidization from other customers through revenues. · Distorts pricing signals. · Can be difficult and administratively costly to implement.
Lifeline rates	· Keeps a basic amount of usage affordable to qualifying customers. · Can help achieve water conservation goals.	· Not consistent with cost-of-service pricing principles. · Can add to utility's revenue instability. · Usage blocks can be hard to determine.
Targeted conservation	· Targets assistance to customers in need. · Can achieve conservation and efficiency goals. · Loss of revenue related to conservation is offset by avoiding disconnection.	· Program implementation may be complex and costly. · Effectiveness depends on consumer cooperation.
Disconnection moratoria	· Explicitly protects public safety and health. · Saves utility disconnection costs.	· Fails to foster bill payment responsibility. · Increases potential for abuse. · Can be perceived as especially inequitable by paying customers.
Water flow restriction	· Technically simple and relatively inexpensive. · Avoids disconnection. · Protects public safety and health. · May motivate customers to pay for service. · Can be used on a voluntary basis.	· Costs as much as disconnection. · Does not address underlying affordability issues. · May violate service obligation standards. · Raises equity and ethical issues.

Source: Author's construct. The advantages and disadvantages are generalized and intended as a guide to evaluating the alternatives according to key arguments.

In evaluating potential programs for water utilities, effectiveness should be carefully considered. Obviously, it makes little sense to implement a measure that is ineffective in helping customers afford their water service and avoid disconnection. Moreover, measures that are highly effective may not be feasible.

A key barrier to feasibility is implementation cost. However, other criteria derived from the regulatory literature also are relevant.[7] For example, the perception that special benefits to select ratepayers are somehow unfair or inequitable can be problematic. Economic efficiency criteria, such as allocative and dynamic efficiency, should be considered. Financial impacts on the utility in terms of performance, viability, revenue stability, and cost recovery, will be of special concern to utility managers. Finally, a variety of public policy and institutional criteria should be considered. These include economic efficiency as well as legal and administrative issues. The evaluation criteria can be weighted to reflect specific policy goals.

When considering a response to the problems of affordability and disconnection, water utilities and regulators should analyze the proposed alternatives in terms of specific evaluation criteria. By anticipating potentially adverse effects, measures can be taken to mitigate their impact. No approach will satisfy all criteria. For example, increasing-block lifeline rates can be simple to administer, but disruptive from the standpoint of revenue stability. For this reason, many utilities continue to prefer uniform rates. Some forms of community assistance may help achieve equity goals but undermine water conservation goals. In other words, some kinds of subsidies may help customers pay their utility bills while weakening the price signal that guides consumption decisions.

Once implemented, an evaluation system should be used to monitor actual outcomes and make recommendations for needed changes. The economist's rule of thumb, of course, is that the marginal benefits of any approach should exceed

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[7] Beecher and Mann, *Meeting Water Utility Revenue Requirements,* chapter 8.

marginal costs. Programmatically, this would suggest that investments in low-income assistance programs should "net back" a positive cash flow to the utility after the actual rate of collection and all collection expenses are considered.[8] Thus, care should be taken to develop information systems that accurately reflect program benefits and costs to the satisfaction of all affected parties, including water utilities and their customers.

Water utilities considering ways to address affordability and disconnection issues for the first time need not reinvent the wheel. The electricity and natural gas sectors provide ample experience from which to draw recommended strategies for getting started in a monopoly environment. An exceptional blueprint for responding to the needs of low-income customers was developed in a report by the Bureau of Consumer Services of the Pennsylvania Public Utility Commission,[9] noted earlier. The vast majority of its recommendations for energy utilities can also be applied to water utilities (see Table 7-3). It may not be necessary to make wholesale changes in utility practices or operations to be responsive to these problems. Utilities can modify many of their existing practices in areas such as consumer education and collections. Even a marginal improvement in communications on the part of utilities and bill payment on the part of consumers can help avoid service disconnection.

Understandably, water affordability can be an especially emotional issue. Many customers may perceive water as an entitlement that should be free because it is a product of nature, essential to life, and has no substitutes. In reality, of course, water is a value-added commodity and, despite their obligation to serve, water utilities must be compensated for the value they add in supplying, storing, transporting, and treating water to appropriate standards, and distributing it to

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[8] On the concept of net back, see testimony of Roger D. Colton, National Consumers Law Center, regarding Denver Water Rates, dated January 1994.

[9] Miller et al., *Final Report on the Investigation of Uncollectible Balances, Docket No. I-900002.*

TABLE 7-3

STRATEGIES FOR RESPONDING TO THE NEEDS OF LOW-INCOME WATER UTILITY CUSTOMERS

Tracking and Referral

- Identify low-income customers by all available means.
- Identify available services for low-income customers.
- Inform low-income customers of the availability of assistance services.
- Make effective referrals to appropriate agencies.
- Follow-up on referrals to determine their effectiveness.
- Make effective use of computer systems for identification and tracking.
- Maintain records on low-income customers, referrals, and benefits received.
- Maintain records on all collection activity associated with low-income customers.
- Use existing credit reporting agencies for data sharing.

Consumer Education

- Educate customers about budgeting for utility bills and timely payment.
- Communicate with customers about billing cycles and estimated bills.
- Develop plain language and other guidelines for all utility communications.
- Coordinate with school and other local consumer education programs.

Conservation

- Provide consumers with conservation information appropriate to their needs.
- Continue existing successful utility conservation programs.
- Evaluate the costs and benefits of targeted conservation efforts.
- Support federal and state funding for targeted conservation programs.

Assistance Funds

- Establish and expand utility company hardship funds.
- Seek donations for assistance from community and corporate neighbors.
- Link the use of hardship funds to consumer education and conservation.
- Seek federal and state support for community-assistance programs.

TABLE 7-3 (continued)

Collection Activities

- Use application credit screening to identify low-income customers.
- Collect uniform data on the costs of handling payment troubled customers.
- Use mapping and other information systems to monitor collection activities.
- Determine the eligibility and access of delinquent customers to assistance.
- Implement tighter, more timely, and more effective collection systems.
- Develop collection strategies depending on payment history and ability to pay.
- Use pilot assistance programs in conjunction with collection efforts.
- Consider waiving late payment charges for customers with a limited ability to pay.
- Use low-cost, soft-core dunning techniques to motivate payment from customers.
- Use telephone contacts to remind low-income customers of payment arrangements.
- Require long-term delinquent customers with ability to pay to submit deposits.
- Increase meter reading to reduce reliance on estimated usage for billing purposes.
- Evaluate the potential use of voluntary service limiters (flow restriction).
- Evaluate the potential use of prepayment meters for customers with ability to pay.

Regulatory Issues

- Inform state regulators and legislatures about low-income utility payment issues.
- Comply with all regulatory standards regarding service, billing, and termination.
- Submit a plan for all assistance programs to regulators.
- Maintain appropriate records for regulators related to assistance programs.
- Consider alternative accounting and regulatory treatment of arrearages.
- Analyze alternative methods for allocating program costs.
- Evaluate alternative rate-recovery mechanisms for program costs.
- Seek regulatory approval for targeted conservation programs.

Source: Adapted from Mitchell Miller, et al., *Final Report on the Investigation of Uncollectible Balances, Docket No. I-900002* (Harrisburg, PA: Bureau of Consumer Services, Division of Consumer Research, Pennsylvania Public Utility Commission, 1992).

customer premises. If droughts and other natural catastrophes serve any purpose, it is to remind citizens of the value of utility services.

Safe drinking water, as well as wastewater and stormwater services, cannot be provided free of charge to individuals or society. Indeed, prices (both absolute and relative) alert customers to the economic value of these services and determine both consumption and production behavior. Price signals can be especially strong when the ability to pay is weak. Ideally, customers at all income levels will be rewarded for conservation and wise use. Thus, low-income customers should not be entirely exempt from receiving appropriate price signals to guide their consumption behavior and promote efficiency. That is, the water bill should reflect variations in usage, even when adjusted for the customer's income. Yet, the tradeoff between overall economic efficiency and affordability of utility services is politically sensitive. A civilized and compassionate society recognizes the importance of lending a helping hand to those in need, particularly when it comes to life's essentials. Many water utilities already accept this philosophy. Policies and programs that help customers afford water service and avoid disconnection also can help utilities cope effectively with the impact of rising costs in their service areas.

APPENDIX A

APPENDIX A

EVALUATION APPLICATIONS

In this appendix applications are classified according to two categories, the scope of the evaluation activity and the nature of the evaluators. The first category is the academic literature, where the scope of evaluation is to investigate the technical performance of a specific program or to compare between several programs of the same nature. The second category is related to evaluation efforts conducted or mandated by governmental or regulatory authority. The scope of evaluation in this category is usually to assess program(s) at the state or national level.

LITERATURE REVIEW

A study by Michael Hennessy (1984)[1] focuses on one particular rate structure (Lifeline Rates) and identifies three research designs and methods commonly used to evaluate its effects. These methods are: (1) inferences from price elasticity and consumption data, (2) inferences from theoretical simulations, and (3) inferences from survey simulations. The inferences from price elasticity and consumption data methods use volume and income data to estimate the sensitivity of consumers to price changes. The common conclusion in all the reviewed work cited by Hennessy suggests little price sensitivity while income

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[1] Michael Hennessy, "The Evaluation of Lifeline Electricity Rates: Methods and Myths," *Evaluation Review* 8, no. 3 (June 1984): 327-46.

sensitivity is higher. The implication is that low-volume users who might benefit under a lifeline plan will probably not increase their consumption (that is, their price elasticity is low). Thus, his empirical findings suggest that an effective lifeline policy may be consistent with a stated policy of promoting energy conservation.

The theoretical simulation methods, although technically sophisticated, have absolutely no empirical data. These approaches attempt to model factors involved in determining the distributional and conservation effects of various rate structures including lifeline rates. One approach used by Berg and Herden (1976)[2] compares a three-block, declining-block rate (DB) and a three-block lifeline rate with the alternatives of food stamps and cash assistance under fixed-budget constraints. In another approach, Dimopoulos (1981)[3] attempts to model the behavior of utilities (not consumers) under specific market conditions and with a particular economic goal. The author simulates the behavior of a two-part flat rate, a DB rate, and an inverted-block rate. Concerning lifeline rates, Dimopoulos suggests in his model the welfare improvements for low-income household are likely to be small. In contrast, the survey simulation approach relies almost exclusively on surveys of households combined with data on actual consumption data. All of the reviewed studies in this category use data to simulate the effects of some hypothetical or proposed lifeline rate and some alternative comparison rate, usually a declining block or flat rate.

Newcomb (1984)[4] employed a quasi-experimental design to assess the cost effectiveness of conservation programs directed at residential customers. In the early stages of energy conservation programs estimates of the potential electricity

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[2] S. Berg and J. Herden, "Electricity Price Structures: Efficiency, Equity, and the Composition of Demand," *Land Economics* 52, no. 2 (1976): 169-78.

[3] D. Dimopoulos, "Pricing Schemes for Regulated Enterprises and Their Welfare Implications in the Case of Electricity," *Bell Journal of Economics* 12, no. 1 (1981): 185-200.

[4] Tim Newcomb, "Conservation Program Evaluations: The Control of Self-Selection Bias," *Evaluation Review* 8 (1984): 425-40.

savings came from engineering studies. These estimates often produced inaccurate estimates of savings actually realized by residential customers. Newcomb determined that actual field measurements of program participants were necessary in order to produce reliable estimates of electricity use. The vehicle for his study was the Low Income Electric Program (LIEP) in Seattle. The absence of a reliable time series precluded the use of a time series design. Weather fluctuations, and rate increases resulting in reduced electricity consumption rendered a simple pre-test-post-test design of little value. The volunteer bias evident in program participants made them different from the average low-income customer in education and attitudes. Therefore, a comparison drawn from nonparticipants would therefore be inappropriate. Newcomb opted to use the group who signed up during the second year of the program's operation as the control group.

Three techniques were used to establish the comparability of the two groups. Data collected from the energy audit were used to compare the age and size of home, number of occupants, and type of space heating. A second source of data came from a survey mailed to both groups to obtain information on other conservation measures taken and the reason for participation in the LIEP program. Finally, meter-verified energy consumption figures were derived for both groups for two months. All supported the equivalency of the two groups. He estimated that the program resulted in a savings of 3,422 kWh a year per participant, valued at $485 per year (1981 dollars) over the thirty-year lifetime of the weatherization measures.

Karol Kern(1986)[5] studied Michigan's low-income energy assistance experimental program, the Voluntary Heating Fuel Budget Plan (VHF). The study concluded that VHF was an effective design for a particular segment of population. A cost-avoidance analysis indicated that by including VHF as a second program option, Michigan reduced the cost of providing energy assistance over what would

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[5] Karol Kern, "Financing Alternatives In Low-income Energy Assistance," *Evaluation Review* 10, no. 4 (August 1986): 434-54.

have been expected under its previous monolithic approach. The analysis of program impact on fuel consumption comprised pre-program and during-program comparisons of participants and nonparticipants. Because a random selection was made from naturally occurring groups of participants and nonparticipants, the basic design was quasi-experimental. To study the program's impact on cost, the design compared costs with VHF and estimated costs without VHF to establish cost-avoidance savings. Three separate estimates of projected costs were developed based on differing assumptions concerning cost and bill payment trends in the absence of VHF. The statistical analysis of the program's impact employed multiple regression as a general method of analysis of covariance.

Stern, Aronson, Darlet et al. (1985)[6] examined incentive programs for residential energy efficiency to assess the roles of the size and types of incentive and nonfinancial aspects of the programs and to infer lessons for policy. The study reviewed participation rates by low-income and higher-income households in incentive programs available to both groups and participation rates in incentive programs aimed specifically at low-income communities. Particular attention was given to the role of nonfinancial features of incentives, which are critical for reaching low-income populations. From a review and analysis of ten incentive programs aimed specifically at low-income populations, the study draws the following conclusions:

- Larger incentives increase participation, but marketing and implementation are more important than incentive size. For example, participation varies tenfold between programs offering identical financial incentives, with greater participation in programs operated by trusted organizations and aggressively marketed by word of mouth and other attention-getting methods.

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[6] Paul C. Stern et al., "The Effectiveness of Incentives for Residential Energy Conservation," *Evaluation Review* 10, no. 2 (April 1985): 147-76.

- Preference for grants versus loans varies with income and other household characteristics. Low-income homeowners and households that are pessimistic about their financial futures tend to prefer grants and rebates.

Ken Egel's (1987)[7] paper is an evaluative study of the home energy audit program (the energy fitness program) operated by the city of Santa Monica, California, from May 1984 through May 1985. The innovative program was designed to test alternative approaches to the federally mandated Residential Conservation Service (RCS) program. The article presents the final results of the evaluation performed to measure the program's effectiveness. The evaluation discussion particularly focuses on program participation and participant net savings in natural gas, electricity, and water resources. For evaluation purposes two measures of program performance were used. The first measure concerns day-to-day operating statistics, such as the number of energy audits completed and energy-saving devices installed, rates of participation, and audit costs. The second measure concerns energy and water savings achieved by a randomly selected sample of audited households above and beyond the savings achieved by a randomly selected sample of "control" or nonaudited households. Linear regression techniques were used to construct statistical models that were based on the recognition of a variety of variables, such as weather, number of residents, number and type of appliances, and the size of the residence. The models used pooled pre- and post-intervention attributes, weather, and participants and nonparticipant data. The evaluation indicated that the use of door-to-door canvassing and the installation of energy saving devices during the audit provide utility customers easier access to program services and increase their motivation to participate by improving the direct benefits of the program. Also, innovations in program delivery methods and benefits seem to have especially advantageous results among

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[7] Ken Egel, "Evaluation Of An Alternative Home Energy Audit Program," *Evaluation Review* 11, no. 1 (February 1987): 116-30.

typically difficult-to-reach customers, such as senior citizens, low-income households, and owners and renters of multifamily housing.

In an earlier attempt to evaluate various types of home energy audits, Richard S. Ridge (1986)[8] introduced a design using a randomized post-test-only control group. To implement this design, 739 applicants for a home energy audit were randomly assigned to one of five groups (146 subjects assigned/group). Audits were then conducted for the subjects in the four treatment groups. Each group was subject to a different version of audit intensity than the others. The comparison between the four treatment groups and the control (untreated) group was conducted using a multiple regression technique in which group membership is represented by dummy coding. The well-known technique is known as analysis of covariance ("ANCOVA"). The analysis concluded that audits result in more energy savings and that less expensive audits can produce the same energy savings as more expensive audits.

Walsh and Aleong (1992)[9] reviewed twenty-two evaluations of residential energy conservation programs in order to assess their usefulness to utilities and regulators. All of the evaluations identified energy saving as the primary objective. Cost effectiveness and widespread participation were secondary objectives. The authors found that most estimates of energy savings were based on simple before-and-after designs, after normalizing for weather conditions. Control groups typically were not employed in the evaluations. Evaluation design issues were given little attention. They found little consistency in assumptions and methodology across the cost-effectiveness studies reviewed. Given the inadequacies of and inconsistencies among the methodologies, few definitive

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[8] Richard S. Ridge,"An Analysis of Various Types of Home Energy Audits," *Evaluation Review* 10, no. 3 (June 1986): 385-95.

[9] Roberta Walsh and John Aleong, "The Design of Residential Energy Conservation Programs Under Least-Cost Planning: The Role of Evaluation," *Policy Studies Journal* 20 (1992): 102-11.

statements concerning the effectiveness of residential energy conservation programs can be made.

Although the analytical standards that typify most evaluations of energy conservation programs are deficient, some studies paid attention to measurement and design concerns. Nadel and Ticknor (1992)[10] assessed four approaches to estimate energy savings:

(a) engineering estimates,

(b) comparison of program participant's pre- and post-daily-kWh use with that of a control group,

(c) comparison of program participant's pre- and post-daily-kWh use without control group with a survey on changes in program participants' energy use pattern, and

(d) conditional demand analysis.

They found that while the engineering method was very easy to use and required the least data and data analysis of the four methods assessed, it produced the most inaccurate estimates for customer subgroups. The daily-kWh-with-control-group method required several years of billing data and a carefully selected control group but produced more reliable estimates than the engineering method. Although the survey approach produced more reliable estimates than the engineering method, it did not work well and was not deemed an adequate substitute for the control group. Finally, the conditional demand method was the most complex and resource-intensive. It required several years of billing data and powerful statistical programs.

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[10] Steven Nadel and Malcolm Tickner, "Electricity Savings From a Small Commercial and Industrial Lighting Retrofit Program: Approaches and Results," *Policy Studies Journal* 20 (1992): 48-56.

Similarly Schultz and Eto (1990)[11] examined a number of important measurement issues surrounding shared-savings programs. They discuss three options for estimating load reductions. They are:

(1) load reduction estimates can be fixed for each measure to be promoted,

(2) an explicit savings methodology can be established prior to implementation, and

(3) load reductions can be established after program implementation, based upon a particular methodology and schedule for monitoring.

Other measurement issues for evaluation research include whether an analysis of all participants' bills or submetering the loads of high efficiency appliances represents the appropriate source for data regarding reliable energy savings. The measurement of avoided costs is also critical in a shared-savings scheme because the avoided costs directly affect shareholder earnings. All these issues define an increasingly important role for evaluation research in utility regulation.

Fowler (1992)[12] addressed issues that arise in the cost-benefit analysis of utility conservation programs. He applies four cost-effective tests to consider the question of whose costs and whose benefits should be considered. They are as follows:

(1) The Participant's Test compares costs and benefits just for the customers who are actually participating in the programs.

(2) The Nonparticipant's Test compares costs and benefits for a utility's customers who are not directly participating in the particular program being examined.

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[11] Don Schultz and Joseph Eto, "Carrots and Sticks: Shared-Savings Incentive Programs for Energy Efficiency," *The Electricity Journal* (December 1990): 32-46.

[12] Hugh Fowler, "Marketing Energy Conservation in an Environment of Abundance," *Policy Studies Journal* 20 (1992): 76-86.

(3) The All-Ratepayer Test compares benefit and costs for all the customers in the utility, both those who participate and those who do not.

(4) The Utility Test compares the benefits and costs for only the utility company as distinguished from the benefits and costs borne by the utility's customers.

Fowler applied the All-Ratepayer perspective to compare the costs and benefits to two new energy conservation and load management products in Sacramento and found them to be sound investments. He argued that a well executed cost-benefits study provides a "level playing field" for comparing conservation/load management programs with the purchase power/generation alternatives.

APPLICATIONS AT THE NATIONAL AND STATE LEVELS

This report has reviewed the evaluation literature regarding individual and/or multiple low-income assistance and conservation program(s). Our survey indicates that there is seldom any consistent effort by public utility commissions (PUCs) to conduct or mandate a specific and comprehensive evaluation design. The survey indicates that relatively few PUCs, such as Maine, New York, Pennsylvania, and Colorado, mandate such an effort on the part of utilities. Also, few studies have attempted to evaluate the impacts and performance of low-income assistance program at national and state levels. In the following, we discuss some of these efforts.

One example of the evaluations at the state commission level is the evaluation efforts made by Central Maine Power Company (CMP) and mandated by the Maine PUC.[13] The commission required CMP to submit an evaluation report

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[13] "Investigation and Modifications to Central Maine Electric Power Company's Electric Lifeline Program for the 1993-94 Program Year," State of Maine PUC, Staff Comments, Docket No. 93-156, May 26, 1993.

that evaluated the payment history, credit, and collection performance of the Electric Lifeline Program (ELP) customers (1992 order). The evaluation of CMP ELP monitored the progress of the program and provided the necessary instruments for CMP's management and regulators. The evaluation has five analytical components: (1) a customer profile analysis, (2) an energy use analysis, (3) an arrearage analysis, (4) a credit and collection cost analysis, and (5) a payment behavior analysis. The examination of participants' payment and arrearage analysis showed several changes in payment behavior that may be attributable to the program. The results indicated an overall increase in the frequency of payments made by participants and a reduction in arrears. The customers with the highest energy usage had increased in average daily balances after the program. The same was true for those customers with the highest incomes.

The impact of the method of customer contacts was also examined. It appears that the credit and collection transaction costs were reduced. The reduction was primarily attributable to the change from predominately phone contacts to predominately less-costly, computer-generated notices. The analysis also shows that the magnitude of arrears after participation in the program is largely determined by the outstanding balance carried by the customer at enrollment. Income does not appear to be a significant factor in explaining post-participation arrearage balance. In studying payment behavior, the study did not control for extraneous influences on a customer's ability to pay (for example, changes in income, obligations, subsidy, or family status).

The evaluation methodology is based primarily on simple before-and-after technique (discussed in the next section). The payment behavior analysis uses the casual analysis approach. In this analysis the ability to pay is defined as the average daily balance carried by the post-ELP enrollment customers. The customer's ability to pay was estimated as a function of several variables: pre-ELP average daily balance, income, annual electric use pre-ELP, and change in electric use after joining ELP. The sample of customers used consisted of 385 participants with one full year of pre- and post-ELP Kwh usage and billing transaction histories.

The parameters of the relationship were estimated using multiple regression. The estimation results suggested that the level of electricity use, its change after participation in ELP, and the amount of the daily balance before the program are by far the most important factors in determining the amount of the customers' average daily balance after the program. A more interesting result was the demonstration that the balances dropped after enrollment. Other variables were tested and found to be insignificant in explaining the post-ELP behavior. Those include household size, age, and home ownership.

The CMP evaluation looked only at a one year sample with no information about how many ELP customers made timely payments, how many were disconnected, the completion percentage of all arrangements, the number of warnings before disconnect, and so on. Due to the lack of these crucial indicators, the lack of historical information to compare pre- and post-program performance, and the failure to assess program efficiency (cost/benefit), the CMP evaluation is of marginal value.

At the national level, only two evaluation studies were primarily directed at the estimation of energy savings and cost effectiveness of the Weatherization Assistance Programs: Peabody (1984),[14] and Oak Ridge National Laboratory (ORNL) study (1993).[15] Numerous evaluations by individual states and utilities have been implemented and reviewed in several publications.[16,17] The national weatherization

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[14] G.A. Peabody, "Weatherization Program Evaluation," (Washington, D.C.: U.S. Department of Energy, Energy Information Administration, Office of Energy Markets and End Use, 1984).

[15] Marilyn Brown, Linda Berry, Richard Blazer, and Ellen Faby, *National Impacts of Weatherization Assistance Program in Single-Family and Small Multifamily Dwellings* (Oak Ridge, TN: Oak Ridge National Laboratory, U.S. Department of Energy, May 1993).

[16] G. Schlegel and S. Pigg, "The Potential for Energy Savings and Cost-Effectiveness of Low-Income Weatherization Programs: A Summary of Recent Evaluations," presented at ACEEE 1990 Summer Study on Energy Efficiency in Buildings, 6.141-6.155, American Council for an Energy-Efficient Economy,

assistance program evaluation (Peabody, 1984) conducted by the Energy Information Administration examined a random sample of 965 single-family weatherized homes in 1981. Although the study showed an average energy savings of more than 9 percent of the home's total energy consumption, it indicated substantial variation in savings across homes. The evaluation method used no control group and was unclear about estimation procedures and weather normalization. The study did not measure the cost effectiveness of the program.

The ORNL study is the latest and considered the most comprehensive study of its kind. In that study, the basic evaluation design for obtaining energy savings estimates is a type of quasi-experimental--the nonequivalent comparison group--design. The design consists of a treatment group of dwellings weatherized in 1989 and a control group of applicants for weatherization services dwellings that had not yet been weatherized by the end of March 1991. This design lacks the random assignment of dwellings to treatment and control groups that characterizes a true experimental design (such randomized experiments are discussed in the next section). The study applied the Princeton Scorekeeping Method (PRISM) (Fels 1986) using data for the year before and the year after installation. To estimate the efficiency of the program, the study used the cost-effectiveness approach applying a cost-benefit ratio and the cost of conserved energy as indicators. The study concluded that weatherization programs were successful in the submarkets (cold and moderate regions). The ORNL study addressed the issue of nonenergy benefits and impacts of the weatherization programs. Such benefits include reduction of environmental externalities, induced employment, increases in property values, and so on. The estimation of these (nonenergy) benefits amounted to

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Washington, D.C., 1990.

[17] S. Cohen, C. Goldman, and J. Harris, *Measured Energy Savings and Economics of Retrofitting Existing Single-Family Homes: An Update of the BECA-B Database*, Report No. 28147 (Berkeley, CA: Lawrence Berkeley Laboratory, 1991).

$976 net present value (1989 dollars) per dwelling. Meanwhile, the benefits from energy savings for the first year was estimated at an average of $116 per dwelling.

OBSERVATIONS

The following observations can be inferred from the above review (see Table A-1):

(1) Quasi- and nonexperimental techniques are the most widely used. True experimental techniques, although reliable and robust, are expensive and time consuming. They were probably not used for these reasons.

(2) Evaluation efforts largely focused on assessing limited technical goals, mainly energy savings and the related financial impacts. Few have assumed the task of assessing nontechnical or nonfinancial impacts.

(3) At the national or state level, little effort has been directed at comparing programs in terms of their design elements, policies, and procedures. Such effort would help to design new programs with the most workable combinations of policies, procedures, and delivery systems. The goal of this report is to address this situation.

(4) The small number of evaluation studies in this area suggests that, although a significant amount of funds were expended on these programs, little funding has been directed to evaluate them. In order to assist the reader in designing and distinguishing suitable evaluation techniques, the next section presents a characterization of the existing evaluation techniques.

TABLE A-1

SAMPLE OF LOW-INCOME ENERGY PROGRAM EVALUATIONS

Study	Area of Applications	Technique and Data	Results
Karol Kerns (1986)	Michigan's Low-Income Energy Assistance (VHF)	cost avoidance; multiple regression; analysis of variance; quasi-experiment: pre- and during- program comparison	VHF reduced cost of providing assistance as a secondary program
Stern, Arnonson, Darlet et al. (1985)	review and analysis of ten low-income assistance programs	analysis of variance	marketing and delivery method are very effective; low-income prefer grants over loans
Michael Hennessy (1984)	review of lifeline rate studies	inferences from: - elasticity and consumption; - theoretical simulation; - survey simulation	little price sensitivity; higher income sensitivity; lifeline should be linked to energy conservation policy
Ken Egel (1987)	home energy audits; Santa Monica, CA Experiment (1984-1985)	linear regression; pooled pre- and post-intervention data	door-to-door plus energy devices installation motivate participation
Richard Ridge (1986)	home energy audits	analysis of covariance ANCOVA; 739 applicants randomly selected: four groups plus one control group	audits save energy; less expensive audits save same energy as expensive ones
Newcomb (1984)	Low-Income Electric Program (LIEP) in Seattle, WA	cost effectiveness; quasi-experiment-- control group of people signed up for next year	program resulted in positive energy savings
Walsh and Aleong (1992)	residential energy conservation: review twenty-two programs	simple pre- and post-test; control group; PRISM cost effectiveness	programs are effective
Nadel and Ticknor (1992)	review of approaches to estimate energy savings	(1) engineering estimates; (2) comparison w/ control group; (3) comparison w/o control group with a survey on usage profile; (4) conditional demand analysis	(1) easy; less data; inaccurate; (2) reliable, needs several years of billing data; (3) did not work well; (4) most complex; needs several years of billing data
Fowler (1992)	conservation programs; applied All-Ratepayers Test to Sacramento load-management programs	cost-benefit analysis	Sacramento load-management program is good investment

Source: Author's construct.

IMPACT ASSESSMENT DESIGNS

Impact assessments are undertaken to determine whether a program has its intended effects. The randomized experiment model, the most powerful research design for establishing causality, underlies all impact assessments. The experimental model depends upon a comparison of one or more experimental, or treatment, groups with a control group. Although many impact assessments cannot make use of a strictly experimental technique, all impact assessment designs compare intervention outcomes with some estimate of what has occurred or would occur in the absence of the implementation.

A major task of impact assessment is to disaggregate the net effects of a program from the gross outcome observed. Various research designs permit researchers to estimate and sometimes counteract the influence of extraneous factors and evaluation design effects. Among the extraneous factors that can mask or enhance the apparent effects of a program are uncontrolled selection or deselection of participants, and endogenous changes, such as interfering events and maturational trends. To assess the true impact of programs, evaluators must be aware of these potential confounding factors and attempt to compensate for their influence.

Aspects that can obscure or enhance apparent net effects include stochastic (random) effects, reliability and validity deficiencies, poor choices of outcome measure, delivery system contaminants, missing information, and sampling bias. To minimize the effects of extraneous factors, different strategies have to be designed. For example, different strategies should be considered for partial- and full-coverage programs, since in full-coverage programs no untreated targets are available to use as controls. A number of design options are available for impact assessments of either full or partial-coverage programs; these range from randomized experiments to time-series analysis. While the various designs differ

widely in their effectiveness, all can be used if proper precautions are taken. Judgmental approaches to assessments include connoisseurial assessment, administrator assessments, and judgments by program participants. Judgmental assessments are less preferable than more objective designs, but in some circumstances they are the only evaluation options available.

The task of impact assessment is to estimate the difference between two conditions: one in which the intervention is present and one in which it is absent. The strategic issue, then, is how to isolate the effects of extraneous factors so that observed differences can safely be attributed to the intervention. There are several alternative approaches that vary in effectiveness in terms of isolating the extraneous effects. All alternatives have the common process of establishing "controls," groups of targets that represent the condition of being without the treatment. The most severe restriction, however, on the choice of assessment strategy is whether or not the intervention in question is being delivered to all (or virtually all) members of a target population. For programs with total coverage, it is usually impossible to identify anyone who is not receiving the intervention and who in essential ways is comparable to the individuals who are receiving it. We map the following schematic classifications of impact and efficiency assessment research designs (Table A-2) according to simultaneous aspects of control strategies, intervention features, and data collection strategies.

Designs for Partial-Coverage Program Assessments

Randomized Experiments

The basic feature in true experiments is the random assignment of targets to treated and untreated groups constituting, respectively, the experimental and control groups. Randomization is a technique for ensuring comparability of experimental and control groups by distributing extraneous factors equally across the groups. Although stochastic effects will create some differences between any two groups, statistical procedures enable researchers to estimate the likelihood that

TABLE A-2

EVALUATION AND IMPACT ASSESSMENT METHODS

Evaluation Method	Type of Control Used	Data Collection	Characteristics
I. Partial-Coverage Programs			
A. True Experiment (randomized)	Experimental and control groups randomly selected	Minimum data needed are after intervention measures; typically consists of before, during, and after measures	* Most powerful to establish causality. * Most reliable results. * Might consider socially "unfair" or "unethical". * Costly, time consuming. * Not useful in early stages.
B. Quasi-experiments			* Most widely used * Cannot measure absolute effects. * Rely only on comparative merits.
(1) Regression-discontinuity	Selected targets compared to unselected targets, holding selection constant	Typically consists of multiple before- and after-intervention output measures	* Rules for selecting targets need to be precise and uniform. * Needs sophisticated statistical skills. * Reliability of results closest to true experiment designs.
(2) Matched Controls	Intervention group matched with controls selected by researcher	Typically consists of before- and after-intervention measures	* Reduce the need for sophisticated skills.
(3) Statistically equated controls	Exposed and unexposed targets compared by means of statistical controls	Before-and-after or after-only intervention output measures and control variables	* Use of multiple regression, log-linear model, or analysis of variance to equate participants and nonparticipants groups. * Cross-sectional data at one point of time. * Subject to errors of variable selections.
(4) Generic Controls	Exposed targets compared to output measures available on general population	After-intervention output measures on targets plus publicly available "norms" of output levels in general population	* Measurements are not easily at hand.

TABLE A-2

EVALUATION AND IMPACT ASSESSMENT METHODS

Evaluation Method	Type of Control Used	Data Collection	Characteristics
II. Full-Coverage Programs			* No control group.
A. Simple before-and-after studies	Targets measured before and after intervention	Output measured on exposed targets before and after intervention	* Least reliable results. * Cannot correct for extraneous effects. * Simple.
B. Cross-sectional Studies for nonuniform programs	Targets differently exposed to intervention compared with statistical controls	After-intervention output measures and control variables	* Rely on comparative merits across programs.
C. Panel studies: Several Repeated measures for nonuniform programs	Targets measured before, during, and after intervention	Repeated measures taken of exposure to intervention and of output	* Good substitute for absence of control group. * Extension to (B) with more plausible results.
D. Time series: Many repeated measures	Large aggregates compared before and after intervention	Many repeated before-and after-intervention output measures on large aggregates	* Most powerful to assess full-coverage programs. * Needs large number of observations.

Source: Author's construct.

observed differences are due to chance rather than to the intervention being studied. Assuming a well-run experiment, the estimate of an intervention's net effects can be expressed as:

$$\textit{Net Effect} = [A] - [B] \pm \tau$$

where:

A = Scores on post intervention outcome measures for randomized experimental group,

B = Scores on post intervention outcome measures for randomized control (unexposed) group,

τ = Design effects and stochastic errors.

In evaluation efforts, randomized experiments are applicable only to partial-coverage programs. The most elaborate randomized experiments are longitudinal studies, which consist of a series of periodic observations of experimental and control groups and, in most cases, extend over a period of years. Most of the large-scale field experiments undertaken to test proposed programs are longitudinal randomized experiments in which participant data are collected over long periods of time.

Post-intervention measures of outcome are the critical measurement in impact assessments. Measures taken before and during interventions, as well as repeated afterward, however, increase measurement reliability and the precision of estimates of net effects. These measures enable researchers to reconstruct how the intervention worked over time.

Despite their power, randomized experiments have several limitations when applied to social programs. First, they may not be useful in the early stages of a program, when interventions may change in ways not allowed for in the experiment. Second, randomization is sometimes perceived as unfair and even

unethical because of the differential treatment of the experimental and control groups. Third, the way in which treatment is delivered in the experimental condition may not resemble treatment delivery in the implemented program. Fourth, experiments are costly and time-consuming. Finally, because experiments require tight controls, the results may be low in generalizability and external validity.

Quasi-Experiments

A large class of impact assessment designs consists of nonrandomized quasi-experiments in which comparisons are made between "experimental" groups created out of targets who have elected (or who have been selected administratively) to participate in a program and groups of nonparticipant who are in critical ways comparable to participants. These techniques are called quasi-experimental because they lack the randomizing procedures essential for true experiments

Four quasi-experimental designs are commonly used: regression-discontinuity designs, matched "constructed' control groups, statistically equated constructed groups, and designs using generic output measures as controls.

Regression-discontinuity designs: Evaluations that are based on regression-discontinuity designs come closest to the randomized experiment in the ability to produce unbiased estimates of net effects. Regression-discontinuity designs test the extent to which a treatment group shifts on an outcome measure, compared to untreated targets, holding constant the factors that determine placement in the treatment group. Regression-discontinuity analysis can be employed only for the assessment of programs in which the rules for selecting targets for treatment are precise and uniformly administered, and require valid and reliable measures of outcomes.

This approach to studying impact is free of many of the problems associated with nonexperimental designs. Its applicability is limited, however, because few

programs select participants in a sufficiently uniform, clearly defined, and precise way. In addition, the statistical analysis required in this approach is highly sophisticated.

Matched "constructed" control groups: This approach is frequently used in circumstances where high-powered statistical procedures cannot be undertaken because of untrained staff or unavailability of computer resources. Typically, a group of targets is selected to receive a treatment, usually by the program administrator. To provide estimates of output in the absence of the intervention, the evaluator selects as controls matching unserved targets who resemble in relevant ways the treated targets as much as possible. The matched constructed-control groups may be chosen from among existing groups, or they may be aggregates of individuals who are comparable to the targets receiving the intervention.

Statistically equated constrained controls: An alternative to matching is provided by statistical procedures that equate participants and nonparticipants. Typically, this is accomplished by using one of several multivariate statistical procedures, such as multiple regression, log-linear models, or analysis of variance. Statistical equating is often used with cross-sectional surveys, in which measurements are made at one time point. Obviously, impact assessments using regression discontinuity, matched constrained-controls, and particularly statistically equated constructed-controls designs are highly vulnerable to errors that may be made in selecting the variables that are to be taken into account in the comparisons between participants and nonparticipant. In addition, in cross-sectional surveys many of the measurements may be based on respondents' recollection of past events, a measurement strategy that often produces both imprecise information and unreliability.

Generic output measures and controls: Generic controls usually consist of measurements purporting to represent the typical performance of untreated targets or the population from which targets may drawn. Although generic controls are widely available for certain subjects (for example, students performance), ordinarily they are not easily at hand. Furthermore, generic controls are rarely suitable because targets are often selected precisely because of the ways in which they differ from the general population (for example, low-income groups versus the rest).

Designs for Full-Coverage Programs

Since there are no unserved targets available to use as controls in these programs, the only comparisons available to the researchers are between the same targets before and after exposures to the intervention. Although, it is also commonplace for partial-coverage programs to use before-and-after designs without comparison or control group, evaluators are strongly advised not to use them for this purpose. In most circumstances the resulting impact estimates will not be credible because of the possibilities for bias resulting from various confounding effects. The following four methods are recommended for full-coverage programs evaluation.

Simple before-and-after studies: Although intuitively appealing, they are among the least valid of assessment approaches. The main deficiency of this design is that researchers cannot disentangle the effects of extraneous factors from the effects of the intervention.

Cross-sectional studies for nonuniform programs: Although many full-coverage programs deliver a uniform intervention to all their targets, there are many in which the intervention varies (for example, level of incentives, type of incentives, delivery methods, and so on). The effects of these variations can be estimated using cross-

sectional surveys that measure how much of a treatment is received and then contrasting measures of output for targets receiving different levels of treatment.

Panel studies for nonuniform programs: Although panel studies appear to be a simple extension of before-and-after designs by the addition of more data collection points, panel study results have considerably more plausibility. The additional time points, through the repeated measures of exposed targets, allow the researcher to begin to specify the process by which an intervention has impacts upon targets. This design is especially important in the study of full-coverage programs in which targets are differentially exposed to the intervention.

Time-series analysis: Although the technical procedures involved in time-series analysis are complicated, the ideas underlying them are quit simple. The researcher analyzes the trend before a treatment was enacted in order to obtain a projection of what would have happened without the intervention. The projection is then compared with the actual trend after the intervention. Statistical tests are used to determine whether or not the observed post-intervention trend is sufficiently different from the projection to conclude that the treatment had an effect.

Time-series designs are the strongest way of examining full-coverage programs, provided that the requirements for their use are met. Perhaps the most serious limitation of many time-series designs is the large number of pre-intervention observations needed in order to model pre-intervention trends accurately (more than thirty points in time are recommended). Indeed, a time-series analysis can be performed only if extensive before-enactment and after-enactment observations on outcome measures exit.

Efficiency Assessments

Efficiency assessments provide a frame of reference for relating costs to program results. In addition to providing information for making decisions on the

allocation of resources, they are often useful in gaining the support of regulators and political constituencies who determine the fate of social intervention efforts. Efficiency analysis can be useful at all stages of a program, from planning through implementation and modification. Two types of analysis are widely used for efficiency assessments: cost-benefit and cost-effectiveness analysis. Both types of analysis are often highly technical.

Cost-benefit analysis requires that program costs and benefits be known, quantified, and transformed to a common measurement unit; that they be projected into the future to reflect the lifetime of a program; and that they be discounted to reflect their present values. Options for monetizing outcomes or benefits include money measurements, market valuation, econometric estimation, hypothetical questions asked of participants, and observation of political choices. "Shadow" or "accounting" prices are used for costs and benefits when market prices are unavailable or, in some circumstances, as substitutes for market prices that may be unrealistic. In estimating costs, the concept of opportunity costs allows for a truer estimate but can be complex and controversial in application. The true outcomes of projects include spillover and distributional effects, both of which should be taken into account in full cost-benefit analysis.

Cost-effectiveness analysis is a feasible alternative to cost-benefit analysis when benefits cannot be calibrated in monetary units. Cost-effectiveness analysis permits programs with similar goals to be compared in terms of their relative efficiency and can also be used to analyze the relative efficiency of variations of a program. Two widely known documents have discussed and described the use of cost-benefit analysis in detail: the *NARUC Manual on Least-Cost Planning*;[18] and the *California Manual of Standard Practice*.[19]

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[18] National Association of Regulatory Utility Commissioners, *Least-Cost Utility Planning, A Handbook for Public Utility Commissioners* (Washington, D.C.: National Association of Regulatory Commissioners, 1988).

[19] California Public Utilities Commission and California Energy Commission, "Economic Analysis of Demand-Side Management Programs," *Standard Practice Manual* (San Francisco, CA: California Public Utilities Commission and California Energy Commission, 1987), 400-87-006.

TABLE A-3

ELECTRIC UTILITIES
MEANS/REGION/CLIMATE

Variable	N	North Central, Moderate	N	North Central Cold	N	West, Cold	N	West, Warm	N	North-east, Moderate	N	North-east, Cold	N	South, Moderate	N	South, Warm	N	National
X1	19	1.94	23	1.78	19	2.26	13	2.38	14	2.42	28	2.50	22	2.90	38	2.73	176	2.40
X2	19	2.73	23	1.21	19	0.84	13	3.07	14	3.42	28	3.57	22	2.18	38	2.31	176	2.38
X5	17	5744279.06	19	844318.89	17	536636.00	13	3460659.54	14	5766325.07	24	4536003.83	19	812609.53	33	2125091.64	156	2839528.00
X6	14	582929.71	21	117605.86	14	152245.43	9	892510.78	14	238313.79	26	322587.62	20	179235.55	20	849772.35	138	384772.00
X7	18	28960.94	21	1945.33	17	4770.12	11	22659.09	14	13647.64	26	12359.69	20	6094.60	22	55278.27	149	18409.00
X8	18	16937.89	17	1564.41	14	3156.79	8	23688.88	12	8502.75	23	10301.22	25	2767.07	17	48159.24	124	14229.00
X9	6	73.33	13	72.76	12	78.08	7	80.42	8	44.75	10	81.90	8	38.75	7	74.71	071	68.95
X10	19	0.89	23	1.00	19	0.94	13	0.92	14	0.78	28	0.92	22	1.00	38	1.00	176	0.94
X11	19	0.57	23	0.52	19	0.57	13	0.76	14	0.35	28	0.32	22	0.68	38	0.84	176	0.59
X12	19	2.54	23	0.93	19	0.77	13	0.86	14	0.87	28	2.50	22	1.39	38	3.03	176	1.84
X13	19	1.42	23	1.01	19	0.70	13	1.25	14	2.15	28	2.24	22	0.78	38	0.25	176	1.13
X14	19	2.04	23	1.88	19	2.94	13	1.65	14	1.91	28	2.46	22	1.54	38	2.89	176	2.21
X15	19	0.50	23	0.40	19	0.39	13	0.52	14	0.85	28	1.08	22	0.56	38	0.48	176	0.60
X16	19	0.42	23	0.36	19	0.22	13	0.21	14	0.35	28	0.47	22	0.27	38	0.22	176	0.32
C1	22	1.00	23	1.00	20	1.00	13	1.00	14	1.00	28	1.00	23	1.00	39	0.97	182	0.99
C2	22	0.95	23	0.78	20	0.90	13	0.61	14	1.00	28	1.00	23	0.52	39	0.84	182	0.83
C3	22	0.40	23	0.65	20	0.60	13	0.00	12	1.00	28	1.00	23	0.17	39	0.28	180	0.50

TABLE A-3 — Continued

ELECTRIC UTILITIES
MEANS/REGION/CLIMATE

Variable	N	North Central, Moderate	N	North Central Cold	N	West, Cold	N	West, Warm	N	North-east, Moderate	N	North-east, Cold	N	South, Moderate	N	South, Warm	N	National
C4	22	0.90	23	0.34	20	0.50	13	0.23	14	0.42	28	0.28	23	0.26	39	0.48	182	0.43
C5	21	0.04	23	0.04	20	0.35	13	0.15	14	0.00	28	0.35	23	0.26	37	0.00	179	0.15
C6	22	0.95	23	0.82	20	0.85	13	0.76	14	1.00	28	1.00	23	0.52	39	0.79	182	0.83
C7	22	0.31	23	0.00	20	0.15	13	0.00	14	0.57	28	0.14	23	0.26	39	0.10	182	0.17
C8	22	1.00	23	1.00	20	0.80	13	0.76	14	1.00	28	1.00	23	1.00	39	0.76	182	0.91
C9	22	1.00	23	0.69	20	0.75	13	1.00	14	1.00	28	1.00	23	1.00	39	0.79	182	0.89
C10	22	0.31	23	0.04	20	0.00	13	0.00	12	0.00	28	0.14	23	0.00	39	0.00	180	0.06
C11	22	0.00	23	0.00	20	0.20	13	0.23	12	0.00	28	0.82	23	0.56	39	0.30	180	0.30
C12	22	0.40	23	0.34	20	0.25	13	0.23	14	0.14	28	0.57	23	0.00	39	0.15	182	0.26
C13	22	0.00	23	0.39	20	0.30	13	0.00	12	0.00	28	0.25	12	0.08	39	0.23	180	0.18
C14	22	0.09	23	0.52	20	0.40	13	0.23	12	1.00	28	0.53	23	0.30	39	0.74	180	0.48
C15	22	0.45	23	0.60	20	0.65	13	0.61	14	0.42	28	1.00	23	2.00	39	0.61	182	0.69
C16	22	0.00	23	0.52	20	0.40	13	0.38	12	0.66	28	0.35	23	0.17	39	0.15	180	0.29
C17	22	0.95	23	0.47	20	0.65	13	0.53	14	1.00	28	0.53	23	0.47	39	0.71	182	0.65
C18	22	0.40	23	0.34	20	0.15	13	0.00	12	0.33	28	0.53	23	0.30	39	0.10	180	0.27
C19	22	0.95	23	0.78	20	0.90	13	0.38	12	1.00	28	0.82	23	0.91	39	0.38	180	0.73

TABLE A-4

GAS UTILITIES
MEANS/REGION/CLIMATE

Variable	N	North Central, Moderate	N	North Central Cold	N	West, Cold	N	West, Warm	N	North-east, Moderate	N	North-east, Cold	N	South, Moderate	N	South, Warm	N	National
X1	26	0.38	24	0.58	31	0.22	13	0.30	14	0.28	23	0.30	34	0.02	34	0.14	199	0.26
X2	26	2.46	24	1.16	31	1.80	13	2.15	14	2.57	23	3.47	34	3.05	34	2.23	199	2.37
X5	21	4117277.71	21	898847.67	28	705340.04	13	2834002.85	13	5550558.31	22	5416347.32	33	682603.55	32	1355846.66	202	2.62
X6	20	304122.55	21	85917.10	23	111230.22	10	1041013.30	13	257339.54	19	291255.89	26	89637.08	19	355699.68	202	0.86
X7	23	18435.83	22	2386.82	25	3273.56	8	33668.75	13	15714.92	19	14179.74	28	4511.43	19	24012.16	183	2290492.00
X8	23	9251.87	16	1561.31	20	2021.75	7	25936.71	13	8597.23	17	10828.53	23	3069.74	14	10592.57	151	257108.00
X9	11	44.90	7	64.71	14	68.00	6	85.50	6	61.16	4	49.25	15	15.33	9	73.77	157	12000.00
X10	26	0.88	24	1.00	30	0.90	13	0.92	14	0.92	23	0.91	34	0.82	34	0.94	133	7327.18
X11	25	0.44	24	0.54	31	0.48	12	0.75	14	0.28	23	0.21	33	0.81	34	0.73	72	53.75
X12	26	1.62	24	0.94	31	0.76	13	1.37	14	1.16	23	2.58	34	2.24	34	3.83	198	0.90
X13	26	2.85	24	0.95	31	1.53	13	0.43	14	2.55	23	4.60	34	3.47	34	0.38	196	0.55
X14	26	1.25	24	1.40	31	2.07	13	1.77	14	1.38	23	1.09	34	1.52	34	1.56	199	1.95
X15	26	0.76	24	0.33	31	0.36	13	0.57	14	0.91	23	1.80	34	1.37	34	0.49	199	2.12
X16	26	0.29	24	0.32	31	0.22	13	0.24	14	0.13	23	0.43	34	0.26	34	0.22	199	1.52
C1	27	1.00	24	1.00	31	1.00	13	1.00	14	1.00	23	1.00	35	1.00	35	0.97	199	0.82
C2	27	1.00	24	0.79	31	0.90	13	0.53	14	1.00	23	1.00	35	0.40	35	0.85	199	0.27
C3	27	0.44	24	0.62	31	0.29	13	0.00	12	1.00	23	1.00	35	0.17	35	0.34	204	0.99

TABLE A-4 — Continued

GAS UTILITIES
MEANS/REGION/CLIMATE

Variable	N	North Central, Moderate	N	North Central Cold	N	West, Cold	N	West, Warm	N	North-east, Moderate	N	North-east, Cold	N	South, Moderate	N	South, Warm	N	National
C4	27	0.96	24	0.33	31	0.70	13	0.23	14	0.42	23	0.17	35	0.20	35	0.42	204	0.79
C5	26	0.00	24	0.04	31	0.22	13	0.23	14	0.00	23	0.08	35	0.20	32	0.00	202	0.44
C6	27	0.96	24	0.79	31	0.90	13	0.76	14	0.85	23	1.00	35	0.40	35	0.77	204	0.44
C7	27	0.33	24	0.20	31	0.09	13	0.00	14	0.57	23	0.21	35	0.20	35	0.17	200	0.11
C8	27	1.00	24	1.00	31	0.90	13	0.76	14	0.85	23	1.00	35	1.00	35	0.54	204	0.78
C9	27	1.00	24	0.66	31	0.61	13	1.00	14	0.85	23	1.00	35	1.00	35	0.80	204	0.21
C10	27	0.37	24	0.25	31	0.00	13	0.00	12	0.00	23	0.21	35	0.00	35	0.00	204	0.88
C11	27	0.03	24	0.00	31	0.09	13	0.23	12	0.00	23	0.73	35	0.62	35	0.11	204	0.85
C12	27	0.00	24	0.33	31	0.00	13	0.00	14	0.00	23	0.00	35	0.00	35	0.00	202	0.10
C13	27	0.00	24	0.37	31	0.19	13	0.00	12	0.00	23	0.43	35	0.02	35	0.14	202	0.24
C14	27	0.59	24	0.70	31	0.16	13	0.23	12	1.00	23	0.60	35	0.20	35	0.68	204	0.03
C15	27	0.44	24	0.79	31	0.58	13	0.53	14	0.28	23	0.91	35	1.00	35	0.57	202	0.15
C16	27	0.22	24	0.54	31	0.19	13	0.30	12	0.66	23	0.52	35	1.07	35	0.22	202	0.49
C17	27	0.96	24	0.45	31	0.77	13	0.53	14	0.85	23	0.60	35	0.37	35	0.62	204	0.67
C18	27	0.25	24	0.33	31	0.09	13	0.00	12	0.33	23	0.60	35	0.20	35	0.14	202	0.31
C19	27	1.00	24	0.75	31	0.70	13	0.46	12	1.00	23	0.91	35	0.97	35	0.51	204	0.64

TABLE A-5

GAS CORRELATION MATRIX

	Reconnection % x_9	Termination % x_{12}	Arrears % x_{13}	Bad Debt % x_{15}	Weatherization c_{14}	Conservation c_{18}
x_9 % reconnect.			-.28/.01			
x_{12} % terminat.				.2/.003		
x_{13} % arrears	-.28/.01					
x_{15} % bad debt		.2/.003				
x_{16} Ratio = $\frac{\text{conn.}}{\text{term.}}$	-.4/.0001		.23/.001			
C_1 Notice						
c_2 W. rest.	.32/.009					.199/.004
c_3 Date rest.					.23/.0008	.44/.0001
c_4 Temp. rest.						
c_5 PSC approv.						
c_6 P. billing	.26/.02				.29/.0001	.17/.01
c_7 I. billing			.18/.008	.14/.04	.21/.002	.27/.0001
c_8 B. billing			.14/.03			.19/.004
c_9 D. billing	.19/.006			.18/.009		

TABLE A-5 — Continued

GAS CORRELATION MATRIX

	Reconnection % x_9	Termination % x_{12}	Arrears % x_{13}	Bad Debt % x_{15}	Weatherization c_{14}	Conservation c_{18}
c_{10} Arr. forgiv.			.29/.0001		.34/.0001	.26/.0002
c_{11} Life rate	-.38/.0008		.21/.002			
c_{12} Limiters				.15/.02	.2/.003	
c_{13} Loans					.35/.0001	.31/.001
c_{14} Weth.[n]						.32/.0001
c_{15} Audits					.18/.007	.31/.0001
c_{16} B. Consl.					.23/.0007	.62/.0001
c_{17} Referral						.39/.0001
c_{18} Conservation[n]					.32/.0001	
c_{19} Fin. Assist.	-.27/.02					

TABLE A-6

ELECTRIC CORRELATION MATRIX

	Reconnection % x_9	Termination % x_{12}	Arrears % x_{13}	Bad Debt % x_{15}	Weatherization c_{14}	Conservation c_{18}
x_9 % reconnect.			-.22/.06			
x_{12} % terminat.				.19/.008		
x_{13} % arrears	-.22/.06			.613/.001		
x_{15} % bad debt		.19/.008				
x_{16} Ratio = reconn. / term.	-.14/.06	.37/.0001				
C_1 Notice						
c_2 W. rest.						.177/.01
c_3 Date rest.						.216/.003
c_4 Temp. rest.				-.18/.01		
c_5 PSC approv.						
c_6 P. billing					.2/.007	
c_7 I. billing						.36/.0001
c_8 B. billing						.19/.009
c_9 D. billing						
c_{10} Arr. forgiv.			.14/.06			.43/.0001
c_{11} Life rate	-.22/.06			.16/.03		

TABLE A-6 — Continued

ELECTRIC CORRELATION MATRIX

	Reconnection % x_9	Termination % x_{12}	Arrears % x_{13}	Bad Debt % x_{15}	Weatherization c_{14}	Conservation c_{18}
c_{12} Limiters			.18/.01			
c_{13} Loans					.43/.0001	.15/.03
c_{14} Weth.[n]						
c_{15} Audits					.22/.002	
c_{16} B. Consl.				.12/.09		.39/.0001
c_{17} Referral						.397/.0001
c_{18} Conservation[n]						
c_{19} Fin. Assist.			.13/.07		-.17/.017	

TABLE A-7
STEP-WISE REGRESSION: GAS UTILITIES

dependent variable X_{12}: percent customer termination of nonpayments

Independent Variables	B	F	Probability > F
Intercept	2.89	18.00	.0001
Target Conservation	3.24	6.81	.011
Region: West	-3.35	7.01	.0107
Weather: Cold	1.85	2.41	.126
Weather: Warm	4.39	13.95	.0005
Date-Based Restrictions	-2.9	7.46	.0086
R^2 = .366 F = 6 P = .0002			

dependent variable = x_{13}: arrears %/total residential billing

Individual Variables	B	F	Probability > F
Intercept	10.57	20.76	.0001
Region: West	-4.13	10.58	.002
Region: South	-4.12	11.77	.0012
Reconnection Fee	-3.32	2.73	.1
% Reconnection within 24 hrs. Termination	-.04	6.11	.016
R^2 = .32 F = 6.45 Probability > F = .0003			

dependent variation = x_{15}: % bad debt/residential billing

Independent Variables	B	F	Probability > F
Intercept	.77	19.92	.0001
Income-Based Billing	-.44	2.39	.12
Arrears Forgiveness	1.28	19.11	.0001
Life-Line Rate	.47	4.66	.03
Region: West	-.638	8.33	.005
Region: Northeast	.399	3.16	.08
Residential Charges to Bad Debt	$4x10^{-8}$	7.42	.008
R^2 = .58 F = 11.83 Probability > F = .0001			

TABLE A-8
STEP-WISE REGRESSION: ELECTRIC UTILITIES

dependent variable X_{12}: % customer termination for nonpayments

Independent Variables	B	F	Probability > F
Intercept	1.59	1.06	.3
Financial Assistance Policies	-2.8	7.18	.01
Region: West	-2.5	5.09	.028
Region: South	3.57	11.29	.001
Customers with Termination	.00002	5.02	.03
% Reconnections within 24 hrs.	.039	6.93	.01
	R^2 = .468 F = 8.81 P = .0001		

dependent variable = x_{13}: arrears %/total residential billing

Individual Variables	B	F	Probability > F
Intercept	4.49	8.14	.006
Region: North Central	1.08	2.68	1.07
Region: Northeast	2.65	14.99	.0003
Reconnection Fee	-2.59	2.85	.09
% Reconnection within 24 hrs. Termination	-.018	3.73	.05
	R^2 = .344 F = 6.7 Probability > F = .0002		

dependent variation = x_{15}: % bad debt/residential billing

Independent Variables	B	F	Probability > F
Intercept	1.04	17.6	.0001
Income-Based Billing	-.04	2.9	.09
Arrears Forgiveness	.7	5.5	.02
Region: Northeast	.7	14.9	.0003
Region: South	.7	4.2	.04
Total Bad Debt Expenses	$5x10^{-8}$	16.6	.0002
% Reconnection within 24 hrs. Termination	-.009	10.46	.002
	R^2 = .52 F = 9.00 Probability > F = .0001		