PAYMENT-PROBLEMS, INCOME STATUS, WEATHER AND PRICES:
COSTS AND SAVINGS OF A CAPPED BILL PROGRAM

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With low-income utility customers facing home energy burdens of 15% of income and more, it comes as no surprise that many of those customers cannot afford to pay their bills in a full, timely and regular basis. As a result, not only do the low-income customers face the social and economic deprivations associated with their inability-to-pay, but the utilities that provide service to them incur the business expenses associated with that inability-to-pay as well. These business expenses include not only the costs of carrying arrears, but the costs of charge-offs and the cost of collections as well.

Irrespective of the unaffordability of home energy during "normal" times, one additional question is whether low-income customers, and the companies that serve them, can beneficially insulate these customers from the vagaries of weather and price-induced spikes in annual and seasonal home energy bills. After the confluence of cold weather and a fly-up in natural gas prices during the 2000/2001 winter heating season in much of the nation, an increasing number of industry observers recognize the harms that arise from extraordinary changes in bills accompanying spikes in price and/or temperature.

Programs directed toward low-income customers are both more likely to reach customers that have accounts in arrears and more likely to reach customers with higher levels of arrears than are programs directed to the residential population as a whole. While the notion that payment-troubled customers are disproportionately low-income is commonly accepted conventional wisdom,[1] remarkably little empirical data has been collected to verify or to challenge that conventional wisdom.

National data reported by the U.S. Census Bureau indicates that the proportion of households in arrears at any given point in time is substantially higher for the low-income population than for the population as a whole. One 1995 census study, for example, reported that while 9.8% of non-poor families could not pay their utility bills in full, 32.4% of poor families could not do so. According to the Census Bureau, while 1.8% of non-poor families had their electric and/or natural

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[1] This is not to say that all low-income customers are payment-troubled, nor that all payment-troubled customers are low-income. It is merely to say that low-income customers are disproportionately payment-troubled.

gas service disconnected for nonpayment, 8.5% of poor families suffered this same deprivation.[2] Unfortunately, systematic information on the arrears of low-income customers is not collected on a state level basis.[3]

The discussion below seeks to answer several questions: (1) are payment-troubles truly centered in the low-income population? (2) is there a relationship between the incidence and extent of payment troubles and temperature and/or price factors? (3) can a utility that introduces a program to insulate low-income customers from the fly-up of bills hope to recoup all or some substantial part of the cost of such a program through offsetting expense savings.

To develop answers to these questions, the discussion below focuses on data from Iowa.[4] Iowa not only reports monthly data on arrears, the disconnection of service, limited collection activities, and write-offs, but reports much of this data specifically for energy assistance recipients. The availability of information for "energy assistance" recipients allows for a comparison of that low-income population to the population as a whole.[5]

The discussion below is broken into four parts:

- **Part 1** considers the relationship between payment-troubled status and low-income status.
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- **Part 2** considers the relationship between various indicators of payment-troubled status, winter temperatures (measured by heating degree days), and natural gas prices.

- **Part 3** considers the expense incurred by a utility associated with nonpayment of residential energy accounts. This section applies per-unit costs to each step in a collection process.

- **Part 4** considers the financial impact to a utility from instituting a program that would control the exposure of low-income customers to changes in temperature and prices.

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2 U.S. Census Bureau, ***Extended Measures of Well-Being: 1992***, P70-50RV (November 1995).

3 There is sporadic corroborative information from the states. One 1998 Illinois report, for example, indicated that while 44.5% of LIHEAP-assisted natural gas customers were in arrears, only 28.9% of "general households" were. Department of Energy and Community Affairs, ***Residential Energy Costs and Assistance in Illinois: The 1997 – 98 Winter***, at 6, Springfield (IL). So, too, has an analysis by the staff of the New Hampshire Public Utilities Commission estimated that roughly 35% of the low-income *electric* customers entering the Electric Assistance Program (EAP) entered the program with arrears. As a general rule, estimates place the average number of customers in arrears at any given point in time at around 12% of the total customer base.

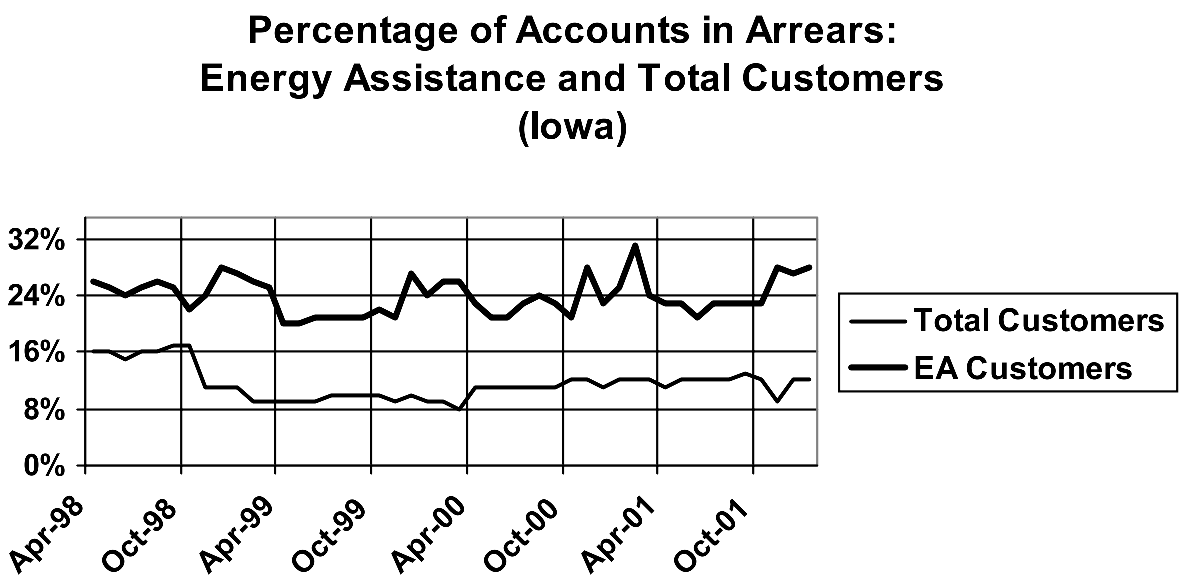
4 A supplement to the report will include brief analyses based on New Jersey and Maryland data. Because of the limitations of this data, however, that data is not included in this main report.

5 Even Iowa, however, does not systematically track low-income customers. Only low-income customers identified also as fuel assistance recipients are included in the "low-income" population.

PART 1.
THE RELATIONSHIP BETWEEN INCOME AND PAYMENT-TROUBLES

The Iowa Utility Board systematically collects information on the incidence of arrears for low-income customers. Under the Iowa reporting system, a "low-income" customer is identified by the receipt of energy assistance through the federal Low-Income Home Energy Assistance Program (LIHEAP). Even in Iowa, however, LIHEAP reaches somewhat less than 20% of the state's total eligible population. As a result, this information is limited both by the fact that customers self-select into the population of energy assistance recipients and by the fact that the energy assistance population "misses" 80% and more of the total low-income population. Nonetheless, the Iowa data is the best there is nationwide.

The percentage of energy assistance accounts in arrears consistently and substantially exceeds the percentage of accounts in arrears in the total customer base in Iowa. The figure below presents information over a 46 month period (April 1998 through January 2002). While, on average, 24% of all energy assistance accounts were in arrears over that time period, only 12% of total accounts were in arrears.



While there is some variation by year, the overall proportions are remarkably consistent over time. The data were examined using twelve month periods. Each period began immediately following the winter heating season (April) and extended through the next March. In this way, each winter heating season was kept intact as a study period.

The metric used to measure "accounts" is the proportion of accounts in arrears rather than the number of accounts. The number of accounts identified as "energy assistance" recipients varies on a month to month basis rather than being consistent throughout the year. The absolute number of accounts in arrears, therefore, does not provide a meaningful number.

Within this framework, the proportions of accounts in arrears on an annual basis were as follows:

Proportion of Accounts in Arrears: Total Customer Base and Energy Assistance Recipients (Iowa)		
Study period	Total Accounts	Energy Assistance Accounts
April 1998 – March 1999	14%	25%
April 1999- March 2000	9%	22%
April 2000 – March 2001	11%	24%
April 2001 – January 2002	12%	24%

As can be seen, on a monthly basis, the proportion of energy assistance accounts in arrears is twice as high (or more) (22% vs. 9%; 24% vs. 11%; 24% vs. 12%) as the proportion of total accounts in arrears. While this ratio had dropped since April 1999, the drop can be attributed to a modest increase in the proportion of non-low-income accounts in arrears (from 9% to 12%) rather than to a decrease in the proportion of energy assistance accounts in arrears.

It is possible to track the relationship between energy assistance accounts in arrears and total population accounts in arrears by: (1) creating a ratio, (2) placing the proportion of energy assistance accounts in arrears in the numerator, and (3) placing the proportion of total customer accounts in arrears in the denominator. It is necessary, however, to be very careful about understanding what this tells you. The ratio does *not* indicate how many accounts of either population are in arrears. It merely tells you the *relative* rate at which customers in each population are in arrears. If the ratio is 2.0, in other words, then energy assistance recipients are in arrears at a rate twice as high as the population as a whole.[6]

Graphing the monthly ratio of the proportion of energy assistance accounts in arrears to the proportion of the total population accounts in arrears reveals a seasonal variation that is not evident in the annual data. Clearly, energy assistance customers fall into arrears at a faster rate than does the total population during the winter months. While the ratio of energy assistance customers in arrears to the total population accounts in arrears hovers around the 2.0 mark for most of the non-heating season,[7] the ratio sees consistent increases during the winter heating months, up to 3.0 or more. In October 1999, for example, 10.6% of all customer accounts were

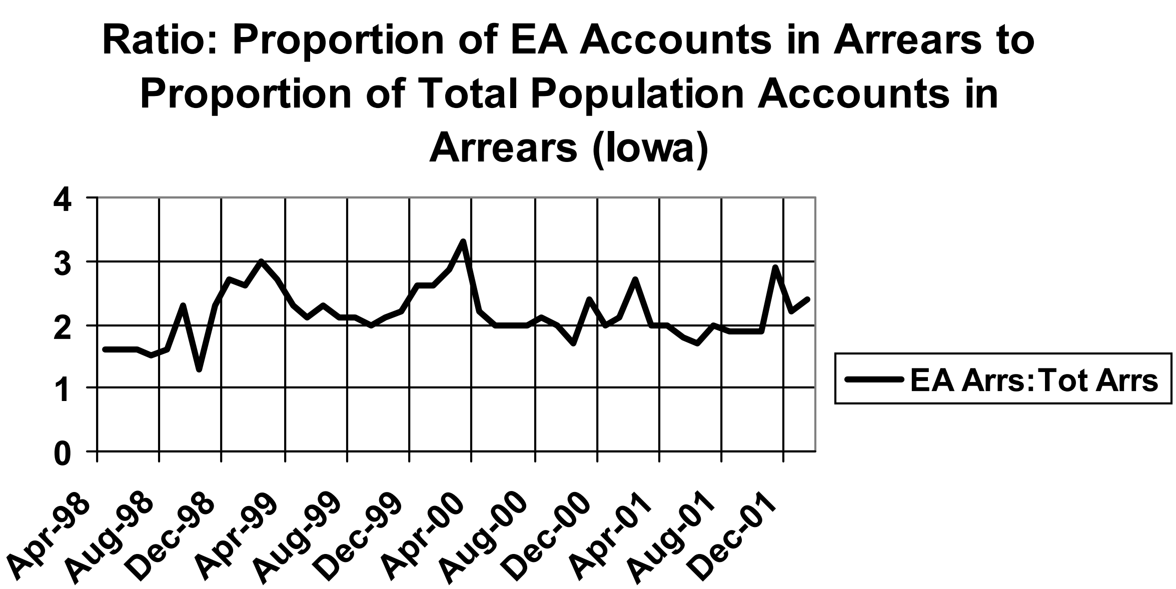
[6] It does not say that twice as many energy assistance customers are in arrears. Merely that the *rate* at which they fall into arrears is twice as high as the total population.

[7] Again, remember that this does not mean that the arrears are constant. It merely means that if the proportion of total population in arrears increases from 10% to 13%, the proportion of energy assistance recipients in arrears has increased at the same rate (from 20% to 26%), leaving a constant ratio of 2.0.

in arrears while 21.7% of low-income accounts were (a ratio of 2.1). By March 2000, the proportion of all customer accounts in arrears had fallen to 8.0% while the proportion of low-income accounts in arrears had risen to 26.2% (a ratio of 3.3). In contrast, during the 2000 – 2001 heating season, the proportion of energy assistance accounts in arrears had increased from 23% (December) to 25% in February. Non-low-income accounts, however, were similarly higher than normal (11% and 12% for December and February respectively), and thus the ratio did not reveal the same variability as in prior years. The purpose of the figure below is to show *relative* rates of arrears, not absolute rates.

Just as clear as the increased rate of energy assistance accounts going into arrears during the winter heating months is the extent to which these customers clear their accounts (relative to the total population) in the non-heating months. The peaks in the ratio occurred in the heating months of each of the four winter periods graphed.[8]

Interestingly, the disparity between the energy assistance population and the total customer population was not as high in the 2000 – 2001 winter heating season (with its high costs) as it was in other years. This can be attributed to two factors. First, as mentioned above, the rate at which total population accounts were in arrears increased, thus narrowing the typical disparity between energy assistance and total population accounts. Second, the higher 2000/2001 winter heating costs were met with a release of additional federal heating assistance benefits. Indeed, the decline in energy assistance accounts in arrears between December 2000 and April 2001 as additional aid was made available is readily evident in the graph below.



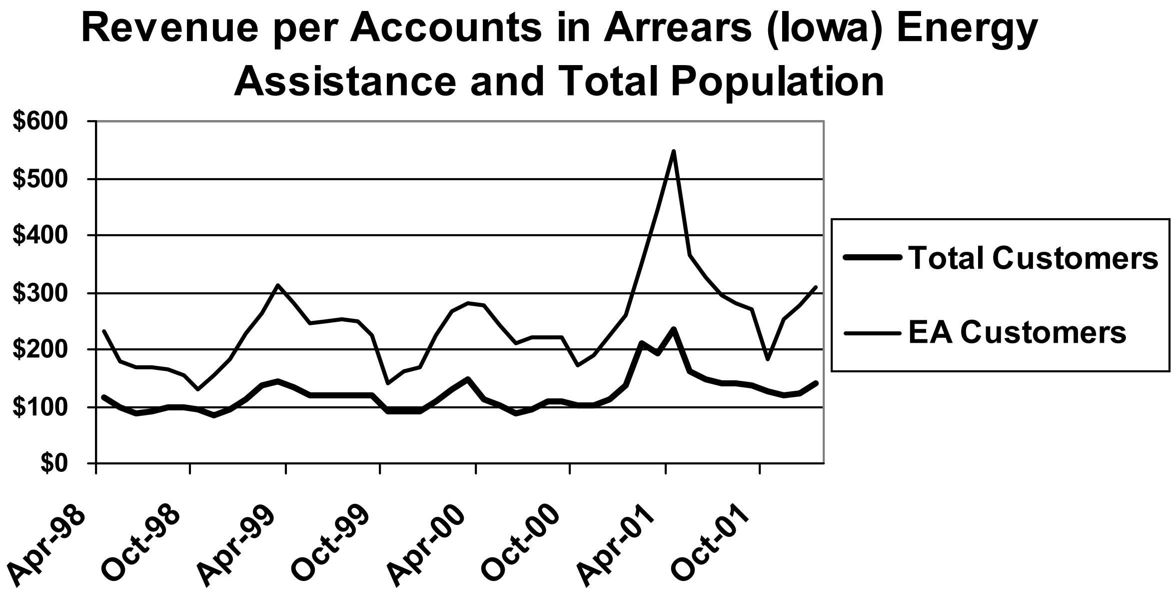
[8] Note that data for the 2001 – 2002 winter heating season is not complete. The most recent data available is through January 2002.

In addition to looking at the *number* of accounts in arrears, it is necessary, also, to look at the *extent* to which accounts are in arrears. The average arrears for energy assistance recipients in Iowa are between $200 and $300 year-round, about twice the level of the total population. It is possible to see the impact of the payment of LIHEAP benefits early in the winter season, as total average arrears (of accounts in arrears) decrease. It is also possible to see the seasonal increase in the arrears experienced by energy assistance recipients.

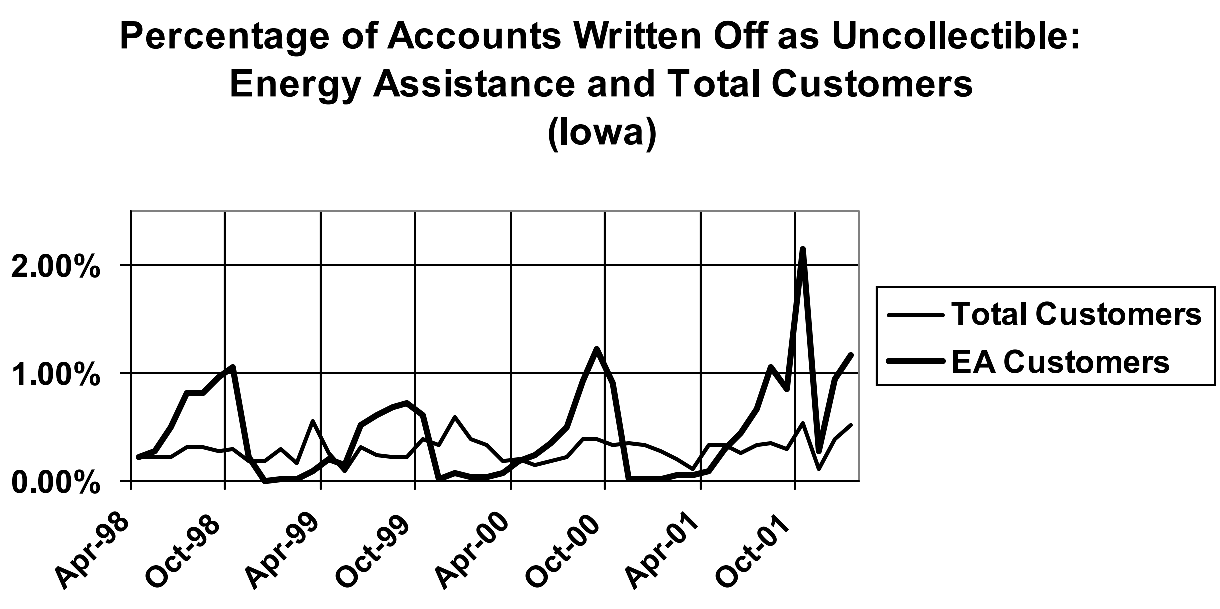
Importantly, as well, is the increase in arrears (for both energy assistance recipients and the total population) that occurred in the 2000- 2001 winter heating season. While for energy assistance recipients, the previous four year high in level of arrears (for those customers with arrears) was about $300 (in April 1999 and April 2000 respectively), the average arrears for energy assistance accounts in arrears skyrocketed to more than $500 in the winter of 2001. So, too, did the average arrears of the total population in arrears see increases to more than $200 in the 2000 – 2001 winter heating season.

Note two additional observations about these 2000 – 2001 winter arrears. First, the level of arrears corresponded to a higher proportion of accounts that were in arrears. In Iowa, in other words, it was true that the high bills of the 2000 – 2001 winter heating season resulted in more customers being behind on their bills. In addition, these customers were *further* behind on their bills than in previous years. Moreover, the level of arrears did not come *back* down to pre-2000/2001 winter heating season levels during the subsequent twelve months. The average arrears for the total population never did come back to the $100 level before beginning another increase in the 2001/2002 winter season. The energy assistance arrears were reduced in the non-heating season, but were already back up to $300 in January 2002, a level not previously reached (before the 2000/2001 heating season) since April 1998.

The relationship between temperatures, prices and arrears will be discussed in greater detail below.



The unprecedented level of accounts in arrears, as well as the historically high level of arrears (on a dollars per account in arrears basis) has two direct impacts on a utility. First, these arrears have led to a fly-up in the number of energy assistance accounts written-off as uncollectible. While Iowa does not separately track the *dollars* of write-off for energy assistance accounts, given the higher level of arrears on a per account basis, it is reasonable to conclude that the dollars of write-off showed a spike similar to the spike in the number of accounts written off.



The monthly spikes in the number of accounts written off is perhaps somewhat misleading because of regulatory constraints placed on the disconnection of service during the winter months (which would prevent the termination of service accompanied by a subsequent write-off). The high bills during the 2000/2001 winter heating season, however, and the increased incidence and level of arrears accompanying those bills, did have a substantive impact on the total average annual rate at which accounts were written off during the following year. On an annual basis, the proportion of energy assistance accounts written off reached nearly 0.8% during the months following the 2000/2001 winter heating season. This was more than twice the write-off rate for the previous two years (in terms of number of accounts written off) and nearly twice the previous four year high from the April 1998 through March 1999 period. Even the increase for the total population (from .26% to .35%) represented a 35 increase in the proportion of accounts written-off as uncollectible.

Proportion of Accounts Written-Off as Uncollectible: Total Customer Base and Energy Assistance Recipients (Iowa)		
Study period	Total Accounts	Energy Assistance Accounts
April 1998 – March 1999	0.27%	0.42%
April 1999- March 2000	0.30%	0.31%
April 2000 – March 2001	0.26%	0.37%
April 2001 – January 2002	0.35%	0.79%
46 month average	0.29%	0.46%

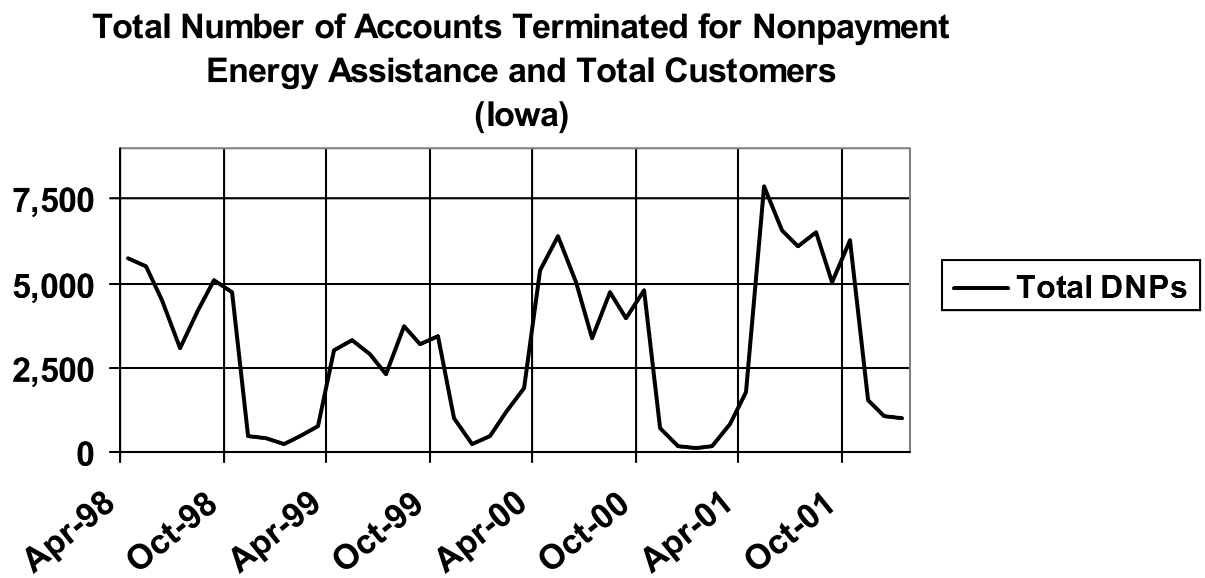
One reason for the spike in uncollectible accounts is the spike in the proportion of accounts disconnected for nonpayment resulting from the 2000/2001 winter heating season. Iowa does not track the number of disconnects separately for energy assistance accounts and for the total population. Only the total number of disconnections is reported.

Not surprisingly, Iowa utilities disconnected a substantively higher number of accounts after the 2000/2001 winter heating season. The number of disconnections per month never fell below 5,000 during the warm weather months following the 2000/2001 winter heating season. This is particularly significant given the observation that in prior years, the number of disconnections per month rarely even *reached* those heights.

It was not merely warm weather terminations that were affected by the incidence and level of arrears resulting from the 2000/2001 winter heating season. The number of terminations during the opening months of the 2001/2002 winter season was unprecedented in scope. The total number of service terminations during the December/January time period for each year for the prior four years was as follows:

Total Iowa Service Disconnections (December/January)			
1998 – 1999	1999 - 2000	2000 - 2001	2001 - 2002
652	712	283	2,142

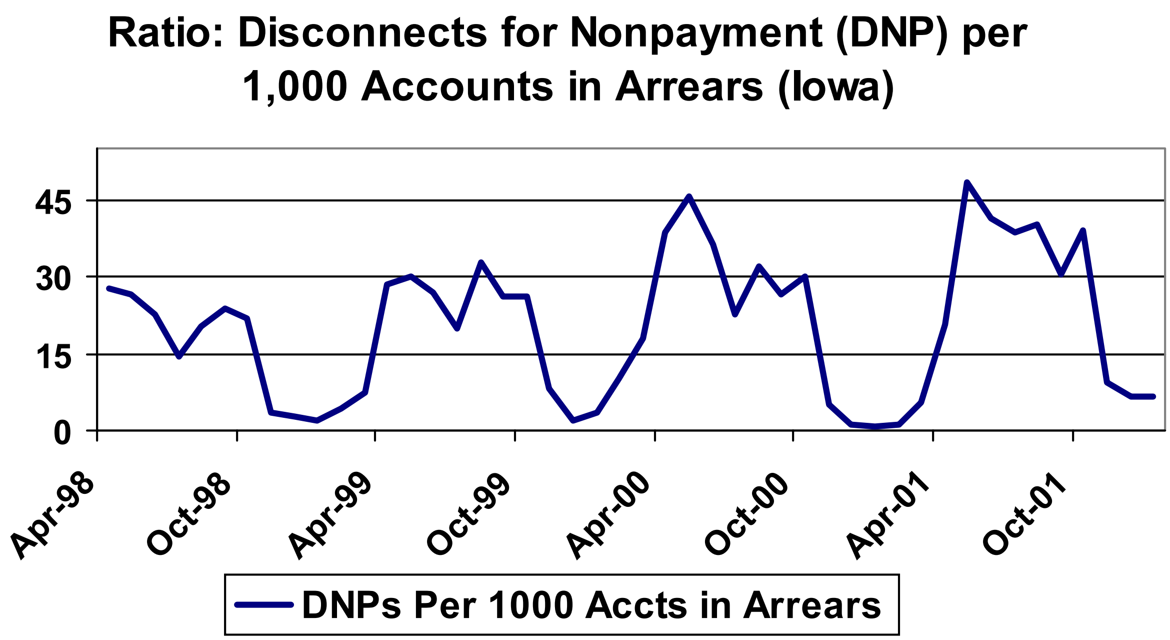
The 2,142 accounts for which service was terminated in December 2001 and January 2002 was seven times as many terminated accounts as in the corresponding time period one year earlier. It was 30% higher than the total number of accounts terminated in the December/January time period for the past three years *combined*.



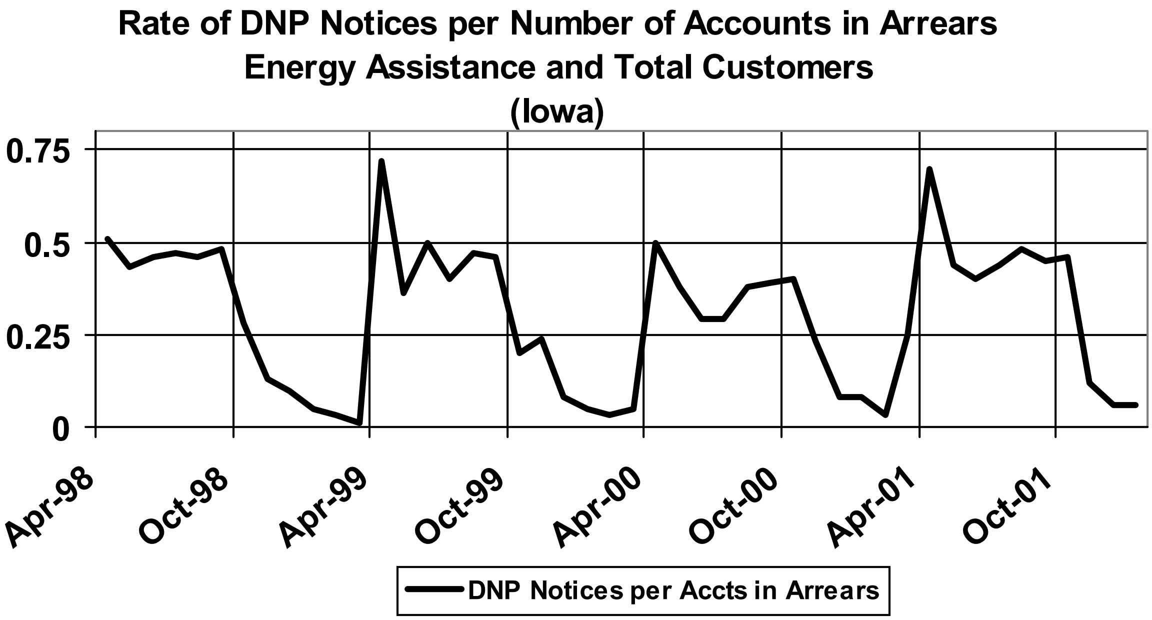
It would be wrong to conclude that the high winter bills of the 2000/2001 winter heating season resulted only in an increase in the total number of accounts experiencing a service termination. *That* observation might result merely from the fact that a larger number of accounts was in arrears after that winter heating season. In fact, the implications go beyond that result.

The figure below translates the number of service disconnections into a rate of disconnection per 1,000 accounts in arrears. Converting the number of disconnections into a rate per 1,000 accounts in arrears factors out the increased number of accounts in arrears. As the figure below shows, Iowa utilities disconnected customers in arrears at a far faster rate than had historically been the case.

Assuming that Iowa utilities did not make a conscious policy choice to disconnect customers under circumstances that would not have resulted in a disconnection in a prior year, what this figure tells us is that after the 2000/2001 winter heating season, a far greater number of customers had dug themselves into an arrears hole which they could not climb out of prior to the termination of service. The rate of service terminations during the warm weather months after the 2000/2001 winter heating season never fell below 30 disconnections per 1,000 accounts in arrears. In contrast, while the 30-per-1000 rate had been reached in occasional months in the previous four years, that rate of service termination had never been reached and sustained over a period of months as was experienced in 2001.



The graph below indicates that it is *not* the case that more customers were entering the collection cycle. While the number of disconnect notices for each account in arrears was somewhat less in the time period of April 2000 through March 2001, the number of notices per accounts in arrears was relatively constant between the other three collection cycles (98-99,99-00 and 01-02). The conclusion must be, when looking at each of these figures in conjunction with each other one, that when customers entered the collection cycle after the 2000/2001 winter heating season, they were less able to extract themselves and were, therefore, more likely to proceed to an ultimate termination of service.



In summary, several conclusions march forward from the data presented above:

- Low-income customers (as identified through the receipt of fuel assistance) have a higher incidence of arrears than does the population as a whole;

- In addition to this higher incidence of arrears, energy assistance customers in arrears have a higher level of arrears than do customers in arrears from the customer base as a whole.

- Winter weather causes a faster increase in the incidence of arrears within the energy assistance population than is caused in the total customer base as a whole.

- Winter weather marked by high bills caused by temperature and/or price spikes has the impact of driving both the incidence of arrears and the level of arrears disproportionately higher in the energy assistance population than in the customer base as a whole.

- The higher proportion of accounts in arrears, coupled with the higher dollar level of arrears (for those customers having arrears) results in an increase in the number of accounts written-off as uncollectible. While dollars of uncollectible are not reported in Iowa, it is assumed that the higher dollar level of arrears for customers in arrears will result in a higher rate of uncollectible dollars as well. The rate of write-off in the energy assistance population can be twice as high as in the total customer base as a whole.

- The higher incidence of arrears, when coupled with the higher level of arrears, arising from price fly-ups results in an increase in the number of disconnections.

- In addition to higher numbers of disconnection, the higher incidence of arrears, when coupled with the higher dollar level of arrears (for those customers having arrears), resulted in a higher rate of disconnections per thousand accounts having arrears. A higher rate of customers in arrears, in other words, were so deeply in arrears, they could not retire their arrears (or at least retire their arrears to an extent sufficient to avoid the termination of service).

A closer look at the relationship between payment troubles, price and temperature, will be presented in the next section.

PART 2.
THE RELATIONSHIP BETWEEN PRICE, TEMPERATURE AND PAYMENT-TROUBLES

This section seeks to provide insights into the relationship between various indicators of payment-troubled status, energy assistance recipients, and two specific factors that can increase bills to those recipients in any given month or year (price and weather). The search for such a relationship using publicly available data is complicated by a variety of factors.

First and foremost is the complete absence of data. Most states do not report data on the incidence of service terminations or on either the number of accounts in arrears or dollars of arrears on a regular basis. Those few states that do publish information do not generally distinguish between the total residential population and the low-income residential population. The state of New Jersey reports data on arrears and disconnects but does not break-out data by customer class. The New Jersey data thus includes residential, commercial, industrial and institutional data all in one number. The states of Missouri and Pennsylvania collect certain information on arrears and collection activities but accords that data confidential status. The state of Colorado has quarterly reporting requirements, but has either allowed utilities to engage in a systematic non-compliance over time or has lost or destroyed all but the most recent months of data. The state of Maryland annually reports data on the winter heating season, but neither collects nor reports data on a total annual or on a monthly basis.

Most states, however, simply do not compile data on collections or payment-troubles for residential customers generally, let alone for low-income residential customers in particular.

Having said that, it is possible to apply basic some analytic tests to data obtained for the state of Iowa. The Iowa Utilities Board reports on a monthly basis:

- The number of energy assistance accounts in arrears;

- The level of arrears for energy assistance accounts in arrears;

- The number of disconnect notices issued to energy assistance accounts;

- The number of energy assistance accounts written-off (but not the dollars of write-off); and

- The number of residential disconnections for nonpayment (but not the number of energy assistance accounts disconnected for nonpayment).

While Iowa also reports the total number of residential accounts and energy assistance accounts on a monthly basis, it does not report total revenue for either population. As a result, monthly bills cannot be calculated. The monthly Iowa reports were obtained for April 1998 through January 2002 (the most recent available), a period of 46 months.

Four measures of payment-troubled status were selected or developed as indicators of the impact of price and/or temperature on energy assistance recipients in Iowa. These included:

- The proportion of energy assistance accounts in arrears;

- The dollars of arrears for accounts in arrears;

- The rate of disconnections for nonpayment (DNP) per thousand accounts in arrears;[9] and

- The index of the number of energy assistance accounts written-off to the total number of energy assistance accounts.

The rational for, and significance of, selecting each one of these indicators was explained in detail in Part 1 above.

Each of these indicators was obtained for the four years used in this study. In addition, within each year, three data points were selected to consider the impacts at different points in the year. The three months selected included:

- April, the month immediately following the winter heating season (and the close of he winter shutoff moratorium);

- July, the middle of the non-heating season when, perhaps, any residual effects of the heating season may have been played out; and

[9] Again, this data was available for the total residential class, not for energy assistance recipients specifically.

- October, the month immediately preceding the next winter heating season, when presumably the effects of the *preceding* season would be at their lowest (and the effects of the coming season would not yet have begun to accumulate).

These twelve variables were the dependent variables used in the inquiry.

	April	July	October
Dollars of arrears per EA account in arrears			
Percent of EA accounts in arrears			
Ratio: EA accounts written off to total number of EA accounts			
Disconnects for nonpayment per 1,000 accounts in arrears			

Two independent variables were selected for consideration. Since average monthly revenue was not available, for either residential customers generally or for energy assistance customers in particular, the factors affecting bills as directly controlled by a capped bill program were selected as the independent variables:

- Temperature; and

- Price

Each of these variables will be explained in the specific section discussing their application.

A simple R^2 analysis was performed for each relationship. An R^2 indicates the "tightness" of the fit of two sets of data. A high R^2 (one approaching 1.0) indicates that changes in the dependent variable are closely explained by changes in the independent variable. A low R^2 indicates that the movements in the two variables are random (or that they, at the least, are not associated with each other). An R^2 does *not* establish causation. It cannot be said, in other words, that a high R^2 demonstrates that the movement in the independent variable *causes* the movement in the dependent variable. It merely indicates that there is an association or relationship.

Temperature

Temperature was measured through the use of Heating Degree Days (HDDs). Heating degree days for the state of Iowa, as reported by the National Weather Service, National Oceanographic and Atmospheric Administration (NWS/NOAA), were obtained for November 1997 through January 2002. The HDDs metric selected for use was the sum of the HDDs in the months of each heating season (November through March) of each year. Each HDD metric was regressed against the twelve dependent variables explained in detail above.

The following R^2s resulted:

	April	July	October
Dollars of arrears per EA account in arrears	0.935	0.731	0.485
Percent of EA accounts in arrears	0.005	0.501	0.738
Ratio: EA accounts written off to total number of EA accounts	0.639	0.012	0.655
Disconnects for nonpayment per 1,000 accounts in arrears	0.426	0.690	0.344

The following conclusions are reached based upon these results:

- There is a strong association between the dollars of arrears for energy assistance accounts at the end of the heating season and the temperatures experienced during the heating season. The strength of that association remains even during the middle of the non-heating season (with a correlation coefficient of 0.73). While the strength understandably wanes the further in time the customers get from the winter heating season, there is a moderately strong association as late as the subsequent October.

- Similarly, there is a moderately strong relationship between the proportion of energy assistance customers in arrears at the selected months and the sum of the heating degree days during the heating months of November through March. While the R^2 began at close to 0.0 for the month of April, it increased to 0.501 for July to.0.730 for the month of October. These data reveal an association between the proportion of accounts in arrears and the extent of Heating Degree Days.

- There is a moderately strong relationship between the proportion of energy assistance accounts written off as uncollectible and the temperature in the preceding heating season. While the relationship virtually disappears during the month of July, it ranges from 0.63 to 0.65 for the months of April and October.

- There is also a moderately strong relationship between the rate at which accounts in arrears experience a disconnection for nonpayment and the temperature in the preceding heating season. The rate of disconnection is measured by the number of disconnections per 1,000 accounts in arrears. The relationship grows stronger from April to July before beginning to relax.

Each of these conclusions is consistent with the narrative discussion of the Iowa data presented in Part 1 of this paper. The conclusions are not of mere theoretical significance. Indeed, they will be used as direct inputs into the discussion of the financial impacts of a capped bill program.

Prices

Prices were measured using actual natural gas bills for the state of Iowa derived from data reported by the Energy Information Administration of the U.S. Department of Energy (EIA/DOE). The Natural Gas Monthly published by EIA/DOE provided data for both the total residential gas consumption[10] and gas prices.[11] The average monthly number of customers was

[10] Gas deliveries by customer class are provided in Table 15.

obtained for Iowa from the EIA/DOE Natural Gas Annual.[12] Dividing total consumption by average customers provided a monthly consumption which, when multiplied by the average price yields a monthly natural gas bill. Bills were calculated for November 1997 through January 2002. The price metric selected for use was the sum of the natural gas bills for the months of November through April of each heating season (for example, November 1997 through April 1998. These annual metrics was regressed against the twelve dependent variables explained in detail above.

The following R^2s resulted:

	April	July	October
Dollars of arrears per EA account in arrears	0.950	0.669	0.854
Percent of EA accounts in arrears	0.001	0.613	0.854
Ratio: EA accounts written off to total number of EA accounts	0.817	0.048	0.599
Disconnects for nonpayment per 1,000 accounts in arrears	0.329	0.768	0.351

The relationships found between these billing metrics and the payment outcome indicators are even stronger than the relationship between temperature and the payment outcome metrics. This is not surprising, of course, since price, standing alone, was not used in the analysis, but rather total bills. The data for total bills would include, as implicit input factors, both price and temperature.

The following conclusions are reached based upon these results:

- There is a strong association between the dollars of arrears for energy assistance accounts at the end of the heating season and the bills experienced during the heating season. The association in April (marked by a coefficient of 0.95) is quite strong. While the strength understandably wanes somewhat in July (0.67) as customers get from the winter heating season, there is still a strong association as late as the subsequent October (0.85).

- There is a moderately strong relationship between the proportion of energy assistance customers in arrears at the selected months and the sum of the heating degree days during the heating months of November through March. While the R^2 began at close to 0.0 for the month of April, it increased to 0.613 for July to.0.854 for the month of October. These data reveal an association between the proportion of accounts in arrears and the size of the natural gas bills in the prior winter heating season.

- There is a very strong relationship between the proportion of energy assistance accounts written off as uncollectible in April and the bills incurred in the preceding

11 Gas prices by month are provided in Table 21.

12 The average monthly number of customers is provided in individual tables for each state. Iowa data is provided in Table 57.

heating season. While the relationship virtually disappears during the month of July, it ranges from 0.82 to 0.60 for the months of April and October.

- There is also a moderately weak relationship between the rate at which accounts in arrears experience a disconnection for nonpayment in April and the bills in the preceding heating season. The rate of disconnection is measured by the number of disconnections per 1,000 accounts in arrears. The relationship grows much stronger for the month of July (up to an R^2 of 0.77) before beginning to relax in October.

In sum, the relationships that are documented above are consistent with the narrative discussion in Part 1. The impacts of temperature and price on bills have a substantive impact on payment outcomes for energy assistance recipients. The issue which is thus presented is whether a program directed toward controlling impact of the two factors of temperature and price can generate real financial savings to a sponsoring utility.

PART 3.
THE COST OF NONPAYMENT.

The last building block to be examined before considering the financial impacts of a capped bill program involves assessing the costs associated with nonpayment. The cost of non-payment of a residential utility bill generally consists of three separate components:

- The cost of collecting the past-due bill (collection costs);
- The cost of obtaining replacement revenue (either internally or externally) for the time the billed revenue goes uncollected; and
- The cost of revenue ultimately written off as uncollectible.

The discussion below will separately consider each of these components.

Cost of Collection

The cost of collecting unpaid bills depends on both the collection interventions that are put into play and the point in time at which the interventions are activated. Little collection activity occurs within the first 30 days after a bill is first rendered. This occurs for three reasons:

- The billed revenue is not overdue; or
- The size of the receivable is not sufficiently large to cost-justify incurring collection expenses; and/or
- The age of the receivable is not sufficiently old to place the receivable at risk of long-term non-collection or eventual uncollectability.

The longer a receivable ages, the more that subsequent bills will pancake on top of the oldest arrears[13] and the greater the long-term risk accrues of eventual uncollectability. On a per account basis, therefore, an older arrears imposes greater costs in three ways:

- It generates a larger number of dollar lag days giving rise to working capital expense;
- It generates more intense (and thus more expensive) collection interventions; and
- It creates high levels of charge-offs.

Reducing both the level and age of arrears, therefore, should result in direct dollar savings to the utility experiencing the reductions.

In reaching this conclusion, resource expenditures that are not avoided altogether but that are redirected to other productive tasks are considered to be "saved" in this analysis. If a half-time full time equivalent (0.50 FTE) can be moved from collecting 90-day old residential arrears to performing other productive work, the labor cost associated with that 0.50 FTE is deemed a "savings" to the collection activities of a company.

Collection Timeline

Assuming a bill is rendered on day 1 of a collection timeline, and is due on Day 20, significant intervention costs begin to accrue to the utility at around Day 40. The following interventions occur along the collection timeline:

- If a customer-initiated in-bound calls occurs, it will generally occur before the due date of the second bill;
- An out-bound collection call will happen within ten days of the date of the second bill (which first contains the Bill 1 arrears);
- A written disconnect notice is issued within ten days of the out-bound reminder telephone call;
- A written disconnect notice generally generates a response by the customer. If a payment is not made, an in-bound call is handled;
- A field disconnection notice is delivered within ten to fourteen days of the presumed receipt of the written disconnect notice;

[13] For an arrears to be 90-days old, the immediately two preceding bills must be in arrears in their entirety. A 30-day or 60-day arrears will not be paid prior to the 90-day arrears being retired.

- A service termination occurs within three days of the delivery of the field disconnection notice;
- If service is reconnected, the reconnection generally occurs within one day of the service termination;
- Write-offs are presumed to occur at day 180 after the initial bill.

The collection time line is as follows:

A TYPICAL COLLECTION TIME LINE AND COSTS

	Days from Bill Date			
	1 - 30	31 - 60	61 - 90	91 – 150
Bill #1 rendered	Day 1			
Bill past due	Day 21			
In-bound call	Day 25 ($8)			
Out-bound call		Day 40 ($5)		
Written DNP notice		Day 50 ($0.50)		
In-bound query		Day 53 ($8)		
Deliver DNP notice			Day 64 ($35)	
Disconnect service			Day 67 ($40)	
Reconnect service			Day 68 ($45)	
Final bill issued			Day 74 ($6)	
Write-off				Day 180
Total cost	$8.00	$13.50	$126.00	$0.00

The costs presented in this time line are rounded to eliminate any sense of false precision. Clearly, also, individual utilities may differ based on individual company costs, procedures, and time lines. Individual customers not only may, but are likely, to deviate from the norm as well.

The Collection Intervention Costs

Assuming that an account traverses the entire range of collection interventions once, that account will cause a utility to incur nearly $150 in costs exclusive of any final write-off amount.[14] Of the total collection costs, 85% ($126 of $147.50) are incurred in the period running form 60 to 90 days after a bill is first issued. Keeping an arrears from entering the 61 – 90 day age bucket will thus provide a substantial cost savings to a utility. However, the bulk of the costs arise from an account entering the active disconnect process. Even if an account enters the 61 – 90 day age bucket, therefore, unless the arrears progresses to the beginning of field services, substantial savings will not arise from collection savings.

The Cost of Replacement Revenue

Whenever a utility bills a dollar of revenue without collecting it, that utility will incur a cost of money associated with the unpaid bill. The cost of money will manifest itself in one of two ways. Either:

- The utility will *procure* money to replace the unpaid revenue (external sources); or

- The utility will use *internal cash* to replace the unpaid revenue (internal sources).

In the first instance, the company will incur a cost at the weighted rate of return. Since working capital is a capital expense for ratemaking purposes, the equity portion of the return will have an income tax component associated with it.[15] In the second instance, in the absence of the need to use the internally-generated cash to meet cash working capital needs, the company would have presumably have invested that cash. Again, the cost consequence of the unpaid revenue is thus quantified at the rate of the weighted cost of capital (grossed up for taxes).

A customer will bring two revenue components into play in any given month:

- The unpaid arrears from prior months' bills;[16] and

- The bill for current usage.

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14 The derivation of cost figures is presented in Attachment A.

15 Since arrears are a relatively permanent aspect of a utility's operations, the working capital reserve is a part of the company's permanent capital requirements. Accordingly, the funds procured from an external source are costed out at a company's weighted cost of capital.

16 This unpaid arrears may be $0, but to maintain some conceptual consistency, the presence of unpaid arrears must be recognized in all instances. To try to distinguish between a customer with "no arrears" and a customer with an arrears of $0 leads to difficulty in application.

The Cost of Arrears

The unpaid arrears will fall into the various aging buckets that a company maintains. For purposes of analysis, the discussion below will assume that a company has three aging buckets: (1) 30-day arrears; (2) 60-day arrears; and (3) 90+-day arrears.

The working capital costs imposed by arrears are based on the number of revenue lag days created by the arrears. The revenue lag days represent the incremental number of days that a bill remains unpaid from the day the bill is first rendered. The days from the day a bill is rendered to an on-time payment is supplied by assumption (15 days, assuming that bills are paid three-quarters of the way through a 20-day payment period). The incremental lag days are then calculated by placing the arrears at the mid-point of each aging bucket.

- A 30-day arrears thus adds 20 days to the initial billing period (the final five days of the payment period plus one-half of the 30-day arrears period).

- A 60-day arrears adds 30 more incremental days (the final 15 days of the 30-day arrears period plus one-half of the 60-day arrears period);

- A 90-day arrears adds 105 more days. Since the 90-day bucket is open-ended, it is unreasonable to assume that the arrears fall within the first 30-days of this age bucket. This analysis supplies the age of 90+-day arrears by taking the arrears out to one-month short of the time at which they are written off as uncollectible (at Day 180). This process adds the final 15 days of the 60-day arrears period plus the 90 more days to 150 days).

The dollar lag days are computed by multiplying the dollars in arrears times the incremental lag days for that month. The dollar lag days are then multiplied by a daily cost of capital to determine the working capital expense.

The table below presents the working capital expense associated with arrears within any given month.

	Bill Date to Due Date	30-Day Active	60-Day Active	90-Day Active
Arrears	$100	$100	$100	$100
Incremental Age	15	20	30	105
Dollar Lag Days	1,500	2,000	3,000	10,500
Annualized Weighted Return	8.5%	8.5%	8.5%	8.5%
Gross Up Factor for Taxes	40.0%	40.0%	40.0%	40.0%
Weighted Return (GUFT)	11.9%	11.9%	11.9%	11.9%
Days per Year	365	365	365	365
Daily Return (GUFT)	0.0308%	0.0308%	0.0308%	0.0308%
Working Capital	$0.46	$0.62	$0.93	$3.29
Annualizing Factor	12	12	12	12
Annualized Working Capital	$5.56	$7.42	$11.14	$39.45
WC per $1,000 Receivables	$55.58	$74.16	$111.41	$394.48

Per $1000 0.0326%

It is important to note that the working capital expense is not additive, but incremental. With 60-day arrears appearing on a July bill, for example, the working capital associated with those dollars in the month they were billed would have been determined in May. The working capital associated with them when they were 30-day arrears would have been calculated in June. The working capital expense above is presented on a dollars-per-arrears ($000) basis.

The working capital expense for a particular company for a particular month would thus need to be determined as follows (in a hypothetical illustration):

	Bill Date to Due Date	30-Day Active	60-Day Active	90-Day Active	Total
WC per $1,000 Receivables	$55.58	$74.16	$111.41	$394.48	
Dollars of receivables	$30,000,000	$3,600,000	$2,000,000	$6,700,000	
Receivables ($1000 increments)	30,000	3,600	2,000	6,700	
Working capital	$1,667,277	$266,970	$222,818	$2,643,006	$4,800,071

The Cost of Current Bills

Current bills in any particular month must be divided into two buckets. The first bucket captures those bills that are paid by the due date. The second bucket captures those bills that are not paid by the due date and thus will be reflected as 30-day arrears in the next month. Both buckets are limited to those dollars that are eventually paid and do not proceed to charge-off.

The significance of the two buckets is simply that dollars in the first bucket are assumed to be paid before the due date. The working capital associated with these current bills thus includes only those days between the billing date and the payment date. In contrast, the dollars that proceed to become arrears go full-term, and thus have a full 20-days of working capital associated with them. For current bills that eventually become arrears, the incremental days of working capital are recognized and calculated in the working capital calculations relating to arrears.

On a per $1,000 basis, the working capital associated with current bills not subject to eventually being charged-off is as follows:

	Bill Date to Due Date
Current bill not in arrears	$100
Incremental Age	15
Dollar Lag Days	1,500
Annualized Weighted Return	8.5%
Gross Up Factor for Taxes	40.0%
Weighted Return (GUFT)	11.9%
Days per Year	365
Daily Return (GUFT)	0.0308%
Working Capital	$0.46
Annualizing Factor	12
Annualized Working Capital	$5.56
WC per $1,000 Receivables	$55.58

The significance of this calculation lies in the ability to reduce the incremental age of the current bill at the time it is paid in the current month. The same calculation, assuming that bills are paid at Day 10 rather than Day 15, would result in the following cost determination:

	Bill Date to Due Date
Current bill not in arrears	$100
Incremental Age	10
Dollar Lag Days	1,000
Annualized Weighted Return	8.5%
Gross Up Factor for Taxes	40.0%
Weighted Return (GUFT)	11.9%
Days per Year	365
Daily Return (GUFT)	0.0308%
Working Capital	$0.31
Annualizing Factor	12
Annualized Working Capital	$3.70
WC per $1,000 Receivables	$37.02

As can be seen, reducing the bill payment date from Day 15 to Day 10 would save nearly $20 per $1,000 of current receivables.

The Cost of Charge-offs

The final cost component to be considered is the cost of charge-offs. The first out-of-pocket cost of charge-offs is the rate at which bills are to be written-off. Charge-offs have both a prospective and a retrospective component to them.

- The prospective component consists of applying the charge-off rate to all future bills rendered for current usage;

- The retrospective component consists of applying the charge-off rate to the arrears that are brought into the program.

While by its nature, the prospective rate will be repeatedly applied (as each month's current usage is billed), the retrospective component involves a one-time application to the arrears that exist on the books as arrears at the beginning of the program. Data does not exist to disaggregate the rate of charge-off based on the age of arrears.

The rate of charge-off differs depending on the age of arrears. Experience counsels that 95% of 30-day arrears are collectable, 90% of 60-day arrears are collectable, and 85% of 90+-day arrears are collectable. As an arrears ages, only the incremental charge-off should be considered. Under the circumstances identified above, the incremental charge-off rate is five percent for each age bucket.

In addition to the charged-off revenue itself, the working capital associated with carrying bills until they are finally charged-off is an expense to be considered. Some portion of each age bucket of arrears will proceed along the collection time line until it is charged off. By having those bills paid in a particular month, rather than proceeding to charge-off, a utility would avoid the working capital from the point in time in question to the date of charge-off. Thus, for example, the time remaining until charge-off would be as follows by age bucket:

- Current receivables: 165 days

- 30-day arrears: 145 days

- 60-day arrears: 115 days

- 90+-day arrears: 10 days

If a company has $100 in current receivables, 2.5% of which will eventually be charged-off (at day 180), then having the entire $100 paid in Month 1 will avoid $0.13 in future working capital simply for the charge-off amount. A 30-day arrears of $100 would result in an avoided working capital of $0.11 simply for the charge-off amount. The calculation translating this into a cost per $1,000 of receivables is set forth below:

	Bill Date to Due Date	30 Day Active	60 Day Active	90 Day Active
Charge-off Working Capital				
Maximum Age of Charge Off	180			
Potential charge-off rate	2.5%			
Potential Charge Off Dollars	$2.50	$2.50	$2.50	$2.50
Days Remaining until Charge Off	165	145	115	10
Dollar Lag Days	413	363	288	25
Potential Working Capital	$0.13	$0.11	$0.09	$0.01
Annualizing Factor	1	1	1	1
Annualized Working Capital	$0.13	$0.11	$0.09	$0.01
WC per $1,000 Receivables	$52.14	$45.68	$36.06	$3.09

<u>Summary and Conclusions</u>

In summary, the costs associated with nonpayment can be categorized into three elements:

- The cost of collection, which involves the expenses associated with interventions which the utility triggers in response to nonpayment;
- The cost of replacing the revenue that is billed but not collected. This cost arises whether the company generates its replacement revenue externally or internally; and
- The costs of charge-offs. This expense involves both the charge-off itself and the working capital associated with the billed revenue carried to the charge-off date.

PART 4:
THE FINANCIAL IMPACTS OF A CAPPED BILL PROGRAM

One response to bill volatility involves programs called a Capped Bill program. Under a Capped Bill program, the participant pays the same bill amount each month for twelve months. An external party –the company that designed and is promoting a Capped Bill program is called WeatherWise USA—acquires financial instruments that pay the participants' bills above the monthly capped bill amount. Bills may increase due to changes in weather or to changes in price. In the event of *lower* bills driven by milder temperatures or an energy price drop, the participant receives a refund at the end of the program year.

The data presented above have been combined into a model that considers the financial impact of a capped bill program. The model considers the change in costs to the utility that might arise from the implementation of a capped bill program. Based on the discussion in Parts 1 and 2 above, the cost savings are estimated assuming three alternative scenarios. Each scenario is an alternative way of considering how a capped bill program might eliminate the impacts of dramatic changes in bills attributable to temperature and/or prices. The three alternatives are:

- **<u>Scenario #1</u>:** Assuming that the energy assistance population will act in the same way as the residential population as a whole;

- **<u>Scenario #2</u>:** Assuming that the energy assistance population in the 2000/2001 heating season instead acted in the same fashion as the energy assistance population in the 1998/1999 heating season, a season in which price and temperature did not play a factor; and

- **<u>Scenario #3</u>:** Assuming that the energy assistance population in the 2000/2001 heating season acted in the same fashion as the energy assistance population acted in the 2000/2001 non-heating season, a time period in which price and temperature did not play a factor in affecting bills.

Results of each of the alternative scenarios are discussed separately below. Each scenario assumes that the capped bill program has 10,000 participants and that the program cost is $100 per participant. Except to the extent that the number of participants might have an impact on the program cost per participant, the analysis of savings on a per participant basis will not be affected by the total number of program participants.

The analysis in this paper does not consider the working capital changes associated with changes in the current payment of bills for current usage.

Scenario #1: Acting as the Residential Customer Class Acts

Scenario #1 tests the financial impacts of a capped bill program that will generate payment outcomes for the energy assistance population that reflect the payment outcomes of the residential population as a whole. Under these conditions, the capped bill program will generate offsetting cost savings of roughly $75 ($74.48) per participant.[17] These savings go to offset a program cost of $100 per participant.

The savings come primarily in three areas:

- Avoided charge-offs ($359,181)

- Avoided working capital associated with month-to-month arrears ($197,312); and

- Avoided collection costs ($132,948).

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[17] This is not to say that each participant generates program savings. But the sum of the savings divided by the total number of program participants yields the savings per participant.

While the costs of disconnecting service are substantially higher than the collection costs associated with 30-day to 60-day arrears, the number of accounts that move into the disconnection cycle is not sufficient to generate substantial dollar reductions.[18]

In contrast, while the costs of collection are relatively low on a per unit of collection basis, the number of accounts subject to collection are sufficiently high to make this part of a company's cost incursion a source of potentially substantial savings.

The calculation of the savings attributable to modifying energy assistance recipient payment outcomes such that they reflect the payment outcomes of the residential population as a whole is set forth in Appendix 1.

Scenario #2: Acting as the Energy Assistance Recipient Population Acts in a Typical Heating Season (and beyond)

Scenario #2 tests the financial impacts of a capped bill program that will generate payment outcomes for the energy assistance population that reflect the payment outcomes of the energy assistance population in a typical heating season (compared to the 2000/2001 heating season). The typical heating season used (where the HDDs approach normal on both a monthly and annual basis) is the 1998/1999 heating season. Under this approach, the impacts of the weather and price are factored out by looking at the behavior of the energy assistance population during a year in which those factors were not in play.

Under these conditions, the capped bill program will generate offsetting cost savings of roughly $24 ($24.08) per participant. These savings go to offset a program cost of $100 per participant.

The savings come primarily in three areas:

- Avoided charge-offs ($131,827)
- Avoided working capital associated with month-to-month arrears ($19,685); and
- Avoided collection costs ($48,795).

The difference in payment outcomes as reported between years are an insufficient basis upon which to build an argument that a capped bill program will generate substantive savings. The reduction in both the percentage of accounts in arrears and the level of arrears per account from 1998/1999 to 2000/2001 resulted in reduced collection costs of tens of thousands (not hundreds of thousands) of dollars. The number of shutoffs for nonpayment, as well as the total collection

18 Because of limitations in data, there is no way to determine the number of accounts that go through some portion, but not all, of the disconnect process. The avoided collection costs exclude any part of the disconnect process. To the extent, for example, that there are accounts that may receive a disconnect notice delivered via a field visit, but that do not experience an actual disconnection of service, there are costs that are not included in this model.

activities, are largely (albeit not entirely) driven by the number of accounts in arrears, not by the level of arrears. The proportion of accounts in arrears, however, is one of the factors with the least strong relationship to temperature and total monthly bill size.

As can be seen, the factor with the largest decrease in savings potential (moving the Scenario #1 to Scenario #2) is the month-to-month avoided working capital associated with arrears. Neither the proportion of energy assistance accounts in arrears nor the level of arrears shows a substantial decline from a "bad" year to a "typical" year. The fall off in working capital savings from Scenario #1 to Scenario #2 was more than 90 percent.

The calculation of the savings attributable to modifying energy assistance payment outcomes such that they reflect the payment outcomes of energy assistance recipients in a year with typical prices and temperature is set forth in Appendix 2.

Scenario #3: Acting as the Energy Assistance Recipient Population Acts in the Non-heating Season

Scenario #3 tests the financial impacts of a capped bill program that will generate payment outcomes for the energy assistance population that reflect the payment outcomes of the energy assistance population in the non-heating season. The payment outcomes in the time period November 2000 through October 2001 were compared to the average payment outcomes for the August through October 2000 time period. Under this approach, the impacts of the weather and price are factored out by looking at the behavior of the energy assistance population during a time period in which those factors are not in play.

Under these conditions, the capped bill program will generate offsetting cost savings of more than $30 ($30.14) per participant. These savings go to offset a program cost of $100 per participant.

The savings come primarily in three areas:

- Avoided charge-offs ($171,922)

- Avoided working capital associated with month-to-month arrears ($25,392); and

- Avoided collection costs ($63,635).

Improving payment outcomes for energy assistance recipients subsequent to a winter heating season when bills are affected by increases due to price and or temperature spikes to reflect the payment outcomes of the non-heating season prior to the price spikes will provide a moderate basis for the conclusion that a capped bill program would generate offsetting cost savings. As with other Scenarios of payment outcomes, the primary reduction in utility expenses will occur in the area of avoided charge-offs. Avoided collection costs are noticeably higher than simply improving payment outcomes to a typical year's level for energy assistance recipients. Working capital savings do not provide a substantial contribution to the offsetting savings.

The calculation of the savings attributable to modifying energy assistance payment outcomes such that they reflect the payment outcomes of energy assistance recipients in the non-heating season is set forth in Appendix 3.

SUMMARY AND CONCLUSIONS

Offering a program that will control low-income exposure to payment outcomes associated with spikes in bills caused by temperature and/or price changes will generate expense savings to the utility that will offset program costs in whole or part. Elements of cost savings will include:

- Foregone collection expenses, including the avoided need to disconnect service for nonpayment;
- Avoided working capital expense; and
- Avoided charge-offs.

The extent to which a capped bill program will generate offsetting savings depends on how the elimination of price and temperature variability will affect low-income payment outcomes. There is no question, based on the discussion above, that low-income customers experience payment outcomes to a utility that are less favorable to a utility than the residential class as a whole. Low-income customers:

- Have a higher proportion of accounts in arrears;
- Have a higher level of arrears on a per account basis;
- Fall more deeply into arrears faster during the heating months;
- Have a higher proportion of accounts written-off as uncollectible;
- Have a higher proportion of accounts in arrears proceed all the way to the disconnection of service.

A capped bill program can help a utility to control these payment outcomes (and thus the expenses associated with these payment outcomes). A capped bill program can:

- Generate $75 in savings per participant if low-income outcomes are reduced to the level of payment outcomes for the total population;

- Generate $20 in savings per participant if low-income payment outcomes can be held constant at the non-heating month levels through subsequent high bill months;

- Generate $30 in savings per participant if low-income payment outcomes can be held constant at the levels of a year that has normal temperature and natural gas prices.

ATTACHMENT A

Cost Component	Outbound Calls	Inbound Call	Field Collection Visit	Mailed Notice	Disconnect	Reconnect	Final bill
Set-up costs	$0.00	$0.00	$6.00	$0.00	$6.00	$6.00	$6.00
Labor minutes	8	15	30	0	30	50	0
Completion rate	80%	100%	100%	100%	100%	100%	100%
Adjusted labor minutes	10	15	30	0	30	50	0
Annual salary	$30,000	$30,000	$40,000	$0	$40,000	$40,000	$0
Salary per hour	$15.00	$15.00	$20.00	$0.00	$20.00	$20.00	$0.00
Productivity factor (6hrs:8hrs)	0.75	0.75	0.75	0.75	0.75	0.75	0.75
Adjusted salary per hour	$20.00	$20.00	$26.67	$0.00	$26.67	$26.67	$0.00
Loaded benefits	35%	35%	35%	35%	35%	35%	35%
Direct labor cost	$4.50	$6.75	$18.00	$0.00	$18.00	$30.00	$0.00
Vehicle cost	$0.00	$0.00	$8.50	$0.00	$8.50	$8.50	$0.00
Materials	$0.68	$1.01	$0.00	$0.15	$0.00	$0.00	$0.00
Mail cost	$0.00	$0.00	$0.00	$0.35	$0.00	$0.00	$0.00
Post-action collections	$0.00	$0.00	$0.00	$0.00	$5.18	$0.00	$0.00
Total cost	$5.18	$7.76	$32.50	$0.50	$37.68	$44.50	$6.00

Additional appendices have been omitted from this report due to their length.
Readers may contact the author for copies.