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Martin G. Kushler, PH.D
Behalf of OCC

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**BEFORE**
**THE PUBLIC UTILITIES COMMISSION OF OHIO**

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| In the Matter of the Application of Vectren Energy Delivery of Ohio, Inc. for Approval, Pursuant to Revised Code Section 4929.11 of Tariffs to Recover Conservation Expenses and Decoupling Revenues Pursuant to Automatic Adjustment Mechanisms and for Such Accounting Authority as May be Required to Defer Such Expenses and Revenues for Future Recovery through Such Adjustment Mechanisms. | ) | Case No. 05-1444-GA-UNC |

# DIRECT TESTIMONY OF MARTIN G. KUSHLER, PH.D.

**ON BEHALF OF**
**THE OFFICE OF THE OHIO CONSUMERS' COUNSEL**

*10 West Broad Street, Suite 1800*
*Columbus, Ohio 43215-3485*
*(614) 466-8574*

**Dated: February 21, 2007**

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## ATTACHMENTS AND EXHIBITS


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| Attachment 1: | Resume of Martin G. Kushler, Ph.D. |
| Exhibit MGK-1: | Company Response to OCC Interrogatory Request No. 45 |
| Exhibit MGK-2: | *"Examining the Potential for Energy Efficiency to Help Address the Natural Gas Crisis in the Midwest"* |
| Exhibit MGK-3: | Company Response to OCC Document Request No. 4 |
| Exhibit MGK-4: | *"Responding to the Natural Gas Crisis: America's Best Natural Gas Energy Efficiency Programs"* |
| Exhibit MGK-5: | Company Responses to OCC Requests for Admissions Nos. 32-39 |
| Exhibit MGK-6: | Company Response to OCC Request for Production No. 5 |
| Exhibit MGK 7: | Governor elect Strickland's Executive Order 2007 – 02S, Coordinating Ohio Energy Policy and State Energy Utilization |

## I. IDENTIFICATION AND QUALIFICATIONS

**Q1: Please state your name and occupation.**

A1: My name is Martin Kushler, Ph.D. I am the Director of the Utilities Program for the American Council for an Energy-Efficient Economy (ACEEE). My business address is 1751 Brookshire Court, Williamston, Michigan, 48895.

**Q2: Please outline your educational background.**

A2: I received a B.A. in Sociology, an M.A. in Psychology, and a Ph.D. in Psychology with a specialty in community research and program evaluation, all from Michigan State University. My doctoral dissertation research was on educational programs to encourage energy conservation. My Ph.D. was awarded in 1981.

**Q3: Please briefly summarize your professional experience.**

A3: I have over 25 years of professional experience in research and evaluation regarding energy conservation and energy efficiency programs. For 8 years I was an Evaluation Manager for the State Energy Office of Michigan. For 10 years I was the Supervisor of Evaluation for the Michigan Public Service Commission. For the past 7 years I have been the Director of the Utilities Program for the American Council for an Energy-Efficient Economy (ACEEE), a non-profit organization dedicated to research and policy development in the area of energy efficiency.

During my career I have written over a dozen journal articles and scores of research reports and professional conference papers on the subject of energy efficiency research and program evaluation. I have also provided consulting services to a number of states regarding energy efficiency issues. During my years of work for the state of Michigan I testified as an expert witness in a number of regulatory cases before the Michigan Public Service Commission. I have included a detailed resume as Attachment 1 to this testimony.

**Q4: Have you testified previously in Ohio?**

A4: No.

## II. INTRODUCTION

**Q5: What is the purpose of your testimony in this proceeding?**

A5: I am appearing as a witness on behalf of the Office of the Ohio Consumers' Counsel ("OCC"). The purpose of my testimony is to explain why the January 12 Stipulation as a package does not benefit ratepayers and is not in the public interest of Vectren Energy Delivery of Ohio, Inc. ("Vectren" "VEDO" or "Company")VEDO ratepayers, and the state of Ohio. I base this conclusion on the fact that the stipulation provides only a very small energy efficiency program that will not provide sufficient benefits on the whole to customers. Additionally, the stipulation affords Vectren the tremendous benefits of a decoupling mechanism, paid for by residential and commercial customers. Given the

significant investment by Vectren's customers, in the form of the decoupling mechanism, there should be reasonable and commensurate benefits to customers. This is absent from the January 12 Stipulation.

My testimony will describe some of the benefits that can be provided by energy efficiency programs, and will recommend increased energy efficiency funding that is more appropriate given the benefits to the utility from decoupling. I will also suggest conditions the Commission may want to impose upon Vectren to reduce customer exposure to significant increases in costs that may result from the decoupling. Further I will address the scope and design of energy efficiency programs that would be desirable for VEDO's service territory and would benefit customers and be in the public interest.

## III. OVERVIEW OF JANUARY 12 STIPULATION

**Q6: What does the January 12 Stipulation provide for in terms of DSM?**

A6: The January 12 Stipulation presents a very limited DSM program which consists of a $2 million low income energy efficiency program funded by Vectren. While this may be a starting point for DSM, it certainly should not be the ending point. Moreover, it is my understanding that in return for the $1.3 million, net of tax investment[1] by VEDO, it stands to collect at a minimum, $7.2 million over the next two years from residential customers through the Sales Reconciliation Rider (SRR), or decoupling mechanism. These economics suggest to me that the

[1] See Company Response to OCC Interrogatory Request No. 45 (Exhibit MGK-1).

January 12 Stipulation as currently structured does not necessarily benefit ratepayers and may not be in the public interest.

**Q7: What energy efficiency program funding modifications would you propose to the January 12 Stipulation?**

A7: I would propose that VEDO be required to offer and fund, in part, an increased scope of natural gas energy efficiency beyond the $2 million low income weatherization if it is to receive the full benefits of the decoupling. The additional funding could be a combination of shareholder and customer funding. For example, funding at the level of the original stipulation that VEDO and OPAE agreed to, $4.67 million over 2 years, would be an adequate minimum base for introducing energy efficiency programs to Vectren's customers.

**Q8: Do you have an opinion on whether the decoupling mechanism can be used in this proceeding as part of a stipulation?**

A8: I am aware that the OCC has put forth legal arguments that suggest that a decoupling mechanism can not be approved as part of this proceeding. Otherwise, I have no opinion on the legality of a proposed decoupling mechanism in this proceeding.

**Q9: Why would you recommend modifying the January 12 Stipulation to at least include more natural gas efficiency programs?**

A9: In 2004, I directed a comprehensive study of the potential for energy efficiency to help relieve the adverse economic impacts of the dramatic increase in natural gas prices seen in the last few years, and to deliver other economic benefits, to states in the Midwest. This study documented the enormous economic costs being imposed on states in the Midwest from these high natural gas prices, and demonstrated how energy efficiency could produce dramatic cost savings and other economic benefits to those states. I have attached a copy of our report ("*Examining the Potential for Energy Efficiency to Help Address the Natural Gas Crisis in the Midwest*") as Exhibit MGK-2.

**Q10: What results did you observe for Ohio?**

A10: The citizens and businesses of Ohio have been hard hit by the dramatic natural gas market price increases that have occurred over the last few years. After a decade of very low and stable wholesale prices in the $2.00 to $3.00 range during the 1990's, wholesale prices have more than doubled, and are projected to never return to those lower levels. As Company witness Petitt noted: "the increase in customer bills due to rising gas costs is not a transitory phenomenon... the fundamentals of supply and demand lead to the reality that higher and more volatile prices are here to stay."[2] The implications of these high costs are particularly serious for Ohio, because the state is extremely dependent (over 87%)

[2] Direct Testimony of L. Douglas Petitt at 4 (March 9, 2006).

on natural gas imported from other states and countries. This results in a tremendous dollar drain on the state's economy to pay for imported natural gas. Ohio's only practical option for reducing that burden is to improve its energy efficiency and thereby import less natural gas.

**Q11: Can you quantify the amount of this dollar drain on Ohio for imported natural gas?**

A11. Yes. In 2002, when wholesale natural gas prices were still in the $3.00 plus range, the wholesale market costs of imported natural gas consumed in Ohio were approximately $2.4 billion. By 2006, at representative wholesale prices, that dollar drain is estimated to be over $5 billion a year. That is essentially the same as taking an extra $2.5 billion dollars away from the Ohio economy each year.

**Q12: How does a significant DSM portfolio of energy efficiency programs, as opposed to the limited program proposed in the January 12 Stipulation, help with this problem?**

A12. Energy efficiency is an excellent strategy for reducing this problem and helps in two fundamental ways. First, when energy efficiency reduces the amount of natural gas consumed by customers, that directly reduces the amount of natural gas that must be imported from out of state. Second, when dollars are spent on energy efficiency programs, those dollars go to pay for local program employees and to local retailers and contractors who sell and install the energy efficiency equipment, rather than flowing out of state to purchase more gas. The end result

is that energy efficiency programs produce additional net economic benefits in terms of total employment and payroll within the state.

**Q13: Did your study attempt to quantify those various economic benefits for Ohio?**

A13: Yes. Our ACEEE study, which looked at state-wide impacts, estimated that a moderately aggressive five year regional program of energy efficiency would result in total utility bill savings to Ohio customers of nearly $800 million per year by 2010, with cumulative savings over five years of nearly $3 billion. In addition, it would produce a net gain of approximately 5,300 jobs and $100 million in additional net annual employee compensation in Ohio by 2010. If the programs were continued, this would grow to nearly 9,600 net new jobs and $220 million in net additional annual employee compensation by 2020.[3]

**Q14: Why do you believe that having VEDO offer comprehensive natural gas energy efficiency programs would be in the best interests of VEDO ratepayers?**

A14: All the broad state economic benefits described above would be shared by VEDO customers in Ohio. In fact, the dollar drain for imported natural gas is even more pronounced for VEDO customers than for the statewide total, because VEDO's 2006 Long Term Forecast Report of Gas Demand, Gas Supply and Resources reveals that VEDO obtains all (100%) of its natural gas from outside the state.

[3] Exhibit MGK-2, Table 25 on page 42.

Operating energy efficiency programs would help keep more of those dollars circulating in the VEDO service territory, rather than being exported to pay for additional natural gas. Beyond these broader economic benefits, however, there is a more direct rationale for operating energy efficiency programs.

Simply stated, it costs far less to save a unit of natural gas than it does to purchase it from market suppliers. Proven experience from other states and utilities that operate natural gas energy efficiency programs shows that these programs can save natural gas at a cost of $2.00 to $3.00 per Mcf. That is less than half the current and projected wholesale market cost of natural gas. If VEDO makes energy efficiency programs part of its overall resource strategy for meeting the natural gas needs of its service territory, the total utility system costs for meeting those needs will be reduced. (This is in addition to the economic benefits of the energy efficiency programs investing in local homes and businesses in the VEDO service territory.)

Lastly, because VEDO does not have a history of operating significant energy efficiency programs, there should be a great amount of technical potential for improving the energy efficiency of homes and businesses in the VEDO service territory, and VEDO customers should have the opportunity to participate in energy efficiency programs that can help capture those savings.[4]

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[4] See Company Response to OCC Document Request No. 4, "Vectren DSM Action Plan: Final Report," prepared by Forefront Economics Inc. and H. Gil Peach and Associates, December 19, 2005 (Exhibit MGK-3).

## IV. FUNDING

**Q15: Are you aware that VEDO has indicated that it intends to file a rate application as early as the summer of 2007?**

A15: Yes. I believe this would be an additional forum to look at whether the level of ongoing funding, set in this proceeding, is appropriate. Moreover, in the context of a rate case proceeding, the revenue implications of the decoupling mechanism can be evaluated in its totality.

**Q16: What benefits do customers receive in exchange for funding energy efficiency programs?**

A16: Customers would receive the opportunities to participate in well-designed energy efficiency programs that could help them significantly reduce their natural gas bills by improving their energy efficiency. In addition, ratepayers in total would benefit by reducing the total cost of natural gas consumption by VEDO ratepayers. My organization's recent review of leading utility natural gas energy efficiency program results indicates that such programs typically have well over a 2 to 1 "benefit to cost ratio", and save natural gas at a cost of in the neighborhood of $2.50 per Mcf, which is less than half the forecasted wholesale cost of natural gas over the next 10 years. Therefore, for every $1 million invested in natural gas energy efficiency programs, more than $2 million in natural gas costs would be avoided for VEDO ratepayers over the life of these measures, plus all the local economic benefits discussed previously. Finally, energy efficiency programs help

reduce total demand for natural gas, which has the effect of putting downward pressure on natural gas market prices, which would benefit all ratepayers. Indeed, our 2004 Midwest study cited previously found that the dollar value of reduced natural gas market prices for all customers over the first ten years would exceed the dollar value of direct energy savings by the natural gas energy efficiency program participants.

## V. RECOMMENDATIONS

**Q17: What specific energy efficiency programs would you recommend for VEDO?**

A17: In general, I would recommend a good mix of programs, covering each customer sector that is helping to fund the programs. My organization recently conducted a nationwide review of programs and identified approximately 30 specific "exemplary" natural gas energy efficiency programs (see: "*Responding to the Natural Gas Crisis: America's Best Natural Gas Energy Efficiency Programs*", attached as Exhibit MGK-4). Many of these programs should be suitable for VEDO. However, rather than recommend specific individual programs in this testimony, I would recommend that the existing collaborative process established by the September 13, 2006 Commission Order meet to design and jointly agree to a portfolio of energy efficiency programs that would be funded. The programs will have the best chance of success if they have good conceptual support from the concerned parties.

**Q18: What is your opinion about the use of "decoupling" as a mechanism to encourage utility energy efficiency programs?**

A18: Decoupling, whereby utility revenues are periodically "trued up" to adjust for actual sales being above or below their forecasted levels, can be an effective way to remove the inherent disincentive utilities face when contemplating the prospect of helping their customers to use less energy by adopting energy efficiency measures.

**Q19: In your opinion, is it in the public interest to grant utilities a ratemaking decoupling mechanism if there is only a very limited energy efficiency programs for customers?**

A19: From a ratepayer advocacy perspective, decoupling can be seen as a policy that provides utilities with some "downside protection" against declining overall sales, which can be particularly helpful to natural gas utilities due to the widespread occurrence of stagnant or declining sales in recent years. In some cases, this can be an especially powerful and beneficial tool for utilities and can reduce or eliminate the risks associated with declining sales. I understand that the decoupling represents a break from traditional regulation in Ohio, as Staff Witness Puican testified, and Vectren executive Niel Ellerbrook admits.[5]

[5] See Attached Exhibit MGK-5, Company Responses to OCC Request for Admissions Nos. 32-39, pertaining to Niel Ellerbrook's statements.

From the customers' perspective the decoupling alone will cost, at a minimum, $7.2 million over the next two years.[6] I also understand there is no cap on the recovery of the decoupling revenues from customers over the next two years. If the utility is to benefit from the decoupling, there should be a significant commitment by the utility that benefits customers. Therefore, I would always recommend that any approval of decoupling be combined with a requirement for substantial offering and funding of effective customer energy efficiency programs. This insures that customers, who are paying for the decoupling, will benefit from the ability to participate in energy efficiency programs and customers in general will benefit by reducing the total costs of natural gas consumption.

The two most prominent state examples of successful implementation of decoupling, Oregon and California, have featured exactly that kind of direct combination of decoupling and aggressive energy efficiency funding.

**Q20: Under what conditions should the Commission consider approving a decoupling mechanism?**

**A20:** Given the significant investment by residential customers that accompany any decoupling mechanism, there should be a reasonable and productive benefit to ratepayers. This is absent from the January 12 Stipulation. I recommend that if the Commission adopts decoupling as proposed by the January 12 Stipulation, not withstanding OCC's legal arguments in this case, the trade off could be in any or all of the following areas:

[6] Company Witness Ulrey Rebuttal Testimony at 4 (April 19, 2006). See also Exhibit MGK-6, Company Response to OCC Request for Production No. 5.

- Increased company funding over the $2 million in the January 12 stipulation, to support **vigorous** energy efficiency programs that can help customers reduce their energy costs.

- A cap on the amount of decoupling generated revenues the Company can collect.

- An adjustment on VEDO's rate of return to account for the Company's reduced revenue shortfall risk.

**Q21. In your opinion does the January 12 Stipulation comport with Ohio Governor Strickland's recent executive order concerning energy efficiency?**

A21: No. The minimal level of energy efficiency funding in the January 12 stipulation is contrary to the recent policy direction regarding energy efficiency that is contained in Governor elect Strickland's Executive Order 2007 – 02S, Coordinating Ohio Energy Policy and State Energy Utilization.[7] The Order sets forth a number of actions that state agencies, commissions, and boards are required to undertake to reduce and improve the energy consumption of the state. The Order clearly states that "it is the responsibility of state government to lead by example in reducing energy consumption in this era of steep energy prices, mounting environmental concerns, and persistent energy security risk."[8] It further states that "by improving energy efficiency and adopting advanced energy utilization technologies, we can make the most of our existing energy resources

[7] Issued on January 17, 2007 (Exhibit MGK-7).

[8] Id at 2.

and also stimulate activity and investment in the energy efficiency services sector."[9]

**Q22: Please summarize your recommendations in this case.**

A22: I recommend that the Commission modify the January 12 Stipulation and approve an order for VEDO funding for energy efficiency programs, in the amount of at least $4.65 million, the level of the original stipulation that all the parties originally agreed to. I also recommend that the Commission, if it is to approve decoupling in this proceeding, over OCC's objections, consider a cap on the decoupling generated revenues the company can collect, and consider an adjustment to VEDO's rate of return to account for the Company's reduced revenue shortfall risk. I also recommend that the Commission provide oversight and approval for this process and for the resulting program plans, as well as provide for monitoring and evaluation of the programs over the remaining time period.

**Q23: Does that conclude your testimony?**

A23: Yes.

[9] Id at 2.

# MARTIN G. KUSHLER

## EDUCATIONAL INFORMATION:

Michigan State University, Ph.D., 1981.
Major: Community Psychology. Minor: Research and Program Evaluation.
Graduate program emphasizing the development, implementation and evaluation of innovative community service programs. Primary area of research: evaluating alternative energy conservation education methods.
Graduated with high honors. GPA: 4.0/4.0

## POSITIONS HELD:

1998- Director, Utilities Program, American Council for an Energy Efficient Economy (ACEEE).
Responsible for directing a wide variety of national, regional and state-level research and policy analysis projects for ACEEE, in the area of energy efficiency and public benefit programs and policies, including directing several national studies of energy efficiency program experience in all sectors. Have compiled extensive information on state legislation and regulatory actions regarding energy efficiency policies and programs. Also responsible for presenting research results in a variety of national and state forums, and for providing technical assistance on the design and implementation of energy efficiency policies and programs to policymakers, regulators, and advocate groups at the federal and state level.

1987-1997 Supervisor, Evaluation Section, Michigan Public Service Commission (MPSC).
Responsible for planning and coordinating all program evaluation activities for the MPSC, including both government and utility funded energy programs. Duties included supervising the design and implementation of monitoring systems and evaluation plans for all energy conservation programs operated by the seven major electric and gas utilities regulated by the MPSC. Responsible for designing overall research plans; developing data gathering instruments (including reliability and validity testing); supervising mail, telephone and person-to-person surveys; and performing data analyses and interpretation, including applying benefit-cost analyses. Participated in writing R.F.P.'s for state issued grants and contracts; in proposal review committees; and in project planning teams. Assisted in the design of direct service programs in all sectors. Duties also included establishing and serving as the Staff representative on several multi-party evaluation collaborative oversight groups.

1981-1986 Manager of Evaluation, Michigan Energy Administration (MEA).
Responsible for designing and conducting evaluations of numerous programs, including a variety of education programs, media promotional campaigns, public and private sector workshops and informational campaigns, and other measures mandated by state and federal legislation. Project Manager for the statewide evaluation of the first two major utility conservation programs in Michigan: The Residential Conservation Service (RCS) home energy audit program, and a special ceiling insulation program for low-income customers. Functioned as an interagency liaison from the Energy Administration to the Michigan Public Service Commission (MPSC).

Additional duties included testifying as an expert witness in MPSC utility cost recovery hearings and making presentations regarding RCS evaluation methodology to organizations such as the National Governors Association and the U.S. Department of Energy.

Also responsible for designing and conducting a series of comprehensive evaluation projects, jointly funded by the Michigan Department of Labor and MEA, focusing on the Low-Income Home Weatherization Program. Responsible for developing evaluation plans to meet management information needs and for consulting with program management regarding the redesign and improvement of program services. Duties also included preparing materials and data summaries for the Governor's Weatherization Monitoring Committee and the House/Senate Weatherization Oversight Committee. Responsible for writing all project evaluation reports and for presenting results to state program management as well as to various interested regional and national audiences.

**OTHER PERTINENT EXPERIENCE**

In addition to the specific responsibilities of the above positions, have maintained a close familiarity and active involvement with energy efficiency research and policy nationwide, through activities such as the following:

X Being a member of the Planning Committee of the International Energy Program Evaluation Conference since 1989, and serving as President of the Board of Directors from 1996-2001.

X Attending and presenting professional papers at every one of the biennial ACEEE Summer Study on Energy Efficiency in Buildings since 1982. Co-chair of the ANational and Regional Conservation Programs@ panel at the 1988 conference. Co-chair of the AGovernmental Programs@ panel for the 1990 conference. Lead author of invited paper on the future of evaluation at the 1992 conference. Co-chair of the AUtilities@ Panel for the 2002 conference.

X Providing independent consultant services to numerous states and the federal government, assessing various aspects of regulatory policy regarding energy efficiency.

X Providing technical assistance to policy makers in a variety of forums, including: legislative proceedings, regulatory hearings, technical conferences, an invited address to the National Governors Association, and invited testimony before Congress.

**PUBLICATIONS**:

Have authored or co-authored two book chapters, over a dozen journal articles, and scores of professional papers and technical reports on a variety of research topics. Major focus areas have been methods of research and program evaluation and the application of evaluation to energy efficiency programs.

**BEFORE**

**THE PUBLIC UTILITIES COMMISSION OF OHIO**

| | | |
|---|---|---|
| In the Matter of the Application of Vectren Energy Delivery of Ohio, Inc. for Approval, Pursuant to Revised Code Section 4929.11, of Tariffs to Recover Conservation Expenses and Decoupling Revenues Pursuant to Automatic Adjustment Mechanisms and for Such Accounting Authority as May be Required to Defer Such Expenses and Revenues for Future Recovery through Such Adjustment Mechanisms. | ) | Case No. 05-1444-GA-UNC |

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**RESPONSE TO INTERROGATORIES AND REQUESTS FOR PRODUCTION OF DOCUMENTS PROPOUNDED TO VECTREN ENERGY DELIVERY OF OHIO, INC.**
**BY**
**THE OFFICE OF THE OHIO CONSUMERS' COUNSEL**
**SECOND SET**

**(February 13, 2007)**

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Pursuant to Ohio Admin. Code §§ 4901:1-19, 4901:1-20 and 4901:1-22, Vectren Energy Delivery of Ohio (VEDO or the Company) submits its responses to the Ohio Consumers' Counsel's Interrogatories, Requests for Production of Documents, and Requests for Admissions, Second Set.

## GENERAL OBJECTIONS

**GENERAL OBJECTIONS COMMON TO ALL INTERROGATORIES AND REQUESTS FOR PRODUCTION OF DOCUMENTS:**

45. What is the net of tax cost to the Company of making a $2 million contribution to fund low income energy efficiency as committed to under the Amended Stipulation and Recommendation?

**RESPONSE:** **AUTHOR: Jerry Benkert**

**The net of tax cost is $1.3 million.**

# Examining the Potential for Energy Efficiency To Help Address the Natural Gas Crisis in the Midwest

Martin Kushler, Ph.D., Dan York, Ph.D., and Patti Witte, M.A.

January 2005

Report Number U051


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## ACKNOWLEDGMENTS

The authors gratefully acknowledge the funding for this work provided by the Energy Foundation, Illinois Department of Commerce and Economic Opportunity, Minnesota Department of Commerce, Ohio Department of Development, Ohio Office of the Consumers' Counsel, Wisconsin Department of Administration, and Wisconsin Energy Conservation Corporation.

The authors also thank their fellow ACEEE staff for their valuable assistance on this project, including Neal Elliott and Anna Shipley for their extensive analytical work underlying much of the technical aspects of this study, and Renee Nida for editing and producing the final report. We also wish to thank our technical modeling consultants, Energy and Environmental Analysis, Inc. and MRG Associates.

## EXECUTIVE SUMMARY

The natural gas cost crisis is real, is projected to worsen, and presents a particularly crucial concern for states in the Midwest.[1] For a variety of reasons, natural gas is an especially important commodity for the Midwest region. Two factors are particularly noteworthy. First, compared to other areas of the nation, the Midwest has a large concentration of heavy industries that are very reliant on natural gas, for both fuel and feedstock purposes. Thus natural gas price increases have a disproportionate impact on the economy of this region.

Second, the Midwest has a very high saturation of natural gas fueled space heating. Due to the high heating load, average residential natural gas bills in the Midwest are nearly four times as much as the national average. Moreover, in the Midwest climate zone, space heating can literally be a life and death issue. Thus natural gas price increases are not only a painful economic blow in the Midwest, they can be a significant health and safety concern as well.

As a result of these factors, the Midwest bears a very heavy cost burden for natural gas. In 2002, before the dramatic increases in natural gas prices, customers in the Midwest were spending over $26 billion on natural gas utility bills. Since then, wholesale natural gas prices have doubled, and are projected to reach levels triple those of the previous decade in the next couple of years. By the time these wholesale price increases flow through into customer rates, natural gas utility bills for the region are projected to reach nearly $40 billion by 2006.

This kind of dramatic cost increase would be bad enough, but it presents a particularly serious financial blow to the Midwest because the region is almost totally dependent on natural gas supplies imported from other states and countries (92 percent of total natural gas consumed in the Midwest is imported from outside the region). This results in a huge dollar drain on the regional economy. (Table 6 on page 13 of the main body of this report shows the extent of the dollar drain for each individual state and for the region as a whole.)

In recognition of these circumstances, and building upon a highly successful national study (Elliott et al. 2003), ACEEE launched the current study to examine the potential for energy efficiency to help address the natural gas crisis in the Midwest.

The results of this study are very encouraging. The data suggest that a modestly aggressive, but pragmatically achievable, energy efficiency campaign (achieving on the order of a 5 percent reduction in both electricity and natural gas customer use over 5 years) could produce tens of billions of dollars in net cost savings for residential, commercial, and industrial customers in the Midwest. These net cost savings would result from the combined effects of electric and natural gas end-use efficiency, as well as the effects of those demand reductions on lowering natural gas market prices for all consumers.

[1] For the purposes of this study, we define the Midwest region as containing eight states: Illinois, Indiana, Iowa, Michigan, Minnesota, Missouri, Ohio, and Wisconsin.

By 2010, customers in the Midwest states could be achieving annual cost savings of $2 billion on their natural gas bills.[2] They could also be saving at least another $2 billion per year on electricity bills.[3] In addition to these direct bill savings, the effects of the energy efficiency policies and programs are projected to produce over 30,000 net new jobs and $750 million in net additional annual employee compensation in the region by 2010. These energy savings and economic benefits would continue to grow correspondingly over longer time periods if the energy efficiency policies and programs were continued.

Of course, achieving these results would require a significant effort in terms of new policies and additional funding for energy efficiency programs. We estimate that the costs to achieve these savings would be about one-third to one-half of the dollar value of the lifetime energy savings, and might require average program investments across the eight states of perhaps $40 million per year per state for natural gas energy efficiency programs and $100 million per year per state for electric energy efficiency programs. However, the resulting economic benefits to the states and the region would be several times larger than the costs. By the end of a 5-year energy efficiency policy and program effort, customers in the Midwest region would be realizing direct savings of over $4 billion per year,[4] in addition to the indirect jobs and economic benefits described above.

Most importantly, the price of doing nothing in the face of this crisis will be enormous, both in terms of the overall economy and the quality of life in the region. Under a "business-as-usual" scenario, by 2006 the Midwest region will be leaking over $29 billion per year from its economy to pay for imported natural gas. These circumstances call for strong policy action.

[2] Approximately one-half of those savings would be due to the direct energy efficiency effects on lower participant bills, and one-half would be due to the effect of reduced overall consumption on lowering market prices for natural gas for all customers.

[3] Electricity energy efficiency is an important part of an overall strategy to save natural gas, due to the large number of natural gas fired generating plants built in the last few years.

[4] The body of this report provides extensive data on the natural gas, electricity, and dollar cost savings by state and for the region as a whole.

## BACKGROUND

From the late 1980's until the early 2000's, the U.S. enjoyed over a dozen years of low and stable wholesale natural gas prices in the range of $2 to $3 per MMBtu.[5] While this was very helpful for the U.S. economy during that time period, it set in motion two trends that are contributing to the current natural gas crisis.

First, this prolonged period of low natural gas prices led many states and utilities to scale back and/or abandon their natural gas energy efficiency programs. Many energy efficiency programs were only marginally cost-effective with wholesale natural gas costing only $2 per MMBtu, and there was no perceived policy imperative to conserve natural gas. Instead, the emphasis was on electricity energy efficiency programs during the 1990's.[6] The end result was that by the early 2000's, the United States had endured nearly a decade of fairly minimal natural gas energy efficiency efforts, an oversight that added to the current natural gas problems we face.

Second, and much more significant, has been the effect of a massive shift toward natural gas as the fuel of choice for electricity generation. A convergence of factors led to this situation (including low capital costs for natural gas fueled power plants and environmental advantages for natural gas), but the movement was fundamentally enabled by the long period of very cheap natural gas prices. The net result is that of the 200,000 MW of new power plant capacity added in North America over the past 5 years, over 90 percent is fueled by natural gas (CERA 2004). This has had a profound effect on prices in the natural gas market, in terms of overall pressure to increase prices due to higher demand and also by eliminating the historical pattern of low natural gas demand (and consequently lower prices) during the summer months[7] (due to the heavy use of natural gas generation to meet summer peak electricity demand).[8]

### The Current Natural Gas Crisis

Driven in part by these factors, the United States now faces what can truly be called a natural gas crisis. Over the past 3 years, natural gas wholesale market prices more than doubled, and recent forecasts[9] project that average wholesale prices may reach $6.50 to $7.00 per MMBtu or more over the next few years—nearly three times the levels of the previous decade.[10]

---

[5] One MMBtu is one million Btu, or approximately 1,000 cubic feet (1 Mcf) of natural gas.

[6] This is somewhat ironic, since it was natural gas and heating fuel oriented programs operated by gas utilities in the late 1970's that really began the era of utility energy conservation programs.

[7] Traditionally, the summer season has been a time when many utilities, especially in the Midwest, would acquire cheap natural gas to put into storage for use in the winter.

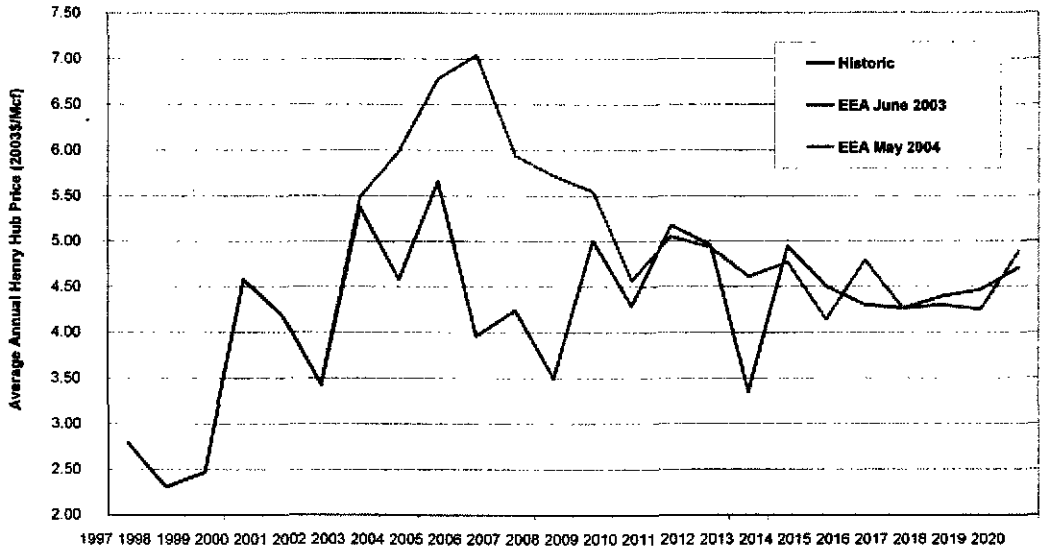
[8] Moreover, much of this additional generating capacity has been low-efficiency single-cycle turbine peaking plants, with operating efficiencies in the very low 17–20% range.

[9] CERA (2004) and EEA (2004); the latter was prepared for this project.

[10] *In fact, wholesale spot market prices for the winter of 2004 have already reached $9 per MMBtu.*

Figure 1 presents a set of two forecasts of natural gas wholesale market prices produced by our lead modeling consultant in this project.[11] The lower line represents their forecast from 2003. The upper line represents their updated forecast from mid-2004, reflecting new and more pessimistic information about domestic production response and the timing and eventual cost of expanded liquefied natural gas (LNG) imports.

**Figure 1. Forecasts of Natural Gas Wholesale Prices**




Source: EEA 2004

As can be seen, the outlook for the next few years is for extremely high natural gas prices, then only declining to levels of $4.00 to $5.00 per MMBtu by 2010 (prices that are still double the historical experience of the 1990's). Moreover, even that post-2010 decline has some substantial risk[12] attached to it, because it is heavily dependent upon the large projected expansion of LNG capacity developing without further delays, accidents, or cost increases.[13]

Despite the current and projected high natural gas prices, however, the prognosis on the supply side is bleak. We will not be able to "drill our way out" of this crisis. Industry experts concede that even with the expansion of gas production efforts, domestic natural gas production is on a declining path, principally due to the depletion of our major producing areas in the lower-48 states. To quote one leading industry group:

[11] Energy and Environmental Analysis, Inc. is a prominent energy industry analysis firm that does natural gas market modeling for the National Petroleum Council, among other clients.

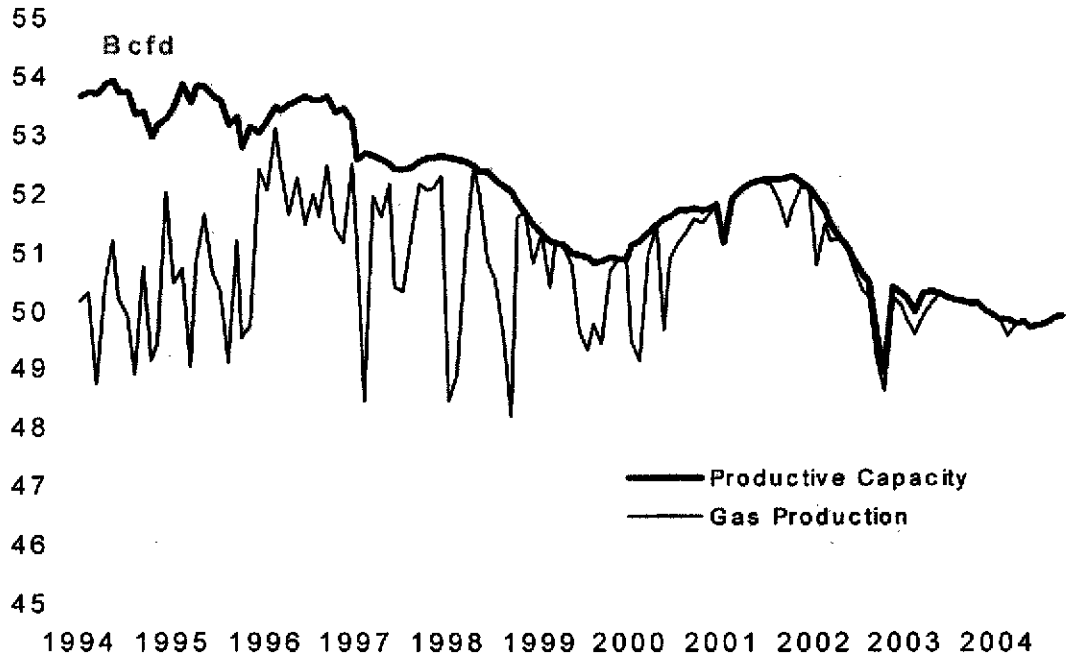
[12] Indeed, a very recent EEA forecast, produced after the analyses for this report were completed, shows wholesale natural gas prices for the 2010 to 2016 time period staying 50 cents to $1.00 per Mcf above the EEA May 2004 forecast shown in Figure 1. (See Appendix A.)

[13] Although the LNG industry has generally had a good safety record, the extremely volatile nature of the product makes LNG facilities potentially hazardous and their construction controversial. In January 2004, an explosion at an Algerian LNG facility killed nearly 30 people and injured scores more (Lindquist 2004).

> *Despite historically high natural gas prices and near-record levels of on-shore U.S. gas drilling activity, gas production in the United States today continues to fall, and CERA expects ongoing declines of U.S. gas production despite an outlook for continued strong drilling levels.* (CERA 2004).

This situation is most vividly illustrated in Figure 2, which is a graph of U.S. ("lower-48") natural gas production capacity versus actual gas production, from 1994 to the present.

**Figure 2. Lower-48 Dry Gas Production versus Dry Gas Productive Capacity**




Source: EEA 2004

Two aspects of this graph are of critical importance. First, note the overall declining path of U.S. domestic (lower-48) production capacity over time. Despite some expected additions to supply (e.g., in the Rocky Mountain region), this overall declining pattern is expected to continue (due to the continuing depletion of our major traditional production areas).

Second, note how over the past few years the "cushion" between productive capacity and actual production has virtually disappeared. The gas industry is essentially producing at full capacity, with no reserve available to help dampen prices. This has been a major contributing factor in the high overall cost and extreme volatility in the natural gas markets over the last couple years.

Not surprisingly, the natural gas market situation has set off alarm bells among consumer groups and particularly among natural gas consuming industries. These extremely high market prices can be devastating to industries that rely heavily on natural gas for energy

and/or feedstock purposes. What is somewhat surprising is the extent to which prominent industry players who have not historically been supporters of energy efficiency have rallied behind aggressive energy efficiency policies as the number one priority for action. Fueled in part by a prominent ACEEE study illuminating the very beneficial effect that energy efficiency would have on driving down market gas prices (discussed in the next section), there have been some strong statements of support for energy efficiency. Here are a few key examples:

> *Policies most likely to have an immediate impact are actions to promote consumer conservation and energy efficiency.*
>
> — National Petroleum Council (2003)

> *Based on the Department's analysis, we concur...that over the next 12 to 18 months there are only limited opportunities to increase supply, and that, therefore, the emphasis must be on conservation, energy efficiency, and fuel switching.*
>
> — U.S. Department of Energy Secretary Abraham (2003)

> *Specifically, we need a concerted national effort to promote greater energy efficiency....*
>
> — Chemical Manufacturer Coalition (2004)—the 11 largest U.S. chemical manufacturers

These quotations are particularly significant because they come from sectors of the economy (the National Petroleum Council, large industry, etc.) that have traditionally not been noted as supporters of government involvement in energy efficiency policy (and, indeed, have sometimes been vocal opponents). However, the natural gas situation is dire enough that even big industry is recommending energy efficiency as a top priority.

Unfortunately, this strong conceptual support for aggressive energy efficiency policies has not yet translated into any concrete federal action or funding to increase energy efficiency. As has been the case in recent years, it has fallen upon the states to demonstrate leadership in this area.

**ACEEE's National Natural Gas Market Study**

In response to accelerating natural gas market problems in 2003, ACEEE[14] launched a national study to attempt to understand the effects that reductions in natural gas demand from energy efficiency and renewable energy could have on reducing natural gas market prices in the near- and mid-term time periods. ACEEE hired Energy and Environmental Analysis, Inc. and had them model the effects of an aggressive but achievable level of reduction in natural

[14] The project was supported by funding from the Energy Foundation.

gas consumption that could be accomplished via existing energy efficiency and renewable energy technologies and proven program delivery mechanisms.

The results of the study were quite noteworthy. Because of the very tight and volatile natural gas market, a reduction of about 1 percent per year in total gas demand could result in wholesale natural gas price reductions of 10 to 20 percent. A 5-year total national investment of approximately $30 billion in natural gas and electricity[15] saving technologies could produce over $100 billion dollars in savings for residential, commercial, and industrial customers (about half due to direct savings from customers participating in the energy efficiency programs and about half from the reduced wholesale market prices for natural gas). For full details on the study methodology and results, please refer to Elliott et al. (2003).

[15] Electric energy efficiency is an important part of the package because of the huge use of natural gas for electric generation. Reductions in electricity use, especially during summer months, can have a large effect on reducing total natural gas consumption.

## PURPOSE OF THIS PROJECT

The purpose of this project is to build upon the central finding from ACEEE's national study (i.e., that achieving relatively small reductions in natural gas demand could achieve large dollar savings for customers) and investigate the potential for capturing such benefits in the Midwest.

In particular, there are two primary areas of focus:

- To examine the potential for economic benefits for the Midwest from reducing natural gas consumption through energy efficiency, both in terms of direct energy savings from energy efficiency programs to participants as well as cost savings from reduced market prices for natural gas.
- To identify existing examples from around the United States of exemplary natural gas focused energy efficiency programs and effective legislative/regulatory policies to facilitate the use of such energy efficiency programs.[16]

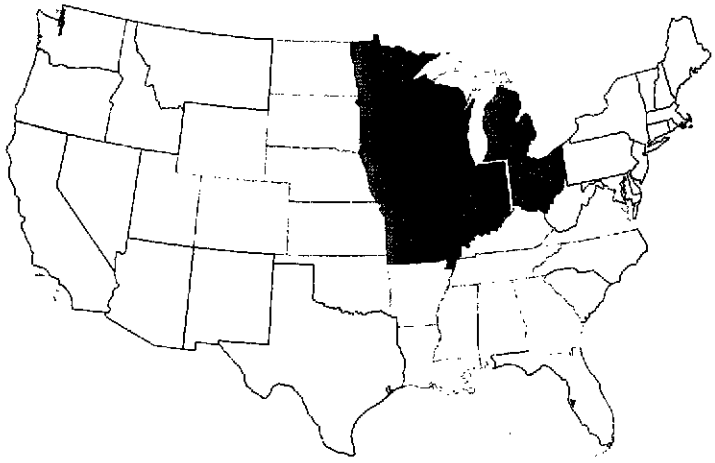
The remainder of the text of this report presents the results for the first of those areas of focus, regarding the analyses of the effects of enhanced energy efficiency on economic benefits in the Midwest. Appendix A shows a recent natural gas price forecast. Then Appendices B through D, respectively, present: information on effective legislative/regulatory policies that have been used in various states to produce natural gas energy efficiency programs; examples of exemplary natural gas energy efficiency programs from around the country; and examples of exemplary electricity energy efficiency programs that are focused on saving electricity during times when natural gas fired generation of electricity is most likely.

[16] As explained above, electricity energy efficiency is an important part of achieving overall reductions in natural gas consumption. However, because electric efficiency programs have received more extensive attention over the past decade, this report puts relatively more emphasis on natural gas efficiency policies and programs.

## DESCRIPTION OF THE MIDWEST REGION

For the purposes of this study, we define the Midwest region as containing eight states: Illinois, Indiana, Iowa, Michigan, Minnesota, Missouri, Ohio, and Wisconsin (see Figure 3 below).

**Figure 3. States in the Midwest Natural Gas Study**



For a variety of reasons, natural gas is an especially important commodity for the Midwest region. Two factors are particularly noteworthy. First, compared to other areas of the nation, the Midwest has a large concentration of heavy industries that are very reliant on natural gas, both for fuel and for feedstock purposes.[17] Thus natural gas price increases have a disproportionate impact on the economy of this region.

Second, the Midwest has a very high saturation of natural gas fueled space heating. Due to a high heating load, average residential natural gas bills in the Midwest are 3.6 times as much as the national average (Elliott et al. 2003). Moreover, in the Midwest climate zone, space heating can literally be a life and death issue.[18] Thus natural gas price increases are not only a painful economic blow in the Midwest, they can be a significant health and safety concern as well.

[17] For example, in the production of chemicals, fertilizer, and other products requiring natural gas as an input material.

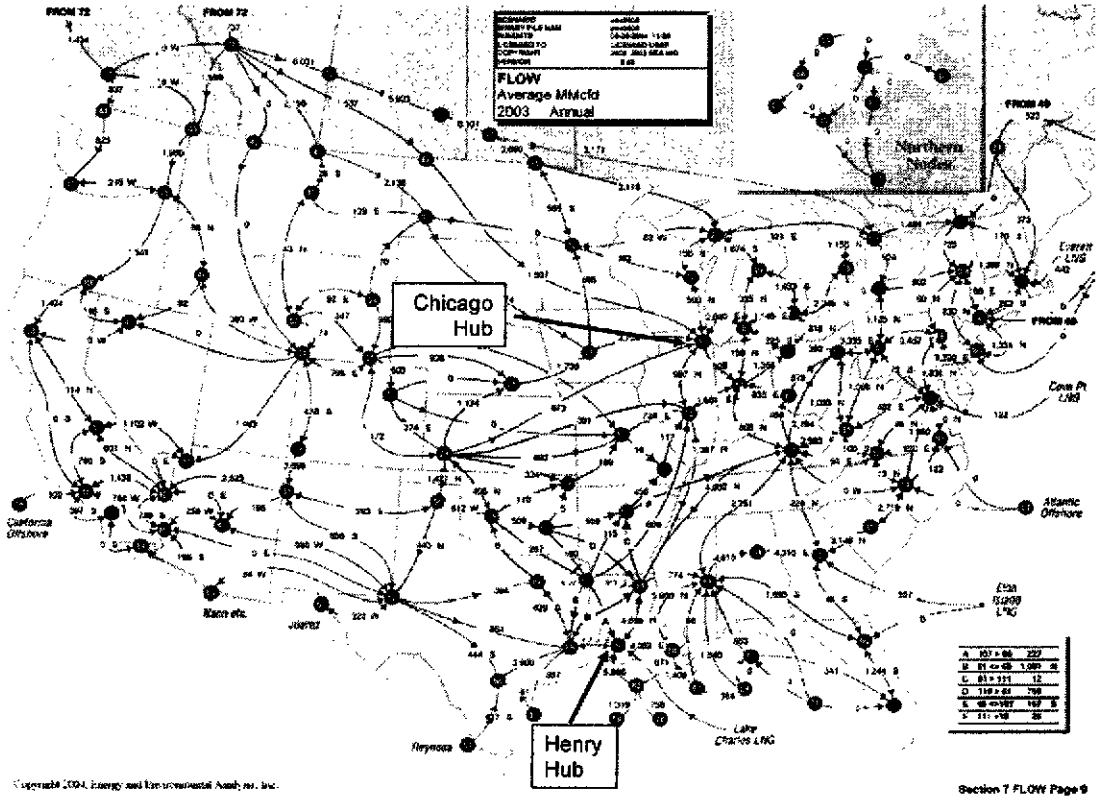
[18] Virtually every Midwestern city will be familiar with tragic cases of households that perished due to fires or asphyxiation from using unsafe alternate heating devices when they could not afford to maintain their utility service.

## The Midwest Natural Gas Market

In order to understand the context for this study, it is useful to have some brief descriptive information about the wholesale gas market serving the Midwest region. The North American natural gas market is a fully integrated system of natural gas pipelines that connect producing regions in the lower-48 U.S. states and Canada to consumers throughout the continental United States and Canada (see Figure 4). Gas storage facilities in both the producing and consuming regions balance the seasonal demand fluctuations that have characterized this market for most of the past half century. Currently, only small quantities of gas are imported into the North American market in the form of liquefied natural gas, which accounts for 2.2 percent of supplies (EEA 2004).

The market price for natural gas is by convention set at the Henry Hub (which is a physical location in southern Louisiana where a number of pipelines from the Gulf of Mexico producing region originate as shown in Figure 4). Futures and spot market contracts for delivery of gas are traded on the New York Mercantile Exchange (NYMEX), with regional wholesale prices set at key hubs where pipelines originate or come together. These prices are set relative to the Henry Hub price with adders for transportation and congestion. For the Midwest, the Chicago hub is used as the reference for wholesale prices.

**Figure 4. Map of Natural Gas Pipelines in North America**

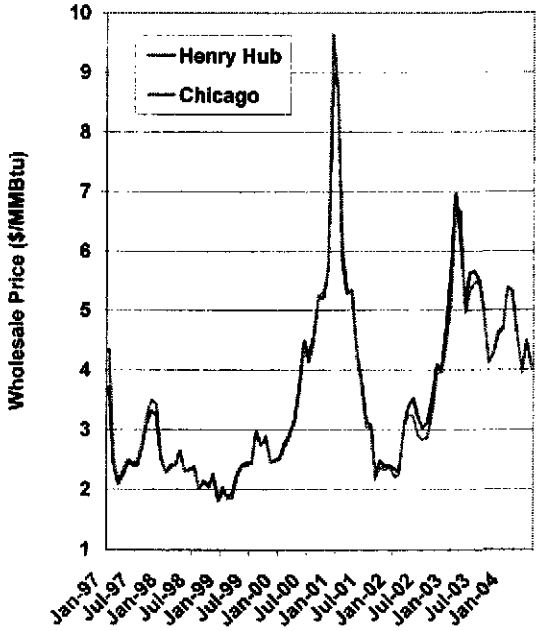


The wholesale price of natural gas is driven by a number of factors:

- *Fundamentals:* Gas prices are determined by the balance of supply and demand in the marketplace. In regional markets, short-term imbalances created by weather-related demand, transmission congestion, or supply disruptions can cause local prices to increase until the market comes back into balance.
- *Technical factors*: Trading momentum, speculator activities, etc., which tend to increase price volatility.
- *Market imperfections and manipulation:* While this has had some impact in certain specific cases, overall it is less than some of the public thinks. The North American natural gas market is generally regarded as very competitive, and so is difficult to move or manipulate over a long-term timeframe, though opportunities exist to exploit tight markets in a very short-term timeframe, usually manifested as increased price volatility.

Gas demand is driven by weather, electricity demand (because of the significant share of electricity generated by gas, particularly on the margin), and economic activity. Chicago Hub prices track Henry Hub prices closely because of the robust network of pipelines that connect the Midwest to multiple producing regions in the South, West, and Canada, with little if any congestion (see Figure 5). As a result, the Midwest typically does not see the winter price spikes seen in other parts of the country such as the Northeast and California where demand outstrips the ability to deliver gas.

**Figure 5. Comparison of Historical Average Monthly Natural Gas Prices at the Henry and Chicago Hubs**




Source: EEA 2004

## Midwest Natural Gas Consumption and Costs

Not surprisingly, the Midwest consumes an enormous amount of natural gas. In the most recent year prior to the onset of the gas crisis (2002), total end-use customer consumption (residential, commercial, and industrial customers) was over 4.1 billion Mcf. At prevailing gas rates, the total annual cost of that consumption in the region was $26.6 billion (see Tables 1 and 2).

If the natural gas consumption for electricity generation in the region is added in, the total gas consumption in the region for 2002 was over 4.5 billion Mcf, and the total cost burden (assuming the electric generators buy their gas at prevailing wholesale prices) was approximately $28 billion (also presented in Tables 1 and 2).

**Table 1. 2002 Baseline Natural Gas Consumption**
(in MMcf)

| State | Residential | Commercial | Industrial | Subtotal | Power Generation | Total |
|---|---|---|---|---|---|---|
| IL | 459,243 | 204,549 | 290,479 | 954,271 | 81,867 | 1,036,138 |
| IN | 156,808 | 82,426 | 259,059 | 498,293 | 35,104 | 533,397 |
| IA | 71,545 | 46,406 | 92,223 | 210,174 | 5,250 | 215,424 |
| MI | 368,720 | 175,055 | 236,133 | 779,908 | 146,133 | 926,041 |
| MN | 135,211 | 104,386 | 95,671 | 335,268 | 13,181 | 348,449 |
| MO | 114,184 | 61,896 | 66,593 | 242,673 | 29,911 | 272,584 |
| OH | 321,278 | 162,764 | 307,748 | 791,790 | 22,722 | 814,512 |
| WI | 137,235 | 85,810 | 137,706 | 360,751 | 20,541 | 381,292 |
| Total Region | 1,764,224 | 923,292 | 1,485,612 | 4,173,128 | 354,709 | 4,527,837 |

**Table 2. 2002 Baseline Natural Gas Costs**
(Millions $)

| State | Residential | Commercial | Industrial | Subtotal | Power Generation | Total |
|---|---|---|---|---|---|---|
| IL | $3,021 | $1,564 | $1,481 | $6,065 | $296 | $6,361 |
| IN | $1,231 | $577 | $1,447 | $3,255 | $138 | $3,393 |
| IA | $519 | $262 | $526 | $1,307 | $21 | $1,328 |
| MI | $2,387 | $1,071 | $1,170 | $4,628 | $449 | $5,077 |
| MN | $918 | $596 | $409 | $1,923 | $53 | $1,976 |
| MO | $934 | $466 | $411 | $1,810 | $105 | $1,915 |
| OH | $2,502 | $1,076 | $1,785 | $5,363 | $120 | $5,483 |
| WI | $1,034 | $537 | $735 | $2,307 | $80 | $2,387 |
| Total Region | $12,545 | $6,150 | $7,962 | $26,657 | $1,263 | $27,920 |

Under the "business-as-usual" baseline scenario, total Midwest natural gas consumption in 2006 would stay about the same as 2002 (see Table 3), but total costs would be far higher due to the projected higher costs of gas ($39 billion for the residential, commercial, and industrial sectors combined, $41 billion if the gas used for electricity generation is added in—see Table 4). These costs represent a nearly 50 percent increase over their 2002 levels.

**Table 3. Projected 2006 Natural Gas Consumption**
Base Case Scenario
(in MMcf)

| State | Residential | Commercial | Industrial | Subtotal | Power Generation | Total |
|---|---|---|---|---|---|---|
| IL | 480,925 | 202,038 | 265,428 | 948,390 | 41,152 | 989,542 |
| IN | 168,446 | 86,025 | 242,955 | 497,426 | 20,149 | 517,575 |
| IA | 75,585 | 45,703 | 88,229 | 209,517 | 6,101 | 215,618 |
| MI | 382,998 | 179,134 | 223,351 | 785,482 | 98,218 | 883,700 |
| MN | 140,684 | 104,835 | 89,080 | 334,599 | 14,163 | 348,762 |
| MO | 113,994 | 59,735 | 61,082 | 234,812 | 18,841 | 253,653 |
| OH | 339,939 | 173,545 | 282,007 | 795,490 | 8,991 | 804,482 |
| WI | 144,200 | 86,157 | 136,139 | 366,495 | 20,581 | 387,076 |
| Total Region | 1,846,771 | 937,171 | 1,388,271 | 4,172,212 | 228,196 | 4,400,409 |

**Table 4. Projected 2006 Natural Gas Expenditures**
Base Case Scenario
(in Millions)

| State | Residential | Commercial | Industrial | Subtotal | Power Generation | Total |
|---|---|---|---|---|---|---|
| IL | $4,892 | $1,956 | $2,306 | $9,154 | $313 | $9,467 |
| IN | $1,896 | $803 | $1,917 | $4,616 | $155 | $4,772 |
| IA | $822 | $424 | $760 | $2,006 | $53 | $2,059 |
| MI | $3,707 | $1,516 | $1,711 | $6,934 | $696 | $7,630 |
| MN | $1,449 | $895 | $595 | $2,939 | $115 | $3,054 |
| MO | $1,232 | $573 | $561 | $2,366 | $142 | $2,508 |
| OH | $3,560 | $1,727 | $2,455 | $7,742 | $71 | $7,813 |
| WI | $1,541 | $822 | $1,099 | $3,461 | $158 | $3,620 |
| Total Region | $19,100 | $8,716 | $11,403 | $39,219 | $1,703 | $40,922 |

## Midwest Dependence on Imported Natural Gas

Another factor that makes the current natural gas crisis such a crucial problem for the Midwest is that the states in the Midwest are extremely dependent upon natural gas imported from other states and countries. In fact, most states in the Midwest import virtually all the natural gas they consume.

Table 5 presents data for each state and the total region regarding the percentage of total gas consumption that must be met by imports. The table also presents the associated economic drain on each state (and the region) from these imports, using the average wholesale natural gas price for 2002.

The results are rather staggering. At 2002 wholesale prices, the Midwest states sent $14 billion flowing out of the region to pay for natural gas imports. (Individual states can see their own dollar drain in Table 5.)

**Table 5. 2002 Baseline Natural Gas Dollar Drain**
(in Thousands)

| State | Total Wholesale Natural Gas Costs[a] | Percent of Gas That Is Imported[b] | Dollar Drain |
|---|---|---|---|
| IL | $3,522,869 | 99.99% | $3,522,393 |
| IN | $1,813,550 | 99.75% | $1,809,015 |
| IA | $732,442 | 100.00% | $732,442 |
| MI | $3,148,539 | 70.82% | $2,229,796 |
| MN | $1,184,727 | 100.00% | $1,184,727 |
| MO | $926,786 | 100.00% | $926,786 |
| OH | $2,769,341 | 87.34% | $2,418,742 |
| WI | $1,296,393 | 100.00% | $1,296,393 |
| Total Region | $15,394,646 | 91.72% | $14,120,293 |

[a] Total wholesale gas costs = baseline 2002 MMcf consumption · Chicago Hub price in 2002 ($3.40/Mcf)
[b] EIA 2004

Moreover, the implications of the current and projected natural gas crisis are sobering. The average annual wholesale gas price for 2002 was only about $3.40 per MMBtu. As discussed previously, wholesale prices are projected to hit $7.00/MMBtu or more over the next few years. Table 6 illustrates the projected dollar drain from the Midwestern states using the current 2006 price forecast. The total dollar drain will have increased to $29 billion, more than twice the 2002 level. At historical consumption levels, every dollar increase in the wholesale price of gas sends an additional $4.5 billion draining from the region.

**Table 6. 2006 Projected Natural Gas Dollar Drain**
Base Case Scenario
(in Thousands)

| State | Total Wholesale Natural Gas Costs[a] | Percent of Gas That Is Imported[b] | Dollar Drain |
|---|---|---|---|
| IL | $7,114,805 | 99.99% | $7,113,844 |
| IN | $3,721,364 | 99.75% | $3,712,059 |
| IA | $1,550,296 | 100.00% | $1,550,296 |
| MI | $6,353,804 | 70.82% | $4,499,764 |
| MN | $2,507,602 | 100.00% | $2,507,602 |
| MO | $1,823,767 | 100.00% | $1,823,767 |
| OH | $5,784,223 | 87.34% | $5,051,940 |
| WI | $2,783,078 | 100.00% | $2,783,078 |
| Total Region | $31,638,939 | 91.79% | $29,042,350 |

[a] Total wholesale gas costs = projected 2006 MMcf consumption · projected 2006 Chicago Hub price ($7.19/Mcf)

[b] EIA 2004

These extraordinary economic costs provide emphasis to the urgent need to improve energy efficiency in the Midwest region.

## Existing Midwest Policies and Programs for Energy Efficiency

Industry experts readily concede that the Midwest region as a whole has lagged far behind such leading regions as the Northeast, California, and the Northwest in terms of energy efficiency policies and programs.[19] Indeed, with a few notable exceptions (i.e., Minnesota, Wisconsin, and to some extent Iowa), most states in the Midwest have had few or no electric utility energy efficiency programs over the past decade, and even less on the natural gas side.

Table 7 presents summary information regarding existing natural gas utility sector energy efficiency programs in the Midwest states. Table 8 presents similar summary information regarding electric utility sector energy efficiency programs.

Overall, the data in Tables 7 and 8 indicate that, with a couple of exceptions, utility sector energy efficiency programs have not been much of a priority in the Midwest region. In view of the serious economic costs that the current and projected natural gas crisis will be imposing on the region, policymakers may want to increase the priority given to energy efficiency. The purpose of this study is to help estimate the economic benefits that could accrue to the region if sufficient energy efficiency policies were adopted.

[19] In ACEEE's most recent "scorecard" assessment of electric utility energy efficiency spending per capita, only one Midwest state (Wisconsin) was ranked in the top ten states nationally (York and Kushler 2002). Moreover, subsequent state budget raids on Wisconsin's public benefits energy efficiency funding will have dropped that state out of the top ten in the next assessment.

**Table 7. Natural Gas Utility Funded EE Programs by Midwestern State**

| State | Law/Rule Requiring Programs? | LI Progs | Annual Funding LI Programs | Non LI Progs | Annual Funding Non-LI Progs | Approximate Annual Savings | Incentives | Does State Produce Annual Reports? |
|---|---|---|---|---|---|---|---|---|
| IL | None | Yes | The IL Dept of Public Aid has a small energy efficiency pilot program for some LIHEAP recipients. | No | N/A | N/A | No | No |
| IN | None | Yes | Some small voluntary utility programs | No | N/A | N/A | No | No |
| IA | Senate File 2403 (1990) and Senate File 2370 (1996) | Yes | See "Annual Funding Non-LI Progs" | Yes | $10.2 million (includes LI and non-LI, does not include municipals) | 413,158 Dekatherms/Mcf/MMBtu (includes LI and non-LI, does not include municipals) | Through 1996 | Yes – a fairly recent development |
| MI | None | No | N/A | No | N/A | N/A | N/A | N/A |
| MN | Minnesota Statutes section 216B.241, subdivision 1a requires natural gas utilities to spend .5% of their GOR on energy efficiency. | Yes | Investor-Owned Utilities:<br><br>2003: $2.5 million | Yes | Investor-Owned Utilities:<br><br>2003: $10.5 million | Investor-Owned Utilities:<br><br>1.8 million Mcf | ? | Yes "status reports" |
| MO | None | Yes | $2,055,000 in 2004 | No | N/A | No summary information, individual utilities may have data. | No | Funding information is tracked by the MO Department of Natural Resources. |
| OH | None | Yes | $4.3 million in 2003<br>$3.8 million in 2004 | No | N/A | N/A | No | No |
| WI | N/A | Yes | The Focus on Energy 2003 Annual Report does not separate out amount spent on natural gas vs. electric. Total electric and natural gas spending in 2003 was $38,961,397 for low income programs. | Yes | Alliant — 2002: approx. $2.17 million, 2003: approx. $1.5 million<br><br>The Focus on Energy 2003 Annual Report does not separate out natural gas vs. electric spending. Total electric and natural gas spending in 2003 was $53,078,245 for industrial and residential programs. | Alliant program savings 2002: 3.8 million therms 2003: 1.5 million therms<br><br>Focus on Energy Savings in 2003: 10.9 million therms (7.2 Ind + Res, 3.7 LI) | Only the Alliant program— not the Focus on Energy programs | No annual reports but evaluations have been conducted on the Focus on Energy programs. |

LI = Low Income

**Table 8. Electric Utility Funded EE Programs by Midwestern State**

| State | Law/Rule Requiring Programs? | LI Progs | Annual Funding LI Programs | Non LI Progs | Annual Funding Non-LI Progs | Approximate Annual Savings | Incentives | Does State Produce Annual Reports? |
|---|---|---|---|---|---|---|---|---|
| IL | 20 ILCS 867/6-6 | Y | IL has a small energy efficiency pilot program for LIHEAP recipients and uses some non-LI EE funds for an Energy Efficient Affordable Housing Construction Program. | Y | $3 million | N/A | No | No |
| IN | N/A | N | N/A | N | N/A | N/A | N/A | N/A |
| IA | N/A | N | N/A | N | N/A | N/A | N/A | N/A |
| MI | Public Act 141 of 2000 established a "Low-Income/ Energy Efficiency Fund" | Y | Approx. $6 million in 2003 | Y | Approx. $ 4 million in 2003 | N/A | No | The Michigan Public Service Commission produces annual reports on the Low Income Energy Efficiency Fund. |
| MN | Minnesota Statutes section 216B.241 requires electric utilities to spend 1.5% of their GOR on energy efficiency. | Y | Investor-Owned Utilities<br><br>2003: $1.3 million | Y | Investor-Owned Utilities<br><br>2003: $50.2 million<br><br>Municipals & Co-ops:<br><br>$15 million | 403 million kWh<br><br>N/A | Y | Y |
| MO | N/A | N | N/A | N | N/A | N/A | N/A | N/A |
| OH | SB3—the "Restructure Electric Industry—Permit Competition Act, 1999 | Y | Electric Partnership Program (EPP): $14.9 million per year<br>+<br>2003: $2.2 million (shareholder funded) | Y | 2002:$13.8 million<br>2003: $14.3 million | (SB3) LI/EPP: 9.5 million kWh/year<br><br>Non-LI (SB3): not available yet | No | Yes, bi-annual report for SB3 programs only |
| WI | 1999 Wisconsin Act 9 | Y | FY 2004: $46.3 million | Y | FY 2004: $61.1 million | June 1, 2001 through June 30, 2003 — 267,862,185 kWh | No | No annual reports but evaluations have been conducted on the Focus on Energy programs |

## METHODOLOGY

The methodology used in this study was originally developed for ACEEE's earlier national study, *Natural Gas Price Effects of Energy Efficiency and Renewable Energy Practices and Policies* (Elliott et al. 2003). Those interested in detailed information on the methodological techniques applied should refer to that larger document.

For the purposes of this report, it is important to understand the four basic methodological steps that were employed.

- First, ACEEE developed estimates of the effects of aggressive but achievable energy efficiency policies on electricity[20] and natural gas consumption, based on extensive prior ACEEE research. We developed estimates of the realistic savings that could be achieved through the implementation of aggressive programs similar to those that have been deployed in recent years in response to recent regional energy shortages. We then applied these estimates to the end-use estimates in each state to develop sector-specific estimates of energy savings for each state.

- Second, a top natural gas market modeling firm (Energy and Environmental Analysis, Inc.) took the electricity and natural gas consumption reductions and factored them in to their detailed natural gas market models, to examine what the market price effects would be from these consumption reductions.

- Third, ACEEE calculated the total cost savings to customers (by state, by sector) from both the net direct effects of the energy efficiency programs on participant bills as well as the overall market price effects on all customers.[21]

- Fourth, another expert modeling firm[22] took the consumption reduction and price effect data and modeled the impacts on key economic indicators such as the net number of jobs and total dollar payroll.

The results of these extensive analyses are summarized in the remaining sections of this report.

[20] Electricity energy efficiency was also an important component, because the use of natural gas for electricity generation is an important factor contributing to the natural gas crisis.

[21] Reductions in net expenditures would result from decreased consumption of natural gas and electricity and from reductions in natural gas prices. No effects on retail electric prices were estimated, so end-use consumer electric expenditures were assumed to be at the 2002 electric price. For the macro economic analysis, it was assumed that that net reductions in natural gas expenditures by electric power generators were passed on to electric consumers.

[22] MRG Associates is a prominent consulting firm that has been active for many years in performing economic modeling on the effects of energy policies.

# RESULTS

## Customer Savings from Energy Efficiency

As a first step, ACEEE developed estimates of potential achievable percentage savings in end-use consumption of natural gas and electricity for each customer sector (residential, commercial, and industrial) and for each state.[23] Those percentage figures for natural gas are provided in Table 9 for several benchmark time periods (i.e., 1, 5, 10, and 15 years). Then Table 10 provides the percentage savings figures for overall natural gas consumption across all sectors. Tables 11 and 12 present the corresponding data for electricity savings.

A natural question arises regarding the nature of the energy efficiency policies that need to be put in place to achieve these projected energy savings. While it was beyond the scope of this project to design or recommend specific policies and programs for the states examined in this study, we do provide examples in Appendices B through D of exemplary energy efficiency programs and policies that we identified in previous research. We also refer the reader to several recent ACEEE reports that address these issues in detail (see Kushler, York and Witte 2003, 2004; Prindle et. al. 2003).

[23] See Elliott et al. (2003) for a complete description of the methodology involved.

**Table 9. Potential Percentage Natural Gas Savings by Sector in Key Benchmark Years**
Midwest Energy Efficiency Scenario

| Residential | | | | |
|---|---|---|---|---|
| **State** | **2006** | **2010** | **2015** | **2020** |
| Illinois | 2.2% | 4.4% | 7.2% | 9.9% |
| Indiana | 1.8% | 3.6% | 5.9% | 8.2% |
| Iowa | 2.2% | 4.4% | 7.2% | 10.0% |
| Michigan | 2.2% | 4.4% | 7.2% | 9.9% |
| Minnesota | 2.2% | 4.4% | 7.2% | 10.0% |
| Missouri | 1.4% | 2.9% | 4.7% | 6.5% |
| Ohio | 1.8% | 3.6% | 5.9% | 8.2% |
| Wisconsin | 2.6% | 5.2% | 8.4% | 11.7% |

| Commercial | | | | |
|---|---|---|---|---|
| **State** | **2006** | **2010** | **2015** | **2020** |
| Illinois | 1.9% | 3.9% | 6.3% | 8.8% |
| Indiana | 1.6% | 3.2% | 5.2% | 7.2% |
| Iowa | 2.0% | 3.9% | 6.4% | 8.9% |
| Michigan | 1.9% | 3.9% | 6.3% | 8.8% |
| Minnesota | 2.0% | 3.9% | 6.4% | 8.9% |
| Missouri | 1.3% | 2.6% | 4.2% | 5.7% |
| Ohio | 1.6% | 3.2% | 5.2% | 7.2% |
| Wisconsin | 2.3% | 4.6% | 7.4% | 10.3% |

| | Industrial | | | |
|---|---|---|---|---|
| **State** | **2006** | **2010** | **2015** | **2020** |
| Illinois | 1.7% | 4.2% | 7.3% | 10.5% |
| Indiana | 1.7% | 4.2% | 7.3% | 10.5% |
| Iowa | 1.7% | 4.2% | 7.3% | 10.5% |
| Michigan | 1.4% | 3.5% | 6.0% | 8.6% |
| Minnesota | 1.7% | 4.2% | 7.3% | 10.5% |
| Missouri | 1.1% | 2.7% | 4.8% | 6.8% |
| Ohio | 1.4% | 3.5% | 6.0% | 8.6% |
| Wisconsin | 2.0% | 4.9% | 8.6% | 12.3% |

**Table 10. Potential Natural Gas Percentage Savings Residential, Commercial, and Industrial Combined In Key Benchmark Years**
Midwest Energy Efficiency Scenario

| State | 2006 | 2010 | 2016 | 2020 |
|---|---|---|---|---|
| Illinois | 2.0% | 4.2% | 7.0% | 9.9% |
| Indiana | 1.7% | 3.9% | 6.5% | 9.2% |
| Iowa | 1.9% | 4.2% | 7.1% | 10.0% |
| Michigan | 1.9% | 4.0% | 6.6% | 9.3% |
| Minnesota | 2.0% | 4.2% | 7.0% | 9.8% |
| Missouri | 1.3% | 2.7% | 4.6% | 6.4% |
| Ohio | 1.6% | 3.5% | 5.8% | 8.1% |
| Wisconsin | 2.3% | 4.9% | 8.3% | 11.6% |

**Table 11. Potential Percentage Electricity Savings by Sector in Key Benchmark Years**
Midwest Energy Efficiency Scenario

| Residential | | | | |
|---|---|---|---|---|
| **State** | **2006** | **2010** | **2015** | **2020** |
| Illinois | 2.4% | 4.8% | 7.8% | 10.8% |
| Indiana | 2.4% | 4.8% | 7.9% | 10.9% |
| Iowa | 2.4% | 3.1% | 4.0% | 4.9% |
| Michigan | 2.0% | 4.8% | 8.4% | 12.0% |
| Minnesota | 2.4% | 3.1% | 4.0% | 4.9% |
| Missouri | 1.6% | 3.2% | 5.1% | 7.1% |
| Ohio | 2.0% | 3.2% | 4.7% | 6.3% |
| Wisconsin | 2.8% | 3.9% | 5.3% | 6.7% |

| Commercial | | | | |
|---|---|---|---|---|
| **State** | **2006** | **2010** | **2015** | **2020** |
| Illinois | 2.8% | 5.7% | 9.2% | 12.8% |
| Indiana | 2.8% | 5.7% | 9.2% | 12.8% |
| Iowa | 2.9% | 5.8% | 9.5% | 13.1% |
| Michigan | 2.3% | 4.7% | 7.6% | 10.5% |
| Minnesota | 2.9% | 5.8% | 9.5% | 13.1% |
| Missouri | 1.9% | 3.8% | 6.1% | 8.5% |
| Ohio | 2.3% | 4.7% | 7.6% | 10.5% |
| Wisconsin | 3.3% | 6.7% | 10.9% | 15.0% |

| | Industrial | | | |
|---|---|---|---|---|
| **State** | **2006** | **2010** | **2015** | **2020** |
| Illinois | 2.1% | 5.1% | 9.0% | 12.8% |
| Indiana | 2.1% | 5.1% | 9.0% | 12.8% |
| Iowa | 2.1% | 5.1% | 9.0% | 12.8% |
| Michigan | 1.7% | 4.2% | 7.4% | 10.6% |
| Minnesota | 2.1% | 5.1% | 9.0% | 12.8% |
| Missouri | 1.3% | 3.3% | 5.8% | 8.3% |
| Ohio | 1.7% | 4.2% | 7.4% | 10.6% |
| Wisconsin | 2.4% | 6.0% | 10.6% | 15.1% |

**Table 12. Potential Electricity Percentage Savings Residential, Commercial, and Industrial Combined in Key Benchmark Years**
Midwest Energy Efficiency Scenario

| State | 2006 | 2010 | 2016 | 2020 |
|---|---|---|---|---|
| Illinois | 2.4% | 5.2% | 8.7% | 12.2% |
| Indiana | 2.3% | 5.2% | 8.7% | 12.3% |
| Iowa | 2.4% | 4.6% | 7.3% | 10.0% |
| Michigan | 1.9% | 4.5% | 7.8% | 11.0% |
| Minnesota | 2.3% | 4.6% | 7.5% | 10.3% |
| Missouri | 1.6% | 3.4% | 5.6% | 7.9% |
| Ohio | 1.9% | 4.0% | 6.7% | 9.4% |
| Wisconsin | 2.8% | 5.5% | 8.9% | 12.2% |

ACEEE then multiplied those percentage savings estimates times the base case projected natural gas and electricity consumption levels for each year, to calculate total projected natural gas and electricity savings levels over time. Again, that data is provided for key benchmark years in Tables 13 and 14.

Finally, Tables 15 and 16 present the projected customer dollar savings from those natural gas and electricity consumption reductions, using projected energy savings and projected retail rates for each sector over time.

**Table 13. Projected Net Natural Gas Consumption Savings (due to Energy Efficiency) by Sector in Key Benchmark Years**
Midwest Energy Efficiency Scenario (MMcf)

| Residential | | | | |
|---|---|---|---|---|
| **State** | **2006** | **2010** | **2015** | **2020** |
| Illinois | 10,603 | 22,438 | 39,487 | 59,306 |
| Indiana | 3,058 | 6,449 | 11,225 | 16,593 |
| Iowa | 1,678 | 3,503 | 6,084 | 9,027 |
| Michigan | 8,444 | 17,771 | 30,884 | 45,584 |
| Minnesota | 3,122 | 6,675 | 11,785 | 17,636 |
| Missouri | 1,637 | 3,333 | 5,561 | 7,904 |
| Ohio | 6,172 | 12,723 | 21,598 | 31,222 |
| Wisconsin | 3,740 | 7,943 | 13,914 | 20,682 |
| Total Region | 38,454 | 80,834 | 140,539 | 207,951 |

| Commercial | | | | |
|---|---|---|---|---|
| **State** | **2006** | **2010** | **2015** | **2020** |
| Illinois | 3,930 | 8,184 | 14,083 | 20,437 |
| Indiana | 1,378 | 2,919 | 5,117 | 7,525 |
| Iowa | 902 | 1,848 | 3,149 | 4,534 |
| Michigan | 3,485 | 7,286 | 12,594 | 18,267 |
| Minnesota | 2,070 | 4,537 | 8,270 | 12,595 |
| Missouri | 763 | 1,575 | 2,685 | 3,854 |
| Ohio | 2,780 | 5,878 | 10,293 | 15,110 |
| Wisconsin | 1,972 | 4,229 | 7,524 | 11,245 |
| Total Region | 17,281 | 36,457 | 63,714 | 93,567 |

| Industrial | | | | |
|---|---|---|---|---|
| **State** | **2006** | **2010** | **2015** | **2020** |
| Illinois | 4,456 | 11,324 | 20,599 | 30,672 |
| Indiana | 4,079 | 10,368 | 18,872 | 28,119 |
| Iowa | 1,481 | 3,786 | 6,827 | 10,101 |
| Michigan | 3,088 | 7,893 | 14,550 | 21,959 |
| Minnesota | 1,496 | 3,823 | 6,886 | 10,210 |
| Missouri | 664 | 1,704 | 3,090 | 4,571 |
| Ohio | 3,899 | 9,903 | 17,992 | 26,756 |
| Wisconsin | 2,689 | 6,838 | 12,461 | 18,588 |
| Total Region | 21,852 | 55,640 | 101,275 | 150,976 |

| Grand Total of Residential, Commercial, and Industrial Combined | | | | |
|---|---|---|---|---|
| **State** | **2006** | **2010** | **2015** | **2020** |
| Illinois | 18,990 | 41,947 | 74,169 | 110,414 |
| Indiana | 8,516 | 19,735 | 35,214 | 52,237 |
| Iowa | 4,061 | 9,137 | 16,060 | 23,661 |
| Michigan | 15,017 | 32,950 | 58,027 | 85,810 |
| Minnesota | 6,688 | 15,035 | 26,941 | 40,441 |
| Missouri | 3,064 | 6,612 | 11,336 | 16,328 |
| Ohio | 12,851 | 28,504 | 49,883 | 73,087 |
| Wisconsin | 8,401 | 19,010 | 33,898 | 50,515 |
| Total Region | 77,587 | 172,930 | 305,528 | 452,494 |

**Table 14. Projected Net Electricity Consumption Savings (due to Energy Efficiency) by Sector in Key Benchmark Years**
Midwest Energy Efficiency Scenario (MWh)

| Residential | | | | |
|---|---|---|---|---|
| **State** | **2006** | **2010** | **2015** | **2020** |
| Illinois | 869,486 | 1,862,814 | 3,292,510 | 4,926,963 |
| Indiana | 570,819 | 1,212,663 | 2,117,245 | 3,130,979 |
| Iowa | 278,121 | 384,197 | 536,759 | 708,530 |
| Michigan | 538,689 | 1,388,599 | 2,586,791 | 3,931,640 |
| Minnesota | 393,052 | 542,964 | 758,570 | 1,001,324 |
| Missouri | 370,639 | 796,248 | 1,411,147 | 2,114,179 |
| Ohio | 806,143 | 1,373,926 | 2,173,613 | 3,066,914 |
| Wisconsin | 509,892 | 759,656 | 1,116,247 | 1,519,706 |
| Total Region | 4,336,841 | 8,321,068 | 13,992,881 | 20,400,236 |

| Commercial | | | | |
|---|---|---|---|---|
| **State** | **2006** | **2010** | **2015** | **2020** |
| Illinois | 991,356 | 2,125,496 | 3,757,876 | 5,624,062 |
| Indiana | 472,988 | 997,688 | 1,737,162 | 2,565,804 |
| Iowa | 213,654 | 456,129 | 806,436 | 1,206,917 |
| Michigan | 517,866 | 1,092,351 | 1,901,988 | 2,809,253 |
| Minnesota | 256,798 | 548,237 | 969,283 | 1,450,636 |
| Missouri | 379,534 | 810,267 | 1,432,551 | 2,143,965 |
| Ohio | 767,415 | 1,618,731 | 2,818,514 | 4,162,971 |
| Wisconsin | 466,673 | 1,000,561 | 1,768,991 | 2,647,484 |
| Total Region | 4,066,283 | 8,649,459 | 15,192,802 | 22,611,092 |

| Industrial | | | | |
|---|---|---|---|---|
| **State** | **2006** | **2010** | **2015** | **2020** |
| Illinois | 887,377 | 2,378,204 | 4,528,100 | 6,991,920 |
| Indiana | 788,307 | 2,078,500 | 3,897,448 | 5,939,314 |
| Iowa | 255,644 | 682,218 | 1,298,943 | 2,005,721 |
| Michigan | 636,824 | 1,679,090 | 3,148,504 | 4,797,999 |
| Minnesota | 527,262 | 1,407,065 | 2,679,051 | 4,136,770 |
| Missouri | 187,848 | 501,297 | 954,469 | 1,473,813 |
| Ohio | 1,265,613 | 3,336,994 | 6,257,282 | 9,535,462 |
| Wisconsin | 515,499 | 1,381,557 | 2,630,485 | 4,061,778 |
| Total Region | 5,064,375 | 13,444,925 | 25,394,281 | 38,942,776 |

| Grand Total of Residential, Commercial, and Industrial Combined | | | | |
|---|---|---|---|---|
| **State** | **2006** | **2010** | **2015** | **2020** |
| Illinois | 2,748,219 | 6,366,514 | 11,578,487 | 17,542,945 |
| Indiana | 1,832,114 | 4,288,852 | 7,751,855 | 11,636,098 |
| Iowa | 747,418 | 1,522,544 | 2,642,138 | 3,921,168 |
| Michigan | 1,693,379 | 4,160,040 | 7,637,282 | 11,538,893 |
| Minnesota | 1,177,112 | 2,498,266 | 4,406,904 | 6,588,730 |
| Missouri | 938,021 | 2,107,811 | 3,798,167 | 5,731,957 |
| Ohio | 2,839,171 | 6,329,652 | 11,249,408 | 16,765,346 |
| Wisconsin | 1,492,065 | 3,141,774 | 5,515,723 | 8,228,968 |
| Total Region | 13,467,499 | 30,415,452 | 54,579,963 | 81,954,103 |

**Table 15. Projected Net Natural Gas Customer Dollar Savings (due to Energy Efficiency) by Sector in Key Benchmark Years**
Midwest Energy Efficiency Scenario (in Millions)

| Residential | | | | |
|---|---|---|---|---|
| **State** | **2006** | **2010** | **2015** | **2020** |
| Illinois | $108 | $160 | $207 | $358 |
| Indiana | $34 | $53 | $78 | $121 |
| Iowa | $17 | $26 | $33 | $58 |
| Michigan | $80 | $116 | $142 | $259 |
| Minnesota | $31 | $45 | $54 | $99 |
| Missouri | $16 | $23 | $33 | $50 |
| Ohio | $63 | $90 | $130 | $199 |
| Wisconsin | $39 | $61 | $77 | $134 |
| Total Region | $390 | $578 | $774 | $1,297 |

| Commercial | | | | |
|---|---|---|---|---|
| **State** | **2006** | **2010** | **2015** | **2020** |
| Illinois | $35 | $45 | $58 | $105 |
| Indiana | $12 | $16 | $23 | $39 |
| Iowa | $7 | $9 | $12 | $22 |
| Michigan | $29 | $35 | $39 | $77 |
| Minnesota | $18 | $22 | $26 | $54 |
| Missouri | $7 | $7 | $10 | $18 |
| Ohio | $27 | $34 | $49 | $83 |
| Wisconsin | $18 | $26 | $32 | $62 |
| Total Region | $153 | $196 | $260 | $468 |

| Industrial | | | | |
|---|---|---|---|---|
| **State** | **2006** | **2010** | **2015** | **2020** |
| Illinois | $38 | $67 | $90 | $166 |
| Indiana | $32 | $53 | $81 | $144 |
| Iowa | $13 | $22 | $29 | $55 |
| Michigan | $23 | $38 | $46 | $97 |
| Minnesota | $10 | $14 | $17 | $36 |
| Missouri | $6 | $11 | $17 | $28 |
| Ohio | $33 | $58 | $87 | $151 |
| Wisconsin | $21 | $36 | $53 | $96 |
| Total Region | $176 | $302 | $423 | $776 |

| Grand Total of Residential, Commercial, and Industrial Combined | | | | |
|---|---|---|---|---|
| **State** | **2006** | **2010** | **2015** | **2020** |
| Illinois | $181 | $272 | $355 | $630 |
| Indiana | $77 | $122 | $182 | $303 |
| Iowa | $37 | $58 | $74 | $135 |
| Michigan | $132 | $192 | $227 | $434 |
| Minnesota | $59 | $82 | $98 | $189 |
| Missouri | $29 | $41 | $60 | $97 |
| Ohio | $123 | $182 | $266 | $432 |
| Wisconsin | $79 | $123 | 162 | $292 |
| Total Region | $719 | $1,076 | $1,457 | $2,542 |

**Table 16. Projected Net Electricity Customer Dollar Savings (due to Energy Efficiency) *by Sector in Key Benchmark Years***
Midwest Energy Efficiency Scenario (Millions $)

| Residential | | | | |
|---|---|---|---|---|
| **State** | **2006** | **2010** | **2015** | **2020** |
| Illinois | $77 | $165 | $291 | $435 |
| Indiana | $39 | $83 | $145 | $215 |
| Iowa | $23 | $32 | $45 | $59 |
| Michigan | $46 | $118 | $220 | $335 |
| Minnesota | $30 | $41 | $57 | $75 |
| Missouri | $26 | $56 | $99 | $149 |
| Ohio | $69 | $118 | $187 | $264 |
| Wisconsin | $38 | $57 | $84 | $114 |
| Total Region | $349 | $671 | $1,129 | $1,647 |

| Commercial | | | | |
|---|---|---|---|---|
| **State** | **2006** | **2010** | **2015** | **2020** |
| Illinois | $70 | $149 | $264 | $395 |
| Indiana | $29 | $60 | $105 | $155 |
| Iowa | $14 | $30 | $52 | $79 |
| Michigan | $41 | $87 | $152 | $224 |
| Minnesota | $17 | $35 | $62 | $93 |
| Missouri | $22 | $47 | $84 | $125 |
| Ohio | $57 | $121 | $211 | $311 |
| Wisconsin | $28 | $61 | $108 | $161 |
| Total Region | $278 | $591 | $1,037 | $1,543 |

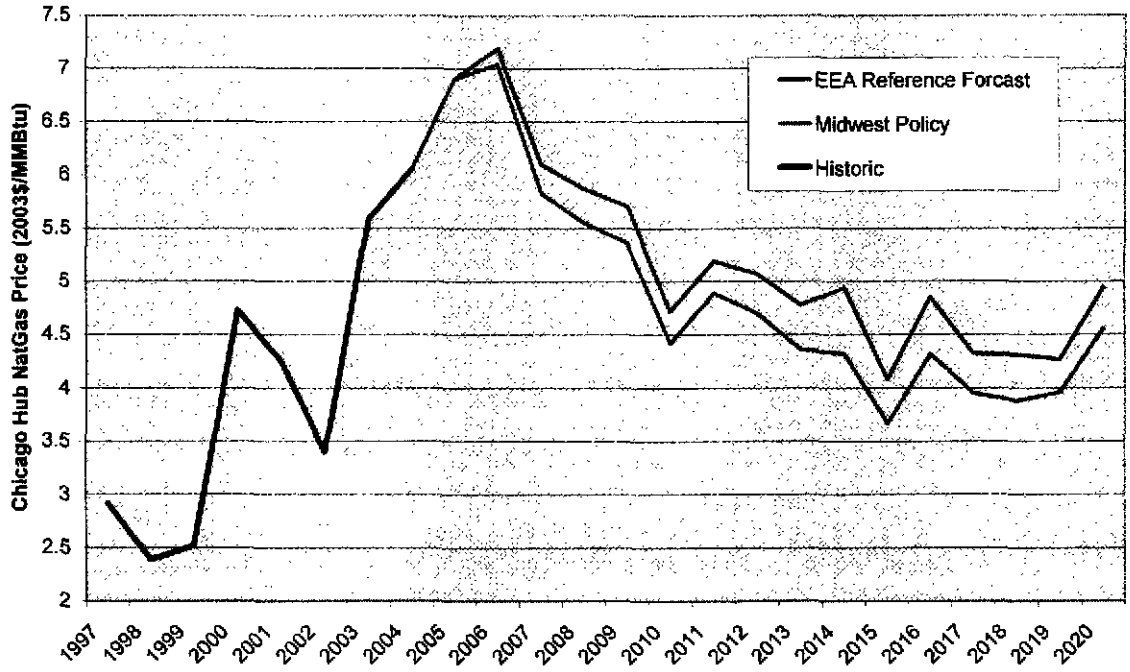
| Industrial | | | | |
|---|---|---|---|---|
| **State** | **2006** | **2010** | **2015** | **2020** |
| Illinois | $44 | $119 | $226 | $349 |
| Indiana | $30 | $79 | $148 | $226 |
| Iowa | $10 | $27 | $50 | $78 |
| Michigan | $32 | $86 | $160 | $24 |
| Minnesota | $24 | $64 | $122 | $189 |
| Missouri | $8 | $22 | $42 | $65 |
| Ohio | $55 | $146 | $274 | $417 |
| Wisconsin | $21 | $56 | $106 | $164 |
| Total Region | $225 | $598 | $1,130 | $1,733 |

| Grand Total Residential, Commercial, and Industrial Combined | | | | |
|---|---|---|---|---|
| **State** | **2006** | **2010** | **2015** | **2020** |
| Illinois | $191 | $432 | $780 | $1,179 |
| Indiana | $98 | $223 | $398 | $596 |
| Iowa | $47 | $88 | $148 | $216 |
| Michigan | $120 | $291 | $532 | $803 |
| Minnesota | $70 | $140 | $242 | $358 |
| Missouri | $57 | $126 | $225 | $339 |
| Ohio | $182 | $385 | $672 | $993 |
| Wisconsin | $88 | $174 | $298 | $440 |
| Total Region | $852 | $1,859 | $3,296 | $4,923 |

## Customer Savings from Energy Efficiency Effects on Natural Gas Market Prices

In addition to direct bill savings from energy efficiency improvements made by program participants, there are also dollar savings to all customers due to the effect of energy efficiency on lowering wholesale market prices for natural gas. Figure 6 presents a graph of the projected wholesale gas prices at the Chicago Hub under the business-as-usual case ("EEA Reference Forecast") and energy efficiency policy case ("Midwest Policy") scenarios.

**Figure 6. Chicago Hub Average Annual Price**




As can be seen, the natural gas consumption reductions produced by the energy efficiency policy implementation produces a notable and gradually increasing level of reduction in wholesale gas prices, beginning with 2 percent in the first year (2006), rising to 6 percent by 2010, and a peak of 13 percent by 2014. The total dollar savings impacts of these price reductions on Midwest customers is presented by sector in Table 17, across all three end-use sectors in Table 18, and for the power generation sector in Table 19.[24]

[24] Note that Table 19 includes the dollar savings to the power generation sector from lower natural gas prices, under the presumption that lower costs to generate electricity would eventually flow through to electricity customers as a result of regulatory and/or competitive forces.

**Table 17. Dollar Savings Impacts of Natural Gas Price Reductions by Sector in Key Benchmark Years**
Midwest Energy Efficiency Scenario (millions $)

| Residential | | | | |
|---|---|---|---|---|
| **State** | **2006** | **2010** | **2015** | **2020** |
| Illinois | $49 | $138 | $167 | $67 |
| Indiana | $20 | $53 | $123 | $114 |
| Iowa | $7 | $20 | $35 | $22 |
| Michigan | $44 | $116 | $146 | $164 |
| Minnesota | $13 | $38 | $41 | $44 |
| Missouri | $12 | $34 | $56 | $46 |
| Ohio | $34 | $97 | $199 | $156 |
| Wisconsin | $15 | $42 | $50 | $48 |
| Total Region | $194 | $536 | $797 | $641 |

| Commercial | | | | |
|---|---|---|---|---|
| **State** | **2006** | **2010** | **2015** | **2020** |
| Illinois | $23 | $59 | $74 | $39 |
| Indiana | $11 | $27 | $63 | $58 |
| Iowa | $5 | $12 | $20 | $13 |
| Michigan | $21 | $54 | $68 | $76 |
| Minnesota | $12 | $30 | $39 | $42 |
| Missouri | $7 | $18 | $30 | $26 |
| Ohio | $18 | $51 | $109 | $87 |
| Wisconsin | $9 | $26 | $31 | $30 |
| Total Region | $104 | $276 | $424 | $362 |

| | Industrial | | | |
|---|---|---|---|---|
| **State** | **2006** | **2010** | **2015** | **2020** |
| Illinois | $29 | $65 | $92 | $128 |
| Indiana | $31 | $83 | $160 | $208 |
| Iowa | $10 | $24 | $39 | $54 |
| Michigan | $24 | $56 | $92 | $151 |
| Minnesota | $12 | $26 | $37 | $49 |
| Missouri | $7 | $14 | $23 | $30 |
| Ohio | $33 | $73 | $153 | $185 |
| Wisconsin | $18 | $50 | $80 | $119 |
| Total Region | $163 | $392 | $676 | $925 |

**Table 18. Dollar Savings Impacts of Natural Gas Price Reduction Residential, Commercial, and Industrial Combined in Key Benchmark Years**

Midwest Energy Efficiency Scenario
(millions $)

| State | 2006 | 2010 | 2016 | 2020 |
|---|---|---|---|---|
| Illinois | $101 | $262 | $333 | $234 |
| Indiana | $62 | $164 | $346 | $380 |
| Iowa | $22 | $57 | $94 | $89 |
| Michigan | $90 | $226 | $307 | $390 |
| Minnesota | $36 | $94 | $118 | $136 |
| Missouri | $26 | $66 | $109 | $102 |
| Ohio | $84 | $221 | $461 | $428 |
| Wisconsin | $42 | $118 | $160 | $197 |
| Total Region | $462 | $1,205 | $1,898 | $1,928 |

**Table 19. Dollar Savings Impacts of Natural Gas Price Reduction for Power Generation in Key Benchmark Years**

Midwest Energy Efficiency Scenario
(million $)

| State | 2006 | 2010 | 2016 | 2020 |
|---|---|---|---|---|
| Illinois | $21 | $39 | $69 | $21 |
| Indiana | $7 | $10 | $124 | $138 |
| Iowa | $13 | $29 | $110 | $65 |
| Michigan | $23 | $36 | $145 | $156 |
| Minnesota | $27 | $47 | $171 | $101 |
| Missouri | $76 | $129 | $526 | $309 |
| Ohio | $3 | $2 | $136 | $160 |
| Wisconsin | $6 | $11 | $17 | $7 |
| Total Region | $176 | $303 | $1,297 | $957 |

## Overall Customer Savings

To summarize, the total dollar savings to Midwest customers from the energy efficiency policy impacts examined in this study are comprised of four basic components: (1) direct savings on natural gas bills from energy efficiency reductions in consumption; (2) direct savings in electricity bills from energy efficiency reductions in consumption; (3) savings in natural gas bills across all customers due to reductions in the wholesale market price of gas; and (4) savings to electricity customers due to the reduced cost of natural gas for electricity generation.[25] The combined savings estimates from these four components are presented for

[25] There is actually a fifth area of customer savings that we were unable to model in this study. That is the likely downward pressure on electricity market prices due to the effect of electricity energy efficiency programs, especially those targeted at summertime electricity use (when natural gas generation is at its highest). While we

4 key benchmark years in Tables 20a through 20d. These tables provide the corresponding data for each individual state and for the region as a whole.

**Table 20a. 2006 Total Dollar Savings to Midwest Customers**
**Midwest Energy Efficiency Scenario**
(in Millions$)

| State | Dollar Savings Due to Natural Gas EE | Dollar Savings Due to Electricity EE | Dollar Savings Due to Reduction in Price | Dollar Savings Due to Reduction in Cost of NG used in Electric Generation | Total |
|---|---|---|---|---|---|
| Illinois | $181 | $191 | $101 | $21 | $493 |
| Indiana | $77 | $98 | $62 | $7 | $244 |
| Iowa | $37 | $47 | $22 | $13 | $120 |
| Michigan | $132 | $120 | $90 | $23 | $365 |
| Minnesota | $59 | $70 | $36 | $27 | $193 |
| Missouri | $29 | $57 | $26 | $76 | $187 |
| Ohio | $123 | $182 | $84 | $3 | $393 |
| Wisconsin | $79 | $88 | $42 | $6 | $214 |
| Total Region | $719 | $852 | $462 | $176 | $2,208 |

**Table 20b. 2010 Total Dollar Savings to Midwest Customers**
**Midwest Energy Efficiency Scenario**
(in Millions$)

| State | Dollar Savings Due to Natural Gas EE | Dollar Savings Due to Electricity EE | Dollar Savings Due to Reduction in Price | Dollar Savings Due to Reduction in Cost of NG used in Electric Generation | Total |
|---|---|---|---|---|---|
| Illinois | $272 | $432 | $262 | $39 | $1,006 |
| Indiana | $122 | $223 | $164 | $10 | $518 |
| Iowa | $58 | $88 | $57 | $29 | $232 |
| Michigan | $192 | $291 | $226 | $36 | $745 |
| Minnesota | $82 | $140 | $94 | $47 | $364 |
| Missouri | $41 | $126 | $66 | $129 | $361 |
| Ohio | $182 | $385 | $221 | $2 | $790 |
| Wisconsin | $123 | $174 | $118 | $11 | $425 |
| Total Region | $1,076 | $1,859 | $1,205 | $303 | $4,443 |

were unable to model that impact in this study, others have researched that effect on electricity market prices extensively (e.g., Cowart 2001), and we feel confident in asserting that this effect would produce significant additional economic benefits for electricity customers in the Midwest.

**Table 20c. 2015 Total Dollar Savings to Midwest Customers**
**Midwest Energy Efficiency Scenario**
(in Millions$)

| State | Dollar Savings Due to Natural Gas EE | Dollar Savings Due to Electricity EE | Dollar Savings Due to Reduction in Price | Dollar Savings Due to Reduction in Cost of NG used in Electric Generation | Total |
|---|---|---|---|---|---|
| Illinois | $355 | $780 | $333 | $69 | $1,538 |
| Indiana | $182 | $398 | $346 | $124 | $1,051 |
| Iowa | $74 | $148 | $94 | $110 | $426 |
| Michigan | $227 | $532 | $307 | $145 | $1,211 |
| Minnesota | $98 | $242 | $118 | $171 | $628 |
| Missouri | $60 | $225 | $109 | $526 | $921 |
| Ohio | $266 | $672 | $461 | $136 | $1,535 |
| Wisconsin | $162 | $298 | $160 | $17 | $637 |
| Total Region | $1,457 | $3,296 | $1,898 | $1,297 | $7,948 |

**Table 20d. 2020 Total Dollar Savings to Midwest Customers**
**Midwest Energy Efficiency Scenario**
(in Millions$)

| State | Dollar Savings Due to Natural Gas EE | Dollar Savings Due to Electricity EE | Dollar Savings Due to Reduction in Price | Dollar Savings Due to Reduction in Cost of NG used in Electric Generation | Total |
|---|---|---|---|---|---|
| Illinois | $630 | $1,179 | $234 | $21 | $2,063 |
| Indiana | $303 | $596 | $380 | $138 | $1,417 |
| Iowa | $135 | $216 | $89 | $65 | $505 |
| Michigan | $434 | $803 | $390 | $156 | $1,784 |
| Minnesota | $189 | $358 | $136 | $101 | $784 |
| Missouri | $97 | $339 | $102 | $309 | $847 |
| Ohio | $432 | $993 | $428 | $160 | $2,013 |
| Wisconsin | $292 | $440 | $197 | $7 | $936 |
| Total Region | $2,542 | $4,923 | $1,928 | $957 | $10,351 |

## Cumulative Savings

The data on dollar savings presented in Tables 15 through 20d has been presented using the convention of providing total annual savings in each of 4 key years: 2006, 2010, 2015, and 2020 (corresponding to years 1, 5, 10, and 15 of an energy efficiency policy initiative). The data represent the savings realized in that year, from that and all prior years' energy efficiency improvements produced by the policy.

Another interesting way to view the data, however, is to consider the cumulative total of savings over time. Figure 7 presents a graph illustrating the growth in grand total cumulative

dollar savings for Midwest customers through 2020. Figure 8 then presents that grand total savings graph with the data disaggregated into each of the four components (i.e., savings due to electric energy efficiency improvements, natural gas energy efficiency improvements, natural gas price reductions to customers, and natural gas price reductions to electricity generators).

**Figure 7. Cumulative Grand Total Dollar Savings**

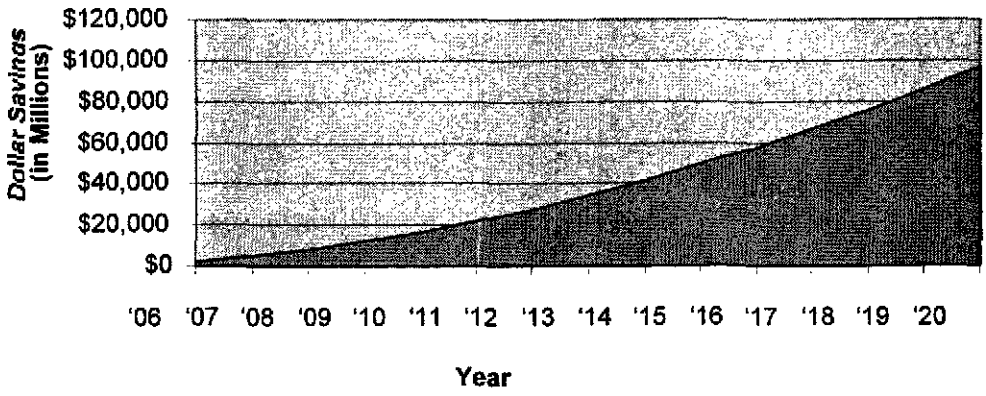
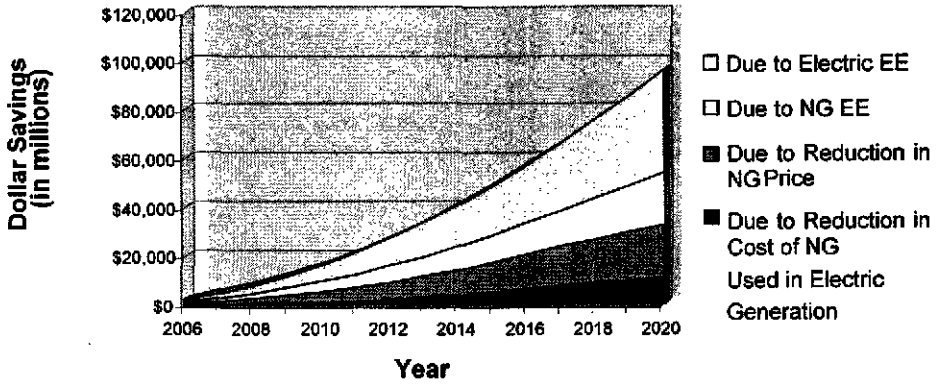



**Figure 8. Cumulative Dollar Savings by Source of Savings**



As can be seen in Figures 7 and 8, the cumulative dollar savings from an aggressive but achievable energy efficiency policy initiative would be quite substantial. After just 5 years, cumulative savings to customers in the region would total over $16 billion, and after 15 years, cumulative savings would approach $100 billion. The single largest component (over 40 percent) would be due to the direct savings from electric energy efficiency. Roughly another 20 to 25 percent each would result from direct natural gas energy efficiency improvements and reductions in the market price of natural gas. The remaining 10 percent would result from the reduction in the cost of natural gas used in electricity generation.

**Costs to Achieve These Savings**

As one might expect, in order to achieve these substantial economic benefits there would need to be significant investments in improving energy efficiency. To estimate these associated costs, ACEEE researched its existing data sets and the extensive literature available within the industry on the costs involved in acquiring energy efficiency savings.

As a general frame of reference, there is considerable research from leading states to document that a portfolio of electric energy efficiency programs can save electricity at a cost of 3 cents/kWh, and a portfolio of natural gas energy efficiency programs can save natural gas at a cost of $1.50 per Mcf (Elliott et al. 2003). For this study, ACEEE identified costs specifically at the customer sector level (residential, commercial, and industrial) and applied those costs in proportion to where the study projected that the electricity and natural gas consumption reductions would need to be achieved. Tables 21 and 22 provide the cost estimates developed for each sector and the weighted overall cost (weighted by the proportion of overall energy savings expected from each sector).

**Table 21. Cost per Mcf to Achieve Savings**
**Natural Gas**

| Sector | Technology Cost | Admin. Adder | Cost of Saved Energy |
|---|---|---|---|
| **Residential** | $1.920 | 25% | $2.57 |
| **Commercial** | $0.667 | 20% | $0.86 |
| **Industrial** | $0.600 | 15% | $0.74 |
| **Weighted Overall Cost** | | | $1.67 |

**Table 22. Cost per kWh to Achieve Savings Electric**

| Sector | Technology Cost | Admin. Adder | Cost of Saved Energy |
|---|---|---|---|
| **Residential** | $0.033 | 25% | $0.044 |
| **Commercial** | $0.019 | 20% | $0.024 |
| **Industrial** | $0.016 | 15% | $0.020 |
| **Weighted Overall Cost** | | | $0.029 |

Consistent with patterns observed in decades of research in the energy efficiency field, the levelized cost per lifetime unit of energy saved is the most expensive in the residential sector ($2.57 per Mcf and $.044 per kWh), followed by the commercial sector ($.86 per Mcf and $.024 per kWh), and least expensive in the industrial sector ($.74 per Mcf and $.02 per kWh). More importantly, all of these costs of conserved energy are much cheaper than the corresponding costs to obtain "supply side" energy resources,[26] thus these energy efficiency programs would be very cost-effective just for the energy "resource" they provide...without even including their beneficial impacts on lowering wholesale market prices. When those larger benefits are taken into account, the benefits to consumers exceed the costs by nearly 4 to 1.

**Understanding the Associated Costs**

In understanding how the associated costs relate to the savings achieved, there are two ways to conceptually frame the costs. The first is to attribute the cost per Mcf or kWh in the year that the Mcf or kWh unit is saved. This recognizes that energy efficiency measures have long useful lifetimes and is appropriate in terms of fairly comparing the benefits and costs of the policy over time. From a conceptual standpoint, this is analogous to regulatory ratemaking treatment of a power plant capital investment, where the costs are amortized and recovered in rates over many years. If this conceptual approach were applied here, the "costs" associated with the energy savings produced by the energy efficiency policies and programs could simply be estimated by multiplying the costs per Mcf (Table 21) or costs per kWh (Table 22) times the respective Mcf or kWh savings credited in each year, and summed over the lifetime of the energy efficiency measures producing the savings. (This approach would not make any distinction as to who pays the cost, e.g., the end-use customer, some type of utility program, or some combination.)

Unfortunately, that approach to conceptualizing the costs does not mesh well with the practical realities of how energy efficiency programs are typically funded. From a practical standpoint, most state programs for energy efficiency set up their funding mechanisms to "frontload" the costs. For example, a system benefits charge may collect $10 million to spend on programs delivered in year 1, whereas the savings from that program will continue

[26] For example, the projected wholesale cost of natural gas in 2006 is over $7.00 per Mcf, and a typical average cost for delivered electricity might be in the range of 5 to 6 cents per kWh.

to accrue over 10 to 15 years or more. Over that 10 or 15 years, the cost per Mcf or kWh saved will work out to be equivalent to the year-by-year approach above. However, for policymakers thinking of choosing a frontloaded funding approach, a more pragmatic way to illustrate the associated costs is required. Such an approach is explored in the next section.

**Estimating Program Funding Needed**

ACEEE anticipates that the energy efficiency savings modeled in this study would be best achieved through a mixture of policy mechanisms, including such things as utility and/or "public benefits fund" supported energy efficiency programs; building energy codes; equipment standards; informational and market transformation strategies; etc.[27] Some of these would require explicit upfront "program" funding (e.g., utility/public benefits programs) while others would be accomplished through other statutory, regulatory, or informational mechanisms (e.g., codes and standards, public information efforts, etc.).

For the purposes of estimating what kind of explicit "program" funding might be required, we assumed that one-half of the total savings would be achieved through actual "program" funding and one-half through the other regulatory, policy, and informational mechanisms. With that assumption, we computed the amount of upfront utility/system benefit program funding that would be required to save the targeted amount of energy, using a standard formula for calculating the "Cost of Conserved Energy".[28]

The average annual savings for the first 5 years of the Midwest energy efficiency policy scenario modeled in this study were 34.6 million Mcf and 6.1 billion kWh.[29] We then divided those annual savings figures by two, to reflect the assumption that half the total savings are achieved through specifically funded utility and/or public benefits programs. That results in average annual "program" savings of 17.3 million Mcf and 3.05 billion kWh. Taking reasonable ballpark assumptions for lifetime costs of conserved energy for such programs (i.e., 3.0 cents per kWh and $2.00 per Mcf), and assuming reasonable typical values for measure lifetime (i.e., 12 years) and a discount rate (i.e., 5 percent real discount rate), we were able to estimate annual "program" funding requirements. We estimate that across the region, annual utility/public benefits program funding of approximately $310 million for gas energy efficiency programs and $800 million for electric energy efficiency programs would be required.

For a rough estimate of funding per state, one could divide those figures by eight (for the eight states we included in the region), resulting in average annual program funding of $39 million for gas energy efficiency programs and $100 million for electric energy efficiency programs. Obviously some states would need to spend more, and some less. The relative allocation among states could be roughly estimated by examining the proportion of total regional savings attributed to each state in Tables 13 and 14.

[27] See *Energy Efficiency's Next Generation: Innovation at the State Level* (Prindle et al. 2003) for a thorough discussion of energy efficiency policy options available to states.
[28] See *Supplying Energy Through Greater Efficiency* (Meier, Wright, and Rosenfeld 1983).
[29] Obtained from Tables 13 and 14 (essentially 2010 reported total savings divided by five, to derive an average annual savings across the first 5 years of programs).

For the purposes of illustration, we have done such an allocation here. Tables 23 and 24 below present what the estimated required energy efficiency program funding per state would be if that proportional allocation of the total program funding were applied.

**Table 23. Amount of Annual Funding Needed to Achieve Projected Savings Natural Gas**

| State | Percentage of Total Regional Savings[a] | Required Funding (In millions) |
|---|---|---|
| Illinois | 24% | $75 |
| Indiana | 11% | $35 |
| Iowa | 5% | $16 |
| Michigan | 19% | $59 |
| Minnesota | 9% | $27 |
| Missouri | 4% | $12 |
| Ohio | 16% | $51 |
| Wisconsin | 11% | $34 |
| Total Region | 100% | $310 |

[a] Percentages based on 2010 savings for each state as a proportion of 2010 grand total regional natural gas savings in Table 13.

**Table 24. Amount of Annual Funding Needed to Achieve Projected Savings Electricity**

| State | Percentage of Total Regional Savings[a] | Required Funding (In millions) |
|---|---|---|
| Illinois | 21% | $167 |
| Indiana | 14% | $113 |
| Iowa | 5% | $40 |
| Michigan | 14% | $109 |
| Minnesota | 8% | $66 |
| Missouri | 7% | $55 |
| Ohio | 21% | $166 |
| Wisconsin | 10% | $83 |
| Total Region | 100% | $800 |

[a] Percentages based on 2010 savings for each state as a proportion of 2010 grand total regional electricity savings in Table 14.

Obviously states could choose to provide greater or lesser amounts of energy efficiency program funding than the proportional allocations presented in Tables 23 and 24. However, the state-by-state energy and dollar savings benefits presented throughout this report are based on those assumed proportional allocations of energy savings accomplishments.

### Broader Economic Benefits

The consumer cost reduction impacts resulting from the energy efficiency policies also would produce certain other broader economic benefits to the states and to the region, principally due to the effects of lower overall energy costs and reducing the amount of

money leaving the region to import fuels. Through the use of comprehensive input-output models,[30] it is possible to project the net effect of these changes in energy costs on the economic indicators of jobs and total payroll within individual states and for the region as a whole. Table 25 presents the results of this analysis.[31]

**Table 25. Projected Economic Benefits of Energy Efficiency Programs by State**

| State | 2010 | | 2015 | | 2020 | |
|---|---|---|---|---|---|---|
| | Number of Jobs | Employee Compensation in Millions $a | Number of Jobs | Employee Compensation in Millions $ | Number of Jobs | Employee Compensation in Millions $ |
| IL | 6,480 | $220 | 9,720 | $300 | 13,160 | $440 |
| IN[b] | N/A | N/A | N/A | N/A | N/A | N/A |
| IA[b] | N/A | N/A | N/A | N/A | N/A | N/A |
| MI | 5,170 | $130 | 7,630 | $200 | 11,380 | $330 |
| MN | 2,570 | $70 | 3,570 | $90 | 5,260 | $140 |
| MO[b] | N/A | N/A | N/A | N/A | N/A | N/A |
| OH | 5,300 | $100 | 9,590 | $220 | 12,430 | $290 |
| WI | 3,320 | $70 | 4,750 | $110 | 7,060 | $160 |
| Total Region[c] | 30,220 | $750 | 48,270 | $1,230 | 66,620 | $1,770 |

[a] All dollar values cited in the table are expressed in 2001 dollars.
[b] State-specific data not available (N/A) for Indiana, Iowa, or Missouri.
[c] "Total Region" includes aggregate results for Illinois, Indiana, Iowa, Michigan, Minnesota, Missouri, Ohio, and Wisconsin.

As can be seen in the table, the energy efficiency policy approach in the Midwest would be expected to produce over 30,000 net new jobs in the region and an estimated increase of $750 million in net annual employee compensation in just 5 years. Over 15 years, those results increase to over 66,000 net new jobs and nearly $1.8 billion in net additional annual employee compensation.[32]

[30] The economic modeling for this component of the analyses was performed by MRG Associates, using proprietary methodology the company has developed based on the well-known IMPLAN input/output model.
[31] Individual state results were produced for a subset of states involved in sponsoring this project.
[32] All "net" figures are net in comparison to the "business-as-usual" base case scenario.

## CONCLUSION

The Midwest as a region bears a very heavy cost burden for natural gas, both because of its large total use of that fuel and because of its extreme dependence (92 percent) on natural gas imported from other states and countries. This burden is approaching a crisis level with the soaring prices that have been observed in the natural gas market during the past 2 years. Wholesale natural gas prices have more than doubled and are projected to be triple their level of the previous decade over the next couple of years.

Notably, the Midwest has no real supply-side options for producing its own natural gas. The only realistic option for addressing this crisis is to dramatically accelerate energy efficiency efforts within the region.

In recognition of these circumstances, and building upon a recent prominent national study (Elliott et al. 2003), ACEEE launched the current study to examine the potential for energy efficiency to help address the natural gas crisis in the Midwest.

The results of this study are very encouraging. The data suggest that a modestly aggressive, but pragmatically achievable, energy efficiency campaign (achieving on the order of a 5 percent reduction in both electricity and natural gas customer use over 5 years) could produce tens of billions of dollars in net cost savings for residential, commercial, and industrial customers in the Midwest. Moreover, we estimate that such an effort would produce over 30,000 net new jobs and $750 million in net additional employee compensation over that time period.

Achieving these results would require a significant effort in terms of new policies and additional funding for energy efficiency programs, but the economic benefits to the states and to the region would be several times larger than the costs. Moreover, the price of doing nothing in the face of this crisis will be enormous, both in terms of the overall economy and the quality of life in the region.

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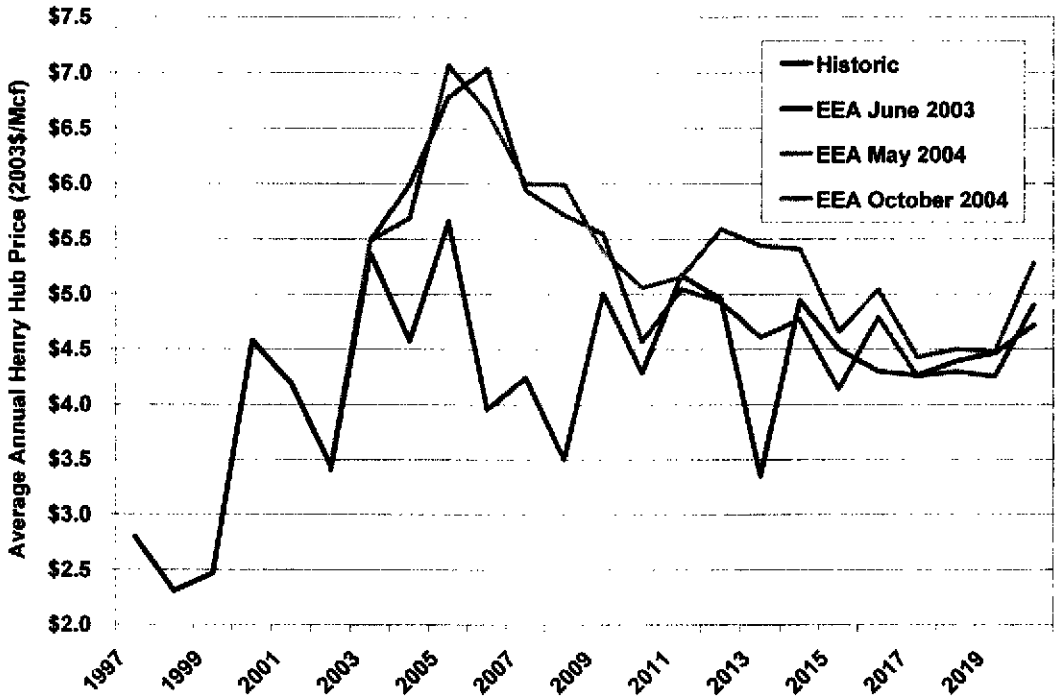
# APPENDIX A: RECENTLY UPDATED NATURAL GAS PRICE FORECAST




Source: EEA 2004

## APPENDIX B: REGULATORY MECHANISMS FOR NATURAL GAS EFFICIENCY PROGRAMS

Research and analysis of natural gas efficiency programs experience to-date has abundantly demonstrated that some type of legislative and/or regulatory requirement and funding mechanism is an essential ingredient for any significant utility energy efficiency program effort to occur (e.g., see Cowart 2001; Kushler and Suozzo 1999; Kushler and Witte 2001). In our recent work to identify and profile exemplary natural gas efficiency programs (Kushler, York, and Witte 2003), we also identified and described the legislative/regulatory foundations underlying exemplary energy efficiency programs that are being successfully delivered in the field today. In this appendix, we present selected highlights of this legislative and regulatory review. Regulatory authorities and/or legislative bodies can take the first critical steps to create natural gas energy efficiency programs by establishing requirements for these programs *and* establishing associated mechanisms that ensure economic incentives are in place for the utilities.

Table B-1 presents summary data for eight states and one Canadian province regarding their legislative and regulatory framework for utility natural gas programs. These nine jurisdictions were chosen because they are the leading areas in terms of utility natural gas energy efficiency efforts. These summary data are based on a variety of inputs, including interviews with appropriate contacts (e.g., state regulatory staff, utility personnel, etc.) and published information (regulatory orders, annual reports, etc.)

Information is provided in the table regarding four categories of legislative/regulatory structure:

1. whether there is a legal requirement in the state to provide natural gas energy efficiency programs
2. whether there is an approved program cost recovery mechanism in place
3. whether there is a mechanism for the utility to earn shareholder incentives for good performance with their natural gas energy efficiency programs
4. whether there is a mechanism in place for utilities to recover "lost revenues" resulting from their natural gas energy efficiency programs

The results presented in Table B-1 reveal some significant patterns among these leading jurisdictions for natural gas energy efficiency. First, seven of the nine jurisdictions have some type of legal requirement for utility funding of natural gas energy efficiency programs, and the other two have strong regulatory encouragement for such programs. All nine jurisdictions have some type of explicit mechanism in place to assure cost-recovery for natural gas energy efficiency program expenditures.

These two key features (i.e., a legislative/regulatory requirement for funding and a mechanism for cost-recovery) have been characterized elsewhere (e.g., Kushler and Witte 2001) as crucial threshold conditions for significant utility energy efficiency efforts to occur. The findings summarized in Table B-1 would seem to bear that out.

Beyond those minimum conditions, the observations regarding other regulatory mechanisms are somewhat mixed. Three of the nine jurisdictions have some type of utility shareholder incentive mechanism and two of those also have a lost revenue recovery mechanism (plus one other jurisdiction has a decoupling mechanism). The presence of these other types of mechanisms to provide economic incentives in only a minority of these leading jurisdictions suggests that they are enhancements rather than minimum threshold conditions for achieving successful natural gas energy efficiency programs. Nonetheless, we do support the use of some incentive mechanism beyond simple cost recovery as a way to help encourage maximum effectiveness on the part of the program administrator. Offering such incentives may be especially important to "jump start" natural gas efficiency programs in jurisdictions where they have not been offered before.

**Table B-1. Summary of Legislative and Regulatory Mechanisms**

| State | Legal Requirement | Cost-Recovery | Shareholder Incentives | Lost-Revenue Recovery | Other Mechanisms |
|---|---|---|---|---|---|
| CA | Yes (required by statute) | Yes (gas public purpose surcharge) | No | No | Also a system benefit charge for low-income energy efficiency programs |
| MA | No (encouraged by regulators) | Yes ("Conservation charges" approved in company-specific regulatory cases.) | Yes (Some gas utilities do have incentive mechanisms.) | Yes (Most utilities have some recovery mechanism.) | Statute requires statewide energy audit program. Funded by small customer charge, administered by state. |
| MN | Yes (required by statute) | Yes (Gas utilities required to spend 0.5% of revenues.) | Yes (Commission-approved mechanism) | No (used to, was replaced by incentive mechanism) | No |
| NJ | Yes (required by statute) | Yes ("societal benefits charge" on customer bills) | No (Used to—no current mechanism) | No (no current authorization) | No |
| Ontario, Canada | Yes (Ontario Energy Board order) | Yes (included in rates, also has a "DSM Variance Account" to reconcile over-and under-spending on EE by utility) | Yes (One major utility has a shared savings mechanism [SSM] with + and – incentives.) | Yes (a lost revenue adjustment mechanism) | No |
| OR | Somewhat (Weatherization is required, other EE efforts encouraged by regulators.) | Yes (Largest gas utility has a Commission-approved surcharge for EE. Funds are transferred to a state agency.) | No | N/A (Used to have one, now the largest gas utility has decoupling.) | Utilities required by Statute to provide weatherization programs. |
| WA | No (encouraged by regulators) | Yes (covered in utility-specific regulatory orders) | No | No | Commission requires "least cost planning," comparing energy efficiency to gas purchasing options. |
| VT | Yes (required by statue and regulatory orders) | Yes (included in rates and reviewed in rate cases) | No | Yes (Net lost revenues are eligible for recovery in rates cases.) | The electricity energy "efficiency utility" in VT operates programs that also produce gas savings. |
| WI | Yes (required by statute) | Yes (Certain funding amounts must by transferred by utilities to the state public benefits EE program.) | N/A (Programs are administered by a state agency.) | No | Statute allows utility to spend more on EE, beyond the minimum it must send to the state, if it wishes. |

## APPENDIX C: NATURAL GAS ENERGY EFFICIENCY PROGRAM EXAMPLES

Natural gas energy efficiency programs have been offered by some utilities for over two decades—many were developed and offered in the 1980s in response to natural gas price increases and shortages. They also developed in conjunction with the rise of integrated resource planning and demand-side management by electric utilities. Since many utilities are combined electricity and natural gas, applying these planning and program principles to both types of service made a lot of sense. Natural gas utilities saw the benefits of improved energy efficiency to their customers and their operations. Although natural gas utility energy efficiency efforts diminished a fair amount during the 1990s, due to the prolonged period of low natural gas market prices, a number of utilities did maintain some high quality programs—which we were able to identify in our recent research.

In this appendix, we provide examples of natural gas energy efficiency programs that we selected and profiled for their "best practices" in our recent national review of exemplary natural gas energy efficiency programs (see Kushler, York, and Witte 2003).

In selecting the programs to profile for this report, we first sought to identify programs that would be most appropriate for the climate, building stock, and customer end-use applications prevalent in the Midwest. We also endeavored to make sure to have at least some programs targeting each major customer sector (residential, commercial, and industrial). Overall, we selected and profile in this appendix a total of nine natural gas energy efficiency programs. (For convenience, the programs are sorted into "residential" and "commercial/industrial" sections.)

## *NATURAL GAS ENERGY EFFICIENCY PROGRAMS FOR RESIDENTIAL CUSTOMERS*

*Residential Space Heating Equipment*

### *Joint Gas & Electric High Efficiency Furnace Rebate Program GasNetworks®*

### PROGRAM OVERVIEW

GasNetworks®, a consortium of gas utilities across the region, partnering with the state's investor-owned electric utilities and Cape Light Compact (CLC), offers a newly created rebate for high efficiency gas furnaces equipped with high efficiency air handlers. These include both electronic commutated motors (ECM) and other furnace fan systems (based on measured performance). The dual rebate program represents the first of its kind in the country. These furnaces not only save natural gas, but also electricity required to power the motor. Since these furnaces save both electricity and gas, GasNetworks® recognized an opportunity partner with the state's investor-owned electric companies and CLC to propose a joint energy efficiency rebate program. GasNetworks® approached the state's investor-owned utilities and CLC and proposed such a program, which resulted in a joint gas and electric rebate program that ultimately benefits consumers, contractors, and the environment.

A $400 mail-in rebate is available for the installation of these high efficiency furnaces. Through the partnership arrangement, the natural gas member companies of GasNetworks® fund $200 and the other $200 is funded through the CLC or the electric company that shares the gas company's service territory. In order to be eligible, the furnace must meet or exceed 92% annual fuel utilization efficiency (AFUE) and be equipped with an ECM or equivalent advanced furnace fan system.

For program administrative efficiency purposes, GasNetworks® uses an administrative vendor to perform the following functions:

- Rebate application review/approval/processing
- Customer inquiry and issue resolution
- Onsite equipment installation verification
- Management reports/data tracking
- Invoicing with necessary back-up

GasNetworks® continues to offer a separate $200 rebate for natural gas furnaces that meet or exceed 90% AFUE.

This program serves customers throughout Massachusetts due to the extensive customer service territories encompassed by GasNetworks®' members, which include Bay State Gas, Berkshire Gas, KeySpan Energy Delivery (New England), New England Gas (Massachusetts), NSTAR Gas, and Unitil. Investor-owned electric companies and energy efficiency providers that are partners for this program include Cape Light Compact, Massachusetts Electric, NSTAR Electric, and Western Massachusetts Electric Company.

The following channels of communication are used to market this program. Individual company recognition is a fundamental issue that is addressed through the placement of logos on the appropriate printed material and forms. Marketing venues include but are not limited to:

- GasNetworks® website and utility websites
- Brochures
- Utility bill enclosures, bill messages, customer call centers
- GasNetworks® and utility newsletters
- Broadcast e-mail
- Home shows, trade shows, trade ally events
- Training seminars
- Trade publications

Marketing, promotion, and similar program activities are accomplished through sponsor coordination, which may include independent and/or joint activities. The program serves residential and small commercial/industrial heating customers. To reach these customers, the program directly targets homeowners, landlords, developers, HVAC/plumbing contractors, manufacturers, and both distributors and wholesalers of high efficiency, qualified equipment.

Massachusetts' regulatory environment has fostered development of this innovative, collaborative program. On November 25, 1997, the Massachusetts Electric Utility Industry Restructuring Act was signed into law. This law positioned Massachusetts as a national leader in deregulation by eliminating utility monopoly service and allowing competition among energy service providers. The law also requires that utilities continue energy conservation programs provided by electric companies, funded through a systems benefits charge. The Massachusetts' gas companies, however, do not fall under this charge. Each gas company must file and negotiate its energy efficiency program budget and plan with the Massachusetts Division of Energy Resources and the Department of Telecommunications and Energy. Some gas utilities earn performance incentives and some earn lost-based revenue. Cost recovery for all gas utilities is based on customer per therm usage.

GasNetworks®, as demonstrated by this innovative program, seeks to be the recognized leader in the energy efficiency industry by providing a dynamic portfolio of natural gas energy efficiency and market transformation programs and services, educating its customers on the value of energy efficiency, and transforming markets to achieve long-term benefits for its members' customers and society as a whole. To achieve these goals GasNetworks® works with governmental agencies and affiliates to promote energy efficient technologies, create common energy efficiency programs, educate consumers, and promote contractor training and awareness of ever-changing natural gas technologies.

**PROGRAM PERFORMANCE**

The Joint Gas & Electric High Efficiency Furnace Rebate Program is very new. It began in May 2003. Early results (through September 2003) are:

- 131 program participants (the annual goal/projection is 896 units)
- electricity savings of 89,735 kWh
- natural gas savings of 24,235 therms
-

Savings estimates are based on the following assumptions:

- Electric savings: heating 600 kWh/yr; cooling 170 kWh/yr
- Gas savings: 185 therms
- Incremental cost: $200
- Measure life: 18 years

A more complete picture of the program's performance will emerge after a complete year of operation, particularly encompassing the heating season when demand for furnace replacements is higher.

## LESSONS LEARNED

While still in its infancy, this program demonstrates the value of collaboration among gas and electric utilities for offering customers a joint rebate. Such an approach is attractive to consumers for its simplicity and ease of participation. At the same time, the participating utilities gain administrative efficiency through joint processing of the rebates, rather than each utility having to process them. Offering this program jointly across Massachusetts also provides program consistency and serves a much larger market for a common service. This allows joint marketing and enhances coordination and cooperation with the numerous individual suppliers of high efficiency furnaces.

This program would be easy to replicate, subject to the mutual coordination and support of electric and gas utilities and other energy efficiency providers that share the same service territory.

## PROGRAM AT A GLANCE

**Program name:** Joint Gas & Electric High Efficiency Rebate Program

**Targeted customer segment:** Residential and small commercial customers

**Program start date:** May 1, 2003

**Program participants:** 131 program participants (through September 2003)

**Approximate eligible population:** 9,000 (based on 10% of the companies' "standard" high efficiency furnace rebates processed during 2002, i.e. 90%+ AFUE, non-ECM)

**Participation rate:** Too new to estimate

**Annual energy savings achieved:** May 1, 2003–September 2003=24,235 therms. Also has achieved electricity savings of 89,735 kWh.

**Cost effectiveness:** The benefit-cost ratio is estimated to be 1.08 utilizing the Total Resource Cost Test.

**Budget**

| Year | Program Costs |
|---|---|
| 2001 | N/A |
| 2002 | N/A |
| 2003 (preliminary) | $378,000 |
| 2004 (projected) | 400,000 |

**Funding sources:** Customer rates per kWh usage or therm usage.

**Best persons to contact for information about the program:**

- Michael Sommer
- Berkshire Gas Company, 115 Cheshire Road, Pittsfield, MA 01201
- Phone: (413)445-0315
- Fax: (413)445-0359
- Email: msommer@berkshiregas.com
- Web page: http://www.gasnetworks.com

- Mary McCarthy
- NSTAR Electric & Gas Co., One NSTAR Way, SW360, Westwood, MA 02090
- Phone: (781)441-3888
- Fax: (781)441-3191
- Email: mary_mccarthy@nstaronline.com

*Residential Space Heating Equipment*

***High Efficiency Furnace Program***
***NW Natural***

## PROGRAM OVERVIEW

The Oregon Public Utility Commission (OPUC) acknowledged NW Natural's (NWN) first Least Cost Plan in 1991, which included the company's first exploration of demand-side resources. In January 1993, NW Natural submitted to the OPUC a proposal to offer seven DSM programs to its Oregon customers including a high efficiency furnace program. The submission also proposed a balancing account program funding mechanism, called a "Conservation Resource Adjustment" (CRA) that allowed the Company to collect both program expense and lost margins occurring from OPUC-approved DSM programs.

Late in the summer of 1995, the company filed its High Efficiency Furnace Program under its CRA mechanism with the Oregon commission. Upon its acceptance, the program was launched in October 1995. Since then, NWN has offered existing and conversion customers a $200 rebate when they install a 90% AFUE or better, full-condensing gas furnace, with a programmable thermostat. Sales from 1996–2000 were relatively flat, averaging a lackluster 2,725 high efficiency furnace sales per year.

In the fall of 2001, NWN re-invented the program by creating strategic alliances with trade allies and building new performance measures into the program. The new approach packaged its $200 rate-funded utility rebate with a newly available Oregon Residential Energy Tax Credit along with coordinated complementary offers from HVAC distributors. The packaged incentive approach dramatically increased program participation and the corresponding adoption rate of ENERGY STAR furnaces. Sales rose to 5,228 in 2001. In 2002, the first full year of the enhanced program, there were 8,089 adoptions—nearly triple those captured in the early years of the program.

The enhanced NW Natural High Efficiency Furnace Program aligned the interests of HVAC distributors, dealers, and equipment lenders with those of the local gas utility, its ratepayers, and customers to promote high efficiency natural gas. In a single year, NWN sponsors three promotional campaigns, two that focus on high efficiency furnaces and one featuring air conditioning. In each campaign, partners contribute value-added components, which, bundled together, create compelling, limited-time offers promoting high efficiency furnaces. Examples have included cash rebates, discounted or deferred financing, and extended warrantees. NWN advertises the offer, pools media buying power, provides market research and target-marketing expertise, and lends the power of its brand to increase the sales of high efficiency furnaces.

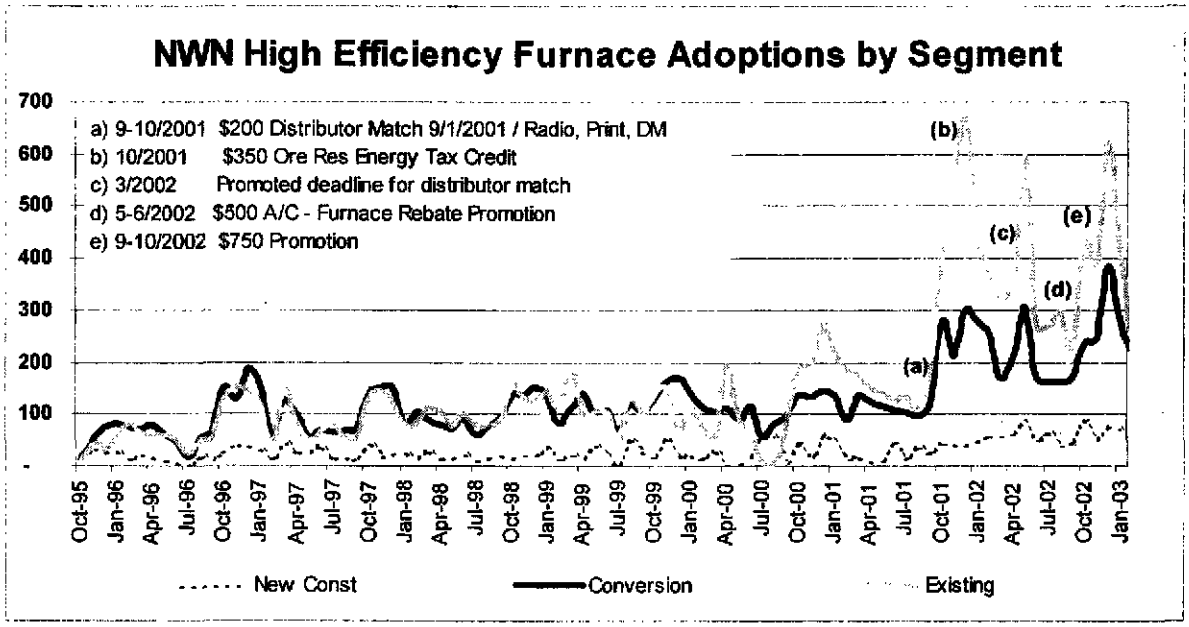
The new market-based, packaged incentive approach to managing the program also makes use of a new performance-management tool. Customer leads are allocated to trade allies based on a variety of performance metrics set by NW Natural. Dealer performance is measured independently, but distributors are measured on the sum performance of dealers representing their brand. The better the brand performs, the more branded customer contacts

the distributor will be awarded in future campaigns. Likewise, the better a dealer performs within a brand (assuming the dealership can handle increased sales volume), the more leads generated from those contacts will be awarded to that dealer.

The program generates two types of customer leads. *Co-branded leads* (bill inserts or direct mail) include both the manufacturer's brand logo and the NWN logo on the piece. NWN initiates the contact with the customer and downloads an event into its Customer Relationship Management System (CRMS) that indicates the brand the customer received in the mail. This allows NWN sales representatives to know the brand with which the customer has interacted, regardless of how the lead was generated. These leads are distributed throughout the NWN service territory to contractors representing the brand. *Unbranded leads* are the result of customers initiating contact with the company. An example might be a lead from a customer whose furnace has failed. In such a case, NWN would allocate the lead to the next eligible participating contractor.

## PROGRAM PERFORMANCE

Since the implementation of the distributor program, market share of high efficiency furnace sales roughly doubled (from about 20 to 40%) during times of active promotion. Sales tracking results show clear evidence of the impact of the limited time offers as indicated in the chart below.




The new packaged incentive has dramatically improved dealer performance. The former practice of distributing leads based on inconsistent, subjective criteria of utility sales staff has been replaced with a systematic, broadly executed, performance-based approach. This approach rewards performance, creates strong market signals to select high efficiency furnaces, and identifies training needs of dealers.

Previously, NWN supported furnace dealers with advertising co-op dollars. This resulted in unfocused, disparate messages being communicated to NWN's market as dealers attempted to differentiate their businesses. In the current program, NWN has created a common platform that all dealers can leverage with their own advertising. With a uniform high efficiency message and a compelling offer across the utility's service territory, customers are hearing and seeing common themes resulting in improved adoption rates for high efficiency furnaces.

An independent impact evaluation of the program in 2001 found the program saved:

- 81 therms in fuel conversion homes,
- 93 therms in new construction homes, and
- 99 therms in equipment upgrades (all in average annual therms).

Applying these savings to the adoption rates shown in the first line of the table below yields the estimated savings shown in the second line of the table.

| | New Construction | Conversion | Existing | Total |
|---|---|---|---|---|
| 1996–2002 adoptions | 2,446 | 10,518 | 13,560 | 26,524 |
| 1996–2002 savings (therms) | 227,478 | 851,958 | 1,342,440 | 2,421,876 |

The same evaluation found benefit-cost ratios of 2.4 for participants and 1.4 for a total resource cost perspective.

## LESSONS LEARNED

NWN High Efficiency Furnace Program is exemplary because it:

1. Creates value for all market participants—customers, implementers, distributors, and dealers. Creation of value for the collaborating parties makes the program's success sustainable.
2. Effectively leverages resources from entire market channel to offset incremental costs.
3. Reinforces core program objectives (savings and service) and values throughout the market channel.
4. Is cost-effective—gas programs typically face difficult cost-effectiveness challenges given the lower avoided cost of gas. The packaged incentive approach significantly improves participant perspective, benefit-cost ratios.
5. Has achieved significant levels of natural gas savings. NWN, a medium-sized gas utility, has saved almost 2.5 million therms in seven years via this program.

This program's relatively long history provides a unique opportunity to examine the impacts of changes in various elements of its design and delivery. NWN has achieved its greatest program success in recent years after it critically evaluated its program and then changed key elements of the program in response to its evaluation. The program has had the chance to grow, mature, and evolve to become more effective and successful over time.

On October 1, 2003, the rebate element of the program was transferred to the Energy Trust of Oregon. NW Natural will continue to monitor and manage dealer performance and reward performance with utility leads. The Energy Trust will provide future program evaluation and both entities will work jointly on program metrics and incentives.

## PROGRAM AT A GLANCE

**Program name:** High Efficiency Furnace Program

**Targeted customer segment:** Residential homeowners/builders

**Program start dates:**
Oregon: Approved Oct 1995, promotion began Jan. 1996
Washington: Approved Oct 2001, promotion began Jan. 2002
Enhanced market strategy introduced Sept. 2001 for both states

**Program participants:**
Oregon: 7,714 in 2002; 26,524 over life of program (1996–2002)
Washington: 375 in 2002 (first full year)

**Approximate eligible population:** 462,000 in Oregon; 47,000 in Washington

**Participation rate:**
Oregon: 1.7% annually; 5.7% over seven-year life *(relative to eligible population)*
Washington: 0.8% annually

**Annual energy savings achieved:** 714,000 therms saved in 2002; 2,421,000 therms saved over life of program (1996–2002)

**Cost effectiveness:** (program years 2001–2002)
Benefit-cost ratios: Participant=2.4; Utility=1.4; TRC=1.4 (total resource cost)
Levelized TRC cost per therm: $0.463

**Program induced market share:** Currently, about 40% of new gas conversions during and following a promotion

**Approximate saturation rate**: Both states at approximately 10.1% in 1997

**Budget and cost information**

| Year | Program Costs ~6% (includes $200 utility rebate) | Customer Costs* | Total Costs (excludes distributor $ & tax credits) |
|---|---|---|---|
| 2001 | $1.2 million | $18 million (5,200 units) | $19.4 million |
| 2002 | $1.7 million | $27 million (7,700 units) | $28.7 million |
| 2003 (preliminary) | $1.4 million | $22.0 million (6,300 units) | $23.4 million |
| 2004 (projected) | Not available—transfers to Energy Trust of Oregon | Not available | Not available |

* $3,500 is assumed as the average installed cost of a high efficiency furnace including materials but without extraordinary installation requirements, unusual premium features, ancillary equipment, or air-handling modification. Also note that between $350 and $550 of stated customer costs are typically offset by Oregon Residential Energy Tax Credit and, for most of the year, distributor incentives, typically valued at roughly $200.

**Funding source:** Ratepayer funding through September 2003 has been provided through a balancing account in both Oregon and later, Washington. Effective October 1, 2003, implementation of the rebate component of the program was transferred to the Energy Trust of Oregon where it is funded through a public purpose charge. NW Natural will use "Category A" rate-based funding to complement Energy Trust communications and marketing. Ratepayer funding is leveraged with distributor marketing funds and the Oregon Residential Energy Tax Credit.

**Best persons to contact for information about the program:**

- Tim Abshire, Director, Planning and Development
- NW Natural, 220 NW Second Ave., Portland OR 97209
- Telephone: (503)226-4211 ext. 2491
- Fax: (503)721-2539
- Email: tsa@nwnatural.com
- Web page: www.nwnatural.com

- Stephen Bicker, Director of Energy Efficiency
- NW Natural, 220 NW Second Ave., Portland, OR 97209
- Telephone: (503)220-2369
- Fax: (503)721-2539
- Email: Stephen.Bicker@nwnatural.com
- Web page: www.nwnatural.com

*Residential Space Heating Equipment*

***HomeBase Equipment Replacement Program***
***Vermont Gas Systems, Inc.***

## PROGRAM OVERVIEW

Vermont Gas Systems' HomeBase Equipment Replacement Program has been offered to customers without interruption since 1993. The program is designed to reduce natural gas consumption and peak day demand in residential buildings that use natural gas for space and water heating by encouraging customers to purchase high-efficiency equipment when existing equipment is at the end of its useful life, or when a customer is switching to natural gas from a different fuel. Vermont Gas Systems has approximately 30,000 residential meters, with an average annual gas consumption of roughly 1,000 ccf.

Eligible customers receive cash rebates to offset most or all of the average incremental cost of purchasing and installing high-efficiency equipment instead of baseline efficiency equipment. The simple payback on the customer's portion of the incremental cost will vary depending on the usage and equipment chosen, but should be 1–3 years or less for most customers replacing either furnaces or boilers. Program savings are also incremental, though the savings that customers see by replacing outdated equipment are often quite significant. Fixed rebates have been established for equipment that has a societal benefit-to-cost ratio greater than one across a wide band of usage levels. Custom screenings are done for larger or staged heating systems that may be appropriate in applications where a single high-efficiency heating plant cannot meet the load requirements. The fixed rebate schedule is as follows:

**Fixed Rebate Schedule**

| **Eligible Equipment** (must be purchased new) | **Required Efficiency** (as listed in GAMA) | **Minimum Usage Criterion** (normalized heating usage) | **Rebate** |
|---|---|---|---|
| Hot Air Furnace | 90%+ AFUE | None | $300.00 |
| Hot Water Boiler | 87%+ AFUE | 1,000 Ccf/yr | $450.00 |
| Steam Boiler | 82%+ AFUE | 700 Ccf/yr | $150.00 |
| Setback Thermostat | n/a | None | $25.00* |
| Water Heater 40/50 gal. | .61+ EF | None | $100.00 |
| Indirect-Fired Storage Tank | heated by an 80%+ AFUE boiler | | $100.00 |

*Only one setback thermostat rebate offered per household

Another customer option available through VGS is rental of water heaters through the closely related Water Heater Rental Program. VGS leases and sells several sizes, types, and efficiencies of water heaters for residential and commercial applications. High-efficiency water heaters (.61 energy factor or greater) are VGS' standard rental units for chimney-vented,

direct-vent, and power-vent applications. No rebates are provided for high-efficiency rental water heaters, as standard-efficiency water heaters are only offered where installation restrictions prevent the use of high-efficiency units. VGS claims savings for rented high-efficiency water heaters, though only administrative costs are charged to the DSM program.

## PROGRAM PERFORMANCE

Though reliable data have been difficult to obtain, VGS believes that the market share for high-efficiency heating equipment in its service territory has increased significantly since initial implementation of this program. VGS' staff members have met recently with local wholesalers to discuss market share for high-efficiency equipment, and anecdotal responses indicate that 90+ AFUE furnaces are now the standard for natural gas hot air systems. Several wholesalers reported that they no longer stock natural gas furnaces less efficient than 90+ AFUE. By comparison, at least one wholesaler reported that purchasers of propane furnaces, for which no comparable rebates are available, often opt for lowest first cost and purchase 80% AFUE furnaces.

VGS' Water Heater Rental Program has been very successful, both in terms of revenue and as a no-cost efficiency initiative for VGS. The higher cost of high-efficiency water heaters results in a slightly higher monthly rental payment for customers, which will typically be offset by the energy savings resulting from the higher energy factor.

Program results through December 2002 are summarized below (includes rental water heater installations):

- Customers with installations: 4,591
- Total utility cost: $1.05 million
- Annualized Mcf savings estimate: 39,441 Mcf
- Peak day savings: 321 Mcf
- Lifetime savings: 670,076 Mcf
- Average annual incremental savings per participant: 8.6 Mcf
- Historical utility cost per annual Mcf saved: $26.69

The annual budget and program goals for FY2003 are given below:

- Customers with installations: 549
- Utility cost: $122,000
- Annualized savings goal: 3811 Mcf

VGS includes a survey along with each rebate check to ensure customer satisfaction. Questions are asked regarding how satisfied the customer is with service received on the phone, inspections, installation contractors, the amount and timeliness of the rebate, and the actual equipment. In 2002, VGS contracted with Dr. James M. Sinkula to tabulate and statistically analyze the results of the surveys that have been returned to VGS over approximately a five-year period. Responses were ranked on a 5-point scale with 1 being the highest. For all of the questions, the mean responses fell between a low of 1.5 and a high of

1.2. The mean response to the question "Overall how satisfied are you with your participation in the program?" was 1.3, indicating a very high level of overall satisfaction. Of 561 valid cases for this question, only 1 customer reported being dissatisfied.

## LESSONS LEARNED

VGS's HomeBase Equipment Replacement Program has provided a consistent message encouraging high-efficiency replacements to contractors, homeowners, and wholesalers without interruption over a ten-year period. This has allowed the local market to look at high efficiency not as a brief trend, but as a technology that has the backing of the largest area energy provider and that is here to stay. Local contractors frequently use VGS' rebates as a sales tool, helping them to up-sell more costly equipment, despite the fact that rebate amounts have gradually decreased with time as high-efficiency equipment has gained greater market acceptance. Anecdotally, many contractors report that they now offer high-efficiency furnaces and boilers as their standard offering, raising awareness of homeowners and putting pressure on competing contractors to follow suit. Over time, VGS has simplified the rebate process, eliminating the requirement of a lengthy application form, but still providing a courtesy inspection of the new equipment by one of its service technicians at no cost to the customer. The success of the Equipment Replacement Program has been supported by Vermont Gas' ten-year history of successful residential new construction programs. In order to meet the efficiency standards required for rebates in the new construction area, virtually all natural gas furnaces used in new construction are 90+% AFUE, and typical boiler efficiencies have increased from AFUEs in the low 80%s to current standards of 85% or better.

## PROGRAM AT A GLANCE

**Program name:** HomeBase Equipment Replacement Program, including a closely related service, Water Heater Rental Program.

**Targeted customer segment:** Residential homeowners

**Program start date:** 1993

**Program participants:** 4,591 customers with installations since program inception (through December 2002)

**Approximate eligible population:** 30,000

**Participation rate:** About 15% (cumulative total) for the program's history

**Annual energy savings achieved:** Annualized savings are 39,441 Mcf for the program; lifetime savings are 670,076 Mcf; average annual savings per participant are 8.6 Mcf; peak day savings (system) are 321 Mcf.

**Cost effectiveness:** Historical utility cost is $26.69 per annual Mcf saved.

**Budget**

| Year | Program Costs |
|---|---|
| 2001 | $102,843 |
| 2002 | 116,542 |
| 2003 (preliminary) | 160,000 |
| 2004 (projected) | 134,565 |

**Funding source:** All of VGS' programs are funded through rates. Program expenses are deferred until reviewed by the DPS and PSB. Upon approval, expenses are amortized in rates over a three-year period.

**Best person to contact for information about the program:**


- Jim Grevatt, Manager, Energy Services
- Vermont Gas Systems, Inc., P.O. Box 467, Burlington, VT 05402
- Phone: (802)863-4511 ext. 372
- Fax: (802)863-8872
- Email: Jgrevatt@vermontgas.com
- Web page: www.vermontgas.com

*Residential Retrofit*

## *Home Performance with ENERGY STAR®: A New York Energy $mart℠ Program*
## *New York State Energy Research and Development Authority*

### PROGRAM OVERVIEW

The goal of the New York Home Performance with ENERGY STAR Program is to develop a comprehensive program for improving the energy efficiency, comfort, affordability, and safety of existing homes in New York State. The New York State Energy Research and Development Authority (NYSERDA) wanted to create a "one-stop" shopping experience for New Yorkers who are considering energy efficiency improvements for their existing one- to four-family homes. The program was initially launched in six target markets: Albany, Binghamton, Buffalo, Rochester, Syracuse, and the Hudson Valley, and expanded into the New York City and Westchester markets in 2003. In 2004, the program will be expanded into the Long Island market (Nassau and Suffolk Counties) in coordination with the Long Island Power Authority. NYSERDA contracts with the Conservation Services Group (CSG) for implementation and marketing services. The program is fuel neutral; it addresses electricity and natural gas efficiency.

Prior to 2001, there were few home improvement contractors in New York who understood and implemented the building science *"house-as-a-system"* approach to their work. The challenge continues to be increasing the skills of the existing small core of contractors and building on existing industry participants—insulation and HVAC contractors who are making energy-related home improvements using traditional techniques. The goal is to expand these contractors' knowledge base and practical application of a "systems approach" for performance-based testing techniques and treatments. Comprehensive energy efficiency treatments include insulation, air sealing, duct sealing, high-efficiency heating and cooling equipment, thermostat controls, high-performance windows, and high-efficiency appliances and lighting.

To build an industry infrastructure of accredited firms and certified technicians, NYSERDA coordinates with the Building Performance Institute (BPI), a national building science resource that sets the national standards for assessing and treating homes. BPI accreditation and certification are required for contractors who wish to participate in the program. The program offers training to assist contractors in preparing for the BPI certification tests. The cost of contractor training, certification, and accreditation offered through the program is incentivized by NYSERDA.

In addition to building a well-trained, professional home performance contractor infrastructure, there was also a need to drive consumer demand for these services. Therefore, NYSERDA developed an aggressive "call-to-action" marketing campaign, which focused on two crucial areas: (1) recruiting and educating contractors to affect change in home improvement services by using a "whole house" approach for diagnosing and treating homes; and (2) increasing consumer awareness of and demand for the services offered by participating Home Performance with ENERGY STAR contractors.

The marketing program, launched in February 2001, includes television, radio, newspaper, direct mail, co-op advertising, public relations, and special events. The spokesperson for the campaign is Steve Thomas, televisions renovation and design expert. Mr. Thomas is featured in all the advertising and sales collateral materials. Participating contractors may use this campaign to promote their own companies and are provided with 25% co-operative advertising support.

Experience has shown that the use of Steve Thomas to spearhead the marketing campaign has brought credibility and recognition to the New York Home Performance with ENERGY STAR Program. His role as a television host positioned him as an unbiased, third-party source for the best resources and information about remodeling, renovating, and building homes. The media campaign has been pivotal in increasing consumer awareness and demand for energy efficiency services. The campaign was also fueled by the concern for rising energy costs and energy supply in New York, as well as nationwide.

The program also offers customers access to reduced-rate financing of energy efficiency improvements. NYSERDA also launched the New York Assisted Home Performance with ENERGY STAR Program, which provides subsidies to income-eligible New York households, who may not qualify for the Weatherization Assistance Program, to complete energy efficiency upgrades to their homes.

## PROGRAM PERFORMANCE

The program is relatively new, but early results are promising. Highlights include:

***Energy Finance Solutions***
*Wisconsin Energy Conservation Corporation*

One of the services offered through NYSERDA's *Home Performance with ENERGY STAR Program* is reduced-rate financing of home efficiency improvements. Wisconsin Energy Conservation Corporation (WECC) offers this service as a contractor with NYSERDA. Including this kind of accessible financing option, which helps homeowners overcome the cost barrier, is an effective way to increase implementation rates of recommended improvements by program field staff.

Since 1995, WECC has operated a residential financing program called Energy Finance Solutions (EFS). As an authorized underwriter and originator of Fannie Mae's Energy Efficiency Loan Program, EFS works with utilities, contractors, and other agencies, such as NYSERDA, in eleven states throughout the country to offer residential customers a simple, affordable way to finance energy efficiency improvements.

Qualified homeowners can use the loan program to finance eligible improvements including: heating and cooling equipment, insulation and windows, water heaters, ENERGY STAR-qualified appliances, and other items. The program serves homeowners who want to implement energy saving measures, but need low-cost financing. Loans are unsecured and may be financed for a fixed term of up to ten years, making monthly payments very affordable to qualified homeowners. Because loans are unsecured, the program is especially appealing to homeowners who do not have enough equity in their home to get a home equity loan.

WECC solicits organizations (sponsors) with an interest in promoting energy efficiency to include the EFS financing option as part of their overall energy efficiency programs. Sponsors receive support from WECC in recruiting contractors and equipment dealers to participate in the loan program. In addition, sponsors may elect to offer to buy-down the interest rate to help increase overall participation.

From July 1, 2001 to June 30, 2002 (WECC's fiscal year), EFS originated more than 1,600 loans totaling more than $10 million and energy savings of 480,300 therms. The 2002–2003 fiscal year is off to a strong start with over 350 loans totaling more than $2.4 million.

For more information on EFS, contact Rob McCorkle, Director—Finance and Administration, WECC, (608) 249-9322 ext. 200, robm@weccusa.org.

- Residential customers have invested more than *$24.7 million* of their own money in home energy improvements. NYSERDA has contributed an additional $3,704,585 in subsidies to help income-eligible households pay for installation of eligible measures under the New York Assisted Home Performance with ENERGY STAR Program.
- Certification of more than 300 technicians, through the Building Performance Institute, in whole house building diagnostics and proper installation of insulation, air sealing and HVAC equipment for greater energy efficiency, health, and safety. Additionally, more than 100 technicians are in the certification process.
- Increased consumer awareness of ENERGY STAR products and services as a result of NYSERDA's marketing campaign and cooperative advertising program with contractors.

## LESSONS LEARNED

The New York Home Performance with ENERGY STAR Program has the stated goal of transforming the market for delivery of energy efficiency services to the existing housing market. As such, the implementation approach taken by this program is unique, differing greatly from the approach taken in the more conventional rebate-driven energy efficiency programs. This unique goal and approach has resulted in a number of interesting lessons learned. A few of those lessons are:

- *Start Small:* By initially launching this program market by market, NYSERDA and program implementers were able to quickly and effectively integrate any program revisions or modifications that were needed.
- *Market Big:* Crucial to the success of this market-based program has been striking a balance between consumer demand and contractor infrastructure. The "call-to-action" mass media marketing campaign, using a celebrity spokesperson (Steve Thomas), brought the program immediate credibility and recognition, which was instrumental in generating quick consumer demand. This aggressive and extensive marketing campaign also served to reinforce to potential participants in the contracting field that NYSERDA was making a long-term commitment to the program.
- *Offer Technical Training:* The "house-as-a-system" approach this program emphasizes was something that most contractors entering the program had little or no experience in. Therefore, it was imperative that comprehensive technical training be made available to them. This program offers basic building science training (Building Analyst I), as well as Specialist Training (currently offerings are Shell and Heating). These trainings prepare contractors to successfully complete the required BPI certification exams. Contractors can also purchase, through the program, the diagnostic equipment (blower door, duct blaster, and CO detector) they will need to do a comprehensive home assessment. The program has sought to minimize the upfront cost of entering the program by subsidizing the cost of the training and offering favorable repayment terms to contractors purchasing equipment.

## PROGRAM AT A GLANCE

**Program name:** Home Performance with ENERGY STAR, a New York Energy $mart$^{SM}$ Program

**Program start date:** February 2001

**Program participants to date**—annual totals as of October 2003:

- Number of households served (jobs completed) = 3,398
- Number of jobs in process = 1,528
- Number of BPI certified technicians = 300
- Number of BPI accredited firms: = 100

**Eligible population or customer segment:** The program serves owner-occupied, one-to-four-family residential buildings in the New York Energy $mart^{SM}$ Program service territory (all areas of New York State except Nassau and Suffolk Counties on Long Island, and 47 municipal or electric cooperative service territories served by New York Power Authority). The total estimated number of households in one- to four-family buildings in New York Energy $mart $^{SM}$ Program service territory is 3.5 million.

**Annual energy savings**

| | |
|---|---|
| Electricity Savings to Date (kWh)* | 1,366,330 |
| kWh Saved to Date per Household | 473 |
| Natural Gas Savings to Date (Billions Btus) | 100.48 |
| Natural Gas Savings per Household (MMBtus) | 34.79 |

*as of August 2003

**Budget:** NYSERDA is committing about $16.5 million through 2003 to this program. About $6.5 million of this is devoted to communications and marketing; $3.0 million to customer financing incentives and lower-income assistance; $2.5 million to contractor incentives; and $4.5 million to program administration, including technical field support.

It is projected that, through 2003, customers will have committed nearly $30 million of investments in eligible home performance measures. It is also projected that, through 2003, contractors shall have committed over $750,000 of investment (not including time spent in training) to enter the building performance industry. Between the three sources, total investment through 2003 is projected to exceed more than $48 million.

**Funding sources:** All New York Energy $mart$^{SM}$ programs are funded by a System Benefits Charge (SBC) paid by electric distribution customers of Central Hudson, Con Edison, NYSEG, Niagara Mohawk, Orange and Rockland, and Rochester Gas and Electric. NYSERDA, a public benefit corporation established by law in 1975, administers SBC funds and programs under an agreement with the Public Service Commission.

New York Energy $mart$^{SM}$ programs are designed to lower electricity costs by encouraging energy efficiency as the state's electric utilities move to competition. The programs are available to electric distribution customers (residential, commercial, institutional, and industrial) who pay into the SBC.

**Best person to contact for information about the program:**

- Andrew Fisk, Senior Project Manager, Residential Energy Affordability Program
- New York State Energy Research and Development Authority, 17 Columbia Circle, Albany, NY 12203
- Phone: (518)862-1090 x 3351
- Fax: (518)862-1091
- Email: residential@nyserda.org
- Web pages: www.nyserda.org or www.GetEnergySmart.org

*Residential Retrofit*

***Residential Weatherization Program***
***KeySpan Energy Delivery***

## PROGRAM OVERVIEW

KeySpan's Residential Weatherization Program was created as a way to encourage residential energy consumers within the KeySpan's Massachusetts service territory to implement energy-savings measures in their homes.

The objective of the KeySpan's overall market transformation effort is to encourage the most efficient use of energy, especially natural gas, wherever practical. To help achieve this objective for its residential customers, KeySpan implemented a residential weatherization program. This program provides customers with incentives to implement energy efficiency measures and encourage market transformation.

Qualifying measures include installation of the following:

- Attic insulation
- Wall insulation
- Basement or crawl space insulation
- Rim joist insulation
- Heating system duct insulation
- Attic ventilation insulation
- Ductwork leakage testing and sealing
- Air infiltration testing and sealing

Incentives to the customer include receiving a 20% rebate up to $750 for implemented measures, as well as reduced energy usage within the home and lower energy bills. To be eligible for a rebate, a contractor, pre-qualified by KeySpan Energy Delivery, must complete all installed measures. Do-it-yourself work does not qualify for rebates. To meet KeySpan's pre-qualification requirements and therefore be eligible to offer weatherization services to KeySpan's residential heating customers, a contractor must provide proof of the following:

- Registration in good standing as a "home improvement contractor" (HIC) within the Commonwealth of Massachusetts.
- Proof of insurance at KeySpan's corporate contractor partner specified minimum levels.
- KeySpan also performs background checks on all contractors through the Massachusetts Attorney General's office to verify a contractor's good standing and to determine if there have been complaints on file against a particular contractor.

Work completed under KeySpan's Residential Weatherization Program must meet all applicable state and local codes. Measures installed are to meet ENERGY STAR® guidelines, where applicable, and installing contractors are responsible for completing and submitting all

rebate applications with proper supporting documentation of work performed. To ensure quality installation, KeySpan inspects newly approved contractor's first three jobs. This inspection consists of an onsite review of the work performed, and, in some cases, may include infrared scanning or related techniques. After the initial three job inspections, KeySpan inspects approximately 20% of jobs performed by contractors performing work under the program.

KeySpan trains and educates its program contractors to provide customers one-stop informational awareness on all its applicable programs. KeySpan holds a minimum of one training event each year for participating contractors to increase their awareness of new technologies and installation practices. KeySpan uses feedback from these training events to identify key areas of interest for future training events.

KeySpan provides customers with a list of certified contractors in their service territory, which it has found to be a very valuable to its customers as a means to assure that they will be working with reputable, qualified contractors. Customers are responsible for full cost of measures implemented. Upon completion of a weatherization project, KeySpan requires proper documentation be completed and submitted by contractors to process the 20% rebate.

KeySpan markets this program to residential heating customers, home improvement contractors, and weatherization contractors through many channels, including:

- Trade relation networking,
- Trade shows and industry workshops,
- Electronic Audit Program,
- Residential Energy Conservation (RCS) Program,
- Bill inserts,
- Newspaper articles and advertising,
- Direct mail,
- Web sites,
- Radio advertisements, and
- Word-of-mouth through satisfied customers.

KeySpan market research shows that the following "drivers to participation"—reasons cited by participants for learning about and enrolling in the program:

- Contractors 33%
- Direct mail 23%
- Bill inserts 22%
- KeySpan sales rep/employee 11%
- Other 11%

## PROGRAM PERFORMANCE

Customers who participate in the program realize significant energy savings; preliminary research of the program indicates customers save an average of 90 therms per year.

The program was launched in October 2001 and to date has served 1,325 KeySpan heating customers in Massachusetts. The program has a current goal of serving 600 participants per year. The program has grown from 345 customers in its first year to 741 customers in its second year (May 2002–April 2003) and for program year 2003–2004 the program is already on track to surpass its participation goal. Long-range forecasts suggest the program will oversubscribe its target goals at least by 20%.

The number of participants in the program continues to increase, monthly and yearly, as KeySpan continues to market the program. KeySpan has found that the cost of installation is the greatest barrier for customer participation, despite the significant rebates available.

KeySpan's market research shows the following demographic observations about program participants:

- Those under 40 and between 50 and 59 years old are "more likely" to participate in the Weatherization Program.
- Customers with incomes less than $100,000 are "more likely" to participate in the program.
- Customers with incomes less than $35,000 are "most likely" to participate in the program.
- The average square footage for participating houses is 1,800 sq.ft.
- Participating households average 3 individuals per household

KeySpan has performed a bill history analysis of past program participants to assess the energy savings benefits of its Residential Weatherization program. Participants included in this analysis needed to have at least twelve months of billing history before and after the installation. Participants served prior to June 2002 represented the sample data. Since this program is relatively new, the sample size was 400 participants. The sample size represents approximately 35% of the customers served to date. After selecting the sample population, each customer's therm consumption data was normalized using heating degree information. Based on the bill history analysis, the average savings per customer was determined to be 90 therms per year. Results of this analysis are summarized below:

Normalized Therm Savings

| | Per Year | Life-Time |
|---|---|---|
| Average Therm Savings[3] (per year) | 90 | 1,800 |
| Average Rebate[1,2] | *$328.55 | |
| Therms Saving per Dollar Rebate | 0.28 | 5.5 |

[1]Average is based on 2002–2003 program year.
[2]Average therm savings of each rebate participant for all eligible rebates processed in a month.
[3]Calculated by comparing the average therm usage between billing history, pre-installation, and post installation

KeySpan has evaluated the program to establish benchmarks and periodically tracks its progress within the market based on these benchmarks. The evaluation found:

- Participants are highly satisfied overall with the KeySpan Residential Weatherization Program and give it a mean rating of 8.9 on a 10-point scale.
- Participants report a positive effect from participation in the program. They indicated that the energy efficiency of their homes increased from 4 to 8 points on a 10 point scale.
- Participants were highly satisfied with the contractor they chose; the mean satisfaction rating was 8.8 on a 10 point scale.
- Twenty percent of Massachusetts non-participants surveyed indicated a "high" likelihood (8–10 rating) for participating in the existing KeySpan Weatherization Program, with a significant number of Massachusetts customers indicating a "very high" (10 rating) likelihood of participation.

## LESSONS LEARNED

A key to the success of KeySpan's Weatherization Program is its reliance on a pre-existing network of installers. KeySpan has compiled a list of home improvement contractors to participate in the program, each one meeting established high-quality standards. This service helps customers readily identify contractors that customers can trust to deliver high-quality services. The incentives offered by the program encourage customer participation, and by requiring installation of measures by qualified contractors, the program supports development of the market for home weatherization services.

## PROGRAM AT A GLANCE

**Program name:** Residential Weatherization Program

**Targeted customer segment:** Residential homeowners

**Program start date:** October 1, 2001

**Program participants:** 1,325 cumulative since inception
Program Year 1 (May 2001–April 2002) = 345
Program Year 2 (May 2002–April 2003) = 741
Program Year 3 (May 2003–August 2003) = 239 (partial year data)

**Approximate eligible population:** 600,000 residential heating customers (Only those homes built prior to 1995 qualify.)

**Participation rate:** Approximately 1.5% of households within service territory

**Annual energy savings achieved:** 119,250 therms

**Cost effectiveness:** Lifetime cost = $0.15/therm saved
*Estimated from Program Year 2 results (Last year represented with full year data available.)

**Budget**

| Year | Program Costs* | Customer Costs | Total Costs |
|---|---|---|---|
| 2001** | $223,752.00 | $87,663.40 | $311,415.40 |
| 2002 | $361,344.00 | $946,119.87 | $1,307,463.80 |
| 2003 (preliminary)* | $237,543.42 | $929,854.45 | $1,167,397.87 |

*Costs are estimated based on program year which runs from May through April through 9/03
** Program Year 2001 represents six months of activity. Start-up cost and administration cost reflect high program to customer cost ratio.

**Funding source:** Massachusetts system benefits charge; program costs recovered through rates

**Best persons to contact for information about the program:**

- Faye Brown, Program Engineer
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- Fax: (781)890-7935
- Email: fbrown2@keyspanenergy.com
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- John Neuhauser, Program Evaluator
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*Residential Retrofit*

***HomeBase Retrofit Program***
***Vermont Gas Systems, Inc.***

## PROGRAM OVERVIEW

Vermont Gas Systems' (VGS) HomeBase Retrofit Program is designed to reduce natural gas consumption and peak day demand in residential buildings that use natural gas for space heating. When applicable and cost-effective, domestic hot water conservation measures are also installed. The program has been offered with only minor modifications since 1993, and is currently available to any VGS residential customer using 1,400 ccf per year or greater (total normalized natural gas use for all end-uses). On a case-by-case basis, services are also made available to owners of smaller houses not meeting the 1,400 ccf/year minimum where it can be established that usage is high for the size of the house. Services are also available to houses not using the 1,400 ccf/year minimum when renovation projects are planned that might include the opportunity to improve the efficiency of the structure or systems, or where the occupants may qualify for low-income assistance. Vermont Gas Systems has approximately 30,000 residential meters, with an average annual per meter gas consumption of roughly 1,000 ccf. In 2001, VGS had approximately 4,600 residential meters with annual use exceeding 1,400 ccf.

An energy audit is performed on each participating building to identify technically feasible energy-saving measures at no cost to the building owner. The audit includes detailed examination of the insulation characteristics of the exterior surfaces of the building, blower door testing including zone pressure diagnostics where appropriate, heating system steady-state efficiency testing, carbon monoxide and draft testing for the combustion equipment, testing of domestic hot water temperature, and evaluation of any existing or potential health and safety issues that could be impacted by the installation of any retrofit efficiency measures. The building's previous natural gas consumption patterns and potential improvements are modeled using a computer audit tool developed by VGS. Savings estimates are "trued up" by adjusting the heating degree days used in the model such that calculated pre-retrofit gas usage matches actual usage records. Building owners are provided with a written report summarizing the audit results and detailing the project economics and incentives available for cost-effective measures.

VGS provides cash incentives to property owners who install the measures recommended by this program. Incentives equal 33% of the installed measure cost if the building owner pays the heating bill for the property. Where tenants pay the gas bill in rental properties, the incentive to the owner is 50% of the installed measure cost. In either case, VGS will offer reduced interest financing for the balance of the installed measure cost through the Vermont Development Credit Union (VDCU). VGS pre-pays VDCU to buy-down the loan interest to the following rates, depending on the customer's preferred loan term: 0% for three years, 2% for five years, or 4% for seven years. VGS guarantees the loans, and files a lien on the subject property as security. Upon receiving notification of loan approval, VGS gives the contractor the go-ahead to schedule installation.

As of the end of 2002, VGS enhanced this retrofit program offering by providing homeowners with the opportunity to increase the interest-subsidized loan principal by up to $5,000 for the purpose of installing a high-efficiency heating system to replace an existing low-efficiency furnace or boiler. In order to take advantage of this offer, customers must also agree to install all of the recommended retrofit insulation and air sealing measures.

In addition to financial incentives, building owners are provided with technical assistance, project management services, and quality control inspections at no cost. Customers have the choice of obtaining competitive bids, or having VGS assign a pre-screened contractor through the "FastTrack" option. "FastTrack" contractors have submitted unit pricing to VGS, which VGS auditors use to prepare job cost estimates, thereby offering better price control to the customer.

Where the building owner's income is at or below 150% of federally established poverty levels, the incentive is 100% of the project cost. The 100% incentive also applies to buildings that are owned by not-for-profit organizations and are at least two-thirds occupied by low-income tenants. Low-income customers who live in one-to-four unit buildings and are interested in participating in the HomeBase Retrofit Program are referred to Champlain Valley Weatherization Service (CVWS) for priority assistance. CVWS verifies the customer's income status and eligibility, performs the energy audit, submits the recommended measures to VGS for screening, and coordinates the installation of the cost-effective energy-saving measures. VGS contributes a portion of the income verification, auditing, project management, and measure costs. CVWS also submits lists of recommended measures to VGS for screening for VGS customers who have applied for services through the Weatherization program, ensuring that qualifying low-income customers receive incentives from VGS whether they apply through VGS or through CVWS.

The program is not limited to any specific type of measure, and the incentives and financing are not capped for any individual customer. All potentially cost-effective and technically feasible natural gas saving measures are evaluated, both in terms of customer economics and avoided cost benefits for Vermont Gas. Typical measures include dense-pack cellulose, blower door-directed air sealing, duct sealing and insulating, and heating system replacement. VGS assesses potential negative impacts of retrofit work and works with customers to address these issues prior to retrofit work being carried out. VGS requires the replacement of active knob and tube wiring prior to retrofit shell measures, and moisture and indoor air quality problems are also identified and addressed. VGS has been a national leader in partnering with the U.S. EPA to identify houses containing vermiculite insulation where testing of potential asbestos contamination of the vermiculite could be carried out. The EPA brochure "Current Best Practices for Vermiculite Attic Insulation" was largely based on research conducted in houses identified by VGS for this study. EPA had been unable to identify any existing housing stock outside of Libby, Montana where testing could be conducted prior to VGS' involvement. VGS follows EPA recommendations and does not recommend or provide incentives for any work that will disturb Vermiculite insulation.

## PROGRAM PERFORMANCE

Program results through December 2002 are summarized below:

- Audits completed: 1,923
- Customers with installations: 1,011
- Total utility cost: $2.66 million
- Annualized Mcf savings estimate: 52,233 Mcf
- Peak day savings: 686 Mcf
- Lifetime savings: 1,096,945 Mcf
- Average annual savings per participant: 51 Mcf
- Historical utility cost per annual Mcf saved: $50.90

The annual budget and program goals for FY2003 are given below:

- Audits planned: 230
- Customers with installations: 152
- Utility cost: $300,000
- Annualized savings goal: 5,420 Mcf

VGS includes a customer satisfaction survey along with each rebate check to ensure customer satisfaction. Questions address satisfaction with scheduling, customer service on the phone, the auditor, the audit report, contractors, the installation of the equipment, and the incentives and financial arrangements. In the spring and early summer of 2002, VGS contracted with Dr. James M. Sinkula to tabulate and statistically analyze the results of the surveys that have been returned to VGS over approximately a five-year period. Responses were scored on a 5-point scale with 1 being the highest. The responses indicate a very high level of customer satisfaction with the program. The mean for the question "Overall, how satisfied are you with your participation in this program?" was 1.3, with no dissatisfied responses.

VGS also conducted a limited internal evaluation analysis using PRISM software to analyze actual savings for program participants. A group of approximately 150 program participants with installations in 1996 and 1997 were analyzed in 1999. This study was not independently reviewed. Of the 150 program participants, 73 were considered to have acceptable usage data when PRISM-recommended criteria were applied to the analysis. This group showed a mean realized savings of 348 ccf per year, for approximately 16% average savings. When less stringent data criteria were used, a group of 121 participants remained, with a mean savings of 360 ccf and 16.7% average savings. The corresponding control group actually saw increased usage of approximately 20 ccf/year. The savings numbers presented above were not adjusted to reflect this apparent increase in the non-participant group.

## LESSONS LEARNED

Vermont Gas Systems HomeBase Retrofit Program provides a comprehensive, turn-key service offering a "house-as-a-system" approach to enhancing home performance. The

program is flexible to meet the specific requirements of any type of residential building found in VGS' territory, from moderately sized single-family dwellings to large, master-metered apartment buildings. The fact that the program has been offered in a consistent format for ten years has allowed VGS to expand the market and contractor base for retrofit services, and has provided opportunities to build customer confidence in the types of work that is typically recommended. VGS building specialists are well trained and experienced, and regularly attend trade conferences such as Affordable Comfort to keep current with energy efficiency trends. While the program is natural gas-focused, VGS staff routinely refer electric efficiency opportunities to Burlington Electric and Efficiency Vermont.

While VGS has been cautious about shifting too much responsibility (and hence liability) from the installation contractor to the utility, experience has shown that in order to keep jobs moving to completion, it is necessary for VGS to take a strong leadership role. VGS increased its involvement significantly over the first two years of program implementation. In addition to performing field audits and drafting reports, VGS auditors' tasks typically include writing job specifications, choosing contractors, making follow-up calls, chasing down signed contracts, reminding contractors to schedule and complete jobs, carrying out final inspections, and providing contractors with punch lists. Despite the best of intentions, customers and contractors both face many competing priorities, and strong VGS involvement has been needed to ensure that this is a production program rather than just an audit program. Even with significant participation by VGS staff, the time lag between audit and completion is often 3–9 months.

Identifying qualified installation contractors has been a significant hurdle for this program—one that has re-appeared at several points during the programs' implementation history. VGS has worked to develop a strong base of local installation contractors who are capable of meeting high standards for both customer satisfaction and energy performance. VGS has provided free training and low-interest loans to contractors wishing to "tool-up" with insulation blowers and blower doors. VGS has found it necessary to repeat such offers periodically to replace contractors who become unavailable for any number of reasons, including relocation, shift in business focus, or the inability to consistently meet VGS' performance standards. The greatest threat to program success has consistently been the struggle to maintain a strong contractor base.

The degree of customer interest in this program, while always present, has varied with external conditions, and this has also created challenges. Whole-house energy retrofits can create an imposing inconvenience for home occupants, lasting between a few days to several weeks or more. Understating the temporary inconvenience of this type of work has occasionally led to disgruntled customers, though in the long term most customers forget the inconvenience as soon as they feel the benefits of improved comfort and reduced heating costs. As would be expected, the program has been most popular and successful during periods of colder weather and higher rates. The local and national economic climate also appears to drive customer interest. Several successive warm winters in the late 1990s came at a time of relatively low rates, during a period of significant economic growth. VGS found that customers were often less interested in pursuing installations when their gas bills didn't seem so high in this context. However, since 2001, VGS has had to increase both its audit and installation capacity in order to respond to customer demand.

Because of the high level of service provided, this program provides tremendous benefits in terms of customer satisfaction and loyalty. VGS continues to add customers at the rate of 1,000–1,500 per year, and many of these new customers are in older homes that were formerly served with fuel oil or propane. The addition of these homes expands the potential retrofit market, and it is anticipated that this program will continue for the foreseeable future.

## PROGRAM AT A GLANCE

**Program name:** HomeBase Retrofit Program

**Targeted customer segment:** Residential homeowners

**Program start date:** 1993

**Program participants:** 1,923 audits performed; 1,011 customers with installations of measures recommended in audits (data through December 2002)

**Approximate eligible population:** Approximately 4,600 customers with annual gas use greater than 1,400 ccf; other residential customers may qualify on case-by-case basis.

**Participation rate:** About 42% of the eligible population has received audits; about 22% has installed measures.

**Annual energy savings achieved:** Annualized savings are 52,233 Mcf for the program; lifetime savings are 1,096,945 Mcf; average annual savings per participant are 51 Mcf; peak day savings (system) are 686 Mcf.

**Cost effectiveness:** Historical utility cost is $50.90 per annual Mcf saved.

**Budget**

| Year | Program Costs |
|---|---|
| 2001 | 209,640 |
| 2002 | 282,234 |
| 2003 (preliminary) | 318,000 |
| 2004 (projected) | 369,643 |

**Customer costs:** The average total project cost in 2002 was approximately $2,900, with the customers' average cost typically being 2/3 of the project cost. In some cases, customers incur additional costs in order to prepare homes for retrofit, including costs for upgrading unsafe wiring, lining chimneys, installing sheetrock over surfaces to be insulated where the existing surface won't support dense-pack insulation, etc.

**Funding source:** All of VGS' programs are funded through rates. Program expenses are deferred until reviewed by the DPS and PSB. Upon approval, expenses are amortized in rates over a three-year period.

**Best person to contact for information about the program:**

- Jim Grevatt, Manager, Energy Services
- Vermont Gas Systems, Inc., P.O. Box 467, Burlington, VT 05402
- Phone: (802)863-4511 ext. 372
- Fax: (802)863-8872
- Email: Jgrevatt@vermontgas.com
- Web page: www.vermontgas.com

# *NATURAL GAS ENERGY EFFICIENCY PROGRAMS FOR COMMERCIAL AND INDUSTRIAL CUSTOMERS*

*Small Business*

***2002 Express Efficiency***
***Pacific Gas and Electric Company***

## PROGRAM OVERVIEW

Pacific Gas and Electric Company (PG&E) has offered the Express Efficiency Program since 1983, making it one of the longest-running utility programs in the country. This profile is a snapshot of the latest full year of the program, which continues to be offered by PG&E for small business customers. While details of the program may change from year to year, such as measures qualifying for incentives and their respective incentive levels, the program as described for 2002 typifies program services provided to customers.

The 2002 Express Efficiency program was a prescriptive retrofit program funded by California utility customers and administered under the auspices of the California Public Utilities Commission (CPUC). It offered financial incentives (rebates) to qualifying customers for installing selected energy-efficient technologies. The program's rebate amounts were set to encourage the installation of energy-efficient technologies by offsetting some of the customer's initial cost.

The program focused on small and medium-sized business customers for the installation of selected lighting, refrigeration, air conditioning, agricultural, food service, and gas technologies proven to increase a business' energy efficiency. Rebates were given for the retrofit or replacement of existing inefficient equipment with qualifying new energy-efficient equipment. Rebates were paid by check directly to the customer or the participating vendor as designated by the customer. The rebate amount depended upon the type and efficiency of the technology installed. The program provided a way for customers to reduce their energy costs and potentially increase productivity while reducing air pollution, preserving natural resources, and helping keep energy costs down for all utility customers by reducing demand.

While most energy efficiency programs ordinarily focus on delivering kW and kWh savings, PG&E, as a dual commodity provider, also targets opportunities to help customers realize natural gas savings by featuring incentives for the installation of prescribed gas-saving measures. Similar to California's Public Purpose Program funding that supports electric savings programs, the funding source for gas measures is a gas surcharge required by the California Public Utility Commission for energy efficiency programs.

In order to assist customers in determining which measures to install, Express Efficiency works hand-in-hand with PG&E's Energy Audit program. Customers who receive an energy audit know the appropriate Express Efficiency measures to choose and approximately how much energy savings they might expect from the installation of the more efficient equipment.

## PROGRAM PERFORMANCE

In 2002, PG&E's Express Efficiency exceeded its gas goal and helped customers save over 13.9 million therms over the life of the gas measures installed.

The Express Efficiency program has transformed and continues to transform the market by educating customers as to the attributes of energy efficiency. Based upon their experience with this program and the qualifying measures, customers have come to demand more efficient equipment. As a result, manufacturers, distributors, and vendors have been driven to provide equipment that meets the requirements for inclusion into the program.

## LESSONS LEARNED

Since its creation in 1983, Express Efficiency has been the most popular program available to small and medium-sized business customers. Its approach to energy efficiency (offering rebates on selected energy efficiency measures) was and is still trusted by customers, and its ease of participation has made it very user friendly.

Desiring to recruit additional new participants into the program and feature specific energy efficient technologies, the 2002 program offered enhanced rebate levels during special promotions. The promotions were directed at customers who were considered hard-to-reach based upon various criteria including their need of greater financial assistance in order to participate. In 2002, PG&E's Express Efficiency program paid incentives to about 4,000 applicants.

PG&E's Express Efficiency program has been in place for 20 years with very few changes in its basic format—only the qualifying energy efficiency technologies have changed over time to address the program's success at raising the bar on product energy efficiency. The mission has been and continues to be helping small and medium-sized business customers understand new technologies and install energy-efficient equipment. Its success is resoundingly echoed by the duplication of program structure and measures by other entities committed to energy efficiency.

## PROGRAM AT A GLANCE

**Program name:** 2002 Express Efficiency

**Program start date:** April 1, 2002

**Program participants:** 4,000 in 2002 (includes both electric and gas customers)

**Eligible population or customer segment:** Small and medium-sized business customers

**Participation rate:** Not available

**Energy savings achieved:** 13.9 million therms over the life of measures installed

**Budget:** $5.76 million for gas and electric measures

**Funding source:** California public goods charge (electric) and gas surcharge for energy efficiency

**Best person to contact for information about the program**

- Carol A. Harty, Program Manager, Supervisor
- Pacific Gas and Electric Company, Mail Code N6G, P.O. Box 770000, San Francisco, CA 94177-0001
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- Email: cah8@pge.com
- Web page: www.pge.com/foryourbusiness

*Commercial/Industrial Building and Equipment Retrofit*

***Boiler Efficiency***
***Xcel Energy***

## PROGRAM OVERVIEW

In 1991 the state of Minnesota passed legislation requiring investor-owned natural gas utilities (IOUs) to spend 0.5% of their revenue to promote energy efficiency. Each Minnesota IOU is required to create and implement programs that reduce natural gas consumption for its customers. The costs associated with the programs are recoverable from the utility's ratepayers as these programs provide societal benefit. Initially Xcel Energy (then Northern States Power Co.) operated its gas and electric utilities separately and therefore implemented gas conservation programs within its gas company. The Boiler Efficiency program has been an area of opportunity for these programs from the beginning. Historically the program has met its goals and budgetary requirements each year through strong HVAC contractor relationships.

In 2000, Xcel Energy combined its gas and electric conservation programs to provide a solid and consistent conservation message to its customers, find efficiencies and best practices among the programs, and leverage a larger electric conservation and efficiency sales force. This consolidation has allowed Xcel Energy to begin exceeding its energy-saving goals while keeping budgets fairly flat.

The Boiler Efficiency program offers rebates that target natural gas savings for commercial and industrial (C&I) and small business customers who use natural gas or dual-fuel boilers for heating or process loads. The rebates are designed to promote the installation of high-efficiency boilers and boiler system auxiliaries that improve combustion and seasonal efficiency. The objective is to provide education and incentives that motivate customers to run boilers at optimum efficiency and offset incremental costs associated with the tune-up or modification of existing boiler systems. This program is unique in that it takes a holistic approach to energy efficiency throughout the life of the equipment. Incentives are designed to provide $2 per MCF saved in the first year, with incentive caps for very large projects. Marketing of this program is done through general conservation advertising (TV, radio, and print), Xcel Energy account managers, and direct mail to customers and HVAC contractors. Sales representatives at Xcel Energy's Business Solutions Center also promote conservation to callers and contractors. The program structure is set up to make a stronger case for HVAC contractors to sell energy-efficient equipment and upgrades but Xcel Energy does not maintain contractual relationships with contractors for the delivery of the program. Xcel Energy staff handle program administration and implementation. Customers simply fill out rebate forms and include an invoice to redeem their rebate.

Applications of boiler systems vary widely among C&I customers. While some customers utilize fairly standard systems to provide comfort heating for employees, others may use custom systems in process applications that are core to their businesses. Because of these differences, the Boiler Efficiency program offers a variety of options and takes a flexible

approach to each application. Xcel Energy evaluates and includes a wide range of technologies, and offers corresponding incentives that meet the needs of most, if not all, applications.

The wide variety of eligible technologies includes:

- New boiler systems and replacement, hot water, and steam
- High efficiency burner controls
- Turbulators
- Steam trap replacement and repair
- Boiler tune up
- $O_2$ trim controls
- Outdoor air reset controls
- Stack dampers
- Blowdown heat recovery
- Stack economizers
- Energy recovery ventilators
- Piping insulation

Xcel Energy utilizes a sliding scale incentive program to influence and reward customers who choose higher efficiency boilers—the higher the efficiency, the higher the rebate. In addition, Xcel Energy evaluates energy savings on a per project basis to ensure that averaging errors are not a factor, as well as normalizing savings for the Minnesota climate. Xcel Energy also promotes the use of the EPA's ENERGY STAR® program where ENERGY STAR® ratings exist for type and size of boilers.

The tables below give the rebate guidelines/

***Rebate Guidelines: High efficiency boilers – minimum thermal efficiency requirements by size***

| | *Thermal efficiency requirements* | | |
|---|---|---|---|
| Size (Btu/hr input) | Hot Water* | Low Pressure | High Pressure |
| Less than/equal to 300,000 | 85% AFUE. | 83% AFUE. | 81.5% AFUE |
| Greater than 300,000 | 83% AFUE | 83% AFUE. | 81.5% AFUE |

* Less than/equal 300,000 Btu/hr hot water boilers must be ENERGY STAR® compliant.

***Rebate Table: High efficiency boilers – maximum rebate amount by size***

| *Size (Btu/hr input)* | *Maximum rebate amount* |
|---|---|
| Less than/equal to 300,000 | Up to $750 per boiler |
| Greater than 300,000 but less than 1 million | Up to $2,500 per boiler |
| Greater than/equal to 1 million and less than 10 million | Up to $5,000 per boiler |
| Greater than/equal to 10 million | Up to $7,500 per boiler |

The program has formulae to determine the exact amount of rebates; the sliding scale used in these formulae yield higher rebates for higher efficiency units.

Xcel Energy's objectives in offering this program are to:

- Achieve energy saving goals of 163,000 MCF.
- Provide Xcel Energy customers with the best advice and best value for their energy usage.

The Boiler Efficiency program budget for 2003 is $595,000.

**PROGRAM PERFORMANCE**

The Boiler Efficiency program has been very successful, exceeding its savings goals cost-effectively. As the data below show, the Boiler Efficiency program continues to increase its goals, impact, and cost effectiveness. Since 2000, the Boiler Efficiency program has helped customers save over 760,000 MCF for $5,500,000 in cost savings. This program is designed to operate at a total program cost of $4/MCF saved, but by leveraging resources, Xcel Energy has been able to operate at an average of $2.50/MCF saved for the last 4 years.

***Summary of 2002 C&I and Small Business Achievements in Minnesota***

| *Boiler Efficiency* | *Gas Goal* | *Gas Actual* | *% of Gas Goal* |
|---|---|---|---|
| Budget | $256,297 | $358,377 | 139% |
| MCF Saved | 117,920 | 164,480 | 139% |

***Summary of 2003 Forecast C&I and Small Business Achievements in Minnesota***

| *Boiler Efficiency* | *Gas Goal* | *Gas Forecast* | *% of Gas Goal* |
|---|---|---|---|
| Budget | $595,000 | $617,553 | 104% |
| MCF Saved | 163,000 | 241,492 | 148% |

High efficient equipment provides immediate savings for consumers and utilities.

One key to this program's success is that it only provides incentives for direct impact activities. As a result, the Boiler Efficiency program alone is responsible for over 60% of Xcel Energy's direct impact gas conservation goal. During 2002, the program produced savings of 164,480 MCF with expenditures of $358,377.

The acceptance of this program has been increasing due to its life-cycle approach. Customers have changed their behavior to conduct tune-ups every year and increasingly contact Xcel Energy before purchasing new equipment to inquire about energy efficiency. This program is well placed with the increasing concern over rising natural gas prices. Xcel Energy has been able to provide efficient solutions to these concerns and customers have responded positively.

Participation in the program remains strong with a good mix of commercial, industrial, and small business customers. Since 2000, the program has had 739 participants, with projects that range in energy savings from 600,000 to 210 therms. Schools and apartment buildings account for the largest percentage of participants, while schools and manufacturing account for the largest percentage of energy saving impact.

## LESSONS LEARNED

Xcel Energy leverages another of its efficiency programs, Custom Efficiency, to ensure that new technologies and strategies are incorporated into the Boiler Efficiency program. The Custom Efficiency process is able to evaluate new energy-saving strategies and projects, which may not have enough market acceptance to offer flat rebates. Most of this activity involves heat recovery such as energy recovery ventilators, condenser heat recovery, and blowdown heat recovery. The Boiler Efficiency program will provide incentives to influence purchase of these technologies based on the Custom Efficiency analysis. In this way, Xcel Energy is able to stay on the leading edge of energy-efficient initiatives and help new technologies bridge the gap of market acceptance.

The Boiler Efficiency program utilizes generally accepted manufacturer specifications, as well as ENERGY STAR® ratings, as the qualifying criteria for incentives. In doing so, this program could be brought to any market and successfully implemented.

The most popular features of Boiler Efficiency continue to be the Boiler Tune-Up rebate and the Burner Control rebate. This popularity certainly has something to do with the mass appeal of these features—every boiler has a burner and every boiler needs a tune-up. Xcel Energy requires that a tune-up involve much more than a simple cleaning. The burner linkages and nozzles must be inspected and adjusted to optimize operation and a combustion analyzer test completed to test efficiency. These steps are required to ensure that the program maintains its energy-saving impact. Burner controls can be an excellent efficiency upgrade to an existing or new boiler. This piece of equipment can significantly increase efficiency without the larger capital expense of an entire new boiler system. Xcel Energy rebates provide incentives for 5:1 turndown ratios and higher.

One of the most innovative features of the Boiler Efficiency program is the fact that most of the rebates are in terms of customer cost. For example, burner controls are rebated at 25% of equipment cost up to $5,000. Putting the rebate in the customer's terms and simplifying the form and process allow decision makers to quickly and easily incorporate Xcel Energy rebates into their purchase decisions. The difficulty in accomplishing this is that a great deal of research is needed to identify cost and energy saving averages for a wide variety of equipment sizes and types.

Xcel Energy will continue to seek out equipment efficiency upgrades and incorporate them into the flat rebate structure. Any time a customer has an opportunity to upgrade rather than replace equipment, there is a greater chance of market acceptance. Ultimately the program will increase baseline efficiencies on new boilers to qualify for rebates as technology makes this possible and current high efficiency equipment becomes standard.

## PROGRAM AT A GLANCE

**Program name:** Boiler Efficiency

**Targeted Customer Segments:** Commercial and small business

**Program start date:** 1991

**Program participants:** 2002 participants = 190; participants since 1995 = 1,390

**Approximate eligible population:** 26,000 C/I natural gas customers in Minnesota (both large and small commercial/industrial customers)

**Participation rate:** 10% of *Commercial and Industrial* (large) customers participated in Boiler Efficiency in 2002 while 0.7% of *Small Business* customers participated in 2002. Over half of the program's total participation has occurred in the last 3 years, with 2003 participation already exceeding 2002.

**Annual energy savings achieved:**

- 2002 annual energy savings = 1,684,800 therms
- 2003 is forecasted to save: 2,414,920 therms
- Program since 1995 = 7,600,000 therms.

**Cost effectiveness:** The Boiler Efficiency program was budgeted to ~ $4 per saved MCF, but has been increasing its cost effectiveness and operates at an average of $2.50 per saved MCF.

**Budget**

| Year | Program Costs |
|---|---|
| 2001 | $625,863 |
| 2002 | $358,377 |
| 2003 (preliminary) | $617,553 (forecast) |
| 2004 (projected) | $755,374 |

**Funding source:** Minnesota Conservation Improvement Program, as directed by the Minnesota Department of Commerce and recovered through adjustment rates

**Best person to contact for information about the program:**

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*Commercial/Industrial Building and Equipment Retrofit*

***Custom "Process" Rebate***
***CenterPoint Energy Minnesgasco***

## PROGRAM OVERVIEW

CenterPoint Energy Minnegasco offers a customized program for its industrial customers that use energy for process loads. The Custom "Process" Rebate program offers incentives to industrial customers to upgrade existing equipment to higher-efficiency equipment.

Since the rebate program is customized, it provides CenterPoint Energy Minnegasco the flexibility to offer rebates for unique energy-efficient industrial applications. Each rebate is handled on a case-by-case basis and the rebate is given for the increased efficiency of the equipment as compared to standard equipment available. The following criteria are utilized to determine the incentive level for Custom "Process" Rebates:

- $0.70 per therm saved
- A buy-down to a 2-year payback
- Fifty percent (50%) of incremental equipment cost
- Twenty-five percent (25%) of total equipment cost

The maximum rebate that a customer receives is the lesser of the above criteria, or the amount necessary to persuade the customer to install the higher-efficiency equipment provided that amount is not greater than the above criteria.

CenterPoint Energy Minnegasco Key Account Sales Managers for commercial and industrial customers are the primary delivery mechanism for the Custom "Process" Rebate program. Internal staff with relevant technical expertise work closely with consulting engineers and the customers to qualify the project for a rebate.

Some examples of the types of natural gas technologies that have received rebates through this customized program include:

- Process boilers
- Economizers
- Tower melters
- Heat treat systems
- Steam blanchers
- Grain dryers
- Holding furnaces
- Batch ovens

The Custom "Process" Rebate program was developed in 1994 to address the potential energy savings in the niche market segment of large commercial and industrial customers, which represents approximately 15% of CenterPoint Energy Minnegasco's throughput. The

original project had a total budget of $300,000 and an annual energy savings goal of 65,000 therms of natural gas. From 1994–1998, the program continued to grow with an increased number of project participants and energy savings each year. In 1999, the program started hitting its stride, generating a significant amount of energy savings in a more cost-effective manner than previous years.

CenterPoint Energy Minnegasco customers learn about the Custom "Process" Rebate program through one-on-one sales with their account manager. Since CenterPoint Energy Minnegasco Key Account Sales Managers are assigned by market segment, they are in a unique position to identify energy-savings opportunities for their customers based on their technical expertise.

In addition to customer incentives, CenterPoint Energy Minnegasco offers an engineering assistance program that will reimburse commercial and industrial customers for a portion of engineering fees assessed by consulting engineers for the design and installation of qualifying energy-efficient process technologies. Customers may qualify for up to $2,500 incentive (not to exceed 50% of anticipated fees) upfront to offset the cost of the engineering fees. Customers may be eligible for an additional $2,500 incentive if qualifying energy-efficient natural gas technologies are installed as a result of the technical recommendations.

Furthermore, CenterPoint Energy Minnegasco offers an industrial audit program that reimburses a limited number of industrial customers a portion of the cost of a comprehensive industrial audit to identify industrial process efficiency improvement measures that may qualify for a Custom "Process" Rebate. Industrial customers may qualify for $5,000 upfront, and may qualify for an additional $5,000 with the installation of qualifying efficient natural gas process technologies.

**PROGRAM PERFORMANCE**

Since the start of the program in 1994, approximately 290 industrial customers (approximately 10% of total industrial customers) have received incentives to upgrade to higher-efficiency natural gas process equipment. The range of incentives is $500 to $125,000 per project, with an average incentive award of approximately $16,000. Of the approximately 60 projects annually, these projects represent more than 50 different technologies each year.

The Custom "Process" Rebate has a participation goal of 60 industrial customers representing an energy-savings goal of 4,000,000 therms of natural gas annually. Since 1999, CenterPoint Energy Minnegasco has met or exceeded that energy savings goal each year. Since 1999, CenterPoint Energy Minnegasco has annually spent approximately $1 million on customized industrial rebates, and has saved annually approximately 5 million therms of natural gas. This program accounts for approximately half of CenterPoint Energy Minnegasco's annual energy savings for its entire portfolio of programs over the last four years.

As an example of a project, Arrow Tank and Engineers in Cambridge, Minnesota uses heat treating–an energy-intensive process–to stress-relieve the metal tanks and vessels it fabricates. The company manufactures propane transport truck tanks, fire suppression vessels, and custom pressure vessels for the air, chemical, food, gas, pharmaceutical, refinery, and water treatment industries. To reduce operating costs and streamline production, Arrow Tank designed and installed a computer controlled and monitored natural gas heat-treatment furnace. When designing the furnace, Arrow Tank asked CenterPoint Energy Minnegasco for help in making the furnace energy efficient. By adding efficiency features such as extra insulation and a high-efficiency burner system, the project qualified for a Custom "Process" Rebate. Joe Stitz, the owner of Arrow Tank, stated, "When we designed the furnace we knew that we wanted it to be state-of-the-art. Qualifying for an energy rebate was a big incentive to include energy efficiency in our system." In four years, the extra insulation and burner control system paid for themselves in energy savings.

CenterPoint Energy Minnegasco, as an investor-owned, rate-regulated natural gas utility in Minnesota, is required by Minnesota Statute to spend 0.05% of its gross operating revenue on conservation programs. The programs are reviewed and approved through a regulatory process by the Minnesota Department of Commerce. All expenditures associated with the conservation program are reviewed annually by the Minnesota Department of Commerce and the Minnesota Public Utilities Commission and awarded cost recovery, provided the expenditures were approved and prudent to ratepayers. CenterPoint Energy Minnegasco's conservation program may qualify for a financial incentive if the program significantly exceeds the statutory spending requirements and energy-savings goals in a cost-effective manner.

## LESSONS LEARNED

The customized approach taken by this program is a key to its success. Industrial customers use a significant amount of energy, but identifying energy-saving opportunities in varying market segments requires unique technical expertise. CenterPoint Energy Minnegasco's Key Account Sales Managers are assigned by market segment, and therefore are technical experts for the industrial processes that their customers use.

To illustrate the importance of customization, the CenterPoint Energy Minnegasco's Key Account Sales Manager that works with the foundries market segment worked with a customer, consulting engineer, and industrial equipment representative to install a more efficient tower melter for a large foundry facility. This state-of-the-art tower melter was the first of its size in the upper Midwest and was met with some skepticism by others in the industry. The success of the technology has resulted in the installation of six additional tower melters in other foundries within CenterPoint Energy Minnegasco's service territory over the last three years. Without the technical expertise and knowledge of both the customers and this market segment, these projects would not have been successful. This foundries example is just one of many market segments where a customized project has moved the marketplace to acceptance and installation of a more energy-efficient technology.

The Custom "Process" Rebate program can be replicated by a natural gas utility that has the internal technical resources to deliver the program to its customers. If a utility must rely on external vendors or consulting engineers to deliver the program to its customers, the program is unlikely to have as great as success as having it delivered by internal staff. The implementation of CenterPoint Energy Minnegasco's program took a few years to start maximizing the energy-savings potential, and that scenario is likely to occur with other utilities as the program is integrated with other sales activities. But, once the program is fully operational, the energy-savings potential is significant and of even greater benefit is the cost-effectiveness of these energy savings.

## PROGRAM AT A GLANCE

**Program name:** Custom "Process" Rebate

**Targeted customer segment:** Industrial customers

**Program start date:** 1994

**Program participants**

| | |
|---|---|
| 2001 program | 57 customers |
| 2002 program | 52 customers |
| 1994–2002 programs | 290 customers |

**Approximate eligible population:** Approximately 3,000 large commercial and industrial customers

**Participation rate:** For the lifetime of the program, approximately 10% of eligible customers have received rebates.

**Annual energy savings achieved:** 2002 program = 4,569,000 therms of natural gas; 1994–2002 total = 23,536,960 therms of natural gas

**Average program measure lifetime:** The estimated lifetime of a significant number of the Custom ""Process"" Rebates is at least fifteen years per technology.

**Cost effectiveness:** The cost per therm saved for the Custom "Process" Rebate has been in the range of $0.26 to $0.29 per therm of natural gas saved. The societal test of the cost/benefit test ranges from 1.15 to 17.0 depending upon the assumptions used in the analysis.

**Budget**

| Year | Program Costs | Customer Costs* | Total Costs |
|---|---|---|---|
| 2001 | $1,267,000 | $3,772,623 | $5,039,623 |
| 2002 | $1,281,000 | $6,823,586 | $8,104,586 |
| 2003 (preliminary) | $915,000 | | |
| 2004 (projected) | $1,200,000 | | |

*Note that this is the incremental cost between standard and higher-efficiency equipment; it does not represent the total project costs.

**Funding source:** CenterPoint Energy Minnegasco's conservation programs are funded through CenterPoint Energy Minnegasco ratepayers.

**Best person to contact for information about the program:**


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## APPENDIX D. EXAMPLE ELECTRIC ENERGY EFFICIENCY PROGRAMS THAT HAVE SIGNIFICANT PEAK DEMAND REDUCTION IMPACTS

Recent research by Elliott et al. (2003) demonstrated the potential impact that reducing peak electric demands can have on natural gas markets. Since much of the nation's summer peaking capacity is now natural-gas based, reducing summer peak electric demands can conserve natural gas supplies and mitigate upward pressure on natural gas prices. Both of these effects can benefit natural gas customers.

In this section we present descriptions of five selected electric energy efficiency programs that we selected and profiled in a recent national study of best program practices (York and Kushler 2003). We selected these programs because they not only addressed energy efficiency, but also had significant peak demand reduction impacts. The programs typically target end-uses such as air conditioning or commercial lighting.

*Residential Air Conditioning*

***Keep Cool, New York***
***New York State Energy Research and Development Authority***

## PROGRAM OVERVIEW

The "Keep Cool" Air Conditioner Replacement and Bounty Program gives New York residents who purchase a new ENERGY STAR® room air conditioner (RAC) the opportunity to turn in their old, inefficient, working RAC and receive a $75 bounty. The program recycles the old, inefficient RACs to ensure they are removed from the system. This $20 million effort also includes a public awareness campaign to affect a change in residents' behavior and purchasing decisions associated with energy consumption.

The Keep Cool program was developed under New York State Energy Research and Development Authority's (NYSERDA) New York Energy $mart® Program to help reduce electric load during the hot summer months, and it is co-sponsored by the Long Island Power Authority (LIPA) and the New York Power Authority (NYPA) to provide a seamless, statewide program. The program is implemented by Aspen Systems Corporation under contract to NYSERDA. Program marketing and a public awareness campaign were developed and implemented by DDB, Bass & Howes, also under contract to NYSERDA.

## PROGRAM PERFORMANCE

The program has been very successful in terms of the numbers of qualifying units sold as a result of the program and the resulting energy and power savings. From a very modest beginning in 2000 of only about 700 units sold, the program grew rapidly. In 2001, about 41,000 units were sold and in 2002 this value is about 176,000 units. NYSERDA estimates that the energy savings due to the units replaced during Keep Cool total over 45 million kWh per year. Total sustained load reduction is over 62 MW. In addition, the "spillover" effect of making more ENERGY STAR units available in the marketplace and increasing demand for the product has resulted in more sales of ENERGY STAR RACs (as opposed to non-ENERGY STAR). Total energy savings from this program so far are over 59 million kWh annually and 72 MW. These energy savings do not include the impact of the public awareness program, which encourages behavior and purchase pattern changes to further reduce energy consumption and to shift load away from peak consumption periods.

The program is having significant "spill-over" impacts. NYSERDA's research indicates that for every ENERGY STAR RAC purchased in New York by a participant in the Keep Cool program, another ENERGY STAR RAC is being purchased by a non-participant. This is likely a result of the increased promotion of the ENERGY STAR label by the retail and manufacturing sector, in combination with the public awareness campaign that is part of the Keep Cool program. Surveys currently taking place are expected to quantify the effects of the awareness campaign and the retail-level activity. However, this spillover effect is considered one of the key pieces of evidence that market transformation is taking place. As the Keep Cool

participants represent only 10–20 percent of the annual RAC market, this spillover is assumed to represent changes in purchase patterns of individuals in the market for RACs.

## LESSONS LEARNED

Keep Cool has affected all levels of the market, from the consumer through the manufacturer. The program has been a catalyst for retailers and manufacturers to promote ENERGY STAR room air conditioners. Retailers dramatically increased their stock of ENERGY STAR RACs in anticipation of the program, increasing share from about 20 percent in 2000 to nearly 60 percent in 2002. Several of the large national manufacturers have already contacted NYSERDA about the future of the Keep Cool Program. Since the program's future is still in the planning stages, many of these manufacturers have indicated a commitment to producing ENERGY STAR models regardless of future program plans. Many manufacturers and retailers have even complemented NYSERDA's efforts to promote the program and encourage consumers to adopt energy-saving measures by using Keep Cool's message on their own marketing materials. Surprisingly, some of these advertisements have been fully funded by them, without the benefit of co-operative marketing funds available through NYSERDA's ENERGY STAR partner programs.

The program has changed from its initial structure. In 2000 and 2001, there was a single contract awarded for all program services, with major subcontracts in turn were given for the key program elements of recycling old units and program marketing. As the size of the program increased significantly, managing the program with a single contractor and multiple subcontractors became too unwieldly. To make program administration more manageable, in 2002 NYSERDA contracted separately for recycling, marketing, and program implementation. A major lesson is that it is more effective and manageable to have clearly focused tasks and associated contracts, rather than one broad contract that covers too many tasks and services.

Another lesson is the importance of establishing and maintaining close relationships with all the program partners, especially the retailers and manufacturers. It is important to have the retailers and manufacturers involved in the entire program development and implementation process to assure close cooperation and that the program meets the needs of these partners. This program would not have been nearly as successful without the cooperation and support of the retailers and manufacturers.

At the current level of activity, it is believed that it will take at least an additional year, or possibly even two, of sustained program activity, at some level, to shift the market to the point where incentives will not be necessary. For 2003, the program target is decreased to 100,000 units. The increased product availability, lower costs due to high demand, and enhanced consumer awareness will be enough influence for consumers to buy ENERGY STAR room air conditioners based on the energy savings and other features, and not so much on the incentive offered. As manufacturers reduce availability of non-ENERGY STAR models and increase the availability of ENERGY STAR ones, this process will become almost "automatic."

## PROGRAM AT A GLANCE

**Program Name:** Keep Cool, New York

**Targeted Customer Segment:** Residential

**Program Start Date:** 2000

**Program Participants (units sold):**

- 721 units in 2000
- 41,000 units in 2001
- 176,000 in 2002
- 100,000 is target in 2003 (scaled back as part of transition strategy)

**Approximate Eligible Population:** NA

**Participation Rate:** NA

**Annual Energy Savings Achieved**
Direct program impacts: 45 million kWh/year
With spill-over effects: 59 million kWh/year

**Peak Demand (Summer) Savings Achieved:**
Direct program impacts: 45 MW
*With spill-over effects: 62 MW*

**Budget:** 2002 budget was about $20 million.

**Funding Source:** New York state systems benefit charge

**Best Person to Contact for Information about the Program**

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- URL: http://www.getenergysmart.org/
  or http://www.nyserda.org

*Residential Air Conditioning*

## *Cool Advantage*
## *New Jersey Clean Energy Collaborative*

### PROGRAM OVERVIEW

Cool Advantage was designed to transform the residential HVAC market to one in which quality installations of high-efficiency equipment are commonplace. The program promotes the sale of high-efficiency equipment and improvements in sizing and installation practices that affect operating efficiency. To achieve its long-term goal, the program must overcome a number of market barriers, including: (1) split incentives (between builders and homebuyers and between owners and renters); (2) consumers' lack of information on the benefits (both energy and non-energy) of efficient equipment and installations; (3) lack of training for HVAC contractors on key installation issues and approaches to "selling" efficiency; and (4) consumers' inability to differentiate between good and poor work or between quality contractors/technicians and those less well qualified.

Cool Advantage employs several key strategies to overcome these barriers:

- Incentives for the sale or purchase and installation of high-efficiency equipment for which documentation of proper sizing and installation is provided;
- Aggressive consumer marketing campaign on key elements and benefits of efficiency;
- Direct marketing to HVAC distributors and contractors through "outreach coordinators;"
- Training of HVAC contractors on key elements of quality installations;
- ENERGY STAR® sales training for contractors (i.e., how to sell efficiency); and
- Promotion of HVAC technician certification.

Cool Advantage has relied on an extensive market study completed in late 2001. This study documented market share for efficient equipment, typical sizing and installation practices, consumer awareness and attitudes, contractor awareness and attitudes, and manufacturer/distributor perceptions. This extensive market research established a baseline for the program and was critical to designing an effective program.

### PROGRAM PERFORMANCE

This program is perhaps the most comprehensive attempt anywhere in the country to promote energy efficiency in the residential HVAC market. A notable feature is its effort to capture the substantial savings associated with improving equipment sizing and the overall quality of the installation. Initial evaluation work suggests that the program has already succeeded in changing some practices—even among non-participants. It also has increased the market share for efficient equipment to levels well above those documented anywhere else (around 30 percent compared to the national average of 4–5 percent for SEER 13 and up, and 20–25 percent compared to the national average of 1–2 percent for SEER 14 and up). Consequently, the program probably captures more peak demand savings from the residential sector (relative to the eligible market) than any other market-driven program in the United States.

## LESSONS LEARNED

Several features of the program are highly innovative. For example, it was the first program in the country to tie rebates not only to the purchase of efficient equipment, but also to the documentation of both proper sizing and installation, including airflow and refrigerant charge. Equally important, other programs are starting to model themselves after Cool Advantage. The Long Island Power Authority is now running a program based on the New Jersey model. National Grid is about to launch a program in Rhode Island that also is modeled on the New Jersey Program. Other states and regions also have expressed interest, including California, Texas, and the Midwest.

## PROGRAM AT A GLANCE

**Program Name:** Cool Advantage

**Targeted Customer Segment:** Residential customers with central air conditioners or heat pumps in New Jersey

**Program Start Date:** 1999

**Program Participants**—Year 2002: 17,963, since inception: approx. 66,000

**Approximate Eligible Population:** 50,000 annually

**Participation rate:** Around 30%

**Annual Energy Savings Achieved**—Year 2002: 14,000,000 kWh (projected), program to date: around 52,800,000 kWh

**Peak Demand (Summer) Savings Achieved**—Year 2002: 12,461 kW, program to date: 47,520 kW

**Other Measures of Program Results to Date:** Current market share is about 30% for SEER 13 and up, and 20–25% for SEER 14 and up.

**Budget**

| Year | Utility Costs |
|---|---|
| 2001 | $11.2 million |
| 2002 | $17 million |
| 2003 (projected) | $13.5 million |

**Funding Source:** Statewide systems benefit charge

**Best Person to Contact for Information about the Program**

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*Commercial/Industrial HVAC*

***Cool Choice***
***Northeast Energy Efficiency Partnerships, Inc. and its program sponsors***

## PROGRAM OVERVIEW

Cool Choice is a marketing-based program for unitary commercial air conditioners and heat pumps meeting the efficiency specifications established by the Consortium for Energy Efficiency. The program is operated in six states through a common marketing and implementation contractor.

The program is very innovative in that a common program is being implemented across six states and a dozen program implementers. The program has also achieved at least a 10 percent market share for high-efficiency equipment and has played a substantial role in increasing manufacturer and purchaser interest in Tier 2 equipment. More than half of the incentives provided by the program are now for Tier 2 equipment. This is an important step for long-term market transformation success.

Cool Choice is developed, delivered, and administered by its sponsors. Northeast Energy Efficiency Partnerships, Inc. (NEEP) functions as coordinator of the sponsor groups. Cool Choice funding is provided by its sponsors, by way of system benefits portions of electric utility rates. Cool Choice sponsors are listed below.

- NSTAR Electric
- National Grid USA Companies
    - Massachusetts Electric
    - Narragansett Electric
    - Granite State Electric
- Efficiency Vermont
- Northeast Utilities
    - Connecticut Light and Power
    - Western Massachusetts Electric
- Burlington Electric Department
- Connectiv Power Delivery
- Public Service Electric & Gas
- Unitil
- United Illuminating
- Jersey Central Power & Light
- Fitchburg Gas & Electric
- Cape Light Compact

Cool Choice's methods are a full range of marketing tactics including education of HVAC contractors, personal outreach and support for contractors, customer awareness marketing, and customer rebates for qualifying equipment. All of these methods contribute to the program's goal of market transformation, which would in the ideal case be measured by sustained market share. Unfortunately the only firm data available at this time is the numbers