BEFORE THE PUBLIC SERVICE COMMISSION
OF THE STATE OF MISSOURI

In the Matter of Atmos Energy Corporation's Tariff Revision Designed to Consolidate Rates and Implement a General Rate Increase for Natural Gas Service in the Missouri Service Area of the Company.	))))))	Case No. GR-2006-0387

PART 2 OF STAFF EXHIBIT 144

COMES NOW the Staff of the Missouri Public Service Commission (Staff), pursuant to the Commission's December 7, 2006 Order Directing Filings And Setting Time For Objections, and submits, as directed, its "Part 2 of Staff Exhibit 144", attached hereto as same.

Respectfully submitted,

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Certificate of Service

I hereby certify that copies of the foregoing have been mailed, hand-delivered, or transmitted by facsimile or electronic mail to all counsel of record this 12th day of December 2006.

/s/ Robert S. Berlin

Section 1

Midwest Natural Gas Initiative, Midwestern State Efficiency Programs

MEEA
Midwest Energy Efficiency Alliance

The Source On Energy Efficienc

Policy Initiatives

Midwest Natural Gas Initiative

MEEA is facilitating the Midwest Natural Gas Initiative, a cooperative initiative by Midwest states to develop a regional plan for energy efficiency. Individual activity at the state level is laying the groundwork for this regional initiative. It is the first time a critical mass of policymakers in the Midwest is recognizing the value of energy efficiency policies on an individual state basis as well as at the regional level.

The goal of the Midwest Natural Gas Initiative is to coordinate a cooperative effort by policy makers in eight Midwest states (Illinois, Indiana, Iowa, Michigan, Minnesota, Missouri, Ohio and Wisconsin) to develop a regional energy efficiency strategy to decrease natural gas consumption by 1% per year for five years. This unique multi-state effort brings together representatives from the governors' offices, public service commissions, state energy offices, consumer counsels and the advocacy community to design a flexible, regional approach to energy efficiency.

Mitigating Rising Gas Prices

The members of the Initiative believe that natural gas and electricity consumption are intimately linked. They believe that as natural gas prices continue to increase, energy efficiency gains in the electric and natural gas sectors can play a role in the short-term to help manage consumer bills and put downward pressure on prices. The natural gas crisis is galvanizing Midwest policy makers to respond with increases in energy efficiency that will provide both short- and long-term benefits.

Learn more at the Midwest Natural Gas Initiative site.

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About the Initiative

What is the Midwest Natural Gas Initiative?

The Midwest Natural Gas Initiative is a cooperative effort by 8 Midwest states to develop a multi-state energy efficiency initiative to decrease natural gas consumption by 1% per year for five years. This will cause wholesale natural gas prices to decrease by as much as 13%. Initiative participants will sign the Memorandum of Understanding (MOU) and each state will work to develop a plan for increasing energy efficiency that accommodates the diversity in policies and programs in their state. Once these plans are developed, Initiative participants will work with support from MEEA to implement each state's respective plans.

Guiding Principles for Initiative Design

1. The Initiative is expandable and flexible, permitting other states to join the initiative if they deem it appropriate.
2. The Initiative does not unduly interfere with other national, state or regional energy efficienc programs and initiatives, but seeks to coordinate and collaborate with them to increase the effectiveness of both.
3. The Initiative has begun simply and will develop over time. Participant input and participatior helps shape the path the Initiative follows

History

In January, 2005, the National Association of Regulatory Utility Commissioners (NARUC) held a conference entitled "The Natural Gas Crisis: Finding Clean Solutions." The goal of the conference was to examine and explore opportunities for increased energy efficiency, renewable resources and clean distributed energy in response to high and volatile natural gas prices. In response to presentations mad at the conference and informal discussion among participants, a group of public service commissioners from the Midwest joined forces to create a regional energy efficiency approach to the natural gas crisis. The Midwest Natural Gas Initiative is a direct result of their efforts.

Framework

The Initiative is coordinated by the Midwest Energy Efficiency Alliance (MEEA), a Chicago-based non profit organization dedicated to advancing energy efficiency in order to support a sustainable economic development and promote environmental preservation. MEEA arranges logistics for meetings and conference calls, facilitates a dialogue between the Initiative stakeholders and serves as a resource of information for the Initiative's stakeholders. The Regulatory Assistance Project (RAP) and American Council for an Energy-Efficient Economy (ACEEE) also provides policy and technical support to the Initiative.

A steering committee directs and monitors the activities of the Initiative. The steering committee consists of Midwest representatives of Public Service Commissioners as well as representatives from RAP, ACEEE and MEEA. The members of the steering committee guide the overall activities of the regional aspect of the Initiative, as well as inform and monitor the activities of each state's individual committee.

Each state has its own committee which will consist of a representative from each of the parties signing the MOU from that particular state. The state committees are responsible for developing and

implementing a state action plan that include policy and program recommendations for achieving the 1% per year reduction in natural gas consumption.

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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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]

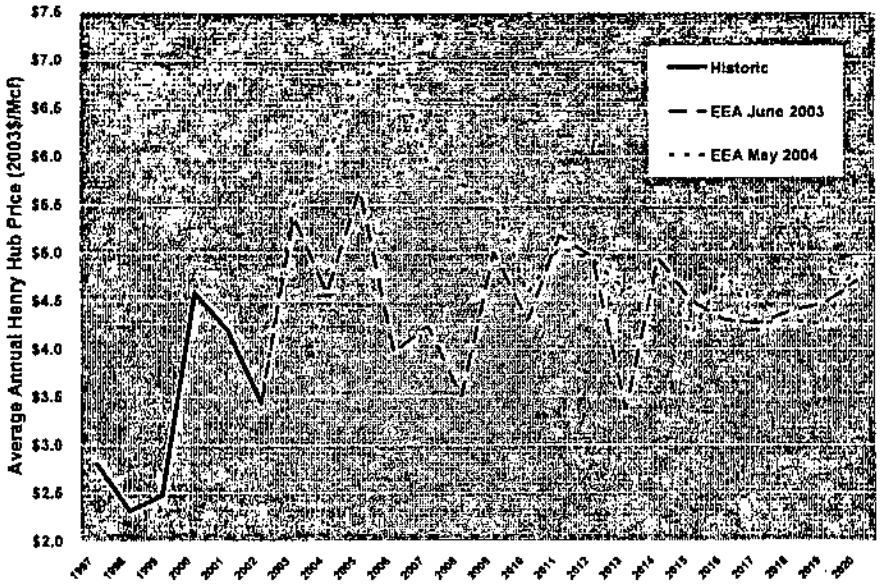
The Current Natural Gas Crisis

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.

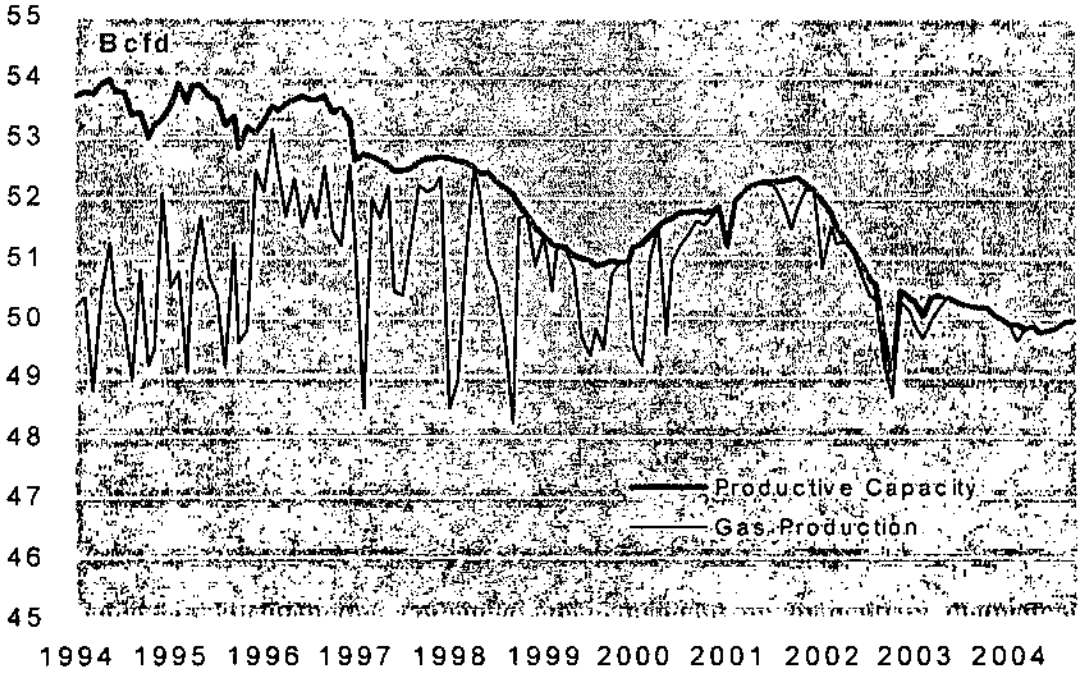
[12] Indeed, a very recent EEA forecast, produced after the analyses for this report were completed, shows wholesale natural gas prices for the 2010 to 2016 time period staying 50 cents to $1.00 per Mcf above the EEA May 2004 forecast shown in Figure 1. (See Appendix A.)

[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.

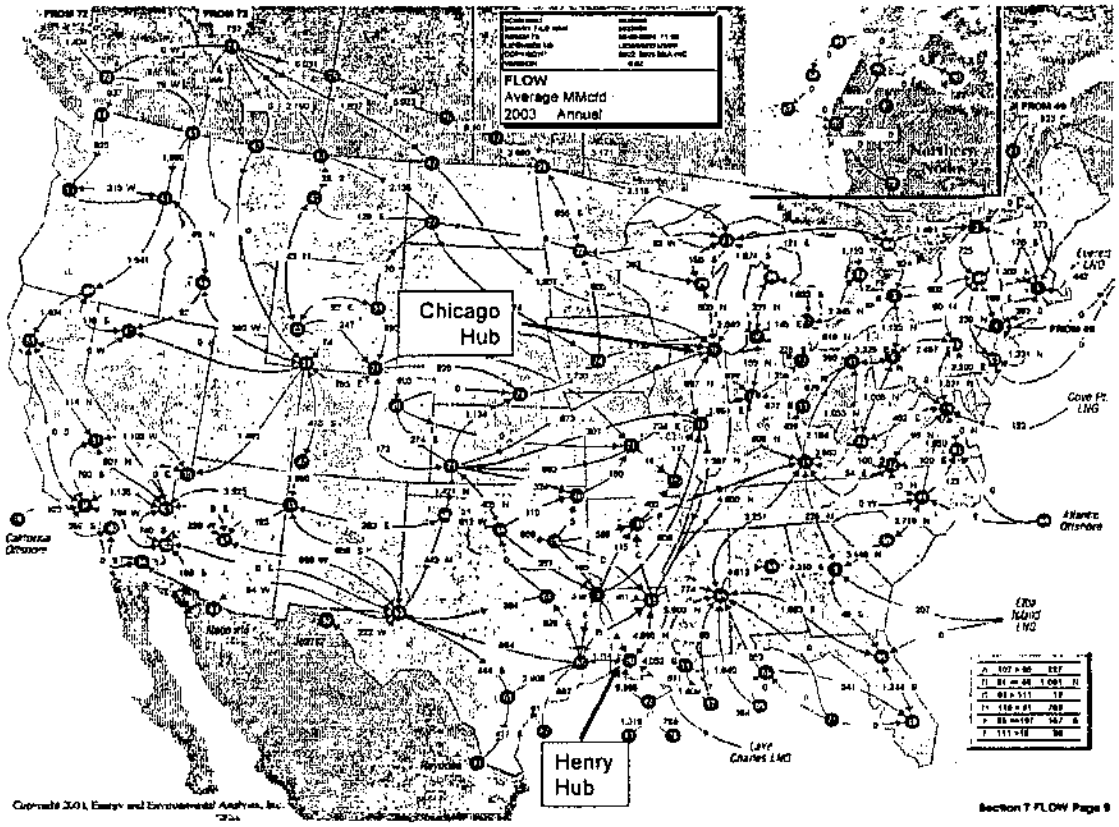
[18] Virtually every Midwestern city will be familiar with tragic cases of households that perished due to fires or asphyxiation from using unsafe alternate heating devices when they could not afford to maintain their utility service.

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

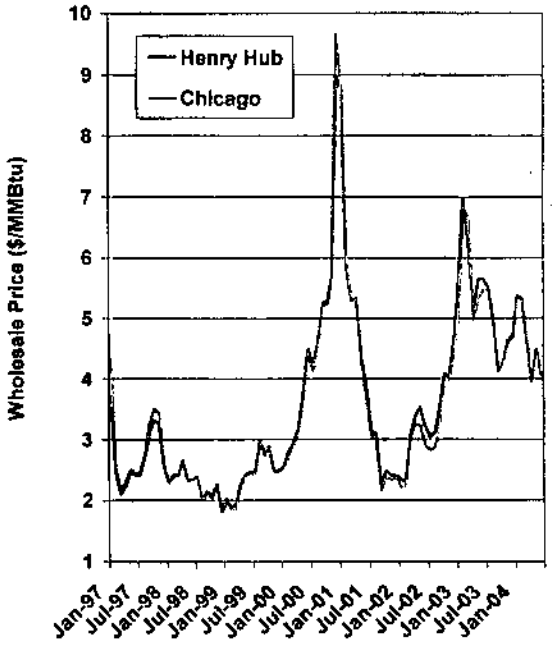


The wholesale price of natural gas is driven by a number of factors:

- *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 (1998)	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: 2003: $2.5 million	Yes	Investor-Owned Utilities: 2003: $10.5 million	Investor-Owned Utilities: 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	approximately $10 million	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 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 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 867/6-8	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 2003: $1.3 million	Y	Investor-Owned Utilities 2003: $50.2 million Municipals & Co-ops: $15 million	403 million kWh 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 + 2003: $2.2 million (shareholder funded)	Y	2002:$13.8 million 2003: $14.3 million	(SB3) LI/EPP: 9.5 million kWh/year 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: $81.1 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	2,585,804
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	$118	$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	$36	$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

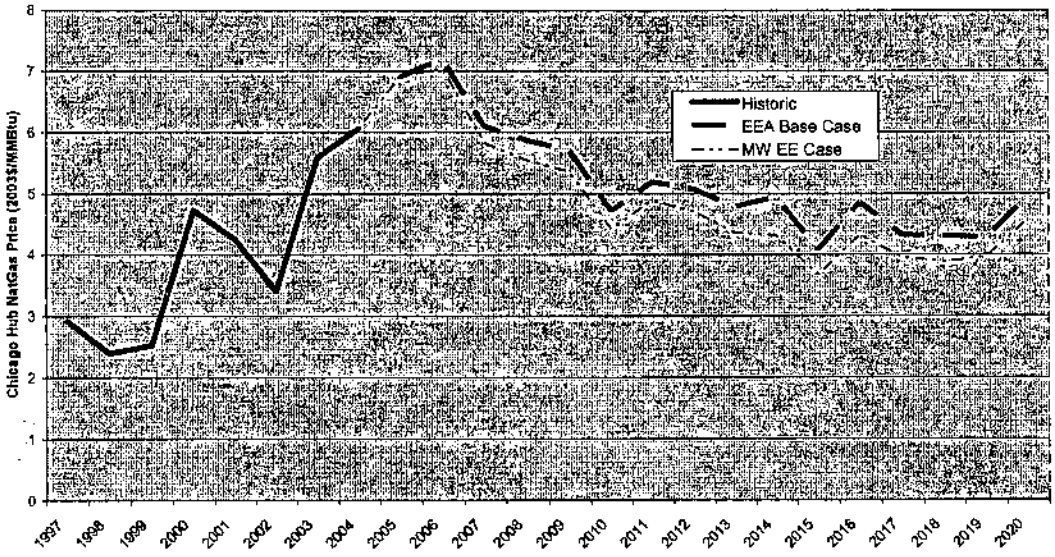
Industrial				
State	**2006**	**2010**	**2015**	**2020**
Illinois	$44	$119	$226	$349
Indiana	$30	$79	$148	$226
Iowa	$10	$27	$50	$78
Michigan	$32	$86	$160	$24
Minnesota	$24	$64	$122	$189
Missouri	$8	$22	$42	$65
Ohio	$55	$146	$274	$417
Wisconsin	$21	$56	$106	$164
Total Region	$225	$598	$1,130	$1,733

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

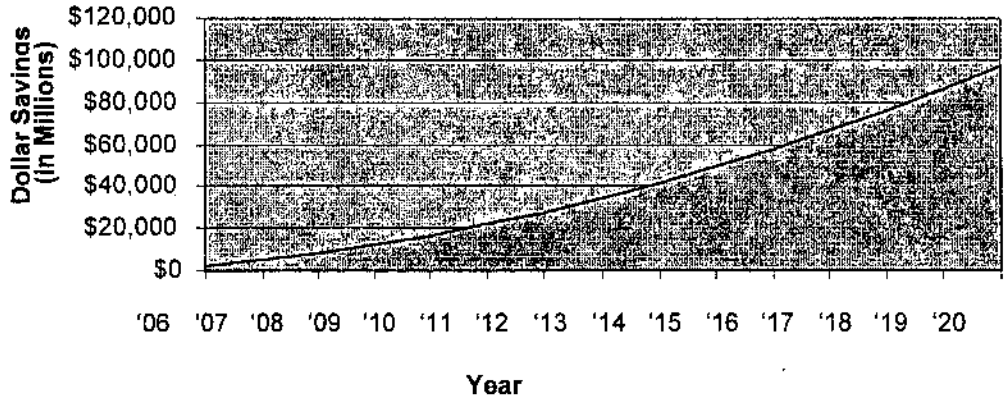
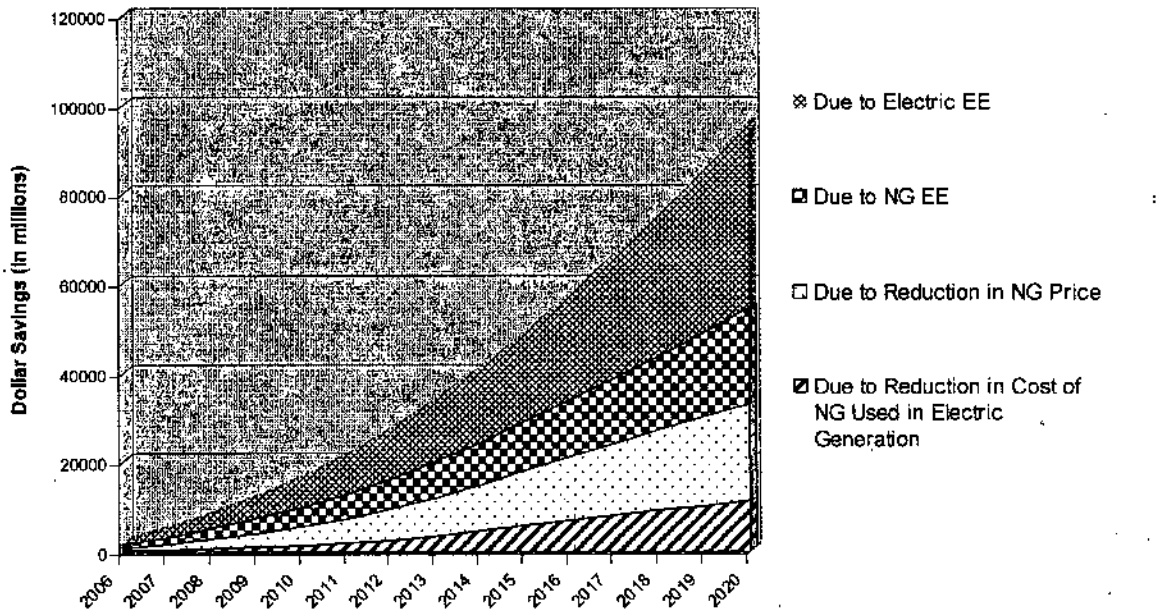


Figure 8. Cumulative Dollar Savings by Source of Savings



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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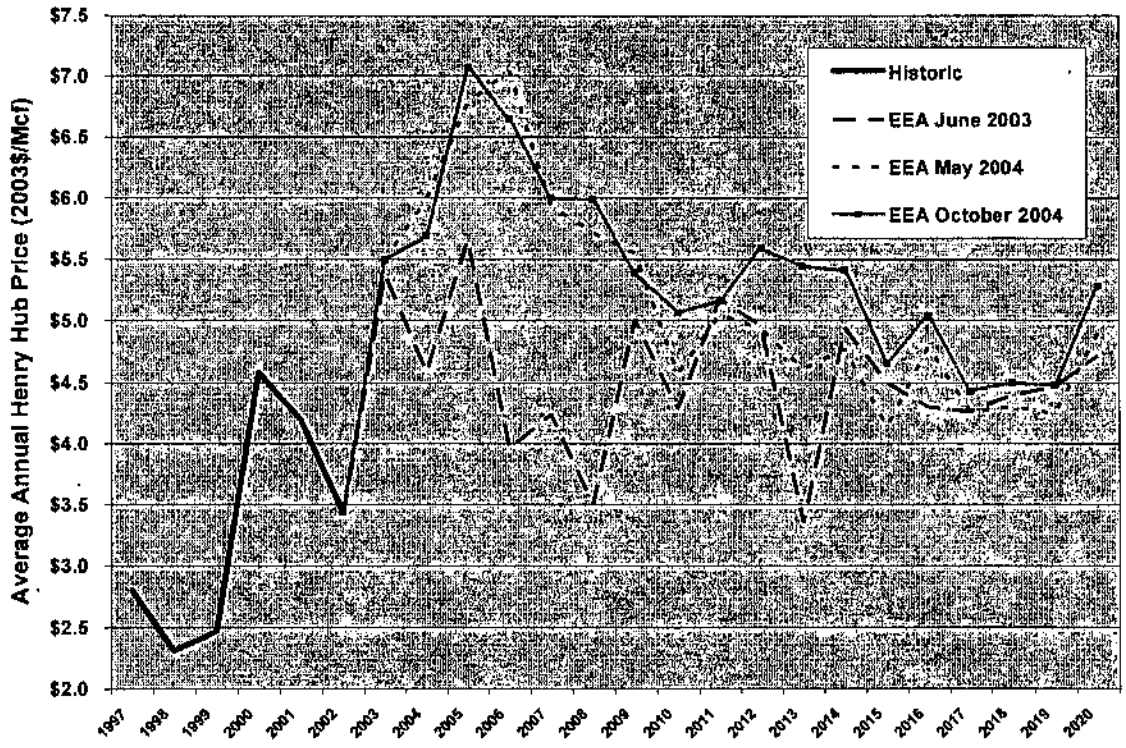
APPENDIX A: RECENTLY UPDATED NATURAL GAS PRICE FORECAST



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.

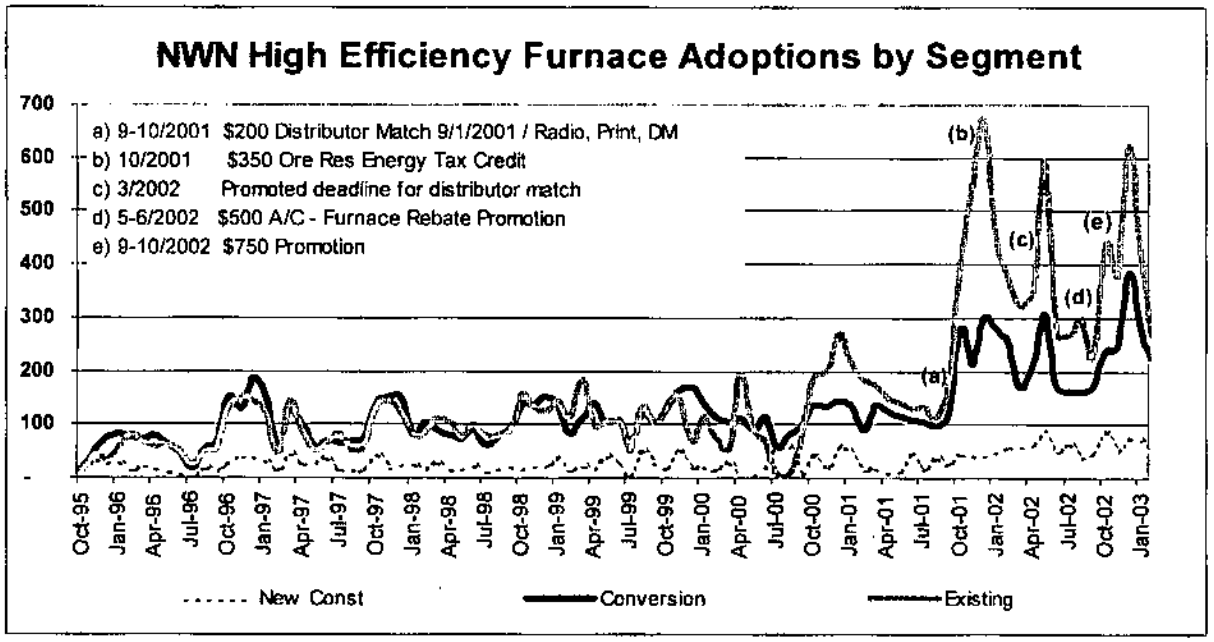
The new market-based, packaged incentive approach to managing the program also makes use of a new performance-management tool. Customer leads are allocated to trade allies based on a variety of performance metrics set by NW Natural. Dealer performance is measured independently, but distributors are measured 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
- KeySpan Energy Delivery, 52 Second Ave., Waltham, MA 02451
- Phone: (781)466-5325
- Fax: (781)890-7935
- Email: fbrown2@keyspanenergy.com
- Website: www.keyspanenergy.com

- John Neuhauser, Program Evaluator
- KeySpan Energy Delivery, 52 Second Ave., Waltham, MA 02451
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- Fax: (781)890-7935
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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

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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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  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

- Thomas R. Donadio, Supervisor, Residential Programs
- Phone: 973-401-8534
- Fax: 973-644-4274
- Email: tdonadio@firstenergycorp.com
- Postal address: JCP&L, 300 Madison Avenue, Morristown, NJ 07962-1911
- URL: http://www.njcleanenergy.com/html/1residential/1_cool_advantage.html

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

of rebated units. The sponsors are confident that there is increasing spillover into the rest of the market.

PROGRAM PERFORMANCE

Cool Choice is geared toward end-use customers using packaged single or split air conditioning or heat pump units, usually rooftop units (RTUs). The initiative covers New Jersey and four New England states: Vermont, Massachusetts, Rhode Island, and Connecticut. There are approximately one million commercial and industrial utility customers in the region. The initiative's strategy is to engage the region's 2,500 HVAC installation contractors, encouraging them to up-sell high-efficiency units to their customers when replacing failed units or for new applications. In addition, the sponsors promote high-efficiency HVAC directly to their C&I customers.

Approximately 920 customers have applied for HVAC equipment rebates through Cool Choice, which has identified and contacted over 2,500 HVAC contractors in the region.

LESSONS LEARNED

Program success takes more than just rebates; it requires persistence and a range of marketing tactics, including contractor outreach, contractor and customer education, technical resources, and information about the program and products targeted. Market players are actively engaged in the markets, and have the knowledge and experience to determine what program services will help them succeed. The players respond positively to clear and substantive messages from people they trust and respect—people they know they can count on when they need services and answers.

PROGRAM AT A GLANCE

Program Name: Cool Choice

Targeted Customer Segment: Commercial and industrial (non-residential) customers.

Program Start Date: Mid-1999

Program Participants: Approximately 920 customers have applied for HVAC equipment rebates through Cool Choice. Additionally, the program has contacted over 2,500 HVAC contractors in the region.

Approximate Eligible Population: One million C&I customers

Participation Rate:
Following are data showing results of the rebate portion of Cool Choice.

Year	Tier 1 Units
2000	385
2001	719
2002 (Oct.)	719
Total Program	1,823

Year	Tier 2 Units
2000	478
2001	1,138
2002 (Oct.)	1,154
Total Program	2,770

Year	PTACs*
2000	1,189
2001	3,402
2002 (Oct.)	NA
Total Program	4,591

Year	Rebate $
2000	$523,232
2001	$1,304,841
2002 (Oct.)	$1,243,713
Total Program	$3,071,786

* PTACs = packaged terminal air conditioners

Annual Energy Savings Achieved: Savings shown below are estimated according to rebate results.

Year	New kWh/yr Savings
2000	1,827,600
2001	3,929,000
2002 (Oct.)	4,786,000
Program Total	10,542,600

Peak Demand (Summer) Savings Achieved: Savings shown below are estimated according to rebate results.

Year	New kW Savings
2000	1,924
2001	3,518
2002 (Oct.)	4,227
Total Program	9,669

Budget: Figures shown under utility costs include program delivery costs, rebate dollars, and sponsor administration. Rebate levels are designed to cover 100 percent of incremental cost; therefore, customer cost is assumed to be nil.

Year	Utility Costs
2000	$1,720,000
2001	$2,293,300
2002 (projected)	$2,176,700
2003 (Projected)	$2,176,700

Funding Sources: Cool Choice is being developed, delivered, and administered by its sponsors. 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

Best Person to Contact for Information about the Program

- Jonathan Linn, Program Manager
- Phone: 207-338-9705
- Fax: 207-338-9594
- Email: jlinn@acadia.net
- Postal address: NEEP, 212 Waterville Rd., Belfast, ME 04915
- URL: http://www.coolchoice.net

Commercial/Industrial HVAC

Rooftop HVAC Maintenance Program
Avista Utilities

PROGRAM OVERVIEW

The Rooftop HVAC Maintenance Program is based on research that Avista had performed on this technology and market. The results of the research revealed a great opportunity for this type of program, and the 2001 energy crisis created the perfect timing for creating and implementing such a program.

The objective was to achieve kWh savings in the summer of 2001 by reducing electric usage in commercial rooftop heating and cooling units through preventative maintenance and repair as well as equipment upgrades. Both large and small commercial customers were targeted, from big box retail and manufacturing plants to fast food restaurants and small retail stores.

This program was developed quickly due to Avista's in-house engineering experts, available research data, and in-house program management resources. Due to the timing of the program launch, Avista was also able to use summer students to add program support and complement its regular staff. The program was developed and launched in less than a month with an initial rollout to local HVAC dealers in the service territory. Avista also tapped into local business organizations such as the restaurant association and building manager group, as well as individual account executive contacts.

The program's main focus was maintaining and improving rooftop units, especially ones that did not already have a maintenance program. The checklist included a 14-point service with a strong emphasis on cleaning as well as replacing and repairing parts such as economizers. The program also offered programmable thermostat installations.

The program had a management team with a strong technical element, as well as administrative and inspection teams for insuring processing and completion.

PROGRAM PERFORMANCE

In just over a three-month period, the program served over 2,000 commercial electric customers at more than 2,700 customer sites. Nearly 8,500 rooftop units were inspected and maintained at these sites. Avista estimates that these measures yield over 13,000,000 kWh annual savings. The company also is surveying customers to see how many of them began maintenance programs as a result of Avista's program. Customers that adopt such routine maintenance programs would provide additional ongoing energy savings, as well as potentially some incremental savings in subsequent years as upgrades and improvements are made from measures identified through routine inspection and maintenance.

One of the primary exemplary program features was the speed with which the program was developed and launched in able to get immediate energy savings as needed to address the

energy crisis of 2001. The key to achieving this objective was utilizing the local HVAC dealers to contact and schedule a large amount of customers in a short time. Another key program feature was to contact building owner/operator organizations to publicize the program services. Finally, the biggest key was probably the free cost to the building owner/operator and the direct payment to the dealer for providing services. This feature of providing free services to customers through dealers allowed for rapid dissemination of program information, which was critical to achieving high participation in a short time.

LESSONS LEARNED

If speed to market had not been so important, it would have been beneficial to conduct additional dealer training ahead of the program launch to customers. Avista ended up having to have some dealers return to customer sites to correct deficiencies that were identified by program staff during post-inspection. It also would have been useful to have increased contact with the customers regarding the benefits of the maintenance and how it could affect energy costs, equipment life, and occupancy comfort.

Avista has surveyed customers to determine if there has been any increase in the number of customers that now perform this type of HVAC maintenance due to the program. Avista would like to offer something similar again. However, because of present electric prices that are lower than those experienced in 2001, the program's cost-effectiveness is changed, which would require some changes in the design of the program. Because of the program's success, Avista has received inquiries and provided input to other parties interested in replicating or designing similar offerings.

PROGRAM AT A GLANCE

Program Name: Rooftop HVAC Maintenance Program

Targeted Customer Segment: Commercial customers with rooftop package HVAC units

Program Start Date: May 9, 2001 (Planned as a temporary program during the 2001 energy crisis, the program ran through July 13, 2001.)

Program Participant: More than 2,000 commercial electric customers at more than 2,700 customer sites, inspecting and maintaining nearly 8,500 rooftop units

Approximate Eligible Population: Approximately 18,000

Participation Rate: 11%

Annual Energy Savings Achieve: Over 13,000,000 kWh annual savings

Peak Demand (Summer) Savings Achieved: NA

Budget

Year	Utility Costs
2001	$1,750,000
2002	Not available
2003 (projected)	Not available

Funding Source: The program was funded from Avista's DSM Tariff rider

Best Person to Contact for Information about the Program

- Chris Drake
- Phone: 509-495-8624
- Fax: 509-777-5242
- Email: chris.drake@avistacorp.com
- Postal address: Avista Utilities, P.O. Box 3727, Spokane, WA 99220-3727

- URL: not applicable as program was discontinued.

Commercial/Industrial Lighting

Lighting Efficiency
Xcel Energy

PROGRAM BACKGROUND

Lighting Efficiency was launched in 1985 and has been one of the top DSM performers in Xcel Energy's portfolio of conservation programs in its Minnesota service territory. Xcel Energy provides rebates to customers who purchase and install qualifying lighting equipment. In addition to rebates, Xcel Energy provides low interest financing. Xcel Energy also works as the energy expert for customers. Xcel Energy has a group of account managers assigned to specific customers as well as a Business Solutions Center with phone reps who can help answer any conservation questions customers have.

Lighting Retrofit	**Rebate Levels**
Fluorescent T8 lamps with electronic ballasts	$9.00 - $15.00
Fluorescent T5 lamps with electronic ballasts	$10.00 - $16.00
Compact fluorescent fixtures	$4.00 - $12.00
Industrial multi-CFL fixture	$25.00
Metal halide & high-pressure sodium fixtures (without 2-level switching)	$17.00 - $45.00
Metal halide & high-pressure sodium fixtures (with 2-level switching)	$30.00 - $65.00
Pulse-start metal halide fixtures (without 2-level switching)	$45.00 - $65.00
Pulse-start metal halide fixtures (with 2-level switching)	$60.00 - $85.00
Reflectors	$0.50/sq. ft.
Occupancy sensors and photocells	$12.00 - $36.00
LED exit sign	$6.00
LED pedestrian signals (walk/don't walk)	$25.00 - $40.00
LED traffic signals	$15.00 - $65.00

New Construction Lighting	**Rebate Without Auto Controls**	**Rebate With Auto Controls**
Fluorescent T8 lamps with electronic ballasts	$1.75 - $2.25	$2.25 - $3.00
Fluorescent T5 lamps with electronic ballasts	$2.00 - $2.50	$2.50 - $3.25
Compact fluorescent lamps/fixtures	$1.00 - $1.75	$1.25 - $2.25
Industrial multi-CFL fixture	$8.00	$9.00
Metal halide & high-pressure sodium	$6.00 - $10.00	$7.75 - $13.00
Pulse-start metal halide fixtures	$8.00 - $12.00	$9.75 - $15.00

If a project does not fit within Xcel Energy's set of prescriptive lighting rebate measures, but does save energy, it can be considered under the Custom Efficiency Lighting program. This

program takes a look at projects on an individual basis and if it passes certain cost/benefit tests, the customer can receive a rebate of up to $200/kW saved.

The program is structured so that customers follow these steps:

- Customer or vendor installs qualifying lighting equipment at facility.
- Customer, vendor, or Xcel Energy account manager fills out the rebate application form.
- For retrofit projects, the form requires customer or vendor to provide detailed information about existing lighting that is being replaced.
- Customer must sign the form stating that the information submitted is accurate.
- Proof of purchase (detailed invoice) must be submitted with application.
- Customer must apply for a rebate within one year of the purchase date shown on the equipment invoice.
- Xcel Energy conducts random spot checks to keep program participants honest.
- Customer receives rebate check in six to eight weeks.

The objectives of the program are to:

- Lower the overall cost of purchasing higher-efficiency equipment.
- Decrease customers' payback time.
- Reduce customers' energy costs.
- Strengthen customer relationships.
- Comply with regulatory mandates.
- Reduce the need to build new power plants, which benefits the environment.

PROGRAM PERFORMANCE

The key to the success of this program lies mainly in Xcel Energy's internal account management team, vendors, and annual promotions.

Xcel Energy has a core group of knowledgeable account managers that work with its large C&I customers. Due to the strong relationships with their customers, these proactive account managers are very successful in selling the Lighting Efficiency program.

Xcel Energy also maintains strong relationships with lighting vendors. The company makes sure to provide them with updated program information and literature through direct mailings, face-to-face meetings, seminars, trade shows, and newsletters.

The last major key to success of this program has been Xcel Energy's annual promotions. Over the last few years, Xcel Energy has offered customers an additional incentive to retrofit their existing T12 systems to T8 or T5 systems. This has worked extremely well and Xcel Energy has a 70 percent saturation level for remaining T12 systems.

LESSONS LEARNED

The two major lessons that Xcel Energy has learned are: (1) that the small business customer needs a more hands on approach; and (2) that its sales channels (internal account managers and outside vendors) are a huge key to its success.

Xcel Energy plans to continue to provide customers with lighting rebates, training, and energy knowledge and to continue to leverage its vendor relationships.

PROGRAM AT A GLANCE

Program Name: Xcel Energy Lighting Efficiency

Program Start Date: 1985

Program Participants to Date (Annual Totals)

2001: 1395
2002: 1149
2003: 840 (goal)

Eligible Population or Customer Segment: All Xcel Energy business customers located in the Minnesota service territory

Participation Rate: NA

Annual Energy Savings Achieved

2001: 88,452,000 kWh
2002: 66,785,000 kWh
2003: 49,054,192 (goal)

Peak Demand (Summer) Savings Achieved

2001: 20,022 kW
2002: 14,681 kW
2003: 9,669 kW (goal)

Budget: Total budget (includes project delivery, utility administration, marketing, evaluation and rebate incentives): 2001: $5,382,907, 2002: $3,335,999, 2003: $3,463,439 (budget)

Funding Source: Xcel Energy is mandated to spend 2% of its Gross Electric Operating Revenue on electric DSM programs. Customers in its Minnesota service territory are charged a CIP (Conservation Improvement Program) cost on their bill.

Best Person to Contact for Information about the Program

- Lisa Kauffman, Product Portfolio Manager
- Phone: 612-904-5321
- Fax: 612-330-2914
- Email: lisa.a.kauffman@xcelenergy.com
- Postal address: 414 Nicollet Mall—RS7, Minneapolis, MN 55401
- URL: http://www.xcelenergy.com/XLWEB/CDA/0,2795,1-1-4_759_1247-779-5_406_669-0,00.html

Section 2

Building Code Assistance Project, DOE State Energy Programs

Building Codes Assistance Project

• B C A P •
Building Codes Assistance Project

If the 15 U.S. states with the most outdated building codes upgraded to the newest model energy codes, the country could save more than 3 billion kilowatt-hours annually. To help consumers, businesses, and the government tap into this potential energy windfall, The Alliance to Save Energy's Building Codes Assistance Project (BCAP) promotes energy-efficient building codes and standards in the United States through advocacy, technical support, and outreach.

Funded by the Energy Foundation and the U.S. Department of Energy, BCAP provides on-site assistance to state and local government officials, customizes adoption and implementation strategies to state needs, promotes and coordinates education and technical support for energy code compliance, and provides public testimony upon request by legislators.

For more information, visit the BCAP website

More for Building Codes Assistance Project ...

Building on Success: Policies to Reduce Energy Waste in Buildings report recommends energy-efficiency policies such as building energy codes, appliance standards, and labeling and information programs. Already, such policies have reduced U.S. energy use in buildings by 10% over the past 20 years and more is possible.

Related Links

U.S. Department of Energy
Energy Efficiency and Renewable Energy

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State Energy Program

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- All SEP Projects in the States & U.S. Territories
- Formula Grants by State
- Special Projects by State
- Case Studies by State
- State Energy Office Project Briefs

SEP Projects in the States and U.S. Territories

Select a state or U.S. territory on the map or from the pull-down menu for summaries of State Energy Program sponsored projects in that state, SEP contacts in the state energy offices, links to the state energy office Web sites, project briefs, case studies on projects from that state, and links to state publications on renewable energy and energy efficiency.

Select a State — Select a state

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U.S. Department of Energy
Energy Efficiency and Renewable Energy

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FEATURES

SEP 2005 Special Projects by State

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- Funding to the States
- Formula Grants
- Special Projects
- History of the State Energy Program
- DOE Guidelines & Federal Regulations

DOE's State Energy Program (SEP) provides grants to the states to design and carry out their own renewable energy and energy efficiency programs.

Funding from the State Energy Program goes to state energy offices in all states and U.S. territories. SEP projects are managed by state energy offices, not by DOE directly. DOE Regional Offices organize the day-to-day business of the State Energy Program and interact with energy offices and other state officials.

The results from the State Energy Program reflect the work of state energy offices. The outcome is an innovative deployment of new energy efficiency and renewable energy technologies across the geographic panorama of the United States and its territories.

- Goals and Metrics
- Organization
- Funding to the States
- Formula Grants
- Special Projects
- Program History
- DOE Guidelines

Printable Version

Section 3

California Energy Efficiency and Conservation Programs, 10/20 Energy Conservation Tariff Press Release

Energy Efficiency and Conservation Program

On September 22, the PUC launched the most ambitious energy efficiency and conservation campaign in the history of the utility industry in the U.S. by authorizing energy efficiency plans and $2 billion in funding for 2006-2008 for the state's utilities, reaffirming that cost-effective energy efficiency is the state's first line of defense against power shortages.

- Read all about the **state's energy efficiency efforts**! [en Español] | [chinese version]
- California Shows Strong Support for the National Action Plan for Energy Efficiency: **Press Release** -- **Memorandum of Understanding**
- Dec. 1, 2006: **Joint West Coast Public Utilities Commissions Workshop** on Energy Efficiency

We are currently evaluating the utilities' 06-08 energy efficiency programs and budgets in A.05-06-004 and examining the state's future energy efficiency policies, administration, and programs in R.01-08-028.

- How to make your home more energy efficient -- our energy efficiency guide.
- About Energy Efficiency and Conservation
- General energy efficiency program descriptions
- Specific energy efficiency programs
- Energy Efficiency program funding
- Energy efficiency strategies
- Library and resources
- Links to more information on energy efficiency and conservation
- Energy Efficiency Programs key to California's energy future
- PUC Green Building Initiative Report to Governor, Oct. 2005
- More information on Low Income Energy Efficiency and Energy Efficiency

Contact:
California Public Utilities Commission
Energy Division
4th Floor - 505 Van Ness Ave
San Francisco, CA 94102

HOT LINE NUMBER 415 703-2776

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California Public Utilities Commission

505 Van Ness Avenue, San Francisco, CA 94102

News Release

FOR IMMEDIATE RELEASE

Docket #: Res G-3384

Media Contact: Terrie Prosper, 415.703.1366, news@cpuc.ca.gov

PUC HELPS EASE IMPACT OF RISING NATURAL GAS PRICES FOR PG&E CUSTOMERS

SAN FRANCISCO, Nov. 18, 2005 – The California Public Utilities Commission (PUC) in ongoing efforts to help consumers manage rising natural gas prices, today approved a program for Pacific Gas and Electric Company (PG&E) that encourages natural gas conservation and provides consumers with an estimated winter gas bill reduction of $200 million.

Under the "10/20" program, PG&E's residential and small commercial customers will receive a 20 percent rebate if they achieve a 10 percent year-over-year reduction in natural gas consumption from January through March 2006. The amount of the rebate would be 20 percent of the customer's total natural gas bill over the same three-month period and be credited to natural gas bills issued after March 31, 2006. The average residential gas customer who reduces their natural gas usage by 10 percent will save approximately $90 under the program with $60 resulting from the rebate and the remainder due to reduced natural gas usage through conservation. Consumers do not need to enroll in the program - their usage will be automatically tracked by PG&E.

Natural gas prices are expected to be at exceedingly high levels during the upcoming winter, due in part to the impact of Hurricanes Katrina and Rita on the Gulf Coast's natural gas production and supply infrastructure. These events caused a further run-up in natural gas prices leading to heightened concerns about 2005-2006 winter natural gas bills.

"I want to commend PG&E and The Utility Reform Network for their collaborative efforts in bringing forth the 10/20 program and proactively addressing winter natural gas bills," said PUC President Michael R. Peevey. "This and other actions the PUC and utilities have taken will help to ease the burden of rising natural gas prices."

The Commission, with the involvement of the state's natural gas utilities and other concerned parties, has taken a variety of actions to help mitigate the impact of anticipated high 2005-2006 winter natural gas prices on consumers. On Oct. 6, 2005, the Commission held a Full-Panel Hearing

to examine ways to reduce the impact of rising natural gas prices on low-income customers. Based on proposals submitted following the Hearing, the Commission expanded the eligibility requirements for the California Alternative Rates for Energy (CARE) program, approved the acceleration of utility energy efficiency plans, and approved natural gas hedging plans for PG&E, Southern California Gas Company, and San Diego Gas and Electric Company in order to protect customers from gas price spikes.

In addition, the Commission strongly supports energy efficiency and conservation as a key step toward meeting California's energy needs. Striving to minimize and use energy wisely serves to ensure adequacy of supply, maintain reasonable prices, and reduce the likelihood and impact of price spikes, as outlined in the state's Energy Action Plan II.

For more information on the PUC, please visit www.cpuc.ca.gov.

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Section 4

Vermont Efficiency Programs And Evaluation

Efficiency Vermont

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Residential | Business

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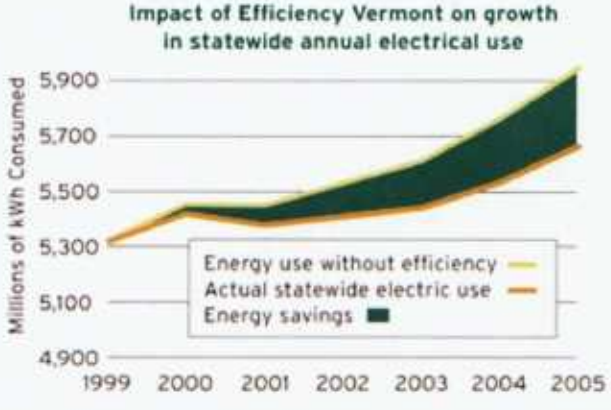
About Us

Who we are
Efficiency Vermont is the nation's first statewide provider of energy efficiency services. We're operated by an independent, non-profit organization under contract to the Vermont Public Service Board.

What we do
We provide technical advice, financial assistance and design guidance to help make Vermont homes, farms, schools and businesses energy efficient.

How we're funded
We're funded by an energy efficiency charge on your electric bill. Before Efficiency Vermont was created, the energy efficiency charge was used to pay for energy efficiency services formerly provided by your electric utility. If you're a Burlington Electric Department (BED) customer, your charge still pays for the energy efficiency services you receive from BED.

How, when and why we got started
We were created in 2000 by the Vermont legislature and the Vermont Public Service Board to help all Vermonters save energy, reduce energy costs and protect Vermont's environment. When we opened our doors, Vermont electric utilities (except Burlington Electric Department) were able to stop providing energy efficiency services. This enabled all Vermonters to receive the same services.



The combined lifetime economic value of all Efficiency Vermont investments since 2000: $207 million.

The lifetime economic value of Efficiency Vermont investments made in 2005: $37 million.

Through energy efficiency investments made since 2000, Vermont is now using 5% less energy than the state would have used.

In 2005, the cost of saving electricity with energy efficiency was approximately 3.6 cents per kWh. That's almost two-thirds less than the 9.6 cents per kWh that utilities would have paid for a comparable electric supply.

Approximate cost of electric efficiency 3.6¢/kWh

Approximate cost of comparable electric supply 9.6¢/kWh

- Vermont ratepayers saved more than $2 for every $1 invested in energy efficiency.
- Vermont businesses that participated in efficiency services realized a 49% return on their efficiency investments.
- Approximate energy savings for all projects completed through 2005: 8 million kWh and $894,000

Efficiency measures installed in 2005 will help Vermonters save the following natural resources:

Water: 435 million gallons -or enough to supply all of Lamoille County for a year.

Oil: 3.5 million gallons -or enough to heat approximately 5,000 typical Vermont homes for a year.

Propane: 2 million gallons -or enough to heat approximately 2,000 typical Vermont homes for a year.

Gas: 446 million cubic feet -or enough to heat approximately 5,300 typical Vermont homes for a year.

Efficiency measures installed in 2005 will result in reductions of the following emissions:

Carbon dioxide: 466,500

Nitrogen oxides: 240 tons

Sulphur dioxides; 650 tons

It all adds up

Vermont's reduction of carbon dioxide in 2005, through energy efficiency in homes and businesses, provided the same emissions reductions that would have been achieved if 76, 300 fewer cars had traveled on Vermont's roads in 2005.

What's New

Efficiency Vermont in the News »

Vermont Collegiate Change a Light Challenge »

Residential Green Building Workshop »

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Efficiency Vermont

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Site Map

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FINAL REPORT: PHASE 2 EVALUATION OF THE EFFICIENCY VERMONT RESIDENTIAL PROGRAMS

Prepared for

Vermont Department of Public Service
Montpelier, Vermont

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ES EXECUTIVE SUMMARY

E.1 INTRODUCTION

This Executive Summary presents an overview of the Phase 2 Evaluation of Efficiency Vermont's programs to promote the adoption of energy-efficient products and construction practices among residential customers and the building professionals who serve them. Efficiency Vermont (EVT) delivers energy efficiency programs to electric customers statewide, with the exception of customers served by the Burlington Electric Department. EVT initiated operation in November 2000, under contract to the Vermont Department of Public Service (DPS). Previous to that, electric and gas utilities delivered energy efficiency services to their customers under the regulatory supervision of DPS. KEMA, Inc. (formerly XENERGY Inc.) completed the first evaluation of EVT's residential programs in 2002.

E.1.1 Program Overview

EVT delivers three main residential programs.

- ***Efficient Products.*** The Efficient Products Program (EPP) encourages and facilitates the purchase of ENERGY STAR qualified home lighting products and appliances through a combination of customer incentives; merchandising support to retailers, advertising, and public relations. The appliance component focuses primarily on promoting ENERGY STAR qualified clothes washers; the lighting component primarily on promoting compact fluorescent light bulbs (CFLs).
- ***New Construction.*** The Residential New Construction (RNC) Program promotes the use of energy-efficient construction methods and components in new single-family homes. This is accomplished primarily by providing a combination of technical assistance, financial incentives, and marketing support to builders, along with Home Energy Ratings (which include on-site inspection and testing) to certify to buyers and owners that participating units meet high energy performance standards.
- ***Existing Homes.*** The Existing Homes Program consists of a number of initiatives designed to capture energy efficiency opportunities in existing homes through retrofit projects addressing building envelope, heating, and cooling systems. In some cases, these programs also aim to provide training and incentives for adoption of energy-efficient practices to contractors who typically serve those markets.

The Efficient Products and New Construction Programs have been part of EVT's portfolio since the organization's inception, and most Vermont utilities had operated predecessor programs for as many as 10 years prior to that. The Existing Homes Program was initiated in 2003 and is still in its early phases of development. As directed by DPS, KEMA did not evaluate the Existing

Homes Program. We did, however, capture responses to the program by vendors in the market they address, and those responses are reported in the relevant sections of the report.

E.1.2 Evaluation Objectives

The principal objectives of the evaluation were as follows.

- Estimate the net effects of EVT on purchases of compact fluorescent light bulbs (CFLs).
- Estimate the net effects of EVT on purchases of ENERGY STAR appliances.
- Assess the effect of EVT on new construction practices.
- Identify and characterize opportunities for new program efforts, particularly appliance recycling.
- Identify opportunities for improving performance of major program components.
- Assess overall program performance vis-à-vis similar programs.

E.2 METHODS

Table ES-1 summarizes the data collection and analysis efforts undertaken to support the evaluation.

E.3 KEY FINDINGS AND RECOMMENDATIONS

The following paragraphs present key findings and recommendations in regard to individual program components and opportunities for new initiatives.

E.3.1 Efficient Products: Lighting Component

Key Findings

- ***EVT's CFL promotion program showed strongly improved results in 2004.*** The number of CFLs purchased through the program through the combined coupon, ITP, and catalog channels grew to 178,669 in 2004 from 72,791 in 2003, and increase of 144 percent in one year. Over the same time period, sales of CFLs in the U. S. as a whole decreased by 6 percent.
- ***The recently introduced manufacturer buydown initiative (ITP) contributed significantly to overall program growth.*** The manufacturer buydown or ITP, which was implemented on a full scale in 2004, yielded sales of 34,430 CFLs. That is 19 percent of total program volume and 32 percent of the increase in volume from 2003 to 2004.

Table E-1
Summary of Phase 2 Residential Program Evaluation Research Activities

Activity / Summary of Topics Covered	Sample Size and Other Details
Review of tracking system database and other documentation.	
Interviews with DPS, EVT and Program Contractor Staff.	In-depth interviews with 15 individuals.
1. **Lighting Program Net Effects Study.** Collect and analyze CFL sales data from a sample of Vermont locations. Corroborate findings with data from the Appliance Saturation Survey. Assess program net effects through comparison to similar data from other states.	• Collected data from **5** retailers accounting for 70 – 80 percent of program volume. • Survey of **100** non-participating retailers to estimate CFL sales.
2. **Appliance Sales Data Collection and Net Effects Analysis.** Collect appliance sales data from a sample of independent appliance dealers: volume of sales, model numbers for estimation of ENERGY STAR market share. Compile information on state-level appliance sales and ENERGY STAR market share from DOE and AHAM.	• Sales data obtained from **48** retail locations, accounting for 50 percent of all program rebates
3. **Appliance Saturation Survey: Telephone Component.** Collect information on appliance holdings, age, efficiency, CFL holdings and purchase, plug loads, heating and cooling equipment, basic housing and demographic characteristics, recruitment for on-site component. **Appliance Saturation Survey: On-Site Component.** Verify numbers and location of CFLs installed, appliance efficiency, appliance age (via model numbers), basic housing characteristics.	• **600** random digit dial sample stratified by region • **83** nested sample recruited from the telephone panel
4. **Refrigerator Life Cycle Analysis.** Estimate potential gross savings, net savings, and persistence of savings using a combination of primary and secondary data.	• Data collected through the Appliance Saturation Survey, plus interviews with program staff, local appliance recyclers, and retailers
5. **New Construction Update: Builder Survey.** Assess builders' knowledge of energy efficiency techniques and benefits; use of efficient construction techniques and equipment; opinions of business value of energy efficiency; current energy efficiency promotion practices; energy-related construction and specification practices prior to and since participation	• **61** builders, random sample stratified by size and region
6. **Other trade ally interviews** Assessment of program marketing and administrative effectiveness, customer response, and trade ally response.	• **30** HVAC contractors, insulation contractors, appliance and lighting retailers, and remodelers.
7. **Process Evaluation.** Comparison of EVT performance to that of other similar organizations. Dimensions of comparison will focus on market penetration and cost of conserved energy.	Data to be derived primarily from EVT records and reports and publicly available information on other programs.

- ***Vermont recorded the highest level of CFL sales per household of any state for which sales data (as opposed to program activity records) were available.*** Using a combination of program records, retailer survey data, and retailer sales records collected by EVT, KEMA was able to develop a robust estimate of total CFL sales in the state in 2004 of 271,170 units or 1.08 units per household. Among areas with active promotional programs, the Pacific Northwest recorded sales of 1.01 units per household estimated

using similar methods. Analysis of point-of-sale scanner data conducted for California utilities found that 2004 sales in California totaled 0.43 units per household and 0.29 units at the national level.

- ***The Net-to-Gross ratio estimated for EVT's promotion of CFLs ranges from 1.22 to 1.36.*** The Net-to-Gross ratio estimated for EVT's promotion of CFLs ranges from 1.22 to 1.36. That is, 2004 CFL sales attributable to the program's influence range from 217,088 to 243,844 units versus the 178,669 units sold or subsidized through the program. This estimate was not sensitive to wide variations in the estimate of key input variables. It is also significantly higher than the current estimate of 1.19 used for planning and savings tracking purposes.
- ***At the household level, installation rate was not strongly related to the number of CFLs purchased.*** Thus, we do not believe that attempts to more closely enforce unit limits for individual customers will yield higher net program savings.

Recommendations

The findings of this evaluation clearly indicate that EVT has done a very good job with the lighting program, particularly in the past two years. KEMA suggests the following steps to sustain and enhance the progress that has been made.

- ***Expand the ITP manufacturer buydown component of the program.*** We believe further development of this approach will help reduce unit costs of the program and diversify the base of retailers and customers participating in the program.
- ***Require that EVT attempt to collect CFL sales information from all participating retailers.*** EVT's success in obtaining the sales data used for this evaluation and the usefulness of the analysis these data supported suggests that the effort should be incorporated into ongoing operations.

E.3.2 Efficient Products: Appliance Component

Key Findings

- ***Vermont continues to have high Energy Star market shares for all four appliances.*** When compared to national and regional averages, Vermont's ENERGY STAR market share in chain stores for each of the four major appliance categories is consistently among the highest estimated levels for individual states.
- ***The weight of evidence suggests that EVT's appliance program and its utility-based predecessors, as well as other long-standing utility programs had a profound impact on the national market success of energy-efficient clothes washers.*** A study commissioned by the Consortium for Energy Efficiency (CEE) found that utility energy efficiency program managers, primarily from California and the Northwest states, played a crucial role in initiating the development of the infrastructure required for effective market transformation programs: contacts with manufacturers, technology assessments, and

common equipment specifications.[1] These efforts were organized on the national level by CEE, beginning informally in 1992. The Vermont utilities joined the initiative in 1996. This work in turn supported a major national effort involving manufacturers and over 200 local program sponsors by the year 2000. Since then the national market share of ENERGY STAR clothes washers has grown from 9 percent to 27 percent (2004). In 2007, the federal minimum standard will be revised to match the current ENERGY STAR specification.

- ***The net effects of the program on the market share of ENERGY STAR clothes washers sold in a given year have declined significantly in recent years.*** In 2001, the net unit sales attributable to the program were estimated at 1,045 versus total program-subsidized sales of 2,719 for a net-to-gross ratio of 0.38. In 2004, the maximum number of net unit sales attributable to the program was 724 versus program volume of 4,179 units, for a net-to-gross ratio of 0.17. This is a maximum estimate that reflects the inclusion in the analysis of a variable that captures the effect of past program efforts as well as other factors that accounted for past growth in Vermont's ENERGY STAR clothes washer market share.
- Findings of decreased net effect in the current year are consistent with recent increases in national ENERGY STAR appliance market shares, as well as with other regional studies. These findings are consistent with a similar analysis conducted in 2003 for a consortium of Massachusetts utilities, and with the overall perceptions of appliance program managers around the country.

Recommendations

- ***In the short run, we believe that EVT should continue to administer rebates for ENERGY STAR clothes washers.*** This is necessary to maintain good relationships with retailer channels that have been built up over many years and to prevent potential sell-offs of non-qualifying models prior to implementation of the next round of federal minimum energy efficiency standards in 2007.
- ***Assess and implement changes to the program that can increase cost effectiveness.*** These expedients may include:
  - Reduce incentive amounts.
  - Limit the duration of appliance incentive promotions to specific months. This approach has been tried in the Pacific Northwest. Market share of ENERGY STAR appliances remain high in that region.
  - Restrict eligibility to models that qualify for the Consortium for Energy Efficiency's Tier 3 standards.
- ***In the longer term it may advance efficiency goals to redirect incentive and business development resources away from appliance promotions to other opportunities. EVT***

[1] Feldman, Shel, Mitchell Rosenberg, Jane Peters. 2001. *The Residential Clothes Washer Initiative: A Case Study of a Collaborative Effort to Transform a Market.* Boston: Consortium for Energy Efficiency.

should initiate discussions with appliance retailers to develop procedures for an exit strategy.

E.3.3 Residential New Construction

Findings

- ***The portion of single-family new homes that enroll in the program is very high compared to participation rates for similar programs elsewhere.*** In the years for which data were available (2001 through 2003), the program developed leads on 1,551 to 1,950 projects, which corresponds to 61 to 74 percent of the typical volume of single-family homes permitted each year (around 2,500). The program also does a good job converting leads to enrollments. This ratio ranged from 39 to 52 percent in the three years covered. The percentage of permitted single family homes that enrolled in the program remained stable in the range of 29 to 32 percent from 2001 to 2003.
- ***EVT has reduced the portion of projects that drop out of the program prior to certification and the pace at which projects are processed.*** Portion of projects completed in same year as enrollment increased from 14% in 2001 to 36% in 2003.
- ***Number of builders with projects enrolled and number of builders participating for the first time increased steadily from 2001 through 2003.*** As of the end of 2003, 200 builders had completed projects through the program.
- ***The number of builders completing multiple projects in one year increased to 30 in 2003 v. 12 in 2002.*** Repeat participation is key to the execution of EVT's strategy to transform the residential new construction market.
- ***The depth and quality of energy efficiency measures in participating homes increased significantly from 2002 through 2004.*** The portion of completed projects with 6+ end-uses addressed increased from 38% in 2002 to 69% in 2004. The portion of completed projects meeting Energy Star rating criterion (86.0) increased from 77% in 2002 to 92% in 2004.
- ***Baseline energy efficiency practices improved between the Phase 1 evaluation (2001) and the Phase 2 study (2005), particularly for measures promoted by the EVT program.*** Inclusion of selected energy efficiency measures, including Energy Star® appliances, energy efficiency fluorescent hard-wired lighting fixtures, and use of blower door tests to measure air infiltration, has increased since the Phase 1 study. These increases are likely a result of program influence.
- ***KEMA uncovered additional evidence of market transformation in interviews with builders.*** Key findings in this regard were as follows.
  - Builder awareness of the non-energy benefits of energy-efficient equipment (including increased comfort and lower equipment maintenance costs) increased by statistically significant margins since 2001.

- Customer requests for Energy Star® rated high-efficiency heating and cooling equipment as priced options have increased dramatically since the Phase 1 evaluation: builders representing 39 percent of the new construction market in Vermont indicated that customers request the equipment as compared with only 8 percent in 2001.
- Builder perceptions of the importance of energy efficiency to the success of their businesses have increased, another likely demonstration of the program's success in transforming the new construction market.

Recommendations

EVT has significantly improved the quality of marketing and delivery for the Residential New Construction program since the Phase 1 evaluation. KEMA has no recommendations for improving program operations or design. Over the course of the evaluation, DPS and KEMA raised questions concerning the cost effectiveness of the program, prompted by its relatively low share of total *annual electric savings* as a portion of total annual electric savings achieved by EVT's residential programs. Upon review of cost and benefit results published in EVT's 2004 Annual Report[2] the program appears to be cost-effective on a total resources basis. Specifically:

- In 2004, the RNC program accounted for 25 percent of EVT's total budget for residential energy efficiency programs.
- First year MMBtu savings, which take into account fossil fuel energy as well as the energy content of delivered electricity accounted for 21 percent of total MMBtu savings.
- The program as a whole was not subjected to a formal total resource benefit-cost analysis in the 2004 *Annual Report.* However, cost and benefit estimates included in the report suggest that the program was cost-effective. The discounted value of the lifetime savings generated by the 2004 RNC program totaled $2.615 million (constant 2003 dollars), without accounting for the environmental and energy market risk adders that have been incorporated into cost-effectiveness calculations in Vermont. The total cost of the program, also in 2003 dollars, was estimated at $1.901 million.
- The observations concerning electric savings that led to the initial concern about the cost effectiveness of the program are accurate. The RNC accounts for only 3 percent of estimated annual electric savings from residential programs, and 6 percent of the lifetime savings. The more favorable total resource results stem from the program's emphasis on longer-lived measures and on measures that save primarily fossil fuel energy.

KEMA recommends that EVT in conjunction with DPS take steps to clarify the rationale for the program. For example, it seems likely that some of the improvement in baseline construction practices is attributable to the program. RNC is also an important for reducing overall energy costs of consumers and a vehicle for leading the market towards future increases in the

[2] Efficiency Vermont. November 2005. *Year 2004 Annual Report and Annual Savings Claim.* Burlington, VT. Tables 2.1.16 and 3.1.12.

stringency of the Energy Code. Moreover, the RNC is an important channel for the delivery of energy-efficient lighting fixtures. During the period between evaluations, we recommend that the EVT Business Development and Planning staffs seek to characterize these program contributions more fully than was possible in this evaluation and to develop potential changes to the program that will enhance these effects.

E.3.4 Potential for New Program Initiatives: Appliance Recycling

The DPS requested that KEMA assess the potential cost-effectiveness of an initiative to provide incentives to customers to turn in used refrigerators and freezers. KEMA used data collected through the 2005 Residential Appliance Saturation Survey (RASS), EVT data, and evaluations of appliance turn-in programs in other jurisdictions to estimate:

- Likely volume and characteristics of appliances that would be turned in;
- Average unit annual energy consumption (UEC) for units likely to be collected by the program (a measure of gross savings per unit);
- A net-to-gross ratio (NTG) that reflects the net effect of a turn-in initiative on a customer's decision to recycle an appliance, versus retaining it in use or transferring it to another user;
- A measure effective useful life (EUL) that reflects how long the appliance would have remained in service in the absence of a turn-in initiative.

The DPS and the Energy Efficiency Utility can use these findings, along with cost information from appliance recycling service providers, to assess the cost-effectiveness of pursuing an appliance turn-in initiative.

Key Findings

Market of Available Units

- Of the 600 RASS respondents, 128 (21 percent) reported that they had had a refrigerator and/or freezer removed from their home in the past three years.
- The majority of all reported discarded units (62 percent) were 15 years or older.
- The vast majority (98 percent) of respondents who disposed of one refrigerator in the past 3 years said that the refrigerator had been their primary refrigerator (not an extra or a back-up unit).
- 64 percent of the discarded primary units were reported to be "working" units (just old or replaced). Twelve percent were reported to be "working, but in need of repair, and nearly 24 percent were characterized as not working when they were discarded.

Savings Estimates

- **Unit energy savings**. KEMA estimated potential unit gross savings from a turn-in program by applying data from the RASS on the age, usage patterns, and means of disposal of refrigerators and freezers to Unit Energy Consumption (UEC) data developed by other studies. This approach yielded estimates of potential gross savings per unit of 1,899 kWh per year.
- **Potential net energy savings**. KEMA developed estimates of potential net program energy savings using the results of recent evaluations of refrigerator turn-in programs in California. Applying findings regarding participation and net-to-gross ratios from these studies, we arrived at an estimated net savings of 1,824 MWh/year. Table E-1 displays the results of this estimate. By way of comparison, the planned level of savings for the clothes washer component of the Appliance program was 1,238 MWh/year in 2004.

Table E-2
Preliminary Estimate of Net Program Electricity Savings Potential

Number of Households	249,450
Annual Participation Rate	1.1% x
Annual unit gross savings (UEC)	1,899 kWh/Year x
Net-to-Gross Ratio	0.35 x
Annual Gross Savings	1,824 MWh/Year

Recommendations

It is clear that an appliance recycling program offers significant savings. We are confident that the estimate of annual unit gross savings represents a reasonable estimate of savings that can actually be achieved with the collection of each unit. We are less confident about the assumed participation rate and NTG ratio. Any attempt to project a participation rate for Vermont on the basis of observations in other states is somewhat speculative. In the case of the NTG ratio, we note that this performance parameter has varied in unpredictable ways within single jurisdictions. The results of this analysis strongly suggest that further efforts to assess the cost-effectiveness of a prospective appliance recycling program are warranted. We recommend taking the following steps.

- Approach vendors such as Recycling North and Appliance Recycling Centers of America to obtain non-binding estimates of the costs of operating a program that involves recycling of 1,500 to 2,500 units.
- Conduct cost-effectiveness screening using the net and gross savings estimates developed for this analysis.

- Conduct sensitivity analysis by varying the average gross savings figure as high as 2,000 kWh per year, and the NTG ratio as high as 0.50.
- Based on the results of this analysis, assess the likelihood of the program becoming cost effective.

E.3.5 Process Evaluation

Generally, KEMA found EVT's residential programs to be very well-managed. In particular, we found the organization's marketing and program tracking procedures and results to be excellent in comparison with peer programs.

One of the most useful ways to assess the overall performance of EVT is to compare it to that of "peer programs" using a consistent set of indicators. In this case, peer programs would consist of long-established public benefit-funded energy efficiency programs that address all or most of the customers in a given state. Unfortunately, regulators in the individual states do not collect program performance information in uniform ways. Thus direct comparisons between programs need to be treated as very general in nature.

Overall, Vermont tied with three out of eight other peer programs considered for the highest level of electric savings as a portion of sales with 0.8 percent. EVT's residential programs captured savings equal to 0.9 percent of total residential electric sales in Vermont.

The cost per first year savings provides a very rough measure of cost-effectiveness for a portfolio of programs. It would be much more appropriate to consider the combined results of the portfolio using the Total Resource Cost Test, or similar measures that take measure lifetime savings, customer costs, and environmental benefits into account. However, such an analysis would require a great deal more data than is readily available from other programs. With this caveat in mind, we see that EVT ranked third among states with peer programs in terms of cost per first year kWh savings. For all of EVT's programs combined, this figure was $0.281/kWh. The range for this indicator ran from $0.231/kWh in Wisconsin to $0.580/kWh in New Jersey. Thus, EVT's performance in this regard was very close to the best of the range presented by the eight peer programs.

5 RESIDENTIAL NEW CONSTRUCTION

5.1 OVERVIEW

5.1.1 Evaluation Objectives

This section provides a characterization of current construction and marketing practices among Vermont homebuilders, especially in regard to energy efficiency in new homes, recognition and understanding of the Vermont Energy Star Homes program, and the perceived effects of this program by builders in Vermont. Data to support this analysis comes primarily from the builder surveys and numerous secondary sources. This section has three primary objectives:

1. Update elements of the new construction baseline developed as part of the Phase 1 Evaluation (2002);
2. Determine builder perceptions of opportunities presented by the new construction program and its effects on new construction practices; and
3. Gauge builders' impressions of changes in market and the role of the Vermont ENERGY STAR Homes program in effecting those changes.

This section of the report also provides an overview of Efficiency Vermont's residential new construction program (the Vermont ENERGY STAR Homes program), including new construction program activity and participation; a discussion of the data sources from which data was collected and methods used to analyze the data; key findings; and detailed results of the analyses.

5.1.2 Key Findings

Key findings from Phase 2 of the residential new construction study include the following:

- The portion of single-family new homes that enroll in the program is very high compared to participation rates for similar programs elsewhere. In the years for which data were available (2001 through 2003), the program developed leads on 1,551 to 1,950 projects, which corresponds to 61 to 74 percent of the typical volume of single-family homes permitted each year (around 2,500). The program also does a good job converting leads to enrollments. This ratio ranged from 39 to 52 percent in the three years covered. The percentage of permitted single family homes that enrolled in the program remained stable in the range of 29 to 32 percent from 2001 to 2003.
- ***EVT has reduced the portion of projects that drop out of the program prior to certification and the pace at which projects are processed.*** Portion of projects completed in same year as enrollment increased from 14% in 2001 to 36% in 2003.
- ***Program participation continues to be concentrated in the Northwest to a greater extent than overall residential new construction activity.*** In 2003, 68 percent of the

completed units were located in the Northwest region v. 48 percent of permitted new single-family homes. This pattern may be attributed in part to the residual effects of having a strong program offered by Vermont Gas Service operating in the region which continues to partner with Efficiency Vermont. The concentration of participating units in the Northwest has decreased slightly since the inception of the program in 2000.

- ***Number of builders with projects enrolled and number of builders participating for the first time increased steadily from 2001 through 2003.*** As of the end of 2003, 200 builders had completed projects through the program.
- ***The number of builders completing multiple projects in one year increased to 30 in 2003 v. 12 in 2002.*** Repeat participation is key to the execution of EVT's strategy to transform the residential new construction market.
- ***The depth and quality of energy efficiency measures in participating homes increased significantly from 2002 through 2004.*** The portion of completed projects with 6+ end-uses addressed increased from 38 percent in 2002 to 69 percent in 2004. The portion of completed projects meeting Energy Star rating criterion (86.0) increased from 77% in 2002 to 92% in 2004.
- ***Baseline energy efficiency practices improved between the Phase 1 evaluation (2001) and the Phase 2 study (2005), particularly for measures promoted by the EVT program.*** Inclusion of selected energy efficiency measures, including Energy Star® appliances, hard-wired fluorescent lighting fixtures, and use of blower door tests to measure air infiltration, has increased since the Phase 1 study. These increases are likely a result of program influence.
- ***KEMA uncovered additional evidence of market transformation in interviews with builders.*** Key findings in this regard were as follows.
  - Builder awareness of the non-energy benefits of energy-efficient equipment (including increased comfort and lower equipment maintenance costs) increased by statistically significant margins since 2001.
  - Customer requests for Energy Star® rated high-efficiency heating and cooling equipment as priced options have increased dramatically since the Phase 1 evaluation: builders representing 39 percent of the new construction market in Vermont indicated that customers request the equipment as compared with only 8 percent in 2001.
  - Builder perceptions of the importance of energy efficiency to the success of their businesses have increased, another likely demonstration of the program's success in transforming the new construction market.

Overview of Data

Data presented in this section are from the 2005 and 2002 surveys of builders as well as a number of secondary sources. This section provides a brief overview of the data.

Homebuilder Surveys. Using a stratified sampling approach based on establishment size and market area, KEMA conducted surveys of homebuilders in Vermont in 2002 and again in 2005. Results were analyzed using population weights or a ratio estimation procedure that yields estimates of market share in terms of total units built (as opposed to the percentage of builders adopting the practice), depending upon the appropriateness of each procedure for each survey question. Results from the 2005 survey are compared with those from the 2002 study, where appropriate, to show trends in new construction practices and energy efficiency program influence over time.

KITT Database. KEMA made extensive use of data contained in the program tracking system and of reports prepared from those data by EVT.

Secondary Sources. In addition to data from the builder surveys, we relied upon numerous other sources of data to provide an accurate snapshot of home construction activities in the state of Vermont. Most significant among these sources are the following:

- **U.S. Bureau of the Census Building Permit data.** The Residential Construction Branch of the U.S. Bureau of the Census provides data on local building permits collected using a mail survey. This data was analyzed to yield a count of new homes constructed in Vermont in 2004.
- **Vermont Department of Taxes Home Sales Price data.** Properties sold in the State of Vermont are subject to a Property Transfer Tax based on the selling price, which is recorded by the Vermont Department of Taxes. These data were analyzed to yield estimates of selling prices for homes in Vermont. This database does not distinguish between existing and newly-constructed homes.
- **Vermont Housing Finance Agency (VHFA) and the University of Vermont's Center for Rural Studies Housing Affordability data.** Multiple data sources published by VHFA and the Center for Rural studies were used to determine housing affordability in Vermont.
- **Dun & Bradstreet iMarket Database Establishment-Level data.** The iMarket database includes establishment-level data for new construction businesses in Vermont. This database has proven to be reasonably accurate source of data on construction establishments' activities and number of employees.

5.1.3 Program Overview

Objectives and Operations

The objectives of Efficiency Vermont's Residential New Construction program, as stated in the original program plan are to:

- Increase market recognition of superior construction associated with ENERGY STAR qualified homes;

- Increase awareness and compliance with the Vermont Residential Building Efficiency Standard;
- Increase penetration of cost-effective electric and fossil-fuel measures in single family new construction;
- Improve occupant comfort, health and safety;
- Institutionalize Home Energy Ratings, and
- Increase the use of mortgage benefits for energy-efficient homes.

The new construction program pursues these objectives by reaching out to builders and other principals in residential new construction projects and offering technical assistance and financial incentives to incorporate energy-efficient design features and equipment. New construction programs have been operating in Vermont for well over a decade. It was not until 2003, when EVT began providing new construction services in the Washington Electric Coop, that one program served all customers statewide.

The key elements of new construction program operations are as follows.

Marketing. EVT pursues a wide range of strategies to market the program to builders. These practices include mounting an annual conference on energy efficiency and building, placement of articles in trade and popular publications, appearance at home shows, presentation at builders and trade association meetings.

Lead Development and Tracking. Leads are developed through a variety of sources, including requests for electric and gas service, Act 250 postings, outreach events, and builders already active in the new construction program. Once a principal in a new construction project is identified, EVT mails the potential participant an application packet. There are separate packets for consumers, builders, and first-time builders. Once the initial packet is sent, Efficiency Vermont follows up in an attempt to secure project enrollment:

The Enrollment Process. Efficiency Vermont sends a package to identified leads that includes an Enrollment Agreement outlining the participant's responsibilities and an Energy Features Form for information on the construction project. The participant returns the Agreement and Form, and project plans to Efficiency Vermont. Staff review the materials for completeness, enroll the project in the tracking system, forward plans and/or energy features form to EVT, and contact the participant to confirm enrollment or request additional information. EVT then reviews the plan and provides technical assistance.

Project Management, Inspection, and Closeout. When EVT receives the project package, staff contact the participant, review the plan, and develop an initial energy rating. EVT provides technical assistance to ensure that the home as will achieve the needed energy rating level and that the home meets ventilation and lighting criteria. EVT monitors the construction process through follow-up calls to the participant. Once the project is complete

EVT conducts the final inspection. Efficiency Vermont notifies the participant if changes need to be made to qualify for certification and incentives through the new construction program. Once the project qualifies, Efficiency Vermont notifies the participant, computes the rebate amount, and notifies EVT of completion.

To qualify for the Vermont Star Home designation, a house had to achieve a Home Energy Rating of 86, which is equivalent to the U. S. Environmental Protection Agency's 5-star ENERGY STAR home rating. Generally, homes must contain high levels of insulation, efficient heating and hot water equipment, and high-quality air sealing measures to meet this rating. (Homes that score 86 or above in the Home Energy Rating will use approximately 20 percent less energy for heating, cooling, and hot water than those that meet the minimum requirements of Vermont's Residential Building Energy Standard.) In addition, qualifying homes need to contain at least 10 energy efficient lighting fixtures or 30 percent (whichever was lower) and efficient mechanical ventilation systems.

The incentive structure has been substantially revamped in the past few years. Participating builders now receive a $100 incentive for homes that meet the basic thermal requirements needed to qualify for the 86 HERS rating plus low wattage mechanical ventilation, heating equipment that draws combustion air from the exterior, and a minimum of 4 qualified lighting fixtures. Builders also receive incentives of $15 for each surface mounted energy efficient lighting fixture and $25 for recessed cans. EVT will also procure a certificate of compliance for the Residential Building Energy Standard (RBES). Builders may earn an additional $700 in incentives for the installation of at least 10 qualifying lighting fixtures plus 3 ENERGY STAR appliances, which may include central heating, central air conditioning, refrigerators, clothes washers, or dishwashers.

5.2 NEW CONSTRUCTION PROGRAM ACTIVITY AND PARTICIPATION

Findings and recommendations from the first evaluation. The first evaluation, completed in 2003, identified a number of issues that needed to be addressed in order to strengthen the performance of the new construction program. These were as follows.

Conduct outreach to improve builder and customer understanding of the new construction program. The first evaluation found that most builders and customers were confused regarding program benefits and procedures. Some of this confusion may be due to frequent changes in the program name and features between 1999 and 2003. To address this situation, EVT had already begun to undertake a number of programs in 2002, including targeted mail and phone call campaigns to builders statewide, outreach to municipal officials, targeted outreach to builders of manufactured homes, and assignment of business development specialists to identify opportunities in regions outside Chittenden County, which were generally underrepresented by builders and participants. KEMA will explore the effects of these programs through interviews with builders and other principals in new construction projects.

Improve the capability of the program tracking system. At the time of the last evaluation, EVT was in the process of implementing its current program tracking system. Program contractors and EVT had experienced difficulties producing useful reports of program activities, particularly in regard to the progress of projects from one stage to another. It thus appeared that there was a large amount of attrition once initial contacts were made, but little information available to understand such patterns or to manage the process effectively. Also, the final disposition of some projects was difficult to ascertain. Based on review of the current tracking system, we believe these issues have, to a large extent, been addressed successfully. We have made extensive use of information from the tracking system and the Beehive milestone tracking application in compiling the quantitative information discussed below.

In the paragraphs that follow we use analysis of the program database to explore how the program has addressed some of the issues brought up in the last evaluation.

Patterns of Recent Program Activity: Success in Enrollment. One way to assess the operation of the program is to estimate the percentage of new single-family homes permitted each year that reach the various stages of project development. Table 5-1 shows the number of 1-2 family homes permitted each year, per the U. S. Census Survey of Construction Permits, as well as the number of leads qualified and projects enrolled. We focus on the years beginning in 2001, the year the program began to take its current statewide shape. Since many factors can delay project completion for months, if not years, it is not appropriate to compare completions to permits issued in a year. It is more appropriate to look at the change from year to year in the elapsed time required to move projects from lead identification to completion. We examine that in another table.

Table 5-1
Trends in Lead Identification and Enrollment

Characteristic	2003	2002	2001
Permits Issued for 1 & 2 unit homes	2,544	2,599	2,431
Leads Qualified as Eligible	1,553	1,950	1,551
Single Family Participants Enrolled	803	760	699
VESH or VT-Star Homes Completed	317	266	194
Drop Outs (Terminations)	99	260	190
Leads as % of Permits	61%	75%	64%
Enrollments as % of Leads	52%	39%	45%
Enrollments as % of Permits	32%	29%	29%

As Table 5-1 shows, Efficiency Vermont has done a good job of identifying and reaching principals in single-family new construction projects. In the years covered, the program has reached principals of 1,551 to 1,950 projects, which corresponds to 61 to 74 percent of the typical volume of single-family homes permitted each year (around 2,500). This is a very high

proportion compared to other states. Vermont's small size and the long tenure of the Efficiency Vermont staff in their positions contribute to this record. The program also does a good job converting leads to enrollments. This ratio ranged from 39 to 52 percent in the three years covered. Generally speaking, the performance of the program in identifying leads and enrolling customers is good, but has not changed significantly since the program took its current form. Finally, attrition from the program decreased by 63 percent between 2002 and 2003. However, it is too soon to determine whether this is a trend.

Time to Completion. Table 5-2 shows the distribution of completed units by year of enrollment for the units completed in 2001 through 2003. The percentage of units completed in the same year as they enroll increased from 14 to 36 percent. However, the percentage of units completed in the two years prior to completion varied from 60 percent in 2002 to 92 percent in 2001. These results reflect the fact that many factors beyond the control of EVT and, at times, builders affect the completion time for projects enrolled in the program.

Table 5-2
Year of Completion v. Year of Enrollment

Year of Enrollment v. Completion	2003	2002	2001
Enrolled Same Year as Completion	36%	31%	14%
Y – 1	41%	29%	78%
Y – 2	4%	38%	8%
Y – 3	8%	1%	1%
Y – 4	1%	2%	-
Y – 5	10%	-	-
Total	100%	100%	100%
n =	316	238	160

Regional Distribution of Enrollments. The previous evaluation found that the RNC program had had more success in reaching builders and owners in the Northwest region of the state than elsewhere.[1] This was due in part to historical patterns of program activity and the concentration of larger builders and developments in the Northwest. This pattern has continued through 2003. Sixty-eight percent of program enrollments came from the Northwest, versus the 48 percent of total units built, per analysis of state tax records. However, the program has done a better job over the years in reaching builders and owners outside the Northwest. See Table 5-3.

[1] See Table 5-34 on page 5–41 for complete definitions of market areas.

Table 5-3
Enrollments by Region v. Permits Issued

Region	Enrollments				Units Built
	2003	2002	2001	2000	2003
Northwest	68%	71%	74%	79%	48%
Southwest	10%	7%	8%	4%	17%
Northeast	4%	3%	2%	-	14%
Southeast	13%	19%	11%	15%	21%
Unknown	5%	-	6%	1%	

Breadth of Builder Participation. Table 5-4 shows the total number of builders that enrolled projects for each program year and the number of those builders who enrolled projects for the first time. Over the five program years, a total of 179 unique builders enrolled projects in the program. These establishments enrolled units in the program in 308 separate instances. The number of first-time participants and total participants increased steadily over the five years. The total number of unique builders enrolled in the program accounts for 25 percent of all establishments that list single-family new construction as their primary business with Dun & Bradstreet. There are many additional establishments and individuals that build homes in Vermont. Efficiency Vermont's mailing lists include as many as 1,500 builders. These results suggest that a relatively small segment of Vermont builders participate in the program. The ideal measure of strength of participation would be the share of total annual new units built by program participants. Unfortunately, the kind of sampling required to make this estimate could be accommodated in the research plan.

Table 5-4
Total Builders and First-Time Builders Enrolled by Program Year

Program Year	Number of Builders w/ Enrolled Projects	Number of First-Time Participants
1999	37	32
2000	68	47
2001	64	33
2002	64	33
2003	75	34
Total	308	179

Repeat Participation. Much of EVT's approach to market transformation revolves around engaging market actors on the supply side, such as builders and contractors, in multiple projects. In this manner, EVT has an opportunity to demonstrate and reinforce the techniques and business benefits of promoting energy-efficient designs and products. Obtaining repeat participation by

builders is difficult in Vermont due to the highly fragmented nature of the residential construction industry. It is characterized by over 1,000 builders and remodelers, the vast majority of whom build no more than one or two units per year.

Table 5-5 arrays participating builders by the number of units completed by year. The data show that both the number and proportion of builders completing multiple units in a year has increased steadily over time. Further analysis is required to explore the pattern of enrollments and of repeat builder participation across program years.

Table 5-5
Builders Participating in RNC by Number of Units Completed by Year*

Units Enrolled	2003	2002	2001	2000	1999
1	43	37	11	4	1
2-4	19	6	2	1	-
5-9	7	4	-	1	1
10+	4	2	-	1	-

* **Note:** due to conversion of data systems, the numbers for the first few years represented in this table are not likely to be accurate.

Comprehensiveness of measure installations. The degree to which builders incorporate the full range of energy efficiency measures into their projects constitutes another dimension of program effects and market transformation. KEMA analyzed project-level data from RNC to assess trends in the number and types of measures installed in participating homes. We also examined trends in Home Energy Rating scores. It should be kept in mind that the program was substantially redesigned beginning January 2002 to provide incentives only to homes that received Home Energy Rating inspections and qualified for the Vermont Energy Star Homes designation. Prior to that, homes could participate in a non-inspection track and receive rebates for individual measures. Table 5-6 through Table 5-8 summarize the results of these analyses. Table 5-6 shows the distribution of completed RNC projects by number of end-uses addressed through program-supported measures. The number of end uses addressed per project has clearly increased over time. In 2000, the modal number of end-uses addressed was four. In the transition year of 2002, one-third of completed projects addressed six end-uses. In 2003 and the first 20 months of 2004, seventy percent of projects addressed six or seven end-uses.

Table 5-6
Percent of Completed RNC Projects by Number of End-Uses Addressed

Number of End-Uses Treated	Program Year				
	2000	2001	2002	2003	2004
1	9%	10%	3%	1%	1%
2	21%	11%	9%	2%	2%
3	11%	9%	8%	8%	5%
4	41%	40%	20%	6%	8%
5	17%	15%	22%	13%	15%
6	1%	14%	32%	65%	62%
7	-	1%	6%	5%	7%

Table 5-7 displays the percentage of projects with specific end-uses addressed by year. For almost all end-uses, the share of projects in which measures are installed increased steadily over the five program years. The increase in the number of completions with envelope, space heating, and water heating measures reflects the elimination of the Vermont Advantage home track from the program. The increase in completions with laundry and refrigeration measures reflects the integration of procedures to promote ENERGY STAR appliances into the RNC program.

Table 5-7
Percent of Completed RNC Projects by End Uses Treated

End Uses Treated	Program Year				
	2000	2001	2002	2003	2004
Air Conditioning	7%	11%	17%	11%	10%
Cooking/Laundry	-	18%	60%	91%	95%
Hot Water Efficiency (fossil fuels)	68%	76%	83%	84%	80%
Hot Water Efficiency (electricity)	1%	-	-	-	-
Lighting	94%	92%	94%	98%	98%
Light Fixtures	92%	87%	90%	97%	95%
Light Bulbs	8%	14%	34%	58%	77%
Lighting Controls	18%	21%	15%	-	-
Other fuel switch	-	-	1%	-	-
Refrigeration	23%	32%	49%	77%	84%
Envelope Efficiency	67%	76%	83%	84%	80%
Space Heating Efficiency	-	42%	75%	89%	88%
Ventilation	67%	76%	83%	84%	80%

Table 5-8 shows the distribution of completed projects (with inspections) by Home Energy Rating score. The table shows a clear upward trend in the percentage of homes that meet the Vermont Energy Star Homes standard (86.0). In 2004, 92 percent of the homes inspected met that standard, up from 53 percent in 2000. Moreover, 15 percent of the homes completed in 2002 attained a score of 88, up from 1 percent in 2001. Again, these increases clearly reflect the effects of changes in program design. However, they may also reflect some degree of market transformation or learning, as builders become more familiar with the requirements of the program and with the technical aspects of energy-efficient construction. We will explore these issues in the evaluation.

Table 5-8
Distribution of Completed RNC Projects by Home Energy Rating Score

HERS Score	2000	2001	2002	2003	2004
< 82.0	2%	1%	1%	-	1%
82.0 - 85.9	46%	33%	22%	12%	8%
86.0 - 87.9	52%	65%	71%	76%	77%
>= 88.0	1%	1%	6%	11%	15%
Units Completed	322	435	414	349	348

The RNC project has clearly made a lot of progress since the end of the previous evaluation. Perhaps most importantly, the new construction program now operates statewide with a unified approach. This provides the basis from which to develop increasingly effective program marketing and outreach activities. It also contributes to containment of the costs that builders experience in participation. The RNC has also significantly improved the quality of record keeping and was able to provide KEMA with a detailed quantitative picture of its operations going back to the beginning of EVT administration.

5.3 MARKET DESCRIPTION

This section uses a variety of sources to estimate the size and describe the segmentation of the residential new construction market in Vermont. On the demand side, we compile information regarding the number, location, and affordability of homes built in Vermont. On the supply side, we characterize the population of builders and develop information on segmentation by firm size, market area, and range of activities.

5.3.1 Demand Side Overview

Our discussion of new construction market characteristics in Vermont is based primarily on the following two sources:

1. **U.S. Bureau of the Census.** The Residential Construction Branch of the U.S. Bureau of the Census provides data on local building permits. Data is collected through a mail

survey using Form C-404, "Report of Building or Zoning Permits Issued and Local Public Construction." Where reports are not received, data are either obtained from the Survey of Use of Permits (SUP), which collects data on housing starts, or are imputed by the Bureau. For places not in the SUP, imputations are used.[2] Based on the description of the sampling method published by the Census, it is unclear how many places in Vermont are included in the SUP.

2. **Vermont Department of Taxes.** Properties sold in the State of Vermont are subject to a Property Transfer Tax based on the selling price. The Vermont Department of Taxes compiles data on the average selling price of primary residences in Vermont as part of its database of property transfer tax statistics. A database of these transactions is maintained for primary residences in which the seller has full interest in the property within the state of Vermont. This database does not distinguish between existing and newly-constructed homes.

Number of New Homes Built

Table 5-9 shows the Census estimates of new privately-owned housing units constructed for the years 2000 through 2004 by building type based on permit data. There is no discernable annual trend in the number of units constructed during this time period across all building types; however, for single-family homes, the number of new units per year continues to rise, increasing by approximately 22 percent since 2000, and by 11 percent between 2003 and 2004. Single-family homes continue to dominate the proportion of new units constructed across all housing types. In structures with 5 or more units, 33 buildings accounted for the 550 new units in 2004, averaging approximately 17 units per building of this type.

According to 2003 data from the National Association of Home Builders (NAHB)[3], 100 new single-family homes create 250 jobs and $11.6 million in economic activity – wages and income to local businesses – in the year of construction alone. Construction of 100 multi-family units creates 112 jobs and $5.3 million in economic activity in the first year of construction. Increases in home construction volume translate to higher income for homebuilders.

[2] A complete description of imputation procedures is available in the Documentation files for County Level Residential Building Permit Statistics at http://www.census.gov/const/C40/Sample/cntyasc.pdf (Manufacturing and Construction Division, U.S. Census Bureau, Washington, D.C.).

[3] National Association of Home Builders, Economics Group, 2003, as cited in the Vermont Housing Council and the Vermont Housing Awareness Campaign, 2004. "Between a Rock and a Hard Place: Housing and Wages in Vermont," online at http://www.housingawareness.org/publications/housing-wages-2004.pdf .

Table 5-9
Annual Estimates of New Privately Owned Housing Units in Vermont by Building Type, 2000-2004

Year	Building Type				Total Units	% Change from Prev. Year
	Single-Family	Two Units	3-4 Units	5 or More Units		
2000	2,212	68	39	187	2,506	-4%
2001	2,349	82	49	267	2,747	10%
2002	2,451	148	50	423	3,072	12%
2003	2,430	162	79	172	2,843	-7%
2004	2,688	234	99	550	3,571	26%

Source: Residential Construction Branch, U. S. Bureau of the Census. 19,000 Place Data Series, Table 2au. New Privately Owned Housing Units Authorized (Unadjusted Units) for Regions, Divisions, and States. Online at http://www.census.gov/const/www/C40/table2.html#annual .

The Residential Construction Branch of the Census Bureau also gathers annual data on the number of building permits by county within Vermont. As shown in Table 5-10, new units in Chittenden County represent nearly a quarter of all units permitted in the state in 2004; 85 percent of these units are in buildings with 5 or more units. Approximately 36 percent of all new single-family homes permitted in Vermont in 2004 were in Chittenden County. The county with the second highest proportion of new housing units in Vermont in 2004 was Windsor, representing 11 percent of the state total across all housing types but only 4 percent of new single-family homes in the state. In Windham County, which represents only 7 percent of the total new units permitted in 2004, 58 single-family units were permitted in 2004, representing 25 percent of the total new single-family units in the state.

Table 5-10
Estimates of New Privately Owned Housing Units in Vermont by County and Building Type, 2004[4]

County	Building Type				Total Units	% of State Total
	Single-Family	Two Units	3-4 Units	5 or More Units		
Addison	187	-	-	-	187	5%
Bennington	185	34	21	56	296	8%
Caledonia	183	-	3	-	186	5%
Chittenden	397	84	37	336	854	24%
Essex	36	-	-	-	36	1%
Franklin	276	14	6	40	336	9%
Grand Isle	37	-	-	-	37	1%
Lamoille	161	18	-	-	179	5%
Orange	100	-	-	-	100	3%
Orleans	177	2	4	82	265	7%
Rutland	168	2	-	12	182	5%
Washington	259	12	8	-	279	8%
Windham	205	58	3	-	266	7%
Windsor	332	10	17	43	402	11%
Total/Overall	**2,703**	**234**	**99**	**569**	**3,605**	**100%**

Source: Residential Construction Branch, U. S. Bureau of the Census: data file CO2004A.txt. Obtained by personal communication (via email) on June 23, 2005.

When the data in Table 5-10 is compiled by market areas as designated by the study, the northwest region dominates the state in permits issued for new construction in 2004 (Table 5-11). More than half of the state's multi-family homes were constructed in the northwest as well as approximately 42 percent of the state's single-family homes. The northeast region of the state represents the smallest proportion of new construction permits issued in 2004 (14 percent).

[4] Although sources for Table 5-9 and Table 5-10 are the same, the total number of housing units in 2004 differs by 34 between the two tables. The U.S. Bureau of the Census postulates that the reason for this discrepancy may be a result of compiling data for the two different tables at different times (before and after changes or corrections had been made).

Table 5-11
Estimates of New Privately Owned Housing Units in Vermont by Market Area and Building Type, 2004

Market Area	Building Type				Total Units	% of Total
	Single-Family	Two Units	3-4 Units	5 or More Units		
Northwest	1,130	128	51	376	1,685	47%
Northeast	396	2	7	82	487	14%
S. West / S. Central	540	36	21	68	665	18%
Southeast	637	68	20	43	768	21%
Total	2,703	234	99	569	3,605	100%

Source: Residential Construction Branch, U. S. Bureau of the Census: data file CO2004A.txt. Obtained by personal communication (via email) on June 23, 2005.

Trends in New Home Prices

Average Price for Primary Residence. According to the Vermont Housing Council and the Vermont Housing Awareness Campaign, while the median 2004 purchase price of a home in Vermont was $165,000 (up 67 percent from 1996), the median price of a newly constructed home was approximately $294,000.[5] Because there is no non-proprietary source of detailed data on new housing prices readily available at a more granular level, we relied upon data from the Vermont Department of Taxes that do not distinguish between new and existing homes.

Table 5-12 shows annual estimates of average home prices for primary residences in Vermont based on Property Transfer Tax statistics. The data show that housing prices in Vermont have been climbing rapidly after some price fluctuation in the late 1980s through mid-1990s (Figure 5-1); rising housing prices result in increased income for homebuilders. The largest increase in per-unit prices between 2003 and 2004 was for condominiums (12 percent), while single-family home prices increased by approximately 10 percent over the previous year. While single-family homes continue to be the most expensive across housing types, the price gap between single-family homes and condominiums has fallen from more than $34,000 in 2000 to less than $27,000 in 2004.

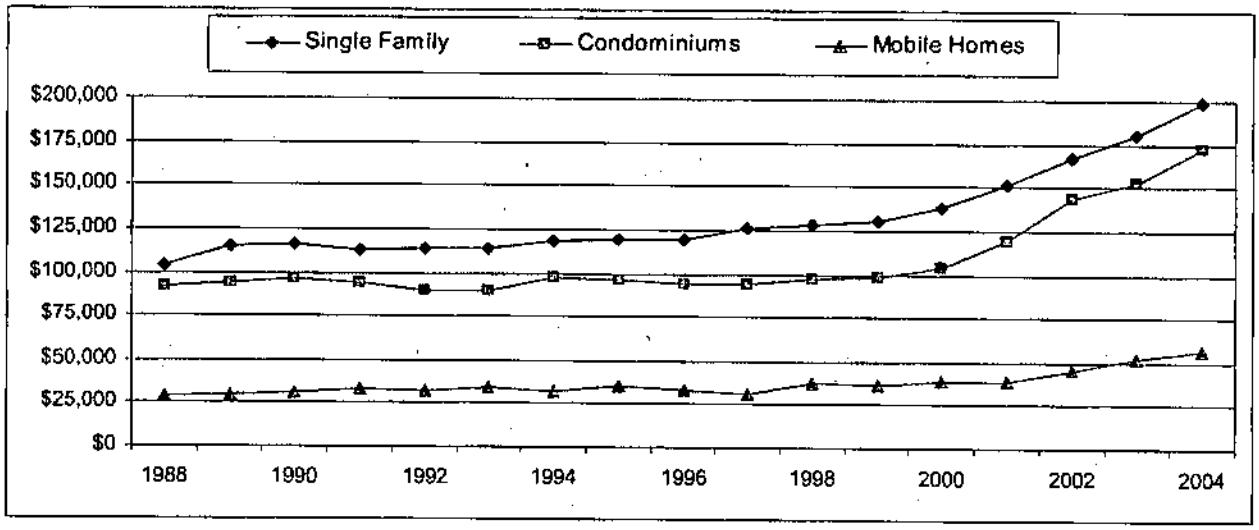
[5] Vermont Housing Facts, http://www.housingawareness.org/facts.htm .

Table 5-12
Annual Estimates of Average Price for Primary Residences (New and Existing) in Vermont by Housing Type, 2000-2004 [6]

Year	Housing Type		
	Single-Family	Condominiums	Mobile Homes
2000	$138,493	$104,194	$38,508
2001	$150,859	$119,686	$38,990
2002	$166,628	$143,208	$45,437
2003	$180,310	$152,896	$52,006
2004	$198,712	$171,914	$56,582

Source: Vermont Department of Taxes, Statistics: Property Transfer Tax, as compiled by the Vermont Housing Finance Agency (VHFA) and the University of Vermont's Center for Rural Studies at Housingdata.org. Online at http://www.houslngdata.org/profile/profileMainResult.php?submitted=stateProfile .

Figure 5-1
Trends in Average Price for Primary Residences (New and Existing) in Vermont by Housing Type, 1988-2004



Source: Vermont Department of Taxes, Statistics: Property Transfer Tax, as compiled by the Vermont Housing Finance Agency (VHFA) and the University of Vermont's Center for Rural Studies at Housingdata.org. Online at http://www.housingdata.org/profile/profileMainResult.php?submitted=stateProfile .

Single-Family Housing Affordability. As shown in Table 5-12, average prices for single-family homes have increased by an average of 9 percent annually since 2000 (8 to 10 percent per year), while median income for a family of four has increased by approximately 8 percent annually in the same timeframe (Table 5-13; 3 to 16 percent per year). According to an online calculator published by the Vermont Housing Finance Agency (VHFA) and the University of

[6] Note: In July 2004, the minimum transaction amount for inclusion of condominiums and single-family homes in the Vermont Department of Taxes Property Transfer Database was set at $30,000.

Vermont's Center for Rural Studies[7], median household income is just high enough to render houses affordable for the average family of four in Vermont, with 2004 income for a family of four only 6 percent higher than required to afford a single-family home at the state average price of $198,712.

Table 5-13
Single-Family Housing Affordability for a Family of Four in Vermont, 2000-2004

Year	Average Price for Single-Family Home (a)	Income Required to Afford an Average-Priced Single-Family Home (with 20% down) (b)	Median Income for a Family of Four (c)
2000	$138,493	$38,487	$43,000
2001	$150,859	$41,924	$45,500
2002	$166,628	$46,306	$46,800
2003	$180,310	$50,108	$55,700
2004	$198,712	$55,222	$58,600

Sources: **(a)** Vermont Department of Taxes, Statistics: Property Transfer Tax, as compiled by the Vermont Housing Finance Agency (VHFA) and the University of Vermont's Center for Rural Studies at Housingdata.org. Online at http://www.housingdata.org/profile/profileMainResult.php?submitted=stateProfile; **(b)** Vermont Housing Finance Agency (VHFA) and the University of Vermont's Center for Rural Studies, "Home mortgage calculator: How much income do you need to afford a house?" Online at http://www.housingdata.org/calculator/priceForm.php; and **(c)** U.S. Department of Housing and Urban Development (HUD)[8], 2005, as compiled by the Vermont Housing Finance Agency (VHFA) and the University of Vermont's Center for Rural Studies at Housingdata.org. Online at http://www.housingdata.org/profile/profileMainResult.php?submitted=stateProfile .

5.3.2 Supply Side Overview

Our discussion of the firmographic characteristics of construction establishments in Vermont is based primarily on the following two sources:

1. **Dun & Bradstreet iMarket Database.** To develop a preliminary profile of the population of Vermont builders, KEMA analyzed establishment data from Dun & Bradstreet contained in the iMarket database. In this and a number of other recent studies, we have found that builder lists developed from Dun & Bradstreet have proven to be generally accurate in terms of reported construction activities and classification by number of employees. [9]
2. **Builder Surveys.** As part of this evaluation, KEMA conducted surveys of 61 establishments that listed residential new construction or remodeling as their primary or

[7] Based on home price, 20% downpayment, 6%mortgage interest rate, 30-year length of mortgage, and other customary monthly housing expenses including taxes and insurance. The additional monthly expenses are added to the monthly mortgage payment, which is annualized and based on the assumption that these housing costs will consume 30 percent of a household's income.

[8] For more information, see www.huduser.org/datasets/il.html.

[9] Due to the intensive use of subcontractors, some builders in the medium category (5 – 24 employees) are likely responsible for large volumes of construction.

secondary SIC. The surveys were designed to yield information on a number of key issues, including business characteristics of the targeted establishments, current construction and marketing practices in regard to energy efficiency, and knowledge of and response to the Vermont Energy Star Homes program. Results from the builder survey are presented in Section 5.3.3.

Number and Distribution of Builders

The iMarket data analysis yielded a count of 1,083 businesses in Vermont that list new construction or remodeling for single- or multi-family as their primary or secondary SICs. Counts of these businesses were obtained by market area and business size category and are shown in Table 5-14. Comparisons between the number of builders by region in the 2002 and 2005 studies are shown in Table 5-15.

Table 5-14
Distribution of Residential Construction and Remodeling Establishments by Size of Business and Market Area, 2004

Market Area	Size of Business			Total Businesses	Percent of Total Businesses
	Small (1-4 emps)	Medium (5-24 emps)	Large (25+ emps)		
Northwest	395	86	10	**491**	45%
Northeast	69	22	-	**91**	8%
S. West /S. Central	200	38	8	**246**	23%
Southeast	208	45	2	**255**	24%
Total Businesses	**872**	**191**	**20**	**1,083**	100%
Percent of Total Businesses	81%	18%	2%	100%	

Source: Dun & Bradstreet's iMarket Database, First Quarter (Jan-Mar), 2005. The D&B Corporation, Short Hills, NJ.

Table 5-15
Distribution of Residential Construction and Remodeling Establishments by Market Area, 2001 and 2004

Market Area	2001		2004	
	N	%	N	%
Northwest	428	47%	491	45%
Northeast	80	9%	91	8%
S. West /S. Central	195	21%	246	23%
Southeast	213	23%	255	24%
Total	**916**	**100%**	**1,083**	**100%**

Sources: Dun & Bradstreet's iMarket Database, First Quarter (Jan-Mar), 2005. The D&B Corporation, Short Hills, NJ; and 2002 study.

Key findings from the analysis of the iMarket data include the following:

- ***Number of establishments.*** The number of establishments increased by 16 percent between 2002 and 2005, potentially due to the increase in construction volume and prices, while the distribution of establishments by market area remained largely unchanged.
- ***Size distribution of establishments.*** These establishments are generally very small: 81 percent of all builders employ fewer than 5 persons (compared with 76 percent in the 2002 study). Overall, builders averaged 7 employees per establishment, with an average of 4 employees for small builders, 15 for medium-sized, and 45 for large builders.
- ***Geographic distribution.*** The geographic distribution of the listed builders by market area mirrors the regional distribution of new home construction, with the majority of businesses and construction activity located in the northwest (see Table 5-11 on page 5–15). This finding implies that home building is very much a local activity in Vermont, a suggestion supported by survey data showing that 68 percent of builders conduct business only within the state of Vermont.

5.3.3 Detailed Builder Characteristics

Detailed builder characteristics were obtained primarily through the builder survey. This section of the report discusses the survey methods and discusses findings related to new construction establishments in Vermont and compares these with findings from the 2002 study. See Section 5-8 for a description of sampling and survey methods.

Sources of Revenue/Involvement in Remodeling. Remodeling accounts for a substantial portion of business revenues among all businesses involved in new construction. Table 5-16 displays information from the builder survey on the portion of sample firms involved in various kinds of construction activities, and the average percentage of total revenue derived from those activities. On average residential remodeling provided 42 percent of total revenues for the sample builders, with a range of approximately 26 percent for large firms up to 47 percent for medium-sized firms.

Twenty-six percent of all builders sampled engage in commercial new construction, 78 percent are involved in residential remodeling, and 23 percent pursue commercial remodeling. The percentage of establishments involved in activities other than residential construction is highest among larger firms. Similarly, larger firms derive a lesser portion of their total revenues (41 percent) from residential new construction than small and medium-sized firms.

Table 5-16
Involvement in and Revenue From Various Construction Activities, 2004 and 2001
(Weighted by Population of Builders)

Construction Practice	Size of Business			All Builders	
	Small (n = 33)	Medium (n =21)	Large (n = 7)	2004 (n = 61)	2001 (n = 54)
Percent of Establishments					
General Contracting: Residential NC	100%	94%	100%	99%	100%
General Contracting: Commercial NC	22%	36%	76%	26%	28%
Residential Remodeling	77%	77%	87%	78%	70%
Commercial Remodeling	21%	32%	47%	23%	32%
Other	2%	-	-	2%	3%
Mean Percent of Total Revenues *					
General Contracting: Residential NC	64%	50%	41%	61%	75%
General Contracting: Commercial NC	11%	9%	24%	11%	3%
Residential Remodeling	40%	47%	26%	42%	17%
Commercial Remodeling	6%	10%	26%	9%	3%
Other	10%	-	-	10%	2%

* 2005 survey did not force the 5 construction practices to add to 100% as in the 2002 study; overall results are thus incomparable.

Extent of construction activity in Vermont. Builders representing approximately 68 percent of the volume of new homes built in 2004 indicated that Vermont is the only state in which they provide their services. As shown in Table 5-17, this distribution has not changed since the 2002 study. Among contractors who build in other states, respondents indicated that 71 percent of their company's total revenues came from the state of Vermont.

Table 5-17
Geographic Distribution of Work Among Builders by State, 2004 and 2001
(Weighted by Volume of New Homes Built)

Location	Percent of Total Market	
	2004 (n = 61)	2001 (n = 54)
Build only in VT	68%	69%
Build in Other States *	32%	31%
NH	62%	45%
NY	37%	55%
MA	46%	30%
ME	4%	<1%
CT / Other	2%	14%

* Respondents allowed to indicate more than one "other" state.

Builders representing 69 percent of the new construction market in the southeast market area reported activity in multiple states, compared with builders representing only 7 to 22 percent of the market share in other areas. Builders representing 20 percent or more of the new construction market reported that their business was concentrated in Windham (24 percent), Washington (22 percent), and Windsor Counties (20 percent). None of the builders' activities were concentrated in Essex County.

5.4 BASELINE CONSTRUCTION PRACTICES

5.4.1 Characteristics of Homes Built

Volume of new construction and market share of size segments. Table 5-18 shows the estimated total number of units built by all Vermont builders by size category, along with the percentage of total units accounted for by establishments in the size category and the average number of units built. Small builders (those with 4 or fewer employees) accounted for the largest share of total units built (73 percent), although each establishment completed, on average, approximately 3 houses per year. Small firms have increased their dominance in the new construction market since 2001; the number of small firms has increased by approximately 60 percent and the number of units constructed by small firms has more than doubled. Upward trends in housing prices have likely made homebuilding a more attractive business.

Medium sized firms accounted for 24 percent of total construction, and the 7 largest firms in the state accounted for an estimated 87 units, or 2 percent of total units constructed. Clearly, residential new construction activity in Vermont is highly fragmented, especially when one takes into account the 15 to 20 percent of homes that are owner-built.

Table 5-18
Volume of New Construction and Market Share by Size Segment, 2004 and 2001[10]
(Weighted by Population of Builders)

Characteristic	Size of Business		
	Small (n = 33)	Medium (n =21)	Large (n = 7)
Number of Establishments in Population			
2004 (n = 61)	872	191	20
2001 (n = 54)	544	125	12
Estimated Total Units Built			
2004	2,780	917	87
2001	1,301	1,076	229
Share of Total Units			
2004	73%	24%	2%
2001	50%	41%	9%
Average Units Built per Establishment[1]			
2004	3.2	9.2	18.6
2001	2.3	8.6	19.1

[1] Unweighted

Home Characteristics. Each survey respondent was asked to indicate the number of housing units they built in 2004 by type of housing and other characteristics. These responses were averaged to yield information about the volume of new construction in 2004; Table 5-19 shows the results of this analysis. Small builders were more active in the multi-family market than large builders, while medium-sized builders were most active in the single-family market. The majority of homes built by all builders were custom homes built for year-round occupancy.

[10] Readers will notice that the total number of units built estimated from the builder surveys exceeds the number of permits isused: 3,784 v. 3,036. We believe much of this discrepancy is due to the effects of the sampling and weighting system used for the builder survey. In order to get information about building practices for a significant number of units, we needed to oversample large builders, and to interview relatively few small builders. In this round of the survey, we randomly interviewed a number of small builders who had built a relatively large number of units in the past year. See the comparison of 3.2 units v. 2.3 units built in Table 5-18. However, because these few sample builders represent such a large population, the impact of their response on the estimate is enormous: 2,708 homes built in 2004 by small builders v. 1,301 in 2001.

Table 5-19
Mean Number of New Housing Units Per Builder
by Size of Business and Housing Type/Characteristic, 2004 *
(Weighted by Volume of New Homes Built)

Housing Type/Characteristic	Size of Business			All Builders
	Small (n = 33)	Medium (n =21)	Large (n = 7)	2004 (n = 61)
Single-Family Homes	4	23	5	8
Two-Family Homes	< 1	< 1	3	< 1
Three-Four Family Homes	1	3	<1	1
Homes with 5 or More Units	5	<1	<1	4
Production Homes	1	<1	<1	1
Built for Year-Round Occupancy	4	25	3	9
Custom-Built Homes	4	25	5	9

* Phase 1 results not included: 2001 survey asked for proportion of total business represented by each housing type rather than the number of units.

Sales Prices. The sample builders were asked to indicate price ranges for the custom and production homes they built in Vermont and sold in 2004. Builders representing 44 percent of the new construction market indicated that the typical selling price for custom-built units was between $300,000 and $400,000. For production homes, builders representing a similar proportion of the new construction market (45 percent) reported the $200,000 to $300,000 range as the typical selling for production homes, with a similar proportion selling for less than $200,000 (41 percent). Further detail is reported in Table 5-20. These results are consistent with data from the Vermont Housing Council discussed above; one-quarter of the new homes built in 2004 sold for more than $400,000.

Table 5-20
Typical Selling Price Range for Custom and Production Homes, 2004 *

Price Range	Custom Homes (n = 59)	Production Homes (n = 3)
Less Than $200,000	5%	41%
$200,000 - $300,000	26%	45%
$300,000 - $400,000	44%	-
$400,000 - $500,000	8%	14%
More than $500,000	17%	-
Total\Overall	100%	100%

* Phase 1 results not included: 2001 survey asked mean price for custom and production homes rather than percentage within price range.

5.5 ENERGY EFFICIENCY IN MARKETING AND CONSTRUCTION PRACTICES

This section of the report characterizes builders' construction and marketing practices regarding energy efficiency in new homes, their recognition and understanding the Vermont Energy Star® Homes Program, and the program effects perceived by builders. Data to support this analysis comes primarily from the builder surveys (n = 61) as compared (where possible) with data from the Phase 1 evaluation (2002; n = 54).

5.5.1 Energy efficiency in the home sales and planning process

Sample builders were asked whether they discussed the benefits of energy efficiency with buyers in the course developing plans for a new home. They were also asked to name the benefits of energy efficiency that they identified to customers. The most striking change between 2002 and 2005 is that builders representing a large proportion of 2004 market share indicated that they emphasize comfort and reduced maintenance costs with homeowners (see Table 5-21 for details). Additional findings include:

- Builders representing approximately 99 percent of the 2004 new construction volume in Vermont indicated that they discuss energy efficiency considerations in all, most, or some cases when developing plans for custom-built homes (as compared with 91 percent in the 2002 study).
- Among builders who discuss energy-efficiency considerations with their customers, builders accounting for 92 percent of new construction volume indicated that they discuss reduced energy costs with homebuyers (no change from the 2002 study), and more than 60 percent mentioned the additional benefits of greater comfort and lower maintenance costs, both statistically significant increases since the 2002 study.
- The only benefits discussed by builders representing a larger segment of the overall market share in the 2002 study than in the 2005 study were environmental benefits.

Table 5-21
Energy-Efficiency Benefits Discussed with Homeowners
When Developing Plans for New Homes, 2004 and 2001
(Weighted by Volume of New Homes Built)

Frequency	All Builders	
	2004 (n =59)	2001 (n = 33)
Reduced energy costs	92%	91%
Greater comfort *	65%	24%
Lower maintenance costs *	60%	12%
Environmental benefits	20%	27%
Higher resale value	19%	21%
Longer component life	10%	9%

* Statistically significant change between 2001 and 2004 at 95% CI.

5.5.2 *Energy-Efficient Features*

Inclusion of Features. Builders in the sample were asked to indicate whether they include specific energy-efficient features in all, most, some, or none of the homes they built in 2004. Table 5-22 shows the proportion of market share represented by builders who indicated that the features were included in "all" of the homes they built in 2004. Key findings include:

- Although large and medium-sized establishments were more likely to include some energy-efficient features than smaller firms, this was inconsistent; in general, there was little variation by business size.
- Marked variation among builders was apparent at the market area level: the largest proportion of homes constructed in 2004 that included many of these features were in the northwest region.

Table 5-22
Inclusion of Energy-Efficient Features in
All New Homes Built by Market Area, 2004
(Weighted by Volume of New Homes Built)

Feature	Market Area			
	NE (n = 5)	NW (n = 21)	SE (n = 15)	SW (n = 12)
Shell Features				
Low-e windows	100%	98%	74%	100%
Basement insulation above R-10	33%	84%	66%	48%
Wall insulation above R-19	61%	64%	75%	45%
Attic insulation above R-38	100%	72%	43%	39%
Reduced air infiltration measured w/blower door test	22%	53%	50%	6%
Argon-filled windows	100%	45%	25%	47%
Floor insulation greater than R-10	33%	58%	30%	18%
HVAC				
Energy Star high-efficiency heating equipment	50%	95%	62%	30%
Programmable thermostats	42%	85%	35%	32%
Energy Star high-efficiency cooling equipment	< 1%	46%	1%	17%
Advanced controls (timers and sensors)	32%	10%	43%	9%
Energy-efficient ventilation systems	32%	78%	50%	16%
Duct sealing and leakage testing	< 1%	44%	28%	3%
Lighting and Appliances				
Energy Star® high-efficiency appliances	56%	67%	38%	9%
Energy Star® hardwired CFL fixtures	25%	57%	22%	64%

Changes since 2002. While builders in the 2005 study were asked to indicate whether they include specific energy-efficient features in all, most, some, or none of the homes they built in

2004, builders in the 2002 study were asked to indicate whether the features were standard on all homes, offered as options to customers, or generally not offered. Table 5-23 compares the 2005 respondents who indicated they included the feature in **"all" or "most"** homes with the 2002 respondents who indicated that the feature was standard.[11] Key findings include:

- Builders representing 94 percent of the 2004 new construction market indicated that they include low-e windows in all or most of the new homes they build, followed by basement insulation above R-10 (86 percent) and Energy Star® rated high-efficiency heating equipment (82 percent).
- Energy Star® high-efficiency appliances are the feature for which the largest increase in market share occurred between 2001 and 2004, increasing from 31 percent to 78 percent (a statistically significant change). Energy Star® hardwired compact fluorescent lighting fixtures increased from 20 to 53 percent, also statistically significant. This change seems clearly related to EVT's efforts with both the lighting/appliance bonus within the new construction program and the retail promotion of these products.
- Argon-filled windows exhibited the largest decline in market share, from 76 to 51 percent.

Table 5-23
Inclusion of Energy-Efficient Features in
All or Most New Homes Built by Market Area, 2004 and 2001 *
(Weighted by Volume of New Homes Built)

Feature	All Builders	
	2004 (n = 61)	2001 (n = 54)
Shell Features		
Low-e windows	90%	94%
Basement insulation above R-10	86%	72%
Wall insulation above R-19	75%	56%
Attic insulation above R-38	59%	55%
Reduced air infiltration measured w/blower door test	49%	21%
Argon-filled windows	51%	76%
Floor insulation greater than R-10	42%	31%
HVAC		
Energy Star high-efficiency heating equipment	82%	*65%*[1]
Programmable thermostats	74%	*51%*[2]
Energy Star high-efficiency cooling equipment	23%	*65%*[1]
Advanced controls (timers and sensors)	29%	*51%*[2]
Energy-efficient ventilation systems	65%	–[3]
Duct sealing and leakage testing	31%	47%
Lighting and Appliances		
Energy Star® high-efficiency appliances †	78%	31%
Energy Star® hardwired CFL fixtures †	53%	20%

* 2005 data represents market share of builders who indicated inclusion of feature in "all" homes, while 2002 data represents market share of builders who indicated inclusion of features was "standard" practice.
[1] Energy Star® heating and cooling systems were combined in the 2002 study.
[2] Thermostats and other controls were combined in the 2002 study.
[3] Energy-efficient ventilation systems were not included in the 2002 study.
† Statistically significant change between 2001 and 2004 at 95% CI.

5.5.3 Energy-Efficient Options

Sample builders were asked to indicate whether they offer any energy-efficiency features as priced options for customers in new homes rather than as standard features. Builders who responded in the affirmative were asked to describe the features most often requested by customers as well as any objections to energy-efficient features that customers typically raise.

Priced Options. Overall, builders representing nearly three-quarters of the new construction market share in Vermont (72 percent) indicated that they offer energy-efficient features as priced options in new homes. Builders representing 79 percent of the market share for small firms indicated that they offer priced energy-efficiency options, compared with builders representing

56 percent of the market in both the medium and large business size categories. Regionally, builders representing the majority of market share in the northwest (91 percent) and southwest (88 percent) indicated they offer priced energy-efficiency options to their customers as compared with lower proportions in the northeast (52 percent) and southeast (46 percent).

Table 5-24
Energy-Efficient Features Most Frequently Requested As Priced Options by CustomersIn New Homes, 2004
(Weighted by Volume of New Homes Built)

Feature	All Builders 2004 (n =61)
Shell Features	
Wall insulation above R-19	7%
Attic insulation above R-38	6%
Low-e windows	5%
Argon-filled windows	1%
Basement insulation above R-10	1%
Floor insulation greater than R-10	< 1%
Reduced air infiltration measured w/blower door test	-
HVAC	
Energy Star high-efficiency heating and cooling equipment	39%
Duct sealing and leakage testing	1%
Programmable thermostats	-
Advanced controls (timers and sensors)	-
Lighting and Appliances	
Energy Star® high-efficiency appliances	11%
Energy Star® hardwired CFL fixtures	-
Offer No Priced Options to Customers	28%

Builders representing 39 percent of the new construction market in Vermont indicated that customers request Energy Star® rated high-efficiency heating and cooling equipment as priced options, compared with only 8 percent in 2001, a statistically significant increase.[12] Builders report that customers request other types of energy-efficient equipment to a far lesser extent, which may reflect effective marketing of Energy Star® rated high-efficiency HVAC equipment in Vermont (Table 5-24). Other noteworthy findings include:

- Builders representing only 3 percent of the market share for large firms indicated that customers request Energy Star® rated high-efficiency heating and cooling equipment as a priced option, compared with 39 percent of medium and 40 percent of small builders.

[12] Statistically significant difference between 2001 and 2004 results at 95% CI.

- Builders representing 31 percent of the market share for large businesses indicated that customers most frequently request basement insulation greater than R10 as a priced option, compared with builders representing less than 1 percent of the market share in other business size categories.
- Regionally, builders in the northeast who indicated that customers most frequently request attic insulation greater than R38 as a priced option represented a higher market share than in any other region (32 percent as compared with 12 percent or less in other market areas).

Customer Objections to Efficient Equipment. Builders representing approximately 28 percent of the 2004 new construction volume indicated that they offer no priced options to their customers. Builders representing 59 percent of Vermont's new construction market share indicated that customers object to the initial cost of the feature when offered as priced options (Table 5-25). Builders representing approximately 38 percent of Vermont's new construction volume in 2004 indicated that customers' objections relate to uncertainty about equipment performance.

Table 5-25
Builder Observations of Customer Objections to Efficient Equipment Offered as Priced Options by Size of Business, 2004 and 2001*
(Weighted by Volume of New Homes Built)

	Size of Business			All Builders	
Feature	Small (n = 33)	Medium (n =21)	Large (n = 7)	2004 (n = 61)	2001 (n =33)
No priced options offered	21%	45%	51%	28%	32%
Equipment cost	62%	52%	49%	59%	36%
Uncertainty about equipment performance	51%	2%	< 1%	38%	†
Equipment quality	11%	< 1%	49%	9%	†
Equipment manufacturer	9%	< 1%	< 1%	7%	†
Other Reason	1%	2%	< 1%	1%	†

* Builders allowed to indicate more than one customer "objection"; total may be greater than 100 percent.
† 2001 responses not comparable (question phrasing was different in 2002 study).

5.5.4 Energy Efficiency as a Business Proposition

Builders were asked to rate the importance of marketing and delivering energy efficient homes to the overall success of their business. Table 5-26 shows their responses. Builders representing approximately half of the 2004 new home volume in Vermont gave a rating of 5 ("Very Important") and builders representing an additional 36 percent gave a rating of 4. While data from the 2002 study is not directly comparable because the question was asked only of builders who were aware of at least one energy efficiency program, the 2002 data should logically show that builders indicated higher importance for energy efficiency as a result of this awareness; the

data, however, show the opposite. Builders representing approximately 85 percent of the new construction market in 2004 indicated that energy efficient homes are at least somewhat important to the success of their businesses, compared with only 70 percent in 2001: this may reflect some measure of program success in increasing builders' recognition of the importance of energy efficiency in new construction.

Table 5-26
Importance of Energy Efficient Homes to Builders' Business Success
by Size of Business, 2004 *
(Weighted by Volume of New Homes Built)

	Size of Business			All Builders	
Importance	Small (n = 33)	Medium (n =21)	Large (n = 7)	2004 (n = 61)	2001 (n =)
1 – Not at all important	1%	37%	<1%	10%	24%
2 – Somewhat unimportant	< 1%	1%	2%	< 1%	1%
3 – Neither important nor unimportant	5%	2%	<1%	5%	5%
4 – Somewhat important	32%	43%	90%	36%	40%
5 – Very important	61%	17%	80%	49%	30%

* Note: results not comparable to 2002 study, as this question was asked only of builders who reported awareness of at least one energy efficiency program in Vermont in 2001.

5.6 AWARENESS OF ENERGY RATINGS AND STANDARDS

Residential Building Energy Standards (RBES). Approximately 69 percent of newly-constructed homes in Vermont in 2004 were built by builders who indicated that they were aware of the RBES, compared with 85 percent in 2001. Of the builders who reported they were aware of the RBES, those who reported posting certificates of compliance (as required by the RBES) represented only 23 percent of new construction volume in the state (compared with 37 percent in 2001). Despite relatively high awareness of the standard, compliance continues to be low priority for builders in Vermont.

Builders who indicated awareness of the RBES were asked to identify, without prompting, home features that were required by the RBES. Table 5-27 shows the percentage of new construction volume represented by builders who were able to name particular features necessary for compliance, by feature and size of business. Builders representing less than 70 percent of new homes built in 2004 were familiar with attic and wall insulation levels required to meet RBES standards, compared with more than three-quarters in 2001. We should note that builders who use VESH to check compliance or who use software packages may be unaware of individual building components considered in assessing compliance.

Table 5-27
Unaided Recall of Features Necessary for RBES Compliance
by Size of Business and Feature, 2004 and 2001
(Weighted by Volume of New Homes Built)

Feature	Size of Business			All Builders	
	Small (n = 24)	Medium (n =17)	Large (n = 7)	2004 (n = 48)	2001 (n = 27)
Low-e windows	68%	86%	69%	72%	40%
Attic insulation at least R-38	78%	36%	69%	69%	77%
Wall insulation at least R-19	76%	40%	69%	68%	77%
Basement insulation at least R-10	68%	25%	69%	59%	44%
Floor insulation at least R-10	65%	16%	62%	55%	35%
High efficiency heating and cooling equipment	45%	83%	85%	55%	28%
Mechanical ventilation systems	40%	21%	64%	36%	-
Duct sealing and leakage testing	34%	2%	< 1%	26%	-
Reduced air infiltration	13%	65%	34%	24%	24%
Other	13%	< 1%	< 1%	10%	-

Home Energy Ratings. Builders representing one-third of the new homes built in Vermont during 2004 indicated that they purchase home energy ratings from third party agencies for any of the homes they build, up from 25 percent in 2001. The most frequently cited reason for not including the ratings is that customers did not request the service. Builders representing approximately 31 percent of 2004 new construction volume indicated that they recommend that their customers obtain home energy ratings, up from 23 percent in 2001. While changes between the 2002 and 2005 studies are significant, they suggest that despite the expense, a fairly sizeable proportion of builders continue to purchase and/or recommend Home Energy Ratings to their customers. We should note that the VESH program staff believe that the respondents significantly overreported their purchase of Home Energy Ratings.

5.7 VERMONT ENERGY STAR HOMES PROGRAM

5.7.1 Reported Program Awareness and Participation

Builders representing approximately 92 percent of the state's new construction in 2004 indicated awareness of the Vermont Energy Star Homes program, showing no change since 2001; the program continues to retain a high level of awareness among builders (Table 5-28). However, of builders who reported awareness of the program, builders representing a larger proportion of market share in 2004 reported participating in the program than in 2001 (43 and 24 percent, respectively). Reported participation in 2004 was lowest among large builders.

Table 5-28
Builder Recognition of and Participation in Vermont [Energy] Star Homes Program by Size of Business, 2004 and 2001[13]
(Weighted by Volume of New Homes Built)

	Size of Business			All Builders	
Characteristic	Small	Medium	Large	2004	2001 (n = 54)
Awareness	89%	99%	100%	92%	95%
Participation (of those aware)	41%	52%	31%	43%	24%

Table 5-29 presents the same data as Table 5-28 broken out by region rather than size. Awareness of the Vermont Energy Star Homes program was fairly high in all regions; participation, however, was negligible in the northeast and southwest regions of the state. Participation in these regions is a persistent problem; data from 2001 show similarly low levels of participation in the northeast and southwest, indicating that recruitment in these areas requires continued persistence.

Table 5-29
Builder Recognition of and Participation in Vermont [Energy] Star Homes Program by Market Area, 2004 and 2001[14]
(Weighted by Volume of New Homes Built)

	Market Area				All Builders	
Feature	NE	NW	SE	SW	2004	2001 (n = 54)
Awareness	81%	96%	84%	99%	92%	95%
Participation (of those aware)	< 1%	49%	61%	7%	43%	24%

5.7.2 Participating Builder Response to Vermont ENERGY STAR Homes

Builders representing 43 percent of the new construction market share indicated that they had received certification and financial assistance from Vermont Energy Star Homes program for homes they built in 2004. For the purposes of this study, builders who received certification and financial assistance from VESH are considered "participants." It should be noted, however, that this reflects somewhat of a narrow view of the Energy Star Homes program's influence on new construction practices. Non-participants (as defined by this study) may still incorporate energy-efficient components into their new homes as a result of advice from Efficiency Vermont without receiving certification or financial assistance through a formal new construction program. In

[13] Awareness N: Small = 33; Medium = 21; Large = 7; Overall = 61
Participation N: Small = 28; Medium = 20; Large = 7; Overall = 55

[14] Awareness N: NE = 5; NW = 29; SE = 15; SW = 12; Overall = 61
Participation N: NE = 4; NW = 27; SE = 14; SW = 10; Overall = 55

other words, the influence of EVT's new construction programs is likely broader than indicated by the data on formal participation.

The following paragraphs summarize findings from the builder survey about the basic characteristics of participating builders, their motivations for participation, and their experiences with the new construction programs. The 2002 study queried builders on their experiences with the Vermont Star Homes program, and results from questions in the 2005 survey on Energy Star Homes are compared with these results where applicable.

Volume of construction and share through the program. The fourteen sample builders who reported participating in the Vermont Energy Star Homes Program in 2004 completed a total of 95 homes in 2004. They reported receiving program certification for 75 of these homes, or 79 percent of the total number of homes they built. In the 2002 study, the 12 builders in the sample who participated in the Vermont Star Homes program reported receiving certification for approximately 57 percent of the homes they built. Although the sample sizes are small, the increase in the proportion of program-certified homes constructed by participating builders is noteworthy.

Influences on Participation. Builders who reported participation in the Vermont Energy Star Homes program in 2004 were asked to identify the sources through which they had heard of the program and the one source that had the most influence on their participation in the program. Most respondents identified only one source of information. In 2001, one-third of the participating builders indicated that Homebuilders Associations were the most important source of information, while a larger proportion of 2004 participating builders indicated that the Vermont Energy Star Homes program staff were the most important source of information in their decision to participate in the program: in fact, 7 out of 10 of the 2004 respondents indicated that their most influential source of information was direct contact with program staff (Table 5-30). This change reflects markedly improved program outreach since 2001.

Table 5-30
Most Influential Sources of Information on the Vermont [Energy] Star Homes Program Among Participating Builders, 2004 and 2001

Source of Information	Number of Participating Builders	
	2004	2001
Vermont [Energy] Star Homes program staff	5	1
Vermont [Energy] Star Homes direct mail, other materials	3	-
Efficiency Vermont program staff	2	1
Efficiency Vermont direct mail, other materials	1	-
Home Builders Associations	-	4
Owner		2
Efficiency Vermont direct mail, other materials	-	1
Utility	-	1
Other trade or professional organizations	-	1
Potential homebuyers	-	1
Don't Know	3	
Total	14	12

Reasons for Participation. Five of the builders who participated in the program in 2004 reported that their main reason for participating was to get marketing support and extra publicity for their company, demonstrating the effectiveness of program outreach emphasizing market differentiation for participating builders. Three builders reported that their main reason for participation was to learn more about efficient building techniques, and two reported participating because they generally think that environmental issues are important. The remaining four builders each had a different reason for participating: to get rebates, because they could charge more for efficient homes, to help market the houses that get labeled, and as a result of questions on environmental aspects of homes from customers. In 2001, the main driver for participation reported by builders was that principals requested their participation (3 builders), while two builders reported that their main reason for participating was to get the rebates. These changes demonstrate a major program impact on the new construction market.

Knowledge of Required Features. The participant portion of the builder survey contained a question sequence in which respondents were asked to name, unaided, the construction features and equipment required for certification as a Vermont Energy Star home. For each feature they mentioned, we also asked whether the respondent been aware of the feature prior to participating in the program.

Table 5-31 shows the results of this sequence for ten key technical requirements of Vermont Star Homes. The 2004 sample program participants mentioned efficient heating equipment most frequently of all required program features (11 of 14); in 2001, 9 of 12 builders recalled efficient

heating and cooling equipment as a requirement.[15] Of those that mentioned high-efficiency heating equipment, 9 claimed to have been aware of the measure prior to participating.

All of the sample participants were able to name at least two construction feature required by the program, while in 2001, all builders could name at least one. More than half of the builders surveyed in 2004 named at least 4 features; these changes demonstrate increased familiarity with the program among builders in the 2005 study as compared with those in the 2002 study, likely a result of effective program outreach.

Awareness. In 2001, seven of the twelve HVAC contractors reported that they were aware of the Vermont Energy Star Program, with only one claiming to be even somewhat familiar with the provisions of the program. In 2004, a higher proportion of HVAC contractors (eight of nine) said they were aware of Vermont Energy Star Homes (VESH) Program, however, only two of these respondents could name one element of the program each.

Table 5-31
Participant Builder Awareness and Adoption of Program Features, 2004 and 2001

Vermont [Energy] Star Homes Program Requirement	Unprompted Awareness		Awareness Prior to Program Participation	
	2004 (n = 14)	2001 (n = 12)	2004 (n = 14)	2001 (n = 12)
Efficient heating equipment[1]	11	9	11	8
Efficient ventilation	10	3	8	3
Efficient light fixtures	9	5	9	3
Efficient cooling equipment[1]	9	9	8	8
High levels of insulation	9	6	7	6
Efficient water heating equipment	5	*	5	*
Energy Star 5-star rating	5	*	5	*
Air sealing	3	6	3	4
Home Energy Rating of 86 or higher	2	*	2	*

[1] Efficient heating and cooling systems were combined in the 2002 study.
* Feature not included in 2002 study.

Marketing and Selling Vermont Energy Star Homes. Builders were asked a series of questions regarding the program's impact on marketing and sales. Key findings from the results of these questions are as follows:

- ***Effects of program requirements on construction costs.*** Of the fourteen participating builders interviewed, 9 indicated that installing features required to gain certification

[15] Note: in the Phase 1 evaluation, efficient heating and cooling equipment were not broken out into separate features as in the 2005 study.

from the program resulted in added construction costs compared to homes without those features (two were not sure). Four of these builders were able to estimate the added construction costs; these costs averaged $6,375 (median = $2,500) and ranged from $500 to $20,000. The 2004 mean and range are similar to those in the 2002 study (mean: $6,766; range: $1,000 to $20,000). We note that builders may have a difficult time estimating added construction costs because these costs depend largely on general home characteristics, particularly size; for example larger homes would generally incur higher additional construction costs to include certain features necessary for certification than would a smaller home. The information above should be treated with some caution given the small number of builders who responded to the question.

- ***Effects of new construction program certification on salability.*** Five of the fourteen builders interviewed reported that they were able to sell certified homes more easily than uncertified homes built during the same period, while 4 were not sure whether it was more or less easy to sell certified homes. In 2001, 8 of the participating 12 builders reported that they were able to sell certified homes more easily.
- ***Effects of program certification on sales prices.*** Seven of the 14 participating builders interviewed reported that they were able to obtain a higher selling price for homes certified through the program (2 were not sure). Only 4 builders were to indicate the average increase in selling price for certified homes, likely because the price increase may depend on the general desirability of the home (size, location, etc) more than efficient construction or features. The four estimates of incremental home prices that respondents offered ranged from $1,000 to $40,000 with an average of $17,750.

5.7.3 Nonparticipating Builder Response to Vermont ENERGY STAR Homes

Familiarity with Program. Forty-one of the builders who indicated that they'd heard of the Vermont Star Homes program answered a series of questions about the construction and equipment features required for the program. Of these, builders representing approximately 19 percent of the 2004 new construction volume outside the program were unable to list any features required for homes to be certified through the program compared with 17 percent in 2001. Among the builders who were able to name at least one required feature, builders representing 70 percent of the non-participant new construction volume mentioned efficient light fixtures in 2004, a statistically significant increase over the proportion who recalled this feature in 2001 (Table 5-23).

Table 5-32
Unaided Recall of Features Required for Vermont [Energy] Star Homes Program Among Non-Participating Builders by Size of Business, 2004 and 2001 (Weighted by Non-participant Volume of New Homes Built)

Vermont [Energy] Star Homes Program Requirement	Percent of Nonparticipating Builders	
	2004 (n = 41)	2001 (n = 42)
Efficient heating equipment[1]	36%	27%
Efficient ventilation	40%	*
Efficient light fixtures †	70%	30%
Efficient cooling equipment[1]	31%	27%
High levels of insulation	45%	42%
Efficient water heating equipment	30%	*
Energy Star 5-star rating	17%	*
Air sealing	3%	40%
Home Energy Rating of 86 or higher	18%	*

[1] Efficient heating and cooling systems were combined in the 2002 study.
† Statistically significant difference between 2001 and 2004 at 95% CI.
* Feature not included in 2002 study.

Familiarity with Services and Marketing Support. Non-participating builders representing approximately 45 percent of new construction volume outside the program indicated that they were familiar with the services and marketing support offered by the Vermont Star Homes Program compared with 74 percent of builders in the 2002 study who reported awareness of the services offered by the Vermont Star Homes program; because of the small sample sizes, however, this change is not statistically significant. More than half of the nonparticipating builders were unable to name any of these services, but the remaining were able to recall at least one, including builder certification, marketing support, technical assistance, and assistance with code compliance.

Value of Services. Builders who indicated that they were aware of the Vermont Star Homes Program but did not participate in the program were read a list of services offered to builders by the Program. These services included the following:

- Review of plans to identify energy saving opportunities;
- Training in energy efficient construction practices;
- Technical assistance during construction;
- Free home energy rating;
- Financial incentives for meeting thermal requirements and for selected equipment; and
- Marketing assistance, including advertising and payment for certain marketing materials.

Builders were then asked to indicate whether or not they felt the services would be useful in marketing the homes they built:

- Builders representing two-thirds (67 percent) of the 2004 new construction volume indicated that they felt such services would be useful, compared with builders representing only 36 percent of the market share in 2001.
- Of the builders who felt the services would be useful, those representing 65 percent of the new construction volume indicated that review of plans to identifying energy saving opportunities would among the most useful services offered.

Builders who represented one-third (33 percent) of the state's non-program new construction volume thought the program would *not* be useful because they were not responsible for marketing the homes they build:

- Builders representing approximately 11 percent of non-program new construction volume stated that the program involves too much paperwork and is thus not beneficial.
- In the 2002 study, builders representing 18 percent of the non-participant new construction volume indicated that the program would not be beneficial to them because other entities (such as architects) market their homes.

Reasons for Nonparticipation. Builders representing approximately 22 percent of the state's non-program new construction volume indicated that their primary reason for non-participation was that they had no trouble selling their homes without the Program's assistance; builders representing 28 percent of non-program market share in the 2002 study cited the same reason. Other reasons mentioned include the following:

- The belief that customers have no interest in energy efficiency;
- No time to become informed about the program;
- No time to learn about the construction techniques required by the program; and
- General dislike of the organized programs.

5.8 BUILDER SURVEY METHODS

As part of this evaluation, KEMA conducted surveys of 61 establishments in the residential new construction and remodeling industry in Vermont. Businesses listed in the iMarket database must designate primary and secondary SICs; because of the relatively low overall number of records where the primary SIC is specifically "New Construction, Single-Family House," the definition of builders for the initial frame was expanded to include all records where the primary or secondary SIC is new construction or remodeling for single- or multi-family homes (see Table 5-33).

Table 5-33
SICs Included in the Builder Survey, 2004

8-Digit SIC	SIC Definition
1521-0000	Single-family housing construction
1521-9901	New construction, single-family houses
1521-0100	Single-family home remodeling, additions, and repairs
1521-0101	General remodeling, single-family houses
1521-0102	Mobile home repair, on site
1521-0103	Patio and deck construction and repair
1521-0104	Repairing fire damage, single-family houses
1521-9902	Prefabricated single-family house erection
1522-0000	Residential construction, nec
1522-0100	Hotel/motel & multi-family home construction
1522-0101	Apartment building construction
1522-0106	Multi-family dwelling construction, nec
1522-0107	Multi-family dwellings, new construction
1522-0200	Hotel/motel & multi-family home renovation &remodeling
1522-0201	Remodeling, multi-family dwellings

The surveys were designed to yield information on a number of key issues, including business characteristics of the targeted establishments, current construction and marketing practices in regard to energy efficiency, and knowledge of and response to the RNC programs. The following paragraphs summarize key methodological aspects of the survey.

Sample Design. KEMA employed a stratified sampling approach. The state was divided into the four market areas shown in Table 5-34. These market areas were established for the 2002 study based on consultation with Vermont realtors, builders, and other market observers to reflect distinctions in market conditions among the market areas. Within these areas, establishments were divided into three size categories based on the number of persons they employed. Estimates of employment from Dun & Bradstreet's iMarket database were used to determine the builders' business size categories, with firms employing 1 to 4 persons designated as "small," firms with 5 to 24 employees designated as "medium," and "large" firms representing those with 25 or more employees. The targeted number of completed surveys was allocated to the six regional/size strata according to the proportion of all employees in all establishments in the sample frame accounted for by each stratum as shown in Table 5-35. The version of the iMarket database used to assemble this data included no "large" firms in the northeast area of the state.

Table 5-34
Vermont Counties by Market Area

Market Area	Counties
Northwest	Chittenden, Franklin, Grand Isle, Lamoille, Washington
Northeast	Caledonia, Essex, Orleans
S. West / S. Central	Addison, Bennington, Rutland
Southeast	Orange, Windham, Windsor

Table 5-35
Targeted Number of Completed Builder Surveys
by Size of Business and Market Area, 2004

	Size of Business			
Market Area	Small (2-4 emps)	Medium (5-24 emps)	Large (25+ emps)	Total Builders
Northwest	14	3	10	27
Northeast	4	1	0	5
S. West / S. Central	5	1	8	14
Southeast	10	2	2	14
Total	**33**	**7**	**20**	**60**

Sample Selection. The total population of builders and remodelers in the SICs shown in Table 5-33 (1,083 establishments) was obtained from the iMarket database. KEMA pulled a simple random sample of 200 establishments from the list and designated these as sample for the remodeler surveys (see Section 6), resulting in a remainder of 883 establishments for the builder surveys.

Interviews Completed. Ultimately, we were able to complete interviews with 61 homebuilders in the size categories specified by the sample design. Table 5-36 shows the allocation of completed surveys among the sample strata defined by region and employment. When sample in the large size category was exhausted within any market area, additional completions were sought in the medium size category within the same market area. The highlighted cells in Table 5-36 show where completed surveys differed from targeted completions.

Table 5-36
Completed Builder Surveys by Size of Business and Market Area, 2004

	Size of Business			
Market Area	Small (2-4 emps)	Medium (5-24 emps)	Large (25+ emps)	Total Builders
Northwest	14	12	3	29

Northeast	4	1	-	5
S. West / S. Central	5	4	3	12
Southeast	10	4	1	15
Total	33	21	7	61

Weighting and Analysis Procedures. Most of the items in the survey were analyzed using a ratio estimation procedure that yields an estimate of "market share" for practices of interest in terms of the portion of units built as opposed to the percentage of builders adopting the practice. Similarly, average values, such as insulation levels, are computed to reflect the population of houses reportedly built by the respondents. Thus, in reporting results, we generally use the formulation "builders representing xx percent of the market" or "builders representing xx percent of all units built."

Weighting and computation of values. Builder survey responses to were weighted to reflect to the number of homes reportedly constructed by the sample builder as well as the population weight of the size stratum from which the firm was drawn. Where the questionnaire sought responses in the form of a number or percentage – say, the portion of homes built with energy efficient features, the survey responses were calculated using the combined ratio estimator $\hat{R}_c$:

$$\hat{R}_c = \frac{\sum_h \frac{N_h}{n_h} \sum_i B_{h_i} x_i}{\sum_h \frac{N_h}{n_h} \sum_i x_i},$$

where

i = sample builder,

N_h = number of builders in the population in sample stratum h,

n_h = number of builders in the sample in stratum h,

B_{h_i} = builder i's response (expressed as a number or percentage), and

x_i = number of new homes builder i built in 2004.

If the question elicited a categorical response (e.g., yes/no), a B_{h_i} was created for each possible response. For the selected response, $B_{h_i} = 1$. For the response/s not selected, $B_{h_i} = 0$.

Precision of estimates. The use of the combined ratio estimator supported the estimate of a standard deviation and standard error for each variable. The standard error for each estimate is shown in a table in the Appendices located directly below the results table on each page. We used the standard errors to calculate appropriate measures of precision for various kinds of

Section 5

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Focus on Energy Releases Multifamily New Construction Best Practices Guide

Project description of a state energy office project dealing with energy efficiency and renewable energy that the State Energy Program (SEP) published in its bimonthly newsletter *Conservation Update*.

October 2006

Multifamily housing developers, architects, engineers, and contractors in Wisconsin have access to a new tool that can help them build comfortable, safe, durable, and energy-efficient apartments and condominiums. *Design & Build for Energy Efficiency: Multifamily New Construction Best Practices Guide* provides technical information and recommendations to help multifamily new construction industry professionals implement cost-effective renewable energy and energy efficiency measures. Focus on Energy's Apartment & Condo Efficiency Services Program developed this desktop reference manual for multifamily new construction industry professionals.

Design & Build promotes the use of integrated design throughout the new construction process and provides specific recommendations for different disciplines, including owners and developers, architects, engineers (civil, structural, HVAC, electrical, and plumbing) and contractors. The recommendations are organized to allow readers to quickly find the information that pertains to their work. Within those sections, icons indicate strategies that may be used to achieve specific goals for efficiency or sustainability, along with potential benefits and associated costs of the strategies. Each section ends with a case study. Rounding out the contents of the new manual are a QuickStart Guide that helps identify key decision and communication points by stages of the design process, and a Resources section.

For more information about Focus on Energy's Apartment & Condo Efficiency Services Program, read the August 2 Focus on Energy press release (MS Word 501 KB).

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Governor Doyle Signs Senate Bill 459, Bipartisan Energy Efficiency and Renewables Legislation

GREEN BAY -- Governor Jim Doyle today signed Senate Bill 459, the Energy Efficiency and Renewables Act, representing a sweeping overhaul of Wisconsin's energy policy, and laying the groundwork for greater energy independence.

"The record home heating costs and gas prices this winter really brought home just how important it is to reduce Wisconsin's dependence on foreign energy sources," Governor Doyle said. "And while the emergency heating assistance I signed into law two weeks ago will help working families this winter – we all recognize that we must also plan for our energy future. Senate Bill 459 lays out that plan, and I am pleased to sign it into law today."

Senate Bill 459 is the result of recommendations made by Governor Doyle's Task Force on Energy Efficiency and Renewables. Governor Doyle tasked this group in 2003 to find commonsense, creative solutions to increase our energy efficiency and use of renewable energy sources to regain Wisconsin's status as a leader in these areas, and spur on economic growth. The 25 member Task Force represented the entire energy community, including utilities, industry, state government, environmental organizations, and rate payer organizations.

"Groups that many times oppose each other on energy policy came together to develop a consensus on these recommendations," Governor Doyle said. "And the result was a bipartisan, balanced policy that not only makes sense for our energy future – it makes sense for our environment and our economy."

The Energy Efficiency and Renewables Act focuses on three areas: increasing the use of renewable energy in Wisconsin, promoting the development of renewable energy technologies, and strengthening the state's energy efficiency programs to maximize their benefit.

Currently Wisconsin imports all of the fossil fuels we use to generate electricity. Senate Bill 459 requires that by 2015, ten percent of the state's electricity be generated from renewable sources. This is enough to supply the needs of 850,000 homes each year, and avoid more than 5.5 million tons of greenhouse gases by 2015.

Additionally, by 2011, the state will leverage its buying power to purchase 20 percent of the energy for the six largest state agencies from renewable sources. The new law also requires the state to update building codes to include higher energy efficiency standards, and create special energy standards for state building projects and purchases.

Senate Bill 459 also encourages the development of energy efficiency and renewable energy technologies, jump-starting new industries and creating jobs here in Wisconsin. The bill requires the state to pursue additional funding for the research and development of agricultural digesters, and it also calls for a pilot program to test the feasibility and cost-effectiveness of burning leftover

corn plants to heat residential space.

Finally, Senate Bill 459 strengthens the state's energy efficiency programs and positions Wisconsin as a national leader in spending on energy efficiency efforts.

The law requires Wisconsin utilities to directly support energy efficiency programs, ensuring that $85 million a year is spent to promote energy efficiency. SB 459 also increases funding to local governments for energy efficiency projects, which will also provide relief to property taxpayers.

"This bill takes an important step forward in moving us toward energy independence by encouraging the use of the energy resources we have right here in Wisconsin," Governor Doyle said. "This will keep more of our energy dollars in our local economies instead of purchasing fuels from outside the state. And investing in new renewable energy technologies will create more good jobs right here in Wisconsin."

Governor Doyle thanked everyone involved in getting this legislation to his desk.

"I want to thank my task force on Energy Efficiency and Renewables for their work to develop a package of common-sense recommendations. However, without the commitment of the legislators that are with us today, these recommendations would have been only that – recommendations. I want to thank Senators Rob Cowles and Dave Hansen as well as Representatives Phil Montgomery and Tom Nelson worked with me in bipartisan fashion to enact this law."

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U.S. Department of Energy - Energy Efficiency and Renewable Energy
Federal Energy Management Program

Energy-Efficiency Funds and Demand Response Programs, Wisconsin

Updated December 2006

What public-purpose-funded energy efficiency programs are available in my state?

The Reliability 2000 legislation in Wisconsin established a public benefits funding mechanism for energy efficiency, renewable energy, and low-income assistance. The energy efficiency and renewable energy programs are administered by the Division of Energy within the Wisconsin Department of Administration.

These energy efficiency programs, collectively referred to as Focus On Energy, replaced the energy efficiency programs that were previously offered by the state's utilities. Wisconsin has contracted with the Wisconsin Energy Conservation Corporation to administer the energy efficiency programs directed at commercial and industrial customers. Federal customers may be interested in several of these programs:

- The Focus on Energy program provides several types of financial incentives and grants to eligible customers for installing qualified electricity and natural gas efficiency measures. These measures include energy-efficient lighting, HVAC equipment, food service equipment, and specialty equipment such as pre-rinse spray valves and anti-sweat door heaters for refrigeration units, as well as custom projects such as motor and compressed air system upgrades or process improvements. Incentives are also available for maintaining equipment, and grants are available for studying the feasibility of proposed energy efficiency projects.
- Through Focus on Energy's Industrial Program, customers can receive free facility audits, training and technical assistance, and energy management benchmarking assistance.

What utility energy efficiency programs are available to me?

WE Energies (WE) offers three energy efficiency programs to its customers:

- The Prescriptive Incentive Program provides rebates for one-for-one replacements of motors, lighting, and some appliances and small air-conditioning equipment.
- The Custom Incentive Program provides incentive payments for more complex energy conservation projects, and also offers partial funding for energy audits and feasibility studies. All projects and studies must receive pre-approval.
- The Request for Proposal (RFP) Incentive Program allows customers to bid for incentives to conduct comprehensive energy efficiency projects that can provide demand reductions to WE. Proposals that combine multiple energy conservation measures, and ones that employ leading edge technologies are favored. Up to $1 million in incentive money is expected to be available for each of the semi-annual bid cycles.
- The New Construction Services Program provides technical assistance, design incentives, and measure incentives to reduce electric demand and energy use of new construction projects.

What load management options are available to me?

WE Energies (WE) offers three Load Management Incentives programs that pay participants for voluntarily reducing their energy use during price spikes in the wholesale electricity market.

- The Dollars for Power program pays customers based on pre-established bid prices for their load reduction: $0.40, $0.80, or $1.25 per kWh. When market prices dictate, We will make requests for individual participants to curtail. Response to any particular request is voluntary; no penalties are assessed if a participant decides not to provide the full load reduction. To participate, customers must be able to curtail a minimum of 50 kW.
- The Power Market Incentives program allows customers to stipulate, on a day-to-day basis, how much they are willing to curtail for a posted price. When market prices dictate, WE will post an incentive for load curtailments. Interested participants may respond with an offer to provide a certain level of load reduction for that price. If their offer is accepted, they are committed to provide that load reduction for the time period specified. To participate, customers must be able to curtail at least 500 kW.
- The PMI Pool program allows a customer, marketer, or agent to combine smaller sites so that the group can participate in a program with the same features as Power Market Incentives. The pool operator manages the participating sites. A minimum commitment of 500 kW per PMI-Pool contract—100 kW for each account—is required.

Xcel Energy's OperationWise initiative offers two incentive programs for peak demand reductions:

- The Electric Rate Savings program offers financial incentives for peak demand reduction projects at commercial and industrial facilities that can reduce load by 50 kW or more Participating customers receive a $3.08 per kW discount on controllable demand every month, but in exchange must commit to reducing their load to a pre-determined level for up to 150 hours per year.
- Xcel's Savers Switch program provides customers with a discount on their energy bill in exchange for granting the utility the right to remotely curtail their air conditioning units for up to 300 hours per year. Customers receive $3 per kW connected to Saver's Switch for the entire year (January through December).

Wisconsin Public Service Corp. (WPSC) offers the Voluntary Energy Reduction Program. The customer must be able to reduce load by 50 kW or more, and may choose from six price notification thresholds (ranging from $0.10 to $5.00 per kWh). Upon being paged (with at least 30 minutes' notification), the customer chooses whether or not it can reduce by its pre-set amount (which can be modified on a day-ahead basis). If the customer then reduces the load (for between two and seven hours), it is remunerated for the kWh reduced at the pre-determined price level.

WPSC also offers the Large Commercial & Industrial Interruptible Rider, in which customers can contract for a given load reduction (with curtallability up to 300 hours/yr.) subject to WPSC's determination of either economic or emergency conditions on the grid. In exchange, the customer receives reduced rates for its year-round consumption.

Alliant Energy's (Wisconsin Power & Light) Interruptible Programs offer a wide variety of both voluntary economic and mandatory emergency demand response programs. One example is the Experimental Emergency Energy Purchase—One Hour Notice program, in which participants agree to self-generate at least 50 kW of capacity during notified events, and then receive a monthly payment of $0.40/kWh

for actual generation requested and received by the utility. In another program, the Experimental Market-Priced Load Curtailment Rider, Alliant notifies participants with an offer to voluntarily curtail load, indicating the curtailment hours and a price quote or estimate. Two versions of this program are available: Day-Ahead and Day-Of, each with different periods of advance notification and remuneration terms. To participate, customers must be able to curtail at least 500 kW. For a complete listing of load management programs available, visit Alliant's Tariff Web Page.

What distributed energy resource options are available to me?

The Database of State Incentives for Renewable Energy (DSIRE) provides information on programs that offer incentives for renewable distributed generation. The following program may of interest to federal customers:

Wisconsin Focus On Energy offers grants (for training, feasibility studies, business and marketing development, and implementation) as well as cash rewards for installing or expanding renewable energy systems at businesses. Rebates for wind energy, solar hot water and PV (20 kW or less) systems cover 25-35% of project cost, capped at $35,000. Rebates for wood energy systems cover 25% of project cost, capped at $5,000.

Are there energy efficiency programs sponsored by the state government?

For information on energy efficiency programs available to federal customers, please see the section above on public purpose funded energy efficiency programs.

What additional opportunities are available to me?

Federal customers also have energy efficiency opportunities available with utilities (such as Alliant Energy and Wisconsin Gas) that have area-wide contracts with GSA and, by extension, all other federal agencies. Agencies should contact their account executive to determine the level of participation by their local utility.