Iowa Department of Natural Resources

Energy Bank

Profile #73

Executive Summary

The State of Iowa has proven to be an incubator for good ideas and the Iowa Energy Bank is yet another home-grown concept that deserves recognition and that will likely result in replication. The Energy Bank has been spurred on by several factors not the least of which has been the state's 97% dependence on out-of-state energy supplies. Iowa is not only energy poor, but annual energy purchases have drained its economy to the tune of over $4 billion per year.

In 1985 the Iowa legislature mandated its Department of Natural Resources to design and implement major energy efficiency initiatives for traditionally difficult market segments: public and non-profit facilities. The resulting Iowa Building Energy Management Program targets state and local government facilities, public school districts and area education agencies, private universities, hospitals, and other non-profit groups. The goal of the program is to install all cost-effective efficiency improvements in these facilities with an aggregate payback period of six years or less by 1998.

The Iowa Energy Bank is a subset of the Building Energy Management Program and was established to facilitate and finance energy improvements in Iowa's 418 school districts, 128 hospitals, 34 private colleges and 15 community colleges, and 967 local governments. (State facilities are addressed under a parallel program called the State of Iowa Facilities Improvement Corporation.) The Department of Natural Resources determined that a combination of audits and engineering analysis followed by lease financing was the most attractive mechanism for the retrofits, allowing public institutions to avoid issuing bonds or calling public referendums to secure the necessary capital. This form of financing also allows the costs of the payments to be less than or equal to the monthly savings from the improvements, providing a win-win situation in this debt-averse state. Participants can also secure financing from alternative sources and the program has recently been enhanced to take advantage of capital loan notes.

Cumulative enrollment in the Energy Bank to date has been very impressive. Already the program has reached 390 participants or 22% of the eligible customers with 265 school districts providing the largest fraction of the savings. Twenty-one hospitals have also undergone retrofits. Of the total participants, 212 have financed improvements through the Energy Bank engaging $8,927,400 worth of retrofit improvements which have resulted in cumulative savings of nearly 23 GWh and over 105 GWh equivalent of natural gas.

Iowa Energy Bank

Agency:	Iowa Department of Natural Resources, Energy Bureau
Sector:	Institutional
Measures:	Electric and gas efficiency measures including lighting applications, thermal envelope improvements, and HVAC equipment
Mechanism:	Third-party lease financing for improvements to schools, colleges, hospitals, and local government facilities
History:	Available to schools since 1986, hospitals since 1988, colleges since 1989, and local government facilities since 1990

1993 Program Data

Annual electricity savings:	1,609 MWh
Annual natural gas savings:	492 mcf
Lifecycle electricity savings:	22,824 MWh
Lifecycle natural gas savings:	6,974 mcf
Cost:	$2,569,300

Cumulative Data (1988-1993)

Electricity savings:	23,749 MWh
Natural gas savings:	3,478 mcf
Lifecycle electricity savings:	168,427 MWh
Lifecycle natural gas savings:	24,671 mcf
Cost:	$12,203,600

Conventions

For the entire 1993 profile series all dollar values have been adjusted to 1990 U.S. dollar levels unless otherwise specified. Inflation and exchange rates were derived from the U.S. Department of Labor's Consumer Price Index and the U.S. Federal Reserve's foreign exchange rates.

The Results Center uses three conventions for presenting program savings. **Annual savings** refer to the annualized value of increments of energy and capacity installed in a given year, or what might be best described as the first full-year effect of the measures installed in a given year. **Cumulative savings** represent the savings in a given year for all measures installed to date. **Lifecycle savings** are calculated by multiplying the annual savings by the assumed average measure lifetime. **Caution:** cumulative and lifecycle savings are theoretical values that usually represent only the technical measure lifetimes and are not adjusted for attrition unless specifically stated.

Agency Overview

The Iowa Department of Natural Resources (DNR) is a State government agency that was established in 1986. Its mission is to protect, conserve, and develop Iowa's natural resources in cooperation with other public and private organizations and individuals to ensure that the quality of life in Iowa is significantly enhanced by the use, enjoyment, and understanding of those resources. The DNR is responsible for waste management, environmental protection, fish and wildlife use, forest and parks management, and energy and geological resources. Within the DNR, the Energy and Geological Resources Division has responsibility for energy-related issues including efficiency.

The DNR has tailored many of its programs to meet the unique needs of Iowans. Iowa is a small, midwestern state covering 56,290 square miles with a population under 3 million people. Des Moines is the largest city with a population of 193,000 and is also the state capitol and the headquarters of the DNR. Iowa's economy has traditionally been based in agriculture with a focus on corn, cattle, and hogs.[R#17]

An important driver for energy efficiency in Iowa is that it imports 97% of its energy resources. Fuel is imported from abroad as well as other from states in traditional forms such as coal, nuclear, natural gas, and oil, as Iowa does not have abundant resources of any of these resources. Because the high costs of these fuels drains the State's economy to the tune of over $4 billion per year, the efficient use of energy resources have been a primary concern of the people and the government since the oil crises of the 1970s.[R#2,6]

The DNR funds its programs from a combination of sources including the State's General Fund, Fish and Wildlife use fees, Federal funding, and national oil overcharge funds that have resulted from settlements with major petroleum companies and which have been allocated to states based on their populations. Total expenditures for the agency have ranged recently from $72,684,300 in FY 1992 to $79,556,300 in FY 1991. The Energy and Geological Resources Division has historically consumed between 8-9% of the DNR's operational budget. The bulk of funding for the Energy Bank program, the topic of this profile, comes from private financing augmented by a small amount of oil overcharge and Federal funds for the program's administration. [R#11,12,13,20] ■

Agency Energy Efficiency Overview

The DNR began to implement energy efficiency programs at the time of its creation in 1986. Iowa's legislature has been particularly proactive in addressing energy issues given the effect that energy consumption has on the state's economy. Efficiency became an even stronger priority after 1988 when the Governor and State Assembly directed the DNR to develop a comprehensive energy plan for Iowa. The resulting plan titled, "Iowa at the Crossroads: 1990 Iowa Comprehensive Energy Plan," delineated the choice between improved energy efficiency, a better economy, and a better environment versus continued reliance on imported energy sources with associated higher costs for economic growth and compliance with environmental regulations. The State chose the former path by adopting The Energy Efficiency Act of 1990 later that year. The Act incorporated many of the ideas found in "Iowa at the Crossroads," including utility reform to encourage efficiency, building ratings, alternative fuel use, and alternative energy production. An updated plan was filed again in 1992 and is required by law to be updated every two years.[R#1,14]

Iowa has become a leader in alternative fuel use most notably for ethanol consumption. The State adopted legislation in 1991 requiring purchases of alternatively-fueled vehicles by state agencies. Iowa has moved to convert its fleet to ethanol by adding twelve Chevrolets that run on 85% ethanol to its Des Moines motor pool. Additionally, 42 Fords using the same fuel mix were purchased by the three state universities and the Department of Transportation, giving Iowa the largest high-blend ethanol fleet in the country.[R#13]

In response to a mandate from the state legislature in 1985 the DNR implemented an innovative and aggressive initiative to reach a traditionally difficult segment of the market: public and non-profit facilities (See also Profiles #49, 64). The Iowa Building Energy Management Program targets state and local government facilities, public school districts and area education agencies, private universities, hospitals, and other non-profit groups defined as exempt from Federal income taxation under section 501(c)(3) of the Internal Revenue Service code. The goal of the program is to install all cost-effective efficiency improvements with an aggregate payback period of six years or less in these facilities by 1998.[R#2,5]

There are two distinct components to the Building Energy Management program. Improvements to state buildings are financed by the State of Iowa Facilities Improvement Corporation (SIFIC), a non-profit corporation established in 1985 by the predecessor to the DNR specifically for this purpose. All other public-sector institutions are eligible to fund efficiency improvements by receiving financing from the Iowa Energy Bank, the subject of this profile. ■

HISTORY

The Iowa Energy Bank was established to finance energy improvements to school districts, area education agencies, and community colleges with the passage of House File 2387 in 1986. This state legislation allowed the Energy Bank to finance cost-effective energy management improvements and provide the necessary technical support for those improvements. It further required each public school facility to receive an energy audit every five years.[R#2]

The enabling legislation was amended in 1987 to allow financing agreements that bound the school districts beyond the current fiscal year. Schools in particular had been unable to enter into shared savings arrangements, or even loan repayments based on energy bill savings, that committed them to payments in future years.

The program was expanded in 1988 when the DNR contracted with the Iowa Hospital Association to provide a financing program for energy improvements to members of the association. The DNR was able to provide an insurance pool for those hospitals with less favorable credit ratings.[R#2]

In 1989, the DNR made a similar agreement with the Higher Education Loan Authority to stimulate energy efficiency improvements in private colleges. At this time the legislation was again amended, significantly strengthening the mandate to pursue energy efficiency. The amended legislation requires public facilities to identify and implement all cost-effective energy improvements. [R#2]

In 1990, the program was again extended as a pilot project for local government facilities. With the success of the pilot phase the Local Government Energy Bank program was expanded in 1991. In 1993 the DNR contracted with the Iowa Association of Municipal Utilities and The Energy Group (a consulting firm) to deliver both the School and Local Government programs.[R#2,20]

STRUCTURE

All four sectors of the Energy Bank operate in roughly the same fashion using a three-step process to identify and implement energy efficiency improvements. First, the client receives an energy audit or comparable walk-through analysis of their facility to determine if and where cost-effective efficiency opportunities exist.

Depending on the findings of the audit regarding the size of the facility and its energy usage, the DNR may recommend implementation of improvements based on this analysis or may recommend a comprehensive engineering analysis of the facility. The engineering analysis specifies technologies, costs, and projected savings of a project.

Finally, financing is offered to cover the costs of all improvements with an aggregate payback of less than six years. Financing has been primarily through lease payments that are structured to be at least revenue-neutral with the costs of the payment less than or equal to the savings from the improvements.[R#2] ■

MARKETING

SCOPING THE MARKET & SELLING THE PROGRAM

Initial estimates by the Iowa Department of Education suggested that roughly 3,500 buildings were operated by schools in the State. However, after completing preliminary assessments of each of the 418 districts it was determined there were only 2,288 school buildings. Additionally, there are 128 hospitals in Iowa, 34 private colleges, and 15 community colleges. Finally, there are 967 local governments of which approximately 400 have a number of buildings eligible for the Energy Bank program. [R#2,15]

DNR staff and contractors make personal visits to school superintendents, mayors and town administrators, county supervisors, and other related organizations to market the program. These representatives develop personal relationships with the potential client that the DNR believes to be essential to convince the client of the impact energy efficiency can have on their budget. In fact, the DNR feels that much of the success of the Energy Bank is predicated on this personal marketing strategy.[R#15,20]

Further enhancing this personal relationship is close cooperation with the Hospital Association, the Higher Education Loan Authority, and the Iowa Association of Municipal Utilities, all of which actively market the program to their constituents.[R#15]

The DNR has also sought to work closely with local utilities given their long-standing relationships with customers and a State mandate for investor-owned electric utilities to spend a minimum of 2% of their gross operating revenues on energy efficiency. Utility representatives are informed of all meetings between the DNR and participants in the program and invited to many meetings. Conversely, utilities involve the DNR in relevant meetings with customers as well. This relationship has grown to the extent that DNR representatives have been given the authority to present utility programs to clients in some cases.[R#15]

DNR has also developed numerous materials including a handbook for participants, brochures, and marketing videos to explain and promote the Energy Bank.[R#3,4,15]

DELIVERY: A THREE-STAGE PROCESS

I. THE AUDIT

To comply with the five-year audit requirement of the legislation the DNR arranged for no-cost audits for all school buildings. In 1987 audits of the first 569 buildings were completed, with an additional 1,687 by 1989, and the final 32 in 1990. Audits were done at no cost to the participants by pre-approved contractors to the DNR.[R#2]

The DNR quickly learned that hospitals and colleges do not require an audit as they are such intensive energy consumers. Instead these groups begin the process at Stage II, the engineering analysis. Conversely, local government facilities may be so small as to make a full engineering analysis unnecessary. Instead they receive one of four types of inspections: a preliminary assessment or check list audit, an energy audit, an engineering analysis, and a water or wastewater treatment study. After this initial step these government participants move directly to Stage III.[R#2]

At the onset of the program the DNR recognized a notable lack of trained auditors and analysts. Thus a contract with Iowa State University was established to provide energy efficiency training and a streamlined review process. This effort has improved the technical quality of the Energy Bank program.[R#2]

II. THE ENGINEERING ANALYSIS

Once an audit has been complete the DNR solicits proposals on behalf of the client for the engineering analysis from a list of pre-qualified firms. The client selects a firm and the analysis is completed. The engineering analysis specifies technologies, costs, and projected savings of a project and is a much more detailed study of the facility's technical and economic potential for efficiency. The results are submitted to the DNR for review. Short-term, interest-free loans are available from the DNR to cover the full costs of the study. After six months the loan is due with a small administrative fee.[R#2]

III. FINANCING AND INSTALLING IMPROVEMENTS

A team of financial consultants and an advisory committee of school officials was assembled in the early stages

of the program to develop a mechanism to fund energy efficiency improvements. This team determined that lease financing was the most attractive mechanism available at the time as it allowed public institutions to avoid issuing bonds or calling public referendums to secure the necessary capital while still providing the funding to the institution to cover the high first costs of the improvements. Currently a financial team consisting of a financial consultant (Evensen Dodge), a law firm (Ahlers), and a capital investment company (Norwest Investment Services) is in place to assist participants to secure and structure their financing. Participants may secure financing from alternative sources should they so desire.[R#2]

There are currently two distinct financing mechanisms available under the Energy Bank umbrella. Lease financing is used for hospitals and private colleges and was used for all market sectors until late in 1993. A capital loan note financing mechanism was instituted in late 1993 for schools, community colleges, and local governments. Each mechanism is described below.

Lease Financing: Lease financing agreements are available to hospitals and private colleges for all energy efficiency improvements with an aggregate payback of six years or less and a minimum cost of $15,000. The interest rate is determined based on the Delphis Hanover bond index and fixed at the time of the lease. For leases of more than four years the rate is set at just below a basis point (0.87%) above the A bond rate while short-term leases are at a rate 0.92% above the A bond rate.[R#2]

To cover the costs of aggregating leases and administering the program a fee of 3.5% of the borrowed amount is charged to the college, of which 1.5% goes to the trade association, an additional 1.5% to the association's fund, and the remaining 0.5% for other costs including the bond council and publications. Hospitals pay a fee of $500 plus $3 per $1,000 borrowed to cover the costs of the financial team. These fees are typically included in the lease arrangement so no up-front costs are incurred by participants.[R#2,20]

Repayments are structured over a three to twelve-year period such that monthly energy savings are greater than lease payments and the initial payment may be made any time from 9 to 18 months after the agreement takes effect. However, the client may choose to accelerate repayment to keep interest costs low if so desired. When this happens the lease payment is likely to outweigh the energy savings, creating a minimal cost to the participant.[R#2]

The Capital Loan Note: The Energy Bank has just begun to implement an alternative mechanism known as a capital loan note for schools, community colleges, and local governments. The loan note is tied to the taxing ability of the jurisdiction rather than to the installed equipment, thereby allowing banks to offer a lower interest rate to participants. The term of the loan note determines the interest rate above the Delphis Hanover bond index, ranging from 0.85 for a three-year note down to 0.12 for a twelve-year loan. As most of the participants finance improvements over at least a six-year period, they receive low interest rates.[R#2,20]

This mechanism also allows the financing of smaller projects while still providing enough flexibility for the participants. Additionally, the capital loan option allows local banks to finance Energy Bank clients, thereby fulfilling Federal community reinvestment act requirements. [R#2,20]

Note that not all participants in the Energy Bank program use the Bank's financing mechanisms. Some are able to finance improvements directly from their own budgets or through bond issues. These organizations use the Bank for its technical services.[R#20]

Installation begins once financing is in place. Participants may use the contractor of their choice, allowing local firms to compete for jobs and benefits from the program. As with the audit, the DNR will work with the participant to develop criteria to select a winning bid from those submitted by contractors that have been pre-qualified by the DNR to participate in the program.

Typically a participant will complete the program in 18 months. The decision-making process by a potential participant as to what measures to pursue and how to structure the financing usually takes on the order of five months, although this varies by type of client. On average the energy audit requires one month to schedule and complete and the engineering analyses 3-4 months. Arranging the financing takes two months, of which the bulk of the time is devoted to selecting improvements and developing a financing plan. Implementing the efficiency improvements typically requires six months.[R#15,20] ☞

Number Measures Installed	*Schools*	*Hospitals*	*Local Government*	*Total*	*Effective Lifetime (years)*
Windows	56	14	18	88	25
Insulation	101	17	20	138	25
Incandescant Replacement	280	59	176	515	10
Ballasts & Delamping	82	61	68	211	10
Air-conditioning Improvements	9	14	29	52	15
Fuel Switching	15	7	4	26	25
Heating Improvements	93	23	59	175	15
Hot Water Modifications	66	12	77	155	15
Total	702	207	451	1360	14.18

MEASURES INSTALLED

Typical measures installed are building envelope improvements, heating and cooling equipment, lighting applications such as ballasts, exit lamp replacements, conversion of incandescent lighting to fluorescent, and swimming pool enhancements. In both schools and local governments the replacement of incandescent lamps with fluorescent lamps has been the most popular measure. Hospitals have favored other lighting applications such as ballast replacement or delamping. As illustrated by the attached table the five most common measures installed by program participants are incandescent replacement (515), ballast, delamping and other lighting improvements (211), heating system improvements (175), water heating improvements (155), and insulation measures (138).

STAFFING REQUIREMENTS

The vision and drive behind the program come from Roya Stanley, the Energy Bureau chief. The Energy Bank is directed by the Building Energy Management Section Supervisor, Greg Wright. Both the Development and Implementation section leaders, Monica Stone and Mary Leite respectively, have responsibility for the Energy Bank program. Under these individuals are three program planners with duties including program tracking, marketing, and implementation of each of the Energy Bank's components. Technical staff are also frequently used to consult on specific questions. Currently, four full-time equivalents (FTEs) are assigned to the Energy Bank.[R#15]

The financial consulting team has employees devoting approximately 0.1 FTE to the program. The program's attorney provides roughly 0.3 FTE. Iowa State University also contributes 2.5 FTEs to the program for training and review purposes, with 0.5 being professional staff and 2 FTEs in student reviewers.[R#15]

Additionally, there are 42 technical contracting firms that have been pre-qualified to provide auditing, analyses, and installation services. Between 20 and 30 of these firms are consistently active in the program. The DNR estimates that most, if not all, of the contractors in Iowa have participated in the Energy Bank program at one time or another.[R#16,20] ■

MONITORING

Through 1993 the Department of Natural Resources relied upon the application forms from audits, engineering analyses, and financing to monitor the Energy Bank program. However, the DNR will begin to offer energy accounting and monitoring services to program participants in 1994 in an attempt to ensure energy savings are achieved and maintained.[R#20]

Beginning in 1994 the DNR intends to monitor the program through a contract with Michaels Engineering, Inc., an Iowa-based firm. Monitoring provisions will include on-site evaluations of facilities to ensure proper installation of measures, will provide for evaluation of operation and maintenance provisions, and will identify further training needs. This information will be used to refine the program as necessary.

Simultaneously, a contract with Iowa Southern Utilities will allow the DNR to improve its program accounting for participants. Under this contract the DNR will be able to provide seminars to participants explaining the accounting system and requirements of the program, develop reports for each client on their monthly energy consumption, and track this consumption on a facility by facility basis.[R#15]

Currently the DNR makes extensive use of its database into which all improvements that are studied are entered. Database information includes whether the improvement was recommended for implementation, the projected cost and savings of the improvement, the financing mechanism employed, and the implementation date.

The information is gathered through surveys that are distributed to participants in the Energy Bank. Results are entered into the database by DNR staff.[R#20]

EVALUATION

The DNR has not performed any evaluations of the Energy Bank program but instead has relied primarily on spot checks of certain installations for use as case studies and staff review of the audit and analysis reports for projects to assess overall program costs and energy savings. ■

Data Alert: The savings figures presented are only for projects implemented with Energy Bank financing. Substantial improvements have been implemented with funding from other sources as described in the Cost of the Program Section.

The DNR tracks energy savings in both kWh of electricity and hundreds of cubic feet (ccf) of natural gas on an annual basis by market sector. The Energy Bank finances those improvements, including fuel-switching, that provide cost-effective energy savings. Therefore some specific projects will provide net gains in the consumption of either electricity or gas but reductions in total usage. In fact annual savings for some market sectors may be negative for a particular fuel as fuel-switching was pursued.

To date the Energy Bank has resulted in total cumulative energy savings of nearly 23 GWh and gas savings of 3,478,794 ccf, equivalent to over 105 GWh. As such, approximately 80% of the energy savings have come from gas savings.

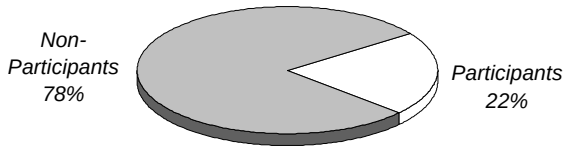
By far the bulk of the electricity and natural gas savings achieved through the Energy Bank have been gained in public schools. Total annual savings for this sector have reached 8,888,959 kWh and 1,513,808 ccf with 1993 savings of 1,330,115 kWh and 420,073 ccf respectively. Hospitals have provided the next largest amount of annual energy savings in the form of 1,615,174 kWh and 162,335 ccf.

Financing from the Energy Bank for all four market sectors has supported total annual savings of 11,874,611 kWh and 1,739,397 ccf since financing began in 1988. Total cumulative savings of 23,749,222 kWh and 3,478,794 ccf have been secured over that time period, and lifecycle savings have reached over 168 GWh and almost 25 million ccf.

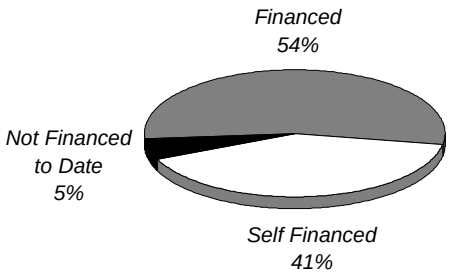
PARTICIPATION RATES

Participation is defined in different ways given the three distinct stages of the Energy Bank program. Therefore, participation figures are noted by enrollment in the program and use of Energy Bank financing for efficiency improvements. Cumulative enrollment in the Energy Bank has reached 390 participants or 22% of eligible customers. Of these, 212 have financed improvements through the Energy Bank and an additional 158 have financed improvements through other means including bond issues or within their budgets. Only the savings from those participants using the Bank's financing are included in the accompanying charts. ☞

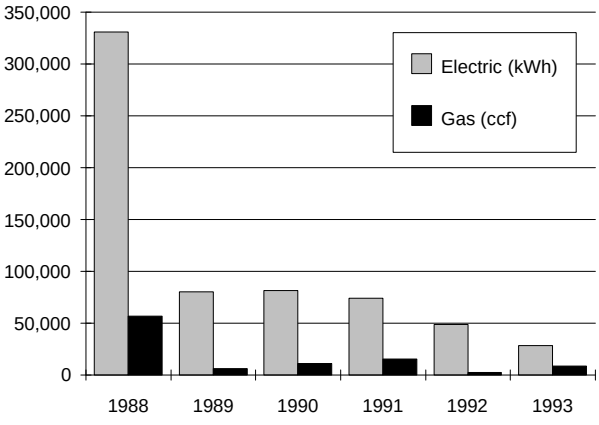
PARTICIPATION



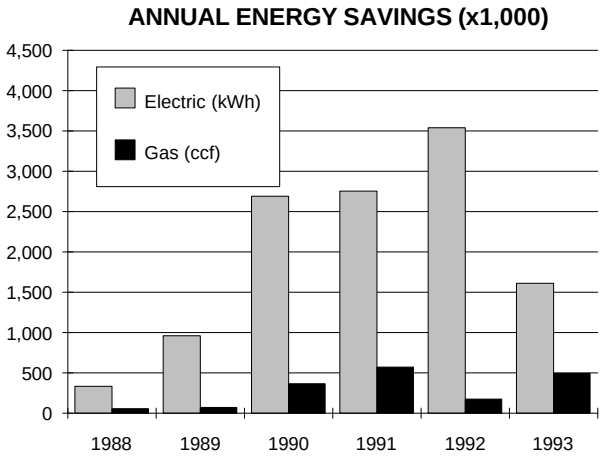
PROJECT FINANCE

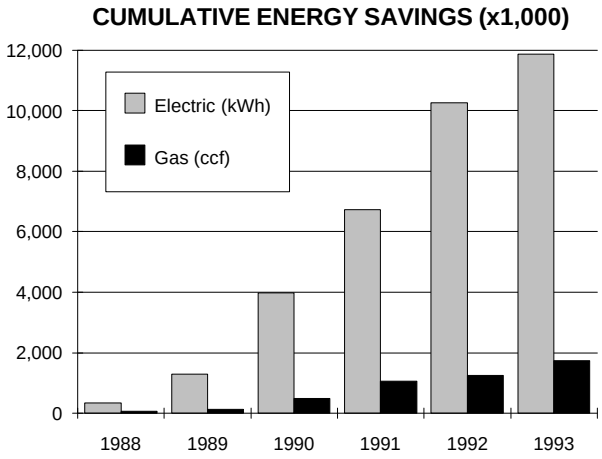


ANNUAL ENERGY SAVINGS PER PARTICIPANT



Savings Overview (Financed by Energy Bank)	*Annual Energy Savings from Schools*	*Annual Energy Savings from Colleges*	*Annual Energy Savings from Hospitals*	*Annual Energy Savings from Local Government*	*Total Annual Energy Savings*	*Cumulative Energy Savings*	*Lifecycle Energy Savings*
Electricity Savings (kWh)							
1988	330,684	0	0	0	330,684	330,684	4,690,362
1989	960,063	0	0	0	960,063	1,290,747	13,617,361
1990	2,376,161	129,058	0	181,853	2,687,072	3,977,819	38,112,946
1991	1,872,137	393,984	360,285	124,846	2,751,252	6,729,071	39,023,263
1992	2,019,799	31,946	1,321,713	162,916	3,536,374	10,265,445	50,159,292
1993	1,330,115	277,879	(66,824)	67,996	1,609,166	11,874,611	22,824,121
Total	8,888,959	832,867	1,615,174	537,611	11,874,611	23,749,222	168,427,345
Gas Savings (ccf)							
1988	56,688	0	0	0	56,688	56,688	804,052
1989	72,584	0	0	0	72,584	129,272	1,029,518
1990	343,036	16,525	0	6,589	366,150	495,422	5,193,406
1991	444,853	10,757	118,355	799	574,764	1,070,186	8,152,349
1992	176,574	8,612	(10,027)	2,357	177,516	1,247,702	2,517,855
1993	420,073	(2,180)	54,007	19,795	491,695	1,739,397	6,974,113
Total	1,513,808	33,714	162,335	29,540	1,739,397	3,478,794	24,671,294





Participation Table	*Schools*	*Colleges*	*Hospitals*	*Local Government*	*Total Participants*	*Annual Energy Savings per Participant (kWh)*	*Annual Energy Savings per Participant (ccf)*
Program Enrollment							
1987	3	0	0	0	3		
1988	41	0	0	0	41		
1989	97	0	0	0	97		
1990	81	2	11	3	97		
1991	29	5	8	13	55		
1992	7	5	14	39	65		
1993	7	9	8	8	32		
Total	265	21	41	63	390		
Use of Energy Bank Financing							
1987	0	0	0	0	0	0	0
1988	1	0	0	0	1	330,684	56,688
1989	12	0	0	0	12	80,005	6,049
1990	28	4	0	1	33	81,426	11,095
1991	31	0	6	0	37	74,358	15,534
1992	66	1	5	0	72	49,116	2,466
1993	50	4	3	0	57	28,231	8,626
Total	188	9	14	1	212		
Self Financing							
Total	135	4	7	12	158		

SCHOOLS

All 2,288 school facilities and community colleges in the State were audited according to State law by 1990. Some 500 of these facilities required no further study as they were either quite efficient or operated for so few hours daily (bus garages for example) that they did not warrant additional attention. A total of 524 buildings have received further technical analysis, representing 23% of the eligible market. A total of 265 of the school districts in lowa have participated to date, with 188 using Energy Bank financing and an additional 135 self-financing improvements. The bulk of the schools enrolled in the program in its early years but financing and implementing have been increasingly steadily since then.[R#2,20]

COLLEGES

Twenty-one private colleges have enrolled in the program to date of a possible 34. This represents 62% of the potential market. A total of 13 colleges have financed efficiency improvements, nine through the Energy Bank.[R#18]

HOSPITALS

Forty-one of the 128 hospitals (32%) in the state have received a detailed engineering analyses. Slightly more than half of these (21) have implemented efficiency improvements with 14 using the Energy Bank to finance projects. [R#18]

LOCAL GOVERNMENT FACILITIES

Since its inception in 1992 the local government component has reached 63 communities with 127 buildings. This represents 7% of the potential market of 967 local governments. However, many of these governments serve jurisdictions of less than 500 citizens making them unlikely participants in the program. The DNR estimates the market potential for this sector to be roughly 400 governments. Thirteen of the governments have implemented improvements with all but one choosing to use alternative sources of funding such as local bonds. [R#2,20]

SAVINGS ADJUSTMENTS

The Energy Bank program as a legislatively mandated effort is in somewhat of a unique position regarding the adjustment of energy savings for factors such as free riders. By law the public buildings that are targeted by the program must implement cost-effective energy efficiency measures, although the law does not include provisions for failure to comply. However, most of these facilities do not possess the in-house expertise necessary to make the best decisions on energy efficiency improvements. Nor do these institutions typically have access to the funding required to implement the improvements. Thus the DNR credits all the savings captured from the program to its efforts and does not adjust them in any manner.

MEASURE LIFETIME

The DNR has adopted a comprehensive list of lifetimes for energy efficiency measures commonly installed with Energy Bank financing. (See the table in the Implementation section). The Results Center has calculated a weighted average measure lifetime of 14.18 years based on the useful lives of individual measures and the number of measures installed. This average measure lifetime is used to calculate lifecycle savings and to calculate the cost of saved energy in the next section.

PROJECTED SAVINGS

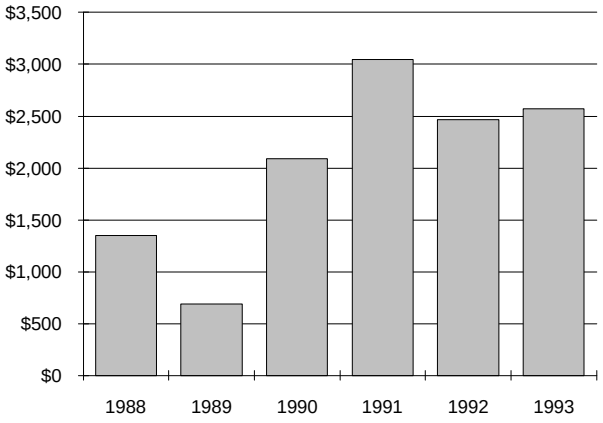
The goal of the Energy Bank is to finance the installation of all energy management improvements with a payback of six years or less in all public and non-profit buildings in the state. The DNR anticipates total annual savings valued at $50 million on a projected investment of $300 million.[R#15] ■

Cost of the Program

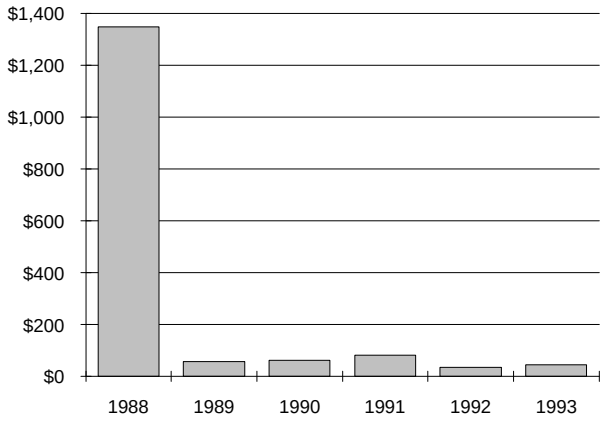
Costs Overview	*DNR Support (x1000)*	*DNR Contract (x1000)*	*School Financing (x1000)*	*College Financing (x1000)*	*Hospital Financing (x1000)*	*Local Government Financing (x1000)*	*Participant Fees (x1000)*	*Total Program Cost (x1000)*	*Cost per Participant in Energy Bank Financing*
1988	$164.8	$880.1	$302.8	$0.0	$0.0	$0.0	$0.0	$1,347.7	$1,347,725
1989	$195.8	$0.0	$488.4	$0.0	$0.0	$0.0	$3.9	$688.1	$57,343
1990	$317.5	$113.7	$1,485.4	$39.0	$0.0	$96.7	$34.8	$2,087.2	$63,248
1991	$384.9	$154.2	$2,303.3	$55.0	$99.4	$33.5	$14.4	$3,044.8	$82,291
1992	$318.9	$61.8	$1,378.0	$19.3	$553.9	$89.4	$45.3	$2,466.5	$34,257
1993	$413.5	$81.3	$1,632.9	$72.4	$208.1	$69.8	$91.2	$2,569.3	$45,075
Total	$1,795.4	$1,291.2	$7,590.8	$185.7	$861.4	$289.5	$189.6	$12,203.6	

Data Alert: The cost figures presented are only for projects implemented with Energy Bank financing. A substantial number of improvements have been implemented with funding from other sources. Please note that 1993 expenditures are levelized to 1990 dollars, per The Results Center convention, using a 1992 conversion factor due to the unavailability of the 1993 conversion at the time of this printing.

TOTAL PROGRAM COST (x1,000)



COST PER PARTICIPANT (x1,000)



The Energy Bank program has cost a total of over $12 million in its 6 year history, or approximately $2 million per year. Of this total sum, approximately 2/3 has been used for school finance. Less than 10% of the total has been used to administer the program.

The Energy Bank has provided for the financing of $34,819,000 (unlevelized) in energy efficiency improvements since its inception. This figure includes the self-financing entities that have used the Bank's technical components but secured funding from other sources. To date, a total of $8,927,400 in efficiency improvements has been financed directly by the Energy Bank.[R#20]

DNR staff project that as much as $240 million in improvements will ultimately be funded through the Energy Bank. Of this amount, $70 million is allocated for schools, $50 million for local governments, $70 million for hospitals and $50 million for colleges. The Energy Bank is funded with capital from private investors in Norwest's program fund. DNR overhead, including staff time and subcontracts, is supported primarily by money from oil overcharge funds and the U.S. Department of Energy's Institutional Conservation Program.[R#2,5,19,20]

COST EFFECTIVENESS

The Results Center has calculated the cost of saved energy for the Energy Bank program for total energy savings financed by the Bank. Total savings were calculated by converting gas savings to electricity savings in kWh-equivalent by using a heat content of 103,500 BTU per ccf and a conversion factor of 3,412 BTU per kWh. The cost of saved energy at a five percent discount rate has ranged from 1.51¢/kWh in both 1990 and 1991 to a high of 6.58¢/kWh in 1988, the program's first year. Most recent costs were 1.56¢/kWh in 1993. These low costs are most likely due to the Bank's financing mechanism and the ability of participants to pursue the least cost energy resources rather than one particular fuel source.

COST PER PARTICIPANT

The cost per participant using Energy Bank financing has ranged from a high of $1,347,725 for the lone participant in 1988 down to $34,257 for the 72 participants in 1992. Given the diversity of the institutions participating in the program, a cost per participant calculation for each market sector is a useful tool to illustrate the costs of financing improvements in each sector. Note the following costs do not include overhead but only the cost of implementing efficiency improvements for those participants using Energy Bank funding.

For the 524 public school facilities, total expenditures of $7,590,800 compute to $14,486 per building. If the number of jurisdictions using the Bank's financing, 188, is used instead of individual buildings, the cost increases to $40,377 per jurisdiction, for example per school district.

Each of the 14 hospital facilities has spent an average of $61,529 on energy improvements. The thirteen participants in the Energy Bank for local government have cost $22,629. A total of $185,700 divided over the nine participating private colleges is $20,633 per college.

COST COMPONENTS

The bulk of Energy Bank financing has been directed to public schools, totalling $7,590,800 from 1988 to 1993. Hospitals have received the next largest increment of financing ($861,400), followed by local governments ($289,500) and colleges ($185,700). Additional support, contracting, and participant fees of $3,276,200 make total program costs from 1988 to 1993 $12,203,600.[R#19] ■

Environmental Benefit Statement

AVOIDED EMISSIONS: Based on 23,749,222 kWh saved 1988 - 1993

Marginal Power Plant	*Heat Rate BTU/kWh*	*% Sulfur in Fuel*	*CO2 (lbs)*	*SO2 (lbs)*	*NOx (lbs)*	*TSP* (lbs)*
Coal	**Uncontrolled Emissions**					
A	9,400	2.50%	51,203,000	1,215,000	246,000	25,000
B	10,000	1.20%	54,599,000	470,000	159,000	118,000
	Controlled Emissions					
A	9,400	2.50%	51,203,000	121,000	246,000	2,000
B	10,000	1.20%	54,599,000	47,000	159,000	8,000
C	10,000		54,599,000	313,000	157,000	8,000
	Atmospheric Fluidized Bed Combustion					
A	10,000	1.10%	54,599,000	144,000	78,000	39,000
B	9,400	2.50%	51,203,000	121,000	98,000	7,000
	Integrated Gasification Combined Cycle					
A	10,000	0.45%	54,599,000	97,000	16,000	39,000
B	9,010		49,113,000	35,000	12,000	2,000
Gas	**Steam**					
A	10,400		29,782,000	0	68,000	0
B	9,224		25,863,000	0	162,000	8,000
	Combined Cycle					
1. Existing	9,000		25,863,000	0	99,000	0
2. NSPS*	9,000		25,863,000	0	47,000	0
3. BACT*	9,000		25,863,000	0	7,000	0
Oil	**Steam--#6 Oil**					
A	9,840	2.00%	43,105,000	653,000	77,000	73,000
B	10,400	2.20%	45,717,000	648,000	97,000	47,000
C	10,400	1.00%	45,717,000	92,000	78,000	25,000
D	10,400	0.50%	45,717,000	272,000	97,000	15,000
	Combustion Turbine					
#2 Diesel	13,600	0.30%	57,212,000	114,000	177,000	10,000
Refuse Derived Fuel						
Conventional	15,000	0.20%	67,923,000	175,000	230,000	51,000

In addition to the traditional costs and benefits there are several hidden environmental costs of electricity use that are incurred when one considers the whole system of electrical generation from the mine-mouth to the wall outlet. These costs, which to date have been considered externalities, are real and have profound long term effects and are borne by society as a whole. Some environmental costs are beginning to be factored into utility resource planning. Because energy efficiency programs present the opportunity for utilities to avoid environmental damages, environmental considerations can be considered a benefit in addition to the direct dollar savings to customers from reduced electricity use.

The environmental benefits of energy efficiency programs can include avoided pollution of the air, the land, and the water. Because of immediate concerns about urban air quality, acid deposition, and global warming, the first step in calculating the environmental benefit of a particular DSM program focuses on avoided air pollution. Within this domain we have limited our presentation to the emission of carbon dioxide, sulfur dioxide, nitrous oxides, and particulates. (Dollar values for environmental benefits are not presented given the variety of values currently being used in various states.)

HOW TO USE THE TABLE

1. The purpose of the accomanying page is to allow any user of this profile to apply Iowa Department of Natural Resources' level of avoided emissions saved through its Energy Bank progam to a particular situation. Simply move down the left-hand column to your marginal power plant type, and then read across the page to determine the values for avoided emissions that you will accrue should you implement this DSM program. Note that several generic power plants (labelled A, B, C,...) are presented which reflect differences in heat rate and fuel sulfur content.

2. All of the values for avoided emissions presented in both tables include a 10% credit for DSM savings to reflect the avoided transmission and distribution losses associated with supply-side resources.

3. Various forms of power generation create specific pollutants. Coal-fired generation, for example, creates bottom ash (a solid waste issue) and methane, while garbage-burning plants release toxic airborne emissions including dioxin and furans and solid wastes which contain an array of heavy metals. We recommend that when calculating the environmental benefit for a particular program that credit is taken for the air pollutants listed below, plus air pollutants unique to a form of marginal generation, plus key land and water pollutants for a particular form of marginal power generation.

4. All the values presented represent approximations and were drawn largely from "The Environmental Costs of Electricity" (Ottinger et al, Oceana Publications, 1990). The coefficients used in the formulas that determine the values in the tables presented are drawn from a variety of government and independent sources.

IOWA DEPARTMENT OF NATURAL RESOURCES' AVOIDED EMISSIONS

The DNR has calculated emissions reductions for the entire Building Energy Management program, including improvements made under the Energy Bank program as well as the State of Iowa Facilities Improvement Corporation. These reductions are 1 million tons of CO2, 1,600 tons of NOx, 2,000 tons of particulates, and 18,000 tons of SO2.[R#5] ■

*** Acronyms used in the table**

TSP = Total Suspended Particulates
NSPS = New Source Performance Standards
BACT = Best Available Control Technology

LESSONS LEARNED

Certainly the most important lesson learned in Iowa is that market segments which are difficult to reach with energy efficiency – schools, hospitals, local government facilities, and colleges – can be effectively reached and retrofitted in relatively short order if the proper legislation and financing mechanisms are put in place. Supported by Iowa's Energy Efficiency Act of 1990, Iowa's DNR has been able to facilitate a dramatic pace of retrofits that will save local jurisdictions tens of thousands of dollars while plugging a drain of millions of dollars out of Iowa's economy.

The Energy Bank has enjoyed solid overall success particularly in financing improvements in schools and hospitals. These two sectors have implemented the bulk of the energy efficiency measures under the Energy Bank program and as such are reaping the bulk of the savings. The Bank is beginning to get substantial participation from local governments and colleges and these components of the program are thus beginning to expand.

The DNR attributes the success of the Bank to its customized marketing strategies focused on direct, personal marketing. One-on-one marketing to decision-makers is employed to secure participation. The DNR believes that offering high levels of assistance throughout the program, from selling the decision-makers to implementing improvements, has been critically important.[R#20]

In a similar vein, cosponsorship of various Bank components has been valuable. The Iowa State trade association for hospitals has been active in convincing its members of the benefits of participation and individual hospitals have responded to marketing from this institution that they trust. Support from the State's utilities is also necessary and beneficial. In fact, DNR is looking forward to increased sponsorship from utilities in the years to come.[R#20]

The DNR has recognized the value of providing monitoring and accounting services to the clients since the program's inception, however fiscal constraints have limited the ability to deliver these services before 1994. Information on the magnitude of energy and financial savings from installations will be used to assist clients in assessing the impacts of their participation as well as refine the program for the future.[R#20]

Perhaps the fundamental lesson to be learned from the Energy Bank is the strength of a flexible financing mechanism. While the lease purchase agreement itself is not a particularly innovative mechanism, the manner in which the DNR has employed it deserves attention.

First, the program has made good use of a full financial team. This assures the participant that their decision to improve energy efficiency will be supported by qualified and experienced personnel. It has also allowed the DNR to overcome State fiscal constraints imposed by tight budgets by leveraging private-sector funding for actual implementation and using public funding for monitoring, accounting, marketing, and technical assistance.[R#20]

Next, the financial advisors work with the participants to develop a financing agreement to meet the individual needs of each customer. This flexibility is critical as it allows each institution to effectively determine the level of commitment that can be made to the program by setting the repayment schedule. Repayments can be structured in such as way to be less than savings from efficiency or accelerated to minimize interest payments. Given the capital constraints that limit so many institutional custom-

ers, the ability to control the amount and timing of financial commitment is a crucial piece of the Energy Bank.

The Energy Bank has succeeded on a different level due to the DNR's careful management of the pace of the program. The program has steadily and continually expanded from its inception such that technical expertise and financing are available to all institutional buildings in Iowa except state and Federal buildings that are covered by other programs. Gradually expanding the program over a four-year period has allowed the DNR to control the program's growth while incorporating design and implementation refinements to each new component.

Of particular note in this area is the ability of the program to lay a foundation of technical expertise. The Energy Bank has stimulated the interest of the engineering and architectural community in Iowa regarding energy efficiency as it has provided an opportunity to both practice and profit. Further, the use of Iowa State University for much of the technical work is also serving to educate graduate students in energy efficiency. Many students that were involved in reviewing the technical analysis while at the university are now employed in the private and public sector in the state.[R#20]

TRANSFERABILITY

The fundamental concept of financing efficiency through a lease purchase agreement is neither new nor particularly difficult to emulate. However, the use of a complete financial team to assist participants is a creative wrinkle in the program worth careful consideration.

The DNR has been notably successful at selling the program to institutional customers by making the link between energy efficiency and the bottom line of the budget statement. A program sponsor seeking to implement a similar effort would have to provide as good a rationale for the customers to participate as the DNR has done. Naturally, the presence of state legislation for such an effort has been helpful in spurring the program on in Iowa. While this legislation has been useful in generating support for the Energy Bank, the flexibility of the program in serving each client group has been more of a factor in its overall success. ■

References

1. Iowa Department of Natural Resources, "Iowa at the Crossroads: 1990 Comprehensive Energy Plan," Des Moines, January 1990.

2. Iowa Department of Natural Resources, "Iowa Building Energy Management Programs: Overview," Des Moines, 1993.

3. Iowa Department of Natural Resources, "Iowa Local Government Energy Bank Program," Des Moines, 1993.

4. Iowa Department of Natural Resources, "Iowa School Energy Bank Program," Des Moines, 1993.

5. Roya Stanley, Iowa Department of Natural Resources, presentation to the International Council for Local Environmental Initiatives, Chicago, 1993.

6. Iowa Department of Natural Resources, "Iowa Building Energy Management Programs: FY 1989 Annual Report," Des Moines, 1989.

7. Iowa Department of Natural Resources, "Iowa Building Energy Management Programs: FY 1990 Annual Report," Des Moines, 1990.

8. Iowa Department of Natural Resources, "Iowa Building Energy Management Programs: FY 1991 Annual Report," Des Moines, 1991.

9. Iowa Department of Natural Resources, "Iowa Building Energy Management Programs: FY 1992 Annual Report," Des Moines, 1992.

10. Iowa Department of Natural Resources, "Iowa Building Energy Management Programs: FY 1993 Annual Report," Des Moines, 1993.

11. Iowa Department of Natural Resources, "Annual Report: Fiscal Year 1990," Des Moines, 1990.

12. Iowa Department of Natural Resources, "Annual Report: Fiscal Year 1991," Des Moines, 1991.

13. Iowa Department of Natural Resources, "Annual Report: Fiscal Year 1992," Des Moines, 1992.

14. Iowa Department of Natural Resources, "Towards a Sustainable Energy Future: 1992 Iowa Comprehensive Energy Plan," Des Moines, January 1992.

15. Greg Wright, Executive Officer, Building Energy Management Program, Energy Bureau, Iowa Department of Natural Resources, personal communication, October - December, 1993.

16. Iowa Department of Natural Resources, "Handbook: Iowa Local Government Energy Bank Program," Des Moines, 1993.

17. "Goode's World Atlas (16th ed.)," Rand McNally & Company, U.S.A., 1982.

18. Iowa Department of Natural Resources, "Energy Bureau Financing Programs Spreadsheet," October 11, 1993.

19. Iowa Department of Natural Resources, "Energy Bureau Energy Bank Yearly Funding Allocations and Sources Spreadsheet," 1993.

20. Monica Stone, Development Unit Leader, Energy Bureau, Iowa Department of Natural Resources, personal communication, November - December, 1993.

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