The Illinois Smart Energy Design Assistance Program

Donald F. Fournier, LEED AP
Chair, Building Research Council
School of Architecture
University of Illinois at Urbana-Champaign

ABSTRACT

In response to growing energy costs and in support of small business, the Illinois Department of Commerce and Economic Opportunity (DCEO) has developed the Smart Energy Design Assistance Program to provide businesses and the public sector with help in identifying opportunities to save energy and money while reducing overhead and operational costs. The program is implemented by the Smart Energy Design Assistance Center (SEDAC), operated by the Building Research Council (BRC) at the University of Illinois at Urbana-Champaign in partnership with 360 Energy Group, LLC.

In the past four years, the program has assisted over 1,560 Illinois clients. These Illinois entities have more than 43,000 employees, representing a geographical cross section of the state. Of these clients, 427 have received quantitative energy-saving project recommendations. Our analysis suggests that, with an additional *first-year* investment of $81.7 million, these clients could accrue *annual* energy cost savings of $17.3 million. For a project life of 20 years, this translates into a 23.8% rate of return on investment. At a 7% discount rate, the energy cost savings represent $107.6 million in net present value.

We have found significant opportunities for energy savings in both new and existing buildings. Our average is about 30% energy savings available. We have also found that clients implement a subset of the recommended projects and attain on average about 54% of the energy savings potential.

INTRODUCTION

Buildings and building-related activities represent one of the largest energy consuming sectors in the United States. In Illinois, from 1950 to 2008, a population increase of approximately 2.7 million translated into dramatic natural resource consumption increases [1]. For example, Illinois residents currently require almost 28 million gallons of petroleum per day. According to the U.S. Department of Energy, annual energy expenditures in the state have now reached over $48 billion, with commercial and industrial buildings consuming over $16 billion alone. This represents a 51% increase since 2003. Overall energy consumption in Illinois amounts to about 4 quadrillion BTUs, nearly two-thirds of which can be attributed to buildings and building-related consumers [2].

In Illinois the building and construction industry is also an important part of the economy, employing over 270,000 persons at an annual payroll that exceeds $10 billion dollars [3]. Clearly, energy efficient facility initiatives that have even modest success in transforming Illinois markets by reducing consumption, increasing efficiencies, and reducing waste can have large impacts on the state's economy.

This article presents the process and results of a smart energy design assistance initiative hosted at the School of Architecture's Building Research Council at the University of Illinois. Begun to help designers and engineers implement renewable technologies and realize more efficient structures and projects, the program has also been successful in helping Illinois businesses remain competitive in the global market place by helping them reduce operational (energy) expenditures. Program results have shown that the typical building can reduce its energy consumption by 30-40% through readily available, state of the shelf efficiency measures.

THE ILLINOIS SMART ENERGY DESIGN ASSISTANCE CENTER

The mission of the Smart Energy Design Assistance Center (SEDAC) is to encourage Illinois building owners, designers, and users to incorporate renewable energy systems and energy efficiency practices into the built environment for businesses. SEDAC accomplishes this by providing information and design assistance in the practice and imple-

mentation of components of energy efficient design, specification, and construction, as well as education to business owners and practitioners. SEDAC also provides support for the Illinois Energy Code, assists with the financial strategies needed for project implementation, and provides assistance for more broadly-defined sustainable design initiatives within the state of Illinois.

The initial concept of SEDAC was tested under a pilot project in late 2004. This project was part of the Illinois Small Business $mart Energy Program and is part of the state's Opportunity Returns Initiative directed by the Illinois Department of Community and Economic Opportunity (DCEO). The smart energy program is designed to provide assistance to businesses for identifying opportunities to save energy and money, thus reducing overhead and operational costs. It also supports resource efficiencies in building design, materials selection, and construction practices as they relate to energy. This program is administered by the University of Illinois at Urbana-Champaign (UIUC) at the School of Architecture's Building Research Council (BRC). The BRC initially partnered with the Geothermal Heat Pump Consortium for program execution.

In the pilot program, the project team performed design assistance energy audits, feasibility studies, and follow-up for 20 small businesses in Illinois. The goal was to help implement energy efficient building design or redesign strategies. The pilot attempted an even distribution of projects across the state—two per economic development region. The work included actual design assistance analysis as well as presentation of the financial benefits of the recommended improvements to the small-business clients. SEDAC was developed out of the pilot to implement the Small Business Smart Energy Program for a larger small-business customer base and a greater range of clients.

Since that time, the program has grown, and funding sources have diversified. Now SEDAC information and services are available to institutional building owners (government agencies, K-12 school systems), municipal governments, and public universities and colleges. SEDAC also assists the state in implementing some of its public sector programs under the electrical portion of the Energy Efficiency Portfolio Standard (EEPS). These programs are the new construction program and the retro-commissioning pilot program. The state also has prescriptive and custom electrical energy efficiency incentive grants available under EEPS. SEDAC directs our clients to either the public sector programs or

the utility-provided programs, as appropriate. Starting in 2011, a natural gas EEPS program will begin in Illinois similar to the electrical sector EEPS.

SEDAC also includes a strong training and educational component aimed at professional development, and many of the courses offer continuing education units. Some training is project-oriented and specifically designed to help individuals who are working to gain requisite knowledge in energy efficient design and applicable new regulations and codes, with an emphasis on recent codes adopted by the state of Illinois. The SEDAC educational curriculum is targeted toward professionals (e.g., architects, engineers), UIUC students (in architecture, planning, and engineering), facility contractors, and facility managers. These educational programs are focused on sustainable design and may eventually provide university certification in that area.

DESIGN ASSISTANCE ACTIVITIES

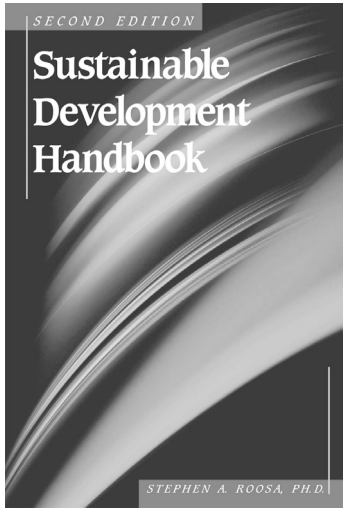
Operation of the Smart Energy Design Assistance Center includes four tiers of service to clients. These are initial consultation (Level 1), energy audits (Level 2), design assistance (Level 3), and project follow up (Level 4). Overall, program intervention will be aimed at familiarizing project engineers and others with innovative, energy efficient design approaches.

The project team understands business realities, and when performing analyses for energy efficiency and renewable energy, we treat the process as a business decision. Therefore, we present financial analyses with tables that contain the monthly cash flows, internal rates of return, and net present values, utilizing a standard set of economic assumptions and investment criteria. SEDAC also periodically reviews the assumptions used for discount and loan interest rates and updates as necessary for market alignment. If clients indicate a preference, then such preferences are used in the analyses.

Level 1: Initial Consultation

Level 1 assistance includes a variety of interactions with design professionals, building owners, and other stakeholders. These initial consultations include one-on-one meetings, presentations, telephone calls, and other correspondence; the purpose is to inform individuals

SUSTAINABLE DEVELOPMENT HANDBOOK, Second Edition



Stephen A. Roosa, Ph.D.

Now available in its fully updated second edition, this important reference provides a thorough examination of recent and ongoing developments, as well as current trends in all areas of the growing field of sustainable development. Sustainable development is a concept that incorporates energy, urban management, environmental objectives, policy integration, and the idea that effective solutions can be achieved in a cooperative manner with concerted effort. Gaining momentum on the world stage in recent years, sustainable development is beginning to significantly redefine the policies and decision making of both corporations and governmental entities. Sustainable development initiatives can vary widely in both scope and application, as well as in success. This book is intended to clarify critical issues, proven approaches and potential pitfalls associated with such initiatives, covering underlying concepts, renewable energy solutions, environmental issues, green design and LEED® programs, sustainable industrial processes, sustainable development policy considerations, local government programs, corporate programs, tracking results, and future trends. This second edition includes complete updates on measurement and verification for LEED projects, as well as a new chapter on cities and carbon reduction.

ISBN: 0-88173-636-8
6 x 9, Illus., 478 pp.,
Hardcover

ORDER CODE: 0642

CONTENTS

BOOK ORDER FORM

① Complete quantity and amount due for each book you wish to order:

Quantity	Book Title	Order Code	Price	Amount Due
	Sustainable Development Handbook	**0642**	**$135.00**	

② Indicate shipping address: **CODE: Journal 2010**

NAME (Please print) BUSINESS PHONE

SIGNATURE (Required to process order) EMAIL ADDRESS

COMPANY

STREET ADDRESS ONLY (No P.O. Box)

CITY, STATE, ZIP

Applicable Discount	
Georgia Residents add 6% Sales Tax	
Shipping Fees	**10.00**
TOTAL	

MEMBER DISCOUNTS
A 15% discount is allowed to AEE members.

☐ **AEE Member (Member No._____)**

③ Select method of payment:
☐ **CHECK ENCLOSED**
☐ **CHARGE TO MY CREDIT CARD**
☐ *VISA* ☐ *MASTERCARD* ☐ *AMERICAN EXPRESS*

Make check payable in U.S. funds to: **AEE ENERGY BOOKS**

CARD NO.

Expiration date *Signature*

④ Send your order to:
AEE BOOKS
P.O. Box 1026
Lilburn, GA 30048

INTERNET ORDERING
www.aeecenter.org

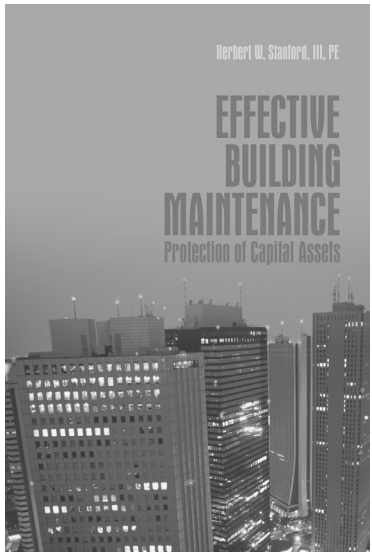
TO ORDER BY PHONE
Use your credit card and call:
(770) 925-9558

TO ORDER BY FAX
Complete and Fax to:
(770) 381-9865

INTERNATIONAL ORDERS
Must be prepaid in U.S. dollars and must include an additional charge of $10.00 per book plus 15% for shipping and handling by surface mail.

EFFECTIVE BUILDING MAINTENANCE: PROTECTION OF CAPITAL ASSETS

Herbert W. Stanford III



The maintenance of a commercial building or facility can in large measure be considered the protection of an important capital asset. This text examines in depth the requirements for effectively designing, implementing and managing both programs and procedures for all areas of building maintenance, from the foundation to the roof, including interior and exterior support systems, as well as sitework elements. Discussed in detail are programmed maintenance as a critical part of asset management, maintenance planning and budgeting, outsourcing of maintenance services, computerized maintenance management, planned replacement vs. major renovation, preventive and predictive maintenance, and energy efficiency, indoor air quality and sustainability considerations. Also explored is the topic of designing a building for effective maintainability, including general construction, plumbing, HVAC and electrical systems.

ISBN: 0-88173-638-4

6 x 9, Illus., 428 pp., Hardcover

ORDER CODE: 0643

CONTENTS

BOOK ORDER FORM

① Complete quantity and amount due for each book you wish to order:

Quantity	Book Title	Order Code	Price	Amount Due
	Effective Building Maintenance: Protection of Capital Assets	**0643**	**$98**	

② Indicate shipping address: **CODE: Journal 2010**

NAME (Please print) BUSINESS PHONE

SIGNATURE (Required to process order) EMAIL ADDRESS

COMPANY

STREET ADDRESS ONLY (No P.O. Box)

CITY, STATE, ZIP

Applicable Discount	
Georgia Residents add 6% Sales Tax	
Shipping Fees	**10.00**
TOTAL	

MEMBER DISCOUNTS
A 15% discount is allowed to AEE members.
☐ **AEE Member (Member No._____)**

③ Select method of payment:
☐ **CHECK ENCLOSED**
☐ **CHARGE TO MY CREDIT CARD**
☐ *VISA* ☐ *MASTERCARD* ☐ *AMERICAN EXPRESS*

Make check payable in U.S. funds to: **AEE ENERGY BOOKS**

CARD NO.

Expiration date *Signature*

④ Send your order to:
AEE BOOKS
P.O. Box 1026
Lilburn, GA 30048

INTERNET ORDERING
www.aeecenter.org

TO ORDER BY PHONE
Use your credit card and call:
(770) 925-9558

TO ORDER BY FAX
Complete and Fax to:
(770) 381-9865

INTERNATIONAL ORDERS
Must be prepaid in U.S. dollars and must include an additional charge of $10.00 per book plus 15% for shipping and handling by surface mail.

and organizations about the program opportunities, answer program questions, offer technical assistance with respect to energy efficiency and renewable energy, and assess the potential value of providing additional program services for that client.

Level 2: Energy Audits

SEDAC performs preliminary energy audits on businesses that request that service. The audits include a review of any existing plans for scheduled construction or renovation, or in the case of existing facilities, a site visit and consultation is conducted. When the building is still in the pre-construction phase, SEDAC reviews the engineering plans and provides recommend approaches to enhance energy efficiency. The results are suggestions for project engineers, architects, and other stakeholders for how to develop and incorporate innovative and efficient design techniques and elements.

For each project, SEDAC analyzes the building usage requirements and general building characteristics, then provides a ranked set of energy cost reduction measures (ECRMs). Once the energy audit is completed and the potential for energy savings determined, SEDAC evaluates the benefit of a complete design assistance process and provides recommendations to the program participant.

SEDAC performs a four step energy audit. Step 1 of the site visit includes surveys of the building envelope (non-energized systems) and all energy-using equipment (energized systems). The next step is a review of the energy users in the building and how they impact consumption (human system).

The third step is a review of the energy bills and rate structure. The process is to assemble at least one year of consumption data for each type of energy used. Then an energy usage spreadsheet and plots of the data are created. Also, the energy usage is related to weather and product output. The goal is to investigate suspicious trends such as summer natural gas usage, winter electrical usage, or usage spikes. Finally, we determine overall $/kWh cost, overall $/therm cost, and benchmark (dollars/sf and Btu/sf) as necessary. The benchmarks are compared with ENERGY STAR Target Finder or USDOE Commercial Building Energy Consumption data (CBECs).

The last step is to identify energy efficiency opportunities. For an audit, we have a standard set of opportunities that we review, plus any unique items like process loads in the client's building. For instance,

we find most grocery and convenience stores benefit from refrigeration efficiency options.

Level 3: Design Assistance

This level of assistance involves a more in-depth building analysis than the energy audit and includes four steps:

- Energy simulation modeling, differential energy calculations, or comparable spreadsheet calculations of the facility.
- Evaluation of individual and resultant energy cost reduction measures (ECRMs).
- A life cycle cost analysis that identifies specific energy cost reduction measures and their potential savings and investment parameters.
- A final feasibility report.

The SEDAC staff or contract design assistance experts are engineers, architects, and design experts skilled at designing and implementing energy efficient construction techniques. These experts can review bid documents, complete and/or review life cycle cost analyses, and provide assistance with a variety of design and other project documents. SEDAC also provides training to other partners, including architects, engineers, and contractors such as HVAC contractors and geothermal well drillers. When geoexchange systems are specified, SEDAC enlists the services of nationally recognized geoexchange design experts, engineers, and architects capable of incorporating the technology into a variety of heating and cooling applications. SEDAC staff and contractors only assist the local engineer and project staff on select aspects of system design that affect overall energy efficiency and performance; they do not actually design the system or replace the local engineer. Program applicants will have complete control over personnel decisions that affect a particular project.

Level 4: Follow-up

SEDAC provides clients with Level 4 services based on their need or when the participant meets obstacles to the implementation of the recommended energy efficient technologies. This is an important element of the program, since the ultimate goal is to implement energy efficiency improvements in order to realize the potential savings. Both

Level 2 and Level 3 program participants may also receive Level 4 services. These services include guidance on financial options, bids, specifications, contractor relationships, and other services as required for implementation of energy efficiency improvements.

DESIGN ASSISTANCE RESULTS

After surveying hundreds of commercial buildings, we have noticed some consistency in the energy cost-saving opportunities. The general categories are lighting, HVAC controls, energy conversion system efficiency, insulation levels, windows, air sealing, heat recovery, and control of ventilation systems.

Lighting options in existing buildings consist mainly of conversion of T-12 fluorescent and high pressure sodium lighting to T-8 fluorescent lighting with electronic ballasts and automatic controls. We find that Super T-8 systems can produce energy savings as high as 40%. Another abundant lighting option is replacing incandescent lamps with compact fluorescent lamps. New building designs benefit from more efficient fixtures, better layouts, and motion detectors.

Many buildings either do not have programmable thermostats or have installed ones that are not used effectively. Owners are taught how to program and use them.

Many older buildings lack sufficient insulation levels by today's standards and suffer from improper placement of insulation and lack of vapor barriers. These buildings also tend to have high levels of infiltration and benefit from air sealing. Most new designs tend to be minimum code and would benefit from higher insulation levels.

Both new designs and older buildings benefit from high efficiency boilers and furnaces. We recommend sealed combustion units, which utilize outside air for combustion. The same goes for gas-fired unit heaters. Also, radiant heating is an excellent retrofit for areas of high air turnover and open doors, such as auto repair facilities. If replacing air-conditioning, we recommend selecting a new unit with SEER of 14 or EER of 11 or greater.

For window replacement in older buildings, we recommend selection of Low-E types, with a U-factor of 0.35 or less. For new buildings, we recommend a U-factor of 0.35 or less and a SHGC of 0.4, unless there is a shading device.

Most older and new buildings do not have heat recovery. We recommend the consideration of enthalpy wheel-type ventilation heat recovery systems where exhaust flows are above 4,000 cubic feet per minute. Also, most buildings lack control of the ventilation system. In retail spaces and other spaces with highly varying occupancies, we recommend the application of demand-control ventilation. For other types of buildings, we recommend the ability to schedule ventilation rates and ventilating only when the building is occupied, or in proportion to the number of occupants.

PROGRAM OUTREACH

SEDAC conducts a marketing communication and public awareness campaign to general members of the public, industry professionals, mass media outlets, and the trade press for article placements. This is composed of press releases, newsletters, case studies, niche market materials, a website, and informational talks and briefings.

Press releases are released by SEDAC directly to local media, through the University of Illinois and through the Illinois Department of Commerce and Economic Opportunity. Project staff pitch story ideas to small business-related magazines and newspapers, association newsletters, and regional publications that report on local economic growth and business opportunities. Project accomplishments are announced to attract publicity and generate additional program interest.

The SEDAC publishes a monthly newsletter highlighting program activities, announcing schedules and calendars, and describing sucesses in the program. There are articles focused on outreach to niche markets targeted by the SEDAC, along with general interest, energy-related topics.

SEDAC also develops case studies and technical notes to publicize program successes and provide technical information to the design community. These are posted on the SEDAC website and included in information available for dissemination.

Marketing and educational materials for client awareness and practitioner knowledge development have also been developed. The niche market materials address energy efficiency for special sectors of the business economy where SEDAC feels market opportunity exists and assistance can be effective. These are niche markets such as hotels,

restaurants, convenience stores, water treatment plants, ice arenas, and retail facilities.

The SEDAC Information Center accommodates requests for further information from the public and disseminates energy publications authored by the EPA and DOE as appropriate and makes them available on the SEDAC website. Audiences include Illinois businesses, architects, engineers, contractors, planners, students of architecture, and other interested members of the public. The team also makes maximum use of the website to provide a medium for dissemination of electronic information, including newsletters; updated calendars and training schedules; technotes and case studies; and other relevant electronic information. The website acts as an information clearinghouse for energy-related news and guidance. SEDAC also maintains a toll-free line and email-response capability through the website interface. The website includes a financial analysis tool that provides clients with the ability to calculate cash flow analyses, internal rate of return (IRR), and the net present value (NPV) of energy efficiency projects. SEDAC also delivers presentations on the availability and results of the program at numerous venues throughout the state of Illinois on an ongoing basis.

PROGRAM RESULTS

As of June 30, 2009, information and support have been received from SEDAC by 1505 Illlinois businesses. These businesses have more than 43,000 employees and comprise over 20 million square feet, representing a geographical cross section of the state. Of these businesses, over 400 have received Level 2 or Level 3 reports with quantitative energy saving project recommendations. Our analysis suggests that, with a one-time investment of $81.7 million, these businesses could accrue annual energy cost savings of over $17.3 million. For a project life of 20 years, this translates into a 23.8% rate of return on investments made. At a 7% discount rate, the energy cost savings represent $107.6 million in net present value terms. From a business perspective, the recommended projects yield $364,500 in positive monthly cash flow ($1,444,700 in monthly savings minus $1,080,200 in loan payments if financed for 10 years at 10%).

SEDAC has found that energy savings range from a low of about 12% to a high of 85%, depending on the type of building and whether

or not it is a new design. The average energy savings of the building set that we have analyzed is about 32%. Energy cost savings range from 10% to 83%, with an average of 30%. It should be noted that the projects with the highest and lowest costs savings were not the same projects with the highest and lowest energy savings. Monetary savings varied considerably, either higher or lower than the energy savings. Monetary savings depended on the type of energy saved and whether or not electrical demand savings were part of the mix. Fuel switching issues also have an impact in this area.

The program cost to do the studies and analyses and recommend savings of a million Btus (MBtu) is $7. This is compared to 2009 annualized energy prices for commercial customers in Illinois of $12.53 for natural gas and $24.71 for electricity (source: U.S. Department of Energy, Energy Information Administration, 2009). In 2007, the electrical cost for commercial customers, as expected, jumped about 10% higher than in 2006 due to electrical deregulation coming into effect. Based on the energy savings potential identified by SEDAC, the client investment to save a million Btus is estimated at about $68, equating to about $2.24 per square foot. This is a weighted average between upgrading old buildings and the differential cost to upgrade new buildings. The program continues to gain momentum, and we expect that program cost metrics will continue to improve as recommended ECRMs are implemented.

Based on the clients who have identified ECRMs that will be implemented and those where the decision not to implement has been made, the SBSE Program has cost approximately six cents per therm saved, three tenths of a cent per kilowatt hour (kWh) saved, approximately $197 per kW of implemented demand reduction, or approximately two cents per dollar saved by the program. It should be noted that the total cost of design assistance is used to value the savings of each energy commodity individually; yet, actually all of the energy and demand savings will be realized for the total cost of design assistance (and the recommended ECRMs). Table 1 shows the

Table 1. Program Return on Investment

SBSE Program has saved…				
1 therm per	1 kWh per	1 MBtu per	1 kW per	$1 per
$0.021	**$0.001**	**$0.13**	**$44.50**	**$0.008**

investment return on the program.

Specifically, $3,543,000 invested in implemented energy savings divided by:

- 20 years x 8,486,333 therms = $0.021 spent per implemented life-cycle therm saved
- 20 years x 142,777,727 kWh = $0.001 spent per implemented life-cycle kWh saved
- 20 years x 1,335,796 MBtu = $0.13 spent per implemented life-cycle MBtu saved
- 34,017kW = $44.50 spent per implemented life-cycle kW saved
- 20 years x $20,394,489= $0.008 spent per dollar saved

Since it generally takes substantially more time for businesses and public entities to implement the recommended ECRMs than it takes for SEDAC to provide design assistance recommendations to additional businesses, there is a lag time for realized savings. This lag time makes it challenging to accurately assess the present value of the program investments and savings. The ultimate goal of the program is to make energy efficiency the norm in small business and public operations in Illinois. A dramatic market transformation and paradigm shift has begun, and performance indicators suggest the program is steadily producing positive results. Of the 176 clients that have reported on implementation, 84% (148 clients) have implemented or started to implement ECRMs. For those 148 clients reporting implementation, 54% of the potential MBtu savings were implemented and 51% of the potential cost savings were obtained. The difference in the energy and cost savings results from the rate structures and the type of energy saved. Also, energy cost savings occur at the marginal rate, which is generally the lowest paid.

The businesses that have received design assistance through the Smart Energy Program can potentially save 1,335,796 million Btus of energy annually. In addition to saving $17.3 million per year, the proposed energy savings of 8,486,333 therms and 142,777,727 kilowatt hours could also provide important environmental and public health

benefits, including the prevention or avoidance of the following estimated emissions:*

230,924 tons of carbon dioxide (CO_2)
640 tons of sulfur dioxide (SO_2)
311 tons of nitrogen oxides (NO_x)
35.1 tons of carbon monoxide (CO)
11.6 tons of particulate matter (PM_{10})
5.92tons of volatile organic compounds (VOCs)
14.64 pounds of mercury (Hg)

IMPLEMENTATION

The goal of the program is implementation, and although we aim for a 100% implementation rate, research and experience with similar programs has shown that the ECRM implementation rate is often between 50% and 75%. Of the 176 clients who have reported on implementation, 84% have implemented all or some of the recommendations. The program has diligently worked to improve the implementation rate over time. Having evolved and matured, the program is now managed toward higher implementation rates by selecting more committed clients and ECRMs that have a higher probability of execution.

Some or all recommended ECRMs have been implemented or started by 148 program participants. At this time, the remaining participants are planning to implement, still considering whether to implement, or have decided not to implement recommended ECRMs.

In short, 400 Illinois participants have received Level 2 or 3 reports and consultations providing detailed energy cost reduction measures. Of these, 148 clients have implemented or started to implement some or all recommended ECRMs; 89 Illinois businesses are planning to implement some or all recommended ECRMs; 135 clients are still reviewing whether to implement all or some recommended ECRMs;

*Conversion factors used to estimate emissions reductions were taken from the report "Emissions Factors and Energy Process for the Cleaner and Greener Environmental Program", April 2007 by Leonardo Academy, Inc.

and 28 clients have decided not to implement recommended ECRMs.

It should be noted that, over time, the number of clients who decide not to implement has remained rather static and is not growing with the number of clients served. Of the 28 businesses who are not implementing, 8 came from the pilot program, before client screening was more thorough. Also, two of the several building projects have been cancelled, two of the clients are out of business, and three indicated they needed grants to proceed. One client, a bank, did not implement on the project analyzed, but it fully implemented on the next branch bank that was built.

As mentioned above, businesses that have implemented or started to implement the recommendations have garnered only about 54% of the potential savings. A review of the types of implemented projects indicates that they lean towards the no-cost and lower-cost options. Most businesses have indicated a desire for monetary assistance, either in the form of grants or low-cost loans to help them with implementation. Illinois is progressing in this arena with the EEPS program (in which electrical incentives are now available and natural gas incentives will start in 2011) and the Recovery Act monies becoming available in the form of block grants to cities and state energy program (SEP) enhancements. The lack of available capital is hindering clients from obtaining greater energy savings, even though the return on that investment surpasses their business hurdle rate or the returns required for public sector initiatives.

CONCLUSIONS

According to the U.S. Department of Energy, annual energy expenditures in the state of Illinois have now reached over $48 billion dollars. The state's commercial building sector is responsible for a large percentage of this expense. Among the policy initiatives and strategies aimed at decreasing this burden on Illinois small businesses and tax payer supported entities is the Smart Energy Design Assistance Center. The program is designed to enhance Illinois energy efficiency, thereby reducing bottom-line costs and improving economic competitiveness and viability. The program provides a centralized mechanism for Illinois businesses and public entities to obtain energy conservation information, energy audits, detailed energy simulations, and direct

implementation assistance on energy conserving design alternatives and their potential for financial return. This unique program has been successful at identifying an overall energy savings potential of 1.34 trillion Btus, with a cost of over $20 million. The implemented savings for the clients in the state who have taken advantage of the services are over 217,000 million Btus of annual energy and over $3.5 million per year. These energy reductions translate directly to additional social and environmental benefits, including reductions of carbon dioxide, sulfur dioxide, nitrogen oxides, and carbon monoxide.

While the immediate and short-term economic and environmental benefits of the program are clear, the long-term educational benefits of SEDAC are also important to note; their inclusion makes the Center a unique and nationally significant entity. Education and training is a key component of SEDAC. Professional development courses, direct training opportunities for students and professionals, and university classes are critical in teaching and spreading information on energy conserving alternatives.

The word of mouth success of SEDAC has shown that both businesses and the public sector in Illinois are interested in energy savings and improving bottom lines through energy conservation. Their interest and willingness to participate and invest in the recommended technologies have improved progressively over the term of the program. A general lack of available capital, however, hinders an even greater success in implementation for clients. Small businesses, by definition, typically lack the capital required to make needed improvements. The current set of incentives, such as business tax deductions or tax credits for renewables and other technologies in the Energy Policy Act of 2005, have not proven sufficient to spur energy efficiency investments on a large scale. It appears that the impediments to saving energy might be too large and the monetary rewards too small for small-scale business owners and the public sector. Recovery Act-funded programs, along with energy efficiency portfolio incentives should amplify the potential and provide the stimulus towards further savings.

The impediments to expanding and sustaining single-focused energy programs such as SEDAC are numerous. Many business owners lack a fundamental understanding of their enterprise's energy consumption and may not understand the need to improve it—nor its potential for return. This might keep many business owners from seeking assistance in the first place. Since they are not well versed in the

process of saving energy, some have expectations that do not fit with reality. Many are seeking a magic bullet to lower their costs and are disappointed to find that energy saving strategies are a combination of many small things that add up to a larger whole. Small businesses are also apt to occupy small buildings, limiting the potential savings opportunities simply by the small scale of the implementation.

The Illinois Smart Energy program is unique in the nation. It is a relatively new program, having started in 2005, and has taken time to establish its presence and inform small businesses and the public sector of the available services. It remains, however, that clients who have implemented energy costs reduction measures recommended in SEDAC reports are obtaining about 54% of the recommended savings—a vast improvement over pre-SEDAC energy usage and cost.

References

1. www.census.gov
2. www.eia.doe.gov
3. http://factfinder.census.gov/

Acknowledgements

The author would like to acknowledge the Illinois Bureau of Energy and Recycling at the Department of Commerce and Economic Opportunity for its support and funding of SEDAC. The author also acknowledges Ameren Illinois Utilities and Commonwealth Edison for their support of the Public Sector Energy Program in the state of Illinois and their alliance with SEDAC in carrying out the energy programs.

ABOUT THE AUTHOR

Donald Fournier is the chair and a senior researcher at the School of Architecture's Building Research Council. He is also the managing director of the Smart Energy Design Assistance Center (SEDAC). Don is a graduate of the University of Massachusetts (BS.EE & MS.ME) and has thirty-five years of experience in the energy and environmental areas; he performs research and consults in the areas of sustainable design and development, green building, strategic sustainability assessments, strategic energy planning and energy security, tribal energy, energy efficiency, and energy management.

Don's avid participation with the United States Green Building

Council has included membership on the LEED Steering Committee, chairing the Multiple Building Projects Product Committee, membership of the Energy and Atmosphere Technical Advisory Group, and chairing the Combined Heat and Power and District Energy subcommittees. He was the U.S. delegate to the International Energy Agency's (IEA) Annex 31, the Environmental Impact of Buildings, and he has been a member of IEA's Future Buildings Forum, the Governor's Green Building Advisory Group, the American Planning Association's Energy Policy Task Force, and the Clinton Climate Initiative Resource Group.