REPORT ON THE COST EFFECTIVENESS AND PROGRESS OF THE SUSTAINABLE BUILDING 2030 STANDARDS

Report to the Minnesota Legislature

Submitted Pursuant to

Minnesota Statute §216B.241, Subd. 9

Office of Energy Security

Minnesota Department of Commerce

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Introduction:

This report is in fulfillment of the Minnesota Statute 216B.241 subd. 9. That statute requires a report on the cost-effectiveness and progress of the Sustainable Building 2030 standards (SB2030). Per the same statute, an implementation plan was submitted to the Legislature in July 2009; the program will be in place and starting in July 2010.

Based upon the work to date, the conclusion is that SB 2030 is cost-effective when meeting the 2010 targets, which is the first phase of the SB 2030 program.

1) History of the Sustainable Building 2030:

In the spring of 2008, the governor signed into law Chapter 278, which provided for the Minnesota Sustainable Building 2030 (SB 2030) standards. The law designated the Center for Sustainable Research (CSBR) at the University of Minnesota as the lead to develop a Minnesota program reflecting the goals of the national *Architecture 2030* program. *Architecture 2030* outlines specific performance targets for energy use in buildings until 2030. Every five years, the total carbon emissions due to energy use in buildings is to be reduced an additional 10% starting in 2010 at 60% and ending in 2030 as a 100% reduction (net zero carbon). This is compared to the average energy use of building in Minnesota in 2003.

The legislation requires CSBR, in cooperation with the Minnesota Department of Commerce, to "establish cost-effective energy-efficiency performance standards for new and substantially reconstructed commercial, industrial, and institutional buildings that can significantly reduce carbon dioxide emissions by lowering energy use in new and substantially reconstructed buildings."

All program elements are to be based on scientific or real world experience in building energy conservation, and all buildings are to be scientifically benchmarked and real reduction in energy consumption measured.

The energy standards for all types of buildings are to be comprehensive, reliable and equitable and provide procedures for the ongoing monitoring of energy use in the buildings that have adopted the performance standards. The legislation also requires that utilities develop and implement programs that help building owners achieve the energy savings goals through design assistance, incentives and verification.

Finally, continued education and training programs for Minnesota designers, engineers and building operators are fundamental to the initiation of the SB 2030 standards and the legislation made education and training a primary goal.

2) Cost-Effectiveness of the Sustainable Building 2030:

The significant improvements in building performance that are called for by the SB 2030 energy performance standards are required to be achieved in a cost-effective manner. Projects and activities are generally thought to be cost-effective if the project or activity results in a net benefit to the consumer or society. In the case of utility administered conservation programs benefits are based on the energy savings over the assumed lifetime of a particular measure. Since the State of Minnesota first began regulating utility programs for saving energy in buildings in 1982, it has established standards, based on industry standards, for evaluating the cost effectiveness of utility programs that save energy in buildings.

In preparation for the Minnesota Sustainable Building 2030 Phase One and Two/Year 1 Report that was submitted to the Legislature on July 15, 2009[1], the Center for Energy and the Environment (CEE) performed preliminary Conservation Improvement Program (CIP) program style cost-effectiveness analysis on a set of 115 buildings in the region that participated in similar design assistance programs and achieved savings of the same order of magnitude expected with the soon to be established Sustainable Buildings 2030 energy performance standard.

Significant assumptions and conclusions from this effort were as follows:

- Energy savings, added costs and utility program rebates were based on the design alternative chosen by the design team
- All other assumptions were chosen to be as representative as possible of current utility program analysis assumptions used in Minnesota.
- All of the building projects across a wide variety of building types were found to have a net benefit to society over an assumed 20 year life.
- When the economics of only the building owner were considered, 94% of the building projects are cost-effective over the same 20 year life-cycle analysis.

The most notable of the above findings is that the review found that for 94 percent of the buildings analyzed, any additional up-front cost yielded enough energy cost savings to make it a cost-effective investment for the building owner. This initial review shows that the energy performance level called for by the SB 2030 standards can be achieved cost-effectively for the overwhelming majority of building types and situations. The projects that did not achieve the energy savings cost-effectively tended to be buildings with special circumstances or limited operating schedules, such as religious buildings and sports facilities.

[1] This document is available online through the Minnesota Legislative Reference Library at http://www.leg.state.mn.us/docs/2009/mandated/090892.pdf

Anticipated increases in utility program incentives will improve the building owner cost-effectiveness, which is expected to result in an even higher percentage of projects that will be able to cost-effectively achieve the SB 2030 energy performance standards.

State-Bonded Project Cost Effectiveness

Based on the analysis noted above, the achievement of the SB 2030 energy performance standards will be cost effective for the vast majority of state-bonded building projects. Additionally, waivers will be granted for the small minority of projects that cannot meet the SB 2030 standards cost-effectively. The waiver process will ensure that the SB 2030 standards do not mandate upgrades that are not cost-effective for any state-bonded projects. Such waivers will be granted after a project team demonstrates that appropriate energy saving design options were investigated in an effort to achieve the SB 2030 performance level but that the design options are not cost-effective for the particular project.

Voluntary Program Participant Cost-Effectiveness and Utility Program Impact

Financial incentives from utility-sponsored energy savings programs (i.e., Conservation Improvement Programs [CIP]) will be important for making the up-front investments in energy performance improvements more attractive for entities that choose to follow the SB 2030 standards voluntarily (i.e., owners of projects that are not state-bonded). While the state-defined 20 year lifetime financial analysis of building owner economics found the great majority of projects to be cost-effective for the owner over the long run, the reality is that decisions by most institutions are primarily driven by shorter economic planning timelines. Fortunately, many utilities have programs that provide technical services and/or financial incentives that make it easier for building development teams to achieve significant energy performance improvements that are cost-effective over a much shorter planning timeline. The level of financial incentives for a number of utilities increased at the start of 2010, and it is anticipated that even higher levels of support will be provided for projects meeting the SB 2030 standard. The language of the legislation requires that utilities address the SB 2030 standards within their programs. Moreover, the evaluation of 115 sample buildings in the region suggests that energy saving programs will still be very cost-effective to utilities with significantly higher financial incentives to customers. Such increases in financial incentives are expected to both provide a more even balance in economic benefits between building owners and utilities, and help utilities meet their aggressive goals for energy savings by increasing program participation as well as the level of savings achieved per project.

3) SB 2030 Program Progress:

Efforts thus far have focused on the development of the tool that will be used to establish customized Energy Standards, development of the administration of the program, case study development, research on types of education classes for designer and building operators, integration of SB 2030 with the utilities' CIP programs (see below) and assisting design teams in the integration of the SB 2030 Energy Standards into pilot projects.

The initial Energy Standards for all new building types were established in July 2009. Currently these Energy Standards are being developed into a web based tool so that designers and building owners can quickly determine their Energy Standard. This tool will allow for setting a customized energy target based on the special circumstances of each projects such as hours of operation, climate zones and space types.

Additional efforts have been made to develop the administrative portion of the program to make it intuitive and helpful for the designers and building operators. Currently there is not an actual operating *Architecture 2030* program to replicate, so all procedures for the SB 2030 program have to be developed. Minnesota is one of the national leaders in the implementation of the program based on the *Architecture 2030* program. Prior experience and close coordination with the *Minnesota Sustainable Design Guideline (MSBG)* program has been essential in developing the procedures. As the statute requires, the *Minnesota Sustainable Building 2030* program will mesh seamlessly with the MSBG. However, additional tools are being developed to assist designers with accurate energy modeling to ensure that the SB 2030 Energy Standards are continuously met throughout design, construction, and operations.

In addition to developing the standards and providing education, the SB 2030 team has continued to evaluate actual projects and their performance compared to the standards. At the end of the first year, the performance of ten case studies was documented. These were all projects designed between 1997 and 2006, long before the standards were in place. A 2030 Energy Standard was calculated and actual energy usage was documented for each project. On average, they are operating within 5% of the 2010 target specified in the 2030 Energy Standard. This indicates that the Energy Standards are feasible to attain for the design and building industry. The construction cost per square foot for a similar non SB2030 building was independently calculated and compared to the actual construction cost for the ten SB2030 documented case studies. The SB2030 construction costs were within 1-2%+ of the expected non SB2030 building cost on average. Since the beginning of this year, two additional case studies and ten new pilot projects have been added. Pilot projects are in the design phase at this point and are using SB 2030 as a design tool. The same depth of information (approximately 30 pages of data) is being tracked on each of these projects. It is already apparent how much easier the data is to collect in real time than going back to retrieve after a project is complete.

As the SB 2030 energy performance standard is implemented, the project team is working cooperatively with utilities to develop and/or modify CIP programs to encourage new buildings to meet the SB 2030 standards. As noted previously, the language of the legislation requires that utilities address these standards with their programs. The work with utilities will help them optimize their program designs and support their efforts. The first step in the SB 2030 utility program work was the review of innovative and effective new construction utility conservation programs from around the country to determine what program elements could be effectively applied in Minnesota. A number of innovative program elements were identified—such as a whole building performance standard for small buildings (used in Wisconsin and several Eastern states) and higher per unit incentives tied to meeting a green building standard (used in California, New York and several other states). The team has discussed a list of program ideas and current programs with a number of key utilities, and they have reacted with interest to a number of the program approaches. Moving forward, the most critical utility conservation program aspects that will be encouraged and supported are:

1) Comprehensive design assistance services,

2) Bonus incentives (per unit of savings) for achieving SB 2030 standards, and

3) Establishing a comprehensive whole-building performance program for small buildings that is based on the achievement of low total building energy use rather than the promotion of specific, individual energy savings features.

Since the official beginning of the SB 2030 program in August 2009, eight pilot projects (6 required and 2 volunteer) have started incorporating the SB 2030 Energy Standards into their projects. Each of these projects is early in the design phase and special assistance is being offered to help them successfully meet the program requirements by July 2010. The design teams will be contacted for these projects in an attempt to track the same level of information as the detailed case study projects mentioned above.

4) Next Steps:

Educational programs for the designer and building operators are being developed with the inputs of the user groups. Interviews were conducted with design and building operator organizations over the fall months to determine the specific needs of each. Each organization is interested in the SB 2030 programs. The educational programs will not only reflect the requirements of the SB 2030 program but also the needs of the designers and operators and the tools to successfully implement these requirements. These educational programs will be offered as pilots during the spring of 2010 and then rolled out to the general public and design organizations during the fall of 2010.

SB 2030 tracking and recording procedures have been developed and will be implemented to ensure that SB 2030 participants are meeting the requirements of the program. Each participant is required to record building energy usage and compare it against the SB 2030 Energy Standard for the building at all stages of design and annually during occupancy.

Most utilities held off on detailed discussions of program changes during the second half of 2009 while CIP program filings for 2010 – 2012 were under review. During this time, the project team has researched and further developed alternatives for dealing with the challenges of the small building design and development process. Now that the CIP program filings have been reviewed and approved, the team is resuming discussions with utilities about the development of pilot CIP programs and/or formal CIP program modification filings tied to the SB 2030 standards, as well as services and financial incentives for pilot SB 2030 projects that can be provided through existing CIP programs.

Conclusion:

Progress is being made on all tasks required to implement the SB 2030 program; the program will be in place starting July 2010. All work on the standards completed to date shows that it is cost effective to meet the 2010 target which represents the first stage of the SB 2030 program. Work will continue on the next stages of the SB 2030 program and, as required by statute, another report regarding the cost effectiveness of the standards and the progress of the program will be made to the legislature in 2013.