A White Paper on Building for Platinum LEED Certification

The planning, design and construction of Great River Energy's headquarters building in Maple Grove, Minn.

By Great River Energy
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Contents

Prologue

On April 22, 2008, Great River Energy, an electric generation and transmission cooperative, dedicated its headquarters office in Maple Grove, Minn. Designed to be the most energy efficient building possible, the structure was awarded Platinum LEED-NC V2.2 certification on Sept. 26, 2008, the first building to achieve such recognition in Minnesota.

The Leadership in Energy and Environmental Design (LEED) Green Building Rating System is a set of criteria established by the U.S. Green Building Council (USGBC) to encourage and accelerate global adoption of sustainable green building. LEED is a third-party certification program and the nationally accepted benchmark for the design, construction and operation of high performance green buildings.

A high performance building is defined by the U.S. Office of Energy Efficiency and Renewable Energy as one with energy, economic and environmental performance that is substantially better than standard practice[1]. The U.S. Environmental Protection Agency (EPA) defines a green building as a structure that is environmentally responsible and resource-efficient throughout its life cycle[2].

Great River Energy headquarters was evaluated by the USGBC based on the LEED for new construction version 2.2 (LEED-NC V2.2) rating system, which tallies a cumulative score based on a 69-point scale. The rating system is as follows: Platinum, 52+; Gold, 39-51; Silver, 32-38. Great River Energy received 56 points and is currently pursuing an additional two points.

Project teams interested in obtaining LEED certification must satisfactorily document achievement of all the prerequisites and a minimum number of points. LEED recognizes performance in six key areas of human and environmental health: sustainable sites, water efficiency, energy and atmosphere, materials and resources, indoor environmental quality and innovation in design.

[1] http://www.eere.energy.gov/buildings/highperformance/design_approach.html
[2] http://www.epa.gov/greenbuilding/pubs/faqs.htm#1

1 Executive summary

1.1 A letter from the CEO

Dear Friends,

Great River Energy has been one of the fastest growing electric utilities in the Upper Midwest over the past 10 years. We serve two-thirds of the geographic area of Minnesota, from the northeast Arrowhead, to the farmland of the southwest, from the Twin Cities, to the North Dakota border.

Owned by 28 member distribution cooperatives, it's our job to continually plan for those members' future energy needs, balancing rates, reliability and environmental stewardship. But the past few years have been particularly challenging in planning for new generation to serve our members.

First, there are escalating financial and environmental costs of building large-scale generation facilities.

Second, policymakers are setting new goals to reduce energy consumption and reduce greenhouse gas emissions. In Minnesota, the Next Generation Energy Act of 2007 requires that every utility achieve annual energy savings equal to 1.5 percent of its gross annual energy sales, beginning in 2010. On a national level, the newly elected president and Congress promise to reduce carbon dioxide emissions and promote renewable energy through new energy legislation.

At Great River Energy, we know the cheapest—and cleanest—kilowatt-hour is the one we don't have to produce. So conservation and energy efficiency have become our "first fuel." Because our customer base is largely residential, one of the best places to begin is in building construction. The more efficiently we build new homes and businesses, the less energy they use and the longer we can delay building expensive new power plants. And because we're a utility that believes in taking its own advice, we decided to set an example when we designed and built our new headquarters building in Maple Grove, Minn.

From the beginning, we told our architects at Perkins + Will that we wanted to build a state-of-the-art building in energy efficiency, sustainability and conservation that includes at least one innovative design feature that has never been done before. We wanted the building to contribute to the advancement of sustainable green building and be an educational tool for others to see how easily—and relatively inexpensively—these technologies could be applied. We wanted our commitment to renewable energy to be visible to even the most casual passerby. Last but not least, we wanted to dispel the notion that energy efficiency and conservation mean sacrificing beauty, functionality or

practicality. Finally, we wanted our building to be a place people want to visit, and a building that employees love coming to every day.

It has turned out to be all that and more.

The 166,000-square-foot building was designed to use approximately 50 percent less energy than a comparable facility built to state code requirements and approximately 90 percent less water than a similarly sized corporate campus. It features an in-lake geothermal HVAC system, in-floor displacement ventilation, daylight harvesting, 72 kilowatts of on-site solar panels and a 200-kilowatt wind turbine. We accomplished all of this for an incremental cost of less than 10 percent more than a conventional corporate headquarters of the same size.

And it is beautiful.

In October 2008, Great River Energy's new headquarters building was honored by the USGBC with its highest designation—Platinum LEED certification. We received 56 LEED points, four more than required for Platinum LEED certification, and our building is one of fewer than 100 worldwide to receive this designation.

During the first six months we occupied this building, more than 6,000 people toured it, learning about the innovative design, energy efficiency and conservation. Other businesses are asking how they can build or renovate their buildings to adopt many of the sustainability features. Our customers and the communities we serve see that asking them to conserve energy is nothing more than we have asked of ourselves.

We're proud of this building and the example we've set. We believe Great River Energy's headquarters building represents no less than a blueprint for the future.

David Saggau
President and CEO
Great River Energy
March 2009

1.2 Why does an energy company care about conservation?

Great River Energy is the second largest electric power supplier in Minnesota and the fifth largest generation and transmission cooperative in the United States in terms of assets. It provides wholesale power to 28 distribution cooperatives in Minnesota and Wisconsin that distribute electricity to approximately 1.7 million people. Its mission is to provide members with reliable energy at competitive rates in harmony with a sustainable environment. Great River Energy provides power to many farms and other customers who depend on a healthy and fruitful planet, and they rely on their electrical utility to keep it that way.

That's why Great River Energy distributed $7 million in energy efficiency rebates in 2008. Energy conservation programs saved Great River Energy and its member cooperatives nearly 67,000 megawatt-hours of electricity in 2007.

Great River Energy is furthering its energy generation by increasing the amount of renewable generation in its portfolio. According to the American Wind Energy Association's 2007 ranking, Great River Energy purchases and sells more wind energy generation than any other electric cooperative in the United States.

Great River Energy's reputation as an innovator is due in large part to its willingness to experiment with new technologies and processes. At Coal Creek Station, a Great River Energy coal-based power plant, waste heat from coal combustion is used to refine coal before it's burned. By reducing moisture content in the refining process, less coal is required to generate the same amount of electricity – leading to increased plant operations and lower emissions.

Great River Energy sells more wind-generated energy than any other electric cooperative in the United States.

As a member-owned electric cooperative, Great River Energy upholds the values held by those who buy its product. Those values are reasonable rates, reliable service and environmental stewardship. Great River Energy's headquarters exemplifies all the things that must happen to uphold those values.

1.3 Why build Platinum LEED?

1.3.1 It just makes sense

Anyone can build a Platinum LEED building with an unlimited budget. One of the most important goals of Great River Energy's headquarters building was to show that a building can be energy efficient without being cost prohibitive. The building is revolutionary, yet undeniably practical.

Great River Energy's headquarters building is a competitively and efficiently built Class A building. The building cost less than 10 percent more than a comparable high quality corporate headquarters building would have cost using traditional construction methods.

The building proves that there is no longer any reason *not* to build sustainable structures. Great River Energy has promoted the importance of energy efficiency for years, but consumers' behavior hasn't changed dramatically. The building displays the benefits of energy efficiency, sustainability and conservation, but the true measure of success will be its effect on future behaviors. As the country grows, developers must look to LEED certified buildings for ideas on how to grow smarter.

Great River Energy's headquarters is a model of ways to use energy more efficiently and a signal that traditional construction methods must be improved. Since construction was completed in April 2008, thousands of people, ranging from architects and builders to curious area residents, have toured the building and learned about its sustainable features. Not everyone will build to Platinum LEED level, but if people can learn one or two ways to save energy from the building, the energy savings down the road will be invaluable.

1.3.2 Growing in an informed, considerate manner

In the United States, buildings account for 68 percent of total electricity consumption and 38 percent of carbon dioxide emissions[3]. To meet the demand for housing in 2030, nearly 60 million new residential units will need to be built[4]. Development doesn't need to slow or cease; it simply must unfold thoughtfully.

Building a cutting-edge office is Great River Energy's contribution to the construction industry's advancement and maturity. There are simple energy-saving methods used in the building that can be applied to all future development, including both homes and

[3] http://www.epa.gov/greenbuilding/pubs/whybuild.htm
[4] Nelson, Arthur, "Toward a New Metropolis: The Opportunity to Rebuild America," (The Brookings Institution Metropolitan Policy Program, December 2005). v.

businesses. Each one reduces greenhouse gas emissions and helps ensure a reliable flow of energy in the future.

1.3.3 Less energy, less infrastructure

In May 2008, Cambridge Energy Research Associates published research that found the costs of building new power plants had more than doubled since 2000[5]. And a majority of the increase occurred after 2005. Environmental and regulatory considerations aside, the cost of new generation resources will cause significant increases in energy price.

The escalating costs of power plants, such as Great River Energy's Coal Creek Station, are increasing the value of conservation.

Wind generation showed the largest increase in cost between 2000 and 2008 in response to increased demand for wind turbines. In the same timeframe, the cost of natural gas-fired power plants increased 92 percent and coal-fired power plants increased by 78 percent. Though the costs of natural gas- and coal- fueled generation have increased the least, impending carbon legislation is an unknown cost that will soon make them considerably more expensive.

By each of us using less energy, the need for new generation facilities is reduced. Great River Energy knows that the cleanest and cheapest kilowatt-hour is the one that it doesn't need to produce, so it is vital that consumers use less energy. There are enough opportunities to conserve energy to delay the need for new power plants and other energy infrastructure without sacrificing quality of life.

[5] http://energy.ihs.com/News/Press-Releases/2008/IHS-CERA-Power-Capital-Costs-Index.htm

1.4 Energy efficiency's payback

A major roadblock to the widespread adoption of energy efficient building practices is sticker shock. Because the technologies used are new and often not mass produced, they come with higher up-front costs. However, there are long-term financial benefits generated by lower energy bills and, in time, incremental costs are recouped with paybacks.

Traditional construction involves seeking vendors who will perform a task at an affordable price and within the requirements of the construction schedule. Often, the lowest bid is selected in an effort to lower up-front costs and effectively manage the construction budget. Building high-efficiency structures requires more thoughtful consideration with respect to subcontract selection, and the cost and quality of building materials. When assessing the cost of a building, the cost can't be measured from the first shovel to the final nail. It must be calculated from the start of construction to the end of the building's life.

Paybacks were a factor in every decision concerning Great River Energy's headquarters building. Without convincing calculations to back them up, this building would not have been built.

2 Designing the building

2.1 Identify the design drivers

If there is one reason why this ambitious project was successful it is because every decision was influenced by a single goal: to build the most energy efficient structure possible.

Great River Energy CEO David Saggau emphasized the building had to be a model of energy efficiency and sustainability that would serve as a learning tool on how to build the right way. As an energy company, Great River Energy focused specifically on energy conservation in the design. To make the building a monument of conservation, energy efficiency was the top priority in every decision.

When designing a building for LEED certification, it's vital that priorities are clearly defined. A project like the Great River Energy headquarters building – one that introduces new technologies, materials, and construction means and methods – can reveal unforeseen consequences that can complicate what are often routine decisions. By identifying and defining the most valued priorities, barriers can be overcome by relying on a set of previously agreed upon guidelines partnered with viable information from contractors and suppliers to make decisions.

2.2 Select the right partners

The first step in the building of a Platinum LEED certified building is to assemble an internal team that understands all the parts of the process. “We started by assembling a core team that understood what it takes to successfully complete an ambitious project,” said Great River Energy Director of Business Operations Mike Finley. “You need to engage all the disciplines in a way that creates synergies in the project.”

Finley selected a team of employees who understood the vision of the project and the importance of the project’s three major goals and how they directly affect the company’s bottom line:

- Drive new construction toward sustainability
- Expand environmental stewardship
- Achieve Platinum LEED certification

Once the internal team was assembled, team members set out to find an owner’s representative, architect and general contractor that understood Great River Energy’s goals and showed passion for the project. As an added measure, a subcommittee of the Great River Energy board of directors was also assembled to evaluate decisions and determine the best options for the company and its 28 member cooperatives.

Great River Energy interviewed three owner’s representative companies and selected the Minneapolis-based Tegra Group due to the organization’s experience building corporate campuses in the Twin Cities area. Tegra Group also appealed to Great River Energy leaders by laying out a plan to keep the ambitious project on budget. Sticking to a budget was much more than just a financial goal for Great River Energy – it would achieve the project’s goal to stand as an example of the practicality of building for LEED certification. The owner’s representative also helped establish criteria for assessing partners to ensure the architect, builder and everyone who worked on the building understood and was committed to the vision – and had the experience to make it work.

An owner’s representative is a particularly necessary partner when building for LEED certification because of its understanding of the approvals and partners needed to introduce new construction concepts. Tegra’s history of successful partnerships with civic leaders was valuable on a project like Great River Energy’s headquarters building because it was so vastly different than any construction projects in the area.

Perkins + Will, a global firm with a Minneapolis office, was named the architect on the project because of the company’s experience with high-performance buildings and willingness to design a cutting-edge structure. The firm also worked with a process called “integrated front-end loaded design” that solicited feedback and input from employees throughout the design and construction phases. This process closely matched the way Great River Energy conducts business by valuing everyone’s input. The

alignment of cultures between Perkins + Will and Great River Energy sparked a synergy that drove the project.

McGough Construction of St. Paul, Minn., was selected as the general contractor due to its commitment to sustainable building practices, roster of LEED accredited professionals and track record with energy efficient buildings.

Gathering a team that communicates well and is willing to collaborate is necessary when constructing a LEED certified building. The USGBC assesses projects from concept to completion, so any miscommunication between partners could cost valuable LEED points. Essentially, when several teams are brought together to build a LEED certified building, they must become one unified group, rather than a complementary collection of specialists.

2.3 Devise a conceptual design idea

Site selection had been completed before the design team was hired, so Perkins + Will and the firm's engineering partner, Dunham Associates, identified the best opportunities for LEED points on the site. They settled on two that would drive the building's efficiency: daylight harvesting and lake-source geothermal displacement heating and cooling. With these defined, the building began to take shape. Two major design concepts were identified as the best opportunities to achieve the building's ultimate goal: to be as energy efficient as possible.

Those two opportunities were not maximized by one or two features of the design – they were a consideration in every design element. For example, daylight harvesting was an influencing factor in everything from the height and material of work area walls to the color of the roof. Since several features were all pointed toward a common goal, the designers took a holistic approach to the building.

The building was designed as a collection of interwoven systems, each enhancing the success of others. Perkins + Will along with the mechanical engineers at Dunham Associates collected data on a matrix that outlined every design option and its effect on energy efficiency and cost. This allowed the team to take a cost-benefit approach and select features that both achieved LEED points and increased efficiency.

2.3.1 Daylight harvesting

The building is deliberately designed with a long axis running east-west. This allows most of the glass to face north and south. Narrow floorplates are designed to harvest maximum daylight, reducing the need for artificial lighting and minimizing heat gain from lights. Daylight atriums in the roof allow natural light into the center of the building.

Dimming ballasts control the lighting and reduce artificial light to limit energy consumption and provide consistent lighting inside, regardless of daylight levels. Motion sensors automatically turn off lights when they're not needed. Overhead lighting fixtures run parallel with exterior walls, so the lights closest to the windows and internal atriums dim to reduce energy use on sunny days. All of the windows also have high-performance coatings that limit heat gain from the sun while allowing daylight to pass through.

Workstations are designed with lower walls to allow more daylight into desk areas, and all offices have a windowed wall to allow the passage of natural light. The building is predicted to use 40 percent less energy for lighting than a standard building as a result of daylight harvesting measures.

2.3.2 Lake-source geothermal heating and cooling

The site offered the opportunity to create what would become one of the building's most unique and efficient features: lake-source geothermal heating and cooling coupled with under-floor displacement ventilation. It is one of the first – if not *the* first – times these two technologies have been combined.

A nontoxic, biodegradable fluid called propylene glycol is mixed with water and pumped through 36 miles of plastic piping coiled at the bottom of nearby Arbor Lake to exchange heat with the lake – heat from the building is extracted during the summer and warmth from the lake is absorbed during the winter. This closed-loop system works with 70 heat pumps internally to conduct the heating and cooling of the facility. There is neither a chiller nor a boiler in the building to back up the lake-source geothermal system.

Arbor Lake, located just north of Great River Energy headquarters made the building's innovative lake-source geothermal system possible.

The efficiency of the geothermal system is compounded by raised floors that allow air to be delivered by in-floor air diffusers located throughout the building, rather than through traditional overhead forced-air systems, which require a significant amount of energy to operate. Floor-level air is supplied at 65-68 degrees Fahrenheit (instead of the usual 55 degrees Fahrenheit for mixing systems) and vents at the ceiling at approximately 80 degrees. The airflow within the space is driven by natural convection reducing the need to use fans.

Both daylight harvesting and lake-source geothermal heating and cooling will be examined in more detail in the LEED Credits section of this paper beginning on Page 24.

2.4 Develop a strategic planning process

Building for Platinum LEED certification requires extensive data collection, collaboration and an almost obsessive commitment to feedback. Because green building is in its infancy, it requires more research than projects built to lower performance standards. Whereas widely adopted construction methods have been perfected over decades, LEED building demands a commitment to questioning techniques and seeking new answers.

2.4.1 Develop design themes

Perkins + Will held meetings to establish the building's design drivers. The first meeting was a vision workshop at which the high-level goals for the building were outlined by Great River Energy leadership. It was at that meeting where CEO David Saggau outlined his vision to build the most energy efficient building possible. That single goal from the vision meeting influenced every decision relating to the building.

Another design theme that came directly from Saggau was a challenge issued to the designers. He asked them to do something with energy efficiency that had never been done in the world. He felt it was important that the design not only conserve energy, but contribute to the evolution of green design. Thus, a new theme was identified: the building would invent a new method for energy efficient construction.

It was also at the vision workshop that Perkins + Will explained the levels of LEED certification. While explaining each point and outlining the differences between Silver, Gold and Platinum LEED certification, the architects made it clear that Platinum LEED certification was attainable for the project and site, but it would be challenging to achieve. The site was immediately ineligible for certain points due to the fact that there was no existing structure, nor was it a brownfield site. The team would need to make the most of the available site resources.

Saggau challenged the team to reach Platinum LEED certification for the building. According to Saggau, Great River Energy's role as a leader in energy efficiency and conservation made this an easy decision. Platinum LEED certification became a design theme.

According to Saggau, Great River Energy's headquarters building had to push the limits of energy efficient construction and set an example of what can be done. Saggau said: "If we can't achieve a Platinum building, who can? If we don't do it, who should? An energy company is the one who should build Platinum LEED; particularly with the attributes this building has, predicted to use 50 percent less electricity."

2.4.2 Collect Data

Data collection for the development of the building began in 1998. At that time, two generation and transmission cooperatives, United Power Association and Cooperative Power, were beginning to discuss a merger. A team was formed to assess the facilities of both companies for future planning. The team selected the existing United Power Association office in Elk River, Minn., as the home of the new company that would become Great River Energy. They also projected that the office wouldn't be large enough to hold the company long into the future, but recommended a remodel of the space to accommodate short-term expansion.

However, a boom in growth throughout Great River Energy's 28 member cooperatives service area required the creation of new generation and transmission assets, and the addition of more employees. In 2004, a board subcommittee was formed to explore whether a new headquarters building was needed. In time, the committee recommended a new headquarters be constructed.

In December 2006, the Great River Energy board approved the decision to build a new headquarters office, and a team was assembled to bring the vision to reality. Once a site was chosen and the design and construction team were selected, the project team began collecting data that would influence the design of the building.

After the vision workshop, McGough and Perkins + Will set up tours of office buildings in the area so employees could identify features they liked and disliked. Comments from the tours helped drive the design process. After the tours were completed, Perkins + Will interviewed every Great River Energy manager and conducted employee focus groups to identify additional design drivers.

Focus groups revealed several design elements that employees valued which guided the design. For instance, daylight was repeatedly named as a feature employees valued in their workspace. This reinforced the commitment to daylighting in the design; it would meet employee preference in addition to promoting energy efficiency. Employees also identified privacy, collaboration, access to colleagues and outside views as features they valued in a workspace.

2.4.3 Engage all of the disciplines

Decisions regarding the project were made by the designe team as a whole. Great River Energy's core team lent their expertise on a variety of topics and led discussions with the architects, builders, engineers and owner's representative. The culture created by the people involved allowed for a highly collaborative and innovative environment. Ideas were thoroughly discussed before decisions were made as a team. This approach is necessary when a project team is focused on creating something completely new. The more questions that are raised in the planning stage serve to minimize surprises during construction.

Green building takes a whole system approach to design and requires early involvement of the design and construction disciplines to be successful. LEED is intended to improve building practices through transformation and innovation, and therefore requires traditional methods of design and construction be changed and modified.

The project team met regularly during construction to discuss the building's progress and present ideas.

According to the architect responsible for the LEED and sustainable design direction portions of Great River Energy's headquarters building, Doug Pierce, Perkins + Will, "We're looking at a significant change in design thinking and attitudes to effectively do Platinum level and 'Platinum plus' buildings day in and day out. Platinum is a good start, but it will be 10 or 20 years before we all will have a really good understanding of how far we can take green building – and have a delivery process that everyone on the team fully understands.

"Right now, it's vital to have partners who are proactive. You need people who understand 'systems thinking' and can help create solutions with very little information to work from."

LEED structures must be viewed as a body of interconnected systems rather than a conglomeration of independent parts. This approach demands holistic analysis throughout the process. A small variable in one system can cause unforeseen issues in others. A proactive and collaborative team encourages early problem solving during design before the issues become potentially costly crises during construction.

This underscores the importance of selecting a team that has LEED experience. A lengthy resume of LEED projects exhibits more than a track record of building and designing efficient systems; it shows an ability to operate in the supremely collaborative nature of building for LEED certification.

Long before construction began, planners saw the green building potential of the Maple Grove site.

2.4.4 Solicit Feedback

Employee feedback was continually sought throughout design and construction. As adjustments were made to the design, employees made sure the building didn't stray from the original idea that was built around their input.

According to Perkins + Will, it's more important to get employee "buy-in" during the construction of green buildings than traditional construction. Green buildings can change employees' environment, and it's beneficial for them to be included in the design dialogue.

Ongoing feedback allowed company leaders to recognize an employee worry that came up even before the building was under construction. For example, some employees raised concerns about the increased cost and time of commuting, which, in many cases, would be more expensive. In response, a bus route was negotiated with Maple Grove Transit that allowed employees to park at the site of the old headquarters building and take a free bus ride to the new office.

In addition to meeting employee feedback, the bus system helped the project make progress toward sustainable sites credit 4.1.

2.5 Make the most of your site

In 2006, Great River Energy sought the help of an architectural consultant and McGough Construction to assess possible sites for their green building potential. They looked at each site and considered 18 criteria that would help the building be as efficient as possible. The Maple Grove site was chosen before Great River Energy decided to pursue LEED certification, but by assessing property with an eye toward energy efficiency the organization ended up with a site that fit well within the LEED framework.

If LEED certification is the goal of a project before site selection begins, the points available should influence the site selection. There are 14 LEED points possible for a sustainable site, but the property can influence the efficiency of the building in many ways. Below are some of the considerations that went into selecting the site in Maple Grove for Great River Energy's headquarters building.

2.5.1 Mass transit

The site's location across the street from a major mass transit hub gave Great River Energy an easy LEED point (sustainable sites credit 4.1) and a head start on a second point by reducing the number of parking spaces needed.

2.5.2 Lake

The proximity to Arbor Lake allowed for the lake-source geothermal heating and cooling system that is a major energy saver for the building.

2.5.3 Building orientation

The building couldn't have saved as much energy due to daylighting if it weren't for the site's ability to accommodate a long, narrow, south-facing building.

2.5.4 Wind profile

The site was determined to have good wind resources, so the approach to renewable energy slanted toward wind energy. Great River Energy originally planned for the building's renewables to be split into two-thirds wind and one-third photovoltaic, but the wind profile allowed Great River Energy to garner three-quarters of the renewable energy needed for LEED points from wind.

2.5.5 Employee amenities

Amenities for employees were a central factor in choosing the Maple Grove site. It has a walking path, access to daycare, grocery stores, medical clinics and many other conveniences that employees value.

2.6 Select materials

2.6.1 Choose materials to meet LEED credits

When building for LEED certification, always select materials with the materials and resources LEED credits in mind. This reinforces the importance of questioning every step in the design and construction process. Don't rely on the materials that have traditionally been used, because there may be a different material that will generate efficiencies or help to earn a LEED credit. Just as construction methods must be challenged during the design phase, crews cannot resort to tried and true, or even commonly preferred, materials during the construction of a LEED certified building.

2.6.2 Make sure materials work with your system

Use of new materials shouldn't be a detriment to a building or system. In addition to considering efficiencies and LEED credits, test materials to find out if they are appropriate for the project and facilities staff. New materials may mean different maintenance practices and unfamiliar installation procedures. Additional education may be required for the maintenance staff. If green building practices are shown to create drawbacks, the sustainable building movement will regress, so it is absolutely vital that any material that strays from traditional methods is at least as effective as the material it replaces.

To select materials, Perkins + Will provided specifications for materials and McGough Construction priced out several options. McGough and Perkins + Will created conceptual budgets based on specified materials and determined what materials were available that had low levels of volatile organic compounds (VOCs). They weighed cost parameters against material characteristics and long-term durability to establish whether it made sense to use recycled materials or locally produced materials for each building feature. The findings of all materials research were submitted to and approved by Perkins + Will before they were purchased.

2.6.3 Check that the correct materials are used

Accomplishing LEED certification isn't just about designing efficient structures, it's about building them. The materials included in the plan must actually make it into the building. When building LEED projects, workers may be asked to change a method that they've honed over an entire career or use a new material. Builders must monitor workers and subcontractors so they don't resort to methods or materials that conflict with the construction documents and overall intent of LEED.

There was a formal process to check materials during the construction of Great River Energy's headquarters building. During construction, a McGough employee was available to answer subcontractors' questions about green products. With a single representative charged with routinely policing materials and ensuring the correct products were being used, crews could get their material-related questions answered quickly. Also, during every bi-weekly safety meeting, construction means and methods

as related to compliance with indoor air quality (IAQ) measures were reinforced to stress the importance of sticking to the approved materials and suggested methods of installation.

All of these measures involved an ongoing process to further educate subcontractors so they understood how vital their installed products and/or material could impact whether a LEED credit was achieved.

By having a process for selecting materials and guaranteeing their use, the construction manager could ensure that they were building to the level of performance that was designed. It is also helpful as documentation for the LEED certification.

2.7 Work with civic leaders

Without effectively communicating with city of Maple Grove officials, the building could not have achieved Platinum LEED certification. A healthy working relationship with the city played a major role in the building's success. "I'm very skeptical that we could have built a Platinum building in any other city," said Great River Energy CEO David Saggau.

Great River Energy's first step into Maple Grove occurred in early 2006 when the company signed a purchase agreement for the property. The agreement was contingent upon the city council's approval of the design – a design unlike any other building in the area. This signaled the beginning of an educational campaign that would inform city officials about the energy-conserving elements of the building, as well as the future of energy.

Though city officials were largely in favor of Great River Energy moving in, there were some who initially resisted the design concept – specifically the wind turbine and lake-source geothermal heating and cooling system. LEED was also new to many city officials. Because the design elements were largely unfamiliar, designers made an effort to connect the building's features to their community benefits and educational potential.

Great River Energy and Perkins + Will presented a design concept during a hearing attended by an assortment of city officials ranging from the city planner to the fire chief. The advantages of a high-performance Platinum LEED building in Maple Grove were outlined and well received by those in attendance.

Although large community meetings often played host to Great River Energy's highly visible and orchestrated presentations, much of the education occurred more in a more relaxed setting. Company leaders would routinely visit city of Maple Grove officials to informally discuss the building and its design, as well as the company's overall strategy, view on energy and vision of the headquarters as an educational resource. By putting a personal touch on the education process, city officials were able to better assess Great River Energy's motivations.

Work with city planners quickly uncovered a solution to accommodate the proposed lake-source geothermal heating and cooling system. After explaining the system's minimal effects on wildlife and aesthetics, the city offered an easement agreement

Pictured here is a rendering of a proposed design for Great River Energy's headquarters building that includes two wind turbines.

that would allow the necessary 36 miles of piping to be coiled below the surface of Arbor Lake. The last remaining hurdle before the design would be approved was the wind turbine.

Great River Energy presented three options for the building's wind energy resources to the Maple Grove City Council. There was an option with three turbines, another with two, and a third with a single turbine to be used on an interim basis. The city council agreed to the third option and the turbine was granted a five-year permit to provide energy for the building. Under those conditions, the council approved the design by a vote of 4 to 1. With that, the property purchase was finalized and construction began a short while later.

In many ways, the method in which Great River Energy worked with the city of Maple Grove during the design approval process innately fulfilled many of the promises it made. Great River Energy spoke of its commitment to educating the public about energy conservation and renewable energy, then spent months educating city officials about those very topics. Great River Energy stressed its commitment to being a positive member of the community and ended up with such strong ties to civic leaders that the company was involved in community events before employees even moved in.

Green building design inevitably travels through unfamiliar territory for all involved. However, by educating community leaders about efficient buildings and LEED certification, a door opens for others to follow, inject new ideas and advance the development of sustainable building.

According to Maple Grove Community Development Director Dick Edwards, the Great River Energy headquarters building has done just that.

"A project like this can set a pattern," said Edwards. "Great River Energy really triggered a lot of interest out there. People are calling our office interested in wind turbines and the green movement. Great River Energy has demonstrated what can be done and this is a first step toward promoting green development."

3 LEED credits

One of the true beneficiaries of LEED certification are the communities in which the structures are built. City of Maple Grove officials became integral members of the project team because they understood the benefits of a Platinum LEED certified building. They knew that with each credit the project achieved, their new neighbor, Great River Energy, lessened its impact on the environment.

The process of pursuing LEED certification is very much the same as designing and building a high-performance building – it requires a team approach. LEED certification is not simply an architect or engineer's pursuit; it's a community-wide effort that requires multiple groups to unite toward a common goal.

A project team can view LEED credits as a problem or an opportunity. The team behind Great River Energy's headquarters building viewed every LEED credit as an opportunity to drive the building's efficiencies. By striving to meet LEED credit criteria, the project team didn't simply design, build and accept whatever efficiencies resulted; team members were driven to design, test, model and tweak to make sure that their designs were not only operable, but highly efficient and finely tuned.

The following section outlines the successes and lessons that unfolded as the project progressed. With each credit, Great River Energy's headquarters building became more efficient and drew closer to its goal of Platinum LEED certification.

Sustainable sites

Prerequisite 1: Construction activity pollution prevention
During the design phase of the project, the team created an erosion and sedimentation control plan to manage runoff during construction. Crews on the construction site monitored daily operations to ensure that all workers, equipment and materials adhered to the plan.

The erosion and sedimentation control plan met the following objectives:

- Prevent loss of soil during construction by stormwater runoff and/or wind erosion, including protecting topsoil by stockpiling or reuse
- Prevent sedimentation of storm sewer or receiving streams
- Prevent polluting the air with dust and particulate matter

The project met the requirements for prerequisite 1.

Credit 1: Site selection
Great River Energy evaluated nine different sites according to their green building potential (though not specifically focused on LEED credits), prior to choosing a site in Maple Grove, a growing community within the Twin Cities metropolitan area.

The site met the following criteria:

- Not prime farmland as defined by U.S. Department of Agriculture
- More than five feet above the 100-year flood elevation as defined by the Federal Emergency Management Agency
- Not within 100 feet of wetlands as defined by Code of Federal Regulations
- Not within 50 feet of nearby Arbor Lake
- Not a habitat for any endangered or critical species
- Not public parkland

Officially incorporated in 1974, the 36-square-mile suburb of Maple Grove is a relatively new addition to the Twin Cities region. With access to many urban amenities including public transportation, parks, biking and walking trails, and entertainment, Maple Grove grew by more than 11,000 residents from 2000 to 2007.

By choosing to build in this area, Great River Energy was able to offer a broad array of services, benefits and amenities to employees, which is important in an increasingly competitive corporate environment.

Great River Energy pursued and met the requirements for credit 1.

Credit 2: Development density and community connectivity
Great River Energy pursued credit 2 through option 2 in LEED-NC V2.2 – community connectivity. The building was constructed on a previously disturbed site within a half of a mile of a residential zone with an average density of 10 units per acre net, within a half of a mile of 10 basic services (as defined by the USGBC) and with pedestrian access between the building and the services.

Great River Energy can participate actively in multiple communities as a member of the greater Twin Cities region, and the company has already taken advantage of this prospect by sponsoring the Minnesota Bike Festival, Living Green Expo, Friends of the Mississippi River's Mississippi River Challenge, and hosting the USGBC Minnesota Headwaters Chapter Annual Meeting.

Great River Energy pursued and met the requirements for credit 2.

Credit 3: Brownfield redevelopment
The term "brownfield," according to the U.S. Environmental Protection Agency, means property, the expansion, redevelopment, or reuse of which may be complicated by the presence or potential presence of a hazardous substance, pollutant or contaminant.

The Maple Grove site was initially developed as a gravel pit and later redeveloped as a business district for the city of Maple Grove. Although the site was extensively disturbed it was not contaminated by hazardous waste making it a grayfield site.

Because the site was not contaminated with hazardous materials, Great River Energy did not pursue credit 3.

Credit 4.1: Alternative transportation, public transportation access
Great River Energy pursued credit 4.1 by following option 2 in LEED-NC V2.2. The building entrance is located within a quarter mile of two or more public bus lines useable by building occupants.

The Maple Grove Transit Center, located across the street from Great River Energy's headquarters building, offers access to multiple bus routes serving the greater Twin Cities area. Additionally, Great River Energy worked with a public transportation service to provide a shuttle bus that travels between its Maple Grove headquarters and its Elk River facility to accommodate employees who live outside the metropolitan area. The buses travel from Elk River to Maple Grove twice in the morning and make two return trips in the afternoon.

Great River Energy pursued and met the requirements for credit 4.1.

Credit 4.2: Alternative transportation, bicycle storage and changing rooms
In addition to proximity to public transportation, Great River Energy encourages employees to explore alternate modes of transportation, such as bicycling. The headquarters facility boasts bicycle racks for 5 percent or more of the building's users and showers for 0.5 percent of full-time equivalent employees. All employees are also welcome to check out bikes during their lunch hour to run errands nearby without using a vehicle.

In June 2008, *Forbes* named Minneapolis one of North America's most bike friendly cities. Though Great River Energy's headquarters is not located in the city center, there are trails that make it a reasonable transportation option for some employees.

Great River Energy pursued and met the requirements for credit 4.2.

Credit 4.3: Alternative transportation, low-emitting and fuel-efficient vehicles
Five percent of the building's parking lot is dedicated to fuel-efficient vehicles. Fuel-efficient vehicles are given preferred parking near the building entrance.

To determine what vehicles qualified as fuel efficient, the project team consulted the American Council for an Energy Efficient Economy (ACEEE) green book and identified vehicles that qualified for premium parking. Employees who drive fuel efficient cars can get a sticker that allows them to park in specified spots near the building's entrance.

Great River Energy pursued and met the requirements for credit 4.3.

Credit 4.4: Alternative transportation, parking capacity
Parking capacity always poses a challenge and credit 4.4 is one of the most difficult points to achieve. The design team explored covered parking, structured parking, concrete paving and several other options, but settled on a single-level bituminous parking lot. Strategies were developed to limit paving, including the bus service from Elk River, the availability of off-site parking and preferred parking for carpools.

By offering numerous transportation opportunities for employees, Great River Energy was able to reduce the number of parking spaces initially required by the city of Maple Grove. Carefully sizing the parking capacity to provide just what is needed has multiple benefits: money not spent on paving can be dedicated to other uses such as landscaping; less land is used for parking, effectively freeing more land for habitat restoration; less paving was needed reducing stormwater runoff and reducing the cost of the associated infrastructure demand; less paving also reduces the heat island effect by exposing less solid surface area to the sun.

Great River Energy pursued and met the requirements for credit 4.4.

Credit 5.1: Site development, protect or restore habitat
More than half of the vegetation (approximately 6.5 acres) on the Great River Energy grounds is native or ecologically adapted to Minnesota. Native plantings account for more than 20 percent of the total site area, including the building footprint. These plants require little to no irrigation once established and can also serve other useful purposes. Reducing the area required for parking was essential in earning this credit.

Public concerns were voiced about the potential of native plantings looking unkempt, however, a considerate landscape design combined with Great River Energy's experience with managing restoration habitats calmed concerns. During public meetings, Great River Energy described years of native plantings at several other facilities across Minnesota along with its staff knowledge in maintaining and grooming them.

The design team paid close attention to site planning and landscape design, bringing clean lines and a managed appearance to the grounds as viewed from the street. Native plants were arranged to be effectively maintained and clean looking.

University of Minnesota-bred fruit trees found on the east and west ends of the building are not considered native or adapted plantings and do not contribute to this LEED credit. However once mature, they will produce cherries, pears, plums and apples for Great River Energy employees and birds and animals that visit the site.

Great River Energy pursued and met the requirements for credit 5.1.

Credit 5.2: Site development, maximize open space
By reducing the size of the parking lot, Great River Energy was able to increase the amount of green space, exceeding the city of Maple Grove's open space requirement by more than 25 percent. In addition to helping achieve credit 5.2, this helped in the pursuit of sustainable sites credit 5.1.

Optimizing parking quantities is a challenging prospect for any design. Even though parking is expensive, providing an overabundance of stalls is the most expedient and most common approach to sizing parking lots. However, it commonly results in a waste of resources, including land. The Great River Energy project team set optimistic parking lot counts very early in the design process, challenging the prevailing wisdom of oversized parking lots. As the project matured, 60 spots were added to the parking lot's original capacity. The total parking count remained well below the amount required by the local zoning code. Green space and restored habitat requirements also continued to be achieved although with little margin remaining for changes.

The team decided to provide a habitat and green space contingency plan in the event that further paving additions or landscape reductions were needed. The project team negotiated an easement with the city of Maple Grove and agreed to restore two

additional acres of land along Arbor Lake as native prairie. This addition extended the immediate environmental and aesthetic reach of the project beyond the property boundaries and ensured that that Sustainable Site Credits 5.1 and 5.2 could be earned.

Great River Energy pursued and met the requirements for credit 5.2.

Credit 6.1: Stormwater design, quantity control
Great River Energy implemented a stormwater management plan, preventing the post-development peak discharge rate and quantity from exceeding the pre-development peak discharge rate and quantity for one- and two-hour 24-design storms.

Great River Energy pursued and met the requirements for credit 6.1.

Credit 6.2: Stormwater design, quality control
Ninety percent of rainfall is captured and treated using acceptable best management practices (BMPs). BMPs used to treat runoff remove 80 percent of the average annual post development total suspended solids.

Great River Energy pursued and met the requirements for credit 6.2.

Credit 7.1: Heat island effect, non-roof
To reduce the heat island effect, projects in developed areas can choose to implement various shading mechanisms including covered or underground parking or reflective concrete paving. When faced with the decision whether to pursue credit 7.1, the team chose to invest project budget in additional native landscape plantings and strategies to reduce parking lot area, such as the employee bus service at the expense of credit 7.1. The reduced parking lot size and expanded green space did serve to reduce the urban heat island effect, however the strategy is not identified as part of credit 7.1. To maintain the construction budget, Great River Energy chose not to pursue this point.

Great River Energy did not pursue credit 7.1.

Credit 7.2: Heat island effect, roof
This building uses a thermal polyolefin (TPO) white roof with a minimum solar reflectance index of 78 to reduce the building's contribution to the urban heat island effect. The "white roof" reflects much of the sun's energy back into the sky rather than allowing it to build up as heat on the roof surface over the course of the day. The roof also helps harvest sunlight within work spaces by reflecting sunlight into the daylighting atriums. The smooth surface of the TPO roofing is good for non-potable rainwater collection and an easy surface for installing photovoltaic racks.

"Living roofs" or "green roofs" have many virtues, and they are another option for earning this credit. They can be used as habitat and help with stormwater management. However, green roofs commonly have a higher up-front cost than white reflective roofs. Because parking lot area was reduced below the zoning requirement, the design team chose to apply all project funds for stormwater management and habitat restoration to the site in lieu of installing a green roof. This opened the opportunity for the project to include the 47,786 square feet of low-sloped white roof with a minimum solar reflectance index of 78.


A white roof and daylight atrium harvest daylight and reduce the energy needed for lighting.

A 688-square-foot living green roof was installed for demonstration purposes, but credit 7.2 was pursued largely through the inclusion of a white roof.

Great River Energy pursued and met the requirements for credit 7.2.

Credit 8: Light pollution reduction

Interior and exterior lighting met the requirements for this credit, lighting areas for safety, security and navigations without impacting the night sky or adjacent properties. Lighting followed the requirements outlined in the Zone ZL3 section of LEED-NC V2.2.

Parking lot and site lighting are woven into the landscape design. Low-profile, cut-off fixtures focus light onto the property, not into the sky. The approach taken toward lighting wasn't to reduce the lighting levels at grade as much as to effectively focus and manage the light through design. The design team made sure that the building optimized the energy used on lighting throughout the project. There is also no uplighting on the building.

Great River Energy pursued and met the requirements for credit 8.

Water efficiency

According to the USGBC, every year Americans extract 3,700 billion more gallons of water than they return to the natural water system to recharge aquifers and other water sources. In some parts of the United States, water levels in aquifers – underground water-bearing permeable rock – have dropped more than 100 feet since the 1940s[6].

By including water efficiency as a LEED category, the USGBC stresses the importance of conserving water to maintain an ample supply of potable water in the future. Though conservation has progressed – U.S. industries use 36 percent less water than they did in 1950 – much water conservation can be achieved through simple changes to building designs. Best of all, many strategies involve either no added costs or short-term paybacks.

Credit 1.1: Water efficient landscaping, reduce by 50 percent

The site landscaping uses a significant amount of native and adapted plantings that will rarely require additional water beyond that provided by natural rain events once established. High-efficiency permanent irrigation was installed to assist in getting them established and provide occasional supplementary watering. Along with reducing water usage, this strategy helps to promote biodiversity.

Landscape designers analyzed the soil on the site to select plantings that would work well in the irrigation environment. More than half of the property is planted with drought-tolerant species native to Minnesota, decreasing the need for turf grass.

Great River Energy pursued and met the requirements for credit 1.1.

Credit 1.2: Water efficient landscaping, no potable use or no irrigation

The site is designed to recycle stormwater for irrigation of turf grass and the establishment of new plantings, dramatically reducing the use of potable water for irrigation.

Great River Energy has an agreement with the city of Maple Grove to use captured rainwater when irrigation as necessary. Site stormwater runoff equal to the amount of water needed for irrigation is directed through a filtration pond and into the city's stormwater pond before being used for irrigation. The project encountered unanticipated challenges with spring stormwater salination caused by winter de-icing of adjacent parking lots that contribute to the pond. The design team continues to explore solutions to this issue.

Great River Energy pursued and met the requirements for credit 1.2.

[6] LEED New Construction and Major Renovation Reference Guide, 3rd ed., Version 2.2 (U.S. Green Building Council, October 2007). 135

Credit 2: Innovative wastewater technologies
Rainwater is collected in a 20,000 gallon cistern. The water is filtered and circulated through an eco-friendly water treatment system using a small amount of hydrogen peroxide to sanitize the water. The water is then used in Great River Energy's toilets and urinals limiting the potable water that ends up in the city's sewer system. Because of this system, Great River Energy's headquarters building is designed to use 80 percent less potable water for sewage conveyance.

Great River Energy pursued and met the requirements for credit 2.

Credit 3.1: Water use reduction, 20 percent reduction
Credit 3.2: Water use reduction, 30 percent reduction
The engineers specified low-flow 0.5-gallon-per-minute aerators and motion sensors on bathroom faucets and dual flush meters on the toilets. All of these measures are predicted to reduce the amount of water used in the building by more than 35 percent, minimizing the burden on the municipal water supply and wastewater systems.

Great River Energy pursued and met the requirements for credits 3.1 and 3.2.

Energy and atmosphere

Prerequisite 1: Fundamental commissioning of the building energy systems
During early the early design phase of the project, a third party was hired to shadow the engineering and installation teams to check all HVAC systems to ensure they functioned as designed.

With a traditional system, engineers outline load and output then installers simply connect the dots. When a system is commissioned, it is tested with actual loads to challenge the design. The building's designers had a method for checking the HVAC equipment at the design phase, but commissioning helped to ensure the system worked and recorded any system tune-ups during installation.

Great River Energy met the requirements for prerequisite 1.

Prerequisite 2: Minimum energy performance
This prerequisite requires that a project achieve at least two of the 10 possible points in energy and atmosphere credit 1. Great River Energy headquarters pursued this prerequisite using option 2 from LEED-NC V2.2., known as whole building energy simulation. This approach grants LEED points on a scale based on the percentage improvement in the proposed building rating compared to the baseline building performance rating defined by ASHRAE/IESNA Standard 90.1-2004. Standard 90.1-2004 represents the minimum requirements for a building's energy efficiency.

After the total energy efficiency and on-site renewable energy production were modeled, the building design is predicted to operate with a 47.5 percent energy cost savings compared to ASHRAE/IESNA Standard 90.1-2004. Ten points are awarded to buildings that can prove at least 42 percent savings.

Great River Energy met the requirements for prerequisite 2.

Prerequisite 3: Fundamental refrigerant management
No chlorofluorocarbons (CFC) were included in the refrigerants used in the construction of Great River Energy's headquarters building.

Great River Energy met the requirements for prerequisite 3.

Credit 1: Optimize energy performance
This credit consists of a possible 10 points which encompass the collective energy strategies used throughout the building. The energy model for Great River Energy's headquarters building includes, but is not limited to, two significant design features:

1. Optimization of daylighting through harvesting and controls

2. A unique – and likely first of its kind – high efficiency HVAC system that combines lake-source geothermal and under-floor displacement ventilation.

This credit was achieved by using an energy model and statistics that represent the building's overall energy efficiency (option 1: whole building energy simulation). Modeling was started early in the design process so it could be used to inform design decisions and system selection. A more than 47.5 percent reduction in energy cost was demonstrated compared to a baseline building per ASHRAE/IESNA Standard 90.1-2004, achieving 10 points for this credit.

The under-floor displacement ventilation system can be seen here under raised floor panels.

Great River Energy was awarded 10 points for credit 1.

Credit 2.1: On-site renewable energy

The building is predicted to receive approximately 14 percent of its energy from on-site renewable resources (approximately 10 percent from wind and about 3-5 percent from the photovoltaic array). The wind turbine produces 200 kilowatts (kw) at full output and the photovoltaic solar array produces 72 kw of energy at full capacity. The on-site renewable energy can produce enough energy to power approximately 50 homes annually.

Company leaders decided early on that they wanted renewable energy on the site. As a leader in energy innovation, the project was an opportunity to display alternative energy sources and educate the public. Planners examined wind, solar and biomass energy for use on the site. Because small-scale biomass energy wasn't a well established energy source, wind and solar were selected.

Great River Energy began its pursuit of on-site renewables by educating Maple Grove city staff. The design team presented reasons why renewables were a good idea for the environment and the city. The project team worked hard to help local government officials and the public understand and appreciate the importance of on-site renewable energy. Clean on-site renewable energy was a vital part of achieving the project's Platinum LEED goal.

LEED points aside, by implementing renewable energy into its headquarters, Great River Energy was making a visible statement about the future of power generation. Great River Energy strives to be a leader in the adoption of emission-free electricity, and purchases the output of several wind farms across the state. The cooperative's generation portfolio also includes biomass resources such as refuse-derived fuel.

Great River Energy initially proposed a plan for three wind turbines on its headquarters site: two small turbines on the north side of the building and a larger one on at the southeast corner. Because it was difficult to get a grasp of what the building's electricity requirements would be, Great River Energy pursued as much wind generation as they could.


Crews assemble the wind turbine rotor and prepare to hoist it to the top of the turbine.

Some public officials and neighbors initially opposed the wind turbine, but warmed to the idea after Great River Energy educated them about wind energy. Two third-party objectors requested that the turbine be denied, citing concerns about aesthetics, electromagnetic interference and safety. All of the concerns could be traced to a general misunderstanding of wind energy. Great River Energy shared its expertise about wind energy and was granted a five-year interim use permit for a single wind turbine.

The turbine, manufactured in Denmark, is a NEG Micon M700. The turbine was first installed and put in service in the Netherlands before being purchased and shipped to Canada. Later, the turbine was purchased by Energy Maintenance Services (EMS) who refurbished and sold it to Great River Energy. The gears in the gearbox were remanufactured and the generator was rewound to change the machine from a two-speed to a one-speed wind turbine to increase efficiency.

Space on the roof was covered with a photovoltaic solar array. Solar "trees" were also installed on the building grounds for demonstration purposes.

Great River Energy pursued and met the requirements for credit 2.

Credit 3: Enhanced commissioning

In order to make sure that all of the green features within the building functioned properly, enhanced commissioning was completed on all systems. This is an additional

measure beyond fundamental commissioning that ensures systems are working as efficiently as possible. This goes beyond the requirements for energy and atmosphere prerequisite 1 by involving a third-party commissioning agent at the design development phase, at the 50 percent completion phase to review plans, and through the first 10 months after building occupancy.

Great River Energy pursued and met the requirements for credit 3.

Credit 4: Enhanced refrigerant management
The mechanical engineer selected types and quantities of refrigerants used in the HVAC systems, kitchen refrigeration equipment and computer room gaseous fire suppression system that minimize or eliminate harmful chemicals.

Great River Energy pursued and met the requirements for credit 4.

Credit 5: Measurement and verification
The engineers created a measurement and verification plan to evaluate the building's energy performance. The plan covers no less than one year of post-construction.

Great River Energy continues to pursue this credit even though the building achieved Platinum LEED certification without it.

Credit 6: Green power
The building is partially powered by on-site renewable energy from the wind turbine and photovoltaic solar array. The remainder is purchased from off-site wind generation facilities. One hundred percent of the building's electricity comes from renewable sources, exceeding the 35 percent required to achieve credit 6.

Great River Energy pursued and met the requirements for credit 6.

Materials and resources

The handling of building materials presents an opportunity to make a building more sustainable from the design phase to construction. Because materials require extraction, processing and transportation, LEED makes sure that those steps are completed with a limited impact on air, water and natural habitats.

The materials and resources category in LEED-NC V2.2 promotes the use of materials that have a reduced impact on the environment and limit negative effects on the health of building occupants and installation crews.

Prerequisite 1: Storage and collection of recyclables

The building was set up for recycling with fixtures for recycling receptacles and a recycling room to reduce the waste that is hauled to landfills. In addition to the required receptacles for paper, corrugated cardboard, glass, plastics and metal, Great River Energy headquarters included compostable waste bins near the cafeteria and in pantries. Organic waste is then taken to a composting facility where it is transformed into compost that is sold to residential and commercial customers.

Great River Energy met the requirements for prerequisite 1.

Credit 1.1: Building reuse, maintain 75 percent of existing walls, floors and roof
Credit 1.2: Building reuse, maintain 100 percent of existing walls, floors and roof
Credit 1.3: Building reuse, maintain 50 percent of interior non-structural elements

Because the building was built on a lot that was not previously developed, Great River Energy did not pursue credits 1.1, 1.2 or 1.3.

Credit 2.1: Construction waste management, divert 50 percent from disposal
Credit 2.2: Construction waste management, divert 75 percent from disposal

More than 95 percent of construction waste was recycled, due largely to a successful recycling program on the construction site.

There are three necessary steps to a successful recycling program during construction: placing recycling facilities in the right places, educating workers and monitoring behavior.

Most contractors are starting to segregate waste and adopt recycling programs, but the industry as a whole doesn't have a consistent approach toward recycling. The construction team set rigorous standards on the site and applied them to all subcontractors. To ensure as much waste was recycled as possible, on-site collection recycling bins were provided so all workers correctly disposed of waste without spending time collecting and transporting it to an off-site recycling center.

Once the facilities were in place, the general contractor educated crews by showing them the correct place to dispose of waste, specific to the materials they planned to use. As new subcontractors began work on the site, they were given a copy of the waste management plan and a tour of the recycling facilities. Recycling was also a recurring topic at every site safety meeting.

Lastly, the general contractor provided a person charged with monitoring the disposal of construction materials. That person reminded crews of the appropriate recycling methods throughout construction and was available to answer questions about materials disposal.

As an added measure, the general contractor monitored materials and tailored recycling facilities so the proper facilities were available when needed. For example, when crews began installing geothermal piping in Arbor Lake, they alerted the general contractor that they'd be creating a lot of plastic waste and recommended that the site obtain additional plastic recycling receptacles. By educating and engaging subcontractors in the recycling process, the project got a boost toward sustainable sites prerequisite 1.

The site's location in the Twin Cities metro area allowed for access to recycling facilities, which aided in the pursuit of these credits.

Great River Energy pursued and met the requirements for credits 2.1 and 2.2.

Credit 3.1: Materials reuse, 5 percent
Credit 3.2: Materials reuse, 10 percent
Because the building was new and not existing, there were no materials to be reused, therefore these points were not pursued.

Credit 4.1: Recycled content, 10 percent (post consumer + ½ pre-consumer)
Credit 4.2: Recycled content, 20 percent (post-consumer + ½ pre-consumer)
The building contains a variety of materials made from recycled content, including rebar framing made from recycled steel and countertops made from recycled glass and concrete. In all, approximately 18 percent of the materials used in the building were post-consumer or pre-consumer recycled content.


Countertops and backsplashes are made from recycled glass.

The facility's concrete structural frame contains more than 45 percent fly ash, a byproduct created when coal is burned to generate electricity. Fly ash from Great River Energy's Coal Creek Station power plant was used in the structure as a replacement for cement and in carpet backing. Using fly ash in construction decreases the amount of waste sent to landfills and eliminates energy needed to produce cement.

Great River Energy pursued and met the requirements for credit 4.1. Credit 4.2 was not pursued.

Credit 5.1: Regional materials, 10 percent extracted, processed and manufactured regionally.

Credit 5.2: Regional materials, 20 percent extracted, processed and manufactured regionally

Approximately 22 percent of the materials used in the building were extracted, processed and manufactured within 500 miles of the building.

By using regional materials, local economies are supported and transportation costs are reduced. Some of the regional materials used in the building include using fly ash from Great River Energy's coal-fueled plants, Lake Superior gabbro, limestone from Mankato, Minn., and pressed wheat stalk board and maple from the upper peninsula of Michigan.

Great River Energy met the requirements for credit 5.1 and 5.2.

Credit 6: Rapidly renewable materials

Materials that are rapidly renewable generally have a harvest rotation of 10 years or fewer. By using these materials, like bamboo, finite raw materials and long-cycle renewable materials aren't depleted.

Rapidly renewable pressed wheat stock board was used in the cupboards. However, for large buildings constructed mostly of concrete and steel frames, it is extremely difficult to use enough rapidly renewable material to meet the credit minimum of 2.5 percent of the total value of the building's materials and products.

Great River Energy did not pursue credit 6.

Credit 7: Certified wood

Approximately 87 percent of the wood used throughout the building is Forest Stewardship Council (FSC) certified, which means it was harvested in an environmentally, socially and economically responsible way. FSC certification is the wood industry's highest certification leading a global effort to better manage forests by protecting their critical biodiversity and role in sequestering atmospheric carbon dioxide.

Great River Energy pursued and met the requirements for credit 7.

Indoor environmental quality

When designing a new structure, it's natural to strive to create a comfortable indoor environment simply out of a desire for an aesthetically pleasing and welcoming building. However, multiple studies have shown tangible boosts in productivity and health in buildings from good indoor air quality, views to the exterior, quality artificial lighting, access to natural daylight and occupant control of lighting levels and air temperature. When combined with other integrated design strategies, the techniques used to boast productivity and occupant satisfaction can dramatically improve energy efficiency. A Study conducted by the Rocky Mountain Institute has several illustrative examples citing multi-tiered performance improvements.

For example, when Pennsylvania Power and Light upgraded its lighting system the company saw a 13 percent increase in productivity and 25 percent decrease in absenteeism – not to mention the 69 percent reduction in energy used for lighting[7]. A Wal-Mart prototype, called Eco-Mart, enhanced daylighting in one half of the store through the use of skylights and saw "significantly higher" sales than the other half.

Great River Energy's initial desire to create an energy efficient building ultimately created unforeseen efficiencies within its workforce. Once the project began the design phase, the architects immediately began discussing the variety of benefits high-performance green design can offer. As a company that values employee productivity and health, the stringent standards of LEED fit ideally within Great River Energy's desire to create an office in which the business can operate efficiently and effectively – in addition to the intrinsic benefits of energy efficiency and sustainability.

Prerequisite 1: Minimum indoor air quality (IAQ) performance

The ventilation system was designed to exceed the requirements of sections 4 – 7 of ASHRAE 62.1-2004, ventilation for acceptable indoor air quality.

Great River Energy met the requirements for prerequisite 1.

Prerequisite 2: Environmental tobacco smoke control

The building designers pursued prerequisite 2 using option 2 in LEED-NC V2.2 as a guide. Tobacco smoke is not permitted within the building. A designated smoking area has been identified that is more than 25 feet from any of the building's air intakes or entrances.

Great River Energy met the requirements for prerequisite 2.

[7] Romm, Joseph, "Greening the Building and the Bottom Line," (The Rocky Mountain Institute, 1998). 1.

Credit 1: Outdoor air delivery monitoring
Permanent monitors were installed to ensure that the air circulated throughout the building is of optimal quality. The fresh air terminals that feed the core building under-floor air systems measure the fresh air to each portion of the building and react to maintain a healthy indoor air quality by measuring the carbon dioxide level in occupied spaces. The carbon dioxide sensors are strategically located throughout the occupied spaces. If air quality strays from the optimal quality by 10 percent an alarm will alert the facilities team who will work to fix the issue.

Great River Energy pursued and met the requirements for credit 1.

Credit 2: Increased ventilation
An under-floor displacement ventilation system delivers low-velocity clean air to the building through a series of small, circular vents located in the floor. Each employee work station contains its own adjustable vent, giving employees the freedom to control the air flow in their workspaces. ASHRAE considers displacement ventilation to be at least 20 percent more effective at delivering fresh air to the breathing zone than conventional mixing systems.

The use of displacement ventilation means that additional fresh air is being provided without an increase in energy use. Heating, cooling, humidifying or dehumidifying outside air requires significant amounts of energy, so reducing the amount needed saves energy. The Great River Energy project chose to pursue the LEED increased ventilation credit by taking advantage of displacement ventilation's tendency to provide more fresh air to the breathing zone. Compared to minimum rates required by ASHRAE Standard 62.1-2004, the building was designed to provide 10 percent more outdoor air and 30 percent more fresh air to the breathing zone.

These measures improve occupant comfort, health and productivity, which increase the occupant alertness by providing more oxygen and removing more airborne toxins than conventional ventilation systems.

Great River Energy pursued and met the requirements for credit 2.

Credit 3.1: Construction IAQ management plan, during construction
In order to maintain high air quality during the construction process, builders and contractors created an indoor air quality (IAQ) management plan.

In accordance with the LEED credit, the construction site met the requirements outlined in the 1995 Sheet Metal and Air Conditioning Contractors National Association IAQ Guidelines for Occupied Buildings Under Construction. All absorptive materials, such as insulation, carpeting and ceiling tile, were stored properly to avoid moisture damage. Enclosed, well-ventilated areas were designated for cutting materials to control dust and other harmful particles. Additional measures that helped control air quality included

capping ductwork and continuing to use temporary ventilation until the permanent system was completed and operable under normal conditions.

Great River Energy pursued and met the requirements for credit 3.1.

Credit 3.2: Construction indoor air quality management plan, before occupancy
The most reliable way to earn this credit is by doing a whole building "flush out." A flush out moves large volumes of modestly conditioned air throughout the building to remove toxicants that linger in the building after the completion of construction. This commonly takes one to two weeks, during which time occupancy is limited.

A flush out for Great River Energy proved to be difficult due to the geothermal heat pump system, which uses water-side economizers instead of air-side economizers for energy efficiency during the spring and the fall. The lack of air-side economizers limited the ventilation system's ability to move large volumes air through the building. The estimated time frame to flush the building was nearly three months.

Due to time and budget constraints, Great River Energy did not pursue this point.

Credit 4.1: Low-emitting materials, adhesives and sealants
All adhesives and sealants applied within the building were low in volatile organic compounds (VOCs) and fell below the VOC limits outlined in the South Coast Air Quality Management District Rule 1168. Aerosol adhesives met the Green Seal Standard for Commercial Adhesives GS-36 requirements in effect Oct. 19, 2000.

VOC limits were clearly stated in each section of the materials specifications, so that credit 4.1 was met whenever materials were needed. All low emitting materials were checked and tracked in the field to ensure the specified materials were used. The general contractor's on-site LEED accredited professional patrolled materials to ensure crews used the low-VOC materials indicated in the building plan.

Great River Energy pursued and met the requirements for credit 4.1.

Credit 4.2: Low-emitting materials, paints and coatings
All indoor paints applied at the site met the IAQ requirements outlined in the LEED-NC V2.2 guide. Paints met the appropriate Green Seal Standards, specific to paint type and surface. Clear interior finishes did not exceed VOC limits established in the South Coast Air Quality Management District rule 1113.

Great River Energy pursued and met the requirements for credit 4.2.

Credit 4.3: Low-emitting materials, carpet systems
All carpet and cushion met the testing and product requirements of the Carpet and Rug Institute's Green Label Plus program. Carpet adhesives used fell at or below the VOC limit of 50 grams per liter.

Great River Energy pursued and met the requirements for credit 4.3.

Credit 4.4: Low-emitting materials, composite wood and agrifiber products
Composite wood and agrifiber products such as particleboard, medium density fiberboard (MDF) and plywood used on the project contained no added urea-formaldehyde resins. All laminating adhesives used were also free of added urea-formaldehyde resins.

Great River Energy pursued and met the requirements for credit 4.4.

Credit 5: Indoor chemical and pollutant source control

Great River Energy did not pursue credit 5.

Credit 6.1: Controllability of systems, lighting
Research has shown that when building occupants can control their indoor environment, stress is reduced and productivity increases. Though much of the lighting in the building is automated to improve energy efficiency, task lighting controllable by the occupants is provided and available to allow individuals to meet their individual task needs preferences.

Great River Energy pursued and met the requirements for credit 6.1.

Credit 6.2: Controllability of systems, thermal comfort
By allowing individuals to control their own environment, the building caters to a variety of preferences, thereby enhancing productivity. Manually operated in-floor diffusers are located in every individual workspace as well as shared multi-occupant spaces. Approximately 99 percent of occupants have access to individual comfort controls exceeding the 50 percent required to achieve credit 6.2. The same climate control functionality at personal workspaces can be found in multi-occupant spaces, such as the cafeteria and conference rooms, to allow for thermal comfort control throughout the building.

Great River Energy pursued and met the requirements for credit 6.2.

Credit 7.1: Thermal comfort, design
The building complies with the requirements of Section 6.1.1 of ASHRAE Standard 55-2004, Thermal Comfort Conditions for Human Occupancy. The engineer created three-dimensional Computational Fluid Dynamics models of the occupied spaces and documented numerically that the design was in compliance through a "percent people dissatisfied" comfort evaluation.

Great River Energy pursued and met the requirements for credit 7.1.

Credit 7.2: Thermal comfort, verification
To verify that the under-floor ventilation system works optimally for employees, building operators will survey occupants within 18 months of initial occupancy. If survey results indicate that more than 20 percent of occupants are dissatisfied with the thermal comfort in the building, corrective action will be taken to improve thermal comfort in accordance with ASHRAE Standard 55-2004.

Great River Energy pursued and met the requirements for credit 7.2.

Credit 8.1: Daylight and views, daylight 75 percent of spaces
Building designers pursued credit 8.1 using option 3-daylight measurement in LEED-NC V2.2 as a guide.

Access to natural daylight is important for occupant health. The human metabolism uses daylight to maintain hormonal balance and regulate sleep patterns. Daylighting studies show significant improvements in productivity as well.

Through the use of clerestory atriums, tall exterior windows, extensive use of interior windows and a light colored interior finish palette, 25 foot-candles of natural daylight reach more than 84 percent of all regularly occupied space in the building. Twenty-five foot-candles of sunlight is frequently adequate for reading compared to 40 or 50 foot-candles of artificial light. Computer simulations were used to predict daylight levels in much of the building. Many workspaces receive 30-35 foot-candles of


The daylighting atriums served as a light source even while construction was still underway.

light, exceeding the 25 foot-candles required to meet the daylight measurement option to achieve credit 8.1.

Great River Energy pursued and met the requirements for credit 8.1.

Credit 8.2: Daylight and views, views for 90 percent of spaces
In addition to exposure to natural daylight, more than 90 percent of occupants have a view of outside from their workspaces. This goal is achieved through several of the building's design features, including open offices and lower partition heights.

Views to the outdoors and long-distance interior views are scientifically shown to contribute to increased productivity and the satisfaction of employees.

Great River Energy pursued and met the requirements for credit 8.2.

Innovation in design

Great River Energy sought all four of the possible innovation in design points as a result of the company's desire to contribute to the maturation of green building design. The following credits describe ways the project team went beyond the requirements specifically addressed in LEED-NC V2.2 during the design and construction of its new headquarters building.

Credit 1.1: Green education center

Great River Energy offers employees and guests the opportunity to interact with building information through kiosks found in the first floor lobby and at www.greatriverenergy.com.

The interactive screens show real-time data on energy savings throughout the building and production from the wind turbine and photovoltaic panels. Other applications include system animations to illustrate how the building's features work and recommendations for environmental savings in people's own homes. Educational signage is also placed inside the building and along walking trails on the grounds to educate the public about the building's energy and water conservation features. Additionally, the building is open to public tours on a scheduled basis.

Great River Energy pursued and achieved credit 1.1.

Credit 1.2: Toxic reduction—ultra low mercury lamps

The use of fluorescent light fixtures throughout the building helps to reduce energy use and energy costs. Great River Energy used ultra-low mercury lamps inside and outside to reduce the use of toxic materials on the project. Eight-foot fluorescent lamps used to illuminate workspaces have very low levels of mercury.

The building met a Lumen-hours-per-pictogram-of-mercury level of approximately 0.6, exceeding the 0.8 required to achieve the point. The project was constructed to meet this criteria however a paperwork technicality during the certification disqualified this credit from being officially earned.

Great River Energy continues to pursue credit 1.2 even though the building achieved Platinum LEED certification without it.

Credit 1.3: 70 percent green power

On-site wind and solar power sources meet approximately 14 percent of the total energy needs of the building. The remaining amount of energy required to power the Great River Energy headquarters building is provided by off-site renewable wind turbines. The project economically supports the use of off-site wind power by purchasing Renewable Energy Certificates.

Great River Energy pursued and achieved credit 1.3.

Credit 1.4: 40 percent fly ash on average in cast in-place concrete

As a utility, Great River Energy has access to some of the newest technologies related to coal and coal byproducts. Fly ash is a byproduct of energy production that can be used in concrete mixtures to reduce the carbon footprint and energy demand of traditional concrete.

The use of fly ash reduces the amount of Portland cement needed in concrete mixtures. For every ton of Portland cement produced, nearly one ton of carbon dioxide is emitted[8].

More than 45 percent of the Portland cement that would have been used through traditional construction was replaced with fly ash. Typical concrete replaces 15-20 percent of Portland cement with fly ash. Designers found that columns, foundations and footings could effectively have higher quantities of fly ash than elevated flat slabs. The surface of elevated flat slabs tended dry rapidly with too much fly ash making them more difficult to finish, whereas concrete placed in boxed formwork could tolerate higher quantities of fly ash.

Great River Energy pursued and met the requirements for credit 1.4.

Credit 2: LEED accredited professional

LEED accredited professionals were at work in many parts of this project. These individuals educated the project team about green building design and construction. LEED accredited professionals were consulted for many of the decisions made about materials and technology. Their contributions helped Great River Energy meet its goals concerning energy efficiency and sustainability.

[8] Hanle, Lisa, "CO_2 Emissions Profile of the U.S. Cement Industry," (U.S. Environmental Protection Agency). 9. (http://www.epa.gov/ttn/chief/conference/ei13/ghg/hanle.pdf)

4 Issues to consider

4.1: Understand the occupants

The future occupants of a LEED certified building are an invaluable resource for establishing design drivers and finding efficiencies. The sooner a design team can get access to a building's inhabitants, the more effectively they can design with them in mind. The availability of Great River Energy employees helped make the new headquarters a success.

4.2: Accountability of design

Be transparent about design elements. Because LEED building involves convincing the USGBC of efficiencies, it is important to be forthcoming with information. If someone challenges one of the design elements it's helpful to point to existing evidence. Because Great River Energy headquarters was built using a systemic design approach, it was difficult to prove the efficiencies using standardized systems. In fact, three of the 10 points gained through Energy and Atmosphere prerequisite 2 were awarded after appeals. By being transparent with data and measurement methodology, Great River Energy preserved three LEED credits.

4.3: Invest time in schematic design

The more time an owner and design team can spend on schematic design the better. With an emphasis on schematic design, the interior systems can be more thoroughly analyzed. This also allows for more accurate cost parameters on a project, because it will reduce the need to change plans during construction.

4.4: Don't lose sight of non-sustainable elements

The continued pursuit of green building depends on its success right now. Owners are hesitant about building for LEED certification because of its reliance on new building systems and construction methods. In order for green building to gain momentum and make a significant impact, the structures must be shown to be as successful as traditional construction. Buildings must function properly with no negative consequences as a result of sustainable elements to ensure the proliferation of green building.

4.5: Challenge everything

High efficiency buildings are, by definition, non-traditional. They are new and different. In order to accomplish the goals of building an efficient structure you have to ask "Is there a better way?" There may be traditional building methods that are better options for a project, but the evolution of green building depends on every project seeking better, more efficient construction methods.

4.6: Record everything

A challenge with LEED construction is tracking changes made to plans and materials. It is vital that any method or material that strays from the plan be recorded to ensure LEED compatibility.

5 Move and occupancy

The efficiencies of Great River Energy headquarters weren't limited to the building systems and construction practices; sustainability remained a goal during the moving process as well. In fact, two of the principles that shaped the building guided the move as well: employee engagement and sustainability.

There was so much effort put into designing a building that would enhance worker productivity that any glitches that hampered someone's job would have contradicted the building's mission. By elevating the importance of a smooth moving process early on, there was very little loss of productivity. The move to Great River Energy's new home was seamless because the right mix of people orchestrated the move in a well thought out manner.

5.1 Moving efficiently

Office equipment for the building was selected in a way that allowed for equipment from the existing office space to be used in the new headquarters. Many of the existing filing cabinets were moved rather than discarded. The color scheme selected for the interior spaces allowed for chairs and office fixtures to be reused without looking dated or out of place. By reusing office equipment, Great River Energy saved hundreds of thousands of dollars in equipment purchases and reduced the waste created by the moving process.

All packing was done in Tyga Boxes, which are reusable, plastic, stackable, wheeled receptacles that reduce or eliminate heavy lifting for employees. Movers communicated by walkie talkie when packing the old building and unpacking at the new headquarters to quickly locate missing items.

Moving was done in eight single-day phases so movers and technical teams could fine tune work spaces and computer equipment to ensure they were fully functional the morning after the move. Trucks were selected to use the fewest amount of trips between destination and origination. When it made sense to use a full semi, that's what was used, but if a 16-foot truck would suffice, that's what was ordered. Trucks were packed full to reduce the number of return trips needed.

Perhaps the most important step toward a successful move was an effort on behalf of the builders, interior designers and moving team to have absolutely every piece in place before moving day. That way, once everything was moved from the old location, it was expected that all the necessary materials were awaiting employees at their new offices. And they were: no boxes or materials were lost during the move.

5.2 Understanding employees' needs

A team of employees ranging from management to administrative staff representing all divisions of the company met six months before moving day to discuss the move. Each member of the team represented a group of employees. The team met monthly to address concerns that were raised during the final months of construction. By starting the preparations so far in advance, all employee questions were addressed and there were no surprises on moving day.

A lot of the employee worries related to technology. People wanted to be sure that their computers would work and they'd have access to their files immediately upon arrival. Any delay could mean major problems for a project. To ensure electronic equipment was moved properly, certain movers were dedicated specifically to electronic office equipment. They securely packed all electronics from the old building and installed them at the destination workspace separately from other equipment. Immediately after installation, testers made sure that all computers were linked to the necessary servers and printers. The goal of a seamless move of technical equipment was met due to seeking concerns from the future occupants of the building.

Employees were able to cater their workspace to their needs, right down to the positioning of their computer and drawers. Movers followed the specifications in the new space and customized each workspace.

5.3 Moving materials

As moving day neared, the moving team shifted its focus from collecting feedback to preparing for the move. Moving packets were created that included checklists to complete before moving, and maps and directories for the new space. The packets were designed to guide employees how to do routine things in the new building that they'd done in the old office, from the location of the mailroom to vending machines.

The team scheduled "Clean up and move" days each of the four months leading up to moving day. Employees were rewarded with prizes for preparing to move. The prizes were larger further in advance of moving day to reward those who planned early.

To minimize waste created as employees cleaned up, a treasure table was set up, at which employees could place materials that they no longer needed. Others were invited to take anything that they could use. Once the final moving day came, all of the materials were donated to Goodwill. This simple measure saved 1,000 pounds of trash from reaching a landfill.

6 Employee engagement

The decision to build a new headquarters office was based on a need to accommodate the needs of Great River Energy employees. The existing office had become severely overcrowded and could no longer accommodate the current employees, much less future growth. In some cases, single-person offices at the Elk River building had been used to house four employees. Conference rooms, once a luxury, were transformed into cubicle spaces for entire teams. Because employee growth was the impetus for constructing a new headquarters building, employee needs were at the forefront of all decisions regarding the structure. “It’s important to involve employees when building for LEED,” said Great River Energy Director of Business Operations Mike Finley. “You need to communicate more than you think.”

A team was formed before the building was designed to collect information about the Elk River space and brainstorm ways to mold the new headquarters into a better physical representation of the Great River Energy culture.

6.1 Site selection with employees in mind

When a headquarters moves, the effects on employees go beyond simply changing their commutes. A new location creates different routines for workers, whether it means rescheduling after-work volunteering or choosing a different dry cleaner. Often employees with kids must re-evaluate child care options or after-school activities. All of those considerations went into the selection of the Maple Grove site. Great River Energy’s facilities staff plotted the location of every employee’s home and used that map as a deciding factor in choosing sites.

Business objectives didn’t always align with every employee’s needs, so there was careful compromise when decisions were made regarding the new building. It was an important business objective to keep the office close to the Minneapolis-St. Paul metro area, or, at the very least, not move farther away from it. One reason is for recruitment purposes: the energy industry was on the cusp of major growth and Great River Energy needed to remain an appealing employer for professionals.

By looking at locations south and east of Elk River, many employees were facing longer commutes. Maple Grove is one of the outermost northwest suburbs of Minneapolis, striking a balance between the company’s need to be close to a metropolitan area and many employees’ desire to stay close to home. As a company that values its employees Great River Energy didn’t feel that was enough to address concerns about commutes. To alleviate commute issues, Great River Energy launched a bus service from the previous headquarters location to the new office in Maple Grove.

Employee amenities were a factor in deciding on a site. The new location would need to offer everything that was available at the previous location and more. As Maple Grove began to appear as the likely new home for Great River Energy, employees were

informed about the area. Many employees weren't familiar with the surrounding amenities and felt better about the move once they learned of them.

6.2 Show employees what's possible

A group of employees toured three corporate offices with LEED components and were asked to pay attention to specific design elements. The group represented all areas of the company. The tours intended to get employees excited about the new headquarters and involved in the design process. Employee input was reflected in every decision. The decision to host tours aligned with the way Great River Energy conducts everyday business – by getting ideas from across the company. Employees in all areas and at all levels help to craft company strategy and the new headquarters followed the same process.

6.3 Culture-based design

Great River Energy harbors a collaborative approach to work, but the Elk River campus wasn't built to accommodate such a collective culture. The Elk River campus consisted of multiple buildings. Eighty percent of the workspaces were closed offices, and open office space accounted for a small portion of work areas. When new employees arrived, they were often placed wherever space could be found. Communal spaces were difficult to find, but the collaborative culture persisted despite the constraints. During the design process, employees recommended that the new office be built to foster collaboration and teamwork. As a result, the Maple Grove building was made up of primarily open offices.

Open offices were selected to maximize employee collaboration. Working groups that had previously been located across several rooms, and at times multiple buildings, were placed in the same area. Teams that had traditionally worked with one another were located in similar areas of the building.

With so many people shifting from closed to open offices, the culture team recognized a need for private spaces in the building. Concerns about privacy and confidentiality were addressed by the addition of "huddle rooms" located throughout the building. These rooms are available for employees to make private phone calls or have confidential conversations with co-workers.

The decision to move toward open offices also allowed for more daylight harvesting. Open office walls were designed to provide privacy, but translucent glass on the tops of walls allowed for the passage of natural light. More than 90 percent of employees have direct access to daylight in the Maple Grove headquarters, a benefit that has been shown to increase productivity.

With an open office environment, noise concerns were addressed with the inclusion of many conference rooms of varying sizes. Open offices go a long way toward small-group collaboration, but conference rooms allow for team or large-group meetings.

Pantries with café-style seating were placed in five locations throughout the new building. The spaces are separate from open offices, but not behind doors. Pantries are equipped with microwaves, refrigerators, sinks and coffee makers and serve as informal employee meeting spaces.

6.4 Keep employees involved during construction

The Great River Energy move team hosted regular lunches that discussed the project. The architects often presented information about the building design and displayed the latest drawings. The construction company presented about green building and recycling practices. Every lunch was also an opportunity for employees to raise questions. Great River Energy made every effort to be transparent as the building progressed so there would be a seamless transition into the new facility.

During construction, employees were invited on bus trips to Maple Grove. The buses introduced driving routes to the new office and allowed employees to see the construction progress. Great River Energy knew that the more familiar employees became with the new office, the easier the move would be.

A display was created near the cafeteria at the Elk River building which displayed artist renderings of the building, office spaces and conference rooms. The architect provided a fly-through video of the facility that was also shown in Elk River. As construction neared, the display included examples of the materials that would be installed in the building as well as samples of the office fixtures that awaited them. When employees began packing, actual offices were assembled in Elk River so employees could get a hands-on feel for their new work areas.

Throughout the planning, construction and move, employee concerns were addressed and questions were answered. In fact, this attention to employee feedback was a reason why Great River Energy was named a “Great Place to Work” in 2008 by *Minnesota Monthly* magazine in the “Great for Employee Voice” category.

6.5 Craft policies to address concerns

Anticipating employee requests to work remotely after the move, Great River Energy established a policy to address requests fairly. One year before the move was scheduled to begin, the company published its flexible work arrangement guidelines. This allowed employees to propose a flexible schedule for working from a remote location, among other options. If a compelling business case was presented, employees were allowed to craft a schedule that better balanced their work with their personal lives.

7 Conclusion

In a way, Great River Energy's headquarters has already done what it was intended to do. Several thousand people have toured the facility and learned of its efficiencies, and the interest shows no signs of waning. The attention the building has gained is proof that people want to challenge the status quo and propel the evolution of efficient building and energy conservation.

Great River Energy's headquarters is so focused on energy efficiency that it's interesting to note that the USGBC's mission behind LEED certification goes far beyond a commitment to building structures that consume fewer resources. LEED is also focused on improving quality of life inside and outside of buildings – long into the future.

Great River Energy took a risk by building a structure with a goal of Platinum LEED certification, and the rewards are just beginning to be revealed. The ultimate gauge of the building's success, however, will be its effect on the next generation of construction in this country. If the millions of structures that will be erected to shelter and employ Americans in the next century follow the path forged by Great River Energy's headquarters building and other LEED certified buildings, the country can preemptively reduce the harm from seemingly unavoidable problems of energy, health and climate change.

LEED certified buildings are not only good for the environment – they're good for business. If that fact wasn't clear two years ago, it certainly is now that Great River Energy built an affordable Platinum LEED certified headquarters building.

There is no longer any reason *not* to build to this level of energy efficiency. Great River Energy's headquarters is a comfortable and reliable building, and a responsible addition to the landscape. It is proof that growth does not need to coincide with increased consumption. There is a smart way to grow and build – and it has already been done at Great River Energy.

According to Great River Energy CEO David Saggau, it takes a remarkable level of dedication and resilience to finish a project like this and remain true to the goals outlined at the start.

"A project that demonstrates this type of commitment doesn't just happen," said Saggau. "It takes people dedicated to the sustainability of our environment. The vision of our entire team made this incredible building a reality – and it can be seen every time you walk through the doors of this building."

8 Awards and recognition

In addition to Platinum LEED certification, Great River Energy's headquarters building collected a variety of awards in recognition of its sustainable features and unique, groundbreaking design.

Below are a few of the awards given to Great River Energy and members of the team who contributed to its success:

- **Building Excellence Award**
  First place in "Large commercial building projects" category
  Aggregate and Ready Mix Association of Minnesota
- **Tekne Award**
  "Green company" category
  Minnesota High Tech Association
- **Governor's Award for Pollution Prevention**
  "Green building" category
  Minnesota Pollution Control Agency
- **ARC Award**
  "Excellence in engineering" category
  Consulting-Specifying Engineer magazine
- **Planning Award**
  "Project that informed the public about planning" category
  Minnesota Chapter of the American Planning Association
- **Leadership Award**
  "Corporate recycling and green building initiatives" category
  Minnesota Waste Wise
- **2008 Business of the Year Award**
  North Metro Mayors Association