Executive Summary

Great River Energy (GRE) is a Generation & Transmission cooperative that is owned by 28 distribution cooperatives to provide power to 1.7 million electric customers in Minnesota and western Wisconsin. GRE has a diverse generation portfolio including the Elk River Resource Recovery Project (ERRRP), a Waste-to-Energy partnership where the Resource Processing Plant (RPP) and Energy Recovery Station (ERS) combine to provide 29 MW of renewable energy by processing waste and combusting refuse-derived fuel (RDF).

The ERRRP has operated since 1989, processing over 9,000,000 tons of municipal solid waste, but under two separate managements. In 2010, Great River Energy purchased RPP and initiated sweeping changes to increase efficiencies and reduce waste. By additional processing of bulky waste and optimizing plant operations to increase metal recovery and reduce residues, the plant has greatly increased its recovery of RDF and recyclable materials and reduced the materials transferred to a landfill to near zero.

Engineering Design Systems and Technologies:

The Elk River Resource Recovery Project (ERRRP) is based on refuse-derived fuel (RDF) technology. The project is made up of the Resource Processing Plant (RPP) where Municipal Solid Waste (MSW) is processed to remove the metals and produce an engineered sized fuel, the Energy Recovery Station (ERS) where the RDF is combusted to produce steam for electrical generation, and the Becker Ash Landfill (BAL) where the final products of combustion are stored. The project can process more than 300,000 tons of Municipal Solid Waste (MSW) annually and produces enough electricity to supply over
25,000 homes. ERRRP primarily receives residential and commercial waste from the Twin Cities counties of Sherburne, Anoka and Hennepin.

ERS was originally a coal-fired generation facility with the first two stoker units in service in 1951. The third unit was added in 1959, doubling the generation output of the station to 45 MW. In the 1980’s, Minnesota enacted legislation restricting the permitting of landfills and several older, smaller coal-fired facilities, including ERS, were converted to RDF. The boiler furnaces were modified, new ash and fuel handling and storage systems were installed and air emission control equipment was added. In August 1989, the ERS and RPP facilities started commercial operation.

The tipping floor is contained in a steel building and is 60,000 square feet, with a 12 inch thick concrete floor and can hold over 4,000 tons of MSW. Overhead doors are utilized to allow trucks in and out of the building at various locations and can be closed to minimize any material from leaving the building. Wheel loaders are used to stack the MSW and then load it into the in-feed conveyor. Items that cannot be processed such as electronics, propane tanks, medical waste (sharps), or appliances are removed from the in-feed line with a grapple crane. Bulky items such as mattresses, furniture or other over-sized material are set aside with the crane and moved over to the bulky waste area of the tipping floor. These items will be loaded into the Komptech Terminator shredder with the loader. As the product moves through the shredder it goes through a low speed rotor that shears it and moves it up a belt where a cross belt magnet pulls out the ferrous material while the burnable material forms a pile. The shredder bulky material will be mixed with the MSW and be processed into RDF. Having a bulky waste shredder helps to keep over 24,000 tons of bulky items out of the landfill annually and increases the amount of recycling and burnable fuel.

There are two parallel processing lines in the plant. Each line is capable of processing over 50 tons of MSW per hour. Having two processing lines allows for either both lines to run to increase the production or have one line running and one line down for maintenance or repairs without hindering the ability to supply the power plant with sufficient fuel to operate.

The processible MSW goes through a flail mill powered by a 1200 HP motor and has 24 hammers weighing 150 pounds each. The mill beats open the bags and reduces the size of the material while spinning at 900 RPM. The MSW then transfers under a series of overhead magnets, used to pull out the ferrous metals for recycling. Over 10,000 tons of ferrous metals are recovered annually.

In the next stage, the MSW goes through a disc screen and air classifier. The disc screen separates material that is oversized and sends it through a secondary shredder. Material that is the correct size
moves on to the air classifier. The air classifier separates the heavy material from the lighter material, removing the items that are not burnable such as bits of concrete and glass, and non-ferrous metals. GRE controls airborne dust in the processing operation by routing dust generated from transfer points and shredding operations to a baghouse to maintain a clean and safe environment for the plant staff, the equipment and the environment.

This residue is loaded into trailers and historically went to a landfill. Performance improvements implemented since 2011 have reduced the amount of residue that goes to the landfill by re-processing it to remove more burnable materials and selling the remaining product to companies that remove the remaining ferrous and non-ferrous metals such as copper and brass for recycling.

The lighter material goes through the eddy current unit which pulls non-ferrous products from the waste stream. As aluminum and other alloys are non-magnetic, the equipment gives a brief charge to the aluminum, which acts as a polarizer. A magnetic field then ejects the aluminum off of the conveyor so that it can be recycled. Over 3.7 million pounds of aluminum and non-ferrous metals are recovered annually at RPP.

The remaining shredded RDF material is loaded into trailers in the plant’s load-out area. As trailers are filled they are monitored to ensure they are within Minnesota’s Department of Transportation limits for transportation on the public roads, and then delivered two miles north to ERS. The RDF barn can store more than 2,000 tons of RDF, which is about a two-day supply. The loader will deposit loads of RDF onto the conveyor belt to move it to the feed system at the power plant. The conveyor is a completely enclosed system that moves the RDF over 625 feet from the RDF barn to the generation building.

In the generation building a distribution conveyor fills the feed storage bins for the three boiler units. There are a total of nine feeders, three for each boiler, that meter the RDF into the boilers. The RDF is metered using variable speed screw augers which deliver the fuel to a vertical chute and through air swept distribution spouts for distribution of RDF into the combustion zone of the boilers. Heavier RDF which does not burn in suspension drops to the traveling stoker grate where combustion is completed. A high pressure over-fire air fan and distribution system on each unit control emissions by promoting complete combustion. The boilers burn the RDF at temperatures exceeding 1,800 °F.

Unit 3 is approximately twice the size of units 1 and 2. The boilers operate at a steam pressure of 615 psig and a temperature of 750 °F. The units are rated at 128, 128, and 268 mmBtu/hr, respectively, which equates to approximately 11.7, 11.7 and 24.4 tons of RDF per hour. Units 1 and 2 are capable of a
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Steam flow 86,300 lb/hr and Unit 3 is capable of 173,600 lb/hr. The combustors can also burn natural gas and fuel oil. Natural gas is used at start-up and as required to maintain proper combustion conditions; #2 fuel oil is used as a backup fuel to the natural gas.

Steam from the boilers is used to operate three Elliott steam turbines with a combined output of 29 MW. The 13.8 kV output of the generator is stepped up to 69 kV in an onsite transformer and delivered to the GRE transmission system.

All three of the combustion units (boilers) are connected to common state of the art air pollution control equipment (APC): a dry scrubber for the control of acid gasses and a baghouse for the control of Particulate Matter (PM). Exhaust gasses are continuously monitored for Carbon Dioxide (CO2), Carbon Monoxide (CO), Sulfur Dioxide (SO2), Nitrogen Oxides (NOX), opacity, and oxygen (O2). The scrubber/baghouse arrangement performs significantly better than the permitted requirement to remove greater than 75% of SO2.

Bottom ash from each boiler unit is conveyed to the water-filled bottom ash conveyor that also serves as a water seal for the furnace. Fly ash is collected from the baghouses and scrubber hoppers and transported to a storage silo. The fly ash and bottom ash are mixed in an enclosed ash storage building prior to loading into covered semi-trailers for transport to the Becker Ash Landfill (BAL). BAL is a state-of-the-art municipal solid waste (MSW) combustor ash landfill owned and operated by GRE, and used exclusively for the storage of ash from ERS.

Environmental Impacts and Regulatory Compliance:

GRE has adopted a decision-making formula that gives equal importance to our three highest priorities: affordable rates, reliable service and environmental stewardship— it’s called the triple bottom line. Every decision GRE makes as an organization is carefully evaluated and held up to these three standards by working to balance each.

These priorities serve as guiding principles for all of GRE’s actions. The organization will do nothing for rates and reliability without assessing environmental implications. But, by the same token, GRE won’t do anything for the environment without fully considering the impact on rates and reliability. Ultimately, it is about conducting business in a way that benefits both sustainability and the bottom-line.

GRE maintains ISO 14001 registered Environmental Management Systems (EMS) for our generation facilities and transmission operations making us one of very few utilities in the United States with ISO 14001 registered facilities.
ISO 14001 requires a company to develop and implement an EMS that identifies and addresses the immediate and long-term impacts of an operation’s activities and processes on the environment. It also provides for the allocation of resources, assignment of responsibilities, and the evaluation of company practices, procedures and processes. As part of the ISO 14001 registration process, an independent registrar must complete a rigorous audit of an operation’s environmental programs. Regular surveillance audits are also conducted by an independent registrar to ensure continued conformance with the standard. The implementation of the EMS program has enabled the project to employ a process of continual environmental improvement. The program fully engages the entire spectrum of employees from plant operations and maintenance staff to corporate environmental staff and corporate management working in a coordinated effort to improve the EMS and overall performance of the project.

The Energy Recovery Station (ERS) achieved ISO 14001 registration in December of 2007. Over one hundred operating procedures have been developed and maintained to ensure operations at the facility are designed to minimize environmental impact. The Resource Processing Plant (RPP) and Becker Ash Landfill (BAL) operate under a similar level of control and environmental awareness, but have not been formally added to the ISO 14001 Registration.

The consideration of the impact of ERRRP on the environment is an integral part of the daily operation. From the moment the MSW is delivered to RPP tipping floor until the ash is delivered to BAL, the environment is a top priority.

At RPP, the haulers deliver on a tipping floor within an enclosed building. When the weather causes excessive wind to move through the tipping floor the doors can be closed between deliveries to minimize the amount of waste that that can be blown into the surrounding areas. Plant employees and/or contractors remove debris that may be on the grounds. In addition to keeping the Great River Energy property maintained, GRE maintains the immediate roadside and surrounding area.

In the event of a spill that involves petroleum or chemical products, protocols are in place to minimize the potential impact to the environment. If a spill is over five gallons, it is reported to the company’s Environmental Administrator, who then reports it to the Minnesota Duty Office and the Minnesota Pollution Control Agency as appropriate. All spills are immediately contained to prevent the release of chemicals into the environment. In most cases, building design and doorway berms serve as secondary containment. This keeps oil inside where it can be quickly captured. As an additional layer of protection, all plant floor drains run through and oil water separator. Another form of containment and clean up used on site is corn cob floor drying agent. The corn cob material absorbs the liquid and is then able to be processed as MSW in most cases. Many other commercial absorbents are not combustible, using corn cob based material allows us to recover energy from any spilled oil. If the chemical that is spilled requires specialty disposal the appropriate companies are called at that time to dispose of the hazardous material.
Wastewater from the processing plant is stored in a holding tank and hauled to a permitted waste water treatment plant for treatment by a hauling contractor. Samples are taken from each load of waste water and are sent to a lab to certify compliance with regulations.

In addition to removal of the contaminants prior to transporting the RDF to ERS, GRE manages its routine operations and maintenance such that the equipment will meet and/or exceed the performance standards needed to meet the permitted air emission limits.

Performance and Performance Improvements

The Elk River Resource Recovery Project has been operating for 25 years. What was once a partnership has now been solely owned by GRE since May of 2010. In those 25 years, many improvements have been made in the process of turning waste into reliable renewable electricity. In addition, contracts have changed that have forced the project to compete with local landfills on an open market basis with minimal subsidies. GRE reviewed all the plant operations to see where reductions in waste or maximized revenue from the sales of material recovered from the MSW.

For the first 20 years of operation approximately 16% of the incoming waste ended up in a landfill, mostly due to the inability to process the bulky waste (non-processibles) and the incomplete removal of burnable material from the residue. The landfilling of this material added to operational costs and resulted in a loss of fuel for energy recovery.

Since 2010, GRE has used a bulky waste shredder to reduce the size of larger materials. This has eliminated the need for disposing of most of the waste and has increased the amount of RDF and metals
recovered. Re-processing the residue involves taking the material that previously would have been landfilled and running it through the equipment again. The combined result of these process changes has resulted in near zero (0.23%) MSW needing to be disposed of at a landfill and an increase in the recyclable metals and RDF produced.

The metals recovered in processing the RDF at RPP can also be “cleaned” to get more of the burnable fuel separated from them and significantly increase their value. In 2010, a secondary cleanup system was installed in the ferrous recovery line consisting of a series of additional air knifes and a drum magnet. The drum magnet allows the separation of contaminants from the ferrous material. A premium price can be achieved for the cleaner ferrous material and less shipping and disposal costs are incurred. The original ferrous was considered a low grade product as there was a lot of plastics and paper mixed with the metal. Prior to the installation of the ferrous cleanup system, the average recovery value was $60 per ton. Through adjusting the equipment and fine-tuning the process, the cleaner ferrous is now regularly sold for over $200 per ton.

In 2013, GRE received approval to expand its cells to expand the capacity of BAL. This expansion allows for new cells to be added, extending the usable life by more than 20 years. The permitting process included working with the City of Becker, Sherburne County and the Minnesota Pollution Control Agency. GRE hosted open houses, site tours and open meetings before the permitting process began to help our neighbors and regulators better understand the project. The permitting process proceeded with no concerns aired through the public notice process.

Although the process of getting the ash to the landfill hasn’t changed much in the past 25 years, the quantity of the ash has changed. As the processing of RDF has improved, the amount of non-combustible materials that go to the power plant and into the ash have decreased. This results in

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Percent (%) of MSW Sent to Landfill

<table>
<thead>
<tr>
<th>Year</th>
<th>% Residue</th>
<th>% Non Processibles</th>
</tr>
</thead>
<tbody>
<tr>
<td>1989-2009</td>
<td>11.40%</td>
<td>0.75%</td>
</tr>
<tr>
<td>GRE 2010</td>
<td>6.00%</td>
<td>0.43%</td>
</tr>
<tr>
<td>GRE 2011</td>
<td>5.40%</td>
<td>0.22%</td>
</tr>
<tr>
<td>GRE 2012</td>
<td>1.20%</td>
<td>0.31%</td>
</tr>
<tr>
<td>GRE 2013</td>
<td>0.00%</td>
<td>0.00%</td>
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</tbody>
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slightly less ash to be disposed of. The percentage of wet ash derived from the RDF is approximately 27% by weight.

The Becker Ash Landfill (BAL) is a state-of-the-art Municipal Waste Combustor Ash Landfill that has been engineered to ensure protection to the environment from potential contaminants in the ash. A double liner system is installed beneath each cell which contains 2 liners and a leachate collection system. After a significant portion of a cell has reached its final elevation an engineered final cover is placed over the top of the waste to eliminate the addition of water to the closed area.

The leachate collection system gathers all leachate generated within the facility and forwards it through two pump houses to holding tanks where it is sampled and analyzed. GRE maintains licenses or permits to haul leachate to three waste water treatment plants for treatment. In 2012, GRE reached agreement with the City of Becker to dispose of the vast majority of the leachate generated by the landfill at the city’s waste water treatment facility. Having a leachate treatment site close to BAL allows GRE to reduce the environmental impacts and cost of hauling leachate long distances.

Dry-Tomb Landfill
Containment and Monitoring Systems used at the Becker Ash Landfill

Coordination and Cooperation with Waste Supply Organization

Great River Energy (GRE) has contracts with haulers in three local counties to bring waste into the facility. The waste either comes in direct from the collection packer trucks or it is brought in from the local transfer stations in larger trailers. The county haulers bring in a contracted amount of waste annually, and coordinate with Resource Processing Plant (RPP) weekly or daily to make sure that all
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facilities are running smoothly. There are times when GRE or other regional waste-to-energy plants need more or less MSW, depending on outage schedules. The communication between the power plant, processing plant, transfer stations, and counties help to ensure that there is adequate fuel available to keep the facilities operating efficiently. In 2013 and 2014, Great River Energy coordinated with Hennepin County during outages of the Hennepin Energy Recovery Center facility to help divert more than 5,000 tons of MSW from landfill.

Other waste streams that are utilized are specialty wastes brought in by companies looking for sustainable ways to dispose of their waste without it going to a landfill. Some of the companies choose to bring their waste to the processing plant to help with their corporate environmental initiatives or to reduce their cost of disposing of the waste. The specialty wastes are commonly items like large quantities of mattresses or plastic waste produced from other recycling processes. These loads are priced according to the amount of processing required for the product and the energy value of the material. Waste that requires processing by the bulky waste shredder and then processing at RPP would cost more than waste that is already sized and can go directly to the RDF barn at the power plant.

A small portion of the incoming waste is directly from citizens. GRE has partnered with local cities and counties to make disposal easy and affordable to minimize illegal dumping of waste and encourage recovery. GRE is able to accept waste from citizens to help them dispose of bulky waste or loads of mixed waste. Citizens are able to bring their waste to the facility and either pay a tipping fee for a load of mixed waste or single item fees for individual bulky items. The fees that are charged are lower than what is available at the local landfill. The lower fees and more flexible hours have been met with positive reactions from the public. Citizens do not need to reside in one of the participating counties to bring in waste. The RPP facility also accepts propane tanks of all sizes at no fee as a service to customers. This also helps prevent the propane tanks from being disposed of with the MSW, which is a significant safety hazard.

GRE considers MSW a resource and regularly tests to see if other materials can be economically recovered. The recovery of golf balls, batteries, motor windings, glass and plastics have been tested. Early tests on plastics recovery have shown that as much 1.5% of incoming MSW can be recovered as #1 and #2 plastic containers. Further testing and engineering studies are planned to confirm that the plastics recovery is economically feasible.

**Facility Planning**

The Resource Processing Plant (RPP) does not process any hazardous waste, appliances, monitors, electronics, tires, propane tanks and other items. Some prohibited items are found in the waste stream and they are handled properly to minimize the environmental impact of our operations. As these items are separated from the MSW they are placed in a designated storage area. Outside companies are hired to collect and recycle appliances, electronics, tires and propane tanks and medical waste (sharps).

Plans for future expansion are contemplated for a joint partnership with the counties to offer single container composting. The composting material would be put in a blue bag and could be placed in the same container as the regular household waste. When the waste is dumped onto the tipping floor the
blue bags could be pulled out and placed into a separate area for pickup. This would reduce an additional truck to the routes to pick up the compostable material and may encourage participation by the citizens because of the simplicity.

**Worker Health and Safety**

Safety is a core value at Great River Energy (GRE) and is considered a key factor in the success of the company. All GRE employees receive extensive safety training when they are initially hired and receive monthly, quarterly, and annual training on a variety of topics. Employees attend monthly safety meetings where topics are covered such as ladder safety and hearing protection. This training is done on site during the normal working hours of the employees. If they are unable to attend due to scheduling conflicts, they are expected to make up the training by watching the video of the presentation and signing off that they did so. This is a time where they can bring up any questions or concerns they may have in regards to health or safety at work or at home. There are quarterly training videos and quizzes that are completed online by every employee. These are also topics related to the work environment and strive to ensure that the employees understand why it is important to follow the safety procedures. Training such as fire safety and extinguishing are completed on an annual basis. Employees must be knowledgeable in the process of discovering a fire and what to do when that happens. The understanding of when they should try to extinguish a fire or when they should have the fire department called is critical and could save lives.

Safety activities are key to keeping employees safe at work in a waste-to-energy facility. All employees receive ongoing training in wearing Personal Protective Equipment (PPE) and are expected to be proactive in the use of such articles. All employees that work directly with the waste-to-energy process are issued company supplied uniforms to minimize the risk of contamination. The uniforms stay on site and are professionally laundered. Employees are issued hard hats, safety glasses, ear plugs, and other safety equipment and are expected to request replacement as needed. Steel toe shoes are also mandatory and employees are reimbursed for the purchase of new boots annually or as needed. The use of puncture resistant soles has been promoted because of the possible exposure to puncture hazards.

The Lock Out Tag Out program is a key part of the training program in regards to keeping employees safe at work. This program involves the locking out of equipment that will be repaired or is out of service. This prevents an unknowing employee from turning on or running the equipment while somebody is in a dangerous area. Both the working employee and the supervisor must have their locks on the equipment to have a double layer of protection for the employees. Another form of protecting the employees is by having designated “no man zones”. These are areas that are not to be entered while the equipment is running. The “no man zones” are confirmed cleared via radio communication and visual inspection before any equipment is turned on.

Housekeeping is another critical way to keep employees safe. Employees are trained on the importance of good housekeeping and keeping pathways clear and to be alert for possible hazards. Daily cleaning occurs along with basic maintenance of equipment.
Even with all of the precautions in place, accidents, injuries and near-misses can still happen in this type of work environment. Any injuries or near misses, no matter how minor, are reported to the supervisor on duty and incident reports are filled out. If an injury falls into the category of a recordable injury, all proper paperwork and notifications are completed and turned in. Great River Energy has a safety team that reviews incident reports and completes site inspections. This group works to prevent injuries before they happen by updating processes and equipment that put workers at risk.

In 2013, GRE asked the local county solid waste management board to help craft legislation that will offer better end disposal options for sharps. In Minnesota, medical sharps from residential users are currently thrown into standard trash containers. Processing of MSW can bring workers into contact with these sharps on a regular basis. Better disposal options can keep them out of the MSW stream. Minnesota is now reviewing legislation for sharps disposal.

GRE also values the health of the employees and supports a strong wellness culture through programs available to employees and their families. GRE’s wellness initiatives landed the cooperative on an elite list of employers--the 2014 Healthiest 100 Workplaces in America.

GRE proudly ranked 31st on this list of which there were thousands entered in this year’s competition. The semi-finalist list included 250 employers from which the 100 healthiest employers for 2014 were selected. This national award recognizes that GRE has achieved remarkable and sustainable success through a broad range of corporate wellness programs and employee wellness initiatives.

**Economics and Cost Effectiveness**

Doing the right thing is not always the most cost-effective way of handling waste. Utilizing the ability to turn waste into electricity is an important step in helping to minimize the amount of land needed to operate landfills. GRE is a not-for-profit cooperative, so their goal is to provide reliable electricity at an affordable price. In the early years of the Elk River Resource Recovery Project, and until recently, the counties assisted with a subsidy to haulers so that they would bring their waste to the facility at a market rate. The competition from local landfills could have caused an issue with being able to operate if there weren’t enough haulers to bring in waste at the higher rate. RPP continued to refine the process and improve the quality of the recyclable materials, therefore receiving better revenues and reduced disposal costs. This increase in net income directly impacts the tipping fee that haulers pay keeping fees competitive with the local landfills that have far lower overhead costs.

Reduction in rates since original project and revenue increases from process improvements have allowed GRE to originally lower our tip fee and then maintain that level while producing electricity at rates that are competitive with other biomass renewable facilities.

**Public Acceptance, Appearance and Aesthetics**

Keeping both the processing plant and the power plant clean and tidy in appearance is important to Great River Energy (GRE). Both the Elk River Station (ERS) and the Resource Processing Plant (RPP) are located in the city limits of Elk River and during the 25 years of operation, there has been great
acceptance and community support for the project. The grounds are maintained on a regular basis to keep a neat appearance. RPP regularly has a contract street sweeper clean not only the GRE parking lots, but also runs the length of the street to help clear the public road of waste that may fall from the trucks as they enter or leave the facility.

GRE also helps keep their surrounding community clean by volunteering. For many years GRE staff has participated in the Adopt-A-Highway Program, keeping more than 2 miles of roadway cleaned each spring and fall.

In the winter of 2013-2014, both ERS and RPP designed and installed holiday light displays. The displays were visible from the highway and were met with positive reactions from both the employees and the public. It was important to GRE to be demonstrating responsible energy usage during the holidays, so all of the lights used in the displays were energy-efficient LED bulbs.

Since the holiday season of 2011, the Resource Recovery Project has “adopted” families through the local Christmas Giving Program. The requested items are purchased by the employees and brought to the distribution location to be distributed to the families in need. From 2011-2013 thirteen families have had their wish lists fulfilled with items such as winter coats, boots, fuel gift cards, personal hygiene products, clothing and toys. Funds and items that exceed requests are spread out among other families in the program. The families are all in the local area and can range from a single parent with one child to a multi-generational household.

GRE is not only a utility that generates electricity for our customers; they are a corporate citizen that recognizes we can have an impact on the communities we serve beyond our business purpose. Each year, GRE makes grants to, and partners with, organizations within our GRE’s member cooperatives’ service areas or near GRE facilities. These organizations have made a positive impact on our
communities and member consumers through contributions and sponsorships. Graduating seniors from several local high schools can apply for financial aid from GRE through their school scholarship programs.

GRE has also helped sponsor and support a number of recycling programs at the local level. The company loans out its high visibility recycling containers to community events. GRE has helped coordinate a recycling program and pilot an organics program at the local Sherburne County Fair.

Also as part of our environmental stewardship along with giving back to the local community, we have mounted a peregrine falcon nesting box on ERS. Working along with the Bob Anderson the director of the Raptor Resource Project from Decorah, Iowa, who bands and tracks the eyasses (young falcons), in the Midwest Peregrine Database. The original nesting box was constructed by a local Boy Scout as an Eagle Scout project and mounted on the ERS in February 2007. Each year we go into local classrooms and share with the students the ERS peregrine falcon nest box project. We invite the students to watch the nest box activities on the web cam and then attend the annual banding of the eyasses, and have students assist in naming the eyasses. To date twenty-one eyasses have fledged from the ERS, with a nesting pair currently incubating four eggs again this year.

GRE hosts booths at multiple events in order to educate the public on the benefits of waste-to-energy plants. These booths have information on GRE as a cooperative and the Elk River Resource Recovery Project available for the public to take with them, and a video is running that runs through the equipment and locations. There is also a display box that showcases the different products as it goes through the process of going from MSW to reliable energy. In addition to educating the public at formal events, GRE also offers tours of both RPP and ERS to the public. School groups, Boy and Girl Scout troops, and the general public are able to see first-hand what waste-to-energy has to offer. In 2013, over 650 children and adults have toured the facilities.

Great River Energy and the Elk River Resource Recovery Project are proud to support our community and environment by handling waste in an environmentally sound way while providing our members with renewable energy.
Great River Energy plant hits a milestone: No landfills

By Joni Astrup
April 11, 2012 at 3:09 pm

by Joni Astrup

Associate editor

Great River Energy achieved a milestone in October 2011 for the first time in the history of the garbage-to-electricity project in Elk River: It didn’t send any garbage to a landfill.

Garbage is processed at a plant in Elk River, where it is turned into refuse-derived fuel that will be burned to produce electricity.

While plant officials can’t promise they’ll never have to landfill again, for the past six months nothing has been landfilled.

“Since September we’ve been working really hard to hold it at zero landfilled. We’ve been really happy with that,” said Steve Vrchota. He is the leader of plant operations at Great River Energy’s Resource Processing Plant in Elk River.

Garbage from Sherburne County and surrounding counties has been processed into fuel since the project went online in 1989. Currently about 250,000 tons of garbage a year from Sherburne, Anoka and Hennepin counties are trucked to the processing plant at 10700 165th Ave. in Elk River. There it is sorted, recyclable materials are pulled out, and the garbage is processed into a fluffy fuel known as refuse-derived fuel or RDF. That RDF is then trucked to the Great River Energy power plant at 17845 Highway 10 in Elk River, where it is burned to generate electricity.

The power plant produces 33 megawatts of electricity — enough to provide power to about 25,000 homes.

Changes at the plant

For the first 20 years of the project, about 83 percent of the garbage that came into the processing plant was turned into RDF, Vrchota said. Four percent was recycled (primarily steel and aluminum) and 12 percent ended up being landfilled. It included a dense residue that was left after processing as well as bulky items like mattresses and pallets.

But all that began changing after Great River Energy purchased the processing plant in April 2010.
Great River Energy began implementing changes to reduce the amount of garbage that was landfilled and increase the amount of RDF produced and recyclable metals sold.

A garbage truck left the Elk River Resource Processing Plant at 10700 165th Ave. after dropping off a load.

“Most of the solutions actually came from all of the people who already work in here (at the processing plant),” Vrchota said.

As a result of the changes, now 94 percent of the garbage becomes RDF. More recyclable metals are being pulled out of the waste stream and diverted from the landfill.

What made this possible?

One of the changes was adding a bulky waste shredder. Great River Energy initially rented one and then bought its own unit, which became fully operational in March. It shreds things like mattresses, box springs and pallets. Shredding allows the plant to recycle things like steel in those bulky materials and process the rest into little pieces of RDF.

The change is saving Great River Energy more than $300,000 a year.

Tim Steinbeck, Elk River Resource Recovery Project manager, said by putting bulky materials in the bulky waste shredder, they can reduce the size of those materials so they will go through the processing plant. “We can remove the metals out of it so we have a higher percentage of metal recovery. And we avoid all of that material going to a landfill,” Steinbeck said.

Another change is a new ferrous metal cleanup system. This material previously contained about 65 percent steel and was sold for about $90 a ton. Now the product contains 85 percent steel and sells for about $250 a ton. Between not having to landfill material and getting a higher rate, the net increase in revenue to the project is approximately $1 million a year. About 7,800 tons of ferrous metal are recycled a year.

A third change is residue reprocessing. This is the residue left after the garbage is processed into RDF. In the past it was landfilled at a cost of about $500,000 a year. Now it is run through the plant a second time. As a result more of the residue is turned into RDF and more metals are recovered. What’s left has enough valuable metals concentrated in it that it can be sold rather than landfilled.

The fourth change involves aluminum recovery. Fine tuning the system has allowed the plant to pull out more aluminum from the garbage and increase revenue by about $150,000 year.
Some materials that used to be landfilled are now being recycled including license plates, aluminum and stainless steel pots and pans as well as brass and copper in faucets, stainless steel sinks, and copper and steel found in motor windings from mixers, hand drills and so forth. More copper and heavy ferrous are also being recycled.

“It helps us with our costs, and you’re not sending useful material to a landfill,” Vrchota said.

He said they can’t guarantee they won’t ever send anything to a landfill again, “but we’re certainly trying to do our best to get as close to zero (material landfilled) as possible,” he said.

**Plant looks at recycling golf balls**

Ever wonder what happens to that golf ball you toss in the trash?

Chances are it ends up in a large container at Great River Energy’s Resource Processing Plant in Elk River, which turns area garbage into a fuel used to produce electricity.

“We get about a hundred a week,” said Steve Vrchota, leader of plant operations at the plant.

The golf balls are being collected and efforts are underway to find a place to recycle them.

**About Great River Energy**

•Great River Energy (GRE) is a consumer-owned, not-for-profit electric utility.

•GRE is owned by its 28 member cooperatives for which GRE generates and transmits electricity. The members are located in the outer-ring suburbs of the Twin Cities up to the Arrowhead region of Minnesota and down to the farmland region in the southwestern portion of the state.

•GRE’s member cooperatives distribute electricity to approximately 645,000 homes, businesses and farms.

•GRE is the second largest electric power supplier in Minnesota and one of the largest generation and transmission cooperatives in the country.

•To learn more about the Elk River Resource Recovery Project, go to [www.youtube.com/watch?v=XQ5jIwyz6nl](http://www.youtube.com/watch?v=XQ5jIwyz6nl) to see a seven-minute video.

*Source: Great River Energy*
Great River Energy is a cooperative electricity provider serving 28 distribution cooperatives in Minnesota and Wisconsin. As an electric cooperative it doesn’t have customers, it has members. Its business purpose is to supply members with reliable and affordable electricity.

The co-op’s Elk River Resource Recovery Project is one of the few waste-to-energy operations with an almost 100% recovery rate. That means that virtually all of the waste taken into the system is either recovered for recycling or burned as RDF to generate electricity. In 2012 only 0.4% of the incoming material was landfilled. This high recovery rate generates income, saves tipping fees, and is good for the environment.

This remarkable performance is a result of careful development work and the right equipment. Engineers at Great River Energy tweaked and modified their processes, and recently the co-op also purchased a Komptech Terminator 5000S stationary electric shredder. According to Great River Processing Plant Supervisor Jack Boogren, the Terminator was “the icing on the cake.”

The Terminator sheds incoming waste down to a particle size that allows for complete processing. Before Great River Energy got the Terminator about 8% of incoming waste was landfilled because it was oversize. With its low speed, high torque, and resistance to contraries, the Terminator can handle items that were previously landfilled, like mattresses, carpet, and even large pieces of twisted metal. That was the reason Great River Energy bought the Terminator, and it has succeeded. As Jack put it, “so far it’s chewed up everything we’ve thrown in. The material comes out the right size for the rest of our process, in one pass.” As a bonus, by shredding previously unshreddable metal items, the Terminator has also increased the metal recovery rate.

Working with Komptech, Great River Energy made some modifications to the Terminator; they hardfaced the teeth and rotor, and also put the electric motors and hydraulic pumps on a skid that can slide in and out of the unit to make maintenance easier. (Komptech is a company that has always prided itself on listening to customers, and has adopted the idea for its machines.)

In general, maintenance is easy, according to Jack, and breakdowns have not been an issue; in over 2000 hours of use the cooperative has not yet run into a stoppage that couldn’t be unstuck simply by reversing the drum in the machine.

Great River Energy originally anticipated running the Terminator about 800 hours in the first year, but has run it more than double that amount. The machine is in use 16 hours a day, 6 days a week. In fact, the Terminator’s ability to handle pretty much anything has encouraged Great River Energy to seek out difficult waste from new sources.

In achieving the near zero-landfill goal, Great River Energy has slashed landfill fees, boosted its income, and taken a major step towards a sustainable future. Komptech is proud that its Terminator is part of it.