Madison Gas and Electric Company

Environmental Cooperative Agreement: Major Accomplishments, 2002-2007

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Introduction

Madison Gas and Electric (MGE) on September 26, 2002, became one of the first Wisconsin companies to sign a five-year cooperative environmental agreement (ECA) with the Wisconsin Department of Natural Resources (DNR) under the State's Environmental Cooperation Pilot Program.

The ECA applies primarily to MGE's Blount Generating Station (BGS) in downtown Madison with a generating capacity of 190 megawatts.

The ECA represents an innovative approach to environmental performance and regulation which:

- Commits MGE to higher environmental standards than required by regulations.
- Outlines actions MGE will take to achieve enhanced environmental performance.
- Reinforces MGE's upgrading of its Environmental Management System (EMS) to International Standards Organization (ISO) 14001 quality.
- Adds flexibility in monitoring and reporting, saving MGE and the DNR time and money while ensuring ample regulatory oversight.

The DNR's news release on the signing of the ECA cited MGE's "tradition of environmental stewardship." "[MGE] continues to build its reputation for seeking new and better ways to improve the environment while meeting all current environmental regulations," DNR Secretary Bazell noted.

The Community Environmental Advisory Group (CEAG) which MGE formed to provide input on the ECA gave feedback helpful in shaping the Agreement. "This group provided valuable advice as the DNR and MGE negotiated the agreement and offers a good model . . . on how to gather community input on environmental management at a facility," Secretary Bazell noted in the news release.

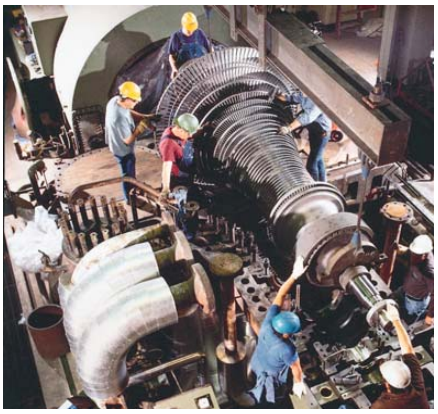
MGE has worked closely and cooperatively with the DNR and CEAG over the past seven years to make strides toward superior environmental performance and leadership in the community.

All ECA requirements have been completed. This report outlines some of the major ECA accomplishments to which all three partners contributed.

Environmental Actions

EMS/ISO 14001

MGE successfully updated its EMS for BGS to fit the ISO's 14001 standards. In October 2004, MGE received official ISO certification and BGS became the first power plant in the state to be ISO 14001 certified. The outcome is a comprehensive process for controlling and improving environmental performance. The enhanced EMS integrates the environment into MGE's daily business operations and emphasizes continual improvement.



- A system-wide compliance calendar tracks regulatory, voluntary, and internal requirements, automatically alerting responsible staff of tasks needing completion.
- The enhanced Continual Improvement Database is more user-friendly, reflected in increased use and reduced maintenance with more effective results.
- MGE's streamlined process for determining BGS' environmental aspects and impacts increases transparency and accountability.

Recently, BGS underwent a successful full-system ISO 14001 three-year recertification audit.

Alternative Fuels

PDF Use at Blount

BGS was one of the first electric generating stations in the country to burn alternative fuels. Under the ECA, MGE continues its 20+-year history of using alternative fuels at BGS which burn cleaner than coal. The Agreement permits MGE's use of paper-derived fuel (PDF) consisting of nonrecyclable pre-consumer paper and plastic wrap in two of BGS' boilers as long as all air emission regulations are maintained.

PDF use has diverted a significant amount of waste from landfill to beneficial reuse and resulted in significant avoided emission reductions since 2003. Burning almost 40,000 tons of PDF displaced the use of nearly 43,000 tons of coal and reduced SO_2 emissions by over 1,000 tons (see table below).

Avoided Emissions From PDF at BGS Since 2003 (in tons)

PDF Burned	Coal Displaced	SO_2	NO_x	Hg (lbs)	PM	CO_2
39,944	42,713	1,063	24.5	1.33	32.4	24,814

Biodiesel Fleet Use

MGE uses B20 biodiesel fuel for about 100 company fleet trucks and off-road equipment which refuel at its downtown Central Service Center. Since the ECA's inception, MGE has purchased 52,878 gallons of biodiesel.

Biodiesel produces significantly less air pollution than petroleum fuel which it can replace. It is manufactured from a variety of renewable sources including waste vegetable, cooking and soybean oils, and animal fats.

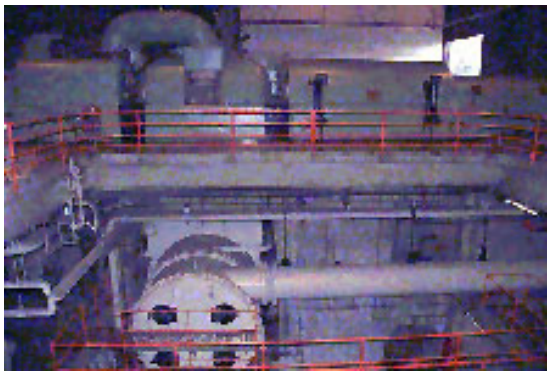
According to Environmental Protection Agency (EPA) data, replacing petroleum-based diesel fuel reduces carbon monoxide (CO) emissions by 10 percent, particulate matter (PM) by 15 percent, sulfates by 20 percent, and hydrocarbons by 20 percent.

Boiler Combustion Improvements

As part of the ECA, MGE continues its ongoing study to improve the combustion efficiency and environmental performance on one of its two largest boilers which produces 400,000 pounds of steam per hour at 950 degrees Fahrenheit.

The Combustion Improvement Study completed in November 2003 recommended several upgrades to improve efficiency in Boiler 8, one of the two largest boilers. Burner upgrades were installed in Boiler 8 in Spring 2006.

Implementation was expected to increase alternative fuel use and potentially reduce nitrogen oxide (NO_x), PM, opacity levels, loss on ignition (LOI), CO, and volatile organic compounds (VOC).



Actual results to date include the following:

- NO_x reductions at all except the lowest loads
- Variable NO_x emission rates at low loads
- Ability to burn more PDF, displacing more coal
- No significant improvement in LOI

In an effort to reduce NO_x at low loads, several short tests were conducted in December 2006 and January 2007. MGE is currently soliciting proposals from combustion optimization companies with the goal of reducing NO_x at low loads.

Voluntary Emission Reduction Registry

MGE is one of the first companies in Wisconsin to enroll in the DNR's voluntary program acknowledging emission reductions that are not required by law and go beyond compliance. MGE worked with the DNR and other stakeholders to develop procedures for this Voluntary Emission Reduction Registry (VERR) and participated as a beta-tester of the Registry forms.

Since 2002, MGE registers all voluntary emission reductions under this system. BT^2, an environmental engineering firm, assists MGE in calculating the reductions, providing third-party verification. The following table summarizes MGE's registered emission reductions to date:

Emission Reductions (Tons) Registered With the DNR

	NO_x	SO_2	PM	CO_2	CO	VOC	Non-Methane HC	Hg (pounds)
2002	805	669	8.96	121,350	0.73	0.0	0.04	0.0
2003	1,217	612	9.0	99,396	0.5	0.0	0.02	0.22
2004	1,198	747	9.4	112,635	0.10	0.0	0.01	0.09
2005	2,226	696	12.0	121,391	0.16	0.10	0.01	0.71
2006*	2,317	372	2.42	120,790	0.22	0.10	0.01	1,264.8
Total	7,763	3,096	42	575,562	1.7	0.2	0.09	1,265.8

*2006 reductions currently pending approval from the DNR. These numbers are subject to change.

Stormwater Filtration Demonstration

MGE installed a stormwater demonstration system on a 1.39-acre parking area on East Main Street in October 2003. One of the first in the state, the system filters out contaminants that run off paved surfaces during rainstorms. Results are monitored and findings shared with government agencies and others. Partners include Earth Tech, an engineering firm; Stormwater Management, a stormwater filter manufacturer; the U.S. Geological Survey (USGS); U.S. Forest Products Research Lab; and the DNR which coordinates the overall project.

The monitoring equipment which has been in place since Summer 2005 is used by MGE and the USGS to measure the system's effectiveness. In 2006, MGE further improved monitoring by installing a closed-circuit TV that automatically records images as storm events occur.

Provisional results of 24 rainfall events monitored in 2005 and 2006 indicate sediment concentrations were generally lower than found at similar sites using urban stormwater monitoring. More detailed analysis will be possible once quality assurance/quality control reviews are complete.

Beneficial Ash Reuse

On an ongoing basis, MGE investigates and implements the best available reuse solutions for two BGS coal production byproducts–fly ash and bottom ash.

Fly Ash
Fly ash is the fine powder formed from the mineral matter in coal. Since June 2004, MGE has utilized fly ash produced at BGS as structural fill in an Iowa limestone mine. In the past five years, more than 30,000 tons of fly ash produced at BGS were diverted from landfill for beneficial reuse.

Bottom Ash
Bottom ash is a coarse, granular, and incombustible by-product of coal production. Of several available uses for this byproduct, the most promising is sub-base material under roadways, parking lots, or commercial and industrial areas.

In 2006, MGE began beneficially using some of the bottom ash produced at BGS, diverting 38 of the 246 tons of bottom ash from landfill to beneficial use as road sub-base material.

Diesel Generator Emission Reduction

MGE in 2006 completed a Diesel Generator Emission Reduction Study which has promising results.

The study tested two different types of PM control technologies as well as engine reliability and efficiency in two diesel generators in MGE's Backup Generator Service program. The program includes 55 diesel generators at Madison-area commercial and industrial sites including Dane County Regional Airport (photo at right of its installation).

The technologies consisted of an Environmental Solutions Worldwide Particulate Reactor and a Continuously Regenerating Technology Particulate Filter.

- Both technologies were found to reduce emissions at a higher-than-expected rate, achieving 42.9 percent and 86 percent decreases in PM, respectively.
- These results suggest the technologies may offer potential benefits for diesel generators and other diesel engines in the future.

MGE uses ultra low sulfur diesel fuel in both this program and at BGS to reduce sulfur dioxide (SO_2) and PM.

Mercury Recycling and Removal

Mercury Thermostat Recycling

Under the ECA, MGE has continued its voluntary mercury thermostat recycling program. This service enables customers and some noncustomers (e.g., building contractors) to drop off mercury-containing thermostats and other devices for recycling.

Below is a table illustrating the program's success:

	Thermostats Recycled	Mercury Recycled (Pounds)
2003-2006	184	1.66

Mercury Inventory and Removal

Starting in 2005, MGE implemented a plan for managing mercury-containing equipment at BGS:

- Equipment known or expected to contain mercury was inventoried to a new level of accuracy consistent with data collection standards for the DNR's VERR.
- Mercury-containing equipment is replaced with mercury-free alternatives where justified. During equipment outages and projects in 2005 and 2006, MGE was able to remove a total of 231.43 pounds of mercury, the majority of which was recycled.
- As of December 29, 2006, 107 pounds of mercury remained in the plant. Removal projects are continuing throughout 2007.

Thermal Discharge Reduction

At the November 2006 CEAG meeting, MGE shared preliminary findings of a Thermal Discharge Utilization and Reduction Study.

The study explored options to reduce BGS' thermal discharge to Lake Monona. Analysis focused on the Livingston Street thermal discharge, one of BGS' two outfalls. Power Engineers Collaborative performed the work.

The report was finalized and submitted to the DNR in March 2007. Major findings:

- Approximately 15 to 20 alternatives were analyzed, ranging in cost from $15,000 to $8.6 million and a thermal reduction of .02 percent (seasonal) to 90 percent (year-round). None of the options achieve full economic payback.
- MGE's Energy 2015 Plan was factored into the thermal discharge forecast, translating into a 90-percent thermal reduction by 2015–a greater reduction than all other alternatives combined. The next-closest reduction option provides only a 45-percent thermal reduction at a cost of $8.6 million with a loss of capacity and efficiency.

Further Emission Reduction Strategies

Beginning in 2003, MGE analyzed numerous options for achieving additional reductions in BGS emissions beyond actions taken as part of the ECA.

Emissions analyzed include NO_x, PM (particles larger than 2.5 microns), SO_2, mercury (Hg), and hydrogen chloride (hydrochloric acid).

Evaluations focused on currently available technologies, using single- and multi-pollutant control strategies and mitigation measures, with the greatest potential for localized or regional air quality impacts.

Options have been assessed in terms of three major criteria:

- Cost-effectiveness for customers
- Ability to achieve environmental benefits
- Feasibility to fit with existing BGS site and equipment

The findings confirm that new controls would require substantial capital investments and major new equipment would need to be located within BGS' facility footprint. BGS is required to meet the new federal Clean Air Interstate Rule by 2015 and Clean Air Mercury Rule by 2018.

MGE decided the best solution, communicated last year as part of Energy 2015, for providing affordable electricity for customers and meeting future emission reductions regulations is as follows:

- Discontinue burning coal at BGS and retire the oldest, least-efficient part of the plant by the end of 2011.
- Continue to burn natural gas on the remaining boilers which operate at 1,250-pounds steam pressure and are the newer parts of the plant.
- Increase MGE's renewable resources by eight times and continue the Company's aggressive conservation and efficiency efforts.

Noise Abatement

Equipment and Scheduling Improvements

MGE made several major improvements in equipment and scheduling to minimize BGS-related noise into the adjacent neighborhood.

The following were completed by 2002:

- Use of quieter bells to alert those nearby of the opening of the gates leading into the coal yard.
- Installation of a new coal conveyor system which eliminated the need for two cranes and the noises associated with their operation.
- Ending reliance on the railroad to transport rail cars in the coal yard at all times of day and night, in favor of a small locomotive serving as a "shuttle wagon" which MGE schedules mostly during the day, reducing night noise.

Noise Complaint Procedure

A noise procedure was implemented in the ECA Baseline Report starting in 2003, routing all calls involving noise concerns to a BGS contact person for prompt resolution.

BGS has not received any noise complaints since the procedure took effect.

One noise inquiry was received in 2006 regarding periodic, low-frequency vibrations which was resolved to the caller's satisfaction by identifying the source (the car shaker) and explaining the equipment's purpose and operation.

Community Involvement

MGE in Summer 2000 formed a Community Environmental Advisory Group (CEAG) to act as a public stakeholder group to work with MGE on the ECA and environmental issues relating to BGS. Beginning in September 2000, CEAG has regularly met to carry out its tasks.

CEAG consists of representatives from the BGS neighborhood, local businesses, environmental groups, DNR, MGE, an elected local official, and an advocate for the interests of low-income families.

CEAG's major responsibilities are to:

- Provide feedback on the MGE/DNR ECA and review MGE's environmental performance under the ECA.
- Provide feedback on MGE's EMS for BGS.
- Provide input on MGE goals and objectives for environmental performance improvement.
- Suggest communications with the public on MGE's environmental programs and performance.

One of the major ECA accomplishments has been the positive and productive relationship between MGE, the DNR, and community members. The group has met over 20 times, often for three hours or more at a time, to review progress under the ECA and discuss audit results and related issues.

Public representation on CEAG and the posting of meeting minutes on MGE's web site have increased the transparency of the ECA process and its accountability to the community. This has enhanced public awareness of and access to information on the environmental impacts of MGE's activities.

All partners have worked hard to build mutual trust through open communication and to foster quality decisions through well-informed, constructive discussion.

Individually and as a group, CEAG members have added valuable input, innovative ideas, and community perspectives. MGE thanks all public and DNR representatives who have served during part or all of the ECA for their contributions and hard work, helping to make the Agreement a success:

Community Members

Rich Bogovich*
Tim Chavez-Mueller
John Coleman*#
Pete Goepfert*
John Imes*#
Lindsey Lee*#
Brian McKee
Tim Metcalfe
Judy Olson*#
Jo Oyama-Miller*#
Keith Reopelle

DNR Members

Kim McCutcheon*#
John Shenot*#

***Current Members**
#Served since CEAG was formed in 2000