

WEC's environmental commitment guiding principles

As principles to guide its actions, the company:

- Includes environmental factors as an integral part of its planning and operating decisions.
- Recognizes the contribution every employee can make to improve the company's environmental performance and encourages employees to become environmental stewards.
- Communicates and reinforces environmental values throughout the company.
- Practices responsible environmental stewardship of all company-owned properties and natural resources entrusted to its management.
- Minimizes adverse environmental impacts of operations by: meeting or surpassing environmental standards, investing in energy efficiency measures, and supporting company recycling and waste reduction programs.
- Supports research and implements new technologies for emissions control, energy efficiency, renewable energy resources, and other environmental and health concerns associated with utility operations.
- Accepts accountability for its operations by responding to environmental incidents quickly and effectively and by promptly informing the appropriate parties.
- Provides public participation opportunities and welcomes communication from stakeholders on environmental issues; and continues to foster constructive working relationships with environmental organizations, community leaders, media and government agencies.
- Participates with government and others in creating responsible laws and regulations to safeguard the environment, community and workplace.
- Commits employee and management resources to support and implement these principles.
- Periodically reviews performance to ensure that programs and practices are consistent with these principles.

Disclosure on management approach

Consistent with the environmental commitment guiding principles (see box), the company pursues a proactive strategy to manage environmental issues. The company is subject to extensive environmental regulations affecting its past, present and future operations. The company incurs significant expenditures in complying with these environmental requirements, including expenditures for the installation of pollution control equipment, environmental monitoring, emissions fees and permits at all of its facilities.

Corporate governance structure and practices support a strategic focus on environmental issues. The chairman of the board, president and chief executive officer of Wisconsin Energy Corporation (WEC) has specific responsibility for climate change-related issues. The vice president-environmental manages WEC's climate change strategies.

The company has a formal mechanism to provide regular updates regarding environmental issues, including climate change, to the audit and oversight committee of the board of directors via quarterly reports from the vice president-environmental. The CEO also provides the board with more frequent updates on this matter, as necessary. The audit and oversight committee assists the board of directors in carrying out the board's responsibility to oversee the company's strategy and compliance with legal and regulatory requirements.

The committee's oversight of environmental matters includes reviewing and providing oversight of environmental compliance matters to ensure that appropriate management attention is being given to such matters. The committee is responsible



for discussing, among other things, the company's major environmental risk exposure and the steps management has taken to monitor and control such exposure. The company continuously monitors and reports on the legislative, regulatory and legal developments in this area. In addition, the company is a member of, and actively participates in, several industry organizations (such as the Edison Electric Institute, Utility Air Regulatory Group, and the Electric Power Research Institute) that are involved in the legislative, regulatory, research, development and demonstration processes.

Responsibility for environmental compliance lies within the company's operating units. The WEC Environmental Compliance Audit program is one way to track the effectiveness of the compliance program across the corporation. This program provides specific requirements for objectivity, scope, auditor qualifications, corporate facility coverage, frequency, quality and responsibilities. Any nonconformance is reported to senior management and ultimately to the board of directors. The quarterly report to the audit and oversight committee of the board of directors includes the status of the environmental compliance audit program. The company also addresses supplier environmental performance through its procurement processes and through supplier audits that use criteria derived from the International Organization for Standardization's 14001 guidelines to measure environmental management system (EMS) compliance.

WEC has a commitment to audit all of its utility operating facilities. The WEC audit schedule is reviewed annually and revised as necessary to meet changing regulatory requirements

and the needs of operating facilities, as well as to identify opportunities for continual improvement. The corporation uses a risk-based approach to potential environmental exposures to determine the necessary frequency of facility audits. WEC's internal environmental audit program includes the key elements of an effective EMS. During 2010, the company conducted audits of four fossil-fueled power plant sites, Site Bulk Material Handling, Steam Services, 12 hydro facilities and 13 service centers.

Supporting a clean energy future

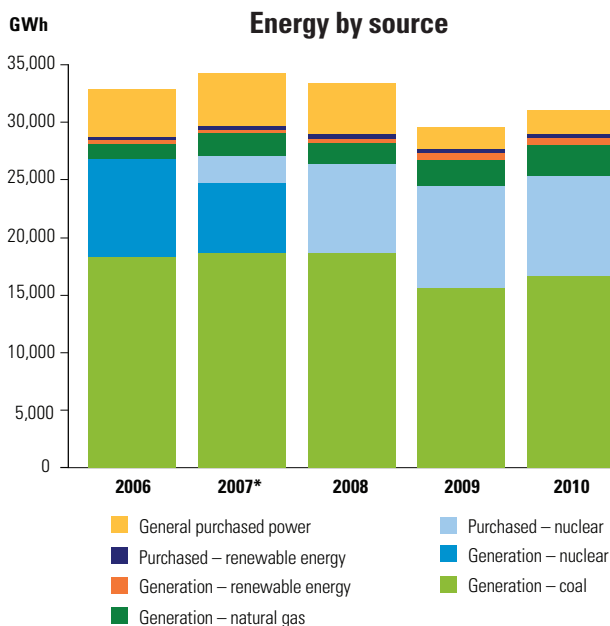
We Energies is committed to making sure customers have the energy they need, building state-of-the-art power plants and making renewable energy a key part of its energy mix.

We Energies evaluates environmental impacts and environmental regulations, including climate change considerations, in all facets of its strategic business planning. The company follows a comprehensive approach to address electricity supply and reliability issues for its customers in a way that considers both the economy and the environment.

The company's environmental performance effectively demonstrates how environmental issues are integrated into strategic planning. Starting in 2000, the company has strategically re-shaped its portfolio of electric generation facilities, resulting in reduced environmental impact and improved environmental performance. WEC improved its overall energy portfolio by adding more efficient generation as part of its Power the Future strategy.

Among the steps taken, planned or under way are:

1. Retiring eight coal-fueled power units totaling 483 megawatts (MW).
2. Adding two combined cycle natural gas units totaling 1,090 MW, which replaced 305 MW of older coal-fueled generation.
3. Adding state-of-the-art, coal-fueled units to provide 1,030 MW of generation, with a performance that ranks among the most thermally efficient coal units in the nation.
4. Entering into a long-term power purchase agreement for the carbon-free energy produced by Point Beach Nuclear Plant, which currently totals 1,036 MW.
5. Executing short-term power purchase agreements for 75 MW of wind generation.
6. Increasing investment in energy efficiency and conservation.
7. Building new renewable capacity, including 307 MW of wind generation in two large wind projects and 50 MW of biomass generation at an existing paper mill.



* We Energies sold Point Beach Nuclear Plant on September 28, 2007.

Renewable energy

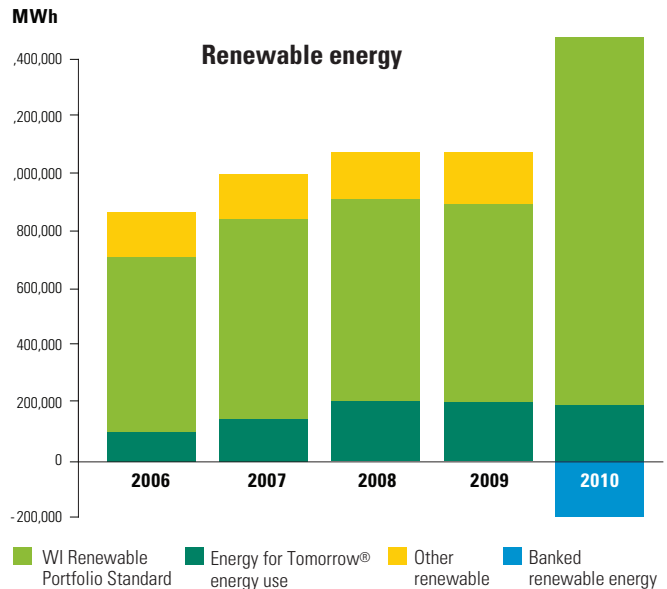
Wind generation. The We Energies Blue Sky Green Field Wind Energy Center, located in Fond du Lac County, Wisconsin, is capable of generating up to 145 MW of electricity with 88 wind turbines – enough to power more than 36,000 homes annually.

The Glacier Hills Wind Park is located in the towns of Randolph and Scott in Columbia County, Wisconsin. The wind project is expected to accommodate 90 wind turbines with a total generating capacity of 162 MW of electricity – enough capacity to power approximately 45,000 homes annually. Construction began in May 2010 with 2012 expected to be the first full year of operation.

Biomass generation. In September 2009, We Energies announced the proposed construction of a biomass-fueled power plant at Domtar Corporation's Rothschild, Wisconsin, paper mill site. Forest residue will be used to produce approximately 50 MW of renewable electricity and also will support Domtar's sustainable papermaking operations. The company expects to invest between \$245 million and \$255 million in the plant and for it to be completed during the fall of 2013.

Hydroelectric generation. The hydroelectric generating system consists of 13 operating plants with a total installed capacity of approximately 88 MW and a dependable capability of approximately 57 MW as of Dec. 31, 2010. Of the 13 plants, 12 plants (86 MW of installed capacity) have long-term licenses from the Federal Energy Regulatory Commission. The remaining plant, with an installed generating capacity of approximately 2 MW, does not require a license.

Renewable portfolio standard. We Energies has more than 400 MW of renewable energy capacity from a variety of sources in Wisconsin, Michigan and the Midwest. Most of it is used to meet the renewable energy portfolio standards in Wisconsin and Michigan, which We Energies supported during the legislative process.



** In 2010, the WI Renewable Portfolio Standard was met using renewable energy amounts banked from a prior year(s).*

Investments in air emission reduction technologies

Sulfur dioxide and nitrogen oxide. Since 2000, the company has spent more than \$3 billion constructing new generating facilities, increasing its total generation capacity by 31 percent. At the same time, the company is significantly reducing its annual emissions of SO₂ and NO_x by installing air quality control systems on its two largest existing coal plants.

The We Energies Pleasant Prairie Power Plant (PPPP) was selected as one of POWER Magazine's top coal-fueled plants in 2007 for its air quality control system project. As part of an agreement between Wisconsin Electric Power Company and the U.S. Environmental Protection Agency, PPPP was retrofitted with selective catalytic reduction systems for NO_x emission removal and wet flue-gas desulfurization units (scrubbers) for SO₂ emission removal. With these environmental control technology installations, PPPP has among the lowest SO₂ and NO_x emission rates of any coal-fueled power plant in Wisconsin.

A new air quality control system also is being constructed at Oak Creek Power Plant units 5-8 and is expected to cut SO₂ emissions by 80 – 90 percent and NO_x emissions by 60 – 70 percent. The company expects the installation to be completed during 2012. Once completed, these projects, along with additional measures taken at other facilities, are expected to result in more than an 85 percent reduction in SO₂ and more than a 70 percent reduction in NO_x by the end of 2012 compared to 2000 emission levels.

The units added in the Oak Creek Power Plant expansion, part of the PTF strategy, are equipped with state-of-the-art emission-control technology.

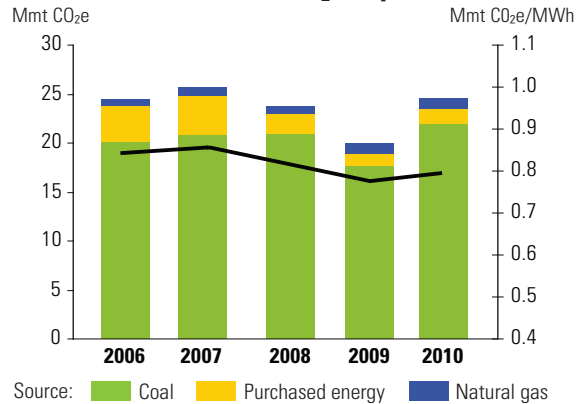
Mercury. As part of the Clean Coal Power Initiative, a mercury removal demonstration project was installed at the We Energies Presque Isle Power Plant in 2006. The \$53 million project, co-funded by the U.S. Department of Energy and We Energies, works to reduce mercury emissions by 70 – 90 percent through the Electric Power Research Institute’s (EPRI) patented TOXECON process.

This process uses a fabric filter in conjunction with sorbent injection to remove mercury and other emissions downstream of the plant’s existing particulate control device. This mercury removal project is one of the largest of its type, currently treating flue gas from Western sub-bituminous coal-fueled units with a total generating capacity of 270 MW.

Carbon dioxide. We Energies hosted a first-of-its-kind project at PPPP, demonstrating a chilled-ammonia scrubber technology to separate and capture up to 90 percent of the CO₂ emissions from a portion of the flue gas from one of the boilers. The technology has the potential to dramatically reduce the cost of removing CO₂ from pulverized coal-fueled power plants and to bring the cost of removing CO₂ from these power plants in line with the estimated cost of removal from proposed integrated gasification combined-cycle power plants.

This was the first step in developing a commercial scale technology to capture CO₂ emissions from existing coal-fueled power plants. The pilot project confirmed the predicted performance of the chilled ammonia carbon capture system at an operating power plant and achieved key research metrics around hours of operation, ammonia release, CO₂ removal levels and CO₂ purity.

Carbon dioxide (CO₂e) equivalents

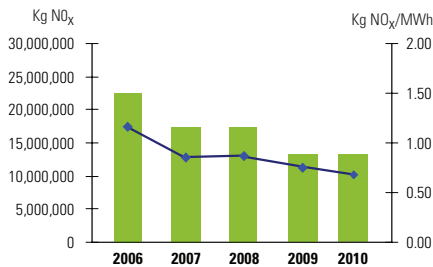


Results of this research were incorporated into a larger scale project at an electric generating plant in West Virginia owned by an unaffiliated utility. We Energies also helped to fund this project. This phase involved injecting the captured CO₂ deep underground into saline aquifers to demonstrate long-term CO₂ storage.

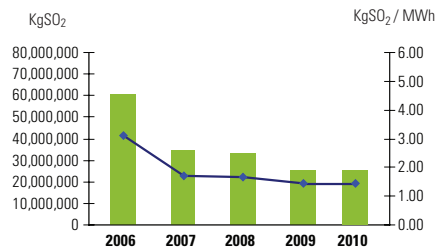
Through We Energies’ sponsorship in EPRI, the company also is investigating:

- The technical feasibility for the electric utility sector to achieve large-scale CO₂ emissions reductions.
- The technology development pathways and associated research and development funding needed to achieve this potential.
- The economic impact of realizing emissions reduction targets.

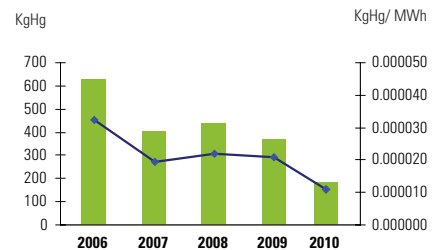
Nitrogen oxide (NO_x) emissions



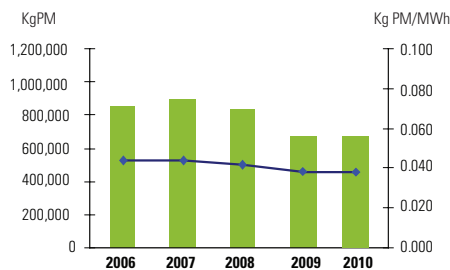
Sulfur dioxide (SO₂) emissions



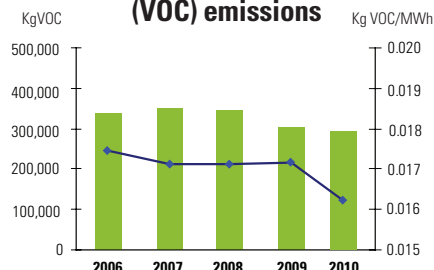
Mercury (Hg) emissions



Particulate matter (PM) emissions



Volatile organic compound (VOC) emissions



■ Emissions (kg) ◆ Emissions (kg/MWh)

Other environmental impact reductions

Natural resource stewardship. The company seeks to enhance the sensitive natural habitats on its land, using sound practices to manage for multiple uses – aesthetics, biodiversity, cultural resources, forestry, recreation, water quality and wildlife. The company also supports stewardship efforts that reach beyond its properties, across state and national borders. Some of its electric and natural gas facilities cross protected or potentially sensitive habitats such as wetlands, grasslands, savannas and forests. When the company considers new facility locations or routes, or maintains and upgrades existing facilities, environmental staff members work with project managers to avoid potentially sensitive areas, take care of the surrounding environment, and minimize ecological, social and cultural impacts.

The company supports habitat protection and/or restoration initiatives at the following sites in its service area: Wilderness Shores Recreation Area (along with numerous Wisconsin and Michigan shoreland areas); Spread Eagle Barrens State Natural Area; Sturgeon River Gorge Wilderness Area; Kurtz Woods State Natural Area; Ulao Creek Watershed; Chiwaukee Prairie; Bain Station Prairie; and Fumee Lake Natural Area.

Near the Oak Creek expansion in Oak Creek, a number of wetland mitigation projects have been constructed and are expected to result in approximately 90 acres of restored wetland, enhanced wetland and upland prairie and upland woodlands that the company will continue to actively maintain and manage. These sites, located near a rapidly urbanizing area along the Lake Michigan migratory bird flyway, will create large habitat blocks and provide a significant water quality buffer for the Root River, a tributary to Lake Michigan. Plans include a public bike and recreational path through portions of these lands. The company also manages 12 restored and created marshes on its properties in Ozaukee and Manitowoc counties, Wisconsin. The company also has protected and restored wetlands along the Ixonia and Port Washington natural gas pipeline projects.

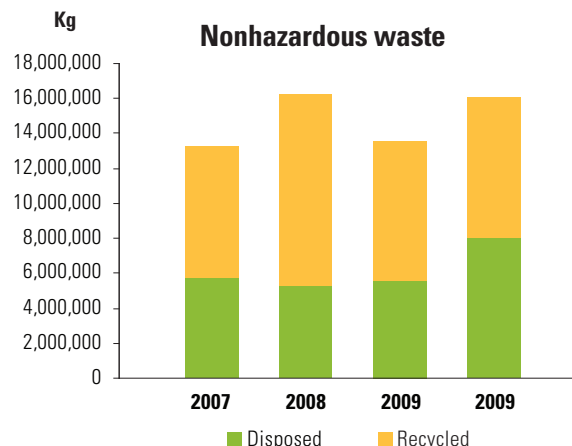
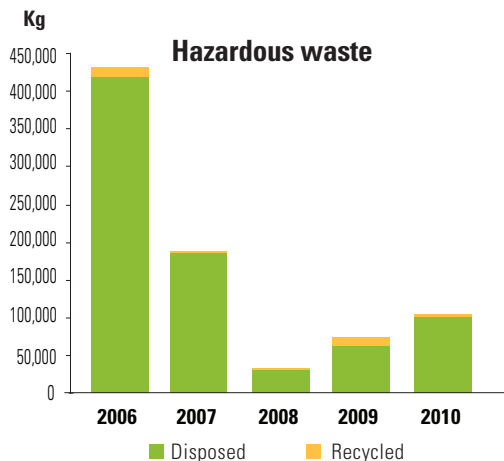
Peregrine falcons are calling the We Energies power plants home. In 1991, We Energies began installing nesting boxes on

several of the company’s power plant chimneys. Since then, 149 peregrine young – about 20 percent of the peregrine falcons born in Wisconsin – have been raised in We Energies’ coal-fueled power plant nesting boxes. At PPPP, We Energies supported the release of 15 captive-bred peregrine falcon chicks in support of the Wisconsin Peregrine Falcon Recovery program.

Members of the company’s staff lead several comprehensive wildlife conservation efforts with the coordination and cooperation of the Wisconsin Department of Natural Resources and multiple partners. Priority goes to species and native ecosystems in the greatest need of protection, recovery and enhancement, including peregrine, bald eagle, osprey and a number of threatened species that have been identified in the service area. The company also has worked with the Michigan Department of Natural Resources and local sport fishing organizations on a penning project for Chinook salmon at the Presque Isle Power Plant. The company supports several activities aimed at controlling invasive plants and animals such as buckthorn, Eurasian water milfoil, garlic mustard, purple loosestrife, sea lamprey and the zebra mussel. The company contributes resources to help other agencies and groups produce educational materials about invasive species and the threat they pose to biodiversity.

Results:

- Less than an estimated 10 percent of distribution projects have any sort of natural resource impacts (wetland/waterway/rare species). Of the <10 percent, the impact is estimated to be less than 0.001 acres of natural resource impact per project.
- Gas lateral pipelines have resulted in a net improvement in quality of wetland habitat and increased biodiversity following construction activities as a result of restoration and management of impacted wetlands.
- Restoration of grassland habitat has resulted in an improved habitat quality for Butler’s garter snakes, as well as an overall increase in biodiversity primarily through the management of invasive species.



Beneficial use of coal combustion products. We Energies has several initiatives that recover and reuse materials produced from plant operations. In 2010, the company beneficially used nearly 110 percent of coal combustion products, such as fly ash, bottom ash and gypsum, system wide versus a national average rate of 41 percent. This included beneficial use of materials recovered from PPPP's ash landfill.

In the past 10 years, We Energies has provided more than 6 million metric tons of coal combustion products for beneficial use. Most of it is utilized as construction materials in the concrete, cement and wallboard markets, and in agricultural soil applications. Additionally, We Energies maintains a proactive research and development program to use coal combustion products. The company anticipates that new air emission control technologies and strategies will generate new and larger quantities of products in the future.

Recycling commitment. The company recognizes the contribution every employee can make toward the environmental performance of the company. The company encourages all employees to be accountable for environmental stewardship by supporting company recycling and waste reduction programs.

Waste minimization is the first step in effective use of materials, and the company's Recycling Commitment encourages all efforts to minimize waste – reduce and then reuse. While the Wisconsin Recycling Bill is a significant driving force for implementing recycling at its Wisconsin facilities, recycling also is an integral part of the company's corporate environmental commitment, affecting all company facilities.

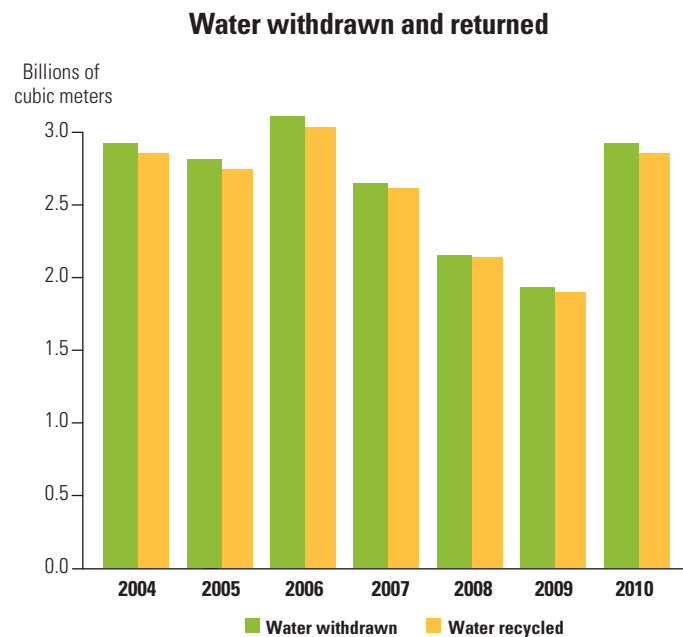
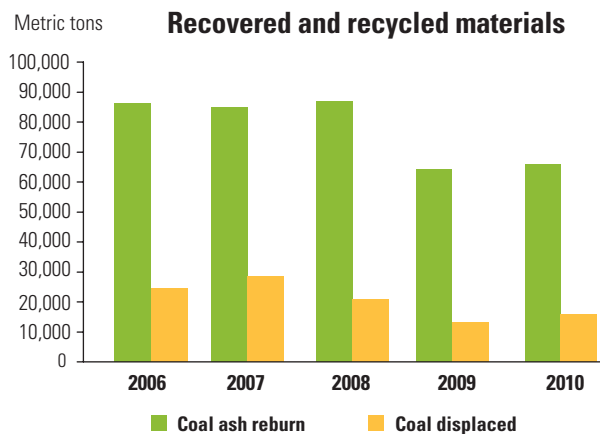
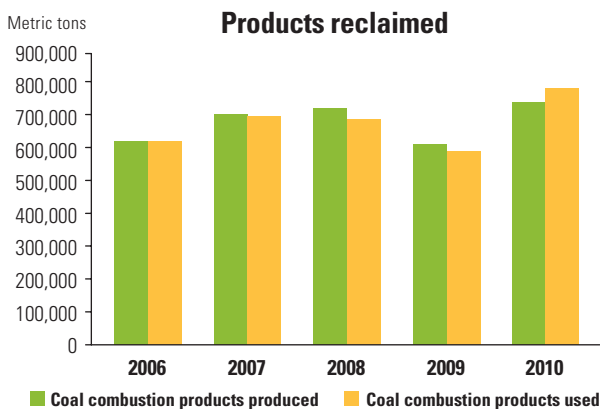
An effective recycling program is economically advantageous. The effectiveness of the recycling program depends on:

- Employee participation.
- Avoided disposal costs due to reducing the amount of material for disposal.
- Proceeds from the sale of recycled materials.
- Cost of operating a recycling program.

Since 2007, the company has recycled nearly 60 percent of the company's nonhazardous waste.

Environmental staff, facility management, supply chain and corporate communications work together to provide the tools and materials needed to make this program successful, but it is the participation of all employees that is the essential component in the company's recycling efforts.

Water use. The company recycles water used in power generation. Most of the We Energies generating facilities use open-cycle cooling systems. These systems withdraw water from a major waterway, pump the water through steam condensers to cool the steam that drives the plant's turbine generators and then return this cooling water to the source.



Climate change

Mitigation of climate change risk

WEC began to address Green House Gas (GHG) emissions over 15 years ago by initiating actions that included conducting an inventory of emissions and emission reductions at power plants and other facilities, assessing emissions and projecting emission trends to establish a baseline and plan future reduction activities, and calculating and publicly reporting GHG emissions, emission reductions and offsets resulting from specialized projects. Company initiatives of demand-side management, power plant efficiency improvements, beneficial use of coal combustion products in place of carbon-intensive materials, distribution system efficiencies, terrestrial sequestration and increased renewable generation have reduced the company's system GHG emissions intensity.

In the area of terrestrial sequestration, in partnership with The Nature Conservancy and other nonprofit organizations and energy companies, the company developed a forest carbon sequestration initiative to manage about 35,000 acres of endangered sub-tropical forest, wetland and pine savanna in Belize, Central America. The partnership seeks to reduce, avoid and mitigate 2.4 million metric tons of carbon over 40 years through land protection and sustainable forest management. The company also is a member of two voluntary consortia of electric power companies that act to achieve carbon dioxide sequestration through tree planting and forest management, along with ancillary benefits of critical wildlife habitat restoration, soil and water quality improvement, and flood reduction. Projects have been undertaken in the lower Mississippi River Valley of the U.S. and in Belize and Malaysia.

In August 2008, the company announced a significant new commitment to environmental initiatives, including:

- Support of projects to reduce GHG emissions.
- Investments in additional renewable energy resources.
- Funding to protect Lake Michigan's ecosystem.
- Retirement of older, less efficient coal generation.

These environmental initiatives are the key elements of a settlement agreement with two groups that opposed the water intake permit for the Oak Creek expansion.

The company supports flexible, market-based strategies to curb GHG emissions, including emissions trading and credit for early actions. The company supports an approach that encourages technology development and transfer, and includes all sectors of the economy and all significant global emitters. The company currently does not have an emission reduction target. Establishing a target that is achievable, without adversely impacting electric service reliability and customer costs, is infeasible at this time because of uncertainty from a variety of diverse areas, including: impacts of the economic recession/recovery; effects of

the Midwest Independent System Operator (MISO); the addition of new units to the generating fleet and subsequent purchase of less energy from other sources; and potential federal, regional and/or state regulatory/legislative requirements.

Because there is a wide range of possible outcomes and effects of potential climate change legislation, the company strives to balance the need to be flexible to react to this variety of outcomes with the need for a secure, low-cost and reliable supply of fuel for generating needs. The company builds flexibility into fuel supply and transportation contracts to address potential climate change legislation.

WEC's net GHG emissions and emission rate (metric tons/megawatt-hour) fluctuate from year to year, depending on the amounts and types of fossil fuels burned and the efficiency and capacity factors of individual generating units. Operation of these units is dependent on dispatch by MISO. Increased use of nonemitting generation sources, such as renewables and nuclear, may help reduce emission rates.

Energy sales are impacted by seasonal factors and varying weather conditions from year to year. The company's electric and natural gas utility businesses are generally seasonal businesses. Demand for electricity is greater in the summer and winter months associated with cooling and heating. In addition, demand for natural gas peaks in the winter heating season. In addition, the company has historically had lower revenues and net income when weather conditions are milder. Mild temperatures during the summer cooling season negatively impact the results of operations and cash flows of the electric utility business. In addition, mild temperatures during the winter heating season negatively impact the results of operations and cash flows of the gas utility business and, to a lesser extent, the electric utility business.

Company rates in Wisconsin are set by the Public Service Commission of Wisconsin based on estimated temperatures that approximate 20-year averages. As a result, the company would expect frequent extreme temperature and weather changes to have a substantial impact on results of operations.

Electric sales, electric system reliability and large construction projects could be impacted by more frequent extreme weather conditions in the midwestern U.S. The company would expect extreme temperature and weather changes to impact its cost of maintaining electric system reliability.

Physical risks associated with climate change

Hydroelectric generation operations could be affected if there is a significant change in the amount of water in some Wisconsin and Michigan waterways. WEC's fossil-fueled power plants are the corporation's primary sources of GHG emissions. Increases in severe weather events may increase storm damage to generating and distribution facilities. In addition, a significant

reduction in water levels in waterways that supply cooling water for fossil-fueled power plants could impact the ability to operate these facilities.

Regulatory and other risks associated with climate change

While there are no current federal, Michigan or Wisconsin regulations limiting GHG emissions, WEC has taken a proactive approach to working with governmental agencies and other groups to address climate change policy. Virtually all of the company's electric operations are potentially impacted by regulatory risks related to climate change. Most company power plants are carbon emitting. The exceptions are company wind and hydro power facilities. The company also has a long-term agreement for purchased power from Point Beach Nuclear Plant, which is in effect until 2030 for Unit 1 and 2033 for Unit 2. Customers are, or in the future may be, exposed to legislation and/or regulation regarding energy efficiency, conservation and reduction of GHG emissions.

The company believes that future governmental legislation and/or regulation likely will require the company either to limit GHG emissions from operations or to purchase allowances for such emissions. However, the company cannot currently predict with any certainty what form these future regulations will take, the stringency of the regulations or when they will become effective. The company expects the U.S. Congress to continue consideration of legislation that would compel GHG emission reductions.

Legislation to regulate GHG emissions and establish renewable and efficiency standards also has been considered at the state level. The state of Michigan has enacted legislation that calls for the implementation of a renewable portfolio standard by 2015 and energy optimization (efficiency) targets up to 1 percent annually by 2015. The state of Wisconsin has adopted

its own renewable portfolio standard and energy optimization targets. During its 2010 legislative session, the Wisconsin legislature considered, but ultimately did not pass, a proposal to increase Wisconsin's renewable portfolio standard and energy optimization targets. There is no guarantee the legislature will not consider similar legislation in the future.

In addition to these federal and state legislative efforts, the U.S. Environmental Protection Agency (EPA) is pursuing regulation of GHG emissions using its existing authority under the Clean Air Act (CAA). In December 2009, the EPA issued its endangerment finding related to GHG emissions, which set in motion a regulatory process that is leading to regulation of GHG emissions from stationary sources, including electric generating units. In March 2010, the EPA finalized its determination of when the CAA's permitting requirements for emissions from facilities, including electric generating units, would apply to GHG emissions. The regulation of stationary sources will occur in multiple steps in the coming years, beginning with the first step that became effective Jan. 2, 2011. This initial step covers sources that are already subject to EPA regulations for emissions other than GHG. The second step, which covers new construction projects and modifications at existing power plants, became effective on July 1, 2011. Additionally, in December 2010, the EPA reached an agreement with several states and environmental groups to propose and finalize rules regulating GHG emissions from certain new or modified coal-fueled power plants and guidelines addressing GHG emissions from certain existing power plants by May 26, 2012. Regulation of GHG emissions from power plants will impact the company's ability to do maintenance or modify its existing facilities, and permit new facilities. Several parties have filed for judicial review of some of the EPA's new GHG rules. In December 2010, the federal court denied a motion to stay the GHG rules pending judicial review, so the rules will continue in effect unless overturned by the court.



Some states and environmental groups brought lawsuits against electric utilities and others to force reductions in GHG emissions based upon their contribution to the alleged public nuisance of climate change. On June 20, 2011, in Connecticut v. American Electric Power Co., the U.S. Supreme Court reversed the decision of the lower court and ruled that the plaintiffs do not have standing to claim nuisance due to GHG released into the atmosphere by the defendants.

There is no guarantee that the company will be allowed to fully recover costs incurred to comply with any future legislation, regulation or order that requires a reduction in GHG emissions or that cost recovery will not be delayed or otherwise conditioned. Any cap-and-trade or GHG tax program that may be adopted, either at the federal or state level, or other legislation, regulation or order designed to reduce GHG emissions could have a material adverse impact on the company's electric generation

and natural gas distribution operations. Such regulation could make some of the company's electric generating units uneconomic to maintain or operate, and could affect its future results of operations, cash flows and possibly financial condition if such costs are not recovered through regulated rates. The company continues to monitor the legislative, regulatory and legal developments in this area. In addition, the company shares its views with legislators and relevant congressional committees of jurisdiction. The company works with trade associations and other organizations to educate congressional offices on the climate change issue generally, the legislative proposals specifically, and the potential impact to customers and constituents. Although the company expects the regulation of GHG emissions to have a material impact on operations and rates, the company believes it is premature to attempt to quantify the possible costs of the impacts.

Summary of We Energies renewable research and development grant projects 2010

Graphene-based solar cells	University of Wisconsin-Milwaukee (UWM)	Development of new and innovative solar cells. Commitment of matching funds provided for U.S. Department of Energy grant applications.
Optimization of wind turbine structural blade design for small wind energy	UWM	Development of small wind new blade design using carbon fiber deposits.
Microbial community analysis	Marquette University, Department of Biological Sciences and Department of Civil Engineering, Joint Project	Research designed to optimize microbial community structure in wastewater anaerobic digesters to enhance the production of methane gas.

2009

Integration of wind turbines with lithium-ion ultracapacitors (LIC) at power	UWM Electrical Engineering Department	The main objective is to develop, model, design, optimize, build a scaled down model, and characterize an integrated system of LIC energy storage and power conversion system that extends mechanical operating life, provides higher power efficiency, and improves quality of output energy and power.
A novel load flow algorithm for high wind penetrated power systems	UWM Math Department Electrical Engineering Department	This project offers a new method that accurately describes the probabilistic nature of load flow from wind turbine sources.

Flow excitation due to turbulent wakes in wind farm	UWM Mechanical Engineering Department	The research objectives of the Wake Group are two-fold: 1) to reduce the increased fatigue loads in wind farms and to increase the lifetime of a wind turbine beyond 20 years, which is demanded by wind electricity industries for almost every project; and 2) to quantitatively measure and predict actual wind fluctuation signals for providing the data to stabilize the electric generator. For these purposes, we will determine and analyze the relation between the wind turbine unit and the excitation of the flow caused by turbulence of wakes.
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Utilizing energy storage with photovoltaic (PV) for residential and commercial use	UWM Electrical Engineering	Department Previous project – The modeling was conducted on a grid with 100-MW PV installed and 100 MWh of energy storage. Deliverables include: <ul style="list-style-type: none"> ■ Implementation of energy storage and power interface with existing PV system. ■ ELCC monitoring for the system. ■ Size optimization of the components. ■ Efficiency measurement. ■ Economics of the generator.
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High-efficiency solar cells based on hybrid nanostructures	UWM Mechanical Engineering Department	The objective is to explore the fabrication and characterization of a QD-sensitized CNT solar cell based on vertically aligned CNTs coated with QDs.
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An Alternative Foundation System for Tubular Wind Towers	UWM Civil Department	<p>Task 1: Analysis of the Alaskan project case history. One main purpose of this analysis is to better understand the complicated interactive behavior of the wind towers and their foundation systems. This task will include advanced dynamic finite element analysis of the Alaskan wind towers. Solutions will be compared with those obtained by Satari and Hussain (2008).</p> <p>Task 2: Preliminary design of the proposed foundation system for large wind towers. Using conventional deep-foundation design methods, the embedded length of a pile group, consisting of six (or more) 24-inch-diameter pipe piles, will be calculated based on the available soil data of several sites from Wisconsin and Illinois. The research team, in consultation with the structural/geotechnical engineers and three of the sponsoring agencies, will select at least four sites that have readily available geotechnical data such as soundings, and conventional in-situ and laboratory soil tests.</p> <p>Task 3: Advanced dynamic analyses of the proposed foundation system for large wind towers. Subsequent to the conventional design performed in Task 2, three-dimensional finite element modeling will be carried out to analyze the tower system, including its foundations and the foundation-soil interaction. All the selected sites in Wisconsin and Illinois will be included, and dynamic wind loads will be considered in the analysis.</p>
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2008

Milwaukee solar GIS system	URS Corporation	Project is a geographic information system compilation and assessment of the solar roof/energy generating potential located throughout the city of Milwaukee. Project complete.
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Wisconsin wood waste resource study	Milwaukee School of Engineering UW Extension	Purpose is to update a 2003 Wisconsin Wood Resource Survey and Utilization Project. This project grew out of the concern over the city of Milwaukee emerald ash borer issue in 2007. The study currently is evaluating the opportunity to incorporate a biomass combined heat and power process at We Energies' Valley Power Plant.
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Utilizing energy storage and PV for residential and commercial customers	UWM Eaton Corporation	The proposed project will provide the opportunity to analyze, model and commercially demonstrate the use of PV in combination with a mix of energy storage technologies. The results of this study will provide an understanding of how best to utilize variable resources such as solar or wind in combination with energy storage to optimize load management, reliability, grid operation economics and other technical challenges inherent to variable energy resources.
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Anaerobic codigestion for increased renewable energy and GHG Emission Reductions	Marquette University Milwaukee Metropolitan Sewerage District	This study will utilize and evaluate wastes otherwise disposed of in a landfill as codigestion agents to increase biogas production at a commercial-scale test facility located at MMSD's South Shore Wastewater Treatment Facility.
Lake Michigan offshore wind measurement	UWM	This project will maintain a National Oceanic and Atmospheric Administration/Great Lakes Environmental Research Laboratory offshore meteorological station with a wind sensor at about 18 meters and add a solar wind profiler to that site to provide wind data up to 100 meters and above at Racine Reef Lighthouse. This will be the first solar wind measurement site on the Great Lakes generating public data. (Project in delay, due to construction delay of repairs on Racine Lighthouse)
Feasibility of a cellulosic ethanol facility with production of fermentation lignin	Standard Biofuels Inc.	Company has patented cellulosic ethanol technology. Feasibility study to assess locating a facility in service territory. Would process 500 tons per day of biomass and produce 10 MG of ethanol and fermentation lignin and cofire biomass fuel. This study is complete.
Biogas Alternatives Study	City of Whitewater Strand Engineering	Project will evaluate various options for energy production from biogas produced at the City Wastewater Treatment Facility.
The Convergence of the Smart Grid with Photovoltaics – Multi Client Study,	Navigant Consulting	Study to evaluate the likely evolution of PV and PV-enabling Smart Grid technologies and the potential for new business models that will arise out of the convergence of the two. Study is complete.