Environmental Perspectives & Research Opportunities for the Power Industry

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Vice President Environmental
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Electric Distribution

Natural Gas Distribution

Electric Transmission

Electric Generation

60% ownership
WEC Energy Group

Service Territory

Company Statistics

- $19 billion market cap (1)
- 1.6 million electric customers
- 2.8 million gas customers
- 60% ownership of ATC
- 70,000 miles electric distribution
- 44,000 miles gas distribution
- $17 billion of rate base (2)

(1) As of 3/31/16
(2) Actual year-end 2015

Legend:
- We Energies
- Michigan Gas Utilities Corporation
- Minnesota Energy Resources Corporation
- North Shore Gas Company
- The Peoples Gas Light and Coke Company
- Wisconsin Public Service Corporation
Environmental commitment
As principles to guide our actions, we:

- Include environmental factors as an integral part of planning and operating decisions.
- Recognize the contribution every employee can make to improve our environmental performance and encourage employees to become environmental stewards.
- Communicate and reinforce environmental values throughout our company.
- Practice responsible environmental stewardship of all properties and natural resources entrusted to our management.
- Minimize adverse environmental impacts of operations by meeting or surpassing environmental standards, investing in energy efficiency measures, and supporting our recycling and waste reduction programs.
- Support research and implement new technologies for emissions control, energy efficiency, renewable energy resources, and other environmental and health concerns associated with utility operations.
- Accept accountability for our operations by responding to environmental incidents quickly and effectively, and promptly informing appropriate parties.
- Provide public participation opportunities and welcome communication from stakeholders on environmental issues; and continue to foster constructive working relationships with environmental organizations, community leaders, media and government agencies.
- Participate with government and others in creating responsible laws and regulations to safeguard the environment, community and workplace.
- Commit employee and management resources to support and implement these principles.
- Periodically review performance to ensure that programs and practices are consistent with these principles.
Environmental Teams

- Air – Bob Greco
- Land – Liz Stueck-Mullane
- Water – Dave Lee
- Strategy – Kris McKinney
- Lab Services – Craig Martin
- Env. Regulatory – Kathleen Standen
- Compliance – Trent Kohl
Positioned for the Future

Supporting a Clean Energy Future

Over the past decade, WEC Energy Group has implemented a multi-emission strategy to achieve greater environmental benefit for lower cost

- Retired older, less-efficient coal-fired generation
- Added two combined cycle natural gas units
- Added state-of-the-art, coal-fired generation with performance that ranks among the most thermally efficient coal-fired units in the nation
- Invested more than $1 billion in renewable energy – including the state’s two largest wind energy sites
- Invested more than $1.5 billion in air quality systems
Positioned for the Future

State-of-the-Art Generation Fleet

Natural gas – 3,753 megawatts
- Port Washington Generating Station among the lowest cost combined-cycle plants in country

Coal – 5,044 megawatts
- Oak Creek heat rate is top 5% in country

Renewables – 483 megawatts
- Wisconsin’s two largest wind farms and biomass plant

Hydro – 169 megawatts

*Owned nameplate capacity
Environmental Challenges: 2016 and Beyond

Air
- Multiple NAAQS
- Interstate Transport (CSAPR)
- Regional Haze/Visibility
- Mercury & Air Toxics (MATS)
- Modeling, Permitting & Monitoring

Climate
- 111(d) Standards – State Plans
- 111(d) Standards – Federal Plans
- 111(b) Standards
- International Negotiations

Water
- Waters of the United States
- Effluent Guidelines Limitations
- 316(b)
- Total Maximum Daily Loads
- Waterbody-Specific Standards

Land & Natural Resources
- Transmission Siting and Permitting
- Endangered Species
- Avian Protection
- Vegetation Management

Waste & Chemical Management
- Coal Ash
- PCBs in Electrical Equipment
- TSCA
- HazMat Transport

Source: EEI April 2016
2015 Results

Environmental Performance

- SO2 (88% reduction)
- NOx (81% reduction)
- Mercury (84% reduction)
2015 Results

Environmental Performance

23% Reduction in Carbon Intensity

Percentage Compared to 2000 Levels

CO2 rate - lbs/mwh
Longer Term Potential Changes

Clean Power Plan (Goals compared to 2005)

28% CO$_2$ reduction by 2025
80% CO$_2$ reduction by 2050

CO$_2$ Emissions not just from Power Production

Expect More Electrification

Electric Vehicles
Small Engines
## Emission Reduction Equipment

- Capital investment of more than $2.5 billion
- Ongoing annual cost of over $400 million

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<td>Coal</td>
<td>WFGD, SCR, WESP, FF</td>
<td>DFGD = dry flue gas desulfurization</td>
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<tr>
<td>Weston</td>
<td>Coal</td>
<td>ReACT, DFGD, SCR, FF, ACI</td>
<td>WFGD = wet flue gas desulfurization</td>
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<tr>
<td>South Oak Creek</td>
<td>Coal</td>
<td>WFGD, SCR, ESP</td>
<td>SCR = selective catalytic reduction</td>
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<td>Pleasant Prairie</td>
<td>Coal</td>
<td>WFGD, SCR, ESP</td>
<td>FF = fabric filter baghouse</td>
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<td>Presque Isle</td>
<td>Coal</td>
<td>LNB, ESP, FF, ACI</td>
<td>ESP = electrostatic precipitator</td>
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<tr>
<td>Pulliam</td>
<td>Coal</td>
<td>LNB, ESP, ACI</td>
<td>WESP = wet ESP</td>
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<tr>
<td>Milwaukee County</td>
<td>Coal</td>
<td>ESP</td>
<td>ReACT = Regenerative Activated Coke Technology</td>
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<td>Port Washington</td>
<td>Natural Gas</td>
<td>SCR</td>
<td>LNB = low NOx burner</td>
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<td>Fox Energy Center</td>
<td>Natural Gas</td>
<td>SCR, WI</td>
<td>WI = water injection</td>
</tr>
<tr>
<td>Valley</td>
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- **WFGD** = wet flue gas desulfurization
- **SCR** = selective catalytic reduction
- **FF** = fabric filter baghouse
- **ACI** = activated carbon injection
Valley Unit 2 – Installed Screens
Twin Falls Hydro Development
Bats and Wind Energy – Smart Curtailment
Future Environmental Considerations

- Distributed generation and micro-grids
  - Less stringent controls on distributed generation?
- Energy productivity through electrification
  - Growth & impact of electric vehicles on emissions?
- Fuel diversity importance
- Energy storage
Thank You – Questions?

Pleasant Prairie Power Plant