

# ENERGY FORUM

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THE WISCONSIN ENVIRONMENTAL INITIATIVE PRESENTS:

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ENVIRONMENTALLY AND ECONOMICALLY

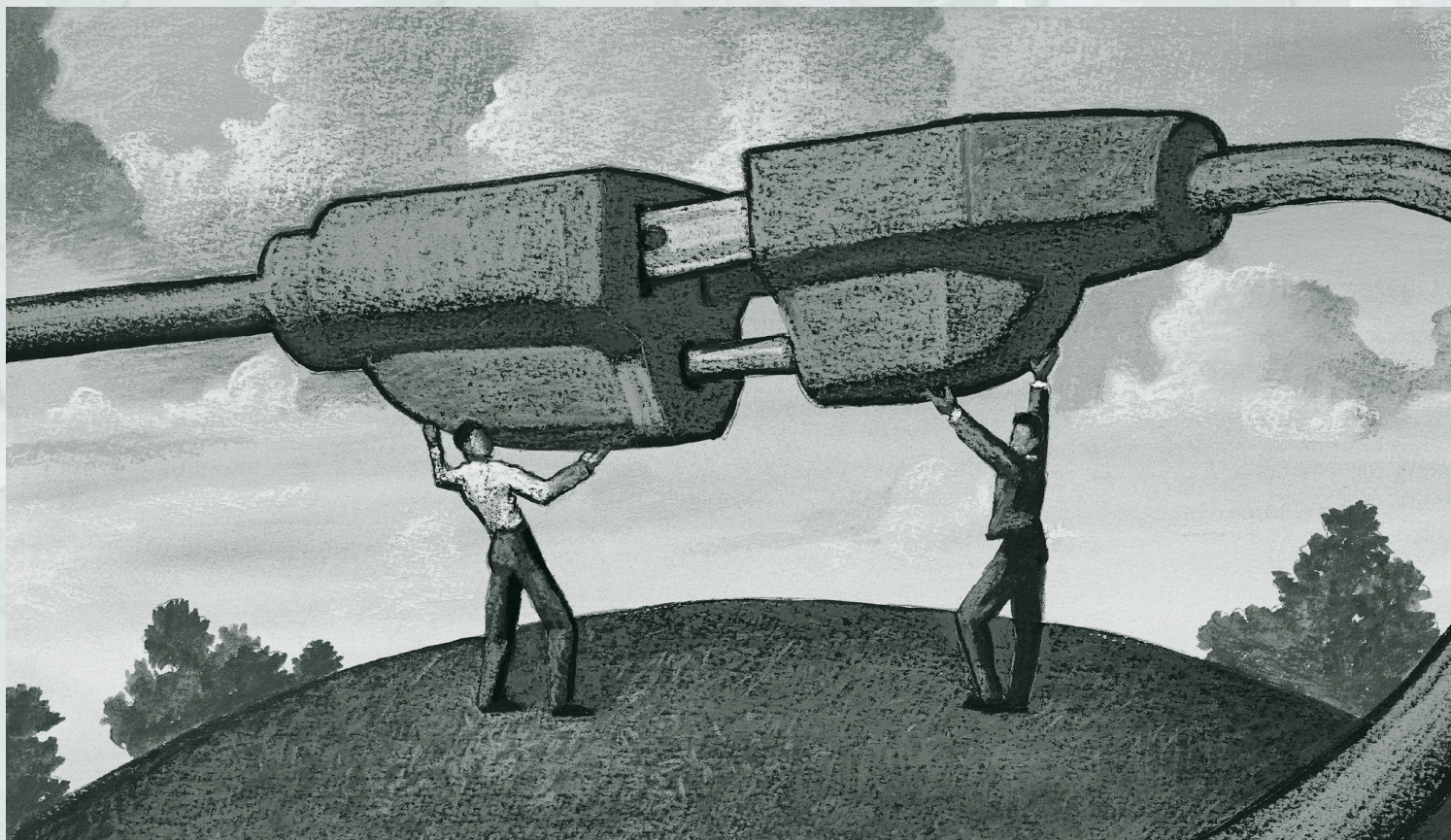
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SOUND ENERGY STRATEGIES

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RECOMMENDATIONS FROM THE ENERGY FORUM WORKING GROUP

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WISCONSIN  
ENVIRONMENTAL  
INITIATIVE



## OUR MISSION:

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Wisconsin Environmental Initiative (WEI) works to improve the environment, economy, and quality of life in Wisconsin through educational initiatives, multi-stakeholder dialogues, and the advancement of best practices in the areas of business strategy, environmental policy, green building, agriculture, and land use.

# ENERGY FORUM



The Energy Forum is part of WEI's environmental policy program, which was established in response to the need to increase communication and collaboration among diverse stakeholders for the purpose of improving environmental and energy policy making in Wisconsin. Program activities are tailored to respond to emerging issues affecting our state and region.

The Energy Forum offers the opportunity for leaders representing all sectors and viewpoints to engage in outcome-driven discussions and develop innovative ways to confront the environmental and economic issues associated with energy production, transmission, distribution, and use.

WEI believes that a bold, action-oriented response to concerns about energy use and production requires successful stakeholder involvement and collaboration, and the establishment of "Partnerships for Progress", innovative alliances between business, utilities, government and citizen groups, working together on common goals, achieving shared rewards, and catalyzing long-term effective solutions to Wisconsin's energy and environmental challenges.

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**"Partnerships for Progress" Working together to develop long-term solutions to Wisconsin's energy and environmental challenges**



**The following sponsors  
make this project possible:**

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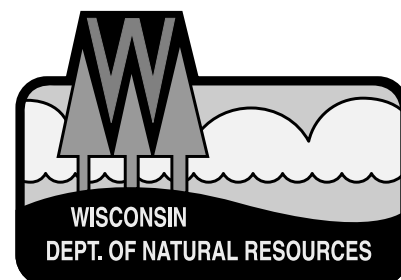
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# ENERGY FORUM REPORT



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**Now is the time to address Wisconsin's energy future. Integrated, long-range plans are needed to help guide the State's energy policy.**

**Energy Forum participants find creative ways to meet Wisconsin's energy needs while positively impacting the environment and economy.**

# Environmentally and Economically Sound Energy Strategies

*Recommendations from the Energy Forum Working Group*

## EXECUTIVE SUMMARY

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Recently, energy has been at the forefront of a number of discussions at the national, state, and local levels. In Wisconsin, energy reliability has emerged as a key concern in determining the future of our state's economy and environment. Our aging energy infrastructure needs to be upgraded and enhanced in order to provide energy reliably, reduce the overall environmental footprint of the energy system, and take advantage of gains to be made through improved energy efficiency. In addition, an improved energy infrastructure is necessary for attracting businesses that will keep our economy strong and continue to provide quality jobs.

For the purpose of addressing the challenges these issues present, the Wisconsin Environmental Initiative established the Energy Forum, a sustained collaborative effort on the part of diverse Wisconsin leaders to find innovative ways to balance the need for reliable energy with our desire to promote a vibrant economy and preserve our environment.

Energy Forum participants met on several occasions over the past year to work together in the development of shared goals and recommendations that can guide Wisconsin's energy policy. The Energy Forum was designed not only to identify common goals and share ideas, but also to work towards their implementation and produce concrete results. The first Energy Forum, held October 5, 2001, convened over 100 leaders representing utilities, industry, environmental organizations, consumer groups, local and state government, and academia. The October meeting provided an opportunity for participants to reach an understanding on the need for both energy reliability and environmental quality, find creative ways to meet Wisconsin's energy needs while positively impacting the environment and economy, and identify mutual interests and values.

About twenty-five participants from the October 5th event signed on to the Energy Forum Working Group. Working Group members refined the more than 150 ideas discussed at the October meeting and categorized the ideas into the following six key Wisconsin energy goals:

- 1) Reduce energy demand through energy efficiency and conservation
- 2) Develop a dynamic energy planning process that is long-term, inclusive, and proactive
- 3) Support business, community, and public education and research on energy and the environment
- 4) Increase investment in renewable energy technologies
- 5) Support market transformation efforts
- 6) Value a balanced approach and diverse energy investments



On May 8, 2002, the working group and other Energy Forum participants convened once again, this time to focus on specific strategies for achieving the six goals. Attendees participated in a series of interactive sessions to learn about and discuss how to implement innovative technologies, practices, and policies that “meet the test” in terms of balancing energy reliability, environmental quality, and a strong economy. The following document presents their recommendations and ideas on tailoring energy policies and decisions to respond to Wisconsin’s economic and environmental goals.

This document is both a guide for Wisconsin’s energy future, and a celebration of effective energy measures already in place in Wisconsin and elsewhere. Included are case studies, information on emerging technologies, and examples of creative policy instruments. The document does not provide official recommendations or final analyses on any of the topics addressed; rather, it suggests ways to connect energy policies and practices with the broader goals for Wisconsin’s future.



## Working Group Endorsements

The following individuals express their support for the vision, goals, and recommendations of the Energy Forum, as presented in this document. Specific views expressed in the document aren't necessarily shared by all working group participants or affiliated organizations, or the Wisconsin Environmental Initiative Board of Directors.

### Energy Forum Working Group Participants

Larry Annen, URS Corporation  
 Jeff Anthony, We Energies  
 Dan Barthold, Miller Brewing Company  
 Linda Bochert, Michael, Best & Friedrich  
 Rich Bogovich, Wisconsin's Environmental Decade  
 David Donovan, Xcel Energy  
 George Edgar, Wisconsin Energy Conservation Corporation  
 Tom Estock, Quad/ Graphics, Inc.  
 Rita Hayen, American Transmission Company  
 Steve Heins, Orion Lighting & Energy Services  
 John Imes, Wisconsin Environmental Initiative  
 Mary Jo Kopecky, Wisconsin Department of Natural Resources  
 Pat Meier, Wisconsin Energy Bureau  
 Paul Meier, UW College of Engineering  
 John Nicol, Focus on Energy  
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## **ENVIRONMENTALLY AND ECONOMICALLY SOUND ENERGY STRATEGIES**

### **RECOMMENDATIONS FROM THE ENERGY FORUM WORKING GROUP**

#### **GOAL #1**

##### **Reduce energy demand through energy efficiency and conservation.**

According to energy analyst Amory Lovins, energy waste annually costs the U.S. economy approximately \$300 billion, while energy conservation measures put in place since the 1970s have saved the U.S. economy about \$1 trillion. Energy efficiency leads to competitive advantage, cost savings, and environmental benefits that are increasingly valued by businesses and communities.

Energy Forum participants identified many ways to increase energy efficiency through tax, financial, and regulatory incentives; measures for buildings, processes and facilities; and supply chain management. They agreed that significant reductions in energy demand can be achieved through policy changes in these key areas.

Moreover, participants recognized the potential for marketing the increased energy reliability as an economic development advantage for the State. Finally, the group agreed that setting a statewide goal of new clean megawatts or negawatts of power by 2020 would help spur development of newer and cleaner energy technologies.

##### **Top priority recommendations for reducing energy demand through energy efficiency and conservation:**

###### **1. Create tax, regulatory, and financial incentives to encourage investment in energy efficiency and conservation.**

The following section outlines several programs currently in place both in Wisconsin and elsewhere that have successfully created tax, regulatory, and financial incentives for conservation and energy efficiency.

**Green Building Tax Credits:** Legislation passed in 2000 in the State of New York offering incentives for green buildings through the New York State Green Building Tax Credit, which makes \$25 million in income and franchise tax credits available for green construction and renovation of commercial and residential spaces. Tax credits range between 5% and 8% of the cost of construction or renovation, depending on the size of the project and whether or not it is located in an Economic Development Area. Additional tax credits are available for the use of fuel cells, photovoltaic modules, and non-ozone depleting air conditioning equipment. Regulations that govern the New York State Green Building Tax Credit were developed by the New York State Department of Environmental Conservation (DEC), with technical assistance from the New York State Energy Research and Development Authority (NYSERDA) and its contractor, Steven Winter Associates. An Advisory Committee including private industry and New York State Agency representatives advised the rule-making process. Additional information can be found at the following web sites: NYS Department of Environmental Conservation: [www.dec.state.ny.us](http://www.dec.state.ny.us) and Environmental Building News: [www.buildinggreen.com](http://www.buildinggreen.com)

**Since 1970,  
energy conservation  
measures have saved  
the U.S. economy  
about \$1 trillion.**

##### **Tax credits for green buildings**

**Efficient buildings get rebates, inefficient buildings get feebates**

**California customers reduce power usage by 20 percent**



**Financial incentives increase energy efficiency throughout Wisconsin**

**Building industry professionals are rewarded with time and money for green construction**

**State-sponsored “Feebates” and Rebates:** “Feebates” are economic instruments based upon the principle that efficient use of technology and practices should be rewarded by the inefficient. For example, a new building would be assessed a fee or receive a rebate based upon energy efficiency performance standards. Given that the average efficiency of new buildings would be expected to rise with rebate incentives, the standards would increase gradually to ensure continuous improvement in building performance. It is important to note that feebates are revenue-neutral, with building fees paying the rebates, rather than as a tax or budgetary item.

One example similar to a feebate is the **Colorado Renewable Energy Mitigation Program (REMP)** which requires that new homes over 5,000 square feet have a renewable energy system or pay a \$5,000 mitigation fee. A local non-profit administers the funds for projects such as PV solar panels for local schools and a micro-hydro electric power plant.

**The California 20/20 Rebate Program**, created in March of 2001, is an example of a state-sponsored incentive program. The program promotes voluntary energy conservation by offering electric utility customers a 15-20 percent rebate for reducing their power usage by 20 percent from the previous year. This conservation effort has helped achieve peak demand savings of 2,600 MW during the June to September 2001 critical summer peak consumption months. [www.flexyourpower.ca.gov/state/fyp/fyp\\_homepage.jsp](http://www.flexyourpower.ca.gov/state/fyp/fyp_homepage.jsp)

**The Wisconsin Focus on Energy Program** provides technical expertise, financial incentives, and a strong network of information for increasing energy efficiency statewide. Financial incentives available include: implementation grants for energy efficiency or renewable energy projects that result in significant energy savings; feasibility study grants to evaluate the potential energy savings of a particular technology or process; service buy-down grants to reduce the costs of energy efficiency-related maintenance services; lending services including interest rate buy-downs and lease payment subsidies; and instant incentives for installing energy-efficient lighting and mechanical systems.

[www.wifocusonenergy.com](http://www.wifocusonenergy.com)

## **2. Promote green design and “smart” building management through standards, incentives, and leadership.**

The following discussion outlines specific ideas for promoting green design and “smart” buildings.

**Streamlined Building Approval Process:** It is recommended that development timelines be shortened for those developers who build energy efficient and environmentally responsible buildings. Developers are rewarded for green construction both in terms of time and money, given shorter approval time means reduced development carrying costs.

**Performance Contracting:** Under performance contracting, professional fees for building designers and construction contractors are partly contingent upon how well the building meets established energy efficiency performance standards. Under this type of program **“shared savings”** agreements may include terms stating that the energy cost savings or shortfalls will be shared between the building owner and the design firm over a period of time ranging from five to 20 years.

**Outsourcing Utility Providers:** Outsourcing allows for vendors to provide, install and maintain power generating equipment and charge back the customer over the long term. Utility outsourcing allows businesses, government, and universities to reap the operational and financial benefits from cogeneration and other clean technologies, while at the same time avoid the up front capital expenditures for such equipment. Customers are able to treat the energy equipment as an operational and maintenance expense as opposed to a capital expense.

In creating the **Chicago Center for Green Technology**, the City of Chicago has transformed a former brownfield site into a national model of energy efficiency and green building design and a healthy place for people to work and visit. Daylighting and other design features, plus the city's first ground-source heat pump, make the building about 40% more energy efficient than conventional buildings of similar size. The building also derives 20% of its energy from solar panels.

### 3. Promote energy efficient technologies and practices for business and schools.

The following discussion outlines specific examples of businesses and schools that successfully incorporated energy efficiency into their everyday operations.

#### What businesses are doing:

Leading Wisconsin companies have demonstrated that abundant opportunities do exist for improving energy efficiency. For these companies, such measures have resulted in reduced expenses and increased profits, improved worker productivity, and a more environmentally friendly corporate image. Companies that participate in the Wisconsin Focus on Energy program ([www.wifocusonenergy.com](http://www.wifocusonenergy.com)) and incorporate high efficiency lighting and windows, state-of-the shelf lighting, heating and cooling systems and environmentally responsible design can achieve similar benefits. For example:

- **The West Bend Mutual Insurance Company's** new headquarters in West Bend reduced energy consumption by 40 percent per square foot with a corresponding 7 percent increase in employee productivity, comfort and air quality versus their old headquarters. At an annual salary base of \$13 million, the company's gain in productivity is worth \$910,000 — a substantial return on investment.
- **The Johnson Controls Brengel Technology Center** in Milwaukee was one of the first 12 buildings in the world to earn The Leadership in Energy and Environmental Design (LEED) certification by using innovative, cost-effective environmental design and construction techniques in the areas of site selection, energy efficiency, water conservation and indoor air quality. LEED has also launched a new building rating system for existing buildings (LEED-EB). This pilot certification program is a powerful tool for evaluating operations, improving occupant health, and optimizing a building's energy and environmental performance.



### Case Study: Transforming the Reichstag into a Model for more Sustainable Architecture

In the reconstruction of the Reichstag (Home of the German parliament in Berlin), the architects proposed extensive use of natural light and ventilation, together with combined systems of cogeneration and heat recovery. The Reichstag's new cone cupola or 'lantern', has quickly become a Berlin landmark and provides twofold roles: reflecting light into the chamber using a moveable shield which prevents solar heat and glare during the day, and at night, the process is reversed and artificial light is reflected outwards making the dome glow dramatically. The cone also contributes to natural ventilation by extracting warm air at a high level, while fans and heat exchangers recycle energy from waste air. Power to drive the air ventilation system is provided by 100 solar panels with a peak output of 40kW. The designers also proposed a radical new energy strategy, using vegetable oil bio-fuels. The oil is burned in a co-generator to produce electricity and reduces carbon dioxide emissions by 94% compared to traditional fossil fuel power sources. Surplus heat is diverted into a natural aquifer where it can be stored for use as warm water to heat the building in winter; or be used in an absorption chiller for cooling in summer.



**Studies conclude that  
students are healthier  
and more productive  
in daylit schools**

■ **Don Simon Homes**, one of Wisconsin's largest homebuilders, recently committed all of their homes (currently almost 300 homes per year) to the Green Built and Wisconsin ENERGY STAR Homes standards. These homes are at least 15% more efficient than code built homes because they integrate efficient design with high levels of insulation, high performance windows, air tightness, and energy-efficient mechanical equipment, lighting and appliances. Building to these standards also means homeowners will save thousands on utility bills.

■ **Quad/Graphics, Inc.** in Pewaukee, one of the world's largest printers of magazines, catalogues and other commercial products, lowered energy use by 8% in 2001 (a reduction of over 349,000 MMBTU) through its compressed air system optimization, computerized monitoring of press equipment, lighting retrofits, and use of energy efficient motors.

■ **Miller Brewing Company** in Milwaukee, is upgrading its powerhouse to enhance efficiency by 5%, reduce NOx emissions by 60% over legal requirements, and reduce greenhouse gas emissions. The company's efforts have reduced emissions by over 22,000 metric tons per year while decreasing overall energy use by 2.5% in the last year.

■ **Orion Lighting and Energy Services**, based in Plymouth, Wisconsin, manufactures and installs custom energy-efficient lighting products for the commercial, industrial, institutional and hospitality sectors. Orion's lighting products require 50% less power than traditional fixtures and produce 30-60% more light.

The company markets energy efficient lighting and reduced electricity demand to both consumers and utilities through Orion's Virtual Power Plant concept, which compares the construction of a 500 MW power plant with Orion's replacement of 2.1 million commercial and industrial fixtures in Wisconsin. Orion estimates that the ten-year impact results in a savings of \$942 million from capital expenditure, operation and maintenance costs, fuel costs, and distribution losses that would typically be incurred with the construction of the power plant. The ten-year impact also avoids the production of about 30 million tons of carbon dioxide, 110,000 tons of sulfur dioxide, 256,000 tons of nitrogen oxides, and 2.3 tons of mercury emissions. [www.orionlighting.com](http://www.orionlighting.com)

**What schools are doing:**

Recent studies provide compelling evidence to increase energy efficiency investments in schools. A study of several North Carolina schools built with daylighting strategies (lighting sensors, low-transmittance glazing, improved lighting fixtures and shading) cut energy consumption by 20 to 64 percent, with a financial pay back of less than three years. More importantly, students outperformed those in both non-daylit new and existing schools by as much as 14 percent. A separate Canadian study concluded students were healthier and attended school three to four days more per year in daylit schools. In Wisconsin, the Energy Center of Wisconsin ([www.ecw.org](http://www.ecw.org)) offers a daylighting collaborative for businesses and school districts to learn from.

**The Massachusetts Green Schools Initiative** is a \$13.5 million initiative to promote the design and construction of a new generation of resource and energy efficient "green" school buildings. Schools will receive grants for design and construction costs associated with installation of green building, energy efficiency and renewable technologies. The program was established to increase awareness of the environmental, educational and cost benefits of designing and building high-performance green schools.

[www.masstech.org/massrenew/greenschools.htm](http://www.masstech.org/massrenew/greenschools.htm)



### Geothermal projects at Evansville and Fond du Lac high schools

The Wisconsin Geothermal Partners for Schools program is helping schools adopt geothermal technology for energy efficient heating and cooling. Schools in Fond du Lac and Evansville have decided to adopt geothermal technology. The ground-source heat pump installed in the new Fond du Lac High School utilizes an outdoor loop buried in the ground. The closed loop system brings heat into the building in the winter, and pumps heat from the building into the ground in the summer. The system is designed to use 25 to 40 percent less energy than traditional heating and cooling systems that will result in long-term energy cost savings for the school.

[www.ecw.org](http://www.ecw.org)

### 4. Establish effective supply chain environmental management and procurement strategies.

Supply chain environmental initiatives are a natural extension of government's role in promoting energy efficiency and protecting the environment. The following discussion highlights several supply chain environmental initiatives.

**The State of Wisconsin and University of Wisconsin** have teamed up with Johnson Controls, Inc., of Milwaukee to trim energy consumption in UW facilities statewide as part of the **Wisconsin Energy Initiative** program. The model program has reduced state energy costs by about \$7.3 million annually. Overall, the state has worked with private sector partners to finance energy efficiency upgrades, benefiting over 50 million square feet of state facilities.

Another supply chain example is **Building Better Buildings: A Blueprint for Sustainable State Facilities**, implemented by the California Sustainable Building Task Force. This program, the result of an Executive Order, encourages the development of sustainable state facilities. A report prepared by the Task Force summarizes the state initiatives that support building green. The report also recommends moving from first cost to life cycle cost analyses, as well as supports energy modeling and an integrated approach to design.

The report is available as a PDF file at: [www.ciwmb.ca.gov/greenbuilding/blueprint/](http://www.ciwmb.ca.gov/greenbuilding/blueprint/).

## GOAL #2

### Develop a dynamic energy planning process that is long-term, inclusive, and proactive.

In creating an energy system that balances reliability, the environment, and the economy, Energy Forum participants recognized that there is a need for a more effective and comprehensive approach to energy planning. The ideas described in this section are offered not as alternatives to the planning processes already in place, but rather as additive measures to help energy decision makers better anticipate future changes and challenges, provide opportunities for stakeholder involvement, and make decisions in the context of broader policy goals and a longer term planning horizon. The working group's proposals suggest general parameters and key elements of an effective planning process. They also reflect the position that neither the Advance Plan nor the Strategic Energy Assessment has provided a comprehensive, effective approach to making energy decisions.

The working group developed potential strategies and ideas to consider for implementing these goals, including the following:

**A Wisconsin State Energy Report\*** (*\*tentative title*), a collaborative information-gathering process designed to provide comprehensive energy information to guide our energy future.

An **energy matrix** designed to allow decision makers to better evaluate energy options in terms of their related impacts on energy, environmental, and economic goals.

**A Wisconsin public-private partnership has reduced state energy costs by about \$7.3 million annually**

**Wisconsin's energy planning should include accurate forecasting, a meaningful planning horizon, and diverse stakeholder involvement**

**Top priority recommendations for developing a dynamic planning process that is long-term, inclusive, and proactive:**

1. Establish greater integration of energy planning efforts between state agencies, public and private interests, and between the state and region.
2. Use proactive measures to avoid the adversarial relationships that often surround energy siting projects and processes.
3. Determine a reasonable and meaningful planning horizon which allows for the development of accurate projections and proactive measures that address emerging energy issues
4. Provide opportunities for diverse stakeholder involvement in assessing energy projections and ongoing discussion of developing issues, questions and trends.
5. Increase flexibility and incentives for energy projects that improve reliability, decrease environmental impact, and are cost-effective.

## **Wisconsin State Energy Report\***

(\*tentative title)

### **Current data and accurately projected energy supply and demand**

The first part of this process would involve gathering data from electricity providers across the state, including: 7- to 10-year energy supply and demand forecast; a description of existing facilities; proposed capacity needed over a 7 to 10-year horizon; proposed energy-efficiency and conservation potential; and proposed transmission infrastructure needed to maintain a reliable system.

The data would be presented in Part 1 of the Energy Report in order to provide a clear picture of what type of generation is needed at what times during the planning period. The data would also indicate in what particular regions of the state new capacity was needed and whether adequate transmission support existed in that area of the state. The data would not indicate who would build/develop the needed capacity; what particular kind of generation (coal, gas-fired CT or CC, or renewable) should be built; or, whether a transmission solution would be an appropriate or adequate substitute for new generation.

### **Understand current regulatory framework**

The second part of the report would describe current regulatory structure, existing energy-related incentives, relevant building codes and requirements for energy-efficient structures, and the strategic direction for Wisconsin's energy future.

### **Diverse stakeholder involvement**

Finally, interested energy stakeholders would collaboratively identify and analyze the trends and issues in Wisconsin's energy future, based on the data provided and current energy policy and law. This section of the report would present a gap analysis based on existing facilities and projected forecast and capacity needs. It would also review the linkage between the proposed transmission and generation infrastructure.

Information presented in the report would be used by agencies, the legislature, the energy industry, or advocacy groups to develop new incentives, rules, policies, or strategies to fulfill our need for safe, reliable energy system while positively impacting the economy and the environment.

### **Energy Matrix**

To date, much work has been done to evaluate the impact of different types of energy generation and distribution on reliability, the environment, and the economy. However, there does not appear to be any organization of this information into a scheme such as a matrix that allows for a systematic analysis of energy decisions. An Energy Matrix would allow all parties interested in energy issues and decisions to better understand the positive and negative effects of energy generation and distribution, as well as provide a disciplined approach to identifying what needs to be done to encourage balanced energy development.

The energy matrix, designed to complement the energy report idea described above, is an attempt to lay out in an organized fashion the effects that various types of energy generation and distribution have on the environment, reliability, and the economy. The matrix will also identify barriers to greater utilization, and identify ways to increase flexibility and provide incentives for projects that provide greater energy balance.

## Energy Matrix

	RELIABILITY						ENVIRONMENT							ECONOMY					
	operational flexibility	available operating conditions	adequate transmission service for power sales	contract terms and conditions for power sales	forced outage rate	planned outage rate	air quality	water quantity	water quality	water-physical attributes	solid waste	land resources and impacts	wildlife and fisheries impacts	local community effects	fuel cost	fuel availability	construction cost	operating life	heat rate
coal fired																			
natural gas fired																			
diesel oil generators																			
solar																			
wind turbine																			
biomass																			
hydroelectric																			
wave/tidal energy																			
geothermal																			
fuel cells																			

### GOAL #3

#### Support business, community and public education and research on energy and the environment.

Effective energy education and research programs are essential to provide the momentum needed for positive change and ultimately create a balanced, future-oriented energy system. Support for ongoing energy education and research in all sectors is needed in order to:

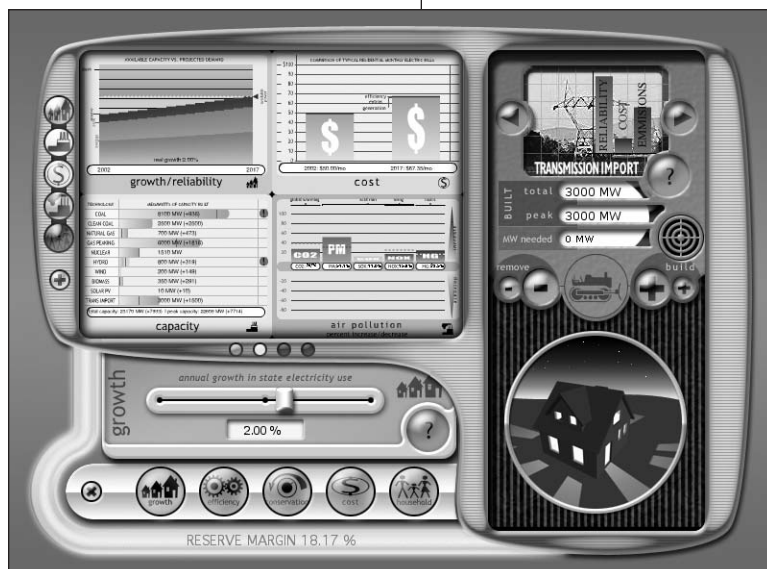
- critically evaluate energy options,
- incorporate new practices and technologies,
- create sound policies, and
- promote a general understanding of the complexities of energy choices.

Education helps energy consumers understand the link between their activities and energy usage, and what is required in order to keep energy affordable and reliable. Education has the potential to increase energy efficiency at all levels, from individual households to energy-intensive manufacturing operations; while research continues to improve energy technologies, making new applications more efficient and reliable, and cleaner.



### Education, stakeholder input and discussion

### Interactive computer model for conducting long-term evaluations of energy choices



### Energy research and assistance programs

### Examples of successful energy education and research programs:

**We the People/ Powering Wisconsin's Citizens' Energy Summit** was established on the belief that media partners of We the People/Wisconsin as well as policy makers concerned about the search for energy solutions can learn a great deal by listening to citizens. Their vision for Wisconsin's energy future is likely to have a catalyzing effect on the ability of the state to come to grips with its supply and demand problems. The goal of the conference was to first make people aware of the nature of Wisconsin's energy problem, then give citizens, experts and advocates the opportunity to engage in a day-long discussion about tough energy choices facing the state. Finally, a hands-on computer exercise, developed by Paul Meier from the UW-Madison School of Engineering, allowed participants to test how people want to balance energy choices, costs and reliability with environmental concerns, such as air pollution. (see below)

### Energy Choice Model

Developed by Meier Engineering Research LLC, the Energy ED simulator is an interactive software program that supplies realistic information on both the environmental impact and economic cost of providing reliable electricity. The user-friendly interface allows participants to observe how their proposed electricity decisions will affect system reliability, cost, and air pollution (See figure below). The simulator provides current data on Wisconsin's electricity system. Users make consumption and transmission choices, and decide which technologies (coal, clean coal, natural gas, nuclear, wind, solar, biomass) to utilize over the next 15 years. As participants modify the system, they see how air pollutant emissions and consumer electric bills rise and fall. In addition to meeting their own environmental and cost objectives, users must account for system reliability by providing an adequate reserve margin for peak electricity demand. Educational "capsules" provide the user with a wide breadth of

current information to assist decision-making. Topics include historic and projected energy use, pros and cons of available technologies, efficiency opportunities, regional and global environmental considerations, land use and habitat impacts, infrastructure requirements, and social issues.

### Wisconsin Focus on Energy

Wisconsin Focus on Energy is a program developed by the Wisconsin Department of Administration (DOA) that encourages government, utilities, the energy efficiency industry and citizens to work together to save money and protect Wisconsin's environment by choosing energy efficient options.

Focus on Energy encompasses services for a wide variety of energy users and producers. The main areas of assistance provided involve education and training, and technical and financial assistance. Target areas included in the program are businesses, residential (including low-income homes), schools, and local government. Businesses can learn about the latest technological advances in efficient technology or receive help in marketing their energy efficient products. Homeowners have access to free advice and information regarding the energy efficiency of their home. Focus on Energy also sponsors pilot projects using renewables and other forms of environmental research.

[www.wifocusonenergy.com](http://www.wifocusonenergy.com)



## **MREA Renewable Energy and Sustainable Living Fair**

**The Midwest Renewable Energy Association (MREA)**, located in Custer, WI, is a nonprofit (501-C3) organization that promotes a sustainable future through renewable energy and energy efficiency. Each year, the MREA brings together experts in renewable energy, energy efficiency technologies, and sustainable living for the Renewable Energy and Sustainable Living Fair. The world's largest of its kind, the fair features workshops and demonstrations that educate energy consumers about using renewable energy technologies, saving money and energy through increased energy efficiency, and other sustainable living practices that protect the environment. Additional workshops offered throughout the year provide educational opportunities for school groups and the community.

[www.the-mrea.org](http://www.the-mrea.org)

## **Educational workshops and demonstrations**

### **GOAL #4**

#### **Increase investment in renewable energy technologies**

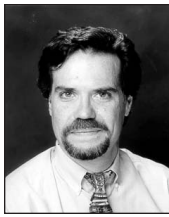
Renewable resources represent a sound energy choice from several perspectives. Greater utilization of renewable energy can help diversify Wisconsin's energy portfolio and take advantage of in-state renewable resources, yielding cleaner, more reliable energy and nurturing smaller-scale, local economies.

Although people often disagree on the near-term potential for using renewable energy sources, there is widespread support for increasing investment in renewable energy technologies as an important way to diversify energy sources, gain additional value from our agricultural lands, promote and enhance national security, and produce clean, reliable energy. Energy Forum participants agree that renewable energy is an essential component of forward-thinking energy policies.

#### **Top priority recommendations for increasing investment in renewable energy technologies:**

1. Improve economic viability of renewables by providing financial incentives for renewable energy projects;
2. Remove barriers to renewable energy technologies, including utility interconnection standards, inconsistent zoning laws and ordinances with respect to renewable energy projects and siting issues;
3. Determine a meaningful increase in Wisconsin's Renewable Portfolio Standard (RPS).

The use of renewable energy resources is steadily growing and becoming an integral part of Wisconsin's energy supply mix. However, financial and market barriers hinder more widespread use of renewables. Options such as tax credits, low-interest loans, grants for demonstration projects, a Renewable Portfolio Standard (RPS), and green pricing programs are just a few of the measures that have the potential to create market-driven incentives and propel renewable energy into the mainstream.



**Peter Asmus**, President of Pathfinder Communications and author of *Reaping the Wind* (recently published by Island Press) and co-author of *Reinventing Electric Utilities* and *In Search of Environmental Excellence*; highlighted the following ideas for increasing investment in renewable energy technologies during his keynote address at the WEI Energy Forum on October 5, 2001:

- Wind royalties are a major factor in generating support among farmers and ranchers. This strategy helps maintain rural character while providing a balance between preserving what makes Wisconsin so attractive (its rural/dairy charm) and accommodating new development in rural regions. Wind farms provide an added benefit by helping reduce the threat of mercury contamination that is now threatening the recreational appeal of Wisconsin's fishing experience.
- Promote local solar and fuel cell companies to keep energy dollars in the state, instead of exporting funds to companies who may be based in other states or countries. Devise a modest tax incentive to give a break to homeowners and businesses that purchase renewable energy products from in-state businesses. Also create incentives for clean energy suppliers and service providers to locate within the state.
- Wisconsin should calculate the cost of peak electricity and based on that cost design its own buy-down rebate program for solar PV, small wind turbines and fuel cell technologies. An education program should also be launched informing consumers of how the cost of these systems can be rolled into home mortgages.
- Create a state co-op to help those consumers intimidated by which contractor and/or renewable energy product they should choose. Such a co-op has been started in California. This should be a favorable model for Wisconsin given its civic pride and previous success with co-ops.

**Examples of other programs and ideas that have the potential to increase investment in renewable energy technologies include:**

**Green Pricing Programs**

Green pricing programs are offered by electric utilities to give energy customers the option to support increased investment in renewable energy. Customers who choose to participate pay a premium on their electric bill, which is applied to the cost of renewable energy investments.

Utilities in Wisconsin and across the nation are increasingly developing green pricing programs for many reasons, including to allow customers to express a preference for renewable energy technologies, allow consumer demand and willingness to pay for renewable energy drive increased investment in renewables, and improve their overall environmental performance.

According to the US Department of Energy's Green Power Network, over 90 utilities are currently offering or planning to offer a green pricing option. ([www.eren.doe.gov/greenpower/pricing.shtml](http://www.eren.doe.gov/greenpower/pricing.shtml)) Six green pricing programs are currently offered by Wisconsin utilities.

**Customers choose to pay a premium for green power**

**WE Energies' energy for tomorrow™** program is ranked among the top 10 green pricing programs in the nation by the DOE National Renewable Energy Lab. One of the only four independently accredited utility green pricing programs in the US, energy for tomorrow(tm) allows consumers to bill their energy use at a slightly higher rate, with the funding generated from this increased rate being directly applied to the development of more renewable energy resources.

**Alliant Energy's Second Nature** works in a similar way, allowing customers to purchase renewable energy equal to 25%, 50%, or 100% of their electric usage. A new wind farm built with these additional green-pricing funds went on line in February, 2002. In addition to wind, Second Nature's renewable energy sources include bioenergy generated from landfill gas.

**Madison Gas and Electric Company** offers residential and business customers the option to purchase wind power at an added 3.33 cents per kilowatt-hour. The company owns and operates a wind farm in Kewaunee County that consists of 17 turbines (each 660 kW) and produces enough electricity to power 3,300 homes. Residential customers can buy wind power in \$5 blocks of 150 kilowatt-hours per month.

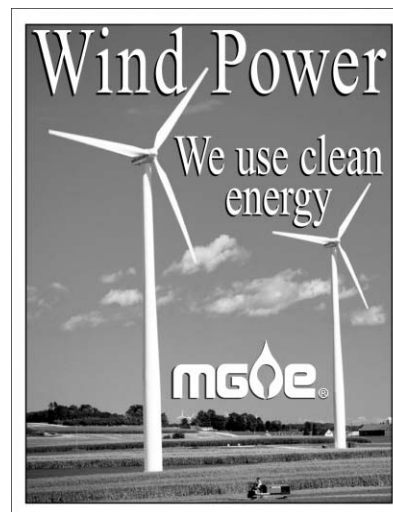
**Wisconsin Public Power, Inc.'s (WPPI) Renewable Energy Program,** allows consumers to purchase blocks of renewable energy based on their average energy use. Renewable energy resources available in the program's portfolio include waste gases from local wastewater treatment facilities, low-impact hydropower, and wind.

### **Renewable Portfolio Standard (RPS)**

A Renewable Portfolio Standard requires an electric provider to include a certain number of renewable energy sources in the energy portfolio they offer to customers. The RPS is essential to making renewables more competitive with more conventional power sources.

Wisconsin's RPS is now set at 2.2%. However, in response to the 2001 State Energy Policy, the WI Department of Administration (DOA) and the Public Service Commission of WI (PSCW) are currently leading an assessment of the potential for increasing Wisconsin's RPS.

**Consumers bill their energy use at slightly higher rates with the revenue being applied to developing renewables**



**Consumers purchase blocks of renewable based on their average usage**

**Wisconsin's RPS is currently set at 2.2%**

## 2001 State Energy Policy supports a shift in the energy market



Tom Casten and Jennifer Wilfrid of WEI at the Energy Forum

**"In the process of improving Wisconsin's economy and air quality, you can lead the US and the global economy to a more sustainable energy future with far less greenhouse gas emission and far less dependence on fossil fuel."**

**—Tom Casten, Energy Forum Keynote Speaker**

## GOAL #5

### Support market transformation efforts

Market transformation seeks to remove market barriers for energy efficient products and services, creating a long-term shift in the energy market towards one that provides real incentives for the efficient use of energy. A shift in the energy market will yield greater efficiency not only in energy use but also in generation and transmission, increasing the value gained from many parts of the energy system.

The importance of creating this shift towards energy efficiency has been recognized and highlighted in the 2001 State Energy Policy as "the bridge between a strong economy and a clean environment." The policy outlines long-term market transformation initiatives to be undertaken by the Wisconsin Focus on Energy and other state programs. These initiatives include:

- energy education and outreach to enable Wisconsin citizens, organizations, and associations to make informed energy decisions
- greater integration of energy and environmental issues to promote solutions that yield high efficiency, low pollution, greater energy reliability, and economic benefits, and
- effective documentation of the results of such programs to "identify and capture the full range of benefits to be achieved through the wise use of energy."

In his keynote address to the Energy Forum on May 8, 2002, entitled "Transforming Electricity," Tom Casten, Chairman and CEO of Private Power, LLC and author of *Turning off the Heat: Why America Must Double Energy Efficiency to Save Money and Reduce Global Warming*, offered Energy Forum participants a list of actions aimed at achieving greater energy efficiency:

- Eliminate the obsolete barriers that were enacted to speed electrification and unleash market forces to drive down energy use, energy prices and associated pollution. Allow electric utilities to profit from efficiency and conservation - the carrot — but expose them to generation and distribution competition - the stick.
- Modernize environmental laws by giving every generator of heat and power identical pollutant allowances per kilowatt-hour produced. With a level playing field, the old plants will pass into post-mature retirement and doubly efficient new plants will take their place.
- Allow on-site generators to purchase backup power from the market, ending the utility's stranglehold on efficient distributed generation. The utilities will soon be principal developers and owners of new DG as a result.
- Set statewide electrical interconnection standards, administered by an unbiased government agency. Make connecting DG as easy as connecting a new motor.
- Allow distributed generation plants to build and operate private wires to nearby users.

"In the process of improving Wisconsin's economy and air quality," Casten concluded, "you can lead the US and the global economy to a more sustainable energy future with far less greenhouse gas emission and far less dependence on fossil fuel."



Energy Forum and working group participants focused on two targeted segments of market transformation which, while they represent different challenges and opportunities for action, play a role in market transformation by creating more choices for efficient energy systems. These include:

- 1) Increasing the diversity of distributed generation and
- 2) Supporting the adoption and use of accurate price signals.

### 1) Increase the diversity of distributed generation

Distributed generation is characterized by decentralized, smaller-scale, diverse energy sources located close to the point of use. Distributed generation currently makes up a small portion of energy generation in Wisconsin; however, interest in distributed generation has grown in Wisconsin because of the potential benefits it can provide, including: improved overall system reliability, increased energy efficiency, increased diversity of energy sources, the ability to provide high reliability where it is needed, a reduced need for additional generation to satisfy peak demand, increased efficiency of transmission, and reduced environmental impact (with renewable distributed resources).

Efforts are currently underway in Wisconsin to establish consensus-based guidelines and interconnection rules for distributed generation, explore possible incentives for the development of distributed resources, and eliminate other technical and business practice barriers that exist to the increased diversity and use of distributed generation.

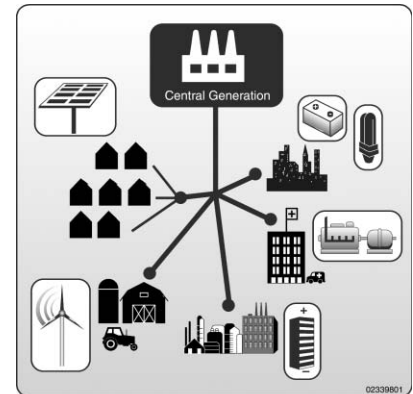
#### **Top priority recommendations for increasing the diversity of distributed generation (DG) in Wisconsin:**

**Develop international, national, state and local DG interconnection and business practices requirements that allow the development of a broad market in which economies of scale in the manufacture of DG units can be realized.**

Most DG equipment is modular in nature, so the greater the demand for modular equipment, the more quickly and effectively the prices of current DR applications will decrease, thereby improving the overall economics of DR applications. Interconnection requirements and contract requirements such as the level of liability insurance all affect the number of applications and the ability to capture these economies. Projects such as the Wisconsin DR interconnection effort are examples of efforts to align state rules and requirements with efforts in other states and on a national basis to ensure that these economies are captured as soon as possible.

**Improve the economics of distributed resources (DR) applications by ensuring appropriate rate structures and pricing applications for regulated utilities and integrating DR applications into environmental compliance laws and regulations, such as increased efficiencies from combined heat and power projects.**

While appropriate interconnection standards and business practices prevent unnecessary costs being imposed on DR projects (thereby retarding their growth in the market), creating appropriate utility rate structure and environmental compliance structures and processes that allow DR projects to actually receive the economic value that they create is equally important.



Source: US DOE Office of Distributed Energy Resources & National Renewable Energy Laboratory

**Definitions:**

from the Wisconsin Distributed Resources Collaborative ([www.wisconsin-dr.org](http://www.wisconsin-dr.org))

**DISTRIBUTED RESOURCES:**

the term “distributed resources” includes modular power technologies and nongenerating demand side management (DSM) measures, such as energy efficiency improvements, that reduce the load at the distribution level of the transmission and distribution (T&D) grid.

**DISTRIBUTED GENERATION:**

locating electricity generators close to the point of consumption — provides some unique benefits to power companies and customers that are not available from centralized electricity generation. Distributed power technologies are inherently modular, and can include renewable energy, fuel cell, and cogeneration systems.

**Key Technologies:** wind turbines, fuel cells, photovoltaics (solar), microturbines, internal combustion engines, combined heat and power, geothermal, hydropower (limited siting opportunities for new facilities in Wisconsin), and biomass fuels.

**Other Resources:**

Consumer Energy Council of America Research Foundation, [www.cecraf.org](http://www.cecraf.org)

California Alliance for Distributed Energy Resources, [www.cader.org](http://www.cader.org)

Public Service Commission of WI Report to the Legislature on the Development of Distributed Generation in the State of Wisconsin

Wisconsin Distributed Resources Collaborative, [www.wisconsin-dr.org](http://www.wisconsin-dr.org)

This value can be in the form of avoided costs based on properly developed rate structures and/or from environmental compliance laws that actually reward benefits supplied by cleaner energy applications such as DR can be. Allowing DR applications to receive hard rewards for the benefits it creates can substantially improve the economics of DR applications. Various efforts are being made to achieve this result. The testing of anaerobic digesters on Wisconsin farms to address waste disposal issues as well as sources of power is an example of the potential benefits that DR can provide.

**Work with state and local zoning and building code officials to develop effective rules and oversight of potential DR applications to prevent unnecessary costs and obstacles to DR projects.**

DR applications can be new and novel, especially for existing land use and building code laws and regulations and those who interpret and enforce such regulations. A DR developer must take time to educate or persuade a local official that an application is appropriate. Whether from lack of information or from inappropriate information, the economics to support a project can be destroyed due to either added costs or risk. The importance of being able to actually develop real world applications is a focus of attention for various efforts seeking to promote the growth of DR.

**Develop workable control structures, policies and systems for the proliferation of small scale DR on existing and future utility distribution systems.**

At the present time, DR applications are unlikely to occur in a magnitude or at a pace that will typically exceed the control or transfer capabilities of the existing transmission and distribution networks. However, DR allows for innovative uses that in effect would make the current primarily “one-way” distribution system have to address applications and uses for two-way flows, as well as uses that require additional or new control strategies and capabilities.

While the point at which problems caused by many DR applications being “hung” on the same lines or networks may be farther off, failing to be able to address those issues when they arrive has the potential to stall the forward momentum in DR development. These issues need to begin to be addressed now so that viable answers are available and can be implemented within an appropriate time frame to prevent such a situation.

**Use targeted tax and other incentives to accelerate the commercialization testing and introduction phase of especially valuable DR technologies and applications (e.g. combined heat and power applications).**

Appropriate DR applications can provide substantial environmental and economic benefits, increased energy security and more effective ways to accommodate energy supply and demand. Some areas may also have direct spin-offs that extend these potential benefits to another area of application. For example, the development of a cost-effective, small scale fuel cell for automobiles could be expected to also help promote the development of technology and an infrastructure that would support the development of fuel cells as a standard means to heat, cool and meet the other energy needs of buildings.

## 2) Support the adoption and use of accurate price signals

One of the most effective ways to spur investment in energy efficiency, energy conservation, or even renewable resources is to provide pricing mechanisms that send proper and timely pricing signals. These mechanisms send a price signal to energy consumers, appropriately encouraging efficiency and conservation when fuel costs and energy demand are high or to avoid costly surges in fuel prices and demand.

There are a wide variety of methods to send these signals. Some allow for variable pricing within the same day or between seasons. Others allow for more static pricing with frequent adjustments from month to month. And still others allow pricing based on projected energy loads during a very limited time frame.

Following are several examples of alternative pricing mechanisms that can be used to send the appropriate signal to customers. Some are already in limited use in Wisconsin or adjacent states while others are just being considered. Not all are available for use now, and those that are used currently may not be in the most effective form. In addition, no one pricing mechanism may be able to send the proper price signal to ensure investment in energy efficient equipment. In reality, two or more of these or other mechanisms may have to be employed to promote the investment. In order for these pricing mechanisms to be successful, utilities must be granted the flexibility to adopt more than one option. This may require legislative as well as regulatory changes to the existing pricing rules.

### **Top priority recommendations for increasing the use of accurate pricing mechanisms**

- 1. Identify the pricing mechanisms or mix of mechanisms that could provide the most benefit to Wisconsin.**
- 2. Eliminate legal and regulatory barriers that prevent the use of some alternative pricing mechanisms in Wisconsin.**

Energy Forum participants learned about and discussed the following pricing mechanisms in terms of their potential benefits and drawbacks, and their applicability to Wisconsin:

#### **Monthly Fuel Clause Adjustments**

Designed to allow utilities to more effectively convey the variability in their fuel prices, this mechanism can foster the more rapid adoption of energy efficiency measures by customers due to escalating energy costs. There are two basic monthly fuel clause adjustment (FCA) mechanisms. One is based on historical values and relies on actual fuel and production expenses. This mechanism has an inherent time lag of 75 to 90 days before an energy price adjustment is made, which can result in a shifting of the price signal from the peak energy use season to a lower energy use season.

The second mechanism is forward looking and is based on estimated fuel costs and estimated energy prices. If done properly, using good estimates, this mechanism can be an effective method to convey rapid changes in fuel prices — both escalating and falling prices. Because estimates are used in this process, a true-up mechanism must be included to protect the customer and the utility from high estimates and low energy prices or low estimates and higher energy prices. In addition, this mechanism can be subject to time lags due to poor estimates or emergency costs such as purchase power costs during forced outages.

Regardless of its limitations, the FCA does allow the utility to send proper price signals more quickly than existing adjustment procedures under the current fuel rules or the biennial rate case requirements.

**Encourages customers to adopt energy efficiency measures due to escalating energy costs**

**Allows customers to take advantage of the variability in energy market prices**

**Allows customers to shift energy use from high price periods to low price periods**

**Allows customers to sell their load back to the utility at a price that is equal to or lower than the current market price**

### **Real Time Pricing**

Already in limited use in Wisconsin, real time pricing (RTP) allows the customer to take advantage of the variability in energy market prices. It is a data and technology intensive mechanism that requires accurate metering equipment and the matching of energy consumption with energy prices. Because of the data management and technology requirements, this can be a costly pricing mechanism for the customer and is not cost effective currently for residential or small commercial and industrial customers. In addition, the customers must be somewhat knowledgeable about their energy costs and energy consumption patterns. Furthermore, if a customer must continue operation due to lost product, down-time costs, or energy quality issues, that customer may have to invest in back up generation for use when the market cost exceeds the cost of production from the back-up generation. This mechanism does send an accurate and timely price signal to the customer.

### **Time of Use**

This mechanism is already in limited use in Wisconsin, also, and allows customers to shift energy use from high price periods to low price periods within the same day or between seasons. The energy prices within these periods, whether within the same day or between seasons, are based on historic average costs, thus a true price signal is not being sent and a shift in energy cost can occur from a high cost, high energy use period (peak period) to a lower cost, lower energy use period (off-peak period). While this mechanism is somewhat future looking, it is still subject to the existing pricing adjustment methods under the current fuel rules or biannual rate case rules.

A variant of time of use pricing mechanism is the 'Super Peak' option. This mechanism estimates when maximum energy use will occur within a season or by a customer class and increases prices considerably to account for the increased fuel costs and energy consumption. Typically, the 'Super Peak' period is quite short, maybe as short as ten days during the typical high use periods or high fuel cost periods. This pricing mechanism incorporates both estimated fuel prices and historical energy consumption patterns (and everything that contributes to those historical energy consumption patterns like average weather conditions). Since estimated fuel prices and average energy consumption data are used to define the 'Super Peak' period, load shifting can occur and a proper price signal may not be sent. In addition, this mechanism will still have to incorporate the existing price adjustment methods under the current fuel rules or biennial rate case requirements.

### **Demand Control Option**

Also known as the load control option, this mechanism has many variants, but all allow customers to sell their load or capacity back to the utility at a price that is equal to or lower than the current market price. Some variants of this mechanism provide a discounted price to the customer for signing up for the program. The customers on this program are subject to the load shifting requirements of the utility with relatively short notice. This can and has caused production problems for customers in the past and may not send a proper price signal since the customer receives the benefit during a non-peak period.

Another variant allows customers to actually sell their load back to the utility based on the current price of the energy market. This variant requires customers to have knowledge of their energy consumption patterns and the impact of energy costs on their overall production costs. In addition, this mechanism may require a customer that cannot afford to shed load due to production losses, power quality, or other issues to have back-up generation.

## GOAL #6

### **Value a balanced approach and diverse energy investments.**

Energy Forum and Working Group participants recognize the value of a balanced, diverse energy portfolio for Wisconsin. The following section identifies priority recommendations for diverse energy investments in the areas of high quality power and distribution, co-generation (combined heat and power) technologies, biomass and waste-to-fuel applications and recommends the use of flexible market-based strategies for meeting energy and environmental goals.

### **Top priority recommendations for diversifying energy investments:**

The following outlines several strategies for creating a balanced energy approach and increasing diversification in energy investments. After each recommendation a sample program or case study is provided.

#### **1. Create super reliable, high-quality power (99.9999%) to attract biotechnology and micro-processing industries. Emphasize fuel-cell development strategy for Wisconsin. Leverage the availability of high-quality power as a competitive factor for attracting New Economy firms to Wisconsin.**

**A German Fuel Cell Park**, located in Berlin, Germany, features a 250 kW natural gas based fuel cell and interactive displays and presentations. Five utilities participated in the project in order to demonstrate the potential of fuel cells to play a key role within a sustainable energy supply infrastructure. For example, a series of interconnected fuel cells (or micro-grid) could be deployed close to the point of use for residential and commercial power supply and heating. Natural gas would be used in the initial phase and the fuel cells would be linked via modern communication systems and serve as a complimentary network to the existing energy supply network. Besides the energy-efficiency and environmental benefits, these micro-grids could evolve based upon demand, thereby increasing reliability while decreasing investment risk.



*A German Fuel Cell Park features a 250kW natural gas based fuel cell.*

**Enable Fuel Cell Corporation\*** is a wholly owned subsidiary of DCH Technology, Inc. located in Middleton, WI. The company was created to commercialize portable and stationary fuel cell technology licensed from Los Alamos National Laboratory. Enable Fuel Cells are hydrogen-based proton exchange membrane (PEM) fuel cells with current offerings ranging from prototypes less than two ounces and the size of a “D” battery to 5kW units. Key ongoing development activities include the development of a 1-10 kW PEM product platform for remote equipment monitoring and continued development of the DCH/Enable family of portable fuel cells for commercial and consumer applications. For more information see [www.enablefuelcells.com](http://www.enablefuelcells.com)  
\*Enable is currently looking for investors.

**German fuel cell park features a 250kW fuel cell with interactive displays and presentations**



**Cogeneration utilizes waste heat, increases energy efficiency, and reduces air emissions**

**“Utilities that go above-and-beyond to achieve meaningful environmental goals should be offered greater flexibility and incentives such as lower government fees and expedited permit review. By setting binding targets for environmental performance and allowing utilities the choices for reaching them, we can spur technological advances, abundant energy resources and environmental responsibility.”**

**— John Imes,  
Wisconsin  
Environmental Initiative**

**Chicago Climate Exchange  
— first US voluntary  
program for trading  
greenhouse gas emissions**

**2. Utilize combined heat and power (CHP) plants to improve efficiency, lower energy costs and lower pollution.**

**Cogeneration** is the simultaneous production of electricity and thermal energy. Heat produced in standard electrical power plants is typically wasted. Utilizing this waste heat increases the efficiency of the plant significantly. **Madison Gas & Electric’s proposed UW Madison cogeneration facility**, a natural gas-fired cogeneration plant, will be one of the cleanest and most efficient power plants in the state. The facility will produce 150 megawatts of electricity, 20,000 tons of chilled water and 500,000 lb/hr of steam capacity. The cogeneration plant will use less fuel than separate heating and electric power plants and will operate with an overall net efficiency of up to 70%. This compares to 30-35% efficiency for a typical power plant. Emission reductions from a state-of-the-art selective catalytic reduction unit will reduce NOx emissions by 80% and carbon dioxide by 15% per year.

**3. Utilize biomass technology to generate electricity from agricultural wastes and create an additional cash crop for one of the state’s largest industries.**

**Biomass** technologies can generate electricity through anaerobic digestion of livestock manure or sewage waste. The Tinedale Dairy Farm in Northeastern Wisconsin converts 48,600 pounds of manure each day from its 1800 Holsteins. The manure produces 300,000 cubic feet of methane gas and generates 750 kilowatts of electricity, enough to power 250 houses.

**4. Support a cap-and-trade “emissions trading” system for four pollutants: sulfur dioxide (SO2), nitrogen oxide (NOx), mercury and carbon dioxide (CO2). Utilities that reduce emissions below the standards could receive relief from New Source Review (NSR) requirements and sell allowances to utilities that don’t. A market-based emission trading system would improve air quality, reward energy efficiency, stimulate clean power sources, reduce regulations and help reduce global climate change economically.**

**The Chicago Climate Exchange (CCX)** is the first U.S. voluntary pilot program for the trading of greenhouse gas emissions. The goal is to design and implement a voluntary private market based in seven U.S. Midwestern states (Illinois, Indiana, Iowa, Michigan, Minnesota, Ohio and Wisconsin) that will set the standard for greenhouse gas emissions trading. The CCX would enable participants to get credit for voluntary carbon emission reductions and to buy and sell credits in order to find the most cost-effective way of achieving reductions. The goal is to reduce participants’ greenhouse gas emissions (representing 20 percent of the region) by 5 percent below 1999 levels in five years.

## **5. Invest in transmission technology that increases conductor capacity to make best use of existing transmission corridors and infrastructure.**

Given the difficulty of building new transmission lines because of regulatory constraints, environmental concerns and strong local opposition, a promising solution may be using **convertible static compensators (CSC)**. This pioneering device will for the first time enable operators to simultaneously control power flows on two or more transmission lines and to instantly transfer electricity from heavily loaded to underutilized lines. The CSC does this by relying on high-speed solid state electronics rather than conventional slower mechanical controls. A CSC project recently completed in New York will boost statewide transmission capacity by at least 200 megawatts - enough electricity to serve about 200,000 homes.

**Composite conductors** provide a way to replace existing conductors in corridors where increased transmission line capacity is needed, avoiding the environmental damage related to removing existing structures and installing new poles and towers.

Lighter and stronger than existing steel conductors, composite conductors have higher conductivity and ampacity, lower sag potential, and can be used on existing towers. Because the cable is lighter, the overall number of supporting structures can be reduced and the distance between spans can be increased. This flexibility in span length can aid in avoiding impacts to sensitive resources in the right-of-way.

While the cost of some of the new composite conductors may be higher than commonly used steel conductors, its' increased strength and lightness could reduce the need for conductor and tower replacement and repairs over the lifetime of a transmission line, commonly 60+ years.

**Convertible static compensators allow operators to control power flows on two or more lines and to transfer loads**

**Composite conductors reduce the need for tower replacement and repairs**

## **Conclusion**

The outcomes of Energy Forum activities of the past year form the basis for this report and a foundation of information and ideas for future initiatives. Energy Forum events have provided a valuable opportunity to recognize positive measures currently being taken by many sectors, identify ways for diverse stakeholders to work together on shared goals, and articulate principles and values that can guide Wisconsin's energy policy.

Energy continues to be the focus of a number of initiatives. It is clear that finding good solutions to energy challenges is going to affect Wisconsin's future in many ways. The combination of media coverage of energy issues and programs targeted more directly towards government and industry leaders responsible for energy-related decisions is creating a broader awareness of Wisconsin's current energy situation and potential for its future. Ongoing support of and participation in these initiatives by diverse Wisconsin citizens will play a significant role in achieving the best possible balance between energy reliability, environmental quality, and a vibrant economy.

## Index of Resources

### **ENERGY EDUCATION RESOURCES:**

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We The People — Powering Wisconsin is a multi-media partnership that is focused on Wisconsin's energy problems and solutions.

[www.wtpeople.com/energy.asp](http://www.wtpeople.com/energy.asp)

WISPOLITICS.COM is Wisconsin's premier political news service. Their "Energy at a Glance" section offers links to Wisconsin's energy stakeholders, the Governor's 2001 Energy Plan and other useful resources.

<http://wispolitics.com/freeser/features/f01062505.html>

Wisconsin Focus On Energy provides information and education regarding the importance of energy efficiency for your home, business and community.

[www.wifocusonenergy.com](http://www.wifocusonenergy.com)

Energy Center of Wisconsin provides energy-efficiency programs, research, and education to residents, businesses, industry and government.

[www.ecw.org](http://www.ecw.org)

Wisconsin Department of Natural Resources - Energy Sector discusses energy and environmental issues and provides data on utility emissions and environmental progress.

[www.dnr.state.wi.us/org/caer/cea/compliance/energy/index.htm](http://www.dnr.state.wi.us/org/caer/cea/compliance/energy/index.htm)

Madison Gas and Electric Environment Page

[www.mge.com/business/environment/index.htm](http://www.mge.com/business/environment/index.htm)

Wisconsin Paper Council Energy Page

[www.wipapercouncil.org/energy.htm](http://www.wipapercouncil.org/energy.htm)

Energy Watch Magazine, created to inform and energize the public dialogue about energy decisions, provides news, facts, and information on current and emerging energy issues.

[www.energywatchwi.com](http://www.energywatchwi.com)

## **OTHER SELECTED RESOURCES:**

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AHC Group, Inc. is a management consulting firm specializing in energy, environmental, and materials strategy. [www.ahcgroup.com](http://www.ahcgroup.com)

American Council for an Energy-Efficient Economy (ACEEE) provides links to energy efficiency related publications and conference proceedings. [www.aceee.org](http://www.aceee.org)

Business for Social Responsibility - Energy Efficiency provides a newly updated report which makes the business case and offers implementation steps for incorporating energy efficiency to cut costs, increase profits, enhance image and further business environmental performance. Includes leadership examples, sample policies and useful links. [www.bsr.org/BSRResources](http://www.bsr.org/BSRResources)

The Center for Small Business and the Environment promotes small businesses and entrepreneurs leading the way to a new economy by protecting and restoring the environment while producing abundant growth and employment. [www.geocities.com/aboutcsbe](http://www.geocities.com/aboutcsbe)

Chicago Climate Exchange is the first U.S. voluntary pilot program for trading of greenhouse gases. Participating Midwest based utility companies represent almost 20 percent of greenhouse gas emissions in the region. [www.chicagoclimatex.com](http://www.chicagoclimatex.com)

Clean Edge helps investors, industry and society understand and profit from clean energy technology. [www.cleandedge.com/index.php](http://www.cleandedge.com/index.php)

Energy Star US EPA's website with resources to improve the energy efficiency of your small business, home or office. [www.energystar.gov](http://www.energystar.gov)

The National Energy Policy (NEP) Initiative is a non-governmental, non-partisan, foundation-funded project to support the development of a stakeholder-based national energy policy. A final expert report presenting the project's findings can be viewed and downloaded from the website. [www.nepinitiative.org](http://www.nepinitiative.org)

Pew Center on Global Climate Change was established to create a forum through which major companies and other organizations can work together to educate the public on the risks, challenges and solutions to climate change. [www.pewclimate.org](http://www.pewclimate.org)

PowerScorecard rates the environmental impact of electricity products. [www.powerscorecard.org](http://www.powerscorecard.org)

RENEW Wisconsin promotes clean energy strategies for powering the state's economy in an environmentally responsible manner. See A Straw Proposal for Stimulating Distributed Generation in Wisconsin on the website. [www.renewwisconsin.org](http://www.renewwisconsin.org)

Repowering the Midwest provides a Clean Energy Development Plan for the Heartland. [www.repowermidwest.org](http://www.repowermidwest.org)

Rocky Mountain Institute (RMI) seeks to foster the efficient and sustainable use of energy resources as a path to global security. [www.rmi.org](http://www.rmi.org)

Wisconsin Environmental Initiative (WEI) works to improve the environment, economy, and quality of life in Wisconsin through educational initiatives, multi-stakeholder dialogues, and the advancement of best practices in the areas of business strategy, environmental policy, green building, agriculture, and land use. See WEI's web site for more information about the Energy Forum. [www.wi-ei.org](http://www.wi-ei.org)

## **GOOD READING!**

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Alliance to Save Energy. Business Energy Checkup ([www.ase.org/checkup/business](http://www.ase.org/checkup/business)) and Home Energy Checkup ([www.ase.org/checkup/home](http://www.ase.org/checkup/home)) are online energy guides that allow you to estimate the energy, economic and pollution savings associated with efficiency upgrades.

Lean and Clean Management: How to Boost Profits and Productivity by Reducing Pollution, Joe Romm (1994)

The Energy Web from Wired Magazine, provides an innovative look at the smarter energy network of the future.  
[www.wired.com/wired/archive/9.07/juice\\_pr.html](http://www.wired.com/wired/archive/9.07/juice_pr.html)

“MicroPower: The Next Electrical Era” by Seth Dunn, discusses the technological, economic, and environmental trends which could push the energy system further toward a more decentralized model.  
[www.worldwatch.org/pubs/paper/151.html](http://www.worldwatch.org/pubs/paper/151.html)

Reaping the Wind: How Mechanical Wizards, Visionaries, and Profiteers Helped Shape Our Energy Future, by Peter Asmus, chronicles the history of commercial wind power in the United States.

Reinventing Electric Utilities: Competition, Citizen Action, and Clean Power, by Ed Smeloff and Peter Asmus, uses in-depth case studies to illustrate the challenges that utility restructuring presents for citizens and the utility industry.

Turning Off the Heat: Why America Must Double Energy Efficiency to Save Money and Reduce Global Warming, by Thomas R. Casten, documents the waste in power and heat generation common today and shows how we can cut carbon dioxide emissions in half and still save money.







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