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The Campus Sustainability Path: The Case of the University of Wisconsin Oshkosh

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Introduction

The University of Wisconsin Oshkosh has emerged as a leader in campus sustainability. Over the course of the past decade, the school has received a growing collection of accolades for its sustainability initiatives from operations to academics. As a Vice Chancellor deeply involved in leading campus operations at UW Oshkosh, I am often asked a number of questions about our accomplishments including: 1) Why we do it? 2) What we do and how do we do it? 3) Is it worthwhile? 4) What lies ahead?

The simple answers are: 1) today's sustainability challenges are already of critical concern and continue to mount, and they demand leadership from universities; 2) we are working on a wide range of projects from energy to water to academics and we do it with buy-in from many stakeholders, a diversity of talents, and lots of hard work; 3) yes, it has been extremely worthwhile on many fronts; and 4) navigating through and around the many treacherous currents and obstacles ahead will not be easy, but successfully pushing forth will bring even greater benefits and rewards.

Why we do it: today's global challenges

As a Chief Business Officer, I am not an expert in matters of sustainability science, but I respect science and the larger Academy. The preponderance of evidence indicates convincingly that we face challenges in the decades ahead that are moving us in unprecedented ways toward global overshoots. As an accountant, I do understand numbers, however, and the numbers I see coming from scientists are alarming. A cursory look at some of the numbers reveals my concerns. On climate change, for example, just a few numbers are quite telling. First, recent reports show that at over 400 parts per million, the atmospheric concentration of carbon dioxide is 100 ppm higher today than they have been for nearly a million years, and 120 ppm higher than during most of the past 1000 years [1]. That's an increase of more than 40% since pre-industrial times. Associated with this increase, ecosystems are being stressed, human lives are being affected, and economies are being challenged. Scientists tell us that there is still time to act to avoid the worst consequences of global warming, but that we must act now and we must act aggressively. They also tell us that instead of moving in the right direction we continue to add to the problem [2,3].

A second set of numbers relates to the loss of biological diversity. With species extinction rates dozens to hundreds of times higher than the background rate from 10,000 years ago and growing, human beings are responsible for kicking off the worst extinction spasm since the demise of the dinosaurs 65 million years ago [4-8]. I mention this because despite looming large among the major anthropogenic environmental calamities, biodiversity receives relatively little attention compared to climate change, and college campuses have less direct influence over habitat destruction—the main driver of these losses—than they have on climate change. Nevertheless, the numbers are alarming and suggest, like those on climate change, that circumstances warrant quick and providential action.

Of course there are many other areas of concern including nutrient loading associated with agriculture, chemical pollution, water quality and supply issues, ozone depletion, and land conversion, among others. I will not dwell on these issues, as they are all well documented in the scientific literature [9]. I will stress, however, that they all add up to big problems that loom large for coming generations. This urgency is what motivates me and my colleagues at UW Oshkosh and explains why we do what we do.

What we do and how we do it

College campuses may arrive at the commitment to pursue sustainability in various ways from a purely top-down approach coming from top administrators, from grassroots student movements, through faculty/staff leadership, or through some combination of the above. However it starts, to succeed and endure several conditions must be met. First, support from across all stakeholder groups must eventually arise around a shared vision and commitment. Second, creative funding strategies must be adopted to pay for initiatives. Third, collaborations and partnerships that leverage assets for mutual benefits can be of great value for advancing the cause.

At the University of Wisconsin Oshkosh, there was a rather quick coalescing of interests beginning around 2001, when a group of students requested the university begin environmental audits. The first audit helped reveal opportunities to implement energy efficiency projects with the potential to save energy and money. The trick was how to fund energy projects that involved expensive equipment. Fortunately, the solution came in that same year when a vendor offered a performance contract, or a master lease agreement for lighting upgrades. Through this financing mechanism, the vendor provided the up-front costs for equipment upgrades for improved energy efficiency, which the campus then paid for with savings on utility bills. During the ensuing years UW Oshkosh signed several additional performance contracts for mechanical equipment, windows, and plumbing fixtures.

Meanwhile, in galvanizing internal support, UW Oshkosh signed the Earth Charter in 2002, which more formally pledged the institution to pursue a course of sustainability. The Earth Charter framework asks signatories to advocate for four broad principles: 1) respect and care for the community of life, 2) ecological integrity, 3) social and economic justice, and 4) democracy, nonviolence and peace. For UW Oshkosh, this pledge has meant intentionally infusing sustainability in all that it does in teaching, research, service, outreach, operations, student affairs, and administration. Of course, we have not done it all at this

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time, because it is a long journey. Building on the Earth Charter pledge, UW Oshkosh signed the American College and University Presidents Climate Commitment (ACUPCC) in 2007, thereby obligating the campus to achieve climate neutrality by mid-century or sooner.[1] Around the same time, the Chancellor formed the Campus Sustainability Council to write a sustainability plan. The next year, UWO released its first Campus Sustainability Plan, which catalyzed many efforts that have helped move campus along the sustainability path. Among the plan's many goals was to hire a Sustainability Director, which it did in 2008. With guidance from the Council and the Director, and lots of hard work from across most campus units, the campus has made great strides.

One of the top priorities was a focus on renewable energy. Specific goals for this priority committed the campus to green building design, buying renewable energy credits, and developing our own capacity to produce renewable energy on campus and in the region. As a result, all new construction and major renovations since 2007 have been built to LEED standards set by the U.S. Green Building Council.[2] Our policy is to strive for LEED Gold certification whenever possible. We currently have four LEED certified buildings (3 Gold, 1 Silver), two inspired by LEED, and several in various stages of design. LEED certified buildings are known to operate more efficiently than conventional buildings, and ours do just that. For example, Sage Hall, a large academic building, was designed to operate 40% more efficiently than a conventionally built building and is some 65% more efficient than the average building in the UW System.

Of course it takes time to build and renovate buildings, so these can only be done slowly over time as opportunities arise. A way to make quick progress toward climate neutrality is to buy renewable energy credits. RECs, as they are called, are done through additional payments that customers make on their electricity purchases. The money raised is then used to finance renewable energy projects. UWO was the first campus in the state to purchase RECs in 2003. Since then, our REC purchases combined with a State of Wisconsin match have ranged from between 3% of campus electricity use to more than 23%. Today, we are at about 17%. Most of the projects our contributions have supported involve wind energy projects.

These accomplishments aside, where UW Oshkosh really shines is in the area of renewable energy generation. Campus now features nearly 300 photovoltaic panels, 228 solar thermal panels, and two ground source geothermal systems with 121 wells. Combined, these installations produce some 5% of campus electricity needs. Our most ambitious projects, however, involve the construction of three biomass digesters that turn organic wastes into energy and compost in a cradle-to-cradle process. The biodigesters warrant special emphasis in this review.

UW Oshkosh is one of 25 charter member campuses in the American Council on Renewable Energy (ACORE). In 2007, I attended an ACORE meeting where we began discussions on managing food waste. That meeting led to an introduction to an energy equipment manufacturing company with some innovative technologies. We pursued the relationship, which resulted in the eventual construction of three biomass digesters in and around the city of Oshkosh, Wisconsin.

The first biodigester (BD1) was conceived of in a series of meetings with our now private-sector partner, the Viessmann Group of Germany and its U.S. subsidiary, BIOFerm Energy Systems. The project also involved the cooperation of Wisconsin Public Services (our power company), the city of Oshkosh, and the State of Wisconsin. BD1 is unique in that it is the first commercial scale dry fermentation anaerobic digester of its kind in North America. The facility is located on campus and produces biogas from food, yard and other organic waste through an anaerobic digestion process. The methane is burned to generate electricity. Presently the facility processes more than 11,000 tons of organic wastes annually and generates the equivalent of 8 percent of campus electricity demand. Campus provides some 700 tons annually mostly from food wastes from cafeterias. Operating at full capacity, the 370-kW generator would produce 10 percent of campus electricity needs at present levels of demand. Thermal energy from the engine heats the plant and soon will heat the Campus Services building, which will save the university more than $22,000 per year in heating costs and will further reduce the university's carbon footprint. Funding for this project came from a $3.7 million investment by the UW Oshkosh Foundation. Grants also supplemented the project including $232,587 from Focus on Energy,[3] $500,000 from the U.S. Department of Energy, and $1.1 million from a U.S. stimulus package grant.

The other two biodigester plants rely on wet digestion. The first is sized for family farms with fewer than 500 cows. This smaller, experimental plant was installed at Allen Farms five miles northwest of campus. It uses a 64 kW generator to produce electricity from manure and other farm wastes. The plant helps to power the family farm. Waste heat warms buildings on the farm and compost is used on farm fields. The plant also serves as a demonstration unit for other farmers in the region and an educational laboratory for UW Oshkosh students, faculty, and staff. This project was funded by UW Oshkosh and the Viessmann Group/BIOFerm with supplemental funds from Focus on Energy and the Wisconsin State Energy Office. The total cost was under $1 million.

The newest digester to launch is in Pickett, Wisconsin 15 miles southwest of Oshkosh on Rosendale Dairy, the state's largest dairy operation. The plant processes 110,000 tons of manure from 9,000 cows into biogas that is burned to generate electricity. The plant is equipped to generate 12.6 million kWh of electricity per year from its 1.4 megawatt generator. That is enough electricity to power the equivalent of 1,200 homes or 40% of campus electricity use. Thermal energy from the engine is used to heat buildings at the facility. The liquid slurry of digestate soon will be processed into a high quality soil amendment. The Rosendale project was funded with an $8 million investment by the UW Oshkosh Foundation and $2 million in grants.

Is it worthwhile?

Have our efforts paid off? As stated earlier, the general answer is yes. In some cases nearly immediate cost savings are realized. For example, $2.3 million in energy conservation projects in 2010 and 2011 are producing savings of roughly $800,000 per year through energy use reductions and campus energy consumption dropped by more than 20%. Similarly, by replacing grass on the football field with artificial

[1] *Climate neutrality* means that the institution operates with a net of zero fossil greenhouse gas (GHG) emissions, which may be achieved by minimizing such emissions to the extent possible and by using carbon offsets and renewable energy credits to mitigate any remaining emissions.

[2] LEED stands for Leadership in Energy and Environmental Design and is the rating system developed by the U.S. Green Building Council, a non-profit organization dedicated to sustainable building design. The LEED system assigns points for green features in several categories that are then tallied up. The total of points places the building project in one of four levels including: Certified (the basic), Silver, Gold, and Platinum.

[3] Focus on Energy is a State of Wisconsin program that directs a percentage of revenues from all power companies in the state into energy efficiency and renewable energy projects.

turf, the campus saves 850,000 gallons of water per year for irrigation. By replacing more than 1,000 high volume toilets with more efficient units and by installing 1,181 low-flow restrictors on faucets, we accrue savings of nearly $131,000 per year in water costs and nearly $4,600 per year in reduced water heating costs. Campus freshwater usage is down by more than 35% from 12 years ago. In other projects, we see that total suspended solids in stormwater runoff are down by more than 40%.

The biodigester projects are too new to talk about their precise economic benefits, but it is true that they have the potential to generate up to approximately 50% of UWO's electricity demand. The amount of energy contained in the waste heat produced from the digester generators may be 50-100% of the electricity they produce. That means that the digesters could at full capacity produce energy equivalent to all of the electricity used by campus. That is a lot of energy and a lot of money. In the most recent reporting period, the Rosendale dairy digester generated nearly $80,000 in monthly electricity sales. Presently, all of the electricity is sold to power companies and the revenues are used to pay off the loans that were used to pay for the construction of the digester facilities. Once the loans are paid off, in ten years or so, the revenues will be available to directly support university programs.

In the meantime, some of the thermal energy will have direct benefits for campus. Waste heat from BD1, for example, soon will be used to heat the Facilities Services building and save the campus more than $22,000 per year in heating costs. The sale of methane destruction credits, in carbon equivalent units, have been secured and will generate additional revenues on the order of $50,000 or more per year. We also generate revenues through tipping fees at BD1 and will through the sale of high quality compost and fertilizers. Other benefits relate to our commitment to climate neutrality. Although we currently sell the renewable energy credits that we generate at our digesters, we are effectively generating enough green energy to offset a significant percentage of all emissions associated with our use of electricity. Add in the 17% of RECs that we currently buy and some sequestered carbon, and the number goes up to well over 100%. Here, it is easy to see that these projects will contribute significantly to our goal of achieving climate neutrality in the coming years.

Other benefits are not so straight forward. Some do not result in savings, but are beneficial by reducing our ecological footprint, as with our prairie planting projects, for example. The major accomplishments of the past several years, however, are at the core of the university's mission. In the end, all of our initiatives provide campus with resources that serve as a living learning laboratory. Students gain firsthand experience in operating facilities and in studying the science of the systems. We made a commitment to the goal when we signed the ACUPCC and became a charter member of ACORE. We are living up to the commitment by reducing our energy consumption, by building our own capacity to generate renewable energy, and most importantly by providing students, faculty, and staff with exposure to part of the solution on the path to a future free of fossil carbon emissions.

What lies ahead?

A major focus of our efforts to achieve carbon neutrality and sustainability has been to develop the tools for our students, faculty, staff, and members of the larger community to learn how all of us can reduce our reliance on fossil fuels. In so doing we are now able to apply the lessons learned to our lives beyond campus at home, in the workplace, and beyond.

As outlined above, the University of Wisconsin Oshkosh's path to sustainability has been paved with genuine commitments, lots of hard work by a diversity of talented people across many stakeholder groups on campus, and by leveraging our assets with grants, creative contracting, and strategic partnerships. We have been very successful to date and the university is well positioned for even greater success. For example, the recruiting materials for the Chancellor we hired in November 2014 make it clear that sustainability is a fundamental part of what defines our institution; indeed, support from the helm has advanced, building on the great work of the previous Chancellor. We have taken measures to further institutionalize sustainability by integrating campus sustainability planning into our strategic planning process so that it is integral to all we do. The recently updated campus sustainability plan adopts a process that requires more frequent revisions and encourages more input from the campus community.

I am certain that much good progress will continue at UW Oshkosh in the coming months and years. We will, for example work on the relatively easy challenges, like continuously improving recycling, bringing sustainability information into new student and new employee orientations, and continuing to make efficiency upgrades when feasible.

Of course, making this happen is easier said than done. We will go as far as we can within the constraints of the larger system in which we operate. We will make the efficiency improvements that in the end will reduce our energy consumption by perhaps 35%. We will buy RECs to the extent that they are affordable, and we will build as much green energy infrastructure as the present cost will allow.

These efforts will take us a long way toward climate neutrality, but will not likely get us all the way there. At this point, new State, Federal, and local policies are needed to bring the negative externalities associated with fossil fuels into account, such as a carbon tax. Others would provide incentives in the form of tax breaks and subsidies for renewable energy investments and would lift current caps on what independent energy producers can generate. Just as sweeping policy reforms with bipartisan support helped to clean up the environment in the 1970s, they can again today, and colleges and universities may be able to play a role. I propose establishing a university presidents' commitment to policy reform that might be organized in a way similar to the American College and University Presidents Climate Commitment. Such a commitment would call on signatories to lobby government as relevant to their particular issues, be it at the federal, state, or local levels, to produce legislation that would encourage renewable energy investments.

In closing, I would say that although society at large must ultimately play the decisive role in making the transition to sustainability, certain key organizations should lead. Just as college communities have championed other relevant issues, so too they should champion the sustainability movement. UW Oshkosh will continue to be among the leaders in its capacity as an institution of higher learning.

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