

# UW Oshkosh's Commitment to Renewable Energy: Partnerships and Opportunities

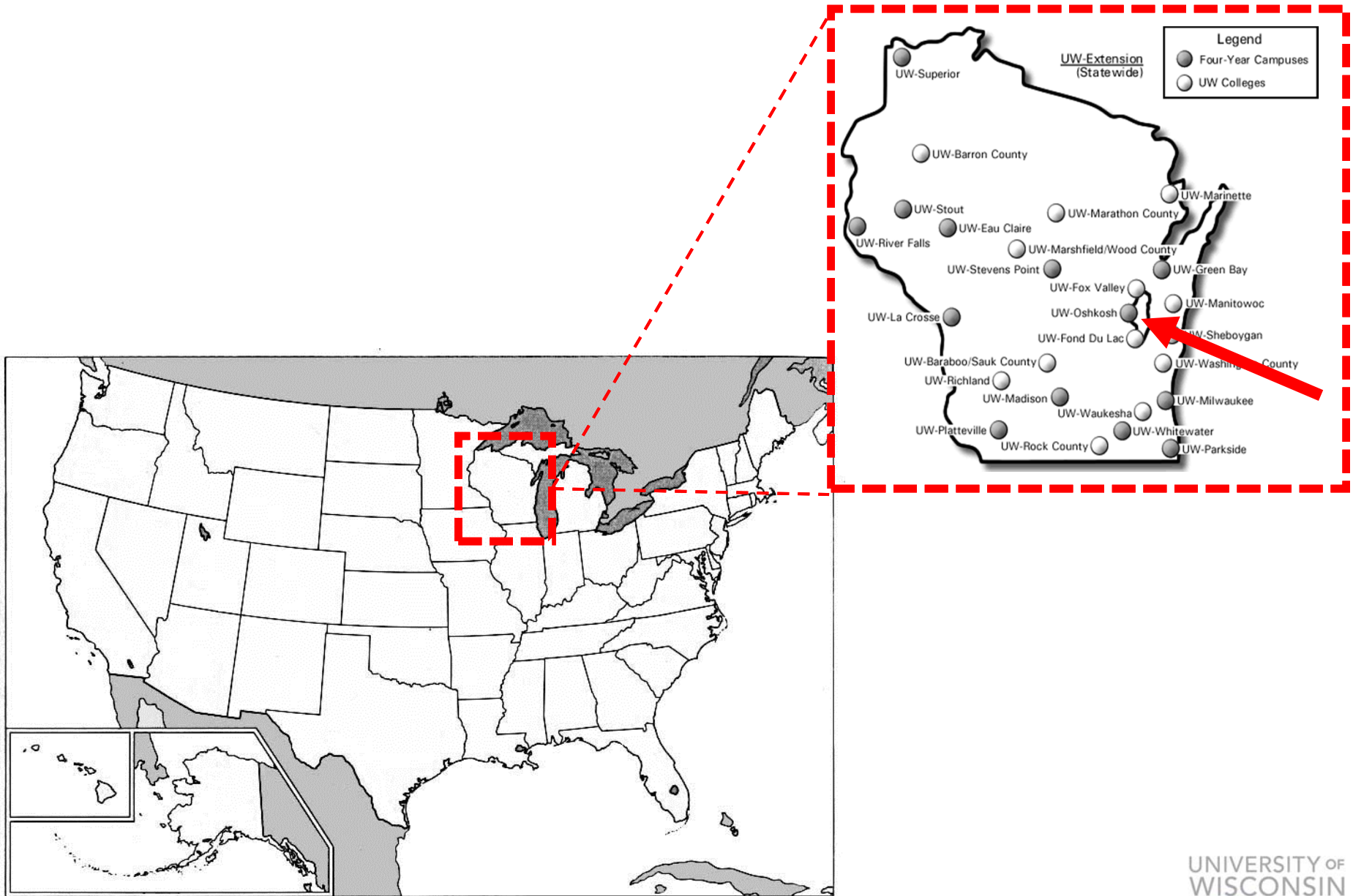
**Tom Sonnleitner, Vice Chancellor**

**March 14, 2012**

**University of Wisconsin - Oshkosh  
Oshkosh, WI 54901**

**<http://www.uwosh.edu/>**

# University of Wisconsin Oshkosh



# Growth Snapshot

- Founded in 1871
- UW Oshkosh-3rd largest university in the State of Wisconsin
- Total headcount enrollment - 13,600 (Includes 1,600 Graduate/Doctoral Students)
- 74 associate, baccalaureate, master's and doctoral degree programs
- 9.1%> in FTE during past 6 years
- Growth Agenda - potential enrollment increase 12.2% by 2025 (*approaching 16,000*)
- Annual Report progress toward goals (<http://www.uwosh.edu/home/strategicplan>)



# UW Oshkosh and Renewable Energy

- Committed to sustainability
- UW Oshkosh adopted comprehensive Sustainability Plan in 2008 (<http://www.uwosh.edu/sustainability>)
- UW Oshkosh is Leader in Buying Renewable Energy
- UW Oshkosh was the first school in the state of Wisconsin to sign the President's Climate Commitment and pledge to attain carbon neutrality

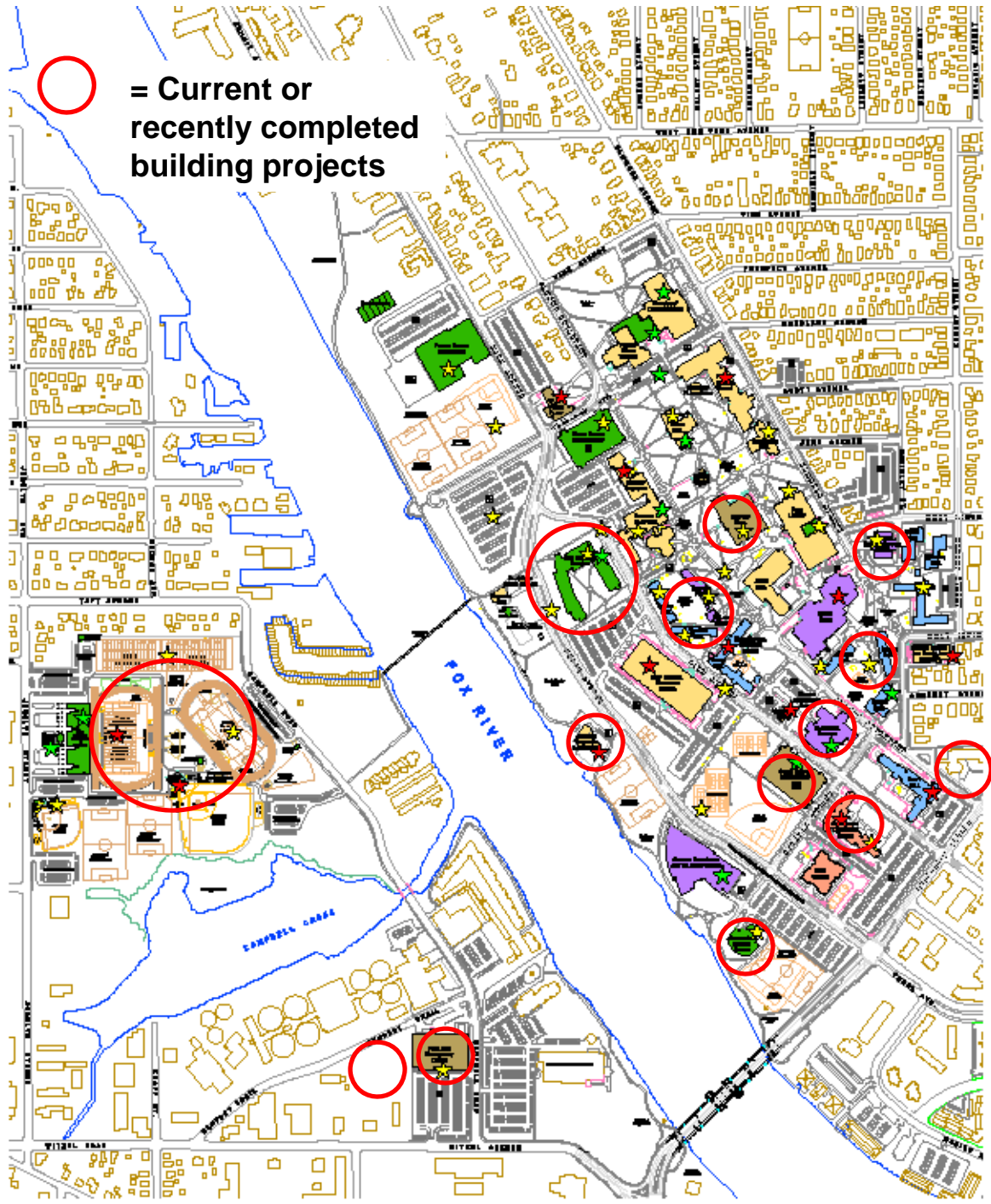
# UW Oshkosh and Renewable Energy

- Coupling of education, research, and private sector expertise
- Demonstration site for a variety of renewable technologies
- Committed to the development of partnerships in renewable energy
- Unique capabilities and positioned for the future



# On-Campus Construction



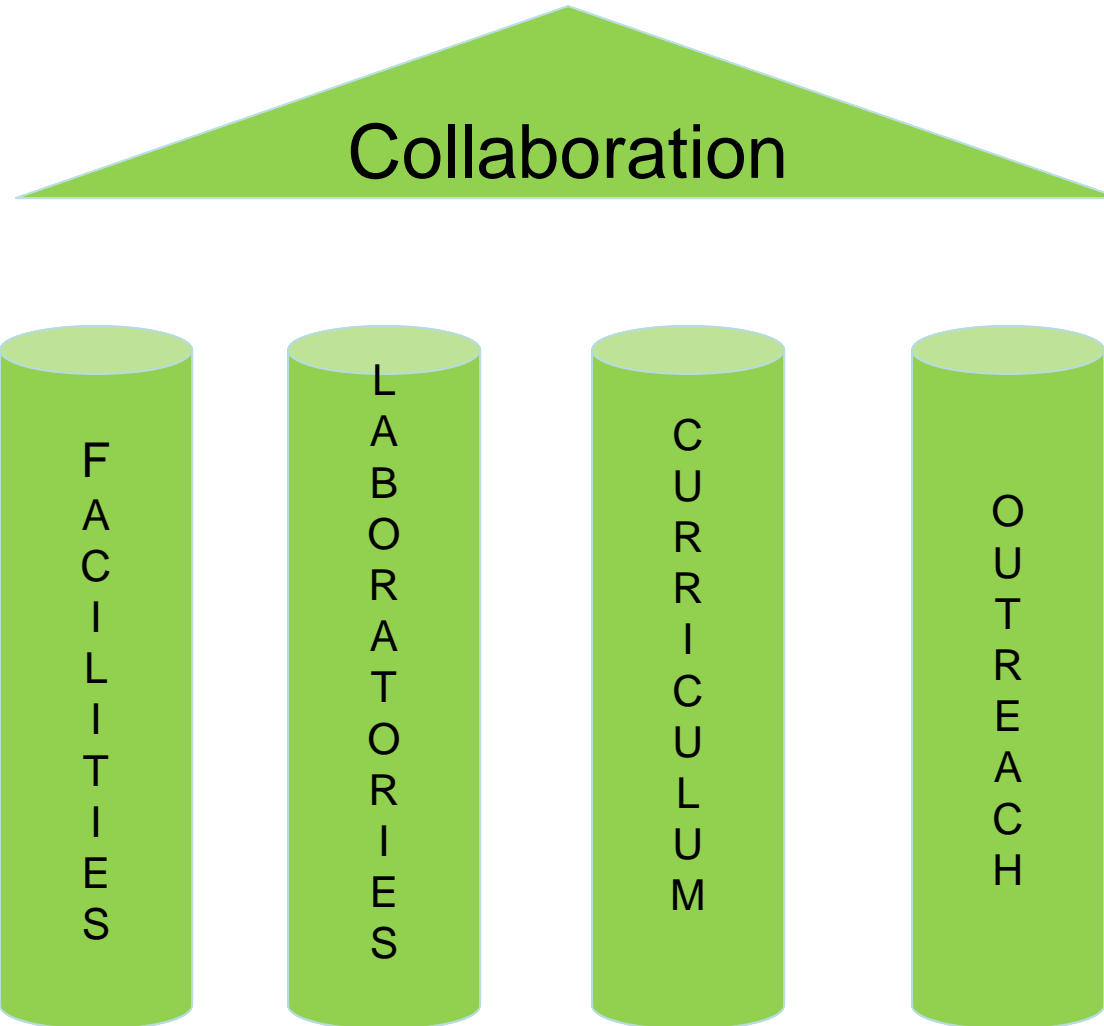


# Renewable Energy on Higher Education Campuses

- **Leading by example:** Universities and colleges are in a unique position to execute projects
  - Groups of motivated, educated and concerned individuals
  - Control of policies and operational methods on bounded and distinct campus
  - Users of large amounts of energy and resources



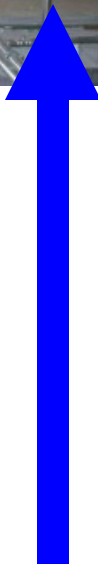
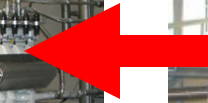
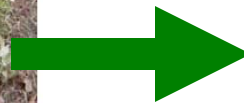
# Pillars of Renewable Energy Focus at UW Oshkosh



# **Digesters and Renewable Energy Technology**

# UW Oshkosh Dry Biodigester I Renewable Energy Facility

- Methane Produced from Dry Fermentation of Organic Waste
- Burn to generate electricity and heat
- Public Outreach and education



# UW Oshkosh Dry Biodigester I Renewable Energy Facility

Oshkosh Wastewater Treatment Plant

WPS

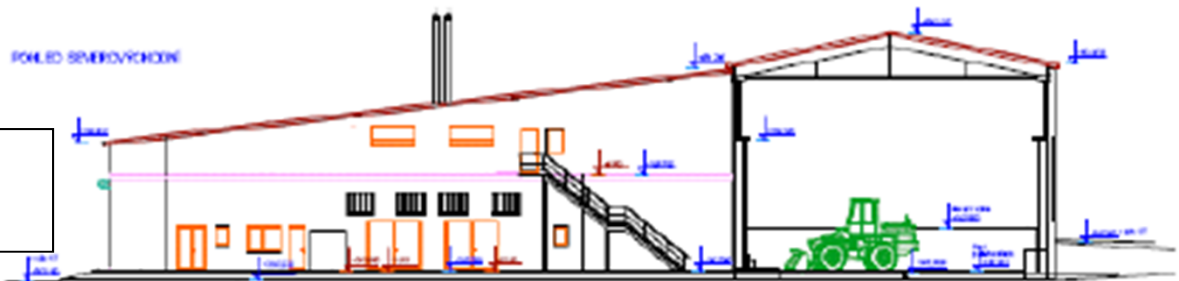
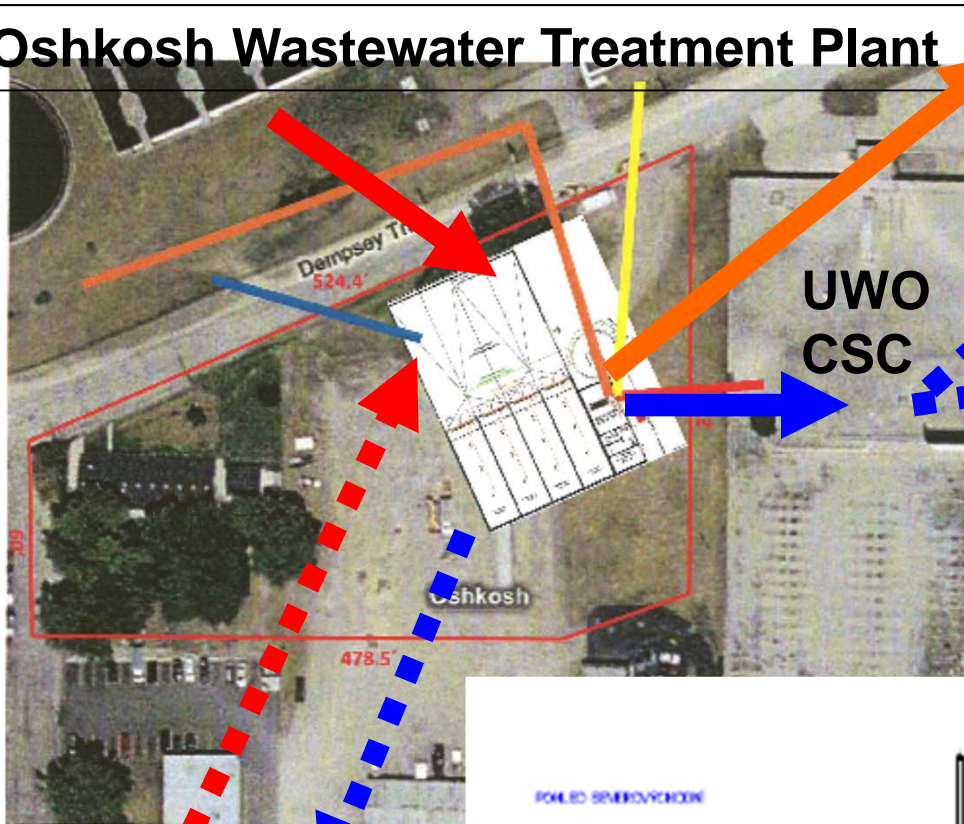
Oshkosh Senior Center

Fox Valley Technical College

UWO  
CSC

Citizens First  
Credit Union

Oshkosh Yard waste Drop Off Site



# UW Oshkosh Biodigester II Renewable Energy Facility

The screenshot shows the top navigation bar with links: About UW Oshkosh, Academics, Athletics, Admissions, Administration, Resources, Calendars, Titan Services, and three social media icons. Below this is a yellow banner with the University of Wisconsin Oshkosh logo and the word "today" in large white letters. A secondary navigation bar contains: ABOUT US, PUBLIC EVENTS CALENDAR, SUBMIT AN ANNOUNCEMENT, a Twitter icon, and a search box labeled "Search the archive...".

The main content area features a breadcrumb trail: Home » Featured, Sustainability. The article title is "UWO partners in second dynamic biodigester project" by Alex Hummel, dated August 29, 2011, with "NO COMMENT" and a "PRINT THIS STORY" link. The article text reads: "Wisconsin's largest dairy farm will be home to one of Wisconsin's most dynamic research, renewable energy production and public education facilities as part of an initiative involving the University of Wisconsin Oshkosh's College of Letters and Science and UW Oshkosh Foundation. On Aug. 24, the UW Oshkosh Foundation Board of Directors unanimously endorsed a proposal to pursue an innovative partnership with Milk Source's Rosendale Dairy and renewable energy companies Viessmann Group and BIOFerm Energy Systems of Madison."

The right sidebar includes a "Categories" list with links to Campus News, New Academic Building, Snapshots, Announcements, Personalities, Research, Sustainability, Alumni News, Alumni Newsmakers, Class Notes and Obits, Alumni Events, Featured, and UW Oshkosh in the News. Below this is a "Weather" section for Oshkosh, WI, showing a 10-day forecast and a current temperature of 44°F.

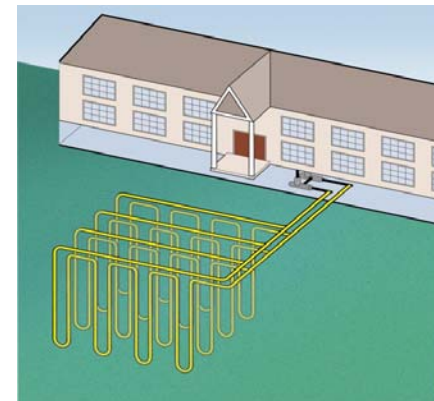


# Biomass for Heat

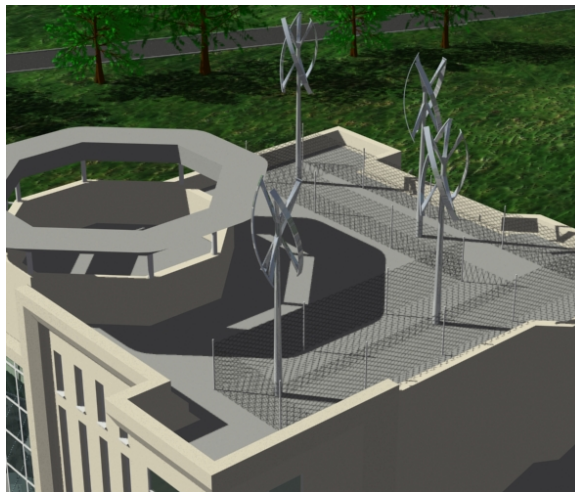
- SynGas Heating Plant Addition (Nexterra)
- Approx. \$12 Million



# Geothermal



# Wind and Solar



# Laboratory Testing



# Need for Laboratory and Pilot Testing

- As consumer of feedstock one needs to know the composition and biogas potential of each feedstock (and digestate).
- Dry fermentation and wet are different – lack of information.
- Must also know the limitations of each feedstock and microbial biochemistry can often be limited by micronutrients.





# Need for Laboratory and Pilot Testing

- Ability to blend feedstock to achieve optimal performance is key to maximizing biogas potential.
- Maximizing biogas potential is key to rapid payback of facilities.
- Odor mitigation studies



# Need for Laboratory, Pilot, and Full-Scale Testing

- UW Oshkosh has noticed a significant difference in biogas potential from a wide-array of feedstocks that are locally available.
- Ability to blend feedstock
- Ability to build upon for simple lab data and test in pilot-scale units to demonstrate efficacy.
- Ability to place feedstock in full-scale application for proof of concept in industrial-scale unit.
- Cradle to grave approach to simple testing through proof of concepts.
- Development of additives and microbial augmentations to maximize biogas generation in customized feedstock blends.



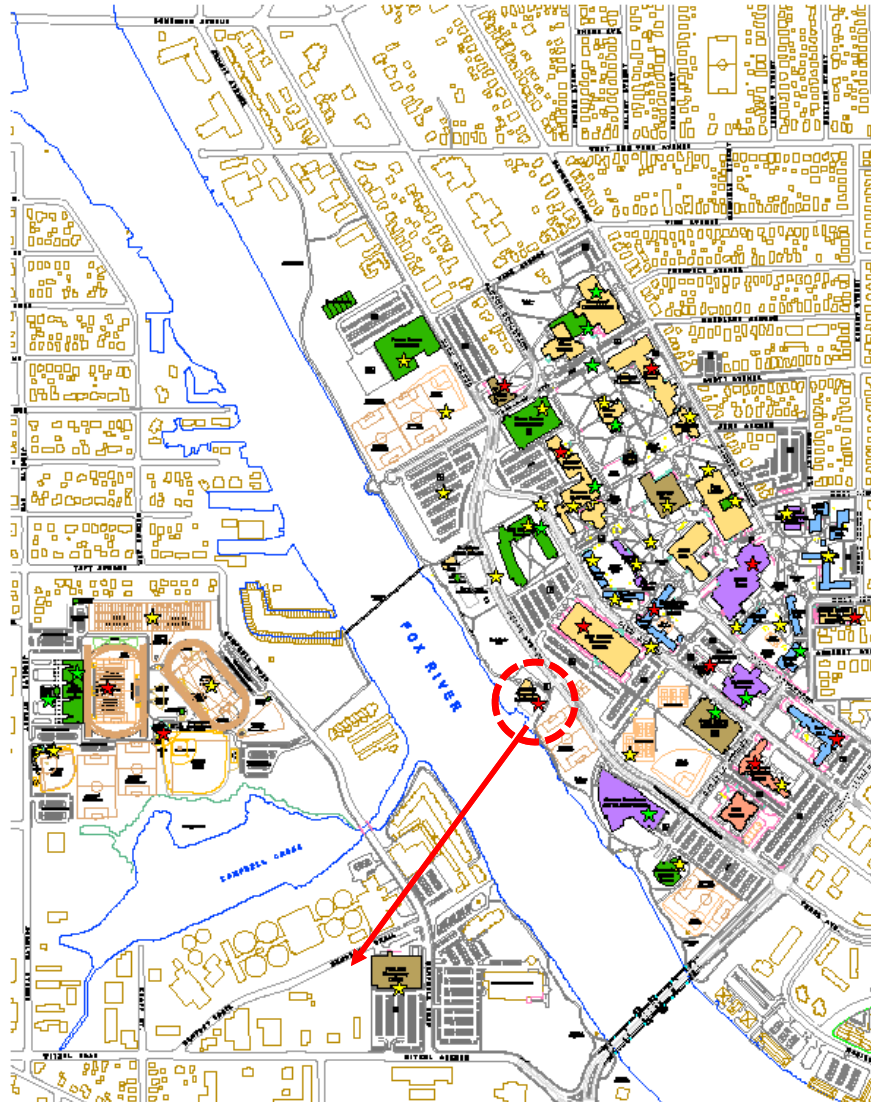
# Laboratory Infrastructure

- Decision to build upon years of bio-based testing and laboratory analysis
- Build upon group of staff researchers with millions of dollars in grant-funded projects
- University investment of ~\$1.2 million in additional staff and facility renovations
- Completed renovation of Phase I of the new facility
- Phase II renovations of the facility are underway and should be completed in December 2012
- Utilization of scientific resources (personnel and capital equipment) of the campus and departments such as Biology and Microbiology, Chemistry, Geology, Geography, Environmental Studies, Computer Science, etc.
- Capability to support visiting scientists, industrial research, and field research/testing.
- Graduate and undergraduate student research assistants

# Capabilities

- Full Service Analytical Capabilities
- On-site testing
- Laboratory testing
- Basic Research
- Applied Research
- Methane Evolution Determinations
- Methanogen selection and optimization
- Air, Water, and Solid matrix testing
- Bench-scale bioreactors
- Pilot-scale bioreactors
- Consulting Services

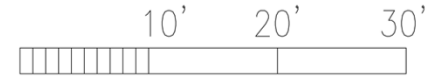
# Laboratory Building



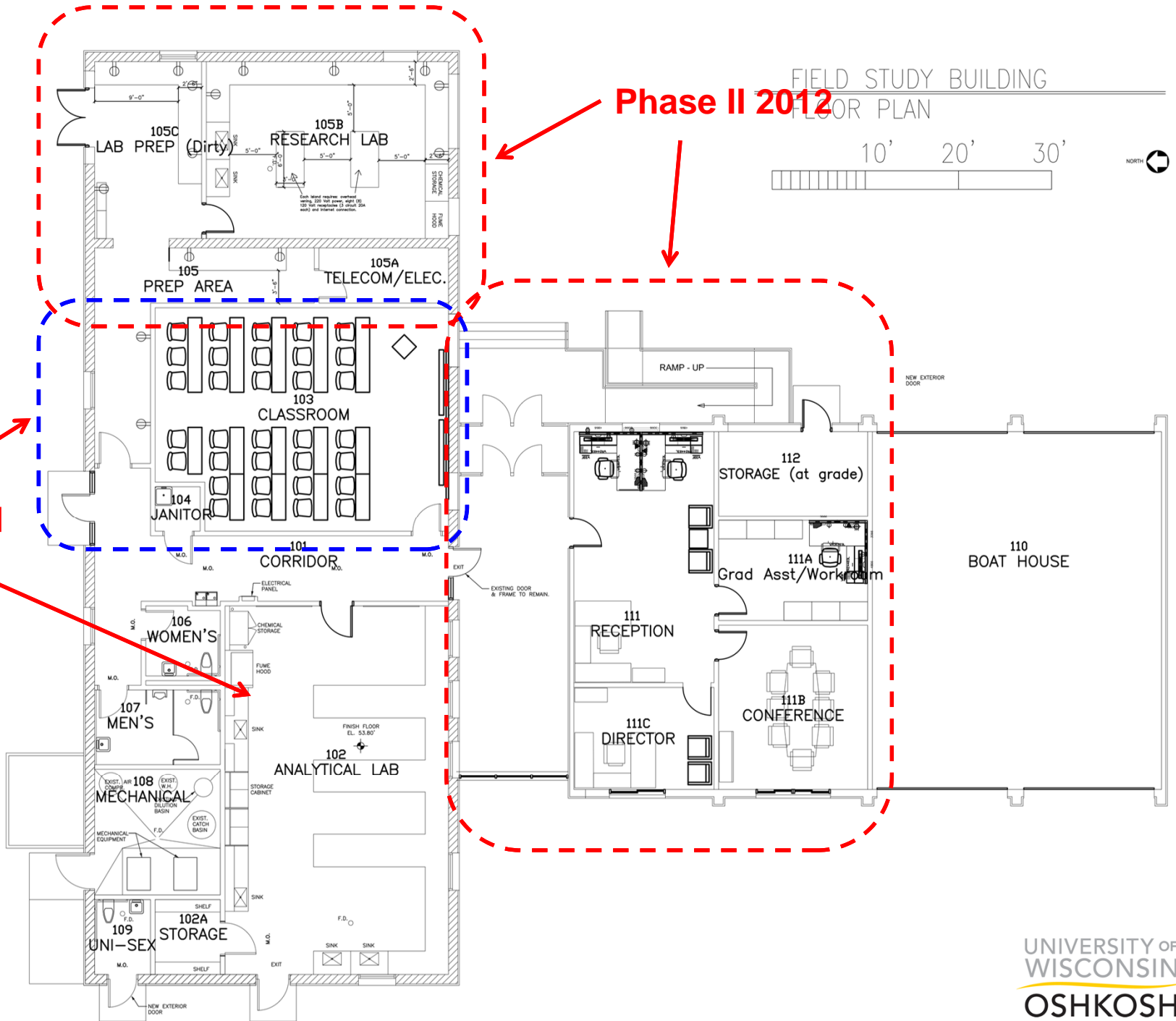


FIELD STUDY BUILDING  
FLOOR PLAN

Phase II 2012



Renovated



# Partners for Laboratory

- Viessmann
- Schmack Biogas GmbH
- BioFerm
- EcoLogic
- Neenah-Menasha Sewerage Commission
- Sanimax
- Allen Farms
- Milksource
- Door County
- IPS
- Kimberly Clark Corp.
- Bemis Corp.
- Alcan Group
- Ashland County
- Vilas County
- Winnebago County
- St. Croix County
- Rosendale Dairy
- US EPA
- WI DNR
- Northern Lake Service
- UW Solid Waste Research Council

# **Renewable Energy Institute (REI)**

## **Curriculum & Outreach**

# Renewable Energy Institute (REI)

- 1<sup>st</sup> REI held in spring 2011.
- 2<sup>nd</sup>, and expanded REI scheduled for spring 2012
- Marriage of education, research, and private sector expertise
- Partnership between UW Oshkosh, Fox Valley Technical College and other academic institutions.
- Unique capabilities and training for renewable energy workforce and those interested in the technology.
- Build upon new Engineering Technology Majors
- Ability to go beyond the classroom
- Utilize on-site examples of renewable energy in educational programs.



# Renewable Energy Institute (REI)

- Offer educational, research, and proof of concept demonstrations of technology.
- Because of infrastructure the UW campus has opportunity to utilize many technologies
- The REI would offer a broad exposure to renewable technologies so that participants can become educated and ascertain which technologies would be applicable to their situation.
- Taught by UW Oshkosh faculty and staff, guest faculty, guest researchers, and industrial experts.

# Renewable Energy Institute (REI)

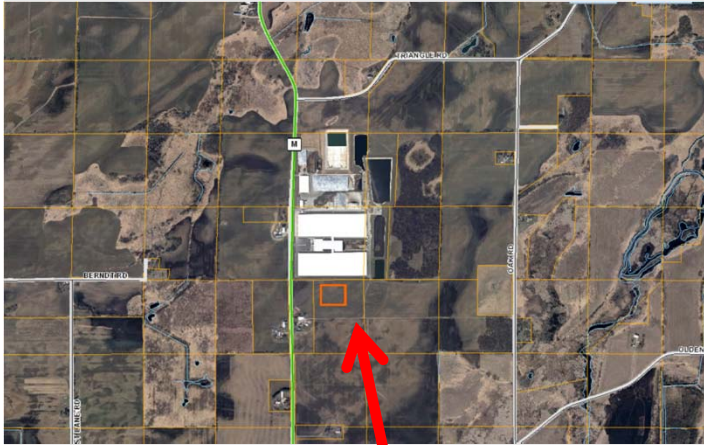
- Research on technologies in order to make continued breakthroughs in refining technologies into more effective next generation technology
- Certificate Programs – Undergraduate and Graduate
  - Renewable Energy Technology Certificate
  - Specific Technology Certificate Programs
- Education of the future workforce (tomorrow's industry/corporate employees, tomorrow's teachers and professors, tomorrow's government and political leaders, tomorrow's scientists)
- Student and faculty exchange programs with German universities
- Funding for REI could come from a variety of sources

# Proposed Rosendale Renewable Energy Facility (BD II)



# I. Project Location

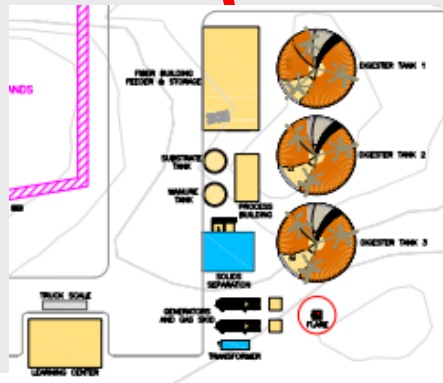
## Proposed Plant Location



Aerial view of Rosendale Dairy



Proposed Plant Site



Proposed Site Layout



## II. Partner Profile, Project Background and Market Impact

### Partner Profile

- Milk Source was founded in 1999 by Jim Ostrom, John Vosters and Todd Willer. Company traces its roots to a small 30-cow dairy farm founded by Vosters parents in 1965. The Rosendale dairy is one of six run by Milk Source.
- Total of 230 employees and an estimated annual revenue of 67 Million €.
- In North East Wisconsin, UW Foundation, representing the 3<sup>rd</sup> largest/2<sup>nd</sup> fastest growing university in the system

# III. Partner Profile, Project Background and Market Impact

## Project Background

- Rosendale Dairy is the largest dairy in WI, milking 7,400 cows. The site has expended large capital to control dairy effluent discharge.
- Opportunity for public university and private entity to serve the greater good for the residents of Wisconsin.

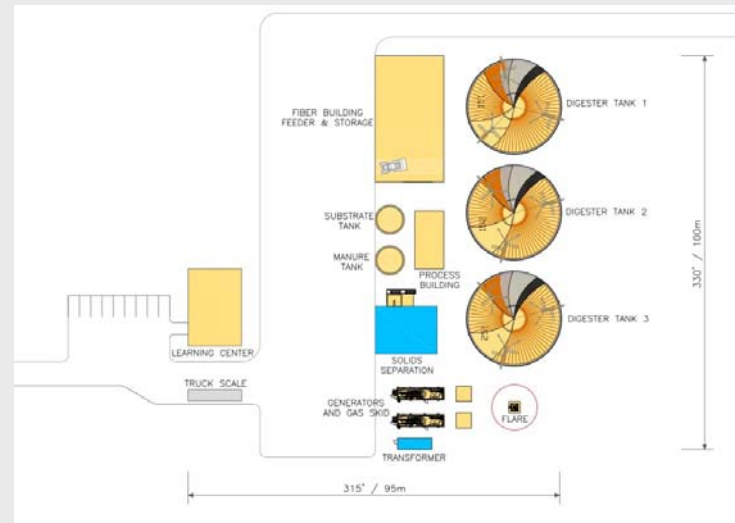
# IV. Partner Profile, Project Background and Market Impact

## Market Impact

- Significant 're-entry' of wet fermentation technology **in the US**. The proposed project will treat waste of the largest dairy in WI.
- Opportunity for university to work with the **market leader** in wet fermentation biogas plants in the US. **Total organics unprocessed for biogas in the US is 58 Million Tons** (86 Million Tons of farm waste) and presents large potential for this kind of project.
- Educational Center of Excellence for residents of North East Wisconsin (K-12, Extension, UWO Students, etc.) In addition, project also includes a Dairy and Digester Science /Research Center.

# V. Plant Specifications and Preliminary Layout

<b>Type of System</b>	
Wet fermentation anaerobic digestion biogas plant	
Hydraulic retention time of 20+ days.	
<b>Plant Parameters</b>	
Installed electrical capacity	2,8 MW
Est. exported elec. production	2,4 MW
Estimated heat production	17,55 MWh
Input material	107.000 t manure 25.000 t food waste
No. of Digesters	3
Volume of each	4.000 m <sup>3</sup>
Estimated Price	7.54 Million €



- The Rosendale plant will be among the 5 largest manure digesters in the US.



# Manure and Commercial Food Waste



Liquid manure being pumped into lagoon



Liquid Food Waste: Cheese Whey shown with curds



Liquid Food Waste: Fats, oils and greases

# UW Oshkosh's Business Model and Challenges

## Advantages from the perspective of Customer

- Income from selling electricity of € (2,4 MW installed capacity x 8.000 hours x 0.069 € per kWh), totaling 1,324,800 €
- Additional earning of tipping fees for 40.000 Tons of Co-substrate (Fats, Oils, Greases, Cheese whey), adding up to 150,000 € (3.75 €/Ton).
- Improved odor control and overall capacity.
- Acquiring leadership and PR advantages through renewable and sustainable efforts.
- Implementing waste to energy solutions which can become a requirement.
- UWO continues to establish themselves as renewable leader; gets scholarship funding

## Internal Challenges

- Dairy partnership and Permitting
- Fiber end use
- PPA

# Summary/Discussion Points

- We believe there is a strong case for the BDII/Rosendale Project(Milk Source & UWO Foundation)
- Outstanding (Educational & Community) benefits (model for WI)
- Need help making this project financially viable
  - A.) Kilowatt rates are too low
  - B.) Increase capacity for special projects/tariffs
  - C.) Need for legislative changes