



SUSTAINABILITY RESEARCH visioning event



Sponsored by the UW- Madison
Sustainability Research Hub



SUSTAINABILITY RESEARCH visioning event

CAMPUS AS LIVING LAB - BREAK OUT SESSION -

Sept 11th, 2024 | **UW-Madison**

Ian Aley, Office of Sustainability
Mark Anderson, Mechanical Engineering
Missy Nergard, Office of Sustainability



Welcome to the Classroom!

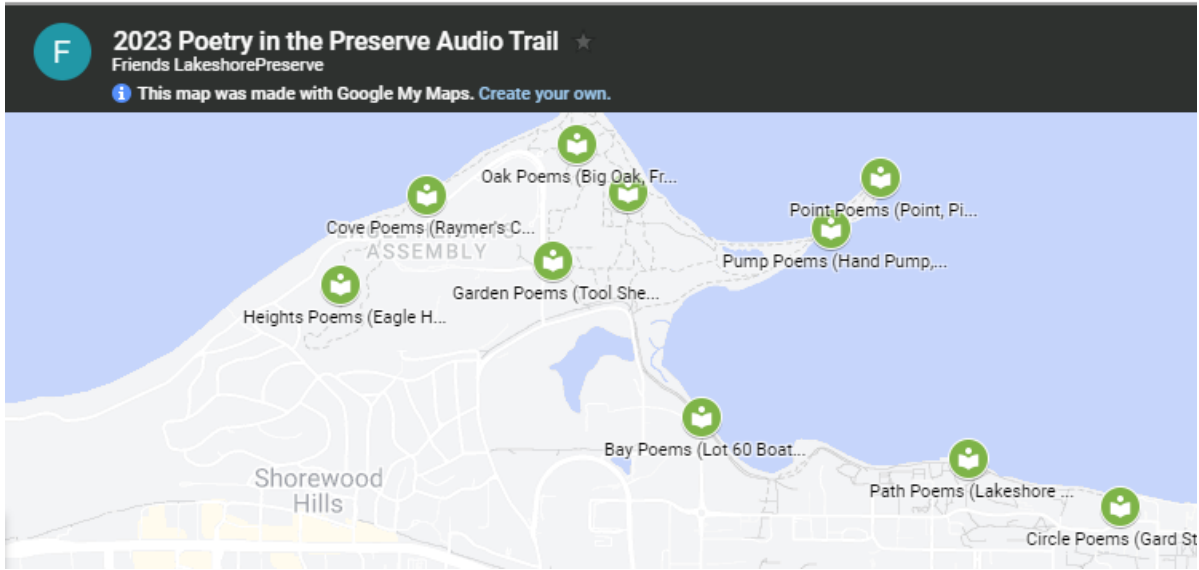


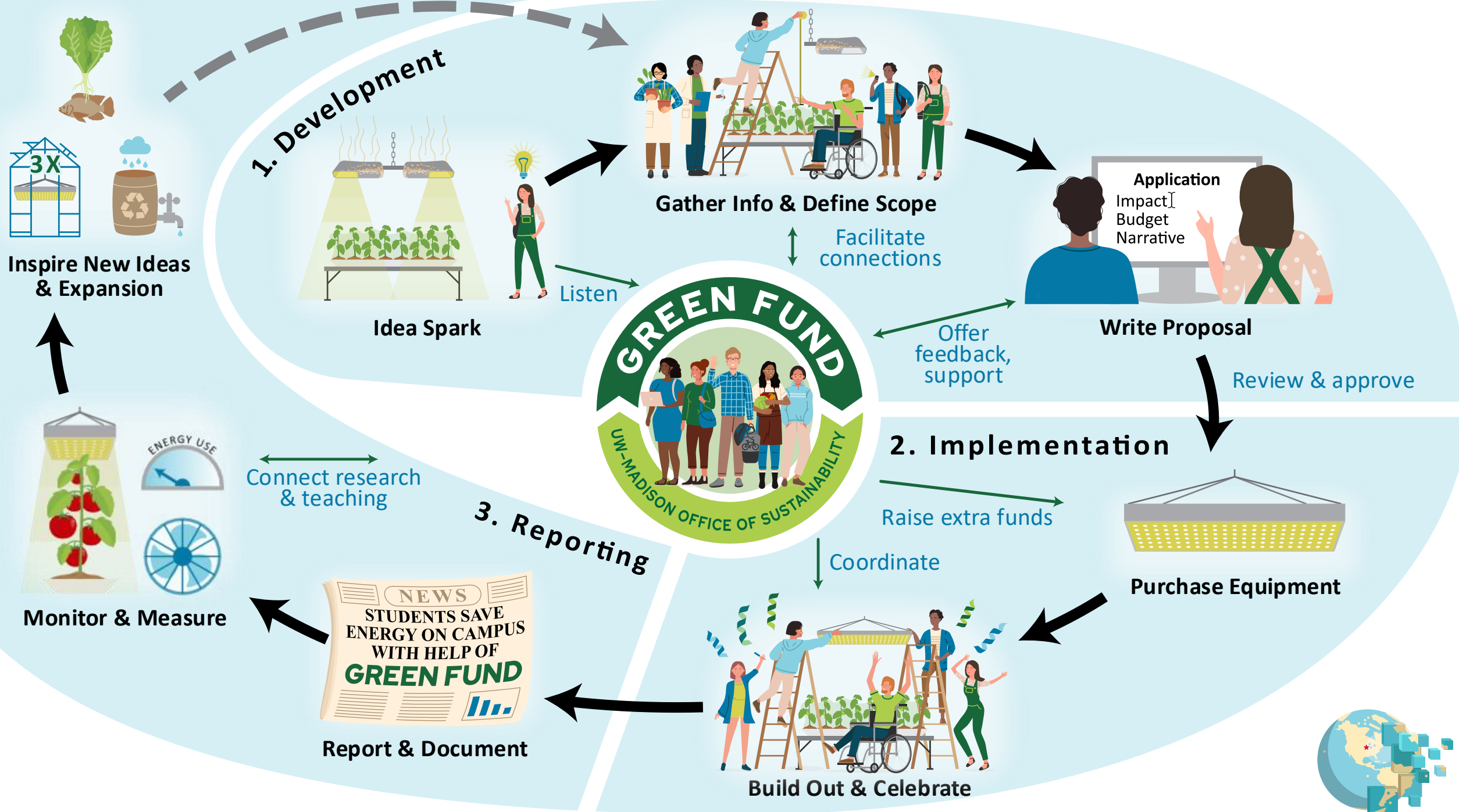
Kindergarten Classroom



Welcome to the Playground!

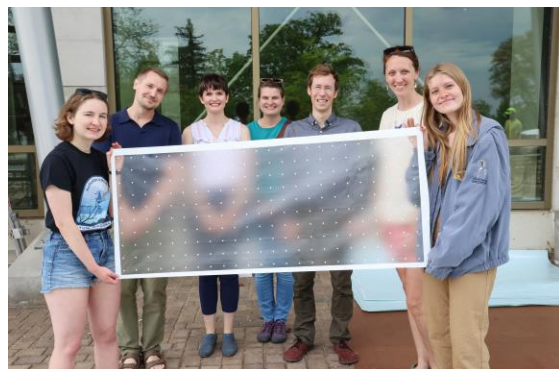
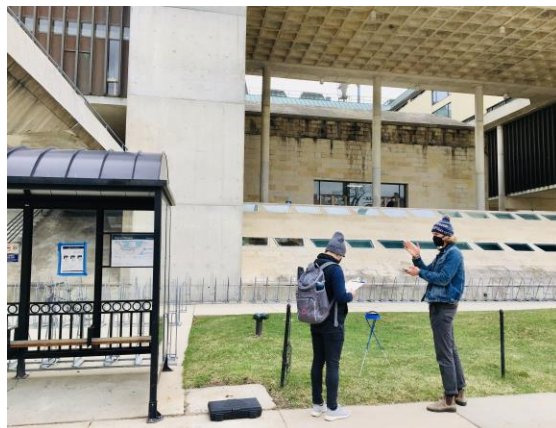




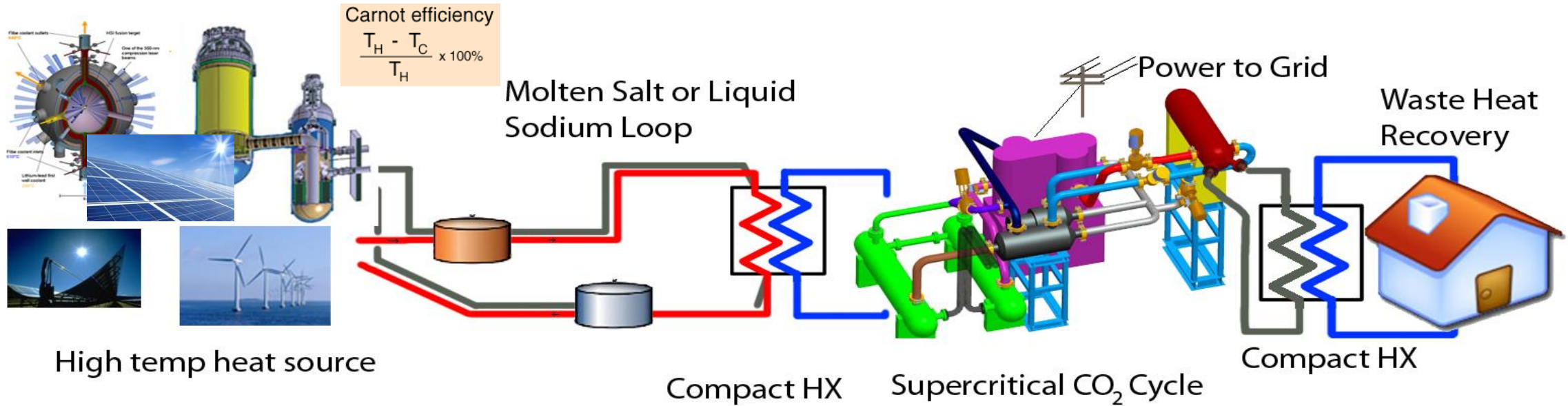




Campus as Living Lab Examples



Improve Energy Utilization and enhance industrial processes



Study advanced energy sources to increase efficiency and power output

- Advanced Nuclear Fission
- Fusion
- Concentrated solar
- PV
- Wind Energy
- Energy storage

Use advanced heat transfer fluids to store and move energy

- Electrical power generation
- Campus heating and cooling
- Grid power stabilization and utilization

Develop and test new power conversion cycles and components to improve efficiency

- Improved efficiency
- Lower cost
- Smaller components
- Higher temperatures
- lower water usage

Reduce/use waste heat for industrial campus Heat

- How can we use waste heat
- Use waste heat from power generation for industrial processes



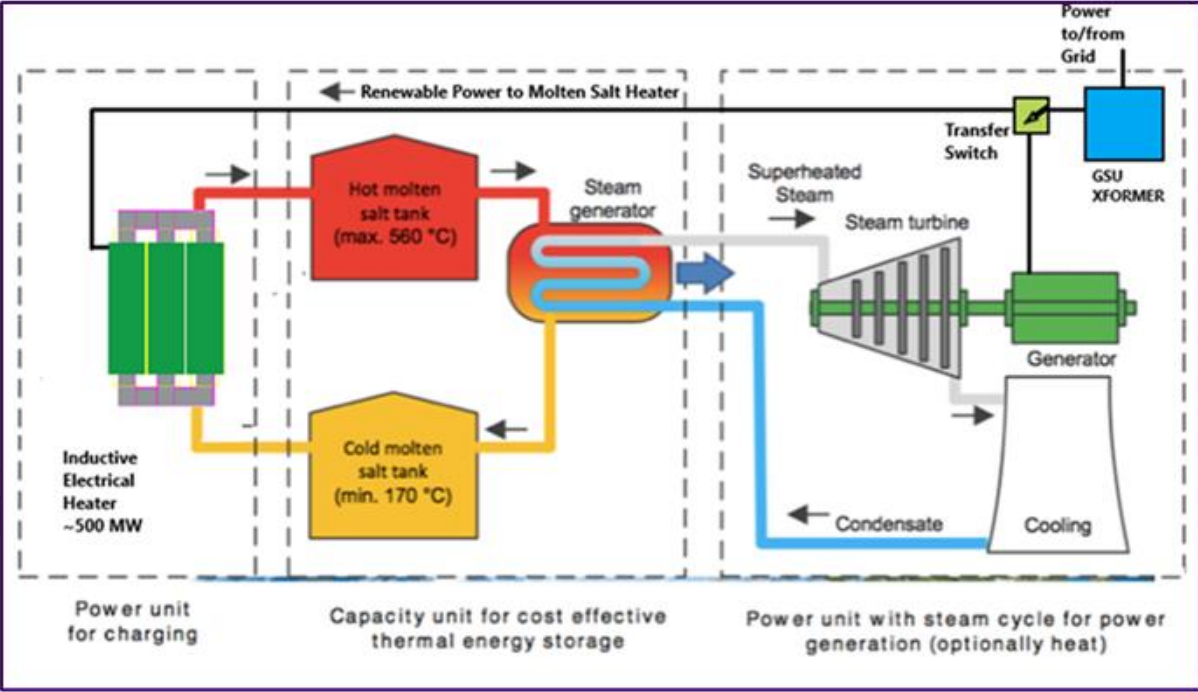
Research collaborations on energy storage



UW-Madison launches historic sustainability initiative



UW Charter Street Cogeneration Plant



Electrify heat production with added storage



Student engagement with campus power heating and cooling



Campus solar projects

Engage with industry to advance campus sustainability goals and teach students about sustainable energy production



UW–Madison is working with Alliant Energy to plan a small-scale solar and agrivoltaics project at the UW-Kegonsa Research Campus near Stoughton, WI

O'Brien 22mW solar field



UW-Madison Kegonsa Research Campus Agrisolar project



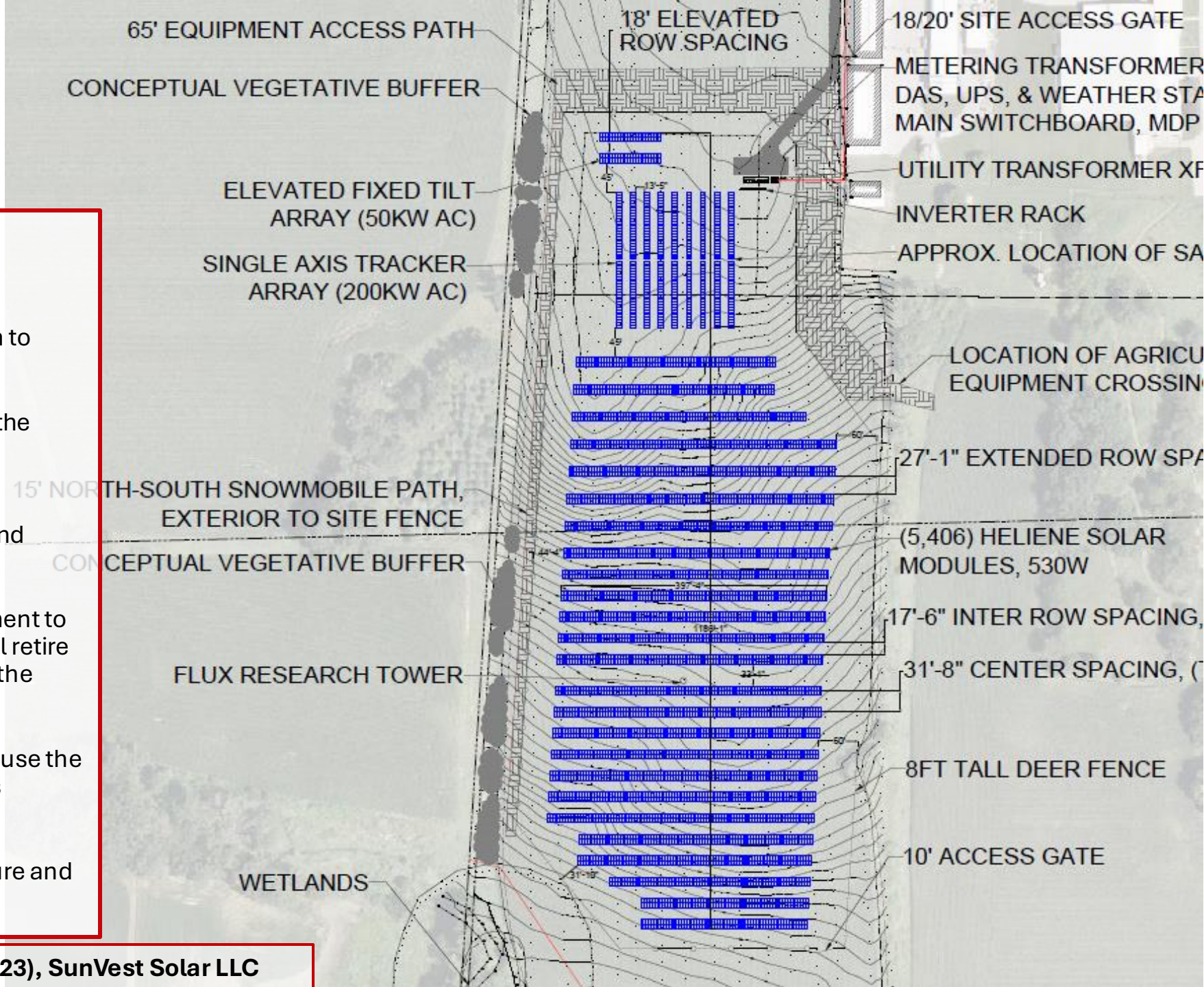


Quick Facts:

- Alliant Energy leases land from UW-Madison to place utility-owned 2.25 MW solar
- Alliant Energy will build, own, and maintain the facility
- Clean energy is delivered to Alliant Energy distribution system powering local homes and businesses
- UW-Madison receives a monthly lease payment to be reinvested in sustainability initiatives; will retire Renewable Energy Certificates (RECs) from the project
- UW-Madison students, faculty and staff will use the facility for education and research purposes
- Demonstration to the greater public about opportunities for the co-location of agriculture and solar



90% Site Concept (Nov 2023), SunVest Solar LLC

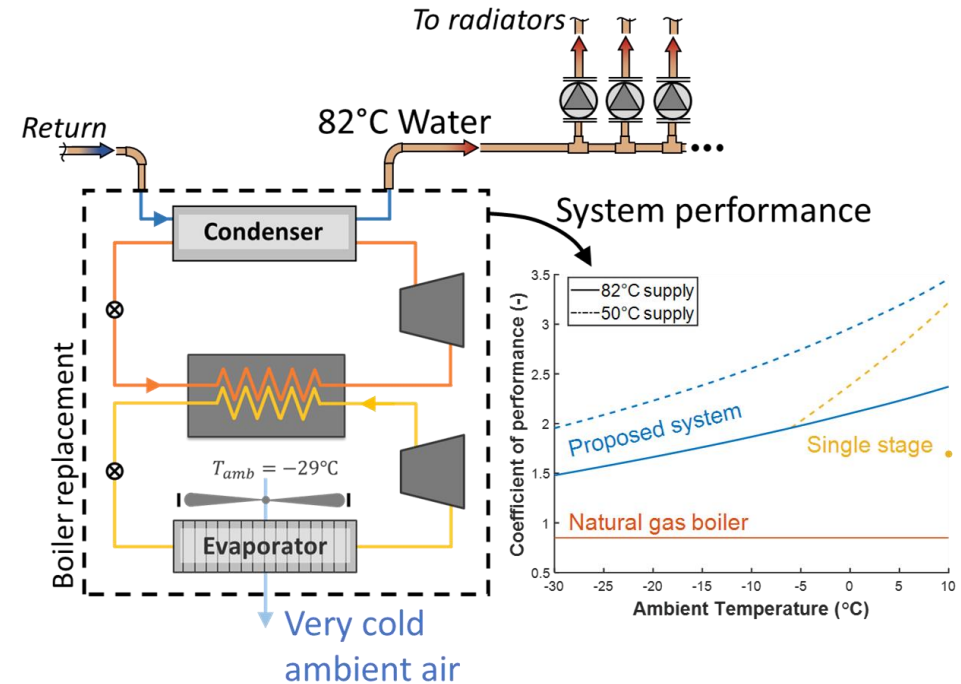


Living Laboratory – Building Energy Research

Goals: Leverage UW buildings for energy system research, industry connections, and highlighting efforts as part of campus-wide sustainability goals.

Example: *Cold Climate Heat Pumps: A Drop-In Replacement for Hydronic Boilers* (DOE, EERE proposal).

- Develop a cascade heat pump that can achieve large temperature lifts, enabling their use in hydronic systems in cold climates.
- Heat pump will provide a seasonal coefficient of performance of 2, resulting in a 10% reduction in CO₂ emissions today and a 75% reduction using 2030 electric grid CO₂ intensities in Wisconsin.
- Partnered with Trane Technologies, establishing stronger relationships with industry.



Impact in Wisconsin: CO₂ emissions reduction compared to an 85% efficient natural gas boiler

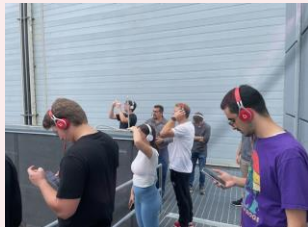
	Proposed system	Electric resistance
2024	10%	-79%
2030 (mid case)	74%	50%
2030 (high renewable cost)	54%	10%

Collaboration, education and outreach partnerships off campus

Columbia County WI Energy Storage Project
200MWh, +10 hour storage



\$30M funding from DOE

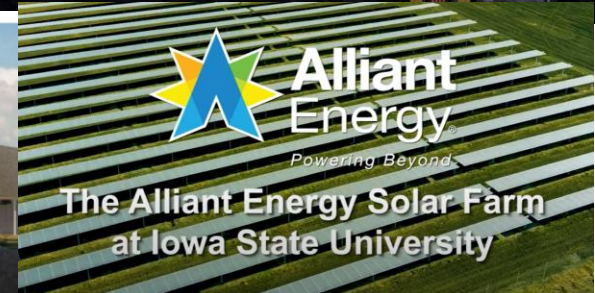
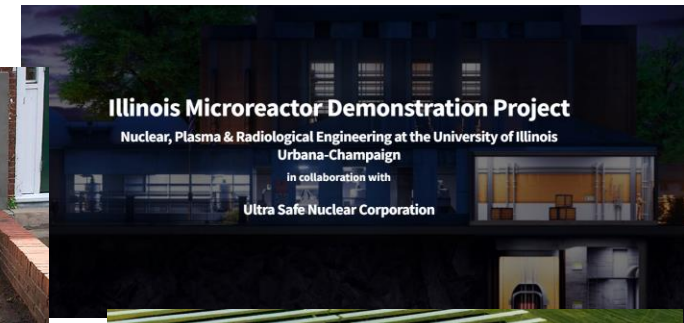


Student engagement
with campus power
heating and cooling

UW is not alone

Peer institutions are pushing forward for energy
and sustainability research on campuses

“While only slightly more than one in 10 Student Voice respondents says sustainability at their college actually affected their choice of institution, colleges are touting green efforts to prospective students. The mere existence of [The Princeton Review Guide to Green Colleges](#), the [Times Higher Education Impact Rankings](#) and AASHE’s [Sustainable Campus Index](#) provides evidence that sharing sustainability efforts is deemed a must”. - Inside Higher Ed



NEXTRA: Working Together for Progress

ACU is leading NEXTRA – the NEXT Research Alliance – among four universities with extensive experience in physics, chemistry and engineering. Launched in Spring 2019, the consortium’s goal is to design, license and commission the first university-based molten salt research reactor, which ACU will host and own. Other members of the consortium are Georgia Institute of Technology, Texas A&M University and The University of Texas at Austin.



Potential Government funding



In December 2021 the U.S. Department of Energy Announced the establishment of the office of clean energy demonstrations (OCDE) to deliver **\$21.5 billion** to large scale clean energy demonstration

July 2, 2024

The U.S. Department of Energy's (DOE) Office of Clean Energy Demonstrations (OCED) issued a [Notice of Intent](#) (NOI) for up to **\$100 million** to fund pilot-scale energy storage demonstration projects, focusing on **non-lithium technologies**, long-duration (10+ hour discharge) systems, and stationary storage applications.



Biden-Harris Administration Announces Nearly \$350 Million For Long-Duration Energy Storage Demonstration Projects

NOVEMBER 14, 2022





UW–Madison Sustainability Goals

- Achieve STARS Gold by 2025
- Establish a Sustainability Research Hub
- Ensure all interested students have access to immersive Sustainability Educational Experiences by 2030
- Achieve a Zero Waste campus by 2040
- Procure 100% renewable electricity by 2030 and meet net-zero emissions by 2048 or sooner
- RISE-EARTH – Hiring 80 faculty in sustainability across 8 colleges

- Here are a few prompts that will be shared during opening and closing remarks. These may make for good discussion points in your sessions as well:
- Regardless of funding potential, what grand challenges in sustainability research is UW Madison well positioned to address?
- What resources would help you develop research efforts in these areas?
- What unique qualities make UW Madison a world-class destination for sustainability researchers? How can we make it even better?
- Do you know of any upcoming funding opportunities that UW-Faculty and the Sustainability Research Hub should be aware of?



- Are there opportunities for your area of research and teaching to be enhanced through leveraging the university infrastructure assets and operations?
- What can we put in place that would make the sustainability research community successful?
- Are there areas of emerging scholarship that we should be engaging and supporting?
- What types of big research endeavors does our campus enable?
- Are there ways in which the university's academic and education enterprise can support the university's operational initiatives?
- What are the big things that we can tackle now?
- What are the big things that we see coming down the line?
- How do you (or could you) incorporate sustainability education in your courses?
What resources would be helpful to you?
- Sustainability is interdisciplinary in practice, what can we put in place to support your sustainability teaching and research?



Planning Notes (remove)

- Introductions
- Discuss structure and roles for presentation and Q&A
 - Proposed presentation structure:
 - Missy – Introductions and kick-off with overview of what “Campus as a Living Lab” is at UW-Madison
 - Ian – Green Fund and examples, student/faculty/staff involvement
 - What is the Green Fund Process
 - Some examples & visuals (lighting conversions, modular agrivoltaics, bird dots, LeanPath System)
 - Mark – Applied research, corporate engagement, other context/examples
 - Molten Salt
 - Mahvi's Heat Pump
 - Kegonsa Research Site, Agri-voltaics
 - Columbia Coal Plant Conversion
 - Courses/tours of facilities (Charter Street Plant)
 - Missy – Close with direction for the future and set the stage for visioning
 - Moderator for Q&A – Missy
 - How do we want to structure the Q&A?
 - Do we want to facilitate a discussion (large or small group) with those in attendance or do we want to invite questions from attendees and have the panel respond?
 - Here are the provided questions. Are there others we want to be sure to ask?
 - What does this topic mean to you?
 - What resources exist to support UW-Madison in this research space?
 - What resources are needed for UW-Madison to be successful in this research space?
 - In what ways can the University support the sustainability research community? Fostering community, building, and maintaining connections?
 - What do you see as areas of opportunity for sustainability research on campus?
- Logistics:
 - Whose laptop do we want to use for the slides?
 - Arrive in the room 15 mins ahead of time (1:00pm) to test technology and check in?
 - Who wants to join the closing panel from 3:45–4:30pm in Tripp Commons? The format of the closing panel will be a 2–3-minute readout from each breakout and then a facilitated discussion with Q/A.

