ENERGY GENERATION, PURCHASING & DISTRIBUTION

Energy is by far the largest contributor to the campus' emissions inventory. The Illinois Climate Action Plan (iCAP) focuses on a detailed strategy of building energy conservation, reducing carbon emissions of generation systems, and the addition of renewable energy sources. This "conserve-and-load" approach is achievable, affordable, and implementable. The 2015 iCAP calls for decreasing energy consumption by 30 percent by FY20.

Progress on efforts to decarbonize the energy generation systems is monitored by the Energy Generation, Purchasing, and Distribution (EGEN) SWATeam.

OBJECTIVES

3.1. The EGEN SWATeam, in collaboration with Facilities & Services and topical consultation groups, will lead an exploration of options for 100% clean campus energy during FY16, and submit recommendations through the campus sustainability process.

Status:
In progress

- COMPLETE: A 200 kW biomass boiler was commissioned at the Energy Farm in June 2017. This system will provide all of the heat for the greenhouse at the Energy Farm, replacing the current propane energy source. Future expansion will look at additional buildings on the Energy Farm that use excess capacity of the biomass boiler system during off-peak heating periods.
- A team at the Prairie Research Institute led by Andrew Stumpf will monitor a geothermal exchange system that will be constructed at the Woody Perennial Polyculture Research Site to heat and cool new and existing greenhouses. Efforts will be undertaken to characterize the site to design the geothermal field and monitor the field. The geothermal system will also heat the soil in one greenhouse where biofuel crops are being grown to evaluate the impact on plant growth.
- A team at the Illinois State Geological Survey led by Yu-Feng Forrest Lin has been conducting a geothermal study on campus, including high resolution subsurface temperature profiling and geothermal property analysis. The team drilled 330 feet and installed a geothermal loop and fiber-optic cables at the Geothermal Research Station in the Energy Farm. Results will help determine the costs and efficiency of geothermal exchange on campus.
- A DOE-funded research project on utilizing heated fluid from deep aquifers on campus started on Oct. 1, 2017. This feasibility study led by Lin will determine if there are opportunities for harvesting the heat from the subsurface fluid to serve multiple buildings on campus (e.g., Energy Farm) and similar applications (e.g., military bases).

3.3. Expand purchases of clean energy. By FY20, obtain at least 120,000 MWh per year and by FY25 at least 140,000 MWh per year from low-carbon energy sources.

Status:
In progress

- COMPLETE: A power purchase agreement (PPA) has been executed for the purchase of ~25,000 MWh of wind power annually for 10 years.
- COMPLETE: Total purchased clean energy in FY18 was 30,704 MWh.
- COMPLETE: A request was submitted to allow longer-term contracts for the purchase of renewable power, and in September 2018 the Board of Trustees approved Prairieland Energy Inc. to enter into 20 year purchase agreements for clean energy.

3.2. Expand on-campus solar energy production. By FY20, produce at least 12,500 MWh/year, and by FY25 at least 25,000 MWh/year, from solar installations on campus property.

Status:
In progress

- COMPLETE: Solar farm was put into operation in December 2015.
- COMPLETE: Total generation for on-campus solar in FY16 was 3,971 MWh/year and 7,084 MWh/year in FY17. Total generation from the solar farm through September 2017 is 11,175 MWh.
- COMPLETE: Additional existing installations include Building Research Council (15 kW), Business Instructional Facility (33 kW), and Wassaja Hall (33kW).
- Projects in progress include a 300 kW system on top of the Electrical and Computer Engineering (ECE) building and a ballast-mounted solar array on the Speech and Hearing Building (funding needs to be secured).
- A recommendation to require all new buildings on campus to include a solar array covering the majority of rooftop surface area was submitted to the iCAP Working Group in February 2017.
- A recommendation to start a project to expand the existing Solar Farm or install a larger farm in a new location was supported by the Sustainability Council, and an RFP is under development at Facilities & Services (F&S).
- On-campus solar generation in FY18 is 6,515 MWh. In FY17, it was 7,274 MWh, and in FY16 it was 3,922 MWh. Total generation from Solar Farm 1.0 so far in FY18 is 6,374 MWh.

3.4. Offset all emissions from the National Petascale Computing Facility (and other successor facilities) by FY18.

Status:
In progress

- A recommendation was submitted to the iCAP Working Group (iWG) in February 2017 to continue discussions with the Vice Chancellor for Research and NCSA about planning a budget to procure offsets for Petascale emissions. As a result, NCSA agreed to include the cost of 100% clean energy in the grant proposal to the National Science Foundation.

ADDITIONAL GOALS

- A recommendation to start/continue discussions with Facilities & Services (F&S), the Institute for Sustainability, Energy, and Environment (iSEE), and other relevant units at the University of Illinois at Urbana-Champaign to recommend a new feasibility study be undertaken to assess the application of geothermal exchange and other geothermal systems (i.e., thermal piles [shafts], borehole thermal energy storage [BTES], Deep Direct Use [DDU]) in retrofitted buildings and new campus facilities. This feasibility study would begin the process of bringing geothermal energy into the campus Energy Portfolio before 2035, and would consider both cost and greenhouse gas emission reduction. The feasibility study could also include a "Living Laboratory" component, in which data from this analysis is used to support future research grant proposals.
- The EGEN SWATeam will review the 2015 iCAP and recommend updates for objectives in the 2020 iCAP. We will consider current energy generation and conservation technologies for campus (solar, biomass, wind energy) and other renewable energy sources (geothermal, hydrogen, etc.) in developing a revised set of objectives. During this process, we will adopt metrics to evaluate impacts from different technologies for energy generation, distribution, and conservation systems (e.g., levelized avoided cost of energy [LACE]).
- The team will encourage collaboration and discussions with other SWATeams to develop integrated approaches to address iCAP goals.
- The EGEN SWATeam would also like to help encourage and support student and faculty involvement in energy generation assessments and studies.

TEAM MEMBERS

CHAIR
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Adjunct Prof., Civil & Environmental Engineering and NRES

Andrew Stumpf
Geologist, Illinois State Geological Survey

Mike Larson
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