**ECBS and EGen SWATeam Joint Meeting with Joyce Mast**

*In attendance: Morgan White, Joyce Mast, Andrea Martinez Gonzalez (ECBS), Marian Huhman (ECBS, through conference call) Yufeng Lin (EGen), Tim Mies (EGen), Dave Boehm (ECBS), Swarnali Sanyal (ECBS), Yun Kyi Ki (ECBS), Karl Helmink (ECBS), Paul Foote (ECBS), Mike Larson (EGen), Sarthak Prasad, Keith Eriksen, Ximing Cai*

1. Introductions of team members
2. Motivation
   1. The Electrical and Computer Engineering Building (ECEB) project helps contribute to objectives of both SWATeams. The goal is to reduce energy consumption and make it zero net energy. ECEB rooftop needs 300 kW and north campus parking deck (NCPD), located on Goodwin and University, needs 1.2 MW.
3. Background
   1. In regards to the building, all of the solar panels have been bought, but there are structural problems. The solar panels need to be mounted at 20° instead of parallel to the roof. When the force of the wind is taken into account with panels at that angle, it was found that ECEB’s structure needed to be strengthened. Architects and the university have been negotiating for who should pay for the necessary changes, as the building was designed to support these panels.
   2. For clarification, zero net energy means ECEB is not powered directly by panels, but they produce energy that goes into the campus grid that equals what they consume.
   3. The 300 kW and 1.2 MW figures were proposed before the building was constructed. Alex Majerko, an MSE graduate student working under Professor Philip Krein, verified in his master’s thesis that, based on the amount of energy used during the first year the building was occupied, ECEB’s annual energy needs could be met by 1.5 megawatts of energy.
   4. ECEB has 967 sensors that collect data daily, including infrared, occupancy, ultrasonic, daylight, smoke detectors, Wi-Fi nodes, etc. A letter of inquiry, required before submitting a proposal, was sent to the Illinois Science and Energy Innovation Foundation (ISEIF) to fund software for these sensors and make the information available to the public to encourage behavioral change/activity. ISEIF is interested in supporting energy-saving projects at the University of Illinois.
   5. Joyce is trying to show the university it is in their best interest to fund the space frame on the NCPD and have a third party install and maintain the panels, similarly to the south solar farm. In regards to solar panels on the NCPD, a feasibility study, funded by the Student Sustainability Committee, was conducted in 2013 and the cost was estimated to be $3,068,608 with 30% contingency charges for the space frame. If the school were to hire a third party to install the solar panels and operate it for a period of time, while giving the university the solar RECs, the cost should be less than the projected $12-15 million.
4. Mike wants to know why it specifically has to be done atop the ECE building. If this amount of money were expanded to land, the space frame would be unnecessary. Morgan says the original goal was to have it all on-site. They had to move to NCPD due to insufficient roof space.
   1. Keith says electrical demand of ECE building is 650 kW. It’s the height of the month. Joyce has been trying to get a year’s demand covered by solar though.
5. Tim Newman has displayed interest in getting energy-use display boards in the building in order to build public awareness on energy usage. Just an FYI by Karl.
   1. Mike says best way to get behavioral change is by displaying a dollar figure on the board. Make a spreadsheet that shows the proper way to operate something to save a certain amount of money. Paul adds on and says students don’t pay bills. A relatable metaphor like “3 cars’ worth” should be used to get the message across.
   2. There’s also a large clean room, which designers said would consume 30% of the building’s energy. Actual energy usage needs to be determined. Lights run 24/7 in that area. Some investments could be made there. Tim Newman and Greg Larson will be contacted on this topic.
6. The SWATeams built on this and discussed other behavioral change topics, such as targeting altruistic people, making messages people-specific, and encouraging pledges. Some people would respond to the goal, as long as there are reasonable expectations.
   1. Andrea wants to know why behavior change is related to installing solar panels
      1. The ECEB is efficient and has the means to measure energy usage. If this behavior change produced results, and the 1.5 MW of energy could be obtained somewhere else, that’s also acceptable for obtaining net zero energy.
      2. One of the overarching efforts for sustainability for iCap goals is to reduce emissions and move towards cleaner energy and encourage conservation.
   2. Andrea suggests since this is the ECEB, the students can be hit a little more aggressively with more sophisticated information, as they will most likely understand energy terminology better than the typical public member.
   3. Mike also suggests encouraging a competition, but there’s no sensors to do this. He suggested dividing the areas based off meters (per square foot) and gave an example of having graduates compete against undergraduates. Is there funding for this?
      1. Morgan says they have different level metering though. Keith says there are 46 electrical meters in the building. Data from meters go into the software program EDNA. Users can see their specific meters. Mike says a graduate student that knows Excel really well would be needed.
      2. Joyce says Deep Learning, a class of pattern-analysis software that costs around $6,000, was recommended to her. More research will be needed to be done on specific software programs.
      3. Andrea says she once saw a public awareness project for water that used block rate. There was a screen that showed the plan for daily water usage and it would say something like “it’s 2 pm and we’re at 80% of today’s water usage.” The water meter could also turn orange as a warning when a certain amount of water has been used. Andrea wonders if something like this could be done for energy to make it tangible for the student body.
   4. Yufeng wants to know if a study has been conducted to compare weekdays vs. weekends to see patterns in energy usage before we do implementation.
      1. Joyce says we’re trying to get funding for this. Information comes in all the time but there is no software to get the results. We know the clean room is an energy hog, for example, but there are no specifics. Data is available somewhere. Karl says this is something they’re working on with Tim Newman.
      2. Morgan says each new day erases the previous day’s data. They haven’t designed a program to download the data into a report.
   5. The teams agreed to have Joyce follow up with Marian and Andrea and Paul because they have background in behavior change. They’re also encouraging Joyce to find someone who can help with the program and software.
7. Does solar on NCPD have to actually be there for ECEB to be net zero energy project?
   1. If the money for the ECEB solar could be donated to the second solar farm, the ECEB can still say they have achieved net zero energy and Solar Farm 2.0 can also make financial progress. Is this possible? It’ll be killing two birds with one stone.
   2. Joyce isn’t sure. One advantage of using the NCPD is using a building that already exists. It’s a space that’s not being used. The only con is the structure rack.
   3. Karl says university is limited on resources though. Cost-effective solution is to most likely put the funding with solar farm.
   4. Paul believes what Morgan is proposing is viable, he recalls exemptions are available for locating the renewable energy source of site.
   5. Joyce is fine with achieving net zero energy through different means. She would like to see it sooner rather than later (before she retires), and hopes it does not take 15 more years (She has already been working on this for 7 years).
8. Yufeng wants to know if wind is the issue with the solar panel structure, then why not use wind turbines?
   1. Joyce says can’t put it on ECEB because:
      1. ECEB students perform optical experiments, which are sensitive to the ambient vibrations produced by wind turbines.
      2. It’s visually unappealing.
      3. Given budgetary constraints, solar was the better route.
   2. These reasons only apply to ECEB. Joyce is not sure about the north campus parking deck. She thinks to get the 1.2 MW, wind turbines are not possible with the space available.
9. Morgan wonders if we can make a SWATeam recommendation to get ECEB to be net-zero to get the push to make it happen. How do we get campus to fund the space frame? Morgan asks team if this is good idea.
   1. Tim says it’s on the campus grid.
   2. Mike says if there’s nothing tying solar panel to the ground, a $3.6 million rack doesn’t make sense. It’d be an inefficient spending of money. If location doesn’t matter, she should push to get ground solar somewhere else.
   3. Solar farm was estimated at $12-15 million. For the same budget as a farm, ECEB would be getting far less solar. Ground-based solar is cheaper/prices are coming down too.
   4. Joyce says it doesn’t have to be the north campus parking deck. If it’s not the best use of the money, then she’s okay with moving the location.
   5. Morgan says check with Phil to see if we can get 1.2 MW through the solar farm.
   6. Dave is concerned about the definition of a net-zero energy building though. It’s implying it is done onsite.
   7. Paul says other schools usually do it in the parking lot next to the building they want to make net-zero. Joyce adds in and says that the north campus parking deck is ECEB’s.
   8. Yufeng wants to know if we can reduce the 1.5 MW through other methods, like chilling water energy savings.
   9. Morgan is concerned the 1.5 MW is referring to net zero power and not net zero energy. She wants to take a closer look at the graduate student’s thesis.
10. Paul says there are people who donated money to make the ECE building net zero energy. This is definitely a high priority that needs to be taken care of quickly, as we are held accountable.
11. ECEB is not LEED certified yet. They’ve submitted design points but construction points are not finished yet. Could you get a LEED point for getting net zero energy elsewhere?
12. Takeaways
    1. Consider behavior change as a way to meet net zero energy. Consider communications with other ways to change behavior instead of just monetary.
    2. Some people think hire someone instead of a graduate student to analyze sensor data. Joyce wants Mike to refer people to her she can talk to about this. Mike suggests Lee (from University of Wisconsin-Madison). Others think a smart electrical engineering student to do the data crunching is fine though. Joyce does have a student in mind (Jason, a PhD student), if Mike’s guy can’t do it.
       1. Mike will contact Lee and Morgan will help put him in touch with Joyce.
       2. We want research ability, not just a report.
    3. Look into combining ECEB’s needs with Solar Farm 2.0.
13. Joyce may contact the SWATeams again. A second joint meeting will not be happening in the near future as of now.