**Objectives: Energy SWATeam**

**Mike Larson**

ML1.

Continue energy conservation goals as outlined in Table 1 of the 2015 iCAP, as well as the 4 objectives outlined on page 21 and 22:

* Maintain/reduce campus GSF.
* Implement best energy standards for buildings and renovations.
* Strengthen centralized conservation.
* Engage/incentivize campus in conservation activities.

*Comments:*

(BR) Good as an overarching objective. May need the specificity provided by elaborating on the individual objectives.

* Maintain/reduce campus GSF. See BR2.
* Implement best energy standards for buildings and renovations. See BR3.
* Strengthen centralized conservation. See KH1, KH2, BR4 and BR5.
* Engage/incentivize campus in conservation activities. Consider sending to Education SWATeam.

ML2.

Continue to investigate options for renewable energy systems on the UIUC campus, including but not limited to:  solar, wind, geothermal, heat pumps, fuel cells, biomass, and nuclear.

* Pursue grant and research opportunities in these emerging renewable energy markets.
* Develop a sub-committee of the SWAT team to document and summarize the potential viability of each technology on the UIUC campus, and put together a plan which starts to prioritize the potential implementation of these technologies on our campus.

*Comments:*

* See AS3 below.
* (BR) Doesn’t the current Utilities Master Plan largely do what is expressed in the second bullet point?

ML3.

Continue to pursue opportunities to purchase more clean energy for use on campus.  This should include both electricity and fuel (biogas, biomass, other)

*Comments:*

* See AS3 below.

**David Antonio Rivera-Kohr**

DRK1. Renewable Energy

* By 2050 use 100% renewable energy to power campus with at least 33% produced on campus.
* By 2025 use 20% renewable energy to power campus with at least 5% of total energy produced from renewable sources on campus.

DRK2. Energy Conservation

* By 2025 decrease total campus energy usage by 5% of 2020 usage.
* By 2050 complete recommissioning and deferred maintenance requests of all university buildings including academic buildings, university housing, athletic facilities and research buildings.
* By 2025 increase the annual retrocomissioning/deferred maintenance fund to $100 million (or whatever amount is reasonable toward achieving conservation goal #2).
* By 2025 reduce non-renewable electricity purchasing from utility grid by 10%.
* By 2050 completely phase out non-renewable electricity purchasing from utility grid.
* By 2050 decrease total campus energy usage by 25% of 2020 usage

(From BR – notes from meeting)

Determine at what point the demand-reduction and the renewables-provision meet to arrive at the zero GHG emissions target. Should the conservation target be at 50%, 25%, 10% or another number of the 2008 energy consumption? Use this point—meeting point, balance point? —to set targets for conservation and renewable energy.

*Comments:*

* (BR) These are my words for what I felt was expressed during the meeting. Much room for improvement. Sorry for putting words in your mouth, David.

**Andy Stumpf**

AS1.

The planning and development of renewable energy technologies (beyond wind and solar) will require an “systems approach” to ensure the energy system across campus runs efficiently and is optimized.

AS2.

Consider Energy Service Agreements where campus funding is not available to upgrade heating and cooling systems.

*Comments:*

* See KH1 below.

AS3.

Promote other renewable energy technologies (e.g., composting, thermal storage, fuel cells, batteries, reuse of waste heat, carbon capture, smart grids).

*Comments:*

* (BR) Consider combining with ML3 above.

AS4.

Explore possibility of using Advanced Small Modular Reactors for energy generation on campus. Faculty from the Department of Nuclear, Plasma, and Radiological Engineering at Illinois would like to talk to the Energy SWATeam about this research.

AS5.

Explore additional opportunities for biomass combustion on campus. A group proposing a much larger biomass boiler on the UIUC campus for heating greenhouses at Turner Hall would like to speak with the Energy SWATeam.

AS6.

iCAP should consider holding listening sessions or open houses to receive input from faculty, staff, and students about the future energy system on campus. Experts in the campus community may have recommendations that could shape the future development of the system.

**Karl Helmink**

KH1.

Energy Conservation Funding through Energy Performance Contracts with Energy Service Companies. (New in 2018). We recommend $10M per year (scalable) of funding for the next 5 years to implement critical projects that work in concert with energy performance contracts (EPC). EPC contracts are fulfilled by specialized, accredited firms known as energy service companies. The university uses EPCs to manage complex projects targeting facilities with high energy use, such as laboratories, maximizing energy efficiency and addressing sizable volumes of deferred maintenance issues along the way. The campus backlog on deferred maintenance is approaching $1 billion.

*Comments:*

* (BR) This is a recommendation currently submitted and returned. It was returned by iWG for lack of specificity, and for not noting the source of the funding. For that see BR1, below.
* Consider with AS2 above.

KH2.

Increase retrocommissioning efforts. They have been shown to have a substantial payback. Double the funding from its current levels for 2020-2025.

*Comments:*

* (BR) This is Karl’s idea but I wrote the text.

**Bill Rose**

BR1.

Determine the cost, over and above normal operations, needed to meet the 0 GHG target. Develop a funding mechanism to meet this cost. Apply this mechanism to fund the specific measures in the objectives shown below.

* Consider the Utilities Production and Distribution Master Plan (2015) as an engineering model for making cost determinations.
* Make this determination before 2022.
* Since reduced energy consumption leads to savings, determine an appropriate amount of revolving fund to meet the iCAP goal, and determine if sunk investments must be made beyond revolving funds.

*Comments:*

* (KH) I think that we are losing sight of a previous goal which was a 50% reduction in campus energy usage. I think that this needs to be retained. Petascale energy usage can be included. We need to maximize energy savings as we invest in deferred maintenance projects.
  + (BR) See DRK1 above

BR2.

Develop a means to oversee university decisions where space may be increased. In the “Message from the Chancellor”, 2015 iCAP report, a target of no net increase in space policy is expressed.

* Establish a Space Policy Watchdog Group responsible to iCAP leadership which notes all university decisions impacting space growth.
* Perhaps permit growth in square footage provided it presents minimal burden on utilities (e.g. Net-Zero construction).

*Comments:*

* (KH) Minimal ??, to make this consistent with the published policy. Not sure that we can get this.
* (BR) Obviously, very hard to enforce.

BR3.

Ensure compliance with required energy codes and facilities standards regarding energy.

* For new buildings, major retrofits that require energy code compliance, and for buildings in design, require the project team to provide electronic input files for ECB energy modeling and energy performance modeling using conventional energy modeling programs. ECB model input files must be provided at Schematic Design; performance model input files must be provided during Design Development. A deliverables checklist for the project may be used to verify delivery of input model files.
* Compliance with facility standards must be demonstrated using C101.5. 1, 2 or 3. <https://www.energycodes.gov/sites/default/files/documents/4_2015%20IECC_Illinois%20Specific%20Amendments_12-23-2015.pdf>
* For buildings constructed since the time that Energy Codes requirements became state law for state-owned buildings, develop ECB models and performance models, then calibrate the performance model to current energy performance.
* Use calibrated models to assist in energy retrofit and retrocommissioning efforts.

*Comments:*

* (BR) Second bullet point. Compliance path 4 permits any statement on stamped drawings by an architect or engineer to demonstrate compliance under state law (too lenient). The university can require compliance under paths 1, 2 or 3.

BR4.

Require Building Envelope Commissioning (BEC) and mechanical commissioning (and recommissioning if necessary) for all building projects. Empower the BEC agent to intervene at all stages of design and construction to ensure that energy performance meets the modeled target performance.

*Comments:*

* (BR) Building Envelope Commissioning currently seems to be in use but I have indications that it is without teeth.

BR5.

Develop expertise in building envelope retrofit and recommissioning.

* As a general rule, apply envelope retrofit before mechanical retrocommissioning so that the equipment is sized to a known load.
* Develop envelope retrofit expertise both in-house and using qualified firms.
* Between 2020 and 2022, apply building envelope retrofit to at least 5 campus buildings. Use the resulting energy savings to project the investment in envelope retrofit to meet the balance point.
* Ensure that building envelope retrofit efforts are not paid for at the expense of other needed deferred maintenance, but are done with funding generated in [Objective 1] above.

BR6.

Convene a group to study allocation of energy for space conditioning and productivity, with the allocation following a declining trend to meet the balance point by 2050. Allocation may be done on a unit basis, in a way that mirrors the handling of funds and space under Budget Reform.

* Use historical energy consumption to set a baseline for buildings completed prior to 2009 (the date of adoption of the Illinois State Energy Code as a building requirement).
* For buildings built after 2009 set the baseline using ECB and performance modeling, described in Objective 3. The baseline for allocation should be the Facilities Standard—80% of ECB.

*Comments:*

* (BR) This changes the way we save energy. Currently we apply efforts at reduction and cross our fingers hoping that it actually saves energy. This objective forces units to use less energy, and to make investment decisions to achieve their goals of comfort and productivity (and space use).

BR7.

Given the large quantities of energy consumed by Petascale, assign a study group to determine how to meet the university supercomputing needs at 10% of the current Petascale consumption.

BR8.

Most fossil fuel consumption on campus goes to maintain the steam/co-generation system at Abbott. Assign a group to study either abandonment of this system, or conversion of the system to non-fossil fuel use.

* This effort may be combined with ML2 above.

*Comments:*

* (BR) The Utilities Master Plan studies 13 options, but IIRC all the options presented there involve retaining the steam co-generation system, which is actually a very efficient means of producing both heating and electricity. The system does not lend itself to being powered by renewables, and the system is far better suited to providing heat during very cold weather than renewables. What happens with this system lies at the heart of whether or not we meet the iCAP goal by physical work on campus, or by purchasing RECs.

BR9.

Require university investments to divest of fossil fuels, achieving fossil fuel divestment by 2022.

* Require SURS to divest of fossil fuels.

*Comments:*

* (BR) Not at all sure if this is within the scope of the SWATeam or of the iCAP effort.

BR10.

Charge F&S with developing an approach to mothballing unused space on campus. The mothballing effort may include draining water piping (plumbing and fire suppression) against freezing. Mothballing may become more common with the introduction of space concerns under Budget Reform.

**Mike Reiter**

MR1.

Propose to modify the standard conditions of Facilities and Services contracts with architectural/engineering consultants to require a “Certificate of Compliance” for all new construction and retrofits, signed by the designer of record for the project. The document will refer to the specific sustainability / energy conservation / efficiency requirements which already exist and have already been codified, which the University is already held to, and require the individual responsible for the design to certify that all requirements are met. This will prevent the delivery of projects that don’t meet the current requirements, likely due to consultants not being fully aware of the requirements they are held to for University projects.

MR2.

Propose to commission a comprehensive planning document that quantifies the current state of energy supply and demand on campus, evaluates the feasibility of various alternative energy resources and their impacts on total carbon output, and proposes staged energy infrastructure improvements for 2020-2050 in a systematic and holistic way. The current project-by-project approach will become less effective as we move forward. A comprehensive planning document is the best mechanism for quantifying the feasibility and level-of-effort (costs) associated with our 2050 net-zero-carbon goal, and will document a clear and realistic path forward from current supply/demand to 2050. The planning document will provide a one-stop-shop for clear, well-organized, transparent, baseline statistics (i.e., meter-by-meter power consumption, short-term and long-term trends) that are readily available to all stakeholders. It will also include comprehensive and realistic estimates for future energy supplies from solar, geothermal, and others based on the actual climatic and environmental conditions on campus. By performing comprehensive feasibility assessments for several potential renewable resources at the same time, the document can propose the most efficient plan to achieve our 2050 goals (i.e., land allocation, balance of energy storage/production, daily/seasonal peak attenuation, etc.) and avoid repeating efforts over the next several decades as working groups and i-Swat teams change. We can refer to the baseline metrics to gauge our performance over the next 30 years and make adjustments as needed. The document will also serve as a financial plan, because the staged energy infrastructure improvements can include cost estimates for design, permitting, construction, and operations/maintenance for each proposed project. University management can earmark dollars now for projects that are 1, 5, 10, or 20 years in the future so the iCAP net-zero by 2050 effort can stay on track. An outside engineering consultant is best qualified to author this comprehensive planning document, with the Energy SWAT team as resources and advisors.

**Yun Kyu Yi**

YKY1.

For the university to plan and develop an economic model to find the best option from various investment options. It is curial to predict reliable building energy usage. To predict building energy usage, it is required to have a computational building energy model to simulate different scenarios to find the best economical investment. However, our college doesn’t have a sophisticated energy model for the whole campus that most of the investments were based on experts' knowledge. Which is difficult to quantifying and justify its judgment. For that reason, it is essentials for a new building to include a whole-building energy model as require submission and also require to model the existing building’s energy model.

YK2.

As new campus budget model to deployed to the units. Each unit needs to understand how much utility fee each unit pays and compare to its peer units will able to plan strategies to reduce utility fee. For that reason, the campus should develop a utility report card by providing strategies to improve its cost.