Sustainability Council

Madhu Khanna, Interim Director
Institute for Sustainability, Energy, and Environment

April 28, 2021

iSEE
Institute for Sustainability, Energy, and Environment

UNIVERSITY OF ILLINOIS URBANA-CHAMPAIGN

Agenda

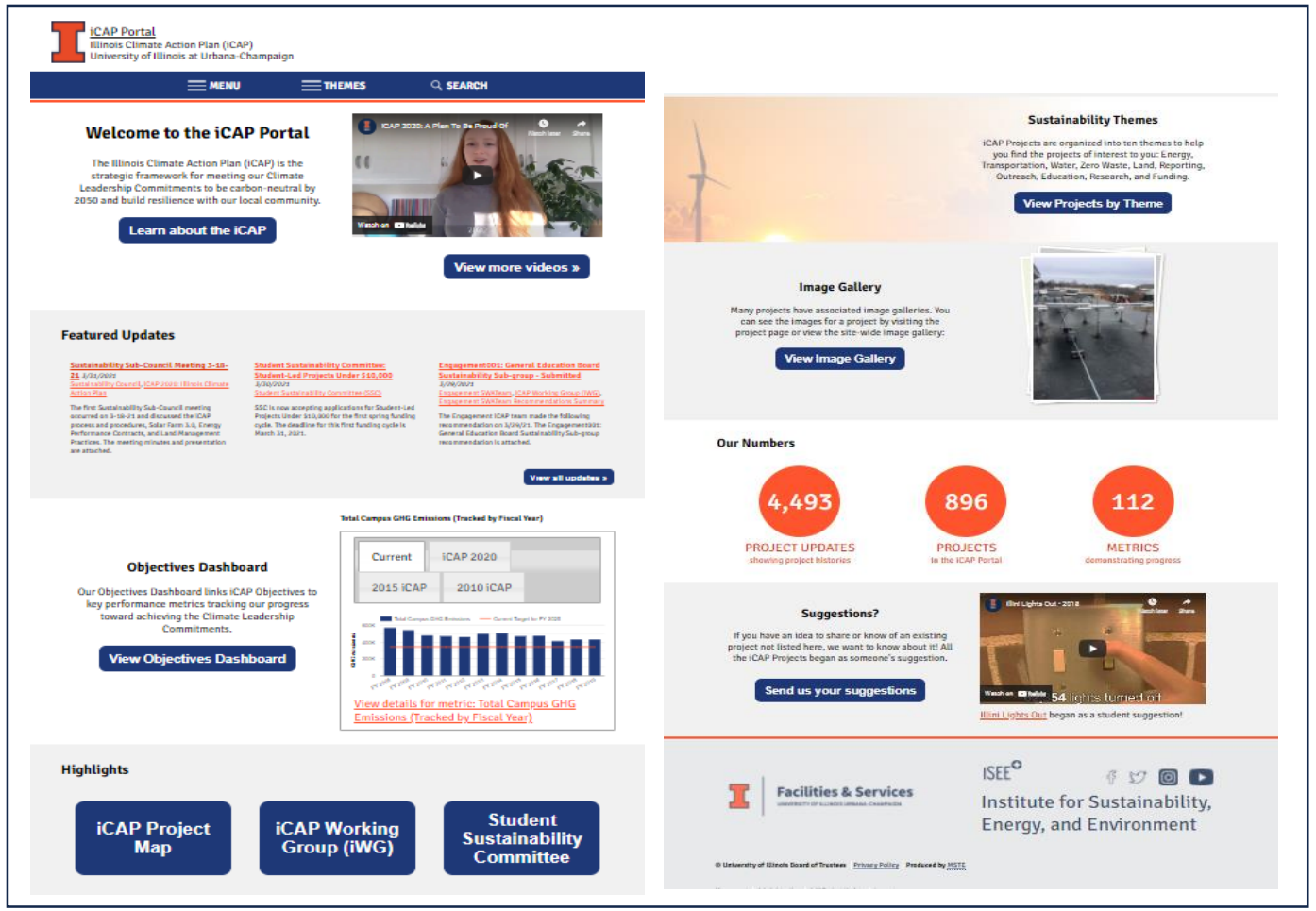
- Key Updates
  - iCAP Dashboard
  - Post-pandemic Implications for ICAP
  - Student Sustainability Leadership Council
  - Engagement001: General Education Board Sustainability Task Committee
  - Land Management
  - Overview of F&S Energy Management Plan
- Action Items
  - Energy004: ACES Energy Performance Contract
- Wrap Up

Key Updates

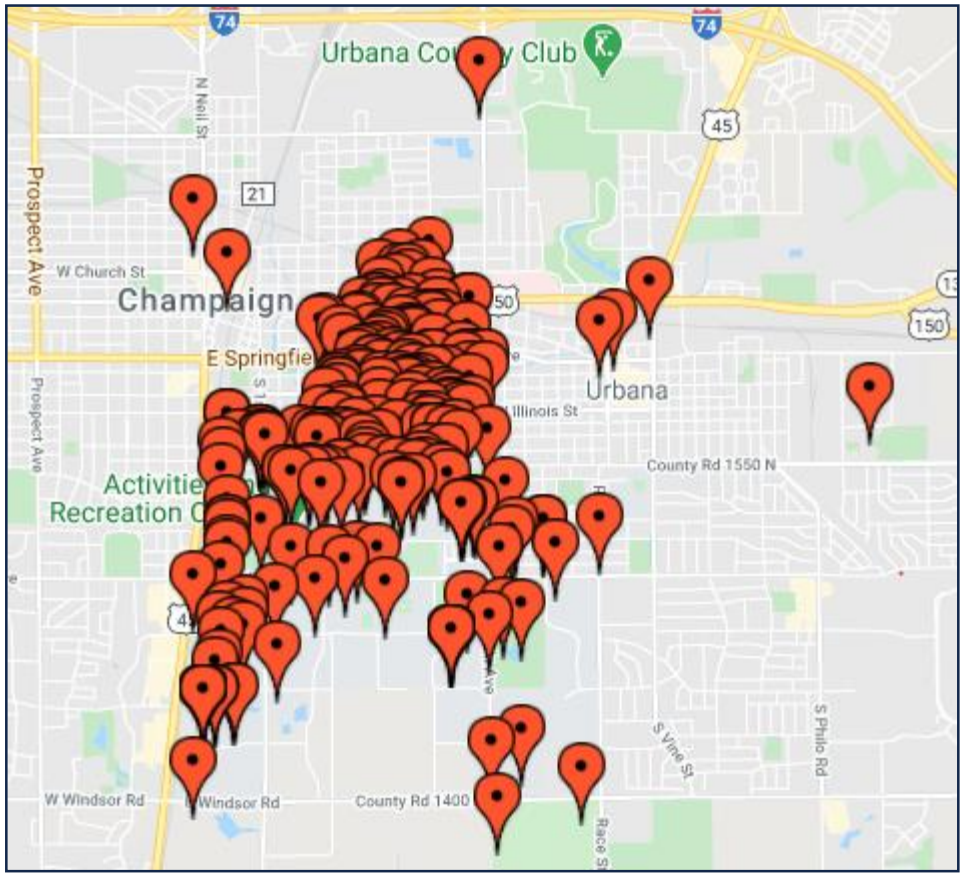
iSEE
Institute for Sustainability, Energy, and Environment

UNIVERSITY OF ILLINOIS URBANA-CHAMPAIGN

iCAP Dashboard



https://icap.sustainability.illinois.edu/objectives



Post-Pandemic Implications for ICAP

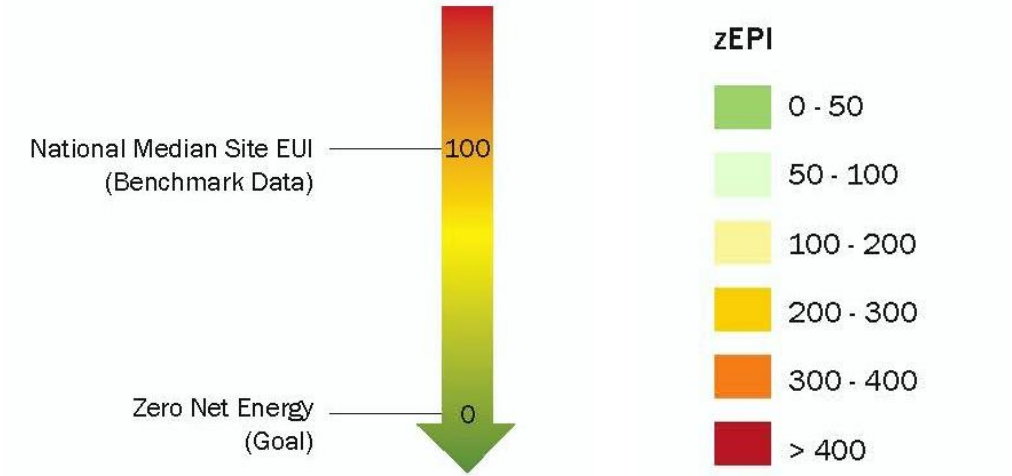
Covid-19 Impacts

- Energy use down 5%
- Water use down 13%
- Landfill waste down 32%
- Housing occ. down 30%

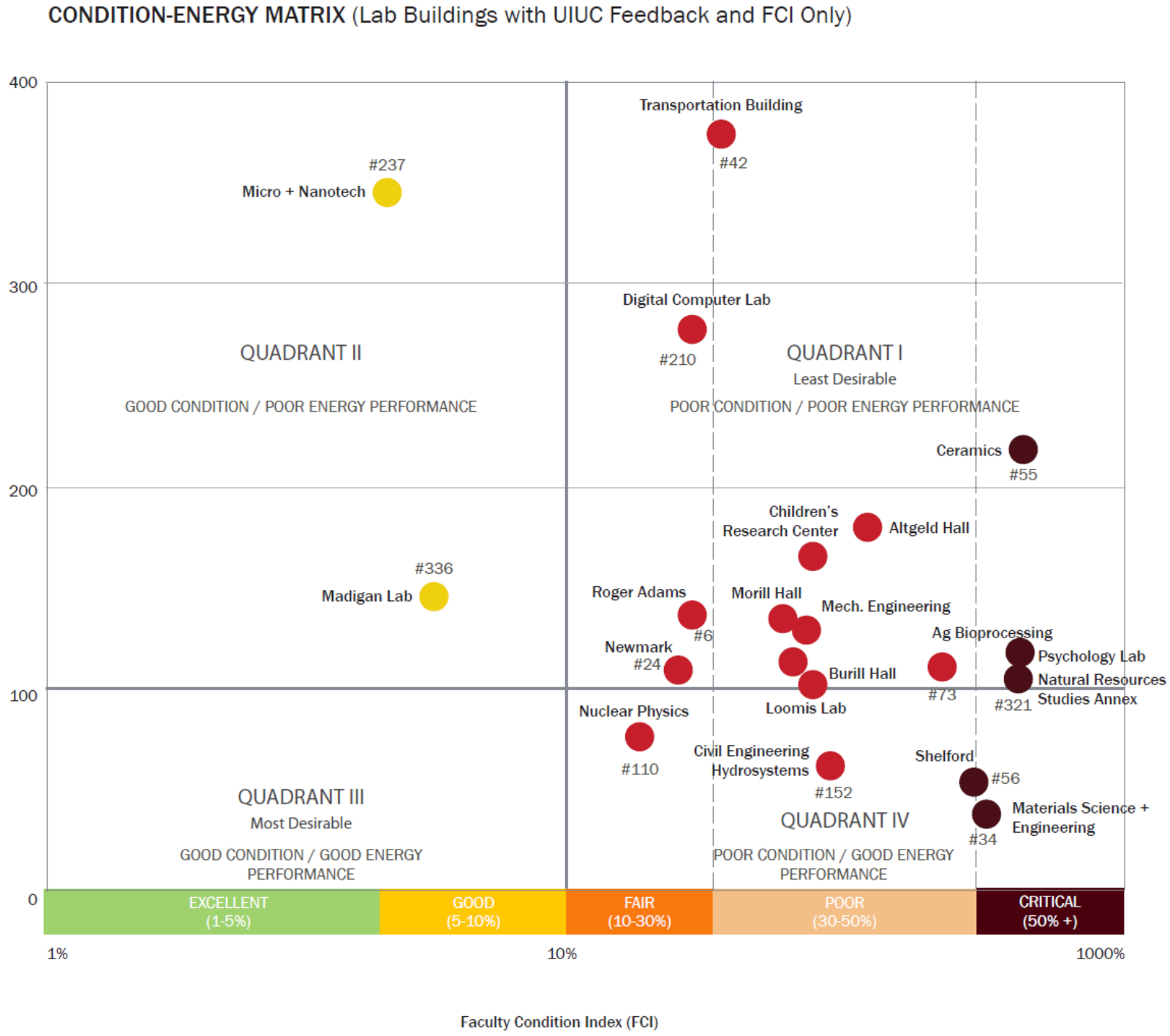
- Post-Pandemic Return to Work on Campus

- New approaches to campus operations
  - Hybrid work model
- Significant variation in performance across buildings
- Consolidation of office space should consider
  - environmental impacts
  - space use efficiency

Zero Energy Performance Index (ZPI)



Energy Performance vs. Facility Condition Index (FCI)



Student Sustainability Leadership Council

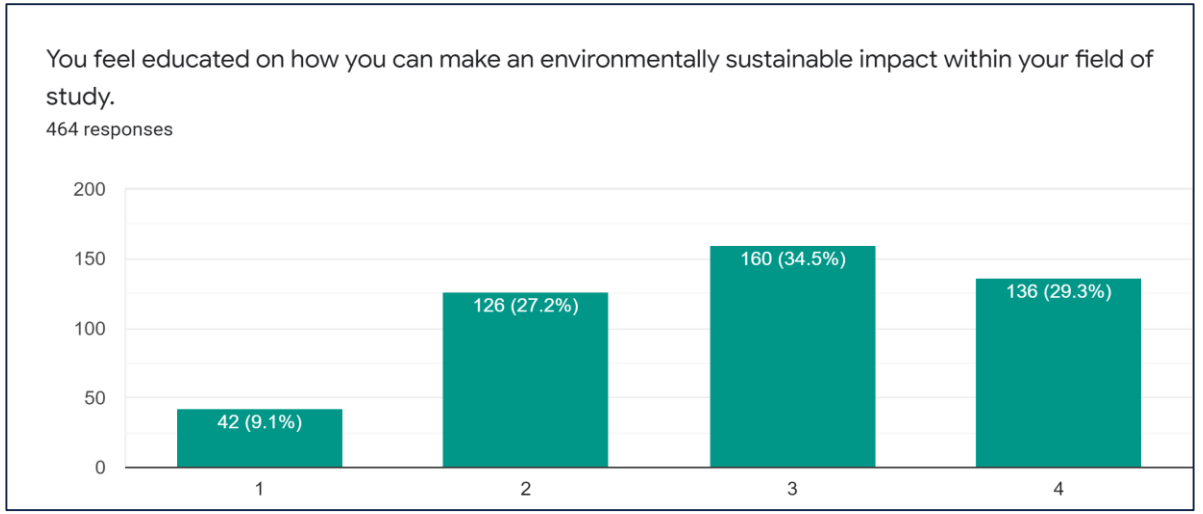
- The SSLC was originally formed by iSEE in FY14
- This spring iSEE relaunched the SSLC
  - Electing a new student leadership
- Purpose
  - For promoting collaborations among RSOs and interactions with iSEE
  - Coordinating campus sustainability outreach and programs between student environmental groups and iSEE.
  - Increasing sustainability engagement by a broader group of students and receiving support for projects and outreach

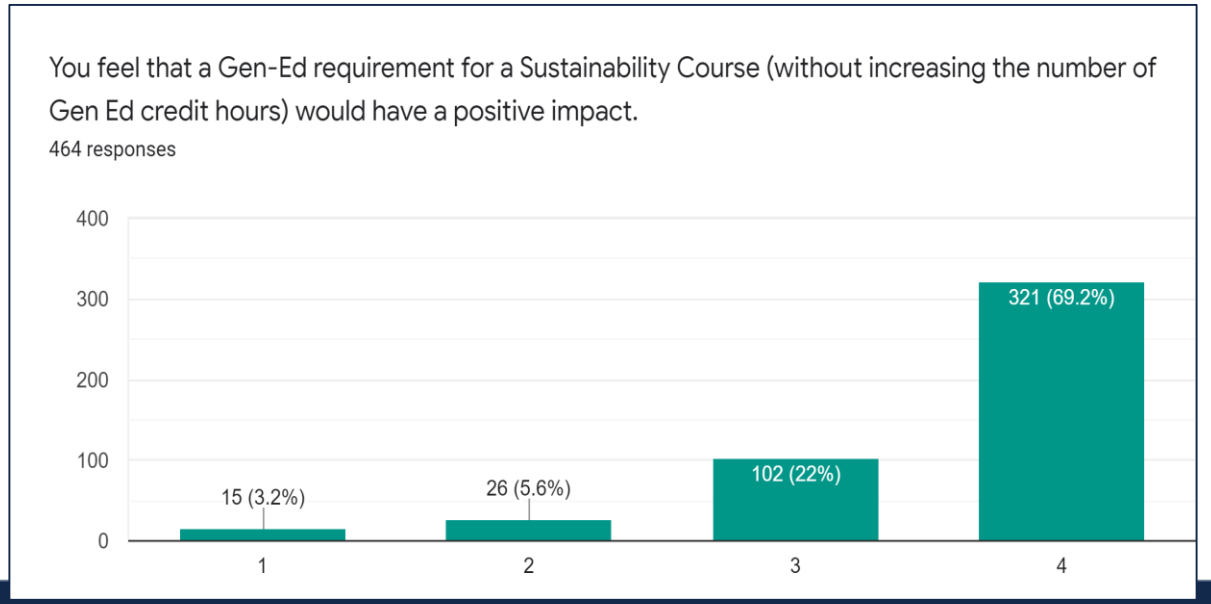
ISG Resolution on Sustainability Gen-Ed

- 3-credit hour of sustainability course replacing 3-hours of existing gen-ed requirement in each college at discretion of the college
- Resolution passed in the 3rd assembly with a vote of 26-1-1
- Large student and faculty support (appendix in RES 3.35)
- Students plan to work with each college to create most efficient plans
  - Formation of sustainability working group or committee (Engagement001) would greatly help organize the efforts

ISG Resolution on Sustainability Gen-Ed

- Students overall do not feel confident in receiving education on how to make an environmentally sustainable impact within their field of study
- Students are supportive of the requirement





Engagement001: General Education Board Sustainability Sub-group

- Illinois Student Government approved resolution in December 2019 – details on next slide
- Education iCAP Team endorses
- Engagement iCAP Team submitted formal recommendation
- iWG supports the formation of a General Education Board Sustainability task committee, as requested by student senate resolution

Engagement001

Bill Stewart

Professor, Department of Recreation, Sport and Tourism

Member of General Education Board, Office of the Provost

Signatory on ISG Resolution

Land Management

- iCAP objectives: Sustainable practices on UIUC non-research agricultural land
- ALUFS004: A committee of ACES faculty, farm personnel, and iSEE members will develop a comprehensive and cooperative management plan for all non-research agricultural land on the UIUC South farms that promotes sustainable practices and implements current best management practices.
- iWG assessment: The plan should include the assessment of the current status, evaluation of operational and financial impacts, and impediments to Best Management Practices.

Land Management

Committee

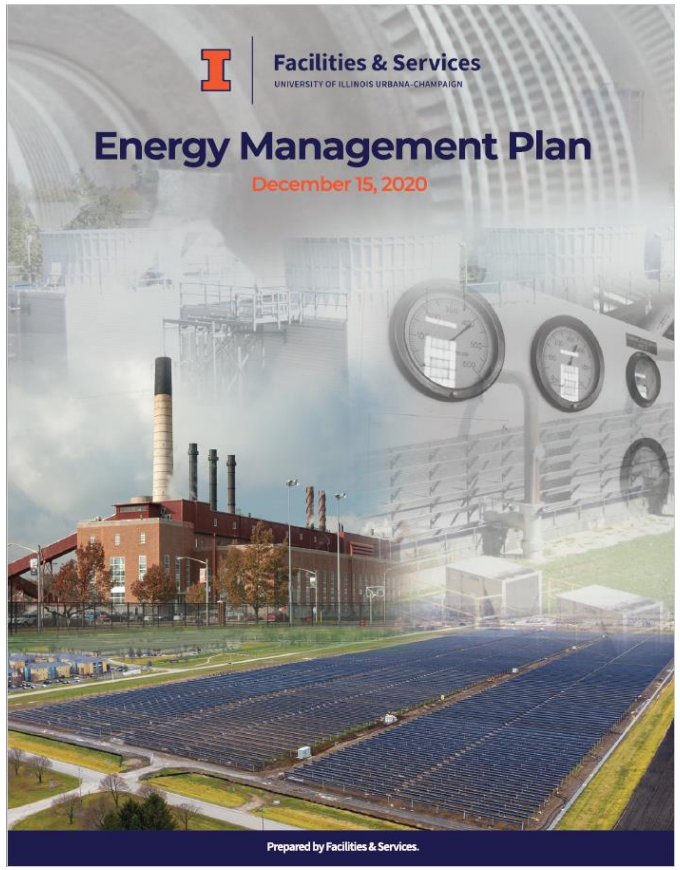
- Head of Crop Sciences, South Farms Management, Faculty, UI System, Ag Property Management, F&S, farmer tenants, iSEE

- Action items for committee:
  - Identify next steps and resource needs for sustainability best practice implementation on South Farms
  - Update and revise best practices in the agronomy handbook
  - Opportunities to engage interested tenants on University-owned land to showcase sustainable land management practices

Energy Management Plan

Facilities & Services
UNIVERSITY OF ILLINOIS URBANA-CHAMPAIGN

Plan Overview



Contents (51 pages)

- 1.0 Framework
- 2.0 Management Plan Basis
- 3.0 Budget and Cost Recovery Enterprise System
  - Utilities Enterprise System
  - Revenue Sources
- 4.0 Supply Side of Campus Energy
- 5.0 Demand Side of Campus Energy
- 6.0 Compliance, Regulatory, and Risk
- 7.0 Energy Management – Comprehensive Plan
  - Energy Reduction Initiatives
  - Planned Projects for FY22
  - Clean Energy Projects
  - Resulting iCAP Impacts

Management Plan Basis

- **Reliability**
  - *Must keep working and providing power under a variety of potential circumstances.*
- **Sustainability**
  - *F&S strongly supports the Illinois Climate Leadership Commitments.*
- **Economic**
  - *We reinvest energy cost savings from the program to improve overall energy efficiency.*
- **Social**
  - *Our greatest resource and investment is in the many diverse people we serve.*
- **Comparatives with Peers**
  - *Performance is benchmarked against peers, through Sightlines, LLC.*

Utilities Enterprise System

The Utilities Enterprise System is operated as a self-supporting system and is designed to recover 100% of its costs while, at the same time, providing a rational method of distributing utility costs to buildings.

Utility Rates for Each Commodity

Commodity	FY 2021 Rates
Steam (per klb)	$18.17
Electric (per kwh)	$0.0841
Chilled Water (per MBTU)	$14.03
Water (per kgal)	$3.97
Sanitary (per kgal)	$3.67

https://fs.illinois.edu/services/utilities-energy/business-operations/utility-rates

Utility Rates Development

- Fuel and purchased utility (electricity, water, sanitary, and natural gas) costs
- Chemicals
- Cost to distribute utilities to buildings
- Operations and administrative overhead costs
- Budgeted maintenance costs
- Major repair/replacement and capital replacement costs
- Debt service
- Over/Under recovery of prior year operating deficits

Recovered Outside of the Utility Rates

- Reduction in existing utility deficit

Revenue Sources

Four Customer Groups

1. State/ICR
2. Auxiliaries
3. Commercial
4. Petascale

State/ICR	Auxiliaries	Commercial	Petascale	Deficit
$48,939	$17,184	$2,417	$10,088	$8,046
56%	20%	3%	12%	9%

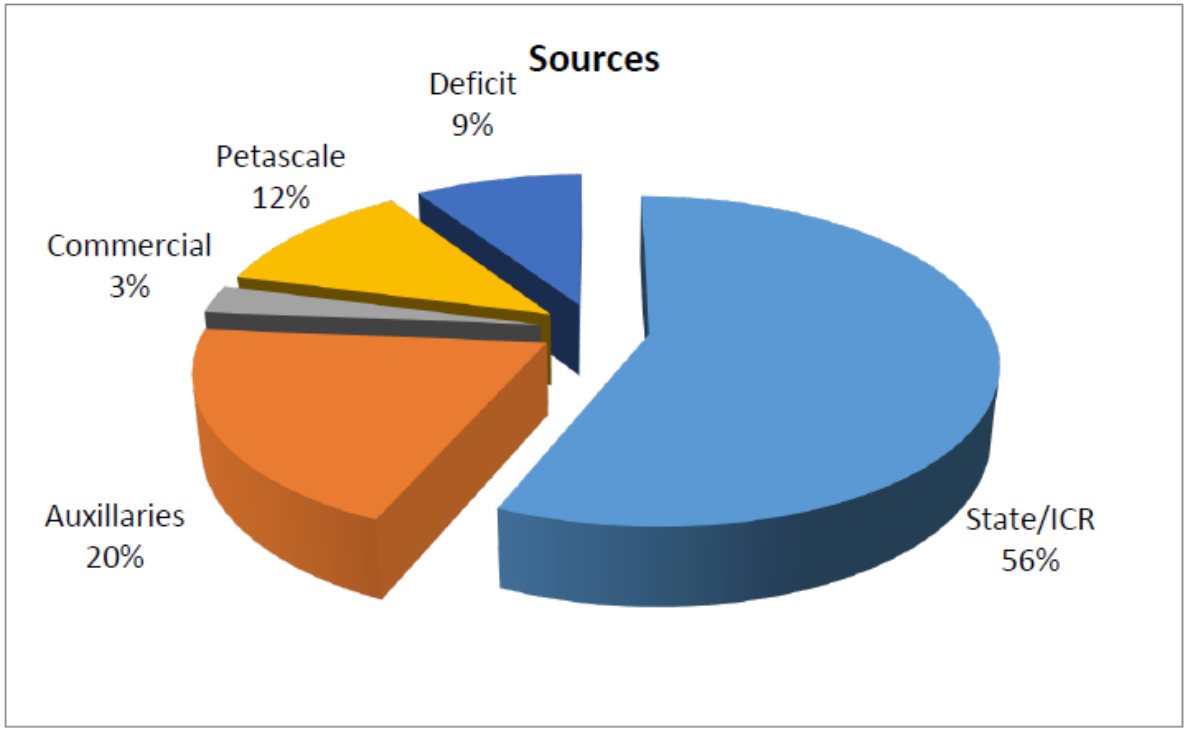


Figure 1. Total Enterprise Revenue (All Figures in $1,000 U.S. Dollars)

Energy Reduction Initiatives

- Retrocommissioning
  - From FY07 to FY20, invested $18M and saved over $70M
  - Can address about 500,000 GSF/year, and save 5,000 to 18,000 MMBTU/year
- Recommissioning
  - Typically includes control upgrades, occupancy sensor installations, and damper replacements
  - Currently five ReCx teams, with a goal to increase to six teams
- Energy Performance Contracting
  - A project delivery method focused primarily on energy/utility reduction
  - EPC project 05 is underway with various lab facilities
- Supply Side Enhancements
  - Efficiency Improvements at Abbott Power Plant, and in Chilled Water System
  - Additional Thermal Energy Storage tank

Energy Reduction Initiatives, cont.

- Planned Comprehensive Maintenance
  - Proactive maintenance is more cost-effective than reactive maintenance
  - Composite crews are dedicated to evaluating and correcting existing energy building infrastructure
- Capital Projects
  - Prioritize energy efficiency within Deferred Maintenance projects
  - Prioritize energy efficiency in campus Facilities Standards for new buildings and major renovations
- Awareness and Incentive Programs
  - International Freezer Challenge – three time winner!
  - Energy Conservation Incentive Program (ECIP) – recognizes buildings with best energy improvement
  - Energy Report Cards – at building and/or college level
  - Eco-Olympics – student-led competition with F&S support in residence halls
  - Energy Dashboards – most recent is at Electrical and Computer Engineering Building

Planned Projects for FY22

- These are the projects planned to begin in FY22
- They are dependent on available funding
- The savings will start when each project is completed

Work Group	Location	Expected MMBTU Reductions	Estimated Savings	
RetroCommissioning (RCx)	State Farm Center	2,073	$ 80,000	
RetroCommissioning (RCx)	Freer Hall	5,982	$ 134,668	
RetroCommissioning (RCx)	Penn. Ave. Res. Hall	1,489	$ 31,083	
Re-Commissioning (ReCx)	12 Buildings	27,141	$ 474,021	
Energy Performance Contracts (EPC)	7 ACES Lab Buildings	78,050	$ 1,505,000	
Supply Side / through an EPC	Automated Chilled Water	92,120	$ 750,000	
		206,855	$ 2,974,772	FY22 Totals

Planned Energy Demand Reductions

- This shows the summary of the five year plan
- Results are dependent on available funding

Combined 5 Year Plan		
Plan	**Energy Savings MMBTUs/Yr**	**Cost Savings/Yr (Based on FY20)**
5 Year Retro Commissioning (RCx) Plan	73,230	$1,203,319
5 Year Re Commissioning (ReCx) Plan	132,778	$2,283,355
5 Year EPC Plan	207,250	$3,828,000
5 Year Supply Side Plan	92,120	$5,650,000
TOTAL	**505,378**	**$12,964,674**

Clean Energy Projects

Existing Systems

- Several installations in place on campus
- 7% clean power in FY20
- EPA Green Power Partner

Existing Clean Energy	Category	Amount
Solar Farm 1.0	On-Site Solar	7,000 MWh/yr
Solar Farm 2.0	On-Site Solar	20,000 MWh/yr
Other Solar on Campus	On-Site Solar	340 MWh/yr
Off-Site Wind	Off-Site Wind	25,000 MWh/yr
Thermal Energy Storage	Energy Storage	50,000 tons
Biomass Boiler	Biomass	198 kW capacity
Geothermal Systems	Geothermal	8 locations

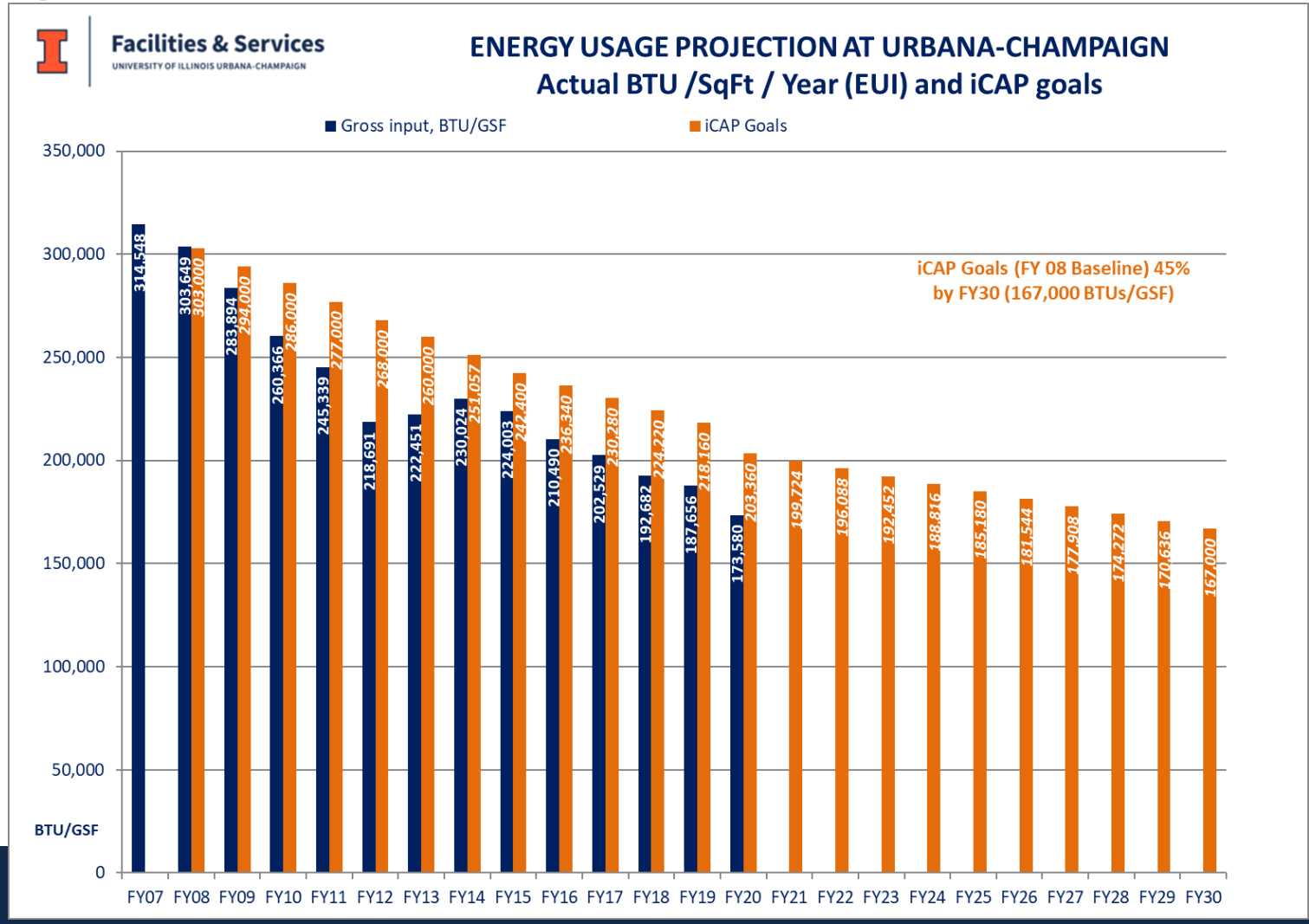
Research and Innovation

- Illinois Geothermal Coalition
- Carbon Capture at Abbott
- Micronuclear Reactor
- Natural gas energy storage
- Hydrogen energy storage
- Compressed air energy storage
- Geothermal battery systems

Resulting iCAP Impacts

Energy Utilization Index

- Results in 50% reduction from FY08 baseline by FY26
- Meets iCAP goal for FY40 ahead of schedule
- Depends on Net-Zero Space Growth
- Requires continued investments



Action Updates

iSEE
Institute for Sustainability, Energy, and Environment

UNIVERSITY OF ILLINOIS URBANA-CHAMPAIGN

ACES Energy Performance Contract

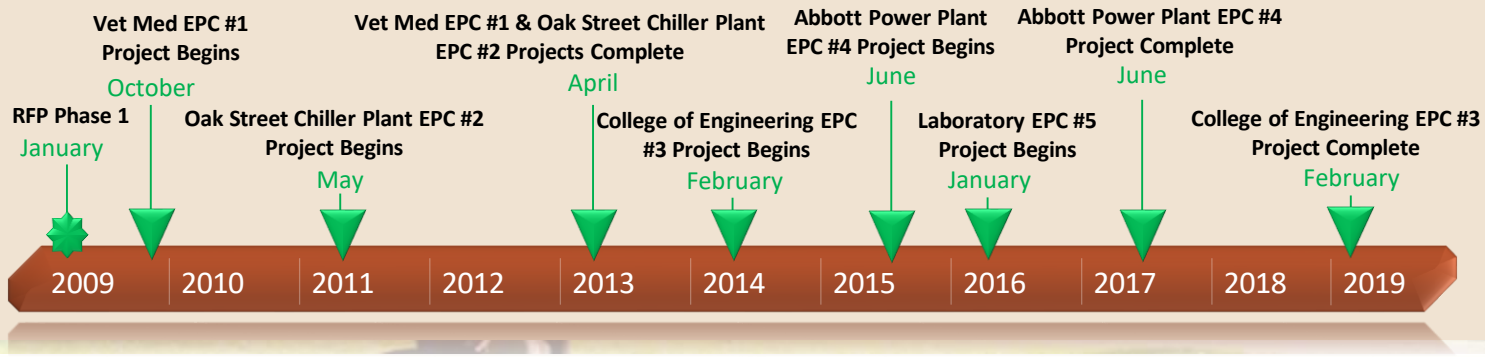
- iCAP objective: Reduce the total annual energy consumption of each college-level unit by at least 20% from an FY15 baseline by FY35.
- Energy004: $10M per year (scalable) of funding for the next 5 years to implement critical projects that work in concert with energy performance contracts (EPC) and/or energy focused capital projects.
- iWG assessment: The iWG recommends that the College of ACES, Facilities & Services, and the Campus work together to prioritize funding for the ACES Energy Performance Contract, and initiate that effort as soon as possible.

What is an Energy Performance Contract (EPC)?

- Design/Build Project with Guaranteed Utility / Energy Savings
- Can address Deferred Maintenance
- Guaranteed Maximum Price

History at UIUC

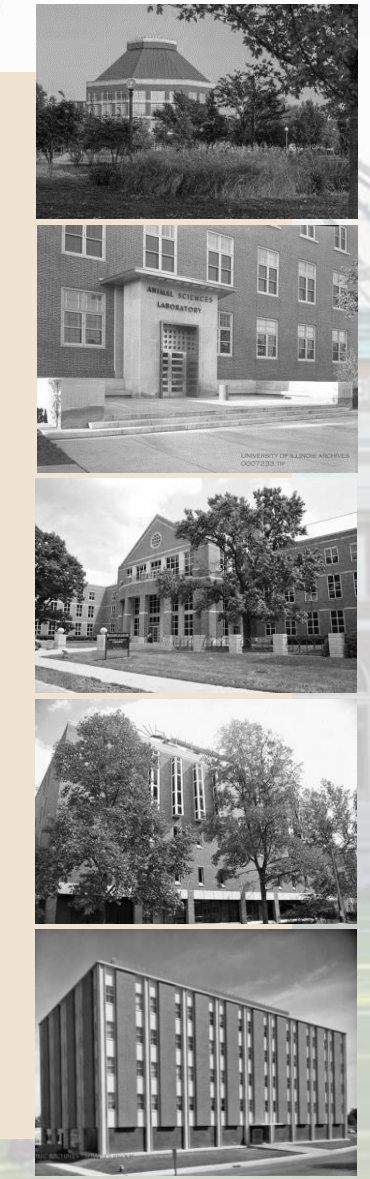
- Total Executed: $110M
- 5 Projects / 17 Buildings
- Guaranteed Savings to Date: $40M
- Est. Deferred Maintenance Impact: $65M



ACES Laboratory Facilities EPC Project

- Estimated Project Cost: $40M
- Number of Buildings Proposed: 7
- Projected Annual Savings: $1.5M in first year, 20 year payback
- Approximately 25% Cost Reduction
- These numbers are rough, preliminary estimates that would be finalized during the audit process when an ESCO is selected.
- Target Schedule: TBD Based on Funding Discussions

Included Buildings	FY18 - FY20 Avg Utility Cost	Anticipated Savings
Animal Sciences Laboratory	$ 495,000	$ 145,000
Turner Hall	$ 740,000	$ 215,000
Madigan Laboratory	$ 1,425,000	$ 420,000
Institute for Genomic Biology	$ 1,675,000	$ 250,000
ACES Library	$ 350,000	$ 65,000
National Soybean Research Center	$ 800,000	$ 230,000
Plant Sciences Laboratory	$ 650,000	$ 180,000
Total:	**$ 6,135,000**	**$ 1,505,000**



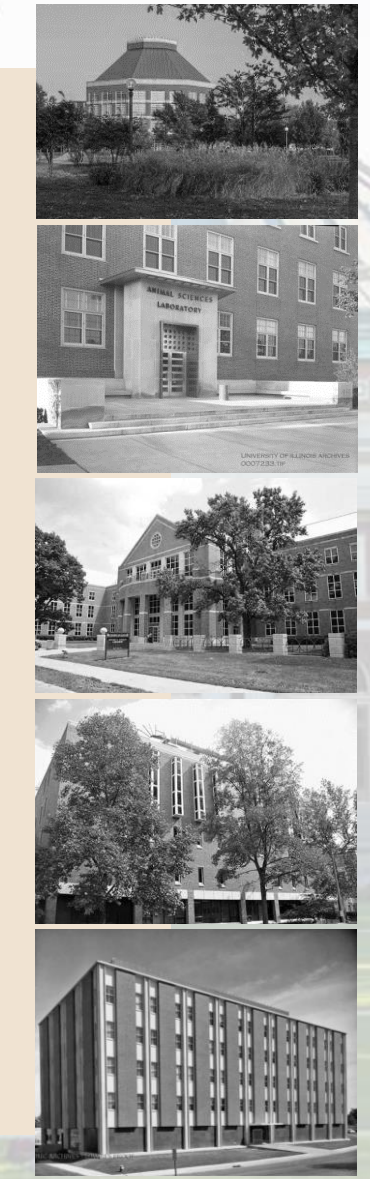
Priorities and Relevance

1. Does this fit into UI Priorities? Yes.
   - **Guiding Principles:** “Financial sustainability is concerned with fiscal resilience and foresight, whereas environmental sustainability encompasses our buildings, our infrastructure, our land, our utilities, and our climate. But the two are interdependent, calling upon our ingenuity and commitment as stewards.”
   - **Strategic Plan:** “Implement and promote Operational Excellence @ Illinois, a campuswide initiative to streamline, innovate, reduce costs, improve services, and coordinate processes at all levels”
   - **iCAP 2020 objective 2.2 is:** “Reduce Energy Use Intensity (EUI) of university facilities from the FY08 baseline by: 45% by FY30, 50% by FY40, and 60% by FY50.”
   - **iCAP 2020 objective 2.2.2 is:** “Reduce the total annual energy consumption of each college-level unit by at least 20% from an FY15 baseline by FY35.”

2. How much energy savings can it generate?
   - Projected reduced energy consumption = 78,000 MMBTU/year

Action for Approval

We would like the F&S staff to work with the College of ACES and the Office of the Provost to do a detailed financial model with a timeline of funding allocation needs and the payback timeline, and to identify potential funding methods to initiate this effort as soon as possible.



Thank you

iSEE
Institute for Sustainability, Energy, and Environment

UNIVERSITY OF ILLINOIS URBANA-CHAMPAIGN