



STUDENT SUSTAINABILITY COMMITTEE

Funding Application – Step I

Funding Criteria

A. General Rules

1. Students, faculty, and staff are encouraged to submit requests for funding. Student-led projects require a faculty or staff sponsor in order to have funds awarded.
2. Funding can only go to university-affiliated projects from students, faculty, staff, and departments.
3. All SSC projects must make a substantial impact on students. This may be a direct impact or an impact through education and engagement. All SSC funding is 100% from student green fees, so the projects funded by the students must benefit them.
4. SSC encourages innovation and new technologies – creative projects are encouraged to apply.
5. Unless a type of expense is specifically listed below as having restrictions, SSC can generally fund it. The items referenced below should not be taken as comprehensive list.

B. Things SSC Can Fund, On A Case-By-Case Basis

1. SSC can fund feasibility studies and design work; however, it must work toward ultimately addressing a sustainability need on campus.
2. SSC can fund staff positions that are related to improving campus sustainability. Strong preference will be given to proposals receiving matching funding from departments and/or plans for maintaining continuity of the position after the end of the initial grant.
3. SSC can fund outreach events with a central theme of sustainability, provided their primary audience is the general campus community.
4. SSC discourages funding requests for food and prizes but will consider proposals on a case by case basis that prove significant reasoning.
5. SSC can fund repairs and improvements to existing building systems as long as it works toward the goal of improving campus sustainability; however, a preference is shown to projects utilizing new or innovative ideas.
6. SSC can provide departments with loans for projects with a distinct payback on a case by case base. Loans will require a separate memorandum of understanding between SSC and departmental leadership pledging to repay the award in full and detailing the payback plan.

C. Things SSC Will Not Fund:

1. SSC will not fund projects with a primary end goal of generating revenue for non-University entities.
2. SSC will not fund personal lodging, food, beverage, and other travel expenses.
3. SSC will not fund any travel expenses.
4. SSC will not fund tuition or other forms of personal financial assistance for students beyond standard student employee wages.

Your Step 1 funding application should include this application. You're welcome to submit optional supporting material such as letters of support or pictures.

Please submit this completed application and any relevant supporting documentation to Sustainability-Committee@illinois.edu. The Working Group Chairs will be in contact with you regarding any questions about the application. If you have any questions about the application process, please contact the Student Sustainability Committee at sustainability-committee@illinois.edu.

General & Contact Information

Project Name: Campus Instructional Facility Geothermal

Total Amount Requested from SSC: \$375,000.00

Project Topic Areas: Land & Water Education Energy
 Transportation Food & Waste

Applicant Name: Associate Professor Liang Liu

Campus Affiliation (Unit/Department or RSO/Organization): College of Engineering

Email Address: Liu, Liang Y <lliu1@illinois.edu>

Check one:

- This project is solely my own **OR**
 This project is proposed on behalf of (name of student org., campus dept., etc.): College of Engineering

Student-Led Projects (Mandatory):

Name of Faculty or Staff Project Advisor:

Advisor's Email Address:

Primary Project Team Members

Name	Department	Email
Liang Liu	College of Engineering (COE)	lliu1@illinois.edu
Qu Kim	College of Engineering (COE)	qkim@illinois.edu
Andy Stumpf	Prairie Research Institute (PRI)	astumpf@illinois.edu
Yu-Feng Lin	Prairie Research Institute (PRI)	yflin@illinois.edu

Project Information

Please review the proposal materials and online content carefully. It is highly recommended you visit a working group meeting to talk through your proposal before you submit it.

Please provide a brief description of the project, its goals, and the desired outcomes:

We want to know: What is your project? What does it concretely produce, accomplish, or solve? Why is this project needed on campus?

When built the UIUC Campus Instructional Facility will be a 5 story classroom on a site bounded by Talbot Laboratory, Grainger Engineering Library, Wright Street, and Springfield Avenue. For your review and consideration we propose a thermal energy project that focuses on advancing engineering systems and significantly lowers greenhouse gas emissions from operational energy for this new Instructional facility.

The goal is to deliver an exceptional high performance building with the lowest entropy possible to exhibit the fundamental second law of thermodynamics. We believe the facility should demonstrate the power of thoughtful and innovative engineering to deliver performance that provides a high-quality learning environment, while respecting the quality of life of not only students, faculty, and staff but also all those affected by the environmental impacts of the building. By providing an abundance of nature through enhanced air ventilation, displacement supply air, daylighting, and night flush we intent to enhance the indoor microbial biome, etc., with the intent of delivering a superb learning environment. In addition, the building will use radiant heat transfer as the mechanism for creating thermal comfort, mimicing the method by which we most naturally like to experience warmth and comfort.

Our proposal is also to reduce dependance on the Abbott Power Plant; while the existing plant has an efficient combined heat and power system, it also relies on fossil fuel to generate energy at a high carbon footprint. With a geothermal system, the total energy needed from the central heating and cooling systems will be reduced for this facility. Our design involves using a condenser water loop to draw energy from potentially different elements. This could include direct extraction of solar energy from solar thermal collectors, then storage of this energy in a ground-source heat exchange system located under the John Bardeen quad. In the future, this system could expand to provide energy sharing with other buildings on the quad. The ground-source heat exchange system will not impede the pedestrian and civic amenities that the students enjoy on and around John Bardeen quad. After completing the borings, the project will restore the quad to its previous services as a public space.

This project is needed in the campus, especially in the Engineering Quad, because it proposes a forward looking design. A design that involves electrifying the campus will set the stage for a carbon neutral future with no fossil fuels and will allow buildings to share thermal resources. Unlike buildings connected to the central plant, which only draw heating and cooling energy in an extractive, linear fashion fed by fossil fuels, by introducing a ground-source condenser loop, buildings in the Engineering Quad have an opportunity to share thermal resources in a cooperative way fed by renewable resources. We are asking the SSC to support this effort with approximately 25% of the cost of the geothermal system.

How will students be involved in the project?

This concept was originally conceived and developed by university students and faculty, so student involvement has been key since its infancy. Two of the team members were funded by the SSC in February 2017 to pilot a new method for geothermal system design that will transform the industry. These team members, Dr. Yu-Feng Lin and Dr. Andy Stumpf, will assist the design team for the Campus Instructional Facility to create the most cost efficient installation possible, through the innovative techniques developed with SSC's previous support.

Additoinally, we propose that the students engage in this project at several points during the design, construction, and operation of the ground-source heat exchange system. During design, students can review the modeling processes and tools that allow the design team to achieve optimal performance within the project budget. During construction, we would like to stage safe distance site visits during the boring of the wells to allow the students to understand the process of installation and volume of displaced earth. We would also design the interface between the heat exchange system and distribution of the heating and cooling with the digital monitoring and control technology necessary to allow tours and real time energy and emissions savings display for further interaction with the heating and cooling systems post-occupancy. The students will also benefit from the comfort of the radiant system and the exceptional learning environment.

How will this project improve environmental stewardship at UIUC?

Embedded throughout the project, there will be moments of potential student engagement and interaction with high performance, healthy features — all visible and tangible to the students. However, we are well aware that invisible engineering strategies can have the highest impact on emission reductions. Our aim is to make as many of these invisible engineering strategies possible a visible teaching and learning opportunity.

We would like the operation of the Campus Instructional Building to be responsive, align and exceed the iCAP plan and overarching sustainability goals. Specific to emissions reduction, we are striving to reduce our energy use intensity with a suite of energy efficiency measures including a radiant heating and cooling system, high efficiency lighting and equipment, and passive dessicant humidity control. However, we will be able to realize the highest possible emissions savings by reducing dependance on the Abbott Power Plant and ask for your support to do so. The load of the radiant system for heating and cooling requires 210 tons (2,520,000 Btu/hour) of cooling capacity. With the \$375,000 requested, the project can take 30% of that load (about 63 tons) and utilize the ground-source system to provide the heating and cooling needed through a combination of the stored thermal energy and electrical energy. The implementation of efficient building systems will reduce source energy and carbon emissions by 35%, and the introduction of a portion of the ground-source system will reduce overall source energy and carbon emissions by another 8%. If the project can achieve a fully-sized ground-source system, the savings could reach 55% when compared against a typical, efficient building.

By significantly bending the carbon curve for the University of Illinois College of Engineering, we propose a new paradigm for campus construction that can inspire future campus improvement projects. You can imagine that similar ground source heat exchange systems could be installed throughout campus on other quads, creating a network that will drastically reduce energy reliance on the Abbott Power Plant.

How will this project inspire change at UIUC and beyond?

The U of I has a long and storied history of research and integration of science, art, and agriculture - all key areas of environmental knowledge. We have noted that the seal of the University includes the steam engine, a sign of innovation and engineering in 1867. We would like our project to also show leadership in engineering, specifically in the way it supplies clean thermal energy with the lowest entropy, utilizing renewable energy. We believe that UI, powered by the optimism of students, is at the forefront of transitioning to a clean energy future. We know that an installation of this scale will attract attention from the public and other universities; it can be an inspiration for others to follow. It is our hope that the largest attention that it attracts is from the student body. When students are inspired to integrate sustainability into every aspect of their life the world changes.

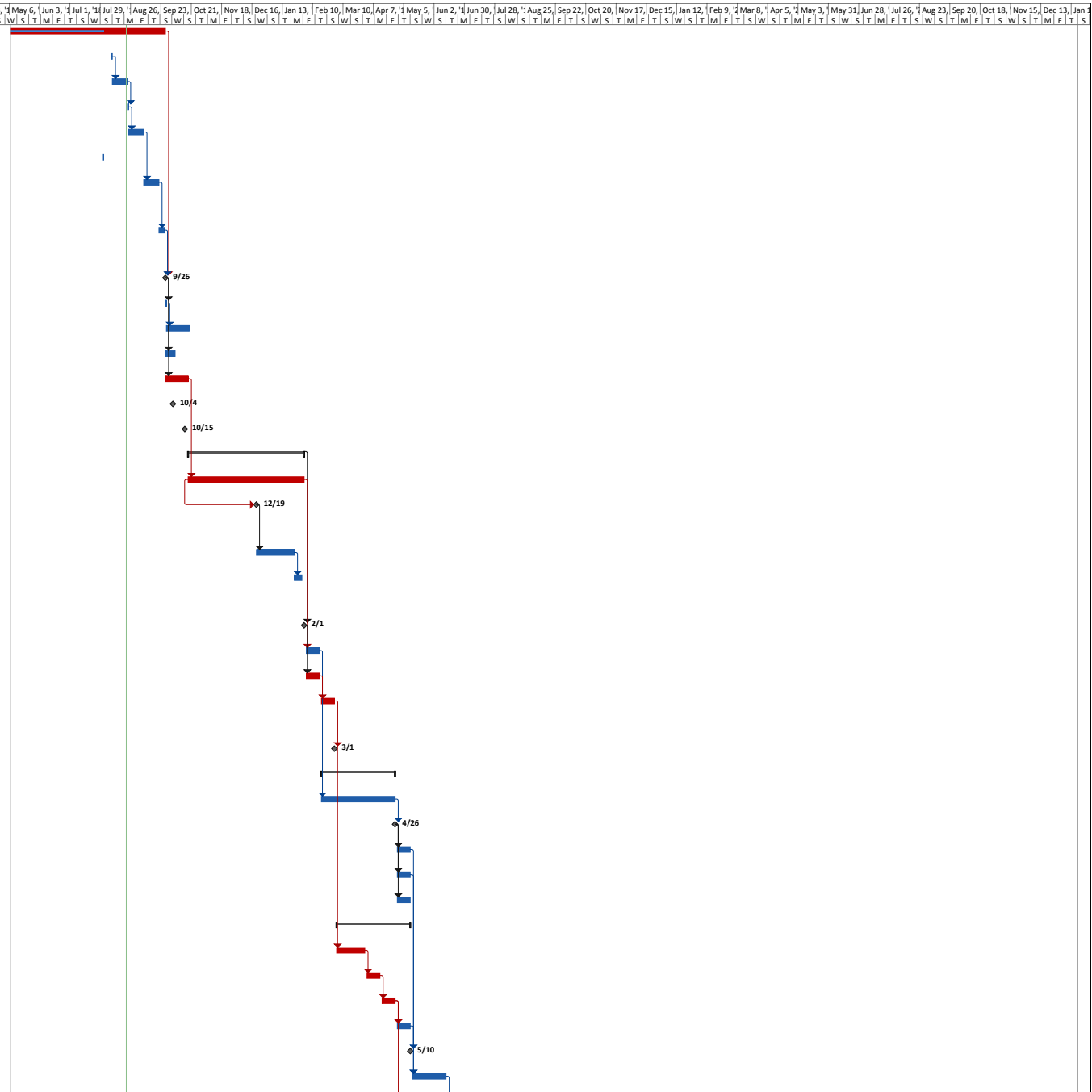
Please list the project timeline and any key milestones:

Please see the supporting project schedule. The ground source heat exchange system would be installed in conjunction with the construction of the College of Engineering Campus Instructional Facility, currently slated to break ground next spring.

Additional comments (Optional)

For your information, please find attached the project schedule, cost estimate, and sustainability goals for the project.

ID	Task Mode	Task Name	Duration	Start	Finish	Predecessors
1		Schematic Design	103 days	Mon 5/7/18	Wed 9/26/18	
2		UIUC Interim SD Meeting	1 day	Wed 8/8/18	Wed 8/8/18	
3		Pepper Component Pricing--major systems	10 days	Thu 8/9/18	Wed 8/22/18	2
4		Confirm Systems-structural and MEP	1 day	Thu 8/23/18	Thu 8/23/18	3
5		SOM Develop System Narratives	10 days	Fri 8/24/18	Thu 9/6/18	4
6			1 day?	Tue 7/31/18	Tue 7/31/18	
7		Pepper SD Estimate--minor input from subcontractors	10 days	Fri 9/7/18	Thu 9/20/18	5
8		Review SD Pricing in preparation for presentation to UIUC	3 days	Fri 9/21/18	Tue 9/25/18	7
9		Presentation to UIUC Schematic Design Mile	0 days	Wed 9/26/18	Wed 9/26/18	1,8
10		SD BIM Model to Pepper	1 day	Thu 9/27/18	Thu 9/27/18	9
11		Pepper insert BIM model into their system	15 days	Fri 9/28/18	Thu 10/18/18	10
12		F&S Code Review	7 days	Thu 9/27/18	Fri 10/5/18	9
13		UIUC Review--SD	15 days	Thu 9/27/18	Wed 10/17/18	9
14		CDAC Review	0 days	Thu 10/4/18	Thu 10/4/18	
15		Chancellor Presentation	0 days	Mon 10/15/18	Mon 10/15/18	
16		Design Development Documents	77 days	Thu 10/18/18	Fri 2/1/19	
17		Drawing and Specification Preparation	77 days	Thu 10/18/18	Fri 2/1/19	13
18		BIM Model to Pepper for DD Pricing	0 days	Wed 12/19/18	Wed 12/19/18	17, 5S+45 days
19		Pepper Internal Estimate	25 days	Thu 12/20/18	Wed 1/23/19	18
20		Review DD Pricing in preparation for submittal to UIUC	5 days	Thu 1/24/19	Wed 1/30/19	19
21		Issue Design Development Documents Mile	0 days	Fri 2/1/19	Fri 2/1/19	16
22		UIUC Review--DD	10 days	Mon 2/4/19	Fri 2/15/19	17
23		VCD/Pepper DD Document Review	10 days	Mon 2/4/19	Fri 2/15/19	21
24		Preparation of GMP Issuance (address UIUC/VCD/Pepper Comments)	10 days	Mon 2/18/19	Fri 3/1/19	23
25		Issue GMP Document Documents Milestone	0 days	Fri 3/1/19	Fri 3/1/19	24
26		Construction Documents (90% Milestone)	50 days	Mon 2/18/19	Fri 4/26/19	
27		Preparation of Construction Documents--50	50 days	Mon 2/18/19	Fri 4/26/19	22
28		Issue 90% Construction Documents Milest	0 days	Fri 4/26/19	Fri 4/26/19	27
29		SOM QA/QC Review	10 days	Mon 4/29/19	Fri 5/10/19	28
30		Pepper 90% Drawing Review	10 days	Mon 4/29/19	Fri 5/10/19	28
31		UIUC F&S Code Review and Sign Off	10 days	Mon 4/29/19	Fri 5/10/19	28
32		GMP	50 days	Mon 3/4/19	Fri 5/10/19	
33		GMP Pricing	20 days	Mon 3/4/19	Fri 3/29/19	24
34		Review of GMP Pricing and Qualifications	10 days	Mon 4/1/19	Fri 4/12/19	33
35		Finalize GMP Amount	10 days	Mon 4/15/19	Fri 4/26/19	34
36		Preparation of GMP Exhibits	10 days	Mon 4/29/19	Fri 5/10/19	35
37		Sign GMP Agreement	0 days	Fri 5/10/19	Fri 5/10/19	36
38		Finalize Construction Documents	23 days	Mon 5/13/19	Wed 6/12/19	29,30



Project: Vermilion Accelerated Sc
Date: Wed 8/22/18

Task	Summary	External Milestone	Inactive Summary	Manual Summary Rollup	Finish-only	Critical Split
Split	Project Summary	Inactive Task	Manual Task	Manual Summary	Deadline	Progress
Milestone	External Tasks	Inactive Milestone	Duration-only	Start-only	Critical	

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ID	Task Mode	Task Name	Duration	Start	Finish	Predecessors
39	Milestone	Issue for Construction Documents Milestone	0 days	Thu 6/13/19	Thu 6/13/19	38FS+1 da
40	Task	Preparation of Closing Documents	23 days	Mon 4/29/19	Wed 5/29/19	35
41	Milestone	Closing	0 days	Wed 5/29/19	Wed 5/29/19	40
42	Task	Notice to Proceed	0 days	Thu 5/30/19	Thu 5/30/19	41FS+1 da
43	Task	Mobilization	10 days	Fri 5/31/19	Thu 6/13/19	42
44	Milestone	Construction Start	0 days	Thu 6/13/19	Thu 6/13/19	43
45	Task	Construction	382 days	Mon 6/17/19	Tue 12/1/20	43FS+1 da
46	Task	FFE	33 days	Wed 12/2/20	Fri 1/15/21	45
47	Milestone					
48	Milestone	Dates for Early Release Trades	50 days	Fri 1/18/19	Fri 3/29/19	
49	Task	Curtainwall	0 days	Fri 1/18/19	Fri 1/18/19	42FS-19 w
50	Task	Precast Concrete	0 days	Fri 1/18/19	Fri 1/18/19	42FS-19 w
51	Task	Structural Steel	0 days	Fri 2/15/19	Fri 2/15/19	42FS-15 w
52	Task	MEPPF (assumes not precast)	0 days	Fri 3/29/19	Fri 3/29/19	42FS-9 wk
53	Task	MEPPF (precast)	0 days	Fri 2/1/19	Fri 2/1/19	42FS-17 w



Project: Vermilion Accelerated Schedule
Date: Wed 8/22/18

Task	Summary	External Milestone	Inactive Summary	Manual Summary Rollup	Finish-only	Critical Split
Split	Project Summary	Inactive Task	Manual Task	Manual Summary	Deadline	Progress
Milestone	External Tasks	Inactive Milestone	Duration-only	Start-only	Critical	

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UIUC COE CIF - Geothermal Option

Scope Alternate Estimate

Hier4Level 4 Code	Alternate Code	Alternate Name	Item Description	Takeoff Qty	Unit	Subs Unit Price	Subs Total	Note
230000			HEATING, VENTILATING, & AIR CONDITIONING (HVAC)					
230000	ALT021	Geothermal HVAC Solution	Geothermal Heat Pump	210.00	TN	2,000.00	420,000	
230000	ALT021	Geothermal HVAC Solution	Geothermal Wells: 450' deep / 3TN/ea (includes loops, glycol, valves, grout, trench/bed/Bf/Ho)	210.00	TN	3,955.00	830,550	
230000	ALT021	Geothermal HVAC Solution	Heat Exchanger, Plate and Frame: HW/CHW at radiant panels	-4.00	EA	25,000.00	-100,000	
230000			HEATING, VENTILATING, & AIR CONDITIONING (HVAC) Total		SF		1,150,550	
310000			EARTHWORK					
310000	ALT021	Geothermal HVAC Solution	Silt Fencing	1,000.00	LF	3.50	3,500	200x200 field, 100x20 link
310000	ALT021	Geothermal HVAC Solution	Concrete Sidewalk Demo	237.04	CY	35.00	8,296	
310000	ALT021	Geothermal HVAC Solution	Load, Haul & Dispose of Site Demo Debris	237.04	CY	35.00	8,296	
310000	ALT021	Geothermal HVAC Solution	Strip Topsoil & Stockpile	740.74	CY	6.00	4,444	
310000	ALT021	Geothermal HVAC Solution	Redistribute & Spread Topsoil	740.74	CY	6.00	4,444	
310000	ALT021	Geothermal HVAC Solution	Sidewalk Grading & Stone Backfill, 6-inch Depth	426.67	TN	32.00	13,653	
310000	ALT021	Geothermal HVAC Solution	Fine Grading Landscape Areas	42,000.00	SF	0.25	10,500	
310000			EARTHWORK Total		SF		53,135	
321300			SITE CONCRETE					
321300	ALT021	Geothermal HVAC Solution	Concrete Sidewalks, 5-inch, Non-Reinforced	12,800.00	SF	6.00	76,800	
321300			SITE CONCRETE Total		SF		76,800	
329000			LANDSCAPING					
329000	ALT021	Geothermal HVAC Solution	Turf, Sod	40,000.00	SF	1.25	50,000	
329000			LANDSCAPING Total		SF		50,000	
330000			UTILITIES					
330000	ALT021	Geothermal HVAC Solution	Site Utilities - relocate existing to accomodate geothermal field		NI			not included
330000			UTILITIES Total		SF			
			Grand Total	144,650.00	SF	9.20	1,330,485	

Tariffs / Escalation	66,524
Subtotal	1,397,009
Contingency	76,836
Subtotal	1,473,845
SDI	18,423

UIUC COE CIF - Geothermal Option

Scope Alternate Estimate

	Subtotal	1,492,268
	CCIP	23,876
	Subtotal	1,516,144
	Payment & Performance Bond	7,581
	Subtotal	1,523,725
	Fee	53,330
	Total Estimate	1,577,055

UIUC CAMPUS INSTRUCTIONAL FACILITY
SUSTAINABILITY

21 SEPTEMBER 2018

SOM

Design Goals

1. Honest
2. Integrity
3. Instructive
4. Flexible
5. Integrated
6. *Sustainable*
7. Efficient
8. Affordable

College of Engineering

- College of Engineering Vision: *“distinguished”*, leverage the *“creation and management of systems and resources”*, and also an *“appreciation of human and ethical values”*

University Home E-mail Maps

Search Catalog

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2018-2019
Academic Catalog

HOME > UNDERGRADUATE > ENGINEERING, COLLEGE OF

General Information

Undergraduate

Agricultural, Consumer and Environmental Sciences, College of

Applied Health Sciences, College of

Business, Gies College of Education, College of

Engineering, College of

Departments

Innovation, Leadership, and Engineering Entrepreneurship

Fine and Applied Arts, College of

General Studies, Division of Liberal Arts and Sciences, College of

Media, College of

Social Work, School of

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Graduate

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Archived Academic Catalogs

Academic Calendar

Class Schedule

Graduate Admission

Undergraduate Admission

Student Affairs

Registration, Tuition, and Cost Information

Engineering, College of

Overview Majors Minors

Office of Undergraduate Programs
206 Engineering Hall
1308 West Green Street
Urbana, IL 61801
PH: (217) 333-2280
<http://engineering.illinois.edu>

The College of Engineering prepares men and women for professional careers in engineering and related positions in industry, commerce, education, and government. Graduates at the bachelors level are prepared to begin the practice of engineering or to continue their formal education at a graduate school of their choice. The curricula provide a comprehensive education emphasizing analysis and problem solving and an exposure to open-ended problems and design methods. The courses are taught in a manner that fosters teamwork, communication skills, and individual professionalism, including ethics and environmental awareness. The classroom experiences, along with outside activities, prepare students for lifetimes of continued learning and leadership. Thus, the engineering programs enable graduates to make significant contributions in their chosen fields while at the same time recognizing their responsibilities to society.

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[Special Off-Campus Programs](#)

[Technical Grade Point Average Requirements](#)

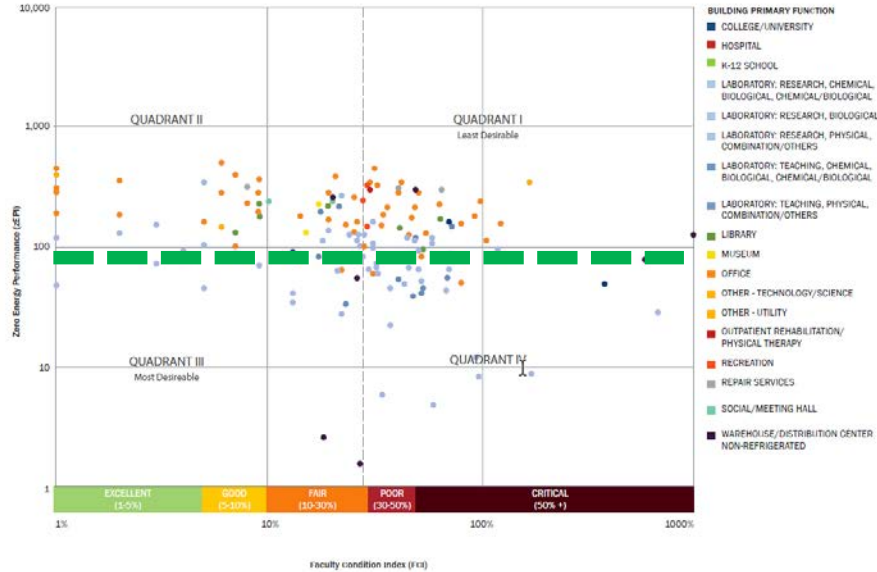
UIUC Master Plan

STUDENT-CENTERED CAMPUS

The intent of the Campus Master Plan is to provide a physical environment to support students' transformative learning; personal growth and development; global and cultural awareness; engagement and leadership; and, lifelong success. The University of Illinois at Urbana-Champaign has over 4.2 million assignable square feet of student life facilities including residence and dining halls, indoor and outdoor recreation facilities, the Illini Union,

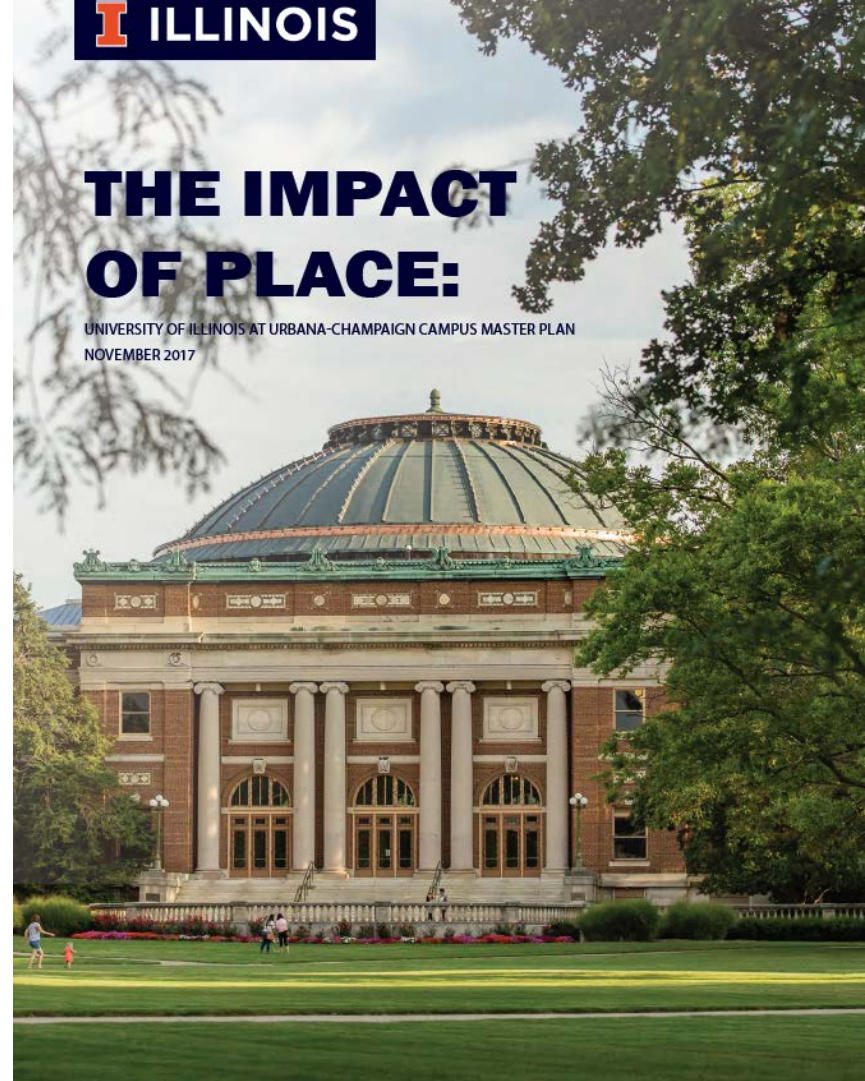


CONDITION-ENERGY MATRIX

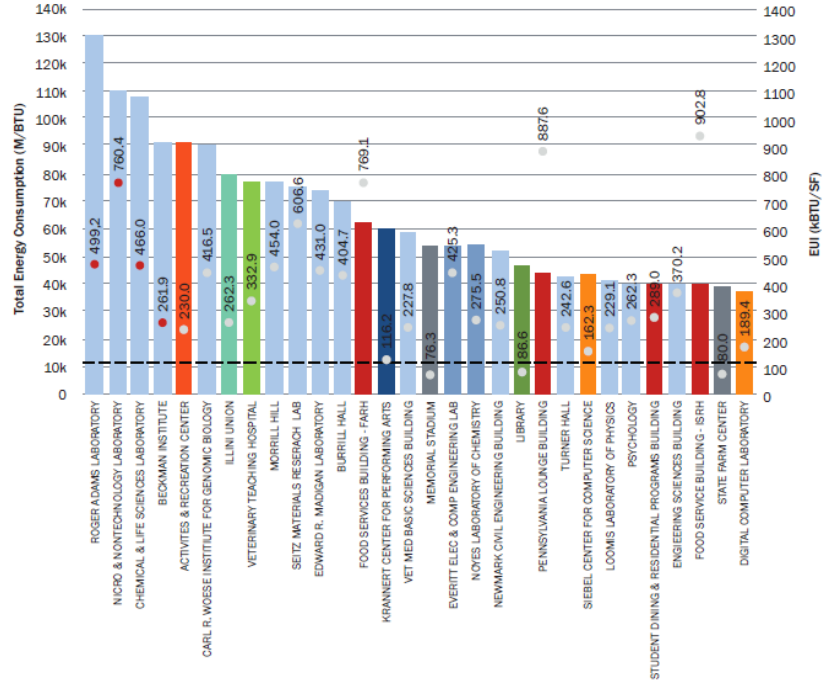


THE IMPACT OF PLACE:

UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN CAMPUS MASTER PLAN
NOVEMBER 2017



UIUC Master Plan

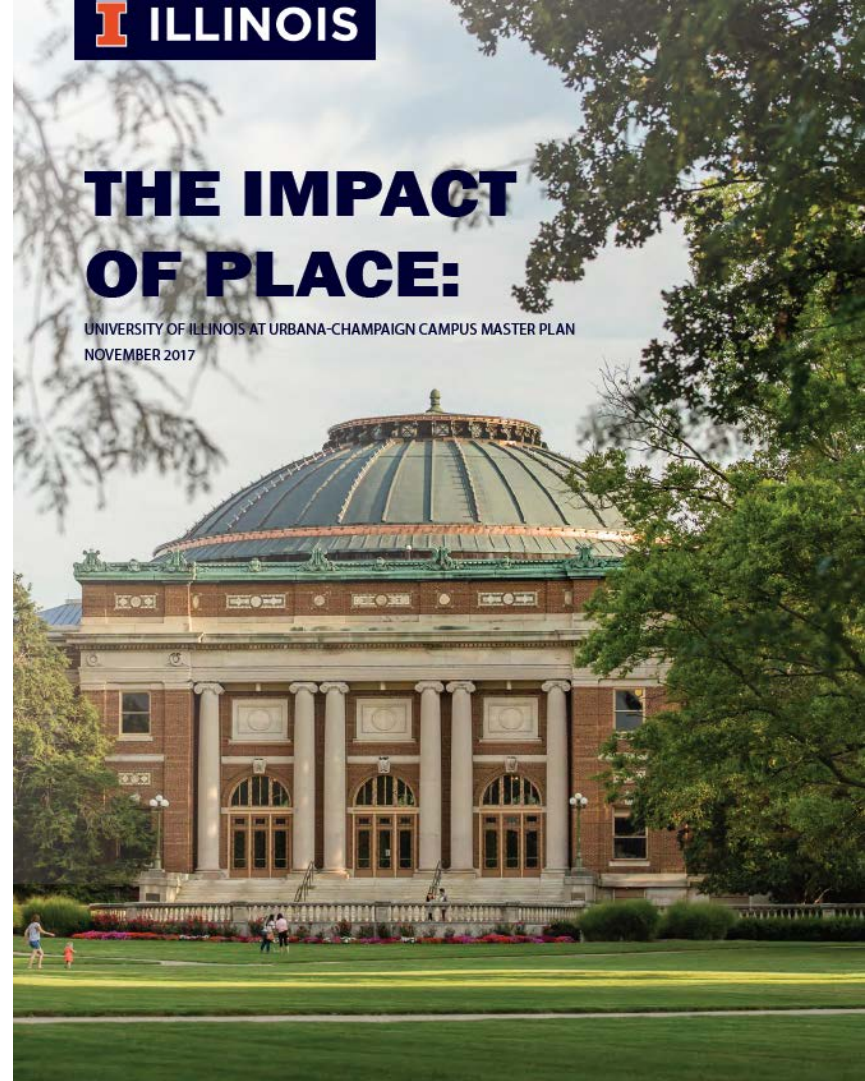


UIUC CAMPUS INSTRUCTIONAL FACILITY
SKIDMORE, OWINGS & MERRILL LLP



THE IMPACT OF PLACE:

UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN CAMPUS MASTER PLAN
NOVEMBER 2017



2015 iCAP

- Carbon neutral ASAP
- Not later than 2050
- Abbott Power Plant (CHP) 50% of campus energy

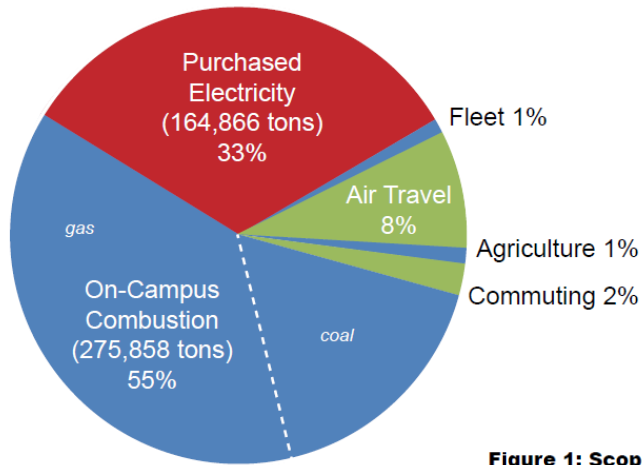


Figure 1: Scope 1, 2, and 3 Emissions.
Scope 1 (on-campus) emissions are colored in blue, scope 2 (purchased electricity) are red, and scope 3 (off-campus) are green.



2015 iCAP

Illinois Climate Action Plan

University of Illinois at Urbana-Champaign

2015 iCAP

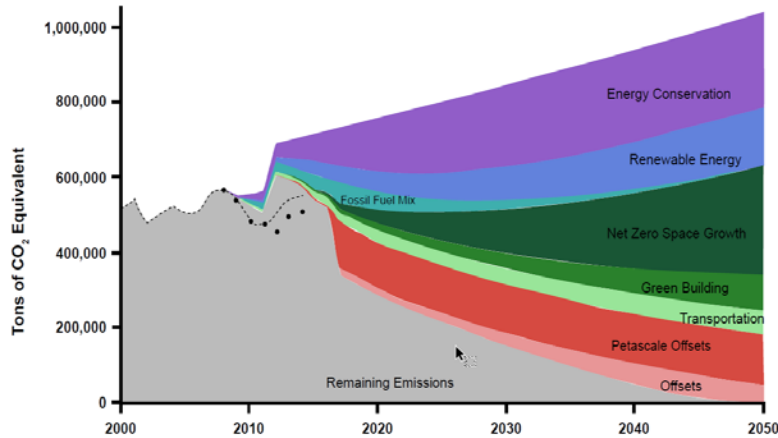


Figure 2: 2015 iCAP Wedge Diagram with annual emissions through FY14 shown as dots and reported emissions through FY14 shown as dotted line



2015 iCAP

Illinois Climate Action Plan

University of Illinois at Urbana-Champaign

Meeting with UIUC Sustainability Team (July 11, 2018)

- Covered bike parking
- Don't like solar or green roof
- Food waste capture
- Natural vegetation prevents flooding
- No Wind
- Geothermal
- Recycle
- Electric heat (heat pump)
- Low temp heating water
- *District heat pump system for engineering quad*
- Micro batteries
- 25% over ASHRAE as campus standard
- Funding opportunities

MEETING MINUTES

MEETING DATE	July 11, 2018	PROJECT	UIUC COE Instructional Facility
TIME	10:30am – 12:00pm CT	PROJECT #	218353-00-CH
LOCATION	UIUC, Engineering Hall, Room 312, 1308 W Green St, Urbana, IL 61801	SUBJECT	Sustainability Discussion
PREPARED BY	Rachael Frank, Dan O'Riley	MEETING #	UIUC 004

ATTENDEES

UIUC

Liang Liu	Associate Dean of Facilities
Doug Reddington	Project Planning Architect
Morgan White	Director of Sustainability
Scott Willenbrock	Professor, Cross-Cutting Physics

DEVELOPMENT

Chris Dillion	President, Campbell Coyle
Kerry Dickson	Managing Director, Vermilion Development

SOM

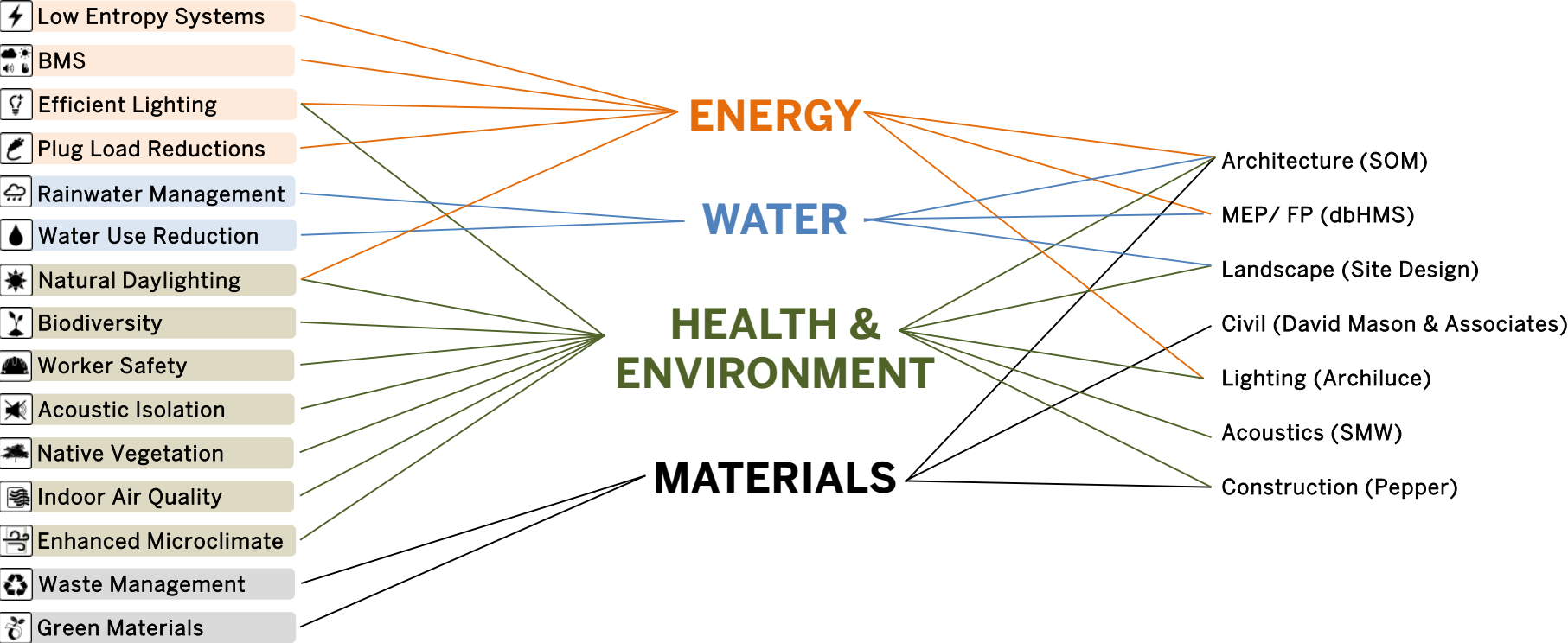
Brian Lee	Partner
Dan O'Riley	Associate Director
James Mark	Associate Director & Project Manager
Rachael Frank	Assistant Project Manager

These notes record the discussions and reflect the current status of the project. If you have any comments or corrections, please notify SOM in writing within 10 days.

ITEM	SUBJECT	ACTION
1.1	<p>Project Overview</p> <p>The meeting began with an overall introduction from Chris Dillion/Campbell Coyle and Liang Liu/UIUC.</p> <ul style="list-style-type: none"> UIUC stated LEED Silver is a starting point for the state. Chris Dillion/Campbell Coyle stated the project goal is for this project to be LEED Gold. 	
1.2	<p>Sustainability Wish List</p> <p>UIUC stated they aspire to include the following elements into the project if possible:</p> <ul style="list-style-type: none"> -Covered Bike Parking 	

High Performance, Low Entropy Design
Honest, Simple Systems

High Performance Design



High Performance Design Enhances Learning

Primary Strategies

ENERGY

- Campus heating and cooling plant
- Radiant slab heating
- Chilled beam cooling
- Displacement ventilation
- Energy dashboard
- Net Zero ready
- LED lighting
- Lighting control
- Big data
- Future weather provisions

WATER

- Sump Pump water reuse
- Condensate recovery
- Fountain water waste reuse
- Sponge Site (Evaporation + Onsite Storage + Permeable Landscape >80% of storm water)
- Water on emergency power

HEALTH & ENVIRONMENT

- Natural Daylighting
- Indoor Air Quality
- Healthy Outdoor Space
- Circadian lighting control
- Natural ventilation
- Big data
- Plants and pets
- Enhanced acoustics

MATERIALS

- Local materials
- Healthy Materials
- Construction waste management

Stretch Strategies

- Heating and cooling plant on site
- Passive House
- Ground source heat pump/Caisson loops
- Solar wall
- Piezoelectricity
- Electrochromatic glass
- Lighting powered by digital infrastructure
- R40 Walls
- Photovoltaic Array

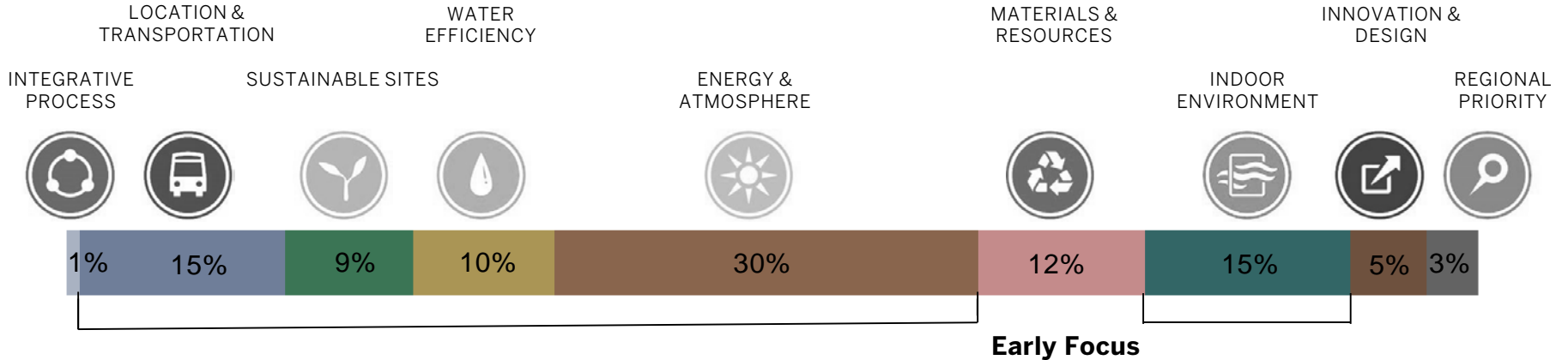
- Stormwater reuse
- No water for irrigation
- 98th % of rainfall retention / detention

- Enhanced Daylighting with North side clerestory for atrium daylighting
- Increased vegetation / Phytoremediation with plant wall
- Thermal comfort app
- Monitor particulates during construction

- Healthy Materials⁺, no red list, higher % of HPD and EPD

Early Focus Areas

- L&T + SS
 - free/cost effective strategies
- Water, Energy, Indoor Environment
 - A/MEP integration requirements and cost implications



THANK YOU