

IQ - ISEE Quarterly

An update from the Institute for Sustainability, Energy, and Environment

What's new in campus sustainability ...

Carbon Sale to Fund Further Work toward Campus GHG Reductions

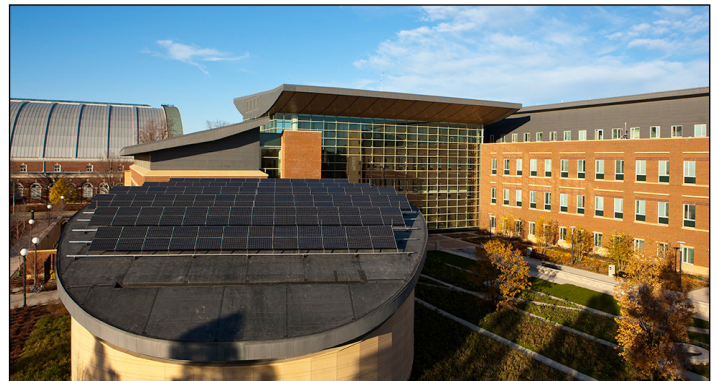
In August, the Institute for Sustainability, Energy, and Environment (iSEE) brokered the sale of the University of Illinois at Urbana-Champaign's certified carbon credits to BP Target Neutral (BPTN) as part of a new Carbon Credit and Purchasing Program through Boston-based nonprofit Second Nature. Proceeds from the sale were more than \$700,000.

Carbon credits are a measure of carbon dioxide or equivalent greenhouse gases (GHG) kept out of the atmosphere. By selling its accumulated carbon credits, Illinois' good work — most of it by Facilities & Services (F&S) — to reduce GHG emissions will fund additional emission reductions and energy conservation projects on the Urbana campus.

"We have taken this step to ensure that our campus can continue to fund the energy efficiency activities that help us push toward carbon neutrality by 2050 or sooner," iSEE Director Evan DeLucia said. "We are glad that Second Nature has helped provide an innovative way for us to fund further work to reach the ultimate goals of the [Illinois Climate Action Plan \(iCAP\)](#)."

The first move will be to purchase carbon offsets to replace the credits sold — as well as additional offsets to create a University virtual storeroom. Campus community members, offices, and academic units will be able to pay for offsets in this storeroom to account for travel or other U of I business activities that increase the campus carbon footprint.

F&S and iSEE will work together to allocate remaining funds toward future projects toward ambitious iCAP goals — including



30% reductions in campus energy usage, energy emissions, water consumption, and agricultural and landscape emissions by 2020.

The sale through Second Nature was made possible because successful, centrally funded energy conservation projects and initiatives on campus have helped reduce energy consumption at the university by more than 25% since 2008.

"Significant energy reduction and the associated cost avoidance is a top priority for campus utilities and energy services," said Kent Reifsteck, Utilities & Energy Services Director at F&S. "Continuing these efforts will directly support the university's teaching and research and help to achieve strategic goals."

[To read more about the sale and the F&S accomplishments that made it possible, visit the iSEE website.](#)

What's inside ...

**Energy Scholars
Website Launched
in August — Page 3**



**'Bin It' Campaign a
Sustainability Week
Highlight — Page 4**

In the Spotlight: Stuti Shrivastava

Stuti Shrivastava is a Ph.D. Candidate in the Department of Plant Biology, and alongside more than 20 student and faculty researchers at the University of Illinois, she is working to create crops *in silico* — computer modeling that will accurately predict plant responses to environmental changes. In a world where climate change already affects many people's ability to grow food globally, a detailed computer model that analyzes the nutritional and growing condition needs of crops may help scientists breed and genetically modify new crops better suited to altered climates.

To achieve this computerized vision of plants, several Illinois departments — including Chemistry, Biomolecular Engineering, Crop Sciences, and Plant Biology — are examining the different levels at which a plant reacts to the conditions of its environment: the atomic and protein level, the interactions between genes and proteins, whole systems within the plant, and finally, the whole plant within its environment.

The overall goal is to tell the story of adaptation inside the plant from the time its surroundings change, Stuti says. As a member of the Amy Marshall-Colón Lab, she studies the second-level step: how the presence (or lack) of a nutrient turns genes on and off in plant cells — called gene expression.

Genes dictate the life-giving chemical operations within plant cells. What Stuti and her team want to know is how the gene expression switch gets flipped from off to on (or vice versa) as environment changes.

For example, think of a plant growing in ideal conditions that suddenly has its water supply cut off, she said.

"The plant is going to respond accordingly to drought and send out signals to say to its cells, 'We are in a state of drought, and we need to respond so that we survive and hope for the drought period to end,'" she said. By observing patterns between the environmental conditions and gene expression levels, she'll identify the "first responders" that tell the plant to (continuing the example) curl up its leaves to save itself from drying out.

Gene expression data is measured in snapshots of chemical markers present in a



plant at a given time point.

"You know what's happening exactly at that time point, but you don't know how that system is responding before or after that particular time point. You have to collect samples at close time points to actually look at (a trend)," she said.

Just like a stop-motion movie or sketched flipbook, the more images you have to run together, the smoother the image or data trend appears. Stuti works with gene expression data from an existing publication (Krouk et al. (2010)) amassed for a study of gene behavior in response to nitrogen, a vital plant nutrient. The readings were taken quite close together at three-, six-, and nine-minute intervals from the time experimental conditions were initiated, and captured the chemical reactions right from the start.

"How are the genes responding?" she asks of her data. "Are they being regulated in such a way that some genes turn on, perform their regulatory reaction, and then shut down, or do they have a continuous expression in the background? What is the backstory behind them?"

The large amount of data available — and the varied ways to analyze it — fascinates her.

Csi researchers part of global food summit

Crops *in silico* co-PI Amy Marshall-Colón and team member AJ Christensen, a National Center for Supercomputing Applications (NCSA) Visualization Programmer, attended the Global Open Data For Agriculture and Nutrition (GODAN) Summit in September 2016 in New York.



Marshall-Colón and Christensen created a writeup on the summit and a mini-documentary on the power of visualization and digital labs in helping to solve the impending world food crisis.

[Read more about the presentation on the NCSA website.](#)

[And check out the new Crops *in silico* webpage!](#)

"You can take that data and analyze it in one way and get some results and then reanalyze your data using some other methods and you'll still get meaningful outputs," she said. "There's so much complexity in biology: Not only in humans, but in plants and fungi and bacteria ... everything is so complex. We are trying to understand the whole processes and pathways behind these interactions. There is always some new idea coming up that you think is interesting and you should explore further."

At the end of the day, Stuti wants to "do something important enough that helps everybody grow."

"My parents are doctors," she said, "I've seen them dedicate their lives to the field of medicine. They are treating patients, and it is their way of making a change in the world. I'm still going to make an impact and change the world in some positive way. Research is my way of doing that. The end goal is helping people," she said.

[Read the full Stuti profile on the iSEE website.](#)

[More about the Crops *in silico* project on the iSEE website.](#)

Enhanced Weathering Centre Funded at Illinois

In Summer 2016, iSEE secured \$910,441 for Professor Evan DeLucia (PI) and Associate Professor Carl Bernacchi (co-PI), both in the Department of Plant Biology, to study enhanced weathering (EW) as part of the newly formed Leverhulme Centre for Climate Change Mitigation.

iSEE Director DeLucia, Bernacchi, iSEE Postdoctoral Research Associate Ilsa Kantola, Department of Plant Biology Technician Michael Masters, and iSEE Technician Chris Sligar comprise the Illinois team. For five years, team members will work on quantifying rates of EW and carbon balance of food crop/bioenergy agroecosystems; testing hypotheses about interactions between EW, crop performance, mycorrhizal growth, and soil properties; and investigating the role of rising CO₂ fertilization on EW, the root microbiome, and plant performance.

Illinois is one of 10 partners in the Centre. Others include the University of Sheffield (lead), the University of Southampton, the University of Bristol, the University of California, the University of Cambridge, the Open University in UK, Cardiff University, the University of Leeds, and the Southeast Asia Rainforest Research Partnership.

The work from this centre is funded by a £10M grant from the Leverhulme Trust, which was established by the will of William Hesketh Lever, the founder of Lever Brothers. Since 1925, the Leverhulme Trust has provided grants and scholarships for research and education; today, it distributes about £80M a year.

[Read more about the new centre on the Sheffield website.](#)



'Energy at Illinois' Launched

In August, iSEE launched a new website to unite the numerous energy scholars on the University of Illinois' Urbana-Champaign campus.

"Energy at Illinois" (energy.illinois.edu) is the new access point for energy-related research, collaborations conducted across campus. The website showcases Illinois scholars' research and engagement programs spread across the continuum of energy from its generation to end user:

- Production / Harvesting, including renewables, fossil fuels, and nuclear;
- Delivery, including physical and wired transmission;
- Storage, including fuel cells and batteries; and
- Demand / Conversion, including motors and residential, commercial and industry use of energy.

In addition, Energy at Illinois has individ-

ual pages for eight issue-focused, cross-cutting energy research areas. On all 12 of these research strengths pages, individual scholars are listed with links to their profiles and work, making it easy to find research collaborators and expert sources.

The site serves as a "front porch" to various energy centers on the Urbana-Champaign campus and that Illinois collaborates in across the nation and overseas — as well as to faculty-led research groups, state surveys, and academic units featuring energy research.

Finally, Energy at Illinois will be a repository for opportunities in the energy field, including those for funding, education, and jobs. And when funding opportunities arise, iSEE stands ready to help build teams of Energy Scholars — and to organize and submit large interdisciplinary research grant applications involving multiple campus units.

Explore the site now at energy.illinois.edu.

Sun Buckets Research Group Finalist for Award

Three University of Illinois Ph.D. students from iSEE's Stored Solar Stove project — Keilin Jahnke, Samantha Lindgren, and Matthew Alonso — are finalists in the Ocean Exchange international competition.

This competition promotes "worldwide solutions with the ability to generate economic growth and increase productivity while reducing the use of nature's resources and the production of waste. The innovators will present the solutions and compete for one of two \$100,000 awards from worldwide sponsors Gulfstream Aerospace Corp. and Wallenius

Wilhelmsen Logistics (WWL)." Winners will be selected in November.

Jahnke, Lindgren, and Alonso are in the Department of Agricultural and Biological Engineering and are part of Sun Buckets, a startup company focused on solutions for the global cooking problem (www.sunbuckets.com).

The Stored Solar Stove project received 2014 seed funding from iSEE and is also supported by the ADM Institute for Prevention of Postharvest Loss.

[Read more about the Stored Solar Stove project on the iSEE website.](#)

What's new with the Student Sustainability Committee ...

13 Projects to be Considered for Funding; 2 Student-led Projects Already Approved

From a highly competitive pool of 29 applications totaling \$2.9 million, the Student Sustainability Committee has invited 13 to move to the next stage of evaluation.



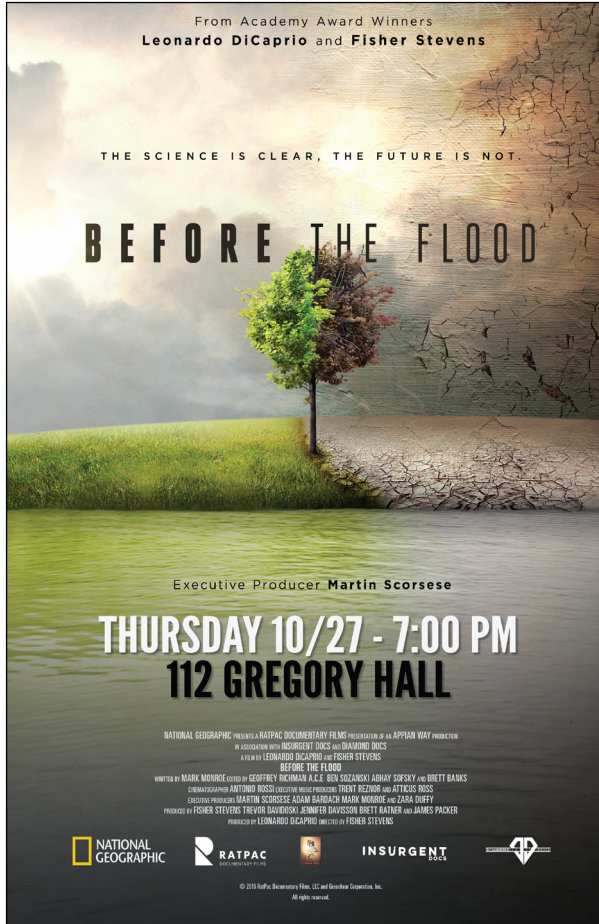
Over the next month, SSC will help applicants develop detailed line-item budgets and more detailed project descriptions.

SSC will make its final decision on which projects to fund by mid-February 2017.

Additionally, SSC selected two small student-led projects for immediate funding, pending administrative approval. The first is an expansion of the wildly successful Illini Lights Out initiative, the first of which occurred in April 2016. The second funded project is for a plot of native plantings near one of the campus residence halls.

If you are interested in helping SSC choose which projects ultimately receive funding, consider attending the public Working Group meetings. Students, faculty, staff, and community members are all welcome to participate.

[A full calendar of meeting times, dates, and locations can be found on the SSC website.](#)



The University of Illinois at Urbana-Champaign was selected to host exclusive pre-release screenings of Leonardo DiCaprio and Fisher Stevens' new documentary "BEFORE THE FLOOD." Hundreds of students, faculty, and staff attended the two screenings, which have since generated a lively conversation among the student body about our personal responsibility to address climate change.

What's new in outreach ...

Sustainability Week Highlighted by New Awareness Campaign

iSEE led the Sustainability Week 2016 celebration on campus with an outreach campaign aimed at increasing student awareness and involvement in individual recycling.

The "Bin It" campaign included YouTube videos of well-known faces on campus, which generated 26,000 social media impressions, games and handouts at various campus sites, which reached nearly 300 students, and a recycling competition.

[Visit the Bin It website to view the videos, learn more about the competition](#)

[— and read up on campus recycling.](#)

The recycling competition prize winners were announced at the Campus Sustainability Celebration, which also featured recognition of iSEE's latest Gold Certified Green Office (the Cline Center for Democracy), Facilities & Services awarding its Energy Conservation Incentive Program (ECIP) winners, and updates from iSEE's Sustainability Working Advisory Teams on Illinois Climate Action Plan progress. More than 150 people attended the Celebration.

iSEE Congress 2016 presentations online

Speakers at "Energy 2030: Paths to a Sustainable Future" made their presentations available for viewing. [Visit the iSEE website to check them out.](#)



In addition, videos of most speakers are also available. [Visit iSEE's YouTube channel to see them.](#)

