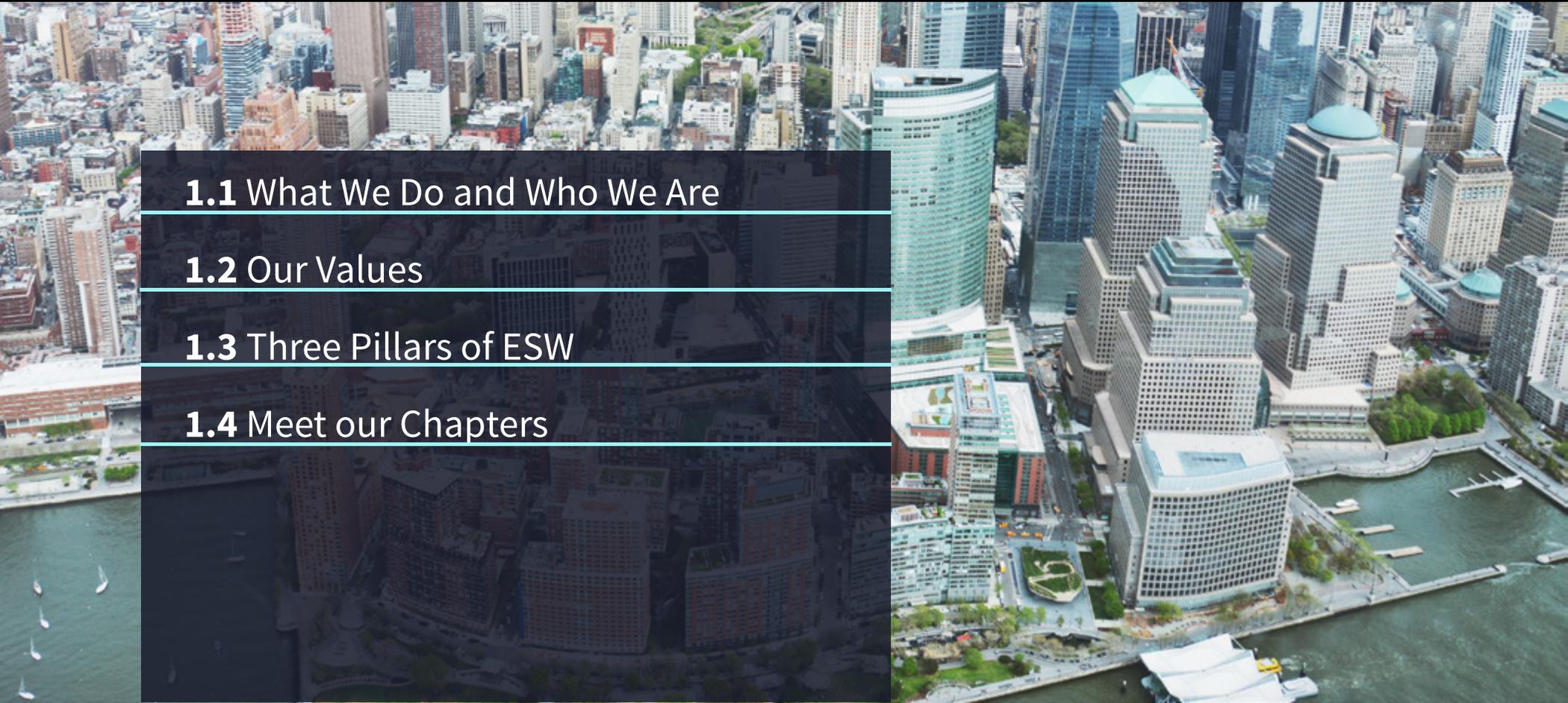




1.0 Hello World

Chapter Basics



1.1 What We Do and Who We Are
1.2 Our Values
1.3 Three Pillars of ESW
1.4 Meet our Chapters

1.1 What We Do and Who We Are

1.2 Our Values

1.3 Three Pillars of ESW

1.4 Meet our Chapters

1.1 Who We Are and What We Do

Engineers for a Sustainable World (ESW) is a non-profit network dedicated to creating solutions to local and global sustainability challenges. Established in 2002, ESW is comprised of students, university faculty, and professionals who believe that technical fields are vital in building a better world. ESW mobilizes students and faculty members through educational programs, sustainability-oriented design projects, and a shared community. Take a look at who we are, what we do, what we stand for, and quick glance at a few of our chapters and the amazing work that they do!



What is ESW?

Engineers for a Sustainable World (ESW) is building the next generation of engineers and scientists, students and professionals from all disciplines by researching, educating, and building a better world one project at a time. Combining a digital education and training with on-the-ground projects, our 40 chapters, 1,000 members, and 2,000 alumni are constantly innovating and testing new approaches to creating a sustainable global community.

Whether we focus on reducing and upcycling food waste at campus dining halls, demonstrat-

ing solar power to grade-school students through a solar-powered smoothie cart, or designing and deploying off-grid disaster response measures in Haiti and New Orleans, our members hone the skills needed in the 21st century to build a sustainable society and economy that respects the planet's limits. In the classroom, we sharpen these skills through courses focused on the systems thinking and creative problem solving necessary to tackle the wicked challenges facing the world today. These local efforts are supported through an ever-expanding online library of skills training, educational con-

tent, and community-building tools. And through our conferences and events, we build bridges that will last a lifetime between students and professionals from diverse backgrounds.

What Do We Do?

ESW is an international network that supports our chapters and benefits our members. We do online short courses and support local faculty, and host regional and annual conferences. Chapters get leader training, connections to others doing similar projects, best practice guides, and project grants.

All of this is run primarily by a distributed team of volunteers (the Leadership Team), and supported by dues, donations, corporate sponsors, and conference registrations. We provide opportunities and training so that sustainability becomes part of the education and practice of every current and future engineer. You can read more about these initiatives below, and donate to help these and other programs flourish.

Collegiate and Professional Chapters

Chapters are the heart of ESW - local groups of individuals working on projects, education, and community. We started with collegiate chapters, and our network includes schools of all shapes and sizes. As we graduate more members, we are founding an initial wave of professional chapters to do their own projects, develop multidisciplinary professional communities, and mentor

A Note on Language

ESW-Headquarters (ESW-HQ) is the term we will use to describe the main ESW office.

The Leadership Team (ESW-LT) is the name for the group of people that create and manage the brand, initiatives, resources, and new directions of ESW.

“We” will refer to the perspective of the Leadership Team.

“You” will refer to you, the reader.

1.1 Who We Are and What We Do

students. We support all of our chapters with leadership training and regional volunteers to help solve problems and find ways that ESW can enhance local efforts.

WPSI (the Wicked Problems in Sustainability Initiative)

Sustainability is full of wicked problems - those that lack a clear definition, have no right or wrong answers, and require significant resources every time you try to change the system. Teaching complexity like this is hard for most schools, but critical for the next generation. WPSI combines local project-based courses with adaptable curricula, professional expertise, and a community around a specific problem each year. We invite you to join us and expose students at your school or company to these problems.

Annual and Regional Conferences

There's nothing like getting together in person. Our Annual Conference, now held in April, brings together hundreds of students, faculty, and professionals from around the country for work-

shops, speakers, and camaraderie around projects, education, and community. Our fall Regional Conferences have the same goals with a tighter community and a more local topical focus. We try out new ways of doing conferences - more than just panels and keynotes - to find the best ways of sharing and learning information, whether it's leadership skills or how to design a solar array.

Short Courses

Adding 'sustainable' to engineering means both new design methods like life-cycle assessment or passive solar architecture, but also exposure to a wide set of topics, such as ecological economics and energy policy. Access to this material should be available to students and professionals regardless of location or local institutions. Since 2014, ESW has offered a series of digital short courses to provide opportunities to learn and engage with new ideas with an eye towards application. Designed to be 4-6 weeks long, digital, and as interactive as possible, they're big enough to have many viewpoints, but small enough for discussion and partici-

pant-driven topics.

Mission & Vision

Our vision and mission guide what we do as an organization. Our vision serves to guide ESW-HQ and all ESW chapters, and represents the ultimate end goal.

The **vision** of ESW is:

“A world of environmental, social, and economic prosperity created and sustained by local and global collective action.”

Every ESW chapter shares this vision, uniting us under a common goal. Building from the vision statement, ESW-HQ has its unique mission, which lays out the general strategy the organization uses to achieve the vision.

The **mission** of ESW-HQ is:

To forge innovative, lasting solutions to local and global sustainability challenges, we:

- **Design** and implement sustainable projects through our student and professional chapters.
- **Educate** and train individuals and organizations on sustain-

able policies and practices.

- **Build** a global network of communities with a culture of sustainability.

Though this is the overarching mission, every chapter has the freedom to develop its own personalized mission statement. Some chapters focus solely on improving the sustainability of their local community, others tend to have a more international focus, and still others tend towards educational outreach and skills development. We encourage you to think carefully about your mission statement and discuss it with both your faculty adviser and local officers.

What really sets ESW apart from other engineering or sustainability organizations is our values. From our definition of sustainability to our views in professionalism, ESW is unique in our approach to handling student chapters. Most importantly, we believe everyone, from the first year engineering student to the English major, can and should be involved in building a more sustainable world.

1.2 Our Values

Social, environmental, and economic sustainability are all necessary.

A sustainable world has to have a robust ecosystem, a lasting and equitable society, and a stable economy. Though our work often focuses on addressing environmental issues, we recognize these other elements as equally important.

Anyone can join and contribute meaningfully.

We recognize the importance of a diversity of skills, backgrounds, and perspectives in addressing complex issues, and actively encourage participation.

We collaborate rather than compete.

While competition is an important element of a sustainable economy, we're concerned with solving problems, not with making a profit. We know the challenges we face are beyond the scope of engineers alone to address, and so we seek to share our knowledge and collaborate with others, in order to

more effectively develop lasting solutions that work for everyone involved.

We are pragmatic optimists.

Pragmatism means seeing the world as it is - in context, with complexity, and often not in very good shape. Optimism is a belief that things can improve. Both are essential for finding effective steps forward.

Implementation and education are equally important for long-term change.

Education is important in understanding environmental issues and training future engineers, but implementation of appropriate solutions is also required to ensure a visible, lasting impact.

Innovation doesn't always mean new technologies.

Appropriate solutions don't always require innovation, but when they do, that can include both technical innovation and innovative implementation of traditional methods and technologies. We build off of what

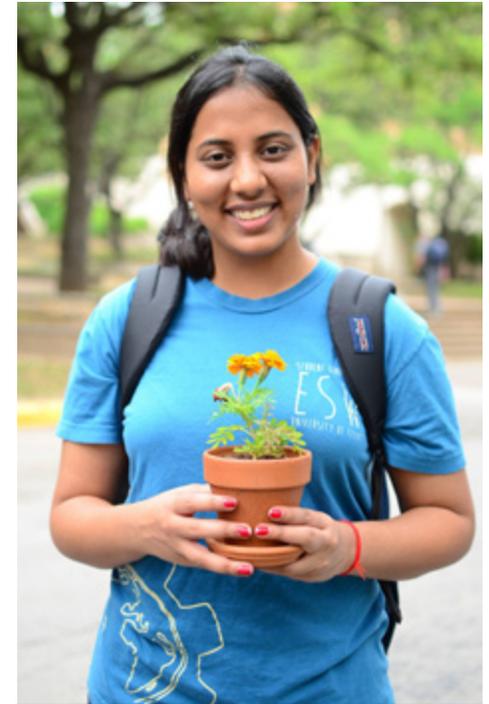
others have done to avoid reinventing the wheel.

It's worth doing the right thing. It's also worth doing things right.

We are ethical and diligent in our work. We develop data-driven solutions to real problems and invest the time and effort to provide quality results, and then we learn from both failures and successes to drive future improvements.

Suits and stiffness are not requirements for professionalism.

Sometimes we need to laugh. Sometimes short sleeves and sneakers make more sense than suits (say, when building gardens). Our ability to be professionals while making a better world isn't compromised by including students or having.



In short, we believe in a holistic, welcoming version of sustainability and engineering.

When we say anyone can join, we really do mean anyone! We welcome students from non-engineering backgrounds, different walks of life, and all manners of diversity. We hope you reflect this openness in your chapters.

Photo credit: UT-Austin

1.3 Three Pillars of ESW



PROJECTS



EDUCATION



COMMUNITY

ESW draws students who want to “do things,” so the bulk of member participation typically lies in projects. Chapters usually develop a team for each specific project, led by a project manager. Projects could be as short as a month, or last for several years —see Chapter 7 for more details. In addition to implementing change through projects, ESW is committed to educating the next generation of technical professionals to be aware and dedicated to sustainability.

Chapters educate their membership and community by hosting lectures, showing

documentaries, and getting involved in education outreach programs with local schools, while ESW-HQ provides webinars and conference workshops for professional and design skills development. This educational component is a key piece that separates ESW from other engineering service-learning organizations.

Beyond projects and education, we believe that a sustainable world requires a strong community—this is where the fun aspect comes into play. Not only does your chapter serve as a community, but ESW serves as a national network of

like-minded people passionate about sustainability. Fun can be educational—a field trip to a wind farm—but it can also just be spending time with other ESW members—like running a race as an ESW team. If you are starting a chapter from scratch or working to revive a struggling chapter, remember the three building blocks of ESW: projects, education, community.

At a glance



50+
Chapters

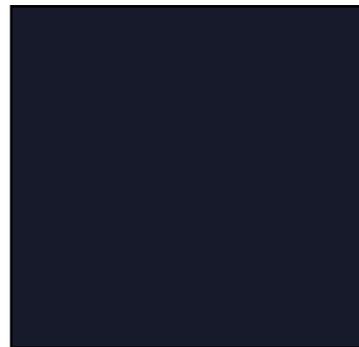


Design

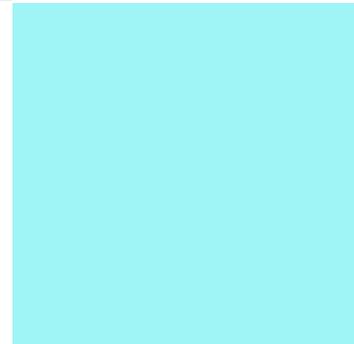
and implement sustainable projects through our student and professional chapters.



Workshops



1250+
Members



Educate

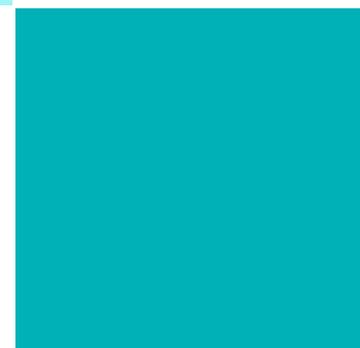
and train individuals and organizations on sustainable policies and practices.

Build

a global network of communities with a shared culture of sustainability.



Short Courses



1.4 Meet Our Chapters

ILLINOIS INSTITUTE OF TECHNOLOGY

From an empty lot on the campus of the Illinois Institute of Technology (IIT) sprang an idea that would materialize to become a multidisciplinary project involving various partners across the university. This was a groundbreaking project for our ESW-IIT chapter! The UFarmIIT project began with a suggestion from a civil engineering professor to turn some vacant space on campus into a productive space for the community. With the help of a first-year architecture design class, students in the ESW-IIT chapter worked with the Office of Campus Energy and Sustainability to create an urban garden on campus.

The initial goals of the project, developed by an architecture student, were to create a few raised planter beds for student volunteers to grow produce for themselves. The ESW-IIT chapter aided in the project by designing and building raised beds, a

hoop house, and a composting facility. The project has since grown to stand on its own as an integral part of the curriculum as well as an independent student organization at IIT.

The space is used by the Inter-professional Projects Program (IPRO) at IIT, a series of courses that trains teams of students from various academic disciplines to address complex problems. The teams work together to develop and complete a project related to service learning, sustainability, and entrepreneurship within

a semester and then display their work during IPRO day on campus. The “Urban Agriculture Innovation” course uses this space to look at problems within the local food system and increase the productivity of urban agriculture in the surrounding Chicago area.

Since the class began in 2012, the farm has grown to incorporate more departments in their research goals. The space now holds electronic monitoring stations that collect baseline data, such as temperature and water consumption, to increase the research viability of the site. Future plans for the site include incorporating aquaponics and a bee habitat as well as developing

a research center. Although the site now operates independently of the ESW-IIT chapter, the group is looking to develop a plan to sell the produce from the site to increase community engagement and create fundraising opportunities. ESW-IIT is continuing to explore the ideas of sustainable agriculture in its urban setting with their new urban farming project looking at blue/green algae as a food supplement. This project is still in the design development phase with a small scale operation in an aquarium, but the project group hopes to develop a full scale model as soon as possible.



1.4 Meet Our Chapters

PENN STATE UNIVERSITY

ESW's Penn State University (PSU) chapter has been working for months on Apparatus X, a multi-purpose living space they hope will make a huge impact in disaster-stricken areas. The idea sprang from an architect student at PSU after he visited New Orleans to do research on architecture in slum areas. He set out to design a disaster relief vehicle that would provide medium and long term shelter to those in need.

The Apparatus X Project is currently in the final stages of its design phases, and project members are hoping to finish the construction phase by the end of the 2015 academic school year. The design is based off of an old stripped-down RV. The disaster relief vehicle will be 24 feet long with seven solar panels and a solar heater on the roof. It will be an adaptable tool trailer, a mobile design studio, and a micro living unit.

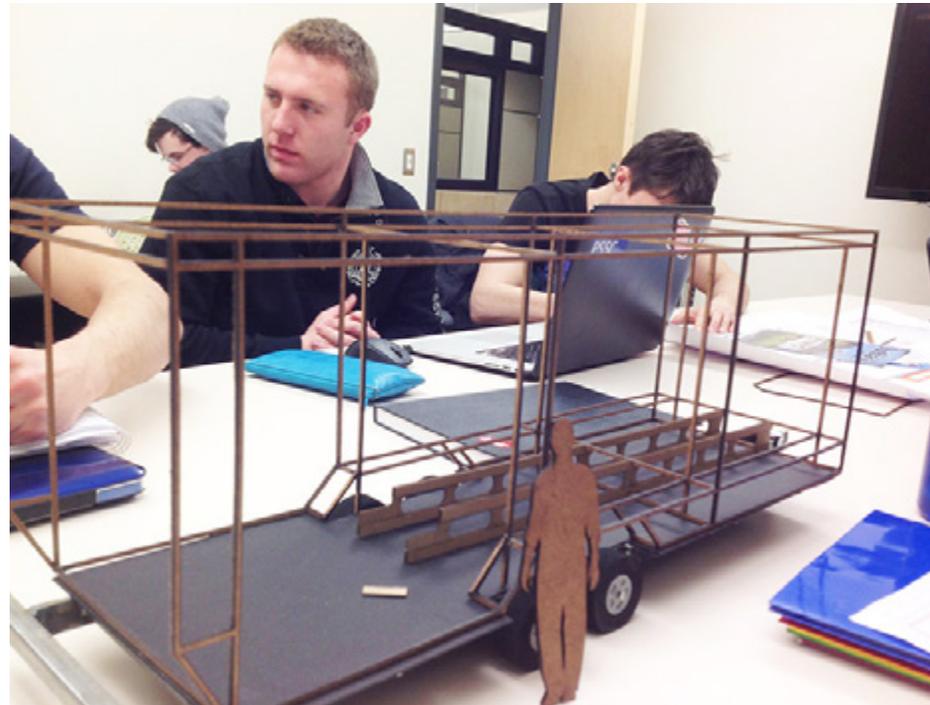
Creating a living space from bare bones is expensive - the total

project budget is about \$25,000. Some of this funding came from corporate sponsors, including IBM's Students for a Smarter Planet. Initially, the project team struggled with fundraising using more traditional methods, so they turned to crowdfunding. After opening an account on Indiegogo, the donations came pouring in - over \$17,000 of the Apparatus X budget came from individual do-

nors in 16 states and 3 countries. The project was also featured on MSNBC and in multiple magazines (including Wired).

It has not always been an easy ride for Apparatus X. It took the project team about two months to get approval from PSU to build the unit on campus. This project also requires a lot of dedication from the students working to complete it, which can be a struggle for students who are working on ESW projects

as an extracurricular. ESW-PSU solved this problem by creating a 4-credit class to work on Apparatus X, alleviating some of the time constraints. Since Apparatus X was the vision of one student, the project team had to have constant communication with him to make sure they were aligned with his plan. This was sometimes a struggle - many new ideas were being thrown around. Despite all these difficulties, the project team hopes to complete the project by May 2015.



Once the students complete construction on Apparatus X, they plan to take it to New Orleans. While some may think New Orleans has been completely restored since Hurricane Katrina, there is still a lot of work that needs to be done. The goal of Apparatus X is to help rebuild the community in the area that is still damaged, and the project team is proud of the work they've done to achieve this goal, from understanding the realistic problem of post-disaster housing, designing a creative solution, and beginning to implement the product where it is needed most.

1.4 Meet Our Chapters

UNIVERSITY OF TEXAS AT AUSTIN

Last spring, the University of Texas at Austin's Engineers for a Sustainable World chapter (ESW-UT) hosted an annual design competition on their campus. The competition, the Alternative Energy Challenge (AEC), encouraged students to design and implement new ideas to generate renewable and sustainable energy. Despite some challenges with fundraising and student interest, the ESW-UT students successfully hosted the event and are planning how to improve the challenge for next year.

The Alternative Energy Challenge was initially aimed at teams of 2-4 undergraduate students in the engineering program. Each team submitted a proposal in the first half of the semester, and ESW-UT provided the top three teams \$300 each to create prototypes of their designs. Later in the semester, the teams presented their designs to a judging

panel of graduate students, faculty members, and industry representatives, and the winning team received a \$1000 grand prize.

The winning design for the 2014 Alternative Energy Challenge was the Hum, or Humble Umbrella, a patio umbrella which could be used at restaurants. This device tried to solve the problem of intermittency between solar and wind power by combining both forms of energy. The umbrella had flexible solar panels that could charge phones during the day while providing shade. At night, the folded-up umbrella acted as a vertical wind turbine, recharging the umbrella's battery power.

The Alternative Energy Challenge was previously hosted by UT's Student Engineering Council, but the competition died out a few years ago. ESW-UT decided to revive the project in an effort



to promote sustainability on campus, but the team faced a few challenges with the revival. They initially faced some trouble with raising the prize money; however, they were able to secure funding from IBM's Student for a Smarter Planet and the UT Student Engineering Council. A more pressing issue was the initial lack of interest from the student body —ESW-UT ended up broadening the challenge to the entire campus, instead of just engineers.

ESW-UT is already looking forward to hosting the challenge for the next two years. They have secured funding from the UT Green Fee, a university fund for environmental service projects on campus. They are also interested in helping products developed in the competition grow past the prototyping stage, ensuring that novel ideas for generating renewable energy turn into devices that help power their community.