



STUDENT SUSTAINABILITY COMMITTEE

Final Report

Project Name: Illini Solar Car, Project Brizo

Date of Report Submission: 9/17/2021

Note: In 2021, Brizo's construction was complete. While Brizo will race again this upcoming summer, the manufacturing of the vehicle is finished, hence the end of this project.

Project Purpose:

Illini Solar Car's goal is to design and build road-legal solar-electric vehicles for the World Solar Challenge and American Solar Challenge. We want to challenge the limits of technology and show that sustainable transportation alternatives are possible.

Project Summary:

Illini Solar Car is a student organization that harnesses the skills from a diverse group of students in pursuit of creating the world's best solar-electric vehicle. Through hands-on, interdisciplinary work that fosters real-world applications, we spark sustainable thinking by designing and building a road-legal car to compete in international competitions.

After traveling thousands of miles powered by the sun, our first car Argo was no longer competitive for racing in cross-country races such as the World Solar Challenge and American Solar Challenge. These races are on the forefront of sustainable innovation and the fierce competition demands teams to bring their best to each event. We took a conservative approach to the design and build of Argo as it was the team's very first car. However, with our second-generation vehicle, Brizo, we decided on a very different design--one that is sleeker and faster than Argo could ever be. We implemented new cutting-edge technology such as a highly efficient solar array, carbon fiber composite shells and chassis, and energy efficient electronics.

We began manufacturing our second-generation vehicle in 2019 with the help of the SSC. In 2020 and 2021 we worked to complete Brizo. Maximizing efficiency, minimizing body weight, and improving aerodynamics and reliability were the team's main goals for an improved vehicle. With each improvement, we are working towards a future with sustainable transportation. We successfully brought this brand-new solar vehicle to the 2021 American Solar Challenge to compete with the best of the best.

Summary of Project Expenditures:

The following table contains an estimate of spending for the development and build of Project Brizo (2018-2021). The green highlighted items were funded through SSC in 2020-2021. The blue highlighted items were funded through SSC in 2019-2020. Note that these expenses only include the costs of designing, building, and manufacturing Brizo. They do not include the \$100,000+ spent on rent, utilities, and competitions during this same time period.

Brizo Expenses	
Solar Cells	\$ 9,000.00
Solar Cell Encapsulation	\$ 11,000.00
Carbon Fiber Rims	\$ 7,500.00
Racing Tires	\$ 3,000.00
Electric Motor	\$ 17,000.00
Electrical Supplies	\$ 35,000.00
Mechanical Supplies	\$ 15,000.00
Manufacturing/Machining	\$ 25,000.00
Composites	\$ 35,000.00
Telemetry Network + Strategy	\$ 5,000.00
Computing & Software	\$ 50,000.00
Rent & Utilities	\$ 60,000.00
Media/Outreach	\$ 5,000.00
Member Development	\$ 5,000.00
Safety Equipment	\$ 5,000.00
Total	\$ 287,500.00

Problems/Challenges Encountered & Overall Progress

This past year saw the end of Project Brizo's construction process. We were able to accomplish all our goals in time to compete at the 2021 American Solar Challenge. See the photo gallery below for detailed images of this progress.

By the end of October of 2020, we completed the chassis construction and by November, it was installed into the vehicle shells. There were delays in the completion of the rolling chassis due to some manufacturing troubles with the steering and suspension. However, the steering and suspension were fully installed by the end of February, 2021.

Large work on the battery box begun in the Fall of 2020 with the spotwelding of the individual battery cells into modules. These were then secured, tested, and mounted into a fiber glass box structure to make the battery box. Further testing and electrical circuit board integration continued on afterwards. By February 2021 the battery box was complete and fully tested. Around the same time, the solar array was wired and installed which allowed the car to charge from the sun for the first time.

In March of 2021, the team held a public (virtual) unveiling event that was very successful. By then, the shell and mechanical components of the car were mostly complete however the electrical system was not yet installed.

Throughout the semester, various electrical components were tested, finalized, and installed inside the car including the motor, battery, lights, and driver interface system.

By the end of June, vehicle integration was nearing an end and the car was finally ready for driving and testing. Throughout July, new drivers were trained, and the car was tested in preparation for the American Solar Challenge.

At the race, the car performed very well. Illini Solar Car was the youngest team to attend but still made an impressive showing. Brizo was the second car to pass inspections and the first new car to do so. The car drove over 500 miles during the Formula Sun Grand Prix qualifying race and was only a few laps behind the 1st and 2nd place teams.

During the road race, Brizo made the 1000-mile journey from Independence, MO to Santa Fe, NM. During the competition, the car drove the second most official miles and placed 4th overall.

Overall, the biggest challenges the team faced throughout the construction of Brizo was related to our ability to stick to our timeline. Some of these challenges were due to internal struggles; as a newer team, we had ambitious goals set for ourselves and had not yet optimized a build schedule for the best results. As the pandemic hit, and our work significantly slowed, sticking to our timeline proved even more difficult.

When we were first funded by SSC in 2019, we believed we would attend the American Solar Challenge in 2020 with Brizo. However, due to timeline delays, and the ultimate cancellation of the event due to COVID-19, this was not possible.

We then had an entire extra year added to our timeline before the next competition, the American Solar Challenge 2021. However, due to unforeseen design mistakes, issues with sourcing materials and access to equipment due to the pandemic, and an overall reduction in manpower, the team was still rushed to finish the car on time. Ultimately, delays in our timeline throughout the past school year reduced the amount of time the team had for vehicle testing and preparation before competition. This unfortunately affected our overall performance. Without a well-tested car, it was difficult to make informed strategy decisions during the race. However, the team is confident that with another year of preparation, we can return even stronger for the American Solar Challenge 2022 next summer.

Student Involvement and Outreach to Date:

Our entire team is operated by undergraduate students at the University of Illinois. While membership fluctuates from semester to semester, our total current membership is over 100 students from over 20 majors across the University.

Students on our team can join a series of subgroups that relate to the various aspects of designing and building a solar powered vehicle. These groups are: Electrical, Mechanical, Business, Media, and Telemetry & Strategy. All students regardless of experience, class standing, and major are welcome to join any subgroup that matches their interests.

Every fall, we run an involved recruitment and onboarding season to attract, teach, and welcome new students to our team. This fall was no exception. Over 600 students from across the University expressed interest in joining our organization and now over 100 of them are a few weeks into our specially designed onboarding process. During onboarding, new members are taught the basics of the tools, software, and skills utilized on our team, giving them everything they need to become a successful member of Illini Solar Car.

Once on our team, all members get an unparalleled experience working on a hands-on, multidisciplinary, and challenging project. Even during their first semester on the team, all members are given a meaningful and interesting project to contribute to our team goals. They gain professional skills that make our students excellent young engineers and problem-solvers.

We have also participated in various events, some through the Grainger College of Engineering, that target middle and high school age students in the area. We teach them about the power of sustainable technology and serve as a representation of the kind of innovation possible at the University of Illinois. In the past year, we have presented to prospective Illinois engineering students, high school students at a local elementary school, as well as a group of underprivileged middle-school age students.

Marketing and Promotion Efforts to Date:

The success of our team's sponsorship and corporate engagement efforts relies heavily on our ability to market and promote our team and the entities that support us. That is why we have dedicated business and media teams that focus on just that. The easiest way for our team to consistently engage and update the public on our mission is through our social media. Across several platforms (Instagram, LinkedIn, Facebook, Twitter) our team has over a thousand followers and even more eyes fall upon our posts as they are shared by the University, friends and family, and our 60+ corporate sponsors. We have also partnered with the Grainger College of Engineering and the new Siebel Center for Design for several articles about our team. Please see the attached list of articles at the end of this document for links.

On our social media, we also frequently share, repost, tag, and post content about our partnership with the Student Sustainability Committee as they are one of our biggest supporters.

We also participate in many local events as a part of the University and in the Champaign-Urbana community. In typical years, we have gone to local schools, displayed our cars at local Cars & Coffee events, and held an event with the Champaign Children's Museum. This past year, we held some virtual events to keep up our marketing and outreach efforts.

In March 2021, we held a very successful livestream event for the unveiling of our second vehicle, Brizo. Hundreds of friends, family, University faculty, and sponsors tuned in to an hour-long event where we debuted our vehicle, had member speeches, and held a question-and-answer session. A recording of the event is accessible here:

https://www.youtube.com/watch?v=RmUlcxG-dxg&ab_channel=IlliniSolarCarTeam. See the photo gallery below for pictures.

Later the same month, we participated in the first virtual Engineering Open House. We produced a video that featured a technical deep dive of our car, Brizo. In April, we also displayed our car at the ECE Earth Walk event.

During the summer, our team participated in our first competition with our new car, Brizo. We drove our solar car from Independence, MO to Santa Fe, NM. Along the way we participated in many different local outreach events that brought the technology of our solar cars to many small communities. Thousands of people were able to see our car and watch it drive over the course of two weeks of competition. From this event, we appeared in many news articles. Please see the attached list of articles at the end of this document for media coverage of our team in the past year.

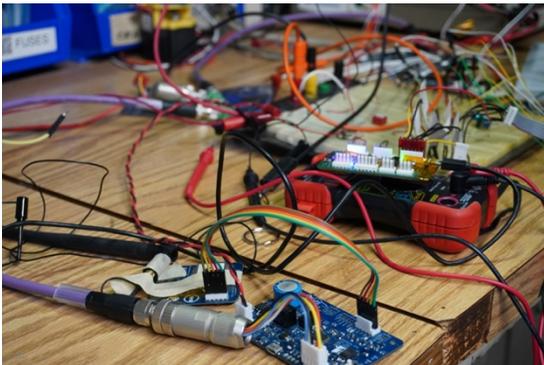
Photo Documentation of Project Progress and Completion



Chassis Assembly and Installation
August/September 2020



Battery Spot-Welding
October 2020



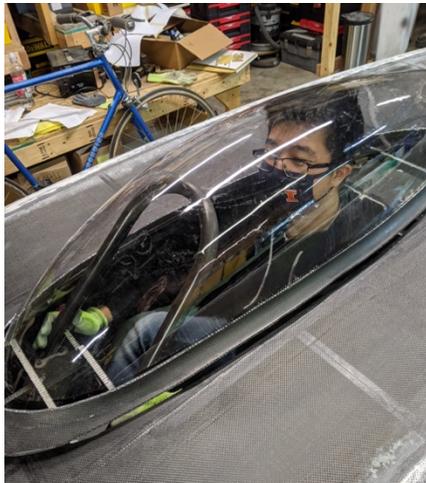
Electrical Testing
November 2020



Shell Sanding and Aerodynamic Improvements
December 2020



Roll Cage Welding
December 2020



Canopy Manufacturing
January 2021



Hinge Installation and Testing
January 2021



Steering Wheel Manufacturing
January 2021



Solar Array Soldering and Installation
February 2021



Shell Vinyl Wrapping
February 2021



Shell Logo Application
March 2021



Completed Shell and Rolling Chassis
March 2021



Brizo Unveiling Livestream Event
March 2021



Brizo on Display at ECE Earth Walk
April 2021



Full Team Photo
May 2021



New Driver Training
June 2021



Car Testing
July 2021



Brizo and Team at Vehicle Inspections Before Competition
July 2021



**Brizo Driving on the Track During the Formula Sun Grand Prix Qualifier
July 2021**



**The Team Celebrates Their 3rd Place Finish at the Formula Sun Grand Prix
July 2021**



**Brizo Drives Through Colorado During the American Solar Challenge
August 2021**



**The Team Celebrates Their 4th Place Finish at the American Solar Challenge
August 2021**

Compilation of Media Coverage from the Past Year

Daily Illini: <https://dailyillini.com/features/student-organizations/2021/03/18/illini-solar-car-team-reveals-new-vehicle-anticipates-success/>

Harper College: <https://www.harpercollege.edu/about/news/archives/2021/posts/051021.php>

Kansas News Outlet: <https://www.wibw.com/2021/07/30/solar-powered-cars-circle-track-heartland-motorsports-park/>

Kansas News Outlet: <https://www.flatlandkc.org/news-issues/solar-settlers-1000-mile-american-solar-challenge-sets-off-along-santa-fe-trail/>

Kansas News Outlet: <https://www.ksnt.com/news/local-news/solar-cars-take-over-track-at-heartland-motorsports-park/>

Santa Fe News Outlet: https://www.santafenewmexican.com/news/local_news/college-students-race-solar-cars-from-missouri-to-new-mexico/article_6afd7652-f6e0-11eb-b029-83184804d351.html?utm_medium=social&utm_source=facebook&utm_campaign=user-share&fbclid=IwAR3K25-EAF5d98S7PaZ7CDrLCJFTDBuv5E0zvOJpE_gCGpwSpfKPbGQ6TQ

Bay Area Circuits Sponsor Highlight: <https://bayareacircuits.com/blog/sponsorship-illini-solar-car/>

Smile Politely: <https://www.smilepolitely.com/culture/the-humble-camaraderie-of-solar-car-racing/>

Siebel Center Newsletter: <https://emails.illinois.edu/newsletter/720651373.html>

Siebel Center for Design/Grainger College of Engineering: <https://grainger.illinois.edu/news/features/solar-car>