View results

Respondent
4 Derin Sozen

03:40
Time to complete

Instructions

Please adhere to the session word counts. Project leads must present their project at a SSC Working Group meeting prior to the submitting their application. The Working Group meeting schedule can be found on the SSC website.

NOTE: This document will be shared publicly on our SSC Illinois Climate Action Plan (iCAP) portal so that others can learn from your project.

If you have any questions about Working Groups and/or the SSC application process, please contact the SSC at Sustainability-Committee@illinois.edu.

1

Has someone from the project's team presented their Step 2 project at an SSC Working Group meeting? *

- (●) YES
- ( ) NO

2

Select the Working Group meeting you attended. *

- (●) Energy + Transportation & Infrastructure Working Group Meeting
- ( ) Food & Waste + Land, Air, & Water Working Group Meeting
- ( ) Education & Justice Working Group Meeting

3

Date of the Working Group meeting you attended. *

10/15/2024

4

Project's Name *

Illini Electric Motorsports - High Efficency EV Racecar

5

Amount of funding requested from the SSC for this project *

$142,724.87

6

Project Category *

- ○ Education & Justice
- ○ Energy
- ○ Food & Waste
- ○ Land, Air & Water
- ◉ Transportation & Infrastructure

7

Project Abstract *

In less than 100 words, briefly describe the project.

Every year Illini Electric Motorsports fully designs, builds, manufactures, and race an electric formula-style car. Every component of the car is sourced, designed, and manufactured by students. We are judged on the power efficiency, raw performance, reliability, and design of our vehicle. Our team consists of 497 members. Since we fully design our own powertrain, members learn the intricacies of developing, building and testing a performant and efficient electric vehicle including the battery pack, motor controls, software, carbon monocoque, and more. Industry giants like Tesla, John Deere and Rivian recruit from IEM to develop the next generation of EVs.

8

What key changes are reflected in your Step 2 application compared to your Step 1 application, if any, and why? *

None, we were suggested to keep our application the same.

Project Lead

9

Project Lead's Full Name *

Derin Sozen

10

Project Lead's Department/Campus Affiliation *

Student - Grainger

11

Project Lead's University Email Address *

dsozen2@illinois.edu

12

All student-led projects require a faculty/staff advisor. Is this proposed project a student-led project? *

NOTE: Only currently enrolled Illinois students are eligible to be a Project Lead.

- ◉ YES (by selecting YES, you affirm that the Project Lead is a currently enrolled Illinois student)
- ○ NO

Faculty/Staff Advisor

A Faculty/Staff Advisor is required for all student-led projects.

13

Faculty/Staff Advisor's Full Name *

Samridh Singh

14

Faculty/Staff Advisor's Department *

MechSE

15

Faculty/Staff Advisor's University Email Address *

ssingh76@illinois.edu

Project's Financial Contact

The project's Financial Contact must be a full-time Illinois employee who has the authority to manage the project's financials and generate financial reports on behalf of the project.

16

Financial Contact's Full Name *

Sarah Power

17

Financial Contact's Department *

MechSE

18

Financial Contact's University Email Address *

sfpower2@illinois.edu

19

Are there additional members of your project team? *

- (●) YES
- ( ) NO

Additional Team Member

20

Team Member's Full Name:

Adi Nikumbh

21

Team Member's Department/Campus Affiliation:

Student

22

Team Member's University Email Address:

nikumbh2@illinois.edu

23

Do you have additional team members? *

- (●) YES
- ( ) NO

Additional Team Member

24

Team Member's Full Name *

Curtis Lam

25

Team Member's Department/Campus Affiliation *

Student

26

Team Member's University Email Address *

cjlam2@illinois.edu

27

Do you have additional team members? *

- (●) YES
- ( ) NO

Additional Team Member

28

Team Member's Full Name: *

Josh Jenk

29

Team Member's Department/Campus Affiliation: *

Student

30

Team Member's University Email Address: *

jajenks2@illinois.edu

Project Questionnaire

31

List your proposed project's timeline and major milestones. *

NOTE: SSC funding agreements remain active for two years. Thus, your timeline should reflect your activities over a two year period or less.

In the next two years/4 semesters, you can expect the team to build two electric vehicles with advanced motor controls and powertrain housed in an advanced carbon fibre monocoque built to compete in Formula SAE Electric Michigan 2025 and 2026. In the first year's car you can expect a vehicle that has advanced regenerative braking system, by driving negative torque to the motors during driving, the vehicle can recharge the battery pack greatly increasing the power efficiency of the vehicle and reducing the number of cells required to build the battery pack, reducing carbon footprint. The vehicle will also sport a carbon fiber monocoque which will greatly reduce the weight of the vehicle and thus improve the power efficiency of the vehicle. We plan to implement reusable vacuum bags, which are new in the industry to greatly reduce our carbon footprint in the manufacturing of our vehicle.
We will use the fall semester to design the vehicle we expect to complete our vehicle design including regenerative braking and the carbon fiber monocoque in November 2024 where we will transition to building and manufacturing the car.
We will complete the plan to manufacture this design of vehicle by the end of fall 2024
We plan on completing the vehicle manufacturing in March 2025 where we will then begin testing.
We will continue to test our vehicle until the FSAE competition in June 2025 to ensure that our design is reliable and to validate our designs and simulations with real-world data.
In the second year vehicle you can expect a fully capable and power-efficient torque-vectoring system that can adjust the amount of power sent to each wheel hundreds of times a second to maximize efficiency during turning. This vehicle, by using composited into our battery pack case and suspension will see a great decrease in weight compared the previous year's car creating even further increase in efficency.
We will use the fall semester to design the vehicle we expect to complete our vehicle design including the torque-vectoring system and carbon monocoque, battery pack, and suspension in mid-late November 2025 where we will transition to building and manufacturing the car.
We will complete the plan to manufacture this design of vehicle by the end of fall 2025.
We plan on completing the vehicle manufacturing in March 2026 where we will then begin testing.
We will continue to test our vehicle until the FSAE competition in June 2026 to ensure that our design is reliable and to validate our designs and simulations with real-world data.
By implementing these two technologies in a two year span, we will be able to greatly improve the efficiency of our vehicle and develop cutting edge technologies in the process with direct industry applications.

32

Describe your project in detail. *

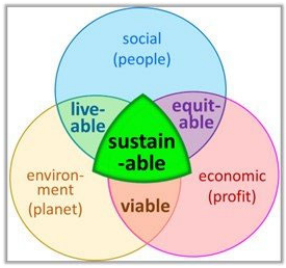
Be sure to address the following:
-What are your project's goals and how do you intend to accomplish them?
-What are your project's deliverables?

Our project goals/deliverables are: an advanced regenerative braking system, a power-efficient torque vectoring system, and an advanced carbon-fiber monocoque.
We intend to achieve this by spending the fall semester in designing the systems surrounding to facilitate the function of these systems, including but not limited to advanced power inverters, battery management systems (hardware and software), Sensors to measure battery pack SOC/SOH to understand when we can deploy regenerative braking, and algorithms to put together these data points together to make a reliable system. We have already worked together with industry giant Bosch Motorsports to help learn more about the intricacies of this system and get feedback on our initial ideas.
For torque vectoring, we will also require advanced power inverters, large sensor arrays, and algorithms necessary to manage the output from the individual motors and gather/process the necessary data to make the informed decisions on how much power to send to each wheel. We have also worked together with Bosch to learn more about the challenges necessary to make this system. We have also been extensively testing modified versions from previous years to learn and validate the algorithms we develop.
A carbon fiber monocoque requires the necessary carbon fiber, bagging materials, and facilities. We plan to purchase materials using from SSC and have worked closely with CML on campus to gain access to the necessary facilities and tools nescessary to manufacture our carbon fiber monocoque. We've done extensive research and manufactured one monocoque previously but we plan to make significant improvements with the help of SSC.

33

Authentic sustainability consists of the overlapping area of 3 spheres: Environment, Society, and Economy.

Describe how your project addresses sustainability. *



EVs are an emerging technology and IEM creates and equips the next generation of engineers that will power the development of future electric vehicles for consumer use. IEM also regularly supports many groups around campus such as NSBE,WECE,MediMech,ASME, and many more by performing many successful workshops to teach the design skills such as electronics and carbon fiber manufacturing that are necessary for the development of electric vehicles and carbon fiber chassis. We provide exposure to many companies in the EV and sustainable Energy industry through our sponsorship program. As opposed to classic formula student vehicles that are powered by gasoline, not only through gas emissions but also the incredibly high noise emissions that are disruptive to the environment.

34

How does your project promote and increase environmental stewardship at UIUC? *

If applicable, also address what the carbon, water, waste, and/or energy savings is associated with your project.

Our project increases environmental stewardship by designing electric vehicles that can reduce our reliance on fossil fuels. Fossil fuel vehicles are one of the most common ways that individuals negatively interact with our environment. The average road car is only 35% efficient, while electric drivetrains can be over 85%. By increasing energy efficiency and allowing more efficient large scale power grids to power our vehicles we can reduce a large amount of carbon emissions.
Our Project will:
• Teach our students how to design, manufacture and test every single component in an efficient electric car
• Increase awareness about electric vehicles and their advancements
• Reduce the Carbon footprint on our team by reducing the amount of energy required for our car

35

Does your project aim to advance one or more of the Illinois Climate Action Plan's (iCAP) objectives? If so, how?

A full list can be found here:
https://icap.sustainability.illinois.edu/objectives

9.1 and 9.2. By investing in electric powertrains instead of the normal formula student gasoline powertrain that have dominated the sport for decades, we are reducing the investment in fossil fuels and increasing investment into sustainable battery/ EV technologies and pushing the efficiency.
We also align with 3.3 by promoting electric vehicles on campus by showcasing what is possible with EV technology, we are spearheading the transition from fossil fuels to sustainable alternatives.
With the use of reusable bagging materials in the manufacturing of carbon fiber composites we will also reduce the waste with iCAP 5.2

36

How many students will be directly impacted by this project? *

500 direct members

37

How many students will be indirectly impacted by this project? *

1500 shown interest in the team every year

38

What is the intended student impact? *

Be sure to address the following:
-How will this project benefit students?
-How will students be involved with this project?
-What educational components are in your project?

There are many benefits to students:
• Learn how to design, build, and test electric vehicle systems
• Apply theory and classroom skills to real world problems
• Build skills relevant to employers and industry
• Develop soft skills, such as teamwork, time management, and communication skills
Student Involvement
• Students will be designing the circuits and writing the code for the project
• Students will be soldering and assembling components for the project
• Students will be testing and validating their designs and implementations
• Students will have to prove the strength and validity of their design in CAD
• Students will have to prove their load capabilities using Finite Element Analysis techniques
Educational Components
• Motor control theory
• PCB Design
• Cooling systems
• Embedded software
• Efficient switching power FETs
• Composite Laminate Theory by analyzing stiffness targets
• Carbon fiber manufacturing

39

Have you spoken with anyone in UIUC's Facilities & Services (F&S) department regarding the feasibility of your project? *

- (●) YES
- ( ) NO

40

With whom in the Facilities & Services department did you speak? *

Kyle Wilcox, MechSE F&S, Mark Pinson, ESPL

Project Finances

41

Has your project team or department previously been awarded funding from the SSC for the same or a similar project? *

- (●) YES
- ( ) NO

42

What is the total amount of SSC funding received to date for the same or a similar project by the project team/department submitting this project ? *

100,000

43

If you receive SSC funding, will your project require additional sources of funding to achieve your project's overall goals? *

NOTE: SSC cannot guarantee financial support beyond that provided in an approved funding agreement.

- (●) YES
- ( ) NO

44

Do you have a plan in place for obtaining additional funding from other sources? *

- (●) YES
- ( ) NOT YET
- ( ) N/A

45

OPTIONAL: Attach any letters of commitment or support here along with any supplemental media that will support your application (presentations, photos, etc.).

46

Download, complete, and submit the **SSC-Budget-Timeline-NEW APPLICATION-template** file linked below. Please be very detailed so that the SSC can fully evaluate the merit of your funding request.

https://studentengagement.illinois.edu/sites/default/files/2024-09/SSC-Budget-Timeline-NEW-APPLICATION-template.xlsx *

SSC-Budget-Timeline-NEW-APPLICATION-template_Derin Sozen.xlsx