



## STUDENT SUSTAINABILITY COMMITTEE

### Final Report

*Thank you for your commitment to green initiatives at the University of Illinois. One of the final steps in completing the terms of the funding agreement for your project is the submission of a Final Report with key information about your project. You will also need to submit a detailed report of expenses (if you don't list it within this document) as well as supporting photos to showcase your project.*

*Please be as accurate as possible in describing the project (including possible setbacks or challenges in meeting the initial goals of the project). Not fully meeting your project's goals will not disqualify you from making future funding requests as long as your reports are as complete and accurate as possible. If you have any questions, please contact the Student Sustainability Committee, at [sustainability-committee@illinois.edu](mailto:sustainability-committee@illinois.edu).*

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**Project Name:** Illini EcoConcept: Designing and Fabricating a Fuel Cell-Driven Vehicle for the Shell Eco-marathon Competition

**Date of Report Submission:** 1/16/2019

**Project Purpose:**

The Illini EcoConcept team (recently renamed EV Concept) aimed to design and manufacture a fuel-efficient concept vehicle to compete in the annual Shell Eco-Marathon. The team also sought to promote the use of sustainable and innovative manufacturing methods and the use of alternate fuels. The car was designed to be battery powered.

**Project Summary:**

The target dates listed in the original application have become irrelevant as two years have passed since the application date. However, this year the team built a new carbon fiber chassis and body for the first time in multiple years which was one of the major goals listed in the original application. The car was named EV-1. Because many of the project leads graduated, the team went through drastic leadership changes and lost most of its knowledge about carbon fiber work. Tremendous efforts were made by the remaining members, which ultimately led to our team relearning how to work with carbon fiber. This allowed us to create our first new and completely customized carbon fiber chassis. This year's chassis design allowed for a decrease in weight and higher structural strength compared to prior designs.

The team also switched fuel categories to keep up with the growing focus on battery powered vehicles. Doing so entailed manufacturing a battery powerful enough to power the concept car as well as designing a safe battery management system. The battery successfully passed the official Shell Eco-Marathon safety inspection. Switching to the battery electric fuel category reduced the overall weight of the vehicle as there is no longer a bulky hydrogen fuel cell and

hydrogen cylinder in the car.

The team participated in the Shell Eco-Marathon 2018 competition on the Sonoma Raceway. EV-1 passed the technical and safety inspections which are a set of rigorous tests performed to ensure the safety of the driver and other participants. Many teams do not make it past these inspections. While last minute technical difficulties disabled the team from qualifying to compete, EV-1 was featured in the front row of Shell's family portrait. A picture is attached.

#### **Summary of Project Expenditures:**

See attached spreadsheet.

#### **Problems/Challenges Encountered**

One of the major problems face by our team throughout the course of this project was the loss of leadership and knowledge. The team not only had to relearn many manufacturing techniques within the course of a year, we also had to implement them onto complicated body and chassis designs. This task took much of our team's effort and time in order to complete the car build. Because the team faced such a steep learning curve, the body panels were manufactured on an accelerated schedule and had warped due to thermal plastic deformation. These issues caused delays for our team at competition.

#### **Problems/Challenges Encountered**

The team decided to switch from hydrogen fuel cell to battery electric which forced the team to design and build additional components like the battery stack, battery management system, and motor controllers. Motor controller design for such high-power application is a very involved process that required multiple iterations. The design our team brought to the competition caused issues.

#### **Student Involvement and Outreach to Date:**

All our previously listed accomplishments have been attained through the hard work of students. The team is constantly recruiting new members. The team presented our previous build in last year's Quad day event and collected over 90 emails to send info-night invitations to. The team also holds a demonstration in the annual Engineering Open House where a presentation about the cars' efficiency and the team driver does a few laps for the public.

#### **Marketing and Promotion Efforts to Date:**

Our team created posters which we have been using to recruit students of all majors for our team. We participate in the Quad day event which allows us to showcase our vehicle to students. We have been featured in a blog post by our sponsor Ansys.

#### **Additional Comments:**

The EV Concept team (formerly Illini EcoConcept) has been struggling with various major issues in the recent years. The team is composed entirely of students, so it is a truly crippling event when multiple sub team leaders graduate at once. This happened in the past years and it

caused the team to lose a lot of knowledge and records. The team has also lost its shop space in the Mechanical Engineering Building due to renovations and was denied the opportunity to move its operations to the ESPL.

Another major complication was the relocation of the Shell Eco-Marathon competition to the Sonoma Raceway. While the team had historically driven to Detroit, traveling to California increases travel costs greatly.

Despite facing these adversities, the team will continue with its project. The EV Concept team is organizing the lease of a rental shop space to continue its operations for the 2018-2019 academic year and sponsors have been contacted to fund the lease. The team is also working to train newer members and document all processes so that there is no loss of knowledge when team members leave the team.

The EV Concept team greatly appreciates the support granted by the Student Sustainability Committee and hope to continue to educate and inspire the future Eco-conscious automotive engineers.

In addition to the above fields, please provide a detailed accounting of how the funding was spent as well as pictures of the final project in an email to [sustainability-committee@illinois.edu](mailto:sustainability-committee@illinois.edu). Thank you again for your commitment to sustainability.