



# REQUEST FOR PROPOSAL

THE 13<sup>TH</sup> U.S. DEPARTMENT OF ENERGY AVTC SERIES  
NORTH AMERICA'S PREMIER COLLEGIATE AUTOMOTIVE ENGINEERING  
COMPETITION



THE ADVANCED VEHICLE TECHNOLOGY COMPETITION PROGRAM  
IS MANAGED BY ARGONNE NATIONAL LABORATORY  
FOR THE U.S. DEPARTMENT OF ENERGY  
<https://avtcservices.org/>  
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# Executive Summary

Item	Description
Request for Proposals Issue Date	October 7, 2021
Submission Deadline for Proposals	January 20, 2022, at 4 p.m. Eastern Standard Time
Required Submission Documents	<ol style="list-style-type: none"> <li>1. Administrative Proposal (requirements in Section D-2) with the following naming convention: <b>UniversityName_EcoCAR_AdminProposal.pdf</b></li> <li>2. DEI Proposal (requirements in Section D-3) with the following naming convention: <b>UniversityName_EcoCAR_DEIProposal.pdf</b></li> <li>3. Administrative Support Letter: (requirements in Section D-4) with the following naming convention: <b>UniversityName_EcoCAR_AdminSupportLetter.pdf</b></li> <li>4. DEI Support Letter: (requirements in Section D-4) with the following naming convention: <b>UniversityName_EcoCAR_DEISupportLetter.pdf</b></li> </ol>
Means of Submission	An electronic PDF version of the Administrative Proposal, DEI Proposal, and University Support Letters must be submitted to the <a href="#">EcoCAR EV Challenge website</a> .
Anticipated Teams Accepted	Up to 14 teams
Eligibility	Schools located in the continental United States that are accredited by the Accreditation Board for Engineering Technology (ABET). Schools located in Canada that are accredited by the Canadian Engineering Accreditation Board (CEAB).
Multiple Submissions	A university may collaborate between multiple campuses as one “team,” however, proposals will only be accepted from one university.
Non-Disclosure/IP Agreement	All participating universities will be required to agree to and adhere to the terms defined in non-disclosure (NDA) and intellectual property (IP) agreements from competition-level sponsors. Under the IP agreement from GM, the student participants and graduate participants will retain ownership of any intellectual property they create while working on the project and will grant GM a license to practice any inventions created. Other competition-level sponsors who donate products which require sharing confidential data with the universities may also require separate NDA and/or IP agreements.

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# A Overview

The U.S. Department of Energy (DOE), in partnership with Argonne National Laboratory (Argonne) and the automotive industry, established the Advanced Vehicle Technology Competition (AVTC) program in 1988. For 33 years, the AVTC program has embodied the heart of American automotive ingenuity and provided the ultimate training ground for future automotive engineers and innovators. More than 27,000 students from 93 unique educational institutions have participated, seeding the industry with engineers who have helped redefine the automobile over the last three decades.

Today, the AVTC program is North America's premier collegiate automotive engineering competition, providing an unparalleled, hands-on educational experience that has transformed the traditional classroom environment into a hub for automotive innovation. By engaging university students in advanced technology research, the competitions also support national efforts to encourage students to pursue careers in science, technology, engineering, and math (STEM) and enable the U.S. to develop the workforce needed to be competitive in the global marketplace.

DOE is pleased to partner with General Motors (GM), MathWorks (MW), and Argonne to launch the 13th AVTC series that will foster a clean energy workforce that reflects the diversity of North America. This public/private partnership will foster the resources of government and industry to empower the next generation of engineers and business leaders to help address the toughest mobility challenges facing our nation.

This new competition series, EcoCAR EV Challenge (EcoCAR), will challenge up to 14 North American universities to engineer a next generation battery electric vehicle (BEV) that utilizes automation and vehicle-to-everything (V2X) connectivity to implement energy efficient customer-pleasing features, and meet the decarbonization needs of the automotive industry. EcoCAR teams will experience a hands-on, real-world environment that exposes students to industry-grade components, tools, and methods, and connects students with industry subject matter experts (SME) and mentors. The four-year competition series will reflect industry best practices with expanded focus on model-based design, vehicle connectivity, and automated controls development. EcoCAR will also include a major focus on equity in mobility, and diversity, equity, and inclusion (DEI) in STEM to help build clean energy mobility solutions and opportunities for all.

As the administrator of this four-year competition series, Argonne is releasing this request for proposal (RFP) to select up to 14 North American universities with accredited engineering programs to participate in EcoCAR. Participation in EcoCAR will be determined through this RFP process; all teams that continue to operate in good faith will remain eligible to participate throughout the four-year competition series. No other teams will be selected to participate in subsequent years.

Teams will be selected for EcoCAR based on multiple factors, including the quality of the proposal, technical expertise, related experience, robust administrative support committed by the university and other local partners, as well as the university's commitment to DEI. Additional updates will be posted on <https://ecocarevchallenge.org/>.

## A-1 EcoCAR: Vision and Goals

The overall vision of EcoCAR is to provide an opportunity for university students to participate in hands-on automotive research and development at the leading edge of technology by using contemporary industry standards and practices. Our detailed vision and technical goals for the competition are listed below.

## A-2 Vision

- Provide a hands-on, real-world experience in STEM that:
  - Fosters practical learning in a safe environment
  - Incorporates the use of math-based tools to improve engineering education
  - Enables participants to develop and refine complex vehicle control and safety systems by using industry testing/validation processes and methodologies
  - Prepares students to work in the automotive, mobility, and energy industries
  - Fosters a clean energy workforce that reflects the diversity of North America.
- Develop highly skilled engineering leaders and innovators with a strong understanding of:

- Advanced propulsion systems
- Propulsion system controls
- Connected and automated vehicle technologies
- Automotive mechatronics
- Model-based design (MBD) techniques
- Structural design and analysis
- Other critical engineering disciplines.
- Support university teams in the recruitment of students in the following disciplines:
  - Mechanical Engineering
  - Electrical and Computer Engineering
  - Computer Science and Software Engineering
  - Industrial Engineering, Systems Engineering, and other engineering disciplines
  - Communications and Business.
- Focus on DEI throughout all areas of the program, including an Innovation in Mobility Equity initiative which challenges teams to identify and address specific equity and electrification challenges in the future of mobility through the application of innovative hardware and software solutions.
- Recruit and retain students that represent the diversity of automotive customers and promote an environment of inclusion and diversity within the program and among the participating teams.
- Educate students in key aspects of project management, enabling them to develop exceptional leadership, teamwork, and professional skills that will better prepare them for their future careers.
- Implement youth outreach and recruiting initiatives that promote careers in STEM.
- Demonstrate the potential of advanced propulsion systems, connected and automated vehicle (CAV) technologies, and other innovative technologies to analyze energy efficiency, leading to greater transportation energy affordability, reliability, and security.
- Challenge students to weigh all the benefits of their design, such as energy efficiency and consumer features, against the constraints of cost and risk of implementation.
- Provide a platform to facilitate systems-level engineering curriculum and instruction in engineering departments at an elevated level.

## A-3 Technical Goals

The technical goals of EcoCAR are as follows:

- Meet decarbonization needs of the automotive industry by applying automation and connectivity technologies to state-of-the-art BEV platforms:
  - Utilize a combination of on-board sensors and bidirectional vehicle-to-everything (V2X) connectivity to implement energy efficient and customer-pleasing automated control features
  - Implement and refine advanced powertrain, charging, and thermal systems to use grid electricity intelligently.
- Identify and address specific equity and electrification challenges in the future of mobility through the application of innovative hardware and software solutions.
- Establish and maintain effective relationships with team-selected customers to guide design decisions and implementation throughout the vehicle development process.

## B About the Competition

### B-1 Team Structure and Interdisciplinary Emphasis

In order to be successful in EcoCAR, universities must employ a strong interdisciplinary initiative both internal and external to the College of Engineering. Teams should recruit students in the areas of Mechanical Engineering, Electrical and Computer Engineering, Software Engineering, and/or Computer Science in order to meet competition objectives and requirements. In addition to the various areas of engineering, EcoCAR has a heavy focus on communications and project

management, with an overarching motivation of diversity, equity, and inclusion. University teams will likely find students from other disciplines to be valuable and necessary assets to the planning and execution of their EcoCAR programs. The emphasis on these areas imitates a real-world automotive industry environment and gives EcoCAR graduates the skills to enter the field fully prepared for a successful career immediately upon graduation.

In order to ensure success in EcoCAR, teams will be given some discretion to assign roles based on the organizational structure that meets their team's needs. However, the teams are provided support through competition or matching funding to implement the following positions:

- Faculty Advisor
- Project Manager (PM)
- Communications Manager (CM)
- Diversity, Equity, and Inclusion Manager (DEIM)
- Vehicle Controls Lead
- Connectivity and Sensors Lead
- Technical Specialist

We do not require that the students for these roles be identified by the time of your proposal submission. However, the roles are explained in the following subsections to convey the depth of the program, to detail the resources required for successful execution, and to reiterate how they are aligned with general industry practices.

### *B-1.1 Faculty Advisors*

Each team is required to provide a minimum of two faculty advisors to support their team. These two primary faculty advisors should collectively have experience in advanced propulsion systems, vehicle design and integration, and CAV technologies. For example, a subject matter expert (SME) advisor may oversee the CAV development, assuming that they have the appropriate expertise. However, one faculty advisor must be appointed the lead of the propulsion system development activities, while the other faculty advisor must be appointed lead of the CAV activities.

Additionally, one faculty advisor must be appointed as the Lead Faculty Advisor for the team, who will be the organizer's main contact and will have responsibility and authority for the program and participating students. Faculty release time and other requirements are defined in a later section.

Additional faculty are strongly recommended to provide the team with additional mentoring and guidance in areas including, but not limited to, Communications, DEI, Project Management, Fundraising/Sponsorship Development, Technical Writing and Presentations, etc. This mentoring may be provided by additional faculty advisors, university administrators or other staff, as well as local industry sponsors or SMEs.

### *B-1.2 Project Manager (PM)*

The Project Manager (PM) is a competition-funded graduate engineering student who serves in a key management role for the overall team. The PM should be a graduate student from any discipline, up to the discretion of the Lead Faculty Advisor, but they must have an engineering undergraduate degree or currently be enrolled in an engineering graduate program. Additionally, the PM must have strong technical and leadership skills and be capable of providing continuity to the team over multiple years. The PM works very closely with the Lead Faculty Advisor to plan, execute, and manage all competition deliverables and requirements, and to ensure the team can operate efficiently and align with business and automotive industry practices. The PM will not only develop the overall project timeline and work plan but is responsible for tracking and executing all project-level activities, knowledge transfer, and recruiting and retention activities. The PM will also work with the Lead Faculty Advisor, College of Engineering staff, and the rest of their student team to manage all local sponsorship and fundraising activities.

### *B-1.3 Communications Manager (CM)*

The Communications Manager (CM) is a competition-funded position that oversees all communications and outreach activities for the team. The CM may be an undergraduate or graduate student and will be funded on an hourly basis. The

CM will work with the team to plan STEM outreach, campus, and community events, and will work with university staff to secure local media coverage and government relations outreach. Your university's Communications department should provide leadership and mentoring to enable the CM's success throughout the four-year program. If a proposing university is unable to fill this role with one of its own students due to the lack of an appropriate Communications degree program, it may collaborate with a neighboring university to obtain a candidate for this role.

### *B-1.4 Diversity, Equity, and Inclusion Manager (DEIM)*

The DEI Manager (DEIM) is a competition-funded position that will work closely with the faculty and team leadership to foster and model an inviting, respectful, and inclusive team environment that allows everyone to contribute and thrive. The DEIM may be an undergraduate or graduate student and will be funded on an hourly basis. In Year 1 of EcoCAR, The DEIM will work with the faculty and team leadership, and diversity specialists from the College of Engineering or university administration, to develop a DEI Plan that enables the team to achieve its DEI goals. The DEIM will work with these and other stakeholders, including from campus and community organizations, to implement their DEI goals throughout all four years of the competition. The DEIM will also research, design, and implement best practices for the team to recruit and sustain women and other under-represented minorities on the EcoCAR team and will support the CM and the team in conducting STEM youth outreach in underserved communities. While the DEIM is tasked with leading and championing these DEI activities, DEI should be incorporated and embraced by all areas of the program.

### *B-1.5 Vehicle Controls Lead Engineer*

The Vehicle Controls Lead is a competition-funded, graduate engineering student who serves as lead or advisor for the Vehicle Controls swimlane. This student is intended to provide management, organization, and leadership for controls development activities that interface with various vehicle systems, including propulsion system control, longitudinal automated features, and systems such as charging and thermal control.

### *B-1.6 Connectivity and Sensors Lead Engineer*

The Connectivity and Sensors Lead is a competition-funded, graduate research assistant who serves as the lead or advisor for the Connectivity and Sensors swimlane. This lead is preferably a graduate student in Electrical Engineering, Computer Engineering, Software Engineering, or Computer Science. However, graduate students in Mechanical Engineering with the appropriate prior experience will be permitted. The Connectivity and Sensors Lead will provide management, organization, and leadership for the development of onboard sensing systems, V2X connectivity systems, and interfacing with Vehicle Controls to implement longitudinal/lateral control features.

### *B-1.7 Technical Specialist*

Universities are required to fund a graduate student to serve as a Technical Specialist through matching funding from the university. As the vehicle development progresses, teams will find themselves lacking areas of knowledge and expertise that are required to execute competition tasks. The Technical Specialist is designed to fill those gaps year-to-year. For this reason, the Technical Specialist should be a graduate student in engineering whose skillset aligns with the expertise needed in a given year. Teams may elect to maintain the same student for multiple years or choose a new technical specialist each year of EcoCAR. Teams are encouraged to consider various technical areas for this specialist to fill, included but not limited to: structural analysis, torque management controls strategies, or a chief engineer who provides continuity and technical leadership year to year.

## **B-2 Competition Format, Structure, and Timing**

### *B-2.1 GM Global Vehicle Development Process (GVDP)*

GM uses a global vehicle development process beginning with the determination of market opportunities and development of requirements. After significant research and planning have occurred, the program initiation milestone will be reached, and design, development, and testing using mathematical models and simulations, decoupled subsystem development, and physical hardware testing will begin. The GVDP has further milestones that dictate feature functionality, calibration, and manufacturing process validation of prototype and integration vehicles until a product is developed that can be sold to a

customer. The GVDP provides GM with a competitive global process that integrates best practices from all regions and is based on several fundamentals of vehicle development, including the following:

- Verified and correlated mathematical models are used as the basis for the vehicle development program.
- Specific subsystem “decoupled development” is employed to reduce risk and remove uncertainty from program timing.
- Virtual and analytical simulations of the product and the process precede any physical property evaluations. GM is increasingly developing and relying on these methods to replace physical prototypes.
- The use of physical prototypes as the primary method of validation is minimized. There is strict adherence to the timing and prototype use requirements outlined in the learning analysis, development, and validation plan.
- Product and process development and validation are based on only two physical prototypes:
  - Integration vehicle
  - Manufacturing validation vehicle.

### *B-2.2 EcoCAR Development Process*

The GVDP serves as a model for the EcoCAR development process, which establishes a year-by-year plan for the analysis, development, and validation of the EcoCAR vehicle design. The goal of this process is to establish a long-term, high-level plan for the four-year competition to guide teams through the development of their vehicle to meet competition goals.

The EcoCAR development process incorporates key goals for simulation as well as propulsion and CAVs system integration and functional testing. The competition places a heavy emphasis on simulation and analysis throughout the series, from initial design approval to vehicle testing and validation. While the process is modeled after the GVDP described above, it is modified to account for academic years, team structures, and overall competition objectives.

### *B-2.3 Four-Year Overview of EcoCAR*

EcoCAR will follow a four-year plan with distinct milestones established for each competition year. These annual milestones lead teams toward the end goal of a fully functional, refined, and reliable vehicle that meets consumer expectations and demonstrates the targeted connected and automated features. Table 1 summarizes the expected goals for each competition year.



TABLE 1: FOUR-YEAR OVERVIEW OF EcoCAR COMPETITION ACTIVITIES AND MILESTONES

Year	Summary of Year-End Goals
Year 1	<ul style="list-style-type: none"> <li>• Customer definition</li> <li>• Implementation of model-based design tools to enable propulsion and CAV system development</li> <li>• Propulsion system design</li> <li>• Design and selection of CAV system</li> <li>• Low-level component packaging and integration design finalized</li> </ul>
Year 2	<ul style="list-style-type: none"> <li>• Donated vehicle delivery (Expected Fall 2023)</li> <li>• Initial vehicle integration</li> <li>• Perception systems functional</li> <li>• V2X and Longitudinal control interfaces tested in HIL/VIL environments</li> <li>• Propulsion system functional at full range of speeds</li> </ul>
Year 3	<ul style="list-style-type: none"> <li>• Reliable propulsion system operation</li> <li>• Longitudinal control features implemented and tested</li> <li>• Initial lateral control implementation tested</li> <li>• Vehicle utilizes V2X inputs for active control</li> </ul>
Year 4	<ul style="list-style-type: none"> <li>• Vehicle integration refined and consumer acceptable</li> <li>• All planned customer-facing features refined and functional</li> <li>• Reliable vehicle with refined calibration – close to consumer acceptable level</li> <li>• Vehicle capable of supervised automated operation within design domain</li> <li>• CAV features refined to meet consumer expectations and maximize efficiency</li> </ul>

As a supplement to the year-end milestones, intermediate milestones will be established for each year of the competition. The resulting glidepath will serve as a month-by-month guide to help teams stay on track over the course of the academic year so that they can achieve the stated milestones and objectives for that year’s competition.

### B-2.4 Competition Deliverables and Events

EcoCAR utilizes various activities to evaluate team understanding of the subject matter and vehicle development progress. These activities range from mid-year written deliverables and professionally judged presentations, to vehicle testing events and the year-end competition. In Years 2, 3, and 4, the year-end competition will bring together all vehicles and teams to compete in a series of rigorous events that evaluate safety, integration quality, performance, energy efficiency, and consumer appeal. Vehicles will undergo a strict static safety inspection and dynamic safety evaluation to ensure EcoCAR vehicle safety requirements are met.

Table 2 provides a list of example activities that may be utilized throughout the EcoCAR EV Challenge. Teams will garner points in each of these activities; the team that scores the most points will win that year’s competition.

TABLE 2: SAMPLE COMPETITION DELIVERABLES AND ACTIVITIES

Events	Example Description (Measurements)
Vehicle Performance	Acceleration, handling, braking, ride quality, drive quality
Energy Efficiency	Evaluation of propulsion system efficiency
CAV System Evaluation	Longitudinal and Lateral CAV system and V2X system demonstration
Written Reports	20-page technical report
Oral Presentations	30-minute formal oral design presentations
Vehicle Design Review	Vehicle inspection and design review
Consumer Appeal	Consumer acceptability review and static vehicle utility
Outreach	Outreach activities review, website, and presentation
Inspections	Vehicle safety and functionality inspections prior to vehicle testing

## B-3 Vehicle Technical Specifications (VTS)

During the first year of competition, teams will identify their targeted customer within the market identified by the competition and derive vehicle technical specifications (VTS) to meet the needs of the customer. Teams should then select propulsion system components and a vehicle architecture to meet that set of VTS. In addition, the competition will establish VTS minimum requirements for metrics such as energy efficiency and vehicle performance. These requirements are the lowest desired level of performance; to produce well-rounded vehicles, teams should design beyond the minimum requirements to meet the needs of their target market.

## B-4 Vehicle Technologies Supported

EcoCAR is a unique competition employing advanced propulsion system, electrification, V2X connectivity, and automation technologies. Teams may propose any propulsion system architectures during the formal propulsion system selection process in Year 1. For EcoCAR, vehicles are limited to using electricity as the sole competition fuel. The use of nonstandard or exotic energy storage devices or energy converters must be pre-approved by the organizers. Team vehicle architectures are subject to approval by organizers pending feasibility of design, availability of components, and other factors. After an architecture is approved, it is very costly and time-intensive to change course and alter the architecture design. Hence, the architecture approval process is put in place as an approval gate to ensure teams can execute their conceptual design and to guard against poor decisions that may have significant negative impacts on subsequent years of the competition.

## B-5 Emphasis on Innovation and Equity in Mobility

The competition will include an Innovation in Mobility Equity Initiative that will challenge teams to identify and address specific equity and electrification challenges in the future of mobility through the application of innovative hardware and software solutions.

## B-6 Safety

Safety is paramount for EcoCAR. Team vehicles must meet competition safety standards for vehicle hardware/integration as well as software/controls and will be subject to a safety inspection before any competition event. Vehicles that do not pass inspection will not be permitted to participate. Any modifications to the vehicle that would compromise safety or crashworthiness must be justified by the team through analysis and approved by an industry SME. Teams will also be expected to incorporate safety-related algorithms into their propulsion system and CAV system controls to ensure the vehicle is able to operate safely in all operating modes. The competition will emphasize a systems safety approach, and teams will be required to complete various industry-standard system safety analyses. Lastly, teams will be required to identify areas and develop protocols to safely test their vehicle throughout the competition.

Teams must also employ adequate lab safety protocol in all work spaces, fabrication areas, and garage areas. Participating schools must develop and submit facility safety plans that define processes and procedures for safe operations in team facilities. These plans must have defined training and certification procedures (approved by the university administration) for all equipment that will be used or worked on during the course of the project, including (but not limited to) high-voltage electrical safety, machine shop, welding, and vehicle hoist operations equipment. Participants must have a working knowledge of the proper use of appropriate personal protective equipment whenever they perform work on EcoCAR vehicles at the schools and at all EcoCAR events.

Additionally, with the introduction of significant CAV-related activities to EcoCAR, teams will be expected to incorporate safety-related algorithms into their propulsion control systems to ensure the vehicle is able to operate safely in all operating modes. When teams are actively operating their vehicle, the driver of the vehicle is expected to be attentive at all times, regardless of what CAV-related technology the vehicle may have.

# C Support for Teams Accepted into EcoCAR

## C-1 Support Provided by the Competition

Participating universities will receive extensive support from competition-level sponsors to enable their success throughout EcoCAR. At the time of the drafting of this RFP, sponsor support for EcoCAR is still in development, although expected commitments from EcoCAR Headline Sponsors are described below. In the previous AVTC series, EcoCAR Mobility Challenge Sponsors contributed \$4.5 million in cash and hardware support to teams through the first three years of the competition (an average of \$130,000 per team per year). This level of support is consistent dating back to EcoCAR 3 (the series prior to the EcoCAR Mobility Challenge), which demonstrates a long track record of strong support from EcoCAR sponsors.

### *C-1.1 Cash Contributions*

The competition intends to provide each team, subject to final budget authorization, an estimated \$90,000 USD/annually to partially fund three graduate students (\$20K/each per year), a Communications Manager (\$15K/year), and a Diversity, Equity, and Inclusion Manager (\$15K/year). These funded positions are critical to enabling the continuity of leadership and expertise required for the team to be successful over the multi-year competition. We recommend the funded graduate students fulfill the roles of EcoCAR Project Manager, Vehicle Controls Lead Engineer, and Connectivity and Sensors Lead Engineer, although the team will be given some discretion to assign roles based on the organizational structure that meets their team's needs.

Universities are required to match the graduate research assistant (GRA) funding with one additional graduate student that can serve as a technical specialist (e.g., Vehicle Systems Engineer, an additional Vehicle Controls Engineer, or Connectivity and Sensors Engineer) or team management role (e.g., Chief Engineer). See Section B-1 for a description of funded positions and Section C-2.4 for further description of matching funding requirements.

The competition intends to provide each new university (that did not participate in the most recent EcoCAR Mobility Challenge AVTC series) an estimated \$50,000 USD in program initiation support ("seed money") to establish their new EcoCAR program and build any required facilities (garage or laboratory space, lift installation, tools/equipment), as well as to supplement the travel support and GM "Blue Dollars" that will be provided by the program throughout each of the four academic years. Universities that participated in the most recent EcoCAR Mobility Challenge series will receive \$15,000 in seed money. If budget authorization allows, seed money will be provided before September 2022 and the launch of Year 1.

The competition also intends for minority-serving institutions to receive between \$250,000–\$500,000 over four years for their program initiation support (this replaces the \$50K seed money that will be distributed to other new universities, as described above) and to fund underrepresented minority faculty and students on their EcoCAR team. The contributions are designed to build automotive programs at minority-serving institutions and to improve recruiting, retention, and engagement of underrepresented minorities throughout all four years of the program.

The competition also intends to provide up to \$10,000 in DEI seed money to all universities to implement their DEI plan, as referenced in Section D-3.

The competition will also donate a production vehicle to each team, delivered after the Year 1 competition. A significant amount of information about the vehicle will be donated to each school on a confidential basis, thereby enabling the teams to perform detailed component location packaging, structural analyses of vehicle modifications, and electrical interfacing. Teams will be required to sign a nondisclosure agreement (NDA) with GM, and the donated competition vehicles will be supplied with a State of Michigan salvage title. The organizers will establish a review and approval process for vehicle modifications to ensure safe operation during vehicle operation.

The competition will also provide significant travel support for teams to attend up to three workshops or testing events plus an end-of-year competition each year. An average of \$20,000 per team per year has been awarded to EcoCAR teams for travel support dating back to the 2014-2015 academic year. Teams will also receive support for shipping their competition

vehicle to any EcoCAR event involving vehicle activities. While this travel support is substantial, universities may have to supplement travel support with additional funding (see Section C-2.1).

## *C-1.2 In-Kind Contributions*

To maximize the success and learning opportunity for EcoCAR teams, the competition will offer various in-kind donations, including software, hardware, and engineering/mentoring support. This will include in-kind support from GM, MathWorks, and various other competition-level sponsors.

### *C-1.2.1 Competition Vehicle Platform*

The competition will provide each university with the competition BEV platform to be used for the duration of the EcoCAR EV Challenge. Teams will receive their donated competition vehicle after the Year 1 competition to allow for the finalization of vehicle donation, licensing, and registration paperwork. Hence, the goal is to prevent these necessary administrative steps from delaying engineering activities during the academic year.

### *C-1.2.2 GM “Blue Dollars”*

In addition to these specialized components, EcoCAR plans to offer each school GM “Blue Dollars” that can be used to obtain GM production North American service parts required in support of its designs. In EcoCAR 3, each school received \$5,000/year. In the past, many other AVTC sponsors also offered no-cost or low-cost parts, controllers, and components to participating schools, greatly leveraging the ability of those schools to develop and implement the complex systems and subsystems required for the competition. We intend to enable that heritage of sponsorship for EcoCAR.

### *C-1.2.3 GM Mentor Program*

Teams will also be assigned a GM engineer as a team mentor. Each GM mentor will be a knowledgeable automotive engineer with years of industry experience and will function as a resource to help guide the team through the vehicle design and integration process. The GM mentor will also serve as a team liaison to GM throughout the competition. In addition, SMEs will provide technical training and be available to participating teams for additional support.

### *C-1.2.4 MathWorks Modeling and Simulation Tools*

The competition will provide MathWorks-sponsored licenses to teams to use MATLAB, Simulink, and other Model-Based Design tools that are used across the automotive industry. Model-Based Design is commonly used for the development of propulsion and CAV systems, naturally leading to a strong emphasis on modeling, simulation, and requirement-based testing in EcoCAR. Additionally, MathWorks will provide teams with a Simulink model of the base powertrain and vehicle dynamics to guide teams on industry-grade development processes.

### *C-1.2.5 MathWorks Mentor Program*

Each team will be assigned a MathWorks Mentor to help them in understanding the tools available to them, and to guide them on best practices for Model-Based Design. The MathWorks mentor team is made up of engineers with experience with Model-Based Design in the automotive industry. Teams will also receive training and support from various SMEs at MathWorks and the Student Competition Team.

### *C-1.2.6 Other Donated Components and In-Kind Support*

The competition also expects to offer EcoCAR teams other in-kind donations from various competition-level sponsors, which may include some or all of the following:

- CAV components, such as radar sensors or V2X modules
- Auxiliary components, such as HV DC/DC converters
- Supervisory controller hardware
- Hardware-in-the-loop simulators
- Vehicle CAN diagnostic hardware and software
- Tools and toolboxes
- Various modeling, simulation, or analysis software suites to support engineering activities.

Teams must note that the competition will make every attempt to supply and/or support teams with all of the components required to implement their desired propulsion system design. However, the competition highly recommends that teams have a plan to purchase or solicit donations for propulsion system components and/or parts that cannot be obtained via donation from a competition-level sponsor. Teams are also not required to use any components offered (other than the production GM-donated vehicle). More information on EcoCAR components will be available at the start of the competition.

## C-2 Support Provided by Universities

To be successful in EcoCAR, teams will have to supplement the support provided by the competition with additional resources from the university or local/team sponsors.

Signed letters of support from the Dean of Engineering or a senior university administrator are required with each proposal (see Section D-4). If accepted into EcoCAR, each team will be required to sign an annual “Good Faith Agreement” (GFA) by September 15 of each academic year, which will reaffirm the university’s full support of the team and explicitly state its willingness to participate in all EcoCAR activities.

### *C-2.1 Matching – Travel and Participation*

EcoCAR teams will be required to travel to workshops and competitions during each academic year. In Year 1, this typically requires student and faculty participation at two to three workshops (3-4 days including travel) and one end-of-the-academic-year competition (6-8 days including travel). In subsequent years, there are typically two workshops (3-4 days including travel) and one end-of-the-academic-year competition (12-14 days including travel). Online tools will be used to replace or supplement in-person training and events to minimize the time students and faculty are away from campus. At least one faculty member must accompany student team members to all workshops and annual competitions to provide technical advising and serve as the official university representative.

GM and other sponsors provide travel allotments to the participating teams, but often, teams find they need to supplement this funding with roughly 15-20% additional funding from the university or local/team sponsors.

The Lead Faculty Advisor is required to work with the university administration and faculty to make arrangements to ensure that students who travel to competition events are not penalized for their absence from campus/class.

### *C-2.2 Matching – Administrative Support*

EcoCAR teams will require the support and guidance of university administration and support staff to plan and execute their activities throughout the four-year program. In their proposals, universities must specify the administrative services that will be provided at no cost to the team throughout all four years of the program. Some examples may include:

- University staff to support the team with accounting, procurement, invoice processing, and travel coordination
- College of Engineering’s Development staff to support the team’s local fundraising and sponsorship efforts
- University or College of Engineering’s Communications staff to support local media relations and team news coverage
- University DEI staff to support the team’s diversity, equity, and inclusion efforts.

If overhead or other fees must be assessed by the university, a description of the fees and what services they apply to must be included in the proposal and will be a factor for acceptance into EcoCAR.

### *C-2.3 Matching Seed Money*

Universities are highly encouraged to match the seed money with an equal amount of university cash contributions. The competition intends to provide seed money, subject to final budget authorization, at the beginning of the first year., however, the university may provide their matching seed money as cash to the team at the beginning of Year 2 of the four-year program. In-kind support from the university administration is not considered an adequate substitute for the matching cash funding requirement.

Historically, AVTC teams have benefitted immensely from procuring a secondary vehicle, compatible with the competition platform, to be utilized during vehicle development as a mule vehicle. For this reason, it is highly recommended for universities to provide additional matching funding to their EcoCAR teams to be used toward the purchase of a second competition vehicle.

### *C-2.4 Matching GRA Funding*

As explained previously, each university is also expected to provide some matching support for the funded positions.

The competition intends to provide each team, subject to final budget authorization, an estimated \$90,000 USD/annually to partially fund three graduate students (\$20K/each per year), a Communications Manager (\$15K/year), and a Diversity, Equity, and Inclusion Manager (\$15K/year). Universities are required to match this funding with at least one additional full-time graduate student (technical specialist). See Section B-1 for descriptions of the funded positions.

These funded positions are critical to enabling the continuity of leadership and expertise required for the team to be successful over the multi-year competition. As previously stated, the competition funded GRAs shall fulfill the roles of EcoCAR Project Manager, Vehicle Controls Lead Engineer, and Connectivity and Sensors Lead Engineer, although the team will be given some discretion to assign roles based on the organizational structure that meets their team's needs.

We also understand GRA rates at different universities may vary. In some cases, the \$20,000 USD annual funding may not cover a university's costs associated with one full-time GRA. We expect that any additional costs to ensure that the competition-funded GRAs are full-time will be supplemented by the university (see GRA matching requirements below). In other cases, the provided funding may cover most of the expenses for two GRAs, with the university providing tuition and other fee waivers. As long as the combined support enables at least four full-time GRAs, one DEI Manager, and one Communications Manager (as described in Section B-1), the program's minimum requirements will be met.

The university will be expected to explain how it met the GRA requirements in the proposal it submits and in annual Good Faith Agreements. Additional details about GRA funding will be provided after the teams are selected.

### *C-2.5 Course Credit*

Universities will be **required** to integrate EcoCAR content into the curriculum of a minimum of **one** course per year, to enable course credit for students for their involvement in EcoCAR. Special consideration will be given on a case-by-case basis for teams unable to establish this course in Year 1. Operating EcoCAR solely as a club activity has not previously resulted in long-term success for AVTCs and will not be permitted as the only mechanism for student involvement.

Best practices in previous AVTCs have enabled AVTC content in a senior design course, supplemented by an independent study or technical elective that enables students to learn more advanced technical concepts and get additional course credit for those involved in multiple years of the program. We recommend that EcoCAR course content be designed by the faculty advisors to best address the needs of their students participating in EcoCAR.

Universities will be required to document the proposed course(s) that will include EcoCAR content and how they will enable a mechanism for course credit for students involved in EcoCAR. Once admitted, teams will be expected to show verification that some participating students are receiving course credit each semester through the submission of an annual Good Faith Agreement.

### *C-2.6 Faculty Support*

As described in section B-1.1, each team is required to provide a minimum of two faculty advisors from the College of Engineering to support their team. Flexibility can be provided about which department within the College of Engineering is represented, but both faculty must have direct and relevant experience in the associated technical areas described in this RFP. Given the commitment required for faculty to support EcoCAR, **at least one** faculty advisor must have at least **two** of the following accommodations from the university:

- Teach one EcoCAR-specific course for course credit annually as part of their normal annual teaching load

- Receive faculty release time for one course from their teaching load annually
- Receive one month of paid summer salary support.

Special consideration for course credit will be given on a case-by-case basis for new teams unable to establish this support in Year 1.

Universities will be required to document their faculty support commitment in their proposals. Additional faculty support is an enabler for team success and will be considered as part of the team selection process. Once accepted, a university will be required to show documentation of faculty support in their annual Good Faith Agreement.

### C-2.7 Facilities

Universities are required to provide a number of facilities on campus at no cost to their EcoCAR team to ensure their success in the program. At a minimum, these facilities must include the following:

- Dedicated garage space with a vehicle lift
- Dedicated and secure storage of vehicle parts
- Reliable access to a receptacle capable of Level 2 charging available at their facility
  - It is recommended that this charging station be capable of at least 10kW charging.
- Secure high-voltage work area to enable high voltage subsystem testing in a secure and safe environment
- Abundant access to a machine shop with fabrication capabilities
- Dedicated team offices and work area for use by the EcoCAR team
  - Must include a mechanism for secure storage and access of digital information provided by GM and other sponsors, as required by competition non-disclosure agreement(s)
- Abundant access to a computer lab with simulation and CAD capabilities
- Abundant access to a closed-course facility for vehicle testing and a method to transport the vehicle to this facility
  - This test area does not need to be an actual vehicle test facility but can be a typical facility repurposed for vehicle testing (a closed parking lot, runway, etc.). Proposals should detail the facility itself, limits to the testing teams can conduct, availability of the facility (cost, scheduling requirements, etc.), and availability of trailering or towing equipment to transport the vehicle to this facility. Note, GM will cover the cost to ship team vehicles to competition events where the vehicle is needed. However, the team does need a method to safely transport their vehicle to local events and closed-course vehicle testing.
  - It is strongly encouraged for universities to have closed courses available to them where they can do both propulsion system and CAV vehicle testing. The propulsion system and CAV testing facilities do not need to be the same, but proposals should detail which facilities are available and what types of testing can be done at each. These facilities are critical for success and accomplishing the testing milestones in the VDP.
- Universities also benefit from an electronics lab, vehicle and engine dynamometer, and test facilities, etc.

All facilities must have appropriate safety equipment for the work performed in each area. Throughout the competition, teams will be required to demonstrate that safety requirements for their work sites are met. Teams will also be required to keep safety documentation up-to-date throughout the four-year program. While many teams will not necessarily have all of these capabilities before they are accepted into the competition, they will be required to have secured computer and simulation facilities, as well as student offices, by September 1, 2022. Teams must also have the appropriate garage space and vehicle lift to safely and adequately integrate, test, and refine their advanced technology vehicles by January 1, 2023. Universities will be expected to explain in the proposal how they will be able to secure these facilities within the required timeframe.

## D EcoCAR Proposals

Each school wishing to be considered for acceptance into EcoCAR must prepare and submit a proposal that conforms to the outline that follows. EcoCAR proposals are to be written primarily by the students, with faculty advisor guidance. Each proposal must be signed by all student authors and indicate their expected graduation dates and faculty advisor(s). Important considerations in the selection process include the extent of administrative support provided, the

interdisciplinary focus of the team’s organizational structure, the commitment and backgrounds of the faculty advisors, the type of facilities available to the proposing team, and the documented experience and expertise of the team in areas applicable to the program.

Participants in this competition become collaborators with the organizers and other teams in a multimillion-dollar, four-year program to design and build the vehicles of tomorrow and train the engineers of the future. A significant factor in the success of schools in prior competitions has been the team’s desire to take advantage of all the opportunities offered in the competition. Knowledge, capability, facilities, and experience are necessary but, on their own, are insufficient for success in EcoCAR. The commitment of the university administration, faculty, and students and the focus on interdisciplinary collaboration are essential to success. The following description outlines the required components for the EcoCAR proposal.

## D-1 Proposal Process Overview

The EcoCAR proposal process is broken down into three documents: the Administrative Proposal, the DEI Proposal, and the University Letters of Support. The required elements of each part of the proposal are detailed within this section and its subsections. Proposals will be reviewed by a team of organizers and sponsors who have the appropriate technical background and experience.

## D-2 Administrative Proposal

### D-2.1 Administrative Proposal Content

Universities are to use this outline for writing their EcoCAR Administrative Proposal. Each Administrative Proposal must include responses to all of the topics noted in the subsequent subsections. Note that this is the university’s chance to demonstrate that it has the knowledge, experience, facilities, and desire and that it will provide the support necessary to compete successfully in EcoCAR. If you cannot meet any portion of the minimum requirements stated below, please describe in detail what you can do instead to still be successful in the program or how you will work to meet these requirements (and an expected time when you intend to satisfy these requirements).

#### D-2.1.1 Abstract

In 500 words or less, describe why your team should receive an invitation to participate in EcoCAR. Include the overall rationale for your school’s participation, including the goals and objectives of the College of Engineering and how these goals and objectives will be met.

#### D-2.1.2 Interdisciplinary Focus

In this section, teams should summarize how their university will specifically enable interdisciplinary collaboration within the College of Engineering and throughout the appropriate areas within the university.

#### I) Engineering

- Provide the expected interdisciplinary engineering plan for your team. Include how the faculty and students from these departments will communicate, collaborate, and provide resources to support systems-level engineering.
- Address how the team will support an increased emphasis on CAV technology (estimated at about 40% of the team’s workload, competition deliverables, etc.).
- Highlight any existing key partnerships within the College of Engineering that will improve your team’s chances of successful interdisciplinary collaboration.

#### II) Project Management

- Describe how you will ensure the Project Manager has the technical and leadership skills to collaborate appropriately with all areas of the team and with the appropriate faculty, administration, and support staff, as needed.



- Describe what resources will be available to support the students' activities (faculty advisors, administrative and staff support, etc.), such as fundraising/sponsorship, accounting, travel arrangements, etc.
- Describe your plan for sponsorship development and how you would accomplish the goal of identifying, confirming, and maintaining these sponsors throughout the four-year program.
- Highlight any existing external sponsorship commitments or key collaborations with local, regional, and/or state organizations that may enhance your team's local support.

### III) Communications

- Describe the department, club, or organization from which the Communications Manager will be recruited (Public Relations, Journalism, Communications, etc.).
- Describe how you will ensure the technical and communications team members work together to plan and execute team deliverables.
- Detail what resources will be available to support the Communications Manager with local media relations and government relations outreach efforts. Include a description of the support provided by the university (College of Engineering's Communications Office or other area of the university) to support the Communications Manager with EcoCAR deliverables.

### IV) Diversity, Equity, and Inclusion

- Briefly describe how your team will collaborate with university administration and diversity specialists to implement your DEI Plan throughout the four-year competition. Additional detail should be added within the DEI Proposal (see Section D-3).

#### *D-2.1.3 Team Personnel Plan*

In this section, teams should describe their plan to establish a team leadership structure, support graduate students, recruit and retain students, and support the faculty members needed to be successful in the competition.

#### I) Team Leadership Recruitment, Retention, and Succession

As team members and student leaders move on throughout the EcoCAR series, planning and executing a successful knowledge transfer plan will be very important. Therefore, teams must have a progression and succession plan for team leadership (in engineering, project management, communications, and DEI) and include it in this section. Please see Section B-1 for a description of the funded student positions referenced below.

- Engineering: Describe how you expect your team will fulfill the key engineering management roles throughout the four-year program: Vehicle Controls Lead Engineer, Connectivity and Sensors Lead Engineer, etc.
- Project Management: Describe how you expect your team will fulfill the Project Manager role throughout the four-year program.
- Communications: Describe how you expect your team will fulfill the Communications Manager role for the four-year program.
- Diversity, Equity, and Inclusion: Describe how you expect your team will fulfill the DEI Manager role for the four-year program.

The proposal should address how your team will ensure continuity over the four-year competition. For example, will there be any overlap between current and future leadership roles? How is the team planning to train its current students to assume leadership roles in the future?

#### II) Team Structure & Recruiting & Retention

In this section, teams present an overview of their strategy to recruit and retain necessary team members from the various disciplines. A detailed plan outlining specific and detailed strategies for recruiting and retaining underrepresented minorities (URMs) should be addressed in your DEI Pan (see Section D-3).

### **III) Faculty Support**

To be successful in the competition, EcoCAR teams will require the support and guidance of dedicated faculty throughout the four-year competition. This section should detail the faculty support afforded to the EcoCAR team.

- Identify the two specific faculty advisors who will support the EcoCAR, team and describe their qualifications and the specific roles they will serve over the four-year program. Describe any relevant experience or backgrounds of the advisors that will enable them to provide information on and share knowledge of automotive systems and to mentor the team.
- Explain each advisor's course load and explain planned funded research commitments during the duration of EcoCAR.
- Describe how the university will meet the requirements for faculty release time, as listed in Section C-2.6.
- Provide a detailed description of any additional faculty who will serve in a mentoring or advisory capacity to the team and how their support will be managed by the Lead Faculty Advisor.

#### *D-2.1.4 Additional University Support*

Describe the support that will be provided by the university. If you cannot meet any portion of the minimum requirements stated in this section, please describe in detail what you can do to still be successful in the program.

### **I) Graduate Student and Assistantship Support**

This subsection covers the use of competition-provided GRA funding, as described in Section B-1 and C-2.4.

- Describe how your university will utilize the funding for the three competition-funded GRAs (Project Manager, Vehicle Controls Lead, and Connectivity and Sensors Lead). Will the university need to supplement this funding to ensure the graduate students are full-time?
- Describe how your university will provide matching funding to ensure there is one additional full-time GRA (Technical Specialist).
- Describe any anticipated additional matching support from the university or outside sponsor for GRAs.
- Describe how your university will utilize the funding to support a Communications Manager, DEI Manager, and any matching funding provided by the university or outside sponsor.

### **II) Curriculum**

- Integration into Existing Curriculum: Explain how EcoCAR will be integrated into one or more existing and/or planned course(s), as described in Section C-2.5.
- Systems-Level Automotive Engineering Curriculum: Include a summary table of any classes available to students that include automotive-engineering-related content in addition to the required classes referenced above. Include advanced vehicle propulsion systems and vehicle technology, as well as control and mechatronics classes, at a minimum.
- Areas of Note: If your school has special institutes or relevant areas of excellence, describe how they will specifically be used to support EcoCAR.

### **III) Academic Credit**

Describe the mechanism that your university will provide for students to meet the minimum requirements for earning academic credit for working on the program.

### **IV) Administration and Support Staff**

EcoCAR teams will require the support and guidance of university administration and support staff to plan and execute their activities throughout the four-year competition as detailed in Section C-2.2.

- Describe the administrative services that will be provided at no cost to the team throughout all four years of the program. As described previously, some examples may include, supporting the team with accounting, invoice processing and travel coordination; supporting the team's local fundraising and sponsorship efforts through the College of Engineering's Development Office; supporting your DEIM and team DEI efforts through the Chief

Diversity Officer or other university specialist; and supporting local media relations and team news coverage through the university or College of Engineering's Communications Office.

- If overhead or other fees must be assessed by the university, a description of the fees and what services they apply to must be included in the proposal and will be a factor for acceptance into EcoCAR.

## V) University Matching Support

### a) Matching Seed Money

As detailed in Section C-2.3, describe how your university will provide monetary support to the prospective EcoCAR team. List any financial support provided by the university to supplement the competition-provided seed money.

### b) Travel

Describe how faculty advisors will participate in annual workshops and competitions. Also state how faculty advisors will ensure students who travel to competition events will not be penalized for their absence from campus/class. List any financial support provided by the university to supplement the competition-funded travel stipends.

### c) Secondary Vehicle

As detailed in Section C-2.3, describe if and how your university will provide support for the prospective EcoCAR team to procure a secondary vehicle platform to aid in vehicle development.

### *D-2.1.5 Prior Student Competition Experience*

Provide a table describing your school's experience in conducting other major vehicle or engineering research or projects; include any team or faculty members who participated in any previous DOE AVTCs, the SAE collegiate design competition series, or other vehicle competitions that would be on your future EcoCAR EV Challenge team.

If your university does compete in additional vehicle competitions, explain how resources will be allocated to properly support EcoCAR. Special attention will be focused on teams who are already heavily engaged in other large-scale student competitions that may compete for resources within the university.

### *D-2.1.6 Facilities*

In this section, teams should describe the facilities support provided by the university.

### I) Required Facilities

Include a table showing the facilities available at the college or university that could be used to accomplish the goals of EcoCAR. Teams must use the template shown in Table 3 (or similar). Teams should provide pictures of any facilities they plan to use during EcoCAR. Teams may place these photos in the appendix, if desired.

TABLE 3: TEMPLATE FOR REQUIRED FACILITIES

Facility	Summary Description	Date Available	On Campus?	Hours of Student Access	Shared or Dedicated
Secured simulation and computing laboratory					
Secured garage with hoist					
Secured office space or work area					
Machine shop and fabrication facilities					
Secured high-voltage work area					
Closed-course facility for vehicle testing (include types of testing, cost, scheduling and other relevant details in the description column)					
Transportation method for your vehicle to local events/testing					
Level 2 Charging Station (Capable of +10kW charging)					

**II) Additional Facilities**

Include a table of any special features or facilities at your university that would enable the team to work more effectively, such as vehicle lifts, dynamometers, a CAD lab, etc. Teams must use the template shown in Table 4 (facilities listed here are examples). Teams should provide pictures of any facilities they plan to use during EcoCAR. Teams may place these photos in the appendix, if desired.

TABLE 4: TEMPLATE FOR ADDITIONAL FACILITIES

Facility	Summary Description	Date Available	On Campus?	Hours of Student Access	Shared or Dedicated
Motor dynamometer					
Chassis dynamometer					
Other					

D-2.1.7 Safety Processes

In this section, teams should outline the safety processes that are currently in place or that will be implemented upon acceptance into EcoCAR.

**I) Team Operations**

Describe how safety will be built into the school’s plans and procedures throughout the competition. Provide an overview of how the university plans to develop the required safety plan(s) for on- and off-campus EcoCAR activities. Be sure to include a summary of current machine shop, welding, vehicle hoist, and high-voltage electrical safety training and certification procedures if they exist.

**II) Vehicle Design**

Include an explanation of the current infrastructure setup for students to learn and implement advanced analytical techniques to justify their designs. This can include, but is not limited to, structural designs or modifications requiring finite element analysis and nonstructural designs requiring computational fluid dynamics, high-/low-voltage circuit analysis, software and controls design, and processes and/or thermal analysis for mechanical and electrical systems.

**III) Facilities and Protocol**

Identify who is responsible for defining and enforcing laboratory safety practices relative to the testing of mechanical systems and high-voltage electrical systems per applicable local fire standards and college or university procedures. Identify who is responsible for defining and enforcing safety practices relative to vehicle systems testing outside of the laboratory environment.

### [D-2.1.8 Fundraising and Outside Relationships](#)

In this section, teams should provide a general project budget and a brief fundraising plan that describes any university support and existing local partnerships, as well as how the team would engage new partners if accepted.

#### **I) Budget Planning**

Provide a high-level, four-year budget outline needed to support successful participation in EcoCAR. Elements to consider include, funding for graduate students and other personnel costs, vehicle parts, subsystems, and components; tools and safety equipment fabrication and finishing; possible testing fees; team travel not provided by the organizers (to workshops and competition events); trade show and sponsorship materials; and community outreach.

#### **II) Fundraising Plan**

Document any existing university or local sponsorship commitments from external partners, and highlight any successful examples of partnerships from a previous program. Provide a plan for acquiring additional contributions (product donations, cash, technical support, etc.). Include letters of support from potential or confirmed sponsors in the appendix, if possible.

### [D-2.1.9 Post-Selection Modeling On-Ramp Activities](#)

In an effort to enable success for the selected teams, the competition will hold various post-selection modeling on-ramp activities. In this section, teams must identify at least two students who will be available to participate in this modeling on-ramp. These students are to be individuals who will be on the team the upcoming year, if accepted into EcoCAR.

This on-ramp will take place between April-June 2022, and the activities will be defined at a later date, but will cover topics such as:

- General MATLAB & Simulink skills assessment
- Training and best practices on requirements-based testing and verification
- Model management and software architecture best practices
- Version Control (Git) best practices.

### [D-2.2 Summary and Discretionary Factors](#)

In this section, teams may include any other considerations that would demonstrate that your school is capable and committed to success in EcoCAR. Include any additional information that may indicate your university has what it takes to be a successful competitor in EcoCAR.

### [D-2.3 Appendix](#)

The appendix is exempt from the page limit, however, teams are restricted in what information can be included. Teams may not use the appendix to circumvent the page limit for the proposal. Therefore, only the following documents may be included in the appendix:

- Photos of facilities secured for use by the team in EcoCAR (see Section D-2.1.6)
- Summary of safety procedures for team facilities (see Section D-2.1.7)
- Letters of support from local sponsors (see Section D-2.1.8).

Teams may include support letters from local sponsors or supporting documentation for facilities, curriculum, etc. Note that the required support letters from the university are a separate document.

## **D-3 Diversity, Equity, and Inclusion Proposal**

The US labor market is projected to grow faster in science and engineering than any other sector in the coming years, and yet, only 6% of all 24-year-old Americans hold undergraduate degrees in STEM disciplines. For URM students, the percentage hovers at 2-3% (*Pathwaytoscience.org; NSF*).

EcoCAR is pursuing a comprehensive approach to advancing equity for all, including women and other URMs who have been historically underserved, marginalized, and adversely affected by persistent poverty and inequality. Advancing equity

requires a systemic approach to embedding fairness in decision-making processes. EcoCAR is working to redress inequities that serve as a barrier to equal opportunities within the competition. By advancing equity, we can create opportunities and encourage the participation of underserved communities and underrepresented groups, which benefits everyone.

As described in Section C-1, the competition intends to provide between \$250,000-\$500,000 to minority-serving institutions, as well as \$10,000 in DEI seed money to universities to implement their DEI plan.

### *D-3.1 DEI Abstract*

In 500 words or less, describe why your team should receive an invitation to participate in EcoCAR. Include the overall rationale for your school's participation, specifically pertaining the outlined DEI objectives of EcoCAR and how these goals and objectives will be met.

### *D-3.2 DEI Proposal*

As part of the application process, applicants are required to submit a DEI Proposal including the following:

- Description of the university's commitment to diversity efforts through the creation of a sustaining and inviting, respectful and inclusive campus environment
- Description of the matching financial commitments from the university to match the competition-funded DEI seed money. Plan for how the team would utilize the DEI seed money, as well as any matching DEI funding from the university, to implement the team's DEI plan throughout the four-year competition series. (Selected teams will be asked in Year 1 to develop a more comprehensive DEI Plan as a scored deliverable for the program.)
- Specific tactics the university would take, if selected, to address URM recruiting, retention, and engagement on their EcoCAR team
- Description of how the team would engage with on-campus organizations for URMs to achieve the team's DEI goals, and to sustain their team's ongoing DEI efforts throughout the four-year competition series
- Description of how the team would incorporate community outreach to underserved communities as part of their Communications and DEI activities
- Description of how the team would design and execute youth STEM outreach activities, including into underserved communities, to attract more URMs into STEM fields
- Identification of the university's DEI specialists who would advise and guide the team, as well as a description of how they would help support the design, development, and execution of the team's DEI efforts.

### *D-3.3 Summary and Discretionary Factors*

In this section, teams may include any other considerations that would demonstrate that your school is capable and committed to success in EcoCAR. Include any additional information that may indicate your university has what it takes to be a successful competitor in EcoCAR.

### *D-3.4 Appendix*

In support of your DEI Proposal, please include the following in an appendix with an explanation how these areas could impact or support the EcoCAR team (financial commitments can be included):

- University and/or engineering department's DEI plan or its diversity, equity, and inclusion goals
- List of any collaborative partnerships the engineering department has with internal and external stakeholders that support and foster a diverse, equitable, and inclusive environment on campus
- List of any engineering department programs that currently provide financial, social, academic, and cultural support to engineering or other students
- List of any current DEI mentoring programs in place within the engineering department
- List of current DEI student recruitment strategies to attract, retain, and graduate diverse students in engineering or other disciplines

- List of any existing inclusion-related training programs offered or required for students or faculty.

As described above, universities accepted into EcoCAR will be required to submit a **Diversity, Equity, and Inclusion Plan** in Year 1 of the competition that describes the objectives and actions the team will take to foster a welcoming and inclusive environment; enhance recruiting, retention and engagement of women and other underrepresented minorities on the EcoCAR team; and support these underrepresented groups in STEM and community outreach.

The DEI Plan will request SMART (specific, measurable, assignable, realistic, and time-related) milestones, supported by metrics, to measure the success of the proposed actions and will contain the following information:

- Statement of Objectives
- Equity Impacts: the impacts of the proposed activities on underserved communities and underrepresented groups, including social and environmental impacts
- Benefits: the overall benefits of the competition to underserved communities and underrepresented groups
- How diversity, equity, and inclusion objectives will be incorporated by the team.

Should a university be accepted into EcoCAR, the team members will be provided with specific details for the content of the plan, but in general, it should focus on these areas:

- Increase the number of qualified students from underrepresented populations to join the team
- Develop support services to ensure graduation success of underrepresented team members
- Promote a diverse community that encourages and provides a successful path for fulfilling a career in engineering or other disciplines
- Develop ways to grow diversity awareness and cultural competency on campus
- Improve access to materials and resources to address barriers to participation on the team
- Create and sustain a welcoming, supportive, and inclusive campus climate and team dynamic where all individuals feel valued and respected.

In Years 2-4, teams will be required to annually review the goals and assess effectiveness of their initiatives.

Teams may include support letters from local sponsors or supporting documentation for DEI efforts. Note that the required support letter from the university is a separate document.

## D-4 University Letters of Support

Universities are required to provide two letters of support. Each letter will be submitted as a separate document.

The **first letter** of support is to be signed by its Dean of Engineering or another senior university administrator, agreeing to meet the following minimum requirements as described below and in Section C-2. This letter should be limited to no more than two pages.

- Travel and Participation
- Administrative Support
- Matching GRA Funding
- Matching Seed Money
- Curriculum Integration and Course Credit
- Faculty Support
- Required Facilities
- Commitment to Interdisciplinary Collaboration
- Any additional support to ensure the team's success.

The **second letter**, signed by the Dean of Diversity, Equity & Inclusion, Chief DEI Officer, or comparable position, should emphasize the university's support and commitment to the team's DEI Proposal as described in Section D-3, as well as any

matching funding or administrative support provided by the university to assist the team in the implementation of its DEI Plan over the four-year competition. This letter should be limited to no more than two pages.

## D-5 Formatting Requirements

### D-5.1 Administrative Proposal

The Administrative Proposal is limited to **17** pages total, excluding the cover page, table of contents, and the appendix (which includes letters of support). Proposals must be written in English and submitted as a PDF document. Teams must use a font size at least as big as 11 point Calibri and may not use margins smaller than 1 inch. Proposals should be written by students and must be signed by all authors and the faculty advisor(s).

Team reports must follow the outline provided in Table 5. This table also illustrates the page limit requirements and provides insight on how the report will be evaluated. Each submission must include responses to all of the topics and must follow the format and structure provided, including the table templates where indicated. The finished report must be signed by the students who participated in authoring the report, as well as any faculty advisor who contributed to the report.

TABLE 5: ADMIN PROPOSAL SUBMISSION OUTLINE AND SCORING

Scoring	Section	Page Limit
0%	Cover Page	No limit
0%	Table of Contents	No limit
3%	Abstract	17 pages
15%	Interdisciplinary Focus	
	Team Personnel Plan	
45%	Additional University Support	
25%	Prior Student Competition Experience	
	Required Facilities	
	Safety Processes	
5%	Fundraising and Outside Relationships	
7%	Summary and Discretionary Factors	
	Appendix	

### D-5.2 Diversity, Equity, and Inclusion Proposal

The DEI Proposal is limited to **eight** pages total, excluding the cover page, table of contents, and the appendix. Proposals must be written in English and submitted as a PDF document. Teams must use a font size at least as big as 11 point Calibri and may not use margins smaller than 1 inch. Proposals should be written by students and must be signed by all authors and the faculty advisor(s).

Team reports must follow the outline provided in Table 6. This table also illustrates the page limit requirements and provides insight on how the report will be evaluated. Each submission must include responses to all of the topics and must follow the format and structure provided, including the table templates where indicated. The finished report must be signed by the students who participated in authoring the report, as well as any faculty advisor who contributed to the report.



TABLE 6: DEI PROPOSAL SUBMISSION OUTLINE AND SCORING

Scoring	Section	Page Limit
0%	Cover Page	No limit
0%	Table of Contents	No limit
3%	Abstract	8 pages
57%	DEI Initial Plan	
5%	Summary and Discretionary Factors	
35%	Appendix	No Limit

## D-6 Submission Criteria

Only one proposal per university will be considered. As stated previously, universities are permitted to partner with another university or college, as long as the partnership is clearly articulated in the proposal. Only one joint proposal will be considered.

An electronic PDF version of the Administrative Proposal, the DEI Initial Plan, and the two University Support Letters must be **submitted through the [EcoCAR EV Challenge website](#)** no later than 4:00 p.m. Eastern Standard Time (US) on January 20, 2022. Teams are to attach the four documents using the following naming convention:

- Administrative Proposal: UniversityName\_EcoCAR\_AdminProposal.pdf
- DEI Proposal: UniversityName\_EcoCAR\_DEIProposal.pdf
- Administrative Support Letter: UniversityName\_EcoCAR\_AdminSupportLetter.pdf
- DEI Support Letter: UniversityName\_EcoCAR\_DEISupportLetter.pdf

The PDF version of the proposal must be able to be viewed and printed correctly; the organizers take no responsibility for, and will make no efforts to correct errors in the proposal or its PDF form. If any uploaded proposal contains PDF errors that will not allow it to be viewed and/or printed properly, it will be returned to the school and will not be reviewed.

**IMPORTANT:** Submissions not conforming to all the requirements of this solicitation may result in rejection of the proposal. Argonne National Laboratory is not responsible for any costs associated with the preparation or submission of a proposal. Argonne National Laboratory assumes no liability for disclosure or use of any proposals for any purpose. Argonne National Laboratory reserves the right to select or reject any or all proposals. Argonne National Laboratory reserves the right to amend the RFP as it may consider appropriate to meet the goals of EcoCAR. Any potential funding associated with selection for EcoCAR is subject to availability of funding from the Government and/or potential Sponsors.

## D-7 Proposal Weighting for Evaluation

Each proposal will be evaluated on the basis of the submitted materials by a panel of government and industry experts. The evaluation criteria for the Administrative Proposal and DEI Proposal are outlined in Table 5 and Table 6, respectively. The organizers will use the following weighting to combine the evaluations for both documents to achieve a final score:

- Administrative Proposal (80%), see Table 5
- DEI Initial Plan (20%), see Table 6

## D-8 Notification of Acceptance or Rejection

Universities submitting a proposal will be notified whether they will be accepted into EcoCAR in early March 2022. Every attempt will be made to notify the university before the end of your Spring Semester. The Dean of Engineering and Lead Faculty Advisor(s) of accepted schools will receive an official acceptance letter. Organizers will also contact the Lead Faculty Advisor of each accepted school to review the program timeline and other details.

Selected universities will also receive an invitation to the Launch Workshop and public announcement of the participating teams and the EcoCAR EV Challenge, tentatively planned for mid-April. Public discussion (including media coverage) about the selected schools or about the competition will be strictly embargoed until specific details are provided by organizers. Teams selected must adhere to the restrictions outlined in the Embargo Document that will be provided to chosen schools.

## E EcoCAR Schedule

Table 7 lists the dates for EcoCAR competition milestones.

TABLE 7: ECOCAR COMPETITION MILESTONES

Date*	Milestone
October 7, 2021	RFP Released
January 20, 2022	Proposals DUE
March 2022	Teams notified of selection (embargoed until post Launch Workshop)
April 2022	Team selection announcement/Launch Workshop
September 2022	Year 1 Kickoff Workshop
October 2022	Year 1 Fall Workshop
February 2023	Year 1 Winter Workshop
May 2023	Year 1 Competition

\*The competition organizers reserve the right to make changes to these dates.

Questions Concerning the RFP and EcoCAR should be sent to [avtc@anl.gov](mailto:avtc@anl.gov)



THE ADVANCED VEHICLE TECHNOLOGY COMPETITION PROGRAM  
 IS MANAGED BY ARGONNE NATIONAL LABORATORY  
 FOR THE U.S. DEPARTMENT OF ENERGY  
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