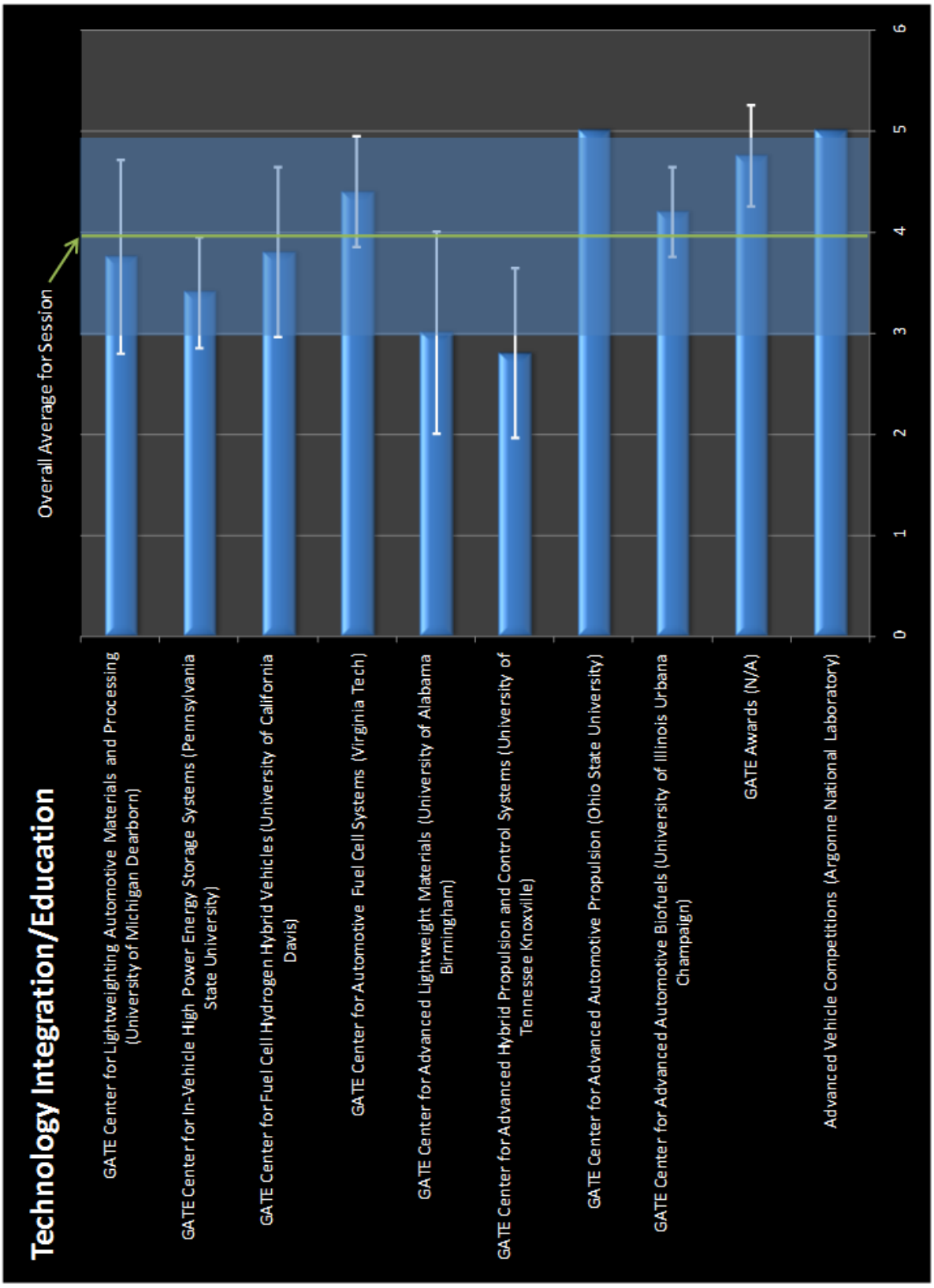
16. Technology Integration and Education

Introduction

In addition to research, the Vehicle Technologies Program supports two college-level education programs to engage some of our nation's best engineering minds in advanced transportation research. Challenge X is a three-year (2004-2007) collegiate engineering competition that offers college engineering students the opportunity to conduct hands-on research and development with leading-edge automotive propulsion, fuels, materials, and emissions control technologies. DOE established the Graduate Automotive Technology Education (GATE) Program to train a future workforce of automotive engineering professionals knowledgeable about, and experienced in, developing and commercializing advanced automotive technologies. To that end, DOE established ten GATE Centers of Excellence at nine U.S. universities that addressed fuel cells, hybrid electric vehicle drivetrains and control systems, lightweight materials, direct-injection engines, and advanced energy storage.

In this merit review activity, each reviewer was asked to respond to a series of six questions, involving multiple-choice responses, expository responses where text comments were requested, and one numeric score response. In the pages that follow, the reviewer responses to each question for each project will be summarized: the multiple choice and numeric score questions will be presented in pictorial form in eight graphs as the last page of each project, and the expository text responses will be summarized in paragraph form for each question. A table and graph presenting the average and standard deviation for each project relative to the overall average and standard deviation for this session is presented below.

Page	Project Title and Principal Investigator	Project Average Score	Project Score Standard Deviation
16-3	Advanced Vehicle Competitions (Forrest Jehlik, Argonne National Laboratory)	5.00	0.00
16-6	GATE Awards	4.75	0.50
16-9	GATE Center for Advanced Automotive Biofuels (Chia-Fon Lee, University of Illinois Urbana Champaign)	4.20	0.45
16-12	GATE Center for Advanced Automotive Propulsion (Yann Guezennec, Ohio State University)	5.00	0.00
16-15	GATE Center for Advanced Hybrid Propulsion and Control Systems (David Irick, University of Tennessee Knoxville)	2.80	0.84
16-18	GATE Center for Advanced Lightweight Materials (Uday Vaida, University of Alabama Birmingham)	3.00	1.00
16-21	GATE Center for Automotive Fuel Cell Systems (Doug Nelson, Virginia Tech)	4.40	0.55
16-24	GATE Center for Fuel Cell Hydrogen Hybrid Vehicles (Joshua Cunningham, University of California Davis)	3.80	0.84
16-27	GATE Center for In-Vehicle High Power Energy Storage Systems (Joel Anstrom, Pennsylvania State University)	3.40	0.55
16-30	GATE Center for Lightweighting Automotive Materials and Processing (P.K. Mallick, University of Michigan Dearborn)	3.75	0.96
	Overall Session Average and Standard Deviation	**3.96**	**0.97**


Technology Integration/Education
Overall Average for Session
GATE Center for Lightweighting Automotive Materials and Processing (University of Michigan Dearborn)
GATE Center for In-Vehicle High Power Energy Storage Systems (Pennsylvania State University)
GATE Center for Fuel Cell Hydrogen Hybrid Vehicles (University of California Davis)
GATE Center for Automotive Fuel Cell Systems (Virginia Tech)
GATE Center for Advanced Lightweight Materials (University of Alabama Birmingham)
GATE Center for Advanced Hybrid Propulsion and Control Systems (University of Tennessee Knoxville)
GATE Center for Advanced Automotive Propulsion (Ohio State University)
GATE Center for Advanced Automotive Biofuels (University of Illinois Urbana Champaign)
GATE Awards (N/A)
Advanced Vehicle Competitions (Argonne National Laboratory)
0
1
2
3
4
5
6

Advanced Vehicle Competitions (Forrest Jehlik of Argonne National Laboratory)

Reviewer Sample Size
This project had a total of 4 reviewers.

Question 1: Does this activity support the overall DOE objectives of petroleum displacement? Why or why not?
Responses were generally positive here. One reviewer noted that, in contrast to GATE (which is for graduate students), this is an excellent educational tool for undergraduate education, adding that it also offers significant technical benefits. One person commented that the hands-on experience for engineering students is vital for the training of future engineers. The program also helps validate concepts DOE has established. Another felt that these student competitions excite students to compete directly in the real-world efforts to integrate new technology into actual demonstration vehicles. One other person stated the program seeks to educate and prepare students to address transportation sustainability, energy and environment. It provides a penultimate experience with a real-world vehicle development process, and provides an excellent opportunity to students overall.

Question 2: Are the goals of the project technically achievable? Have the technical barriers been identified and addressed? Is the project likely to overcome those technical barriers? Please comment on the project's strategy for deployment of technologies.
One person indicated that there has been excellent oversight and management of a multi-year process, while another commented that this is an established program that has already demonstrated output. The barriers have been addressed. Similarly, one person wrote that the program follows a tried and true strategy (and has been successful for many years). One reviewer stated that the DOE Automotive Engineering Design Competition is among the best organized design competitions. The program challenges students to perform design and fabrication at a level that is comparable to major automotive manufacturers.

Question 3: Characterize your understanding of the technical accomplishments and progress toward DOE goals: please state the reasons for your assessment.
One reviewer noted that the program demonstrated a wide variety of different powertrain configurations to solve emission and fuel economy challenges. Another stated that the competition aspect drives innovative approaches to overcoming key issues/barriers and helps to focus the technology. One response indicated that the program addresses the lack of graduating engineers who have specific and practical knowledge in areas of advanced vehicle propulsion system, adding that, to be successful, the team must be strongly multidisciplinary. Often, the DOE Vehicle Competition is the first time these students will be required to interact in a meaningful fashion with engineers and professionals from other disciplines. One final response stated that their assessment was based on the fact that student education and the promotion of advanced technology are certain outcomes.

Question 4: What is the likelihood that the project team will move the technologies toward or into the marketplace? Please state the reasons for your selection.
A reviewer commented that this program produces graduates with specific experience in advanced vehicle propulsion systems, emissions, vehicle design and integration, as well as exposure to public relations, business, economics and marketing. Another added that the training of students to enter industry or to continue their education through GATE will have significant long-term national impact. An important aspect here is that students are exposed to real-world design approaches (and disappointments), which allows them to determine their career choice in the automotive design area.

One person indicated that most concepts will at least in part be in a list of solutions to meet future regulations. Another reviewer commented that the competition focus is to move technology to a "production" feasible state.

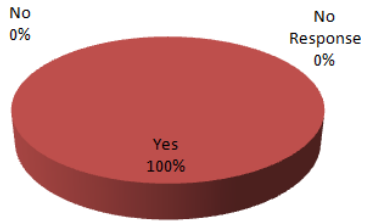
Question 5: How sufficient are the resources for the project to achieve the stated milestones in a timely fashion?
One reviewer stated that the money was well-spent to train students for future work and to validate technical concepts, while another added that the program offered great bang for the buck. One reviewer felt that the Advanced Vehicle Competitions (AVC) should not be funded at the expense of GATE, but stated that both GATE and the AVC merit funding increases. The payback in providing the nation with qualified automotive engineers is high. AVC should continue to seek strong industry co-sponsorship, which encourages the government-academic-industry alliance to grow new technology.

One final reviewer stated that support from DOE and other competition sponsors is at a high level. However the program goals are also highly challenging to the participating universities. The person adds, successful participation still requires substantial financial commitment from the participating universities and can sometimes present a challenge.

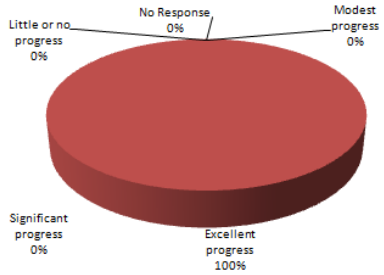
Question 6: Summary rating: when scoring this project, consider the relevance of the work to DOE's objectives, potential impacts on DOE/VT goals, project accomplishments, likelihood of technology transfer, and sufficiency of project resources.
There were no expository comments for this question: refer to the graphic on the next page for this project's summary score.

Project: Advanced Vehicle Competitions

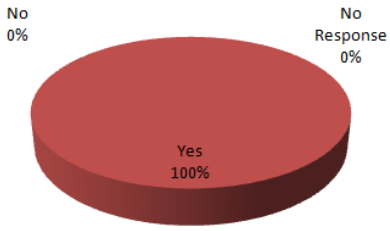
Question 1: Does this project support the overall DOE objectives of petroleum displacement?



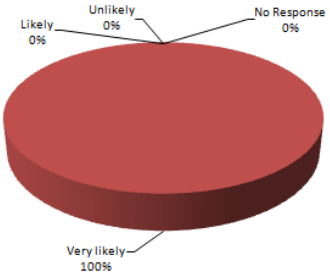
Question 3: Characterize the technical accomplishments and progress toward goals.



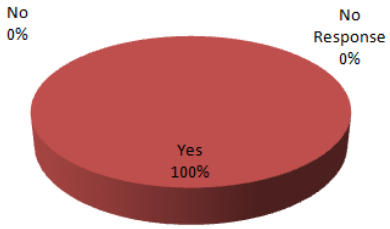
Question 2a: Are the goals of the project technically achievable?



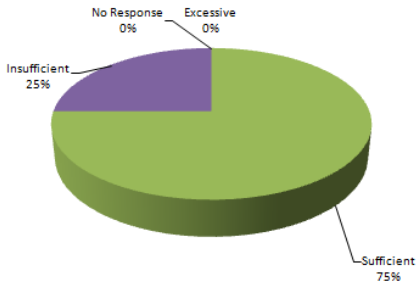
Question 4: How likely is the project team to move technologies into the marketplace?



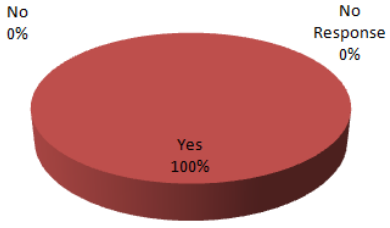
Question 2b: Have the technical barriers been identified and addressed?



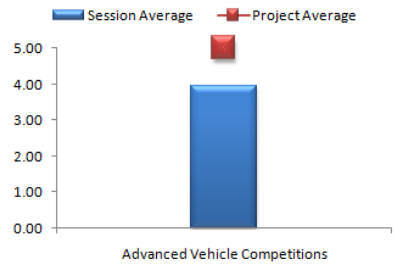
Question 5: Characterize the resources available for this project to achieve the stated milestones in a timely fashion.



Question 2c: Is the proposed work likely to overcome technical barriers?



Question 6: Overall Rating



GATE Awards

Reviewer Sample Size
This project had a total of 4 reviewers.

Question 1: Does this activity support the overall DOE objectives of petroleum displacement? Why or why not?
Reviewers provided generally positive responses here. One person stated that the project contributes to these goals indirectly through collaborative efforts with industry and academia, along with advanced course development and practical experience in advanced energy-efficient vehicle technologies. Both programs help prepare new graduates with the tools and experience to contribute immediately as new hires with OEMs and Suppliers. Another response stated the project supports Challenge X and GATE – both the educational component and the actual pre-prototype efficient vehicle design. Another reviewer added that student competitions not only stimulate technology development/integration but also prepare the next generation of engineers with the skills necessary to further this work in their future careers. One final person added that the program supports the goal to reduce petroleum consumption and reduce GHG production, and also helps address the shortage of engineers to work in the energy and environmental issues in the automotive fields.

Question 2: Are the goals of the project technically achievable? Have the technical barriers been identified and addressed? Is the project likely to overcome those technical barriers? Please comment on the project's strategy for deployment of technologies.
Responses were again generally positive. One reviewer indicated that the project was appropriate for stimulating technology development/integration and career development. Another added that the overall strategy was sound - effectiveness will be judged at the individual center level. The person added that collaboration with industry was generally very strong, but would recommend consideration of closer integration with National Laboratories, perhaps on internships. Two reviewers commented that the major goal of the project is to educate more engineers who are familiar with efficient vehicle design and who will help develop the energy sustainability issues in transportation, with one adding that the program thus has a long-term vision. The other reviewer added that the program offers excellent educational opportunities that challenge students.

Question 3: Characterize your understanding of the technical accomplishments and progress toward DOE goals: please state the reasons for your assessment.
One reviewer stated that the key barrier is probably funding, while another commented that the program, long-term, is essential, adding that there is a shortage of competent engineers in this area at present.

Another reviewer felt that some centers appear to have an excellent record of developing students who appear to be in-demand for key positions in industry. Some centers appear to be developing state of the art courses, while others appear to be much weaker.

Question 4: What is the likelihood that the project team will move the technologies toward or into the marketplace? Please state the reasons for your selection.
Two reviewers stated the program trains new graduates and the next generation of engineers on advanced technology, with one person adding that the programs also simultaneously explore technologies that can be moved to the marketplace in the near term.

Another reviewer stated that their conclusions were based on prior experience with student competitions and their achievements. One person stated the question was not suited to this program.

Question 5: How sufficient are the resources for the project to achieve the stated milestones in a timely fashion?
Multiple reviewers stated that the program could use more funding, with one person adding that the program goals set a high benchmark, but also provide strong support. Another person stated this as "likely big bang for the buck."

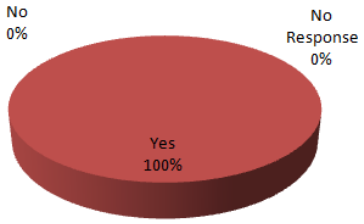
One response indicated that long-term educational output should be emphasized in the non-competitive arena. The person adds that, although in the reviews he or she checked "sufficient" for each individual school, the overall GATE funding is low when the cost of graduate education is considered. To sustain GATE, and make it significant in the eyes of educational institutions, it will require funding to be increased at the 20 to 30% level.

One final reviewer recommended additional funds that should be utilized for an internship activity where GATE Students either: (1) compete for a summer "fellowship" to work on site (for example, the summer before the students' last year) at a National Lab or Industry through a competition administered at DOE and openly competed for by students forming proposed collaborations with intended partners and/or (2) graduate student projects defined with university/National Lab/industry advisors where student spends at least one term at a National Lab and/or Industry. The reviewer also recommends eliminating duplication or redirecting the focus of some centers (e.g., there are two lightweight materials centers).

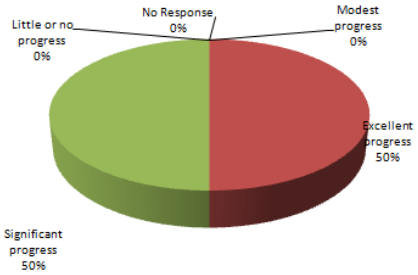
Question 6: Summary rating: when scoring this project, consider the relevance of the work to DOE's objectives, potential impacts on DOE/VT goals, project accomplishments, likelihood of technology transfer, and sufficiency of project resources.
There were no expository comments for this question: refer to the graphic on the next page for this project's summary score.

Project: GATE Awards

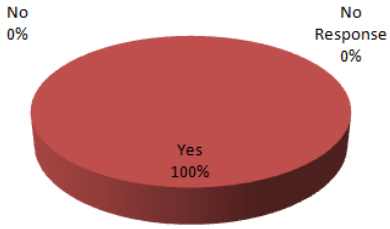
Question 1: Does this project support the overall DOE objectives of petroleum displacement?



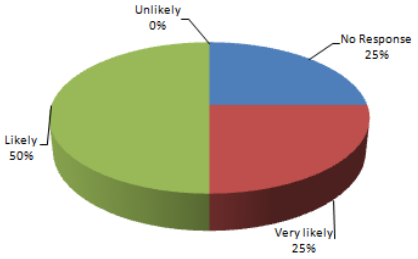
Question 3: Characterize the technical accomplishments and progress toward goals.



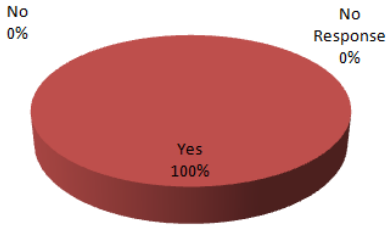
Question 2a: Are the goals of the project technically achievable?



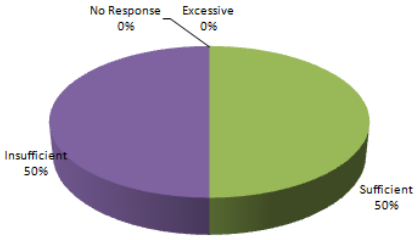
Question 4: How likely is the project team to move technologies into the marketplace?



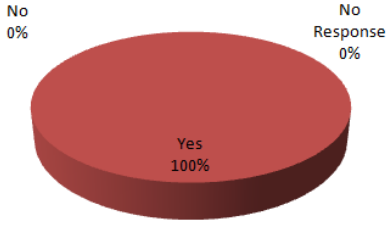
Question 2b: Have the technical barriers been identified and addressed?



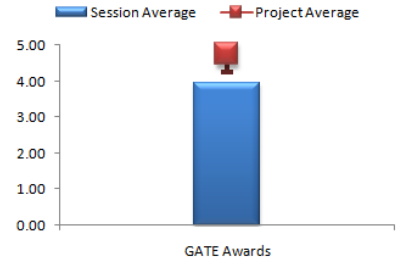
Question 5: Characterize the resources available for this project to achieve the stated milestones in a timely fashion.



Question 2c: Is the proposed work likely to overcome technical barriers?



Question 6: Overall Rating



GATE Center for Advanced Automotive Biofuels (Chia-Fon Lee of University of Illinois Urbana Champaign)

Reviewer Sample Size
This project had a total of 5 reviewers.

Question 1: Does this activity support the overall DOE objectives of petroleum displacement? Why or why not?
All of the responding reviewers noted that advanced biofuels are clearly central to DOE objectives, specifically petroleum replacement. One reviewer noted that biofuels are an important part of DOE strategy, while another added that biofuels is a key topic and research area where there is probably a current lack of engineering expertise. One other person highlighted ignition and combustion processes, reducing GHGs, and, again, the displacement of petroleum-derived fuels.

Question 2: Are the goals of the project technically achievable? Have the technical barriers been identified and addressed? Is the project likely to overcome those technical barriers? Please comment on the project's strategy for deployment of technologies.
Responses were strongly favorable to the group's cross-fertilization between biology and fuels disciples (agricultural and mechanical engineering), with one person adding that this is essential for success and that the group importantly recognized that the combustion of biofuels is not well studied, and this area will be emphasized. Another added that this approach should help address barriers, while one person stated that this program directly addresses this agricultural and automotive industries cooperation. One final reviewer noted there was good industry support and input.

Question 3: Characterize your understanding of the technical accomplishments and progress toward DOE goals: please state the reasons for your assessment.
One reviewer commented on the good industry interface and significant publications of the group, adding that emissions was stated as a goal but not mentioned after that. Another reviewer, similarly, noted that there appears to be very strong interaction with industry, but closer ties with National Labs are strongly recommended.

Two reviewers noted that seven students have graduated from the program, with one person commenting that this was a major output, adding that the program recognizes the educational disconnect between agricultural/biological and mechanical/automotive work, and seeks to address this disconnect. The other reviewer noted that the GATE certificate in biofuels provides a focus for students and showcases their qualifications to employers. However, some courses in the certificate do address broader topics than the core focus.

Question 4: What is the likelihood that the project team will move the technologies toward or into the marketplace? Please state the reasons for your selection.
Multiple reviewers noted that the program appears to be well positioned to provide well-trained students for industry and academia, with one person adding that the research and courses on significant aspects of biofuels will provide training for students in relevant areas. Another person stated students educated in this area are likely to impact industry in the future; this is the major product, and it has a long-term benefit. There could be some immediate, applicable technology outcomes (there are some technology transfer claims). New courses will impact the student body. The Ford/Cat funded project on predicting combustion properties based on biofuel composition is valuable and will have more near-term benefit. Publication output is impressive.

One reviewer stated that it looks like good work, but without baselines and specifics of progress (against industry baselines), it is hard to measure actual progress for a number of topics. Another response commented that students are made aware of the importance of emissions and the regulatory environment that impacts fuel production and usage in the automotive industry. The program brings expertise from vehicle technologies, fuel production, combustion, agriculture, and biology. Several research programs are underway with industrial sponsors, leading to 16 archival publications and 28 conference papers. They have internships established for students to foster interaction with industry.

Question 5: How sufficient are the resources for the project to achieve the stated milestones in a timely fashion?

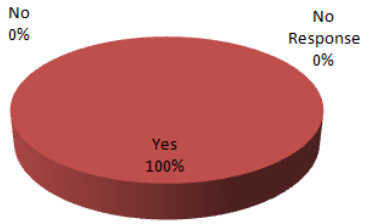
All responses noted industry support, with one person stated that the group appears to be able to partner with industrial firms to obtain additional funding. Another said that the investigators have leveraged some industry support from Ford, Caterpillar and John Deere, adding that the group has broad resources. One person stated that funding appears to be at a high level based on existing support, noting that industry support is available and that this group has broad resources. One final reviewer stated that funding was probably OK, and that industry sponsorships should help further leverage DOE funds.

Question 6: Summary rating: when scoring this project, consider the relevance of the work to DOE's objectives, potential impacts on DOE/VT goals, project accomplishments, likelihood of technology transfer, and sufficiency of project resources.

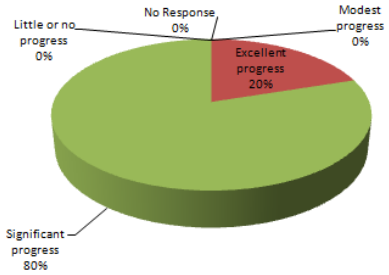
There were no expository comments for this question: refer to the graphic on the next page for this project's summary score.

Project: GATE Center for Advanced Automotive Biofuels

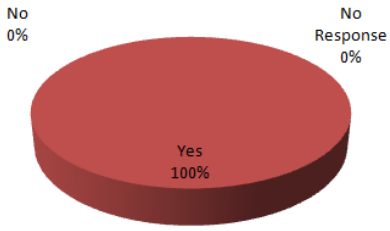
Question 1: Does this project support the overall DOE objectives of petroleum displacement?



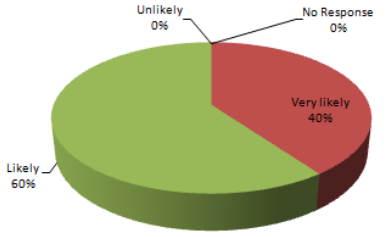
Question 3: Characterize the technical accomplishments and progress toward goals.



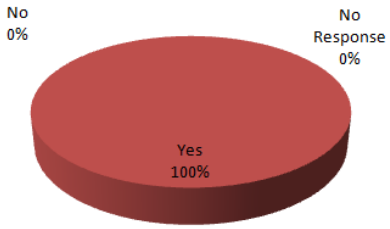
Question 2a: Are the goals of the project technically achievable?



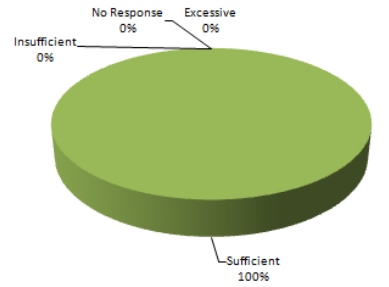
Question 4: How likely is the project team to move technologies into the marketplace?



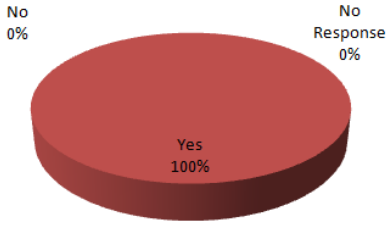
Question 2b: Have the technical barriers been identified and addressed?



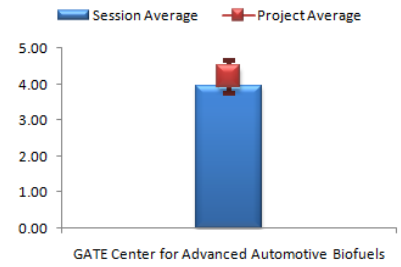
Question 5: Characterize the resources available for this project to achieve the stated milestones in a timely fashion.



Question 2c: Is the proposed work likely to overcome technical barriers?



Question 6: Overall Rating



GATE Center for Advanced Automotive Propulsion (Yann Guezennec of Ohio State University)

Reviewer Sample Size
This project had a total of 4 reviewers.

Question 1: Does this activity support the overall DOE objectives of petroleum displacement? Why or why not?
One person stated that the scope is consistent with DOE objectives, while another noted that system integration is essential for automotive engineering optimization - so this objective does ultimately impact petroleum use reduction. One person stated that hybrid drivetrain and control systems research directly impacts potential petroleum displacement. There is also a wide focus on other key energy topics. Student/engineer training and development provides building block for future development of technologies/vehicles that meet the petroleum displacement goals. One other reviewer stated that the program addresses modeling, control and system integration of advanced automotive propulsion systems, and system integration is the overarching theme. This person added that the program focuses on advanced combustion, advanced energy storage systems and other traditional areas, but with a system integration focus.

Question 2: Are the goals of the project technically achievable? Have the technical barriers been identified and addressed? Is the project likely to overcome those technical barriers? Please comment on the project's strategy for deployment of technologies.
Responses were generally positive for this question. One person stated that there is a very strong team at OSU, and a high degree of leveraging of funding, adding that there are no clear technical barriers to identify in the area (it is more steadily developmental), but sufficiency in funding was identified as a barrier. Of course, the reviewer adds, every educational institution is hungry for more resources. Another person felt that the program appears to have very broad depth, multiple university disciplines (departments), leverage of resources, and international guest researchers and lecturers. There is unique course development! The program also offers distance learning opportunities.

Two reviewers noted that funds were highly leveraged with industry sponsors. One person added that the program laid out key barriers - funding (need funds to support longer term graduate student commitments). The program shows a good focus on getting students involved in the progression of technology development through integration/demonstration. The other felt that there is a high degree of leveraging of other funds to boost the number of graduate students graduated from the program. The multidisciplinary approach builds on core science, engineering science, advance engineering product engineering and ultimately to product engineering. Students are involved in core science, but their project is brought all the way through product engineering. Classes are taught across disciplines and the program utilizes team teaching of courses to accomplish goals.

Question 3: Characterize your understanding of the technical accomplishments and progress toward DOE goals: please state the reasons for your assessment.
Again, responses were generally positive, with one person noting that there was good placement of students within industry, and the program offers distance learning opportunities for OEMs. Another commented that OSU had "success metrics" in the presentation - they understand GATE and how it can be integrated into a larger program. Multi-department work is important. Building "real vehicles" (e.g. Bonneville fuel cell vehicle) is a great training ground, and can be used to verify/enhance teaching & modeling tools – it grows the students, but not necessarily the technology. One person highlighted the program's stress on system integration, adding that industry participation helps

develop well-rounded engineers that understand the key aspects/barriers for integration of laboratory technologies that meet the demand of the marketplace. Another noted that the synergy with automotive design competitions is a plus of the program. The program has a focus on building real vehicles, which is the best method to teach system integration.

Question 4: What is the likelihood that the project team will move the technologies toward or into the marketplace? Please state the reasons for your selection.

One person stated that the product is student output and education - and OSU is certainly successful. The output in distance learning is noteworthy. Secondary benefits may arise from some of the research - e.g. battery ageing work. Plug-in hybrid understanding (e.g. grid impact) is valuable for students to have a more holistic view of energy use. One reviewer stated their conclusions were based on the program's focus on integration and demonstration as well as core technology development. The person also commented on the development of actual vehicles (puts the technology to the road). One final reviewer stated that the goal is to place as many Ph.D. and Masters-level scientists into industry as possible. There are well defined metrics to assess the success of meeting this goal. The person also stated that a secondary benefit may be achieved by virtue of the research topic and projects that Ph.D. and Masters students complete.

Question 5: How sufficient are the resources for the project to achieve the stated milestones in a timely fashion?

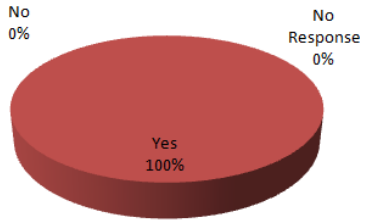
One person indicated that this is a strong program with several senior investigators – so there are resources available to them beyond DOE GATE. Challenge X synergy is a plus. "Sufficient" was checked in the interests of retaining an appropriate number of GATE schools under the constraint of a fixed overall budget. All of the GATE schools merit some increase to compensate for clear, recent rising costs. One other reviewer felt that there is a good leverage with industry sponsors, and it appears to be good program.

Question 6: Summary rating: when scoring this project, consider the relevance of the work to DOE's objectives, potential impacts on DOE/VT goals, project accomplishments, likelihood of technology transfer, and sufficiency of project resources.

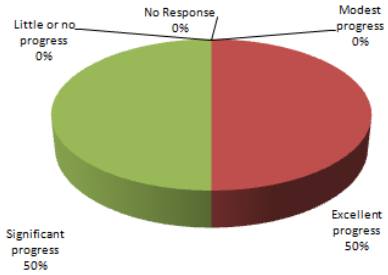
There were no expository comments for this question: refer to the graphic on the next page for this project's summary score.

Project: GATE Center for Advanced Automotive Propulsion

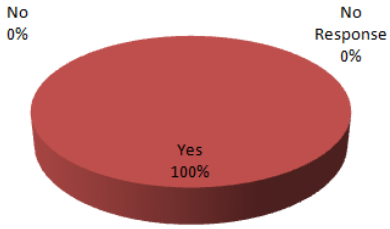
Question 1: Does this project support the overall DOE objectives of petroleum displacement?



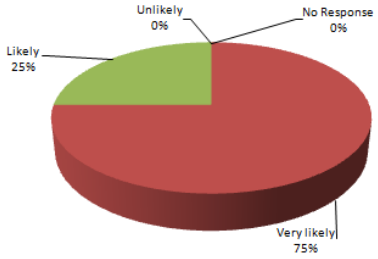
Question 3: Characterize the technical accomplishments and progress toward goals.



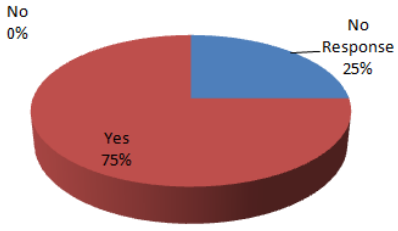
Question 2a: Are the goals of the project technically achievable?



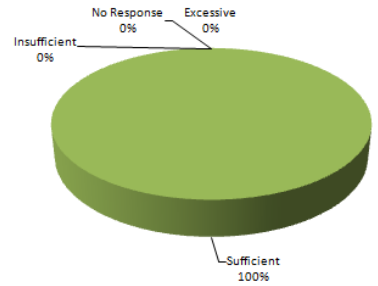
Question 4: How likely is the project team to move technologies into the marketplace?



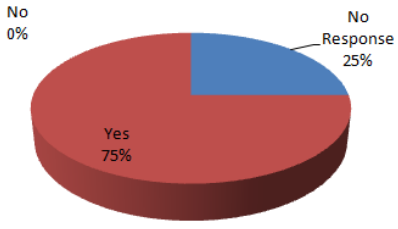
Question 2b: Have the technical barriers been identified and addressed?



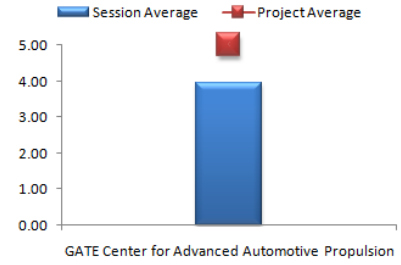
Question 5: Characterize the resources available for this project to achieve the stated milestones in a timely fashion.



Question 2c: Is the proposed work likely to overcome technical barriers?



Question 6: Overall Rating



GATE Center for Advanced Hybrid Propulsion and Control Systems (David Irick of University of Tennessee Knoxville)

Reviewer Sample Size
This project had a total of 5 reviewers.

Question 1: Does this activity support the overall DOE objectives of petroleum displacement? Why or why not?
Responses were generally positive to this question, with one person stating the program was within scope of DOE's objectives, while another indicated that the hybrid vehicle GATE center supports efficient vehicle design. One person stated that the research and teaching topics are relevant to reduce petroleum usage, and another added that the hybrid drive and control system research is directly related to the DOE's petroleum displacement goals. One final review noted that the center focuses on hybrid systems. The focus is on hybrid drive trains and control systems, and there are four areas of focus.

Question 2: Are the goals of the project technically achievable? Have the technical barriers been identified and addressed? Is the project likely to overcome those technical barriers? Please comment on the project's strategy for deployment of technologies.
Two reviewers commented that the program had a strong GATE history, with one adding that it was oriented to student training, with strong industry collaboration. The other also noted that the goal is to overcome technological barriers preventing the development and production of cost effective, high efficiency vehicles in the U.S. market. The approach is to train a future workforce of automotive engineering professionals knowledgeable about developing and commercializing advanced automotive technologies.

Other comments were less positive, with one response indicating that two of the three courses do not appear to be "special" or unique to the topic of GATE focus. Similarly, one person felt that the program seems to adequately address the necessary curriculum and program requirements – but didn't seem to feature anything unique that would set it out from the rest of the program. This person added that there is a low student count - due to uncertainty of funding – and that the program needs more sponsoring partners. One final reviewer added that the course development seems limited compared to the best in class. Courses, limited as they are, do not seem to be in demand. There appears to be modest leveraging through other organizations. Progress is negatively impacted by facility issues that necessitated relocating dynamometers to temporary locations; a permanent relocation will occur in coming months. There is significant recent growth in leveraging funding.

Question 3: Characterize your understanding of the technical accomplishments and progress toward DOE goals: please state the reasons for your assessment.
Multiple reviewers commented that there are a low number of students and a lack of unique courses, with one person stating that the courses are fairly generic (e.g. IC Engines), but are suited to training students for the workforce. Another commented that the activity level appears low relative to the best in class, but that it appears that the GATE designation has opened the door to projects from other funding agencies. One person noted that the investigator acknowledges that student count is low but steps are underway to recruit new qualified students. Another response stated that the program seems to be holding its own - but not grow or excelling. Projects seem to be too diverse, not integrated and focused to core program. They seem to take what they can, but don't have the prestige to pull in key sponsors and projects. This ability would greatly improve their knowledge and ability in the core program area.

One reviewer stated that the objectives are well-defined - including course development. GATE fellows are working on a biodiesel project, which is not hybrid vehicle oriented, but still meets DOE's needs to reduce petroleum consumption. To contrast, another person stated that the heavy fuel and biodiesel projects do not relate to focus.

Question 4: What is the likelihood that the project team will move the technologies toward or into the marketplace? Please state the reasons for your selection.

Multiple reviewers commented that there are a low number of students and a lack of unique courses, with one person stating that the courses are fairly generic (e.g. IC Engines), but are suited to training students for the workforce. Another commented that the activity level appears low relative to the best in class, but that it appears that the GATE designation has opened the door to projects from other funding agencies. One person noted that the investigator acknowledges that student count is low but steps are underway to recruit new qualified students. Another response stated that the program seems to be holding its own - but not grow or excelling. Projects seem to be too diverse, not integrated and focused to core program. They seem to take what they can, but don't have the prestige to pull in key sponsors and projects. This ability would greatly improve their knowledge and ability in the core program area.

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Question 5: How sufficient are the resources for the project to achieve the stated milestones in a timely fashion?

One respondent stated that course development, leveraged funding, and the number of students are a bit limited compared to best in class. Multiple reviewers commented on this issue of leveraged funding, with one stating that the GATE center is meeting the goal of training students for the energy industry, but should seek more tightly focused co-funding if the hybrid design aspect is going to be emphasized. Another stated that not enough outside funding is being generated to adequately leverage DOE dollars.

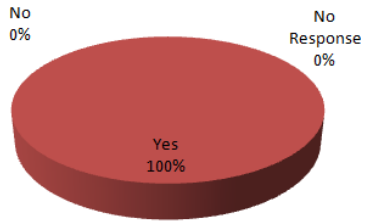
One reviewer stated that UT should develop more unique courses and also have more recognizable industry partnership contributions to course development related to GATE focus. One other person commented on the interaction with external partners for several research programs supporting the GATE program, totaling $1.7 million. This person indicated that collaborative research projects associated with GATE program could seek to be more focused, similar to earlier responses.

Question 6: Summary rating: when scoring this project, consider the relevance of the work to DOE's objectives, potential impacts on DOE/VT goals, project accomplishments, likelihood of technology transfer, and sufficiency of project resources.

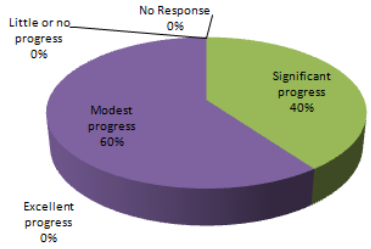
There were no expository comments for this question: refer to the graphic on the next page for this project's summary score.

Project: GATE Center for Advanced Hybrid Propulsion and Control Systems

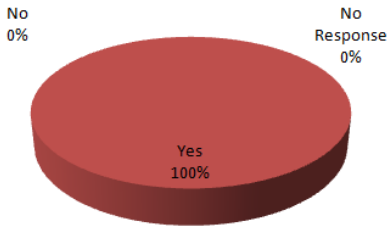
Question 1: Does this project support the overall DOE objectives of petroleum displacement?



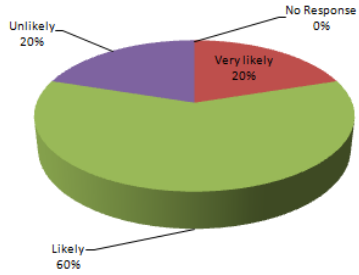
Question 3: Characterize the technical accomplishments and progress toward goals.



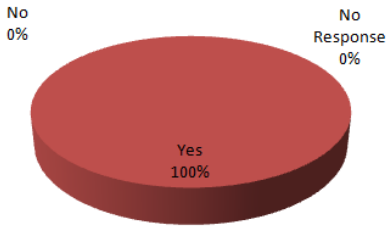
Question 2a: Are the goals of the project technically achievable?



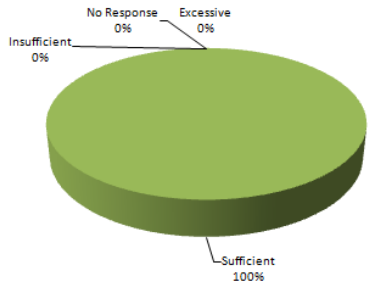
Question 4: How likely is the project team to move technologies into the marketplace?



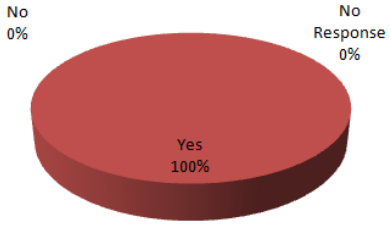
Question 2b: Have the technical barriers been identified and addressed?



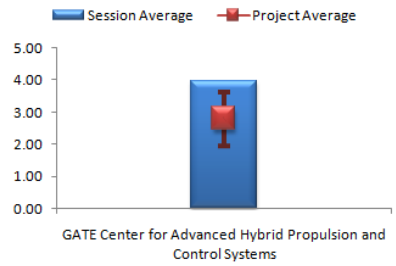
Question 5: Characterize the resources available for this project to achieve the stated milestones in a timely fashion.



Question 2c: Is the proposed work likely to overcome technical barriers?



Question 6: Overall Rating



GATE Center for Advanced Lightweight Materials (Uday Vaida of University of Alabama Birmingham)

Reviewer Sample Size
This project had a total of 5 reviewers.

Question 1: Does this activity support the overall DOE objectives of petroleum displacement? Why or why not?
One person noted that the program took a multidisciplinary approach to understanding automotive research and education problems, citing the collaborations on impact modeling. This reviewer added that vehicle weight reduction emphasis is an important area. One response stated that the program seeks to develop materials which can improve the efficiency of vehicles through weight reduction using advanced composite polymers and plastic materials, and that it is successfully moving expertise into the marketplace through the graduation of students with the necessary expertise to make near-term contributions to this area of research and product development. Another added that knowledge and use of lightweight materials would help reduce petroleum usage, while one person chose to highlight the program's student training and technical development.

In contrast, one person stated that, while the benefits of the program appear mostly through training students, it was not clear that there were significant advancements of technology. The person added that the applications mentioned were not within the scope of DOE's priorities (e.g. transit buses, guardrails).

Question 2: Are the goals of the project technically achievable? Have the technical barriers been identified and addressed? Is the project likely to overcome those technical barriers? Please comment on the project's strategy for deployment of technologies.
Multiple reviewers indicated that they liked the idea to expose and create interest in high school students. Separately, one person added that the structural composites projects for guardrails and transit applications did not appear to have a significant impact on energy consumption, and also that the value of partnering with ORNL was clear but the activities were not well explained or documented. Another reviewer commented that the program had coherent objectives for the recruitment of students, that an advisory board had been established, and that they were developing relevant courses. One final reviewer stated that the deployment strategy addresses interdisciplinary cooperation to access the necessary expertise from multiple engineering disciplines, and that the program has also identified several applications/markets for technologies and materials under development. This response also noted the automotive certificate and the biomedical courses being offered.

Question 3: Characterize your understanding of the technical accomplishments and progress toward DOE goals: please state the reasons for your assessment.
Responses to this prompt were somewhat mixed, with one reviewer noting that he or she would like to see the scope of materials and processes expanded, and another commenting that the program was still early in process. Another noted that they have worked to build industry collaborations through direct interactions with students and industry, as well as conferences and workshops. This reviewer also noted the alliances with ORNL.

One person commented that industry collaboration is important, and is growing. Alabama appears to offer good opportunities for local industry interaction, and there is progress since the last review. However, this reviewer added, not all collaborations are geared to weight reduction or vehicle

efficiency. Another person commented that the specifics are only generally touched on, and that the program sounds promising but was the presentation was light on specific details and Q&A. There are lots of project areas, but no specific goals to measure concrete progress.

Question 4: What is the likelihood that the project team will move the technologies toward or into the marketplace? Please state the reasons for your selection.

One person commented that their response considered mostly the graduation of students, which they feel to be a major objective and output. The reviewer added that applied topics appear to have direct relevance to industry.

There was some disagreement regarding deploying the resultant technologies, with one person indicating that the products developed may find their way to the marketplace, and another reviewer stating that the program has identified several segments of the market that can benefit from the development and technologies. One person specifically noted their example of an application for transit buses. To contrast, another reviewer indicated that it was hard to tell the baseline of the technologies that improvements are compared to. Also, this person stated that there was not much detail on the group's ability to integrate new technologies in a high production setting (real factory).

Question 5: How sufficient are the resources for the project to achieve the stated milestones in a timely fashion?

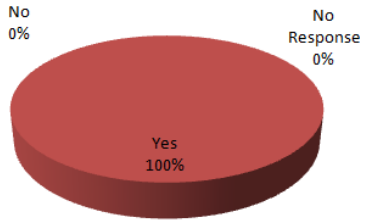
Multiple reviewers commented that the investigators are starting to leverage the available project funds to acquire additional external funding, with one person indicating that they seem to leverage DOE funds well. One of these reviewers additionally commented that the program leverages industry collaborations to directly support GATE interaction with students, while another noted that investigators might consider carefully the balance of resources between general automotive/materials engineering topics and the specific emphasis on lightweight materials. One reviewer stated that it was hard to tell how much more bang would be associated with additional funding. One final reviewer stated that, in general, the developed courses do not appear to be significantly unique or advanced to require additional resources for development.

Question 6: Summary rating: when scoring this project, consider the relevance of the work to DOE's objectives, potential impacts on DOE/VT goals, project accomplishments, likelihood of technology transfer, and sufficiency of project resources.

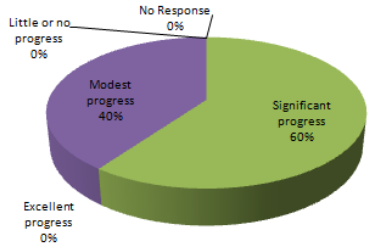
There were no expository comments for this question: refer to the graphic on the next page for this project's summary score.

Project: GATE Center for Advanced Lightweight Materials

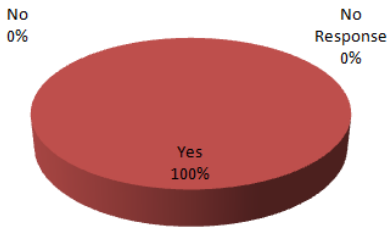
Question 1: Does this project support the overall DOE objectives of petroleum displacement?



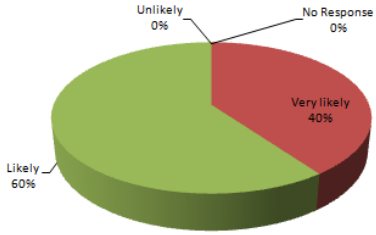
Question 3: Characterize the technical accomplishments and progress toward goals.



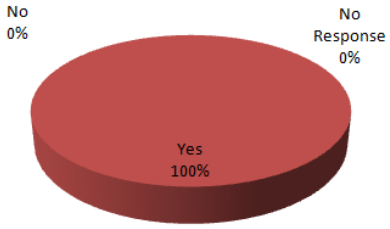
Question 2a: Are the goals of the project technically achievable?



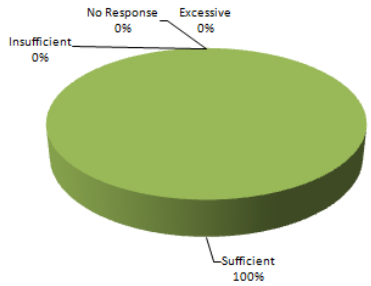
Question 4: How likely is the project team to move technologies into the marketplace?



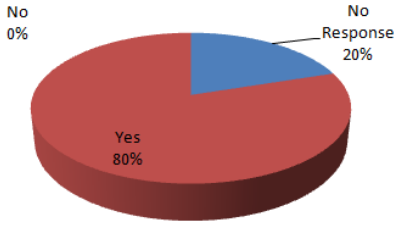
Question 2b: Have the technical barriers been identified and addressed?



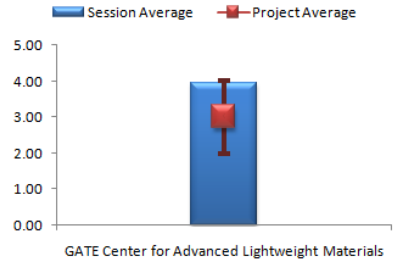
Question 5: Characterize the resources available for this project to achieve the stated milestones in a timely fashion.



Question 2c: Is the proposed work likely to overcome technical barriers?



Question 6: Overall Rating



GATE Center for Automotive Fuel Cell Systems (Doug Nelson of Virginia Tech)

Reviewer Sample Size
This project had a total of 5 reviewers.

Question 1: Does this activity support the overall DOE objectives of petroleum displacement? Why or why not?
Responses were generally positive, with multiple reviewers stating that hydrogen and fuel cells would help displace petroleum for mobility and is highly related to DOE goals. One person stated that fuel cell systems are clearly central to DOE's objectives towards petroleum displacements. Similarly one person wrote that the center emphasizes fuel cells – a long-term solution to oil displacement. One final response indicated that the program emphasizes overcoming technical barriers for hydrogen fuel cells, high efficiency vehicles in general, and also addresses hybrid vehicles. The program is focused on clean domestic fuels and energy security, with multidisciplinary learning opportunities. The program engages students in applied automotive research in fuel cell technologies for vehicles.

Question 2: Are the goals of the project technically achievable? Have the technical barriers been identified and addressed? Is the project likely to overcome those technical barriers? Please comment on the project's strategy for deployment of technologies.
One person stated that the group's approach utilizes university and industry leveraged resources, as well as NSF center funding – this is clearly defined and seemingly very effective. The involvement of multiple university departments appears to provide beneficial multidisciplinary approach, and there is a strong development of unique courses. Another reviewer commented that there is a need for engineers in hydrogen / fuel cell industry & research – this is identified. Graduation of engineers is primary output. This is achievable. Separately, the program has identified technology barriers in the fuel cell area.

One response stated that there was good interfacing with various different departments and areas with VT that mirrors what industry must do. Another stated that the multidisciplinary focus is important toward the achievement of goals and overcoming barriers for implementation, but felt that the group could use more government lab interaction.

One final response said that the program seeks to address the lack of engineers, and also to address energy sustainability in transportation. Also, OEMs lack some technologies and materials that are needed to bring fuel cells to market. The program takes a collaborative approach between academic departments: mechanical engineering, material science, engineering science and mechanics department. This collaboration is key to success.

Question 3: Characterize your understanding of the technical accomplishments and progress toward DOE goals: please state the reasons for your assessment.
Responses were generally positive, with one person stating that this is a well thought out program with diverse expertise and leveraged externally. Another noted that curriculum development, recruitment, research, publication and information dissemination are all identified as goals and are being achieved. There is an integrated research plan. One person chose to highlight the number of students moving to automotive firms, and also on the detail of research. Another added that courses and research support improvement in membrane durability of fuel cells. Research is conducted in conjunction with industrial sponsorship. There is an integrated research plan.

In contrast, one person stated that there was no discussion of specific barriers that need to be overcome. It is hard to quantify actual progress – no baselines were provided to measure progress and or potential end goals (energy saving) potential for research gains.

Question 4: What is the likelihood that the project team will move the technologies toward or into the marketplace? Please state the reasons for your selection.

One reviewer stated that their conclusions are based primarily on the program developing well-trained students. Another stated that the primary product is information output and the graduation of well-educated students – there is strong evidence of success. The course hours completed are substantial, adding that there may also be real-world impact from the research on membranes and water removal, but other projects are more learning exercises in system design. One response stated that VT is addressing via research some of the major challenges that need to be solved to make fuel cells viable for transportation. One person stated that the product of this program is graduation of students who have been exposed to the issues of energy sustainability in transportation. The program gives students the expertise to have an immediate contribution upon graduation. There may also be a real-world impact through the industrial collaboration through research projects.

One final response stated that it seems impressive but hard to quantify actual progress - no baselines to measure progress and or potential end goals (energy saving) potential for research gains. It is mostly confined to students entering workforce and publications.

Question 5: How sufficient are the resources for the project to achieve the stated milestones in a timely fashion?

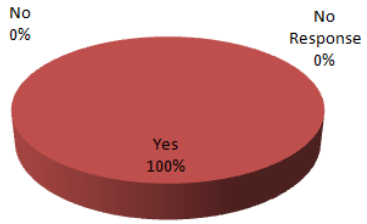
One person noted that the program is levering GATE funds and industrial research sponsorship, while another felt there was a good partnership with industry and the general automotive community. A response commented that there is synergy with other research programs, and there is some added support beyond DOE GATE. There are ambitious plans for the next year, but these are probably attainable using the expected resources. One final reviewer stated that the group seems to be making good progress with current funding, but it is hard to tell what additional "bang" will be derived by more "bucks."

Question 6: Summary rating: when scoring this project, consider the relevance of the work to DOE's objectives, potential impacts on DOE/VT goals, project accomplishments, likelihood of technology transfer, and sufficiency of project resources.

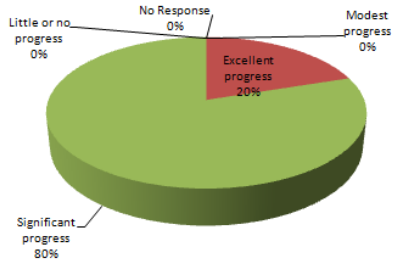
There were no expository comments for this question: refer to the graphic on the next page for this project's summary score.

Project: GATE Center for Automotive Fuel Cell Systems

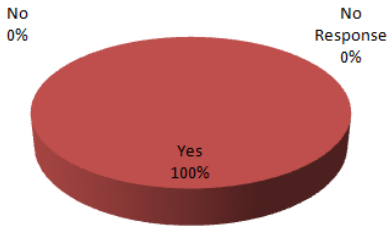
Question 1: Does this project support the overall DOE objectives of petroleum displacement?



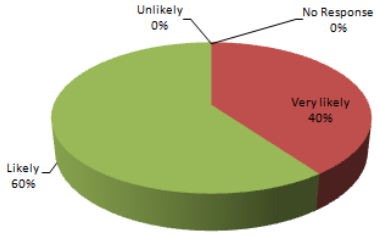
Question 3: Characterize the technical accomplishments and progress toward goals.



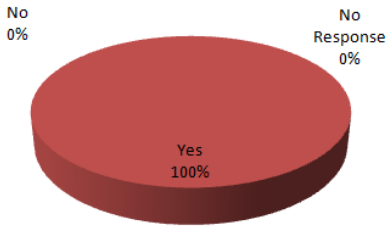
Question 2a: Are the goals of the project technically achievable?



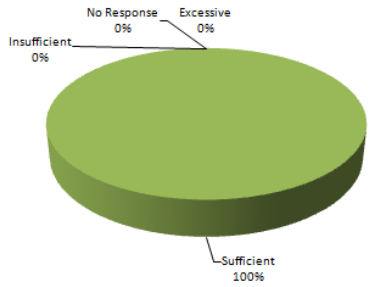
Question 4: How likely is the project team to move technologies into the marketplace?



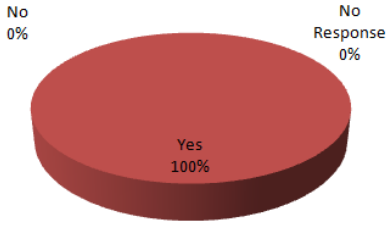
Question 2b: Have the technical barriers been identified and addressed?



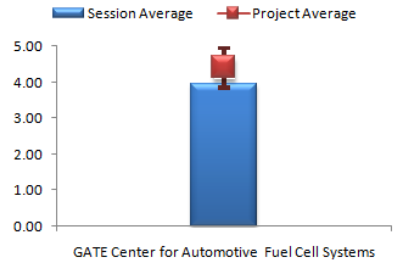
Question 5: Characterize the resources available for this project to achieve the stated milestones in a timely fashion.



Question 2c: Is the proposed work likely to overcome technical barriers?



Question 6: Overall Rating



GATE Center for Fuel Cell Hydrogen Hybrid Vehicles (Joshua Cunningham of University of California Davis)

Reviewer Sample Size
This project had a total of 5 reviewers.

Question 1: Does this activity support the overall DOE objectives of petroleum displacement? Why or why not?
One person stated that the program was within the scope of DOE's objectives, while another added that the fuel cell and hybrid emphases both support alternative, efficient propulsion systems. Similarly, another person felt that the research areas are all directly relevant to DOE goals and to the eventual displacement of petroleum - especially inclusion of infrastructure issues. One other stated that the program's goals focus on training future engineers in the areas of fuel cell, hydrogen and hybrid vehicles. The reviewer added that the program also stresses the policy aspect.

Question 2: Are the goals of the project technically achievable? Have the technical barriers been identified and addressed? Is the project likely to overcome those technical barriers? Please comment on the project's strategy for deployment of technologies.
One person stated that education is the main output, noting that the center recognizes the shortage of skilled professionals. Another added that there is an extensive list of areas for study that should prepare students for the future. One person indicated that there was a good layout and understanding of overall program goals and objectives, and a good multi-disciplinary approach. The person also noted the focus on component, system, and infrastructure (the infrastructure is a key point that other centers seem to be lacking), adding that the program needs more industry (OEM) sponsorship and interaction. One response commented that there are not currently enough students that know how to do integration of mechanical and electrical systems in hybrid vehicles, and that there is also not enough graduating students who have an understanding of policy aspects. Program is cross training for transportation leaders, as it attempts to expose students to fuel, vehicle, engine, fuel production and transportation policies.

One other person felt that the combination of two previous centers is appropriate and beneficial, and the opportunity to integrate policy context with technology appears unique and beneficial. The cooperation of multiple engineering departments and ITS offers unique breadth, and the program appears to offer unique classes although perhaps not as many as some other centers. There is good leverage with California Energy Commission. There is also beneficial consideration/coordination with PHEV/Grid interaction, and the creative competitive student selection process is cost-shared by non-GATE research grants.

Question 3: Characterize your understanding of the technical accomplishments and progress toward DOE goals: please state the reasons for your assessment.
One reviewer commented that there was a good layout of research plan components but little description of actual projects and progress toward project completion. Another stated that the number of students appears to be lower than most programs.

One person stated that GATE program activities are strongly integrated with overall UC Davis activities in these research areas. This indicates a high level of integration of the GATE program into the overall UC Davis curriculum and research focus. Another noted that it is difficult to separate the GATE activities and outcomes from UC Davis broader activities. For example, STEPS alone dwarfs

GATE. This is positive because it implies high leverage, but it also makes it more difficult to quantify how the GATE funding specifically helps. There is an impressive continuity in student graduation.

Question 4: What is the likelihood that the project team will move the technologies toward or into the marketplace? Please state the reasons for your selection.

One person indicated that there is a competitive process (promoting quality) for GATE scholar recruiting – and students will be the main output. The students are obliged to show that their research will satisfy the GATE objectives as part of the application. Another also stated that the product is education and that the program graduates students who have expertise not only in technologies and core science related to hydrogen and fuel cell vehicles, but also transportation policy implications. The high level of integration of the GATE activities with broader UC Davis programs and curriculum enhances the likelihood of achieving this goal. The reviewer adds that there is a competitive application process to be a GATE student, and students are required to develop an integrated research plan.

One other person stated that there is a broad range of focus areas - but felt that there was little specific information on the ability to move research into the marketplace.

Question 5: How sufficient are the resources for the project to achieve the stated milestones in a timely fashion?

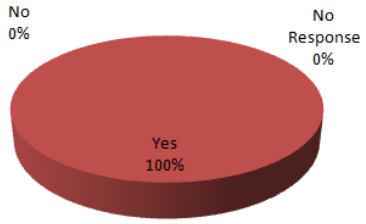
One person stated that the partnerships developed aid this effort greatly, while another felt that the program needs more industry sponsorship to leverage DOE funds. One person felt that the program was leveraging existing programs and laboratories at UC Davis, as well as external partners. One final person commented that UC Davis is a giant in the advanced transportation research area. The presentation showcased UC Davis broadly. However, this reviewer has no doubt that the GATE funding is facilitating some adventurous research (including economic issues), and there is good evidence of course development.

Question 6: Summary rating: when scoring this project, consider the relevance of the work to DOE's objectives, potential impacts on DOE/VT goals, project accomplishments, likelihood of technology transfer, and sufficiency of project resources.

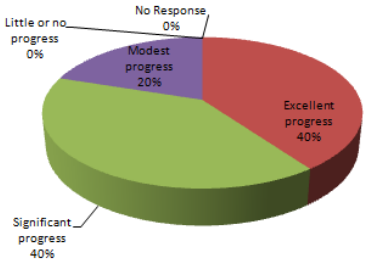
There were no expository comments for this question: refer to the graphic on the next page for this project's summary score.

Project: GATE Center for Fuel Cell Hydrogen Hybrid Vehicles

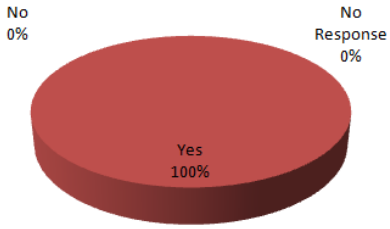
Question 1: Does this project support the overall DOE objectives of petroleum displacement?



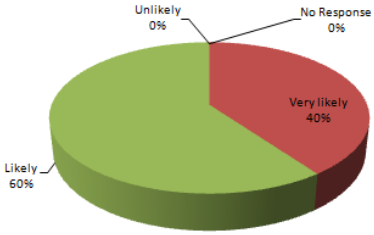
Question 3: Characterize the technical accomplishments and progress toward goals.



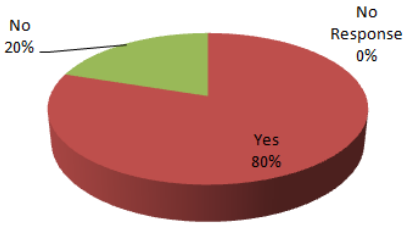
Question 2a: Are the goals of the project technically achievable?



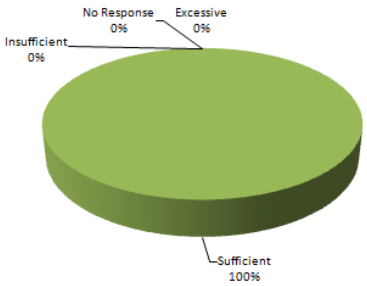
Question 4: How likely is the project team to move technologies into the marketplace?



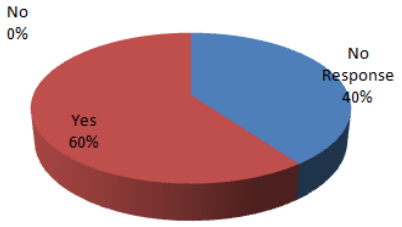
Question 2b: Have the technical barriers been identified and addressed?



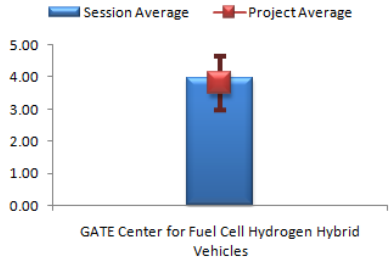
Question 5: Characterize the resources available for this project to achieve the stated milestones in a timely fashion.



Question 2c: Is the proposed work likely to overcome technical barriers?



Question 6: Overall Rating



GATE Center for In-Vehicle High Power Energy Storage Systems (Joel Anstrom of Pennsylvania State University)

Reviewer Sample Size
This project had a total of 5 reviewers.

Question 1: Does this activity support the overall DOE objectives of petroleum displacement? Why or why not?
One person stated that the scope aligns with DOE objectives, while another commented that energy storage systems are directly applicable technologies toward the ultimate goal of petroleum displacement. Similarly, one response indicated that the energy storage emphasis addresses a critical area in hybrid vehicle design, which in turn addresses vehicle efficiency. Another stated that energy storage is important aspect of hybrids and fuel cell vehicles. One final reviewer noted the focus on a graduate curriculum for high power in-vehicle storage for hybrid electric and fuel cell vehicles: batteries, capacitors, flywheels. The program is developing an integrated systems approach to energy storage.

Question 2: Are the goals of the project technically achievable? Have the technical barriers been identified and addressed? Is the project likely to overcome those technical barriers? Please comment on the project's strategy for deployment of technologies.
One reviewer commented that there is a strong group of faculty members, with an established structure, and there is also an established GATE curriculum. Another stated that the unique curriculum (energy storage) was a positive, but that not much national lab interaction and industry sponsorship is visible. One person stated that they were not sure why diesel combustion and emissions was part of PSU's GATE program.

A reviewer stated that the inclusion of flywheels for energy storage is unique, and that hardware in the loop appears to be unique. The program's course development seems a bit limited compared to the best in class, but the exchange program with a university in Spain is beneficial. The program stepped up recruiting efforts to get back on track in the number of students. This is the only Energy Storage center, but leadership in the technology is not clear. One reviewer stated that their approach builds on the synergy of electrochemical, composites manufacturing and the Center for Dielectric Studies. They have added power electronics, diesel combustion and emissions, and Hybrid and Hydrogen Vehicle Research Center. There is a strong team of faculty with an established organization. There is a well established and defined GATE curriculum that focuses on energy storage. The reviewer also noted that all "GATE Fellows" must follow the GATE Curriculum and develop a research theme in energy storage. Other students can take the GATE Curriculum, but without having a restriction on their research topic.

Question 3: Characterize your understanding of the technical accomplishments and progress toward DOE goals: please state the reasons for your assessment.
One person noted that GATE Fellows have research specifically in energy storage, but other GATE students can take GATE courses – this provides two pathways for student education. Another felt that the number of students is adequate and the courses appear to be new or different than they were without GATE. Another person commented that the program seems to address student development – but was concerned that there was not much discussion of specific technical projects and progress. One final reviewer stated that the synergy with the DOE Advanced Vehicle Competitions is a positive feature.

Question 4: What is the likelihood that the project team will move the technologies toward or into the marketplace? Please state the reasons for your selection.

Multiple reviewers were interested in the support and placement of students, with one person stating that they based their conclusions on placing well-trained students. Another noted that 18 GATE fellows have been funded, adding that the research topics are important and relevant to vehicle design. There is good publication output, but it is not clear how much the GATE fellows are exposed to industry. One other reviewer stated that the output is students who are specifically educated to address energy storage for HEV and fuel cell vehicles. The person adds that the well structured GATE curriculum enhances the success in achieving this goal. There is a long list of industry research relationships, as well as outreach to local festivals and industry conferences and workshops. The program plans to expand interaction with local industry in the involvement/sponsorship of GATE program. Overall, the emphasis is on students.

One person stated that publications and partnerships with industry and other government agencies make the GATE involvement valuable and useful in training. One person felt that there was not much presented that deals with the direct movement of technologies to the marketplace (other than FutureTruck competition vehicles).

Question 5: How sufficient are the resources for the project to achieve the stated milestones in a timely fashion?

One reviewer commented that PSU / PTI understand how to leverage GATE funds. There are related programs that fund additional students. GATE and Challenge X offer synergy. Another agreed that the program leverages other federal, state and industrial funding. The program has a strong record of support from industry sponsors to support curriculum with software licenses. One response stated that the number of courses is not too large, but the partnerships with domestic and overseas organizations provide very valuable experience.

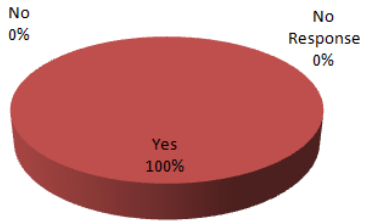
One final reviewer indicated that there was no specific indication of how much leverage there was from outside and industry sources (other than "good"); listed names, but no idea of how much funding is provided from each sponsor. The person added that this funding seems to be more "in-kind" and product and product support sponsorship, and that the program overall seems to be student-limited (availability) not funding.

Question 6: Summary rating: when scoring this project, consider the relevance of the work to DOE's objectives, potential impacts on DOE/VT goals, project accomplishments, likelihood of technology transfer, and sufficiency of project resources.

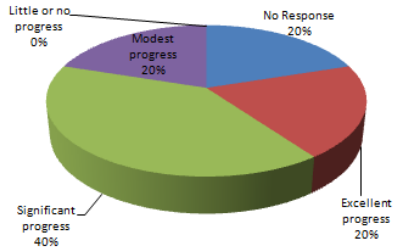
There were no expository comments for this question: refer to the graphic on the next page for this project's summary score.

Project: GATE Center for In-Vehicle High Power Energy Storage Systems

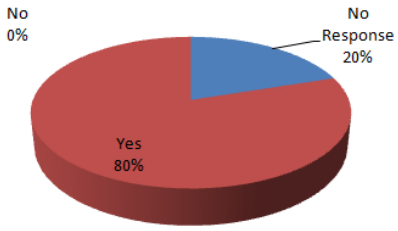
Question 1: Does this project support the overall DOE objectives of petroleum displacement?



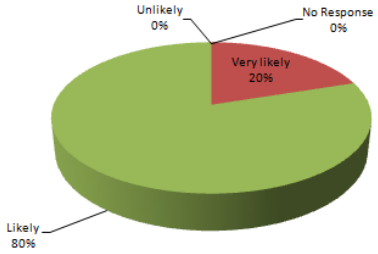
Question 3: Characterize the technical accomplishments and progress toward goals.



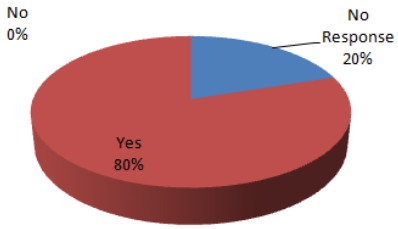
Question 2a: Are the goals of the project technically achievable?



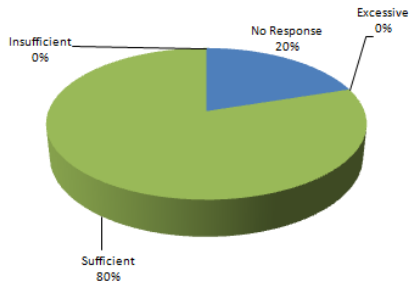
Question 4: How likely is the project team to move technologies into the marketplace?



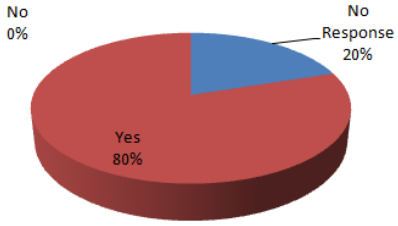
Question 2b: Have the technical barriers been identified and addressed?



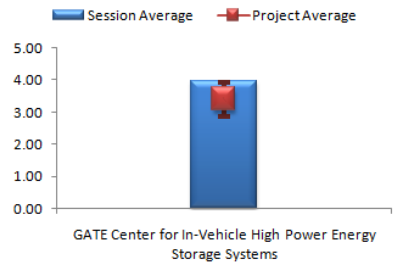
Question 5: Characterize the resources available for this project to achieve the stated milestones in a timely fashion.



Question 2c: Is the proposed work likely to overcome technical barriers?



Question 6: Overall Rating



GATE Center for Lightweighting Automotive Materials and Processing (P.K. Mallick of University of Michigan Dearborn)

Reviewer Sample Size
This project had a total of 4 reviewers.

Question 1: Does this activity support the overall DOE objectives of petroleum displacement? Why or why not?
Comments here were generally positive and focused on improved fuel economy. One response noted that the lightweight vehicle emphasis supports improved fuel economy, while another wrote that CLAMP is directly related to reducing fuel consumption on new vehicles. One reviewer stated that improvements to lightweight materials directly relate to the DOE petroleum displacement goals. This person added that, while not as glamorous as other technologies, it facilitates efficiency improvements for all vehicles (regardless of drive train). Similarly, one final respondent commented that the program focuses on lightweight automotive materials and processing to improve vehicle efficiency. Their goal is to create a university/industry/government education and research center, with an emphasis on training graduates and transferring technology to industry.

Question 2: Are the goals of the project technically achievable? Have the technical barriers been identified and addressed? Is the project likely to overcome those technical barriers? Please comment on the project's strategy for deployment of technologies.
Responses were again generally positive here. One reviewer stated that their products are research/information and qualified student output, adding that the courses and research topics are well suited to the objectives, and the thrust into fuel cell materials is novel. Another person commented that the program is somewhat unique with respect to advanced materials and the educational process.

One person noted that the presentation directly addressed how they were going to address key barriers to increase energy efficiency through the use of advanced materials for weight reduction. This person added that inclusion of manufacturability is a key benefit, as it is not just finding high-strength materials, but also about how to economically manufacture vehicles using these materials that is important. Another added that there appears to be a good focus of curriculum and graduate research related to lightweight materials for vehicles. This person added that the program may benefit from some courses focusing on the implications of lightweight design of vehicles to include safety implications as well as manufacturing processes.

Question 3: Characterize your understanding of the technical accomplishments and progress toward DOE goals: please state the reasons for your assessment.
One reviewer commented that courses and projects directly relate to GATE focus, and UM-D is also involving industry speakers in programs. Another stated that one positive of the program is that it seems to have a large number of students and their research appears to be directly meeting the advanced material needs of industry.

One other reviewer felt that there appears to be a good grounding in the coursework, and even in the materials area, but indicated that UM-D may want to be clearer about the focus on the specific issues related to lightweight design. (This person adds that this is a generic GATE concern, not limited to UM-D – which courses should be in the core curriculum, and which should be GATE supported? If the core is not supportive enough of the topic area, the GATE resources may not be directed at the topic area closely enough.)

Question 4: What is the likelihood that the project team will move the technologies toward or into the marketplace? Please state the reasons for your selection.

Multiple responses commented on the fact that UM-D is graduating students, with one adding that this is the main objective, so there is already measurable output. Papers have also been published. Another stated that training of advanced materials engineers will be a vital component to meeting new CO_2 reduction regulations. Similarly, one reviewer stated that the output is the transfer of knowledge/information to industry and qualified graduates in the field of lightweight automotive materials. The program also seeks to enhance continuing education of practicing engineers through seminars and colloquia. They have developed a database on material properties, processing and test methods that has been made available to industry through web-based resources, along with conducting regular seminars and symposia. Another person stated that a positive of the program is that it has already demonstrated results in the transfer of advanced materials knowledge to industry.

Question 5: How sufficient are the resources for the project to achieve the stated milestones in a timely fashion?

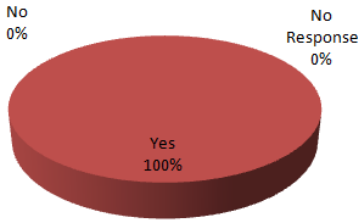
Responses to this prompt were generally positive. One person stated that UM-D appears to be using GATE funds directly on GATE focus courses and research. Another felt that the program is succeeding at the present funding level, adding that faculty are seeking external funding in the materials / GATE area. Similarly, one person stated that the program has good industry support that leverages DOE funding. One final reviewer noted that there are multiple proposals in development to augment the GATE research areas.

Question 6: Summary rating: when scoring this project, consider the relevance of the work to DOE's objectives, potential impacts on DOE/VT goals, project accomplishments, likelihood of technology transfer, and sufficiency of project resources.

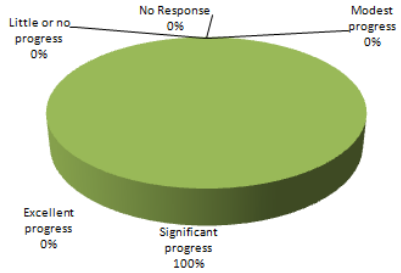
There were no expository comments for this question: refer to the graphic on the next page for this project's summary score.

Project: GATE Center for Lightweighting Automotive Materials and Processing

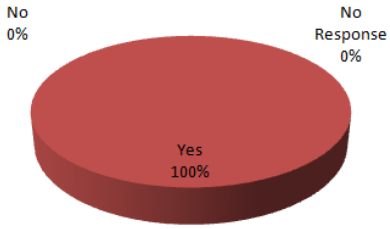
Question 1: Does this project support the overall DOE objectives of petroleum displacement?



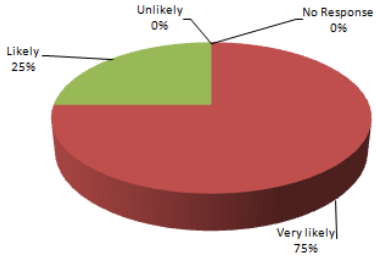
Question 3: Characterize the technical accomplishments and progress toward goals.



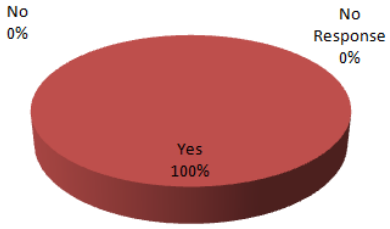
Question 2a: Are the goals of the project technically achievable?



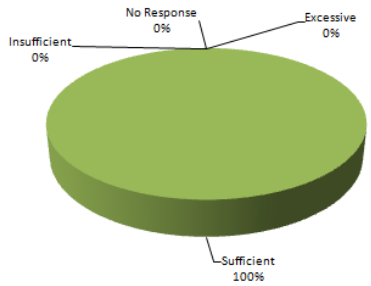
Question 4: How likely is the project team to move technologies into the marketplace?



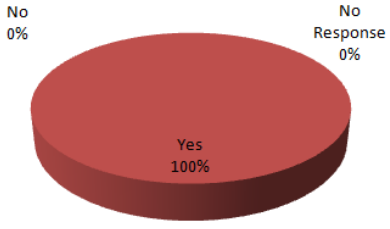
Question 2b: Have the technical barriers been identified and addressed?



Question 5: Characterize the resources available for this project to achieve the stated milestones in a timely fashion.



Question 2c: Is the proposed work likely to overcome technical barriers?



Question 6: Overall Rating