8. Technology Integration

The Technology Integration subprogram accelerates the adoption and use of alternative fuel and advanced technology vehicles to help meet national energy and environmental goals and accelerate dissemination of advanced vehicle technologies through demonstrations and education. This subprogram's efforts logically follow successful research by industry and government and help to accelerate the commercialization and/or widespread adoption of technologies that are developed in other VT program areas. Deployment activities linked to R&D also provide early market feedback to emerging R&D.

Subprogram functions include both regulatory and voluntary components. The regulatory elements include legislative, rulemaking, and compliance activities associated with alternative fuel requirements identified within the Energy Policy Acts of 1992 and 2005 (EPACT 1992 and EPACT 2005), as well as the Energy Independence and Security Act of 2007 (EISA). Voluntary efforts include demonstration of advanced technology vehicles to verify market readiness and public information, education, outreach and technical assistance efforts. VTP works with public/private partnerships between DOE and local coalitions of key stakeholders across the country (such as through Clean Cities) to implement strategies and projects that displace petroleum. In addition, the annual DOE/EPA Fuel Economy Guide publication and related data dissemination efforts (required by law) are produced, along with the website www.fueleconomy.gov.

Education aids in overcoming institutional barriers to widespread use of advanced vehicle technologies and alternative fuels, and serves to train the next generation of participants in this technology sector. Activities such as the Advanced Vehicle Competitions (EcoCAR) and Graduate Automotive Technology Education (GATE) encourage the interest of university student engineers and engage their participation in advanced technology development.

EcoCAR: The NeXt Challenge: EcoCAR is a three-year engineering competition sponsored by the Vehicle Technologies Program and General Motors (GM). EcoCAR, which began in 2008 and concludes in 2011, challenges students to reengineer a 2009 Saturn Vue. The Challenge involves engineering a system that reduces fuel consumption and lowers emissions by using advanced vehicle technologies. This is state-of-the-art training and allows students to mirror the real-world development process used by GM and other auto manufacturers from around the world.

Automotive X Prize: DOE has partnered with the Automotive X Prize to develop an educational outreach program aimed at engaging students (kindergarten-12) and the public in learning about advanced, energy-efficient vehicles. The Automotive X Prize (AXP) is an open competition with the goal of inspiring a new generation of super-efficient vehicles that dramatically reduce oil dependence and greenhouse gas emissions. DOE is providing $3.5 million over three years for this outreach effort.

Graduate Automotive Technology Education (GATE): DOE established the GATE Program in 1998 to train a future workforce of automotive engineering professionals knowledgeable about, and experienced in, developing and commercializing advanced automotive technologies to help overcome technology barriers preventing the development and production of cost-effective, high-efficiency vehicles for the U.S. market. To that end, DOE has eight designated GATE Centers of Excellence at U.S. universities that address hybrid electric vehicle drivetrains and control systems, lightweight materials, advanced combustion engines, alternative fuels, fuel cells, and advanced energy storage.

EPAct Transportation Regulatory Activities: VTP manages several transportation-related regulatory activities established by the Energy Policy Act of 1992 (EPAct), as amended by the Energy Conservation Reauthorization Act of 1998, EPAct 2005, and the Energy Independence and Security Act of 2007 (EISA). These activities seek to reduce U.S. dependence on imported oil through the use of alternative fuels and alternative fuel vehicles (AFVs) in fleets, as well as through the use of other petroleum-displacement methods. EPAct 1992 defined certain fuels as alternative fuels and directed DOE to undertake regulatory activities that focus on building an inventory of fleet AFVs in Metropolitan Statistical Areas/Consolidated Metropolitan Statistical Areas, which were selected to serve as launching pads for alternative fuels and advanced vehicle technologies.

Clean Cities: Clean Cities advances the nation's economic, environmental, and energy security by supporting local actions to reduce petroleum consumption in transportation. Clean Cities has a network of approximately 100 volunteer coalitions, which develop

public/private partnerships to deploy alternative and renewable fuels, idle reduction measures, fuel economy improvements, and emerging transportation technologies.

In August 2009, DOE announced the selection of projects supporting two program areas under ARRA: transportation electrification education; and clean fuels, vehicles and infrastructure development. With funding totaling $39 million, the 10 ARRA-funded Advanced Electric Drive Vehicle Education activities support educational programs to substantially reduce petroleum consumption. Activities under this program include engineering degree and certificate programs, emergency responder and safety training, consumer and K-12 educational outreach, developing and providing teaching materials, and training service personnel, vehicle mechanics, and supporting infrastructure.

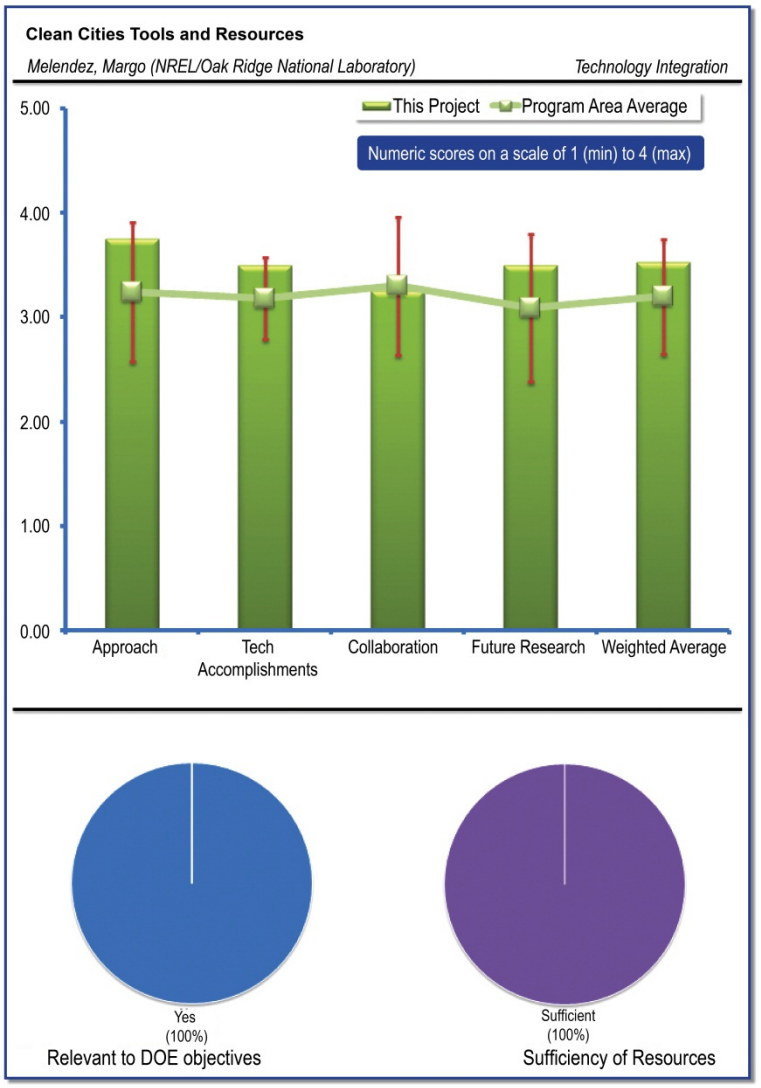
Additionally, the Department announced the selection of 25 projects totaling nearly $300 million that will speed the transformation of the nation's fleet. These projects will place more than 8,000 alternative fuel and energy efficient vehicles on the road, and establish hundreds of refueling locations/recharging sites across the country, which are both activities that support efforts to reduce petroleum consumption. Activities include development of alternative fuel infrastructure and alternative fuel corridors; alternative fuel vehicle deployment, including deployments of light-duty alternative fuel vehicles and vehicle conversions; upgrades to existing alternative fuel infrastructure; technical training; and education and outreach. For this merit review, these projects were included as Technology Integration poster presentations, and were not reviewed.

In this merit review activity, each reviewer was asked to respond to a series of questions, involving multiple-choice responses, expository responses where text comments were requested, and numeric score responses *(on a scale of 1 to 4)*. 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 graph form for each project, and the expository text responses will be summarized in paragraph form for each question. A summary table presenting the average numeric score for each question for each project is presented below.

Presentation Title	Principal Investigator and Organization	Page Number	Approach	Technical Accomplishments	Collaborations	Future Research	Weighted Average
Clean Cities Tools and Resources	Melendez, Margo (National Renewable Energy Laboratory/Oak Ridge National Laboratory)	8-4	3.75	3.50	3.25	3.50	3.53
Clean Cities 2009 Petroleum Displacement Awards	Scarpino, Michael (National Energy Technology Laboratory)	8-6	3.75	3.00	3.25	2.25	3.13
Penn State DOE Graduate Automotive Technology Education (Gate) Program for In-Vehicle, High-Power Energy Storage Systems	Anstrom, Joel (Pennsylvania State University)	8-8	3.50	3.50	3.50	3.25	3.47
UC Davis Fuel Cell, Hydrogen, and Hybrid Vehicle (FCH2V) GATE Center of Excellence	Erickson, Paul (University of California-Davis)	8-10	2.75	3.25	2.75	3.00	3.03
The University of Tennessee's GATE Center for Hybrid Systems	Irick, David (University of Tennessee)	8-12	3.25	3.25	3.50	3.25	3.28
University of Illinois at Urbana-Champaign's GATE Center for Advanced Automotive Bio-Fuel Combustion Engines	Lee, Chia-fon (University of Illinois at Urbana-Champaign)	8-14	3.75	3.25	3.50	2.75	3.34
Center for Lightweighting Automotive Materials and Processing	Mallick, P.K. (University of Michigan-Dearborn)	8-16	2.00	1.67	3.00	2.33	2.00
GATE Center for Automotive Fuel Cell Systems at Virginia Tech	Nelson, Doug (Virginia Tech)	8-18	3.67	3.67	3.00	4.00	3.63
GATE Center of Excellence at UAB in Lightweight Materials for Automotive Applications	Vaidya, Uday (The University of Alabama at Birmingham)	8-20	2.67	3.00	3.33	2.67	2.92

Presentation Title	Principal Investigator and Organization	Page Number	Approach	Technical Accomplishments	Collaborations	Future Research	Weighted Average
EcoCAR the Next Generation	De La Rosa, Kristen (Argonne National Laboratory)	8-22	3.67	3.67	4.00	3.67	3.71
OSU GATE Project	Guezennec, Yann (Ohio State University)	8-24	3.00	4.00	3.33	3.33	3.58
Overall Average			3.25	3.25	3.31	3.09	3.24

Clean Cities Tools and Resources: Melendez, Margo (National Renewable Energy Laboratory / Oak Ridge National Laboratory) – ti003



Reviewer Sample Size

This project had a total of four reviewers.

Question 1: Does this project support the overall DOE objectives? Why or why not?

All reviewer feedback was positive. The first reviewer said on-road vehicles account for most of the petroleum consumed in the U.S. To reduce petroleum consumption significantly, the focus of attention must be on cars and trucks. That is precisely the focus for the three website initiatives presented. These initiatives provide high quality, unbiased information on actions that reduce petroleum use. Another reviewer commented that the tools presented are very helpful to fleets that are looking to make the switch to alternative fuels.

Question 2: What is your assessment of the approach to performing the work? To what degree are technical barriers addressed? Is the project well-designed, feasible, and integrated with other efforts?

The first reviewer remarked that the tools for collecting, displaying and communicating information have been continually refined since these initiatives commenced in the 1990s. Additionally, the reviewer stated that with the Alternative Fuels and Advanced Vehicles Data Center (AFDC) and the Fuel Economy Guide, individual consumers have access to easily understandable and objective information to support decisions which help achieve better fuel economy and increased use of alternative fuels. This reviewer said accessing of NREL's on-line tools often leads to extensive interaction with users of the tools; this results in continual improvement and responsiveness to the needs of a variety of users. Another reviewer commented that deployment covers many areas. This reviewer continued that they like the approach and that focus on updating online tools is critical these days. The last reviewer noted that NREL needs to find a better way to get the word out on all of their products. This reviewer asked if they could use Clean Cities TV to hold monthly town hall type meetings.

Question 3: Characterize your understanding of the technical accomplishments and progress toward overall project and DOE goals.

The first reviewer said they were always amazed at the vast array of tools NREL provides. Another reviewer said that combining its expertise with ORNL's excellent survey and modeling abilities, NREL produces exceptional information products. Adding that in total, the three websites (AFDC, FuelEconomy.gov and Clean Cities) have millions of visits each year and use is increasing with awareness of, and respect for, the information provided. The next reviewer noted that the presentation has 10 accomplishment slides. This reviewer added that each one was packed with content (e.g., information tools, technical support mechanisms, data displays, samples of graphics, feedback forums and initiatives, examples of website upgrades and additions, etc.). This same reviewer continued that the oral presentation conveyed a sense of continued enthusiasm and excitement about the initiatives being presented;

the employment of leading edge information systems technologies; and the on-going interactions with numerous stakeholders. Another reviewer said that updates on website were impressive but it was not clear how much data sharing tools have been deployed.

QUESTION 4: WHAT IS YOUR ASSESSMENT OF THE LEVEL OF COLLABORATION AND COORDINATION WITH OTHER INSTITUTIONS?

The reviewers had mixed opinions concerning the collaboration and coordination with other institutions. The first reviewer said that partnerships, collaborations and routine interactions have been established with literally hundreds of stakeholders and website users (e.g., vehicle producers, Clean Cities Coordinators, trade associations, Federal and state government agencies, universities, media organizations and others). The first reviewer continued by saying that industry and other media managers are turning to NREL-managed websites as a credible source of information. This reviewer added that these government websites have been featured by others, such as CNN Money, and NREL has been approached by Google about collaborating on development and communication of EV information. The second reviewer addressed the Google topic, saying that the GeoEVSE initiative with Google sounds exciting if it can be deployed. The last reviewer was not aware of any collaboration or coordination with others, especially with EPA or the Federal Aviation Administration (FAA), both of which have funds available for alternative fuels.

QUESTION 5: HAS THE PROJECT EFFECTIVELY PLANNED ITS FUTURE WORK IN A LOGICAL MANNER BY INCORPORATING APPROPRIATE DECISION POINTS, CONSIDERING BARRIERS TO THE REALIZATION OF THE PROPOSED TECHNOLOGY, AND, WHEN SENSIBLE, MITIGATING RISK BY PROVIDING ALTERNATE DEVELOPMENT PATHWAYS?

The first reviewer stated that development of NREL's websites and results is on-going: e.g., work is being done to improve the content and value of EV and PHEV information. The reviewer provided another example stating that a re-designed Clean Cities website will be launched soon, and work will be done on the AFDC website. The second reviewer noted that future Internet plans sound like they would enable quicker and more reliable information sharing that would be easy to maintain for DOE. This reviewer added that it sounds like a lot of hurdles need to be overcome first though, and that widgets are needed to allow other websites to link to the information seamlessly. This same reviewer suggested a website to bring together all the information that is becoming available on E15. The last reviewer commented that there is always something on the back burner at NREL and they already have a long list of projects.

QUESTION 6: HOW SUFFICIENT ARE THE RESOURCES FOR THE PROJECT TO ACHIEVE THE STATED MILESTONES IN A TIMELY FASHION?

The first reviewer had detailed comments concerning resources and felt it was a judgment call. The reviewer stated that their scores indicated their view that outstanding results are being achieved with the resources currently provided. The first reviewer elaborated that they felt that more funds are not needed and, while initiatives could probably get by with fewer resources, this would slow website improvements and valuable collaborations with stakeholders would be reduced. This same reviewer applauded these initiatives commenting that they are likely among the best in Vehicle Technologies from a benefit/cost perspective (if that metric could be accurately measured). The second reviewer remarked that resources are sufficient, but more emphasis should be placed on supporting field staff that can put the vehicles on the road.

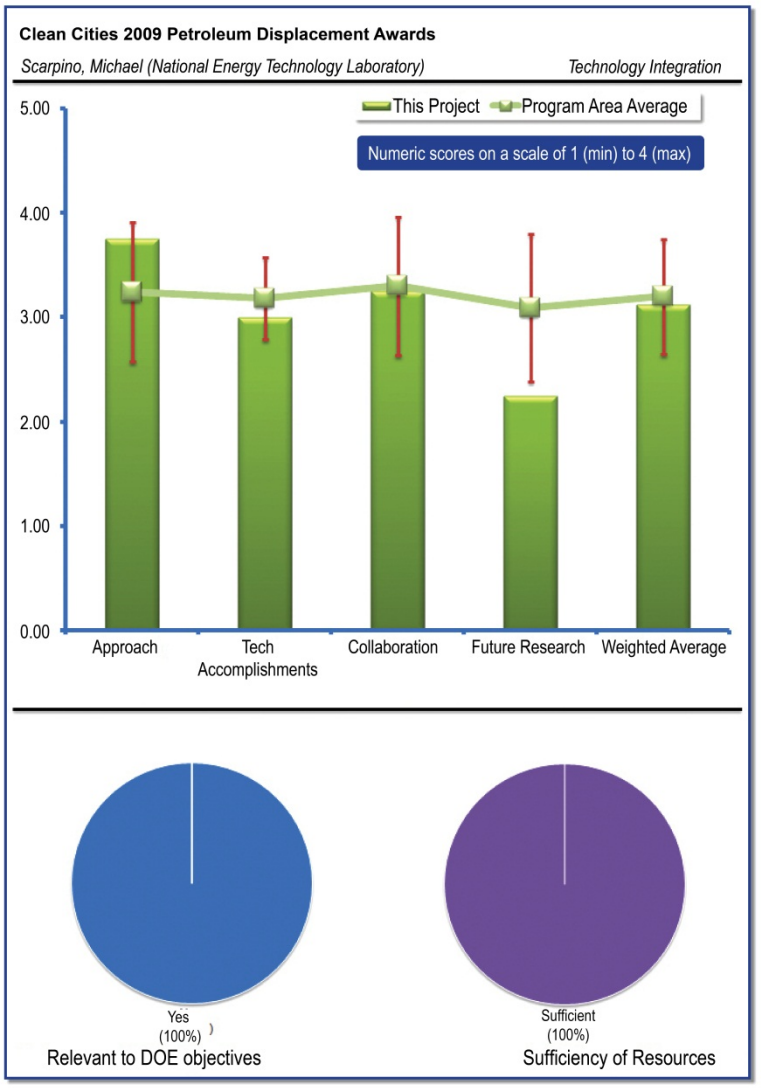
Clean Cities 2009 Petroleum Displacement Awards: Scarpino, Michael (National Energy Technology Laboratory) – ti0004

Reviewer Sample Size

This project had a total of four reviewers.

Question 1: Does this project support the overall DOE objectives? Why or why not?

All reviewers' comments were generally positive. The first reviewer stated that on-road vehicles account for most of the petroleum consumed in the United States and continued to remark that to reduce petroleum consumption significantly, the focus of attention must be on cars and trucks which is precisely the focus of the initiatives covered in this session. The first reviewer elucidated that the primary objective of the $298.5 million DOE ARRA program is to increase the use of alternative fueled and fuel-efficient vehicles, in order to reduce dependence on imported petroleum. The same reviewer noted that the $13.7 million DOE Clean Cities Petroleum Displacement Program has the same key objective that these are the most heavily funded vehicle deployment initiatives in the history of DOE. The second reviewer asserted that this project directly places alternative fuel vehicles on the road.



Question 2: What is your assessment of the approach to performing the work? To what degree are technical barriers addressed? Is the project well-designed, feasible, and integrated with other efforts?

The first reviewer said the following four points provide evidence of a sound strategy: (1) Multiple projects (25 ARRA and 23 non-ARRA); (2) Awards resulting from competitive solicitations; (3) A requirement that a designated Clean Cities coalition be included with each project application; (4) Projects dispersed across the U.S. The first reviewer said it was good that the program encompasses vehicle acquisition, infrastructure development, training and data collection. The same reviewer elaborated that despite the size of ARRA program (more than $800 million with cost share) and the number of projects, the task and sub-task descriptions on slides 6 through 9 are logical, understandable and believable. Additionally, the first reviewer pointed out that three areas of interest -- vehicle acquisition, refueling infrastructure and education -- are covered in the non-ARRA Clean Cities petroleum displacement initiative and that the presentation did not include task descriptions and milestones for this initiative. The first reviewer then noted that the activities associated with each area of interest were identified. The second reviewer expressed that they would like to see a better balance of projects distributed equally among the various fuel types. In particular, the second reviewer suggested that more emphasis should be placed on propane as a vehicle fuel.

Question 3: Characterize your understanding of the Technical Accomplishments and Progress Toward Overall Project and DOE goals.

The initial reviewer complemented the presenter by saying that responding to such a large infusion of funds is a major management challenge and that those responsible have responded well. This reviewer continued stating that the number of compressed natural gas and liquefied petroleum gas vehicles being subsidized, as a percentage of the total, is surprising and it would be useful to understand the factors contributing to that result. The initial reviewer added that the metrics for which information is presented on the ARRA program are about vehicles and stations, rather than petroleum displaced and emissions reduced. This same reviewer then asked if it is too soon to provide data on metrics more directly related to DOE goals, and recommended that this issue be considered in future reviews. The second reviewer commented that it was an excellent approach of looking at shovel ready projects for grants. This reviewer asked about the justification for some funding grants being slanted to Clean Cities and public municipalities over private companies. The third reviewer stated that additional ARRA funding resulted in more project activity in one year than the previous 12-13 years combined, but was extremely disappointed to see that all of the 2011 competitive grant funding would be devoted to electric vehicle readiness. The third reviewer favored more diversity among fuel and technology types. The last reviewer briefly stated that timeliness is difficult to review and analyze.

Question 4: What is your assessment of the level of collaboration and coordination with other institutions?

The first reviewer stated that this is a no-brainer because there are hundreds of collaborators and partners associated with the two initiatives presented e.g., state agencies, Clean Cities coalitions, local governments, fleets, fuel companies, utilities and universities. The reviewer continued that the total cost share exceeds 60%. The second reviewer said that this is an area that needs improvement. Two reviewers indicated that the program could benefit from increased visibility/participation at industry & trade events and interagency collaborative Federal government meetings.

Question 5: Has the project effectively planned its future work in a logical manner by incorporating appropriate decision points, considering barriers to the realization of the proposed technology, and, when sensible, mitigating risk by providing alternate development pathways?

The first reviewer mentioned that the activities for the coming year are stated in general terms. This reviewer said recognition of the importance of project monitoring is indicated, which is a plus, and that DOE will need to follow through on its intentions in this regard. The first reviewer noted that there is not much on data collection in the presentation, other than a general statement that there is lots of reporting and documentation. This reviewer recommends that plans for data collection and analysis be fully developed and shared with those responsible for ARRA project data at NREL. The first reviewer concluded by saying there should be extensive interaction with NREL staff on this topic. The second commenter thought that industry will probably hit the ethanol blend wall in 2012. This reviewer asked what the program is doing to promote use of more ethanol and E15. The last commenter observed that all FY-2011 Clean Cities grant funding was targeted for electric vehicle initiatives and noted that this lack of diversity did not provide any alternative pathways for consideration, thus limiting the effectiveness of future planning efforts.

Question 6: How sufficient are the resources for the project to achieve the stated milestones in a timely fashion?

The first reviewer was pleased to see these initiatives taking advantage of the capabilities and commitment of those engaged in Clean Cities and remarked that the presenter did an outstanding job covering initiatives that include 48 individual projects. The first reviewer continued, stating that this is a judgment call, and the number of projects selected for funding match the large amount of resources provided. This same reviewer pointed out that a related issue is whether nearly a billion dollars, including cost share, is sufficient to stimulate additional market activity and accelerate significant petroleum displacement in transportation. This reviewer went on to say that dividing the ARRA program resources by the number of vehicles results in about $100,000 per vehicle. This reviewer added that this includes funding for training and education, which likely has excellent benefit/cost ratios. The reviewer continued that DOE's managers and staff are doing an outstanding job with the hand they were dealt, but the implications of this simple calculation deserve exploration. The second reviewer said that Clean Cities seems to be sufficiently staffed though they would like to see more action and fewer meetings.

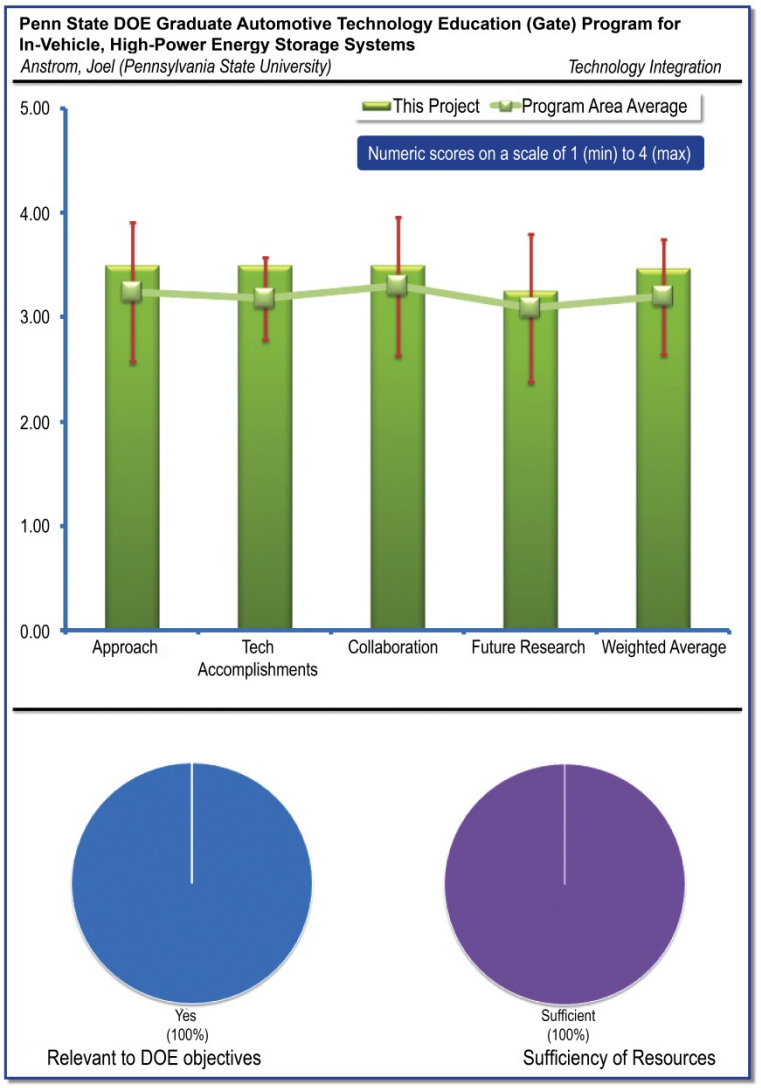
Penn State DOE Graduate Automotive Technology Education (Gate) Program for In-Vehicle, High-Power Energy Storage Systems: Anstrom, Joel (Pennsylvania State University) – ti006

Reviewer Sample Size

This project had a total of three reviewers.

Question 1: Does this project support the overall DOE objectives? Why or why not?

Overall the reviewers provided positive feedback concerning the Graduate Automotive Technology Education (GATE) program. The initial reviewer commented on the purpose by noting that the training of the next generation of engineers on advanced automotive technologies is focused on petroleum-replacing/reducing technologies. This reviewer continued saying that it is good that Penn State University's stated focus is on placing graduates within industry. Another reviewer explained that, while it does support the development of future engineers to develop fuel efficient technologies in transportation, the presenter did little in the way of communicating this message. This same reviewer stated they would assume that the students understand the policy implications of the nation's dependence on imported oil. The final reviewer acknowledged that the GATE Center is focused on developing engineers and scientists that can develop and deploy energy storage systems in future vehicles, which is critical to achieving petroleum reduction.



Question 2: What is your assessment of the approach to performing the work? To what degree are technical barriers addressed? Is the project well-designed, feasible, and integrated with other efforts?

The first reviewer said that this was a broad program, technology-wise, and remarked that it has maybe a bit too many technologies -- resulting in a very complex program structure across many technology centers. The first reviewer continued that at the same time, Penn State University relies heavily upon pre-existing structure within the university (established technology centers), and then GATE coordinates among them for the student opportunities. The second reviewer pointed out that there was not a lot of discussion as to what the technical barriers are and why those three areas are selected. The second reviewer then questioned if this was a need that is not addressed in many other schools and asked wondered what makes this unique to the engineering world. The final reviewer asserted that Penn State University has integrated many related activities in vehicle technologies and solar technologies to make this a very impressive activity. Also, Penn State University is providing education opportunities in energy storage from a broad range of approaches, including the development of the storage technology and the integration of it into a vehicle.

Question 3: Characterize your understanding of the technical accomplishments and progress toward overall project and DOE goals.

The first reviewer remarked that it appears as if Penn State University's GATE program has had the best student rate of participation and graduation, although it is hard to compare since the time frames are not always listed and the panelist concluded that they have

met the goals that they have set out to achieve. The second reviewer remarked that there are an impressive number of students and they have attracted a reasonable amount of funding in addition to the GATE funding. The final reviewer strongly believed this curriculum is self-sustaining and would continue without U.S. Department of Defense (DOD) funding. The final reviewer noted that the project is accomplishing a great deal in vehicle competitions, but at the same time, as included in the presentation, Penn State University does not appear to have developed many courses for the formal curriculum, especially given GATE involvement since 1999. This reviewer added that Penn State University has appeared to succeed using DOE-funded GATE positions as a basis for additional GATE positions funded by other organizations. This reviewer noted that graduates were placed in the auto industry and national/government labs.

Question 4: What is your assessment of the level of collaboration and coordination with other institutions?

The first reviewer thought that the GATE program has strong collaboration betweenANL, GM and MathWorks. This reviewer questioned if this was due to the EcoCar program or the GATE initiative. The first reviewer finished by stating that a stronger description of how the GATE program works with EcoCar would have been helpful, more at the academic level between professors. The second reviewer summarized that there is good integration with the Solar Decathlon team and other related activities at Penn State University. The final reviewer noted that Penn State University is working with other universities plus DOE and General Motors through EcoCar, and that given the broad range of technologies within the Penn State University GATE effort, might expect to see a bit more outside coordination than currently exists. The reviewer continued that as the presentation moved on, the reviewer saw some additional coordination with national labs, state, industry, and others, though it seemed a bit more project-by-project than overall approach to coordination. This reviewer concluded that they are basically largely coordinating when needed, except for a few outreach events/workshops.

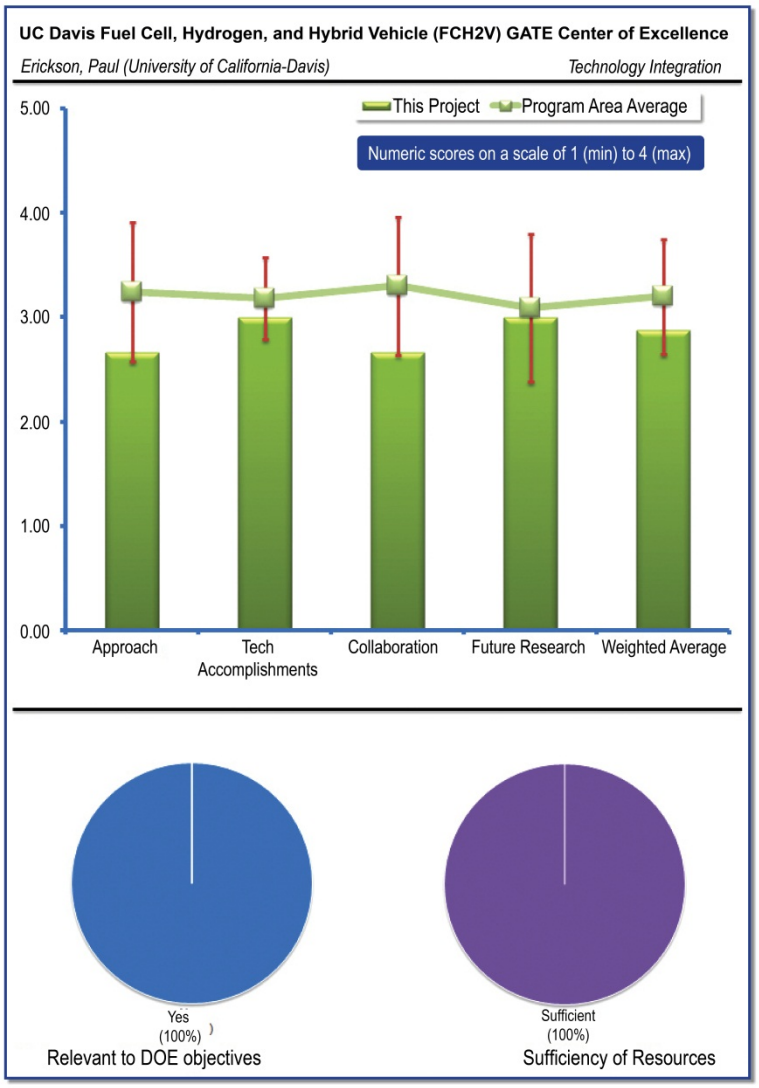
Question 5: Has the project effectively planned its future work in a logical manner by incorporating appropriate decision points, considering barriers to the realization of the proposed technology, and, when sensible, mitigating risk by providing alternate development pathways?

The first reviewer said that Penn State University is mostly promising more of the same, but is also looking to expand to new partners. The second reviewer thought that this activity is headed in the right direction and would like to see Penn State University review the relevant DOE technical barriers and show how they are addressing these barriers. The final reviewer did not get a sense of what needs improvement and asked if there is a way to accelerate growth in the number of graduates without losing quality. The reviewer queried if there were any metrics on new partnerships that they want to develop or improve upon, or new courses to develop. This reviewer questioned how they engage their partners in getting feedback or from the students.

Question 6: How sufficient are the resources for the project to achieve the stated milestones in a timely fashion?

The first reviewer observed that Penn State University is not claiming any funding barriers, plus Penn State gets additional funding from DOT, NASA, NSF, Defense Advanced Research Projects Agency (DARPA), DOE, the Commonwealth of Pennsylvania, and claim highly leveraged funding. The second reviewer said the resources are appropriate and additional resources would require more graduate school applicants desiring to get into this area which is unfortunately not the situation.

UC Davis Fuel Cell, Hydrogen, and Hybrid Vehicle (FCH2V) GATE Center of Excellence: Erickson, Paul (University of California-Davis) – ti007



Reviewer Sample Size

This project had a total of three reviewers.

Question 1: Does this project support the overall DOE objectives? Why or why not?

The first reviewer commented that the center is training the next generation of engineers in fuel cells, hybrids, and hydrogen, and conducts government/industrial-supporting research and coordination. The first reviewer commented the UC Davis program attempts to cross-train across policy and technical areas and future efforts will go back to primary focus on automotive technology side, and de-emphasize policy. The initial reviewer concluded that UC Davis focuses on the number of fellowships as its key measure of success. The second reviewer said that it has grown an educated workforce in advanced automotive engineering, while the third reviewer said that fuel cell vehicle and HEV technologies are critical for the next generation automotive engineers.

Question 2: What is your assessment of the approach to performing the work? To what degree are technical barriers addressed? Is the project well-designed, feasible, and integrated with other efforts?

The initial commenter said that the program appears to realize difficulty in cross-training for policy and technical engineering areas and is going back to primary focus on technical side. This reviewer surmised that due to long-term involvement in GATE, they seem to have the mechanics (organizational aspects) of running a GATE program under control and noted that the program requires students to develop detailed research plans with their applications. The second reviewer also reflected that fellows must develop a research plan and will study courses in fuel cell and hybrid components; vehicle and energy systems; and fuel pathway analysis—a good cross section of academic studies. The same reviewer noted that a limited number of fellows since 1999, with only three to five supported each year (2005 and beyond). The third reviewer stated that HEV and fuel cell vehicle technologies are somewhat complimentary at the electrical drive interface; however, UC-Davis left the reviewer with the impression that UC-Davis is somewhat overwhelmed trying to maintain two centers, or two thrust areas rolled into one center.

Question 3: Characterize your understanding of the technical accomplishments and progress toward overall project and DOE goals.

The first reviewer had the opinion that graduating three to five students per year and getting them into automotive or automotive related industries is impressive. The second reviewer stated that three students were fully supported from 2010-2011 awards, plus three from 2009-2010 awards and two students were partially supported. The second reviewer added that previously there were three in 2008-2009 and four in 2007-2008 and before this four to five students per year, some awarded multiple years. The reviewer commented there was a strong focus in presentation on what each is or was researching and that they expect 36 Masters of Science

(M.S.) and 21 Ph.D. candidates through 2011 to be hired by auto industry and universities. The reviewer noted that there are 40 classes available and the presentation was a bit light on details concerning specific accomplishments, at least at a programmatic level. The final reviewer pointed out that they had merged the two GATE centers in 2005, but is having difficulty with engineering students becoming involved in the policy area, which is unfortunate. The reviewer went on to say that the program developed different courses after the merger and they would like to see more students participate in the program.

Question 4: What is your assessment of the level of collaboration and coordination with other institutions?

The first reviewer remarked that collaborations are primarily within other parts of UC-Davis. The reviewer added that there is some industrial funding coming in, but considering the program and the depth of UC-Davis transportation expertise, the reviewer would have expected more. The second reviewer stated that the GATE program collaborates well within the University, across multiple programs and with non-technical organizations (policy through Institute of Transportation Studies [ITS]) and based upon presentation, not much collaboration shown outside of the University. The final reviewer thought the collaboration with ITS-Davis was a brilliant idea but it is unfortunate that it is not working and wondered if the student still takes the full fuel cycle analysis course. The reviewer continued there was not a lot of ongoing collaboration with industry and it seems students are being placed, but the reviewer is not sure throughout the course of the academic years what collaboration with the private sector is transpiring on behalf of the students or center. The reviewer said there was only one example of industry cost share and would recommend a direct correlation of where the students are placed in the list of organizations provided.

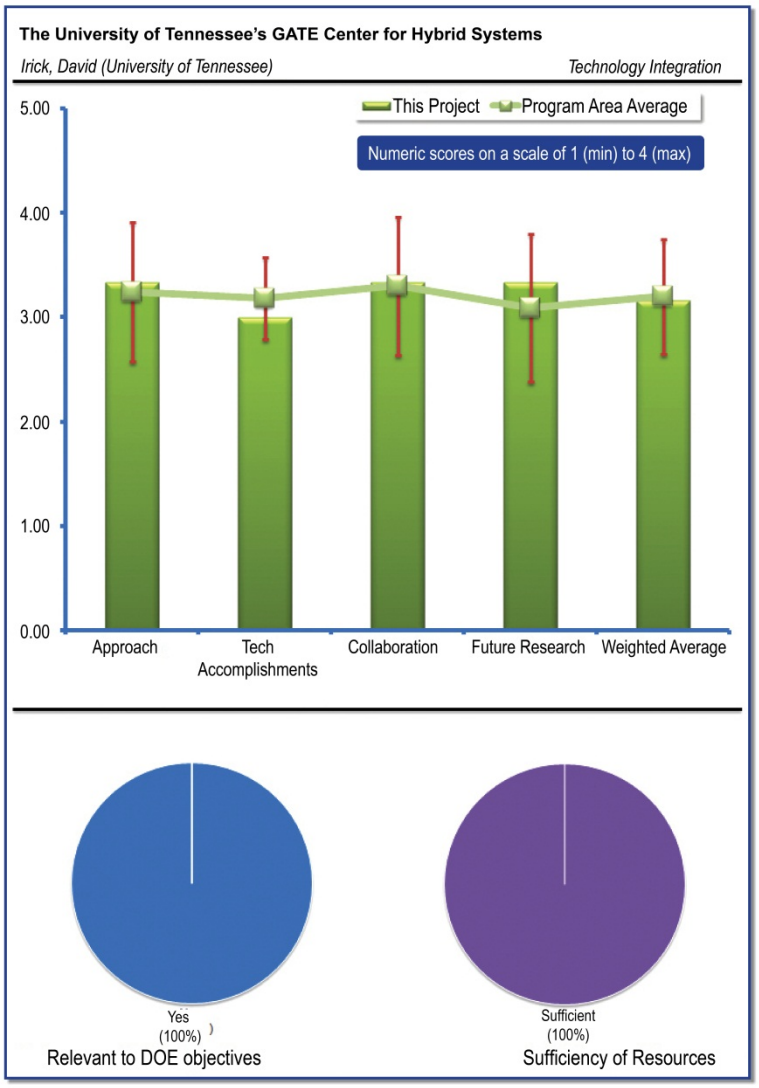
Question 5: Has the project effectively planned its future work in a logical manner by incorporating appropriate decision points, considering barriers to the realization of the proposed technology, and, when sensible, mitigating risk by providing alternate development pathways?

The first reviewer stated that based upon the presentation, more of same promised, but the GATE program appears to have the system down and went on to say that future focus is more on hybrid technologies, which probably makes sense based upon industry and government changing focus somewhat away from H_2 and fuel cells. The second reviewer said that it will decouple itself from the ITS, but not sure how that will enable more students to graduate from this program they added that the next important step is to focus on hybrid propulsion systems and course development will ensue over the next year. The final reviewer acknowledged that the GATE program has plans to refocus their efforts and concentrate on vehicle technologies and the reviewer would like to see UC-Davis review the relevant technology barriers identified by DOE and state how they are addressing these barriers.

Question 6: How sufficient are the resources for the project to achieve the stated milestones in a timely fashion?

Most of the reviewers felt no additional funding was needed but one disagreed with this view. The first reviewer expressed that the GATE program did not go forward with EcoCar due to lack of support from university and difficulty with securing laboratory space. The reviewer felt that limitation on numbers of students was solely due to funding, although partially-funded students include outside (leveraged industry) funding. At the same time, the numbers of students is relatively consistent throughout life of UC-Davis program, so it is hard to say that funding is insufficient at this time. The first reviewer acknowledged that the GATE program was able to leverage efforts with numerous in-house programs and labs, plus on-campus H_2 refueling station. The second reviewer agreed by adding that there was no evidence in the presentation that additional funding would advance their activities. The final reviewer said UC-Davis asked for no-cost extension so they may have more than they need.

The University of Tennessee's GATE Center for Hybrid Systems: Irick, David (University of Tennessee) – ti008



Reviewer Sample Size

This project had a total of three reviewers.

Question 1: Does this project support the overall DOE objectives? Why or why not?

The reviewer's responses were generally positive. The first reviewer pointed out that training engineers in hybrid technologies is a key need within industry to help reduce petroleum use. The second reviewer noted that they are educating a workforce of advanced automotive engineers. The final reviewer stated that focus on powertrain and power electronics for hybrid vehicles is critical for the next generation of vehicles.

Question 2: What is your assessment of the approach to performing the work? To what degree are technical barriers addressed? Is the project well-designed, feasible, and integrated with other efforts?

The first reviewer said that the project provided a dual program: fellows and research assistants and tied very closely to student competitions and fellows serve as team leads for student competitions (particularly EcoCar); they added that competitions were implemented as senior design projects. The first reviewer concluded that long-term involvement shows that, like others in GATE, they've got the system down. The second reviewer noted that it appears that new courses are continuing to be developed and expanded and testing and laboratory facilities are being developed or expanded and there are three departments which are part of the GATE center. The reviewer wondered if it is possible to include more students in the program. The final reviewer commented that University of Tennessee has good integration across the mechanical engineering and electrical engineering departments but more industry involvement would be beneficial which could be accomplished through guest lecturers, an industrial advisory board or several other approaches.

Question 3: Characterize your understanding of the technical accomplishments and progress toward overall project and DOE goals.

The first reviewer felt that the university developed five specific courses under GATE program, which focus on hybrid systems and IC engines, and continued that there have been 28 students through program since 1998, roughly two-three total (fellows and assistants) per year and graduates have gone onto national labs and industry. The reviewer said that according to the presentation, current/recent focus has been on facilities and expanding capabilities and they are moving into new facility (after a fire in 2006) and it will be a significant improvement from previous facility (there will be grants from industry to help). The reviewer noted that there was less emphasis in the presentation on specific programmatic accomplishments outside of the facility. The first reviewer added that the presenter was refreshingly candid concerning one major barrier facing the program, which was the university's desire to chase after "fad" NSF technologies, rather than providing a consistent commitment to long-term appropriate technologies likely to provide

significant impact. The second reviewer stated that the number of courses developed and number of students graduating is good. The final reviewer would like to see industry partners take a more active role in strategic planning and correcting any barriers to implementation.

Question 4: What is your assessment of the level of collaboration and coordination with other institutions?

All reviewers felt that collaboration with other institutions was generally good. The first reviewer specified that the GATE program is collaborating with other University of Tennessee (UT) campuses, plus with DOE, ORNL, ANL, INL, and industry. The second reviewer noted that the GATE program had good partnerships with labs, other DOE programs, and industry, and would like to know the direct correlation between student graduates and placements between industry and academic institutions. The final reviewer said that the collaboration with ORNL and support from Denso is good.

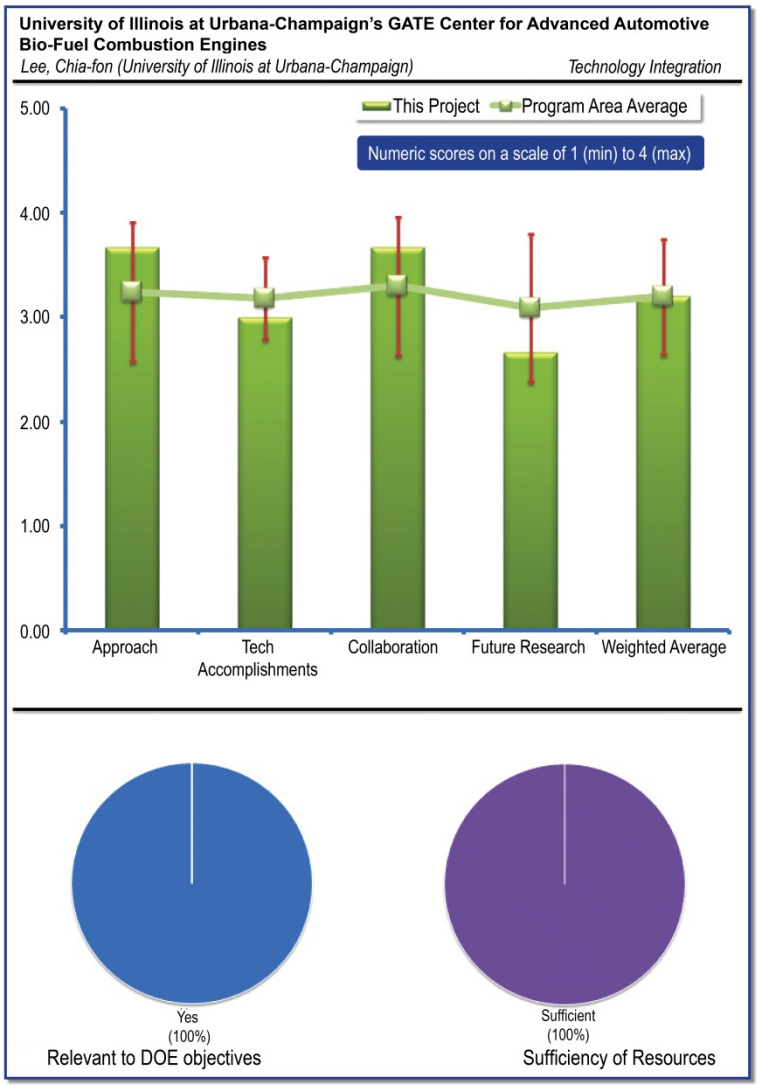
Question 5: Has the project effectively planned its future work in a logical manner by incorporating appropriate decision points, considering barriers to the realization of the proposed technology, and, when sensible, mitigating risk by providing alternate development pathways?

The first reviewer pointed out that according to presentation, they're promising largely more of same, but also adding EcoCar2 and that the presentation includes a slight mention of new activities once established in new facility, with additional capabilities. The second reviewer stated they seem to have good direction for knowing what future steps to take; good synergy with EcoCar2; good industry partners and laboratories. The second reviewer went on to say they are adding an advanced power control systems facility and have a coherent explanation of current and planned research. The final reviewer acknowledged that they had a good focus on continuing to develop courses but the commenter would like to see University of Tennessee-Knoxville review the relevant technology barriers identified by DOE and state how they are addressing these barriers.

Question 6: How sufficient are the resources for the project to achieve the stated milestones in a timely fashion?

Reviewers generally agree that the current funding is adequate. The first reviewer stated that they have obtained some resources from industry (Denso) to support development of new facility and have obtained $2.5M in funding from government and industry (including from student competitions), plus $600k from the University. The reviewer adds that they did not do EcoCar1, but are doing EcoCar2. The second reviewer noted that the program has leveraged a lot of resources and it will be critical to demonstrate needs future rounds of funding. The final reviewer commented the balance of funding available to students whom desire this curriculum is about right.

University of Illinois at Urbana-Champaign's (UIUC)GATE Center for Advanced Automotive Bio-Fuel Combustion Engines: Lee, Chia-fon (University of Illinois at Urbana-Champaign) – ti009



Reviewer Sample Size

This project had a total of three reviewers.

Question 1: Does this project support the overall DOE objectives? Why or why not?

All the reviewers feel that this GATE program is beneficial for a variety of reasons. The first reviewer explained that training next generation of engineers on biofuel combustion is critical for increased replacement of petroleum. Another reviewer supports the development of advanced biofuels under the Renewable Fuel Standard, as amended (RFSII) by educating more automotive engineers to enter the workforce with a background in advanced biofuels and its effect on combustion. The final reviewer asserts that biofuels have the highest probability of becoming a sustainable transportation fuel.

Question 2: What is your assessment of the approach to performing the work? To what degree are technical barriers addressed? Is the project well-designed, feasible, and integrated with other efforts?

The first reviewer felt that that UIUC appears to have utilized funding to develop a program, courses and syllabus, which is then offered to many more students than some other GATE programs (46 from 2007-2010, approximately 10 to 11 per year). The reviewer went on the point out that 12 Ph.D. students have graduated to date (plus 12 M.S.), and went to industry, universities and national labs and are adding five M.S. students in the new program. The first reviewer also stated that program is cross-cutting research required of students, including technical, economic, and legal issues for biofuels, which should result in more well-rounded students. The second reviewer thought that performance measure of evaluation from students is important to making continual improvements to the curriculum and placing students with industry partners as interns is also important to future employment with these stakeholders. The final reviewer said that UIUC is building on their core competencies and supplementing DOE funding with industrial partnerships.

Question 3: Characterize your understanding of the technical accomplishments and progress toward overall project and DOE goals.

The first reviewer briefly stated that it is an impressive list of publications. The second reviewer said that the program is continuing to develop new courses -- one added this year, one modified, adding that UIUC is looking at water emulsified fuels for power generation applications. This reviewer has concerns on the ultimate viability/usefulness of such fuels. The second reviewer said the presentation included specific accomplishments, including results from many research efforts in biofuels area and that the presenter was clearly focused on showing the program's accomplishments, perhaps since UIUC hasn't been in GATE as long as some of the other universities. The second reviewer's only concern is that presentation needs to be pared down a bit and actually had *too* much detail on

accomplishments, although some detail is appropriate. The final reviewer stated that the goal or barrier was to develop a set curriculum to develop automotive engineers with a background in advanced biofuels and its effect on engines, but wondered what the barriers were within the institution that have been addressed. This reviewer also said that there was much talk about the technology and research work, but questioned if the students' research played a role in its success, stating that this was unclear. The reviewer elaborated that there was only one new course developed and one course modified; and questioned if there had been any substantial improvement and if the additional students in the lectures series is really making a significant difference. This reviewer felt that all of these were questions that should be more fully addressed next time.

Question 4: What is your assessment of the level of collaboration and coordination with other institutions?

The initial reviewer said that numerous identified partners include international universities, plus U.S. and international auto/fuel industry members. Another reviewer thought the GATE program had many good stakeholder partnerships, including international partners, but wondered how many students have went on to full employment with each of the institutions listed as partners and stated that it would be better to show direct correlations. The reviewer concluded that the intern program was a good start with Caterpillar Inc. The final reviewer stated that the program has a very strong list of corporate partners.

Question 5: Has the project effectively planned its future work in a logical manner by incorporating appropriate decision points, considering barriers to the realization of the proposed technology, and, when sensible, mitigating risk by providing alternate development pathways?

The first reviewer said that the presentation included specific plans for Phase III -- algae fuels, chemical kinetics of bio-butanol, and combustion efforts utilizing plasma -- and that it was good to see specifics provided, which is perhaps a function of not being an original GATE university. The second reviewer asserted that there was not much of a discussion in this area, but the presenter ran out of time. This reviewer stated that according to the presentation, the industry advisory board will look at curriculum to suggest needed changes which is a good idea and the reviewer would like to see how much more effectively the students could be placed in engine manufacturing or fuels industry. The third reviewer said that adding and actively involving an industrial advisory board will be very beneficial and they would like to see UIUC review the relevant technology barriers identified by DOE and then state how they are addressing these barriers.

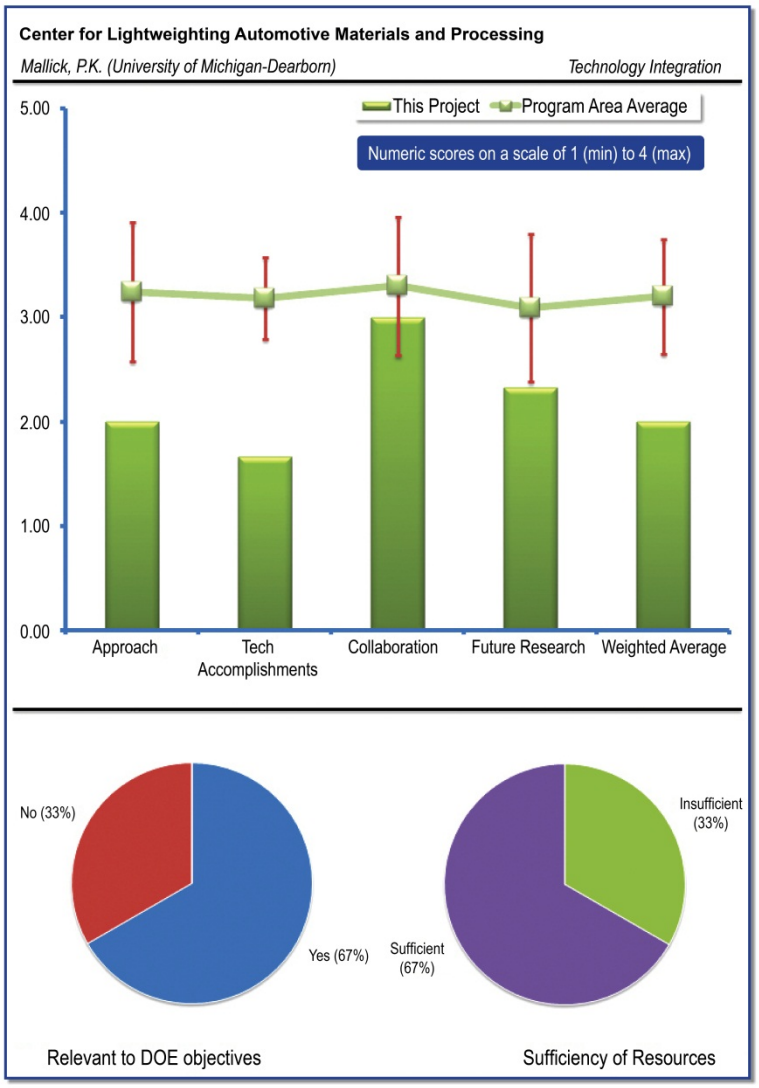
Question 6: How sufficient are the resources for the project to achieve the stated milestones in a timely fashion?

Reviewers concluded that no additional funding was necessary. The first reviewer said that funding was 80% DOE and 20% university and there is no indication of concerns about funding in presentation. Another reviewer stated that there was no evidence presented that additional funding would result in improved quality or quantity of graduates, and the final reviewer commented that the project had good private resources.

Center for Lightweighting Automotive Materials and Processing: Mallick, P.K. (University of Michigan-Dearborn) – ti010

Reviewer Sample Size

This project had a total of three reviewers.



Question 1: Does this project support the overall DOE objectives? Why or why not?

The first reviewer said the project meets DOE goal of creating graduate courses in lightweight automotive materials and that lightweight automotive materials contribute to petroleum displacement. Another reviewer agreed that making vehicles lighter is one path to displace petroleum and students experienced in lightweight materials for vehicles are needed. The final reviewer said they were unable to determine if the results of this project meets the criteria, since the award criteria for the review was unknown (not furnished) to the reviewer and, since the lion's share of the project is directed towards research and not education, as the presenter admitted. The reviewer questioned if this meets the criteria for what the grant was originally intended for and if it is a research or education grant. It appeared to this reviewer that education is a very secondary goal for this grant and the funds have been used primarily to conduct research. The reviewer added that, in terms of petroleum displacement there are no metrics developed, hypothesized or real that can be used to determine effectiveness, concluding that the presentation was much more of a technology and research brief rather than a presentation oriented to education. This reviewer stated that when questioned about the funds use in terms of research as opposed to education the reviewer's response was that doing research is the same as education. The reviewer felt the problem with this is that the funds are going toward reducing the department's overhead as DOE funds are used as an adjunct to pay professor salaries instead of orienting the funds towards education, internships or the like.

Question 2: What is your assessment of the approach to performing the work? To what degree are technical barriers addressed? Is the project well-designed, feasible, and integrated with other efforts?

The first reviewer remarked that Professor Mallick edited a book on materials, design and manufacturing for lightweight vehicles but there is no indication how this book is being included into the research, development, design or manufacturing processes of car companies. The second reviewer stated that the presenter did not identify why DOE or the auto industry needs engineers trained in the lightweight automotive materials; rather, the presenter cited the barrier as the university not having a Ph.D. automotive program. The third commenter said that the university implemented a Ph.D. program, which will help with providing experienced students for research projects and were focused on developing graduate student classes, seminars, and sponsored research.

Question 3: Characterize your understanding of the technical accomplishments and progress toward overall project and DOE goals.

The first reviewer remarked that the rating for this is fair because new courses have been developed for the program at a cost of approximately $30,000, or one month's professor's salary, for each course developed. That means that out of $886,000 for total project funding only 3% has been used for education course development and the rest is research funding. The second reviewer noted that four objectives were cited: developing a new graduate course, continuing research and publications, offering two assistantships, and organizing and holding one technical workshop. However, half the presentation was devoted to research projects, and it was not clear which were supported by GATE funds and which were funded by outside organizations. The second reviewer concluded that the benefit to the students was not evident. The third reviewer stated that there were plenty of research projects but it was difficult to determine the performance indicators since the number of students graduated and number of students taking the classes, and number of students hired in the area was not presented.

Question 4: What is your assessment of the level of collaboration and coordination with other institutions?

Three reviewers agreed that there was collaboration taking place in the program. The first reviewer said that they collaborated with industry partners, universities, and laboratories during seminars and research projects. The second reviewer acknowledged a good amount of collaboration among the various partners associated with the program in terms of numbers of participants and the value each brings to the table. The final reviewer said that collaboration with PNNL, Chrysler, Ford, the U.S. Automotive Materials Partnership (USAMP), and AISI was cited in one place, and in another place those organizations plus Washington State University, Texas A&M at Qatar, the Masdar Institute in Abu Dhabi, and Ulsan Institute in South Korea. The reviewer commented that it was not clear in most cases of the roles of the research partners or the objectives or focus of the collaborations.

Question 5: Has the project effectively planned its future work in a logical manner by incorporating appropriate decision points, considering barriers to the realization of the proposed technology, and, when sensible, mitigating risk by providing alternate development pathways?

The first analyst said the program is building upon past years and another course will be developed, another seminar, and more research areas. The second analyst stated that both past work and proposed future work is heavily oriented towards research, without a clear identification of the roles for the students. If a significant amount of the GATE funds are used to support faculty research, this does not support the DOE goals. According to the final reviewer, it is hard to say, since the presentation was mostly a technical research presentation about lightweight materials. Their goal is to conduct more research in 2011 and the reviewer is not sure if that is what the money was supposed to be used for.

Question 6: How sufficient are the resources for the project to achieve the stated milestones in a timely fashion?

The first reviewer says that the total project is $700,000 of DOE funding with $180,000 matched by the university, or 25%. The resources appear well spent. The second reviewer stated that funding is higher than other institutions for less or the same results. The final reviewer would hold funding on this project until an assessment can be made by DOE personnel about whether the funds are being properly used. This reviewer questioned if this is a research directed grant or an education directed grant, and if it is the later, then the funds have been improperly used.

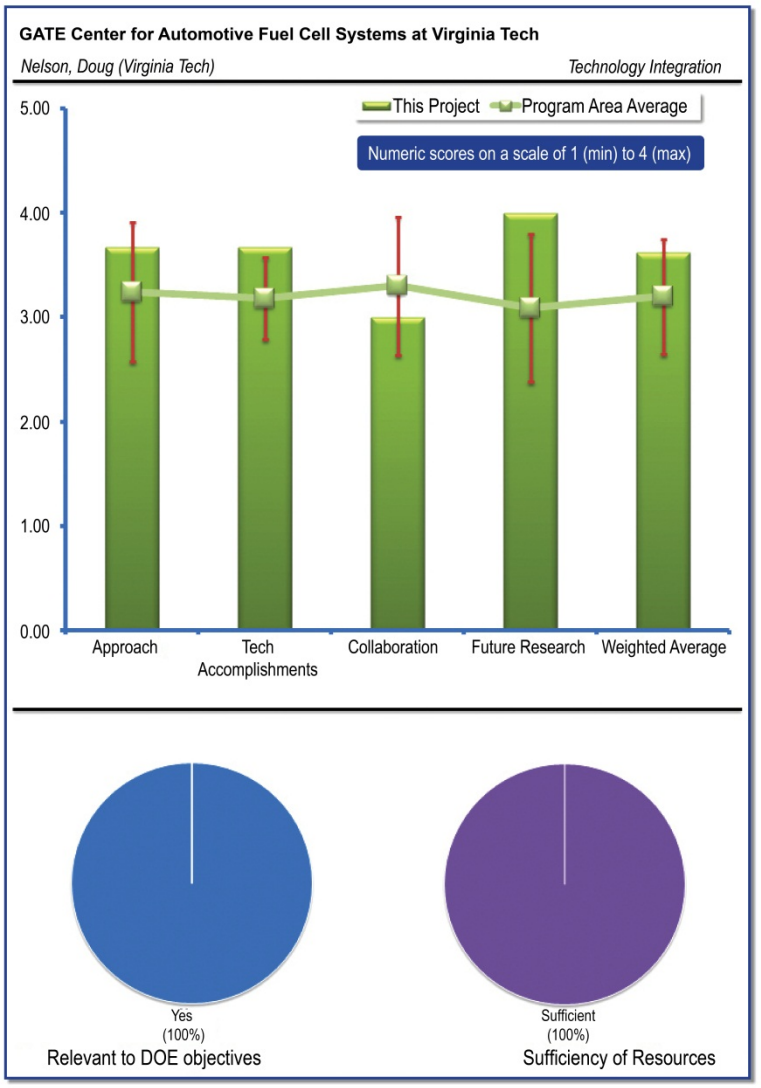
GATE Center for Automotive Fuel Cell Systems at Virginia Tech: Nelson, Doug (Virginia Tech University) – ti011

Reviewer Sample Size

This project had a total of three reviewers.

Question 1: Does this project support the overall DOE objectives? Why or why not?

The second reviewer said fuel cells are a major research and development effort at DOE, which has a major objective of petroleum displacement and this activity directly addresses the DOE educational objective for fuel cell systems. The second reviewer said that fuel cells are one path for petroleum displacement, but there still are many technology barriers for fuel cells and engineers working in this area would help to provide breakthrough research in fuel cells. This reviewer noted that students did not get hired into fuel cell jobs, but were hired into automotive projects. The final reviewer commented that one has to look at the goal of petroleum displacement as a long term requirement that is addressed by this grant. It is addressed in terms of the future influence that students will have on the development of lightweight, more utilitarian vehicles in the next 10 to 15 years and therefore does meet that requirement insofar as education contributions to future outcomes.



Question 2: What is your assessment of the approach to performing the work? To what degree are technical barriers addressed? Is the project well-designed, feasible, and integrated with other efforts?

The first reviewer commented that barriers were clearly defined for this project, and include insufficient supply of graduate engineers with proper background and the need for new knowledge in critical technologies, e.g., durability and water transport. The second reviewer commented that barriers were clearly identified: insufficient supply of graduate engineers with the proper background and the development of new knowledge in fuel cell durability and water transport. The third reviewer said the project seems like a very organized effort, worked with research efforts and utilized the graduate student support, provided by the GATE program, very effectively to bring in and keep quality students.

Question 3: Characterize your understanding of the technical accomplishments and progress toward overall project and DOE goals.

The first reviewer remarked that there are five new courses that have been developed in the area of automotive fuel cell technology and 19 students have been funded by the grant and three times that many have attended at least one of the courses as an elective but not matriculated in a fuel cells related major. This reviewer adds that this is an admirable achievement and the funds have been dedicated 100% towards education. The next reviewer stated that education objectives of curriculum development, student research,

and industry interaction are clearly stated, so that progress was easy to follow. The final reviewer said that two classes were developed and two others (Senior Design) covered some of fuel cells and four students have been hired in automotive fields.

Question 4: What is your assessment of the level of collaboration and coordination with other institutions?

There were mixed opinions on the quality of collaboration. The first reviewer said that there was a major partnership with General Motors Fuel Cell Program, as well as fuel cell developers. The second reviewer stated that there was a good collaboration with EcoCar and a limited number of industry/GATE projects on fuel cells. The reviewer commented that the GATE program has been more focused on vehicle systems. The final reviewer said it appears that most of the collaborations with other institutions were in the form of attendance at symposiums and forums rather than partnering with organizations to deliver more educative programs.

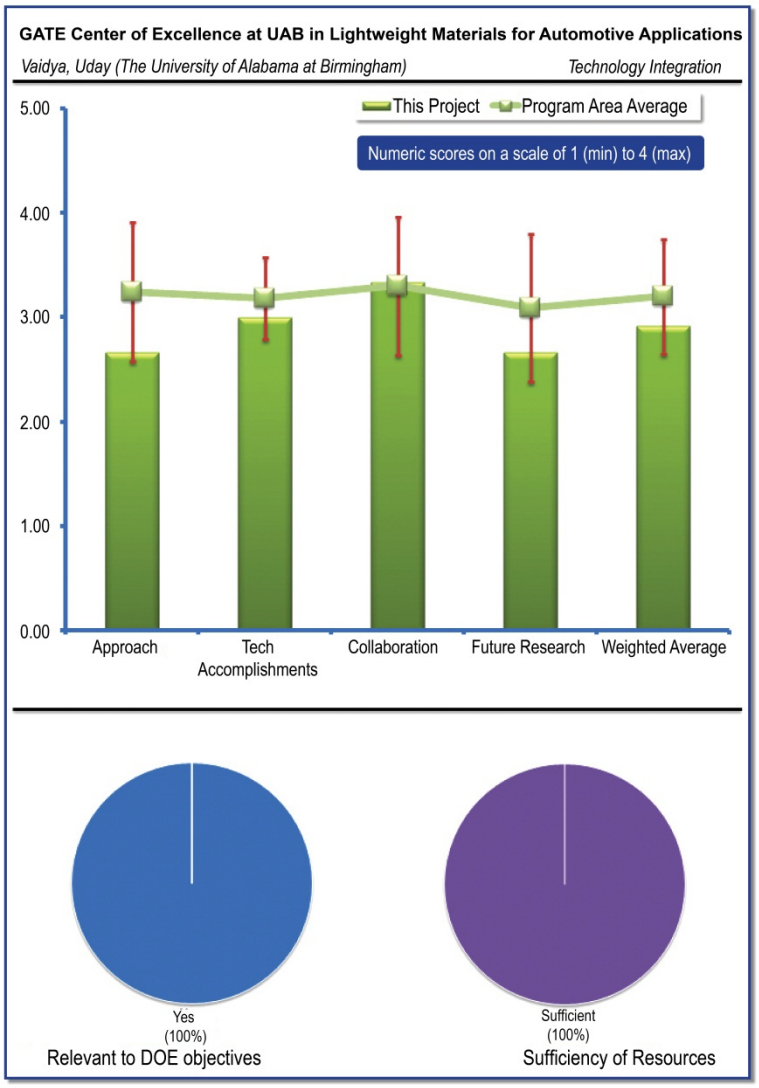
Question 5: Has the project effectively planned its future work in a logical manner by incorporating appropriate decision points, considering barriers to the realization of the proposed technology, and, when sensible, mitigating risk by providing alternate development pathways?

Two of the reviewers said that the grant is 100% complete and no future activities are planned. The third reviewer gave credit for how well this year's work focused on previously defined objectives. The reviewer mentioned that the program is being completed in May 2011 and that proposed future work makes sense.

Question 6: How sufficient are the resources for the project to achieve the stated milestones in a timely fashion?

One reviewer stated that the resources appeared to be sufficient and recommended an additional grant be made to Virginia Tech to enhance and keep the project going. The presenter stated that the program has made excellent progress and the reviewer is encouraged that that all the funds were used as imagined, specifically towards educating students. The second reviewer agreed that the project made effective use of DOE GATE funds, with a cost share of 25%. The final reviewer explained that there was adequate funding for the number of classes developed and students graduated.

GATE Center of Excellence at UAB in Lightweight Materials for Automotive Applications: Vaidya, Uday (The University of Alabama at Birmingham) – ti012



Reviewer Sample Size

This project had a total of three reviewers.

Question 1: Does this project support the overall DOE objectives? Why or why not?

Reviewers generally agree that this project is valuable. The first reviewer asserted that automotive lightweight materials are important for petroleum displacement and this activity meets a DOE education objective. A second reviewer explained that making vehicles lighter is one path to displace petroleum and students experienced in lightweight materials for vehicles are needed. The third reviewer said that the project appears to be academically sound but notes that this is not his field of expertise.

Question 2: What is your assessment of the approach to performing the work? To what degree are technical barriers addressed? Is the project well-designed, feasible, and integrated with other efforts?

The first reviewer had very detailed comments that said the approach to recruiting students to graduate schools appears to be working well. The project shows signs of good recruitment and good investment in capability-building at the undergraduate level; however, the project does not put into operation the concept of a pipeline in a sufficiently wide-reaching manner. This reviewer further expands, saying that pipeline activities seem to focus primarily on traditional classroom-based training for undergraduates and this element of training students could be improved by establishing some contacts with industry and maybe pursuing some programming that focuses specifically on career development. The reviewer went on to state that a pipeline concept could also be improved by integrating historically black colleges and universities (HBCU) and community college partners in more substantive ways—perhaps with an option for students at these institutions to do a summer research internship at UAB. The first reviewer continued, commenting that the workshops for these students are a good component of the program but won't necessarily prepare students from either audience in a rigorous enough manner in succeed in a graduate program. The second reviewer expressed that barriers were not identified during the presentation and said that the presenter responded to queries with discussions about problems with GATE funding, not how UAB uses GATE funds to address technical barriers. The final reviewer stated that it seems like a very well-organized GATE program at UAB and the program integrated work with workshops/seminars and student projects.

Question 3: Characterize your understanding of the technical accomplishments and progress toward overall project and DOE goals.

The first reviewer stated that there were an impressive number of graduate students supported by the GATE program, a good number of graduate courses had been developed, and that the undergraduate student pipeline is an innovative approach. This reviewer added that some stated goals (manufacturing, virtual classroom) were not addressed or not addressed well. The second reviewer noted that a

large number of courses (seven to eight) had been developed and there is a nice graduate program that provides a GATE certificate if four of the courses are taken. The second evaluator adds that there are a good number of student-funded and research projects in lightweight materials. The final evaluator said the program has clearly made progress in research, has resulted in a number of curricular opportunities, and has incorporated a large number of students at UAB. Although, the final reviewer is not sure the program is using its connections to partner institutions as effectively as it could be.

QUESTION 4: WHAT IS YOUR ASSESSMENT OF THE LEVEL OF COLLABORATION AND COORDINATION WITH OTHER INSTITUTIONS?

Most reviewers' comments concerning collaboration and coordination were positive. The first reviewer expressed that there was good partnering with auto companies, suppliers, ORNL, and small businesses. The second reviewer stated that there was a very good collaboration structure between the university and other institutions, industries, and laboratories. The third reviewer said that, in terms of industry, the Honda Pilot project is an excellent example of collaboration between academia and the private sector and the virtual classroom and hands-on workshops are also excellent examples of letting students see what industry is like. The third reviewer went on to say that, in terms of partnerships with non-UAB academic institutions, ideas for collaboration are good, but the model appears to be mostly a top-down distribution of knowledge from UAB to other institutions—that is, the collaboration with other institutions relies primarily on UAB offering workshops for partner institutions. This reviewer concludes that, while there is certainly coordination, it is unclear if there is true collaboration within these partnerships.

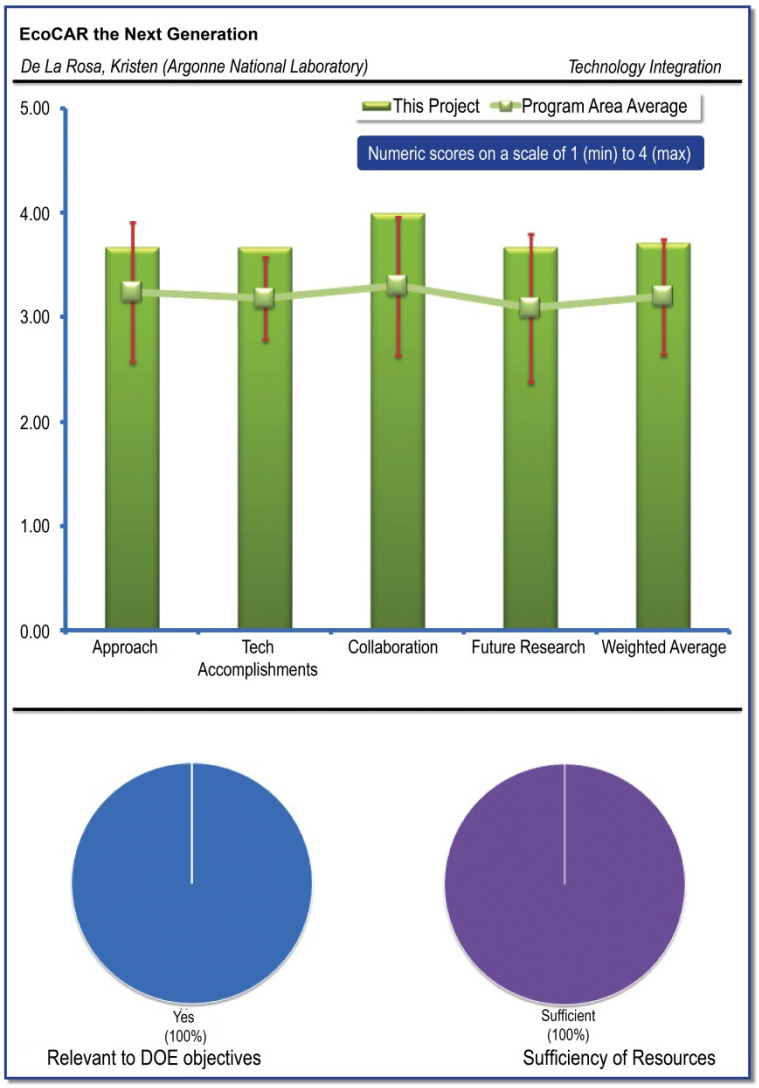
QUESTION 5: HAS THE PROJECT EFFECTIVELY PLANNED ITS FUTURE WORK IN A LOGICAL MANNER BY INCORPORATING APPROPRIATE DECISION POINTS, CONSIDERING BARRIERS TO THE REALIZATION OF THE PROPOSED TECHNOLOGY, AND, WHEN SENSIBLE, MITIGATING RISK BY PROVIDING ALTERNATE DEVELOPMENT PATHWAYS?

The first reviewer explained that this seems like a program (new classes taught, student certificates, etc.) that will continue even without GATE funding, which shows the benefit the GATE funding provided and how well UAB utilized that funding. The second reviewer pointed out that the program appears to be creating new research goals while planning to continue existing educational programming and the approach is sound, but it might be nice to see some degree of novelty in student-focused components. The final reviewer stated that there was only one bullet on the last slide: UAB is applying for a five-year renewal to expand impact in low-cost carbon fiber, biocomposites and application development for automotive to align with CAFE standards and medium/heavy truck. No explanation and no discussion during the presentation.

QUESTION 6: HOW SUFFICIENT ARE THE RESOURCES FOR THE PROJECT TO ACHIEVE THE STATED MILESTONES IN A TIMELY FASHION?

Opinion on resources varied widely. One reviewer said that the resources appear effectively spent although there was no information on cost sharing. Another reviewer said this GATE program looked like a very good investment and much was achieved. The final reviewer said that the program will need a new grant to continue plans and has applied for it.

EcoCAR the Next Generation: De La Rosa, Kristen (Argonne National Laboratory) – ti013



Reviewer Sample Size

This project had a total of three reviewers.

Question 1: Does this project support the overall DOE objectives? Why or why not?

Evaluators were overall supportive of this project. The first reviewer is confident that this project fully supports the objectives of petroleum displacement and the genesis of the project was done more than 20 year ago and uses a build-a-little, test-a-little philosophy that is truly experientially based. The first reviewer adds that it could be called a Live In-Field Simulation or proof-of-concept whereby schools and partnering organizations actually are required to design, build and test their concepts. The reviewer continues that the students gain a tremendous insight into dealing with challenges that arise and actually seeing their work result in something. This reviewer concludes by stating that measurement is key, as the cars are subjected to numerous tests and overall this is great concept and great work. The second reviewer stated that the size of the competition and the number of students included in the project—combined with what appears to be a rigorous system of checks and balances prior to the competition—suggest that there should be novel findings in a number of the projects submitted as part of the EcoCar competitions. The third and final reviewer said that workforce development leading to engineers and scientists that will develop and deploy automotive technologies of the future is critical to petroleum savings.

Question 2: What is your assessment of the approach to performing the work? To what degree are technical barriers addressed? Is the project well-designed, feasible, and integrated with other efforts?

The first reviewer explained that, in terms of the participants who are members of each school team, one point made during the presentation was that these young men and women are the most sought after new hires by a number of the participating companies and so they immediately bring their influence into a GM or another company who is dealing with challenges much like the ones they faced in developing their special car. This reviewer added that, in terms of lessons learned while developing each automobile, it seems that there is a direct input from those who are supporting the development from each of the participating organizations. The second reviewer said that the size of the competition -- and the fact that its requirements and standards are being continually refined through contact with government, industry, and academia--suggests a great training opportunity for students further praising the program as novel for its attention to community outreach and public relations. This evaluator concluded by noting that the use of a technical inspector/reviewer(s) before the team can come to competition also makes a nice training intervention—and can catch problems and find teaching moments efficiently. The final reviewer acknowledged that directing the schools to follow the same processes as GM has been a major step forward and will provide a better educational experience.

Question 3: Characterize your understanding of the technical accomplishments and progress toward overall project and DOE goals.

The first reviewer referred to one comment made during the presentation that noted that one team had built a car with a resulting 100+ miles per gallon, this is not imagined or theorized results but actual results. The reviewer explained that developing insights into these types of technical breakthroughs speaks highly about the success of this type of project. The second reviewer stated that program components are well-conceived, well-organized, and appear to be meeting all objectives and felt that this presentation demonstrated the clearest effort to think carefully about student learning outcomes and to create the right environment to achieve them. The reviewer added that it is also clear that there is significant anecdotal data that the student placement record is very high and suggests the program might consider putting some resources into tracking official placement data or doing other assessment work to continue to highlight its successes. A third reviewer explained that refinement of the rules to be more technology neutral is very good.

Question 4: What is your assessment of the level of collaboration and coordination with other institutions?

One reviewer was not sure there are any other programs in the entire grant cycle that can compare with this project and said their in-kind cash contribution is $75 million and other funds of $7.3 million outside of the $4.3 million from DOE, adding that their industry partners represent some of largest auto makers and suppliers, including the government of Canada. A second reviewer noted that competition involves strong links to GM and involves students with both GM goals and objectives and DOE goals and objectives and the program also integrates 16 different universities, thereby offering opportunities for students from a wide range of places and giving them the chance to interact with each other and their respective faculties. The second reviewer explained that the program seems to be especially strong in its efforts to create an industry-like environment for students to work in, through the partnership with GM. The final reviewer noted that the sponsor list and external contributions have grown impressively.

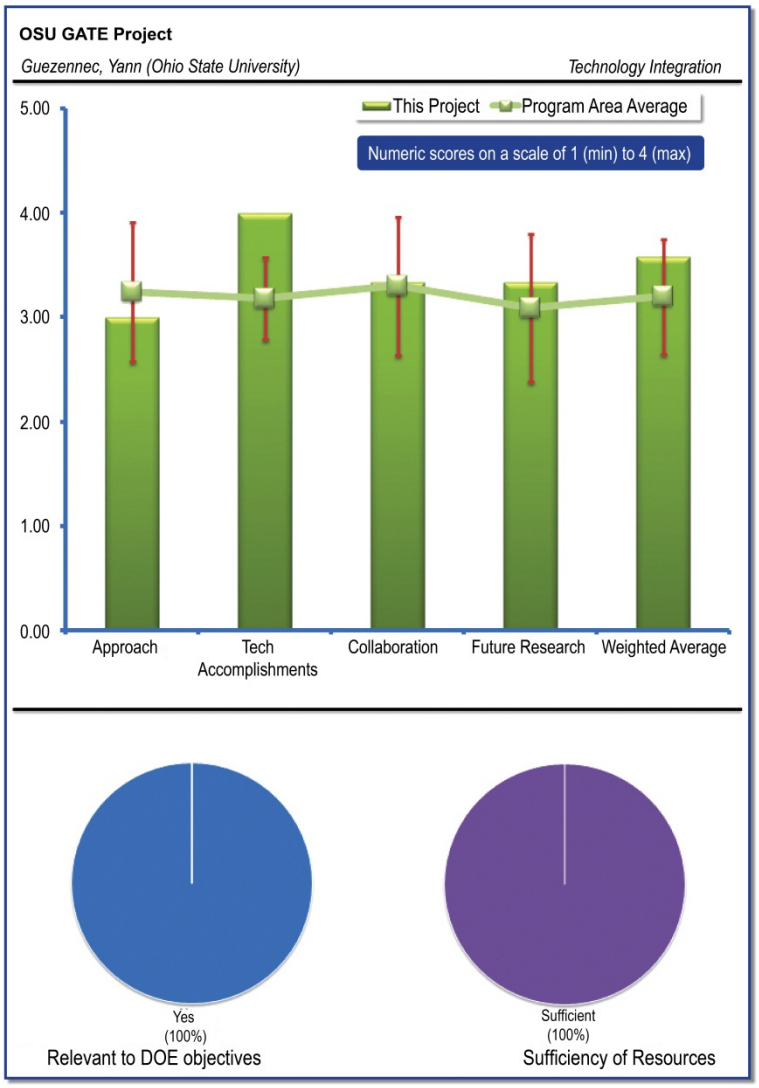
Question 5: Has the project effectively planned its future work in a logical manner by incorporating appropriate decision points, considering barriers to the realization of the proposed technology, and, when sensible, mitigating risk by providing alternate development pathways?

One reviewer said the planned future activities are both aggressive and achievable; they are focused on barriers and have the talent, the will, professionalism and dedication to assure that they will succeed, no matter the challenge. This reviewer is convinced that a program of this sort that provides real hands-on learn-by-doing-opportunity is in and of itself the best type of motivation for those involved. The reviewer continued, driving down a road in a modified vehicle getting upwards of 70, 80 or even 100 MPG gives participants a sense of real meaning and of making a difference, it is a reward unto itself and the reviewer is confident that those proposed future activities will be met and achieved. The second reviewer stated that future work seems to suggest careful and thoughtful refinement in the tradition already established to create ongoing competition series. The third reviewer noted that enhancements to Ecocar2 will make the process and results more realistic and result in even better researchers entering the workforce.

Question 6: How sufficient are the resources for the project to achieve the stated milestones in a timely fashion?

The first reviewer observed that with most of the funds coming from outside of DOE, this is a poster child project, meaning this represents how effective and efficient government can really work with a truly collaborative based partnership and it represents an amazing example of 21st Century leadership that is creating a movement or force for change. The second reviewer affirmed that they seem to know what kind of funds they need to continue the program; and they have a record of continuing the program for more than 20 years. The final reviewer stated that additional funding might enable more schools to join the competition, but that would create a burden on the sponsors while adding only marginal value.

Ohio State University GATE Project: Guezennec, Yann (Ohio State University) - ti015



Reviewer Sample Size

This project had a total of three reviewers.

Question 1: Does this project support the overall DOE objectives? Why or why not?

All of the reviewers agreed that this technology should be pursued. The first commenter said modeling, control, and systems integration of automotive systems is critical to successful commercializing of advanced technology vehicles, which in turn meets the DOE petroleum displacement objective. The second reviewer stated that system integration is huge for petroleum displacement and many of the job opportunities in the automotive industry are for system integration. The final reviewer stated that the project appears academically sound but this is not his area of expertise.

Question 2: What is your assessment of the approach to performing the work? To what degree are technical barriers addressed? Is the project well-designed, feasible, and integrated with other efforts?

The first evaluator suggested it is a very well organized project and was a great approach. The second reviewer pointed out that technical barriers are not identified and the barrier identified is funding needed to be stretched over an additional year. The reviewer added that there have been considerable accomplishments, so it is hard to determine the significance of the identified barrier. The third reviewer explained that the program is well-developed and well-organized, makes excellent use of resources from other existing programs, and appears fairly simple though—graduate fellowships and coursework. The third reviewer added that there is not much in terms of programmatic innovation and given the grant's focus on training students for industry, it would also be nice to see more links to private sector partners specifically for the career development of the GATE students.

Question 3: Characterize your understanding of the technical accomplishments and progress toward overall project and DOE goals.

One reviewer said the objectives were clearly stated: student recruitment, curriculum development, student research, vehicle competitions, and placement of graduates and says the accomplishments were easy to follow. The second reviewer stated that (1) a good number of classes developed (2) program provided funding for many graduate students (3) program integrated GATE with many other programs (EcoCar, buckeye bullet, etc.). A third reviewer explained that the program shows a lot of progress in curriculum development and course offerings.

Question 4: What is your assessment of the level of collaboration and coordination with other institutions?

One reviewer stated that there appear to be very strong partnerships with industry in terms of research agenda development and funding and partnerships with industry to create new graduate fellowships are nice program components. The reviewer added that it is

unclear how much career development programming accompanies these partnerships. This reviewer stated that partnerships with other universities seem to come primarily through participation in new research grants together and there does not appear to be a strong collaborative component in the existing program. The second reviewer said there are several good collaborations, but they could have used more elaboration. The third reviewer stated that it was very strong work with EcoCar and a land speed record vehicle.

Question 5: Has the project effectively planned its future work in a logical manner by incorporating appropriate decision points, considering barriers to the realization of the proposed technology, and, when sensible, mitigating risk by providing alternate development pathways?

The first reviewer stated that there was only one bullet indicating that a new GATE proposal was submitted in April, but no elaboration. Another reviewer said that there will be continued involvement in EcoCar. A third reviewer said future activities appear to be continue existing programs, continue advancing research.

Question 6: How sufficient are the resources for the project to achieve the stated milestones in a timely fashion?

One reviewer said that the resources were well spent and that a recurring theme is that DOE funds flow intermittently, creating problems for the university. The reviewer added that this is likely true for all GATE universities and consequently DOE should address this problem. The second reviewer stated that they have exceeded many of the milestones required by the GATE program. A third reviewer explained that the program requires a new grant to continue programs and has applied for it.