1. Hybrid and Vehicle Systems Technologies

Introduction

Hybrid and vehicle systems research provides an overarching vehicle systems perspective to the technology research and development (R&D) activities of the U.S. Department of Energy's (DOE's) vehicle research programs, and identifies major opportunities for improving vehicle efficiencies. The effort evaluates and validates the integration of technologies, provides component and vehicle benchmarking, develops and validates heavy hybrid propulsion technologies, and develops technologies to reduce the parasitic losses from heavy vehicle systems. Analytic and empirical tools are used to model and simulate potential vehicle systems, validate component performance in a systems context, benchmark emerging technology, and validate computer models. Extensive collaboration with the technology development activities is required for success. The results of hybrid and vehicle systems activities are used to estimate the national benefits and impacts of DOE-sponsored technology development, and successfully transfer developed technology to industry.

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. 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 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
Advanced Vehicle Testing Activity (AVTA) - Vehicle Testing and Demonstration Activities	James Francfort (Idaho National Laboratory)	1-6	3.22	3.22	3.67	3.22	3.28
Plug-in Hybrid (PHEV) Vehicle Technology Advancement and Demonstration Activity	Rosalind Sell (General Motors) and Greg Frenette (Ford)	1-8	2.43	2.86	3.00	2.57	2.73
Advanced Vehicle Benchmarking of HEVs and PHEVs	Barney Carlson (Argonne National Laboratory)	1-11	3.30	3.60	3.00	3.00	3.38
Off-Cycle Benchmarking of PHEVs; Wide Range of Temperatures and Aggressive Driving Cycles	Barney Carlson (Argonne National Laboratory)	1-13	3.20	3.00	3.10	3.00	3.06
Argonne Facilitation of PHEV Standard Testing Procedure (SAE J1711)	Michael Duoba (Argonne National Laboratory)	1-15	3.90	3.00	3.70	3.30	3.35
PHEV Engine and Aftertreatment Model Development	Stuart Daw (Oak Ridge National Laboratory)	1-17	3.00	3.00	3.14	2.71	2.98
Heavy Duty & Medium Duty Drive Cycle Data Collection for Modeling Expansion	Gary Capps (Oak Ridge National Laboratory)	1-19	3.13	3.25	3.38	3.00	3.20
Light Duty Plug-in Hybrid Vehicle Systems Analysis	Tony Markel (National Renewable Energy Laboratory)	1-21	3.43	3.57	3.00	3.29	3.43
Government Performance Result Act (GPRA) / Portfolio Decision Support (PDS)	Sylvain Pagerit (Argonne National Laboratory)	1-23	2.63	2.75	2.75	2.63	2.70

Presentation Title	Principal Investigator and Organization	Page Number	Approach	Technical Accomplishments	Collaborations	Future Research	Weighted Average
PHEVs Component Requirements and Efficiencies	Aymeric Rousseau (Argonne National Laboratory)	1-25	3.50	3.25	2.63	2.75	3.17
Autonomie Plug&Play Software Architecture	Aymeric Rousseau (Argonne National Laboratory)	1-27	2.89	3.22	2.67	2.75	3.01
Overview of Friction and Wear Reduction for Heavy Vehicles	George Fenske (Argonne National Laboratory)	1-29	3.67	3.67	3.67	3.67	3.67
Overview of Thermal Management	Jules Routbort (Argonne National Laboratory)	1-31	3.14	2.43	3.17	2.40	2.70
DOE's Effort to Reduce Truck Aerodynamic Drag through Joint Experiments and Computations	Kambiz Salari (Lawrence Livermore National Laboratory)	1-33	3.40	3.00	3.00	2.40	3.03
Active Combination of Ultracapacitors and Batteries for PHEV ESS	Ted Bohn (Argonne National Laboratory)	1-35	3.00	2.63	3.13	3.00	2.83
Battery Systems Performance Studies - HIL Components Testing	Neeraj Shidore (Argonne National Laboratory)	1-37	3.00	2.88	2.63	2.75	2.86
Parasitic Energy Losses	George Fenske (Argonne National Laboratory)	1-39	3.00	2.86	3.14	2.86	2.93
Integrated Vehicle Thermal Management Systems (VTMS) Analysis/Modeling	*Matthew Thornton (National Renewable Energy Laboratory)*	*1-41*	*2.00*	*2.00*	*2.00*	*2.00*	*2.00*
Renewable Fuel Vehicle Modeling and Analysis	*Aaron Brooker (National Renewable Energy Laboratory)*	*1-43*	*3.00*	*2.00*	*1.00*	*2.00*	*2.13*
Low-Friction Hard Coatings	*Ali Erdemir (Argonne National Laboratory)*	*1-44*	*3.00*	*3.00*	*3.00*	*3.00*	*3.00*
Route-Based Controls Potential for Efficiency Gains	*Jeffrey Gonder (National Renewable Energy Laboratory)*	*1-46*	*3.00*	*3.00*	*3.00*	*2.00*	*2.88*
PHEV Development Test Platform Utilization	*Henning Lohse-Busch (Argonne National Laboratory)*	*1-47*	*4.00*	*4.00*	*4.00*	*3.00*	*3.88*
GPS Travel Survey Data Collection and Analysis	*Tony Markel (National Renewable Energy Laboratory)*	*1-48*	*3.00*	*4.00*	*3.00*	*3.00*	*3.50*
CoolCab Truck Thermal Load Reduction	*Ken Proc (National Renewable Energy Laboratory)*	*1-49*	*2.50*	*2.50*	*3.00*	*2.00*	*2.50*
Erosion of Radiator Materials by Nanofluids	*Dileep Singh (Argonne National Laboratory)*	*1-50*	*4.00*		*2.00*		*1.25*
Enabling High Efficiency Ethanol Engines	*Robert Wagner (Oak Ridge National Laboratory)*	*1-51*	*3.33*	*3.00*	*3.00*	*2.67*	*3.04*
Heavy-Duty Vehicle Field Evaluations	*Kevin Walcowicz (National Renewable Energy Laboratory)*	*1-53*	*3.00*	*3.00*	*4.00*	*3.00*	*3.13*
Efficient Cooling in Engines with Nucleated Boiling	*Wenhua Yu (Argonne National Laboratory)*	*1-54*	*2.50*	*2.00*	*2.50*	*2.00*	*2.19*
Heavy Duty Vehicle Modeling & Simulation	*Aymeric Rousseau (Argonne National Laboratory)*	*1-56*	*3.00*	*4.00*	*4.00*	*3.00*	*3.63*
Fuel Efficiency Potential of Hydrogen Vehicles	*Thomas Wallner (Argonne National Laboratory)*	*1-57*	*3.00*	*3.00*	*2.00*	*3.00*	*2.88*
PHEV Control Strategy	*Aymeric Rousseau (Argonne National Laboratory)*	*1-58*	*3.00*	*3.00*	*2.50*	*3.00*	*2.94*
D3 Website Database	*Glenn Keller (Argonne National Laboratory)*	*1-59*	*3.00*	*3.00*	*2.00*	*3.00*	*2.88*

Presentation Title	Principal Investigator and Organization	Page Number	Approach	Technical Accomplishments	Collaborations	Future Research	Weighted Average
Heavy Truck Friction & Wear Reduction Technologies	*Michael Killian (Eaton Corporation)*	*1-60*	--	--	--	--	--
Nanofluid Development for Engine Cooling Systems	*Elena Timofeeva (Argonne National Laboratory)*	*1-61*	*3.50*	*3.50*	*2.50*	*3.50*	*3.38*
Nanofluids for Thermal Conditions Underhood Heat Transfer	*Wenhua Yu (Argonne National Laboratory)*	*1-62*	*3.00*	*2.00*	*2.00*	*2.50*	*2.31*
OVERALL AVERAGE FOR VEHICLE SYSTEMS			**3.13**	**3.03**	**3.02**	**2.85**	**3.03**

NOTE: Italics denote poster presentations.

Overview of Hybrid and Vehicle Systems Technologies: Lee Slezak (U.S. Department of Energy)

1. Was the Sub-program area adequately covered? Were important issues and challenges identified? Was progress clearly presented in comparison to the previous year?

A reviewer stated the sub-program was adequately covered. There continue to be challenges identified with inadequate budgets on certain projects. Another reviewer commented the subprogram area of VSS was very well described, but the challenges, issues, and progress since last year were not well described. One reviewer mentioned the presentation was maybe a bit on the short side but generally okay. Comparison with prior years was fairly limited while the issues and approach were well covered. Comments from another reviewer noted it was good but a brief overview. The link between modeling and simulation, and testing was given. No information was given relative to the previous year other than budget. Two reviewers answered yes with one adding; overall this is excellent and very informative.

2. Are plans identified for addressing issues and challenges? Are there gaps in the project portfolio?

A reviewer stated they personally would like to see a more comprehensive strategy that shows the linking of all the programs in the Vehicle Technologies Program, including how they tie into other parts of DOE projects. This would be along the line of a Technology Roadmap, which would show progress on projects as well as future expectations of project milestones for the upcoming years. This should also make it easier to budget for upcoming years. Another reviewer noted the planning seems well thought out, especially for PHEV-related studies. The focus is necessarily short term because of economic conditions, but will hopefully return to longer range after the current crisis is over. More studies are needed in the field of fuel conversion devices such as diesel engine generators, micro turbines, free-piston engines, and so forth to support the development of series PHEVs. Fuel cells have already received more than their fair share of coverage. One reviewer mentioned the plan seems OK, except it was unclear to them why two sharply different vehicle types are addressed - small passenger cars and heavy trucks. There may be a good reason but it would be interesting to know why these were chosen - what about the midrange, such as light trucks and delivery vehicles? Another reviewer stated that the targets and challenges were not sufficiently covered. One reviewer said the plan was not really addressed in the presentation with another reviewer noting there are significant cost gaps with all these technologies for hybridization.

3. Does the Sub-program area appear to be focused, well-managed, and effective in addressing the DOE Vehicle Technologies Program R&D needs?

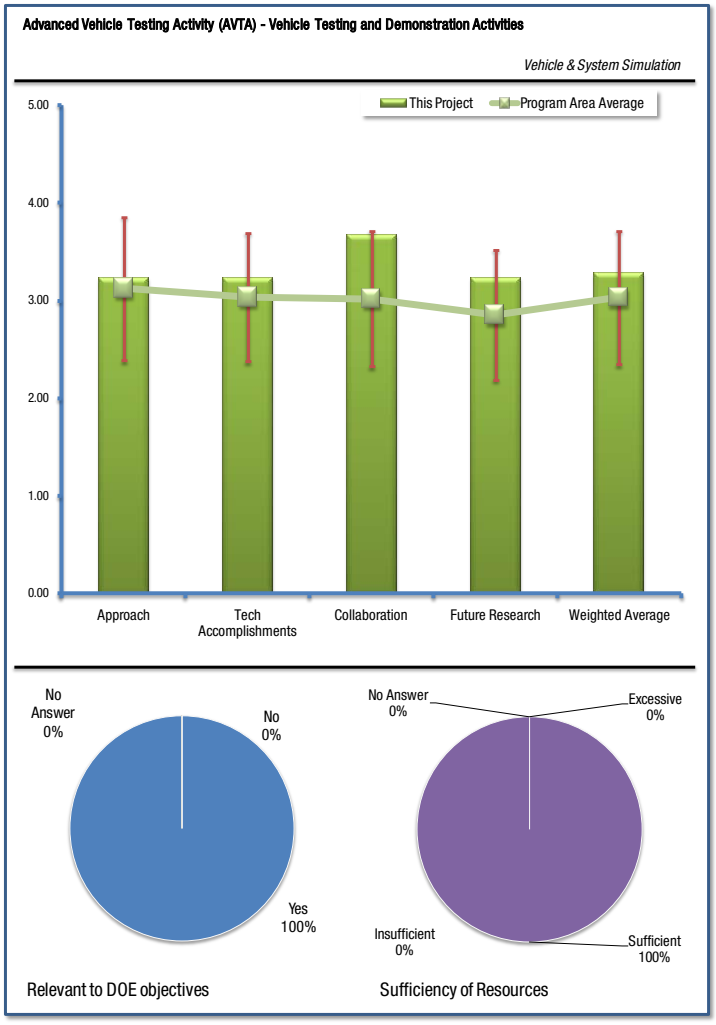
A reviewer stated they believe that the DOE Vehicle Technologies is moving in the correct direction with improved methods in modeling! They truly appreciated the work that ORNL is doing with regards to putting together a rather large industrial fleet. ANL is also touching on interesting financial/business modeling which has merit -- and is showing stretch in thinking. If we continue to look at projects as systems, we are moving in the right direction. Another reviewer notes in general, the program is very well focused and managed considering the very broad range of projects and topics being covered in VSS. Four other reviewers answered yes with one adding it's not quite clear how the many studies are integrated and where they will lead? And will they ever end? What is the final state?

4. Other comments:

A reviewer stated VSS is one of the most important programs at DOE. It is developing tools and techniques for studying system level interactions and synergies. This is where some of the biggest gains and insights are to be found. It is unlikely that component suppliers or OEMs would develop these tools or make them generally available. Another reviewer mentioned from a management standpoint, they would put further measurables on the projects (i.e.: milestone dates, milestones being met, estimated hours of tasks being met, etc) such as what is done in the Engineering Services industry. We also need to be cognizant that fuel economy and emissions are inherently linked. One reviewer commented many of the smaller VSS projects seem to be a bit unconnected from the main goals and focus; try to show how they support the entire program. Comments from another reviewer noted they would prefer

data sheets and project lists where the budget dollars listed match the ones in the researchers' presentations. One reviewer stated the research area is of very high relevance with another reviewer commenting well done.

Advanced Vehicle Testing Activity (AVTA) - Vehicle Testing and Demonstration Activities: James Francfort (Idaho National Laboratory)



Reviewer Sample Size

This project had a total of 9 reviewers.

Question 1: Does this project support the overall DOE objective of petroleum displacement? Why or why not?

Reviewers felt this work involved comprehensive and advanced testing and demonstration of a suite of DOE test vehicles, including PHEV, HEV, HICEV and EV and NEV models (all of which have high potential to reduce petroleum consumption, and near term potential for introduction). Overall the reviewers felt the project directly supports the DOE objective of petroleum displacement by conducting test track, dynamometer, battery testing, field testing, evaluations of accuracy and efficiency, validations of various performance variables in each demonstrate of vehicles. A reviewer said by supporting the advancement of technologies for various types of electric vehicles, the DOE is supporting new alternatives in fuel technologies and fuel displacement. The work provides benchmarking vehicle and fueling infrastructure data to target setters, technology modelers, R&D programs and DOE management, therefore supporting the overall DOE goal of petroleum displacement.

The vast amount of information collected (including providing insight on how real world customers will use plug in vehicles.) will help purchasers and policy makers understand which vehicles offer the most fuel savings. One reviewer felt that the project was a very visible program that helps with commercialization of these technologies to have a real and early impact.

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?

One reviewer feels the approach to the work appears comprehensive and well-designed. They feel the new technologies are well integrated to the work, as they become available. Also, the work is a productive partnership between INL and ETEC (Phoenix), where ETEC is managed by NETL. Furthermore the reviewer feels the mission and geographical data is diverse and strong, similarly other reviewer felt there were clear milestones.

One reviewer points out that the project depends quite a lot on the availability of partner fleets. The variability of driver behavior, climate, charging patterns etc. make it very hard to draw clear conclusions, but they certainly are trying. Another felt it was a very good testing program and data source, but barriers will be addressed by others. At the vehicle testing and data collection/processing level, many issues have been solved.

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

Reviewers feel the AVTA program appears to have made significant progress towards its 2008 milestones, and has leveraged testing relationships to maximize testing value to DOE and taxpayers. Reviewers noted that the many

milestones had been achieved producing and distributing high volumes of high quality data, while current problems in technologies were partly identified. Also noted by the reviewer was that the work and data has been provided as a resource to other government groups such as Clean Cities Program and National Science Foundation. Also mentioned is that the detailed milestones within each category of vehicles is extensive. One reviewer raised the question whether the data can be useful in future designs and if there is a point when victory can be claimed and the program closed?

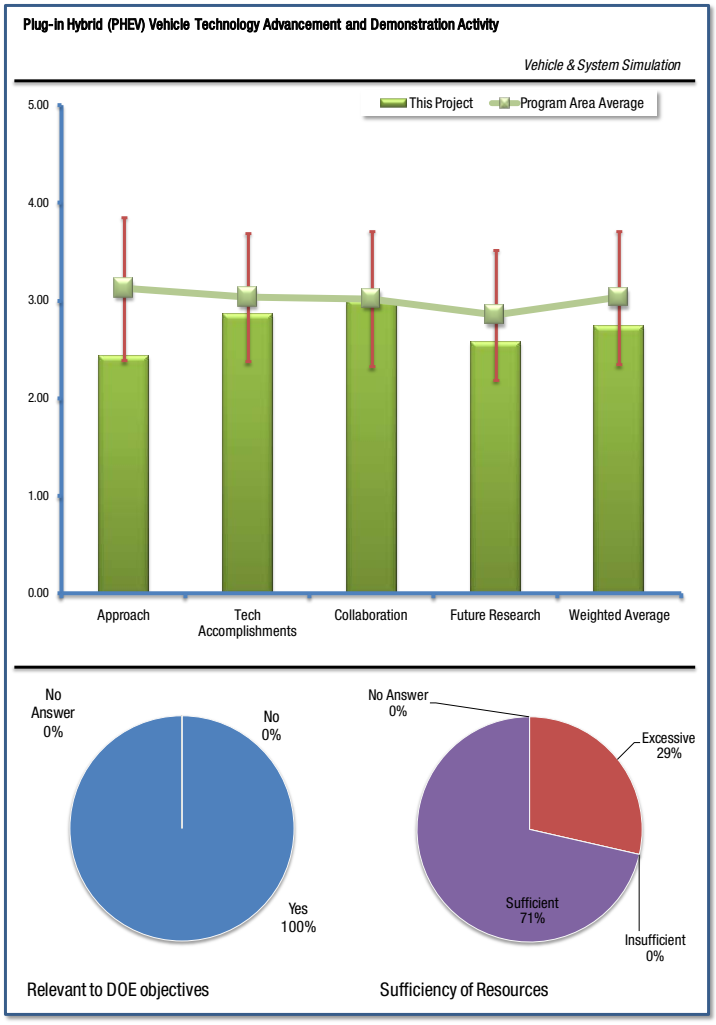
Question 4: What is your assessment of the level of collaboration and coordination with other institutions?
A reviewer noted that the collaboration and coordination of this program appears strong with a wealth of coordinated efforts across disciplines, agencies and areas of interest. They also note that the work is a well-coordinated effort between INL and ETEC where ETEC is managed by NETL. Reviewers note that there is good executive collaboration with strong, demonstrated leadership from INL and is well coordinated with state government and industry stakeholders, so much so that one reviewer wondered if too much time is spent just keeping all the stakeholders informed. Another reviewer points out that they should coordinate test work, dynamometer, and end-of-life tear-down data better with other labs.

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?
Reviewers conclude that projects plans for future work and testing appear adequate given the budget allocated. The future work planned appears logical and flexible enough to allow for contingency and technical barriers. They note that the mule testing for battery systems seems especially sensible, and allows for some unique testing and even high-risk, high-payoff advancement. A reviewer notes that the work and new milestones seem to have realistic near-term potential for commercialization and will continue to support CARB's requirement that all NEVs be tested by the AVTA.

A few reviewers like that the program is using its lessons learned from prior years to tune its approach and has a good focus at overcoming barriers. One reviewer would have liked to see a way to extract useful design data from the data collection. A reviewer says the project needs to address the issue of fleet versus typical consumer/owner driver behavior and that the current testing and data probably cannot address this issue.

Question 6: How sufficient are the resources for the project to achieve the stated milestones in a timely fashion?
The reviewers all generally feel that the resources are sufficient appear adequate and effective. One reviewer says the team has accomplished a significant amount of work and provided necessary data with a relatively small budget (to the work performed), and has done an excellent job of leveraging coordinated facilities and partners.

Plug-in Hybrid (PHEV) Vehicle Technology Advancement and Demonstration Activity: Rosalind Sell (General Motors) and Greg Frenette (Ford)



Reviewer Sample Size

This project had a total of 7 reviewers.

Question 1: Does this project support the overall DOE objective of petroleum displacement? Why or why not?

One reviewer feels that the work is well aligned with the DOE's overall mission of decreasing the nation's dependence on petroleum by optimizing system component integration, and including advanced ESS. The reviewer notes that while this project is still in its beginning production phase, it has accomplished DOE requested milestones in a relatively short amount of time (only about a half of a year). The reviewer says that when complete, the project will have developed one of the first commercially available plug-in hybrid electric vehicles (PHEV) produced by an automotive manufacturer that will incorporate advanced lithium-ion battery technology and feature high tech E85-capable Flex Fuel engine technology. Overall by evaluating and testing the balance of fuel economy, emissions, vehicle performance and battery life tradeoffs, the project directly supports DOE overarching VSS objectives of displacing petroleum. Some reviewers note that it is critical for the big three to develop practical, affordable PHEVs and it is significant that GM/Ford treating this as a production development program rather than just a research project.

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?

A reviewer says that the approach to the project objective appears strong overall. Because some of the technical approach falls into proprietary information, it will be difficult for this reviewer to grant an 'outstanding' performance on approach without access to more technical information on the materials science and engineering novel approach to the work. However, enough information is presented to indicate a strong, comprehensive systems approach to the work. One reviewer makes the point that basing the program on an overweight mule vehicle is a serious weakness in the approach. Many others have taken this path and fallen short of their goals. Why would this project be different?

Many reviewers point out that the report does not indicate what data will be shared with the DOE, such as trip data, CS, CD FE and plug in habits. They also point out that not enough data or sufficient detail (mainly in the GM's information) was presented to evaluate. Another reviewer feels that statistical relevance of so few vehicles from Ford could hamper data analysis. Other potential faults/questions mentioned by reviewers can be found below:

- Will comparisons to the other Vue powertrians such as conventional, mild hybrid, and the base 2-mode HEV be included?

- Will development issues with the main plug-in components be shared? If so, relevance may be rated at medium to high.
- No discussion of cost analysis for vehicle production. In the past, lack of progress by OEMs on hybrid vehicles was excessive cost.
- Cost barriers and mitigation techniques have not been discussed which may very well prove to be the key barrier.
- One reviewer asked whether this project could move "faster," and was given the answer that we are working as fast as we can. The reviewer believes that there are ways to make the project go faster, while still maintaining engineering integrity.

Question 3: Characterize your understanding of the technical accomplishments and progress toward overall project and DOE goals.
Reviewers conclude that according to the public information presented, the work has rapidly made significant progress against the project's performance baselines. The project is only 8% complete but is on schedule. DOE - HQ review in April 2009 indicated excellent progress toward mule prototyping and production is still on track. Again, it would be better for this reviewer to have access to more technical information in ESS to comment on overcoming technical barriers and significant accomplishments, but DOE-HQ indicates that ESS and integration is on track. Another reviewer points out that it is difficult to truly assess progress so far as no specific milestone dates are provided in which to gauge progress against plans.

A reviewer would like DOE to consider how OnStar technology could be used for other DOE projects for communication, mapping driver behavior, etc.

Question 4: What is your assessment of the level of collaboration and coordination with other institutions?
One reviewer feels that the collaboration and coordination of the work with other institutions appears good. Another reviewer mentions that collaboration with EPRI seems particularly wise considering the potential impact on utility infrastructure and capacity. Another reviewer feels partners have been defined but collaboration is not highly evident at this point.

One reviewer saw that the one critical technical area that does seem to include a partner is power electronics and machines. Additionally, as PHEVs clearly have a better value proposition in certain applications and geographical locations, the reviewer feels it would be beneficial to consider adding a State entity to prepare the ground for initial niche market entry. Another reviewer would like to have seen more details on how the collaborations are actually going. Are some collaborators behind schedule, other ahead of schedule?

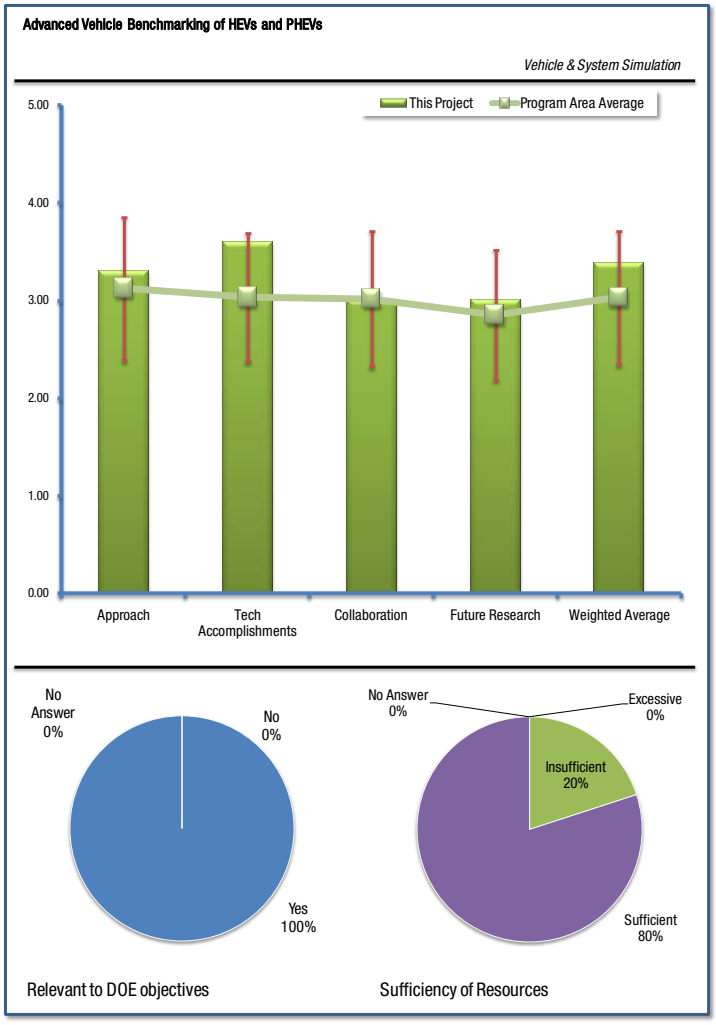
Question 5: Has the project effectively planned its future work in a logical manner by incorporating appropriate decision points, considering barriers to the realization of the proposed technology, and, when sensible, mitigating risk by providing alternate development pathways?
Some reviewers feel the proposed future research plans appear sound. But many reviewers feel the data provided is very generic with insufficient detail to judge the proposed work accurately, but the limited information provided appears sound and logical.

One reviewer points out that there is no mention of production cost analysis or indication of production volume determination. Another reviewer recommends to document process specific to PHEV/EV vehicles and how to utilize on-star as a data collection mechanism on broader terms. Is there possible integration with the smart grid? Furthermore, a reviewer reminds us that there are still many technical challenges ahead.

Question 6: How sufficient are the resources for the project to achieve the stated milestones in a timely fashion?
One reviewer specifically mentions that to review the budget fairly more information is needed but at first glance and without much detailed data for analysis, the budget appears accessible and excessive, but one reviewer says it is actually too difficult to ascertain from the presentation given. Another reviewer states that major OEMs should be

accomplishing this type of study on their own, not relying on the government funds at this point in time. One reviewer makes a point that the GM program extends too long (2014) to be impactful.

Advanced Vehicle Benchmarking of HEVs and PHEVs: Barney Carlson (Argonne National Laboratory)



Reviewer Sample Size

This project had a total of 10 reviewers.

Question 1: Does this project support the overall DOE objective of petroleum displacement? Why or why not?

Reviewers feel that the project provides accurate, valuable, relevant and comparative data on emerging petroleum-replacing light duty vehicles, data useful to OEMs and policymakers. Furthermore reviewers approve of the benchmark testing of low fuel consumption vehicles, which helps to provide good validation information for analytical models.

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 reviewers believe that the technical approach is rigorous and seems ok, but that there are too few PHEV's to be benchmarked and much depends on vehicle availability and manufacturers' design choices.

Two reviewers bring up the following points: Is it really necessary to benchmark all of the vehicles proposed in order to validate analytical models? This could go on for a long period of time with new models constantly emerging. When is the amount of data adequate? Furthermore, testing of mostly production or near-production vehicles only demonstrates how the barriers have been addressed so far.

One reviewer mentions that the presenter said that a benchmark test manual is not used and does not exist. They feel that while the data collection, analyses and reporting appear to be first rate, benchmark testing could possibly be optimized and done more efficiently if a benchmark test manual were developed and utilized. This comment is relevant to conduct of operations, data fidelity, test repeatability, quality control and quality assurance.

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

A reviewer brings up that obtaining advanced technology vehicles is difficult due to the prototype nature of PHEVs. Another reviewer says that eight vehicles were benchmarked during the reporting period and a great deal of useful information was obtained and made available to stakeholders. The reviewer views this as the "gold standard" of advanced vehicle testing and data reporting for the technical community. Another reviewer feels the project is making significant progress and gaining excellent insight into vehicle performance.

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

One reviewer felt the collaborations were not clearly stated, while another clearly listed the collaborators to include the INL, AVTA and OEMs and noted that detailed results from the vehicle benchmark testing are available on the

ANL web site. Another reviewer felt that it appeared as if the project is providing free information to OEMs. If the OEMs are so interested in the data, they should be cost-sharing in the activity.

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?

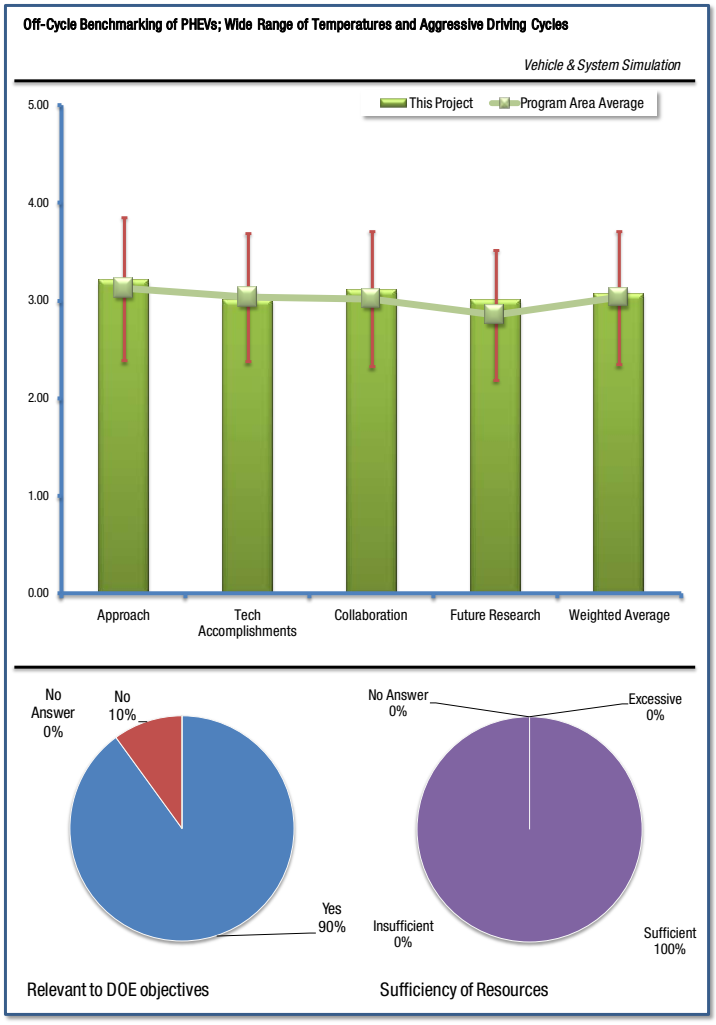
Overall the reviewers felt that a good selection of models appears in the list for future testing and fall exactly in line with expectations. One reviewer noted that the planed testing of the proposed Upgrade APRF capability for Sub-Freezing FTP and Hot SC03 with solar heat load capabilities for 5-cycle testing capability sounds like an interesting subfield. The only criticism came in the suggestion to do a more balanced load of PHEV testing vs. HEV testing (there is only one PHEV planned). It was also suggested that there needs to be some definition of scope and end-point so that this does not become a never ending project (there will always be more vehicles to test).

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

One reviewer commented on the difficulty in getting early vehicle models and it will be an ongoing challenge. They felt the research team appears to be coping with this problem. Other reviewers felt that the resources were not clearly formulated and questioned how expensive some of the equipment might be.

One reviewer pointed out that if future work is to expand the APRF to full 5 cycle capability will require more resources.

Off-Cycle Benchmarking of PHEVs; Wide Range of Temperatures and Aggressive Driving Cycles: Barney Carlson (Argonne National Laboratory)



Reviewer Sample Size

This project had a total of 10 reviewers.

Question 1: Does this project support the overall DOE objective of petroleum displacement? Why or why not?

The reviewers felt that he work supports the overall DOE objective of petroleum displacement by providing important data for PHEVs. They felt it accomplished this by providing data on the effect of temperatures and driver aggressiveness on real world fuel efficiency/consumption variance. In general the reviewers thought the work helps the DOE understand and is necessary to help comprehensively assess the petroleum displacement potential of PHEVs in real world scenarios, but only in the definition of petroleum displacement being a function of battery power and capacity of the PHEV.

Some reviewers felt that this information is critical to educate the customer on how to maximize fuel economy and another thought that the issues of off-cycle performance could be better understood using analysis tools.

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?

One reviewer stated that the work takes a very logical approach to the two problems of effect of temperature and aggressive driving. Another reviewer elaborated on their rating saying that the approach receives a 'fair' from them and not a 'good' only because the work seems very mundane, straightforward and the drive-cycle tests fairly limited. They suggested that the work might be enhanced by extended applications. (Granted the budget is very small for more extensive work). One reviewer felt that given the straight-forward range of tests, the data provided is comprehensive and effective.

Another reviewer commented that the cold ambient problem and aggressive driver problem are very dependent on controller strategy. In this study, most of the testing was performed on one vehicle model (i.e. the same controller strategy). On a similar note, other reviewers wondered how the cold environment tests will enter into future design considerations - do we need larger or different batteries at low temperatures or some warming system? How will the results be transferred to the design community? What could be done to make future designs insensitive to temperature effects?

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

A reviewer felt that the work proposed and budget provided, the accomplishments are sound and that the project does provide some interesting data on performance at sub-freezing temperatures. Another reviewer felt that the project

seems to be doing as well as can be expected, but they also point out that the fleet data do not seem to be particularly useful, except to illustrate the wide spread in performance.

Two reviewers had similar opinions on the accomplishments by saying that this task has demonstrated strong technical accomplishments including the impacts of cold temperatures and aggressive driving on engine operating time, usable battery capacity and charge depletion range, and emissions. They both noted that an interesting finding is that charge depletion range can decrease, increase, or remain constant depending upon battery power and capacity. Furthermore they were interested to see the effect of driving intensity on energy consumption differs for vehicle EV capability. Overall they feel this task is demonstrating significant productivity and usable results.

Question 4: What is your assessment of the level of collaboration and coordination with other institutions?
Reviewers commented that the project collaborates with Environment Canada (collaboration with Canada viewed as very good) who provides the Cold Dynamometer testing facility, Idaho National Lab, on-road fleets and not many others. They recommend that coordination might be improved or extended to other vehicle partners or national labs such as ORNL.

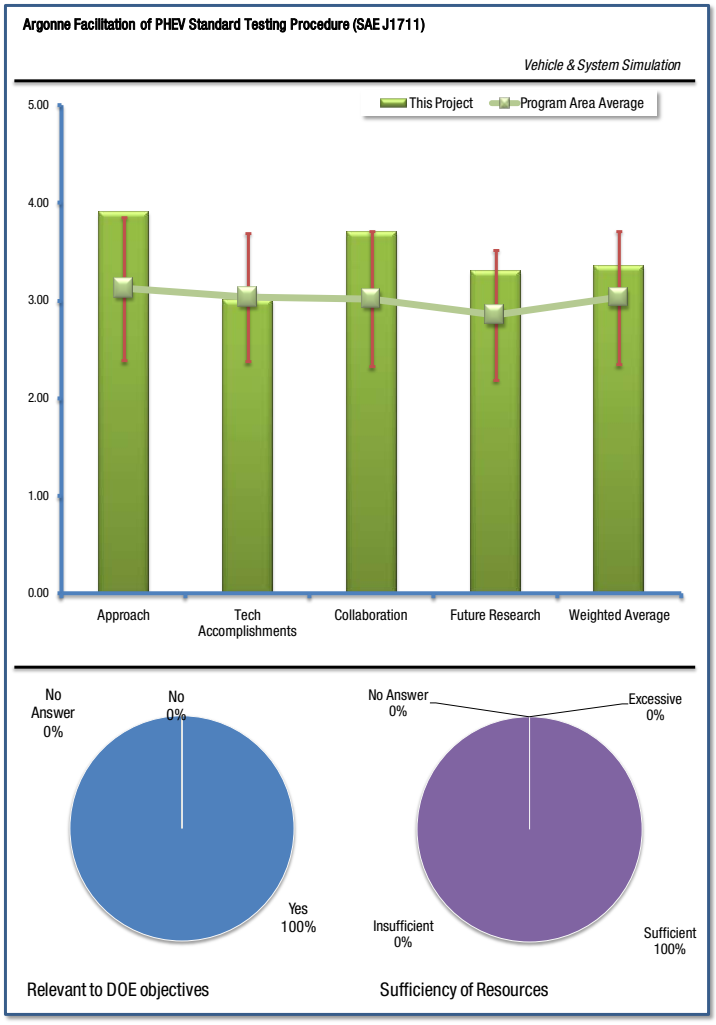
Question 5: Has the project effectively planned its future work in a logical manner by incorporating appropriate decision points, considering barriers to the realization of the proposed technology, and, when sensible, mitigating risk by providing alternate development pathways?
Some of the reviewers think the proposed work appears sound and logical but possibly a bit mundane and they make the comment that it seems to be more of the same, more-or-less, testing vehicle types as they become available. One reviewer goes as far to say "My opinion is that I did not see a need for future work as outlined."

One reviewer commented that they would like to see additional study as to the variation of CD range obtained vs. use function/vocation, temperature and humidity, and driver behavior vs. ideal. They feel that mathematically predicting range based on these factors would serve very useful to future efforts to cost effectively improve it.

While some reviewers thought that the facility upgrade plans are good, another reviewer gave some detailed insight on the issue: they felt the proposal for future work to upgrade the Advanced Powertrain Research Facility (APRF) with to sub-freezing and hot A/C capabilities should be closely examined. They feel this is an expensive proposition ($1.5-1.8 Million) and it may be more advantageous to continue to use Environment Canada's facilities. The same reviewer also thinks that this task may also benefit from establishment of a longer term vehicle testing plan (2-3 years out) that bounds the types of PHEVs to be tested and to what level.

Question 6: How sufficient are the resources for the project to achieve the stated milestones in a timely fashion?
All ten reviewers thought that the resources were sufficient. Some comments were that the budget is small but the milestones and expected accomplishment comparable. One reviewer said that the task is sufficiently funded and should continue at current levels.

Argonne Facilitation of PHEV Standard Testing Procedure (SAE J1711): Michael Duoba (Argonne National Laboratory)



Reviewer Sample Size

This project had a total of 10 reviewers.

Question 1: Does this project support the overall DOE objective of petroleum displacement? Why or why not?

Most of the reviewers agree that by providing SAE procedure standards, the work supports the overall DOE objective of petroleum displacement. They applaud the project for providing testing and evaluation standards for a suite of J1711 PHEVs and eventually the J1634 platform. A reviewer also points out that is good that the project does not directly support the regulations efforts at EPA but provides the complementary testing capabilities and set of baseline standards to establish regulations in the future. The reviewers also like that project is including development of common terminology and definitions. A few reviewers note that a standardized PHEV testing procedure is needed, to fight conversion companies' claims of "100 mpg". This project is a necessary step towards consistently quantifying petroleum displacement.

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?

One reviewer comments that the approach to the work and establishment of J1711 HEV and PHEV standards appears comprehensive and sound. They continue by saying that the dynamometer testing methods are very carefully approached and designed with adequate attention the PHEV unique operation. They also applaud that the testing, experimentation and evaluation is compatible with legacy testing requirements and overcome historical barriers for longer PHEV tests. One reviewer feels there is a need to find a way to relate DC energy measured on vehicle to AC kWh from charger. Another reviewer states that SAE is the right forum and participation from all OEM's is appropriate.

One reviewer complemented the project team by saying "Very challenging problem that probably only the team and facilities at ANL can address."

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

Reviewers say overall the project appears that it is meeting its established project milestones with respect to its baseline performance goals. The reviewers feel that the project team has made significant progress toward its technical objectives of establishing J1711 standard procedures and point out that success would not have been possible without DOE maintaining leadership in vehicle systems. The reviewers also feel the project team has also been very proactive in communicating with it various stakeholders, including JARI-ISO, CARB, EPA. The amount of partnership and collaboration should be commended and has contributed to the overall technical accomplishment and progress of the project.

There is concern among a few reviewers about the timeline, one of them is that this standard has been under construction for some time. They feel the end of the year is a target that must be met and this project should be concluded before that. The reviewers point to the rewrite, which has been in progress for a couple of years now. Based on the time it took for the rewrite the reviewers feel that coordinating and getting consensus from all parties may be difficult. Overall the reviewers feel there needs to be a greater drive for results in a more timely fashion.

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

Reviewers say that the collaboration and coordination for this project is extremely challenging, and is necessary to gather all of the input and understanding of how PHEVs operate and perform. The project does an outstanding job of raising consensus with its wide range of stakeholders and takes a leadership role in the J1711 Task Force and the joint work between ANL and INL (Testing -ANL & On-Road EVAL INL) is commendable. The reviewers mention that the nature and level of collaboration and coordination was discussed and shown to be excellent in addressing the varying interests of a wide variety of stake holders.

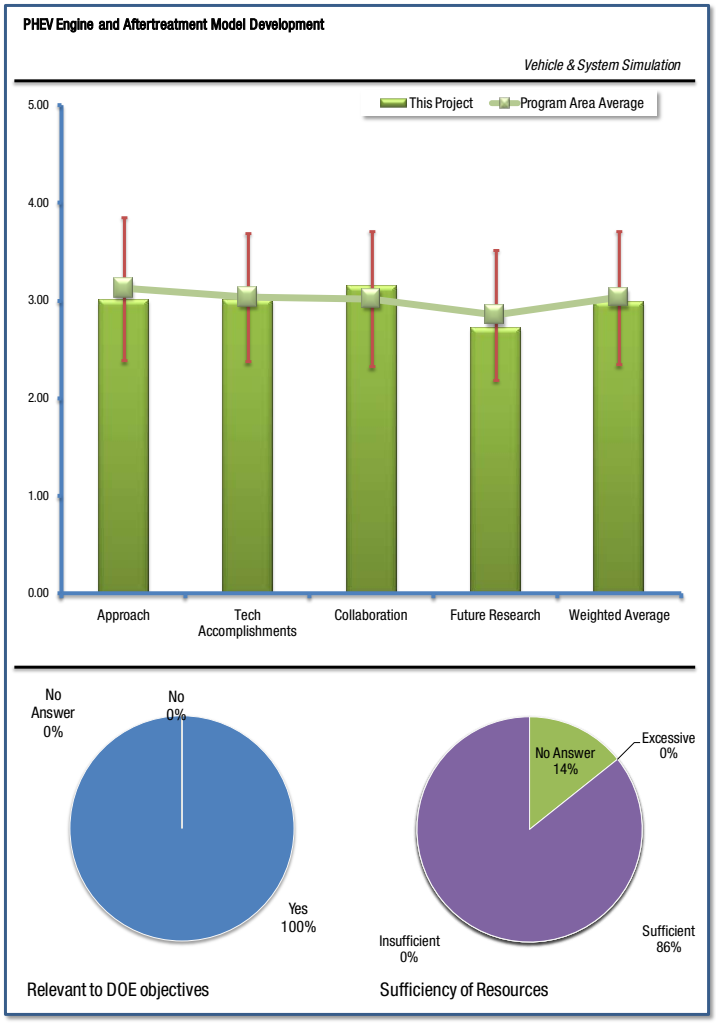
Question 5: Has the project effectively planned its future work in a logical manner by incorporating appropriate decision points, considering barriers to the realization of the proposed technology, and, when sensible, mitigating risk by providing alternate development pathways?

Reviewers agree that the project is nearing a successful completion and that wrap-up by Q4 2009 is an appropriate timeline.

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

All ten of the reviewers agree that the level of resources is sufficient and that the budget of $300 million was used efficiently and in a timely fashion producing a very significant effect. One reviewer felt that there was not enough information available to determine if resources were sufficient.

PHEV Engine and Aftertreatment Model Development: Stuart Daw (Oak Ridge National Laboratory)



Reviewer Sample Size

This project had a total of 7 reviewers.

Question 1: Does this project support the overall DOE objective of petroleum displacement? Why or why not?

The reviewers agree that the aftertreatment of IC engines used in hybrid powertrains will become more and more challenging as the engine is used less and electric motors are used more. This is an area that needs to be studied in detail. The reviewers believe that the model developments will facilitate future development and implementation of non-petroleum or limited-petroleum using vehicles. They point out that helping define where resources should be applied for maximum petroleum displacement does support objectives. However, one reviewer says that engines and aftertreatment in the LD sector will be obsolete if AEDV's are available so better focus would be on HD engine/aftertreatment simulation studies.

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?

One reviewer says that a model based approach here seems to be overestimating the ability of current simulation tools and that the project team needs to make sure that the results are correlated to full vehicle testing.

Some other reviewers feel that the project is well planned and executed and appears to address the most important barriers. They would have liked to see more specifics on what type of models and maps were being discussed, analytical, thermodynamic, computational, etc.

One reviewer says that the barriers represented in the project could be overcome and there should be additional planning and costs associated with getting engine models. They feel that PHEV engine optimization can also be modeled.

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

The reviewers say that 2008 milestones were achieved and the 2009 milestones are in progress. They mention that the project team performed a detailed analysis making good use of available data and issues were efficiency addressed. One reviewer makes the point of that it seems the validations are very good, almost too close to experimental results for comfort; perhaps all has been done? Another reviewer makes the statement that various advanced engine technologies should also be considered/modeled going forward.

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

Reviewers provided very little feedback on this question only saying that it seems to be very good and that one of the reviewers liked the continued outreach to industry, including the CLEERS consortium.

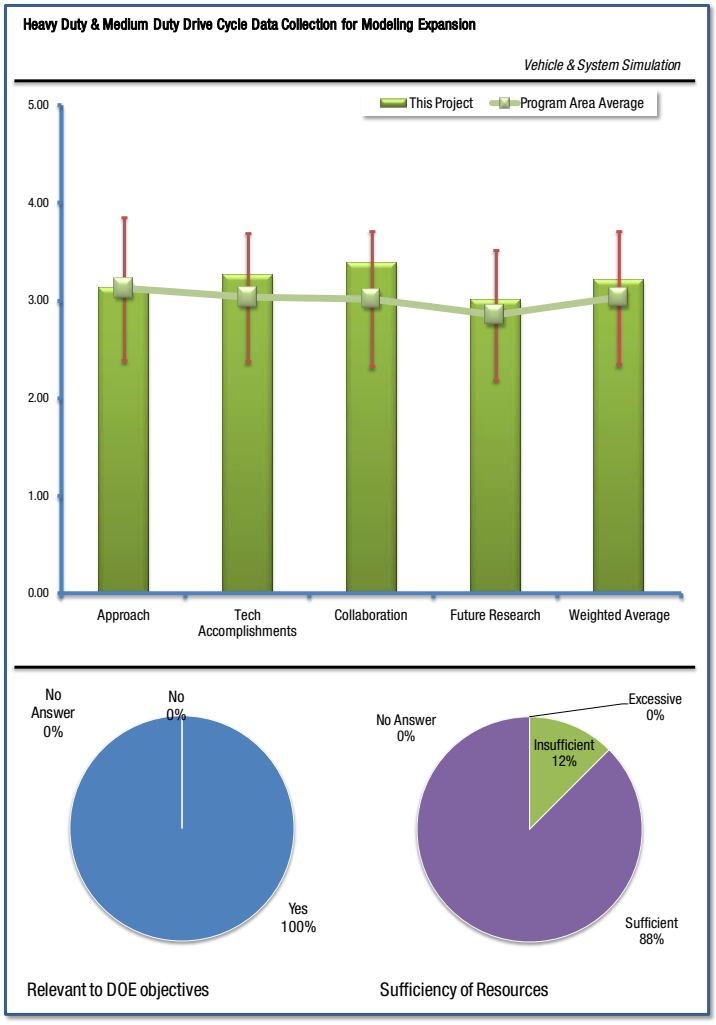
Question 5: Has the project effectively planned its future work in a logical manner by incorporating appropriate decision points, considering barriers to the realization of the proposed technology, and, when sensible, mitigating risk by providing alternate development pathways?

Reviewers feel that the project has well planned research, they feel the project captured many of the technologies that need to be incorporated but failed to discuss how to define actual interactions and compare to other (non-diesel) technologies. One reviewer points out that there are many opportunities here for future research as the audience noted such as: hydrogen fumigation of gasoline engines (SWRI indicated a 5-20% fuel economy improvement through their HEDGE consortium). Biofuel effect on emissions and emission equipment needs to be reviewed (some work being done by NREL in this area).

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

All six of the reviewers feel the resources are sufficient, but some feel that there was not enough information. Other reviewers feel that it was not quite clear from the presentation but seem to be OK.

Heavy Duty & Medium Duty Drive Cycle Data Collection for Modeling Expansion: Gary Capps (Oak Ridge National Laboratory)



Reviewer Sample Size

This project had a total of 8 reviewers.

Question 1: Does this project support the overall DOE objective of petroleum displacement? Why or why not?

A reviewer says that the project develops and tests effective and practical methods to collect and analyze operating data to measure heavy truck fuel consumption. They feel the knowledge obtained will be critical in prioritizing customer and research program choices in selecting technologies to improve heavy/medium duty truck fuel economy. Another reviewer point out that characterization of heavy-duty drive cycles is key to developing technologies that can improve their fuel efficiency. Another reviewer says that instrumentation of vehicles is a key to determining "true" driving cycles. The cooperation of fleets is highly important in this area, and ORNL should be commended for being able to obtain as much data as they have.

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?

One reviewer feels the barriers defined by the presenter seem narrowly focused on this specific project, and of little broad or long term value. While another reviewer feels the key barriers and targets are identified barriers and the project has demonstrated good progress on overcoming the barriers and meeting the targets.

Many reviewers gave praise to the excellent acquisition and analysis of data and said that it is good to get the data. Some reviewers' feel the best approach would to enable dispersal of the data to industry and that it would have been helpful for ORNL to show the depth of the data parameters that were collected on this project.

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

The reviewers point out that sixteen objectives and 12 milestones have been accomplished so far in 2008 and 2009; they also note that the report has been completed and is available to public. One reviewer recommends that a complete vetting of the wireless download data acquisition would be helpful to the audience, as well as understanding how this would work on other programs -- including off-highway vehicles.

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

One reviewer feels that the cooperation of DOE/DOT/EPA is absolutely critical to making this project a success and that the shared funding is a good indicator of cooperation. Another reviewer points to the fact that the project has obtained use of 12 vehicles plus partnerships with relevant organizations as an example of collaboration. Similarly, another reviewer says there is excellent coordination with end users and the project may want to coordinate with HTUF to gain understanding of how hybrids perform in different applications.

One reviewer would love to see more sharing of the data, including the sharing the analysis of the data that was collected.

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?

A reviewer says that the future works described seems like a collection of activities without clear focus. Another reviewer had a contrasting view that the future work coincides with the targets and objectives of the project and has a detailed schedule of performance. One reviewer says that they are not sure that highway wrecker trucks represent a large fraction of typical vocations and recommends that the project investigate other vocations instead.

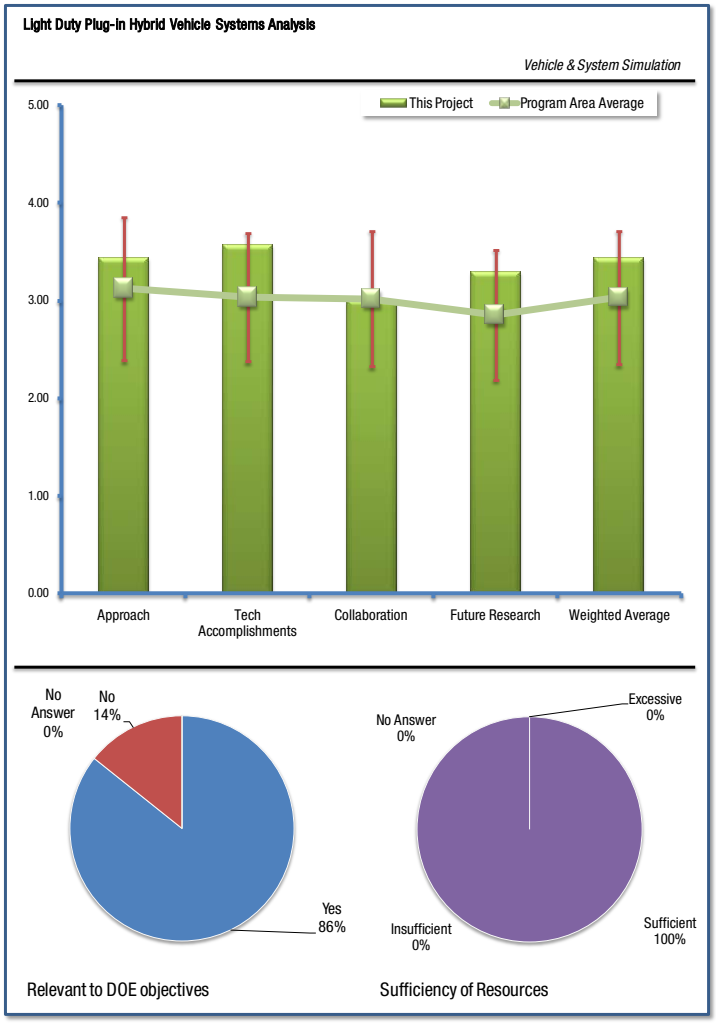
One reviewer is very excited to see what duty-cycles are derived from this data and was personally interested in seeing what the duty-cycle looks like across Trans Canada-US crossings.

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

Some reviewers agree that the combined agency funding and effective use of resources is evident and that the budget, expenditures and progress appear to be in balance.

One reviewer says additional resources will be necessary to fully define drive cycles of a wider variant of truck vocations. Another reviewer would love to see the man-hours associated with this project and the cost to instrument a truck, as it would be helpful for other projects across the DOT, EPA and ARB.

Light Duty Plug-in Hybrid Vehicle Systems Analysis: Tony Markel (National Renewable Energy Laboratory)



Reviewer Sample Size

This project had a total of 7 reviewers.

Question 1: Does this project support the overall DOE objective of petroleum displacement? Why or why not?

One reviewer says that this project takes an overall systems approach to advancing light-duty PHEV systems which directly supports the DOE objective of petroleum displacement.

Another reviewer feels that the project will make it possible to develop an integrated picture of battery charge/discharge patterns based not just on driving behaviors but on grid electricity availability when wind power is used for charging.

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?

One reviewer feels the approach includes comprehensive collaborations (SAE, GM, Metro, Labs) that appear to strengthen the approach, and give the data and analysis the breath required. Another reviewer wonders if all the data are necessary - effect of wind cycle, for example, while OK it is marginally relevant at this time. They feel it could obviously become useful later on in time when vehicle penetration is much greater than now but by then both technologies will be significantly different. Also, they think it would be interesting to compare driver data from the different cities to see how much commonality there is and whether there could be a semi-standard model for driver behavior that can be used for technology development.

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

A reviewer commented that to achieve the overarching finding, various technical accomplishments were achieved within for travel pattern data applications, battery cost/life modeling, PHEV integration with renewables, economic assessment tools, and PHEV test procedure improvement. The reviewer also mentions that the project worked with an SAE committee (Labs and Industry) to evolve the J1711 standard. Another reviewer mentions that “Slide 26 is unclear and needs some elaboration.”

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

One reviewer notes that the collaborations are critical to the analysis and report findings and that the project had strong collaborations with stakeholders, including Congressional Visitors, General Motors, Chevy Volt, Xcel Energy and V2Green, Hymotion, EnergyCS, and Hybrids-Plus, Tesla Motors and AC Propulsion, Southern California Edison and Google. Another reviewer says “Seems Ok if not spectacular.” A reviewer would like to know what "active on SAE J1711" means and highlights the cooperation with vehicle and trip data efforts at INL AVTA, and perhaps UC-Davis work.

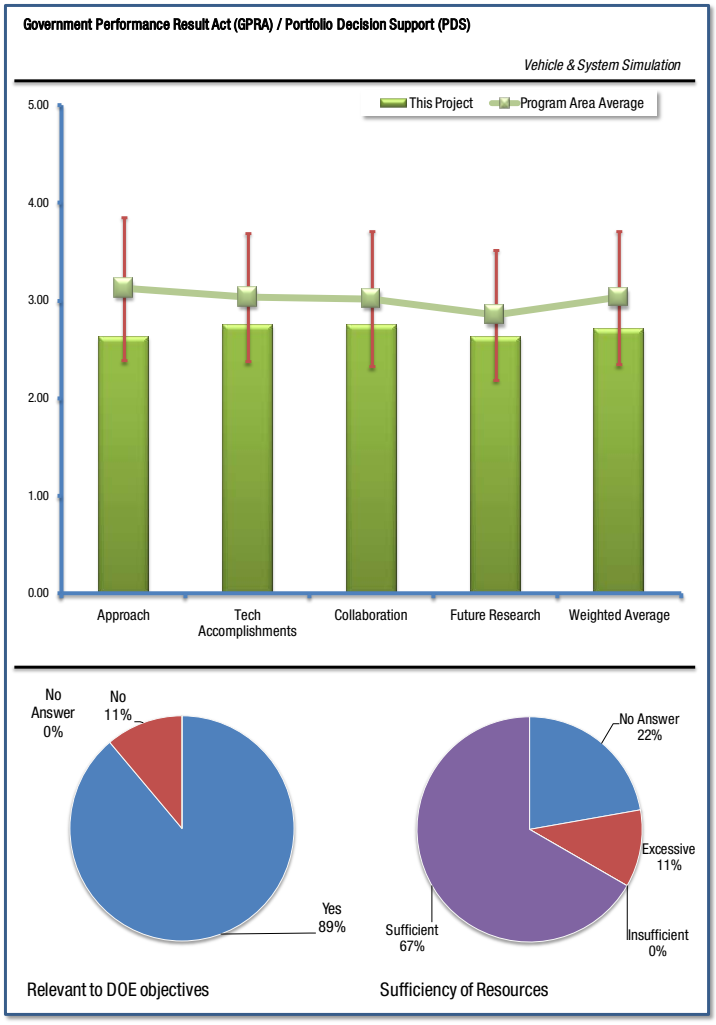
Question 5: Has the project effectively planned its future work in a logical manner by incorporating appropriate decision points, considering barriers to the realization of the proposed technology, and, when sensible, mitigating risk by providing alternate development pathways?

One reviewer believes that the future work proposed is bound to be as successful as the initial work provided and this work will continue to be very valuable to the government, industry and the consumer. Another reviewer would like for the project to consider more interaction with others on proposed work.

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

All six of the reviewers feel that the resources are sufficient. One reviewer believes that the budget is moderate for the amount of data provided. Another reviewer points out that, while not clearly addressed, there are no obvious budgetary barriers nor windfalls.

Government Performance Result Act (GPRA) / Portfolio Decision Support (PDS): Sylvain Pagerit (Argonne National Laboratory)



Reviewer Sample Size

This project had a total of 9 reviewers.

Question 1: Does this project support the overall DOE objective of petroleum displacement? Why or why not?

The reviewers believe that the project directly supports the DOE objectives of reducing our national dependence on petroleum, by further developing the Government Performance Results Act (GPRA), and specifically assessing the efficacy of the FreedomCAR initiative. The reviewer also notes that this project is able to project what the total petroleum displacement would be, if we were to meet all FreedomCAR milestones.

Reviewers state that it is important to understand the potential impacts of vehicle technology utilization. The project also serves to help guide future research and development by evaluating benefits of latest technologies both from a component and control perspectives.

One reviewer says that the program looks at efficiency of overall government programs and from their point of view this is not applicable (i.e. the things this project reviews help to meet the DOE objectives not the actual project). Another reviewer would have liked to have known what the FreedomCAR goals are so they could have assessed better.

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?

One reviewer recommends that the approach might be more sharply focused by including a more detailed level of component variables along the drivetrain or for example materials advancement in energy storage systems. Some reviewers believe the approach was not presented in detail and the project could use better substantiate cost assumptions. They also think the project should reference studies where possible. Another reviewer says it is hard to understand the approach and there doesn't seem to be a coherent strategy. They state it appears like a “shotgun" approach to the do analysis without a well-defined goal.

Another reviewer points out that the project leaves out hydraulic hybrids, flywheel solutions, system solutions with waste heat recovery, turbo compounding, optimized biofuel based engines for hybrids, and other technologies.

On the other side one reviewer says that the barriers have been identified and are being successfully addressed, the project appears to be well designed and has demonstrated its feasibility and has shown integration with other FreedomCAR team efforts. Similarly another reviewer feels the approach appears sound and logical and has implemented means to examine and assess the petroleum displacement potential of a large number (approximately 600) powertrain/fuel/vehicle size configurations. But this reviewer still questions cost.

Question 3: Characterize your understanding of the technical accomplishments and progress toward overall project and DOE goals.
One reviewer noted that the project has achieved 75% total project complete on an aggressive schedule. They also said in addition to GPRA/PDS, the team results were used to support other studies like component requirement uncertainties, fuel efficiency improvement of different fuels, configurations and cost benefit analysis of each technology. One reviewer said significant analysis has been accomplished but it's difficult to understand how it all hooks together. Reviewers commented that the project has exhibited high productivity and solid results. They were pleased with the interesting results that were presented on hybridization petroleum displacement benefits with vehicle class and fuel cell HEV fuel consumption uncertainties. Another reviewer felt that there was more reporting than analysis.

Question 4: What is your assessment of the level of collaboration and coordination with other institutions?
Reviewers thought that the work demonstrates strong, close and appropriate collaborations with various technical teams, National Laboratories, Additional experts, Academia, and PSAT/GREET users. Another reviewer thought that there are lots of opportunities to collaborate with similar work at other agencies, within industry, etc.

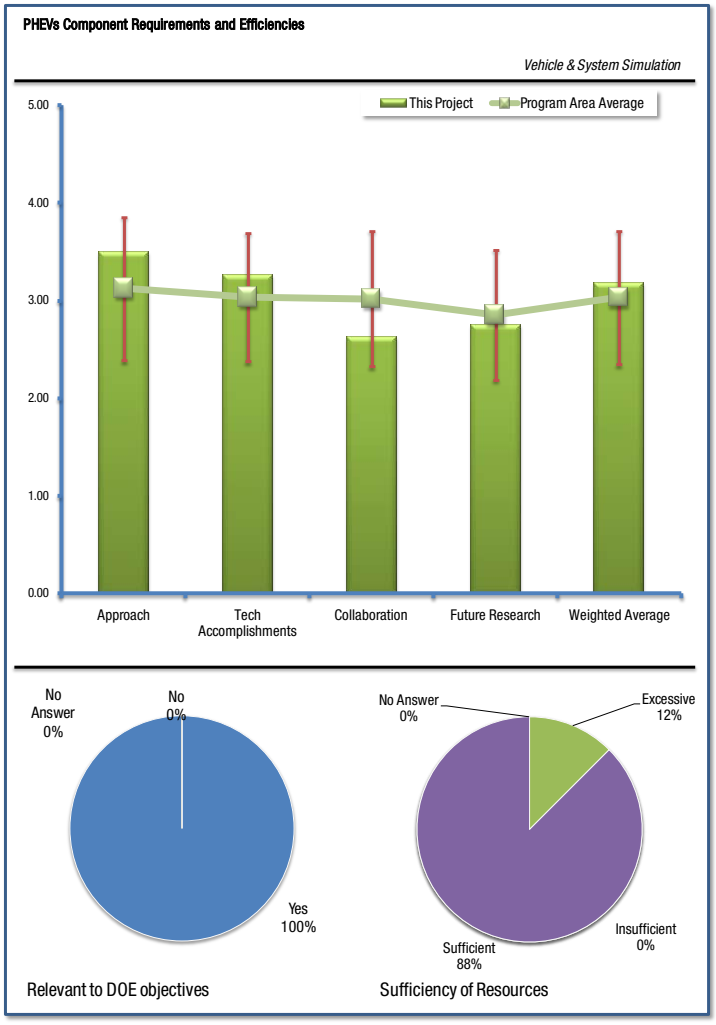
One reviewer thought that it was not clear where some of the data comes from, especially costs- it would beneficial to have a clearer picture of this aspect. For example, exactly which literature sources are tapped and approaches used to access cost information. What other approaches or sources (including direct purchase) could be used to broaden access? Another question they had was how well coordinated this activity is with the automotive system cost model effort historically conducted at ORNL and now at NREL.

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?
Reviewers thought that the future work proposed and focused on addressing the barriers is logical, and is planned systematically. They also said that it builds very nicely and appropriately on past years work.

Another reviewer thought that the use of an optimization tool for component sizing and control strategy tuning is a good approach as well increased implementation of Monte-Carlo risk analysis. But they said there is a lot of details are provided on other future activities and recommended that consideration be given to bounding the number of powertrain/vehicle size/fuel configurations to be examined to increase accuracy and acceptance of results. One reviewer elaborated that there are many techniques one can use for portfolio analysis and this project needs to be rethought.

Question 6: How sufficient are the resources for the project to achieve the stated milestones in a timely fashion?
One reviewer commented that the budget could be increased and another said it was not discussed. To elaborate on the excessive budget the reviewer said that the amount of funding for this activity seems to be excessive in terms of benefits to DOE.

PHEVs Component Requirements and Efficiencies: Aymeric Rousseau (Argonne National Laboratory)



Reviewer Sample Size

This project had a total of 8 reviewers.

Question 1: Does this project support the overall DOE objective of petroleum displacement? Why or why not?

A reviewer said that the relevance of this work was not clearly stated. It may have some limited value in guiding early component decisions. Other reviewers said that the project is relevant to the transition to electric vehicle fleets and is useful for PHEV energy consumption estimation, in particular as battery energy capacity changes.

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?

A reviewer said that the RWDC based results are useful, but should also include standard drive cycles for comparison? Is US06 close enough to RWDC? Another reviewer thought that significant analysis has been accomplished but it is difficult to tell how it applies to the problem at hand.

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

One reviewer thought that the accomplishments appeared clear and readily understood. Another reviewer said the presentation was very hard to follow, charts were not clear or understandable and the presenter should have used a pointer when referring to complex charts with lots of data. Some reviewers thought that most goals seem to have been reached by now and that there was good analysis accomplished, but did not understand what it all meant.

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

The reviewers generally agreed that collaboration was minor and may have been the nature of the project, it appeared to be a predominantly in-house study and support activity. The reviewers also wondered if fleet data from AVTA or other data on drive cycles from NREL could have been used.

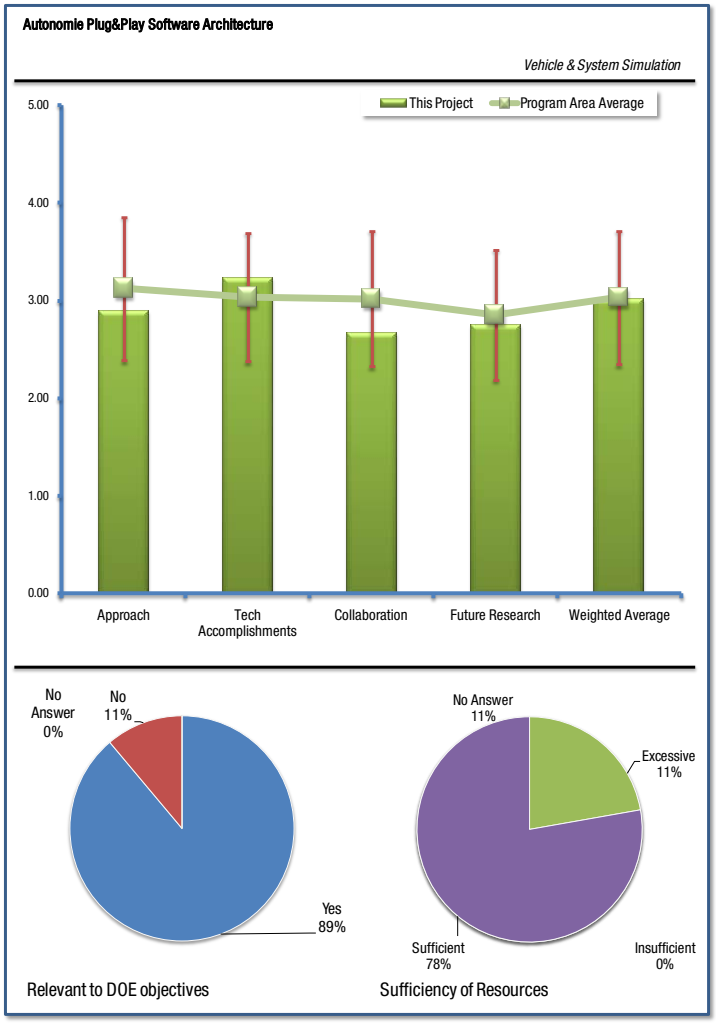
Question 5: Has the project effectively planned its future work in a logical manner by incorporating appropriate decision points, considering barriers to the realization of the proposed technology, and, when sensible, mitigating risk by providing alternate development pathways?

While one reviewer said that the future work seemed to be very reasonable, another said that it seemed to be rather random questions that are being addressed. The same reviewer also wondered how the future work feeds into a coherent answer to a question.

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

One reviewer said that it was not specifically discussed but there seemed to be no specific budget-related problems. A reviewer added that the amount of funding for this effort appears excessive related to its value.

Autonomie Plug & Play Software Architecture: Aymeric Rousseau (Argonne National Laboratory)



Reviewer Sample Size

This project had a total of 9 reviewers.

Question 1: Does this project support the overall DOE objective of petroleum displacement? Why or why not?

One reviewer feels that the project may or may not support the overall DOE objective of petroleum displacement, but they feel it may well improve the efficiency of the overall processes and thereby help reduce petroleum consumption in very general terms. But this is only their guess, as it was not addressed clearly or specifically in the presentation.

Other reviewers view this as a supportive analysis tool and say that bringing technologies to the market faster through lifecycle modeling and simulation is an absolute necessity for bringing about highly electrified vehicles that will maximize fuel displacement. They also point out that cost to assess vehicular technologies would be reduced, time to market would be accelerated, and the ability of smaller firms (with more limited resources) to contribute would be enhanced.

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?

In general the reviewers point out that this project will help sort technologies quickly to reduce hardware build iterations and the work seems to be very well done, even if it possibly is only marginally relevant to the DOE mission. It may also intrude on the areas of activity generally handled by the software industry or by universities. One reviewer points out that this is very good and useful work, but the vehicle technical barriers will be overcome with or without this program. They would have also liked to see an example of the methodology to outline the consistency of modeling analysis from one project to the next.

One reviewer made helpful suggestions that the scope of this effort appears to be well organized, but is extremely broad. They said the project appears to attempt to provide universally applicable software architecture for integrating all models - both future and existing. They feel there is a need for additional metrics such as computer hardware requirements, speed of analyses, cost of maintenance, cost of training, nor prioritization of the boundless options.

Another reviewer elaborates in detail that the barriers in the presentation are not specific technology/software development barriers-- they are actually goals that the tool hopes to achieve. As such the reviewer feels it is difficult to assess the effectiveness of the approach. Furthermore they feel that the approach seems reasonable but would benefit from a harder discussion of the overall potential show stoppers, approaches to address them, and contingencies. Some of the potential show stoppers the reviewer points out is not only software development barriers but also industry collaboration and ways of doing business and how these elements could affect implementation of an industry wide enterprise software system.

Question 3: Characterize your understanding of the technical accomplishments and progress toward overall project and DOE goals.
The reviewers feel that the project is doing nice work and objectives are on target for this complex program. They stated that given the daunting scope of this effort, the projected completion of the first version of this code by September 2009 is to be lauded.

However due to the fact that clear performance indicators and milestones are not detailed it makes it difficult to truly assess progress, so the reviewer will have to wait until September to see if it lives up to its claims. A reviewer recommends since this is a fairly large task, it would benefit from a more structured project outline with very clearly delineated subtasks, milestones (including go/no-gos), and contingency approaches. The reviewers do note that if this task should prove successful, it would prove a revelation in the conduct of car design and development. A reviewer does caution that in some ways, the task appears to be trying to be everything to everyone which may not be feasible from a technical nor business standpoint.

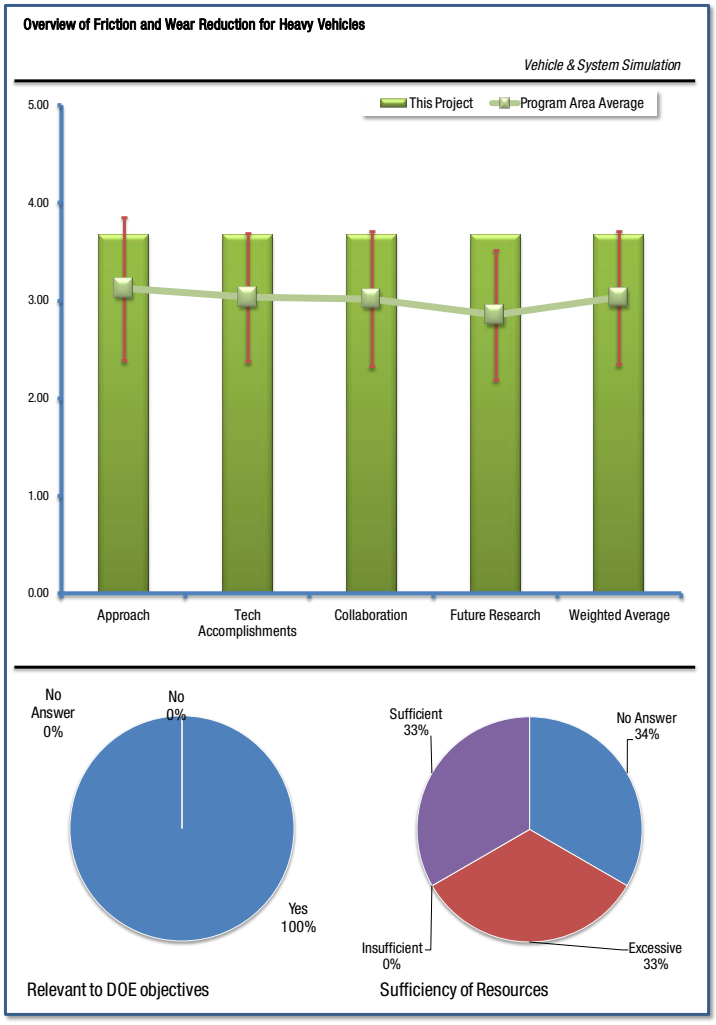
Question 4: What is your assessment of the level of collaboration and coordination with other institutions?
In general the reviewers agree that collaboration with GM, Mathworks and Mechanical Simulation is excellent, but it is not clear if anybody else is involved. They recommend as the product matures, universities, National Labs, OEMs and other users should be called upon to provide a range of models and software options beyond those utilized by GM, which may already have some degree of in-house standardization. They would hope to soon have buy-in from the rest of the vehicle systems analysis community (including support of Ford and Chrysler and if possible some large suppliers) and that the project will be rolled out in a commercially available way. One reviewer makes the point that the simulation world is moving rather fast, and cautions if the project is really capturing all of the latest capabilities with the current partners involved?

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 reviewers feel that there are extensive goals and the project seems to be on target. However they note that the end date for this project is specified as September 2010, but the list of future activities seems to be very general and open ended, with little in the way of specifics or prioritization. They recommend that if this is planned to be an ongoing level-of-effort project, it should be so stated. The reviewers also say that the efforts to initiate the definition of a standard for the automotive industry are very appealing and well received, but question how the distribution within the industry will work and state that it needs to be part of the plan.

Question 6: How sufficient are the resources for the project to achieve the stated milestones in a timely fashion?
While one reviewer says the task is sufficiently resourced other reviewers raise concerns. Two reviewers fees that budget/resources were not addressed and no clear budget-related problems identified. Other reviewers note that this appears to be a project driven by budget rather than scope and ask if GM will continue with their side of the project.

Another reviewer recommends that the annual maintenance cost of this project needs to be assessed. They say it was verbally mentioned at $1.2 million annually. They also point out that modeling needs will continue to be enhanced, such as tying into infrastructure, modeling emissions, etc.

Overview of Friction and Wear Reduction for Heavy Vehicles: George Fenske (Argonne National Laboratory)



Reviewer Sample Size

This project had a total of 3 reviewers.

Question 1: Does this project support the overall DOE objective of petroleum displacement? Why or why not?

A reviewer said that the project directly supports the overall DOE objective of petroleum displacement by investigation the effects of friction and wear for heavy vehicles and their effect on energy use. By gathering test and modeling data on Safety, Durability, Reliability, of heavy vehicles the project promotes energy efficiency and more responsible use of petroleum.

Another reviewer points out that a lot of work has been done in this field, so the gains are likely to be incremental.

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?

Reviewers feel the project takes a comprehensive approach including experimental and theoretical (and modeling with simulation) to reduce friction and wear in heavy vehicle systems is effectively working to reduce our dependence on petroleum. They also feel that the experimental and modeling approach is effective.

Another reviewer thought that there was a very strong scientific approach that carries through a collection of projects with a related theme. The use of the APS to measure residual stresses versus depth was impressive. A reviewer also complements the project for an excellent approach to defining a bench-top test rig to validate the analytical approach.

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

One reviewer believes that there was some very encouraging progress made in hard coatings. Another reviewer said that there was good progress made in defining the characteristics of the problem and in defining an approach for how to tackle the investigation.

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

The reviewers complemented the project for working with key players in the modeling and simulations arena, namely Ricardo and for using a university partner. They also note that the breadth and coordination with the partners appears well coordinated.

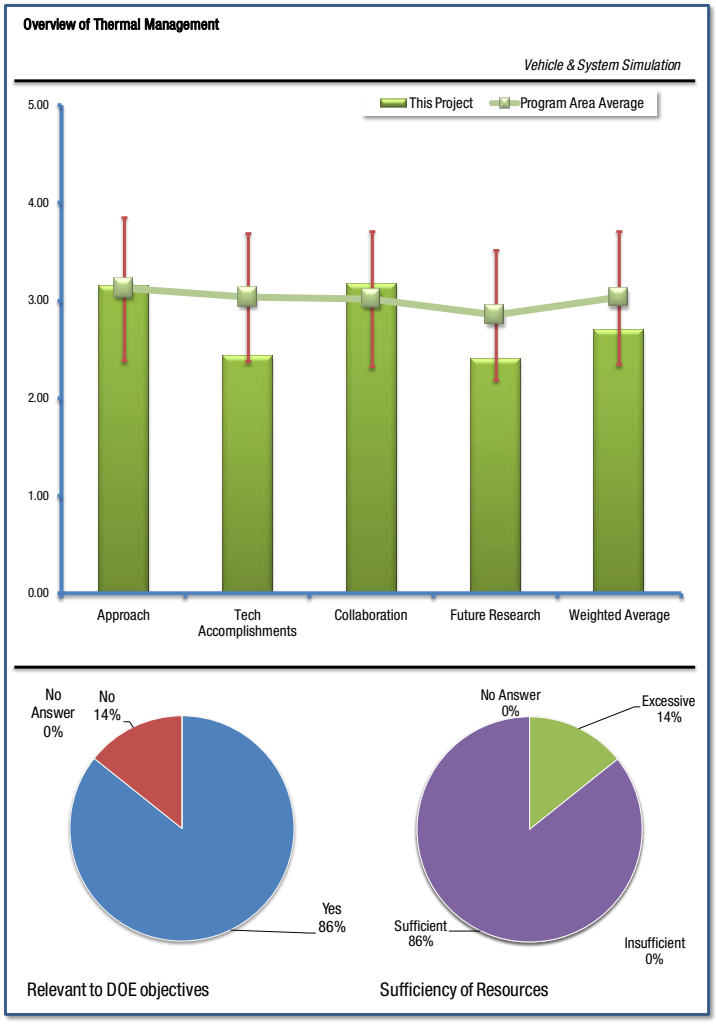
Question 5: Has the project effectively planned its future work in a logical manner by incorporating appropriate decision points, considering barriers to the realization of the proposed technology, and, when sensible, mitigating risk by providing alternate development pathways?

The only comment provided for this question was a reviewer wanting to understand what other organizations are investigating friction reduction in the engine and how their activities could be coordinated.

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

The reviewers said that the budget resources appear adequate to perform the work and achieve the project milestones. One reviewer felt that the cost to benefit ratio seems to be a bit out of balance unless the benefits of the technology could be better calculated.

Overview of Thermal Management: Jules Routbort (Argonne National Laboratory)



Reviewer Sample Size

This project had a total of 7 reviewers.

Question 1: Does this project support the overall DOE objective of petroleum displacement? Why or why not?

The reviewers felt that the program's three principal investigations all contribute to advancing the DOE objective of petroleum displacement. They noted that the results of this work, in the long term, may result in more effective heat transfer through automotive radiators, leading to smaller radiators (reduce fuel consumption in heavy duty trucks by 2.5% via downsizing and reshaping of the radiator and reduced pumping losses) and consequent drag reductions in vehicles, thus reduced fuel usage. One reviewer stated that nanofluids are potentially attractive in other areas such as industrial applications.

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?

Reviewers like the experimental and analytical approaches to the nanofluids project and believe it is sound, logical, straightforward and uses up-to-date methods. A reviewer points out that the project objective mentions "nanotubes or other cooling schemes" but nothing further is said about "other cooling schemes" in the body of the presentation. They also mention that the suite of projects has been ongoing since at least FY06 and they are surprised to see that the critical barriers are only now being quantified in FY08. Further, the suite of five projects has the same identical list of barriers. There is also insufficient information regarding the details of the barriers and approaches in regards to the individual projects as presented.

One reviewer says that ANL's approach to nanofluids is very well structured and logical, with a balanced and coordinated theoretical and empirical effort well underway. They also point out that ANL is conducting work for others (TARDEC and Michelin) in this area and is also receiving cost share funding from commercial entities (Saint Gobain and Michelin) indicating strong industrial interest in this technology.

One thing that the reviewers pointed out was that one area that could be improved is a harder, more transparent presentation of specific project go-no-go milestones and potential show stoppers from research through end-use applications. This is discussed but not in significant detail.

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

One reviewer said that this project faces problems in fluid mechanics, small particle interactions, and surface chemistry that may pose fundamental barriers to meeting the objectives. Thus there is a large portion of basic research to address. Considering the fundamental issues and a 40% level of accomplishment, the project appears at risk of not

meeting its objectives. Another reviewer pointed out that the sub-projects seem to be well under way, except the erosion test which is coming on line, a different reviewer said that technical accomplishments have been solid over the last year or two with progress being achieved in a number of fronts. One reviewer could not tell specifically which accomplishments and progress pertained to which of the five projects, especially in the context of the history, scope, funding and duration.

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

The reviewers point out that the project has enlisted a very good list of collaborators and has shown strong collaboration. Another reviewer could not tell which set of collaborations went with which project, while a different reviewer said that ANL's work with others for TARDEC and co-funding from the DOE industrial technologies program indicate a strong effort to coordinate and leverage industry expertise. They feel that the funding should continue to be aggressively pursued.

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?

A reviewer points out that improving the air-side heat transfer coefficient of a radiator is the hardest problem because features that increase the coefficient also tend to increase pressure drop and impede heat transfer. Another reviewer says that the systematic characterization is a part of important fundamental research.

A reviewer could not tell which future research went with which project. Further, they point out that a bulletized list of nouns and adjectives with no verbs and timing does little to inform anyone about what the plans really are.

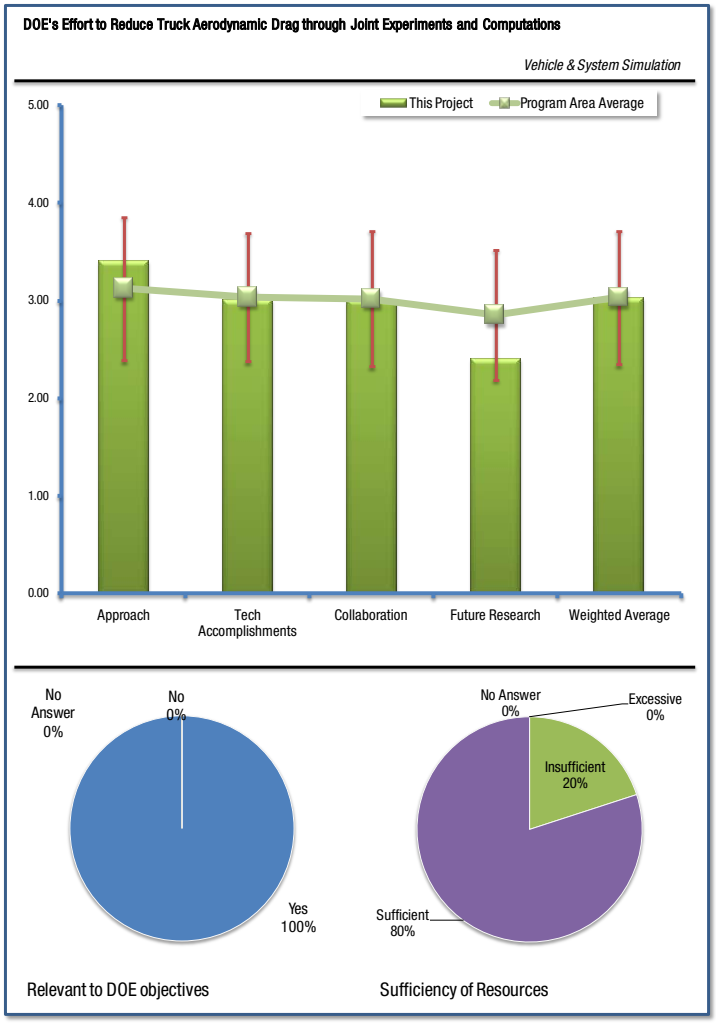
One reviewer said the proposed future research is logical and follows from technical achievements thus far and continues to say that it may already be well understood, but it would be beneficial to have a very clear understanding of potential commercial barriers to widespread application of nanofluids- most especially cost requirements. They think this may help narrow down future research areas.

One critical reviewer points out that if you look at the overall thermal system of the vehicle, it would be nice to have a smaller radiator through the use of a new fluid, but there are overall issues that are driving a vehicle to actually need to have larger cooling systems. They also point out that using the picture of a flat square hooded PACCAR truck compared to a streamlined NAVISTAR truck was biased.

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

The reviewers said that there was not enough information available and that it was unclear as presented, no clear budget-related problems seem to have been identified. Another reviewer thought that the list of milestones were really a list of activities, rather than a list of specific accomplishments with a specific completion date.

DOE's Effort to Reduce Truck Aerodynamic Drag through Joint Experiments and Computations: Kambiz Salari (Lawrence Livermore National Laboratory)



Reviewer Sample Size

This project had a total of 5 reviewers.

Question 1: Does this project support the overall DOE objective of petroleum displacement? Why or why not?

The reviewers point out that reduction of aerodynamic drag in heavy vehicles is clearly an enabler for fuel economy improvement in trucks and is capable of relatively near term results.

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 feasibility of the approach is limited by the availability of the Ames facility. In light of this, the project is well designed to test multiple vehicle configurations in a limited amount of test time. One reviewer wonders how the project is planning to encourage industry to apply validated improvement ideas.

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

One reviewer notes that there is still no market penetration. Another reviewer states that this investigation has been going on for a number of years and it is difficult to tell what the recent progress has been. One reviewer mentions the practical aspects of getting trailer manufacturers to incorporate changes into their trailers needs to be considered.

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

The reviewers point out that there is good collaboration with OEMs and end-users, but need to bring in trailer manufacturers as they will be the ones to incorporate many of the aero changes that need to take place. One reviewer says there should have a fleet in the project team. They also want to know how the results will be integrated into the EPA SmartWay program.

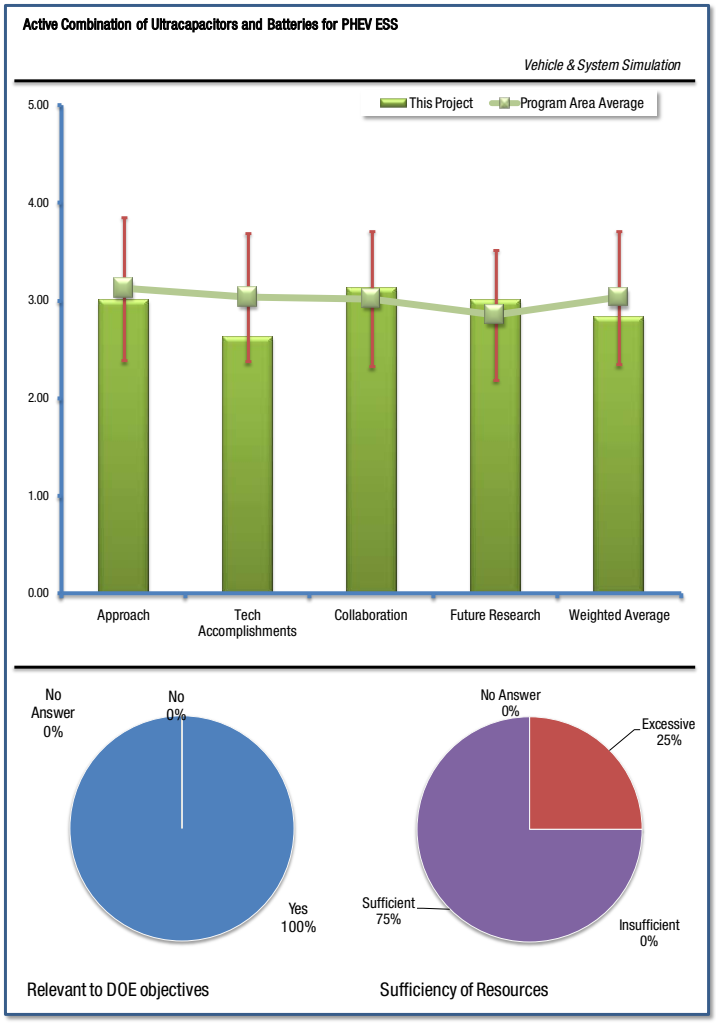
Question 5: Has the project effectively planned its future work in a logical manner by incorporating appropriate decision points, considering barriers to the realization of the proposed technology, and, when sensible, mitigating risk by providing alternate development pathways?

The reviewers say it is not clear what will happen after the Ames wind tunnel test is completed and that the project should also consider mass and cost added by devices. The reviewers also say there is a need to determine how aero devices will be better accepted by the trailer manufacturers and end users. A reviewer wants to know what publication plans for benefits have been addressed and if results will be drive cycle based.

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

One reviewer gave the comment that greater funding is needed to help educate the end-user and prepare them for new technologies entering the market.

Active Combination of Ultracapacitors and Batteries for PHEV ESS: Ted Bohn (Argonne National Laboratory)



Reviewer Sample Size

This project had a total of 8 reviewers.

Question 1: Does this project support the overall DOE objective of petroleum displacement? Why or why not?

One reviewer felt that in general, the project does support the overall DOE objective of petroleum displacement. They also mention that to really address the overall DOE objective it would be helpful if the project include a more comprehensive cost analysis with the systems analysis program. Another reviewer comment was that the PI stated with a limited budget ($800K for FY 2009) cost was not assessed and they felt that that amount seems like a reasonable budget to include cost assessment analysis. With this assessment the project would be more effective toward meeting DOE goals in FreedomCAR and therefore better support the overall goal of petroleum displacement by assessing cost. Another reviewer points out that advanced energy storage is an enabling technology for advanced vehicles aimed at petroleum displacement.

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?

A reviewer said that, as stated above, the technical systems approach appears fine but should include not only the energy/power assessment but a cost assessment to be a more effective approach. Another reviewer said that the project has a well-planned approach covering most or all of the main bases.

One reviewer commented in detail that the key to this project is cost reduction compared to a battery-only energy storage system. They also point out that no cost study results have been presented yet, but rather are the penultimate task. They feel the cost study should have been done as the first task to determine whether any of this work has merit. Given the high cost of ultracapacitors and the expected higher cost due to the more complex control system demands, it is difficult to see how this approach can overcome the key barrier of cost, which is the only one not resolvable with a battery-only energy storage system. They also say that this task does not fit well under Vehicle Systems, but rather, if it is to be done at all should be performed under the auspices of the Energy Storage Technical Team that has the capabilities, resources and expertise to monitor and perform this work. The reviewer also points out that this concept has been previously investigated by the Energy Storage Technical Team and judged to be not viable.

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

One reviewer felt that the team has done a nice job of investigating (experimentally and theoretically) SOC- state of charge controls and regulations, and best practice in ultracap -battery systems. A different reviewer feels that there has been impressive progress to date, and some questions about long-term performance will presumably be answered in the next stage of the work.

Another reviewer points out that the presenter stated the project is 80% complete, yet the 24-month cycling of the three lithium-ion battery packs is only in its first quarter, and no cost trade study has yet been presented which is the key to whether this project should proceed. A second reviewer brings up a similar point that the project still needs to show cost can be the same as an oversized battery when DC/DC, caps, controller are added (system complexity).

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

The reviewers point out that quite a few industrial and lab collaborators and that ultracap studies support other DOE programs. One reviewer would like to see this work coordinated with and reviewed by Electrochemical Energy Storage Tech Team and USABC.

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?

A reviewer feels that the proposed future work appears fine. This work will leverage interest from OEM's, DOE EE-Tech Team & ES-Tech Team. A different reviewer also mentions that it seems that most of the remaining problems will be addressed, except possibly the questions of overall cost.

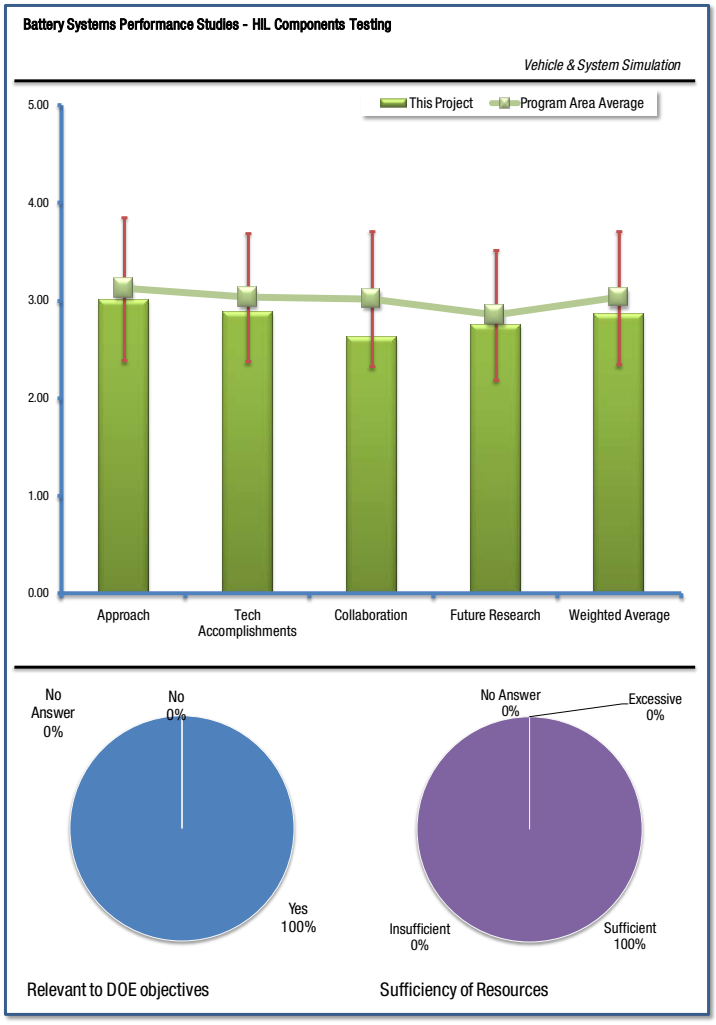
Furthermore a reviewer points out that the energy storage performance studies are a duplicate of efforts being performed by the Electrochemical Energy Storage Technical team members who have vastly more experience and resources. Some of the studies on battery and/or ultracapacitor performance and system trade-off have already been performed by the ECES team.

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

One reviewer wonders if the funds are used as effectively as possible, despite the project team feeling the resources are not sufficient for the work. It would be better judged with a breakdown of the budget. Immediate results -better results, less cost with cost analysis of the packages includes. etc.

Reviewers feel the system cost study is key to the efficacy to this project. One also mentions that it is a relatively inexpensive scoping study could and should be done and results presented before this project proceeds. A reviewer also says the FY-2009 budget of $800k appears excessive for the identified scope.

Battery Systems Performance Studies - HIL Components Testing: Neeraj Shidore (Argonne National Laboratory)



Reviewer Sample Size

This project had a total of 8 reviewers.

Question 1: Does this project support the overall DOE objective of petroleum displacement? Why or why not?

The reviewers point out that this work addresses important issues for battery life and cost in PHEVs and helps to define how battery system performance affects fuel economy. One reviewer says that if optimized strategies identified are valid once other system level factors are introduced then this will improve cost effectiveness of PHEVs.

One reviewer would like to have this extended to more a national level, that says, if this is the typical drive cycle that we will see in the US on PHEVs, there is a portfolio of PHEVs that would need to be used to cover these driving cycles, and extend that to a National Portfolio of PHEVs with a petroleum displacement at a National level.

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?

One reviewer points out that the approach is good, but it is limited to Saft lithium batteries only and feels the study should be generalized to include other types of batteries.

A reviewer also says that there is a very good combination of HIL battery testing with vehicle models to show cycle life and possible cost impacts. A different review felt that the single factor analysis implies no interaction with other system level factors and that results may not be valid. The reviewer looks forward to future work which will address this. They also made the point that a warm engine was assumed in the fuel consumption numbers.

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

The reviewers point out that since the study is narrowly focused on Saft batteries, it is of limited use in planning and developing PHEV vehicles. However other reviewers feel that there is very good progress on tasks with demonstrated results and publications.

A different reviewer thinks this could be extended to trade-off of costs, full life cycle costs, use of types of metals in batteries (where do they come from) vs. petroleum displacement and of course, emission trade-offs.

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

The limited comments from reviewers point out that this appears to be a predominantly in-house study and they would like to see another data set besides Johnson Controls- SAFT.

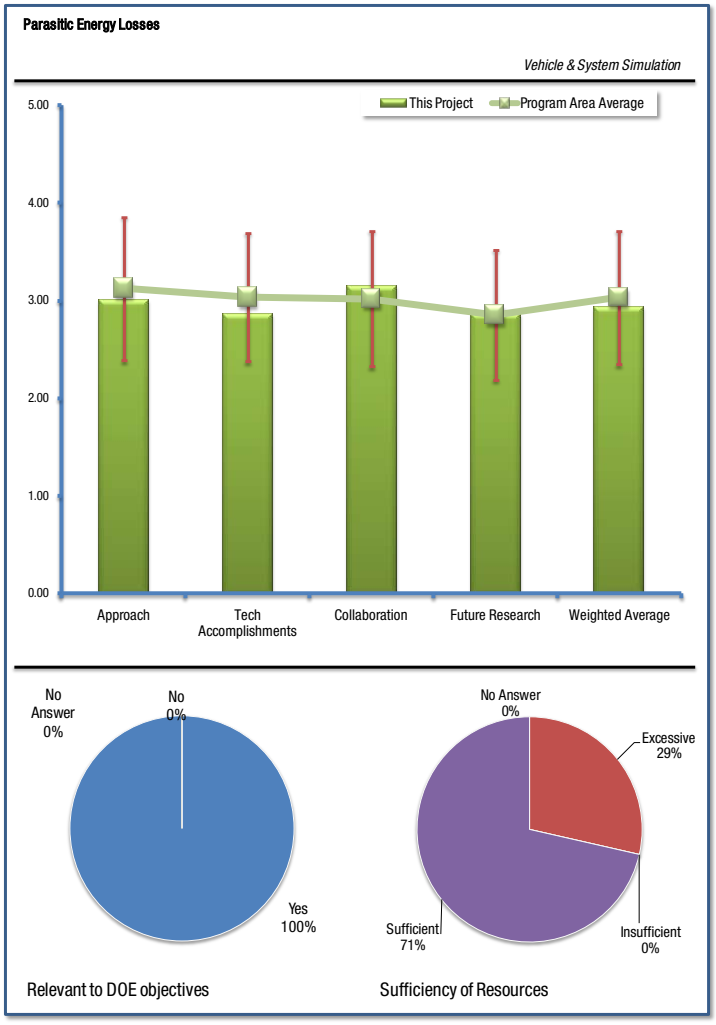
Question 5: Has the project effectively planned its future work in a logical manner by incorporating appropriate decision points, considering barriers to the realization of the proposed technology, and, when sensible, mitigating risk by providing alternate development pathways?

One reviewer feels that there is good definition of next steps of the analysis. But another reviewer would like to see thoughts extended on this study. They ask what assumptions have really been made for battery replacement for the 15 year assumed life of the vehicle.

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

The reviewers feel the funding is adequate for the expected benefits of this study.

Parasitic Energy Losses: George Fenske (Argonne National Laboratory)



Reviewer Sample Size

This project had a total of 7 reviewers.

Question 1: Does this project support the overall DOE objective of petroleum displacement? Why or why not?

The reviewers agree that reduction in friction losses clearly could improve fuel economy and lead to petroleum displacement. One reviewer points out that limited but important potential for fuel consumption reduction. They point out that the project needs to demonstrate that the results of this project will be adopted in the market to actually achieve reductions.

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?

A reviewer points out that the approach is good, if somewhat pedestrian and incremental, there are no clear indications of promise of breakthrough in any of the areas. Nevertheless they feel the work is necessary. One reviewer points out that in Slide #3 of the presentation is an Energy Map, but some of the units are in horsepower. It is incorrect to mix energy and power on the same flow chart. Yet another reviewer says that this is a good approach to making some difficult measurements that relate to practical engine systems. Two reviewers have also pointed out that this project appears to be redundant with vss_12, Friction and Wear Reduction for Heavy Vehicles.

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

Reviewers feel that good progress was made in benchtop testing. One reviewer elaborates that things are moving along at a measured pace, as they have for years. And maybe that is the best one can expect in this complex field.

A different reviewer says a number of accomplishments were cited, but no cumulative measure of reduction in friction losses was presented. They would like to be provided the net cumulative impact of friction loss reduction that has been actually realized by this project, not only the hypothetical potentials. Also, they would like the project to quantify and provide the potential fuel savings for each of the research areas.

One reviewer commented that there have been very little, if any, recent publications on results in the literature and would like to know why.

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

Reviewers point out that there are a number of good partnerships that were identified and they seem to be reasonable. Further, some of these include cost share.

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?

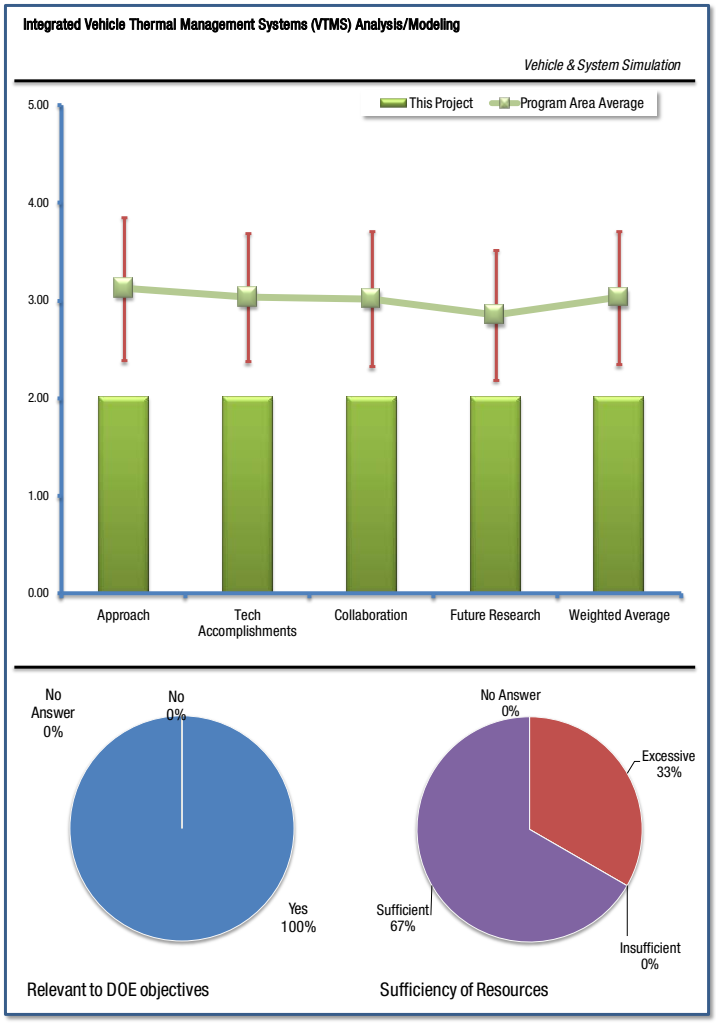
Reviewers point out that the path forward seems reasonable, while it is more of the same but that is probably OK.

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

Reviewers say it is unclear if budgetary issues limit any of the work. They see a steady need to continue to research and develop new coatings and additives that may lead to reduction in friction losses. Some reviewers feel the funding seems reasonable relative to all the other projects funded by the overall DOE program.

However a few reviewers feel this is very high funding for the relative output of data and publications, and wonder if partners that stand to benefit could share more of the cost. They also point out that this funding, along with the Friction and Wear Reduction for Heavy Vehicles, appears to be excessive for the relative benefits that could result.

Integrated Vehicle Thermal Management Systems (VTMS) Analysis/Modeling: Matthew Thornton (National Renewable Energy Laboratory) - POSTER



Reviewer Sample Size

This project had a total of 3 reviewers.

Question 1: Does this project support the overall DOE objective of petroleum displacement? Why or why not?

Reviewers feel that this is an important research area that investigates current technologies for improved vehicle thermal management, waste heat utilization, and integrated cooling. They say that any improvements in energy efficiency may lead to petroleum reduction, but may have rather limited potential.

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?

A reviewer gave insight that the project started in FY07, yet one of the FY08 goals is to identify potential areas for research related to waste heat utilization and that this looks like funding looking for scope. They elaborate that the project looks like it is duplicating many existing capabilities elsewhere including the OEMs, universities and National Labs. They say the DOE resources should not be utilized to duplicate existing capabilities such as developing thermal modeling capabilities and performing run-of-the-mill thermal analysis scenarios. A reviewer also says the specified barrier is about a commercially viable integrated vehicle thermal management system, yet the approach and scope of this work does not address the commercial viability (i.e., cost) anywhere. The reviewer is not even sure if the stated barrier truly is a barrier.

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

A reviewer says that the presented technical accomplishments mostly look like restatements of well know or easily obtainable component and system performance and operating conditions. They continue to say that there is really nothing new here that couldn't be done by the OEMs if it interested them and they saw value in it.

A different reviewer says these are limited results of limited value. They also say that the heat exchanger for power electronics and ac condenser was integrated in the 2004 Prius. The 2010 Prius has engine exhaust heat recovery into the coolant. This work is being done at the vehicle systems level by OEMs. They also say that most previous reviewer comments have not been addressed.

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

One reviewer says that the partnerships are with other National Labs rather than industrial customers or OEMs which leads them to believe there is not much outside interest in this work.

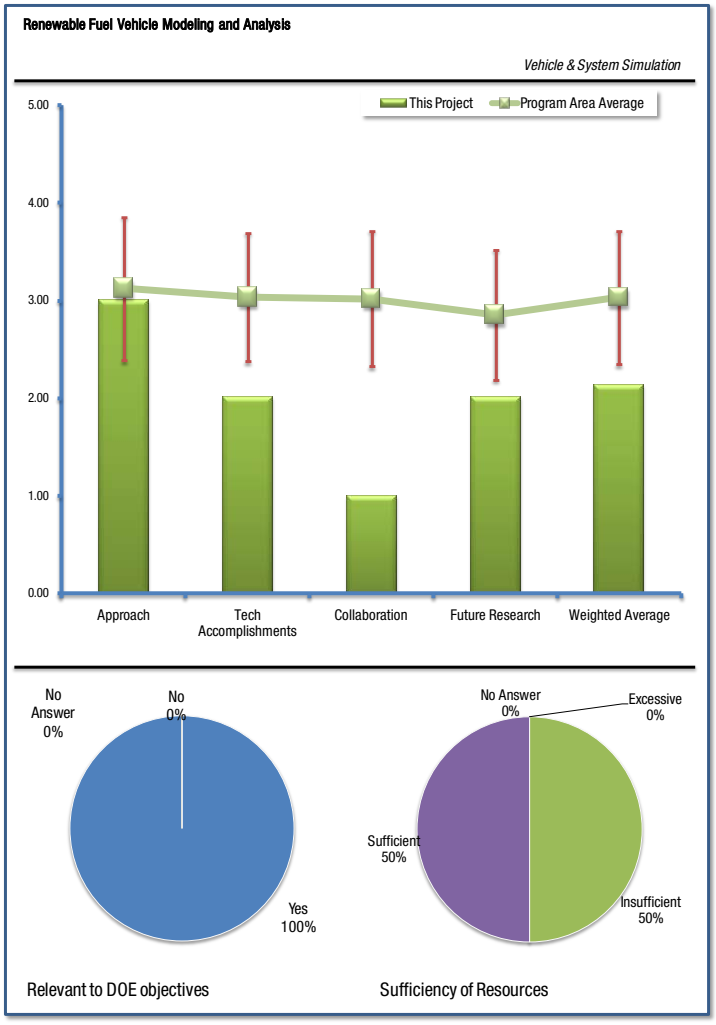
Question 5: Has the project effectively planned its future work in a logical manner by incorporating appropriate decision points, considering barriers to the realization of the proposed technology, and, when sensible, mitigating risk by providing alternate development pathways?

One reviewer feels that this is an important area, transfer and costs should be considered. A different reviewer says that there is not much of anything new or anything that couldn't be done by the OEMs if they cared about it.

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

One reviewer is disturbed that this appears to be 100% DOE funded. A different reviewer didn't see a lot of value in this project and at a minimum, it should be combined with the NREL CoolCab Truck Thermal Load Reduction project.

Renewable Fuel Vehicle Modeling and Analysis: Aaron Brooker (National Renewable Energy Laboratory) - POSTER



Reviewer Sample Size
This project had a total of 2 reviewers.

Question 1: Does this project support the overall DOE objective of petroleum displacement? Why or why not?
The reviewer says this is very important research area for the future. No other comments were made.

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?
One reviewer says that the projects long term perspective is analyzed and is a very good approach. Without looking at optimization of systems involving renewable fuels the analysis is missing major opportunities.

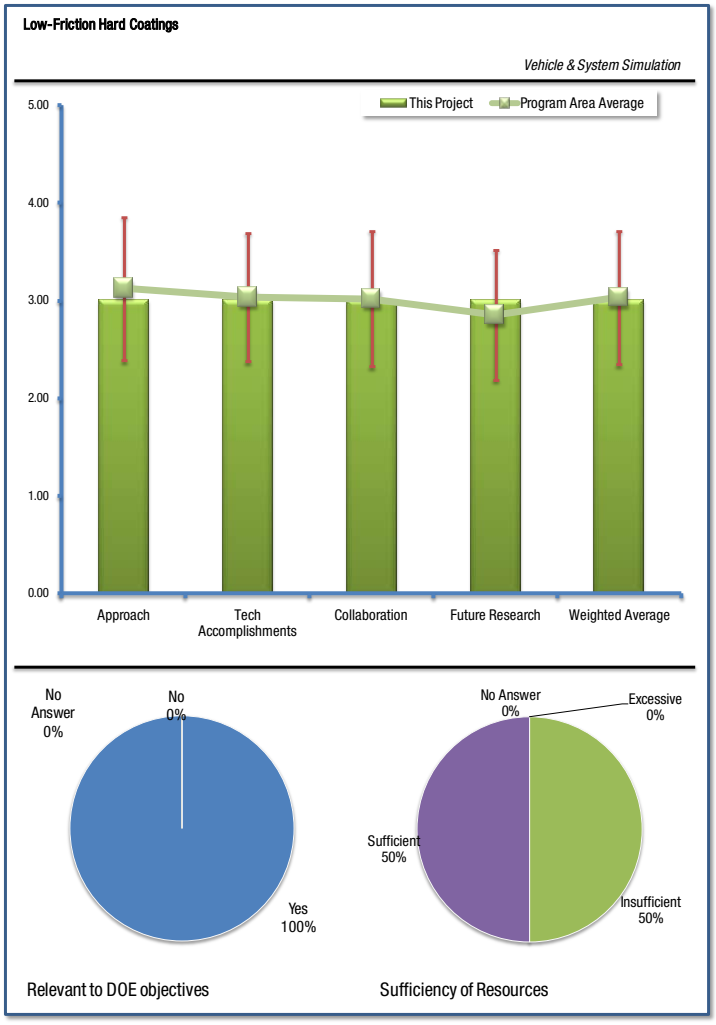
Question 3: Characterize your understanding of the technical accomplishments and progress toward overall project and DOE goals.
One reviewer says that HEVs could provide a large reduction in oil use with little additional cost. They also say that the major challenge to address is the cost analysis and the need for lower cost ethanol or increasing efficiency. No other reviewers made comments.

Question 4: What is your assessment of the level of collaboration and coordination with other institutions?
One reviewer points out that the industry could also be involved and allow for market entry factors to be analyzed. A different reviewer asks if there is even any collaboration at all.

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?
None of the reviewers provided comments back to this question.

Question 6: How sufficient are the resources for the project to achieve the stated milestones in a timely fashion?
None of the reviewers provided comments to this question.

Low-Friction Hard Coatings: Ali Erdemir (Argonne National Laboratory) - POSTER



Reviewer Sample Size

This project had a total of 2 reviewers.

Question 1: Does this project support the overall DOE objective of petroleum displacement? Why or why not?

One reviewer points out that the component and system performance is too low. Another reviewer says the improved surfaced coatings may be used on components to extend life and reduce friction which leads to petroleum displacement.

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?

One reviewer notes that the approach to the work is very encompassing and includes look at component and system performance, safety, durability, and reliability, vehicular operational demands. They also say that the approach for the target problem is fine but might be improved by including future mechanical and wear testing....and more experiments at APS to look a residual behavior.

A different reviewer says that the approach looks sound and reasonable and is comprised of a series of logical steps with go/no-go decision points and has led to the bench top demonstration of a new capability. They feel this could be further strengthened if the specific criteria for continuing or stopping at each of the decision points were specifically stated.

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

One reviewer says the effort is commendable but will rely heavily on the partnerships beyond ANL to be truly successful. Another reviewer feels the project shows promise for success.

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

One reviewer says that to truly achieve demonstration, commercialization and scale up, it may behoove the team to include more collaborators in the commercial sector to truly go into production mode. A different reviewer says the collaborators are appropriate for this work and are involved in the key steps leading to commercialization of a product.

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?

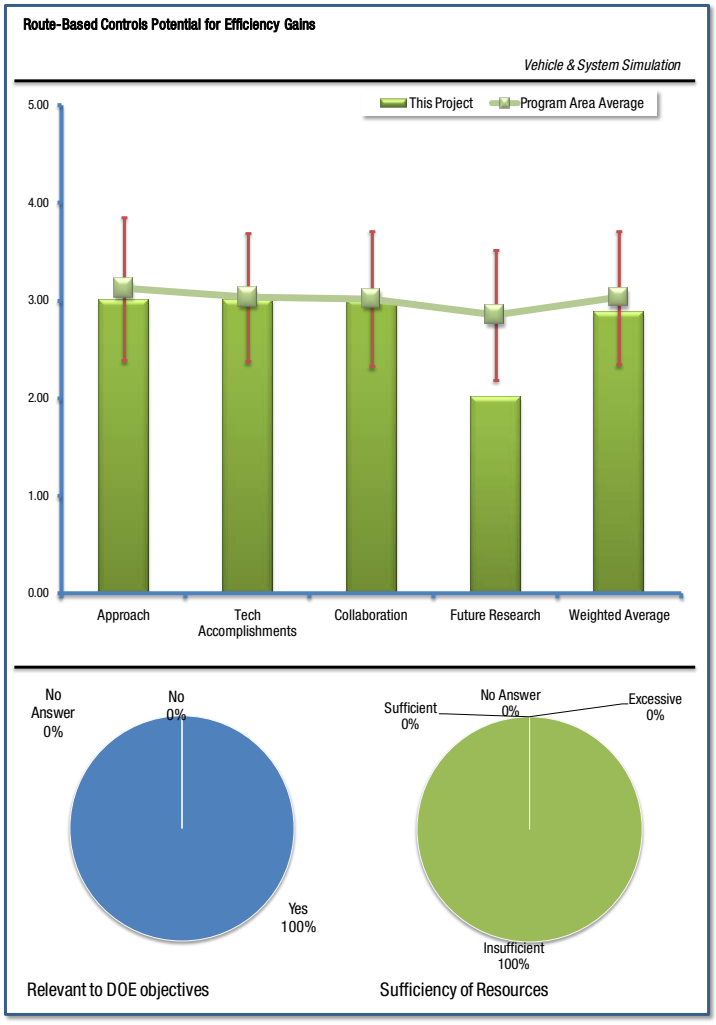
A reviewer feels that to truly achieve the future work as outlined, the ANL team will need to increase collaboration with industrial partners, demonstrate more effective cost-competitiveness and benefits and include partners who can

take production full scale quickly and economically. Another reviewer says the proposed future work looks like a logical conclusion to this project.

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

One reviewer feels that the budget appears sufficient for the characterization but not demonstration, commercialization and scale up --if truly achieved. A second reviewer says that no funding issues were identified.

Route-Based Controls Potential for Efficiency Gains: Jeffrey Gonder (National Renewable Energy Laboratory) - POSTER



Reviewer Sample Size
This project had a total of 1 reviewer.

Question 1: Does this project support the overall DOE objective of petroleum displacement? Why or why not?
The single reviewer felt that relatively free fuel consumption reduction is something that must be explored.

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 single reviewer would like to know if z-dimension map data was included. They felt it wasn't clear from the presentation materials.

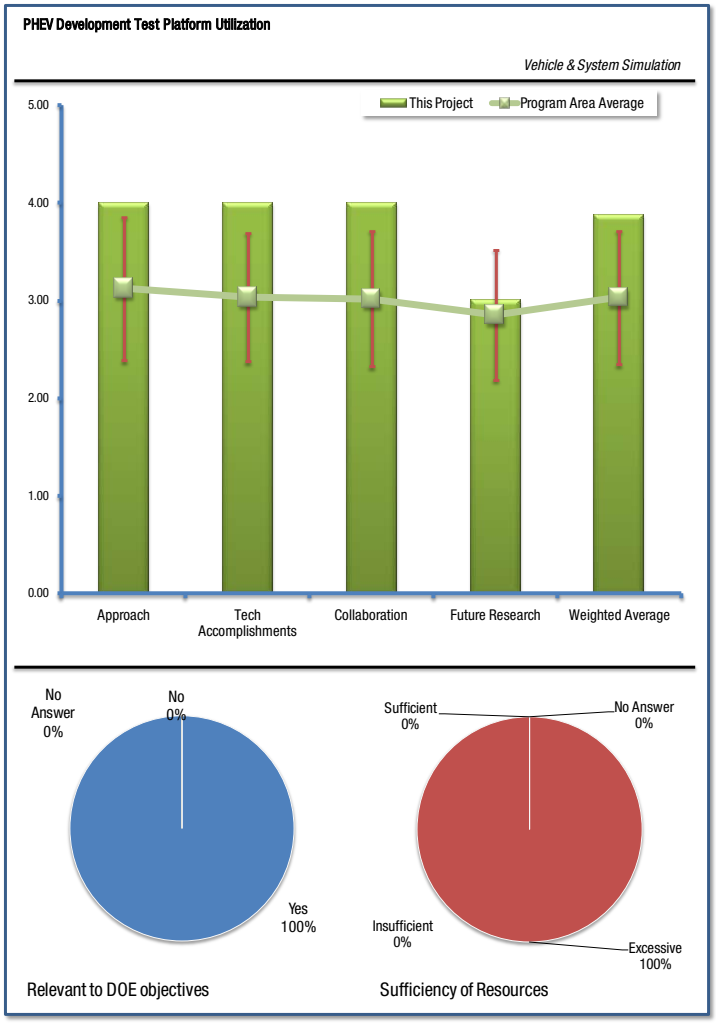
Question 3: Characterize your understanding of the technical accomplishments and progress toward overall project and DOE goals.
There was only one reviewer for this presentation and they did not comment on this question.

Question 4: What is your assessment of the level of collaboration and coordination with other institutions?
There was only one reviewer for this presentation and they did not comment on this question.

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 reviewer feels that true benefits are likely to be seen from combining green routing with other ITS, active safety, and smart pedals.

Question 6: How sufficient are the resources for the project to achieve the stated milestones in a timely fashion?
The reviewer feels the funding is insufficient and that much greater focus in this area is warranted.

PHEV Development Test Platform Utilization: Henning Lohse-Busch (Argonne National Laboratory) - POSTER



Reviewer Sample Size

This project had a total of 1 reviewer.

Question 1: Does this project support the overall DOE objective of petroleum displacement? Why or why not?

The single reviewer thought that the evaluation of EV, HEV and PHEV systems in the context of the total vehicle is key to understanding the performance of each systems and its interactions with other systems. They feel that this will contribute to the development of EVs, HEVs and PHEVs which will lead to petroleum displacement

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 single reviewer felt that the approach looks reasonable and has led to the development of the new system evaluation capability provided by the Modular Automotive Technology Testbed and its use in evaluating system impacts and interactions as demonstrated in the collaborations with the SAE J1711 test standards committee.

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

The sole reviewer said that the accomplishments look noteworthy and have led to the development of the new system evaluation capability provided by MATT and its use in evaluating system impacts and various scenarios that could not easily be done in a production or prototype vehicle. They also think the timely collaborations with the SAE J1711 test standards committee are also noteworthy.

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

The reviewer also felt that it appears this new capability has aided the SAE J1711 committee in the formulation of new PHEV test standards.

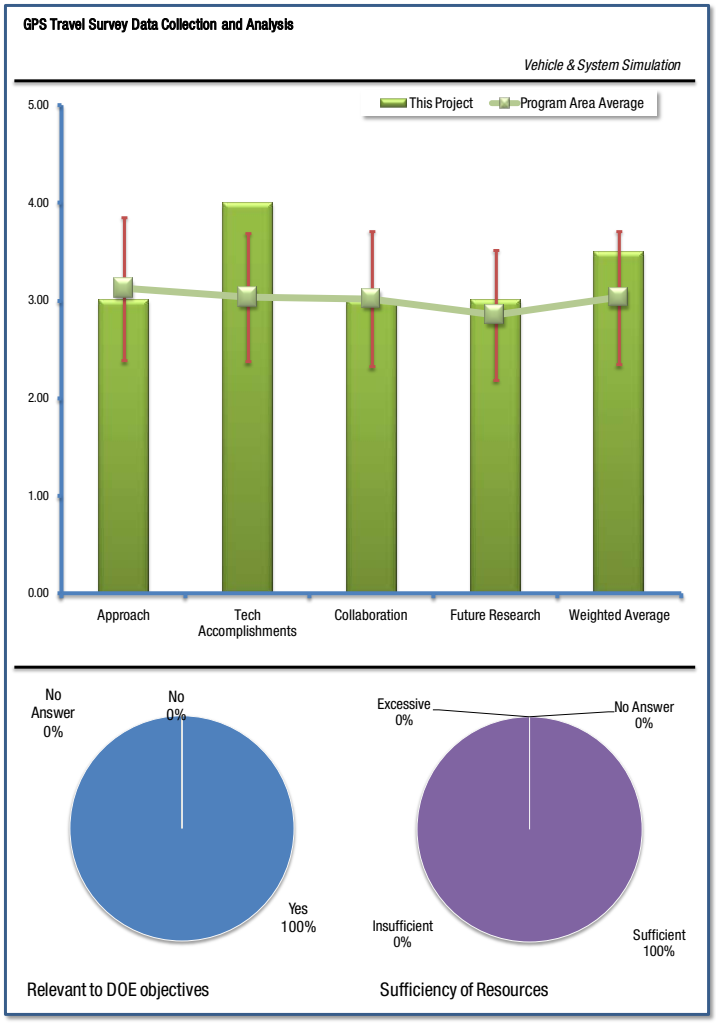
Question 5: Has the project effectively planned its future work in a logical manner by incorporating appropriate decision points, considering barriers to the realization of the proposed technology, and, when sensible, mitigating risk by providing alternate development pathways?

The reviewer said the proposed future work seems like a reasonable utilization of this new capability.

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

The single reviewer feels the resources are excessive given that the new capability has now been established and that an $800K budget for the proposed scope of work seems excessive.

GPS Travel Survey Data Collection and Analysis: Tony Markel (National Renewable Energy Laboratory) - POSTER



Reviewer Sample Size
This project had a total of 1 reviewer.

Question 1: Does this project support the overall DOE objective of petroleum displacement? Why or why not?
The reviewer thought that collection of car usage profile data is useful in overall infrastructure and vehicle design, especially PHEVs, and that it will eventually lead to some fuel savings and substitution of PHEVs for gasoline driven autos.

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 reviewer says that there are no real barriers, project is quite straight forward. They recommend that it might be a good idea to integrate it with the two projects presented from ANL, 03 and 04.

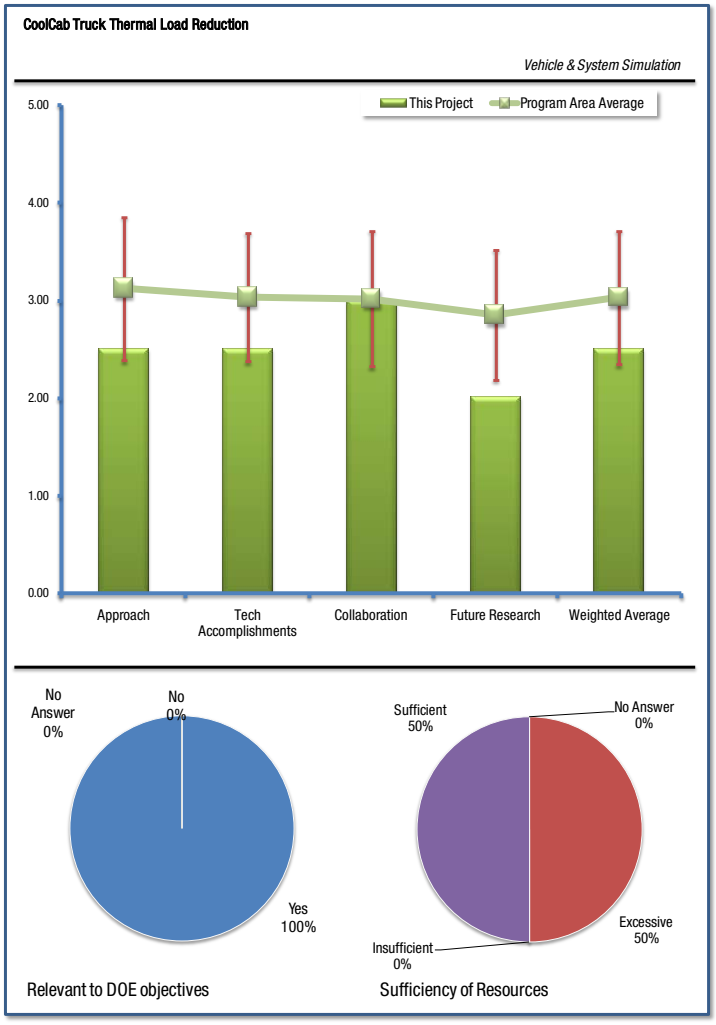
Question 3: Characterize your understanding of the technical accomplishments and progress toward overall project and DOE goals.
The reviewer noted that the project was a one-year project and has been completed.

Question 4: What is your assessment of the level of collaboration and coordination with other institutions?
The single reviewer said that there was some collaboration reported with GM, MPOs, Battelle and FHWA. They also mentioned again that it might have been useful to include the two ANL projects in the list of 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 reviewer says that since the project is finished the planned future work is only a suggestion. As such it seems very good. They wonder if any more data of this nature is needed, when should the project stop.

Question 6: How sufficient are the resources for the project to achieve the stated milestones in a timely fashion?
The single reviewer noted that the project generated a large amount of data on a small budget.

CoolCab Truck Thermal Load Reduction: Ken Proc (National Renewable Energy Laboratory) - POSTER



Reviewer Sample Size
This project had a total of 2 reviewers.

Question 1: Does this project support the overall DOE objective of petroleum displacement? Why or why not?
One reviewer felt that a reduction in truck cabin heat loads during idle will reduce the use of air conditioning and result in a reduction in petroleum consumption.

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?
One reviewer felt that the approach is quite good, but not clearly stated in the presentation. The other reviewer said that this work seems like it could have been done with existing thermal analysis tools by the OEM or a paid consultant. This reviewer does not see the need for a National Lab to develop new tools when adequate existing tools are available.

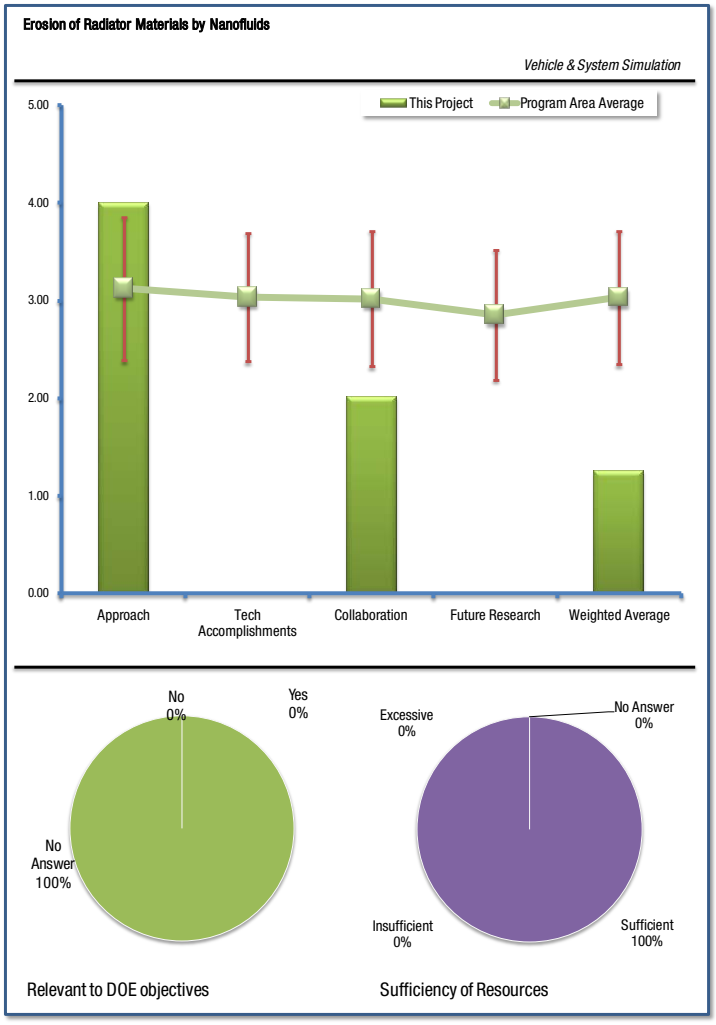
Question 3: Characterize your understanding of the technical accomplishments and progress toward overall project and DOE goals.
One reviewer said that the development of simple to use analysis tools for HVAC load will help the OEMs to make improvements. A different reviewer said the results are interesting, but have no real surprises and could have been obtained elsewhere.

Question 4: What is your assessment of the level of collaboration and coordination with other institutions?
One of the reviewers said the collaborating organizations seem appropriate.

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 that the results should be generically applicable to future cab designs and they don't see a need to repeat or further refine this work.

Question 6: How sufficient are the resources for the project to achieve the stated milestones in a timely fashion?
A reviewer pointed out that the scope is largely completed and they did not see a need for any further work by a National Lab. They felt that, at a minimum, this project should be combined with the NREL Integrated Vehicle Thermal Management System Analysis/Modeling project.

Erosion of Radiator Materials by Nanofluids: Dileep Singh (Argonne National Laboratory) - POSTER



Reviewer Sample Size

This project had a total of 1 reviewer.

Question 1: Does this project support the overall DOE objective of petroleum displacement? Why or why not?

The single reviewer said that the project effectively supports the DOE objective of petroleum displacement by investigating the effects of nanofluids for thermal management in heavy vehicles that are not established. Furthermore they feel the work investigates comprehensive questions to understand improve energy efficiency using nanofluids 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 reviewer feels that the approach is sound and takes an excellent detailed look at effect of nanofluids in various aspects of the systems. They note that the experimental approach uses SAXS and other very advanced characterization tools, complemented with strong modeling analysis.

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

The reviewer said that the accomplishments are underway and consistent with the project approach and that SAX characterization measurements are impressive. They also feel that the team is measuring the erosion of radiator material using SiC EG/H_2O based nanofluids and looking at velocity and impact angle as well as particle loading. They continue to elaborate by saying that this surely will be important for understanding the effect of nanofluids and continue on the path to understand/find any showstoppers for use of them in heavy vehicle systems.

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

The reviewer noted that the partners include TARDEC/WFO and Michelin WFO/cost-share, but say that the partnership and collaboration could be expanded.

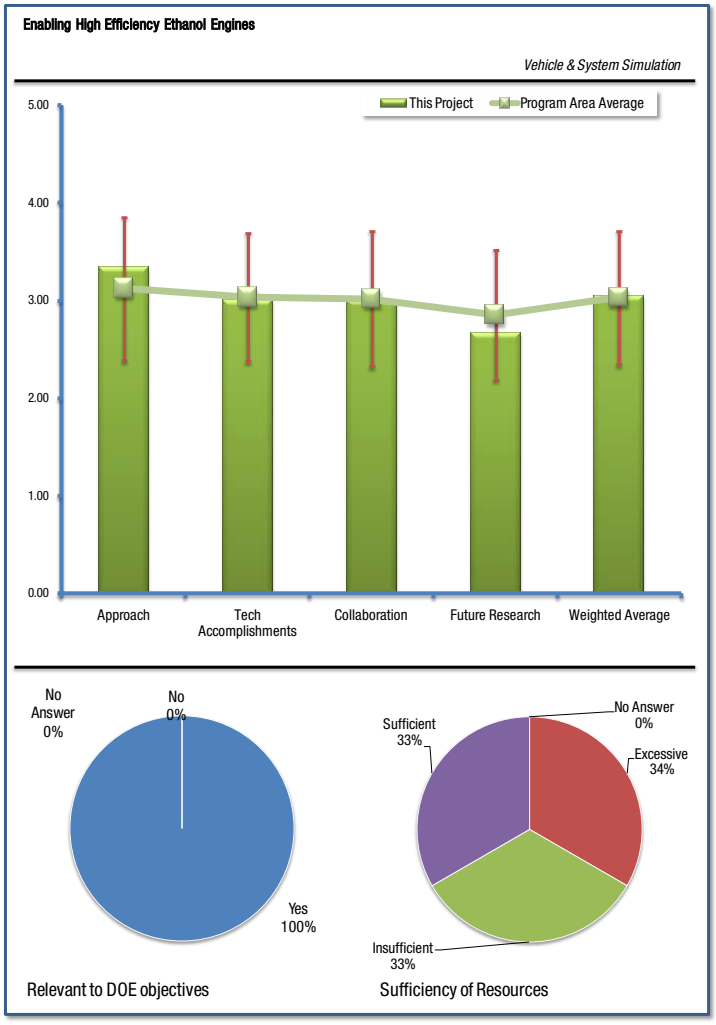
Question 5: Has the project effectively planned its future work in a logical manner by incorporating appropriate decision points, considering barriers to the realization of the proposed technology, and, when sensible, mitigating risk by providing alternate development pathways?

The reviewer gave a simple comment about the future work after describing what the work would be: “This is fantastic”.

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

The reviewer feels that the project has a very humble budget for the work achieved.

Enabling High Efficiency Ethanol Engines: Robert Wagner (Oak Ridge National Laboratory) - POSTER



Reviewer Sample Size

This project had a total of 3 reviewers.

Question 1: Does this project support the overall DOE objective of petroleum displacement? Why or why not?

One reviewer points out that combustion engine efficiency/management are important issues in regard to petroleum displacement. Another reviewer says that the development of alternative-fueled engines may lead to petroleum displacement. A different reviewer says that in order to reduce the amount of petroleum consumed, alternative fuels, such as ethanol, need to be maximized in their efficiency of use.

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?

A reviewer says that this activity makes use of state-of-the-art engine technology through industry partnership in support of VTP R&D priorities. They also say that the approach for the work as accomplished appears to be reasonable. A different reviewer says there is excellent coverage of the experiment field with single cylinder engine and Saab bi-fuel engine work to be able to assess ethanol combustion characteristics.

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

One of the reviewers noted that the work is still in progress and it is hard to comment on technical accomplishments, but that they look good so far. Another reviewer says the important technical accomplishments are the development of engine models and corresponding ethanol-based engine maps that can be used in vehicle system simulation codes as PSAT. They note that these have largely been accomplished. One of the other reviewers said that there has been good progress towards meeting the objectives of defining ethanol combustion characteristics and improving engine efficiency.

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

One reviewer feels that active collaboration with industry for testing is advantageous. A different reviewer says that interactions with Delphi were mentioned several times and seem reasonable. One of the other reviewers say that that it is good to have a CRADA with Delphi and co-funding with Fuels Program, but that the project could use the involvement of an engine manufacturer as well.

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?

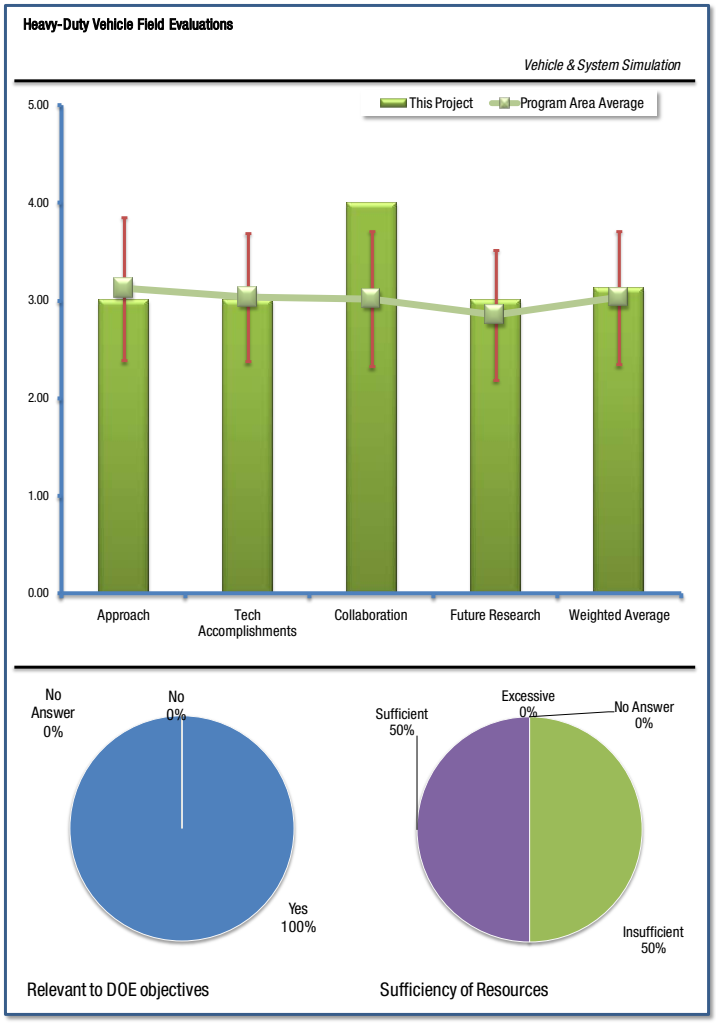
One of the reviewers says that there are good potential and concrete goals. Another reviewer says that the important aspects of this project are the engine models and associated ethanol-based engine maps. They say that this has largely

been completed and the need for further development should be greatly diminished. Furthermore they note that other ethanol-based engine work is likely already being performed by the OEMs at a much larger and more sophisticated level. They feel that future work at ORNL should focus on simulations and analyses utilizing the newly developed capabilities. One of the other reviewers says that the project has a good plan for addressing barriers and demonstrating ethanol capabilities.

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

One reviewer says that the identified budget is $150k/yr from Vehicle Systems plus $350k/yr from Fuels Technologies for a total of $500k/yr and that given that the most important new capabilities have now been largely established the $500k/yr seems excessive for the proposed engine and system simulation studies. Another reviewer says that for the potential benefits to be demonstrated by this activity in the improved efficiency of ethanol engines, this project seems to be under-funded.

Heavy-Duty Vehicle Field Evaluations: Kevin Walcowicz (National Renewable Energy Laboratory) - POSTER



Reviewer Sample Size
This project had a total of 2 reviewers.

Question 1: Does this project support the overall DOE objective of petroleum displacement? Why or why not?
One reviewer says that fleet measurements of this type are useful, but only support the objectives of petroleum displacement indirectly. Another reviewer says that this activity helps to characterize the performance of hybrid trucks and buses, leading to an expanded penetration of these vehicles in the marketplace.

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?
A reviewer felt that there was a good approach to data acquisition and analysis. They also said that development of an analysis tool to develop duty cycle characteristics is valuable.

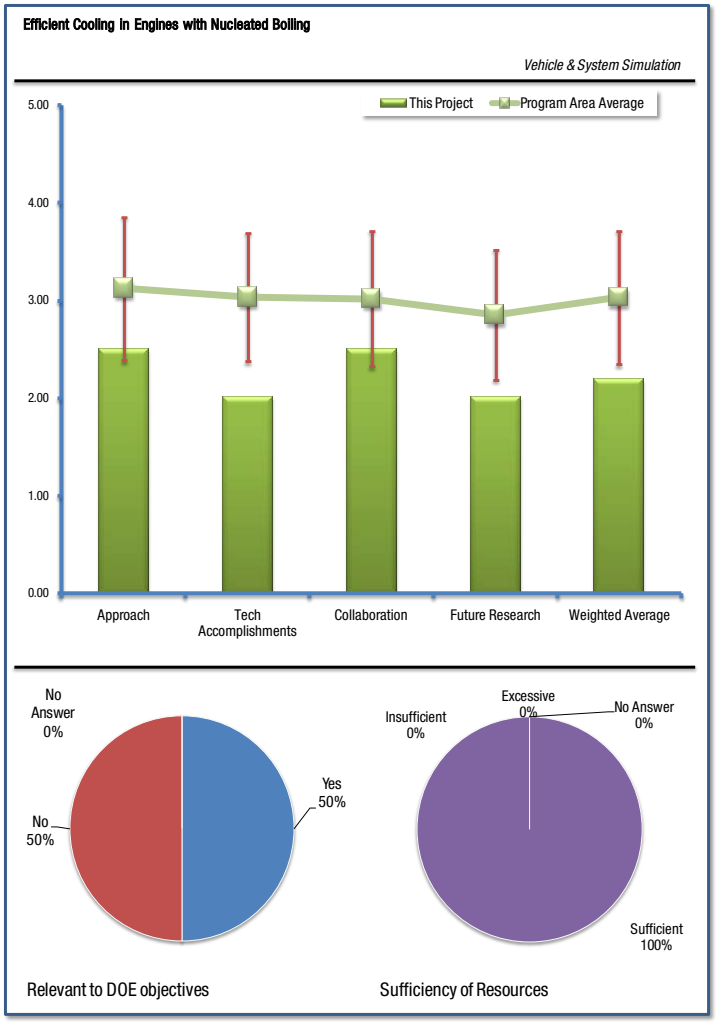
Question 3: Characterize your understanding of the technical accomplishments and progress toward overall project and DOE goals.
One of the reviewers said that there was a good assessment of test vehicles and performance results. They also feel that there is a need to determine whether plug-in capability for school buses provides a significant benefit for the additional cost.

Question 4: What is your assessment of the level of collaboration and coordination with other institutions?
A reviewer pointed out that there was excellent collaboration with a number of end-users, vehicle OEMs and suppliers.

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 of the reviewers felt that the engine off at idle performance measurement is critical to determining potential of hybrid configurations. They also noted that the further development of duty cycle analysis tool should be beneficial.

Question 6: How sufficient are the resources for the project to achieve the stated milestones in a timely fashion?
A reviewer felt that the funding was insufficient and additional resources are required to expand the work on the duty-cycle analysis tool and to monitor additional vehicle vocations.

Efficient Cooling in Engines with Nucleated Boiling: Wenhua Yu (Argonne National Laboratory) - POSTER



Reviewer Sample Size

This project had a total of 2 reviewers.

Question 1: Does this project support the overall DOE objective of petroleum displacement? Why or why not?

One of the reviewers thought that any improvements in heat transfer could result in reduced system weight leading to reduced petroleum consumption. The other reviewer thought that this is a sub point and thermal systems really need to be looked at with regards to the overall vehicle system.

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?

One of the reviewers said that the presentation alludes to potential engine and aerodynamic enhancements but they are not mentioned any further and in reality this is strictly a 2-phase heat transfer and fluid flow study using mixtures of water and ethylene glycol. They go on to say that the only reasonable place where 2-phase heat transfer and fluid flow might occur is at the heat source which is the engine, not in the radiator where heat is dissipated. Otherwise, the penalty due to the increase in pumping power required for 2-phase flow would likely overshadow any improvements in heat transfer. Because of many potential issues including greatly increased pumping power requirements and the potential for flow blockages, this reviewer believed a 2-phase flow system comprised of engine, pumps, hoses, flow passages and radiator is not feasible. Thus, they feel that the aerodynamic improvements from reduced radiator sizes really don't come into play since the project is most likely limited to single-phase flow and heat transfer at the radiator which is already well studied and understood.

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

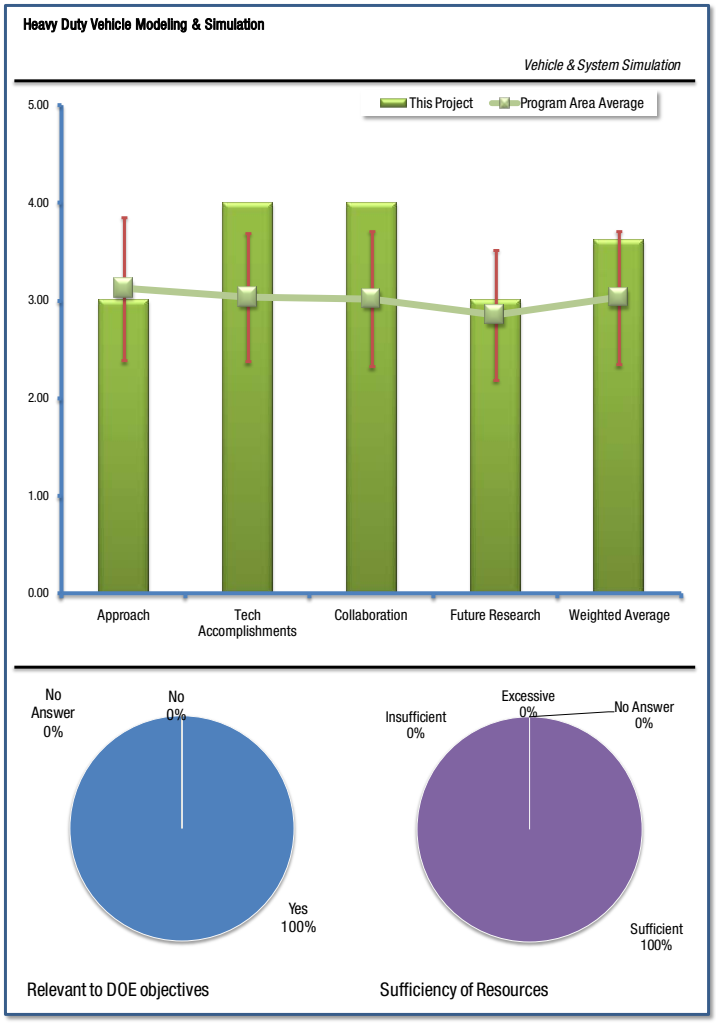
A reviewer felt that the presentation mixes current reporting-period results with past accomplishments. They feel much of the discussion of technical accomplishments is related to heat transfer and fluid flow studies in horizontal geometries, which is not part of the present scope. The PI told the reviewer that the present work is for vertical geometries. Further, the reviewer notes that much of the work relates to 2-phase flow and heat transfer in both horizontal and vertical geometries which has already been accomplished by others as exemplified by the use of the figure on Page 12 which they believe was lifted from a rather old and uncited text book. The reviewer continues to say that the world-wide commercial nuclear power industry has and continues to perform extensive studies on 2-phase flow and heat transfer in all kinds of geometries for both pressurized light water reactors and boiling water reactors. They note that the only truly unique aspect of this work is the use of a 2-phase mixture of water and ethylene glycol.

Question 4: What is your assessment of the level of collaboration and coordination with other institutions?
A reviewer noted that potential collaborations with PACCAR and Caterpillar were mentioned but are still pending.

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 of the reviewers said that once the vertical geometry studies are complete, the project should be brought to a close. They see no need for additional work to combine the results of the horizontal studies with those of the vertical studies. The reviewer noted that the two cases bound other orientations and one can logically interpolate between these extremes if needed.

Question 6: How sufficient are the resources for the project to achieve the stated milestones in a timely fashion?
A reviewer pointed out that the resources seem reasonable and once the vertical geometry studies are complete, this project should be brought to a logical conclusion.

Heavy Duty Vehicle Modeling & Simulation: Aymeric Rousseau (Argonne National Laboratory) - POSTER



Reviewer Sample Size
This project had a total of 1 reviewer.

Question 1: Does this project support the overall DOE objective of petroleum displacement? Why or why not?
The single reviewer thought that this helps develop and support a valuable simulation tool for heavy duty 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 single reviewer did not have any comments for this question.

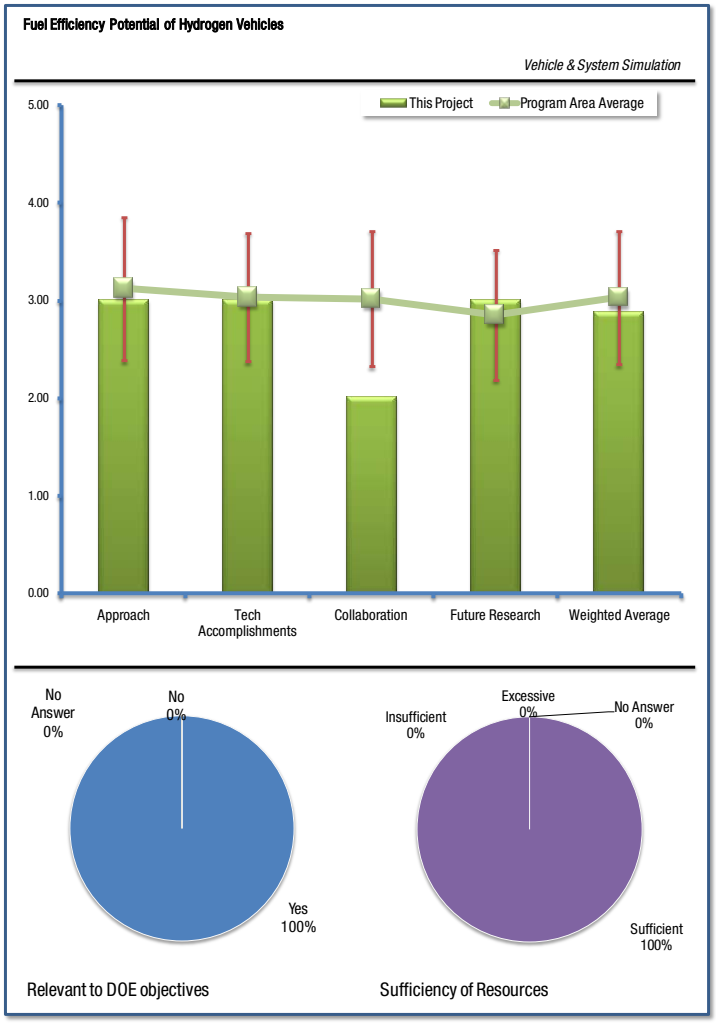
Question 3: Characterize your understanding of the technical accomplishments and progress toward overall project and DOE goals.
The reviewer thought that the correlation between PSAT and measured data was very impressive.

Question 4: What is your assessment of the level of collaboration and coordination with other institutions?
The reviewer commented that there was a very wide variety of contributors and that it is essential to collect this quantity of data.

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 single reviewer did not have any comments for this question.

Question 6: How sufficient are the resources for the project to achieve the stated milestones in a timely fashion?
The single reviewer did not have any comments for this question, but thought the amount of resources was sufficient.

Fuel Efficiency Potential of Hydrogen Vehicles: Thomas Wallner (Argonne National Laboratory) - POSTER



Reviewer Sample Size

This project had a total of 2 reviewers.

Question 1: Does this project support the overall DOE objective of petroleum displacement? Why or why not?

One reviewer thought that the data on hydrogen fuel use in combustion engines is needed for economic estimation and engineering designs. The other reviewer thought that alternative-fuel vehicles have the potential to reduce petroleum consumption.

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?

One reviewer commented that the approach seems to be well done. But, they do mention that some of the graphs are difficult to read and the choice of reference gasoline engine is not quite clear, as two graphs seem to show different numbers. The other reviewer said the study investigated the use of H_2 ICE in various vehicle configurations and found them to perform quite well.

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

One reviewer says that the accomplishments seem to be more or less on target. The other reviewer noted that the project is near completion and has generated useful information related to H_2 ICE data in hybrid powertrains.

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

One reviewer noted that no collaborations were mentioned and the other reviewer said that the collaborations were limited to in-house within ANL.

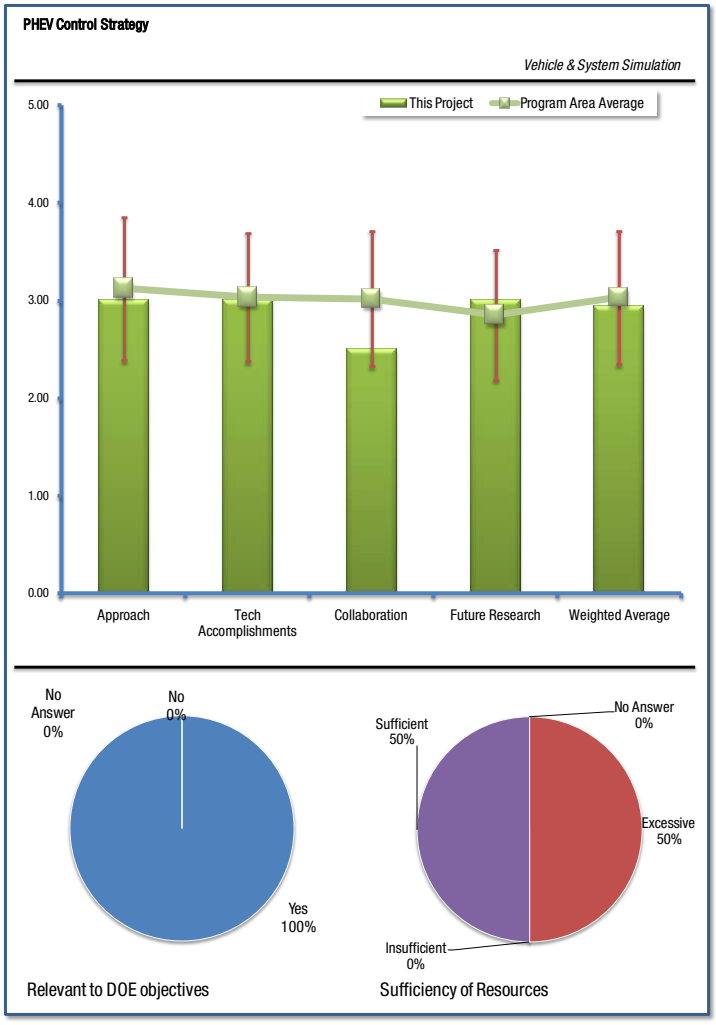
Question 5: Has the project effectively planned its future work in a logical manner by incorporating appropriate decision points, considering barriers to the realization of the proposed technology, and, when sensible, mitigating risk by providing alternate development pathways?

One reviewer said that it seems to be the right approach - moving from one cylinder to multi cylinder H_2 engines, for example. The other reviewer thought that the project has been successfully completed and could enable further H_2 ICE studies if so desired.

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

Both reviewers agreed that the resources seemed reasonable for a study of this depth and scope.

PHEV Control Strategy: Aymeric Rousseau (Argonne National Laboratory) - POSTER



Reviewer Sample Size
This project had a total of 2 reviewers.

Question 1: Does this project support the overall DOE objective of petroleum displacement? Why or why not?
One reviewer noted that optimizing control strategies leads to optimization of vehicle performance and the commensurate reduction in petroleum consumption. The other reviewer agreed by saying that this work indirectly supports PHEV work to reduce fuel consumption.

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?
One of the reviewers said that the objective was to investigate and determine the best control strategy for a PHEV within certain constraints and the objective was met. The other reviewer felt that the details and optimization of HEV control strategies will depend on specific vehicles and implementation by OEMs. They further noted that while the importance of control strategy is well known, most of the results can be anticipated, and the uncertainty of applying optimization at this stage of vehicle analysis is questionable.

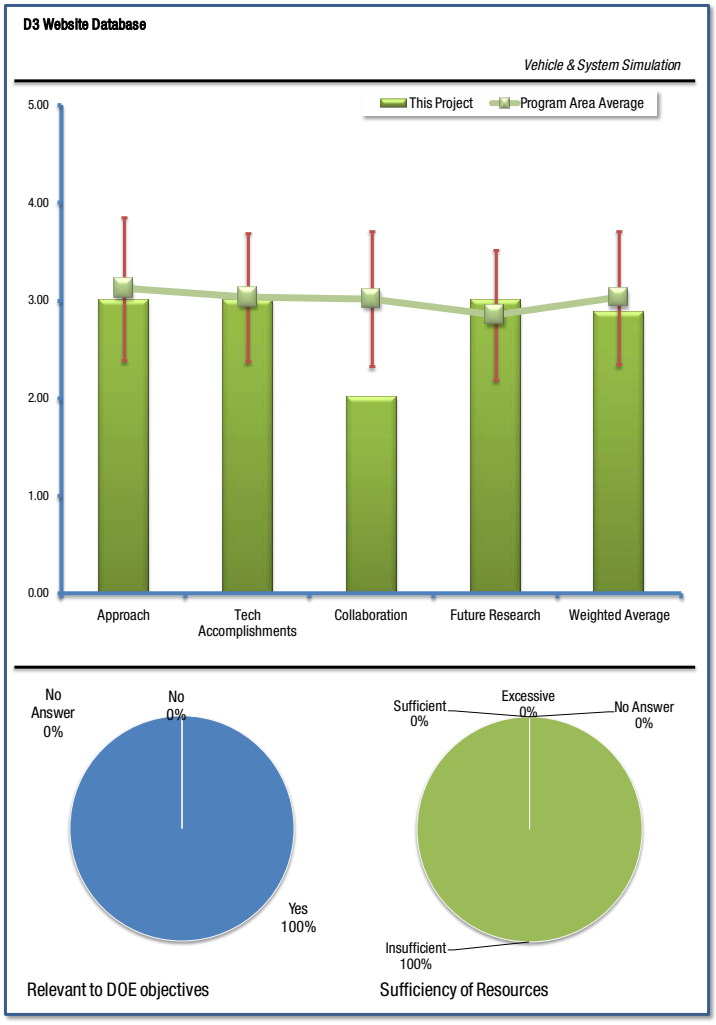
Question 3: Characterize your understanding of the technical accomplishments and progress toward overall project and DOE goals.
One of the reviewers thought that the project completed the objective of investigating and determining the best control strategy for a PHEV within certain constraints. The other reviewer felt that the project demonstrated expected results.

Question 4: What is your assessment of the level of collaboration and coordination with other institutions?
The reviewers agreed that collaboration existed between this project and some EPA partners, along with work accomplished with ATVA, NREL and others on drive cycles.

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 of the reviewers noted that the PI proposes additional control strategy studies. The reviewer felt that this may be warranted and desirable but scope needs to be bounded and prioritized.

Question 6: How sufficient are the resources for the project to achieve the stated milestones in a timely fashion?
A reviewer said that for a study of this scope, size and nature, the size of the budgets, especially FY08, seem rather large.

D3 Website Database: Glenn Keller (Argonne National Laboratory) - POSTER



Reviewer Sample Size
This project had a total of 1 reviewer.

Question 1: Does this project support the overall DOE objective of petroleum displacement? Why or why not?
The single reviewer felt that this project provides detailed data on vehicle dynamometer performance that should be beneficial to the industry and educational institutions.

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 reviewer felt that it would be good to define and quantify the need for this type of tool in order to better justify the activity. They also noted that these types of databases are expensive to set up, customize and maintain, so justification of the project is a must.

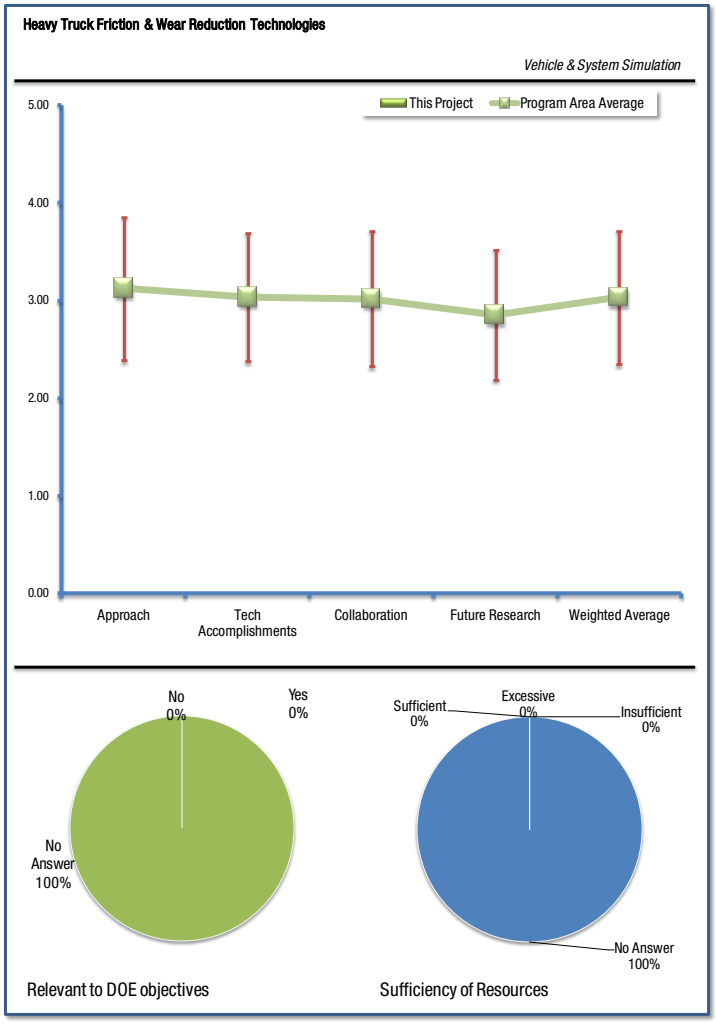
Question 3: Characterize your understanding of the technical accomplishments and progress toward overall project and DOE goals.
The reviewer also said that the project seems to be making good progress on a limited budget. They also commented that the one page reporting tool is useful for a snapshot of vehicle dynamometer performance.

Question 4: What is your assessment of the level of collaboration and coordination with other institutions?
The reviewer said that more extensive coordination with other commercial entities would be helpful in defining and expanding the utility of this tool.

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 single reviewer said that the next steps in database and access refinement seem appropriate.

Question 6: How sufficient are the resources for the project to achieve the stated milestones in a timely fashion?
The reviewer felt that the resources are insufficient and that if this is truly a necessary tool, the amount of funding it is receiving is insufficient to fully build its capabilities.

Heavy Truck Friction & Wear Reduction Technologies: Michael Killian (Eaton Corporation) - POSTER



Reviewer Sample Size
This project had a total of 1 reviewer.

Question 1: Does this project support the overall DOE objective of petroleum displacement? Why or why not?
The primary reviewer did not see this presentation (it was a poster presentation). There were no other reviewers listed and no other comments made.

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 primary reviewer did not see this presentation (it was a poster presentation). There were no other reviewers listed and no other comments made.

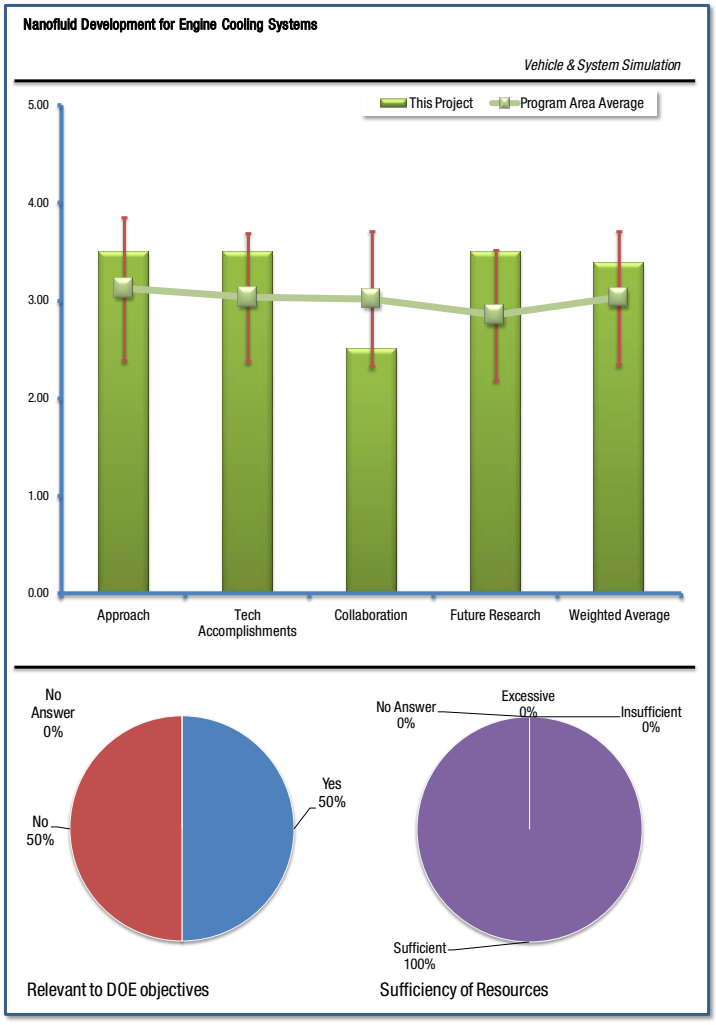
Question 3: Characterize your understanding of the technical accomplishments and progress toward overall project and DOE goals.
The primary reviewer did not see this presentation (it was a poster presentation). There were no other reviewers listed and no other comments made.

Question 4: What is your assessment of the level of collaboration and coordination with other institutions?
The primary reviewer did not see this presentation (it was a poster presentation). There were no other reviewers listed and no other comments made.

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 primary reviewer did not see this presentation (it was a poster presentation). There were no other reviewers listed and no other comments made.

Question 6: How sufficient are the resources for the project to achieve the stated milestones in a timely fashion?
The primary reviewer did not see this presentation (it was a poster presentation). There were no other reviewers listed and no other comments made.

Nanofluid Development for Engine Cooling Systems: Elena Timofeeva (Argonne National Laboratory) - POSTER



Reviewer Sample Size

This project had a total of 2 reviewers.

Question 1: Does this project support the overall DOE objective of petroleum displacement? Why or why not?

One of the reviewers felt that the contribution is somewhat indirect, by noting that the project is directed towards improving the heat removal efficiency of the radiator fluid in trucks. The reviewer said this in turn, will allow a decrease in radiator size with resultant weight reduction and decreased air resistance and this, then, results in lower fuel consumption.

The other reviewer felt this is a sub point and felt that the thermal systems really need to be looked at with regards to the overall vehicle system.

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?

One of the reviewers said that the project is very nicely done work, and the PI obviously knows the nanofluids field and the related chemistry. They do note that some theoretical development remains to be done in the field, such as heat transfer and viscosity vs. particle shape. They feel that this might worth some future effort.

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

A reviewer said the project is doing very well, although somewhat limited by the size and shape of nano- or submicron particles available.

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

One of the reviewers said that the level of collaboration is relatively minor, mostly contribution of particles from Saint Gobain, but certainly worthwhile.

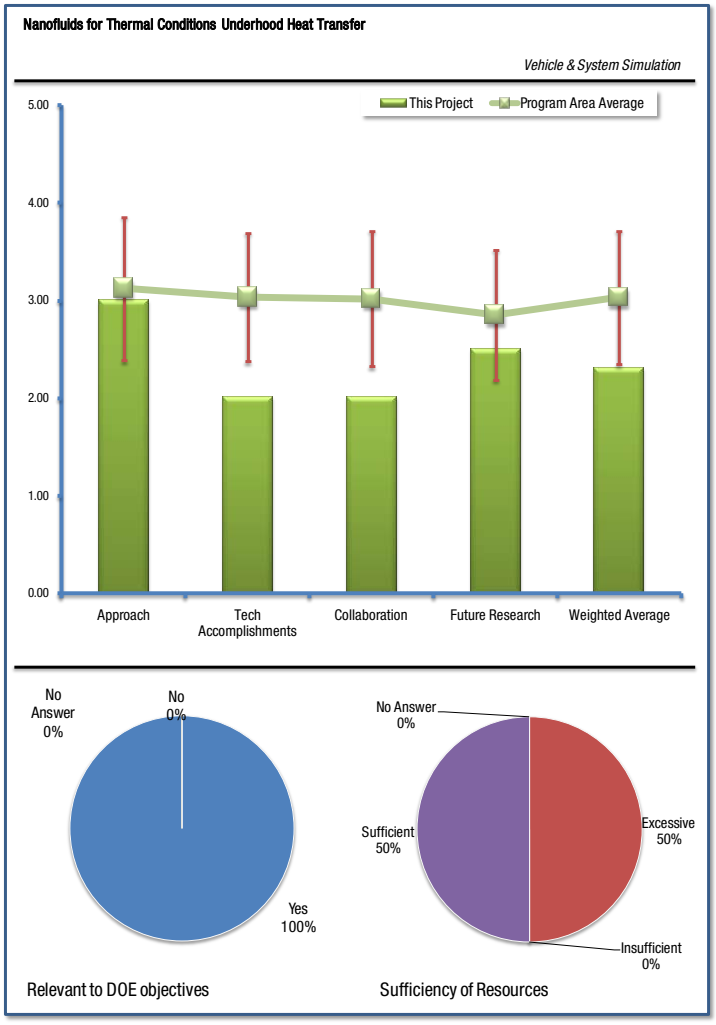
Question 5: Has the project effectively planned its future work in a logical manner by incorporating appropriate decision points, considering barriers to the realization of the proposed technology, and, when sensible, mitigating risk by providing alternate development pathways?

One reviewer felt that the project is well on track and has interesting promise, not only for diesel coolant development but potentially for many other technological cooling applications.

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

The reviewers feel that the level of resources seems to be ok.

Nanofluids for Thermal Conditions Underhood Heat Transfer: Wenhua Yu (Argonne National Laboratory) - POSTER



Reviewer Sample Size

This project had a total of 2 reviewers.

Question 1: Does this project support the overall DOE objective of petroleum displacement? Why or why not?

One of the reviewers felt that the project contributes to the DOE objective of petroleum displacement by looking at engine cooling via behavior and evaluation of nanofluids. They also said that by looking at the reduction of radiator weight, aerodynamic drag, and parasitic energy losses by engineering stable nanofluids, the project is increasing energy efficiency systems that could displace petroleum further. They also commented that nanofluids have high thermal conductivities, high heat transfers, low viscosity, and are environmentally friendly. The other reviewer said that the possibility of significantly enhanced heat transfer offered by nanofluids could lead to a small reduction in engine weight and a small reduction in petroleum consumption.

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?

A reviewer felt that the PI seems to have a good understanding of heat transfer and fluid flow and a systematic approach to the research.

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

One of the reviewers said that while the quality of the work appears to be very high, the amount of progress and nanoparticle-associated improvements seems somewhat more limited. They feel some small incremental improvements in heat transfer seem possible but nothing really revolutionary appears to be on the horizon. Since the project is specified to have been ongoing since FY06, it seems odd that the critical barriers were not identified until FY08.

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

The reviewers note that the partners include TARDEC/WFO, Saint Gobain-cost share, Michelin WFO/cost-share, PACCAR (CRADA in progress) and Industrial Technologies Program (DOE). One notes that the nature of the collaborations is not really discussed. A reviewer also feels that given the limited success, it is difficult to envision much third-party interest. Further they noted that no third party funding or cost share was identified.

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 of the reviewers said it would be nice to see simulations already on past results. The other reviewer felt that given that various aspects of this work have been ongoing since at least FY06, the potential improvements so far seem be rather under whelming and nothing in the proposed future work shows any potential breakthroughs.

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

One reviewer feels the funds are adequate for the targeted program. However the other reviewer feels that given the limited improvements observed in heat transfer so far, the budget increase in FY09 to $400K from $250K in FY08 seems excessive and unwarranted.