14. Vehicle Systems and Simulation

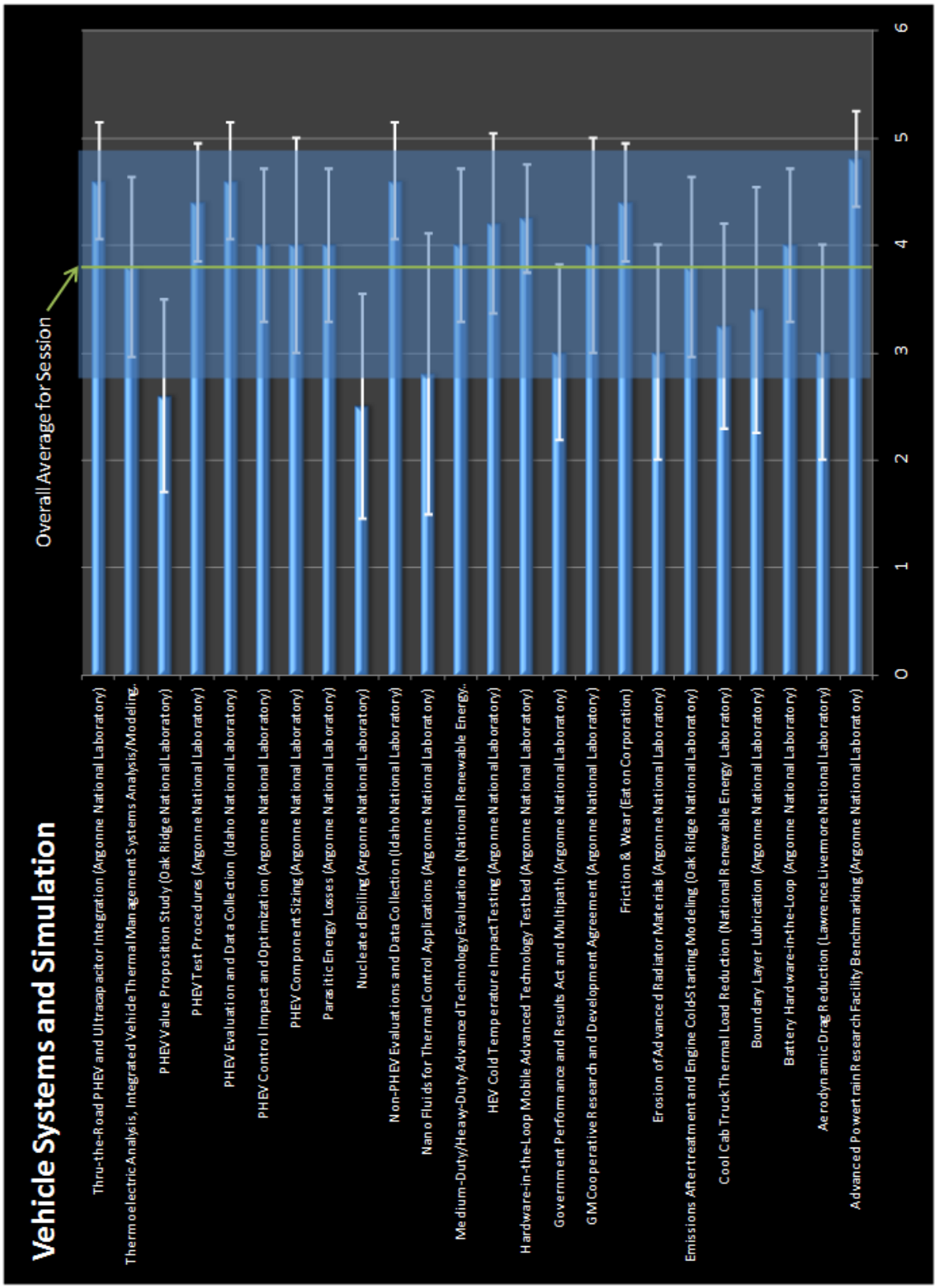
Introduction

Vehicle systems and simulation research provides an overarching vehicle systems perspective to the technology research and development activities of 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 six questions, involving multiple-choice responses, expository responses where text comments were requested, and one numeric score response. In the pages that follow, the reviewer responses to each question for each project will be summarized: the multiple choice and numeric score questions will be presented in pictorial form in eight graphs as the last page of each project, and the expository text responses will be summarized in paragraph form for each question. A table and graph presenting the average and standard deviation for each project relative to the overall average and standard deviation for this session is presented below.

Page	Project Title and Principal Investigator	Project Average Score	Project Score Standard Deviation
14-4	Advanced Powertrain Research Facility Benchmarking (Barney Carlson, Argonne National Laboratory)	4.80	0.45
14-7	Aerodynamic Drag Reduction (Kambiz Salari, Lawrence Livermore National Laboratory)	3.00	1.00
14-9	Battery Hardware-in-the-Loop (Neeraj Shidore, Argonne National Laboratory)	4.00	0.71
14-12	Boundary Layer Lubrication (Oyelayo Ajayi, Argonne National Laboratory)	3.40	1.14
14-15	Cool Cab Truck Thermal Load Reduction (Ken Proc, National Renewable Energy Laboratory)	3.25	0.96
14-17	Emissions Aftertreatment and Engine Cold-Starting Modeling (Stuart Daw, Oak Ridge National Laboratory)	3.80	0.84
14-20	Erosion of Advanced Radiator Materials (Dileep Singh, Argonne National Laboratory)	3.00	1.00
14-23	Friction & Wear (Mike Killian, Eaton Corporation)	4.40	0.55
14-25	GM Cooperative Research and Development Agreement (Aymeric Rousseau, Argonne National Laboratory)	4.00	1.00
14-27	Government Performance and Results Act and Multipath (Sylvain Pagerit, Argonne National Laboratory)	3.00	0.82
14-29	Hardware-in-the-Loop Mobile Advanced Technology Testbed (Henning Lohse-Busch, Argonne National Laboratory)	4.25	0.50

Page	Project Title and Principal Investigator	Project Average Score	Project Score Standard Deviation
14-32	HEV Cold Temperature Impact Testing (Barney Carlson, Argonne National Laboratory)	4.20	0.84
14-35	Medium-Duty/Heavy-Duty Advanced Technology Evaluations (Kevin Walcowicz, National Renewable Energy Laboratory)	4.00	0.71
14-38	Nano Fluids for Thermal Control Applications (Wen Yu, Argonne National Laboratory)	2.80	1.30
14-41	Non-PHEV Evaluations and Data Collection (Jim Francfort, Idaho National Laboratory)	4.60	0.55
14-44	Nucleated Boiling (Wen Yu, Argonne National Laboratory)	2.50	1.05
14-47	Parasitic Energy Losses (George Fenske, Argonne National Laboratory)	4.00	0.71
14-50	PHEV Component Sizing (Phil Sharer, Argonne National Laboratory)	4.00	1.00
14-52	PHEV Control Impact and Optimization (Dominik Karbowski, Argonne National Laboratory)	4.00	0.71
14-54	PHEV Evaluation and Data Collection (Jim Francfort, Idaho National Laboratory)	4.60	0.55
14-56	PHEV Test Procedures (Michael Duoba, Argonne National Laboratory)	4.40	0.55
14-59	PHEV Value Proposition Study (Richard Smith, Oak Ridge National Laboratory)	2.60	0.89
14-62	Thermoelectric Analysis, Integrated Vehicle Thermal Management Systems Analysis/Modeling (Tony Markel, National Renewable Energy Laboratory)	3.80	0.84
14-65	Thru-the-Road PHEV and Ultracapacitor Integration (Ted Bohn, Argonne National Laboratory)	4.60	0.55
	Overall Session Average and Standard Deviation	**3.80**	**1.01**


Vehicle Systems and Simulation
Overall Average for Session
0
1
2
3
4
5
6
Thru-the-Road PHEV and Ultracapacitor Integration (Argonne National Laboratory)
Thermoelectric Analysis, Integrated Vehicle Thermal Management Systems Analysis/Modeling..
PHEV Value Proposition Study (Oak Ridge National Laboratory)
PHEV Test Procedures (Argonne National Laboratory)
PHEV Evaluation and Data Collection (Idaho National Laboratory)
PHEV Control Impact and Optimization (Argonne National Laboratory)
PHEV Component Sizing (Argonne National Laboratory)
Parasitic Energy Losses (Argonne National Laboratory)
Nucleated Boiling (Argonne National Laboratory)
Non-PHEV Evaluations and Data Collection (Idaho National Laboratory)
Nano Fluids for Thermal Control Applications (Argonne National Laboratory)
Medium-Duty/Heavy-Duty Advanced Technology Evaluations (National Renewable Energy..
HEV Cold Temperature Impact Testing (Argonne National Laboratory)
Hardware-in-the-Loop Mobile Advanced Technology Testbed (Argonne National Laboratory)
Government Performance and Results Act and Multipath (Argonne National Laboratory)
GM Cooperative Research and Development Agreement (Argonne National Laboratory)
Friction & Wear (Eaton Corporation)
Erosion of Advanced Radiator Materials (Argonne National Laboratory)
Emissions Aftertreatment and Engine Cold-Starting Modeling (Oak Ridge National Laboratory)
Cool Cab Truck Thermal Load Reduction (National Renewable Energy Laboratory)
Boundary Layer Lubrication (Argonne National Laboratory)
Battery Hardware-in-the-Loop (Argonne National Laboratory)
Aerodynamic Drag Reduction (Lawrence Livermore National Laboratory)
Advanced Powertrain Research Facility Benchmarking (Argonne National Laboratory)

Advanced Powertrain Research Facility Benchmarking (Barney Carlson, of Argonne National Laboratory)

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

Question 1: Does this activity support the overall DOE objectives of petroleum displacement? Why or why not?
One reviewer commented that there is an applied, near-term impact, while another stated that the testing of vehicles and components supports the modeling of future technologies. The results are used by private and public organizations to determine future testing and products. One other individual stated that generating benchmarking data is critical in understanding potential improvements in reducing fuel use. The other remarked that DOE objectives weren't discussed in presentation but the linkage is clear. Benchmarking won't save petroleum by itself but by making standardized, validated data available to others, it can be leveraged to save petroleum. This reviewer adds that this program appears to be a key piece of the overall program.

Question 2: Are the goals of the project technically achievable? Have the technical barriers been identified and addressed? Is the project likely to overcome those technical barriers? Please comment on the project's strategy for deployment of technologies.
The first reviewer stated that the facilities are running and producing correlated data, while another commented that the data and test procedures are used by many organizations. One reviewer stated that the group continues to overcome data collection challenges in a timely manner, which will allow the data to support product development.

One final reviewer noted that this is a measurement and benchmarking project. Thus, it serves to identify technical barriers, but in itself doesn't take steps to overcome those barriers. That appears to be left to other coordinated projects. The measurement and simulation techniques have improved substantially over the years, and there is a strong collaboration with industry. This is an impressive demonstration of Argonne's ability to help OEMs move in the right direction to optimize their systems. Is DOE working with the eventual market winners? Will Hymotion and Hybrids Plus be able to make an important impact on the market? Is the technical team structure sufficient to ensure that Argonne will be able to transfer their body of knowledge to other OEMs (Toyota, GM, ...)? Should more effort be made to ensure ANL's knowledge is broadly communicated?

Question 3: Characterize your understanding of the technical accomplishments and progress toward DOE goals: please state the reasons for your assessment.
One reviewer stated that very good quality results were demonstrated, while another added that ANL has provided extensive data on numerous vehicles, which has contributed to technology advancements. One individual stated that this public analysis of operations of plug-in hybrids will clearly influence the future direction of development and deployment of these systems. This project appears to have collected lots of data in a short time and to be an efficient use of funds. Is torque slip of the tires an important source of losses, particularly during aggressive driving and at winter conditions?

One final reviewer stated that there need to be easy ways for OEMs to obtain the test data, adding that this hasn't been effectively demonstrated yet.

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

The first respondent commented that information from ANL benchmarking is already being used within the OEMs to address strategies and technical challenges. Similar to this first comment, one person wrote that data provided from testing has been utilized by the industry to improve product performance. Another remarked that standards developed will be adopted by industry, and there is good interaction with OEMs.

One reviewer stated that the work with OEMs appears likely to move this directly into the market, adding that it is less clear that consumers will pull the technology into market. Perhaps later stages of the technology should demonstrate overall benefits to end users, including cost and environmental impacts.

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

One person indicated that, as batteries take a larger role in reducing fuel consumption, the effects of ambient temperatures become a more significant impact. Upgrades in the facility will be needed to understand the effects of ambient temperature. Another reviewed agreed about the need for lab upgrades and additional capacity. They perhaps need more on-track data to calibrate the lab dynamometer. It is interesting to get a wider range of conditions and vehicles. This reviewer would fund this area more aggressively because a poor understanding of usage could be a major killer of this technology if market barriers aren't understood and overcome quickly.

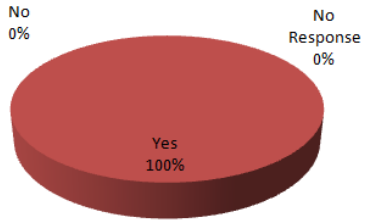
One reviewer stated that ANL seems to have vehicle availability, and the timing is appropriate for the level of staffing.

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

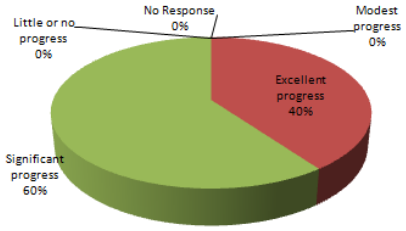
There were no expository comments for this question: refer to the graphic on the next page for this project's summary score.

Project: Advanced Powertrain Research Facility Benchmarking

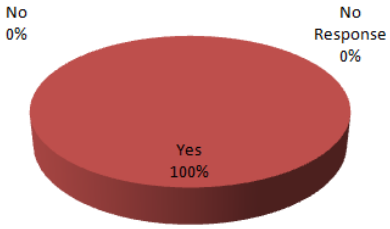
Question 1: Does this project support the overall DOE objectives of petroleum displacement?



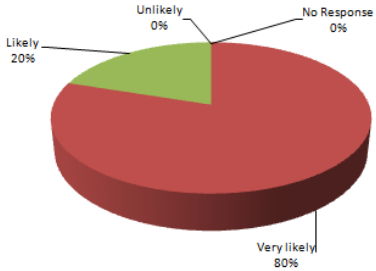
Question 3: Characterize the technical accomplishments and progress toward goals.



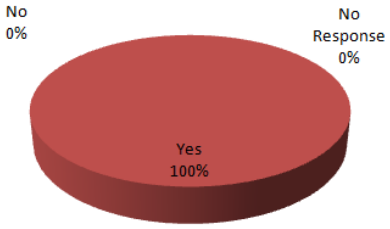
Question 2a: Are the goals of the project technically achievable?



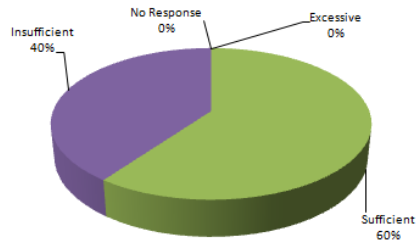
Question 4: How likely is the project team to move technologies into the marketplace?



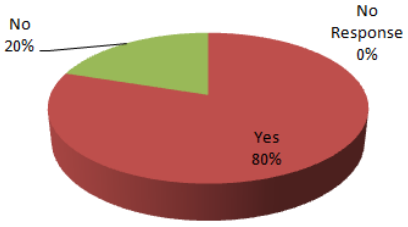
Question 2b: Have the technical barriers been identified and addressed?



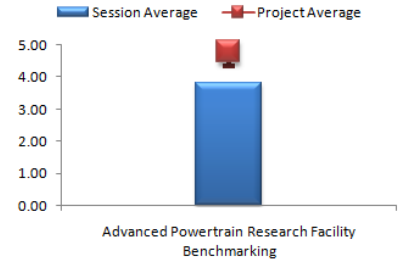
Question 5: Characterize the resources available for this project to achieve the stated milestones in a timely fashion.



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



Question 6: Overall Rating



Aerodynamic Drag Reduction (Kambiz Salari, of Lawrence Livermore National Laboratory)

Reviewer Sample Size
This project had a total of 3 reviewers.

Question 1: Does this activity support the overall DOE objectives of petroleum displacement? Why or why not?
The lone respondent stated that this project provides guidance and testing for aerodynamic analysis to reduce fuel consumption.

Question 2: Are the goals of the project technically achievable? Have the technical barriers been identified and addressed? Is the project likely to overcome those technical barriers? Please comment on the project's strategy for deployment of technologies.
There were no responses to this prompt.

Question 3: Characterize your understanding of the technical accomplishments and progress toward DOE goals: please state the reasons for your assessment.
There were no responses to this prompt.

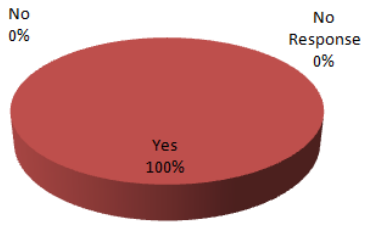
Question 4: What is the likelihood that the project team will move the technologies toward or into the marketplace? Please state the reasons for your selection.
There were no responses to this prompt.

Question 5: How sufficient are the resources for the project to achieve the stated milestones in a timely fashion?
There were no responses to this prompt.

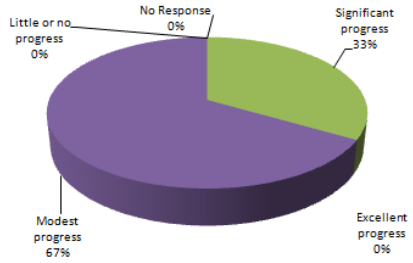
Question 6: Summary rating: when scoring this project, consider the relevance of the work to DOE's objectives, potential impacts on DOE/VT goals, project accomplishments, likelihood of technology transfer, and sufficiency of project resources.
There were no expository comments for this question: refer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

Project: Aerodynamic Drag Reduction

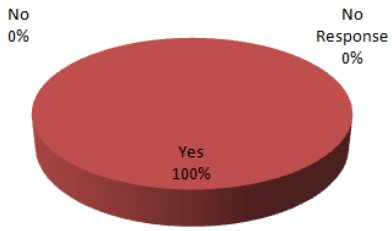
Question 1: Does this project support the overall DOE objectives of petroleum displacement?



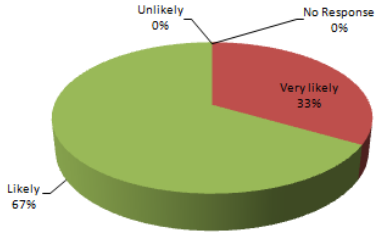
Question 3: Characterize the technical accomplishments and progress toward goals.



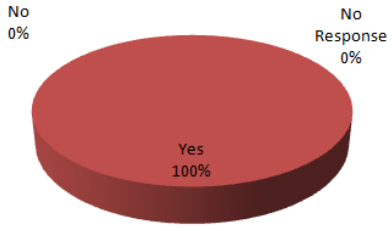
Question 2a: Are the goals of the project technically achievable?



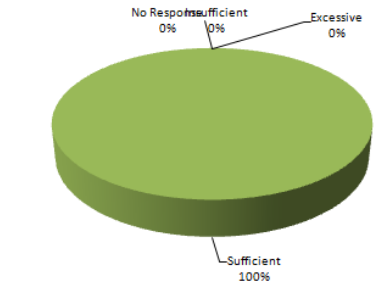
Question 4: How likely is the project team to move technologies into the marketplace?



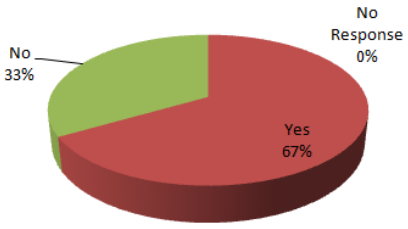
Question 2b: Have the technical barriers been identified and addressed?



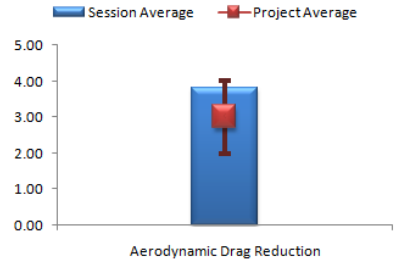
Question 5: Characterize the resources available for this project to achieve the stated milestones in a timely fashion.



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



Question 6: Overall Rating



Battery Hardware-in-the-Loop (Neeraj Shidore, of Argonne National Laboratory)

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

Question 1: Does this activity support the overall DOE objectives of petroleum displacement? Why or why not?
One reviewer commented that this project supports the development of energy storage systems, and another person added that battery technology is very important for HEVs and PHEVs and for petroleum displacement. One other reviewer said that DOE components generated from other technology team funding are to be benchmarked and tested through a HIL process at the labs, and this is one of those tools. One final respondent said that this aspect was not discussed in the presentation. However, the optimization of battery use cycles will allow the optimization of petroleum reduction in hybrid and electric vehicles.

Question 2: Are the goals of the project technically achievable? Have the technical barriers been identified and addressed? Is the project likely to overcome those technical barriers? Please comment on the project's strategy for deployment of technologies.
The first response noted that battery technology is the central barrier for PHEVs. Another reviewer commented that ANL has shown that the system is functioning, and is awaiting DOE projects to test components from the FreedomCAR portfolio. One final reviewer indicated that this project is still at an early stage. The test facility built appears to be an improved route to optimizing batteries and vehicles. It isn't clear yet that this is a better route than existing test methods, but this method appears to have good potential. Will there be an issue of calibration with actual vehicles?

Question 3: Characterize your understanding of the technical accomplishments and progress toward DOE goals: please state the reasons for your assessment.
One reviewer stated that there is good progress with HIL and integration with other projects. Another added that this is a rapid, thorough development of a new test tool. This reviewer added that the progress in the early stage of the project appears strong. It isn't yet clear that this route will enable more rapid development of new solutions, but the approach appears to have good potential. This project should be funded for the next few years, while being evaluated for its ability to produce breakthroughs compared to other approaches. This reviewer added that the weaknesses / limitations of this approach weren't made clear in the presentation.

One other reviewer stated that he or she has not seen a timing plan as to when components will be available for testing. This reviewer would specifically like to see more detail on "Battery Efficiency and Vehicle Fuel Economy" information from the chart on slide 5. This reviewer agrees that the FE vs. SOC appears to be negligible. There should be controls in place to try and target small, but focused, gains in mpg. This reviewer would also like to see how some of the factors on slides 5 and 6 translate into gallons saved on urban, highway, and US06 conditions for 12,000 miles per year of driving.

Question 4: What is the likelihood that the project team will move the technologies toward or into the marketplace? Please state the reasons for your selection.
The first response suggested that the result could potentially be utilized by industry for development. Another reviewer commented that the data will be used to change designs or to show that technology is ready to be incorporated into an OEM product. One final person stated the optimization of battery charge rates, temperatures, and use cycles seems like it will spur battery and control system development. Whether or not the tool is useful to achieve this hasn't yet been demonstrated, but it has

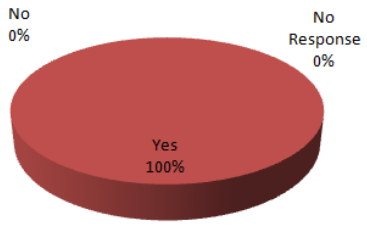
a good likelihood to occur as this early stage project advances. This reviewer asks, is the system sufficiently robust to cover the full range of battery technologies?

Question 5: How sufficient are the resources for the project to achieve the stated milestones in a timely fashion?
One reviewer asked, are there resources available to test a sufficient range of batteries? This reviewer thinks the project's success will depend heavily on the success of other, more real world data gathering projects. This project may be a little ahead of its need relative to other projects, although it will clearly be needed in the future. One other reviewer commented that the system is up and running, and the tweaking of systems appears to be occurring at the proper pace.

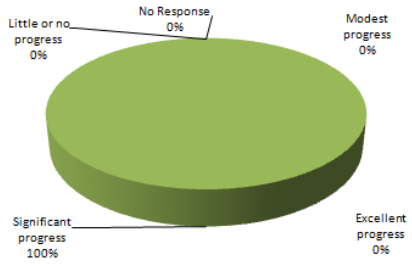
Question 6: Summary rating: when scoring this project, consider the relevance of the work to DOE's objectives, potential impacts on DOE/VT goals, project accomplishments, likelihood of technology transfer, and sufficiency of project resources.
There were no expository comments for this question: refer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

Project: Battery Hardware-in-the-Loop

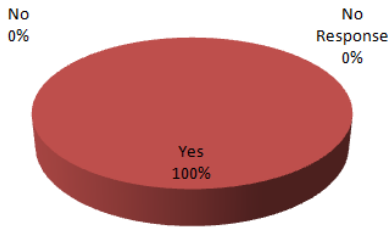
Question 1: Does this project support the overall DOE objectives of petroleum displacement?



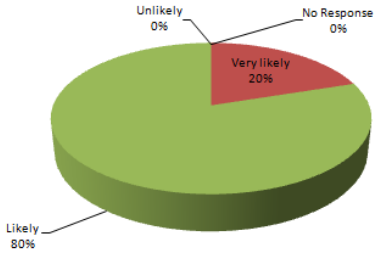
Question 3: Characterize the technical accomplishments and progress toward goals.



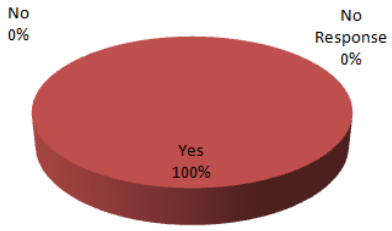
Question 2a: Are the goals of the project technically achievable?



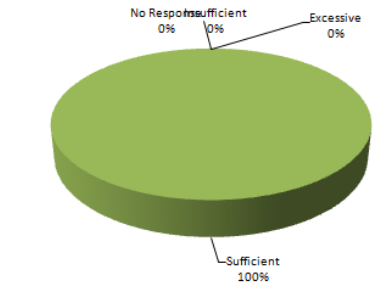
Question 4: How likely is the project team to move technologies into the marketplace?



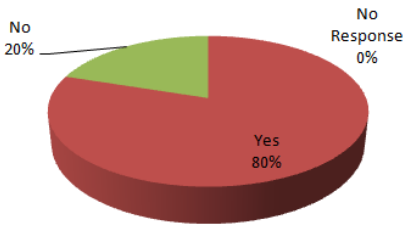
Question 2b: Have the technical barriers been identified and addressed?



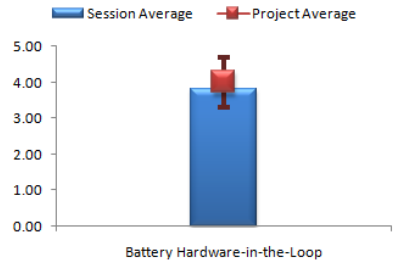
Question 5: Characterize the resources available for this project to achieve the stated milestones in a timely fashion.



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



Question 6: Overall Rating



Boundary Layer Lubrication (Oyelayo Ajayi, of Argonne National Laboratory)

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

Question 1: Does this activity support the overall DOE objectives of petroleum displacement? Why or why not?
One reviewer commented on the possible gains of 5% efficiency, while another person noted that weight savings are related to fuel savings. One individual responded that reducing engine losses has a one-to-one impact to reducing/displacing petroleum.

One other reviewer stated that a very high potential for petroleum reduction was claimed, but asked whether it was realistic to achieve this.

Question 2: Are the goals of the project technically achievable? Have the technical barriers been identified and addressed? Is the project likely to overcome those technical barriers? Please comment on the project's strategy for deployment of technologies.
The first reviewer stated that there is the possibility of higher power density, which can reduce component size and weight. Another commented that the testing looks extensive and purposeful. Small changes in efficiency can translate into large fuel savings in this class of vehicles. One person stated that the fundamental approach to defining mechanisms and developing predictive models appears sound. This reviewer added that it is less clear if hard ceramic coatings will be deployed in the market. Is the scuffing test still a valid predictor for these hard coatings?

One final reviewer indicated that it is difficult to answer as yes or no. This is somewhat of a high-risk research area that has been ongoing for some time. That the goals will be achieved remains to be seen. The stated goal of 10-15 % fuel consumption reduction is unlikely.

Question 3: Characterize your understanding of the technical accomplishments and progress toward DOE goals: please state the reasons for your assessment.
One reviewer noted that the group has derived a model to represent scuffing. Proof of concept achieved. Another person stated that the data looks extensive, and savings can be realized. It will be interesting to see how the savings will change if translated to 12,000-15,000 miles/year driving passenger cars or light-duty trucks. One other respondent noted there is a good blend of theoretical approaches and lab measurements, and good testing using tools not readily available outside of DOE (APS, for example). Measuring surface chemistry and chemistry in real time during tribology experiment is an important advance.

Question 4: What is the likelihood that the project team will move the technologies toward or into the marketplace? Please state the reasons for your selection.
The first respondent stated that, from the presentation, it looks as if an industry partner is participating. Another person commented that this basic work will likely lead to broader benefits, adding that direct commercial partners are less clear at this point. One final reviewer stated that this is longer-term research that is not yet ready for the marketplace.

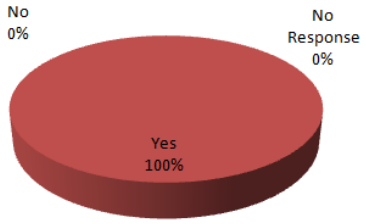
Question 5: How sufficient are the resources for the project to achieve the stated milestones in a timely fashion?
There were no responses to this prompt.

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

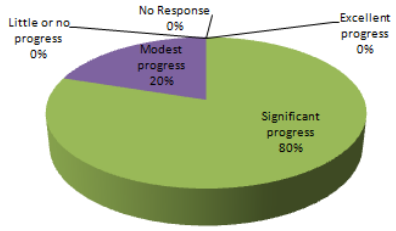
There were no expository comments for this question: refer to the graphic on the next page for this project's summary score.

Project: Boundary Layer Lubrication

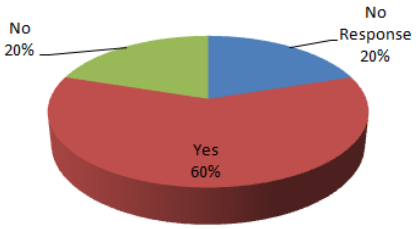
Question 1: Does this project support the overall DOE objectives of petroleum displacement?



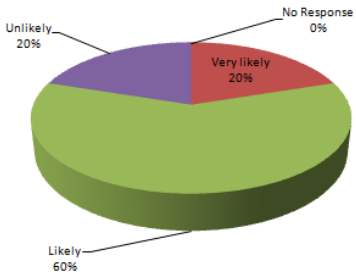
Question 3: Characterize the technical accomplishments and progress toward goals.



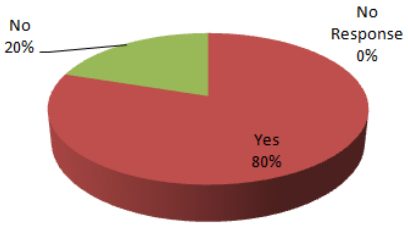
Question 2a: Are the goals of the project technically achievable?



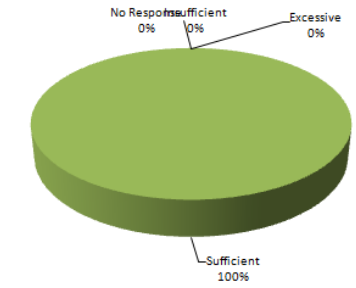
Question 4: How likely is the project team to move technologies into the marketplace?



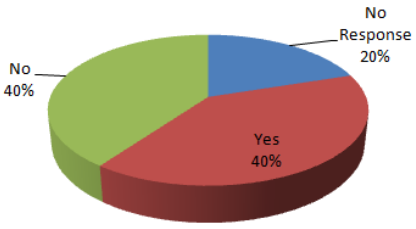
Question 2b: Have the technical barriers been identified and addressed?



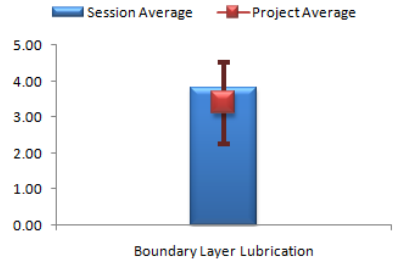
Question 5: Characterize the resources available for this project to achieve the stated milestones in a timely fashion.



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



Question 6: Overall Rating



Cool Cab Truck Thermal Load Reduction (Ken Proc, of National Renewable Energy Laboratory)

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

Question 1: Does this activity support the overall DOE objectives of petroleum displacement? Why or why not?
One reviewer stated that the project has modest but important potential. The other person to respond stated that the goal is directly to reduce fuel use by highway trucks. However, the importance of overall fuel savings wasn't made clear. This reviewer asks if this is a refinement of technologies that should be left to OEMs.

Question 2: Are the goals of the project technically achievable? Have the technical barriers been identified and addressed? Is the project likely to overcome those technical barriers? Please comment on the project's strategy for deployment of technologies.
One reviewer indicated that the close cooperation with OEMs should lead to direct deployment, while another stated cost will be an issue for adoption of these technologies.

Question 3: Characterize your understanding of the technical accomplishments and progress toward DOE goals: please state the reasons for your assessment.
The first response asked, what are the key invention and improvements made available from DOE's involvement? This appears to be a necessary piece of the overall program to eliminate idling, and thus should be done, but it appears to be of a lower value when considered as a standalone project. The other respondent added that the impact of this work has not been demonstrated.

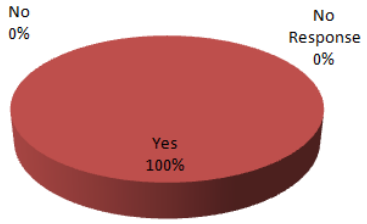
Question 4: What is the likelihood that the project team will move the technologies toward or into the marketplace? Please state the reasons for your selection.
The lone respondent stated that there is strong OEM involvement, adding that later fleet demonstrations may be useful.

Question 5: How sufficient are the resources for the project to achieve the stated milestones in a timely fashion?
There were no responses to this prompt.

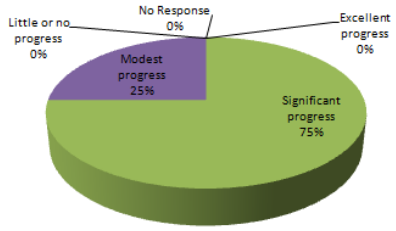
Question 6: Summary rating: when scoring this project, consider the relevance of the work to DOE's objectives, potential impacts on DOE/VT goals, project accomplishments, likelihood of technology transfer, and sufficiency of project resources.
There were no expository comments for this question: refer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

Project: Cool Cab Truck Thermal Load Reduction

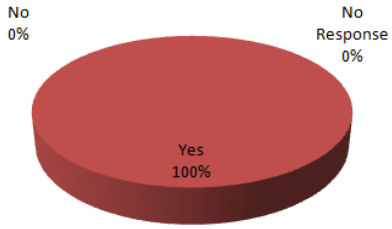
Question 1: Does this project support the overall DOE objectives of petroleum displacement?



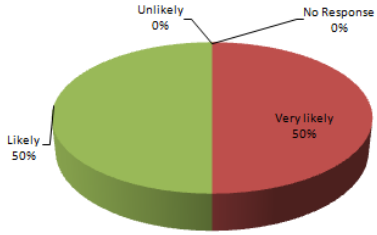
Question 3: Characterize the technical accomplishments and progress toward goals.



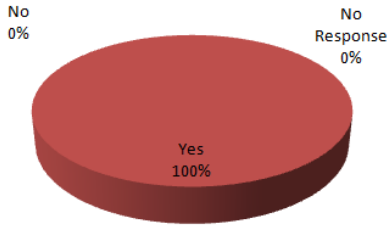
Question 2a: Are the goals of the project technically achievable?



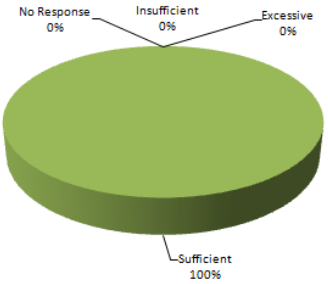
Question 4: How likely is the project team to move technologies into the marketplace?



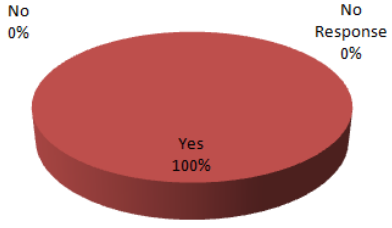
Question 2b: Have the technical barriers been identified and addressed?



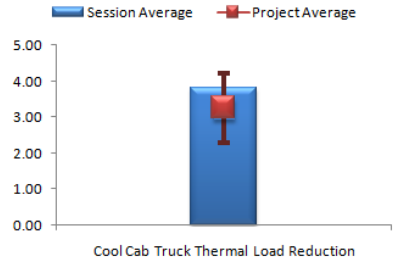
Question 5: Characterize the resources available for this project to achieve the stated milestones in a timely fashion.



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



Question 6: Overall Rating



Emissions Aftertreatment and Engine Cold-Starting Modeling (Stuart Daw, of Oak Ridge National Laboratory)

Reviewer Sample Size

This project had a total of 5 reviewers.

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

One reviewer stated that the emissions improvement controls and technologies enable fuel improvement technologies, allowing displacement of petroleum. Similarly, one person stated that this work addresses a significant issue in the technologies needed to reduce petroleum consumption. A reviewer noted that this program does not directly reduce petroleum consumption; however, it does model the potential emissions produced by advanced technology. This is necessary to ensure that the advanced technologies do not cause a dramatic increase or any increase in emissions. One final reviewer indicated that this aspect was not discussed in presentation. However, he or she assumes that emissions restrictions can limit achievable fuel reductions. Modeling emissions and fuel economy of engines thus would have a direct connection to petroleum displacement.

Question 2: Are the goals of the project technically achievable? Have the technical barriers been identified and addressed? Is the project likely to overcome those technical barriers? Please comment on the project's strategy for deployment of technologies.

One reviewer stated that interactions with OEMs and engine manufacturers aren't clear. The deployment route wasn't made clear either, but the reviewer supposes that it will mainly occur through the publication of results. This project appears aimed more at identifying technical barriers so that others can overcome them. The other respondent noted that, comparing the model to testing, they seemed to correlate well, but it is unclear if the models will translate as use patterns are changed.

Question 3: Characterize your understanding of the technical accomplishments and progress toward DOE goals: please state the reasons for your assessment.

The first respondent said that the program has provided ethanol, diesel, and thermoelectric models for PSAT integration. Another reviewer commented that transient emissions modeling has been historically very difficult. A robust study should continue, since the single model-to-test comparison has shown good progress. One final response stated that this group appears to have generated lots of data with modest funding. This reviewer asks if the engine maps, which are generated from data obtained from existing vehicles, are sensitive to proprietary OEM control algorithms. Are the engine models sufficiently robust to accommodate control strategy variations? Is this making public data that OEMs already have, or is this generating data that OEMs wish to have?

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

One person remarked that the results could be of value to government and industry to understand the influence of advanced technologies on emissions. Another person stated that this will move better measurement technologies and data into the public realm, but it is unlikely, in and of itself, to bring commercial technologies to the marketplace. One final reviewer indicated that there is a desire for lean burn, gasoline direct injection, diesel, etc. technologies to reduce fuel use, and improving emissions technologies will enable wider use of these innovations. If possible, this reviewer would like to see a tradeoff of what emissions constituents are worth relative to each other – i.e., what is the customer value of CO_2 vs. NOx in grams per mile?

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

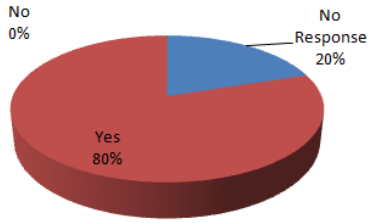
One reviewer stated that the program appears to generate lots of results with modest funding. Another added that ORNL and ANL are working well together. One reviewer commented that this program has provided emission models and maps for PSAT, along with developing diesel and thermoelectric models in a timely manner.

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

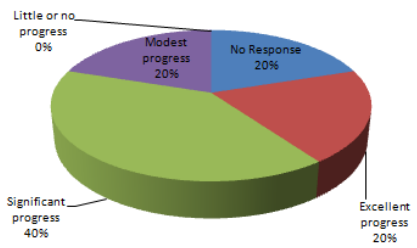
There were no expository comments for this question: refer to the graphic on the next page for this project's summary score.

Project: Emissions Aftertreatment and Engine Cold-Starting Modeling

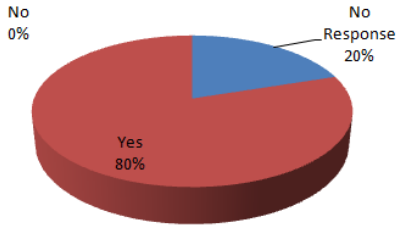
Question 1: Does this project support the overall DOE objectives of petroleum displacement?



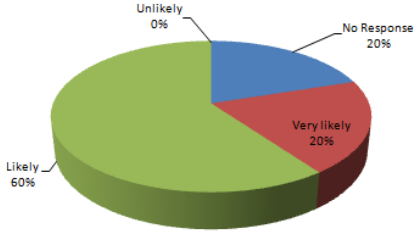
Question 3: Characterize the technical accomplishments and progress toward goals.



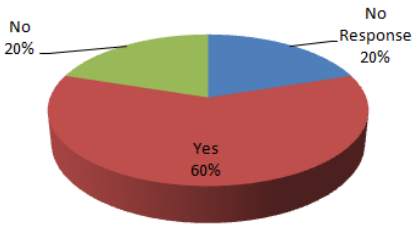
Question 2a: Are the goals of the project technically achievable?



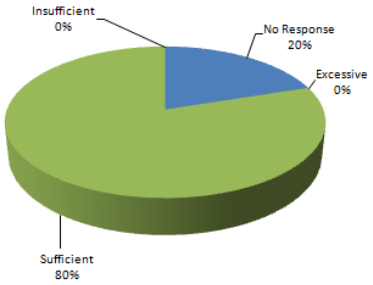
Question 4: How likely is the project team to move technologies into the marketplace?



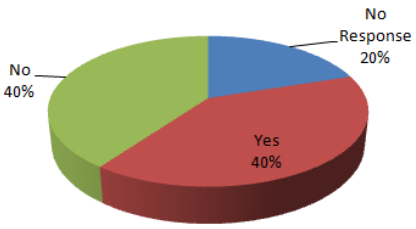
Question 2b: Have the technical barriers been identified and addressed?



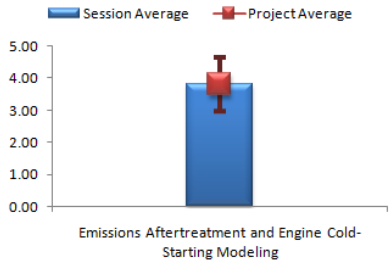
Question 5: Characterize the resources available for this project to achieve the stated milestones in a timely fashion.



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



Question 6: Overall Rating



Erosion of Advanced Radiator Materials (Dileep Singh, of Argonne National Laboratory)

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

Question 1: Does this activity support the overall DOE objectives of petroleum displacement? Why or why not?
One reviewer commented that nanofluids are being investigated for improved cooling systems, and the objective of this project is to understand the impact of nanofluids on cooling system components. Another person stated that this is nice supporting work to the project Nano Fluids for Thermal Control Applications – 16822.

One response stated that there was an optimistic estimate of potential reduction, while another said that work on nanofluids has no relevance toward petroleum displacement.

Question 2: Are the goals of the project technically achievable? Have the technical barriers been identified and addressed? Is the project likely to overcome those technical barriers? Please comment on the project's strategy for deployment of technologies.
The first respondent stated that determining the effects of nanofluids on radiators is important to any commercialization of nanofluids and technically achievable. There are no significant barriers to achieving those goals. However, there are significant issues involving commercialization of nanofluids which are not being addressed by this effort.

Another reviewer noted that test data showing no additional wear, while one other person indicated that this is testing to evaluate the impact of nanofluids, but without any plan to solve the issue of erosion.

Question 3: Characterize your understanding of the technical accomplishments and progress toward DOE goals: please state the reasons for your assessment.
One reviewer commented that the researchers have identified component deteriorations caused by the nanofluids. Another response stated that the testing is looking to be on track and the simulation shows benefits.

One reviewer said that the preliminary data shows no erosion using the SiC nanofluids. However, this reviewer adds that they should have focused on more relevant materials (AlO, CuO) for their preliminary results. Particle sizes were not mentioned, and the feasibility of nanofluids was not established.

Question 4: What is the likelihood that the project team will move the technologies toward or into the marketplace? Please state the reasons for your selection.
One person commented that reducing cooling system size requirements has many advantages, while another reviewer stated that the testing may help a company to commercialize their own products. One response noted that they established collaboration with commercial nanofluids companies, as well as with manufacturers of tires.

One person wrote that nanofluids have no commercial potential.

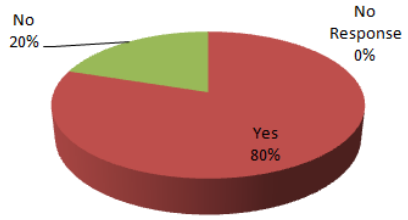
Question 5: How sufficient are the resources for the project to achieve the stated milestones in a timely fashion?
One person suggested that companies that can benefit from this work should help fund it. The other respondent indicated that DOE should not be investing in nanofluids for enhanced heat transfer.

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

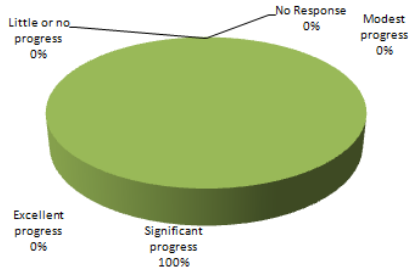
There were no expository comments for this question: refer to the graphic on the next page for this project's summary score.

Project: Erosion of Advanced Radiator Materials

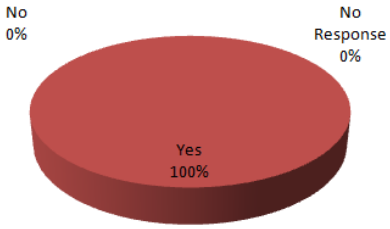
Question 1: Does this project support the overall DOE objectives of petroleum displacement?



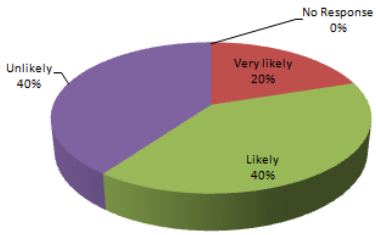
Question 3: Characterize the technical accomplishments and progress toward goals.



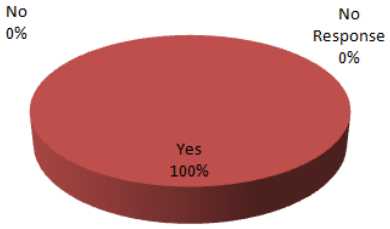
Question 2a: Are the goals of the project technically achievable?



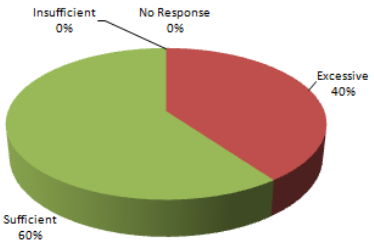
Question 4: How likely is the project team to move technologies into the marketplace?



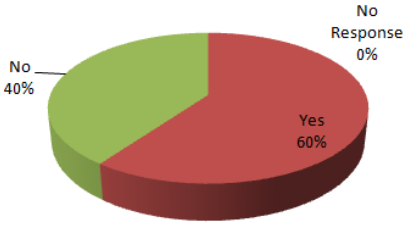
Question 2b: Have the technical barriers been identified and addressed?



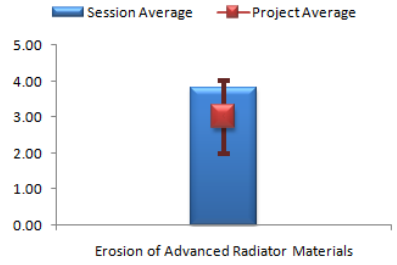
Question 5: Characterize the resources available for this project to achieve the stated milestones in a timely fashion.



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



Question 6: Overall Rating



Friction & Wear (Mike Killian, of Eaton Corporation)

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

Question 1: Does this activity support the overall DOE objectives of petroleum displacement? Why or why not?
The first reviewer stated that the group has achieved a significant reduction in churning losses as well as a reduction in friction due to lube advancements. Another commented that reducing transmission losses has a 1-to-1 impact to reducing/displacing petroleum. One other reviewer noted the 2-4% fuel efficiency increase on heavy truck fuel. One final reviewer stated that there will be a small but important level of fuel consumption reduction that adds up over many vehicles over time.

Question 2: Are the goals of the project technically achievable? Have the technical barriers been identified and addressed? Is the project likely to overcome those technical barriers? Please comment on the project's strategy for deployment of technologies.
One person commented that the project seems logical and appears to have a rapid payback if fleets can be convinced. Another remarked that the testing looks extensive and purposeful. Small changes in efficiency can translate into large savings in this class of vehicles, and the $1,200-2,400 per year savings can drive rapid changes. One other reviewer indicated that the initial claim states that there is no impact on durability, but this must be proven.

Question 3: Characterize your understanding of the technical accomplishments and progress toward DOE goals: please state the reasons for your assessment.
One reviewer stated that three of four research areas are meeting or exceeding targets, and the industrial partners have a clear path to commercialization. The other respondent noted that the data looks extensive, and savings can be realized. This reviewer added that it will be interesting to see how the savings will change if translated to the 12,000-15,000 miles/year driven in passenger cars or light-duty trucks.

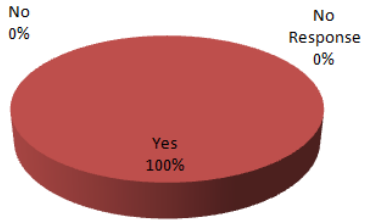
Question 4: What is the likelihood that the project team will move the technologies toward or into the marketplace? Please state the reasons for your selection.
The first reviewer stated that Eaton and Car are pulling, while another respondent stated that part of this project seems like commercial development rather than research. One other reviewer indicated that the $1,200 to $2,400 per year savings can drive rapid changes.

Question 5: How sufficient are the resources for the project to achieve the stated milestones in a timely fashion?
There were no responses to this prompt.

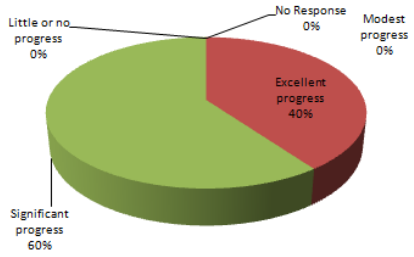
Question 6: Summary rating: when scoring this project, consider the relevance of the work to DOE's objectives, potential impacts on DOE/VT goals, project accomplishments, likelihood of technology transfer, and sufficiency of project resources.
There were no expository comments for this question: refer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

Project: Friction & Wear

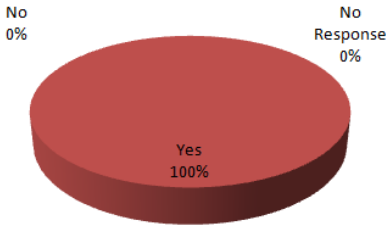
Question 1: Does this project support the overall DOE objectives of petroleum displacement?



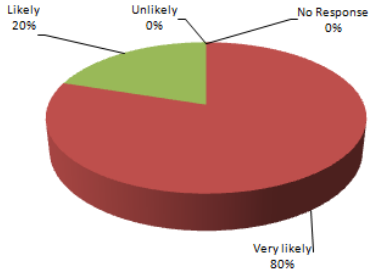
Question 3: Characterize the technical accomplishments and progress toward goals.



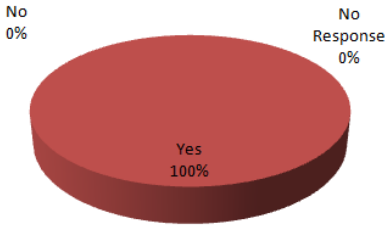
Question 2a: Are the goals of the project technically achievable?



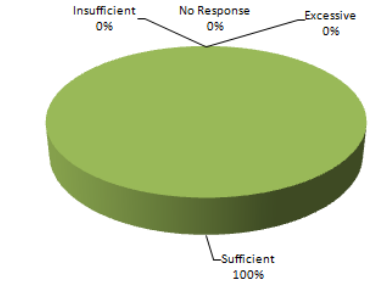
Question 4: How likely is the project team to move technologies into the marketplace?



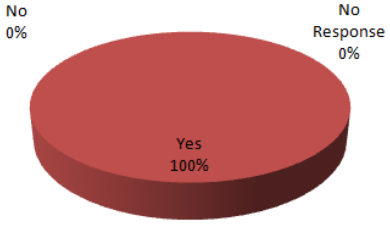
Question 2b: Have the technical barriers been identified and addressed?



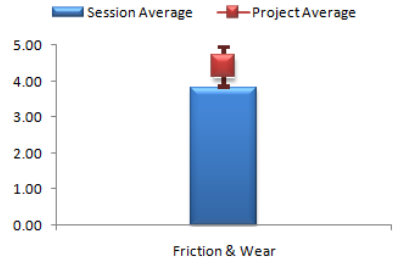
Question 5: Characterize the resources available for this project to achieve the stated milestones in a timely fashion.



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



Question 6: Overall Rating



GM Cooperative Research and Development Agreement (Aymeric Rousseau, of Argonne National Laboratory)

Reviewer Sample Size
This project had a total of 3 reviewers.

Question 1: Does this activity support the overall DOE objectives of petroleum displacement? Why or why not?
There were no responses to this prompt.

Question 2: Are the goals of the project technically achievable? Have the technical barriers been identified and addressed? Is the project likely to overcome those technical barriers? Please comment on the project's strategy for deployment of technologies.
The lone respondent commented on the direct GM involvement, adding that deployment through GM is clear. This reviewer asked if there is a need to commercialize PSAT, or if Argonne can sustain the work for the long term.

Question 3: Characterize your understanding of the technical accomplishments and progress toward DOE goals: please state the reasons for your assessment.
Both respondents commented that the work is just starting. One added that the approach appears to be well thought out. Can Argonne sustain ownership of PSAT, or is it expected that PSAT may become a commercial code supported by a commercial entity?

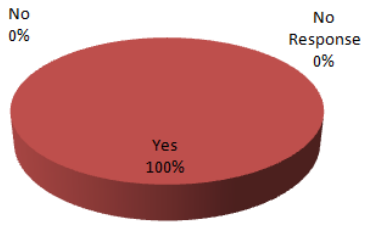
Question 4: What is the likelihood that the project team will move the technologies toward or into the marketplace? Please state the reasons for your selection.
The lone respondent cited direct GM involvement.

Question 5: How sufficient are the resources for the project to achieve the stated milestones in a timely fashion?
The lone respondent asked if more resources should be spent on integration with other industry standard software.

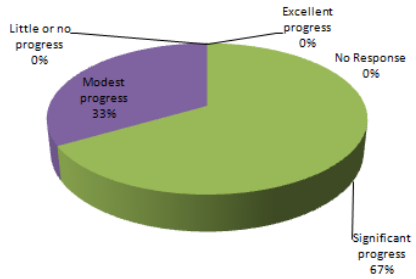
Question 6: Summary rating: when scoring this project, consider the relevance of the work to DOE's objectives, potential impacts on DOE/VT goals, project accomplishments, likelihood of technology transfer, and sufficiency of project resources.
There were no expository comments for this question: refer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

Project: GM Cooperative Research and Development Agreement

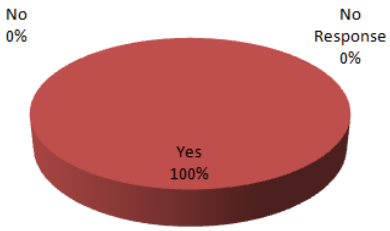
Question 1: Does this project support the overall DOE objectives of petroleum displacement?



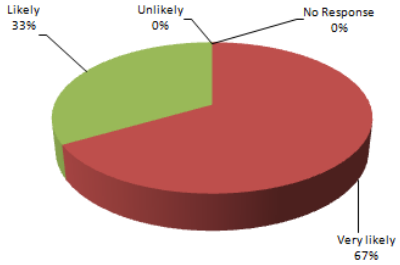
Question 3: Characterize the technical accomplishments and progress toward goals.



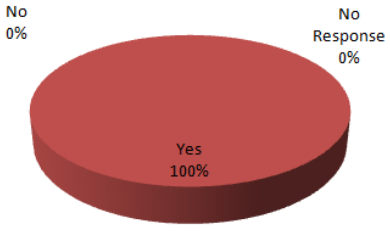
Question 2a: Are the goals of the project technically achievable?



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

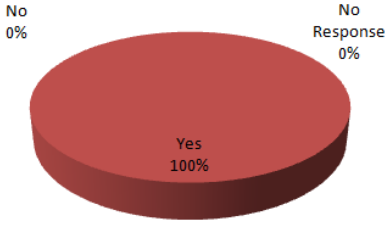


Question 2b: Have the technical barriers been identified and addressed?

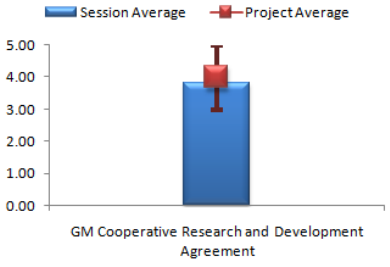


Question 5: Characterize the resources available for this project to achieve the stated milestones in a timely fashion.

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



Question 6: Overall Rating



Government Performance and Results Act and Multipath (Sylvain Pagerit, of Argonne National Laboratory)

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

Question 1: Does this activity support the overall DOE objectives of petroleum displacement? Why or why not?
One reviewer stated that this is a direct goal of the project, while another commented that they are satisfying DOE goals by estimating the impact of technologies. One other person indicated that this is a very high level look at technology potential.

Question 2: Are the goals of the project technically achievable? Have the technical barriers been identified and addressed? Is the project likely to overcome those technical barriers? Please comment on the project's strategy for deployment of technologies.
The lone respondent stated that this is essentially a modeling study that can be easily performed. This reviewer doesn't see any technical barriers.

Question 3: Characterize your understanding of the technical accomplishments and progress toward DOE goals: please state the reasons for your assessment.
The lone respondent stated that the presentation only showed what could be accomplished. This also seems very similar to NREL's T3 project. This touches on more extra-agency models, but looking at the technology and how many barrels of petroleum it can displace is very similar to the T3 project. Considering that this tool is already trying to estimate the marketplace in 2050, is a second method to do this type of forecast really necessary?

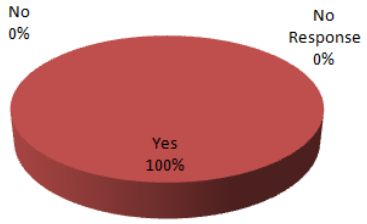
Question 4: What is the likelihood that the project team will move the technologies toward or into the marketplace? Please state the reasons for your selection.
The lone respondent stated that this is more focused to overall potential. This information is more streamlined for DOE use than for OEM use.

Question 5: How sufficient are the resources for the project to achieve the stated milestones in a timely fashion?
One reviewer stated that this seems to be a large effort cross-connecting with other models, but it seems to be properly staffed considering. Another individual suggested that the level of funding potentially seems high for this level of work.

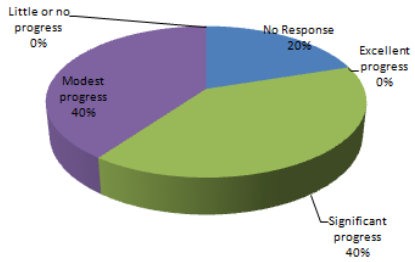
Question 6: Summary rating: when scoring this project, consider the relevance of the work to DOE's objectives, potential impacts on DOE/VT goals, project accomplishments, likelihood of technology transfer, and sufficiency of project resources.
There were no expository comments for this question: refer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

Project: Government Performance and Results Act and Multipath

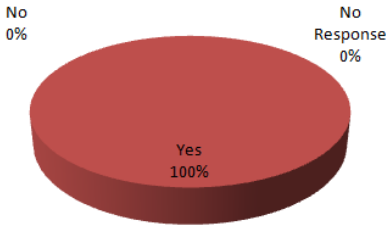
Question 1: Does this project support the overall DOE objectives of petroleum displacement?



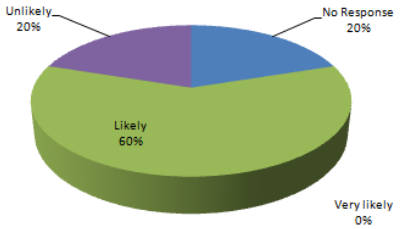
Question 3: Characterize the technical accomplishments and progress toward goals.



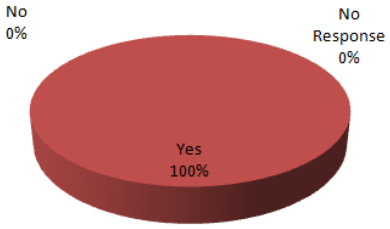
Question 2a: Are the goals of the project technically achievable?



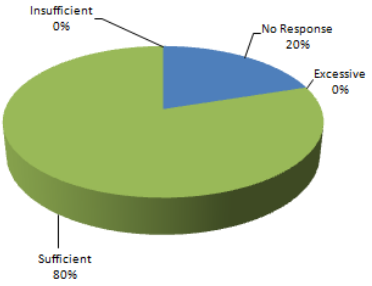
Question 4: How likely is the project team to move technologies into the marketplace?



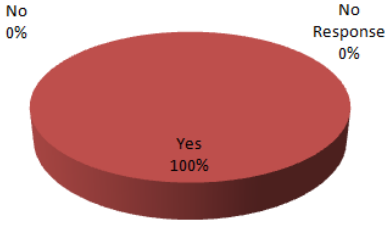
Question 2b: Have the technical barriers been identified and addressed?



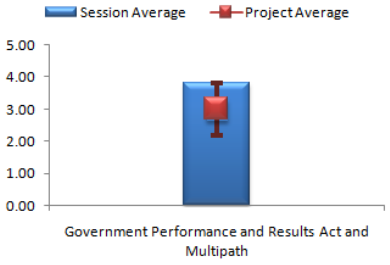
Question 5: Characterize the resources available for this project to achieve the stated milestones in a timely fashion.



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



Question 6: Overall Rating



Hardware-in-the-Loop Mobile Advanced Technology Testbed (Henning Lohse-Busch, of Argonne National Laboratory)

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

Question 1: Does this activity support the overall DOE objectives of petroleum displacement? Why or why not?
One reviewer indicated that this work validates and supports modeling efforts along with component testing. Another person stated that this aspect was not discussed in the presentation, but his reviewer assumes that this allows a measurement of components and linkage to modeling, and establishes the basis for other programs to obtain direct fuel savings. One respondent stated that DOE components generated from other technology team funding are to be benchmarked and tested through an HIL process at the labs, adding that this is one of those tools.

Question 2: Are the goals of the project technically achievable? Have the technical barriers been identified and addressed? Is the project likely to overcome those technical barriers? Please comment on the project's strategy for deployment of technologies.
The first reviewer commented that this project is obtaining basic research data and assumes that deployment will occur via publication of results. This wasn't clear from the presentation, and the technology deployment route wasn't discussed except for indirectly in linkages to other projects' slides. One other reviewer stated that ANL has shown that the system is functioning, but they are awaiting DOE projects to test components from the FreedomCAR portfolio.

Question 3: Characterize your understanding of the technical accomplishments and progress toward DOE goals: please state the reasons for your assessment.
One person stated that this program has shown some significant progress this year. They have overcome setup issues and have applied the system to support model validation and PHEV test procedures.

Another reviewer indicated that this is a strong program to develop a research tool that appears to be an essential part of future progress. That said, it isn't clear how this tool will result in innovations but it will certainly allow better testing and development of individual components in a more rapid and scientific manner than if all is done on actual vehicles. A final reviewer stated that they have not seen a timing plan regarding when components will be available for testing.

Question 4: What is the likelihood that the project team will move the technologies toward or into the marketplace? Please state the reasons for your selection.
A reviewer commented that the results from this project will likely transfer into test procedures and/or product development for industry and government agencies, while one other reviewer added that the data will be used to change designs or show that technology is ready to be incorporated in an OEM product. One final reviewer noted that this is a basic research and tool development project. It will accelerate the progress of other projects but, in and of itself, it will do little to bring these technologies to market.

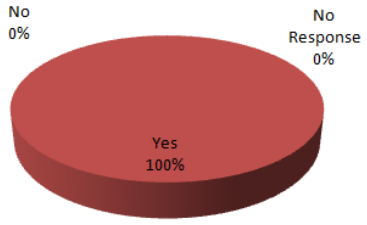
Question 5: How sufficient are the resources for the project to achieve the stated milestones in a timely fashion?
One individual stated that the project appears to be making good progress with the existing level of funding. Another added that the system is up and running, and a tweaking of these systems appears to be occurring at the proper pace.

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

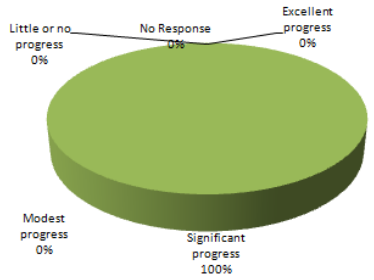
There were no expository comments for this question: refer to the graphic on the next page for this project's summary score.

Project: Hardware-in-the-Loop Mobile Advanced Technology Testbed

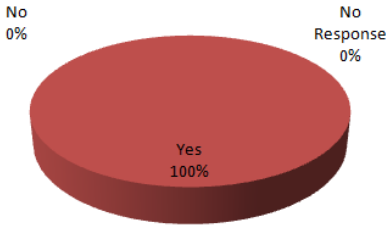
Question 1: Does this project support the overall DOE objectives of petroleum displacement?



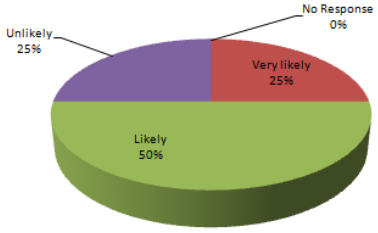
Question 3: Characterize the technical accomplishments and progress toward goals.



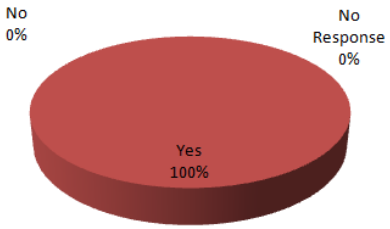
Question 2a: Are the goals of the project technically achievable?



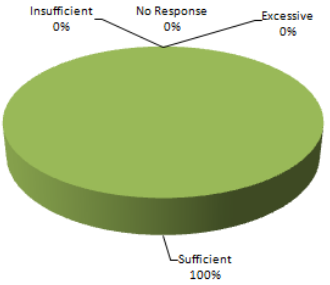
Question 4: How likely is the project team to move technologies into the marketplace?



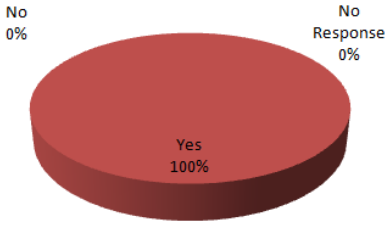
Question 2b: Have the technical barriers been identified and addressed?



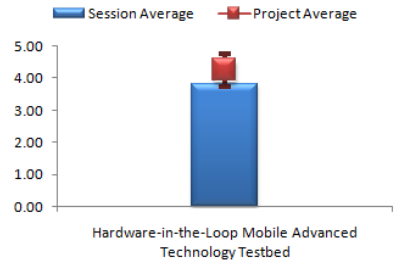
Question 5: Characterize the resources available for this project to achieve the stated milestones in a timely fashion.



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



Question 6: Overall Rating



HEV Cold Temperature Impact Testing (Barney Carlson, of Argonne National Laboratory)

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

Question 1: Does this activity support the overall DOE objectives of petroleum displacement? Why or why not?
One reviewer stated that this study is crucial to understanding the effects of cold ambient temperatures on fuel consumption. Another person noted that this aspect was not discussed in presentation, but yes, this project does give direct displacement of petroleum.

One final reviewer noted that the study is quantifying what additional fuel might be saved by using advanced warm-up components or strategies.

Question 2: Are the goals of the project technically achievable? Have the technical barriers been identified and addressed? Is the project likely to overcome those technical barriers? Please comment on the project's strategy for deployment of technologies.
The first response indicated that the project appears to be at the stage of collecting data and developing an early understanding of this data. Routes to deployment weren't made clear, but they don't appear necessary at this stage of the work. Likewise, the strategy appears to be an identification of technical barriers to set the stage for others to overcome them. Thus, this project alone should provide insight into testing techniques and technical barriers of cold weather use of hybrids, but it doesn't appear capable of developing routes to overcome the barriers in and of itself.

The other respondent stated there needs to be some comparison to conventional vehicles, and how much they lose at cold temperatures. Also, the adjustments for the label currently address what customers are seeing in-use for fuel economy across ambient temperatures. It probably needs to be pointed out that additional testing for labels is not needed.

Question 3: Characterize your understanding of the technical accomplishments and progress toward DOE goals: please state the reasons for your assessment.
One person stated that this project is a very important issue for HEVs. Another individual commented that the group performed cold weather testing in ambient conditions, adding that the next step is to utilize a controlled climatic test cell to provide consistent results. One reviewer said that this is a good collection of data and a beginning of understanding this data. Solutions to overcome difficulties posed by low temperatures haven't yet been developed. Thus, this project has served to measure and make clear the technical barriers, but eventual solutions aren't yet clear.

One final reviewer stated that they need more comparison testing to conventional systems. This reviewer would also like to see the breakdown in added fuel due to lost regeneration, lost autostop, and the rest (which would presumably be driveline warm-up and what is lost to ambient temperatures, from higher temperature differences).

Question 4: What is the likelihood that the project team will move the technologies toward or into the marketplace? Please state the reasons for your selection.
The first reviewer commented that the results from this test will be valuable to industry for the development of components and systems. Another noted that rapid warm-up is being addressed by several manufacturers. Knowing how much can be gained by building fuel economy robustness across ambient temperatures will help set priorities for the project.

One reviewer indicated that this is a measurement project, such that it is not yet at a stage of developing solutions. The technology to transfer appears to be the measurement methods and the understanding of technical barriers. Does a market and business case analysis need to be associated with this project? For example, is leaving the car plugged in overnight and keeping the battery heated feasible? Block heaters are now common in the northern US and Canada where many people plug their car in on winter nights – why not do this for EVs?

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

One reviewer stated that sufficient progress has been achieved and future testing has been scheduled. Depending upon the results, this program may demand more resources. Similarly, another reviewer recommends increasing funding and coupling the current project scope to market and business case analyses, adding that this area may discover a major barrier to implementation.

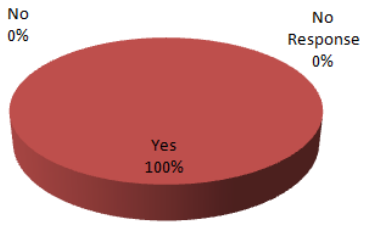
One final response notes that ANL seems to have vehicle availability, and the timing is appropriate for the level of staffing.

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

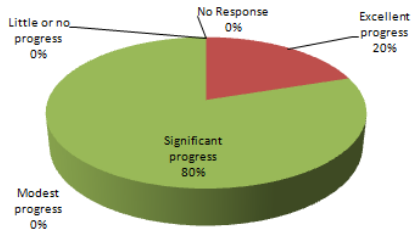
There were no expository comments for this question: refer to the graphic on the next page for this project's summary score.

Project: HEV Cold Temperature Impact Testing

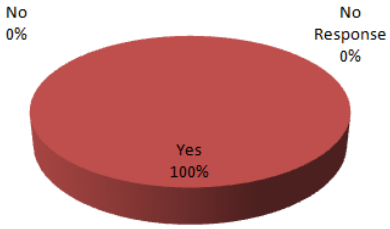
Question 1: Does this project support the overall DOE objectives of petroleum displacement?



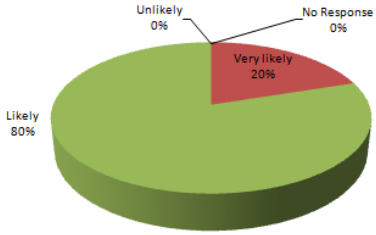
Question 3: Characterize the technical accomplishments and progress toward goals.



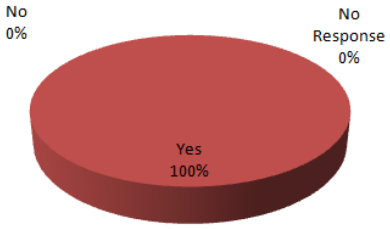
Question 2a: Are the goals of the project technically achievable?



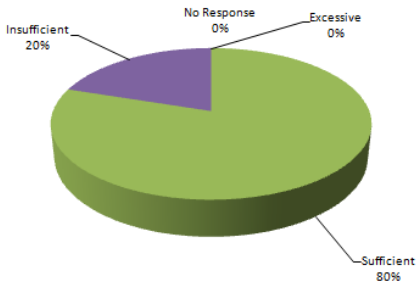
Question 4: How likely is the project team to move technologies into the marketplace?



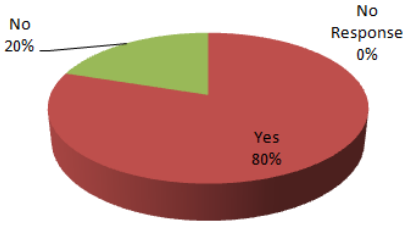
Question 2b: Have the technical barriers been identified and addressed?



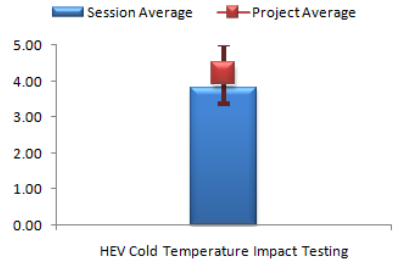
Question 5: Characterize the resources available for this project to achieve the stated milestones in a timely fashion.



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



Question 6: Overall Rating



Medium-Duty/Heavy-Duty Advanced Technology Evaluations (Kevin Walcowicz, of National Renewable Energy Laboratory)

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

Question 1: Does this activity support the overall DOE objectives of petroleum displacement? Why or why not?
One person noted that this is specifically a study of reducing fuel usage. The reviewer added that mid-range trucks use less fuel than passenger cars or heavy trucks, but they still represent a large category. The tasks have a good alignment to DOE's mission. Another reviewer stated that reducing fuel consumption via hybridization is a popular method of displacing petroleum. This is a nice supporting project on the heavy vehicle side to INL's Non-PHEV Evaluations and Data Collection 13342 and 13271.

Question 2: Are the goals of the project technically achievable? Have the technical barriers been identified and addressed? Is the project likely to overcome those technical barriers? Please comment on the project's strategy for deployment of technologies.
The first reviewer stated that the project provides useful data output, while another wrote that the project is studying largely deployed technologies to encourage further deployment on a large scale. This reviewer adds that there are strong links to fleets and manufacturers. The demonstration approach appears successful to encourage widespread usage. Users in this category are often weak about adopting fuel saving technologies. This reviewer asks whether this study should demonstrate the value of hybrids compared to other available technologies. Is an improved adoption strategy needed?

One final reviewer commented that this is a data collection project and does not have any difficult technical barriers.

Question 3: Characterize your understanding of the technical accomplishments and progress toward DOE goals: please state the reasons for your assessment.
One person commented on the large amount of data to sort through, adding that it provided a nice look at many factors in driving hybrid vehicles. The other respondent stated that the comparison of old and new technologies in existing vehicles clearly demonstrates strengths and weaknesses of these technologies. This reviewer asks, is there an adequate dissemination and publication of results for fleets to be fully aware of technology benefits? For example, will this group coordinate with the EPA SmartWay program to help extend SmartWay to this sector of trucks?

Question 4: What is the likelihood that the project team will move the technologies toward or into the marketplace? Please state the reasons for your selection.
The first reviewer pointed to the published data, while another person stated that learning from this data can drive changes to future product. One other response noted that the group is working with largely deployed technologies and with OEMs. Should there be more work with more fleets? Are UPS and Fed-Ex fleets enough to convince a large portion of the market to adopt these technologies?

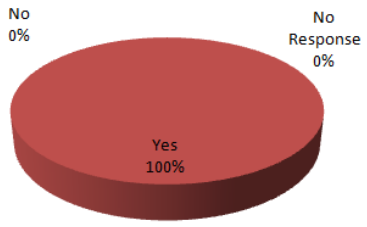
Question 5: How sufficient are the resources for the project to achieve the stated milestones in a timely fashion?
One reviewer asked, are resources sufficient to encourage adoption by smaller fleets and individual owners? Are resources sufficient to bring OEMs on board? The other person to respond stated that the number of vehicles looks good and manpower is adequate.

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

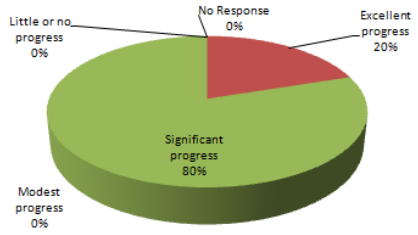
There were no expository comments for this question: refer to the graphic on the next page for this project's summary score.

Project: Medium-Duty/Heavy-Duty Advanced Technology Evaluations

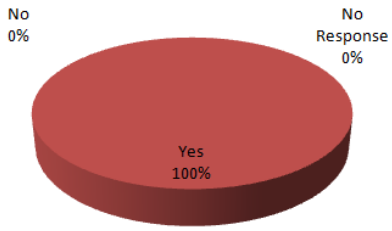
Question 1: Does this project support the overall DOE objectives of petroleum displacement?



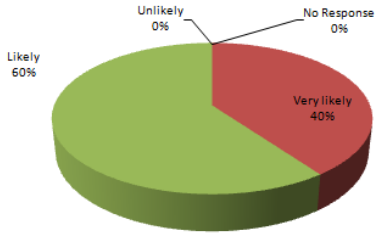
Question 3: Characterize the technical accomplishments and progress toward goals.



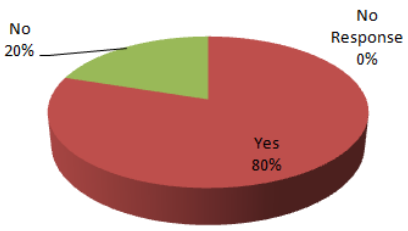
Question 2a: Are the goals of the project technically achievable?



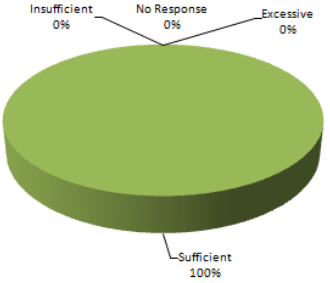
Question 4: How likely is the project team to move technologies into the marketplace?



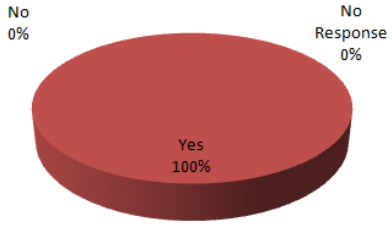
Question 2b: Have the technical barriers been identified and addressed?



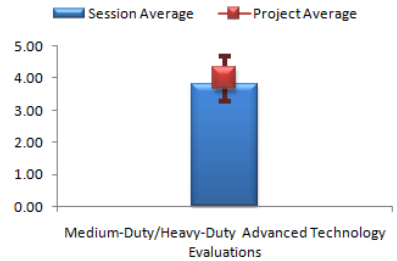
Question 5: Characterize the resources available for this project to achieve the stated milestones in a timely fashion.



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



Question 6: Overall Rating



Nano Fluids for Thermal Control Applications (Wen Yu, of Argonne National Laboratory)

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

Question 1: Does this activity support the overall DOE objectives of petroleum displacement? Why or why not?
One reviewer stated that reducing engine losses has a 1-to-1 impact on reducing/displacing petroleum use. Another person commented that this would improve heat transfer, thereby reducing radiator size and aerodynamic drag, and also reducing coolant pump losses.

One other reviewer felt that the potential is relatively small, and was not quantified. This needs to be addressed in the future. One final reviewer commented that the work on nanofluids has no relevance toward petroleum displacement.

Question 2: Are the goals of the project technically achievable? Have the technical barriers been identified and addressed? Is the project likely to overcome those technical barriers? Please comment on the project's strategy for deployment of technologies.
The first reviewer stated that this seems to be the proper class of vehicle to take this on. It looks applicable to HV motor and battery cooling as well, and might be an interesting next step. Some of the reductions in cooling needs could lead to a secondary advantage of reducing aerodynamic loads due to ram air cooling requirements. Another person stated that this work seems like it should be done in cooperation with a company that wants to develop and commercialize these fluids, with help in specialized measurements and facilities from ANL.

One reviewer indicated that the objective of increasing convective heat transfer using colloidal suspensions of nanofluids is not realistic, so the goals of the project are not achievable. Technical barriers associated with particle aggregation and depositions on surfaces have not been properly addressed.

Question 3: Characterize your understanding of the technical accomplishments and progress toward DOE goals: please state the reasons for your assessment.
The first reviewer said that testing is looking to be on track and the simulation shows benefits. Another individual commented that the flowmaster simulations have been described, but the results are not quantitative.

To contrast, one final reviewer stated that enhancements in thermal conductivity using nanofluids reported at ANL have been discounted by most other researchers who have founded agglomeration of particles using similar materials. No data on convective heat transfer or viscosity was presented. The reviewer added that the hot wire technique is known to produce anomalous results.

Question 4: What is the likelihood that the project team will move the technologies toward or into the marketplace? Please state the reasons for your selection.
The first reviewer noted that the group is presently working with commercial nanofluids and working with Michelin Tire for an application of nanofluids. Another person added that reducing the cooling system size requirements has many advantages.

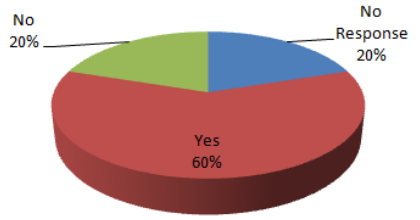
One reviewer stated that nanofluids have no commercial potential.

Question 5: How sufficient are the resources for the project to achieve the stated milestones in a timely fashion?
One reviewer commented that this type of work should be partially funded by a commercial company interested in making a product. The other respondent wrote that DOE should not be investing in nanofluids for enhanced heat transfer.

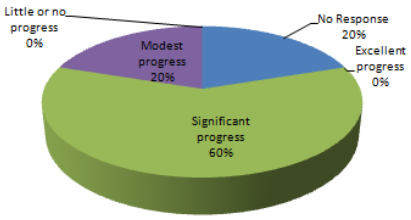
Question 6: Summary rating: when scoring this project, consider the relevance of the work to DOE's objectives, potential impacts on DOE/VT goals, project accomplishments, likelihood of technology transfer, and sufficiency of project resources.
There were no expository comments for this question: refer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

Project: Nano Fluids for Thermal Control Applications

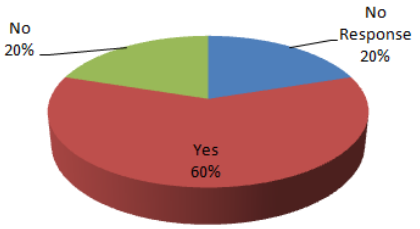
Question 1: Does this project support the overall DOE objectives of petroleum displacement?



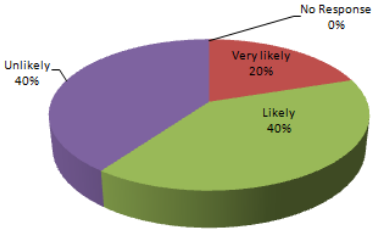
Question 3: Characterize the technical accomplishments and progress toward goals.



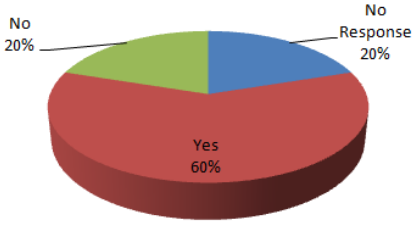
Question 2a: Are the goals of the project technically achievable?



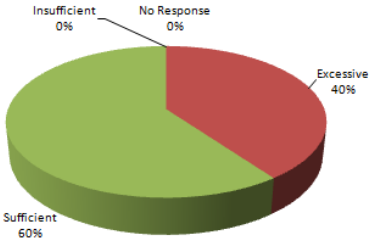
Question 4: How likely is the project team to move technologies into the marketplace?



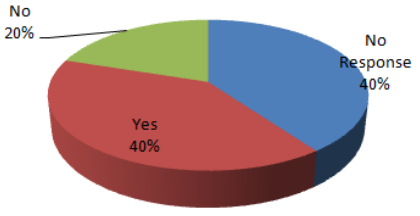
Question 2b: Have the technical barriers been identified and addressed?



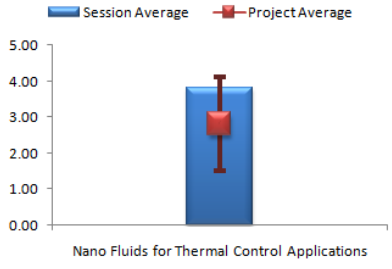
Question 5: Characterize the resources available for this project to achieve the stated milestones in a timely fashion.



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



Question 6: Overall Rating



Non-PHEV Evaluations and Data Collection (Jim Francfort, of Idaho National Laboratory)

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

Question 1: Does this activity support the overall DOE objectives of petroleum displacement? Why or why not?
One reviewer stated that this is a direct study of petroleum replacement by alternative energy vehicles. A second reviewer added that they are testing present vehicle technologies, which provides guidance for the further direction of component programs. Another person commented that reducing fuel consumption via hybridization is a popular method of displacing petroleum.

Question 2: Are the goals of the project technically achievable? Have the technical barriers been identified and addressed? Is the project likely to overcome those technical barriers? Please comment on the project's strategy for deployment of technologies.
The first reviewer stated that the group works with commercial and R&D companies to analyze the viability of commercialization. Another response stated that they are testing commercial or near-commercial vehicles. The group is studying deployed technologies, and this data should encourage further development and sales of these vehicles.

One reviewer commented that this is a data collection project and does not have any difficult technical barriers.

Question 3: Characterize your understanding of the technical accomplishments and progress toward DOE goals: please state the reasons for your assessment.
One person stated that the program gives a clear demonstration of the value of deployed technologies. Another reviewer commented that there is a large amount of data to sort through, providing a nice look at many factors in driving hybrid vehicles. One other reviewer commented that this is not a RD&E program. However, the program does provide data to private and public organizations to determine the direction and viability of HEV technologies.

Question 4: What is the likelihood that the project team will move the technologies toward or into the marketplace? Please state the reasons for your selection.
The first respondent indicated that there is good interaction with industry and states, while another person added that the project works directly with OEMs and third party companies that have technologies available for sale. The data collected can be utilized to improve these technologies. One reviewer noted that this project is studying deployed technologies and encouraging their widespread adoption. One final response, similarly, suggested that the information from data can drive changes to future products.

Question 5: How sufficient are the resources for the project to achieve the stated milestones in a timely fashion?
One person commented that new technologies are tested within an acceptable time to provide feedback for technology improvements. Another stated that the number of vehicles looks good and manpower is adequate.

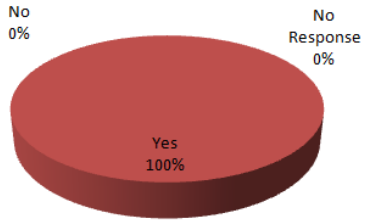
One final respondent suggested that it would be nice to see larger-scale testing of fuel cell hydrogen vehicles. This reviewer asks: will NEV vehicle use grow to be an important segment? Is studying this segment the best use of DOE resources compared to doing increased studies of passenger car / highway hybrid vehicles?

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

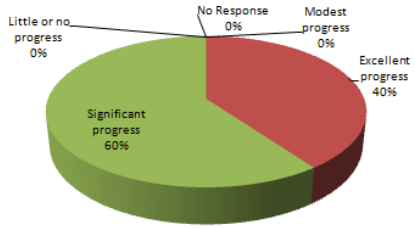
There were no expository comments for this question: refer to the graphic on the next page for this project's summary score.

Project: Non-PHEV Evaluations and Data Collection

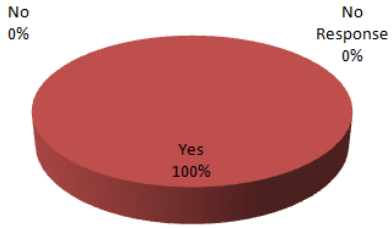
Question 1: Does this project support the overall DOE objectives of petroleum displacement?



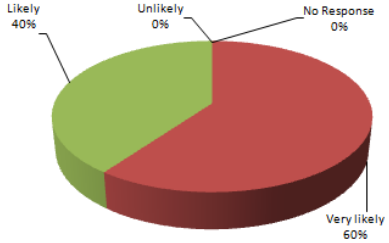
Question 3: Characterize the technical accomplishments and progress toward goals.



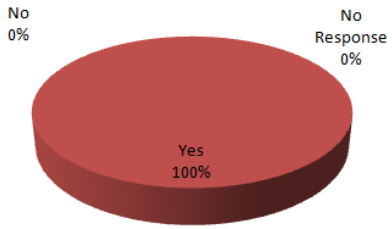
Question 2a: Are the goals of the project technically achievable?



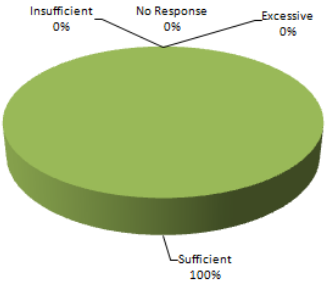
Question 4: How likely is the project team to move technologies into the marketplace?



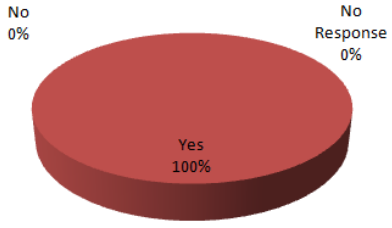
Question 2b: Have the technical barriers been identified and addressed?



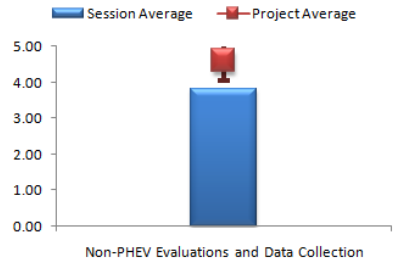
Question 5: Characterize the resources available for this project to achieve the stated milestones in a timely fashion.



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



Question 6: Overall Rating



Nucleated Boiling Wen (Yu, of Argonne National Laboratory)

Reviewer Sample Size
This project had a total of 6 reviewers.

Question 1: Does this activity support the overall DOE objectives of petroleum displacement? Why or why not?
One reviewer stated that reducing the size and weight of radiators has a clear link to reduced use of fuel, while another commented that reducing engine losses has a 1-to-1 impact on reducing/displacing petroleum. One reviewer also commented on the reduction in coolant system and aerodynamic drag.

Another person stated that the work on pool boiling to decrease cooling system weight is relevant to DOE objectives. However, this reviewer adds that it seems impractical. One other reviewer wrote that the justification for the estimates given in the summary are not justified from a vehicle system's level.

Question 2: Are the goals of the project technically achievable? Have the technical barriers been identified and addressed? Is the project likely to overcome those technical barriers? Please comment on the project's strategy for deployment of technologies.
The first response stated that this seems to be the proper class of vehicle to take this on, but it could be applicable to light-duty vehicles as well.

Another reviewer noted that the technical barriers were identified; however, no description was given for overcoming these barriers. The group needs to investigate transient conditions. How will a higher pressure cooling system affect component requirements? Similarly, one person commented that the range of the transient regime of engine radiator operation in the field hasn't been identified. It isn't clear if this application of nucleated boiling can be applied in actual vehicles. This is a good study and should continue, but a later stage should examine if commercial application is actually possible.

Another individual noted that the team's experience with boiling heat transfer applied to an on-road vehicle system/engine is relatively low. One final reviewer stated that the goals of the project to characterize pool boiling heat transfer is certainly achievable and has been done been may others. However, the technical barriers to implementing this technology to cool engines in heavy vehicles are significant and are not being addressed by this program. Boiling heat transfer using water/ethylene glycol has a number of problems, such as viscosity and pressure increases.

Question 3: Characterize your understanding of the technical accomplishments and progress toward DOE goals: please state the reasons for your assessment.
Results were generally positive in this section. One reviewer stated that there has been good experimental progress. Is there previous literature and experiments available? One other person stated that the testing is looking to be on track and the simulation shows benefits. Another commented that the project has successfully measured pool boiling heat transfer and their results fit well to well-established correlations. They have modified this correlation to account for the composition of mixed fluid systems. These are low technical barriers, but they have been accomplished.

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

One reviewer stated that reducing cooling system size requirements has many advantages, while another person stated that the work has yet to demonstrate that this technique could be applied to cooling in a vehicle with transient loads.

One response stated that this may cause changes in other coolant components that may not be accepted by industry. Similarly, another reviewer indicated that there will be strong industry reluctance to change mechanism of radiator operation. Nevertheless, strong experimental results may overcome this reluctance. One final person responded that it seems unlikely that this has commercial potential, given the barriers described above.

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

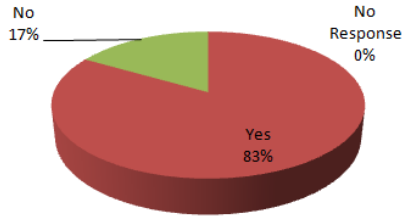
The lone respondent stated that DOE should not be investing in boiling heat transfer in the engine block due to the hurdles in commercializing this concept.

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

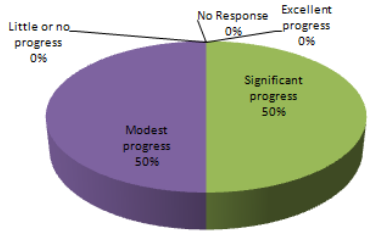
There were no expository comments for this question: refer to the graphic on the next page for this project's summary score.

Project: Nucleated Boiling

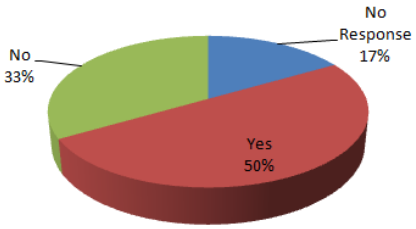
Question 1: Does this project support the overall DOE objectives of petroleum displacement?



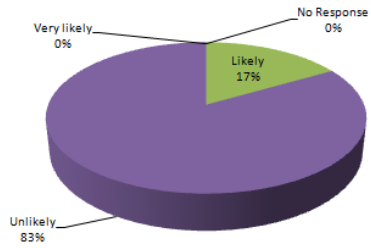
Question 3: Characterize the technical accomplishments and progress toward goals.



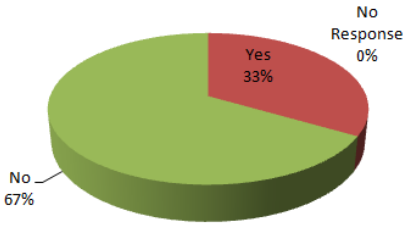
Question 2a: Are the goals of the project technically achievable?



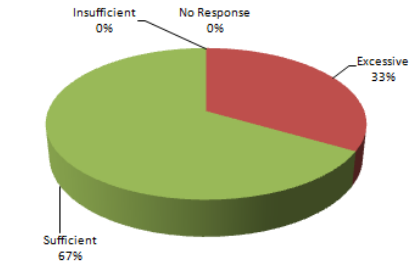
Question 4: How likely is the project team to move technologies into the marketplace?



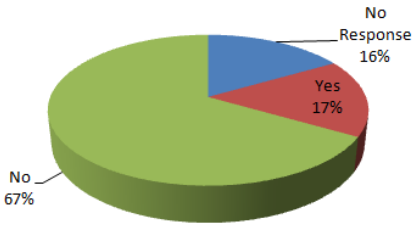
Question 2b: Have the technical barriers been identified and addressed?



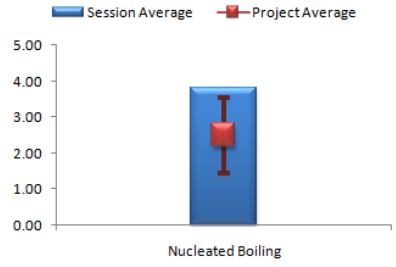
Question 5: Characterize the resources available for this project to achieve the stated milestones in a timely fashion.



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



Question 6: Overall Rating



Parasitic Energy Losses (George Fenske, of Argonne National Laboratory)

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

Question 1: Does this activity support the overall DOE objectives of petroleum displacement? Why or why not?
The first reviewer commented that reduction in friction is and will always be an area to continue research. From a system level, this will reduce petroleum production. Similarly, one other person stated that reducing losses has a 1-to-1 impact to reducing/displacing petroleum. Another reviewer stated that this accounts for up to 10% of engine losses, giving a clear link to petroleum savings.

One final reviewer stated that this research is widely applicable to many vehicle platforms. This reviewer also asked whether the very high potential and market penetration that was used to show a large petroleum reduction was realistic.

Question 2: Are the goals of the project technically achievable? Have the technical barriers been identified and addressed? Is the project likely to overcome those technical barriers? Please comment on the project's strategy for deployment of technologies.
One person stated that their strategy appears to be a demonstration of technology followed by convincing commercial partners to come forward. This reviewer added that it may be helpful to have commercial partners identified early if this has not already been done.

Another person stated they were not sure how the energy pie would look if this was true: "Reduce heavy truck parasitic losses (friction, aero, rolling, etc.) …. from 39 percent of engine output … to 24 percent…" This reviewer asks, wouldn't it be better to phrase it as a reduction of individual losses? Couldn't the percentage be changed by just increasing losses elsewhere? He or she likes the weighted approach to the engine mapping. The Advanced Combustion Tech Team talked about doing the same thing, but the reviewer doesn't know whether that was taken on. One final reviewer commented that cost is of course an issue, and then asked about the impact on engine reliability.

Question 3: Characterize your understanding of the technical accomplishments and progress toward DOE goals: please state the reasons for your assessment.
One reviewer noted that the models have shown a 3-5% improvement in fuel economy and the researchers are in the process of testing a single-cylinder. Another felt the data looks extensive and savings can be realized. It will be interesting how the savings will change if translated to 12,000-15,000 miles/year driving in passenger cars and light-duty trucks.

One other reviewer commented that the project appears technically sound, but is still early in getting data. A final reviewer stated there was modest progress from on-going work.

Question 4: What is the likelihood that the project team will move the technologies toward or into the marketplace? Please state the reasons for your selection.
The first response stated that savings can drive rapid changes, while another person added that some technologies have already been commercialized. To contrast, one reviewer felt that the commercial partners in the project don't appear to be clearly on board.

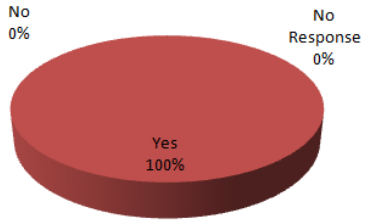
Question 5: How sufficient are the resources for the project to achieve the stated milestones in a timely fashion?
The lone respondent stated that there is a strong collaborative team.

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

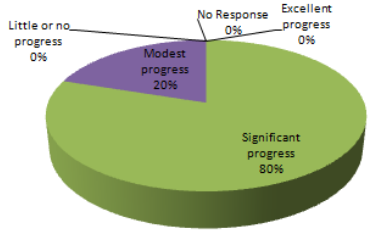
There were no expository comments for this question: refer to the graphic on the next page for this project's summary score.

Project: Parasitic Energy Losses

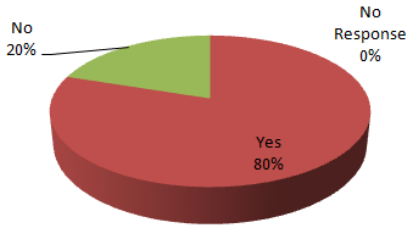
Question 1: Does this project support the overall DOE objectives of petroleum displacement?



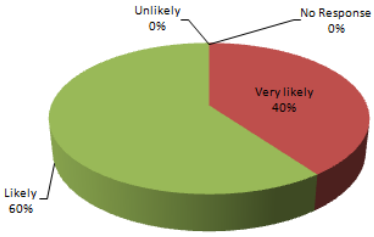
Question 3: Characterize the technical accomplishments and progress toward goals.



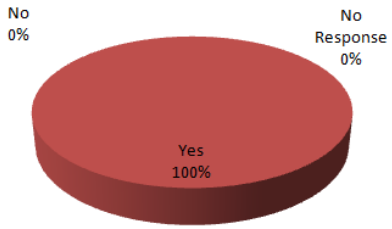
Question 2a: Are the goals of the project technically achievable?



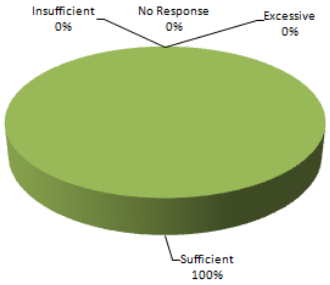
Question 4: How likely is the project team to move technologies into the marketplace?



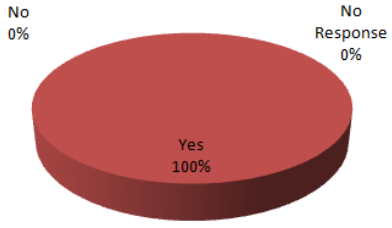
Question 2b: Have the technical barriers been identified and addressed?



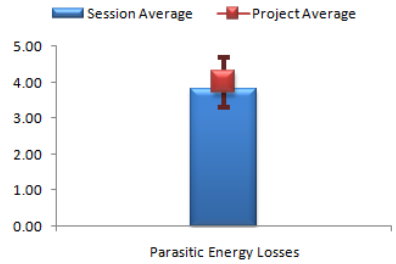
Question 5: Characterize the resources available for this project to achieve the stated milestones in a timely fashion.



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



Question 6: Overall Rating



PHEV Component Sizing (Phil Sharer, of Argonne National Laboratory)

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

Question 1: Does this activity support the overall DOE objectives of petroleum displacement? Why or why not?
One reviewer indicated that this work supports DOE PHEV work, while another noted that is assists in defining component sizing, which is used to determine the direction of R&D. One other reviewer stated that this project is supporting cross-technology team requirements. Another individual indicated that this was not discussed in the presentation but will clearly allow a major impact.

Question 2: Are the goals of the project technically achievable? Have the technical barriers been identified and addressed? Is the project likely to overcome those technical barriers? Please comment on the project's strategy for deployment of technologies.
The first response noted that the group has gathered component data, developed a model, and validated the model. These results are then used to determine component sizing and performance for optimization. Another reviewed stated that coordination with tech teams and OEMs on those teams appears important for success. This project appears more directed at identifying barriers than about developing solutions. This reviewer thinks that this is prudent and correct for this stage of the project. One final reviewer commented that simulation programs are in place at ANL, and this is the utilization of those tools.

Question 3: Characterize your understanding of the technical accomplishments and progress toward DOE goals: please state the reasons for your assessment.
One person indicated that this is a good start with a strong use of the existing DOE infrastructure. The respondent began by noting that the next steps indicated in slide 6 are several factors larger than the information presented on the previous slides. The reviewer added that the development of additional "real world" cycles is probably not of great importance for this project, but a more robust set of vehicle needs might be (things like the amount of power and energy needed to start the engine at -30 to -40°C). The power and cooling requirements to drive a 6% grade for 20 miles at 55 mph at 50°C ambient would be better for sizing than just another drive profile at 20°C ambient.

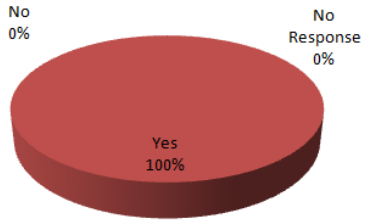
Question 4: What is the likelihood that the project team will move the technologies toward or into the marketplace? Please state the reasons for your selection.
The first reviewer remarked that it appears OEMs will use the sizing and analysis data, and thus this data and strategy will move to market, but new technologies are unlikely to result from this work. The other respondent also indicated that OEMs will use the technology that is generated by the ESS and EE technology from these requirements, but the actual sizing will be done based on specific vehicle needs.

Question 5: How sufficient are the resources for the project to achieve the stated milestones in a timely fashion?
The lone respondent stated that there is good progress with limited funding.

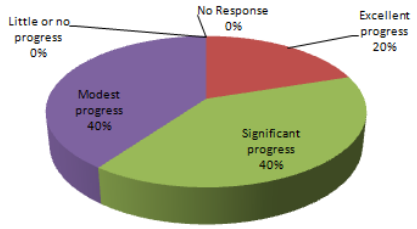
Question 6: Summary rating: when scoring this project, consider the relevance of the work to DOE's objectives, potential impacts on DOE/VT goals, project accomplishments, likelihood of technology transfer, and sufficiency of project resources.
There were no expository comments for this question: refer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

Project: PHEV Component Sizing

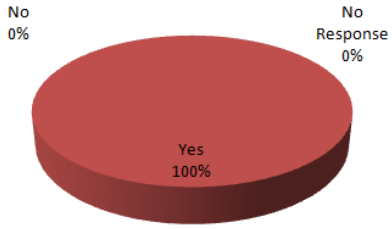
Question 1: Does this project support the overall DOE objectives of petroleum displacement?



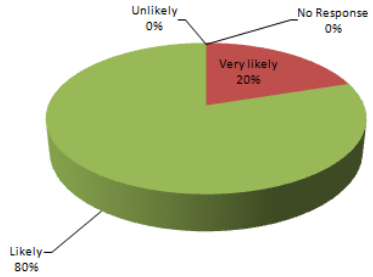
Question 3: Characterize the technical accomplishments and progress toward goals.



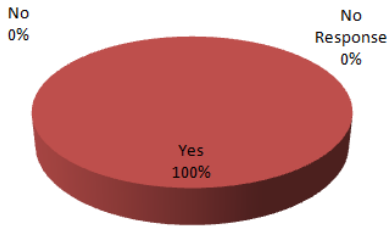
Question 2a: Are the goals of the project technically achievable?



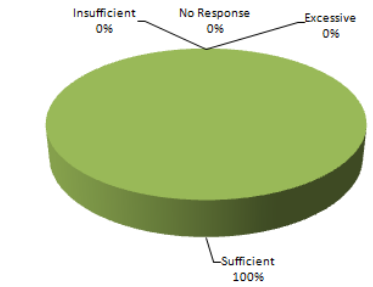
Question 4: How likely is the project team to move technologies into the marketplace?



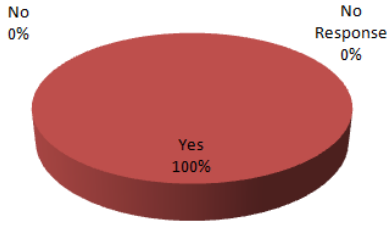
Question 2b: Have the technical barriers been identified and addressed?



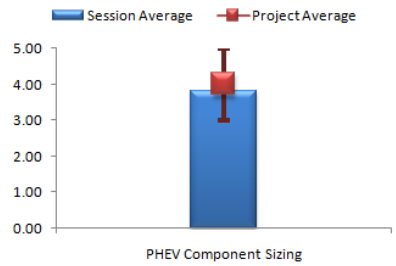
Question 5: Characterize the resources available for this project to achieve the stated milestones in a timely fashion.



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



Question 6: Overall Rating



PHEV Control Impact and Optimization (Dominik Karbowski, of Argonne National Laboratory)

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

Question 1: Does this activity support the overall DOE objectives of petroleum displacement? Why or why not?
One reviewer noted that PHEVs directly reduce petroleum consumption, while another person added that this project supports DOE's PHEV work. One reviewer commented that the study is directly looking at petroleum displacement strategies. Another individual noted that the researchers are developing optimized control strategies to determine the pathway towards the lowest fuel consumption.

Question 2: Are the goals of the project technically achievable? Have the technical barriers been identified and addressed? Is the project likely to overcome those technical barriers? Please comment on the project's strategy for deployment of technologies.
The first reviewer remarked that there is good linkage through the entire DOE plug-in hybrid team to transfer knowledge to OEMs. Another reviewer said that there is a nice blend of testing and simulation data, and that this project is well-integrated with other ANL projects.

Question 3: Characterize your understanding of the technical accomplishments and progress toward DOE goals: please state the reasons for your assessment.
One person commented here on the nice results showing the value of a blended strategy compared to EV/CS mode, noting that the control strategy is sensitive to assumptions of trip length. Does this mean that the vehicle should ask the driver how far they expect to go on a given trip? Will this lead to GPS integration, where the driver always indicates destination and the vehicle, in real-time, calculates the best control strategy?

The other respondent stated that the conclusion of this study is that the battery should be empty at the end of driving – not empty too soon, nor should it have energy left at the end. This reviewer would like to see some comparison of how much longer the driving distance is for the Best Charge Depletion Controls to equal the AER Case. The reviewer added that this could drive the size of the battery for powertrains that will utilize Charge Depletion only, without any AER.

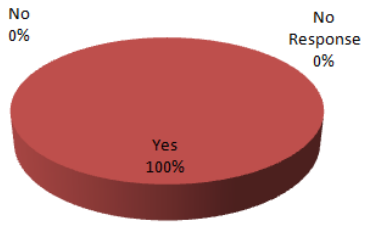
Question 4: What is the likelihood that the project team will move the technologies toward or into the marketplace? Please state the reasons for your selection.
One reviewer commented on the strong participation of OEMs, while the other respondent stated that battery sizing is paramount in managing vehicle cost.

Question 5: How sufficient are the resources for the project to achieve the stated milestones in a timely fashion?
The lone respondent suggested that the resources seem high for this level of work.

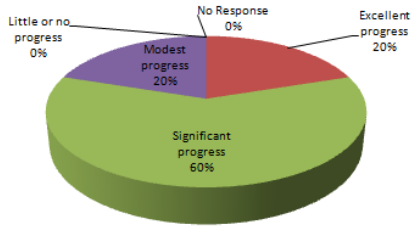
Question 6: Summary rating: when scoring this project, consider the relevance of the work to DOE's objectives, potential impacts on DOE/VT goals, project accomplishments, likelihood of technology transfer, and sufficiency of project resources.
There were no expository comments for this question: refer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

Project: PHEV Control Impact and Optimization

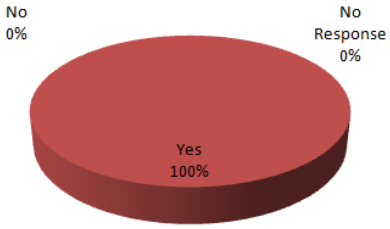
Question 1: Does this project support the overall DOE objectives of petroleum displacement?



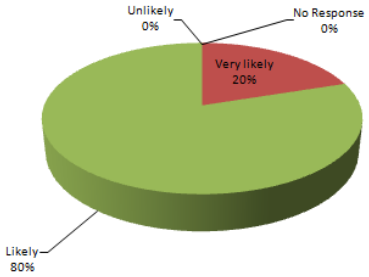
Question 3: Characterize the technical accomplishments and progress toward goals.



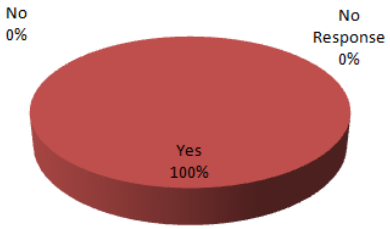
Question 2a: Are the goals of the project technically achievable?



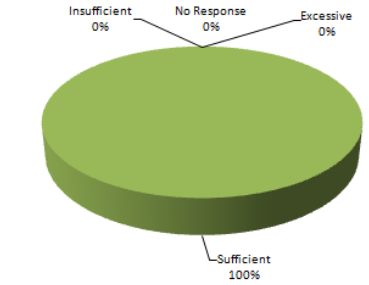
Question 4: How likely is the project team to move technologies into the marketplace?



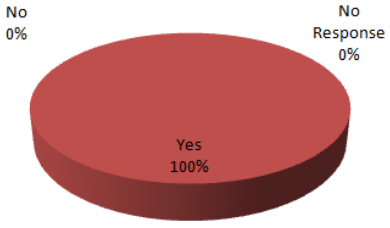
Question 2b: Have the technical barriers been identified and addressed?



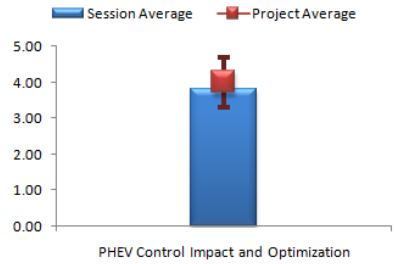
Question 5: Characterize the resources available for this project to achieve the stated milestones in a timely fashion.



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



Question 6: Overall Rating



PHEV Evaluation and Data Collection (Jim Francfort, of Idaho National Laboratory)

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

Question 1: Does this activity support the overall DOE objectives of petroleum displacement? Why or why not?
One reviewer stated that this will result in consumers using electricity instead of gasoline for vehicle propulsion. Another person noted that plug-in hybrid use will help reduce petroleum usage, adding that there is a clear linkage here. One response stated that there is a very good, direct, near-term petroleum reduction impact. One final reviewer stated that the program provides data on present technology vehicles. This provides guidance for future project selection, leading to reduced petroleum displacement.

Question 2: Are the goals of the project technically achievable? Have the technical barriers been identified and addressed? Is the project likely to overcome those technical barriers? Please comment on the project's strategy for deployment of technologies.
The first reviewer noted that this project works with commercial and R&D companies to analyze the viability for commercialization. Another commented that field tests and collaboration with manufacturers, as well as linkage to modeling and policy, are strong points to encourage deployment.

One reviewer stated that this is a data collection project and does not have any difficult technical barriers.

Question 3: Characterize your understanding of the technical accomplishments and progress toward DOE goals: please state the reasons for your assessment.
One response stated that this is an impressive, quick start, adding that it is a bit too early to know how the expected data will influence the eventual deployment of the technology. By necessity, the data is heavily oriented toward a few vehicle models and only a couple convertors, but it appears to have a high potential. The other respondent stated that the data is very interesting, and can be used to support the J1711 rewrite, but these early aftermarket PHEVs should not be the main input to the new utility factors.

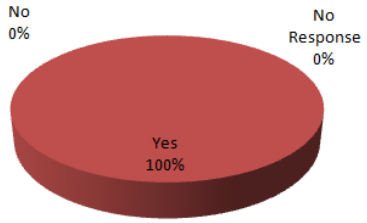
Question 4: What is the likelihood that the project team will move the technologies toward or into the marketplace? Please state the reasons for your selection.
One reviewer noted the fleet and industry testing, while another person stated that the test results and data are the products to be transferred. One final reviewer commented that PHEVs are in design at major OEMs, adding that this data can help in the control strategies development and component sizing work.

Question 5: How sufficient are the resources for the project to achieve the stated milestones in a timely fashion?
The first reviewer commented that there is strong funding, while the other respondent felt that the number of vehicles looks good and that the manpower is adequate.

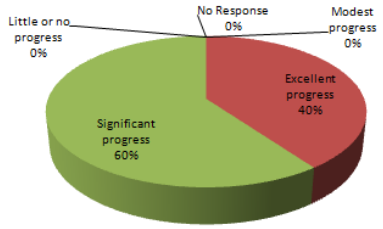
Question 6: Summary rating: when scoring this project, consider the relevance of the work to DOE's objectives, potential impacts on DOE/VT goals, project accomplishments, likelihood of technology transfer, and sufficiency of project resources.
There were no expository comments for this question: refer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

Project: PHEV Evaluation and Data Collection

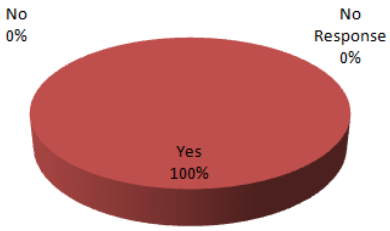
Question 1: Does this project support the overall DOE objectives of petroleum displacement?



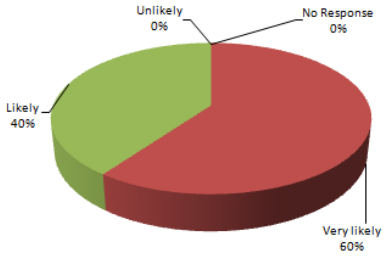
Question 3: Characterize the technical accomplishments and progress toward goals.



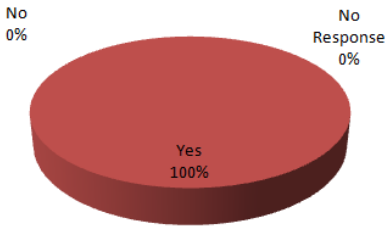
Question 2a: Are the goals of the project technically achievable?



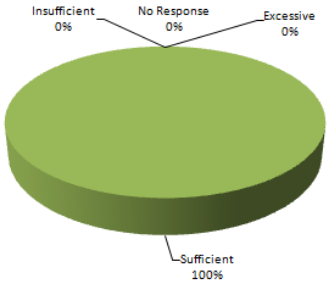
Question 4: How likely is the project team to move technologies into the marketplace?



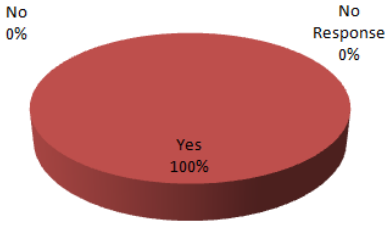
Question 2b: Have the technical barriers been identified and addressed?



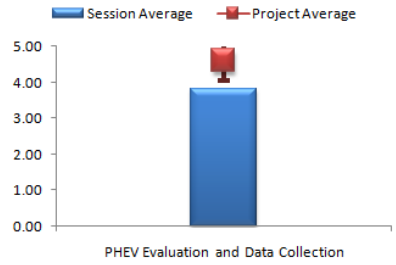
Question 5: Characterize the resources available for this project to achieve the stated milestones in a timely fashion.



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



Question 6: Overall Rating



PHEV Test Procedures (Michael Duoba, of Argonne National Laboratory)

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

Question 1: Does this activity support the overall DOE objectives of petroleum displacement? Why or why not?
One reviewer stated that the program does not directly reduce consumption, but it does provide a method to measure consumption of petroleum and electrical energy. This is essential for measuring advancements in technology. One person noted that electricity used to propel the vehicle directly displaces petroleum, while another commented that the PHEV has very high potential. One reviewer commented that the DOE objectives weren't discussed in the presentation, but added that accurate test procedures appear critical to knowing how much petroleum will be displaced. Thus, while not directly contributing to petroleum reduction, it appears to be critically needed for the program overall.

Question 2: Are the goals of the project technically achievable? Have the technical barriers been identified and addressed? Is the project likely to overcome those technical barriers? Please comment on the project's strategy for deployment of technologies.
The first respondent stated that the group was showing leadership in this standard development. Another noted the strong ANL leadership in development of SAE, JARI, and ISO methods that will be used by entire industry. The industry and government acceptance and use of the method will constitute a clear success of deployment. This appears likely. One person added that the input from this project will contribute to a method to measure energy consumption.

One final reviewer stated that using input from all stakeholders was a must for the procedure development. The SAE agreement to the procedure is also a must.

Question 3: Characterize your understanding of the technical accomplishments and progress toward DOE goals: please state the reasons for your assessment.
One person stated that the group is addressing the complex issues for testing PHEVs. Another response noted that they are in the process of developing a method to overcome the challenges of measuring energy consumption of a PHEV. It addresses blended and all-electric range vehicles by utilizing a utility factor. Barriers, such as the length of the test, still exist; however, this program is making progress to overcome those barriers.

One person commented that the development of a standard industry test method appears to be progressing well. This reviewer asks if there is risk that OEMs will figure out how to "game" the test to be able to market artificially high mileages without these claims being adequately explored. Will there be adequate calibration with real world results? One final person indicated that the need for a consistent relationship to compare is needed.

Question 4: What is the likelihood that the project team will move the technologies toward or into the marketplace? Please state the reasons for your selection.
The first reviewer commented that, since the participants in J1711 include industry and government agencies, it is very likely to partially or fully transfer this into the marketplace. Another person agreed, stating that the results of this work and standards development will likely be adopted by various organizations. One reviewer indicated that there is a clear need for a test method, which someone will develop. The ANL group appears to have a leadership position and thus have a good likelihood of becoming the standard if the project continues to be well led and if it has adequate resources.

One final respondent remarked that using input from all stakeholders was a must for procedure development, and SAE agreement to the procedure is also a must.

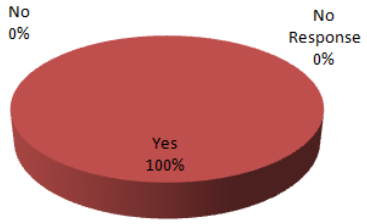
Question 5: How sufficient are the resources for the project to achieve the stated milestones in a timely fashion?
One person stated that the program is making sufficient gains, while another commented that ANL has a good deal of experience working with the OEMs and other laboratories.

One reviewer asked, is more funding needed for calibration with real world conditions and to ensure integration and collaboration with other standards being considered world-wide?

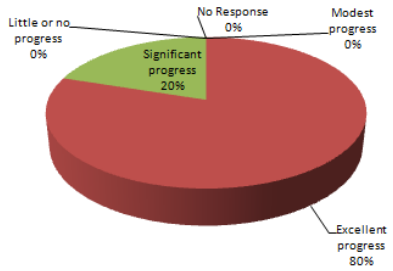
Question 6: Summary rating: when scoring this project, consider the relevance of the work to DOE's objectives, potential impacts on DOE/VT goals, project accomplishments, likelihood of technology transfer, and sufficiency of project resources.
There were no expository comments for this question: refer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

Project: PHEV Test Procedures

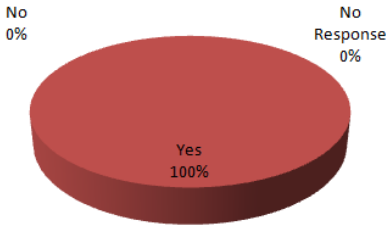
Question 1: Does this project support the overall DOE objectives of petroleum displacement?



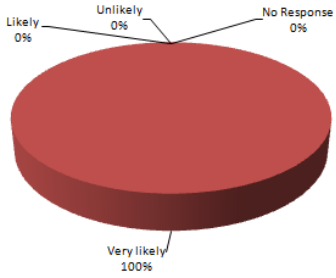
Question 3: Characterize the technical accomplishments and progress toward goals.



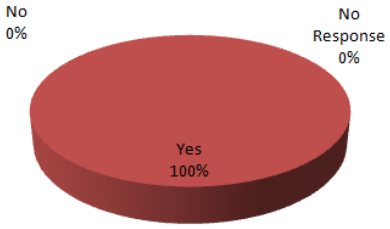
Question 2a: Are the goals of the project technically achievable?



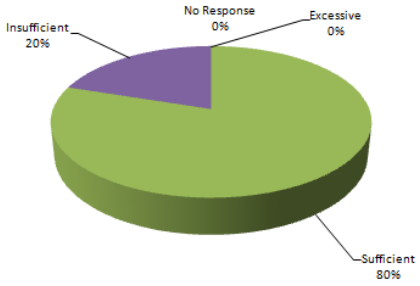
Question 4: How likely is the project team to move technologies into the marketplace?



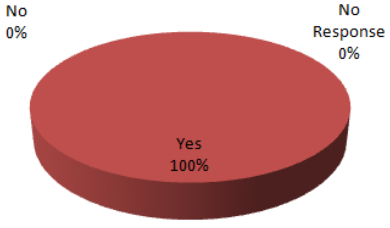
Question 2b: Have the technical barriers been identified and addressed?



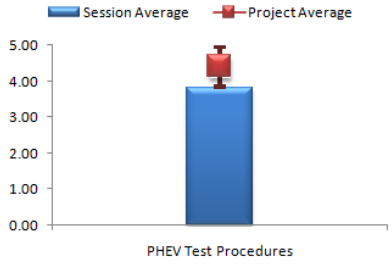
Question 5: Characterize the resources available for this project to achieve the stated milestones in a timely fashion.



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



Question 6: Overall Rating



PHEV Value Proposition Study (Richard Smith, of Oak Ridge National Laboratory)

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

Question 1: Does this activity support the overall DOE objectives of petroleum displacement? Why or why not?
One reviewer stated that this project is investigating potential business opportunities to improve the value to a PHEV customer, thereby encouraging PHEVs, while another person added that PHEVs will displace petroleum. One final reviewer stated that this was not discussed in the presentation, but the value proposition / business case appears to be critical to move forward.

Question 2: Are the goals of the project technically achievable? Have the technical barriers been identified and addressed? Is the project likely to overcome those technical barriers? Please comment on the project's strategy for deployment of technologies.
The first respondent stated that the review with 120 industry experts is impressive. However, there is concern that the approach is more about obtaining consensus to obtain political points and funding rather than to obtain a real understanding of the market place and needs for understanding the value proposition, particularly of the end users. The reviewer is familiar with market assessment and business development methodologies of the venture capital community and of the business community. This project seems to have another approach. If this study were done by Ideo, Sagentia, Innovia, or other commercial value proposition development companies, would there be a different conclusion? Will marketing to consumers and status / fashion be an important part of consumer choice? This study assumes that by 2030 fad and fashion won't be as important and thus it will boil down to economics. The reviewer adds that the study also seems to avoid some key policy questions (like scenario of severe carbon caps) and perhaps does not take sufficiently into account probable gains of IC engines.

The other person responding supposes that generating this information is "technically achievable," but it is difficult to translate what the consumer says is wanted into what is required. A Prius is not the lowest cost of ownership vehicle, the roomiest, best handling, quietest, or fastest, yet is among the highest selling cars. He or she would like to see if there are translatable factors in its value proposition to PHEVs. The reviewer suggests making sure that V2G is defined properly to the survey groups. If V2G significantly impacts battery life, the relatively small amount of earnings from V2G would be vastly outnumbered by battery replacement costs.

Question 3: Characterize your understanding of the technical accomplishments and progress toward DOE goals: please state the reasons for your assessment.
The first reviewer stated that it is difficult to accurately predict the component cost and performance for 2030. That, along with the difficulty in predicting the market influences for 2030, makes it challenging to place high value in the results. The results can only be as accurate as the assumptions.

One person indicated that the work is just starting, while another added to this by saying that lots of questions and data collection remain. One person also noted that the project is just beginning; it is too early to know its technical accomplishments. The study plan and approach appear solid. Will a sensitivity analysis be done on the starting assumptions?

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

One reviewer stated that the project results may provide direction for project funding to support the industry in PHEV research. Another indicated that, if value can be shown, vehicles designs will be impacted.

One other reviewer commented that this isn't a technology development project, but rather a value proposition project. This reviewer strongly supports the project objectives, but is concerned that the approach may not be the best one.

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

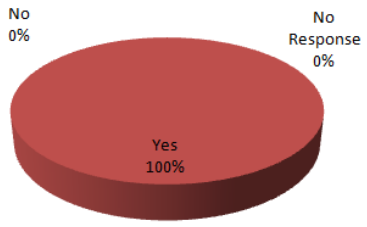
The lone respondent asks whether there should be more funding to allow partnering with a professional value proposition firm. A DOE laboratory doesn't appear to have a strong background in this area.

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

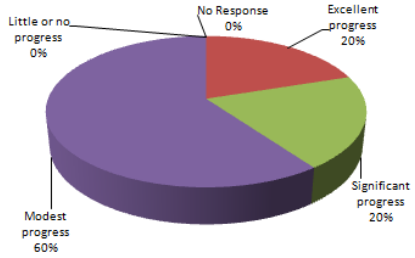
There were no expository comments for this question: refer to the graphic on the next page for this project's summary score.

Project: PHEV Value Proposition Study

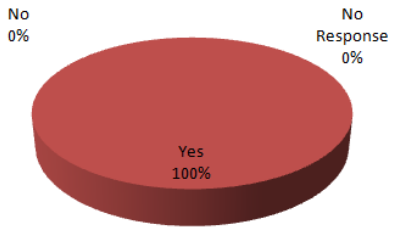
Question 1: Does this project support the overall DOE objectives of petroleum displacement?



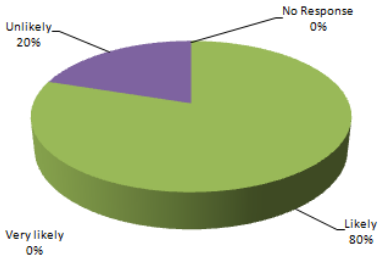
Question 3: Characterize the technical accomplishments and progress toward goals.



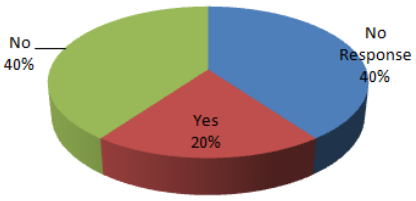
Question 2a: Are the goals of the project technically achievable?



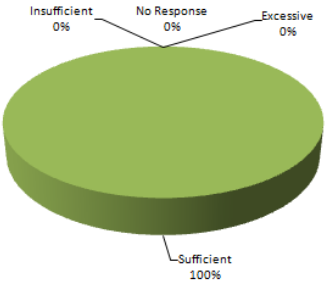
Question 4: How likely is the project team to move technologies into the marketplace?



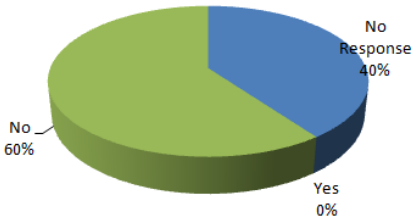
Question 2b: Have the technical barriers been identified and addressed?



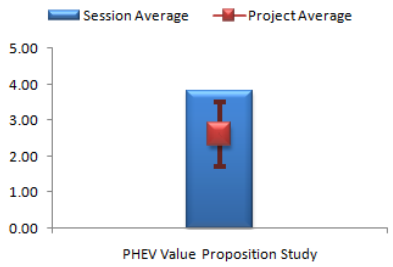
Question 5: Characterize the resources available for this project to achieve the stated milestones in a timely fashion.



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



Question 6: Overall Rating



Thermoelectric Analysis, Integrated Vehicle Thermal Management Systems Analysis/Modeling (Tony Markel, of National Renewable Energy Laboratory)

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

Question 1: Does this activity support the overall DOE objectives of petroleum displacement? Why or why not?
One reviewer stated that the group performs modeling to determine direction for advanced technologies. Another noted that all four sub-areas focus on improving the use of the battery pack to reduce petroleum use. One other person indicated that this effort provides general support to DOE for HEVs and PHEVs.

One reviewer stated that this was not discussed in the presentation.

Question 2: Are the goals of the project technically achievable? Have the technical barriers been identified and addressed? Is the project likely to overcome those technical barriers? Please comment on the project's strategy for deployment of technologies.
The first reviewer stated that measuring data and processing it for analysis is straightforward, while another person commented that having a better understanding of these technologies will enable deployment.

One reviewer indicated that the route to transfer knowledge to OEMs or others wasn't clearly presented. This reviewer assumes that this will mainly occur through the publication of results and work with other project teams.

Question 3: Characterize your understanding of the technical accomplishments and progress toward DOE goals: please state the reasons for your assessment.
One person stated that the approach to plug-in hybrid modeling appears clear. Thermal mapping and integration may be repeating work already well in hand by OEMs. Does this work need more collaboration with OEMs? Are OEMs requesting this work or is the effort to make publicly available information that is considered proprietary by OEMs? It seems clear that thermoelectric work should slow down or stop. Can the work be closed with an analysis of the efficiency the thermoelectrics need to obtain to become useful in automotive markets, and thus be useful as a guide for research in that area?

The other respondent indicated that there is some concern about generating new drive cycles, such as how the PHEV will be compared to conventional technologies if different cycles are being used. Route-based controls is a good pre-competitive area for FreedomCAR research. This reviewer questions whether or not drivers will likely be monitored for reduced consumption. Recovering waste heat is also a good pre-competitive area for FreedomCAR research. Is there also something to be gained by directly using exhaust heat to warm driveline components? The integrated thermal management is a great idea to reduce cost in hybrids, but make sure efficiency maps are based on thermal operating temps for motors, batteries, power electronics, and transmissions. This reviewer adds that single operating temperatures may have adverse efficiency and life effects, outweighing potential cost gains.

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

One person stated that the results are to be utilized by industry and government to provide input into the direction of advanced technologies. The other respondent added that route-based controls and waste heat recovery are greatly untapped in the current automotive marketplace. These technologies need to be driven to be low hanging fruit for OEM use.

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

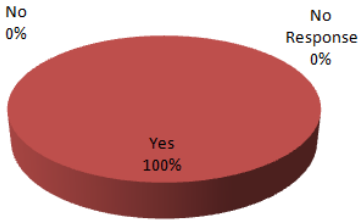
One reviewer stated that the thermoelectric work needs to be phased down. Another person suggested that the current resource allocation seems high for this level of work.

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

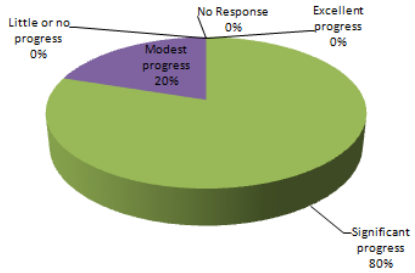
There were no expository comments for this question: refer to the graphic on the next page for this project's summary score.

Project: Thermoelectric Analysis, Integrated Vehicle Thermal Management Systems Analysis/Modeling

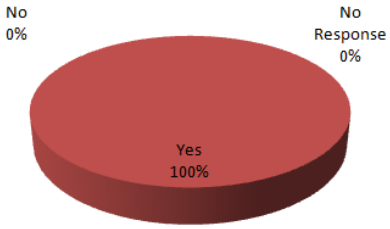
Question 1: Does this project support the overall DOE objectives of petroleum displacement?



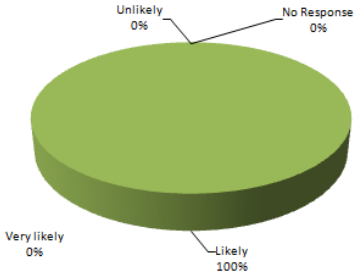
Question 3: Characterize the technical accomplishments and progress toward goals.



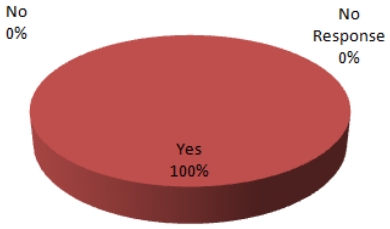
Question 2a: Are the goals of the project technically achievable?



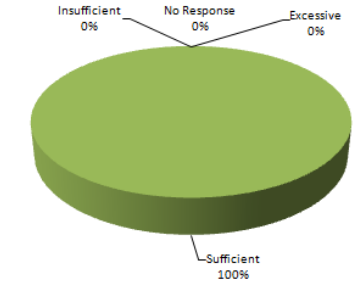
Question 4: How likely is the project team to move technologies into the marketplace?



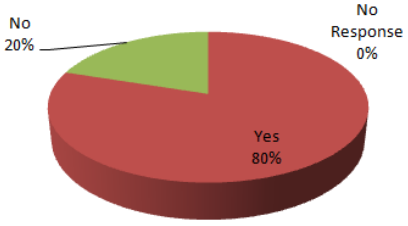
Question 2b: Have the technical barriers been identified and addressed?



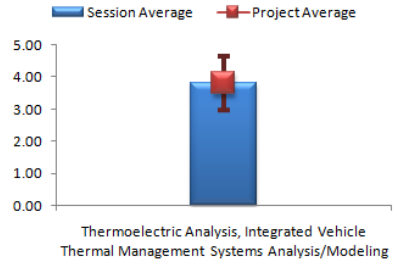
Question 5: Characterize the resources available for this project to achieve the stated milestones in a timely fashion.



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



Question 6: Overall Rating



Thru-the-Road PHEV and Ultracapacitor Integration (Ted Bohn, of Argonne National Laboratory)

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

Question 1: Does this activity support the overall DOE objectives of petroleum displacement? Why or why not?
One reviewer noted that this will result in consumers using electricity instead of gasoline for vehicle propulsion, and another person added that PHEVs have a large potential for petroleum reduction. One individual commented that this program will analyze the possible benefits of an ultracapacitor / battery combination to improve the performance of the electrical storage system in a HEV/PHEV. One final reviewer stated that the DOE objectives weren't discussed in the presentation. However, the objective of promoting hybrid and plug-in technologies will directly displace petroleum usage.

Question 2: Are the goals of the project technically achievable? Have the technical barriers been identified and addressed? Is the project likely to overcome those technical barriers? Please comment on the project's strategy for deployment of technologies.
The first reviewer stated that the project is providing early testing to aid the deployment of PHEVs. Another person commented that the strategy appears more directed to obtaining basic knowledge that will enable future progress and get around limitations of OEMs not wanting to share internal knowledge (for example, controller algorithms). This reviewer adds that a direct route to deployment wasn't made clear, but it doesn't appear necessary at this point in the early stages of the project. Likewise, this project appears more aimed at identifying technical barriers than in overcoming them at this stage. The project is at an early stage, and thus this is normal and acceptable. One final response indicated that the experience from the Prius benchmarking and MATT's development should help get the program in a position to generate the data regarding gasoline displacement.

Question 3: Characterize your understanding of the technical accomplishments and progress toward DOE goals: please state the reasons for your assessment.
One response stated that there has been very good progress in a relatively short period of time for this sort of work, while another person similarly commented that the project is at an early stage but appears to be on a solid path to make future progress. One reviewer noted that a test vehicle was modified and used to perform testing to support J1711.

One final individual, in contrast, suggested that controls modifications may hold up the program longer than expected or planned.

Question 4: What is the likelihood that the project team will move the technologies toward or into the marketplace? Please state the reasons for your selection.
Responses to this prompt were generally positive. One reviewer commented that the results from test vehicles can be utilized by government and industry for the development of products and test procedures, while another person added that the early demonstration and testing of PHEV and ultracapacitor technologies will aid in their transfer. One reviewer noted that OEM's are stating that PHEVs are a near-term technology. Data from this project could be used in component sizing and development of future PHEV designs. One person commented that the study is at an early stage but is working directly with suppliers and OEMs. Thus there appears to be a solid basis for future technology transfer.

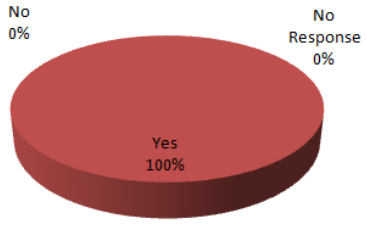
Question 5: How sufficient are the resources for the project to achieve the stated milestones in a timely fashion?
One response stated that the project has made sufficient progress to test vehicles to support J1711 testing and is on schedule to initiate capacitor/battery testing in 2008. Another said that having a better tie to the OEM controls would be useful, but proprietary information could hold up progress if that avenue is chosen exclusively.

One final reviewer stated that marrying ultracapacitors and batteries and extending this effort to marrying other types of power sources appears to have merit to balance the strengths and weaknesses of various technologies. Supplies tied to one technology are unable to do this, and this is a great area for DOE to show leadership across technologies and companies. This reviewer recommends increasing the budget of this project.

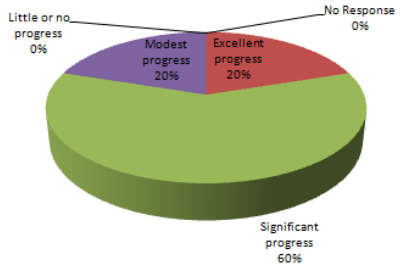
Question 6: Summary rating: when scoring this project, consider the relevance of the work to DOE's objectives, potential impacts on DOE/VT goals, project accomplishments, likelihood of technology transfer, and sufficiency of project resources.
There were no expository comments for this question: refer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

Project: Thru-the-Road PHEV and Ultracapacitor Integration

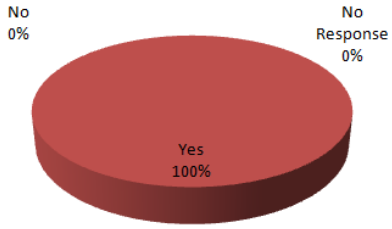
Question 1: Does this project support the overall DOE objectives of petroleum displacement?



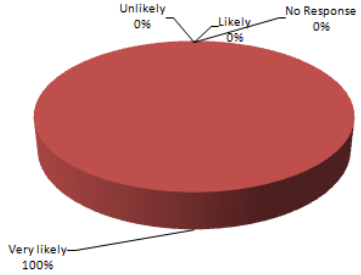
Question 3: Characterize the technical accomplishments and progress toward goals.



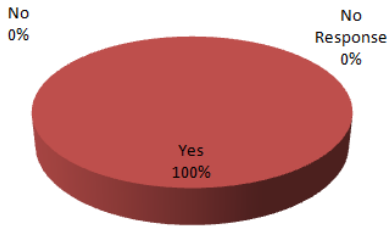
Question 2a: Are the goals of the project technically achievable?



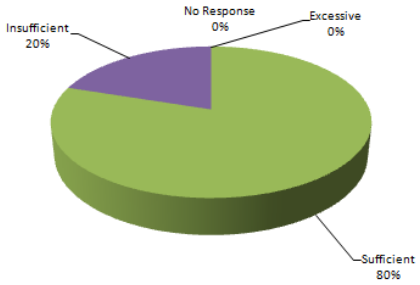
Question 4: How likely is the project team to move technologies into the marketplace?



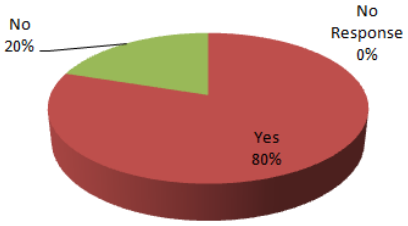
Question 2b: Have the technical barriers been identified and addressed?



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



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



Question 6: Overall Rating