1. Hybrid and Vehicle System Simulation

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

In August 2009, the DOE announced the selection of ten projects totaling $425 million for development, deployment, and validation of hybrid vehicles, and deployment of charging stations across the nation. American Reinvestment and Recovery Act (ARRA)-funded transportation electrification activities will aid in the deployment of technologies that help to reduce petroleum consumption. Activities include deployment of 18,000 public and private charging stations in major metropolitan areas across the country, and deployment of truck stop electrification infrastructure at 50 sites across interstate corridors. Additional deployment activities include development, validation, and deployment of light- and medium-duty electric drive vehicles.

Subprogram Feedback

The U.S. Department of Energy (DOE) received feedback on the overall technical subprogram areas presented during the 2014 Annual Merit Review (AMR). Each subprogram technical session was introduced with a presentation that provided an overview of subprogram goals and recent progress, followed by a series of detailed topic area project presentations.

The reviewers for a given subprogram area responded to a series of specific questions regarding the breadth, depth, and appropriateness of that DOE Vehicles Technologies Office (VTO) subprogram's activities. The subprogram overview questions are listed below, and it should be noted that no scoring metrics were applied. These questions were used for all VTO subprogram overviews.

Question 1: Was the program area, including overall strategy, adequately covered?

Question 2: Is there an appropriate balance between near- mid- and long-term research and development?

Question 3: Were important issues and challenges identified?

Question 4: Are plans identified for addressing issues and challenges?

Question 5: Was progress clearly benchmarked against the previous year?

Question 6: Are the projects in this technology area addressing the broad problems and barriers that the Vehicle Technologies Office (VTO) is trying to solve?

Question 7: Does the program area appear to be focused, well-managed, and effective in addressing VTO's needs?

Question 8: What are the key strengths and weaknesses of the projects in this program area? Do any of the projects stand out on either end of the spectrum?

Question 9: Do these projects represent novel and/or innovative ways to approach these barriers as appropriate?

Question 10: Has the program area engaged appropriate partners?

Question 11: Is the program area collaborating with them effectively?

Question 12: Are there any gaps in the portfolio for this technology area?

Question 13: Are there topics that are not being adequately addressed?

Question 14: Are there other areas that this program area should consider funding to meet overall programmatic goals?

Question 15: Can you recommend new ways to approach the barriers addressed by this program area?

Question 16: Are there any other suggestions to improve the effectiveness of this program area?

Responses to the subprogram overview questions are summarized in the following pages. Individual reviewer comments for each question are identified under the heading Reviewer 1, Reviewer 2, etc. Note that reviewer comments may be ordered differently; for example, for each specific subprogram overview presentation, the reviewer identified as Reviewer 1 in the first question may not be Reviewer 1 in the second question, etc.

Subprogram Overview Comments: David Anderson (U.S. Department of Energy) – vss000

Question 1: Was the program area, including overall strategy, adequately covered?

Reviewer 1:
The reviewer said yes, definitely.

Reviewer 2:
The reviewer said that the presenter did a very good job in the beginning of the presentation to explain that Vehicle and System Simulation (VSS) was the last step in the process since all the Vehicle Technologies Office (VTO) work needs to be integrated into an overall vehicle and evaluated. In addition, the goals and objectives were explicitly addressed.

Reviewer 3:
The reviewer said yes, and clarified that the key points of the program were sufficiently covered in an orderly fashion so as to bring relevance and relationship to each.

Reviewer 4:
The reviewer said yes, and observed a systems approach to integrating work from engine, battery storage, transmission and driveline improvements.

Reviewer 5:
The reviewer said that work, goals, and value were adequately covered by area. This reviewer emphasized that the strategy was not so clear, unless the strategy was simply to attack challenges listed. The reviewer opined that this was not a real strategy.

Question 2: Is there an appropriate balance between near- mid- and long-term research and development?

Reviewer 1:
The reviewer said yes.

Reviewer 2:
The reviewer observed that the work in this program was mainly focused on near and mid-term evaluations. The projects will ultimately provide information towards meeting the long term goals of petroleum displacement.

Reviewer 3:
The reviewer believed so, and elaborated that the entire technology was being introduced on a greatly accelerated scale that was necessary to build business case, maturity, and acceptance; therefore, some things get "fuzzy" when trying to understand the time relationship.

Reviewer 4:
The reviewer believed that the program was probably a little current biased to mid-term biased. However, the reviewer observed a pretty good balance, overall.

Reviewer 5:
The reviewer said that there is a decent balance, although this reviewer thought there could be some more near-term focus (i.e., could focus on getting the technologies into commercialization). This reviewer believed especially, that more resources could be put on finding heavy-duty (HD) and medium-duty (MD) applications that have a payback for hybrid systems through more money going to the National Renewable Energy Laboratory's (NREL) Fleet DNA database. The reviewer also suggested modeling of proposed hybrid systems using existing components where possible in applications that have data in the Fleet DNA would be helpful. Given recent interest, this reviewer indicated that natural gas could be another area for short-term research and development (R&D) and long-term R&D, especially more engine development (i.e., modeling) that optimizes the engine for natural gas.

Question 3: Were important issues and challenges identified?

Reviewer 1:
The reviewer said yes, absolutely.

Reviewer 2:
The reviewer said yes, well done.

Reviewer 3:
The reviewer found that major challenges of extending electric vehicle (EV) range and improvement of EV charging as well as the need for grid integration were identified.

Reviewer 4:
The reviewer commented yes, and summarized issues and challenges as petroleum reduction goals, reduce greenhouse gas (GHG) emissions, and advance vehicle electrification.

Reviewer 5:
The reviewer said yes, and that one other challenge is likely the cost for hybrids. That could be system cost in addition to component costs covered by other groups. According to this reviewer, another challenge would be to include natural gas systems in the research given its surge in vehicle use.

Question 4: Are plans identified for addressing issues and challenges?

Reviewer 1:
The reviewer responded yes, and elaborated that for each of the challenges identified, there were associated strategies to be completed to address the challenges.

Reviewer 2:
The reviewer said yes. By definition, the programs are designed to address the significant issues. The reviewer found that the depth and quantity of programs underway have a significant range of scope to cover the various challenges.

Reviewer 3:
The reviewer responded that the tools available were being deployed to address the challenges that have been identified in the presentation and talk. This reviewer did not know if plans were in place for the challenges the reviewer previously mentioned. These challenges understandably were not identified in the presentation.

Reviewer 4:
The reviewer observed that several funding opportunity announcements (FOAs) were listed, and a series of tools and focus areas to address the challenges, but not so much in the way of plans. This reviewer expressed hope and trust that the program team has detailed plans, but it was unclear.

Reviewer 5:
The reviewer noted that the EV Everywhere Grand Challenge and a broad overview of topics were to be expanded upon during subsequent session presentations.

Question 5: Was progress clearly benchmarked against the previous year?

Reviewer 1:
The reviewer commented that a large number of accomplishments and progress had been identified in each of the five focus areas this program addresses.

Reviewer 2:
The reviewer said yes.

Reviewer 3:
The reviewer said yes.

Reviewer 4:
The reviewer asserted that the measurables were quantified even greater through the individual program presentations.

Reviewer 5:
The reviewer commented that progress was compared to previous year plans.

Question 6: Are the projects in this technology area addressing the broad problems and barriers that the Vehicle Technologies Office (VTO) is trying to solve?

Reviewer 1:
The reviewer commented asserted that this was done well.

Reviewer 2:
The reviewer commented that the current portfolio including vehicle evaluation, modeling and simulation, component and systems, codes and standards, and systems optimization, provide an excellent mix of projects which help to address problems and barriers that VTO is working on.

Reviewer 3:
The reviewer said yes.

Reviewer 4:
The reviewer said yes, it is tying the other groups together.

Reviewer 5:
The reviewer said that regarding objectives, yes. The reviewer noted that results are general for this overview, but this reviewer expected specifics to be presented during the expanded reports in the sessions.

Question 7: Does the program area appear to be focused, well-managed, and effective in addressing VTO's needs?

Reviewer 1:
The reviewer said absolutely on all accounts. There has been a significant effort to this technology development and remarkable results from the DOE team.

Reviewer 2:
The reviewer said yes, the tool and focus areas interlink to cover all aspects of the area and build on the base level simulations to the highest level simulations. According to the reviewer, this is an area in which this program shines.

Reviewer 3:
The reviewer said yes, this program currently has 40 projects that are well managed and provide excellent information to help address VTO goals and objectives.

Reviewer 4:
The reviewer said yes.

Reviewer 5:
The reviewer responded yes, it supports the other VTO areas.

Question 8: What are the key strengths and weaknesses of the projects in this program area? Do any of the projects stand out on either end of the spectrum?

Reviewer 1:
The reviewer commented that the projects associated with evaluating the complete system and providing real in-use data were extremely important in determining the state-of-the-art of the technologies being evaluated.

Reviewer 2:
The reviewer noted that EV technologies were discussed, which could also offer improvement opportunities for other areas, like building efficiencies (heating, ventilation, and air conditioning (HVAC), etc.).

Reviewer 3:
The reviewer remarked that codes and standards work may be more important than anything else because this is one of the few places the industries can meet to work these out and then present a united view internationally. The reviewer observed that the work with industry to better model hardware is excellent (for example, Autonomie) and is another strong point. For this reviewer, a weakness was that some of the modeling systems of preference are still fairly speculative. The reviewer said that work where industry is not given a voice often has had some rather "political" assumptions.

Reviewer 4:
The reviewer remarked that many of the projects focus on batteries and hybrids, which can be a strength if there are ways to use that knowledge in products that eventually get to production. For passenger cars, batteries and hybrids have an outlet in production for the LEAF, Volt, and other vehicles. However, for MD and HD trucks, according to this reviewer, there are no large outlets to production because strong business cases (payback to the customer) for hybrid products have not emerged. The reviewer recommended that projects addressing this missing piece for MD and HD trucks would help get hybrids across the chasm in this market. The reviewer wondered if perhaps more focus on natural gas given its recent rise in use would be helpful.

Reviewer 5:
The reviewer said that the diversity of project scopes prohibits this reviewer from placement on such a spectrum.

Question 9: Do these projects represent novel and/or innovative ways to approach these barriers as appropriate?

Reviewer 1:
The reviewer commented well thought out and innovative as opposed to novel perhaps.

Reviewer 2:
The reviewer commented probably not novel but certainly appropriate.

Reviewer 3:
The reviewer said yes, in general terms. The reviewer remarked that the presentation was light on specifics, but thought that presentations later in the day and week would provide specifics.

Reviewer 4:
The reviewer responded yes, with the exception of focus on system payback and development of hybrid systems for MD and HD trucks.

Question 10: Has the program area engaged appropriate partners?

Reviewer 1:
The reviewer found that this project collaborates extensively with industry, other government agencies, national laboratories, and academia, as well as within DOE and VTO itself.

Reviewer 2:
The reviewer commented yes, especially through the phenomenal efforts of the national laboratories.

Reviewer 3:
The reviewer said this was one of the better engagement programs, and that the program team works with many people.

Reviewer 4:
The reviewer commented yes, and specified both light- and heavy-duty. National laboratories and original equipment manufacturer (OEM) involvement was noted. The reviewer also noted that Autonomie was given as an example of effective utilization of models by industry and other partners.

Reviewer 5:
The reviewer said yes, and specified laboratories and industry.

Question 11: Is the program area collaborating with them effectively?

Reviewer 1:
The reviewer asserted that the collaboration is a very important and effective part of the success of this effort, as evidenced from the progress and accomplishments.

Reviewer 2:
The reviewer said yes, absolutely.

Reviewer 3:
The reviewer commented that it appeared to be a broad based collaboration with academia, industry and government partners.

Reviewer 4:
The reviewer said yes.

Reviewer 5:
The reviewer commented that it was hard to say. The reviewer elaborated that the program gets data from partners, but it was unclear how much the partners benefited, as they should in a true and effective partnership.

Question 12: Are there any gaps in the portfolio for this technology area?

Reviewer 1:
The reviewer said that the five focus areas being investigated provide an excellent portfolio. Therefore, according to the reviewer there does not seem to be any gaps.

Reviewer 2:
The reviewer was unable to identify any gaps.

Reviewer 3:
The reviewer said that no gaps were evident from this presentation.

Reviewer 4:
The reviewer remarked that as mentioned in previous answers for other questions, natural gas work is a gap, as is focus on system development and payback for MD and HD hybrid systems.

Reviewer 5:
The reviewer identified new calculation techniques for solving future problems or problems too complex to solve now. The reviewer elaborated that vehicles and society are very messy and complex problems, and new techniques might clarify a lot.

Question 13: Are there topics that are not being adequately addressed?

Reviewer 1:
The reviewer commented that it appears the topics were being addressed adequately.

Reviewer 2:
The reviewer said no.

Reviewer 3:
The reviewer was unable to identify topics not being adequately addressed.

Reviewer 4:
The reviewer said none, other than advanced techniques.

Reviewer 5:
The reviewer suggested that a topic that could be better addressed is return on investment (ROI) studies and system development for HD hybrid systems that would encourage market adaption.

Question 14: Are there other areas that this program area should consider funding to meet overall programmatic goals?

Reviewer 1:
The reviewer said no.

Reviewer 2:
The reviewer said yes, and suggested safety specific performance standards – about $15 million in conjunction with the U.S. Department of Transportation (DOT).

Reviewer 3:
The reviewer referenced responses to Questions 12 and 13 related to advanced techniques.

Reviewer 4:
The reviewer noted that 10 FOA projects were listed and were relevant for further funding. Some of those include SuperTruck, autonomous vehicles, wireless charging, transmission efficiency improvement, and others.

Reviewer 5:
The reviewer suggested that this program should include even more work with industry partners for development and commercialization of MD and HD hybrid products. Much money went into components for HD hybrids (Remy and the battery manufacturers to name two). The reviewer suggested that more money could be spent on the modeling, development, and testing of those components in full hybrid systems. Without that help, even companies like Eaton and BAE were having a hard time getting hybrids across the chasm in the MD and HD markets. The reviewer noted that China and Europe end up doing the system development and getting the systems into production.

Question 15: Can you recommend new ways to approach the barriers addressed by this program area?

Reviewer 1:
The reviewer said no.

Reviewer 2:
The reviewer said no.

Reviewer 3:
The reviewer said no. The reviewer elaborated that barriers were not discussed in detail at this overview session. This reviewer expected that the program reports will provide more insight into barriers that need resolution.

Reviewer 4:
This reviewer acknowledged hitting this topic pretty hard in some responses to questions prior to this one. The reviewer proposed possible systems for MD and HD hybrids using off the shelf components and testing them with major truck OEMs. The reviewer commented that natural gas engines for vehicles can be optimized. This department could also simulate proposed engines and test those engines in vehicles once they are built.

Question 16: Are there any other suggestions to improve the effectiveness of this program area?

Reviewer 1:
The reviewer said no.

Reviewer 2:
The reviewer said no.

Reviewer 3:
The reviewer's only suggestion to help enhance the program would be to consider providing additional funding to this program area to allow for more vehicles to be evaluated.

Reviewer 4:
The reviewer said continued support of modeling and simulation, tools and tool development, lab and field evaluation, codes and standards, and vehicle systems optimization.

Project Feedback

In this merit review activity, each reviewer was asked to respond to a series of questions, involving multiple-choice responses, expository responses where text comments were requested, and numeric score responses *(on a scale of 1.0 to 4.0)*. In the pages that follow, the reviewer responses to each question for each project will be summarized: the multiple choice and numeric score questions will be presented in graph form for each project, and the expository text responses will be summarized in paragraph form for each question. A table presenting the average numeric score for each question for each project is presented below.

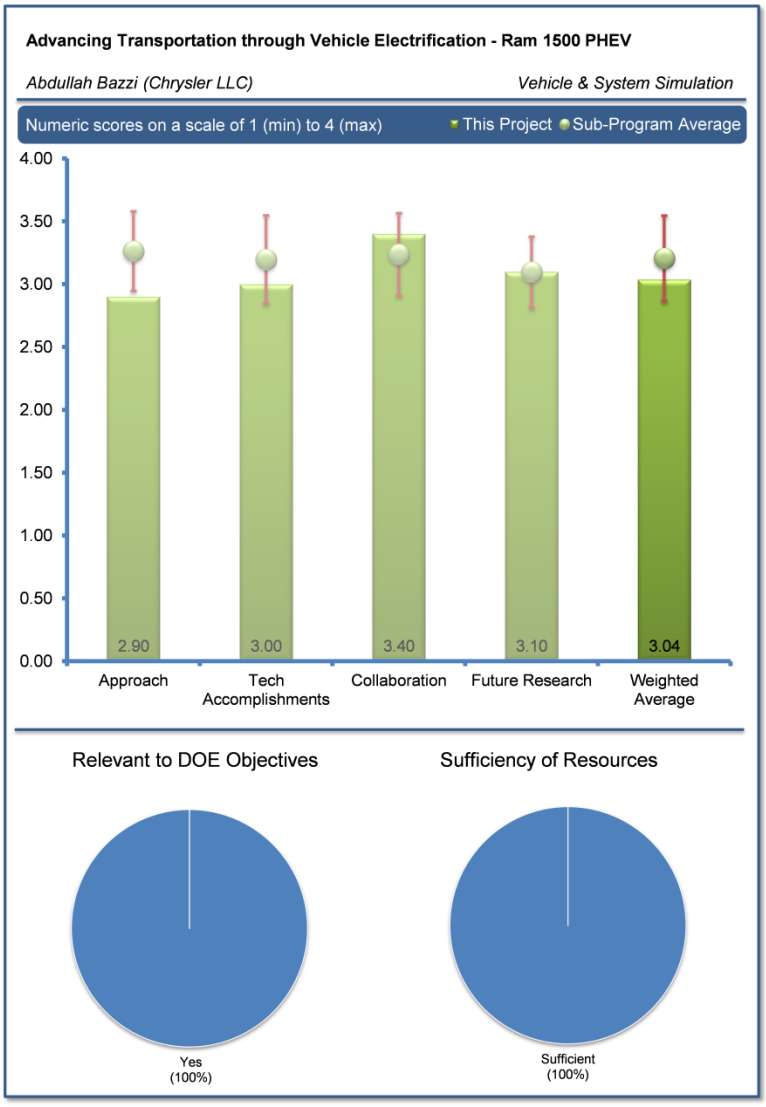
Presentation Title	Principal Investigator and Organization	Page Number	Approach	Technical Accomplishments	Collaborations	Future Research	Weighted Average
††Advancing Transportation through Vehicle Electrification - Ram 1500 PHEV	Abdullah Bazzi (Chrysler LLC)	1-13	2.90	3.00	3.40	3.10	3.04
††Smith Electric Vehicles: Advanced Vehicle Electrification + Transportation Sector Electrification	Robin Mackie (Smith Electric Vehicles)	1-16	3.30	2.90	3.10	2.60	2.99
††Class 8 Truck Freight Efficiency Improvement Project	Derek Rotz (Daimler Trucks North America LLC)	1-20	3.70	3.80	3.90	3.50	3.75
††Technology and System Level Demonstration of Highly Efficient and Clean, Diesel Powered Class 8 Trucks	Ken Damon (Peterbilt)	1-23	3.50	3.67	3.83	3.17	3.58
††SCAQMD:Plug-In Hybrid Electric Medium-Duty Commercial Fleet Demonstration and Evaluation	Matt Myasato (SCAQMD)	1-26	3.17	3.00	3.17	3.00	3.06
Medium and Heavy-Duty Vehicle Field Evaluations	Kevin Walkowicz (National Renewable Energy Laboratory)	1-30	3.38	3.38	3.38	3.00	3.33
† DOE/DOD Parasitic Energy Loss Collaboration	George Fenske (Argonne National Laboratory)	1-33	3.20	3.00	2.90	3.00	3.04
Vehicle Integration & Aerodynamics for Next-Gen Heavy Trucks	Kambiz Salari (Lawrence Livermore National Laboratory)	1-37	3.40	3.40	3.20	3.20	3.35
Idaho National Laboratory Testing of Advanced Technology Vehicles	Matthew Shirk (Idaho National Laboratory)	1-41	3.33	3.33	3.17	3.17	3.29
Advanced Vehicle Testing & Evaluation	Tom Garetson (Intertek)	1-44	3.13	2.75	3.38	2.75	2.92
Advanced Technology Vehicle Lab Benchmarking - Level 1	Kevin Stutenberg (Argonne National Laboratory)	1-47	3.63	3.50	3.38	3.13	3.47
Advanced Technology Vehicle Lab Benchmarking - Level 2 (in-depth)	Eric Rask (Argonne National Laboratory)	1-51	3.50	3.50	3.25	3.25	3.44
Electric Drive and Advanced Battery and Components Testbed (EDAB)	Barney Carlson (Idaho National Laboratory)	1-55	2.63	2.88	2.50	2.88	2.77
Integrated Vehicle Thermal Management – Combining Fluid Loops in Electric Drive Vehicles	Daniel Leighton (National Renewable Energy Laboratory)	1-58	3.50	3.33	3.50	3.50	3.42
Advanced HD Engine Systems and Emissions Control Modeling and Analysis	Zhiming Gao (Oak Ridge National Laboratory)	1-61	3.25	3.38	3.13	3.00	3.27
† Codes and Standards to Support Vehicle Electrification	Ted Bohn (Argonne National Laboratory)	1-64	3.67	2.67	3.33	3.00	3.04
Development of High Power Density (HPD) Driveline for Vehicle Efficiency Improvement	Oyelayo Ajayi (Argonne National Laboratory)	1-67	3.10	3.30	2.80	2.90	3.14

Presentation Title	Principal Investigator and Organization	Page Number	Approach	Technical Accomplishments	Collaborations	Future Research	Weighted Average
CoolCab Test and Evaluation and CoolCalc HVAC Tool Development	Jason Lustbader (National Renewable Energy Laboratory)	1-70	3.75	3.38	3.50	3.38	3.48
Development and Demonstration of a Fuel-Efficient Class 8 Highway Vehicle	Pascal Amar (Volvo Trucks)	1-72	3.50	3.40	3.60	3.30	3.44
Improving Vehicle Fuel Efficiency Through Tire Design, Materials, and Reduced Weight	Timothy Donley (Cooper Tire)	1-75	3.38	3.50	3.25	3.50	3.44
A Materials Approach to Fuel-Efficient Tires	Peter Votruba-Drzal (PPG)	1-78	3.00	3.00	3.00	3.13	3.02
System for Automatically Maintaining Pressure in a Commercial Truck Tire	Robert Benedict (Goodyear)	1-81	3.50	3.88	3.25	3.50	3.66
Next Generation Environmentally Friendly Driving Feedback Systems Research and Development	Matthew Barth (University of California at Riverside)	1-84	3.00	2.88	3.75	3.13	3.05
Look-Ahead Driver Feedback and Powertrain Management	Rajeev Verma (Eaton Corporation)	1-87	3.00	2.75	3.25	2.75	2.88
EV - Smart Grid Research & Interoperability Activities	Keith Hardy (Argonne National Laboratory)	1-90	3.00	3.25	3.38	3.13	3.19
Wireless Charging Testing	Barney Carlson (Idaho National Laboratory)	1-93	3.50	3.40	3.20	3.20	3.38
Electric Drive Vehicle Climate Control Load Reduction	John Rugh (National Renewable Energy Laboratory)	1-96	3.25	3.25	3.38	3.25	3.27
High Efficiency, Low EMI and Positioning Tolerant Wireless Charging of EVs	Allan Lewis (Hyundai)	1-99	3.50	3.10	3.30	3.20	3.24
Wireless Power Transfer and Charging of Plug-In Electric Vehicles	Perry Jones (Oak Ridge National Laboratory)	1-103	3.40	3.20	3.60	3.00	3.28
† Dynamic Wireless Power Transfer Feasibility	Perry Jones (Oak Ridge National Laboratory)	1-107	3.25	3.00	3.25	2.75	3.06
Development of Nanofluids for Cooling Power Electronics for Hybrid Electric Vehicles	Dileep Singh (Argonne National Laboratory)	1-110	3.60	3.90	3.00	3.20	3.63
PEV Integration with Renewables	Anthony Markel (National Renewable Energy Laboratory)	1-114	3.38	3.63	3.13	3.38	3.47
Zero Emission Heavy Duty Drayage Truck Demonstration	Brian Choe (SCAQMD)	1-117	3.20	3.00	3.20	2.90	3.06
Houston Zero Emission Delivery Vehicle Deployment Project & Hydrogen Fuel-Cell Electric Hybrid Truck Project	Allison Carr (Houston-Galveston Area Council)	1-121	2.00	1.75	2.25	2.08	1.92
† Fleet DNA	Kevin Walkowicz (National Renewable Energy Laboratory)	1-125	3.30	3.20	3.60	3.10	3.26
APEEM Components Analysis and Evaluation	Paul Chambon (Oak Ridge National Laboratory)	1-129	2.88	3.00	3.25	3.00	3.00
Vehicle to Grid Communications Field Testing & Analysis	Richard Pratt (Pacific Northwest National Laboratory)	1-132	3.33	2.83	2.67	2.83	2.94
Motor Standards Support	Laura Marlino (Oak Ridge National Laboratory)	1-135	3.50	3.00	3.50	3.33	3.23
ARRA Data Reporting and Analysis	Kevin Walkowicz (National Renewable Energy Laboratory)	1-137	3.25	3.25	3.38	2.88	3.22

Presentation Title	Principal Investigator and Organization	Page Number	Approach	Technical Accomplishments	Collaborations	Future Research	Weighted Average
Trip Prediction and Route-Based Vehicle Energy Management	Dominik Karbowski (Argonne National Laboratory)	1-141	3.50	3.30	2.90	2.90	3.25
Internal Combustion Engine Energy Retention (ICEER)	Jeff Gonder (National Renewable Energy Laboratory)	1-145	2.67	2.50	2.50	2.50	2.54
Vehicle Level Model and Control Under Various Thermal Conditions	Aymeric Rousseau (Argonne National Laboratory)	1-148	3.10	3.00	3.00	2.70	2.99
Impact of Advanced Technologies on Engine Targets	Neeraj Shidore (Argonne National Laboratory)	1-152	3.38	3.13	3.13	3.25	3.20
In-Vehicle LEESS Test Platform Evaluation of Lower-Energy Energy Storage System Devices	Jeff Gonder (National Renewable Energy Laboratory)	1-155	2.63	3.25	3.00	2.75	3.00
Dynamic Wireless Power Transfer Vehicle and Infrastructure Analysis	Jeff Gonder (National Renewable Energy Laboratory)	1-159	3.38	3.25	3.50	3.38	3.33
DC Fast Charging Effects on Battery Life and EVSE Efficiency and Security Testing	Jim Francfort (Idaho National Laboratory)	1-162	3.38	3.38	2.63	3.50	3.30
Thermal Control of Power Electronics of Electric Vehicles with Small Channel Coolant Boiling	Dileep Singh (Argonne National Laboratory)	1-166	3.25	3.50	3.50	3.38	3.42
Cummins MD & HD Accessory Hybridization CRADA	Dean Deter (Oak Ridge National Laboratory)	1-169	3.63	3.50	3.75	3.50	3.56
† Vehicle Thermal Systems Modeling in Simulink	Jason Lustbader (National Renewable Energy Laboratory)	1-172	3.63	3.38	3.50	3.25	3.44
Advanced Climate Systems for EV Extended Range	John Meyer (Halla Visteon)	1-175	2.88	3.00	3.25	3.13	3.02
Innovative Heating System for Cabin Heating in Electric Vehicles.	Timothy Craig (Delphi Automotive Systems)	1-178	3.25	3.13	3.13	3.25	3.17
EV Project Data & Analytic Results	Jim Francfort (Idaho National Laboratory)	1-181	3.63	3.50	3.63	3.25	3.52
† Autonomie Maintenance and Enhanced MBSE	Shane Halbach (Argonne National Laboratory)	1-183	3.25	3.25	3.25	3.13	3.23
† Impacts of Advanced Combustion Engines	Scott Curran (Oak Ridge National Laboratory)	1-186	3.33	3.50	3.33	3.50	3.44
† Powertrain Controls Optimization for HD Hybrid Line Haul Trucks	David Smith (Oak Ridge National Laboratory)	1-190	3.33	3.17	3.33	3.17	3.23
† Grid - Vehicle Communications and Charging Control	Richard Pratt (Pacific Northwest National Laboratory)	1-192	2.83	3.00	3.00	2.83	2.94
Overall Average			**3.26**	**3.20**	**3.24**	**3.10**	**3.21**

Note:
† denotes poster presentations.
†† denotes Recovery Act presentations.

Advancing Transportation through Vehicle Electrification - Ram 1500 PHEV: Abdullah Bazzi (Chrysler LLC) - arravt067



Reviewer Sample Size

A total of five reviewers evaluated this project.

Question 1: Approach to performing the work - the degree to which technical barriers are addressed, the project is well-designed, feasible, and integrated with other efforts

Reviewer 1:

The reviewer commented that the project overcame issues associated with Phase I batteries voltage imbalances and generated additional route based adaptive controls with significant fuel consumption benefits for fully charged vehicles.

Reviewer 2:

The reviewer remarked that this project uses a direct approach. If the project team wants to know how these vehicles will work, put them into normal use and monitor all the relevant parameters. The reviewer suggested that the final results compare performance and fuel economy to conventional equivalent vehicles. The reviewer questioned whether fuel use could have been decreased if drivers charged more often.

Reviewer 3:

The reviewer affirmed that the project had a good approach on applying new technologies to plug-in hybrid electric vehicles (PHEVs), which can be used for other vehicle classes. However, the Phase II sample size is too small. The presenter did not explain the reasons for having smaller sample in Phase II. In addition, the presenter did not provide concise answers to the reviewers questions, which could have helped clear some of the issues raised in the questions.

Reviewer 4:

The reviewer stated that overall, this was a good demonstration project. There are lots of vehicles providing quite a bit of data. It was not made clear in the presentation why the second generation battery had less capacity that resulted in an expected all-electric range (AER) of half the first generation-equipped vehicle. The reviewer questioned why the problems with the first generation batteries were not found before. The reviewer asked if it was the chemistry or the integration into modules/pack that caused the degradation issues.

According to the reviewer, the real-world fuel economy results are not overly impressive. If these results are better than the conventional vehicle counterpart, it would be useful to see such a comparison for future presentations. The reviewer found the units to be confusing and questioned why the units were not either Wh/mile or miles per gallon equivalent (MPGe) for charge depleting (CD) mode.

The reviewer is disappointed in the plug-in electric vehicle (PEV) lineup for Chrysler and stated that it is unclear how much of an impact this project has had on Chrysler's plans for the future. If the U.S. Department of Energy (DOE) provides such a high level of funding, it should be expected to result in a serious effort on Chrysler's part to introduce more PEVs.

Reviewer 5:
The reviewer suggested reading comments for the next question. The reviewer commented that there was a lack of project detail in the presentation.

Question 2: Technical accomplishments and progress toward overall project and DOE goals – the degree to which progress has been made, measured against performance indicators and demonstrated progress toward DOE goals.

Reviewer 1:
Apart from the problems associated with the first generation battery, the reviewer believed that the project progress appears on track. The design effort has been completed for Phase II, and the specified number of vehicles has been deployed for both phases.

Reviewer 2:
The reviewer noted that the project is on schedule.

Reviewer 3:
The reviewer was especially interested in two factors, namely the improvements achieved in battery balancing with the replacement batteries, and the active fuel economy optimization. The latter should be emphasized, and the reviewer would like to see more discussion of how this could be applied to other vehicles.

Reviewer 4:
The reviewer commented that the project has achieved progress in Phase II despite the small number of samples. It showed good results for the new tested technologies. However, the project needed to provide more information on the creation of green technology jobs, because it is one of the objectives.

Reviewer 5:
In the reviewer's opinion, the learning experience of cell balance and thermal control were easily avoidable with institutional knowledge within the technology, though it was unclear who was ultimately responsible in this case (i.e., the OEM or the battery supplier), and the lessons learned are societal in nature that this can really happen. The reviewer commended DOE for stepping in and salvaging a bad situation, but the reduction in scope and lost field experience was costly.

Question 3: Collaboration and coordination with other institutions.

Reviewer 1:
The reviewer noted that the competence and scope of collaboration was impressive.

Reviewer 2:
The reviewer acknowledged the project had broad collaboration with appropriate partners.

Reviewer 3:
The reviewer stated that the project has good collaboration with a diverse group of partners that include research institutes, and utility providers.

Reviewer 4:
The reviewer observed that the list of participants and demonstration partners is impressive. There appears to be a wide variety of demonstration locations.

Reviewer 5:
The reviewer remarked that perhaps a better initial core competence would have been better.

Question 4: Proposed future research – the degree to which the project has effectively planned its future work in a logical manner by incorporating appropriate decision points, considering barriers to the realization of the proposed technology, and, when sensible, mitigating risk by providing alternate development pathways.

Reviewer 1:
The reviewer remarked that the technical aspects are very well covered. The reviewer is also interested in the people aspects. The reviewer hopes the project team will discuss whether the drivers bothered to plug in when appropriate. Also, the reviewer questioned if the vehicle characteristics were well matched to the uses that were tried. The reviewer also asked if a larger AER would have been useful, if charging time impacted vehicle utility, and what were the best fits, where the vehicle characteristics worked best with the functions performed.

Reviewer 2:
The reviewer observed that the future plan will continue in the same track for monitoring the functionalities that were identified in Phase II. Also, it appears that the lessons learned helped and will help in commercialization of technologies for future products.

Reviewer 3:
The reviewer noted that there are several interesting aspects on side project, such as the reverse power flow and map-based fuel economy optimization. There appears to be well-established plans to examine these issues and to complete the remaining milestones. The reviewer looks forward to seeing the end of project results.

Question 5: Does this project support the overall DOE objectives of petroleum displacement? Why or why not?

Reviewer 1:
This reviewer said that developing PHEV technologies has a great potential for improving fuel efficiency and thus supporting DOE objectives.

Reviewer 2:
The reviewer commented that obviously, any electric miles achieved are displacing petroleum miles. It would be good if the researchers actually quantify savings by comparing fuel use with fuel use for equivalent conventional vehicles.

Reviewer 3:
The reviewer stated that demonstration projects were useful for several reasons, including the design experience gained in addition to the potential to displace petroleum by furthering the knowledge of real-world PEV performance and helping to create economies of scale. As mentioned above, Chrysler's efforts to introduce PEVs into its lineup have been minimal. This reviewer hopes that this project will spur Chrysler to bring more PEVs to market that will be sold everywhere in the United States.

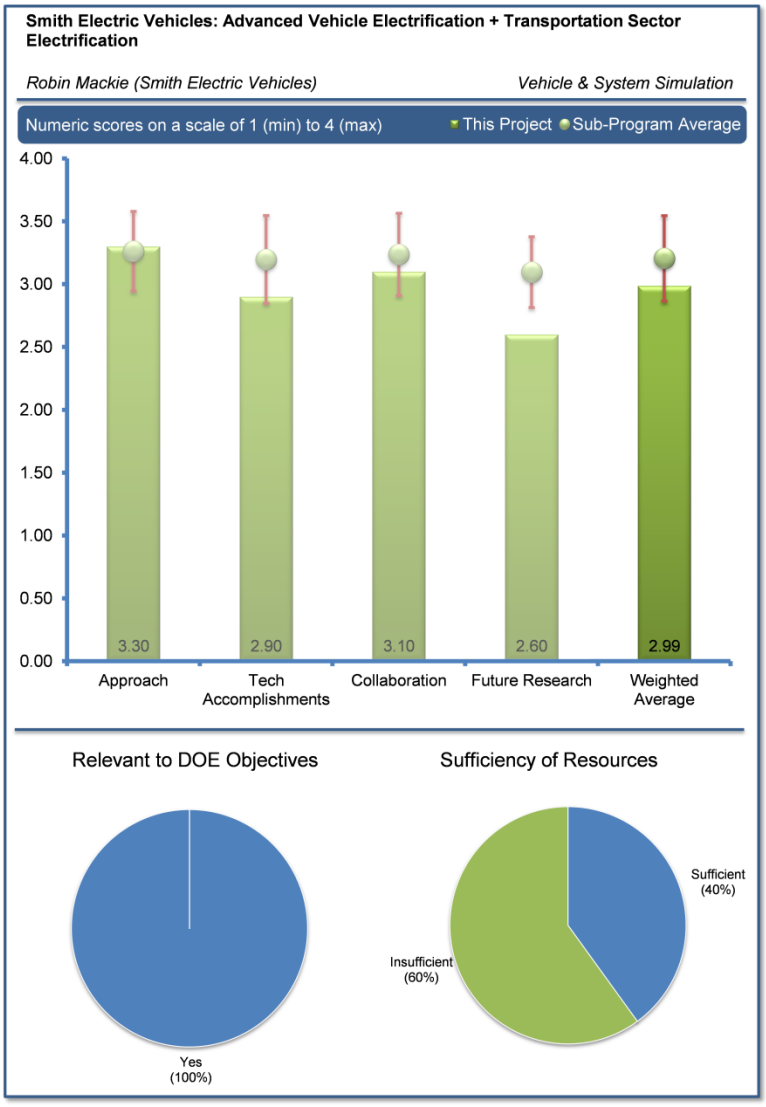
Question 6: Resources: How sufficient are the resources for the project to achieve the stated milestones in a timely fashion?

Reviewer 1:
The reviewer said that $100 million was a lot of money, but the project had to design the vehicles and there are lots of testing and measurement and analysis. In addition, there are various technical advances, etc., about charging and vehicle to grid (V2G)–so it seemed reasonable, but without detailed budget information, the reviewer noted that it was hard to say much.

Reviewer 2:
The reviewer noted that it appeared that the project had no resources issues for the completion of the work despite the time extension.

Reviewer 3:
The reviewer commented that while the funding level was very high, the funding appeared necessary to complete all of the tasks for the number of vehicles deployed, along with the design effort and side projects.

Smith Electric Vehicles: Advanced Vehicle Electrification + Transportation Sector Electrification: Robin Mackie (Smith Electric Vehicles) - arravt072



Reviewer Sample Size

A total of five reviewers evaluated this project.

Question 1: Approach to performing the work - the degree to which technical barriers are addressed, the project is well-designed, feasible, and integrated with other efforts.

Reviewer 1:

The reviewer stated that the deployment of electric commercial vehicles is a crucial part of the DOE's objectives. The SMITH electric vehicle project approach is completely in line with what is expected. It is unfortunate that the market conditions were not correct for this project to reach its final phase per the original project plan.

Reviewer 2:

The reviewer said that it was refreshing to hear honesty on real problems. The reviewer recounted that the project approach is simple and direct—put 500 vehicles on the road and see how the vehicles perform.

Reviewer 3:

The reviewer noted that establishing a new OEM is a monumental task that has only been accomplished in recent history by Elon Musk with Tesla Motors. While this reviewer appreciated the vision and was certain that the Smith Electric Vehicle team was completely dedicated to the success of this project, the project was up against a huge challenge on all fronts. Spending discipline, technological superiority and access to capital represent just a few of the areas that the team has to be leaders in the industry in, just to keep afloat.

Reviewer 4:

The reviewer stated that the project was essentially a demonstration of an all-electric vehicle (AEV) under the ARRA mechanism. The project set out to supply 500 medium-duty commercial AEVs, collect data on their field performance, and create 225 jobs in the United States.

Reviewer 5:

This reviewer acknowledged that Smith Electric Vehicles developed a fleet of all-electric MD commercial vehicles and the supporting technologies. The ideal use case is in a high density, urban environment for last-mile delivery/distribution of items such as soft drinks, potato chips, stationary, etc., with high stop-start duty cycle. The vehicle has a higher cost initially ($27,500 extra) compared with a conventional vehicle; however through incentives and improved efficiency, there is an approximately three-year payback on that initial investment followed by a cost savings to the customer, assuming an average use case. The reviewer recounted that the ARRA goals included the creation of 225 jobs within the United States. The present employment is lower (only 52 employees presently) due to poor

business conditions and lack of capital investment and demand for the vehicle platform. Smith Electric Vehicles is further considering development of grid services (e.g., peak shaving, etc.) to provide additional cost savings to customers.

Question 2: Technical accomplishments and progress toward overall project and DOE goals – the degree to which progress has been made, measured against performance indicators and demonstrated progress toward DOE goals.

Reviewer 1:
The reviewer noted that building and deploying 439 vehicles was pretty impressive. The data the project is collecting is interesting and will help future buyers decide whether to invest in such trucks. In addition, the proprietary components of the system appear to be significant steps forward, although it is hard to tell from the level of detail provided in this review. This reviewer preferred a day-long review for a project spending $70 million.

Reviewer 2:
The reviewer indicated that the technical accomplishments for this project were very good. To develop and deploy batteries of different sizes to support differing customer requirements is a feat in its self. Again, the reviewer added, that it is unfortunate that the final number could not be reached in time for this review. It is hoped that Smith Electric Vehicles can deploy the remaining units and still remain solvent.

Reviewer 3:
The reviewer observed that the Smith Electric Vehicles team had made a significant accomplishment with their efforts. Unfortunately, as the team has experienced, the team has to make never before seen achievements just to survive.

Reviewer 4:
The reviewer said that 439 vehicles were delivered to date (only 17 since the last Annual Merit Review [AMR]). The PI was open and honest about the financial problems of the company. The PI however promised that the rest of the vehicles would be delivered. Meanwhile, some valuable and very useful data were collected from the currently operating vehicles. Due to financial reasons again, the number of jobs created in the United States were far below the target.

Reviewer 5:
This reviewer observed that the vehicle deliveries and employment numbers presently did not meet the ARRA objectives, but that deliveries should be completed by the end of this year. 9 million miles achieved at 300,000 miles/month on the vehicle fleet. The data being delivered to the National Renewable energy Laboratory (NREL) has had a positive impact on the analysis of electric vehicle (EV) systems and their use, for example Smith Electric Vehicles has determined that most of its customers are using significantly less than the full range of the vehicle. The electric machine was stated to be 92-93% efficient. For a permanent magnet (PM) motor, this is lower than expected. The reviewer asked if this was the peak efficiency value and if the value includes inverter and/or gearbox losses. The reviewer continued it was further stated that the overall cost to operate this system was more important than its efficiency to its customer base. The battery remains the primary cost driver of the system. For new deliveries, Smith Electric Vehicles has developed a modular battery approach up to 120 kilowatt-hours (kWh), in 20kWh increments. Smith Electric Vehicles works with each prospective customer to right-size the battery pack based on their delivery route. This can significantly reduce the payback time of the EV investment.

Question 3: Collaboration and coordination with other institutions.

Reviewer 1:
In spite of the company's financial problems, there was clear evidence of good collaborations with universities, a national laboratory and commercial organizations, including end users.

Reviewer 2:
The reviewer observed that there are numerous partnerships and customers that Smith Electric Vehicles closely works with, including the Kansas University Center for Research, Bristol University (UK), Leicester University (UK), QM Power, FedEx, NREL, Burns & McDonald, Schneider Electric, TARDEC, and Missouri University of Science and Technology. The reviewer asked if Smith Electric Vehicles also sold its developed subsystems to other OEMs.

Reviewer 3:
The reviewer noted that the project team had made efforts to maintain their commitments and would continue so if the working capital was available.

Reviewer 4:
The reviewer said that the collaboration is as expected. The work with NREL using the proprietary data recording system is as the reviewer would have expected. The analysis of the data does not surprise the reviewer. There are still some range fears out there even with the commercial operators and even with real data, it will take time to overcome these unnecessary concerns and ensure that deployed EVs are utilized to the best of their design abilities.

Reviewer 5:
The reviewer noted that several appropriate institutions were mentioned as collaborators on this or other projects, but it was unclear just what the partners did in relation to the project being reviewed.

Question 4: Proposed future research – the degree to which the project has effectively planned its future work in a logical manner by incorporating appropriate decision points, considering barriers to the realization of the proposed technology, and, when sensible, mitigating risk by providing alternate development pathways.

Reviewer 1:
This reviewer admired the project team's initiative in overcoming the financial setbacks that led to the interruption of production. The reviewer would have liked to see more information developed on the suitability of the vehicles for different types of use/duty cycle. The reviewer inquired about the following: which vocations fit best; which vocations required more miles than the vehicles could supply; what size batteries would be best and for what use if the batteries were oversized; and how the vehicles performed when compared to conventional ones.

Reviewer 2:
This reviewer stated that future plans in the project consisted of delivery of the balance of 500 vehicles as well as technology development and enhancement of the vehicle performance. The PI also talked about plans to address the financial problems.

Reviewer 3:
The reviewer noted that the future work included delivery of the remaining 61 vehicles under the effort, assuming additional capital investment could be secured. Such investment would allow production to restart and 95 new workers to be hired.

Reviewer 4:
This reviewer stated that the future work was not really relevant here. The only outstanding tasks are to complete the delivery of the remaining vehicles and then to track them for the remainder of the project.

Reviewer 5:
This reviewer commented that restarting production would be a difficult task given the expense and supplier support required.

Question 5: Does this project support the overall DOE objectives of petroleum displacement? Why or why not?

Reviewer 1:
This reviewer commented that these vehicles do not use petroleum – cannot do better than that.

Reviewer 2:
The reviewer said that electric commercial vehicles are a very relevant study and one that when finally proven successful, would contribute enormously to the DOE's objective of reduced petroleum usage.

Reviewer 3:
The reviewer stated that the use of AEVs would no doubt result in significant petroleum displacement, particularly when the electricity is generated from non-oil sources.

Reviewer 4:
This reviewer stated that the project aligns with DOE goals.

Reviewer 5:
This reviewer said that yes, Smith Electric Vehicles has determined that over 1 million gallons fuel have been saved across the Smith Electric Vehicles fleet compared to performing the same services using 8 miles per gallon MPGe vehicles.

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

Reviewer 1:
The reviewer quoted that the total budget for 500 vehicles is about $ 67.5 million, which translates to about $135,000 per vehicle. This is certainly a sufficient level of funding for this demonstration project.

Reviewer 2:
From a resource perspective, the reviewer thought that Smith Electric Vehicles has had a hard time. The reviewer recognized the market conditions and coming from an eSTar background, the reviewer had every sympathy with the team on this project.

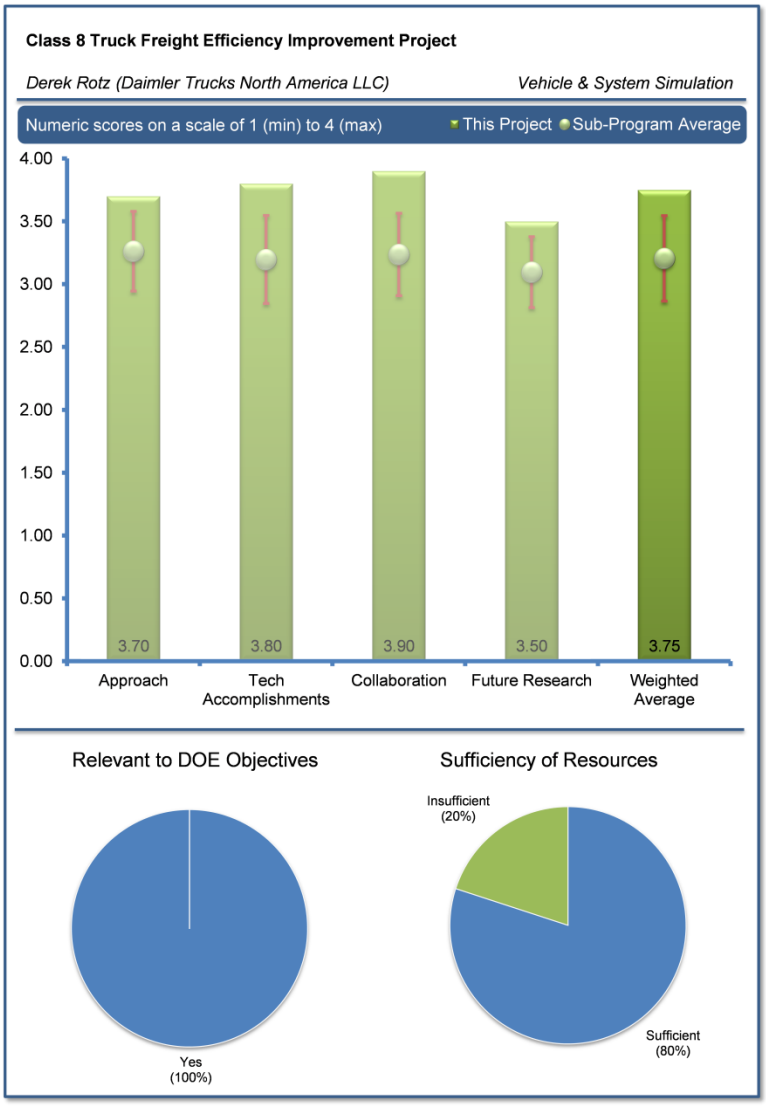
The reviewer believed that from a headcount perspective, Smith Electric Vehicles had sufficient resources to support the project. From an overall liquidity perspective, the reviewer believed, this is where the project failed.

Reviewer 3:
The reviewer commented that vehicle programs require hundreds of millions to launch, so the project amount was clearly insufficient.

Reviewer 4:
The reviewer commented that it was hard to evaluate. Any project that includes design of vehicles and creation of infrastructure to build them is going to cost a lot of money; but without detailed budgets, it was impossible to say much that is intelligent.

Reviewer 5:
The reviewer recounted that the Smith Kansas City EV production facility was shut down while working to secure additional private investment in the company ($70 million) and transition production of key components (batteries, battery management system [BMS], motors and controllers) to high volume suppliers to improve quality and reduce cost. Given the present level of project funds and supplementary private investment, the project will not complete its objectives. The reviewer concluded that assuming additional private investment can be secured, the remaining deliveries will be completed.

Class 8 Truck Freight Efficiency Improvement Project: Derek Rotz (Daimler Trucks North America LLC) - arravt080



Reviewer Sample Size

A total of five reviewers evaluated this project.

Question 1: Approach to performing the work - the degree to which technical barriers are addressed, the project is well-designed, feasible, and integrated with other efforts.

Reviewer 1:

The reviewer said that this project was very well managed, and the technical barriers were clearly managed with good engineering practices. There are no fundamental technical issues with the approach, the results, the analysis, and the future development.

Reviewer 2:

The reviewer commented that there was a broad approach to freight efficiency improvement. All types of losses seemed to have been investigated to maximize efficiency.

Reviewer 3:

The reviewer observed a well-structured program with strong participants. The reviewer would have liked to see additional truck manufacturers participating.

Reviewer 4:

The reviewer observed that the project was currently in Phase 4, the build phase. The reviewer noted the project was 80% complete and was impressed with Daimler's scenario analysis, rather than just picking what the team thought was best or believed from prior reviews. The reviewer continued to say that the data is from Society of Automotive Engineers' (SAE) fuel tests now, not just analytics. The reviewer stated that a sample (first prototype) then final demonstrator vehicle is being built now in Phase 4. The reviewer also noticed all kinds of integration challenges with a sample, which was then subjected to a series of tests-including durability and reliability. This reviewer was very pleased with the waste heat recovery (WHR) of 6kW with exhaust only.

Reviewer 5:

The reviewer pointed out that Slide 6 showed a comprehensive technology list to achieve the program goals, which was helpful to understanding the program. The reviewer was not so sure what the return of investment would be after investing so much on hybrid, and only to receive 1-3% benefits. The integration of the WHR package into vehicle seemed very complicated. The reviewer again was not sure how it would impact the cooling and aero.

Question 2: Technical accomplishments and progress toward overall project and DOE goals – the degree to which progress has been made, measured against performance indicators and demonstrated progress toward DOE goals.

Reviewer 1:
This reviewer observed strong achievements on milestones. The reviewer recounted testing of a truck – a big milestone with all the unique systems. The reviewer commented good work with various tests using emotor to eliminate 400 pounds of batteries, starter, etc. The reviewer commented that the over-the-road testing exceeded 50% fuel economy improvement - 52% and 61% on the two routes, Oregon and Texas. The reviewer exclaimed 1,500 lbs. weight savings!

Reviewer 2:
This reviewer said that given the funding level, the program has accomplished quite a bit. The objectives are high, and should be.

Reviewer 3:
This reviewer observed an extensive use of the testing facilities to develop and prove out individual components. The reviewer continued to say it seemed like the whole development process would generate a lot of know-how that could be applied to production programs much sooner than the actual technology used on SuperTruck will make it on the road.

Reviewer 4:
The reviewer commented that the technical accomplishments were more than what was expected from this project.

Reviewer 5:
The reviewer commented that the results shown in Slide 12 indicated that 50% freight efficiency was already achieved. It seemed it would be helpful to indicate how the 1,550 lbs. reduction was achieved.

Question 3: Collaboration and coordination with other institutions.

Reviewer 1:
The reviewer observed that there were a good mix of program partners, the technology investigated was important and the reviewer would have liked to see a broader participation from the truck chassis manufacturers.

Reviewer 2:
The reviewer stated that the comprehensive collaboration with suppliers leverages the expertise required to optimize the truck as a system – great job.

Reviewer 3:
The reviewer said that the project involves many partners, thus fully utilizing DOE funding to achieve the program goals.

Reviewer 4:
The reviewer said there was not much to mention in this review, but clearly there must have been strong coordination to get to such a strong conclusion. The reviewer noted that the fleets obviously contributed.

Question 4: Proposed future research – the degree to which the project has effectively planned its future work in a logical manner by incorporating appropriate decision points, considering barriers to the realization of the proposed technology, and, when sensible, mitigating risk by providing alternate development pathways.

Reviewer 1:
This reviewer stated that no more research was required at this time. The project just needed to assemble the vehicle and run the tests. It seemed to be on the way to achieve the program goal.

Reviewer 2:
This reviewer stated that not much detail was provided about future work but there seemed to be a rough timeline in place to proceed with the build and further testing.

Reviewer 3:
This reviewer observed that the project was now moving on to build the final prototype. However, the reviewer suggested going back and redoing some of the tests given. A sample testing is a good adjustment to the plan.

Reviewer 4:
This reviewer said that as the program matures, new avenues for research become apparent. The reviewer would have liked to see a review of the program coordinated with the next steps or future possibilities line-up for a follow-on program.

Question 5: Does this project support the overall DOE objectives of petroleum displacement? Why or why not?

Reviewer 1:
The reviewer stated that line trucks represent a sizeable portion of the fuel consumption in the United States and are a foundational part of the goods transport. Programs like this have made a noticeable difference in the technology and more importantly the behavior of the truck operators. This program is loaded with new concepts that can continue the efficiency improvement of the line truck and only needs two things (i.e., keep getting the message out, and keep doing more of what it is doing). The reviewer further observed nice work.

Reviewer 2:
This reviewer noted that the project was at $120 billion of fuel burned by NA sleeper tractors, and exclaimed yes.

Reviewer 3:
The reviewer noted that early vehicle tests already showed over a 50% improvement in freight efficiency. This progress already demonstrated support of the overall DOE objectives of petroleum displacement.

Reviewer 4:
The reviewer commented that the project is on track to demonstrate over 50% improvement in freight efficiency.

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

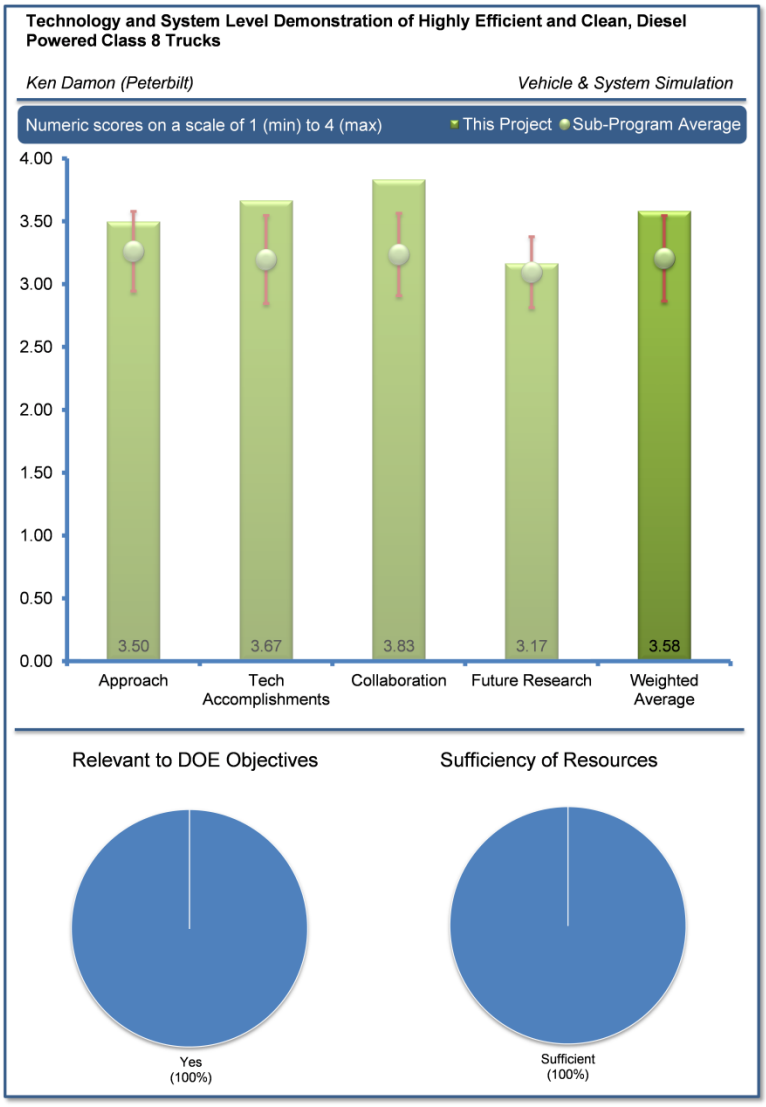
Reviewer 1:
This reviewer thought that Daimler was getting excellent use of their resources and were clearly dedicated to success.

Reviewer 2:
This reviewer stated that the project was on its way to achieve all program goals.

Reviewer 3:
This reviewer observed that the resources were not directly addressed within the presentation.

Reviewer 4:
This reviewer commented that the project needed additional resources to engage with a larger manufacturer set.

Technology and System Level Demonstration of Highly Efficient and Clean, Diesel Powered Class 8 Trucks: Ken Damon (Peterbilt) - arravt081



Reviewer Sample Size

A total of three reviewers evaluated this project.

Question 1: Approach to performing the work - the degree to which technical barriers are addressed, the project is well-designed, feasible, and integrated with other efforts.

Reviewer 1:

This reviewer commented that this project was very well managed, and that the technical barriers were clearly managed with good engineering practices. The reviewer found no fundamental technical issues with the approach, the results, the analysis, and the future development.

Reviewer 2:

This reviewer said there were very comprehensive approaches, covering most of the parts and corners of technologies.

Reviewer 3:

This reviewer stated that the presenter did not include specific Approach slides for the past year's work, but did show summary Gantt charts. Last year's approach appeared to have included switching from a fuel cell to a battery for the alternate power unit (APU), completing the Demo 2 vehicle, and the 24-hour test. The reviewer concluded that it would have been nice to see even more emphasis on overcoming deployment barriers to increase the near-term deployment likelihood for technologies demonstrated as part of the program.

Question 2: Technical accomplishments and progress toward overall project and DOE goals – the degree to which progress has been made, measured against performance indicators and demonstrated progress toward DOE goals.

Reviewer 1:

This reviewer said that the results from the data shown were outstanding.

Reviewer 2:

According to this reviewer, the project's accomplishments included integrating a lithium-ion (Li-ion) battery to support idle engine off, which would be designed to recharge over a subsequent six-hour period of highway driving (though the presenter acknowledged that some customers may require a shorter recharge time). Other accomplishments included completing integration of the many additional energy saving features on the Demo 2 vehicle, and considering driver acceptance to incorporate feature enhancements such as an automatically retractable skirt at low speed and easy move-ability for service access. The presenter reported impressive results demonstrating fuel economy and freight efficiency improvements in excess of the established goals, though it would have been nice to see some test data with more repeatability/uncertainty quantification. This reviewer expected that a few repetitions could be performed

for a very small percentage of the overall project budget, or at least this could be done over smaller test cycle sections to more precisely confirm the benefits over those sections that make the largest contribution toward the overall savings. It is good that for each result that both freight-ton-miles per gallon (FTMPG) and miles per gallon (MPG) are shown.

Reviewer 3:
While the reviewer acknowledged kudos for the significant achievement throughout the program, the reviewer felt the presentation was too sales/marketing focused rather than focusing on technical detail. It was unnecessary to show Slides 24 to 27, which were not relevant to the program goals. The reviewer continued to say that it was unclear how the APU worked. More specifically, the reviewer wanted to know if the battery was fully charged before the truck ran (Slide 14).

Question 3: Collaboration and coordination with other institutions.

Reviewer 1:
While working with the key partners of the program, the reviewer noticed that Slide 12 demonstrated a successful story in working with all possible partners in achieving the program goals.

Reviewer 2:
This reviewer said that sufficient collaboration appeared to have occurred with subcontractors, suppliers, trailer manufacturers and end users.

Question 4: Proposed future research – the degree to which the project has effectively planned its future work in a logical manner by incorporating appropriate decision points, considering barriers to the realization of the proposed technology, and, when sensible, mitigating risk by providing alternate development pathways.

Reviewer 1:
This reviewer observed that the project was on its way to completing the program on vehicle side, and thus the future plan was mainly to write a report.

Reviewer 2:
This reviewer said that the project was concluding, so not much was stated regarding future work. The speaker mentioned that some technologies (such as weight saving enhancements) would be making it into near-term production vehicles, but no estimation was given as to the incremental level of production vehicle fuel savings that might be expected. It would have been nice to have more details in the presentation.

Question 5: Does this project support the overall DOE objectives of petroleum displacement? Why or why not?

Reviewer 1:
This reviewer acknowledged that the project was very relevant to both DOE's petroleum displacement mission and to the ARRA program goals for job creation.

Reviewer 2:
According to this reviewer, many of technologies could be used in production in next few years, which significantly improved freight efficiency. This supports the overall DOE objectives of petroleum displacement.

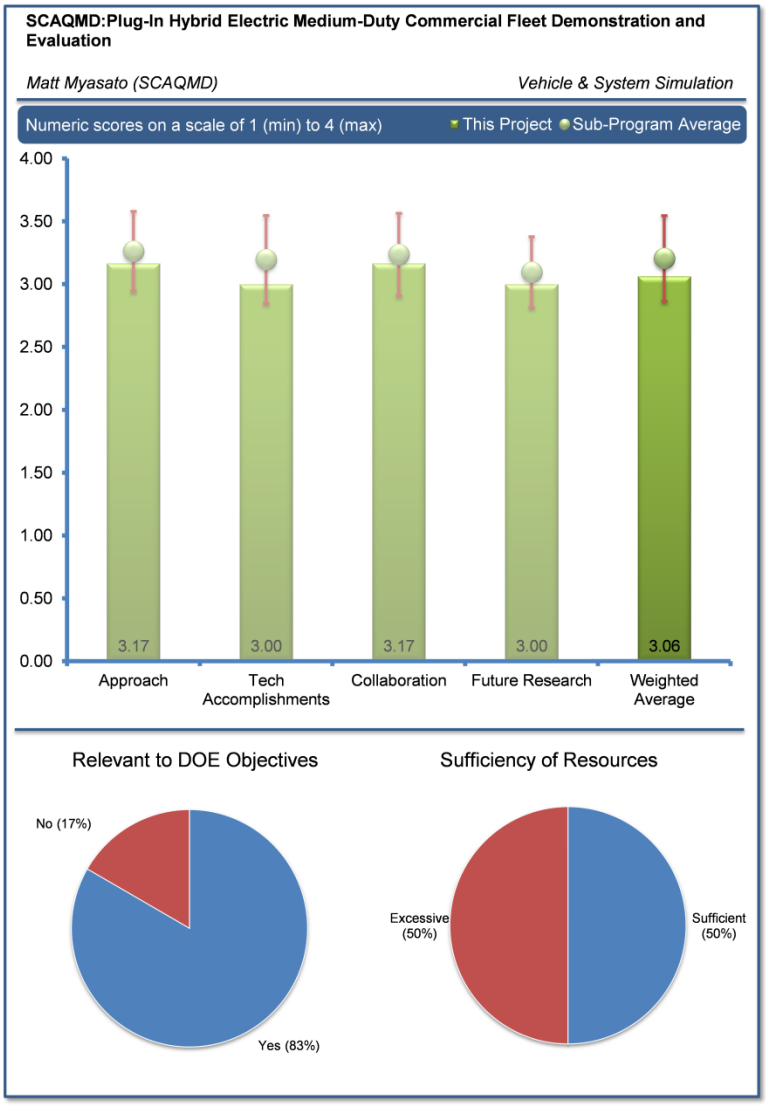
Question 6: Resources: How sufficient are the resources for the project to achieve the stated milestones in a timely fashion?

Reviewer 1:
This reviewer observed that the project was just on the way to accomplish the program goals.

Reviewer 2:

This reviewer said that this was a large, roughly $80 million research activity and given the short 20 minute presentation with limited technical details, it was difficult to make an informed judgment about the sufficiency of the resources.

SCAQMD: Plug-In Hybrid Electric Medium-Duty Commercial Fleet Demonstration and Evaluation: Matt Myasato (SCAQMD) - arravt083



Reviewer Sample Size

A total of six reviewers evaluated this project.

Question 1: Approach to performing the work - the degree to which technical barriers are addressed, the project is well-designed, feasible, and integrated with other efforts.

Reviewer 1:

The reviewer commented that the design and development of the PHEV drive systems, fleet selection, deploying vehicles and performance assessment is excellent.

Reviewer 2:

This reviewer commented that the project is very good, and the weaknesses are beyond the control of the project leadership. The reviewer acknowledged that finding effective technology partners is not easy, and that the project faces many risks.

Reviewer 3:

This reviewer appreciated the PI's presentation style and delivery. It was easy for the reviewer to get an understanding of the project with the explanations. The reviewer noted that the approach relied heavily on commercial partners for design, development and deployment of both the Class 2 and Class 6/7 work trucks. In addition, the large demonstration fleet size and the vast deployment area really make this project scope unrealistic. It appears a re-scoping of the project may prove useful and allow the team to show more progress and results.

Reviewer 4:

This reviewer said that the presenter commented that specifically covering approach to the project may have been too aggressive, and that their deployment opportunities relied on the launch performance of start-ups. The California Air Resources Board (CARB) was shown as a barrier, but for this type of prototype deployment, DOE should be able to assist in obtaining waivers to help mature the technology. The early partnership plans did not come to fruition, and having new partner plans required additional modifications. The reviewer suggested that this needs to be understood in the preparation.

Reviewer 5:

This reviewer commented that the project had a fairly simple approach (i.e., build and deploy the vehicles and see how they work, which is enough of a challenge). Unfortunately, the material received by the reviewer was not very detailed, which made it hard to evaluate such a large project.

Reviewer 6:
The reviewer said that the approach should include a good plan to compare to baseline vehicles in order to assess effectiveness.

Question 2: Technical accomplishments and progress toward overall project and DOE goals – the degree to which progress has been made, measured against performance indicators and demonstrated progress toward DOE goals.

Reviewer 1:
This reviewer noted that the project team got a vehicle out on the road in commercial operation, which was a major achievement. Some of the components represent important advances relative to conventional vehicle. The reviewer particularly admired the Odyne approach of hybridizing both the propulsion and the work functions of the truck.

Reviewer 2:
This reviewer observed that it was very good to see data from the Odyne field data and the fuel consumption and emissions testing. The data is encouraging because the PHEV technology shows improvements for both fuel economy and emissions. Finding 65 participants in 23 states to participate in the project showed very good progress, according to the reviewer.

Reviewer 3:
The reviewer commented that good progress has been made given the changes with OEMs, and added that the project is moving along well.

Reviewer 4:
According to this reviewer, the results from the Odyne test vehicles were very promising. There appeared to be a lot of areas of optimization remaining with regards to battery and electric machine sizing. Even the control system in place could provide a lot of unique benefits. The reviewer added that a more thorough understanding of just a few of these trucks would seem like valuable information that could be shared with industry to shape the next generation hybrid work truck.

Reviewer 5:
The reviewer commented that the efforts of Odyne appeared to be as much as the reviewers could hope to receive. The reviewer continued to say that the VIA Motors effort looked more like a science project that if successful would expand the industry understanding of the benefits and costs of this technology.

Reviewer 6:
This reviewer said that more information on fleet return on investment (ROI) needs to be developed to inform the government of opportunities to support the technology transformation to production levels through incentives, or to focus in other areas of advanced transportation for research.

Question 3: Collaboration and coordination with other institutions.

Reviewer 1:
This reviewer stated that this collaboration had a particularly varied and competent set of collaborators, chosen to be the best match for what was to be demonstrated.

Reviewer 2:
The reviewer noted that the fleets and OEMs had evolved, but it was evident that there would be a good mix of collaborative partners to complete the project.

Reviewer 3:
The reviewer noted that the project had a very good set of partners involved in the project. Also, there are 65 locations in 23 states where the trucks will be tested. The states are identified, but it would be good to have a list of the locations where the trucks will be used.

Reviewer 4:
To this reviewer, the project seemed to have stabilized with respect to the performance of the partners.

Reviewer 5:
This reviewer said there was a good presentation of the current project status, but again that the South Coast Air Quality Management District (SCAQMD) as a project lead needed to break down barriers for partners. The reviewer continued to say that the gathering of power take-off (PTO) duty cycle information was very valuable.

Reviewer 6:
The reviewer observed that significant barriers existed on the collaboration front given the lack of commercial partners. The project may need to re-scope the project once more substantial contracts are available. The reviewer concluded that VIA Motors may provide some insight, but that relationship is still in its infancy.

Question 4: Proposed future research – the degree to which the project has effectively planned its future work in a logical manner by incorporating appropriate decision points, considering barriers to the realization of the proposed technology, and, when sensible, mitigating risk by providing alternate development pathways.

Reviewer 1:
According to the reviewer, the project has done a good job with re-planning future work based on evolving vehicle plans.

Reviewer 2:
To this reviewer, the project seemed effective even considering the delays. The reviewer hoped that the natural gas movement would not render this technology irrelevant with respect to lifecycle cost, but noted that this was beyond the control of the project.

Reviewer 3:
The reviewer commented that the plan for future work –was to complete the build of 54 VIA vans, 123 VIA trucks and 121 Odyne trucks and to get the trucks into service is very good. The trucks should all be in operation over the next several months followed by data collection. The reviewer was concerned that if there were any delays there would not be enough time before the projects end to collect and analyze the data.

Reviewer 4:
This reviewer said that the project had a good plan in place to recover, but based on past history the reviewer was apprehensive of the success of this project to continue to provide data. The reviewer continued to say that the creation of the field data beyond the current planned should be a requirement, as this may be the largest benefit of the project.

Reviewer 5:
This reviewer suggested that the team include comparison to conventional vehicle performance in their final results. The reviewer also wanted to know whether the operators remembered to plug in overnight, and whether the batteries needed to be recharged during the day. If not, the reviewer asked if a smaller battery would do for some uses. The reviewer commented that a matching design to use would be important.

Reviewer 6:
This reviewer noted that the future work included a lot of vehicles that were being built by the industry partners. The connection to VIA Motors does not appear that strong. VIA is currently in production, so those vehicles are likely to make it through production. The reviewer would like to see a sharper focus on the intended/expected results from future work. The reviewer said that these vehicles would make an interesting study as they enter the workforce, but it was just not clear how this project was going to capitalize on those vehicles.

The reviewer recommended to reduce the fleet size understudy as well as to focus on just a few unique regions of the country that provide interesting terrain, weather, duty cycles to fully capture the possibilities of these hybrid work vehicles.

Question 5: Does this project support the overall DOE objectives of petroleum displacement? Why or why not?

Reviewer 1:
This reviewer commented that the Odyne vehicle results were quite impressive.

Reviewer 2:
To this reviewer, this project is very important both in field data collection for Class 2-7 vehicles and technology introduction into fleet environments.

Reviewer 3:
The reviewer said that any time the PTO is powered from the battery, oil is saved, and that the vehicles drive using less fuel as well.

Reviewer 4:
The reviewer stated that the project is relevant to the DOE petroleum displacement goals. The reviewer added that once the vehicles are on the road and data starts to be collected, the project would provide excellent information to DOE regarding PHEVs.

Reviewer 5:
This reviewer said yes, these trucks will help to develop advanced, efficient powertrains in niche applications, but the technology will be able to scale into other vocations and vehicles if successful.

Reviewer 6:
This reviewer noted that air emissions were significantly reduced from idling. This was not an obvious improvement in petroleum usage.

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

Reviewer 1:
To this reviewer, resources appeared sufficient but there was concern that since the project would complete in just over a year from now, and it has only spent on 40% of the funds.

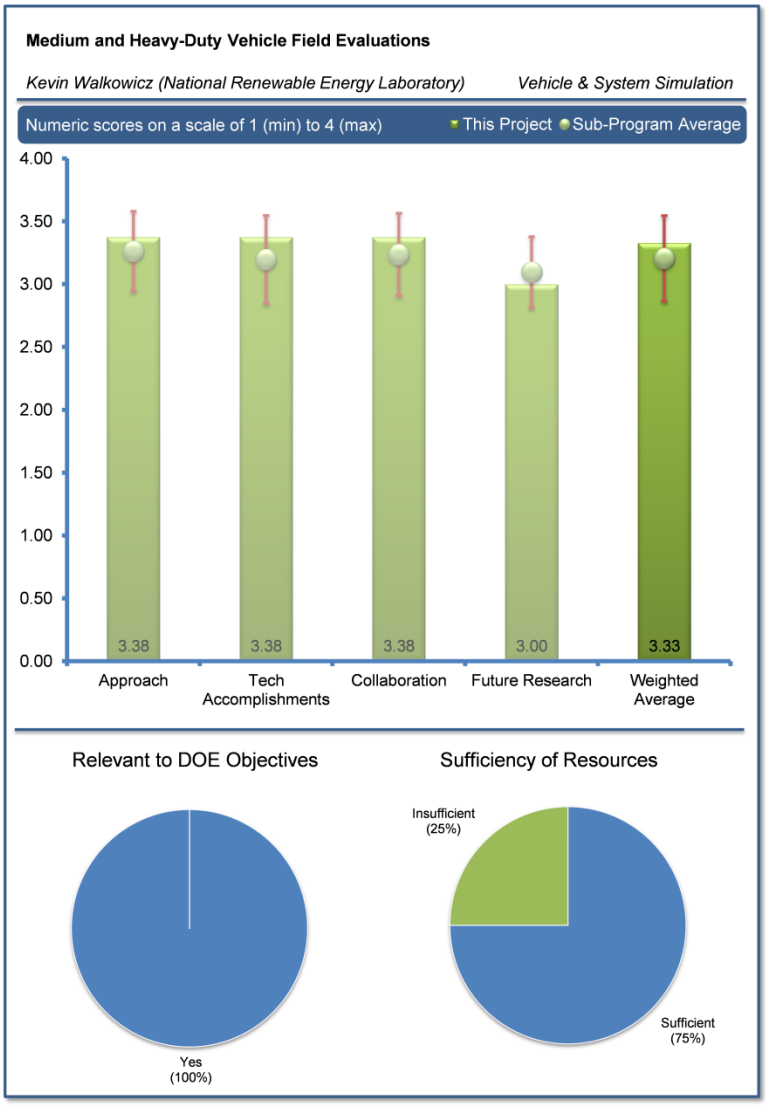
Reviewer 2:
According to this reviewer, the project seemed to indicate that pre-project simulation and other prototype work could have had a much better ROI.

Reviewer 3:
This reviewer stated that the scale of this project was too large considering the early system designs. A large deployment would be better if there was a third design iteration or higher of this technology. This would help launch the commercialization of these products (assuming there is strong interest).

Reviewer 4:
This reviewer asked again, how one could evaluate $90 million in expenditures in a 20-minute talk.

Reviewer 5:
This reviewer commented that given the lack of completion, the funds appeared to be underutilized.

Medium and Heavy-Duty Vehicle Field Evaluations: Kevin Walkowicz (National Renewable Energy Laboratory) - vss001



Reviewer Sample Size

A total of four reviewers evaluated this project.

Question 1: Approach to performing the work - the degree to which technical barriers are addressed, the project is well-designed, feasible, and integrated with other efforts.

Reviewer 1:

This reviewer liked very much the grouping of fleet projects into a single project scope – EV and other technologies. The reviewer clearly recognized the barriers to adoption of technologies and said that NREL was well poised to help the industry in this way. The reviewer was not sure how projects were selected. The reviewer said that it was good to include maintenance data, as there generally is a cost plus or minus here that should be included in the fleet ROI.

Reviewer 2:

This reviewer liked the Consumer Reports-style evaluations of heavy-duty vehicles in the field. It can offer quite a bit of information to businesses wanting to invest but who do not have the supporting information. The reviewer added that there was good structure, investigations from a real world perspective.

Reviewer 3:

This reviewer noted that the program provided valuable feedback on in-service technology use and effectiveness based on how vehicles are used. Numerous benefits are derived from these efforts including gaining an understanding of technology benefits in use, degree of fit between vehicle and application, real-world benefits in terms of fuel economy, and also identifying technical barriers such as demand charge penalties for an EV fleet. Regarding project planning, the project start/end dates were not clear. The reviewer concluded that it was hard to judge what was accomplished this year and in the past.

Reviewer 4:

The reviewer said that the approach described on Slide 6 seemed reasonable and the reviewer appreciated the results made available through publications and DOE programs such as Clean Cities. Given the diversity between the Frito-Lay and Peloton truck platoon testing, the reviewer commented that the selection of the projects appeared to be too broad. The reviewer found the Frito-Lay study very interesting. It would really reinforce the importance of the data if the project would comment on how it has helped other fleet operators, given that is presented as one of the project objectives.

The reviewer continued to say that the transition to the Peloton truck platoon testing was odd. It was not obvious how this type of testing fit in with the Frito-Lay and UPS fleet projects. Given the projects were so different it diluted the focus from the reviewer's perspective. The reviewer concluded that maybe it was just the structure of the program that allowed these to be binned together.

Question 2: Technical accomplishments and progress toward overall project and DOE goals – the degree to which progress has been made, measured against performance indicators and demonstrated progress toward DOE goals.

Reviewer 1:
This reviewer said it looked like a good start for the program with a good structure. The program success will be determined by the number and type of tests which should be determined by a constant survey/discussion with potential users of the information.

Reviewer 2:
This reviewer said that it seemed this set of projects really involved the partners to collect data that the team was interested in. These are the innovators for technology procurement and deeply understanding the use data is crucial to next adopters. The reviewer emphasized that this was exciting. The reviewer observed the project was going deeper than just fuel savings. Peloton platooning close following the distance issue with the cooling fan needing to come on significantly more often was highlighted by this reviewer as an excellent example of how this work helped find issues early. The reviewer added that linking field data to laboratory data was critical to accelerating adoption of these technologies. Fleets and truck builders want to be sure that they will really get the benefits. The reviewer remarked that this is so important!

Reviewer 3:
This reviewer commented that the technical accomplishments were clearly shown and well presented. According to the reviewer, Slide 8 showed that "EVs still save nearly 2/3 fuel costs" while the results were expressed in percentages of fuel economy improvement for the other two projects. The reviewer recommended that it would be more straightforward if it was all stated the same way; just a minor point the reviewer found while reading through the slides on their own. The results from the tests confirmed the impact of the technologies and the reviewer then suggested that it would be helpful to show how these results were being used because the objective was to provide the unbiased data to guide intelligent usage of new technology to fleet operators.

Reviewer 4:
This reviewer recounted that 3 main fleet projects collected data which generated useful insights, Frito Lay's EV fleet (10 vehicles), UPS hydraulic hybrid fleet (40 vehicles) and platooning fuel economy test (2 vehicles). This was a significant workload including data collection, analysis, and conclusion. These efforts also led to a reality check on standard drive cycles (e.g., NY Comp, charge sustaining [CS] hydraulic hybrid vehicle [HHV], heavy heavy-duty diesel truck [HHDDT]) by comparing and contrasting in-service use (e.g., Baltimore Custom) against those drive cycles. The reviewer then concluded that identifying a more appropriate drive cycle would minimize the risk of over/under-evaluating the technology potential.

Question 3: Collaboration and coordination with other institutions.

Reviewer 1:
This reviewer applauded the collaboration with numerous partners (UPS, Frito Lay, and Peloton) to participate in the program. This strong collaboration leads to generating the most relevant results in terms of technology performance.

Reviewer 2:
This reviewer appreciated the fact that Frito-Lay and UPS were involved using actual trucks in service.

Reviewer 3:
The reviewer commented that the team seemed to work well with the partners. The reviewer suggested to maybe seek out others who could utilize the data and to be sure to make them aware of these results for a bigger overall impact.

Reviewer 4:
This reviewer observed good collaboration now, but the reviewer suggested that it needed to expand – almost like having a business development function attached.

Question 4: Proposed future research – the degree to which the project has effectively planned its future work in a logical manner by incorporating appropriate decision points, considering barriers to the realization of the proposed technology, and, when sensible, mitigating risk by providing alternate development pathways.

Reviewer 1:
This reviewer liked the alignment with SuperTruck moving forward – looking at how that project has helped bring more technologies into these innovator fleets.

Reviewer 2:
The reviewer said that the future work was well defined. The reviewer suggested including more in-depth review of the findings and how it is transferable to other fleets to solidify the findings.

Reviewer 3:
The reviewer said there was great potential here, but recommended to please use a potential user outreach activity to identify more and priorities.

Reviewer 4:
This reviewer observed that additional projects were indicated for the remainder of 2014 including Berks Area Regional Transport Authority (BARTA) and XL Hybrid. The reviewer recommended starting early to identify future collaboration as it takes time.

Question 5: Does this project support the overall DOE objectives of petroleum displacement? Why or why not?

Reviewer 1:
The reviewer commented that this was crucial to increased and faster commercialization of technologies.

Reviewer 2:
To this reviewer, these data collection efforts provided valuable feedback to DOE to assess the impact of vehicle technologies on its petroleum displacement goals and provide input to inform areas of R&D that show the most promise.

Reviewer 3:
This reviewer acknowledged that moving new technologies past the early adopters is always difficult. This is a program that is positioned to assist in that role.

Reviewer 4:
The reviewer said that the project certainly identifies an important area of new technology deployment, and looked forward to hearing about the results at a much larger scale if they are adopted.

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

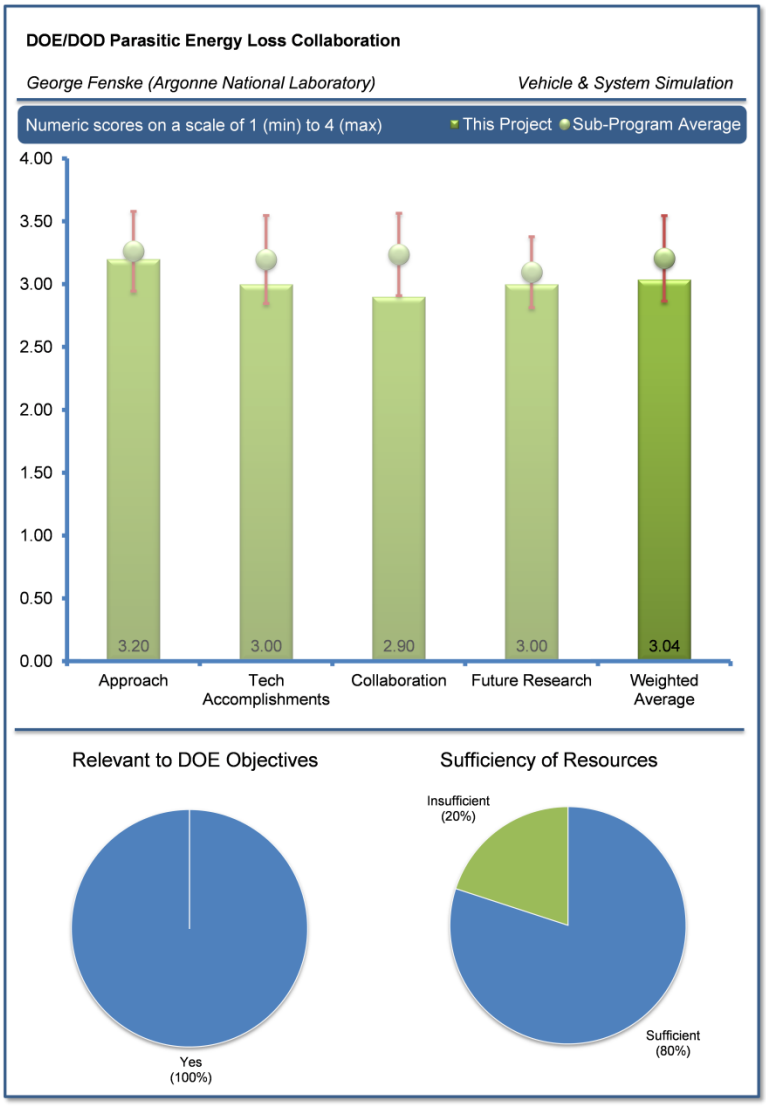
Reviewer 1:
To this reviewer, it looked like NREL was getting done a good deal for the resources available.

Reviewer 2:
This reviewer said that the project needed to expand in a deliberate fashion with stronger connections to the potential user community. The reviewer remarked good program!

Reviewer 3:
This reviewer commented that the funding appeared to be sufficient.

Reviewer 4:
This reviewer did not have the experience in this area to comment on funding.

DOE/DOD Parasitic Energy Loss Collaboration: George Fenske (Argonne National Laboratory) - vss005



Reviewer Sample Size

A total of five reviewers evaluated this project.

Question 1: Approach to performing the work - the degree to which technical barriers are addressed, the project is well-designed, feasible, and integrated with other efforts.

Reviewer 1:

This reviewer said that the work was foundational in the continuing pursuit of energy efficiency improvements, and thought this was an excellent approach.

Reviewer 2:

The reviewer commented that the three phase approach of the project to develop modeling capability, perform experimental tests, and finally validate the results was very sound.

Reviewer 3:

The reviewer stated that the project is heavily leveraging prior work and models that were developed by Ricardo on engine losses. The commenter highlighted that gaining access to these models, and integrating them, is very powerful in understanding frictional engine losses and providing a value on the impact of surface finish changes and lubrication improvements.

Reviewer 4:

The reviewer recounted that the overall technical approach for the Argonne National Laboratory (ANL) DOE/U.S. Department of Defense (DOD) Parasitic Energy Loss Collaboration project was technically sound, having been refined over a number of years. It has three logically defined tasks with clearly identified activities therein which synergistically work to advance the knowledge base of cutting edge approaches to reducing friction in vehicular applications.

The reviewer observed that the project goals are to develop a public database to estimate impacts of viscosity, asperity function, and surface finish on friction losses at different engine speeds and loads; and to develop an experimental database on the impact of lubricant additives, advanced materials, temperature, and contact stress on asperity friction. It is important to note that these databases are really targeted to help small lubricant/additive manufacturers as larger ones likely already possess this capability.

While the technical approach to identifying new opportunities to reduce friction in engines is strong, the reviewer perceived that there were significant questions given the very conservative, risk adverse nature of the lubricants and additives industry, if the approach overall will ever really lead to significant commercial penetration of new friction reduction technologies. The reviewer suggested that it may be beneficial to consider re-scoping or at least augmenting the technical approach of this task with a possible industry visioning road-mapping component with the goal of altering the evolutionary paradigm of friction reduction technology development and subsequent implementation in vehicular applications. The reviewer concluded that the DOE and ANL are in an ideal position to fulfill

this function in helping to bring together diverse elements of the industry in an attempt to achieve consensus on ways to dramatically accelerate the development of precompetitive technologies and subsequent implementation in vehicles.

Reviewer 5:
The reviewer stated that the area of parasitic and friction losses in an engine is a relevant area of focus for the improvement in engine efficiency. The design of the research has relied heavily on theory by means of modeling and simulation. The friction coefficients were measured using a reciprocating rig and used to revise the model. This approach is the first step to adding empirical data to the model, but it is not necessarily representative of friction occurring in an engine due to other environmental conditions. There has not been much actual engine validation against empirical test bench data completed to date. The reviewer added that this amounts to a weakness in the results generated by a non-validated model.

Question 2: Technical accomplishments and progress toward overall project and DOE goals – the degree to which progress has been made, measured against performance indicators and demonstrated progress toward DOE goals.

Reviewer 1:
This reviewer saw impressive accomplishments adding to the sophistication of tribology evaluation.

Reviewer 2: .
This reviewer said that the technical accomplishments and progress during this project have been very good. The suite of codes was made operational working with Ricardo and studies were initiated for a small spark ignition (SI) engine. Scans of critical lubrication parameters were performed. In Task 2, the reviewer noted that the protocols were established to analyze data to isolate asperity friction from deferent conditions and the data showed asperity friction can vary by a factor of four or more.

Reviewer 3:
The reviewer observed that the project had demonstrated a steady stream of technical accomplishments under Task 1 including establishing a cooperative research and development agreement (CRADA) with Ricardo for use of their friction codes for various engine components, modeling of piston/ring friction in a small bore SI engine, modelling the impact of viscosity on power-cylinder losses, and application of codes to simulate the impact of surface finish and friction on power-cylinder friction forces and power losses. The trends related to viscosity, asperity friction, and surface finish observed by this reviewer, have been found to be consistent with automotive trends.

Under Task 2, the reviewer recounted that the accomplishments include development of test protocols to measure friction under boundary and mixed lubrications conditions; illustration of the range of boundary friction coefficients that can be expected for an unformulated oil, a fully formulated oil, and a fully-formulated oil with friction modifier; and the impact of temperature and coatings on asperity friction. Task 3 validation activities using an engine dyno are scheduled to commence in fiscal year (FY) 2015.

Reviewer 4:
The reviewer acknowledged the good progress made in integrating the models and developing understanding on the effects of lubrication improvements, surface finish, and other areas. However, the commenter indicated that a timeline/plan was not evident. The reviewer suggested that a timeline that shows project action officer tasks and tasks of collaborators would be helpful in understanding progress versus plan and contribution of collaborators in a real project sense.

Reviewer 5:
This reviewer observed that since project inception in FY 2010, progress has amounted to simulation results and some bench tests on a reciprocating rig. Technical progress has been made, albeit slower than expected. The reviewer continued to say that the simulation results could be obtained earlier in the program, leaving time for engine validation, which is scheduled for FY 2015. Arguably, the reviewer commented, that engine validation would require a larger effort than simulation, despite the plan allocating FY 2010-14 to simulation and FY 2015 only for validation.

Question 3: Collaboration and coordination with other institutions.

Reviewer 1:
The reviewer noted that the project was very well coordinated with engine and truck OEMs, the DOD, engine component manufacturers and lubricant suppliers. The reviewer said having these partners on the team makes for a strong project.

Reviewer 2:
This reviewer acknowledged that this project has steadily increased in recent years the extent of collaboration and coordination with other institutions and is now a strong suite. The diversity of partners includes engine and truck partners, DOD, an engine component manufacturer, and suppliers from the lubricant industry, as well as coordination with other DOE Vehicles Technology programs. The reviewer said that this was excellent. One suggestion the reviewer provided would be to try and pull in entities that represent the overall fuel/lubricants/additives industry (not a specific company) to gain insight, guidance, and support holistically. The reviewer concluded that the cost share for this project is very good at approximately 37% over its lifetime.

Reviewer 3:
The reviewer commented that Ricardo was named as a partner for their in-kind contribution of software. The reviewer would have liked to see collaboration with an engine manufacturer who would make use of the research results.

Reviewer 4:
The reviewer commented that most of the collaborators provided will be more heavily engaged during the engine/component testing.

Reviewer 5:
The reviewer's impression was that the project is largely internal. The subject and results are valuable to a broad industry set and should be shared. The reviewer recommended addressing a broader technology transfer to industry, or publication of results in appropriate journals, or discussing those activities in next year's report.

Question 4: Proposed future research – the degree to which the project has effectively planned its future work in a logical manner by incorporating appropriate decision points, considering barriers to the realization of the proposed technology, and, when sensible, mitigating risk by providing alternate development pathways.

Reviewer 1:
This reviewer saw a good concept for continuing research.

Reviewer 2:
The reviewer saw that the proposed future technical research for simulation, the friction database, and engine validation is reasonable following on logically to recently completed and currently ongoing activities. The reviewer commented that it was important to keep user friendliness in mind in the development of the friction database to encourage widespread understanding and utilization.

Reviewer 3:
The reviewer stated that simulation testing is the key to validating the models. The commenter noted that engine simulation testing is planned as well as integration of the validated models into Autonomie, which will yield usable knowledge for engine/lubrication developers. The reviewer reiterated earlier comments that a timeline would be helpful to understand when activity are planned to occur.

Reviewer 4:
The reviewer commented that the proposed future work of completing engine validation testing will be a key result.

Reviewer 5:
The reviewer expressed concern that the plan scheduled engine validation activities are too late in the overall program, since time and effort is expected to make up a significant portion of the research.

Question 5: Does this project support the overall DOE objectives of petroleum displacement? Why or why not?

Reviewer 1:
To this reviewer, this project was extremely relevant to the goals of the VTO. By reducing friction losses in both new and legacy vehicles, the reviewer commented that there would be a reduction in the amount of fuel used in the transportation sector. In addition, reducing frictional losses in vehicles will help achieve the higher fuel economy standards in the future.

Reviewer 2:
This reviewer commented that this was a foundational element for energy efficiency of mechanical systems.

Reviewer 3:
The reviewer commented that attaching engine losses through enhanced lubrication can be applied across the entire national fleet of vehicles.

Reviewer 4:
This reviewer agreed that an improvement in tribology would lead to reduction in engine losses and therefore contribute to DOE's goal of petroleum displacement.

Reviewer 5:
This reviewer said that reducing friction has significant potential to improve fuel economy across a multitude of new and legacy vehicles. While the potential may only be as high as 5% for any one vehicle, spread over millions, the reviewer pointed out that the benefits become very large.

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

Reviewer 1:
This reviewer observed good progress, and urged the project team to keep going!

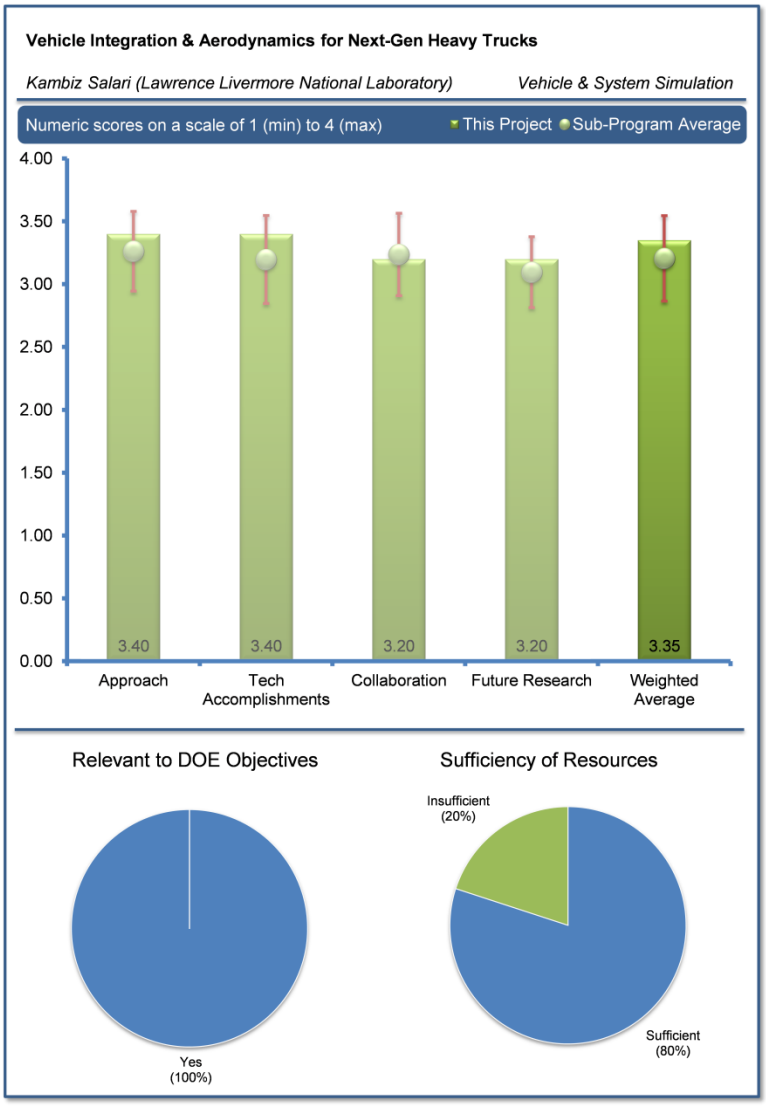
Reviewer 2:
To this reviewer, the resources were sufficient for the project and appeared to be on track to be used by the end of the project.

Reviewer 3:
This reviewer believed that the overall scope and budget of the program was sufficient to reach the target. However, the reviewer said that the plan should have scheduled engine validation earlier in the program, since that activity is expected to take a significant amount of time.

Reviewer 4:
This reviewer stated that the resources were adequate for the current scope of activities. According to the reviewer, should the project scope be expanded to include an industry coordination, visioning/roadmapping component, a modest increase in resources would likely be needed.

Reviewer 5:
The reviewer agreed that the project appears to be progressing; however, because a timeline for the tasks was not provided it was hard to tell.

Vehicle Integration & Aerodynamics for Next-Gen Heavy Trucks: Kambiz Salari (Lawrence Livermore National Laboratory) - vss006



Reviewer Sample Size

A total of five reviewers evaluated this project.

Question 1: Approach to performing the work - the degree to which technical barriers are addressed, the project is well-designed, feasible, and integrated with other efforts.

Reviewer 1:

The reviewer commented that this was an important problem. The reviewer observed an excellent research plan and described the PI as impressive. The reviewer concluded by enthusiastically remarking that the approach was well done.

Reviewer 2:

The reviewer stated that the presenter rightly identified aerodynamics as a major area for improvement potential for commercial vehicles and has also targeted the trailer as an area of focus, given both its large contribution to overall drag and due to its current shape, which is not aerodynamics. The research splits both dry van box trailers as well as tankers. Given the relatively small population of tankers in the overall fleet and their infrequent use in long haul applications, tanker development should take less of a priority. Regarding dry van trailer work, the research strikes a good balance between evaluating conventional designs (exposed trailer door hinges and corrugated sidewalls) as well as more advanced design (tail devices). The reviewer believed gains are to be made on both fronts.

Reviewer 3:

The reviewer commented that much of private sector product development followed the approach presented in this project. Following this computer aided engineering (CAE), modeling, and full scale prototyping allows the work to support the OEMs that would take the concepts into production. As noted by the reviewer, close ties to industry are essential to keep the objectives as close to real world workable solutions that can be put to use.

Reviewer 4:

This reviewer said that the approach to work with industry, suppliers, truck and trailer builders and fleets was laudable and important if not crucial. The reviewer did not see sufficient evidence that this team was really working that deeply with these companies. The reviewer noticed the project could look deeper into other effects rather than just aero-improvement to make it easier for end-users to adopt. The reviewer added that it was very helpful using the full wind tunnel, but asked when the last time these trucks were in the tunnel.

Reviewer 5:
To this reviewer, it seemed that the method used was experimental base, and that there was no computational fluid dynamics (CFD) application. In Slide 6, the presentation mentioned virtual testing. The reviewer asked if this meant that the 1/8 scale was a test or CFD simulation.

Question 2: Technical accomplishments and progress toward overall project and DOE goals – the degree to which progress has been made, measured against performance indicators and demonstrated progress toward DOE goals.

Reviewer 1:
The reviewer commented that this was a well-thought out research plan and strongly emphasized that this was also an excellent presentation.

Reviewer 2:
The reviewer noted that the accomplishments of the project focused on smaller well documented results that rolled-up to support the overall project objectives. This makes both the individual studies and overall impact useful to the end-users.

Reviewer 3:
This reviewer said it was nice to finally publish the full scale tunnel test data. The reviewer recounted that it seemed to have taken quite a while to get this out. The reviewer commented that the presenter was spending too much of the 20 minutes sharing general data on trucks rather than explaining what was accomplished in the project. The reviewer noted the recent 1/8 wind tunnel test and remarked that there was very good data on cargo container fuel efficiency/deficiency. The reviewer continued to say that that the new tractor design test is a good addition to the plan, and observed no real discussion of new design. The reviewer pointed out tankers. The reviewer suggested clarifying percent improvements with respect to speed, etc. The reviewer would very much like to see more evidence of accomplishments in these presentations and even in the industry press and information being shared in the general trucking media. The reviewer observed that the project would then get this data out there and open for others to build upon.

Reviewer 4:
The reviewer observed that the researcher developed some key insights which could shape the direction of future development, such as straight versus curved tails, tail hinges and corrugated trailer side walls. Furthermore, the development on the Generic Speed Form (GSF) 1 is a bold and ambitious approach for drastically reducing drag. The reviewer applauded this approach, while at the same time recommended to aggressively push towards maturing the basic shape into a functional truck. Normally any aerodynamic gains in basic aerodynamic work quickly erode as a design matures. The reviewer said that it would be important to closely monitor drag performance during this evolution to minimize aero performance degradation.

Reviewer 5:
This reviewer asked why the results with full wind tunnel and scale tunnel were quite different in Slide 13. The reviewer said it needed to be more specific to describe the difference between these two testing results. The reviewer concluded that it would be helpful to use the same scale to plot the results.

Question 3: Collaboration and coordination with other institutions.

Reviewer 1:
This reviewer said it was the best collaboration seen in the session. The reviewer commended the project on the excellent job building collaborators.

Reviewer 2:
To this reviewer, the project showed exceptional integration with laboratories and industry partners.

Reviewer 3:
The reviewer saw that there was evidence of collaboration with fleets on testing and results evaluation. The reviewer would like to see collaboration expanded with trailer and aerodynamic device manufacturers (also cargo container manufacturers) expanded to make best use of the knowledge generated.

Reviewer 4:
According to this reviewer, there was not much evidence of collaboration and it seemed that the team may not be learning enough from this opportunity to understand more deeply how these trucks are operated and requirements needed.

Reviewer 5:
The reviewer suggested that there should have been one slide specifically to talk about partners for their involvement of this project.

Question 4: Proposed future research – the degree to which the project has effectively planned its future work in a logical manner by incorporating appropriate decision points, considering barriers to the realization of the proposed technology, and, when sensible, mitigating risk by providing alternate development pathways.

Reviewer 1:
This reviewer observed good future work.

Reviewer 2:
This reviewer recounted that the project mentioned platooning as a future piece of work and thought it was a good use of resources.

Reviewer 3:
This reviewer thought the future plans were both reasonable and showed great promise. The reviewer found the project interesting and very current to today's needs.

Reviewer 4:
The reviewer asked if the vehicle GSF1 would be fitted into the current powertrain system. The reviewer continued to say that the approach used for tank type of truck was interesting, and looked forward to seeing the results.

Reviewer 5:
The reviewer would have liked to see this research expanded, because aerodynamics is one of the largest contributors to fuel consumption and holds the largest areas for improvement potential.

That said, the plan moving forward should include specific milestones and go/no-go criteria, a defined scope and finite time plan – including project end. For new ideas (e.g., the GSF development,) new projects should be proposed and approved.

Question 5: Does this project support the overall DOE objectives of petroleum displacement? Why or why not?

Reviewer 1:
According to the reviewer, right now the project generates good technical ideas and development results; however, the programmatic side would benefit from more structure (milestones, plan, budget, scope.)

Reviewer 2:
This reviewer noted that this was an excellent area that needed to be addressed by the long haul industry.

Reviewer 3:
This reviewer said that this was low hanging fruit. This was very important work and could solve an important problem. The reviewer said the project did excellent work.

Reviewer 4:
This reviewer said yes, absolutely. Aerodynamics is one of the largest levers for improving fuel economy for commercial vehicles where additional research can provide benefit.

Reviewer 5:
This reviewer indicated that the improvement of aerodynamics, and thus fuel economy supported the overall DOE objectives of petroleum displacement.

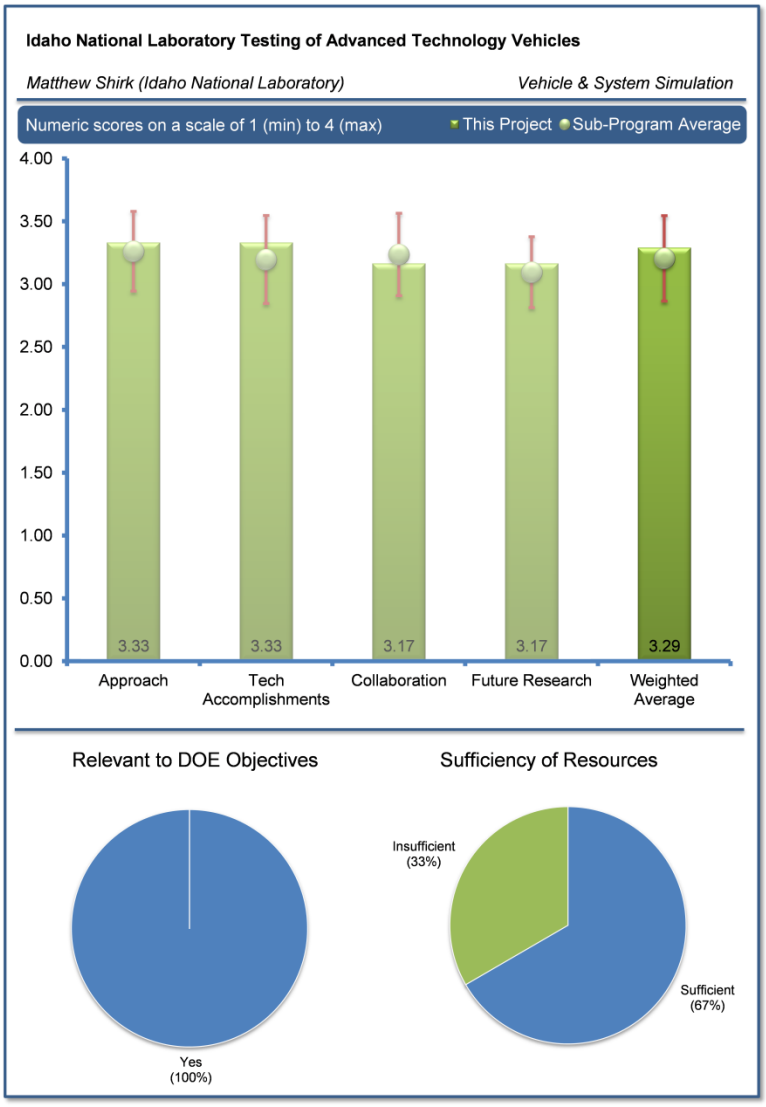
Question 6: Resources: How sufficient are the resources for the project to achieve the stated milestones in a timely fashion?

Reviewer 1:
To this reviewer, the project had performed well and was structured in a way that additional funding could be put toward further progress.

Reviewer 2:
This reviewer questioned the amount gained from this project. The reviewer stated this was a very important topic.

Reviewer 3:
The reviewer felt that the magnitude of importance needed in aerodynamic improvements was not matched to the scope and size of this project. Aero is a major topic and the efforts, though focused in the right area, are insufficient. According to the reviewer, it would be preferred to increase the budget, but also to increase output and deliverables to accelerate developments in this area.

Idaho National Laboratory Testing of Advanced Technology Vehicles: Matthew Shirk (Idaho National Laboratory) - vss021



Reviewer Sample Size

A total of three reviewers evaluated this project.

Question 1: Approach to performing the work - the degree to which technical barriers are addressed, the project is well-designed, feasible, and integrated with other efforts.

Reviewer 1:

This reviewer commented that this project was another in the collaborative set of national laboratory led programs. The reviewer added that this was an excellent example of a technology snapshot that is providing technical fleet data from an evolving market and technology.

Reviewer 2:

Overall, the reviewer stated that this kind of macroscopic testing of advanced technology vehicles is very valuable - especially when aspects such as charge efficiency, battery discharge, and dyno testing are included.

What is lacking is a standard set of metrics to evaluate and report in-use performance such as driving behavior. It is useful to have charge efficiency, battery capacity with fast charge, and standard consumption metrics; but there is so much more that can be done to show driving behavior (and as a result component response). For instance, the U.S. Environmental Protection Agency (EPA) came up with the 5-cycle ruling with mostly internal combustion engine (ICE) vehicles and only two hybrids. No PHEVs, no EVs. The EPA has done great analysis to evaluate vehicle specific power, speed-acceleration distribution, and resultant weights for standard drive cycles that represent this behavior. According to the reviewer, it is hard to know if these weights apply to EVs without conducting the same analysis on them. The reviewer suggested to please refer to the 5-cycle guidance document (pages 49-69) for this analysis and to repeat it with the fleet of EVs. Figure III-4 is especially informative if the team could include EVs on it. The reviewer thinks that the researcher and the organization have the right set of tools to do what was stated above; and that this would provide additional value to other laboratories, OEMs, and the general public for how advanced technology vehicles perform in the real world.

Reviewer 3:

The reviewer noted that the approach that had been outlined of using existing test procedures for each technology (to evaluate vehicles or other procedures developed based on fleet managers recommendations) provides for an excellent way to generate data from the advanced technology vehicles. The reviewer added that the testing performed on vehicles is very comprehensive and includes bench tests, closed test track, on road fleet testing or vehicle and infrastructure demonstration by private fleets, and allows for a wide variety of analysis and reporting of the state of the vehicles being evaluated.

Question 2: Technical accomplishments and progress toward overall project and DOE goals – the degree to which progress has been made, measured against performance indicators and demonstrated progress toward DOE goals.

Reviewer 1:
The reviewer observed that the technical accomplishments and progress had been outstanding this year. The accomplishments listed for vehicle testing, battery testing, and vehicle and infrastructure demonstration projects show tremendous progress for the year and provided DOE with valuable information. The reviewer continued to say that the codes and standards support, and federal fleet outreach work this year had also been excellent and would help to eliminate barriers identified for this activity.

Reviewer 2:
This reviewer noted that it was a significant challenge to manage a fleet of vehicles through any test cycle and program. The selection of 4/model makes perfect sense for the fleet. The reviewer looked forward to end-of-project reports.

Reviewer 3:
According to this reviewer, it seemed like the technical approach was thorough and methodical. The team just needs to go a level deeper (as noted in the reviewer's previous comments) to have a standard set of takeaways for each vehicle/fleet added to the testing sequence.

Question 3: Collaboration and coordination with other institutions.

Reviewer 1:
This reviewer observed that the collaboration in this project had been excellent. With the help of private testing firms, other national laboratories and OEM automotive companies and fleet users for the vehicle and infrastructure demonstration project, this overall activity continues to be a success. The reviewer added that the federal agencies for both codes and standard development and federal fleet outreach programs were well coordinated.

Reviewer 2:
This reviewer saw great cross-functional activity. The reviewer suggested collaborating with ANL more and comparing energy consumption and other loads from their dyno testing. The reviewer asked how the fleet consumption for driving, HVAC, etc., changed with average driving speed, driving distance, ambient temperature, etc.

Question 4: Proposed future research – the degree to which the project has effectively planned its future work in a logical manner by incorporating appropriate decision points, considering barriers to the realization of the proposed technology, and, when sensible, mitigating risk by providing alternate development pathways.

Reviewer 1:
The reviewer commented that there were several remaining challenges and barriers identified that would provide for the opportunity for testing, evaluation and demonstration projects. The reviewer recounted the future work to include expansion of vehicle and infrastructure demonstrations and continuing to provide testing and data collection for future projects would continue to increase the data base and knowledge of these advanced technology vehicles.

Reviewer 2:
This reviewer stated that the future research seemed encouraging but mostly recommended staying on the course outlined. The reviewer suggested pushing the boundaries and going more in-depth. The reviewer asked to please contact other EV manufacturers like Tesla or Nissan for ideas on various things that can be done with the data that are especially interesting to OEMs. The reviewer would also like to provide some feedback to the PI regarding the direct current (DC) fast charging presentation for the LEAF.

This reviewer provided the following recommendations on things to investigate as the next phase of the project: mixed cycling (daily Level 2 charging and fast charging over the weekends, as the latter could be at a higher temperature); find a way to include the impact that depth of discharge (and charge) has on degradation in the design of experiments; and try rates higher than 50kW to push the envelope for fast charging. The reviewer further inquired about the power level at which degradation starts to significantly deviate from Level 2

charging, and remarked that 50kW is too low to enable transport electrification. The reviewer stated a need to keep pushing this boundary faster, and that the project had the resources to do this.

Question 5: Does this project support the overall DOE objectives of petroleum displacement? Why or why not?

Reviewer 1:

This reviewer stated that this activity was very relevant to the DOE goal of petroleum reduction by performing testing and demonstrations of vehicles and infrastructure to identify the potential petroleum displacement of the technology.

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

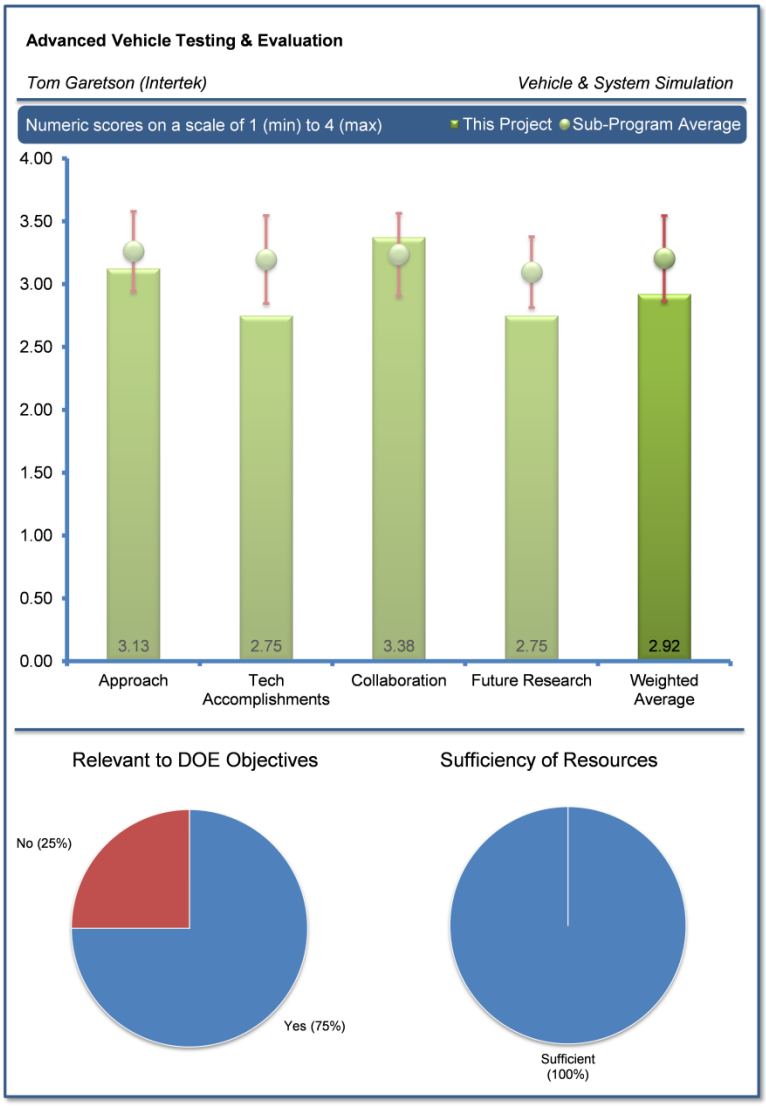
Reviewer 1:

According to this reviewer, there were large amounts of results and information from this project with the relatively small amount of resources provided.

Reviewer 2:

This reviewer imagined a need for more data analytics resources but that this needed to be verified with the PI. Also, the reviewer said that more cars and experiments were needed to push fast charging power levels higher.

Advanced Vehicle Testing & Evaluation: Tom Garetson (Intertek) - vss029



Reviewer Sample Size

A total of four reviewers evaluated this project.

Question 1: Approach to performing the work - the degree to which technical barriers are addressed, the project is well-designed, feasible, and integrated with other efforts.

Reviewer 1:

This reviewer had reviewed this project in the past, and it seemed to this reviewer that process improvements were being implemented continuously to address the issues that have arisen in the past.

Reviewer 2:

The reviewer said that the approach outlined of procedure and documentation development followed by the data collection of baseline testing, fleet testing, accelerated testing and a variety of traction battery tests will provide DOE with an excellent set of data to evaluate these advanced technologies.

Reviewer 3:

The reviewer observed that the plan for this project covered all of the relevant technical aspects of performance of advanced vehicles in use. The reviewer would have liked to see a bit more about the people aspects. The reviewer asked if the drivers charged when needed, if the vehicles did the required functions well, and if there were any operational problems.

Reviewer 4:

The reviewer wished there was more information about the standards for the tests (test protocols), whether they were nationally accepted (or established by consensus-standards organizations), why and how they were chosen, and what the baseline is (how the baseline was established) rather than an emphasis on the numbers of vehicles and types of vehicles tested and miles driven.

Question 2: Technical accomplishments and progress toward overall project and DOE goals – the degree to which progress has been made, measured against performance indicators and demonstrated progress toward DOE goals.

Reviewer 1:

This reviewer stated that progress on this project had been very good. A total of 54 vehicles had been tested in the field and 6 vehicles had baseline testing complete. There was no data presented in the presentation except for miles driven by the Toyota Prius. It would have been good to present the baseline testing and field testing that had been generated.

Reviewer 2:
The reviewer noted that this project was collecting key performance data for in-use vehicles. The reviewer was hoping that the project team would also provide clear insights into how the vehicles differ, and which types of users would be best suited by the different models.

Reviewer 3:
According to this reviewer, progress had been slow - more than halfway through the timeline, only 15% had been completed, though as the PI stated, there were issues beyond control that affected the level of progress, such as bankruptcy.

Reviewer 4:
The reviewer observed that the project is vastly behind schedule. It started October 2011 and ends September 2016 but is only 15% complete when it should be more than 60% complete. If the delay was not their fault, the reviewer pointed out that a revised schedule of milestones should have been worked out with DOE.

Question 3: Collaboration and coordination with other institutions.

Reviewer 1:
According to this reviewer, the vehicle testing and analysis team was top-notch. The reviewer would have liked to see a more varied set of users, beyond taxis and messengers. The reviewer knew the team wanted high mileage, but normal consumers, like commuters, would have been useful as well.

Reviewer 2:
The reviewer noted that the collaboration with national laboratories and other industry partners was very good.

Reviewer 3:
This reviewer commented that the list of collaborators is wide and diverse, including private companies, other national laboratories, and a university.

Reviewer 4:
This reviewer observed that there was no problem here at all.

Question 4: Proposed future research – the degree to which the project has effectively planned its future work in a logical manner by incorporating appropriate decision points, considering barriers to the realization of the proposed technology, and, when sensible, mitigating risk by providing alternate development pathways.

Reviewer 1:
The reviewer commented that the future plan to evaluate over 50 models and 150 vehicles along with 12 infrastructure sites would provide a great deal of data for the evaluation of these advanced technologies.

Reviewer 2:
The reviewer had a couple of comments regarding the approach in general, which could perhaps be addressed to some extent as the project progresses. The largest number of samples of any vehicle in the tested fleet is four. This is not likely to yield statistically significant results. If the generated data are meant for the consumption of the general public, given the general lack of awareness of statistical methods (even among engineers), these results could be at a minimum, misleading. Recognizing that increasing the sample size comes at great expense, it may help to compare the results of the tests with data from dealerships (for instance), if such data were available. It may also make sense to include some form of confidence intervals. In general, the reviewer was not a fan of accelerated reliability testing – it takes the OEMs years to develop accelerated reliability tests, and these are usually developed based on accumulated customer data. Since the only customer data that are readily available are from the advanced vehicle testing activity (AVTA) itself, it may be helpful to show that the accelerated test in correlates in some form to the accumulated data from the other vehicles – for example, the reviewer suggested comparing the rotating moment histograms for the two cases.

Reviewer 3:
Again, the reviewer would have liked to see more attention paid to the less technical aspects. The technical aspects are covered well (the reviewer assumed end-of-test performance will be compared to initial performance). The reviewer asked if the drivers charged when they should have, if the drivers could have gotten more electric miles, or if that would have impinged on working hours.

Reviewer 4:
The reviewer saw that the future research was focused on catch-up with the schedule (running more tests).

Question 5: Does this project support the overall DOE objectives of petroleum displacement? Why or why not?

Reviewer 1:
The reviewer noted that all of the vehicles being tested would reduce petroleum use compared to ICE. The results should tell just how much (e.g., less if driver uses CS mode).

Reviewer 2:
To this reviewer, the project is relevant to the DOE objectives of petroleum displacement. Evaluation and testing of battery electric vehicles (BEVs), PHEVs, hybrid electric vehicle (HEV), and ICE will provide the VTO with valuable information regarding advanced vehicle technologies life cycle cost data and how much petroleum consumption is reduced by using these advanced technologies.

Reviewer 3:
According to this reviewer, one of the barriers to increased usage of advanced technology, vehicles was the lack of reliable information on total ownership costs. It is a chicken and egg problem. Better estimates of total ownership costs will emerge as the sales of these vehicles increase, etc.

The reviewer added that this testing activity addresses this issue to some extent by providing independent testing results.

Reviewer 4:
The reviewer stated that the relevance was NOT direct. Insofar as providing test data to consumers or buyers of electric vehicles is influential in decision making, the choice of whether to displace vehicle with an ICE with an EV lies ultimately in the consumer or buyer.

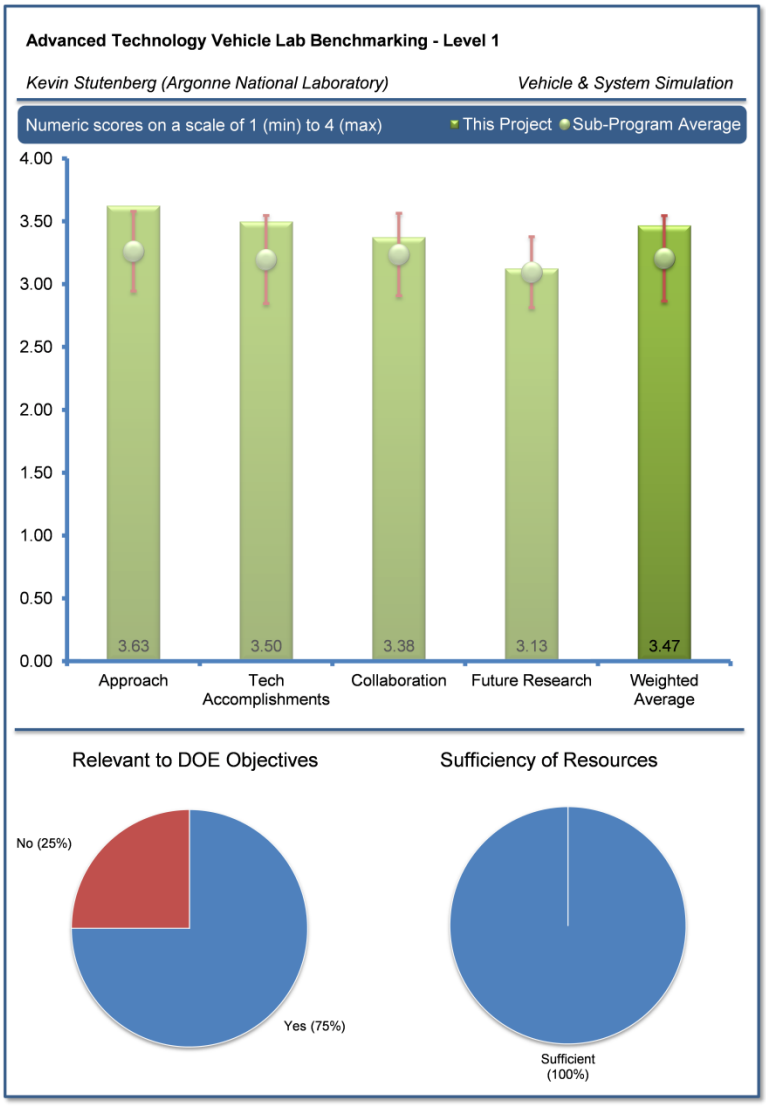
Question 6: Resources: How sufficient are the resources for the project to achieve the stated milestones in a timely fashion?

Reviewer 1:
The reviewer commented that it would be nice if the sample size for each model vehicle could be increased, but given the cost associated with this activity, the funding is probably at an appropriate level.

Reviewer 2:
The amount of funds appeared to be sufficient according to this reviewer. However, since the project was only 15% complete and the project's timeline was about 50% complete, the reviewer wanted to know if the funds would be able to be spent by the end of the project.

Reviewer 3:
The reviewer stated lots of cars, lots of tests, and lots of analysis costs lots of money. The reviewer could not say much more without detailed budgets.

Advanced Technology Vehicle Lab Benchmarking - Level 1: Kevin Stutenberg (Argonne National Laboratory) - vss030



Reviewer Sample Size

A total of four reviewers evaluated this project.

Question 1: Approach to performing the work - the degree to which technical barriers are addressed, the project is well-designed, feasible, and integrated with other efforts.

Reviewer 1:

According to this reviewer, this is a well leveraged program which has great potential through solid empirical testing, which is challenging. The reviewer added seeing an excellent mix of database management, codes and standards support, model support, and U.S. DRIVE support. Although the reviewer had not been in the dynamometer downloadable database (D3) prior to the review, the reviewer planned to do so as time allowed. The reviewer said there was excellent analysis presented on temperature effects.

Reviewer 2:

The reviewer thought the approach was very thorough and could not make any suggestions for improvement. The reviewer was not sure about agreeing with the efforts expanding to include more extreme tests, such as Level 2 tests.

Reviewer 3:

The reviewer said that this benchmarking activity has developed very proficient testing methods that can be adjusted to individual activities. The overall approach is excellent and includes testing at INL for mileage accumulation and track testing, baseline testing at ANL and accelerated fleet testing at INL.

Reviewer 4:

This reviewer stated that ANL's Advanced Technology Vehicle Laboratory Benchmarking - Level I project is a long established (since 1998) activity that has had a strong history of accomplishment. A strong project approach and accompanying procedures have been refined and honed over the years. The reviewer noted that the approach involved utilizing a purpose-built research laboratory for automotive benchmark activities combined with well-established and proficient testing methods adjusted to individual technologies. Refinement over the years has resulted in advanced and unique facilities and instrumentation, continuous improvement of testing procedures, standardization of test plans including instrumentation and drive cycles that are adjusted for individual vehicles, and the development of a significant knowledge base of advanced vehicles and testing methods. This person reported that the Advanced Powertrain Research Facility (APRF) has expertise in testing a broad range of vehicular powertrains and alternative fuels. The basic APRF test process consists of incorporation of mileage accumulation, track testing, and coast down information from INL's Advanced Vehicle Testing Activity; baseline dyno testing consisting of test procedure preparation and vehicle instrumentation, dyno testing, and analysis; followed by data dissemination to national laboratory and United States Council for Automotive Research (USCAR) OEMs via the D3. This was all very sound to the reviewer and should be continued. The reviewer concluded that as time has gone on, it becomes

harder to achieve significant further efficiencies in the project, but this task should always be keeping process/procedure efficiency and costs savings in the forefront of the mind to maintain the cost viability of the project in the future funding constrained scenarios.

Question 2: Technical accomplishments and progress toward overall project and DOE goals – the degree to which progress has been made, measured against performance indicators and demonstrated progress toward DOE goals.

Reviewer 1:
According to this reviewer, the technical accomplishments and progress had been very good and continue to address the barriers of lack of standard test protocols and providing information on advances in technology. The reviewer recounted that the specific accomplishments include the refined data management, analysis and reporting capabilities, vehicle testing, which is in-progress in collaboration with INL, and many test results and raw data that have been made publically available.

Reviewer 2:
This reviewer said this was redundant with prior comments, but that the solid data being generated by this project would provide valuable insight to technology growth and needed efforts.

Reviewer 3:
This reviewer noted that it appeared that all the milestones have been met.

Reviewer 4:
This reviewer stated that FY 2013/2014 project activities have a solid list of accomplishments, including Level 1 testing of 11 vehicles with very different powertrains; continued evaluation of thermal impact on energy consumption and powertrain operation of conventional, alternative fuel, and electrified vehicle technologies; further development/refinement of the D3; enhanced signal and testing lists available to OEMs and DOE partners; as well as continued codes and standards support. Compressed natural gas (CNG) versus gasoline engine efficiency has been compared, the temperature effects on BEV range examined, the effect of climate control setting energy consumption examined, and a study of blended PHEV fuel displacement is examined, which varies heavily on design and controls. ANL's APRF benchmarking tests are providing prototypes for power rating procedures for SAE J2908. Overall, the reviewer saw a solid list of accomplishments that can continue to be built upon.

Question 3: Collaboration and coordination with other institutions.

Reviewer 1:
According to this reviewer, the Level 1 benchmarking activities had a strong and extensive list of collaboration and coordination partners which had been built up over the years. These partners span the OEMs, suppliers, other national laboratories, adjacent activities within ANL, international partners for testing and codes and standards related activities and universities. The reviewer concluded that it would be difficult to significantly further the level of collaborative partners.

Reviewer 2:
This reviewer saw that extensive coordination and collaboration existed between the APRF and U.S. DRIVE, international partners such as KATECH, Japan Automotive Research Institute (JARI) in Japan and the Joint Research Center in the European Union. In addition, the APRF helps with DOE technology evaluation and works closely with other national laboratories including NREL, ORNL and Idaho National Laboratory (INL). The reviewer verified that coordination also existed with the AVTA working with ANL and INL, and the Advanced Vehicle Technology Competition working with General Motors (GM) and universities.

Reviewer 3:
This reviewer would have liked to see EPA and CARB as a partner if emissions are being benchmarked.

Question 4: Proposed future research – the degree to which the project has effectively planned its future work in a logical manner by incorporating appropriate decision points, considering barriers to the realization of the proposed technology, and, when sensible, mitigating risk by providing alternate development pathways.

Reviewer 1:
The reviewer said that it was good that the PI was already thinking about benchmarking autonomous vehicle technologies, intelligent vehicle control systems, and active safety systems (such as adaptive cruise control in combination with forward collision warning system).

Reviewer 2:
This reviewer observed that the future work would continue to address the barriers and help to meet the DOE goal of petroleum displacement by continuing Level 1 benchmark work with emphasis on thermal testing. In the future, the reviewer recounted that there would be several potential vehicle models that will be added to the test matrix.

Reviewer 3:
This reviewer thought that the FY 2014 focus likely included Level 1 testing of a variety of vehicular powertrains including, EVs, PHEVs, diesels, range extender, bi-fuel vehicle, and a CNG conversion. Evaluation of the thermal effects on energy consumption and powertrain behavior will continue as will further development of data management and analysis tools for quicker data distribution. APRF also indicated that the project may begin greater involvement in analyzing and disseminating data. Presently, the APRF cannot handle extreme cycles like high altitude testing. Additionally, areas like adaptive cruise control may be something to consider. The reviewer suggested that it would be especially beneficial if ways to handle these types of testing could be accommodated, maybe through innovative duty cycle development, without having to incur the cost of significant new equipment installation.

Question 5: Does this project support the overall DOE objectives of petroleum displacement? Why or why not?

Reviewer 1:
This reviewer said absolutely.

Reviewer 2:
This reviewer noted that the APRF was very relevant to the overall DOE objective of petroleum displacement. This project would provide DOE advanced vehicle test data and analysis, which will enable petroleum displacement through technology assessment and data dissemination.

Reviewer 3:
According to this reviewer, the Level 1 Benchmarking activities of the APRF are very important to continue the advancement of vehicular technologies through independent and unbiased technology evaluations including accurately establishing the current state-of-the-art, baselining technical targets and goal setting, providing input to and validation of vehicle and systems models, and providing data for procedures development and validation for codes and standards development. All these benefits, said the reviewer, help increase the rate at which advanced vehicular technologies are explored and more broadly understood and ultimately considered for implementation in the nation's vehicular fleet.

Reviewer 4:
The reviewer perceived that providing the consumer with data on alternative fuel vehicle performance only indirectly supported petroleum displacement. Notwithstanding, the reviewer felt that the real value of this effort was providing an independent, objective, impartial third-party verification and validation of data or source of vehicle performance data for use by the public and whoever needs it.

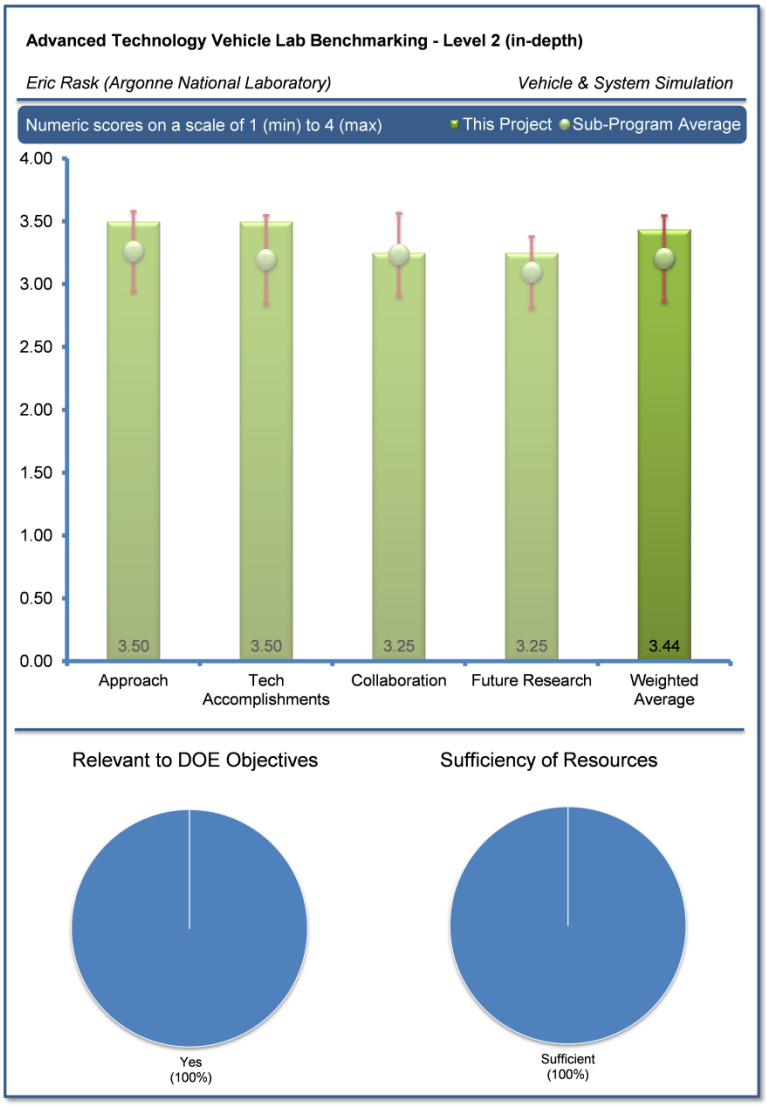
Question 6: Resources: How sufficient are the resources for the project to achieve the stated milestones in a timely fashion?

Reviewer 1:
This reviewer observed that there was a large amount of results and accomplishments for the amount of funding provided for this project.

Reviewer 2:

This reviewer noted that resources were sufficient for the current and projected task activities.

Advanced Technology Vehicle Lab Benchmarking - Level 2 (in-depth): Eric Rask (Argonne National Laboratory) - vss031



Reviewer Sample Size

A total of four reviewers evaluated this project.

Question 1: What is your assessment of the approach to performing the work? To what degree are technical barriers addressed? Is the project well-designed, feasible, and integrated with other efforts?

Reviewer 1:

The reviewer thought that the approach of selecting a vehicle for in-depth testing and providing extensive instrumentation to evaluate thermal and electrical loads was excellent.

Reviewer 2:

The reviewer perceived that, as this was the first full evaluation of a BEV at ANL, it was approached in a very comprehensive way. The system by system monitoring of draw from the energy storage device creates a proper understanding of the efficiencies of each sub-system and the overall contribution of each to the whole vehicle. The reviewer advised to keep an eye on how the sub-systems interact under various levels of state of charge (SOC).

Reviewer 3:

The reviewer reported that, while novel and difficult, this process attempted to compare what is in many circumstances incomparable at the detailed depth of the activity.

Reviewer 4:

The reviewer commented that after having been refined over a number of years, the approach to Level 2 benchmarking testing at ANL is sound. In short, it consists of determining the right vehicle to test given the uniqueness of a vehicle's technology and significant input and recommendation from stakeholders including DOE, industry, and national laboratories. A test plan is prepared of which a significant portion (approximately 70%) is relatively standard based on previous test plans and about 30% is customized to the specific vehicle and stakeholder requests. Extensive instrumentation is undertaken using a mix of direct instrumentation, off-line sensors, and controller automated network (CAN) bus information. Subsequently, the vehicle is tested across a wide range of regulatory, real-world, and specialized drive cycles. This reviewer further reported that a wide range of ambient temperatures and solar loads are evaluated to assess the impacts of HVAC on vehicle efficiency and range. Data is then assessed with full data sets downloaded to DOE and industry stakeholders and subsets made available to the public through the dynamometer downloadable database. The reviewer perceived that this was a solid approach having withstood the test of time. However, the reviewer believed some serious thought needs to be given to whether the Level 2 testing should always be completely comprehensive. The reviewer advised that it may be possible to get essentially all the information and results needed by conducting fewer tests, possibly running fewer drive cycles, instrumenting fewer components, or finding other viable shortcuts.

Question 2: Technical accomplishments and progress toward overall project and DOE goals – the degree to which progress has been made, measured against performance indicators and demonstrated progress toward DOE goals.

Reviewer 1:
The reviewer reported that institutional knowledge in the vehicle systems and measurements was very apparent and well executed.

Reviewer 2:
The reviewer asserted that the project's technical accomplishments support the goal of increased battery capacity and lower mass or road loads for increased vehicle range. Testing showed 65-113 mile full depletion range depending on the type of test cycle operated. The reviewer observed that progress had been shown through the dissemination of data to industry and the public.

Reviewer 3:
The reviewer stated that so far the initial evaluation of the Ford vehicle has achieved most if not all of the intended understandings of the vehicle systems. The reviewer definitely recommended looking deeply at how the systems interact and are prioritized for draw at low SOC.

Reviewer 4:
The reviewer related that Level 2 testing has been completed for the Ford Focus BEV, with the final report and data outreach pending. Preliminary testing and break-in is complete for the 2015 Honda Accord PHEV, with in-depth testing ongoing. The reviewer further reported that full depletion cycle testing of the Ford Focus BEV is completed exhibiting a 65-113 mile full depletion range depending upon cycle aggressiveness and a roughly 85% SOC swing from full depletion to full charge. An in-depth look at the energy allocation has been conducted examining losses at high, low, and standard ambient temperatures across tractive energy, axle/tire losses, drive line losses, HVAC, and accessories. This person also indicated that some unique preliminary insights have been observed including that axle losses can interact with HVAC loading to over/under emphasize the penalty of heating/cooling at extreme temperatures, and that battery preconditioning may lead to secondary benefits such as reduced heating loads. Level 2 testing has also provided input to SAE J2908 hybrid powertrain ratings. The reviewer judged the overall level of technical accomplishments to be reasonable.

Question 3: Collaboration and coordination with other institutions.

Reviewer 1:
The reviewer reported that all correct partners appear to be identified and are utilized.

Reviewer 2:
The reviewer said it seemed that the U.S. DRIVE collaboration was the only true collaboration cited. SAE is stated as receipt of test procedures, so not sure what the collaboration is there. The reviewer was not sure about some of the others, but suggested that some suppliers of the sub-systems may be excellent collaborators to approach.

Reviewer 3:
The reviewer observed that the in-depth testing provided information to many groups including U.S. DRIVE, tech team and OEMs. Work is also coordinated with several national laboratories such as NREL, ORNL, and INL.

Reviewer 4:
The reviewer relayed that ANL's Level 2 laboratory benchmarking has a long history of collaboration and coordination with other entities including AVTA at INL, SAE for standards support, industry through U.S. DRIVE, tech teams, etc., other national laboratories, and internally with adjacent projects at ANL. The reviewer judged that these collaborations are sound, but advised that it is important to always be on the lookout for additional collaborations that may add value or new insights to advanced technology vehicle laboratory benchmarking.

Question 4: Proposed future research – the degree to which the project has effectively planned its future work in a logical manner by incorporating appropriate decision points, considering barriers to the realization of the proposed technology, and, when sensible, mitigating risk by providing alternate development pathways.

Reviewer 1:
The reviewer suggested that future efforts should include a mapping of the state of the art in the systems and subsystems in the vehicles; for example, how the Honda sub-systems compare to the Ford sub-systems in their respective full system roles. The reviewer believed that the data generation and analysis capability was clearly appropriate and that after more vehicles were tested, it was clear to the reviewer that a time based comparison of subsystems development efficiency was possible and highly desirable for industry and for future development planning.

Reviewer 2:
The reviewer observed that the future work to complete the testing of the Honda Accord PHEV will provide a second set of in-depth data for use by DOE.

Reviewer 3:
The reviewer reported that for FY 2014, the 2015 Honda Accord PHEV would continue to be tested, but pointed out that not much ancillary information was provided as to what specifically or potentially would be uniquely looked for in the testing of the Honda Accord PHEV.

The reviewer relayed that the cost of Level 2 advanced technology vehicle laboratory benchmarking has steadily increased over the years to where now it appears to cost approximately $350,000-$400,000, each time deep dive testing is conducted on a vehicle. This cost limits the number of vehicles which can be assessed to a maximum of one per year. Given the likelihood of constrained funding scenarios moving into the future, this can be somewhat problematic. The reviewer suggested that it may be beneficial to conduct an in-depth analysis of all the cost drivers of Level 2 testing from test procedure development, to the extent of instrumentation, drive cycle selection and bounding, testing, analysis, and subsequent data dissemination. The reviewer felt that there has to be some areas where the process can be further simplified. Cost/benefit decisions can be made such as restricting to a degree the number of components that are instrumented or drive cycles conducted, or more efficient data analysis/dissemination procedures could be implemented without significantly impacting the quality and extent of data made available. This is very important to the long term viability of Level 2 testing to show continued cost-effectiveness with ongoing efforts to achieve more value with the same or fewer resources.

Question 5: Does this project support the overall DOE objectives of petroleum displacement? Why or why not?

Reviewer 1:
The reviewer felt that the project is extremely relevant to the DOE goals of petroleum displacement. DOE has an emphasis on increased electric vehicle market penetration and technology development. The reviewer thought the work in this project will help provide in depth information on electric vehicles and will help to advance the state of technology.

Reviewer 2:
The reviewer found that understanding the performance envelope of these vehicles and understanding how the immature technology has moved forward shows the potential for increased displacement.

Reviewer 3:
The reviewer considered advanced vehicle testing necessary to benchmark start-of-the-art vehicular technologies to support technology goal setting; support hardware/model validation; support standards development through validation; and provide an unbiased, independent assessment of technologies.

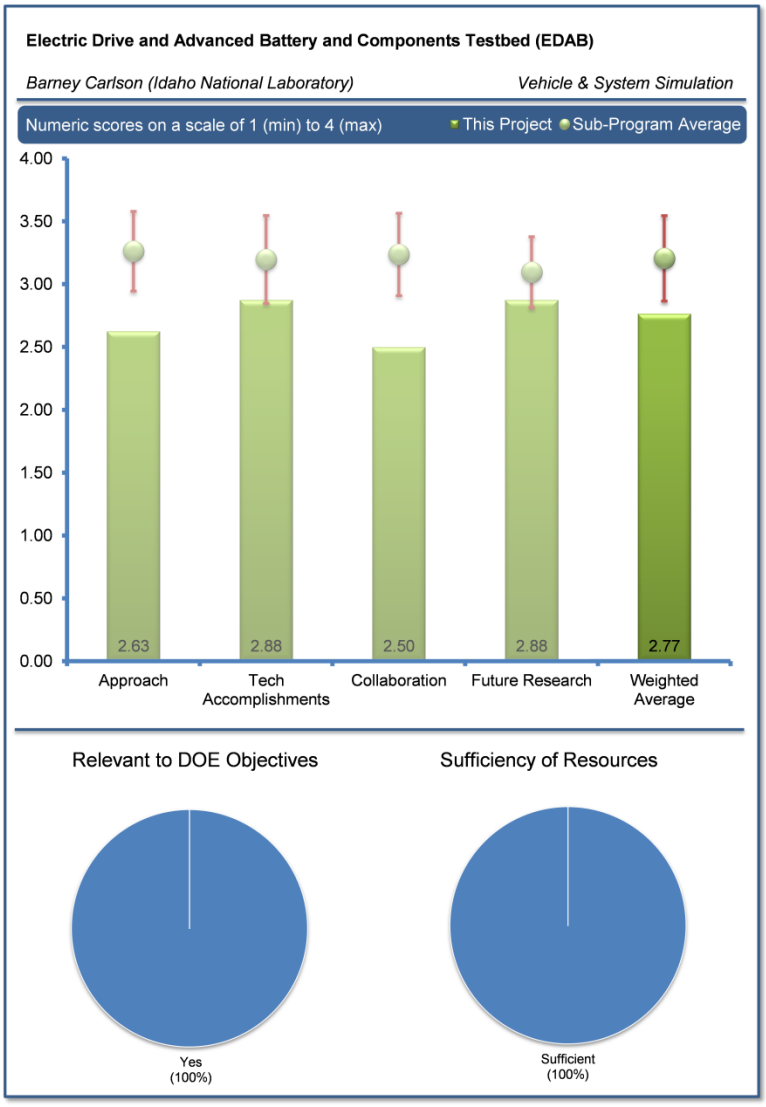
Question 6: Resources: How sufficient are the resources for the project to achieve the stated milestones in a timely fashion?

Reviewer 1:
The reviewer said the project seems to have the correct group of resources, but that suppliers of subsystems could be a good addition.

Reviewer 2:
The reviewer commented that available resources should be adequate to complete the project as planned.

Reviewer 3:
The reviewer opined that resources for the task outlined are sufficient.

Electric Drive and Advanced Battery and Components Testbed (EDAB): Barney Carlson (Idaho National Laboratory) - vss033



Reviewer Sample Size

A total of four reviewers evaluated this project.

Question 1: What is your assessment of the approach to performing the work? To what degree are technical barriers addressed? Is the project well-designed, feasible, and integrated with other efforts?

Reviewer 1:

The reviewer found that the idea of testing a battery to see how it performs after some service time is a good approach, and also liked the idea of comparing it to what the manufacturer claims. The reviewer thought it would be best if the cycle the battery is run through is very close to the cycle or vehicle the battery was designed for. The reviewer stated that for the EnerDel battery the vehicle it was designed for was little smaller than the LEAF, and asked if the Toshiba pack was designed for a vehicle/system that is similar to a Volt.

The reviewer saw that a lesson was learned with EnerDel and work for the second battery is being done with a company that wants to collaborate like Toshiba.

Reviewer 2:

The reviewer believed that independent testing like this gives a perspective, but without participation or even feedback from the manufacturer, the conclusions that can be drawn are somewhat limited.

Having said this, the reviewer found the approach to be appropriate, as the initial manufacturer EnerDel was contacted and chose not to respond. At least Toshiba has agreed to support the effort!

Reviewer 3:

The reviewer was not sure why the approach was chosen, as this kind of a build of a vehicle may have been more appropriate if it were to validate a hardware-in-the-loop (HIL) system using an environmental battery test chamber and to validate or correlate with system simulation software. The reviewer could not see the value of the output data other than the possibility to use it for validations or correlations.

The reviewer pointed out that the first test battery pack was not current technology so results may have little informational use. It was stated that it was chosen because it was available. Both the manufacturer and the vehicle producer would have tested for the same characteristic changes but in an actual real world vehicle application.

Reviewer 4:

The reviewer commented that based on the technical results there was a "big miss" in planning for this project with EnerDel ESS. As such, the reviewer thought that it was difficult to look at the rest of the project objectively. The reviewer recommended that clear due

diligence be done before projects are done. The reviewer noted that this was a $250,000 project for FY 2014. As such, the rest of the reviewer's ratings for this project were rated accordingly low.

Question 2: Technical accomplishments and progress toward overall project and DOE goals – the degree to which progress has been made, measured against performance indicators and demonstrated progress toward DOE goals.

Reviewer 1:
The reviewer believed that the test results on the EnerDel battery are good for reference and to understand how a battery can degrade. The reviewer said that having the test bed to test future batteries is also a good accomplishment.

Reviewer 2:
The reviewer viewed the technical accomplishments to be in line with the overall project objectives.

The reviewer mentioned that support from EnerDel would have added more meaning to the result achieved so far.

Reviewer 3:
The reviewer's specific observation was that the degradation started out at a much greater than published rate from the manufacturer, and then shifted slope after about 175 cycles to be more in line with manufacturer degradation slope. The reviewer believed that this needed to be understood or the time spent testing will not yield much. The reviewer wondered if it was due to average daily temperature changes, charge pattern changes, or something else. The reviewer stated again that to do this with no collaboration with the pack maker is a bit futile.

The reviewer considered that what was learned was that in this application the level of available charge capacity dropped, but not in accordance with manufacturer published information, but not why it happened.

The reviewer concluded that the project could also provide value if it could result in an understanding of how the Energy storage system will interact with the many sub-systems on the vehicle.

Question 3: Collaboration and coordination with other institutions.

Reviewer 1:
The reviewer perceived that collaboration with other national laboratories has kept the project on track and is critical to the success of the matching the battery packs to the duty-cycle.

Reviewer 2:
The reviewer recognized the effort to contact EnerDel and they did not reply back. The reviewer was glad that the researchers are involving Toshiba for the second round, and felt that, outside that first battery pack maker, the collaboration is very good.

Reviewer 3:
The reviewer stated that making data generally available is not an example of collaboration. The reviewer observed no real collaborations cited in the presentation, unless the reviewer does not understand what is meant by collaboration. The reviewer believed that in general some of these projects seemed to be "stove piped," with little development of a collaboration strategy. The reviewer cautioned against showing collaborations if none exist.

The reviewer perceived that setting up a series of tests of varying energy storage systems (ESS) systems with individual manufacturers collaborating on the testing of their products would make a lot more sense. By doing this, the ESS industry could see how their products stack up when benchmarked against others for certain characteristics. The reviewer believed that this could move the bar upward in the competitive marketplace.

The reviewer finally concluded that the lack of battery manufacturer involvement makes this a marginally effective project.

Question 4: Proposed future research – the degree to which the project has effectively planned its future work in a logical manner by incorporating appropriate decision points, considering barriers to the realization of the proposed technology, and, when sensible, mitigating risk by providing alternate development pathways.

Reviewer 1:
The reviewer stated that moving to a new battery pack from Toshiba is completely appropriate and the logical next step.

Reviewer 2:
The reviewer hoped that the next test cycle/application will use a pack very close to the cycle or application that the pack/cell was designed for. The reviewer believed the idea of tying in modeling of the Cell (with CellSage) to the actual performance of the pack in the test bed is a very good one.

Reviewer 3:
The reviewer recommended that if the project is to be continued, it should be done with a clear eye on working closely with the battery manufacturer, and only test some current or near-future storage packs. The reviewer also stated that it should also be an opportunity to create a benchmarking program for certain important ESS characteristics.

Question 5: Does this project support the overall DOE objectives of petroleum displacement? Why or why not?

Reviewer 1:
The reviewer perceived that either debunking or reinforcing manufactures claims is very relevant.

Reviewer 2:
The reviewer said that, yes, we do need to know how batteries degrade or hold steady in energy and power over use as hybrids and electric vehicles are adopted more by the public.

Reviewer 3:
The reviewer perceived that it probably does conceptually, but the output is marginal for the reasons stated in the other sections. The reviewer suggested that it should be structured for creation of new information pertinent to future ESS development.

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

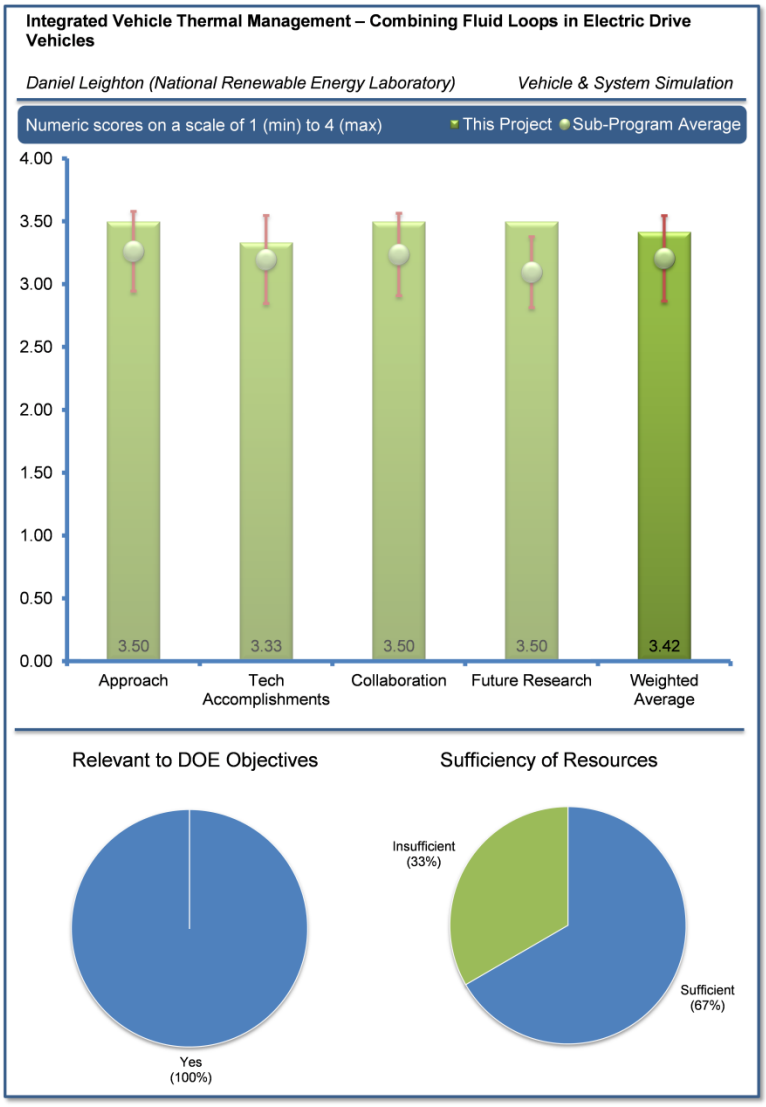
Reviewer 1:
The reviewer concluded that if further battery packs are to be evaluated and the test bed continues to be used (after the Toshiba pack work is done) then more funding will be required.

Reviewer 2:
The reviewer did not see any indications where additional resources would benefit the program and equally there are no indications that insufficient resources are causing program delays.

Reviewer 3:
The reviewer found that resources are sufficient for what is actually being done, but may be insufficient if the approach were changed.

Reviewer 4:
The reviewer emphatically said up front fail bike.

Integrated Vehicle Thermal Management - Combining Fluid Loops in Electric Drive Vehicles: Daniel Leighton (National Renewable Energy Laboratory) - vss046



Reviewer Sample Size

A total of three reviewers evaluated this project.

Question 1: What is your assessment of the approach to performing the work? To what degree are technical barriers addressed? Is the project well-designed, feasible, and integrated with other efforts?

Reviewer 1:

The reviewer thought the multi-year approach to the project was well thought out with reasonable deliverables.

Reviewer 2:

The reviewer found that the technical approach was well defined and the approach was a logical progression based on the availability of hardware for evaluation. Each step (i.e., modeling, test fixture, and vehicle testing) improved results, and therefore forwarded the study.

Reviewer 3:

The reviewer said that this project interestingly makes an already simpler vehicular configuration even simpler, and cited creative solutions for low temperature operation.

Question 2: Technical accomplishments and progress toward overall project and DOE goals – the degree to which progress has been made, measured against performance indicators and demonstrated progress toward DOE goals.

Reviewer 1:

Through working with Tesla, the reviewer got the impression that the project team was employing a similar system on the Model S, and wondered if there were any production EVs that were combining fluid loops currently.

The reviewer found that this was an excellent area of study and that the presenter was very knowledgeable about the project and technical details surrounding it.

In this reviewer's past experience with an EV OEM, the reviewer observed a huge gap in understanding of the cooling/heating options available for the power electronics, battery, and passenger compartment across the industry. The reviewer thought that this area deserved a lot more attention and that this project was just the beginning, and honestly believed the scope and support could be increased due to the value of the information improving the range and efficiency of EVs.

Reviewer 2:

The reviewer asserted that there was a good use of mixed tools - analytics, modeling, bench, and vehicle.

Reviewer 3:
The reviewer reported that progress did not appear to be behind schedule, but it was insufficiently clear as to the results of the analysis method employed to date. The main accomplishment was identified as the testing rig, which appeared to meet the needs of the project, but the reviewer believed a brief explanation of the features would be useful. The reviewer expected that results reported next year should be interesting.

Question 3: Collaboration and coordination with other institutions.

Reviewer 1:
The reviewer recognized that collaborators and their roles were identified in the presentation and clarified in the question and answer session, and indicated that they seemed to be sufficient for work to date and planned work.

Reviewer 2:
The reviewer commented that private industry and automotive suppliers were appropriately engaged to support the project. A larger program could certainly support it.

Reviewer 3:
The reviewer stated that there was excellent collaboration and coordination for the fuel related entities that are involved, but that it seemed there could have been earlier coordination with a car builder.

Question 4: Proposed future research – the degree to which the project has effectively planned its future work in a logical manner by incorporating appropriate decision points, considering barriers to the realization of the proposed technology, and, when sensible, mitigating risk by providing alternate development pathways.

Reviewer 1:
The reviewer reported that Part 3 of the project is integrating this system onto an on-road vehicle, which will be an excellent validation test for the concept.

Reviewer 2:
The reviewer was glad to see the plans to get this on a car inside this budget/project.

Reviewer 3:
The reviewer concluded that the future work proposed was logical and clear. The reviewer reported that no decision points were identified, but did not seem necessary as the purpose was to see to what degree the combined fluid system met thermal management requirements.

Question 5: Does this project support the overall DOE objectives of petroleum displacement? Why or why not?

Reviewer 1:
The reviewer asserted that this is a key enabler to increasing the range of EVs to a customer acceptable amount.

Reviewer 2:
The reviewer stated that efficiency improvement will reduce fuel consumption and that weight reduction will reduce fuel consumption. Further, this person pointed out that this technology applies to EVs, a technology that already reduces petroleum consumption.

Reviewer 3:
The reviewer believed that simplifying new technologies can really help adoption by lowering costs and decreasing complexity for maintenance, etc.

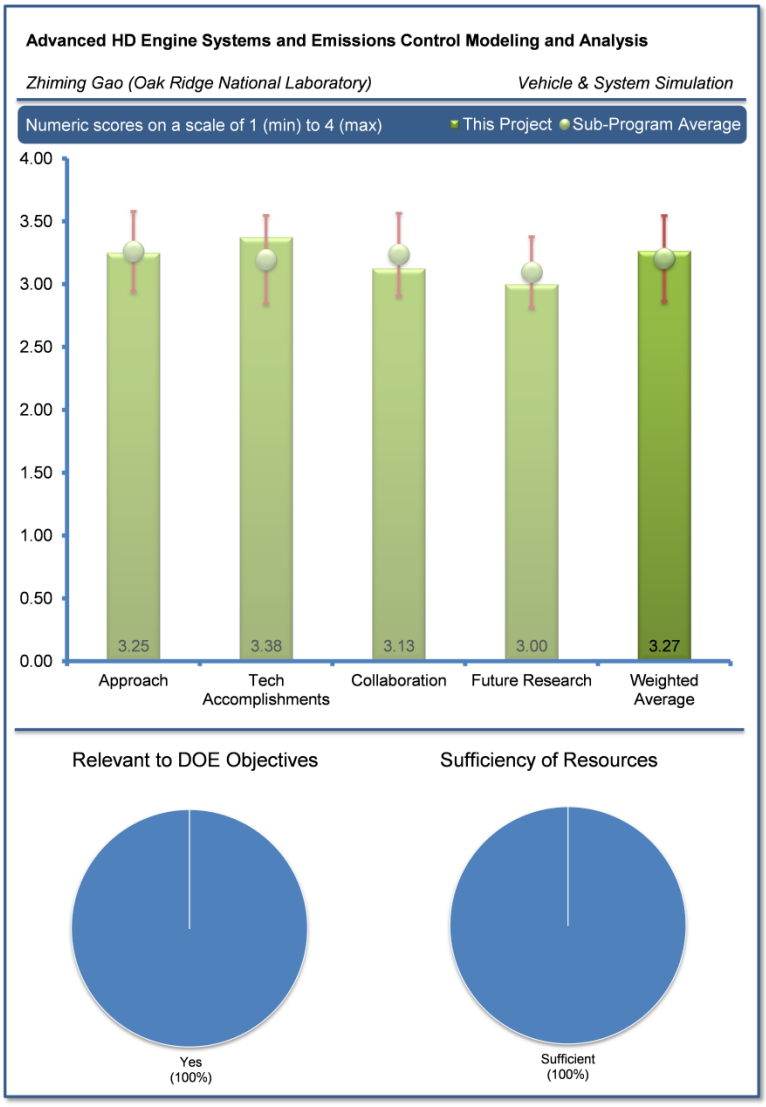
Question 6: Resources: How sufficient are the resources for the project to achieve the stated milestones in a timely fashion?

Reviewer 1:
The reviewer indicated that no deficiency in resources could be identified as all work to date and planned activities seemed manageable with resources identified.

Reviewer 2:
The reviewer commented that resources seemed sufficient, but was a little unsure.

Reviewer 3:
The reviewer could not comment on the appropriateness of the funding, but from the reviewer's perspective this subject could use additional attention because it is useful to EV deployment.

Advanced HD Engine Systems and Emissions Control Modeling and Analysis: Zhiming Gao (Oak Ridge National Laboratory) - vss048



Reviewer Sample Size

A total of four reviewers evaluated this project.

Question 1: What is your assessment of the approach to performing the work? To what degree are technical barriers addressed? Is the project well-designed, feasible, and integrated with other efforts?

Reviewer 1:

The reviewer found the integration of exhaust emission and hybrid system performance to be an excellent tool. Developers struggle with this analysis and the tool will be very helpful. The reviewer concluded that leveraging of the data and developed models of the various DOE programs into the modeling tool is an excellent use of resources to accomplish the project.

Reviewer 2:

The reviewer reported that the project is combining DOE databases that already exist – and concluded integration is important to solve MD/HD system hybridization. The reviewer believed this project had a very good research plan.

Reviewer 3:

The reviewer said there was a very good engineering approach to the problem statement. There was an organized process and appeared to be an adequate selection of test equipment and references. The reviewer perceived that the project needed a broader inclusion of user/operators beyond the local transit operator, and suggested using New York City transit, which has in-depth knowledge of their vehicles over a long period.

Reviewer 4:

The reviewer recommended that the work should include economic feasibility when models and materials cause more expense to the systems that are under evaluation.

Question 2: Technical accomplishments and progress toward overall project and DOE goals – the degree to which progress has been made, measured against performance indicators and demonstrated progress toward DOE goals.

Reviewer 1:

The reviewer reported good technical progress and good data on vehicles and driving cycles.

Reviewer 2:

The reviewer believed the project was on track, and the work plan seemed reasonable.

Reviewer 3:
The reviewer left some general comments on all projects. There was no Gantt chart that showed planned progress versus actual progress. It was hard for the reviewer to assess progress against the original plan.

The reviewer concluded that the improved Autonomie model showed that the research was being integrated into tools that improve the performance of industry development design teams. The energy loss distribution provided a good focal point on where to focus to yield the greatest result for the effort. The bar chart clearly showed this reviewer that addressing engine idle was a very big deal.

The reviewer stated that product cost of the hybrid system is a deterrent to adoption, and that the ability to optimize the parallel hybrid motor/inverter and battery for greatest impact/cost was very important. The reviewer said that many systems oversize the drive or battery system which in turn limits market adoption.

Question 3: Collaboration and coordination with other institutions.

Reviewer 1:
The reviewer asserted there was a good choice of partners.

Reviewer 2:
The reviewer indicated that OEM collaborators should be added. The reviewer saw the need for bus agencies and bus manufacturers to be working with the project. In this reviewer's opinion the buses need to be hybrids.

Reviewer 3:
The reviewer recognized that the project has leveraged much work completed to integrate capabilities into the model. However, the degree of collaboration with the stated partners was not clear to the reviewer. The rating provided is higher than what the briefing can justify primarily because of the information that was leveraged to provide greater modeling capabilities for others.

Reviewer 4:
The reviewer commented that this project needs the collaboration of outside agencies especially builders and operators. The reviewer though that this will be a difficult request, but will be very worthwhile in converting this valuable tool into a productive service for the taxpayer.

Question 4: Proposed future research – the degree to which the project has effectively planned its future work in a logical manner by incorporating appropriate decision points, considering barriers to the realization of the proposed technology, and, when sensible, mitigating risk by providing alternate development pathways.

Reviewer 1:
The reviewer reported good progress; the project appeared to be on track and planned future work is reasonable.

Reviewer 2:
The reviewer stated that the project is scheduled to end at the end of FY 2014, and concluded that planned work to finish the project is good.

Reviewer 3:
The reviewer considered the proposed research to be good, judged in a micro-environment of the involved technologists. The reviewer believed the project should be evaluated against the larger operational world of heavy hybrids with field operators and addressing their business and operational issues.

Question 5: Does this project support the overall DOE objectives of petroleum displacement? Why or why not?

Reviewer 1:
The reviewer found the modeling tool capabilities to be excellent and thought it will assist system designers in developing more cost effective and impactful systems that will lead to greater market adoption.

Reviewer 2:
The reviewer said that, yes, we need hybrid MD and HD vehicles. The project raises important questions. The reviewer said that more than building models, the project will need to have collaborators so that it will be used.

Reviewer 3:
The reviewer concluded that programs testing transitional technologies is a good function of the national laboratories, but the effort should be put forth to insure a relevant test regime addressing field operational issues if possible.

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

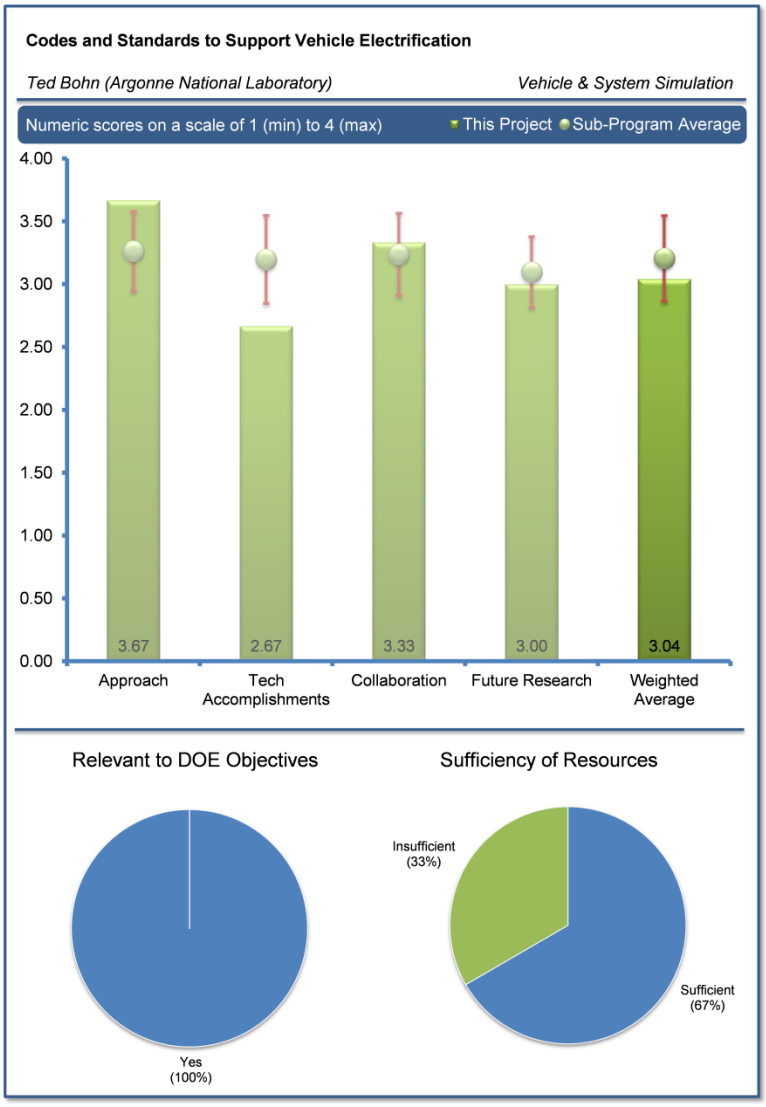
Reviewer 1:
The reviewer recognized there was a good validation of modelling, and that bus modelling is important.

Reviewer 2:
The reviewer found funding sufficient for the current approach, but thought it could be expanded if a larger consortium was built.

Reviewer 3:
The reviewer concluded that economics must be considered in all projects, but that accomplishments should have deployment feasibility points as well.

Reviewer 4:
The reviewer reported that FY 2014 funding shows as current expected funding, and that it looked like the chart had not been updated, or that the funding was questionable.

Codes and Standards to Support Vehicle Electrification: Ted Bohn (Argonne National Laboratory) - vss053



Reviewer Sample Size

A total of three reviewers evaluated this project.

Question 1: What is your assessment of the approach to performing the work? To what degree are technical barriers addressed? Is the project well-designed, feasible, and integrated with other efforts?

Reviewer 1:

The reviewer thought the idea of making up components to test out proposed standards is a good one, when off the shelf components are not appropriate or not available.

The reviewer concluded that providing leadership on the standards is important, especially if industry is taking a wait and see approach or are in disagreement.

Reviewer 2:

The reviewer applauded that this poster session was the highlight, and inquired about whether Ted can be cloned. The reviewer highlighted that the researcher has the most enthusiasm that they have seen for a DOE project. The commenter liked what they saw from a Test Procedure and Tools and Charging Communication Controls, albeit this was a poster session and not a full-on demonstration with vehicles. The reviewer stated that this presentation had all the right timing charts that are desired, including timing, dollars, and timing for future work. The commenter noted having brainstormed potential future work with the researcher, and hopefully the researcher captured the ideas.

Reviewer 3:

It appeared to the reviewer that there was significant concurrent activity and collaboration with most of the right partners; however, DOT should be involved from the roadway infrastructure and vehicle-to-vehicle (V2V) and vehicle to infrastructure (V2I) connectivity perspective. The reviewer suggested considering the DOT Intelligent Transportation Systems Joint Program Office (ITSJPO)

Question 2: Technical accomplishments and progress toward overall project and DOE goals – the degree to which progress has been made, measured against performance indicators and demonstrated progress toward DOE goals.

Reviewer 1:

The reviewer stated that input has been given on several standards, and leadership was provided on several others. A laboratory was set up to provide test grounds for what is being proposed for the standards.

The reviewer was not clear on how much actual research was done on the grid beyond current charging methods and communication.

Reviewer 2:
The reviewer found that, based on the level of detail provided, it was very difficult to tell how much was accomplished and what was involved to do so and what is the significance. There is one slide dedicated to this. The reviewer related that no performance indicators were provided to assess progress toward DOE goals. There were no responses to reviewer comments or discussions about anticipated barriers to achieving FY 2015 objectives.

The reviewer left the final remark that a key slide for all the acronyms would be very helpful for reviewers.

Question 3: Collaboration and coordination with other institutions.

Reviewer 1:
The reviewer saw that there was good collaboration to get the standards to progress.

Reviewer 2:
The reviewer noted that there appeared to be significant and appropriate collaboration with many entities involved, which was a long and tedious process. As this reviewer mentioned before, the DOT/ Federal Highway Administration (FHWA)/National Highway Traffic Safety Administration (NHTSA) should be consulted to ensure that their perspective, input and challenges are considered.

Question 4: Proposed future research – the degree to which the project has effectively planned its future work in a logical manner by incorporating appropriate decision points, considering barriers to the realization of the proposed technology, and, when sensible, mitigating risk by providing alternate development pathways.

Reviewer 1:
The reviewer recognized that the grid research part of the work would likely need to be emphasized with any remaining time and budget. This first part of the work looked to have focused on facilities (test site) and standards.

Reviewer 2:
The reviewer believed that areas of attention, milestones, and goals were clearly presented, but suggested that some strategy should be included to overcome anticipated barriers from lessons learned in FY 2014.

Question 5: Does this project support the overall DOE objectives of petroleum displacement? Why or why not?

Reviewer 1:
The reviewer applauded that the project was spot on.

Reviewer 2:
The reviewer indicated that standardization for charging and hybrids in general to lower costs would be needed.

Reviewer 3:
The reviewer thought that interoperability is key to increasing market penetration for EVs and reducing reliance on fossil fuels for transportation energy. This also aligns with EPA and DOT objectives.

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

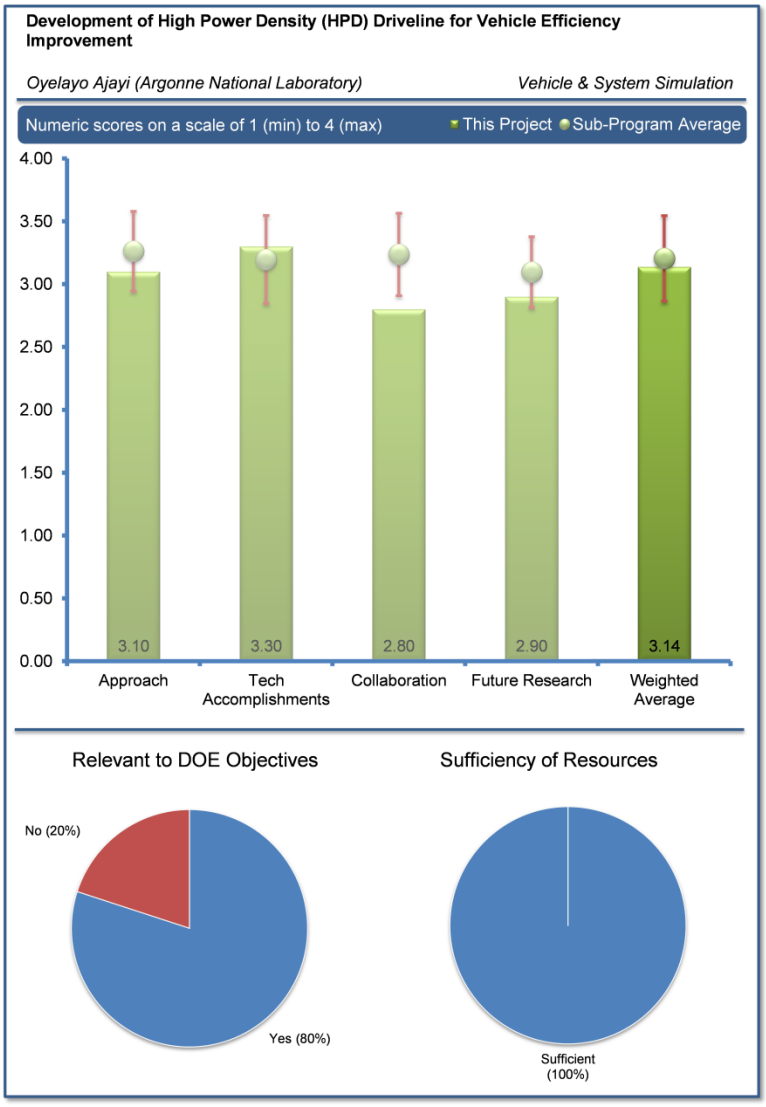
Reviewer 1:
The reviewer asked if more resources were given to the researcher if they could achieve more.

Reviewer 2:
The reviewer got the impression from talking with the presenter that, except for the laboratory, this project is somewhat of a one-man-show. The reviewer suggested that perhaps that is why grid research appears to have not been given as much emphasis as the standards.

Reviewer 3:

The reviewer thought that, provided that similar funding levels are maintained, significant progress should be made.

Development of High Power Density (HPD) Driveline for Vehicle Efficiency Improvement: Oyelayo Ajayi (Argonne National Laboratory) - vss058



Reviewer Sample Size

A total of five reviewers evaluated this project.

Question 1: What is your assessment of the approach to performing the work? To what degree are technical barriers addressed? Is the project well-designed, feasible, and integrated with other efforts?

Reviewer 1:

The reviewer perceived that this is an important problem; reducing vehicle weight is a key problem that needs a solution.

Reviewer 2:

The reviewer found the approach to be sound, with results to date for support. The reviewer would have liked to see more background material on the 2X and 3X life increase criteria and determination. Contact fatigue seems to be the largest hurdle (3X life increase), yet was left to be tested last.

Reviewer 3:

The reviewer relayed that the program seeks to achieve weight reduction by removing tribological barriers by applying novel materials, coatings and lubricants to driveline gears. Estimated savings to achieve 3-4% vehicle weight reduction and 2-3% fuel consumption reduction are large enough to warrant the program. The reviewer also reported that the program also rightly focuses on a systems approach in finding an optimal mix of coatings and lubricant. The research activities focus on tribological theory which is rightly the focus. That said, this reviewer believed the program would benefit from including an application component to the theory by showing how they would apply to transmissions and axles.

Reviewer 4:

The reviewer reported that the approach was to look at scuff and wear, and is appropriate. However, the reviewer sensed that, because the transmission is a collection of gears, claims on reduction of weight should be balanced on the basic fact that transmissions are sized based on first and reverse gears.

Reviewer 5:

The reviewer said the approach seemed too far separated from the objective of achieving a significant vehicle weight reduction. The reviewer would rather see the objectives and approach stated in a way that the surface treatments and lubricant development are stated more prominently. The reviewer would imagine that there are some very notable goals well short of making a lightweight gear box. As a viewer in the audience noted, this study is ignoring the bending moment and noise requirements that are likely to arise during the lightweighting efforts.

Question 2: Technical accomplishments and progress toward overall project and DOE goals – the degree to which progress has been made, measured against performance indicators and demonstrated progress toward DOE goals.

Reviewer 1:
The reviewer observed an impressive PI, and remarked good research plan. The reviewer quoted the PI as saying that the "easy part is done -- the hard work is to come." According to the reviewer, this demonstrates the fact the PI does understand problem. The reviewer concluded excellent progress of this team.

Reviewer 2:
The reviewer noted the rapid development of a novel lubricant formulation which shows promise to meeting the project objectives is outstanding.

While the initial results are encouraging to the reviewer, the often contradictory nature of wear life versus scuffing life versus contract fatigue life lends to some concern over the final contact fatigue results.

Reviewer 3:
The reviewer stated that there appeared to be good progress made in lubricant development, which led to a patent pending formulation that improved scuff resistance.

Reviewer 4:
The reviewer reported the ANL P.F. lubricant showed amazing improvements in scuffing life, which is impressive. It was not clear if there is some other trade-off not presented that the commercially available lubricants address that the ANL P.F. does not. The reviewer said it seemed as if only half of the story is available.

Question 3: Collaboration and coordination with other institutions.

Reviewer 1:
The reviewer reported that the collaboration that existed appears to be well-coordinated and a large contributor to the overall project success. The reviewer was a bit unclear regarding the level of involvement each of the collaborators provided. Ideally, the reviewer would have liked to see more collaboration with gearbox manufacturers.

Reviewer 2:
The reviewer asserted that the project does identify a lubrication additive partner; however, there could be a stronger collaboration with automotive component manufacturers to get input on the coating & materials portion of the project.

Reviewer 3:
The reviewer asked where the big lubrication suppliers were (e.g., Exxon-Mobil). The reviewer emphatically stated that gear manufacturers should be interested in the great research.

Reviewer 4:
There are only three HD transmission manufacturers in the United States (i.e., Caterpillar, Allison, and Eaton). The reviewer would like to have seen at least one of these companies as a partner in this investigation.

Question 4: Proposed future research – the degree to which the project has effectively planned its future work in a logical manner by incorporating appropriate decision points, considering barriers to the realization of the proposed technology, and, when sensible, mitigating risk by providing alternate development pathways.

Reviewer 1:
The reviewer was very excited that a 60% reduction in friction was achieved, and thought it was excellent work. The reviewer went on to exhort that the future work plan is impressive, but needs cost data and materials research, as new alloys are coming.

Reviewer 2:
The reviewer believed that the remaining barriers are well laid-out and the proposed future work indicates the overall goals. The reviewer would have liked a better understanding of the methodology that will be used to evaluate contact fatigue and how the other failure modes will be avoided during evaluation.

Reviewer 3:
Moving forward, the reviewer would have liked to see the PI actively work to push the formulation into production via the formulation partner. Also, the reviewer recommended acquiring driveline components for in situ testing purposes.

Reviewer 4:
The reviewer found the future work plan and the path forward to meet the project objectives to be unclear.

Question 5: Does this project support the overall DOE objectives of petroleum displacement? Why or why not?

Reviewer 1:
The reviewer said this work is very important – reduced weight and improved fuel economy is the promise of this research. The only negative this reviewer pointed out was the need for more collaborators.

Reviewer 2:
The reviewer concluded that improvements in scuff and wear factors will lead directly to transmission and axle efficiency increases and ultimately lead to fuel economy improvements.

Reviewer 3:
The reviewer stated the project is a supporting weight reduction which in turn results in petroleum displacement. The authors did a good job of outlining why increased lubrication is necessary for increased power density.

The reviewer asserted that, while the project outcome itself does not directly result in weight reduction of the vehicle power train, it is a necessary catalyst in the overall process.

Reviewer 4:
The reviewer said that, yes, improving tribological properties in axles and transmissions have the potential to displace petroleum. This project takes a different approach by looking at technologies which enable the design of smaller, more lightweight components, which is novel. The reviewer remarked that other similar programs in tribology tend to focus on friction reduction.

Reviewer 5:
The reviewer indicated the project is not currently demonstrating any petroleum displacement results.

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

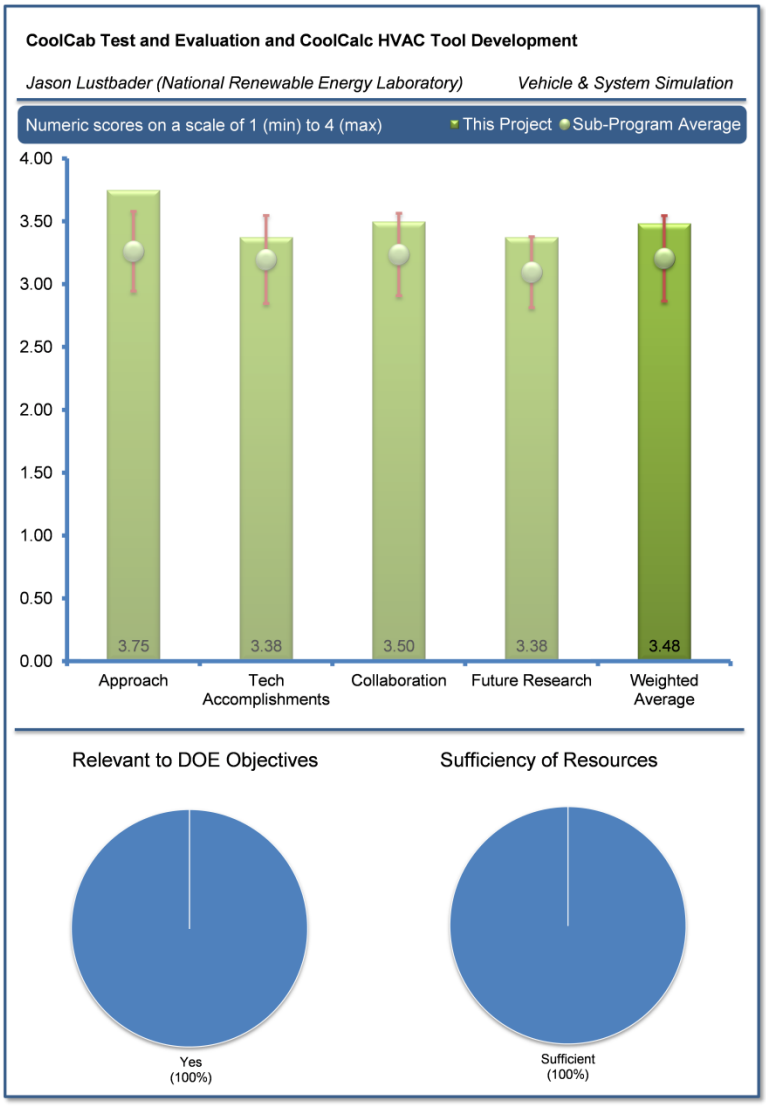
Reviewer 1:
The reviewer noted good progress, and believed resources appeared to be sufficient.

Reviewer 2:
The reviewer said resources appeared sufficient.

Reviewer 3:
The reviewer concluded that the resources were well defined, necessary, and properly utilized.

Reviewer 4:
The reviewer concluded that the resources appeared to be sufficient.

CoolCab Test and Evaluation and CoolCalc HVAC Tool Development: Jason Lustbader (National Renewable Energy Laboratory) - vss075



Reviewer Sample Size

A total of four reviewers evaluated this project.

Question 1: What is your assessment of the approach to performing the work? To what degree are technical barriers addressed? Is the project well-designed, feasible, and integrated with other efforts?

Reviewer 1:

The reviewer stated this was an excellent research plan and that there was a highly qualified PI. The reviewer had been following this project for a number of years, and had been impressed with the progress so far. The reviewer cited new regulation requirements for idle reduction.

Reviewer 2:

The reviewer commended the excellent bottom-up approach, focusing on reducing the HVAC need rather than simply taking the current requirements as a given.

Reviewer 3:

The reviewer thought that quantifying benefits and risks with fleets in mind was excellent. A 30% goal for system level approach means the project is methodical and understands how to keep the drivers comfortable. The reviewer thought the developed CoolCalc tool would be good for the future

Question 2: Technical accomplishments and progress toward overall project and DOE goals – the degree to which progress has been made, measured against performance indicators and demonstrated progress toward DOE goals.

Reviewer 1:

The reviewer recognized great accomplishments with clear contributions to addressing the project objectives.

Reviewer 2:

The reviewer stated that there were impressive accomplishments.

Reviewer 3:

The reviewer observed many strong accomplishments tied very closely to end-user needs. The reviewer thought this program was well matched to industry needs, even though the end users were not yet responding to the opportunities available here.

Reviewer 4:

The reviewer found that good progress appears to have been made in evaluating efficacy of various advanced technologies.

Question 3: Collaboration and coordination with other institutions.

Reviewer 1:
The reviewer noted excellent partners.

Reviewer 2:
The reviewer observed good links with OEMs that can use the research results.

Reviewer 3:
The reviewer said that, in general, there is no problem. However, it would be very helpful to use the knowledge base of the partner organizations to get a good estimate on fuel savings potential (refer to the last of the critical assumptions and issues).

The reviewer believed that quantifying the benefit and impact of the various advanced treatments and technologies is clearly very important, and with all the great progress that has been made in this project, it can be done easily and effectively over some assumed drive cycle. The reviewer suggested that what is perhaps needed more is to relate this to real world driving cycles, and the relationship with the partners should be leveraged here to quantify this better. It may even be beneficial to bring in some trucking companies as partners.

Question 4: Proposed future research – the degree to which the project has effectively planned its future work in a logical manner by incorporating appropriate decision points, considering barriers to the realization of the proposed technology, and, when sensible, mitigating risk by providing alternate development pathways.

Reviewer 1:
The reviewer thought that the project had a well thought out research plan.

Reviewer 2:
The reviewer thought that the most important aspect of the project going into the future was to have very reliable fuel use and payback period analysis. In this reviewer's mind, this if anything would be the biggest carrot to persuade customers - trucking companies, which would then ask the truck manufacturers - to go for the upfront investment. The reviewer recommended that, in order to achieve this, the project probably needs to include trucking companies as partners.

Question 5: Does this project support the overall DOE objectives of petroleum displacement? Why or why not?

Reviewer 1:
The reviewer said that, yes, any design improvements to the cab that would result in heating load reductions would result in a reduction of fuel consumption.

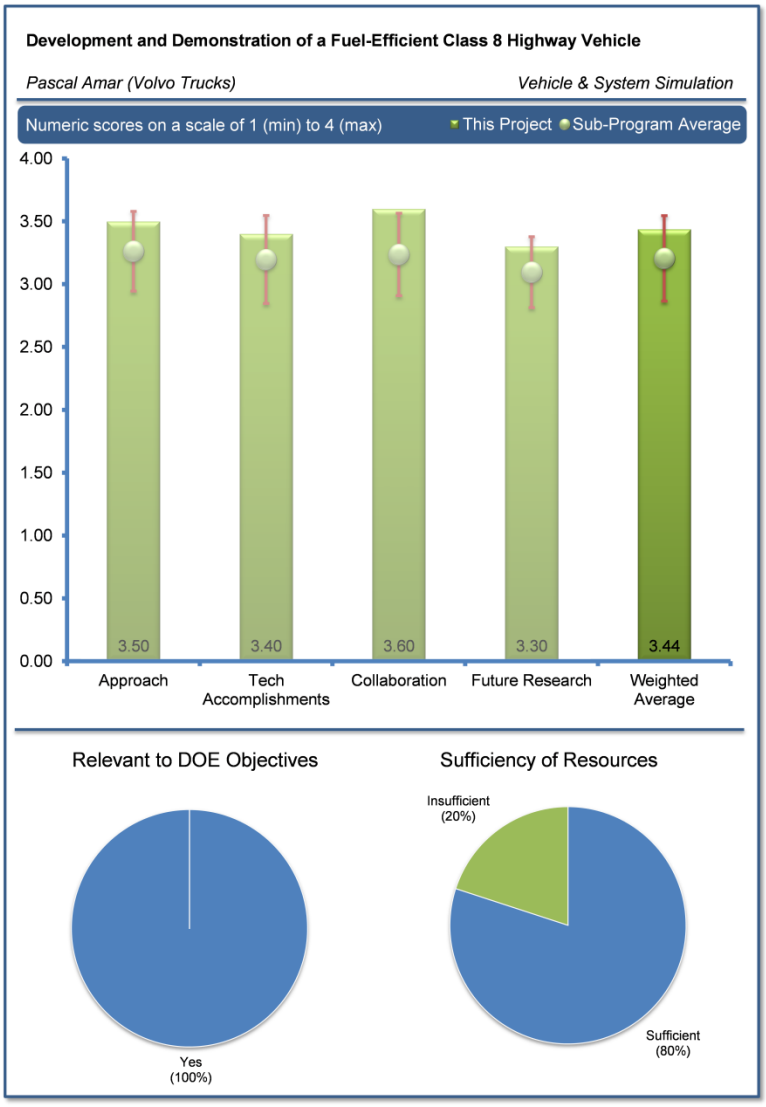
Reviewer 2:
The reviewer concluded that thermal management of the cab will reduce oversize units and will save energy. Knowing the load will improve sizing the battery.

Reviewer 3:
The reviewer emphasized really needing this help as movement progresses toward less idling for so many reasons.

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

Reviewer 1:
The reviewer concluded that the project was definitely meeting expectations for accomplishments versus budget.

Development and Demonstration of a Fuel-Efficient Class 8 Highway Vehicle: Pascal Amar (Volvo Trucks) - vss081



Reviewer Sample Size

A total of five reviewers evaluated this project.

Question 1: What is your assessment of the approach to performing the work? To what degree are technical barriers addressed? Is the project well-designed, feasible, and integrated with other efforts?

Reviewer 1:

The reviewer cited great use of simulation techniques to refine the design before proceeding with hardware prototyping, and thought that the emphasis on integration efforts to make sure that the pieces of the puzzle fit nicely together was also great.

Reviewer 2:

The reviewer found this project to be very well managed, and the technical barriers were clearly managed with good engineering science. There are no fundamental technical issues with the approach, the results, the analysis, and the future development.

Reviewer 3:

The reviewer reported the overall project approach was presented as starting with a 2+ year period of concept selection (baseline testing, modeling and evaluation) followed by development, integration and eventually testing in a demo truck. The previous year spanned the conclusion of the concept selection phase and into the initial stages of the development and refinement phase. The reviewer related that the presenter emphasized the importance of an integrated design approach--factoring together the interactions between effects such as driving demand, heat rejection, packaging and cooling needs. While no details were presented, the presenter also mentioned soliciting driver acceptance feedback for some of the more dramatic feature changes relative to a traditional truck, which to the presenter seemed like a good idea.

Reviewer 4:

The reviewer commented that technology selection was wrapping up in this phase and starting to be integrated into a full vehicle design, and that the project had finished a first workable prototype and tested it. The reviewer questioned if it was designed for real operating conditions, and how those were changing. The reviewer thought Slide 5 to be a very good simple view of how the energy is used in baseline versus SuperTruck; need less power for instance. The reviewer further relayed that Volvo continues to have a strong end customer buying into their designs, which optimized as well as limited the challenges for fleets to buy, and also ran dynamometer and field testing.

Reviewer 5:

The reviewer said that it seemed that the tractor front shape and hood must be raised in order to accommodate the device associated with WHR, which is a major change on the truck. It is shown that WHR may not be in an optimal design. The reviewer recommended that a

technology list slide or table should be used to describe what are being used in the program. Without this list, it was not clear how the program goal is to be achieved.

Question 2: Technical accomplishments and progress toward overall project and DOE goals – the degree to which progress has been made, measured against performance indicators and demonstrated progress toward DOE goals.

Reviewer 1:
The reviewer commented on the excellent path to first prototype, and how the project made selections quickly, tested 16 configurations, exceeded first target of 41% by 2%, and is going now to downsize to 11L from 13L. The reviewer wondered what material will be used for ultra-light frame assembly - 45% lighter aluminum for now!

Reviewer 2:
The reviewer thought that a 43% improvement in a vehicle was excellent considering that the program got started late compared to its competitor. The reviewer also suggested that it would be helpful to show the route used for this program, since without this, it could be misleading.

Reviewer 3:
The reviewer reported that the work seemed to be proceeding and progress was being made, but presentation lacked details on all aspects. For instance, testing does not specify the nature of those tests or their duration, therefore it is difficult to assess whether results are meaningful.

Reviewer 4:
The reviewer reported that accomplishments included chassis dyno and on-road testing of the Phase I concept configuration(s), and achieving both fuel economy and freight efficiency improvements that approached the eventual 50% goal. As a result, the project team is expecting to significantly surpass this goal by the end of the project. The reviewer relayed that considerable progress has been made on the individual factor goals as well--such as achieving a 30% aerodynamic drag reduction (relative to the eventual target reduction of at least 40%), an improvement in engine brake thermal efficiency to 48% (relative to the eventual 50% target), and achieving over 40% weight reduction with a custom aluminum frame rail assembly.

Question 3: Collaboration and coordination with other institutions.

Reviewer 1:
The reviewer stated that good collaboration is obvious and cited frame rail collaboration with Metalsa as a good example.

Reviewer 2:
The reviewer reported that a number of collaboration partners appear to be actively involved in the project.

Reviewer 3:
The reviewer concluded that the project utilizes many other companies to work on the program.

Reviewer 4:
The reviewer said that there seem to be fewer partners and suppliers than other SuperTruck projects, and wondered if more partnerships (and therefore freight efficiency improvements) could be leveraged from Volvo suppliers

Question 4: Proposed future research – the degree to which the project has effectively planned its future work in a logical manner by incorporating appropriate decision points, considering barriers to the realization of the proposed technology, and, when sensible, mitigating risk by providing alternate development pathways.

Reviewer 1:
The reviewer believed that although future work is not very detailed, it seems to have the right components.

Reviewer 2:
The reviewer noted that the emphasis for the future work in the next year of the project is on building the demonstrator truck. The future work discussion did not go into detail on the testing plan, but hopefully the team will be able to achieve the high efficiency improvement levels anticipated (and will be able to place some uncertainty bounds around the numbers). The reviewer is hopeful the team will also be able to show that technologies which have been developed and advanced through the project will be making their way into a production program.

Reviewer 3:
The reviewer indicated a future final demonstrator.

Reviewer 4:
The reviewer stated the future work shown in Slide 14 displayed the road map of how the final vehicle was assembled.

Question 5: Does this project support the overall DOE objectives of petroleum displacement? Why or why not?

Reviewer 1:
The reviewer hoped this would be a huge opportunity for major U.S. fuel and emissions savings.

Reviewer 2:
The reviewer concluded that improvement of freight efficiency is a clear indication of supporting the overall DOE objectives of petroleum displacement.

Reviewer 3:
The reviewer believed the project certainly supported DOE's petroleum displacement objectives.

Reviewer 4:
The reviewer pointed out that this project currently achieves a 43% freight efficiency improvement with more improvements yet to be made. All those new technologies developed on SuperTruck projects are the way to go to displace petroleum.

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

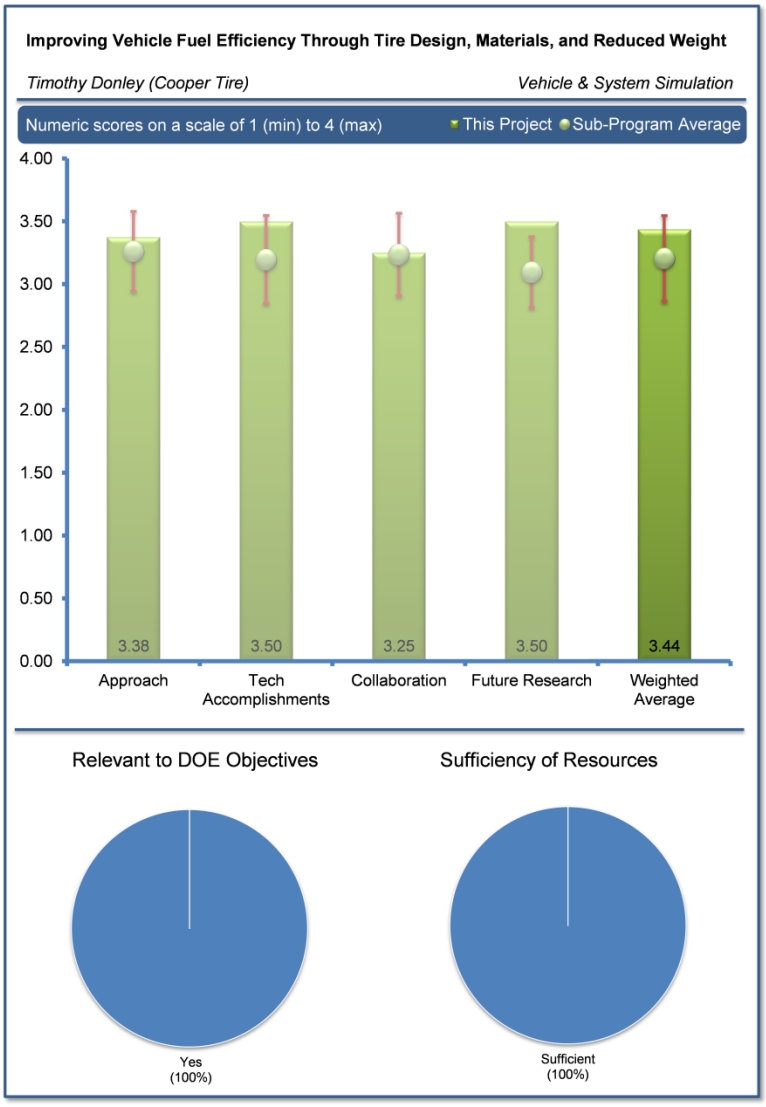
Reviewer 1:
The reviewer concluded that with only a 20 minute presentation and limited details it is difficult to make an informed statement about the sufficiency of the project resources. However, it did seem noteworthy to the reviewer that the Volvo team is expecting to surpass the SuperTruck program targets with a budget roughly half the size of some of the other teams.

Reviewer 2:
The reviewer stated that this project is getting a lot done for half the money of the other teams.

Reviewer 3:
The reviewer pointed out that the funding level is much less that its competitor.

Reviewer 4:
The reviewer observed that the resources involved on this project were not detailed in the presentation.

Improving Vehicle Fuel Efficiency Through Tire Design, Materials, and Reduced Weight: Timothy Donley (Cooper Tire) - vss083



Reviewer Sample Size

A total of four reviewers evaluated this project.

Question 1: What is your assessment of the approach to performing the work? To what degree are technical barriers addressed? Is the project well-designed, feasible, and integrated with other efforts?

Reviewer 1:

The reviewer believed that the project approach to investigate several technologies at one time is ambitious but reasonable. However, the reviewer cautioned that at this phase of the project the project should concentrate on developing and combing the successful technologies to have a product that can be commercialized. The reviewer pointed out that the approach for reducing the tread depth should be considered because it can effect on road safety.

Reviewer 2:

The reviewer believed this project effectively addresses the barriers to this topic.

Reviewer 3:

The reviewer observed that the project has pursued several paths for developing tires with reduced rolling resistance and tire mass, both of which impact fuel consumption during use. Reducing the mass of the tire also has the potential to reduce manufacturing costs and energy use. The reviewer reported that several technologies were evaluated individually to quantify the effects on rolling resistance in addition to wear and traction, and appropriate considerations have been made to ensure that overall performance will be satisfactory in key areas of consumer expectations. Plans to combine the technologies are appropriate and it is reasonable to expect that the technology combinations will provide very good results. The reviewer recognized that appropriate go/no-go decisions were included in the project plan and the path forward used relevant performance metrics to assess the viability of each technology. Some of the technologies did not meet all performance targets and were eliminated from consideration, which indicates that challenging targets were set and higher risk approaches were included in the project plan. The reviewer stated that, nonetheless, other options have proven to be successful, and the project approach has included a good balance of stretch objectives and more moderate technology approaches. The reviewer believed the costs of the technologies were not clearly discussed in the presentation, however, and it is not clear that the set of technologies pursued can be manufactured at a cost that is commercially acceptable.

Question 2: Technical accomplishments and progress toward overall project and DOE goals – the degree to which progress has been made, measured against performance indicators and demonstrated progress toward DOE goals.

Reviewer 1:

The reviewer found that progress has been clearly defined, and noted that it was useful to identify the design/material features which contributed to the weight reduction/fuel savings and those that were not pursued due to high technical risk.

Reviewer 2:
The reviewer said the project has achieved progress in 50% of the proposed technologies. In addition, it showed that successful technologies when combined can achieve the DOE goals.

Reviewer 3:
The reviewer observed that multiple material evaluations and tire builds have been completed. The technologies evaluated show very high potential for providing significant rolling resistance reductions. The reviewer reported that tire testing using industry-accepted test procedures have demonstrated the rolling resistance and mass benefits of the constructed tires. The magnitude of fuel savings expected from a change in rolling resistance was stated verbally during the presentation and is believed to be reasonable, and a realistic target was established for the rolling resistance improvement needed to achieve at least 3% fuel savings. The reviewer stated that test results were presented relative to the performance of a reference tire, but its rolling resistance was not compared to that of the overall Cooper Tire product line. Therefore, it is not clear if the approximately 30% reduction in rolling resistance that is targeted represents an improvement that will yield 3% better fuel economy than the average tire. The reviewer found that more clarification of the benefits relative to an average tire from Cooper Tire's product offerings would be helpful.

Question 3: Collaboration and coordination with other institutions.

Reviewer 1:
The reviewer found the collaborations presented indicate a positive relationship with suppliers, and some research was conducted with the national laboratory, although it seems that the collaboration with NREL did not result in significant benefits to the project. Details of a "project team" environment among the partners were not provided, so it is not possible to assess the degree of coordination among the partners on the project.

Reviewer 2:
The reviewer concluded that the project could benefit from more collaboration with companies, research institutes, or labs specializing in advanced materials development.

Question 4: Proposed future research – the degree to which the project has effectively planned its future work in a logical manner by incorporating appropriate decision points, considering barriers to the realization of the proposed technology, and, when sensible, mitigating risk by providing alternate development pathways.

Reviewer 1:
The reviewer believed that the Phase 2 Tire Program proposed which combines the technologies was a good approach.

Reviewer 2:
The reviewer observed the proposed future approach for combining the successful technologies and also further perform a limited testing of the unsuccessful technologies is most logical.

Reviewer 3:
The reviewer commented that future research addresses strengths and challenges from prior work. This reviewer believes that the selection of research to continue is very relevant and will advance the project goals. The planned tire builds seem to have a very high probability of yielding a tire design that fully satisfies the targets for the project, and additional research activities will address other potential improvements in material hysteresis.

Question 5: Does this project support the overall DOE objectives of petroleum displacement? Why or why not?

Reviewer 1:
The reviewer reported that the results thus far indicated that the DOE objectives were being met.

Reviewer 2:
The reviewer indicated that project goals for tire rolling resistance reduction can be achieved, and assuming that the tires can be produced and are commercially successful, it can be expected to result in fuel savings of several percent.

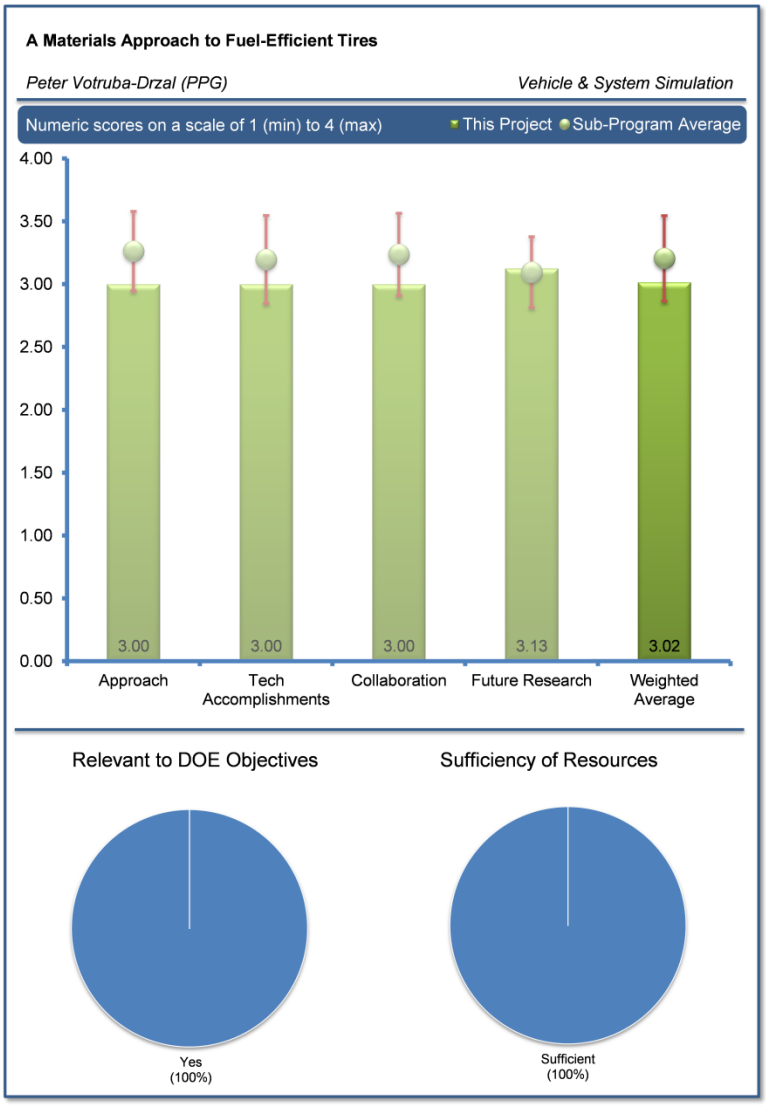
Reviewer 3:
The reviewer said the program showed that tire rolling resistance reduction can be achieved by combing the developed technologies that showed positive results.

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

Reviewer 1:
The reviewer believed the resources budgeted for the project, including those provided by the company, to be appropriate for the materials development, tire builds and testing that have been conducted and are planned.

Reviewer 2:
The reviewer judged that the project has sufficient funding resources to achieve the needed results.

A Materials Approach to Fuel-Efficient Tires: Peter Votruba-Drzal (PPG Industries) - vss084



Reviewer Sample Size

A total of four reviewers evaluated this project.

Question 1: Approach to performing the work - the degree to which technical barriers are addressed, the project is well-designed, feasible, and integrated with other efforts.

Reviewer 1:

The reviewer reported that this project has two material approaches (tire barrier coating and tire filler) that address reducing fuel consumption.

Reviewer 2:

The reviewer said of the filler approach that it is the most promising technology for tire rolling resistance improvement but needs to accelerate development by performing tire tests soon. The reviewer indicated that the coating approach needs to address manufacturing issues in this stage of the project.

Reviewer 3:

The reviewer reported that the technical tasks for material development appear to have been successfully executed, but activities to demonstrate an improvement in the rolling resistance in the tire have been rather limited and plans to evaluate tires occur only very late in the project. The reviewer thought that earlier and better integration with the project partner Goodyear would have been prudent to prove out positive results using tire road wheel and on-road testing as opposed to exclusive laboratory-based material evaluations and assessment of barrier coating adhesion.

The reviewer pointed out that potential processing issues for modified silica with Goodyear formulations were identified as a risk, yet this has not been evaluated with the project over 80% completed. Similarly, the strategy outlined for filler development indicates a goal of "improved tread wear with equal (or better) rolling resistance." The reviewer presumed that the rolling resistance improvement is the primary objective of the project and will be achieved by using a reduced tread depth tire design, and with improved wear of the material and constant hysteresis, a reduction in tire rolling resistance could be expected with similar tire wear performance. The tradeoffs between rolling resistance and wear performance in a tire are rather complex, and an evaluation with actual tires is necessary to evaluate the overall performance. As the reviewer stated above, not performing these evaluations with actual tire testing earlier in the project leaves little room for follow-up development if the results are not as expected.

Question 2: Technical accomplishments and progress toward overall project and DOE goals – the degree to which progress has been made, measured against performance indicators and demonstrated progress toward DOE goals.

Reviewer 1:

The reviewer observed significant progress in the fillers and coatings technologies. However, manufacturing issues may not result in the commercialization of a product.

Reviewer 2:
The reviewer said that it would be useful to have the milestones for the two technology approaches (tire filler and tire barrier) separated into two charts or more clearly defined for clarity of the project. The reviewer said that it seemed that the testing of the barrier technology is further along versus the testing of the filler material, but the milestone charts does not separate testing between the two approaches.

Reviewer 3:
The reviewer found that slides for Technical Accomplishments and Progress made on fillers do not highlight specific improvements made for tire rolling resistance. The data presented appears very similar to that shown in 2013, and advancement in overcoming technical barriers is not clear. Again, there is no evidence of collaboration with tire manufacturer to quantify the benefits in actual tires. The reviewer commented that evaluations of the inner layer show reasonable results for adhesion and oxygen (O_2) retention performance in the laboratory. A comparison with 2013 results does not clearly show improvements made in O_2 transmission rate performance, however.

The reviewer observed that items listed under Proposed Future Work from the 2013 AMR presentation were not addressed systematically, and it was unclear for several aspects of those tasks as to what specific barriers had been resolved with research conducted during the past year. Some results from research were shown, but the reviewer found that a clear presentation of specific advancements made addressing the barriers of the project is lacking.

Question 3: Collaboration and coordination with other institutions.

Reviewer 1:
The reviewer observed good collaboration with a tire manufacturer and a research institute that specialize in advanced materials research.

Reviewer 2:
The reviewer concluded that collaboration with Goodyear and North Dakota State University were well defined.

Reviewer 3:
The information presented indicated that Goodyear, acting as a subcontractor for the project, had very little activity for the work completed to date other than providing some tires for evaluation and some limited information. The tire manufacturer participation was critical for building tires and evaluating their performance at multiple stages of material development, but this had been left out until the very end of the project. Goodyear's participation "Working in an advisory role" is not sufficient to ensure project success, and there is no evidence that this role had influenced the project direction significantly. This is a very significant weakness in the project.

The reviewer remarked that the collaboration with North Dakota State University for synthesis of soybean oil-based materials was mentioned nowhere else in the presentation. It is apparent that there were no active collaboration and coordination of activities during the project.

Question 4: Proposed future research – the degree to which the project has effectively planned its future work in a logical manner by incorporating appropriate decision points, considering barriers to the realization of the proposed technology, and, when sensible, mitigating risk by providing alternate development pathways.

Reviewer 1:
The reviewer pointed out that key metrics for filler technology does not list rolling resistance. The reviewer was unclear if rolling resistance testing will be conducted for filler technology evaluation or if only being evaluated for material properties at the compound level.

Reviewer 2:
The reviewer commented that the basis for decisions and future directions to be pursued using go/no-go evaluations is not evident in the proposed future work, and a complete set of individual tasks to be completed is not clearly provided. Instead, rather general descriptions are given. The reviewer identified evaluation of the materials in a tire build as a clear need, and there are plans to do so at least for the coatings. The reviewer said that stated plans for fillers list key metrics for materials processing and further material property evaluations,

but tire testing is not clearly indicated. It was unclear to the reviewer that there will be a final measurement to characterize the rolling resistance improvement achieved as a result of the research performed.

Reviewer 3:
The reviewer suggested that the filler future approach needs to provide more details on testing tires. This reviewer further commented that the future coatings approach has identified future risk areas and how to manage them.

Question 5: Does this project support the overall DOE objectives of petroleum displacement? Why or why not?

Reviewer 1:
The reviewer remarked that the project's material approach is most promising for improving tire fuel efficiency and should support the DOE objectives.

Reviewer 2:
The reviewer commented that both technologies would contribute to the objective of reduction in fuel consumption.

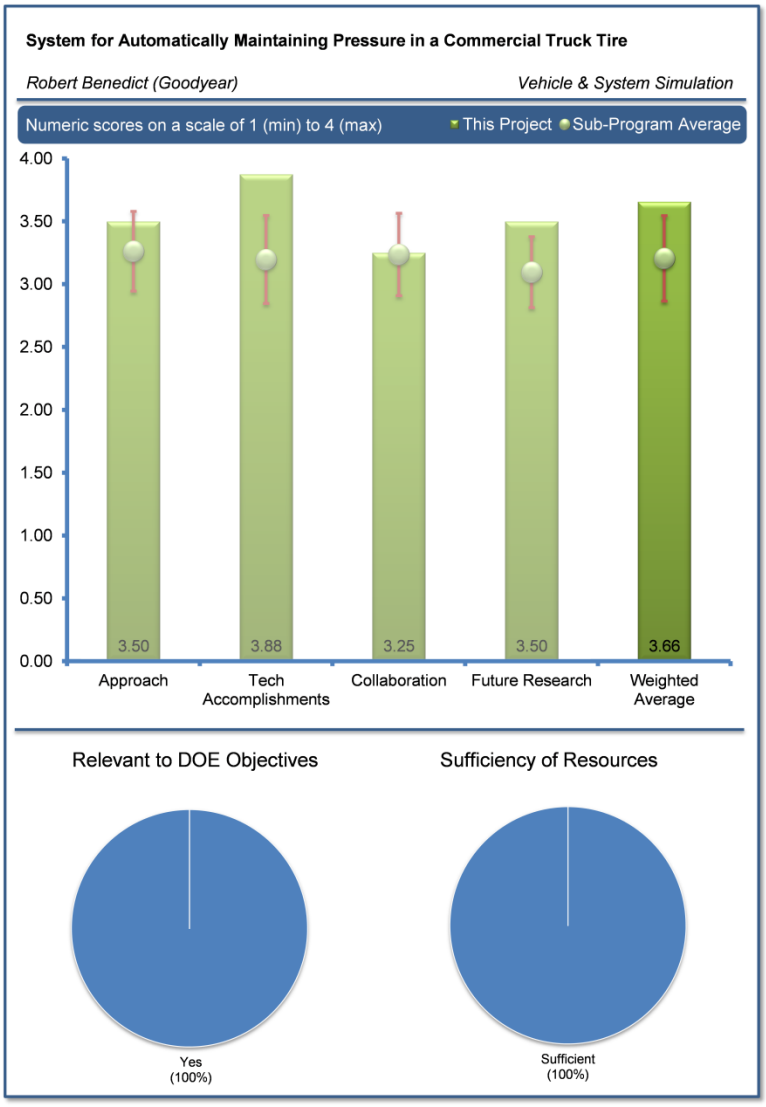
Reviewer 3:
The reviewer said that the research addresses DOE objectives of petroleum displacement through improvements in tire rolling resistance, which has a direct impact on the fuel consumed by vehicles.

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

Reviewer 1:
The reviewer said that resources appeared to be adequate to perform the work planned for the project.

Reviewer 2:
The reviewer found that the project has sufficient resources.

System for Automatically Maintaining Pressure in a Commercial Truck Tire: Robert Benedict (Goodyear) - vss085



Reviewer Sample Size

A total of four reviewers evaluated this project.

Question 1: Approach to performing the work - the degree to which technical barriers are addressed, the project is well-designed, feasible, and integrated with other efforts.

Reviewer 1:

The reviewer complimented that this project is very well managed, the progress is very clear, and the benefits are huge not only for fuel saving but for automotive safety as well.

Reviewer 2:

The reviewer noted that this project addresses objective of reducing fuel consumption through improvement to tire inflation maintenance.

Reviewer 3:

The reviewer remarked that barriers to development and implementation of the system have been well-identified and addressed using a systematic project approach. Commercial barriers have also been addressed through a survey with customers, and it appears there is significant interest in the product. The reviewer noted that cost information was not included as part of the survey, however, which could impact the final acceptance. Design improvements addressing size, weight and cost have been pursued effectively, and on-vehicle testing has been initiated. The reviewer concluded that overall, the project has been executed very well and is progressing favorably.

Reviewer 4:

The reviewer found that the project has a good approach by using a device that can automatically maintain air pressure for the life of the tire. Also, the device is contained within the tire casing with some changes to the tire structure that would not prevent tire retreading or repair.

Question 2: Technical accomplishments and progress toward overall project and DOE goals – the degree to which progress has been made, measured against performance indicators and demonstrated progress toward DOE goals.

Reviewer 1:

The reviewer complimented that the project showed excellent progress in several areas, for example, design optimization, laboratory tests, passing DOT requirements, and significant vehicle testing.

Reviewer 2:

The reviewer said that optimization of the design and extensive testing conducted indicates good progress of this proposed concept.

Reviewer 3:
The reviewer said that testing of the inflation system using several test methods has been completed (and additional testing is continuing) to evaluate the performance and durability of the device. The project set appropriate performance targets and work focused on meeting these. The reviewer commented that the project team optimized and redesigned the system to overcome prior technical barriers and to address concerns for bead durability and other performance attributes of the inflation system. The research activities have been very proactive to develop a quality product and there is a clear attention to detail in the development. The reviewer noted that performance of the redesigned system, as measured in the laboratory, in a test fleet and at Goodyear Proving Grounds, has been very good. Endurance testing was identified as a barrier/critical need in previous developments, and Goodyear has addressed this directly with extensive testing.

Reviewer 4:
The reviewer said that the goals were successfully achieved.

Question 3: Collaboration and coordination with other institutions.

Reviewer 1:
The reviewer said that this project showed excellent collaboration with Eaton in the design process.

Reviewer 2:
The reviewer noted that Goodyear is the sole project participant, but the project team has worked closely with its suppliers (particularly with Eaton) to develop and thoroughly evaluate a quality product. It was apparent to the reviewer that the work to develop the regulator and other components of the system was conducted with very good coordination with the supplier.

Reviewer 3:
The reviewer acknowledged that there are good indicators of collaboration with parts manufacturers.

Question 4: Proposed future research – the degree to which the project has effectively planned its future work in a logical manner by incorporating appropriate decision points, considering barriers to the realization of the proposed technology, and, when sensible, mitigating risk by providing alternate development pathways.

Reviewer 1:
The reviewer detailed that future research plans include improvements in the manufacturing process, refinements to the system design, and continuation of long-term performance and durability testing, using both machine testing and on-road evaluations. The project will perform tire re-treading evaluations and conduct initial testing in a commercial vehicle fleet. The reviewer noted that evaluations and design iterations are very thorough and address all major technical barriers identified.

Reviewer 2:
The reviewer commented that the fuel consumption testing planned on vehicles with air maintenance technology (AMT) tires and without AMT tires is useful to quantify the benefits of the new technology. It was unclear to this reviewer whether this testing would include any conditions for the non-AMT tires to simulate under-inflation. The reviewer noted that rolling resistance and 180-day air retention testing is listed as part of the Technical Release Testing for 2014/2015. The reviewer recommended that it would be beneficial to have more information (timeline, details, and results if completed) for these tests to support project goals.

Reviewer 3:
The reviewer said that the project plan covers several tire development and evaluation points. Also, the project future showed that significant tests will be performed to assist in improving developed system performance.

Question 5: Does this project support the overall DOE objectives of petroleum displacement? Why or why not?

Reviewer 1:
The reviewer found that this project supports DOE objective of fuel reduction.

Reviewer 2:

The reviewer commented that the project would support DOE objectives by maintaining the tire air pressure, which can result in less fuel consumption and reduced wear, beside other benefits.

Reviewer 3:

The reviewer detailed that maintaining tire pressure at proper levels will result in improvements in rolling resistance, with a direct impact on reductions in fuel consumption. The impact on fuel efficiency was shown to be 2.4% for 20% tire under-inflation. The reviewer pointed out that it was not clear if a specific goal for fuel efficiency improvement was defined, but the overall benefit will clearly depend on specific fleet practices and the number of tires that are typically under-inflated. This reviewer is skeptical that 20% under-inflation is representative of a majority of tires in heavy-duty commercial trucking fleets, so the actual benefit may be considerably less than the 2.4% shown. Nonetheless, according to the reviewer, this technology can be expected to have a very positive impact on fuel efficiency, emissions, wear and tire durability. The benefits for reducing roadside breakdowns due to tire failures as described in the presentation has additional potential for reducing the petroleum consumption associated with tire production in addition to time and costs associated with loss of service.

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

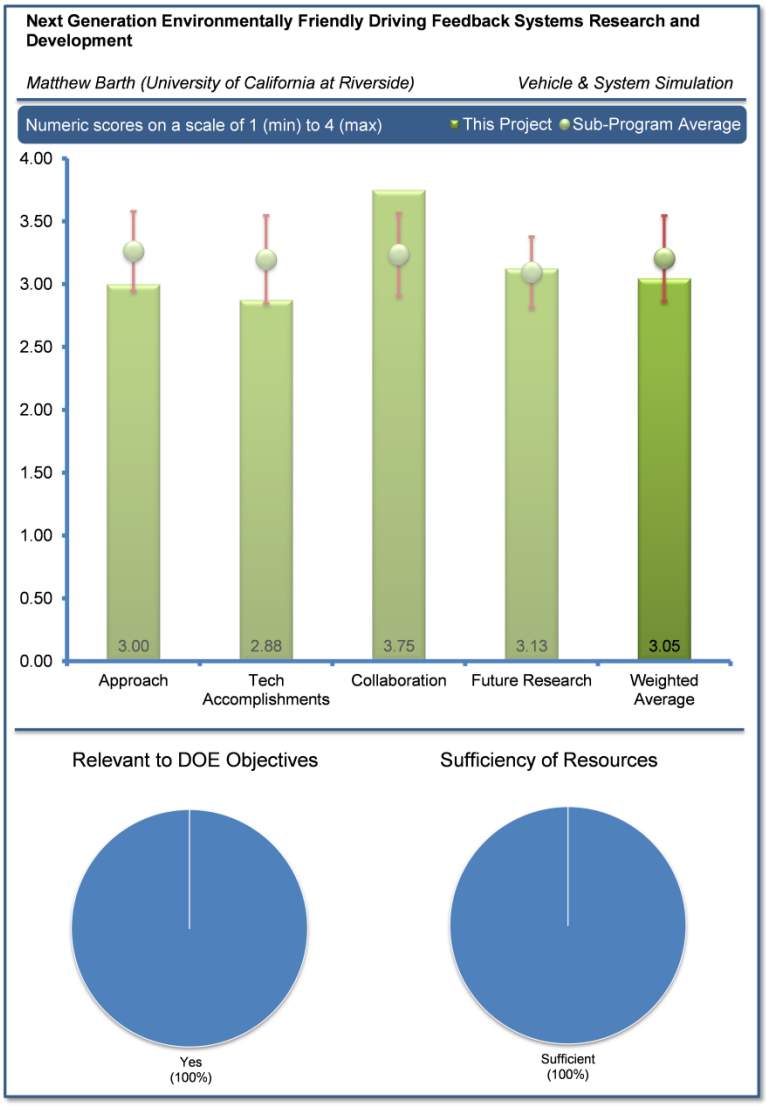
Reviewer 1:

The reviewer said that the resources for the project appear to be adequate and appropriate for the planned research.

Reviewer 2:

The reviewer found that this project has adequate funding.

Next Generation Environmentally Friendly Driving Feedback Systems Research and Development: Matthew Barth (University of California at Riverside) - vss086



Reviewer Sample Size

A total of four reviewers evaluated this project.

Question 1: Approach to performing the work - the degree to which technical barriers are addressed, the project is well-designed, feasible, and integrated with other efforts.

Reviewer 1:

The reviewer found that the overall approach seems to have been sound, including trip scheduling, navigation, driver feedback and eco-scoring/ranking elements. Pertinent information, such as real-time traffic, seems to be included, and the team seems to have arranged for a good variety of test vehicles for the field operational test (FOT). The reviewer suggested that further validation of the fuel measurement approach would have been helpful, as the presenter referred to a separate study suggesting that CAN fuel measurement is within 3% of actual fuel use. The reviewer pointed out that this uncertainty level is above the greater than 2% fuel efficiency improvement goal, and it is unclear whether this comparison was made on the actual vehicle models planned for use in the FOT.

Reviewer 2:

The reviewer remarked that the presentation focused too much on the technology and data collection effort rather than the much more important aspects of the driver. Too little discussion was given to the human-machine interface, driver acceptance of the feedback mechanisms, whether the driver felt being pressured into driving unsafely (even when some of the feedback was merely advisory), and the issue of the control being taken away from the driver. The reviewer pointed out that although 11 experts were used for the system design, driver acceptance of the system should always be a final and ultimate goal. Driver acceptance of the system was not obtained nor was there a survey conducted of the drivers about their feelings about the system and the feedback provided. The reviewer strongly emphasized that another issue not discussed was driver selection – whether this was random. Even if not random, it would have been advantageous to the researchers if the drivers selected were among the worst in fuel economy.

The reviewer recommended that the project should have clarified whether the eco-routing navigation software was for passenger cars or for truck, and take into account height clearance, size and weight restrictions, and turning geometries. The reviewer recommended that the project should have also clarified whether the engine is idling for power take-off to operate lift equipment and if so, whether this type of legitimate idling is taken into account in the fuel economy for driving.

Question 2: Technical accomplishments and progress toward overall project and DOE goals – the degree to which progress has been made, measured against performance indicators and demonstrated progress toward DOE goals.

Reviewer 1:
The reviewer wished the project had been able to integrate with the scheduling software used by Riverside. The reviewer understood why this was not possible.

Reviewer 2:
The reviewer pointed out that this study has a period of performance of three years, and that the study should be closer to 85% completed.

Reviewer 3:
The reviewer pointed out that the comparison to the baseline was not clear, given the 2% goal, and because of the uncertainty of data collected from the vehicles' engine control unit (ECUs), the benefits shown might not be within the statistical significance. The reviewer commented that the results might not be conclusive.

Reviewer 4:
The reviewer detailed that accomplishments in the past year seem to have included design of the eco-driving feedback system using a modular on-board diagnostics (OBD) plus Android human-machine interface (HMI), which should be easily replicable in a variety of vehicle settings The eco-score development seems to have been thoughtfully arranged so that custom weightings could be applied as best fits for different applications and so that drivers are not penalized for conditions out of their control. The reviewer said that it would have been helpful to hear more about the team's recommended process for developing customized weightings for the eco-score components. It seemed to the reviewer that it would be more appropriate to measure the speed component against the eco-advisory speed band (with a drop in the score when the driver deviates both above and below the band) rather than only when the driver exceeds the speed limit. The reviewer remarked that it would also be helpful to attempt to correlate the eco-score with fuel savings achieved and to adjust the score methodology accordingly to align it with the best efficiency that one could expect to achieve over a given cycle. For example, adjust the distribution band on the acceleration/deceleration score components, or credit the driver for minimizing any use of the brake pedal versus maximizing coasting/engine braking.

Question 3: Collaboration and coordination with other institutions.

Reviewer 1:
The reviewer acknowledged that there appears to have been extensive collaboration and coordination on this effort.

Reviewer 2:
The reviewer suggested that the investigators should have more control over selection of drivers among the collaborators. According to the reviewer, if driver selection was not intended to be random, the investigators could have taken the opportunity to select the worst drivers to get the maximum improvement in fuel economy performance.

Question 4: Proposed future research – the degree to which the project has effectively planned its future work in a logical manner by incorporating appropriate decision points, considering barriers to the realization of the proposed technology, and, when sensible, mitigating risk by providing alternate development pathways.

Reviewer 1:
The reviewer noted that completion of the FOT and corresponding analysis are the remaining tasks for the project. The reviewer noted that in response to a question the presenter expressed a good plan for trying to control for factors such as increased air conditioning usage between the baseline, and experimental data collection periods of the FOT. This can be challenging, particularly for limited sample sizes, so it may or may not work out. The reviewer hopes that it does.

Reviewer 2:
The reviewer commented that there is no future research except completing the last module of the system, system integration, and field operations test.

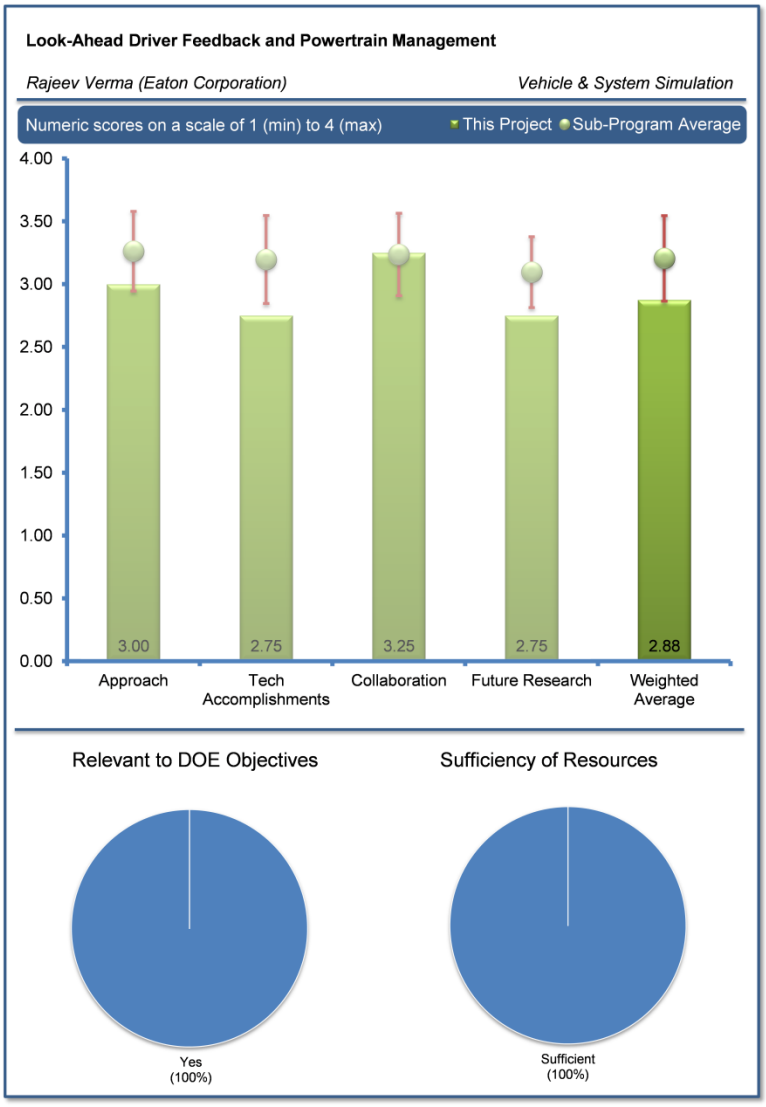
Question 5: Does this project support the overall DOE objectives of petroleum displacement? Why or why not?

Reviewer 1:
The reviewer acknowledged that the project is directly relevant to displacing petroleum consumption.

Reviewer 2:
The reviewer commented that studies have shown that improving driver performance can improve fuel economy by as much as 17%

Question 6: Resources: How sufficient are the resources for the project to achieve the stated milestones in a timely fashion?
No comments were received in response to this question.

Look-Ahead Driver Feedback and Powertrain Management: Rajeev Verma (Eaton Corporation) - vss087



Reviewer Sample Size

A total of four reviewers evaluated this project.

Question 1: Approach to performing the work - the degree to which technical barriers are addressed, the project is well-designed, feasible, and integrated with other efforts.

Reviewer 1:

The reviewer thought the project had limitations from its original design, but within those limitations the approach has been correct and efficient. The reviewer said that the PI's have been consistent and true to the approach.

Reviewer 2:

The reviewer found that the overall flow of the approach is good, moving from evaluations with simulation tools to concept creation, prototype development/testing/refinement, and then deployment in a larger pilot test. The reviewer commented that the planned incorporation of some automated eco-assist features to remove some of the dependence on driver compliance also seems like a good idea. The reviewer thought that the details of the planned system evaluation following the pilot test were not very clear, particularly the planned use of Autonomie mentioned at the end of the presentation. The reviewer thought that it would be reasonable to use a simulation tool to evaluate the approach over cycles beyond those captured during the pilot test, but according to the reviewer it was not clear if that is the intent. If that is not the intent, then the reviewer suggested that clarification is needed on what additional insight is expected from the simulated versus measured results. If that is the intent, then the reviewer suggested clarification is needed on how the researchers plan to complete the non-trivial task of deriving second-by-second speed profiles representative of driving with the look-ahead system on versus off.

Reviewer 3:

The reviewer observed that the investigators did not properly present the baseline measures, and the benefits would be hard to quantify.

Reviewer 4:

The reviewer found that the presentation was too focused on the technology (i.e., Gen 1, Gen 2, and Gen 3, signal phase and timing, certification of modified TECU code, etc.) and data collection, and spent very little time on the much more essential issues, such as human-machine interface, driver selection, and how feedback was provided to the driver. The reviewer pointed out that after all, this is a study of improving driver's fuel economy performance, so the first and foremost focus should be on the driver. Most important, the reviewer noted that the baseline for each driver was omitted. The reviewer said that the investigator hardly described the baseline, so how can one compare improvement; the reviewer asked what fuel economy improvement would be compared to. The reviewer suggested that driver input (instead of the fleet manager) should have been solicited on human-machine interface as well as receipt of feedback on driving performance and taking away control of the vehicle. The reviewer noted that the driver input is much more important than getting

approval from the fleet manager because the topic is improving driver performance, not fleet manager performance. The reviewer pointed out that it cannot be assumed that the driver accepts the system (stated on Slides 4-5 of the presentation). The reviewer strongly recommended that the driver must always be tested, or queried, for driver acceptance.

Question 2: Technical accomplishments and progress toward overall project and DOE goals – the degree to which progress has been made, measured against performance indicators and demonstrated progress toward DOE goals.

Reviewer 1:
The reviewer said that the team seems to have made good progress on evolving the prototype system and on demonstrating the strengths and limitations of the dedicated short-range communication (DSRC) component. The reviewer cited as an example that it does a good job estimating the distance to the next vehicle but that the signal needs to be improved in order to get more advanced information from RSE equipment at upcoming intersections. The reviewer said that the team has also integrated the system into a prototype vehicle and performed initial testing with Eaton employees, suggesting fuel economy improvement in the 1%-7% range. The presentation stated that 30,000 miles of pre-pilot data collection was planned on the instrumented trucks – the reviewer presumed that this will be the baseline and a comparable amount of data will be collected during the pilot with the system turned on.

Reviewer 2:
The reviewer wished the pilot test could have been completed prior to the AMR. However, the reviewer thought that the PI's are making good progress and are doing what the project team set out to do. The reviewer noted there were some delays, but overall well done.

Reviewer 3:
The reviewer pointed out that this project has a period of performance of three years ending in September 2014. The reviewer thought that the project should be about 85% done rather than 75% done. The reviewer believed that the pilot test should have been completed and the validated, and safety certification should have been completed. The reviewer commented that on Slide 14, it was not clear why an automobile is being shown for the driving simulator study. A truck simulator should have been used.

Reviewer 4:
The reviewer said that simulation results from the models could be presented to show possible benefits. There is no data to suggest that the claimed benefits will be within the specified range.

Question 3: Collaboration and coordination with other institutions.

Reviewer 1:
The reviewer found that there seems to have been good collaboration between several organizations.

Reviewer 2:
The reviewer believed that Con-Way fleet management approval should have been restricted. The reviewer believed that the driver approval is much more critical. Otherwise, collaboration with ORNL and University of Michigan Transportation Research Institute (UMTRI) are okay.

Question 4: Proposed future research – the degree to which the project has effectively planned its future work in a logical manner by incorporating appropriate decision points, considering barriers to the realization of the proposed technology, and, when sensible, mitigating risk by providing alternate development pathways.

Reviewer 1:
The reviewer commented that future research is catching up with the schedule (i.e., completing Phase 3).

Reviewer 2:
The reviewer pointed out that completing the pilot test and analysis of the results seemed to be the main remaining items for future work. The reviewer noted that details were limited on the specific data analysis plan.

Reviewer 3:
The reviewer did not have a good sense for the overall commercial viability of this type of system. The reviewer would like to hear more about how the fleet managers involved in the upcoming pilot test regard this type of system and its potential. The reviewer thought that the research team was working well within the boundaries of the project.

Reviewer 4:
The reviewer said that proposed future work was discussed very briefly, but the next stage was not clear.

Question 5: Does this project support the overall DOE objectives of petroleum displacement? Why or why not?

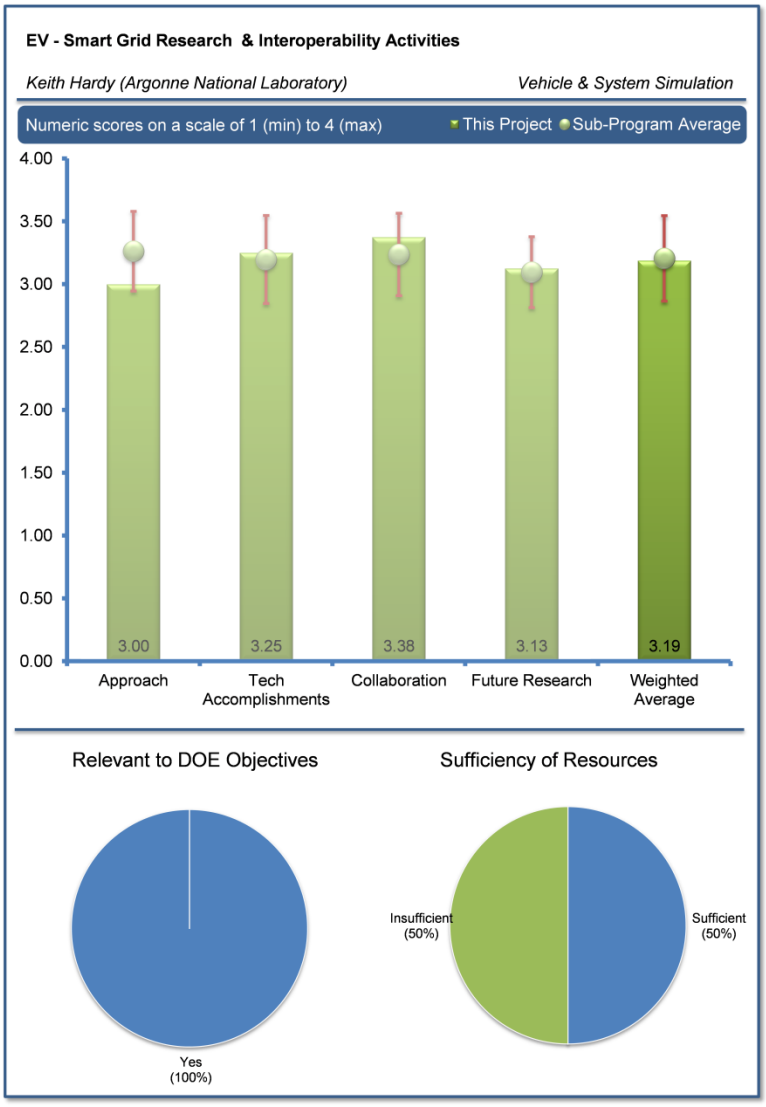
Reviewer 1:
The reviewer commented that the project is directly relevant to reducing petroleum consumption for vehicles on the road.

Reviewer 2:
The reviewer remarked yes, studies have shown that changing human driver performance can yield as much as a 17% improvement in fuel economy.

Reviewer 3:
The reviewer said that the project has been able to document reasonable expectation of petroleum displacement.

Question 6: Resources: How sufficient are the resources for the project to achieve the stated milestones in a timely fashion?
No comments were received in response to this question.

EV - Smart Grid Research & Interoperability Activities: Keith Hardy (Argonne National Laboratory) - vss095



Reviewer Sample Size

A total of four reviewers evaluated this project.

Question 1: Approach to performing the work - the degree to which technical barriers are addressed, the project is well-designed, feasible, and integrated with other efforts.

Reviewer 1:

The reviewer found that the stated barriers are valid. There is considerable integration of activities. The reviewer remarked that the scope appears to be overly ambitious for the funding resources.

Reviewer 2:

The reviewer commented that the project team is integrated with the relevant standards committees and is leveraging and progressing existing standards to achieve goals. The reviewer observed that the standards committees are making good progress. The reviewer commented that the team has developed a capable lab to test the interoperability of many different permutations and combinations of electric vehicle supply equipment (EVSE) and PEVs.

Reviewer 3:

The reviewer said that the barriers are clearly difficult but it was not clear from the presentation how the overall approach addresses the barriers in an efficient manner. It was unclear to this reviewer how these efforts were coordinated with the many other similar efforts at other laboratories, companies, and universities. While the project team certainly works with other organizations, it was unclear to the reviewer how well these synergies work and how efficiently ANL uses funding provided.

Reviewer 4:

The reviewer remarked that it seems interoperability is quite important, but the problem needs to be clearly stated with an example. The reviewer inquired about the following: which standards/protocols differ the most between various OEMs and charger manufacturers; which ones matter the most; is it possible to get consensus on the ones that are most important; and how do these affect the actual performance. The reviewer perceived that working towards interoperability is a vague term and could use a better definition or explanation with a specific example.

Question 2: Technical accomplishments and progress toward overall project and DOE goals – the degree to which progress has been made, measured against performance indicators and demonstrated progress toward DOE goals.

Reviewer 1:

The reviewer remarked that the project presented numerous tangible technical accomplishments.

Reviewer 2:
The reviewer remarked that getting the interoperability center built and operating is a big deal and goes well with SAE J2953 test procedure. The reviewer expected for the next AMR that there would be a listing of interoperability testing completed and plans for future vehicles and EVSEs. The reviewer recommended including a list of typical shortcomings and pitfalls (if applicable) for vehicle builders and EVSE suppliers that result in interoperability issues. The reviewer was unsure if the listing would be appropriate to be included in the standards document or not.

Reviewer 3:
The reviewer said that it seems progress is being made with the excellent laboratory capability. However, it was unclear to the reviewer if any testing was done with high power charging, simulating grid behavior, etc. Even with one sample set of standards in place, it would be helpful to see test results and outcomes.

Reviewer 4:
Given the importance of this metric, the reviewer would have assumed the presenters would have spent much more time clearly presenting their accomplishments. It was clear from the presentation that the project team is busy but it was not so clear how the team is progressing towards goals and overcoming barriers. The reviewer said there is no doubt that setting standards is slow and complicated, but the project team should still be able to quantify progress more clearly.

Question 3: Collaboration and coordination with other institutions.

Reviewer 1:
The reviewer acknowledged much collaboration globally with China and Europe regarding harmonization of standards. The reviewer recognized that this is going to be very hard to achieve given that some parties see an advantage to being different as a way of protecting their market or market-share. Regarding Grid Connectivity, the reviewer observed a good mix of vehicle OEMs, EVSE suppliers, utilities, and standards groups.

Reviewer 2:
The reviewer found that collaboration was very clearly stated and highlighted. The task of making common standards required collaboration and it seemed like this was happening.

Reviewer 3:
The reviewer said that it was clear that the project team works with other organizations, but it was not at all clear how well that works. The reviewer expressed confidence that ANL is well thought of and effective, but again the presentation did not give any metrics about effectiveness.

Question 4: Proposed future research – the degree to which the project has effectively planned its future work in a logical manner by incorporating appropriate decision points, considering barriers to the realization of the proposed technology, and, when sensible, mitigating risk by providing alternate development pathways.

Reviewer 1:
The reviewer said that the future work proposed covers a continued and broad array of activity that includes further work on standards development, grid connectivity (V2G, V2I, V2V), compliance testing, interoperability testing, and reporting. The reviewer said that given all of the activity, it seems that the funding is inadequate. The reviewer wondered if perhaps a greater degree of in-kind funding should be accounted for (unofficial if required).

Reviewer 2:
The reviewer found that the path outlined seemed good, but the reviewer would highlight conducting tests that highlight which standards are important or matter the most. This is the only way to push the envelope and make progress (or obtain consensus) faster.

Reviewer 3:
The reviewer found that the future work had low information content regarding future standards development schedule. The reviewer would like to know how future work maps to community consensus priorities such as the American National Standards Institute (ANSI) Roadmap 2.0.

Reviewer 4:
The reviewer said that proposed future research has a strong flavor of more of the same; trust us and we will do good things. For this reviewer, it was hard to see what is new and what critical metrics are being used to measure progress toward barriers and goals.

Question 5: Does this project support the overall DOE objectives of petroleum displacement? Why or why not?

Reviewer 1:
The reviewer commented that if done well, it will get more chargers in the field for vehicle electrification.

Reviewer 2:
The reviewer said that the standards issues, particularly regarding integrating with the grid, is a critical market barrier that takes a long time and a lot of work to address. This person further noted that it is hard to be patient with standards definition organizations (SDOs), but it is what it is, and for DOE to be effective here, the commitment has to be solid.

Reviewer 3:
The reviewer said that electrification directly attacks dependency on petroleum and carbon emissions. The project team's activities directly affect the rate and potential for adoption of electrified vehicles.

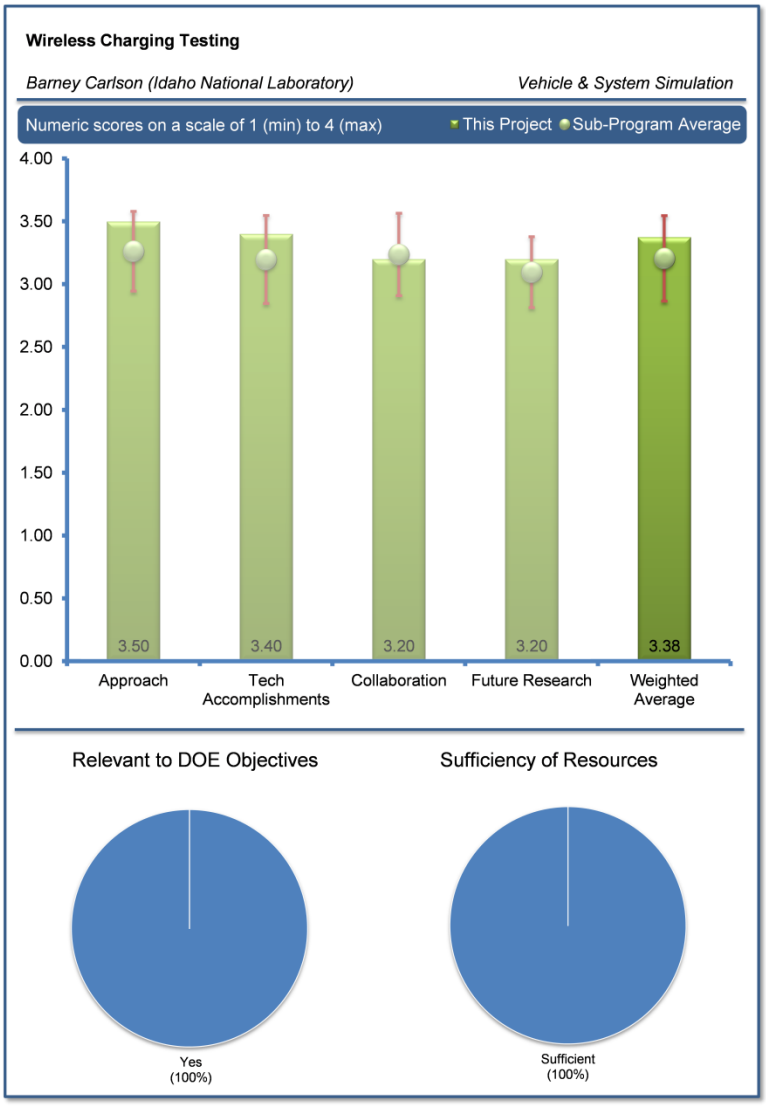
Question 6: Resources: How sufficient are the resources for the project to achieve the stated milestones in a timely fashion?

Reviewer 1:
The reviewer referenced a comment made in question four. It seemed to this reviewer that the funding was not adequate to achieve all of the stated goals.

Reviewer 2:
The reviewer acknowledged that it was hard to tell for sure from such a short presentation, but the reviewer's sense was that either the scope was too large for the resources or the resources were too low for the scope. The reviewer said that like many similar laboratory programs, there is a large cost in ongoing basic support to fund engaging the industry.

Reviewer 3:
The reviewer said that the project may want to narrow its scope to match funding.

Wireless Charging Testing: Barney Carlson (Idaho National Laboratory) - vss096



Reviewer Sample Size

A total of five reviewers evaluated this project.

Question 1: Approach to performing the work - the degree to which technical barriers are addressed, the project is well-designed, feasible, and integrated with other efforts.

Reviewer 1:

The reviewer said that given the emerging nature of the subject area, the approach was excellent in quantifying system performance.

Reviewer 2:

The reviewer applauded excellent approach, and commented very methodical in building the test apparatus, the design of experiments, and presentation of data.

Reviewer 3:

The reviewer observed a good approach to the work. The reviewer noted new work on Debris Tolerance and System Response. The reviewer also observed an interesting summary on Efficiency Results (at 3.3 kW output with 100mm gap).

Reviewer 4:

The reviewer commented that the layout of the wireless charging test rig created a very controlled environment for systems evaluation, and then the testing moved to greater levels of fidelity to an actual vehicle system test. The reviewer acknowledged that this allowed for isolation of system, vehicle, and foreign object effects.

Reviewer 5:

The reviewer commented that a high-quality test facility for wireless charger testing had been completed. It does and will continue to provide useful data on wireless charging efficiency.

Question 2: Technical accomplishments and progress toward overall project and DOE goals – the degree to which progress has been made, measured against performance indicators and demonstrated progress toward DOE goals.

Reviewer 1:

The reviewer said that the wireless charging evaluation facility was completed, and seems to be producing useful data. The reviewer said no major issues in this area, and progress seemed very good.

Reviewer 2:

The reviewer complimented excellent progress in establishing test procedures and testing available equipment.

Reviewer 3:
The reviewer said excellent progress to date in developing the test set-up for wireless changing system and evaluation of the Evatran wireless charging system with the Chevrolet Volt.

Reviewer 4:
The reviewer commented that the researchers completed the testing of Evatran's PLUGLESS wireless charger in coordination with the Apollo Demonstration Program. The commenter also noted that the INL charger test facility was established.

Reviewer 5:
The reviewer found that the targets for wireless charge transfer efficiency seemed adequate. However, the reviewer recommended that targets needed to be specified over a range of output DC bus voltage. Measuring efficiency at a fixed bus voltage was not as informative as listing the complete charge efficiency over the entire SOC window for the battery. The reviewer requested that the project please incorporate this into the targets and experimental plan.

Question 3: Collaboration and coordination with other institutions.

Reviewer 1:
The reviewer said that appropriate partners were established with excellent communication.

Reviewer 2:
The reviewer acknowledged that the project clearly demonstrated collaboration in all areas. The commenter explained that it was very important that testing parameters are established as well as SAE test procedures and standards development. The reviewer appreciated that INL slogged through the SAE standards because that is very important.

Reviewer 3:
The reviewer said good presentation of the overall plan.

Reviewer 4:
The reviewer said that the project team seems to have only one industry partner, but the SAE committee work will have significant contributions to the industry in general. The reviewer noted that more industry partners would aid the project though.

Reviewer 5:
For this reviewer, it was unclear in the briefing the degree to which Evatran participated in the evaluation of the system. However, according to the reviewer, the degree to which they are needed for honest broker testing of the system should be limited as well.

Question 4: Proposed future research – the degree to which the project has effectively planned its future work in a logical manner by incorporating appropriate decision points, considering barriers to the realization of the proposed technology, and, when sensible, mitigating risk by providing alternate development pathways.

Reviewer 1:
The reviewer said that future work seemed to be in line with addressing/overcoming barriers.

Reviewer 2:
The reviewer said that future work was somewhat constrained by vendor equipment availability and willingness to cooperate.

Reviewer 3:
The reviewer commented that, instead of writing generalities, they would like to see a more strategic approach as to what INL would like to test including identifying where there are "holes" in the SAE procedures and standards, and suggesting a way to plug the holes.

Reviewer 4:
The reviewer recommended that the project please add the above recommendation on dynamic DC voltage (to emulate a battery) to the future research plan.

Reviewer 5:
The reviewer said that the proposed future work is good. However, the timing of the proposed future work is not clear and depends on the availability of systems. The reviewer commented that agreements for (timing of) collaboration to complete work needs to be highlighted or identified to provide confidence that the proposed work is achievable. The reviewer suggested that a Gantt chart be used in the future.

Question 5: Does this project support the overall DOE objectives of petroleum displacement? Why or why not?

Reviewer 1:
The reviewer said that wireless charging will help to overcome a barrier to electrification of vehicles, which is simply plugging in a vehicle.

Reviewer 2:
The reviewer remarked that the project advances test procedures and standards for wireless EVSE, which are needed for increased EV acceptance in the market.

Reviewer 3:
The reviewer agreed that wireless charging is a key enabler to customer acceptance of EVs. This work will help the industry understand how efficiently this sort of charging can be, and what customer issues may be.

Reviewer 4:
The reviewer said that wireless charging would increase the adoption of EV vehicles; however, safety needed to be considered for this trade-off.

Reviewer 5:
The reviewer confirmed that wireless charging would increase the adoption of EV vehicles; however, safety needs to be considered for this trade-off. The reviewer suggested that INL may even want to consider establishing the safety codes on debris, etc. The reviewer concluded by exclaiming that the researchers keep going.

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

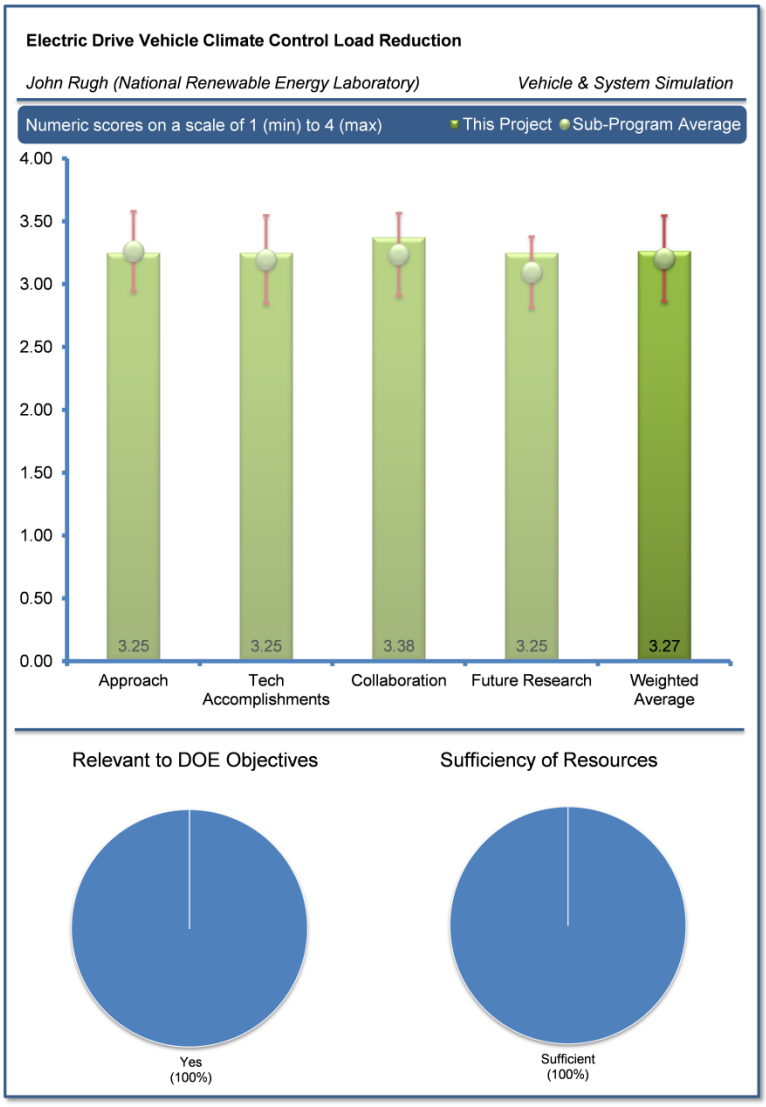
Reviewer 1:
The reviewer said that that project appeared to have adequate resources.

Reviewer 2:
The reviewer said that test facilities were sufficient, and that the project should be very useful for years ahead.

Reviewer 3:
The reviewer agreed that the progress seems to be sufficient and as such, they would say resources are sufficient. The reviewer asked what else the researchers can do with their resources. The commenter also asked how far INL can push on this. The reviewer concluded by stating that this looks like a great start.

Reviewer 4:
The reviewer said that the test set-up and approach are excellent. Most of the risk has been removed through the thoughtful test approach. The reviewer said that the greatest risk lies in getting the systems and participation of the manufacturers to complete the testing.

Electric Drive Vehicle Climate Control Load Reduction: John Rugh (National Renewable Energy Laboratory) - vss097



Reviewer Sample Size

A total of four reviewers evaluated this project.

Question 1: Approach to performing the work - the degree to which technical barriers are addressed, the project is well-designed, feasible, and integrated with other efforts.

Reviewer 1:

The reviewer said that the project is robustly looking at the alternatives and tradeoffs, including cost. The project's goal of a 10% goal is bold, but seems achievable. The reviewer was excited to see early engagement with Ford, and remarked great.

Reviewer 2:

The reviewer remarked that the effort has a greater focus on occupant comfort rather than overall vehicle cooling with a goal to increase range by 10% through improved thermal management while maintaining or improving occupant comfort. The reviewer asked if the automaker can incorporate sensors into each seat position, similar to those used for passenger detection for the airbag system, or use seatbelt latch sensors, to selectively open vents to minimize cooling for non-present passengers.

Reviewer 3:

The reviewer found that this project specifically targets efficiency improvements of the vehicle HVAC system, which has a large impact on EV range and hence is a large technical barrier for EV adoption and ultimately energy consumption. The reviewer remarked that the zonal approach to climate control and the use of a manikin are a novel and potentially effective ways to evaluate and minimize climate control loads, while providing the occupant(s) with a comparable comfort level as conventional systems today. The reviewer found that with a range reduction of 20-40% due to climate loads, the program target to improve range by 10% is insufficient in magnitude to overcome barriers. The magnitude of the technical barrier needs to be matched with equally ambitious goals.

Reviewer 4:

The reviewer found that the objectives, approach and strategy seem to be too broad as they cover everything from cost to comfort evaluation techniques. It is almost an "all of the above" approach to vehicle climate controls in EDVs.

Question 2: Technical accomplishments and progress toward overall project and DOE goals – the degree to which progress has been made, measured against performance indicators and demonstrated progress toward DOE goals.

Reviewer 1:

The reviewer detailed that the PI completed cold weather testing on the vehicle to assess techniques during the heating mode. Level 2 chargers have been installed in test area. The test vehicles have been set up/reconfigured to have full control and awareness of the HVAC state and sensors. The reviewer described that software improvements and manikin updates have been identified as a result of testing,

which resulted in constructive feedback to the manufacturers of those systems. The energy savings due to zonal configurations (including overhead vents) has been quantified. The reviewer noted that the impact of window glazing has also been assessed, resulting in a measured 5.3°C decrease in interior temperature under specific test conditions. The reviewer acknowledged that the positive impact of a 15-30 minute pre-ventilation cycle is now understood. The performance of climate control systems can be rather subjective. The reviewer asked if there was sufficient diversity in the test group participants to capture the sensation and comfort ratings.

Reviewer 2:
The reviewer detailed that the project created necessary test cycles for heat soak and cooling. The reviewer commented zonal cooling advantages, window tinting, and ventilation, for heating, insulation, etc. The reviewer found that the practical use of various potential solutions was very good. Real world in vehicle testing that helps ensure believability of data. The reviewer observed simulations, and overhead AC vent.

Reviewer 3:
The reviewer said that practical approaches such as overhead or lap ducting configuration showed improved passenger comfort as measured on the manikin can be maintained with lower blower settings with some energy savings. The reviewer said that pre-ventilation shows promise as a simple measure for minimizing energy; however, predicting timing to begin pre-ventilation remains a challenge. These represent good incremental improvement, but the reviewer suggested looking at more aggressive thermal measures to further climate load reduction.

Reviewer 4:
The reviewer said that for the conducted sub-studies, results supported by test data were shown. For some cases, it was not clear if the small delta in temperatures was a significant improvement in the performance. The reviewer said that the sensitivity of the interior air temperature in each case was not obvious.

Question 3: Collaboration and coordination with other institutions.

Reviewer 1:
The reviewer found that clearly the project was working well with Ford and a few HVAC automotive suppliers.

Reviewer 2:
The reviewer observed good coordination with other laboratories, and that it looked like excellent work with Ford to maintain applicability.

Reviewer 3:
The reviewer noted that the PI discussed collaboration with Ford, Gentherm, Measurement Technology Northwest (MTNW) and ThermoAnalytics. The project also has further crosscutting with VTO and national laboratories, specifically ANL.

Reviewer 4:
The reviewer noted in-kind support and guidance from an OEM – Ford – as part of a CRADA. The reviewer suggested that the project would benefit from supplier collaboration for thermal measures as well (e.g., insulation and glazing).

Question 4: Proposed future research – the degree to which the project has effectively planned its future work in a logical manner by incorporating appropriate decision points, considering barriers to the realization of the proposed technology, and, when sensible, mitigating risk by providing alternate development pathways.

Reviewer 1:
The reviewer said that the PI alluded to investigating other novel thermal measures, such as seats, which was welcome. The reviewer said that another round of summer testing, as well as fitting the vehicle up with a prototype design for testing, are reasonable next steps to prove out these measures.

Reviewer 2:
The reviewer said that it seems like the project has a steady stream of various climate control investigations to conduct. Looking forward, according to the reviewer it appears the project will cover more diverse topics, such as manikin performance, winter/summer testing, and even improved range calculations.

Reviewer 3:
The reviewer said that the PI has proposed investigation into heated windshield de-fog testing, as well as an additional round of summer vehicle evaluation.

Reviewer 4:
The reviewer said that round two of summer and winter tests will clearly help with more robust tests.

Question 5: Does this project support the overall DOE objectives of petroleum displacement? Why or why not?

Reviewer 1:
The reviewer commented that the project rightly targets the HVAC system as an area of focus to reduce energy consumption in EVs and increase range.

Reviewer 2:
The reviewer said that climate control for EVs is an area of great interest to get EV driving ranges to a customer-acceptable level.

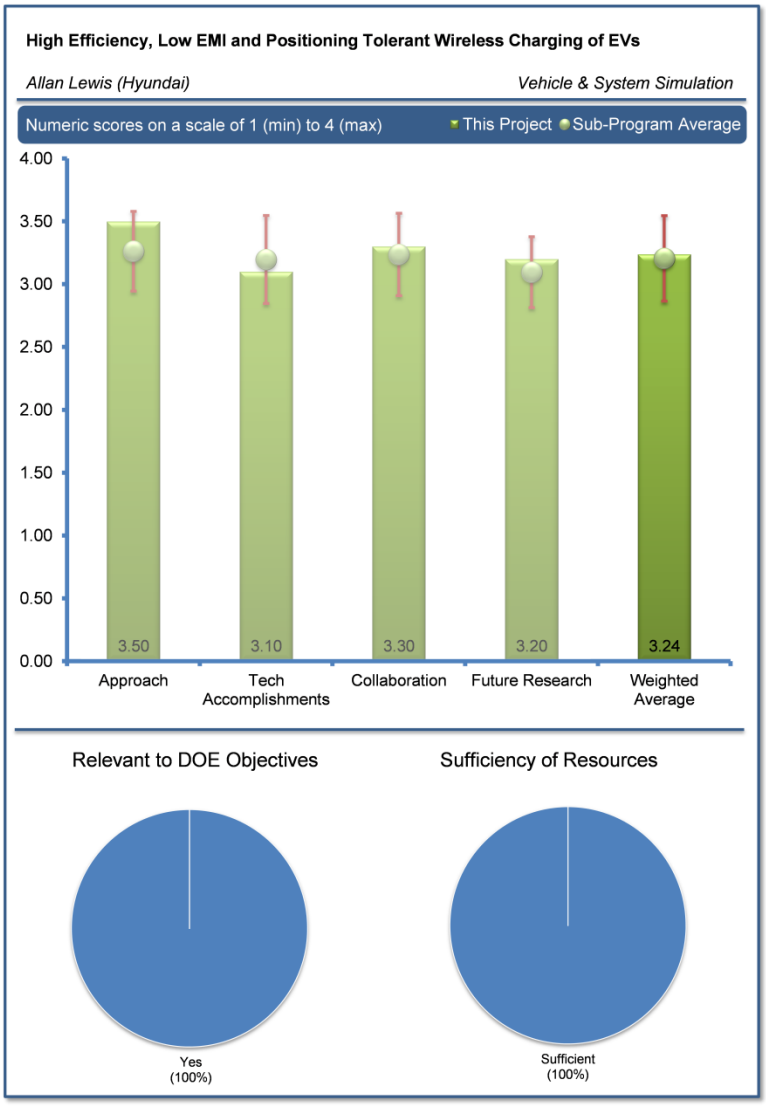
Reviewer 3:
The reviewer commented that a reduction in climate control load will result in less fuel used in vehicles.

Reviewer 4:
The reviewer said that EV range anxiety and climate control is a big deal for this. The reviewer said no free heat for heating.

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

Reviewer 1:
The reviewer said that the project is on track with the current level of resourcing.

High Efficiency, Low EMI and Positioning Tolerant Wireless Charging of EVs: Allan Lewis (Hyundai) - vss102



Reviewer Sample Size

A total of five reviewers evaluated this project.

Question 1: Approach to performing the work - the degree to which technical barriers are addressed, the project is well-designed, feasible, and integrated with other efforts.

Reviewer 1:

This reviewer thought that the technical approach used to overcome EV adoption through wireless charging of vehicles at similar efficiencies as a wired charging system and also attacking the alignment flexibility through use of asymmetric coils was an excellent approach.

Reviewer 2:

To this reviewer, the systematic development including the assessment of symmetric and asymmetric coils was sound. The reviewer added that the project appeared to have clear objectives and a path for achieving them.

Reviewer 3:

This reviewer observed that the project was very much led by the vehicle company from a true production integration perspective. This gave the project a solid dose of reality. The reviewer added that this would help define the issues, and new development and validation requirements for these systems.

Reviewer 4:

This reviewer stated that the objectives were appropriate and thought that the stretch target of 19 kW charge power was ambitious.

Reviewer 5:

The reviewer praised the well done presentation. The commenter noted that the researchers are behind on the timing for this project. The reviewer reported that Hyundai believes that there is a small take-rate for "Self Park" functionality and also believes that a high power transfer rate is required, especially for high density living areas.

Question 2: Technical accomplishments and progress toward overall project and DOE goals – the degree to which progress has been made, measured against performance indicators and demonstrated progress toward DOE goals.

Reviewer 1:

The reviewer said so far so good. The reviewer especially noted that when a phase was not completely finished the OEM would rather get an extension than to short change the effort toward the results. The reviewer said this showed a firm commitment to the project as a potential application by the OEM.

Reviewer 2:
This reviewer stated that the technical accomplishments were good but in general the project appeared to be running about six months behind milestones. The reviewer pointed out the need to look at how the schedule can be recovered or realign milestones with timing that is executable. The reviewer also commented that the second generation efficiency of 86% with asymmetric coils is very good. The reviewer added that the longitudinal offset tolerance of the system at over 40 inches is excellent.

Reviewer 3:
This reviewer observed good progress. The reviewer continued to say that the level of detail was relatively lacking compared to the Oak Ridge National Laboratory (ORNL) wireless charging project.

Reviewer 4:
According to this reviewer, the slippage of the December 2013 milestone is concerning. It was not clear that this project could get back on track, and there was nothing in the presentation to provide confidence that a contingency plan had been developed. The presenter mentioned asking for a no-cost extension, but did not provide details for why this had been necessary. The reviewer added that the experimental results were encouraging, and if the design for Gen III could be completed expeditiously, this project has the potential to achieve its objectives.

Reviewer 5:
The reviewer simply indicated that the project is 50% complete.

Question 3: Collaboration and coordination with other institutions.

Reviewer 1:
The reviewer indicated that partners included Hyundai and Mojo Mobility.

Reviewer 2:
This reviewer stated that there were good collaboration partners with a scope appropriate for their background and capabilities. The collaboration listing of the partners and the scope for each partner is excellent. It allows the reviewer to understand what each partner is doing. The reviewer finished by saying that this was a best practice.

Reviewer 3:
This reviewer commented that the collaboration between the wireless charger developer and the auto OEM was coupled quite closely out of necessity.

Reviewer 4:
This reviewer recounted that this was an auto company project and it seemed that the collaborations were the same as any other OEM led program. The OEM is leading and conforming the project to its mode of doing business and the collaborators are operating within that system.

Reviewer 5:
This reviewer recalled that the collaboration with Mojo Mobility appeared to be insufficient. The reviewer then added that this project would likely benefit from more collaboration with industry and perhaps with other research groups to help with the design.

Question 4: Proposed future research – the degree to which the project has effectively planned its future work in a logical manner by incorporating appropriate decision points, considering barriers to the realization of the proposed technology, and, when sensible, mitigating risk by providing alternate development pathways.

Reviewer 1:
Assuming the Gen II design is completed, this reviewer commented that the demonstration project of five PEVs with wireless power transfer (WPT) should provide useful real-world data.

Reviewer 2:
The reviewer mentioned that the FY 2015future research includes a fleet build-up and validation.

Reviewer 3:
According to this reviewer, although admirable as an ultimate goal, it was not clear how technical roadblocks to 19 kW charging would be overcome.

Reviewer 4:
This reviewer recounted that the next steps are to follow the task pattern of a production program but with the inclusion of this new technology that will require new test and validation protocols be developed to assure durability, reliability and safety. To this reviewer, it would be very informative to see what the outcome of the new test requirements will be.

Reviewer 5:
This reviewer suggested that the proposed future work plan be revisited due to a six month schedule slip versus the original plan. The plan to reduce x-axis length makes sense since a greater than 40-inch misalignment is more than what should be required. The reviewer noted that the FY 2015 proposed work includes national laboratory testing without any national laboratory listed as a partner. According to this reviewer, the FY 2015 scope that includes building up a small fleet and completion of durability testing (with other tests) sounds ambitious.

Question 5: Does this project support the overall DOE objectives of petroleum displacement? Why or why not?

Reviewer 1:
This reviewer said that the project addresses an issue with EV adoption and is making good progress on wireless charging coil size optimization and driving frequency as a factor for efficiency in the operation. The reviewer added that the project was also demonstrating excellent efficiency of wireless charging versus available wired charging efficiency systems.

Reviewer 2:
This reviewer said the project supported technology for increased market acceptance of EVs.

Reviewer 3:
The reviewer explained that the goal is to reduce dependence on conductive charging stations, and develop a wireless charging system that meets industry guidelines.

Reviewer 4:
This reviewer acknowledged that if more people adopt EVs due to ease of charging, more petroleum would be displaced.

Reviewer 5:
This reviewer said that the need for WPT is debatable, at least for stationary charging (quasi-stationary seems to be more obviously attractive), but that research must be done to explore this technology and determine its feasibility from both a technical and commercial standpoint. This reviewer concluded that the project should make a significant contribution to this effort.

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

Reviewer 1:
To this reviewer, a project that involves designing a product requires the level of funding provided.

Reviewer 2:
This reviewer said it seemed that the OEM was committing the resources required, not limiting it to the funding available.

Reviewer 3:
According to this reviewer, this project appeared to have adequate resources.

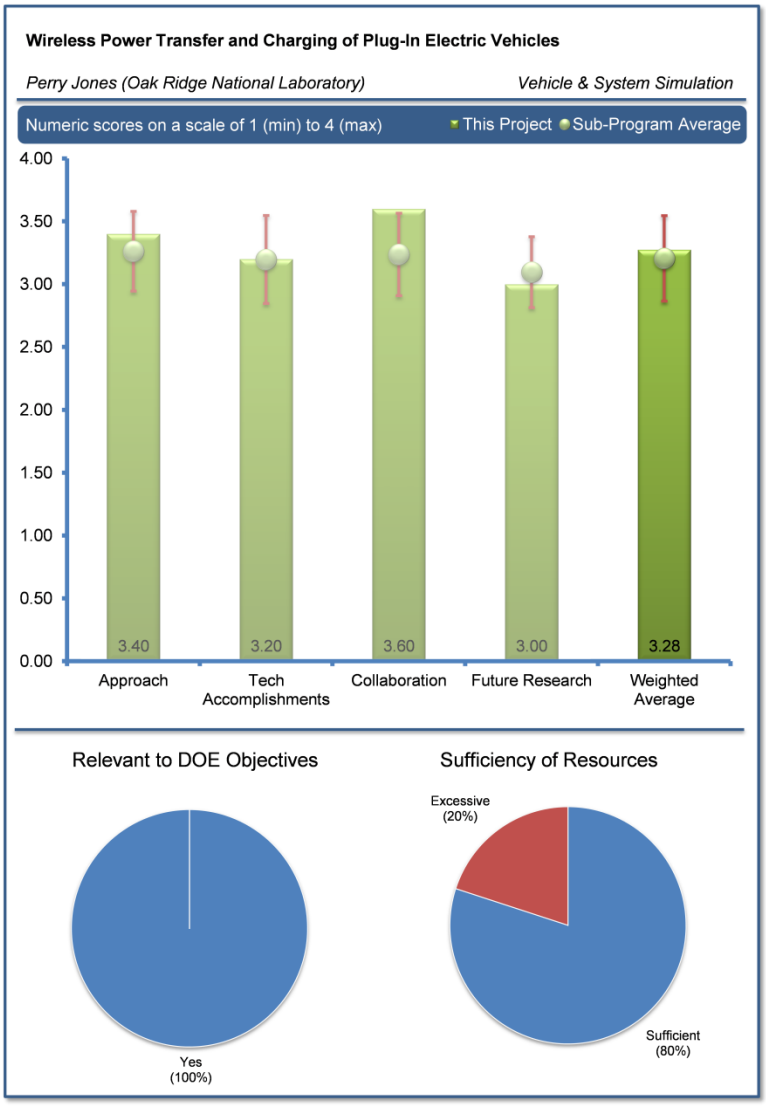
Reviewer 4:

The reviewer offered that the researchers need to ensure they stay on time for the project. It would be helpful for the reviewer to have seen a more intense timing plan which includes where the project is behind, and a plan for how to catch up on time.

Reviewer 5:

This reviewer commented that while the funding for FY 2014 appeared to be sufficient, the funding levels for FY 2015 were not provided and would need a boost to complete the proposed scope.

Wireless Power Transfer and Charging of Plug-In Electric Vehicles: Perry Jones (Oak Ridge National Laboratory) - vss103



Reviewer Sample Size

A total of five reviewers evaluated this project.

Question 1: Approach to performing the work - the degree to which technical barriers are addressed, the project is well-designed, feasible, and integrated with other efforts.

Reviewer 1:

This reviewer noted the excellent technical approach in attacking known difficulties.

Reviewer 2:

The reviewer really liked this project and the combination of partners (e.g., Toyota, Evatran, Clemson University, and ORNL.

Reviewer 3:

This reviewer said that overall, the justification for the project is sound and all sorts of factors (including market need and acceptance) were taken into account. The setting of targets were well justified and the set-up of experiments (misalignment, frequency, etc.) were also thorough. This reviewer commented that the efficiency target needs to take into account changing DC voltage on the output side. In other words, the target should not be efficiency at just one DC voltage point, but the entire range of the battery SOC/voltage. Power electronics losses (and hence efficiency) will change as a function of this.

Reviewer 4:

This reviewer observed that the project addresses EV adoption barrier of plugging in the vehicle. The Approach and Strategy (Slide 8) highlights Opportunistic, Quasi Dynamic, and In-motion/Dynamic wireless charging, but this long term view is not addressed in any timing/larger time frame schedule. This reviewer added that wireless charging at the same efficiency as a wired charging system is a good accomplishment and supports that this is a good direction to go with charging of vehicles.

Reviewer 5:

The reviewer said that the project approach appeared sound based on accomplishments and partners included. This project seems to be an integral part of DOE's multi-pronged effort to explore wireless charging. The support of the private sector by a national laboratory is a good model for how DOE projects are supposed to impact the technology sector. One comment the reviewer had would be that it would have been good to know why the second OEM vehicle partner was lost and to be more specific about how this impacted the project.

Question 2: Technical accomplishments and progress toward overall project and DOE goals – the degree to which progress has been made, measured against performance indicators and demonstrated progress toward DOE goals.

Reviewer 1:
This reviewer noted that the technical objectives were achieved, with innovations in wireless charging design. The reviewer indicated that a very good efficiency was achieved.

Reviewer 2:
This reviewer noted that the data was well presented and it seemed the project was on its way. The reviewer added that more resolution can be added to the set of experiments that include misalignment and frequency. The reviewer also suggested that data at intermediate frequencies and misalignment distances should be added to provide a more complete trend/picture. The data output should be in the form of a plot rather than a table. According to this reviewer, this would be quite useful.

Reviewer 3:
The reviewer would like to see more emphasis on the "uniqueness" of ORNL's developed wireless power transfer technology. The reviewer thought it was a little "undersold" in the presentation. The commenter requested that presenter should have shown why ORNL is good at this, and why it is not coming from industry.

Reviewer 4:
The reviewer pointed out that the technical accomplishments were being met and that the project was on track. One thing that was not clear was whether the SAE decision to go with a different frequency would negatively impact this project going forward and whether Evatran would abandon the technology in favor of one that adheres to the SAE standard. The reviewer suggested that providing evidence of a contingency plan for this situation and a discussion of what the reasons are for the SAE decision would be good additions to future presentations.

Reviewer 5:
This reviewer commented that milestones of significance that are one and a half years apart are too long. There should be more trackable mile markers in the process that provide guidance on project timeliness. Slide 14 shows percent misaligned. There is no measure with this data and needs to be grounded with dimensions to be relevant. The bench test set-up showed more of a breadboard layout for the system. To this reviewer, this looked like it was a long way off from vehicle integration. The reviewer did note that gaining an agreement with Toyota as a vehicle partner was a big achievement and congratulated the team.

Question 3: Collaboration and coordination with other institutions.

Reviewer 1:
The reviewer emphasized that it was a great idea to think about technology proliferation and collaborating with Evatran. The reviewer added that it was great to see national laboratories work towards implementation of the technology as opposed to making just research reports. The reviewer strongly urged to please keep pushing this.

Reviewer 2:
This reviewer said that all appropriate partners were included, from OEM to device manufacturers and standards committees. The reviewer also noted that there was good communication.

Reviewer 3:
To this reviewer, all of the players were on board to achieve success in demonstrating wireless charging on vehicles.

Reviewer 4:
This reviewer identified that having a major vehicle OEM as well as the preeminent wireless charging OEM as partners speaks to the successful collaborative efforts of this project, despite the loss of one vehicle OEM.

Reviewer 5:
The reviewer really liked the collaboration of partners. Of course, the reviewer thought it was a bit disappointing that this is not a GM or Ford project, but instead it was a Toyota project.

Question 4: Proposed future research – the degree to which the project has effectively planned its future work in a logical manner by incorporating appropriate decision points, considering barriers to the realization of the proposed technology, and, when sensible, mitigating risk by providing alternate development pathways.

Reviewer 1:
The reviewer motivated that ORNL keep going on this work. The reviewer asked what else ORNL could do with more time and money, and to outline it.

Reviewer 2:
This reviewer stated that the future research plans were reasonable and achievable up until the March 2015 milestone, but no details on what would be done subsequent to the initial deployment were given.

Reviewer 3:
This reviewer saw good future objectives. The reviewer said that the benefits of vehicle testing could be spelled out more clearly, and further inquired about what would be achieved in-vehicle that was not feasible on a test buck.

Reviewer 4:
This reviewer observed that the proposed future research and the planning provided in the briefing did not adequately provide appropriate decision points, risk mitigation plans/alternate pathways. The project is behind schedule due to loss of a vehicle OEM. However, there are other elements that appear to be behind as well. The reviewer concluded that the goals of the project were not addressed in the proposed future work or in the milestones.

Reviewer 5:
This reviewer pointed out the need to include full SOC window on the output side. The reviewer also suggested more resolution to understand variability. Also the reviewer recommended considering other topologies and to do a cost/efficiency tradeoff analysis.

Question 5: Does this project support the overall DOE objectives of petroleum displacement? Why or why not?

Reviewer 1:
The reviewer really liked Slide 3, which showed the Project Relevance.

Reviewer 2:
This reviewer said that the project supported the advancement of EV ease-of-use for better market acceptance.

Reviewer 3:
According to this reviewer, the project addresses barriers for EV adoption which directly impacts petroleum displacement.

Reviewer 4:
The reviewer said that the need for WPT is debatable, at least for stationary charging (quasi-stationary seems to be more obviously attractive), but research must be done to explore this technology and determine its feasibility from both a technical and commercial standpoint. The reviewer concluded that this project should make a significant contribution to this effort.

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

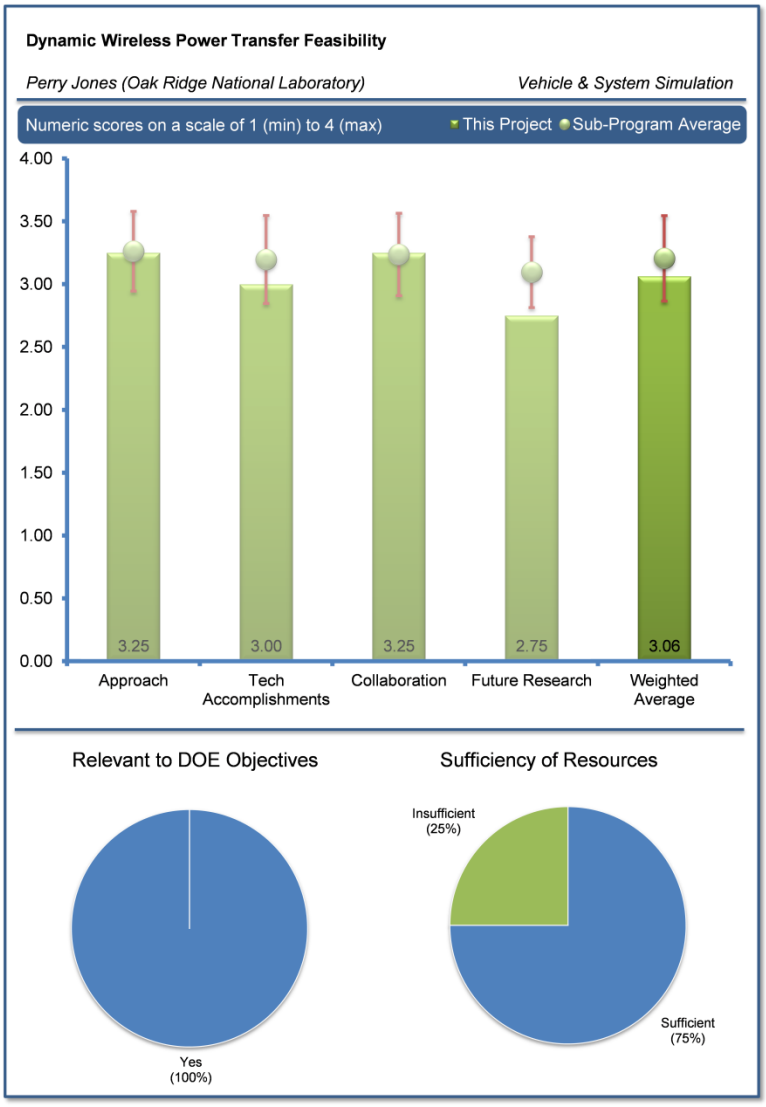
Reviewer 1:
The reviewer personally liked seeing the milestones that were laid out and a clear indication of whether the researchers can meet them, or not. And, if the milestones were not met, a plan was presented of how the researchers will be able to make up the timing.

Reviewer 2:
This reviewer noted that the resources appeared adequate.

Reviewer 3:
The reviewer noted that the project funding was sufficient, although the funding from the DOE to the partners is 8:3, and it would be better if this ratio was more even. Also, the reviewer noted that without knowing how many vehicles were going to be deployed, that it was difficult to judge the level of funding.

Reviewer 4:
This reviewer said that there is a lot of funding for the project and it was not clear on what elements the funding was being applied or when the funding was being spent. Given the level of funding, more detail should have been provided for the spend plan and how project risks were being addressed.

Dynamic Wireless Power Transfer Feasibility: Perry Jones (Oak Ridge National Laboratory) - vss104



Reviewer Sample Size

A total of four reviewers evaluated this project.

Question 1: Approach to performing the work - the degree to which technical barriers are addressed, the project is well-designed, feasible, and integrated with other efforts.

Reviewer 1:

The reviewer liked this presentation because it was far-reaching and, there was enthusiasm from the presenter.

Reviewer 2:

This reviewer noted that the approach was excellent because it was focused on defining requirements for dynamic wireless power transfer (DWPT) and that that it used real world data as a basis to inform the analysis.

Reviewer 3:

The reviewer said that the idea of estimating dynamic wireless charging costs was a good one. Doing that with not many working systems is challenging.

Reviewer 4:

This reviewer commented that the availability of existing traffic data is cited as a barrier, but no reference is provided on the sources sought. FHWA may be a good source to check on traffic statistics, classification and volume. It is stated that it is difficult to obtain quantitative comparisons of current DWPT technologies. The reviewer asked if this was presumably because of the level of maturity of the systems and IP concerns. Perhaps, the reviewer added, that more than one could be compared side by side by DOE to aid in this with confidentiality agreements in place to gain insight to support the rest of the study. At some point DWPT is going to have to be evaluated at a test track to verify the assumptions made for this high level impact study, as well as evaluating their performance, spatial requirements, construction, operation and durability. The reviewer suggested that this should be proposed future work. The reviewer also added that a key slide for all the acronyms would be very helpful for reviewers.

Question 2: Technical accomplishments and progress toward overall project and DOE goals – the degree to which progress has been made, measured against performance indicators and demonstrated progress toward DOE goals.

Reviewer 1:

The reviewer commented that this was a study, versus something exceptionally technical.

Reviewer 2:

This reviewer stated that getting the cost estimates for the wireless charging infrastructure was a good accomplishment. The reviewer would like to see more detail behind those calculations if it is not proprietary to see where areas for improvement lie.

Reviewer 3:
This reviewer described the results as credible and noted that they satisfied the minimum requirements of the primary objectives.

Reviewer 4:
This reviewer observed that some aspects that affect DWPT deployment were not stated, such as safety and durability. More detail is needed on the rationale for choosing 25kW as the power level, coil spacing and pavement type for the cost projection. The reviewer said that the following did not come through in the presentation: whether 1/2 mile and 667 coils are at 25kW; what was needed to maintain a light-duty (LD) vehicle charge at 40-45mph; and how much was each coil.

Question 3: Collaboration and coordination with other institutions.

Reviewer 1:
The reviewer acknowledged the excellent coordination between labs. In fact, at this poster review the reviewer and presenter were able to get all the labs to discuss the "market penetration slide," which the reviewer indicated that they did not agree with, although the commenter agreed that it could be directionally correct.

Reviewer 2:
This reviewer observed that the collaborations were good except a dynamic wireless charging company would be helpful to have on board if one could be brought to the table. Also, the non-attaining Air Quality Management Districts (AQMD) in California would be good collaborators if not already on the team.

Reviewer 3:
This reviewer suggested more interaction with DOT for traffic data for the deployment scenarios and future field trials to obtain in service performance evaluation on a closed course test track.

Question 4: Proposed future research – the degree to which the project has effectively planned its future work in a logical manner by incorporating appropriate decision points, considering barriers to the realization of the proposed technology, and, when sensible, mitigating risk by providing alternate development pathways.

Reviewer 1:
This reviewer commented that the future work proposal is narrow which is okay if it were presented in the context a strategic view of the DWPT R&D.

Reviewer 2:
The reviewer reported that this was a futuristic look. The commenter would like to see some cross-pollination with German and the Dutch researchers on this topic. The reviewer indicated that they have had the Dutch Government give them presentations several years ago that were in this same space.

Reviewer 3:
This reviewer did not know if it made sense for another project or extension unless there was a company interested in assisting with the dynamic wireless charging that provided something that could be more commercially feasible than what is available from ORNL.

Reviewer 4:
This reviewer noted that it is stated that infrastructure impacts would be investigated, but does not specify which infrastructure. It appears the project is referring to an electrical grid infrastructure, but the pavement infrastructure is likely to be a much larger hurdle. This reviewer recommended considering field trials with both coil and linear transfer configurations.

Question 5: Does this project support the overall DOE objectives of petroleum displacement? Why or why not?

Reviewer 1:
The reviewer explained that this project is trying to answer how we can charge vehicles on the go, and thus displace petroleum.

Reviewer 2:
According to this reviewer, DWPT is an innovative way to fuel transportation vehicles that potentially enables EVs to further exploit advantages inherent to the technology (e.g., speed of light energy transfer and high efficiency energy conversion characteristics). These characteristics enable the increased use of renewable energy and will displace petroleum consumption.

Reviewer 3:
This reviewer commented that roadway and vehicle electrification will go a long way toward DOE, and also support DOT and EPA goals of cleaner air and reduced fossil fuel consumption for the transportation sector.

Reviewer 4:
This reviewer observed that this would help reduce petroleum use and emissions if it can be done at an acceptable cost to the driver/government. The cost for benefit would need to be evaluated versus other technologies such as generator on-board series hybrid, all electric vehicle, etc.

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

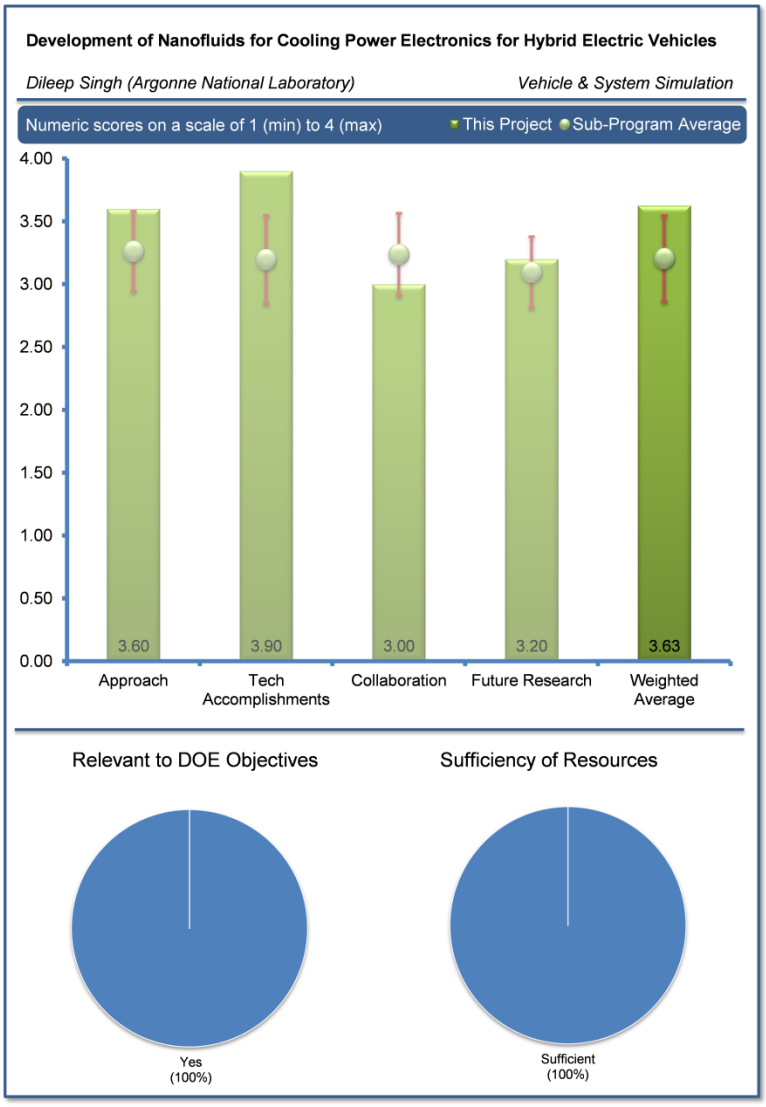
Reviewer 1:
This reviewer stated that the resources were sufficient for the initial phase of investigation. This area deserves more R&D and additional resources.

Reviewer 2:
This reviewer observed that the resources were sufficient, except that the next steps would benefit from an interested industry partner such as Siemens is with the Catenary system (which obviously is not possible for this effort because it is not wireless.)

Reviewer 3:
This reviewer opined that to really make significant advancements in evaluating the feasibility of DWPT, actual field trials of the technology need to be conducted to learn many things about installation, performance, maintenance, service, communications, spatial requirement, etc. This will support a much more robust projection of broader implementation viability studies.

Reviewer 4:
The reviewer indicated that this was a futuristic study.

Development of Nanofluids for Cooling Power Electronics for Hybrid Electric Vehicles: Dileep Singh (Argonne National Laboratory) - vss112



Reviewer Sample Size

A total of five reviewers evaluated this project.

Question 1: Approach to performing the work - the degree to which technical barriers are addressed, the project is well-designed, feasible, and integrated with other efforts.

Reviewer 1:

The reviewer commented that this project sought to develop an advanced coolant based on nanofluid that would allow for the elimination of low temperature cooling system in future HEVs. This reviewer observed that the project was carried out in three steps: defining the figure of merit of the proposed nanofluid through thermal analysis; lab scale formulation of nanofluids; and preliminary scale-up test and reliability tests. The reviewer noted that the approach was very well thought out, challenging yet feasible, and excellently executed. It provided a solid framework, both theoretically and experimentally, for future development and commercialization.

Reviewer 2:

To this reviewer, it appeared to be a thorough well planned and executed investigation of the alternatives that nano-particles provide to enhance cooling. The reviewer noted that from the presentation, it was hard to tell what efforts had been done this past year versus over the past several years, but as a whole--good approach.

Reviewer 3:

This reviewer said that this was a very strong project which is focused on cooling power electronics for HEVs and which has executed a strong approach throughout its duration. It has built heavily upon and is a natural extension of previous nanofluid work conducted at ANL with regards to heavy duty vehicle applications. An effective nanofluid engineering approach to formulate Graphite nano-Platelets (GnP) optimized suspensions has been implemented to meet property requirements defined by thermal analysis of cooling requirements for HEV power electronics. The reviewer added that the approach is very structured and strongly supported marching towards the desired project conclusion.

Reviewer 4:

This reviewer stated that cooling electronics would save energy through reduced weight.

Reviewer 5:

This reviewer indicated that the approach was quite unique and did not think it was necessarily limited to power electronics. The application to IC engines is an over looked extension.

Question 2: Technical accomplishments and progress toward overall project and DOE goals – the degree to which progress has been made, measured against performance indicators and demonstrated progress toward DOE goals.

Reviewer 1:
The reviewer noted that the project had demonstrated numerous technical accomplishments in FY 2013. The study of shape effects and surface functionalizaon of graphite nano-platelets shows that surface functionalization creates core-shell structures and helps to improve suspension stability. Thermo-physical properties of GnP in ethyl glycol/H_2O were examined and concluded that surface functionalization negatively degrades thermal conductivity (approximately 45%) but dramatically lowers viscosity (greater than 100 times less viscous). Diameter/thickness are critical for viscosity indicating an optimal geometry is needed. The experimental nanofluid was evaluated in laminar and turbulent flow and the goal of the thermal conductivity of greater than1.5 of the base fluid was achieved. ANL has successfully demonstrated a nanofluid F-B- GnP in ethyl glycol / H_2O, which is beneficial in both laminar and turbulent regimes with approximately 80% and 35% improvements in heat transfer coefficients, respectively. A top level cost analysis was conducted showing that the GnP additive will increase the cost of the coolant by 20% per volume, but has the potential to incur cost savings through reduced coolant requirements; smaller, simpler, single cooling systems; reduced vehicle weight, and increased fuel efficiency. In FY 2014, ANL has optimized the GnP nanofluid preparation procedure for scale-up including investigating the effects of ball milling on thermo-physical properties and the effect of the GnP additive on properties of commercial Prestone 50/50 coolant. It was found additives in the Prestone coolant interfere modestly with graphitic additives, but that ball-milling decreases viscosity by approximately 3% while leaving thermal conductivity unaffected. The reviewer recounted that ANL successfully scaled-up the nanofluid in quantities sufficient for heat transfer test. The reviewer added that quality control steps were introduced to offset the sensitivity of the nanofluid properties to the fluid parameters. ANL achieved the properties of the small batch nanofluid on the larger 0.5 liter scale. The efficiency of the nanofluid at real heat exchanger conditions has demonstrated an experimental average heat transfer coefficient enhancement of 1.46. Test fouling and erosion experiments of the nanofluid coolant in close to real exchanger conditions has demonstrated no clogging after hundreds of hours of testing with an estimated pumping power penalty of only approximately 7.5% more for the nanofluid than the ethyl glycol/H_2O base fluid. The reviewer also recounted that the technology-to-market efforts have led to three patent applications, an NDA with Dynalene Inc., and additional commercial interest from Hussman Corporation, a refrigeration systems manufacturer. Overall, the reviewer acknowledged that there was a very impressive list of accomplishments.

Reviewer 2:
The reviewer noted a good understanding of the technology by the PI.

Reviewer 3:
This reviewer observed that the accomplishments were aligned with the project and DOE objectives. The reviewer found the topic and its application really quite interesting and worthy of further investigation.

Reviewer 4:
The reviewer said that there appears to have been great progress this year in narrowing options for enhanced heat transfer fluid by using graphite particles. Assuming the results continue to hold through further testing, the reviewer indicated that the results will be very important to the auto industry in general.

Reviewer 5:
This reviewer recounted that the main achievements of the project are the identification of the figure of merit for the nanofluid and the development of a stable nanofluid system, currently the only known system that meets the figure of merit. The project has progressed as proposed and the scale-up and reliability tests were also very impressive as they have brought the technology a lot closer to commercialization. The reviewer concluded that the results of the projects can find commercial applications beyond the HEVs and in general HVAC systems.

Question 3: Collaboration and coordination with other institutions.

Reviewer 1:
This reviewer commented that there was not a lot of emphasis on this, but that it appeared to be a good path forward with an industrial partner.

Reviewer 2:
The reviewer opined that the project needed more collaborators including OEMs and battery manufacturers. National Institute of Standards and Technology (NIST) has done a lot of work in this area and should be a collaborator. The reviewer added that Purdue University is working in the area and may be a good collaborator.

Reviewer 3:
The reviewer would like to see collaboration with an engine manufacturer and a coolant manufacturer so that the full potential for this technology can be fully appreciated.

Reviewer 4:
This reviewer said that there was not a lot of information provided with regards to collaboration and coordination, and it appears that it has been relatively limited. Reviewing the reviewer comments from last year, it appeared to the reviewer that ANL has worked with NREL to help identify cooling requirements for HEV power electronics and has received some input from industrial manufacturers. It very well may have been beneficial to expand the breadth of collaborations especially on the industrial side to best understand commercial requirements and issues that may pose a barrier to commercialization and gauge overall industry acceptance.

Question 4: Proposed future research – the degree to which the project has effectively planned its future work in a logical manner by incorporating appropriate decision points, considering barriers to the realization of the proposed technology, and, when sensible, mitigating risk by providing alternate development pathways.

Reviewer 1:
It was not clear to this reviewer what the next step for technology transfer was. Although the results are very impressive, there still exists a gap to real commercial deployment. This reviewer asked if since this project was wrapping up this year, if Valvoline or Dynalene will license the technology and continue the development work. The reviewer wanted to know if an OEM will work with ANL to continue the development through a CRADA and if further development work would be carried out in another government program.

Reviewer 2:
The reviewer said that the project targets completion in FY 2014 and is on schedule to do so. Efforts are underway to find additional industrial partners to commercialize the technology through the ANL Technology Development & Commercialization. The primary question the reviewer had was if there were additional justifiable efforts that could be undertaken to further garner industrial interest in the technology and improve the likelihood of commercialization. For example, the reviewer asked if longer fouling/clogging and/or suspension studies under extreme conditions should be conducted and if it was possible to further build off this project to enhance the viability of nanofluids for HD truck applications.

Reviewer 3:
The reviewer suggested including more nanofluid research, which the team are experts in--nanoparticles will improve heat transfer rates and fuel economy. The reviewer observed that the project was coming to an end but there was much more to do.

Reviewer 4:
According to this reviewer, the proposed future work should include running an engine durability cycle and determining how the nano-particles remain in suspension, what erosion is experienced, and how the thermal properties deteriorate over time.

Reviewer 5:
The reviewer said that apparently DOE funding would be ending, and it was not clear if there was a path forward to continue the development efforts. The team did suggest some options that were being pursued.

Question 5: Does this project support the overall DOE objectives of petroleum displacement? Why or why not?

Reviewer 1:
This reviewer observed that this project was very relevant as successful development and commercial implementation of nanofluids for cooling power electronics in HEVs could eliminate the need for a low temperature cooling system leading to reductions in cost and weight, as well increased efficiency and lifetime of power electronics. These benefits would increase the viability of HEVs in the general market place with their concomitant energy efficiency and fuel displacement benefits. The reviewer added that the development of nanofluids have significant potential as well with regards to improving cooling in HD vehicles which can lead to cost and weight reductions as well as increased aerodynamic flexibility to improve fuel economy.

Reviewer 2:
According to this reviewer, making engines more efficient and burning less fuel is very much aligned with DOE objectives.

Reviewer 3:
The reviewer commented that this technology could provide energy savings to the existing cooling system without combining the high temperature and low temperature systems. This is important as it helps to technology gain market foothold before the new cooling system is in place.

Reviewer 4:
The reviewer said that heat transfer was important in PEV and EV vehicles. The reviewer added that thermal interface materials (TIM) thermal conductivity above 7.5 W/M-K is high and may not be available.

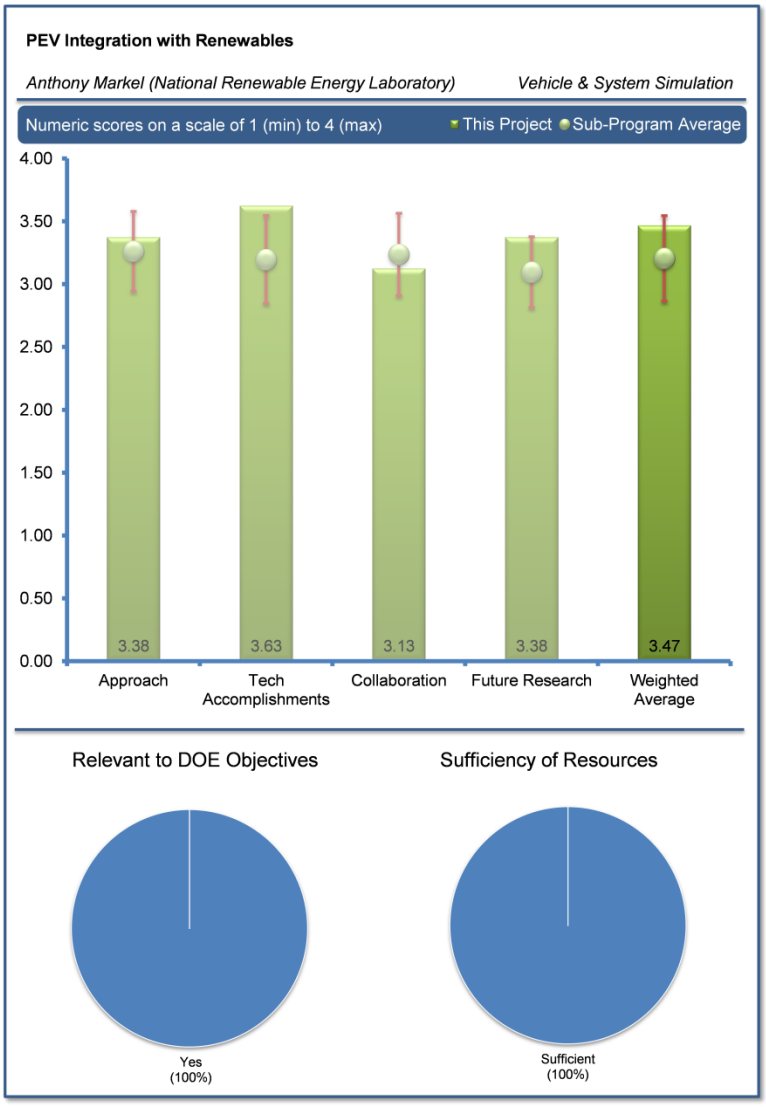
Question 6: Resources: How sufficient are the resources for the project to achieve the stated milestones in a timely fashion?

Reviewer 1:
The reviewer commented that there was a low budget for the quality of the output being received--excellent leveraging.

This reviewer observed that the project best utilized the group's expertise in thermal nanofluids and that it has sufficient resources to carry out the technical development efficiently.

Reviewer 2:
This reviewer stated that the resources were sufficient for the project as outlined.

PEV Integration with Renewables: Anthony Markel (National Renewable Energy Laboratory) - vss114



Reviewer Sample Size

A total of four reviewers evaluated this project.

Question 1: Approach to performing the work - the degree to which technical barriers are addressed, the project is well-designed, feasible, and integrated with other efforts.

Reviewer 1:

The reviewer said that, given the complicated nature of interactions between the grid, renewables, vehicles, and building loads, it was refreshing to see some work/thinking that shows all of this in slide/presentation.

Reviewer 2:

The reviewer felt this was important work--renewables can have improved reliability from EVs.

Reviewer 3:

The reviewer relayed that the approach is designed to gain an understanding of how, when and if vehicles could be integrated into a local grid segment or to a specific building to create benefits. This is an important question and should be studied. The reviewer believed that by gaining an understanding of how solar and vehicles may be able to interact is one step in that direction.

The reviewer pointed out that in the discussion it was cited that the needs of the vehicle users must be programmed into the system if a V2G system would ever be broadly implemented. The reviewer asked how this could be done without adding new activity to the driver should be studied.

Reviewer 4:

The reviewer stated that there did not seem to be a unified approach to addressing the central problem of integrating renewables using PEVs; a number of analyses appear to be combined together. The reviewer thought it was promising to see that there is a lab that incorporates the correct tools/functionality to highlight these interactions.

Question 2: Technical accomplishments and progress toward overall project and DOE goals – the degree to which progress has been made, measured against performance indicators and demonstrated progress toward DOE goals.

Reviewer 1:

The reviewer reported that the project is maximizing the available data, and stated that charge management was important.

Reviewer 2:

The reviewer found the plot showing potential revenue impact of various energy storage sizes for various building loads to be very helpful.

The reviewer suggested that the cost associated with incorporating bi-directional capability into vehicles be further refined and included in the analysis. This shouldn't be difficult to calculate. A first pass attempt at this is necessary and could follow with review/input from OEMs.

Reviewer 3:
This reviewer remarked that it seems like interesting work has been done, but there does not appear to be a clear roadmap towards producing a result that directly addresses the central goal. This may be caused by an ill-defined goal, continued the reviewer. If so, the reviewer opined that the project should be redirected towards a general value analysis, which appears to be the unifying theme of the work presented.

Reviewer 4:
It seemed clear to the reviewer from the discussion that the results of this project are indicating that it will be far into the future when vehicles can have any significant effects on the grid. This is due to the need for high numbers of vehicles to have significant effect - this answer is a significant output of the study. The reviewer felt that to know when and why the grid could make use of vehicle energy storage is seen as potentially having real benefit.

The reviewer suggested the alternative is to also look at how permanent energy storage vs. mobile energy storage would compare on a function/cost/benefit basis, and also understand the full cost to the vehicle owner when the battery capacity degradation may be accelerated due to added cycling of the battery.

Question 3: Collaboration and coordination with other institutions.

Reviewer 1:
The reviewer said that this is work in progress, but that it was great to see that test sites are being built in Colorado.

Reviewer 2:
The reviewer thought that the most significant collaborations are still planned, and that it will be good to see the value created as these collaborations are exercised.

Reviewer 3:
The reviewer saw that collaboration to date appeared to be weak, but that the proposed partners looked good.

Reviewer 4:
The reviewer recommended expanding collaborators to universities, such as Virginia Tech, as some universities are very strong in the area. The reviewer also stated that utilities need to be on board, and pointed out that NIST is also working on smart buildings.

Question 4: Proposed future research – the degree to which the project has effectively planned its future work in a logical manner by incorporating appropriate decision points, considering barriers to the realization of the proposed technology, and, when sensible, mitigating risk by providing alternate development pathways.

Reviewer 1:
The reviewer felt there was an excellent research plan, and that emergency power is great.

Reviewer 2:
The reviewer thought the completion of this work plan would help to clarify the questions about vehicle to grid and quantify the parameters required to make such grid interface useful and economically viable.

Reviewer 3:
The reviewer concluded that the path forward seems worthwhile, but asked to please incorporate the cost of bi-directional charging for vehicles and considers how using vehicle batteries compare with stationary storage cost assuming some cost per kilowatt-hour of power (or a range of values).

Reviewer 4:
There does not seem to be a clear roadmap to reach a well-defined goal. Interesting work has been done, however, so it seems that the project definition should be changed to allow the continuation of the general valuation work.

Question 5: Does this project support the overall DOE objectives of petroleum displacement? Does this project support the overall DOE objectives of petroleum displacement? Why or why not?

Reviewer 1:
The reviewer was impressed by the primary investigator, and felt this was an excellent use of cost data.

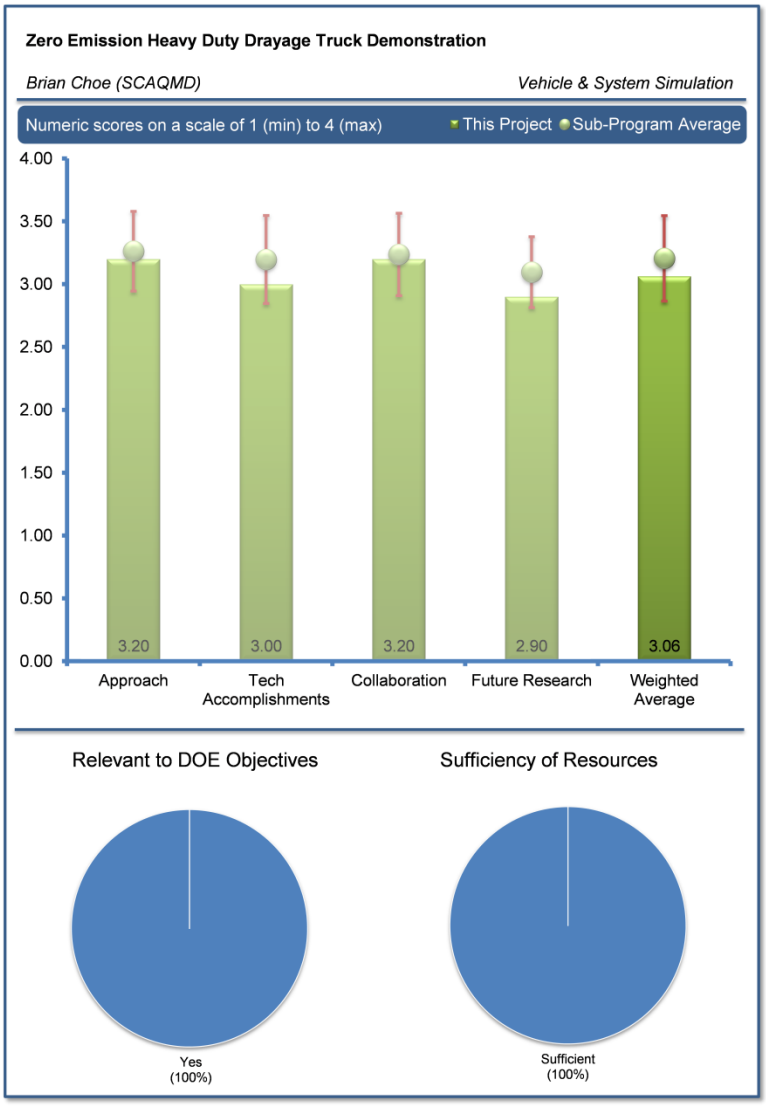
Reviewer 2:
The reviewer stated that decreasing the cost of PEVs will increase sales and decrease petroleum use.

Reviewer 3:
The reviewer concluded this project was mostly on the grid side, rather than on the vehicle side.

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

Reviewer 1:
The reviewer said that this wasn't directly addressed, but seemed sufficient.

Zero Emission Heavy Duty Drayage Truck Demonstration: Brian Choe (SCAQMD) - vss115



Reviewer Sample Size

A total of five reviewers evaluated this project.

Question 1: Approach to performing the work - the degree to which technical barriers are addressed, the project is well-designed, feasible, and integrated with other efforts.

Reviewer 1:

The reviewer thought that the approach of developing four different types of zero-emission dryage trucks to be used in near dock operation, local operation and regional operation will provide an excellent set of real world data to help evaluate this technology.

Reviewer 2:

The reviewer opined that this is another one of the "just do it" projects. This person commented that to find out if these trucks will work for this type of application, build them and put them into service. The reviewer described this as elegant and not so simple. The one piece the reviewer was uncertain about was how the trucks are matched with routes. The reviewer further inquired about how the trucks were scheduled, if recharging impinged on their work time, and if the range was matched to the routes. The reviewer suggested that this optimization bears discussion.

Reviewer 3:

The reviewer found the overall project scope to be thorough and well thought out, consisting of multiple manufacturers with multiple powertrain offerings, dynamometer performance testing to evaluate, and real world applications.

The reviewer suggested that the target objectives could be more specific, and would like to see a quantitative determination of success. The reviewer asked what the performance expectations for the OEM partners during design were. A year to design and implement an entire platform ready for real-world testing seemed to the reviewer to be a bit optimistic.

Reviewer 4:

The reviewer said this was a very interesting project; overall, a good project when viewed through the lens of technology demonstration. As a technology commercialization effort, the reviewer would be wary of the tech providers, and would further like to see the fuel cell truck go head to head with the electric trucks. These trucks are a niche within a niche within a niche. The reviewer did not believe that two different technologies can survive in this market niche. Comparing them head to head would narrow the field down so that it can be commercialized in the future.

Reviewer 5:

The reviewer felt that, in concept, multiple versions of four types of hybrids would give a good cross section of drayage truck technologies. It appeared to the reviewer that the technologies and vehicle developers selected have a long way to go in developing a

proven platform. The reviewer warned that results from unrefined technologies may give false indication of the performance possible, but understood how the project was scoped and originally planned. It is good that the fleet size is limited and only a single location is being used.

Question 2: Technical accomplishments and progress toward overall project and DOE goals – the degree to which progress has been made, measured against performance indicators and demonstrated progress toward DOE goals.

Reviewer 1:
The reviewer felt that design of the HD EVs is a big accomplishment. The hardware and software improvements were key to making trucks like these commercially feasible.

Reviewer 2:
The reviewer thought progress was satisfactory. Given the project partners and the nature of these vehicles delays are to be expected.

Reviewer 3:
The reviewer saw that there has been some progress in each of the four different types of trucks with TransPower having four BEVs completed. The other three truck designs have recently started vehicle integration or will start shortly and all vehicles will be on the road in 2015. The reviewer stated that even though the vehicles are all to be on the road in April 2015 and the project has been extended to 2016, there is concern that the project will be able to collect two years' worth of data.

Reviewer 4:
The reviewer reported that most of the technical accomplishments to date were reporting out on the development progress from the various suppliers. The reviewer believes the product development for each manufacture of each of these vehicles to be a substantial effort and expected having reliably running vehicles to be considered a significant accomplishment. The reviewer would caution against making judgment on the performance of these fairly immature prototypes. Clearly the project team recognizes this with the TransPower design improvements that occurred over this past reporting period.

Reviewer 5:
The reviewer said it was still in the early stages for the project so it was difficult to judge progress to date. Based on the schedule on Slide 5 and the future work on Slide 16, it appeared to the reviewer that the project was behind schedule.

Question 3:
Collaboration and coordination with other institutions.

Reviewer 1:
The reviewer felt that, given the problems some of the other EV projects have encountered, it was very wise to use several suppliers. This also gave an interesting mix of designs. The reviewer concluded that the analysis and testing teams are excellent, and although there is only one fleet partner, it is in the perfect niche for the test.

Reviewer 2:
The reviewer reported that there is good collaboration and coordination with the participants in the project. Four EV manufacturers will provide a range of technology to be evaluated. The reviewer expected that using NREL for data collection and University of California Riverside for dynamometer testing would provide for excellent results.

Reviewer 3:
The reviewer stated the list of collaborators and expertise was very diversified and applicable. The reviewer exclaimed well done.

Reviewer 4:
It appeared to the reviewer that the vehicle developers were still making progress and demonstrating good collaboration with the DOE team.

Reviewer 5:
Collaboration appeared satisfactory to the reviewer.

Question 4: Proposed future research – the degree to which the project has effectively planned its future work in a logical manner by incorporating appropriate decision points, considering barriers to the realization of the proposed technology, and, when sensible, mitigating risk by providing alternate development pathways.

Reviewer 1:
The reviewer felt the proposed future research continues to follow the approach path and is well laid-out.

Reviewer 2:
The reviewer stated that the plan for future work is logical, but was concerned that the demonstration portion may get cut short.

Reviewer 3:
The reviewer would like to make sure there is a component of the work that deals with optimizing vehicle scheduling for various routes to best utilize the different vehicles. The reviewer was also assuming it will be hard to get two years of data by the scheduled project end date.

Reviewer 4:
The reviewer relayed that the project has a schedule to have all of the vehicles on the road by April 2015. By getting these vehicles on the road and collecting and analyzing in use data the project will be able to address the identified barriers.

Reviewer 5:
The reviewer found that the plan for FY 2014 and FY 2015 did not support the overall project objective of demonstrating the performance of these new vehicles. This is primarily due to the long development cycle that is required to design, manufacture, develop and test a vehicle platform. The reviewer suggested that the first phase of the project could be just getting the vehicles designed and prototyped, with the second phase of the project being testing, and only if the vehicles have completed a basic validation phase.

Question 5: Does this project support the overall DOE objectives of petroleum displacement? Does this project support the overall DOE objectives of petroleum displacement? Why or why not?

Reviewer 1:
The reviewer said that, obviously, using EVs instead of diesel trucks reduces petroleum use. In this case, improvement of air quality is an even more important benefit.

Reviewer 2:
The reviewer believed that obtaining zero emission drayage truck data in real world operation would help promote market acceptance of this technology. By gaining market acceptance this technology is likely to be used and will support the DOE objective of petroleum displacement.

Reviewer 3:
The reviewer found the objectives to be directly aimed at petroleum and emissions reduction and the target market shows promise to be significantly impactful.

Reviewer 4:
The reviewer pointed out that these trucks are petroleum free.

Reviewer 5:
The reviewer said the vehicles are expected to reduce the use of petroleum, but that validation will have to occur at a much later date or possibly in another project.

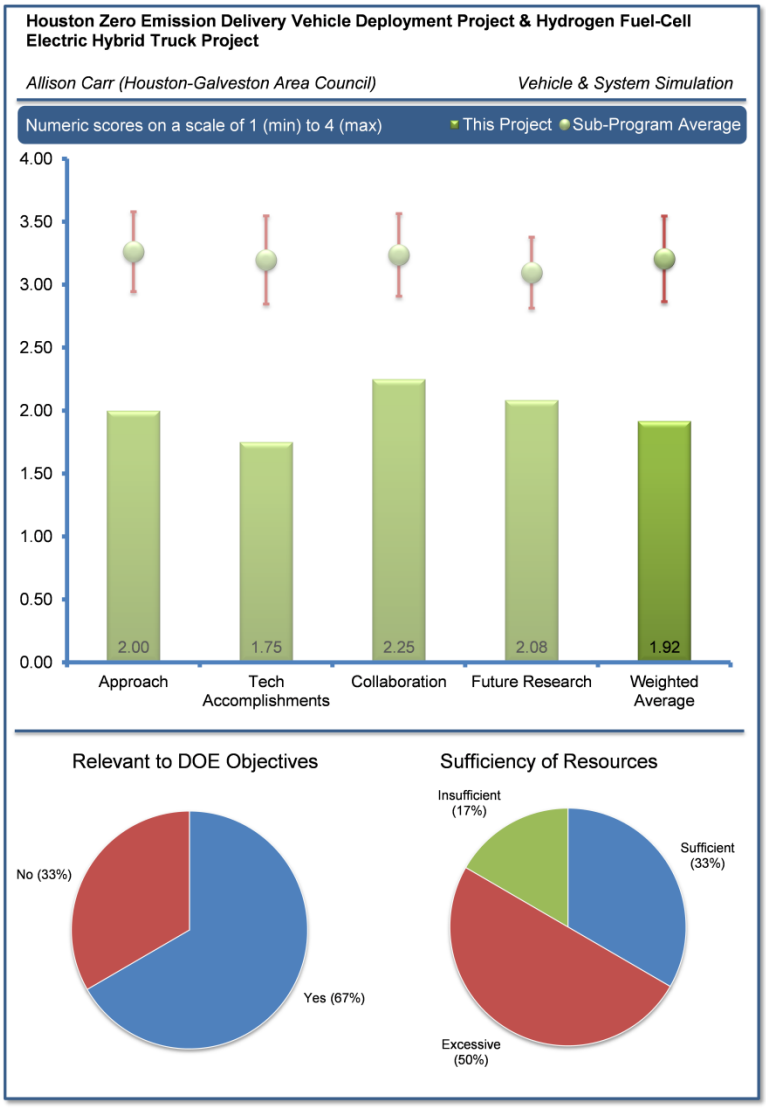
Question 6: Resources: How sufficient are the resources for the project to achieve the stated milestones in a timely fashion?

Reviewer 1:
The reviewer stated that funding appeared adequate for the stated milestones.

Reviewer 2:
The reviewer thought that, given all of the design work required, this project is pretty trim. But, as with all the large projects, it is hard to evaluate with no budget data.

Reviewer 3:
The reviewer judged that funds appeared to be sufficient, but there is a concern that the project has spent only 20% of the DOE funding and the project is over 60% complete.

Houston Zero Emission Delivery Vehicle Deployment Project & Hydrogen Fuel-Cell Electric Hybrid Truck Project: Allison Carr (Houston-Galveston Area Council) - vss116



Reviewer Sample Size

A total of six reviewers evaluated this project.

Question 1: Approach to performing the work - the degree to which technical barriers are addressed, the project is well-designed, feasible, and integrated with other efforts.

Reviewer 1:

The reviewer indicated that the current approach, of identifying fleet and OEM partners for the project, providing funding to selected partners, to begin vehicle monitoring, and data collection, is adequate.

Reviewer 2:

The reviewer stated that the project is not likely to contribute to overcoming barriers. The reviewer added that too many hurdles exist outside the control of the project leadership. Also, the reviewer said that high percentage cost share projects are difficult to execute now in today's economic reality.

Reviewer 3:

The reviewer said that the chances of success of this project seemed slim, as the difficulty to identify infrastructure and available production vehicles provided significant barriers that may be unsurmountable.

Reviewer 4:

The reviewer observed that the cost of this project would be way too high, and the reviewer was not sure if this technology can be even seen in production in 2030 and beyond.

Reviewer 5:

The reviewer reported that the objective and approach statements are beyond the scope and abilities of the Houston-Galveston Area Council. The reviewer added that even with complete commercial partnerships the project is too challenging to consider. The reviewer said that there is a big disconnect between funding and expenditure. This is another project struggling with the supplier partners. Two projects are part of this review. The reviewer pointed out that smith trucks are unable to supply the product. The reviewer indicated that it is a bit discouraging how project is unable to pursue objectives as stated. The reviewer added that there are big process problems, sounds like government. Also, the project team is conducting a call for projects. The reviewer stated that the project team is looking for OEM partners. The reviewer said it was a tough call on this project, and the project scope is under revision. The reviewer stated that a lot of time was spent trying to re-scope the project. The reviewer added that this project seems like money in search of a project. The reviewer remarked that Amp electric and UPS are likely candidates. The project looks promising as a containment action. The appropriate path forward is an ongoing theme.

Reviewer 6:
The reviewer stated that this review is for two truck deployment projects, one of which is larger ($8 million) than the other, and also considerably more nebulous and poorly planned. The reviewer added that the types of vehicles and their planned uses are not well-defined, so it is hard to know if there was going to be a good match. The reviewer stated that the researchers relied on one vendor for electric trucks, which turned out to be unfortunate, and could not find anyone, who could build the fuel cell trucks, probably because such vehicles might not make much sense. Also, the reviewer said you cannot deploy and test if you do not have vehicles.

Question 2: Technical accomplishments and progress toward overall project and DOE goals – the degree to which progress has been made, measured against performance indicators and demonstrated progress toward DOE goals.

Reviewer 1:
The reviewer reported that since the project has been delayed there have been no technical accomplishment, but progress has been made by determining the old partners will not be in the program and the project needs to be restructured.

Reviewer 2:
The reviewer hated to be so harsh, but observed that the project team really did not get anywhere. Then again, continued this reviewer, the team did not spend much money.

Reviewer 3:
The reviewer indicated that the project had slow progress and was limited to no technical accomplishments.

Reviewer 4:
The reviewer stated that the progress is limited and that partnerships have been formed but the technology providers are not committed.

Reviewer 5:
The reviewer observed that given the inability of the commercial market to support the Houston-Galveston Area Council there have been no significant accomplishments.

Reviewer 6:
The reviewer stated that not too much progress has been made so far on the hydrogen fuel cell; in the meantime, the zero emission delivery vehicles were suspended.

Question 3: Collaboration and coordination with other institutions.

Reviewer 1:
The reviewer said that there is evidence of good collaboration from partners, but too many hurdles exist for the collaboration to be effective.

Reviewer 2:
The reviewer remarked that because the project is being restructured, it is not known yet who the project will be coordinated with.

Reviewer 3:
The reviewer said that the project team had some competent looking partners.

Reviewer 4:
The reviewer asked what happened to the partners that should have been in place for the project to receive the award.

Reviewer 5:
The reviewer commented that the project relied too much on the commercial partners.

Reviewer 6:
The reviewer stated that an industrial or fleet partner should be chosen to show a certain level of support from industry.

Question 4: Proposed future research – the degree to which the project has effectively planned its future work in a logical manner by incorporating appropriate decision points, considering barriers to the realization of the proposed technology, and, when sensible, mitigating risk by providing alternate development pathways.

Reviewer 1:
The reviewer indicated that this future plan may be satisfactory as a plan, but it will significantly delay project timing for ability milestones. The reviewer added that the lack of supporting infrastructure and available validated hardware seriously jeopardizes the likelihood of success for this project.

Reviewer 2:
The reviewer stated that the next steps for the fuel cell electric hybrid project is to identify and agree upon a path forward for procurement and deployment of zero emission Class 8 trucks. The reviewer suggested completing the call for papers and selecting zero emission delivery vehicle partners for deployment of at least 30 trucks.

Reviewer 3:
The reviewer mentioned that if Smith starts production again, maybe this team will be able to deploy some electric delivery trucks, but the reviewer does see the team actually getting anywhere on the hydrogen (H_2) trucks.

Reviewer 4:
The reviewer remarked that it is difficult to justify continuing with current project objectives.

Reviewer 5:
The reviewer claimed that the zero emission delivery vehicle has to start over again, and no clear path can be seen.

Reviewer 6:
The reviewer stated that the path forward for the project is dubious.

Question 5: Does this project support the overall DOE objectives of petroleum displacement? Why or why not?

Reviewer 1:
The reviewer indicated that this project is relevant to the DOE objectives because it is to accelerate the introduction of electric transportation technologies into the cargo transportation sector.

Reviewer 2:
The reviewer pointed out that the project can be relevant if the benefits of the cost part can be shown.

Reviewer 3:
The reviewer said sure, if the project team ever deployed any trucks, the team would displace some oil.

Reviewer 4:
The reviewer stated that the value of the project will be to redirect to simulation and proper duty cycle definition for future product specification. The reviewer added that deployment should no longer be a focus.

Reviewer 5:
The reviewer commented that the lack of technology providers does not support the objective of petroleum reduction.

Reviewer 6:
The reviewer stated that no impact to petroleum displacement was demonstrated.

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

Reviewer 1:
The reviewer stated that it is not clear if the funding identified for this project is adequate or not since at this time the project is being restructured.

Reviewer 2:
The reviewer indicated that the funding is insufficient to obtain the quantity of vehicles desired.

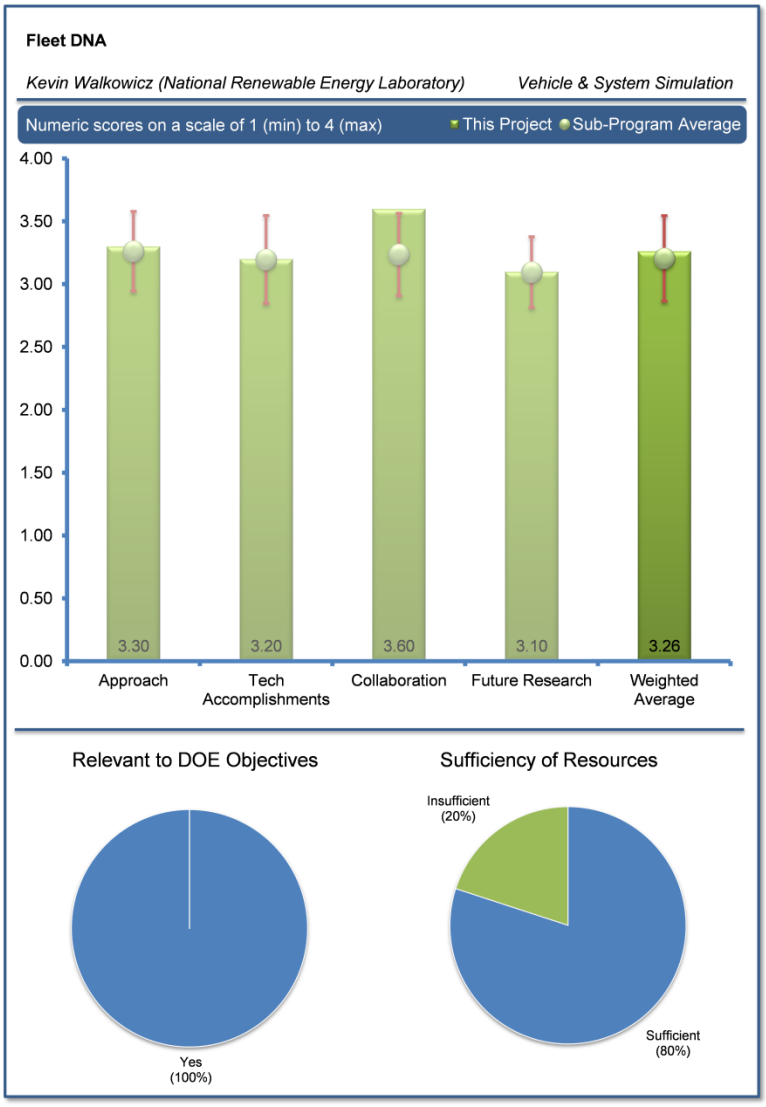
Reviewer 3:
The reviewer said that the current low spend status shows misalignment with project funding.

Reviewer 4:
The reviewer does not see this team actually accomplishing their tasks; the reviewer thought the team should send the money back.

Reviewer 5:
The reviewer is not sure that the program can even get started.

Reviewer 6:
The reviewer observed that the resources would not have been excessive if the hardware deployments and correct partnerships had been made, but given the lack of progress on this project it should be considered for cancellation.

Fleet DNA: Kevin Walkowicz (National Renewable Energy Laboratory) - vss119



Reviewer Sample Size

A total of five reviewers evaluated this project.

Question 1: Approach to performing the work - the degree to which technical barriers are addressed, the project is well-designed, feasible, and integrated with other efforts.

Reviewer 1:

The reviewer stated that the approach provided is excellent. The development of the five distinct phases of the project is a well-structured plan that will provide for a successful project. The reviewer added that the specific phases of secure data storage, data base structure, data selection, data collection and data reporting is well designed.

Reviewer 2:

The reviewer stated that the approach addresses the intent of transparency along the lines of the open.gov initiative. The reviewer added that the project is an acknowledgement of the requirement challenges of data management and security that is addressed up front in a thoughtful and meaningful way. Although, it appears that the data management and reporting is in line with the Data Quality Act (DQA) is not mentioned.

Reviewer 3:

The reviewer remarked that this research provides objective vehicle use data that is both timely and relevant to numerous stakeholders including state agencies, federal agencies and end users. The reviewer added that the project is timely and relevant in the sense that the data created in this research will be used by policymakers who are crafting rulemaking to regulate greenhouse gas emissions. The reviewer stated that the project is also well designed to cover a broad spectrum of commercial vehicle classes and applications. The large sample size was greater than 2,000 before the program end. The data will also be used to provide useful drive cycle data for simulation tools commonly used at the national laboratories and in industry. The reviewer commented that it was stated that this project will assist in determining benefits of using technologies such as hybrid, electric vehicles, alternative fuels, etc. It would arguably bring more benefit to fleet owner by evaluating conventional technologies to save fuel. For example, engine rating, transmission gearing, overdrive versus direct drive, axle ratios, tires, etc. Furthermore, public access to data is limited to sanitized, simplified reports. The more useful drive-cycle data access is limited. To increase the benefits of the program, it would be worthwhile to look into ways to make some drive-cycle data available; for example in some anonymize form, or without global positioning system (GPS) coordinates and curvature information in the drive cycle.

Reviewer 4:

The reviewer reported that the project strong point appeared to be characterization of fleet drive cycles of MD and HD vehicles used in specific real world vocations. The reviewer pointed out that the project weakness appears to be insufficient resolution/detail regarding component and system characteristics necessary to enable robust model development and validation. For instance, they estimate a vehicles mass but have not yet validated their estimation algorithm. The reviewer stated that the project team appeared to be documenting

system level usage patterns of technologies at a high level without trying to capture independent variable and component details that could inform development of component and system level models.

Reviewer 5:

The reviewer said that the overall project objective was sound and provided a useful data storage and dissemination tool. The reviewer added that the novel methods for calculating road grade and estimating vehicle parameters from field data appear to be significant contributions; however, it was unclear why there were not many known mass data points. The reviewer asked if the vehicles in the study were not known, and if so, why not. The reviewer also reported that one limitation of the data appears to be that only open-source OBD data or OEM-supplied data are available and no "CAN cracking" was performed for the vehicles in which data loggers have been installed. The reviewer asked as more vehicles is being introduced by companies that are not partners, how the data from high voltage (HV) batteries will be obtained. The reviewer also asked if the plan was to increase the number of partners, engage in CAN cracking activities, or ignore vehicles for which neither was an option. The reviewer commented that the justification for use of FastSim at all rather than Autonomie exclusively doesn't appear to be compelling. The advantages of the former should be explicitly stated in subsequent years. The reviewer added that the term "kinetic intensity" is obscure and should be explained, for example using the equations from SAE World Congress paper 2007-01-0302.

Question 2: Technical accomplishments and progress toward overall project and DOE goals – the degree to which progress has been made, measured against performance indicators and demonstrated progress toward DOE goals.

Reviewer 1:

The reviewer reported that significant progress has been made in expanding deployments and harmonizing data, which is a very complicated and tedious process. Additionally, the reviewer stated that more detail on how this is accomplished should be well documented. The reviewer added that the website is a very effective tool and a very valuable resource for education. The foresight to integrate existing analysis tool where possible is commendable. The reviewer indicated that this is an enormous amount of work, but it is important. The reviewer added that some information should be provided on data formats, such as xml. The reviewer asked what, if any, standards were being followed.

Reviewer 2:

The reviewer stated that improvements to the data storage warehouse, positions the program well to handle large amounts of data in a useable format. The reviewer commented that a robust and structured approach appeared to be in place to be scaled up to handle a large population of vehicle data. The project is well set-up for the future. The reviewer added that additional analytics such as algorithms for gross vehicle weight estimation and elevation grade data are a good foundation to enhance capabilities, such as fuel consumption analysis.

Reviewer 3:

The reviewer stated that the project team has made significant progress in collecting vehicle data. The reviewer added that this start in the right direction that should be built upon to provide information to inform future R&D and regulatory efforts.

Reviewer 4:

The reviewer stated that the technical accomplishments provided in FY 2014 have shown good progress towards the project objectives. Accomplishments include development of initial phase two interactive website and preliminary method to estimate mass based on drive cycle, fuel consumption and road grade information. The reviewer added that several tools have been developed in FY 2014 including the fuel economy modeling FASTSim integration with Fleet DNA Project.

Reviewer 5:

The reviewer stated that the project appeared to be on schedule. The reviewer would have liked to know a little bit more about the mass estimation study (which the reviewer would call the parameter estimation study since it appears as though the PI is estimating the ABCs, and not just mass). The reviewer then asked if there are milestones involved or simply a target date of sometime in FY 2015.

Question 3: Collaboration and coordination with other institutions.

Reviewer 1:
The reviewer stated that most of the key players cited as collaborators are there, but DOT is an obvious omission. The DOT may provide valuable information about not only their own fleet, but also about all the commercial traffic from which they collect information. The reviewer suggested that the researchers consider collaboration with the National Information Exchange Model because data harmonization is such a large part of the effort (https://www.niem.gov/Pages/default.aspx). The reviewer stated that the Indianapolis project was a good application of research results example.

Reviewer 2:
The reviewer stated that this project appears to have strong collaborations with industry and government data providers. The reviewer added that it also appears to have strong collaborations with ORNL for data collection.

Reviewer 3:
The reviewer reported that collaboration and coordination with other institutions is very good. This year there is more interaction with industry/government and OEMs. The reviewer added that there are additional industry partners, more interaction with national laboratories, government and universities as well as OEM and industry groups.

Reviewer 4:
The reviewer indicated that evidence of strong collaboration was provided based on specific examples when asked. The reviewer added that numerous partners in industry as well as federal/state agencies and national laboratories were described in detail.

Reviewer 5:
The reviewer said that this project has an impressive array of project partners and participants. The reviewer added that it appears as though efforts are continually being made to add partners and participants to the project.

Question 4: Proposed future research – the degree to which the project has effectively planned its future work in a logical manner by incorporating appropriate decision points, considering barriers to the realization of the proposed technology, and, when sensible, mitigating risk by providing alternate development pathways.

Reviewer 1:
The reviewer remarked that there are several key areas for proposed future work including integration of results into the Alternative Fuels Data Center, the integration of additional modeling software with the fleet DNA data base and into non-DOE tools such as EPA Motor Vehicle Emissions Simulator (MOVES). In addition, the reviewer said that the project is looking at selective cycles and vehicle type to evaluate potential for fuel cost savings over a range of technologies and fuels is planned for future work. The reviewer added that the project will be applying the fleet DNA to several other areas including helping EPA GHG Phase 2 regulations as well as SCAQMD and CARB next year.

Reviewer 2:
The reviewer said that the data reporting and website plans appeared to be well-established, but the modeling aspect does not have the same structure. The reviewer added that the plans to bring more vehicles with known parameters into the parameter estimation study needs to be made more solid.

Reviewer 3:
The reviewer indicated that the target to add vehicles to the dataset will help to increase the objectivity and relevance. Conducting what if scenarios using advanced technologies are also a useful outcome. The reviewer added to also conduct what if scenarios with conventional technologies as well, because conventional technologies also have a large influence on fuel consumption (engine rating, transmission, axles, and tires). The reviewer added that with the program ending in FY 2015, questions arise regarding maintenance and further data collection efforts beyond. This research has merit and the outcome add value to numerous stakeholders. Also, the reviewer said it would be recommended to draft a plan for operation of the data servers and maintenance of the data after the project ends.

Reviewer 4:
The reviewer stated that additional sensor information on ride quality may be considered. These days, accelerometers are everywhere, so some indication of the effect of ride quality on the fleet performance would be valuable to determine effects of pavement condition on the overall fleet performance relative to other variables.

Question 5: Does this project support the overall DOE objectives of petroleum displacement? Why or why not?

Reviewer 1:
The reviewer commented that the project is extremely relevant and will be useful to the VTO. The reviewer added that the data gathering activity will provide information to government, OEMs fleets and researchers to help provide for drive cycle development, customer use profiles and provide a data source for modeling and simulation.

Reviewer 2:
The reviewer stated that the project is helping researchers to collect data for assessment of real world technology requirements and system level performance of advanced MD and HD vehicles.

Reviewer 3:
The reviewer reported that this project provides objective and relevant data how commercial vehicles are being used, which several consumers rely on including policy and decision maker at federal/state agencies as well as industry to effectively create rules that are effective in displacing petroleum in support of DOE's mission.

Reviewer 4:
The reviewer noted that any slight gains that can be made in fleet efficiency translate to a large effect on GHG emissions and fuel consumption.

Reviewer 5:
The reviewer claimed that while LD vehicles get most of the attention, MD vehicles and HD vehicles account for a significant proportion of the U.S. petroleum consumption. The reviewer added that the Fleet DNA tool enables stakeholders from a wide variety of areas to access data that can help make fleet and design decisions to reduce petroleum consumption of these vehicles.

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

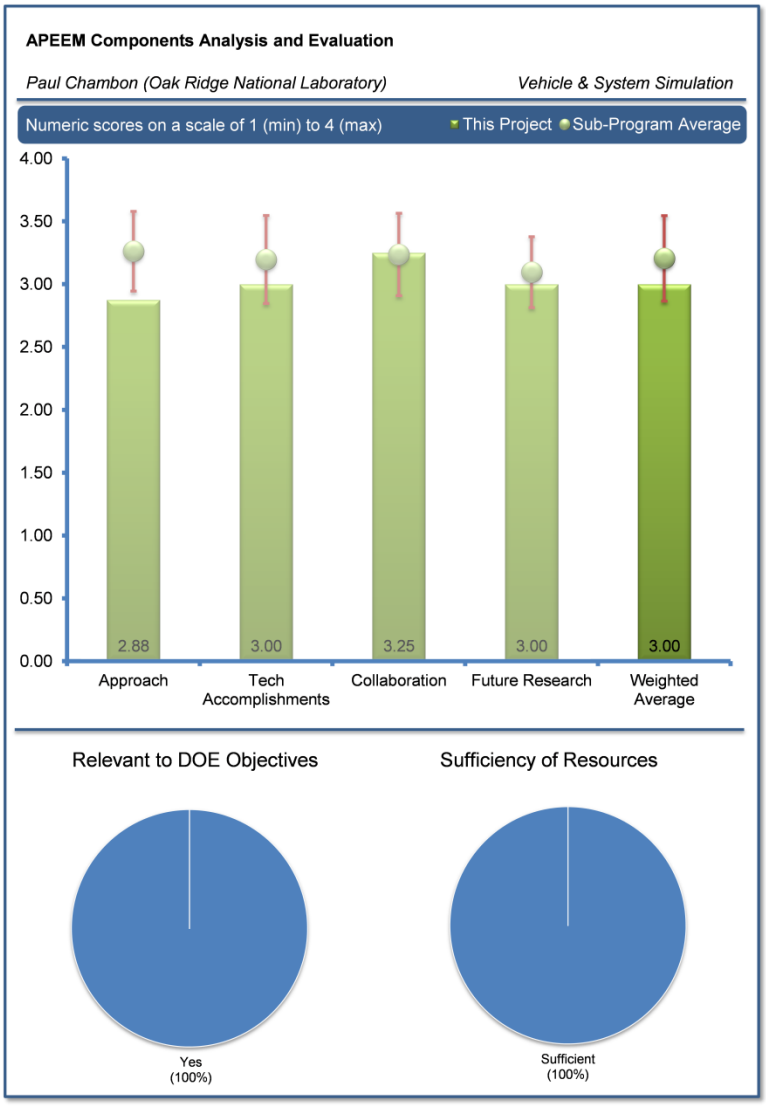
Reviewer 1:
The reviewer noted that with funding 60% complete and the project in Year 3, it appears funding will be sufficient to complete the project.

Reviewer 2:
The reviewer claimed that funding appears to be sufficient.

Reviewer 3:
In talking with the presenter, the reviewer concluded that it did not appear as though more funds were required to complete the project and the level of current funding is appropriate for the scope of work.

Reviewer 4:
The reviewer said that to fully address the project objectives, the team should have more resources to increase the depth of information that they capture regarding component characteristics and system states.

APEEM Components Analysis and Evaluation: Paul Chambon (Oak Ridge National Laboratory) - vss121



Reviewer Sample Size

A total of four reviewers evaluated this project.

Question 1: Approach to performing the work - the degree to which technical barriers are addressed, the project is well-designed, feasible, and integrated with other efforts.

Reviewer 1:

The reviewer indicated that this is a program with exciting potential. The reviewer added that it is good to see that the project is making it through the initial difficult stages of setting up a dynamometer laboratory. Also, the reviewer said that the next stage is the evaluation of some known components to establish a validated capability.

Reviewer 2:

The reviewer noted that significant thought was given to the need for the facility and its integration with other lab functions; however, hardware purchases lacked formality of a rigorous technical specification development. The reviewer said that more thought should be given to both calibration and validation of the hardware and the Autonomie models that are planned to drive it.

Reviewer 3:

The reviewer stated that the approach to procure and commission a test cell to characterize steady state and transients of hybrid electric powertrain components provides for an adequate way to reach the goals of the project.

Reviewer 4:

The reviewer commented that it is not clear how "Validate, in a systems context," is a barrier. The VTO Multi-year Program Plan lists it as a goal for VSST. This statement could serve as a goal for this project, but the reviewer would imagine that the barriers in this case are costs, and a lack of standard protocols for transient testing, and the goal of this project would be to address the latter.

Question 2: Technical accomplishments and progress toward overall project and DOE goals – the degree to which progress has been made, measured against performance indicators and demonstrated progress toward DOE goals.

Reviewer 1:

The reviewer said that the project has had good progress to date. The reviewer added that it takes a long time to set-up this type off facility.

Reviewer 2:

The reviewer commented that all procurement activities have been completed and commissioning of the test cell is scheduled for July 2014. The reviewer added that preliminary electric machine characterization has been successfully completed.

Reviewer 3:
The reviewer indicated that hardware purchases are on schedule; however, startup and calibration (where you typically do not know what you do not know) are yet to be completed.

Reviewer 4:
The reviewer stated that significant progress appears to have been made in the set-up of the test cell. It is not clear though, whether the e-machine characterization (shown on Slide 11) is an accomplishment from the standpoint of transient testing. If these are steady state maps for the motor, this capability already existed at ORNL. The reviewer suggested to make it clear in the presentation if this is a result of transient testing.

Question 3: Collaboration and coordination with other institutions.

Reviewer 1:
The reviewer asserted that there was an excellent thought process to integrate the test results of the new facility with other ORNL laboratory functions, and with other laboratories.

Reviewer 2:
The reviewer noted no issues here.

Reviewer 3:
The reviewer stated that collaborations between ORNL, ANL, U.S. Drive Electrical and Electronics Tech Team, the VTO Advanced Power Electronics and Electric Motors (APEEM) group have been essential to provide the necessary information for the project to move forward.

Reviewer 4:
The reviewer pointed out that collaboration is mostly internal at this point and understandably. The reviewer thought it would be interesting next year to see how the facility is intended to be used by the access to technologies for test, both production and developmental. The reviewer added that the mix should be more developmental but validated through current production systems.

Question 4: Proposed future research – the degree to which the project has effectively planned its future work in a logical manner by incorporating appropriate decision points, considering barriers to the realization of the proposed technology, and, when sensible, mitigating risk by providing alternate development pathways.

Reviewer 1:
The reviewer described proposed future research as good so far, and suggested expanding as the facility is established.

Reviewer 2:
The reviewer stated that after the commissioning of the test cell it would be an excellent plan to support the DOE APEEM program through the use of the new test facility.

Reviewer 3:
The reviewer said that in the response to reviewer comments from 2013, the PI stated that scope of this project is the procurement and commissioning of the new test equipment, and that the actual projects will be funded by other projects. With this in mind, the reviewer asked if the nucleate boiling project is considered as a part of this project, or if it is a separately funded project. The reviewer added that if the FY 2015 future work is not part of vss121, it should perhaps be made clear that vss121 is completed with the commissioning of the test cell.

Reviewer 4:
The reviewer reported that the creative parts of the project are complete, with the purchase of the facility hardware. The reviewer added that the detail work of getting the pieces to work together has yet to be done.

Question 5: Does this project support the overall DOE objectives of petroleum displacement? Why or why not?

Reviewer 1:
The reviewer indicated that this project can assist the DOE and industry in the selection of relevant technologies for pursuit/investment and could shorten an industrial selection process if properly established.

Reviewer 2:
The reviewer claimed that the ability to benchmark transient response of current technology and establish improvement areas will help direct DOE efforts to improve electric drive components.

Reviewer 3:
The reviewer said that this test cell will be important to the future work of the advanced power electronics and electrical motors R&D activity and will support the goal of petroleum displacement.

Reviewer 4:
The reviewer stated that steady state characterizations of powertrain components are frequently (perhaps always) used in evaluating the fuel economy potential of advanced technologies; however, by neglecting the transient characteristics, there may be testing powertrain configurations that are not necessarily acceptable from a customer experience standpoint, perhaps in terms of performance, or drivability, or some other dimension. The reviewer added that characterizing transient behavior of these components and incorporating them in simulations should make the simulation more realistic and the results of the simulation more in line with customer expectations.

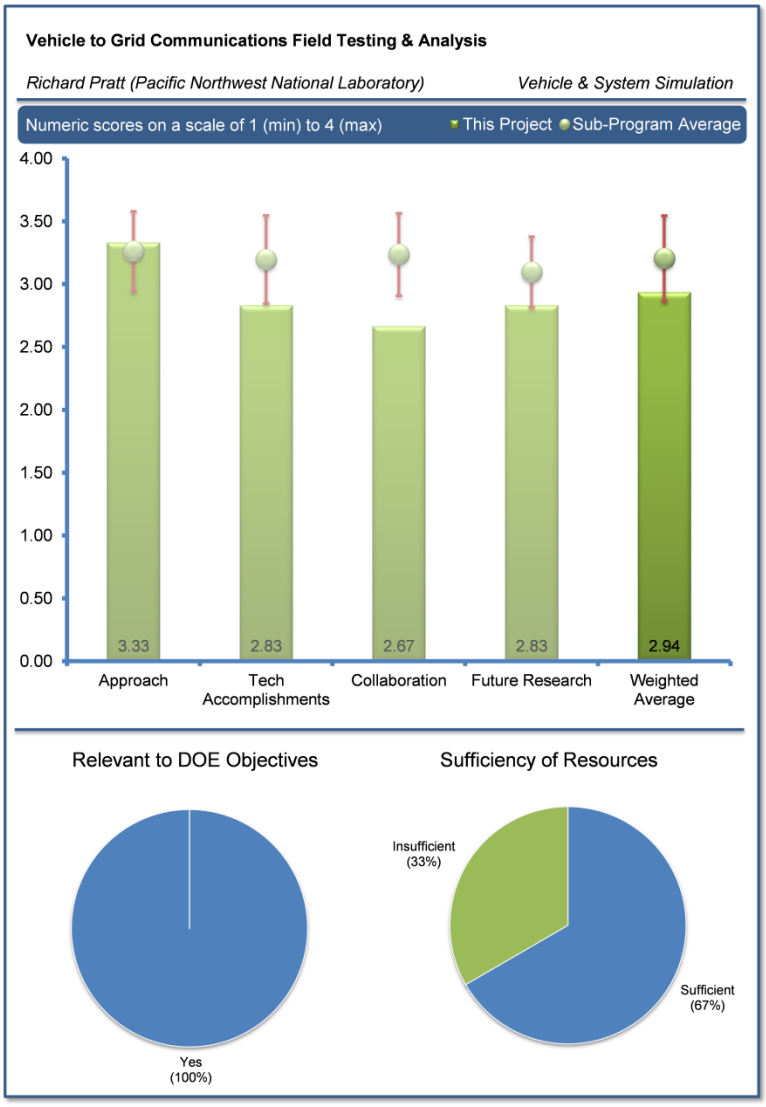
Question 6: Resources: How sufficient are the resources for the project to achieve the stated milestones in a timely fashion?

Reviewer 1:
The reviewer felt that the resources are sufficient to complete this project but future work identified in the presentation has not been funded yet.

Reviewer 2:
The reviewer said that care should be exercised to obtain proper resources to startup and calibrate the facility. The reviewer added that validation of the initial test results should be a serious consideration and will require both technical and operational resources.

Reviewer 3:
The reviewer said that resources were sufficient, but bordering on insufficient. The reviewer added that next year's progress will determine how fast the lab achieves validation and more importantly recognition by industry for what it is trying to do.

Vehicle to Grid Communications Field Testing & Analysis: Richard Pratt (Pacific Northwest National Laboratory) - vss122



Reviewer Sample Size

A total of three reviewers evaluated this project.

Question 1: Approach to performing the work - the degree to which technical barriers are addressed, the project is well-designed, feasible, and integrated with other efforts.

Reviewer 1:

The reviewer explained that the project is a blend of grid and vehicles. The project provides a path that recognizes that both can work better together with a system of systems approach. The reviewer added that the project is looking to leverage the growing existing fleet's technology to perform grid interactive services to enable a stronger grid and provide good battery charging capability.

Reviewer 2:

The reviewer noted that the use of employee-owned vehicles saves money and gets buy-ins. The reviewer liked the fact that the project starts out simple and advances. The reviewer also liked the fact that the approach tries to look at the impact of on and off charging multiple vehicles at one time; however, the importance of some manual override to allow the homeowner to decide what should get priority on the household electric load cannot be underemphasized and was omitted from this project. The homeowner should be allowed to decide whether electric vehicle charging is more important or running the air conditioner and certain household HD appliances (i.e., dishwasher, washer, dryer, etc.) is more important during peak periods when there is a goal of capping the electric power demand.

Reviewer 3:

The reviewer stated that the project approach addressed some of the barriers mentioned in the presentation. The reviewer would have liked to hear more about how the charging scheme biased charging to meet owner preferences and provide communication between chargers.

Question 2: Technical accomplishments and progress toward overall project and DOE goals – the degree to which progress has been made, measured against performance indicators and demonstrated progress toward DOE goals.

Reviewer 1:

The reviewer said that the project had excellent results in demonstrating the capability of load coordination in minimizing the peak loading of a home over a day. The reviewer suggested that the project include a follow-on scope to investigate the fiscal viability of peak shaving and other grid services to offset the cost of an EV.

Reviewer 2:
The reviewer said that the fact that the project is only 50% complete, started October 2013 and is due to end September 2014 does not bode well. The reviewer assumed that progress must be linear in the absence of a schedule of milestones in the presentation. The reviewer claimed that the project should have been about 66.6% to 75% completed.

Reviewer 3:
The reviewer reported that, for the testing approach, the project used a home load assumption. The reviewer commented that the project would have benefited from doing more testing on the assumption of the home load. The reviewer added that it appeared that the amount of charge needed for each car was a manual input, which is not ideal; however, if the EVs could not be modified and that information was not part of the standard set of signals provided the reviewer could see why manual adjustments were necessary.

Question 3: Collaboration and coordination with other institutions.

Reviewer 1:
The reviewer stated that Bonneville Power Administration was not listed on Slide 2 or Slide 14 as a collaborator. The reviewer asked why electric power from a utility, whose source of electric power generation is primarily hydroelectric, was chosen should have been answered. Also, the choice of Professor Steve Letendre from University of Vermont was not listed on Slide 2. The reviewer concluded why this person was chosen was not clear.

Reviewer 2:
The reviewer indicated that the partners provided on Slide 2 do not align with the list of collaborators on Slide 14. The reviewer added that having SAE and NIST are not really partners, committees are not partners. The reviewer stated that the only partner that appears to have contributed/benefitted is AeroVironment.

Reviewer 3:
The reviewer commented that the project acknowledged collaborations with SAE and the University of Vermont as well as industrial partners involved in the project. The reviewer added that further coordination with utilities to verify the home load assumption would have been useful.

Question 4: Proposed future research – the degree to which the project has effectively planned its future work in a logical manner by incorporating appropriate decision points, considering barriers to the realization of the proposed technology, and, when sensible, mitigating risk by providing alternate development pathways.

Reviewer 1:
The reviewer said that future research seems to be focused on catching up to complete the project by September 2014; there is no vision beyond that.

Reviewer 2:
The reviewer noted that the project is ending at the end of FY 2014. The reviewer suggested a follow-on scope to look at the fiscal value of grid services.

Reviewer 3:
The reviewer explained that the project still has field testing to do which will enhance the findings of this effort. The reviewer added that a useful scenario would be to look at the California International Organization for Standardization (ISO) and what happens in the Spring/Fall with the influx of rooftop solar.

Question 5: Does this project support the overall DOE objectives of petroleum displacement? Why or why not?

Reviewer 1:
The reviewer said that this project is highly supportive of the overall DOE objective of petroleum displacement.

Reviewer 2:
The reviewer indicated that the project clearly demonstrated that EVs can have a positive impact on the grid by reducing peak loads and spreading loading out more evenly which can improve utility efficiency and reduce utility investments.

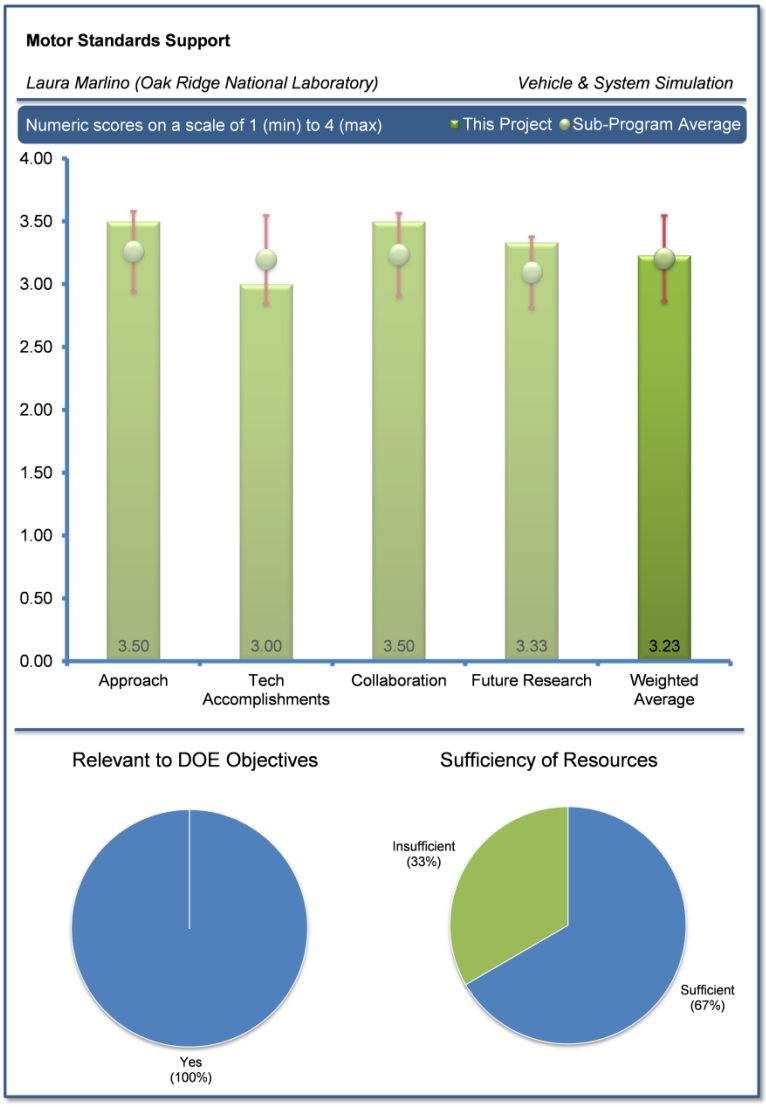
Reviewer 3:
The reviewer stated that charging multiple vehicles at home may be an issue; we do not want brown-outs when everybody in the neighborhood is doing it.

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

Reviewer 1:
The reviewer explained that the project team had a very resourceful approach to use employee owned vehicles; however, this introduces risk to the project in that the vehicles can easily be denied from the research. The reviewer suggested that funding be increased to provide the vehicles required.

Reviewer 2:
The reviewer said that the resources for the project were sufficient.

Motor Standards Support: Laura Marlino (Oak Ridge National Laboratory) - vss123



Reviewer Sample Size

A total of three reviewers evaluated this project.

Question 1: Approach to performing the work - the degree to which technical barriers are addressed, the project is well-designed, feasible, and integrated with other efforts.

Reviewer 1:

The reviewer stated that it is great to see this effort underway again. The reviewer pointed out that some of the outstanding issues that were brought up are extremely relevant and worth getting resolution on. The reviewer asked which inverter should be used for testing because this has an impact on motor operating points, losses, etc. The reviewer also stated another issue was that efficiency maps need to include how the input and output power was measured and the accuracy of those sensors, especially for low torque points, which are critical for EPA testing.

Reviewer 2:

The reviewer said that this was an essential task that needed to be accomplished, and probably would not see much progress from the manufacturer's side if there was not an external organization that was facilitating the whole process.

Reviewer 3:

The reviewer stated that the approach being used in this project to address the lack of standardized test protocols seemed sound. The project is going through the SAE project and collecting input for all the key stakeholders. The reviewer added that the main point associated with the testing is that this project seeks to test the motor-inverter combination using the inverter designed for the given motor rather than a standard inverter. In order to get the apples to apples comparison sought by this project, the reviewer said that further research is needed on measurement accuracy and how to look at losses.

Question 2: Technical accomplishments and progress toward overall project and DOE goals – the degree to which progress has been made, measured against performance indicators and demonstrated progress toward DOE goals.

Reviewer 1:

The reviewer indicated that the project has made a lot of process with researching standards and test procedures. The reviewer added that the project defined the five tests that will be performed as peak power, torque, continuous power, continuous torque and efficiency mapping.

Reviewer 2:

The reviewer said that the progress of this project is not entirely within the control of the PI, and requires the OEMs to play a more active role. The reviewer added that given the nature of the beast, the project is likely to progress slowly.

Reviewer 3:
The reviewer commented that it seems like this work is in its early stages. So, it is hard to judge technical progress.

Question 3: Collaboration and coordination with other institutions.

Reviewer 1:
The reviewer noted that it seems like the correct committees are involved and that there are enough motor experts on those committees. The reviewer added that it would be useful to have inverter/power electronics input as well.

Reviewer 2:
The reviewer indicated that collaboration with SAE, national laboratories, OEMs, universities and Tier 2 suppliers was mentioned. Also, international collaboration with China and Nissan was mentioned. This sounds like many parties to orchestrate with limited funds. The reviewer added that other collaborations that should be considered are with the standards committees associated with cooling and isolation requirements, and perhaps Ricardo.

Question 4: Proposed future research – the degree to which the project has effectively planned its future work in a logical manner by incorporating appropriate decision points, considering barriers to the realization of the proposed technology, and, when sensible, mitigating risk by providing alternate development pathways.

Reviewer 1:
The reviewer claimed that the future issues are clearly outlined; however, getting resolution towards them will be tricky.

Reviewer 2:
The reviewer would like to have heard more from the current PI (as opposed to a previous contributor in the audience) about how the future work was going to be accomplished. The PI proposed to validate test methods on LD in FY 2015. That seems hard to do and it was unclear where the funding is for validation.

Question 5: Does this project support the overall DOE objectives of petroleum displacement? Why or why not?

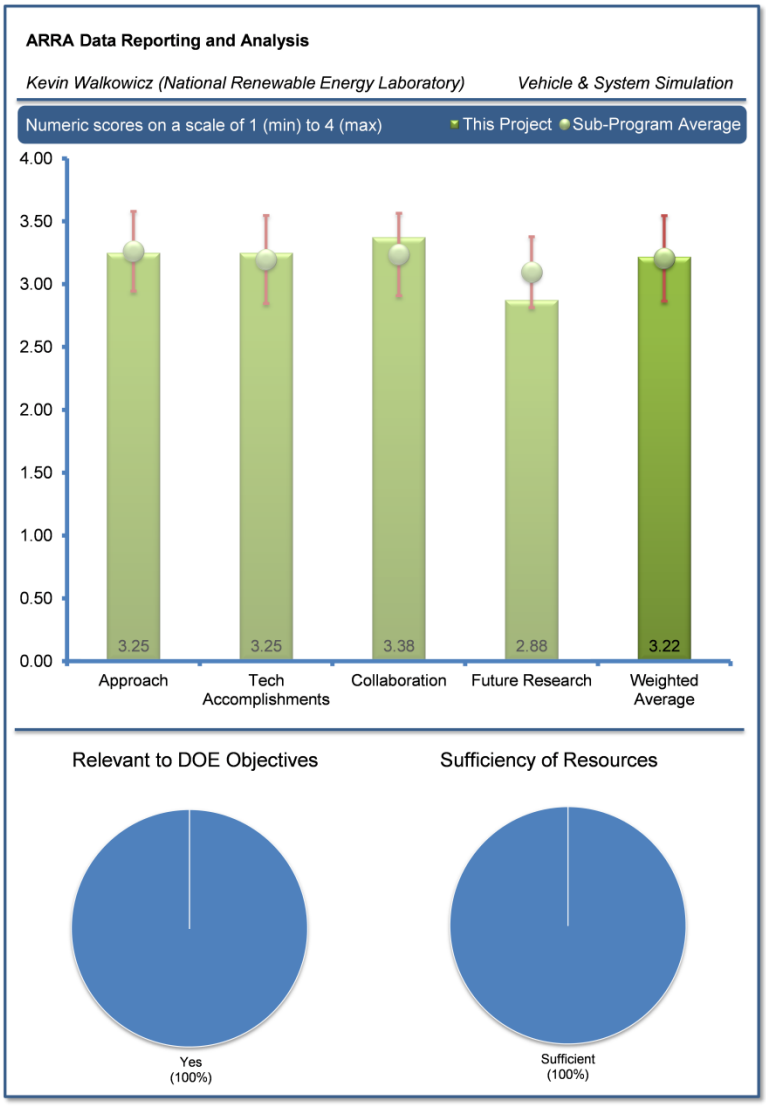
Reviewer 1:
The reviewer said yes, by ensuring that the performance numbers published by all the OEMs can be compared on the same basis, it helps the customer make a more informed decision (even though the average customer may not even be aware of it).

Reviewer 2:
The reviewer pointed out that standards by themselves do not displace petroleum, thus the project provided secondary support to the DOE's objectives.

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

Reviewer 1:
The reviewer stated that the resources seemed a little low given the level of coordination needed and the little direct control the PI had over the other contributors to the project.

ARRA Data Reporting and Analysis: Kevin Walkowicz (National Renewable Energy Laboratory) - vss124



Reviewer Sample Size

A total of four reviewers evaluated this project.

Question 1: Approach to performing the work - the degree to which technical barriers are addressed, the project is well-designed, feasible, and integrated with other efforts.

Reviewer 1:

The reviewer stated that the approach to collect and analyze data on over 25 parameters from each vehicle, to provide reports to the general public is very good. Also, it will help to educate the public about truck electrification. The reviewer added that the truck electrification project has collected data over a one-year period at 50 sites. This data showed that by using this technology, over 32,000 gallons of diesel fuel was saved that would have otherwise been used during idle. This information could help fleets to move toward this technology.

Reviewer 2:

The reviewer remarked that the approach to data collection and reporting on four separate projects appeared to meet the requirements for analysis and dissemination.

Reviewer 3:

The reviewer stated that this project is only receiving and analyzing the data from ARRA funded projects without any input to vehicle deployment and operation (i.e., listen only mode). The reviewer commented that the project team had a relatively standardized approach to data collection and reporting. The reviewer added that it would be good to see vehicle uptime as it compares to conventional diesel vehicles. Also, the reviewer said that it was good to see plans go through the dataset after the collection is complete for a more in-depth analysis.

Reviewer 4:

The reviewer indicated that regarding project planning the project start/end dates and overall project structure are not clear. The reviewer perceived it was hard to judge what was accomplished this year and in the past. The reviewer noted that a large data set of in-service vehicle use was collected, which is valuable. That being said, the real benefit of the project is the analysis of the data to generate insights and draw conclusions. The reviewer added that while periodic reports were created to highlight vehicle usage, there did not appear to be a robust analysis plan in place or an explanation of what sort of objectives are sought upfront.

Question 2: Technical accomplishments and progress toward overall project and DOE goals – the degree to which progress has been made, measured against performance indicators and demonstrated progress toward DOE goals.

Reviewer 1:
The reviewer said that the progress in this project has been very good. The reviewer pointed out that a large amount of data has been collected and analyzed on the 500 Smith EVs. The reviewer added that analysis has determined the potential grid load effects and how these vehicles may impact electrical demand.

Reviewer 2:
The reviewer stated that large datasets are being collected, and will hopefully be used for further analysis and be made available to the public. Because some of the vehicles are not commercially available anymore, it would be nice to see these data used as lessons learned for development of future electric trucks.

Reviewer 3:
The reviewer said that all four projects appeared to be meeting all execution and reporting requirements. The reviewer added that all projects are either substantially complete or completing in 2014.

Reviewer 4:
The reviewer commented that detailed data collection on 459 Smith EVs, 101 Navistar eStars and 1,000 electrified truck stop pedestals culminated in the creation of 23 reports. The reviewer said that the project appeared to be largely a data collection effort to date.

Question 3: Collaboration and coordination with other institutions.

Reviewer 1:
The reviewer said that the partners involved in the project represented good collaboration with industry and local government. The reviewer added that this type of coordination has provided for a successful project.

Reviewer 2:
The reviewer explained that data reporting was a requirement of ARRA funded projects. The reviewer noted that it would be nice to see an opportunity for NREL to provide feedback to fleet users, besides quarterly summary reports, on potential opportunities for operational optimization (are vehicles used on proper routes, would driver training be helpful in case there is significant variation in the data set). The reviewer added that it is understood that this was most likely out of scope for the current project but since the data set is very significant there could be a lot of lessons learned based on data summary as well as on individual fleet operations.

Reviewer 3:
The reviewer noted that this project had collaboration with numerous fleets and vehicle OEMs for data collection efforts.

Reviewer 4:
The reviewer said that collaboration with project partners was an essential part of these projects and the fact that all are substantially complete demonstrates the effectiveness of the collaboration.

Question 4: Proposed future research – the degree to which the project has effectively planned its future work in a logical manner by incorporating appropriate decision points, considering barriers to the realization of the proposed technology, and, when sensible, mitigating risk by providing alternate development pathways.

Reviewer 1:
The reviewer stated that collecting additional data through FY 2015 will help this project address the barriers identified of obtaining unbiased data and variable commercial fleet use. The reviewer added that the new effort proposed for FY 2015 and FY 2016 to use data to analyze operation for energy efficiency, energy storage cost improvements and better placement of vehicles into fleets to optimize return on investment should be considered by the DOE.

Reviewer 2:
The reviewer thought it was nice to see plans for in-depth data analysis after the collection of data is completed. Additional parameters of interest in follow-on analysis would be battery pack failures (if any), battery/range degradation, vehicle utilization (uptime, miles between road calls) if possible compared to typical baseline vehicles. In general, the reviewer said that the opportunity to incorporate some fleet feedback might compliment the current dataset for a more complete analysis. For example, MGP equivalent might look great but there could have been start ability, cold weather issues, inadequate vehicle speed and performance according to drivers that would not necessarily come out of the current dataset.

Reviewer 3:
The reviewer said that it was mentioned that for FY 2015, the data analysis portion of the project will begin. The reviewer would have liked to see a clear understanding what insights would like to be gained upfront, from the data collection and analysis activities.

Reviewer 4:
The reviewer reported that more definition on the future analysis that is or could be undertaken is needed. The reviewer added that the secondary analysis that was done as a result of what was learned could also be pursued.

Question 5: Does this project support the overall DOE objectives of petroleum displacement? Why or why not?

Reviewer 1:
The reviewer commented that this project collects and analyses data from electric trucks to allow better understanding of the state-of-the-art of the technology. The reviewer added that the MD EV data collection will help design, purchase and research investments and in the long term help with petroleum displacement.

Reviewer 2:
The reviewer remarked that all technologies employed for these studies very directly address the reduction in petroleum consumption.

Reviewer 3:
The reviewer noted that this project collects data on electric drive vehicles and provides operational summaries. The reviewer added that this data will not only be useful to potential fleets interested in purchasing these vehicles but also for development of future generations of electric trucks. Therefore, this project is directly supporting increased EV deployment in MD and HD truck segments.

Reviewer 4:
The reviewer said that this project's activities of collecting and analyzing vehicle technologies in service provide a measure of impact is highly aligned with DOE's goal of displacing petroleum.

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

Reviewer 1:
The reviewer pointed out that, for FY 2015-2016, DOE should consider funding follow-on work to conduct in-depth analysis and engage fleet operators as appropriate to get a better understanding of the vehicle use and performance from the operator's perspective. Additionally, there could be valuable lessons learned and recommendations that could be made for specific fleets based on how their individual data sets compare to the aggregated average. The reviewer added that making this large data set available in some form to researchers at the national laboratories, universities, other OEMs and suppliers if not to the general public, would be very helpful for additional analysis, future generation electric vehicle technology development, as well as fleet education.

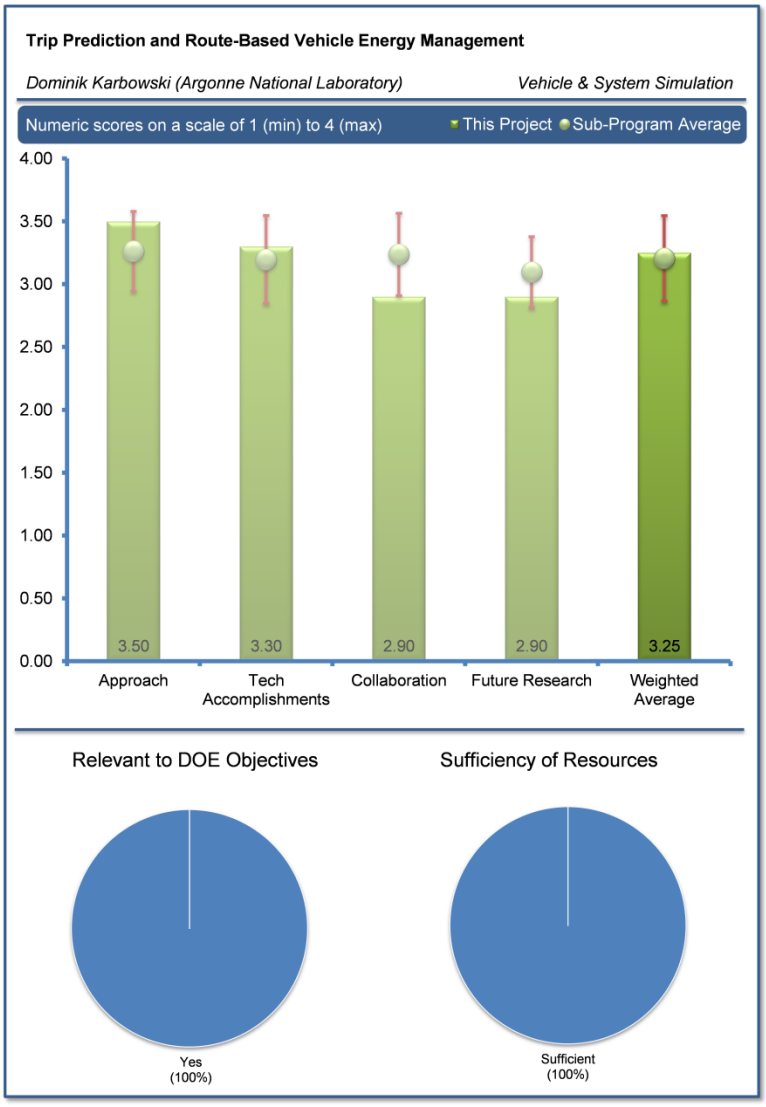
Reviewer 2:
The reviewer stated that funds appear to be sufficient for the activities planned in this project.

Reviewer 3:
The reviewer said that the project funding appears to be sufficient.

Reviewer 4:

The reviewer did not identify any deficiencies in meeting objectives/milestones, so the reviewer concluded that resources must be sufficient.

Trip Prediction and Route-Based Vehicle Energy Management: Dominik Karbowski (Argonne National Laboratory) - vss125



Reviewer Sample Size

A total of five reviewers evaluated this project.

Question 1: Approach to performing the work - the degree to which technical barriers are addressed, the project is well-designed, feasible, and integrated with other efforts.

Reviewer 1:

The reviewer stated that this is an excellent piece of work, showing what the capabilities are with the availability of big data and computing power.

Reviewer 2:

The reviewer said that the approach developed for trip prediction and route based energy management is very good and should provide the tools to complete the project.

Reviewer 3:

The reviewer reported that the approach for the subject was good. The reviewer supports the concept of developing incremental improvements to the existing geospatial mapping systems that can be translated into an efficiency improving product.

Reviewer 4:

The reviewer noted that trip prediction and route-based vehicle energy management is an interesting concept with the potential to improve vehicular trip efficiency across a variety of vehicles and trip itineraries. The reviewer added that the approach for this project appears sound basically using existing technology and information including drivers input, traffic information, and GPS data to feed an itinerary computation. Also, the reviewer stated that the detailed segment-by-segment information is then fed into a speed prediction algorithm generated from a constrained Markov Chain approach, where synthetic speed vehicle speed profiles are generated. The outputs are processed and filtered and ultimately a transition probability matrix is constructed. The reviewer commented that an optimal control strategy is subsequently developed based upon the Pontryagin Minimization Principle (PMP). The benefits of the optimal energy management strategy are then evaluated. The reviewer saw no glaring deficiencies evidenced in this approach and it is good that the proposed technology can likely be accommodated in today's technology vehicles.

Reviewer 5:

The reviewer mentioned that the trip prediction and route-based energy management are an important area for petroleum displacement. This project appears to be creating the fundamentals that will lead to the real-time control that is needed for trip prediction and energy management to realize the potential efficiency improvements for all types of vehicles. The reviewer added that on Slide 11, the PMP results only improve upon the reference case late in the drive. The reviewer asked if this was a consistent result for the Prius PIP. The reviewer also wondered if finding the instantaneous optimization for each time step does indeed get one the global optimization for the route. The average savings was 5% for the Prius, but the reviewer asked how this relates to the best that could be done if a complete optimization was done by eliminating the stochastic nature of driving.

Question 2: Technical accomplishments and progress toward overall project and DOE goals – the degree to which progress has been made, measured against performance indicators and demonstrated progress toward DOE goals.

Reviewer 1:
The reviewer commented that the analysis appeared to be well-supported and logical.

Reviewer 2:
The reviewer stated that the progress in the project has been very good. Showing 5% fuel savings through optimal energy management is an excellent result and shows how this work will help to ultimately provide for reduced petroleum consumption.

Reviewer 3:
The reviewer explained that overall, the technical approach is very good. The reviewer had one concern (which the reviewer thought could be easily remedied) when the reviewer looked at the synthetic speed profiles on Slide 8. The speed trace appears, at times, to have rather abrupt transitions from one speed to another. This is not an issue when using steady state maps to predict fuel consumption. But, based on some other presentations from this year's AMR (e.g., vss121), the intention appears to be to move towards better representation of transient behavior to capture the system behavior. The reviewer added that some smoothing of the speed profiles may be required to prevent unacceptable levels of accelerations. The plot on Slide 8 may just be a cartoon to convey a point, in which case, please ignore this comment.

Reviewer 4:
The reviewer said that this is a two year project currently scheduled to end in September 2014. The reviewer added that based on the duration of the project and funding levels, a significant amount of progress has been achieved. The project is roughly on schedule (maybe a little behind). The reviewer stated that the basic concept has been scoped with specific technical accomplishments.

First, the reviewer noted the speed profile generated from constrained Markov Chain where for each itinerary segment the algorithm generates a stochastic speed profile until the a solution matches the segment constraints and subsequently the entire trip is the concatenation of stop periods and sped profiles from all segments.

Second, and in reference to synthetic vehicle speed profiles, this reviewer observed multiple stochastic speed profiles for the same target micro-trip have been generated and combined to form one synthetic speed profile for one entire itinerary.

Third, and in reference to Markov Chains, the reviewer commented that using real world data, processing and filtering of trip data has been successfully undertaken. This reviewer further stated that each trip was being quantized and a probability matrix has been defined after normalization.

Fourth, and in reference to energy management using the Pontryagin Minimization Principle, this reviewer reported that optimal control strategy for a Prius PHEV has been identified and implemented in a control strategy for Autonomie.

Fifth, this reviewer indicated that the benefits of the optimal energy management strategy have been evaluated for the Prius PHEV over the defined itinerary resulting in an approximate 5% savings. The reviewer observed a solid list of accomplishments over the last year and a half.

Reviewer 5:
The reviewer said that the project appears to be progressing, and the Prius results show that the approach is sound. It would be helpful to the reviewers for specific milestone dates to be listed to allow for a better understanding of the project status. The reviewer asked why some of the milestones are broken up into two sections.

Question 3: Collaboration and coordination with other institutions.

Reviewer 1:
The reviewer perceived that the overall collaboration/coordination for the project seemed good. Partners include HERE for a free demo license of ADAS-RP and support for data processing. Internal coordination exists with ANL's Transportation Research and Analysis Commuting Center (TRACC) for traffic dynamics support and stochastic tool development, and coordination with OEMs. The reviewer added that one possible notable omission is the lack of coordination with other national laboratories such as ORNL, which has done work in the recent past using Markov Chains (Andreas Malikopoulis).

Reviewer 2:
The reviewer commented that listed in the proposed future work is integrating other real world trips from other databases (presumably the PI is referring to the Transportation Secure Data Center that is maintained by NREL). The reviewer said perhaps this should have been done sooner rather than later, it would have helped to validate the approach and assumptions going into this project much better.

Reviewer 3:
The reviewer said that collaboration with HERE, which provided a free license of ADAS-AP, was essential to the project. The reviewer added that other groups including ANL transportation research and analysis computing center and OEMs also participated in the project.

Reviewer 4:
The reviewer opined that the collaboration front is satisfactory at best. Nokia is a minor player in the market trying to survive. The reviewer suggested that the project team should go after a company like Google or Apple. The OEMs will be buying the software from one of them anyway. The reviewer stressed that the project team needs to think bigger.

Reviewer 5:
The reviewer stated that the only significant collaboration appears to be with HERE. The reviewer said that there is discussion with OEMs mentioned, but nothing to indicate the level of collaboration. Also, the reviewer reported that collaboration with other modeling groups, from other national laboratories, industry, and academia, might be useful additions to the project.

Question 4: Proposed future research – the degree to which the project has effectively planned its future work in a logical manner by incorporating appropriate decision points, considering barriers to the realization of the proposed technology, and, when sensible, mitigating risk by providing alternate development pathways.

Reviewer 1:
The reviewer said that the proposed future research is exactly where this project should strive to achieve. The reviewer added that the listed future tasks are appropriate and feasible.

Reviewer 2:
The reviewer reported that the proposed future work of evaluating other applications such as trucks and buses as well as different configurations would be useful information to obtain.

Reviewer 3:
The reviewer commented that evaluating trip plans by developing an algorithm is admirable but needs to address the many inputs that will affect the process, only a couple have been addressed here.

Reviewer 4:
The reviewer pointed out that the proposed future research contains good elements, but appears to jump the gun. While initially promising results (approximately 5% fuel economy improvement) have been demonstrated for a Prius PHEV over a single itinerary, this may very well prove to be a high water mark. The reviewer added that the presenter indicated the Prius PHEV may be an optimal vehicle for this type of technology and the drive cycle chosen appears to be fairly optimal as well. As a result, this technology may have considerably less promise than seems on the surface when it is examined across the benefits to the vehicles that will predominate in the nation's fleet for many years and over more typical driving cycles. Also, the reviewer said that prior to conducting future research on

this topical area, it is recommended that a thorough assessment be done as to the comprehensive real potential of this technology across the nation's fleet. As part of this assessment, coordination with OEMs should be conducted to assess the cost of the technology to the consumer through its benefits.

Reviewer 5:
The reviewer referenced previous comments regarding integrating other real world maps from other databases.

Question 5: Does this project support the overall DOE objectives of petroleum displacement? Why or why not?

Reviewer 1:
The reviewer stated that the project is relevant to the VTO goals because it will help enable highly efficient cars and reduce energy use.

Reviewer 2:
The reviewer indicated that by utilizing more realistic drive cycles, it will bring in a real-world dimension to the calculations and petroleum displacement predictions.

Reviewer 3:
The reviewer reported that while unproven, trip prediction and route-based vehicle energy management does offer the potential to improve vehicle trip efficiency over a wide range of vehicles and driving applications, potentially leading to solid petroleum savings.

Reviewer 4:
The reviewer said that being able to enter one's destination into the vehicle computer and then having the vehicle optimize the control system (in real time) would significantly reduce petroleum consumption. The reviewer added that this project has potential to add considerably to the art.

Reviewer 5:
The reviewer commented that incremental improvements to our mapping system will always be needed.

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

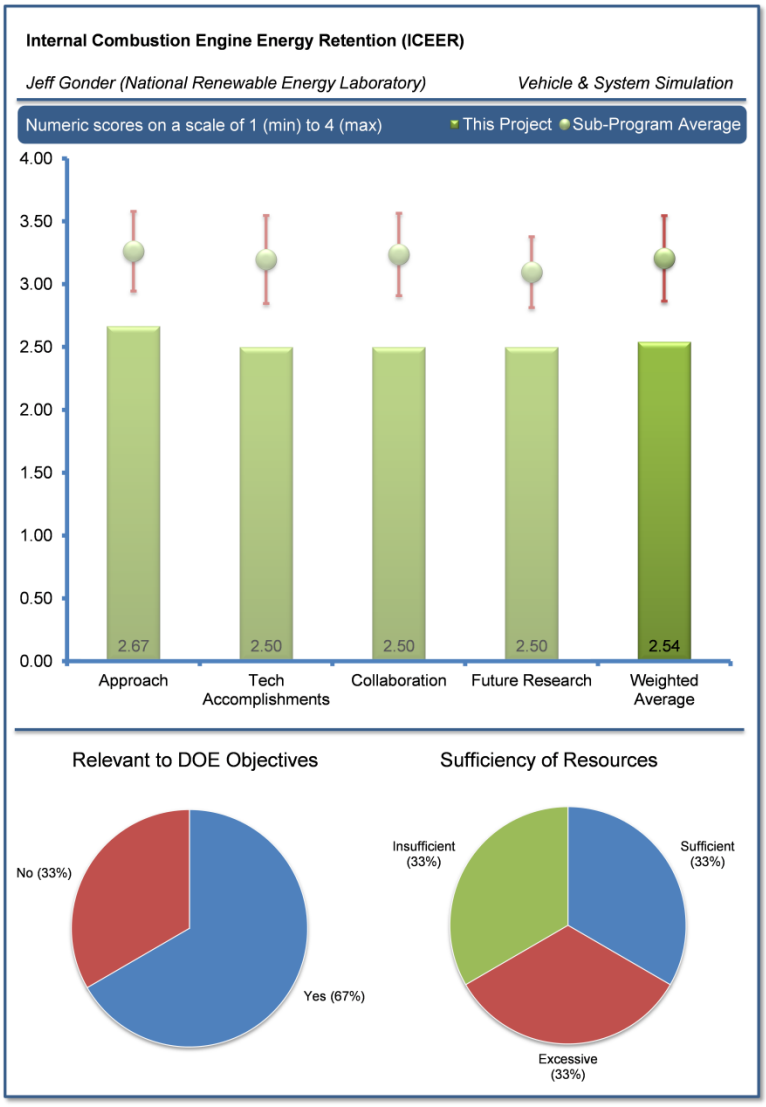
Reviewer 1:
The reviewer remarked that the resources are adequate to complete the proposed work.

Reviewer 2:
The reviewer stated that resources are sufficient until the program management expands the vision of what this project can do and who it is working with.

Reviewer 3:
The reviewer commented that the resources applied to the project are sufficient.

Reviewer 4:
The reviewer reported that the resources for this project appear appropriate and commensurate with the level of effort required for success.

Internal Combustion Engine Energy Retention (ICEER): Jeff Gonder (National Renewable Energy Laboratory) - vss126



Reviewer Sample Size

A total of three reviewers evaluated this project.

Question 1: Approach to performing the work - the degree to which technical barriers are addressed, the project is well-designed, feasible, and integrated with other efforts.

Reviewer 1:

The reviewer indicated that the approach of coordinating with ANL's APRF in the collection of dynamometer data on a conventional Ford Fusion, and obtaining industry feedback is very good.

Reviewer 2:

The reviewer reported that any effort to improve the efficiency of vehicles is worth pursuing, this project addresses one of the areas where the solutions may be easier, lower cost, and be applicable to the vast majority of vehicles on the road. The reviewer added that it was not clear to the reviewer the extent to which the five-cycle methodology does not capture the cold start penalty when a cold start Federal Test Procedure (FTP) cycle is included. The reviewer commented that the presentation for subsequent years might quantify the gap between the current five-cycle methodology and what the project finds is a more reasonable approach (i.e., cold start cycles for Highway Fuel Economy Test (HFET) and US06). Also, the reviewer thought that what is missing in the project is a comprehensive survey of what technologies or techniques there are for energy retention that can be used to address this problem, and what the individual potential of each for energy retention is. If none exist, or none can be implemented in a cost effective manner, then a significant portion of the project might be less relevant. Finally, the reviewer stated that it was not clear why FASTSim was used instead of Autonomie since their modeling was to be quite detailed.

Reviewer 3:

The reviewer commented that this appeared to be an unconnected project that someone was sponsoring for NREL education only. The reviewer added that the engine/auto industry and even EPA had a good understanding of this issue and approaches to manage (or not). The reviewer warned that unless the team gets a real connection to the industrial members addressing this issue then the program should be seriously questioned.

Question 2: Technical accomplishments and progress toward overall project and DOE goals – the degree to which progress has been made, measured against performance indicators and demonstrated progress toward DOE goals.

Reviewer 1:
The reviewer stated that accomplishments and progress in this project have been very good. The reviewer added that cold start data and cold start model developed of fuel consumption over time correlated very well. In addition, it was shown that cold start fuel consumption rate is much higher than for hot start. The reviewer noted that engine oil temperature rise over time for the data versus the developed model also showed a very similar result. The reviewer also said those cold start penalties were found to be sensitive to time of year, geography and drive profile.

Reviewer 2:
The reviewer commented that the modeling progress appears to be proceeding well but the reviewer did not get a sense of what the status is exactly. Slide 10 says "reasonably accurate," but a more specific quantification would have been welcome. The reviewer believed this project should be concurrently researching possible energy retention strategies, especially if a prototype design and build is planned.

Reviewer 3:
The reviewer commented that there is questionable value in test results that appear to simply report generally accepted facts.

Question 3: Collaboration and coordination with other institutions.

Reviewer 1:
The reviewer reported that NREL, the lead of this project, has been working with ANL and OEMs Chrysler, Ford and GM. Working with these partners show good collaboration and are well-coordinated.

Reviewer 2:
The reviewer noted that the collaboration with ANL seems solid, with the dyno data being shared and put to use; however, “conversations” with OEMs is not very specific. The reviewer suggested that the project team should collaborate with university researchers, as it may be fruitful.

Reviewer 3:
The reviewer said that "Active conversations with USCAR OEMs during otherwise scheduled meetings" is not adequate for collaboration.

Question 4: Proposed future research – the degree to which the project has effectively planned its future work in a logical manner by incorporating appropriate decision points, considering barriers to the realization of the proposed technology, and, when sensible, mitigating risk by providing alternate development pathways.

Reviewer 1:
The reviewer stated that the proposed future work to develop equivalent models for hybrid electric and large truck or SUVs and to investigate which energy retention strategies merit, further investigation will help to overcome barriers of reducing petroleum usage.

Reviewer 2:
The reviewer explained that the plans for model improvement are sound; however, the plans for the prototyping do not appear to be well established.

Reviewer 3:
The reviewer suggested a re-evaluation of the program content, direction, and who the project team works with before going further. The reviewer stressed that industry relevance is important.

Question 5: Does this project support the overall DOE objectives of petroleum displacement? Why or why not?

Reviewer 1:
The reviewer remarked that as the presentation suggests, energy retention in ICE vehicles is a low-hanging fruit for petroleum displacement, and this project could have a significant impact on the transportation fleet.

Reviewer 2:
The reviewer stated that since laboratory cold start impacts show an increase in fuel use around 10%, than by addressing cold start issues would help reduce fuel use and thus support petroleum displacement. The benefit of a 1% efficiency improvement from cold start improvement translating into taking nearly 2.5 million vehicles off the road may be exaggerated since any energy reduction strategies would apply to new vehicles not to the legacy fleet.

Reviewer 3:
The reviewer said that this project is an internal test program that has little relevance from an industrial perspective, if it does not matter to anyone then it will not change anything.

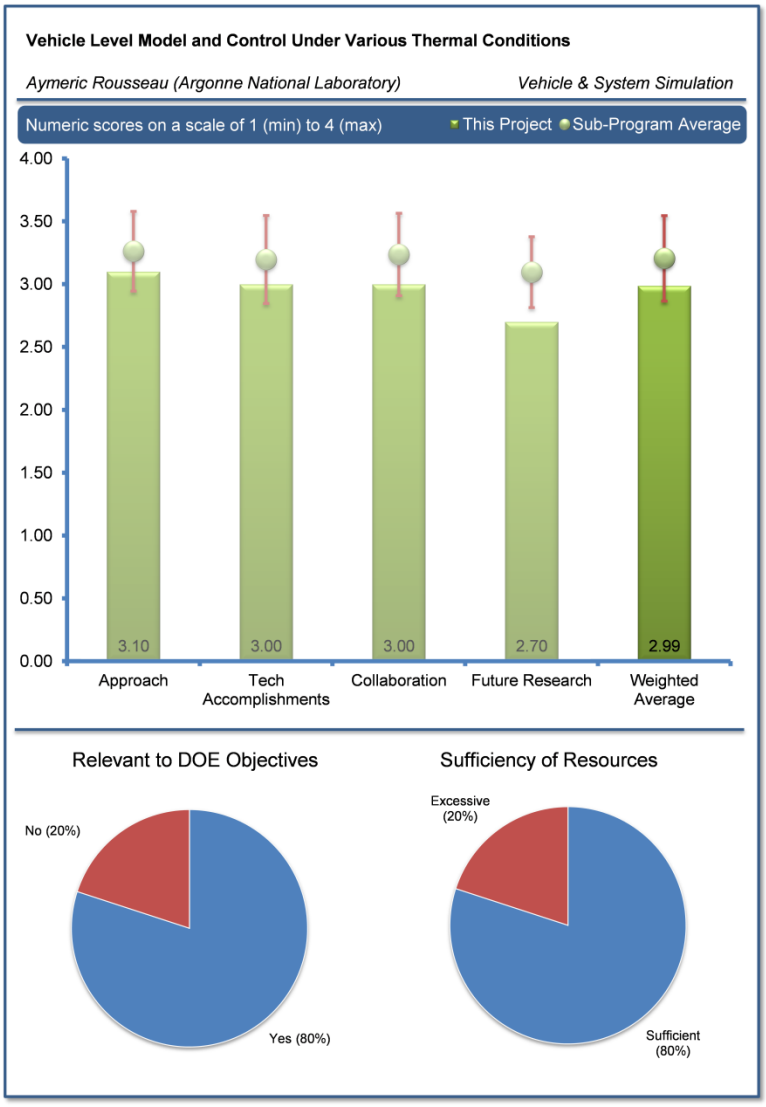
Question 6: Resources: How sufficient are the resources for the project to achieve the stated milestones in a timely fashion?

Reviewer 1:
The reviewer indicated that it is possible that the resources for the prototyping stage will be insufficient because the modest amount allocated is currently going towards modeling alone.

Reviewer 2:
The reviewer stated that the funding for this project is sufficient.

Reviewer 3:
The reviewer believed the project needs to be reevaluated.

Vehicle Level Model and Control Under Various Thermal Conditions: Aymeric Rousseau (Argonne National Laboratory) - vss127



Reviewer Sample Size

A total of five reviewers evaluated this project.

Question 1: Approach to performing the work - the degree to which technical barriers are addressed, the project is well-designed, feasible, and integrated with other efforts.

Reviewer 1:

The reviewer said that the approach of using test data from ANL APRF, to develop control and performance analysis. Then, comparing test data and simulation data. The reviewer's model validation is excellent.

Reviewer 2:

The reviewer said that these are good vehicles to model; many are in the marketplace. The reviewer added that the need to model the components and system and validate the models is clear. The reviewer said that more of the time/budget could have been allocated to the controls.

Reviewer 3:

The reviewer stated that the approach, in general is very good; however, when dealing with systems that have discontinuous on-off behavior, such as thermostats, there can be a significant spread in the results because of small changes in initial conditions. This will have to be captured, perhaps by using Monte Carlo simulations to predict the average behavior of a population of vehicles. The reviewer is not entirely convinced at this point, that after understanding the characterizing the average behavior of the vehicles, any significant advantage can be gained by using detailed models and large scale simulations to quantify the benefit achieved in real world drive cycles. A tool such as FastSim may be more appropriate for this task. As mentioned before, the reviewer is not entirely convinced (either way) and perhaps one way of understanding the level of detail that is needed in these models to perform large scale analyses, may be best answered by comparing the results from both FastSim and Autonomie. The reviewer did not mean to imply that Autonomie is of not an appropriate tool, but perhaps in some cases, when looking at the very big picture, a tool with a coarser resolution may be more appropriate.

Reviewer 4:

The reviewer was conflicted with this project, and noted that it appeared to have been well run, but lacked real world relevance. The reviewer asked for whom the model was made. The reviewer wanted to know how the model improved the industry, and asked how the model impacted the energy efficiency of the on-road vehicle.

Reviewer 5:

The reviewer stated that Autonomie is a well-established tool that is used by many in academia and industry. Therefore, improvements to the models' fidelity are always welcome. The reviewer added that thermal system management is crucial, especially in advanced vehicles, and this project is useful in helping modelers achieve results that approach real-world data. As an aside, the reviewer was confused by the schematic of the Prius on Slide 8, in which the EM connected to the sun gear on the planetary gear with the engine was

labeled "MOT2' and the one connected to the ring gear on this same planetary gear was labeled "MOT". From everything that the reviewer had read about the Prius, Toyota labels the former Motor 1 and the latter Motor 2.

Question 2: Technical accomplishments and progress toward overall project and DOE goals – the degree to which progress has been made, measured against performance indicators and demonstrated progress toward DOE goals.

Reviewer 1:
The reviewer stated great work.

Reviewer 2:
The reviewer commented that the work on the model and the validation was very thorough. The reviewer added that the controls work, hopefully, would be done in the end of this project and future projects.

Reviewer 3:
The reviewer said that the milestones are being met and are on track to be completed by the end of the project. The reviewer added that technical accomplishments on Slide 18 show very good results for the simulation versus test results regarding fuel consumption, SOC and temperature. Unfortunately, due to the animation used on Slide 18 in conjunction with the required PDF format, the first set of data shown during the presentation is covered up by the second set of data and not available to the reviewer. The reviewer said that because animation was used on Slide 18 all of the results presented during the meeting could not be seen on the file that is saved in PeerNet. This may be a common problem for other presentations and should be addressed in the future.

Reviewer 4:
The reviewer claimed that considerable progress has been made in the models' development, and the project appears to be on track to meet its targets and milestones. The reviewer added that the simulation results shown are very good, although the SOC of the battery and engine temperature did not track as well, which becomes obvious when it stops tracking after doing so before, for example, the SOC, after approximately 440 seconds and for the engine after approximately 630 seconds.

Reviewer 5:
The reviewer indicated that in an isolated sense this project seems to have accomplished a reasonable amount for the funding; however, national laboratory projects that are performed for the benefit of the laboratory do not impact transportation efficiency and generally result in a report on the shelf. The reviewer did not see much of a connection to the real world in this presentation.

Question 3: Collaboration and coordination with other institutions.

Reviewer 1:
The reviewer commented that ANL has collaborated with several entities including OEMs, national laboratories and battery suppliers to help develop component thermal models. The reviewer added that these collaborations have been essential to the success of the project.

Reviewer 2:
The reviewer indicated that the project team collaborated with OEMs and national laboratories to get their models. The reviewer wondered what other controls the team is investigating and if the team would share them with this project, especially NREL on the Advanced Climate Control mentioned in this presentation.

Reviewer 3:
The reviewer stated that the project has gathered a sizeable number of participants. The reviewer wondered about the OEM contributions for the EM and transmission, the reviewer asked if the data will be open source or if these model blocks be closed from viewing.

Reviewer 4:
The reviewer said that this was an isolated lab study, with little connection to the industry. The reviewer noted that when asked the presenter had no idea why some of the vehicles responded to the tests the way they did. The reviewer asked if anyone talked to the OEM for a critical evaluation

Question 4: Proposed future research – the degree to which the project has effectively planned its future work in a logical manner by incorporating appropriate decision points, considering barriers to the realization of the proposed technology, and, when sensible, mitigating risk by providing alternate development pathways.

Reviewer 1:
The reviewer said please see earlier comment. The reviewer added that the title of the project does not seem to indicate that this project is restricted to HEVs, extended range electric vehicles (EREVs), PHEVs, etc. Vehicle thermal management system (VTMS) is of equally great concern to vehicles with conventional powertrains as well, and more vehicles are being equipped with advanced thermal management systems such as active grille shutters, transmission oil heater, etc. The reviewer said that it would be worthwhile to extend the scope of this project to examine the effect of VTMS on fuel economy improvement in vehicles with conventional powertrains as well, to try to quantify the true benefit of these systems, and perhaps to provide assistance to EPA in their rule making.

Reviewer 2:
The reviewer indicated that the suggestions of future work, to quantify temperature impact of electrified powertrains, under different driving conditions, and the development of controls to mitigate the impact of temperature on vehicle energy consumption would be useful to peruse, but because the current project ends in FY 2014, additional funding would be necessary.

Reviewer 3:
The reviewer said that the presentation mentions future controls work. To reinforce the title of this work, if time and budget allow, this reviewer would recommend work on what controls can be used to improve fuel efficiency. The reviewer added that the insulation and WHR mentioned in another presentation (vss126) would be helpful but the fuel fired heater should not be ignored.

Reviewer 4:
The reviewer stated that the project is complete this year.

Reviewer 5:
The reviewer commented that the proposed future work listed is more like aspirational goals than developed plans for how to achieve results. The reviewer added that more detail on the path to achievement is warranted for future presentations.

Question 5: Does this project support the overall DOE objectives of petroleum displacement? Why or why not?

Reviewer 1:
The reviewer commented that better models mean better design, and if Autonomie can improve its thermal management system models, OEMs can use this tool to develop improved physical systems that will consume less energy and there is a potential for significant petroleum displacement as a result.

Reviewer 2:
The reviewer said that yes, temperature has a big effect on hybrid efficiency currently. The reviewer added that the next step is what actions (improvements to systems, components, and controls) should be taken once the system is modeled.

Reviewer 3:
The reviewer stated that because temperature has a significant impact on electric drive energy consumption this project is very relevant to the DOE objectives of petroleum displacement.

Reviewer 4:
The reviewer said that the OEMs are investing tremendous effort in developing VTMS, presumably with the goal of improving fuel economy, There is no doubt that effective thermal management will improve the fuel economy of any vehicle, conventional or otherwise. The reviewer added that this project should help quantify the benefits of these technologies better, and perhaps offer some insights into how these systems can be further improved.

Reviewer 5:
The reviewer noted that there was no apparent connection to the industry the team is evaluating.

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

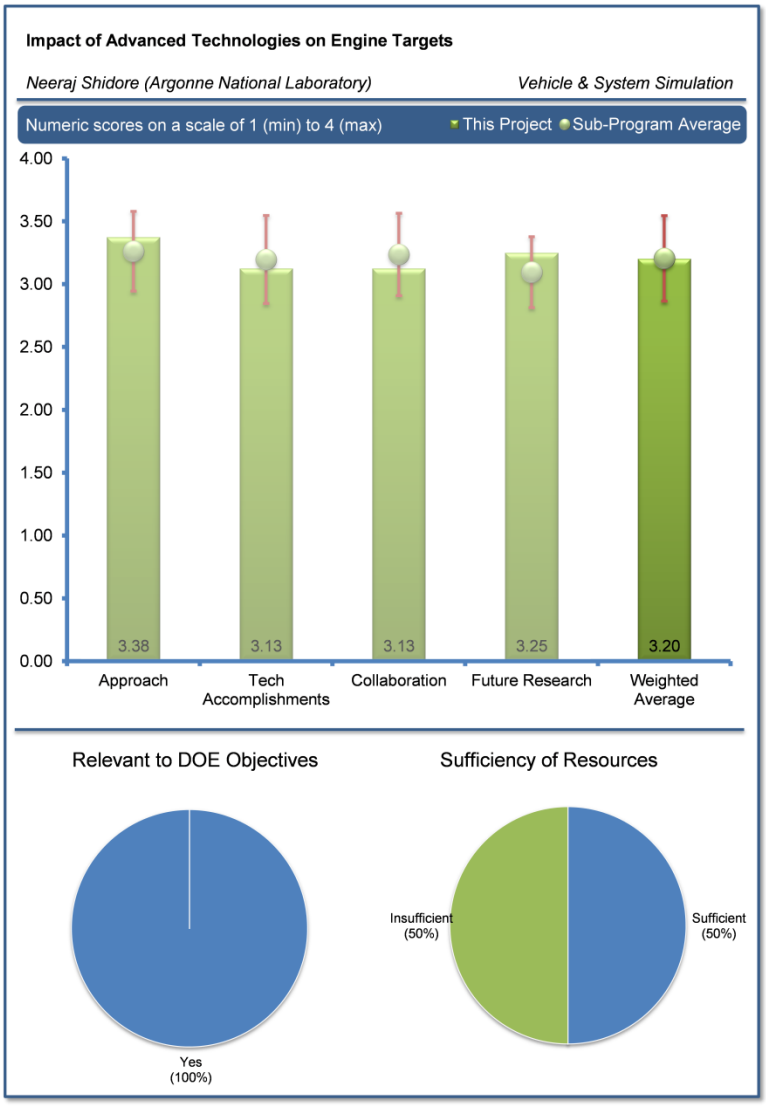
Reviewer 1:
The reviewer said that because funding for the project is 80% complete and ends in September of this year, there are sufficient funds to complete the project and achieve the stated milestones.

Reviewer 2:
The reviewer stated that more resources for controls work to improve the thermal system looks to be needed.

Reviewer 3:
The reviewer commented that the resources appear sufficient and appropriate for this project; however, the reviewer was confused as to why the funding for FY 2013 was twice that of the other two years. The reviewer added that an explanation would be useful for subsequent reviews.

Reviewer 4:
The reviewer indicated that the DOE should carefully consider the content of a project and if the project team is duplicating tests and modeling that have been conducted by industry.

Impact of Advanced Technologies on Engine Targets: Neeraj Shidore (Argonne National Laboratory) - vss128



Reviewer Sample Size

A total of four reviewers evaluated this project.

Question 1: Approach to performing the work - the degree to which technical barriers are addressed, the project is well-designed, feasible, and integrated with other efforts.

Reviewer 1:

The reviewer remarked that the technical approach is very good and helps to address deficiencies in this type of study.

Reviewer 2:

The reviewer reported that the overall approach to the challenge of evaluating engine technology is good. In particular, using simulation tools to consider engine technologies as part of an overall powertrain should provide a more realistic evaluation of performance. The reviewer stated that as a starting point, use of steady state engine fuel maps is reasonable, but this does have some limitations, particularly for certain types of engine technology (high EGR engines, highly boosted engines, and etc.). The same limitation holds for the fairly simplistic transmission models used (e.g., while in general it might be reasonable to set a limit on low speed, high torque operation, there are some engines that are designed to run in that regime – like diesels). The reviewer added that the use of dynamic engine models and transmissions that have been optimized for those engines may give better results. Instead of focusing on an evaluation of engine technology, the reviewer said that another option would be to focus on powertrain technology and only consider engine and transmission together as a unit. The reviewer stated that another consideration that did not seem to be covered was a sensitivity analysis of the model output to the model inputs, and to model design. In other words, an evaluation of the fuel economy impact of different input parameters like shift schedule, engine fuel map, and engine model type (static versus dynamic) might provide some guidance in terms of where to focus efforts to improve accuracy. If small changes in shift strategy result in +/-5% fuel consumption, but using a dynamic engine model instead of a static fuel map only impacts fuel consumption by +/-1%, then perhaps the steady state fuel map is good enough and focus should be on the shift schedule. The reviewer added that the choice of technologies selected for evaluation seemed reasonable. The reviewer commented that an additional focus on diesel may make sense given the focus on fuel economy. The reviewer added that stop/start technology should be considered for all powertrain options.

Reviewer 3:

The reviewer observed that the concept of modeling improvement from various engine technologies is a very good one especially since comparing real world engines was not possible. The reviewer added that validating the modeled results on a single real engine would have benefits.

Question 2: Technical accomplishments and progress toward overall project and DOE goals – the degree to which progress has been made, measured against performance indicators and demonstrated progress toward DOE goals.

Reviewer 1:
The reviewer commented that there was good work in achieving project objectives. The reviewer added that where possible, error bars should be incorporated into the results rather than showing an absolute benefit for the technology changes. For example, the 8-speed transmission benefit is dependent on the particulars of the transmission rather than being constant. Also, the reviewer said that if known, the error estimates for the engine map changes should be incorporated.

Reviewer 2:
The reviewer reported that good progress had been made on the models. The reviewer added that uncertainty estimates for the results, especially where there is not an exact physical model, as suggested by another reviewer would be helpful for evaluating the results.

Reviewer 3:
The reviewer stated that the progress so far seemed reasonable.

Question 3: Collaboration and coordination with other institutions.

Reviewer 1:
The reviewer noted good communication with U.S. DRIVE Advanced Combustion & Emissions Control (ACEC) tech team and good expert engine modeling support from Ingenieurgesellschaft Auto und Verkehr (IAV).

Reviewer 2:
The reviewer observed that the collaboration with other project partners seemed to support the project objectives. The reviewer added that greater collaboration with industry partners might provide additional value.

Reviewer 3:
The reviewer stated that the collaboration with IAV and U.S. DRIVE is strong. The reviewer added that collaboration with the OEMs would be valuable especially if the OEMs helped with the single physical engine to validate the model.

Question 4: Proposed future research – the degree to which the project has effectively planned its future work in a logical manner by incorporating appropriate decision points, considering barriers to the realization of the proposed technology, and, when sensible, mitigating risk by providing alternate development pathways.

Reviewer 1:
The reviewer stated that the future work is well defined and clearly supports project objectives.

Reviewer 2:
The reviewer stated that the proposed future activities include improving the fidelity of the engine and transmission models, this is a good step. The reviewer suggested that the next steps also include use of thermal and emissions models. Generally, these kinds of models do not return very good results without significant calibration and validation effort, which may be outside of the scope of this project. The reviewer added that instead of focusing on emissions and cold start, a good next step would be a sensitivity analysis to a range of different parameters to better understand the sources of error and uncertainty in the analysis. Then efforts could be focused on those factors which have the largest impact.

Reviewer 3:
The reviewer is not sure how accurate emissions prediction is likely to be. A significant effort and a plethora of test data are needed to develop accurate GT engine models. The reviewer commented that this is a challenging task because many of the studies described here are not in production. The reviewer added that this is similar to what was done by IAV over the past many months, the reviewer is not sure that using high fidelity engine models will bring anything more to the table, given the goals of the project. For the level of accuracy

expected from a project of this nature, it may be sufficient to use engine maps, and perhaps a mean value model to obtain a better dynamic response. This reviewer concluded that Einstein's quote, "Everything should be as simple as it can be but not simpler," applies.

Reviewer 4:
The reviewer indicated that the final results and suggestions for optimizing fuel economy while keeping the costs acceptable will be very helpful for DOE goals. The reviewer suggested that the project team should consider validating the model on a single actual physical engine if there are resources or future funding. The reviewer realizes that the displacement differences will be difficult and expensive to put in a physical model. Perhaps a direction for impact could be obtained by looking at just two displacements.

Question 5: Does this project support the overall DOE objectives of petroleum displacement? Why or why not?

Reviewer 1:
The reviewer noted that this is the first comprehensive study that the reviewer has seen that quantifies the effect of advanced technologies on engine targets. The reviewer said that as this process gets more refined, it should improve the accuracy of fuel economy improvement predictions from various advanced technologies, and provide a quick check to verify the accuracy of manufacturer's claims.

Reviewer 2:
The reviewer stated that this project supports DOEs goals by helping to provide a better evaluation of how powertrain technologies can reduce fuel usage in the real world. The reviewer added that often in research efforts, the linkage between real world impact and the component or sub-system performance is not well established. This project establishes a methodology and tools for making that evaluation.

Reviewer 3:
The reviewer said that this project provides detailed understanding of benefits of future engine developments to guide direction for best fuel efficiency.

Reviewer 4:
The reviewer remarked that the DOE direction on what technologies provide best benefit for the cost will help guide industry in picking technologies to put on their production engines.

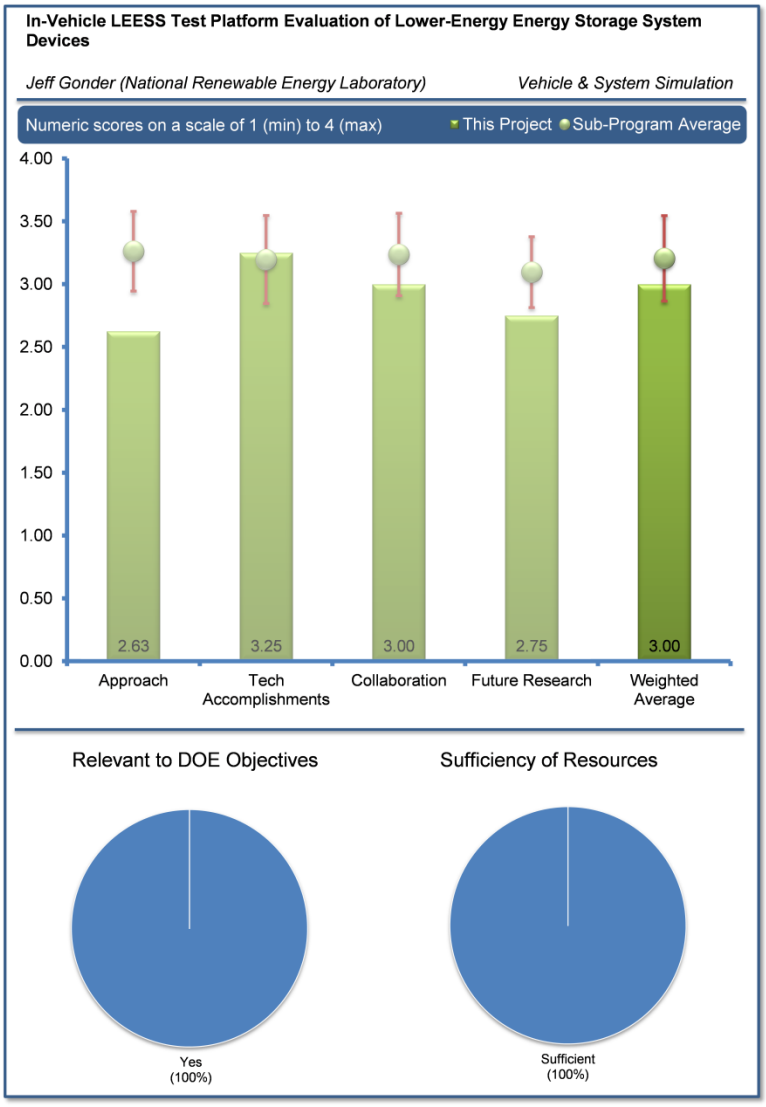
Question 6: Resources: How sufficient are the resources for the project to achieve the stated milestones in a timely fashion?

Reviewer 1:
The reviewer said that the resources, $200,000 for one year, are insufficient to further develop the models.

Reviewer 2:
The reviewer pointed out that in one year, with one quarter to go, the dollars allocated do not seem enough to get all the results even without correlating the model.

Reviewer 3:
The reviewer commented that resources are sufficient for project goals.

In-Vehicle LEESS Test Platform Evaluation of Lower-Energy Energy Storage System Devices: Jeff Gonder (National Renewable Energy Laboratory) - vss129



Reviewer Sample Size

A total of four reviewers evaluated this project.

Question 1: Approach to performing the work - the degree to which technical barriers are addressed, the project is well-designed, feasible, and integrated with other efforts.

Reviewer 1:

The reviewer stated that the analysis and the approach were great. The reviewer added that all the testing was focused on quantifying the gains under relevant profiles. The reviewer noted that because the gains are incremental, it would be helpful to quantify the added cost for OEMs to implement this technology. This may show that the gains are not significant enough to offset the additional cost.

Reviewer 2:

The reviewer reported that the premise for the project is interesting, and the experimental approach is very good. A little more analytical work might have been a nice compliment to the experimental work. The reviewer added that while testing one alternative lower energy storage device is an excellent start, an analytical evaluation showing the impact of a range of different energy storage capabilities and the impact at the system level would have been interesting. This might have also helped to justify the choice of the particular energy storage device that was tested. The reviewer commented that because the premise is that lower energy storage will provide similar benefits at lower cost, it would have been nice to see some evaluation of costs for both the baseline system as well as the alternative. The reviewer noted that if costs had been considered, it would have been possible to create fuel consumption versus cost/energy storage capacity. Creating curves for both the nickel-metal hydride (NiMH) battery, as well as the alternative would show the trade-off between cost and fuel consumption for both technologies, and provide better understanding if lower energy storage really does provide a better cost/benefit trade-off.

Reviewer 3:

The reviewer stated that it appears that an evaluation of cost will be conducted near the end of the project, yet the purpose of the project is to evaluate a means to reduce the cost of a hybrid energy storage system. A more comprehensive approach to the USABC power assist hybrid goals could have been done to evaluate charge power and discharge power goals as well as the currently evaluated available energy goal. The reviewer added that it is not clear that a smaller device, but one with a significantly higher power to energy ratio will provide a cost savings, even if there is no performance degradation. Modeling could have been done to evaluate the impact of modifying USABC power assist hybrid goals. The reviewer commented that it is not clear that any upfront modeling was done as part of the coordination with the USABC.

Reviewer 4:

The reviewer indicated that the basic idea of attempting to replace existing battery energy storage systems in HEVs with lower cost energy storage system combinations is a good one. HEVs only account for about 3% of new vehicle sales, largely probably as a result of higher initial cost. If that cost differential could be driven down significantly or eliminated, it is likely HEV sales would take off with concomitant higher fuel economy and resulting energy savings. The reviewer's fundamental concern with regards to the approach surrounds the lack of modeling and back-end sequencing of cost studies. To date, the task has heavily emphasized the development of a full-HEV test bed for in vehicle lower-energy energy storage system (LEESS) device evaluation, and comparison, bench, and in-vehicle dyno testing. The reviewer said that it seems an alternative and probably more cost effective approach would be to conduct modeling studies upfront of technology combinations of particular interest (and having significant industrial support) to determine whether it is likely they would be able to meet the technical requirements of the vehicle. The reviewer added that if the particular LEESS technology of interest passed these criteria, an impartial economic assessment should then be conducted with industry to gauge whether the particular technology was really viable from a system, cost, and business standpoint. Then, if these two criteria were successfully met, HEV test bed and bench and dyno testing would be conducted. As the task is set up now, it is highly likely that significant resources will be expended testing technologies, which will likely fail from a commercial standpoint due to cost and business considerations which have not been adequately scoped out up front.

Question 2: Technical accomplishments and progress toward overall project and DOE goals – the degree to which progress has been made, measured against performance indicators and demonstrated progress toward DOE goals.

Reviewer 1:

The reviewer indicated that the listing of accomplishments for the project is reasonable given the task duration and funding levels. Bench testing has been completed on the first LEESS (lithium ion capacitor (LIC) form JSR Micro). The reviewer added that rated energy comparison for the LIC system compared to the stock NiMH has been determined. A 2012 Ford Fusion Hybrid has been modified to enable operation on alternative LEESS devices while maintaining stock operating capability using production NiMH cells. Also, the reviewer noted that 0-60 mph in-vehicle acceleration comparison testing has been conducted which illustrated comparable performance between production NiMH and LEESS LIC configurations. The reviewer added that in vehicle dynamometer testing compared the voltage range and fuel and energy use of a production NiMH versus three LIC configurations. The reviewer added that the results indicate small fuel use differences between the HEV configurations with all showing significant savings compared to a non-hybrid vehicle. The energy window of each ESS configuration was also measured for each cycle and summarized. The reviewer said a significantly reduced energy window resulted in negligible fuel use consumption difference on most cycles and only a small increase on the US06 test. Overall, the reviewer said the project had a respectable list of accomplishments.

Reviewer 2:

The reviewer said that a rigorous approach has been taken to the evaluation of the energy storage devices selected for evaluation. The reviewer added that the results for the LIC provide a strong technical foundation for the evaluation of the USABC power assist hybrid available energy goal.

Reviewer 3:

The reviewer stated that there was great experimental work in evaluating the different energy storage systems.

Question 3: Collaboration and coordination with other institutions.

Reviewer 1:

The reviewer stated that the project seemed to benefit from strong collaboration with a range of outside partners including Ford, Maxwell, USABC, and etc.

Reviewer 2:

The reviewer reported that overall, the level of collaboration and coordination for the project is good. The reviewer noted that NREL has coordinated with the USABC (Chrysler, Ford, GM, and DOE/national laboratories) on the precursor analysis for LEESS performance targets for power-assist HEVs; Ford for a CRADA on the Fusion conversion; JSR Micro for the LIC modules for

evaluation; Maxwell Technologies for electrochemical double-layer capacitors (EDLC) modules for upcoming testing; and cost share collaboration between VSST and Energy Storage for the project as a whole. The reviewer added that as alluded to under Approach, it would be good to include modeling activities upfront and possibly associated coordination therein with other national laboratories such as ANL and ORNL, as well as detailed communication with the OEMs and technology suppliers with regards to cost and business assessments of the various technology options.

Reviewer 3:
The reviewer said that it is too early in the project to share results with the USABC Energy Storage Tech Team; however, once work is complete, a comprehensive discussion with the Tech Team should occur, including the potential to evaluate charge and discharge power goals in future work.

Question 4: Proposed future research – the degree to which the project has effectively planned its future work in a logical manner by incorporating appropriate decision points, considering barriers to the realization of the proposed technology, and, when sensible, mitigating risk by providing alternate development pathways.

Reviewer 1:
The reviewer said that the future plan also seems sound; however, there is not a whole lot of value in improving mild-hybrids. The reviewer commented that we need to make a push towards PHEVs and BEVs.

Reviewer 2:
The reviewer commented that evaluating additional alternatives for energy storage would be a good next step; however, at the top of the list should be to include cost considerations in the analysis. The reviewer added that including cost for the individual systems tested will allow some evaluation of cost versus benefit. However, these data points could also be used to anchor an analytical study showing a broader consideration of the impact of different size energy storage systems, the fuel consumption benefit each could provide at the system level, and the system level costs.

Reviewer 3:
The reviewer reported that consideration should be given to diversifying the next two evaluations to look at reduced power as well as reduced energy and perhaps increased energy and reduced power. The reviewer added that coordinating with modeling resources to provide guidance in this area would be useful.

Reviewer 4:
The reviewer said that modelling activities and rigorous cost and business case assessments should be added upfront to the project to assess and screen technologies before any further testing activities (not currently envisioned) commence.

Question 5: Does this project support the overall DOE objectives of petroleum displacement? Why or why not?

Reviewer 1:
The reviewer commented that the project is definitely relevant given the potential of HEVs to reduce petroleum consumption if their penetration rates into the nation's fleet can be significantly increased.

Reviewer 2:
The reviewer said yes, to help improve understanding of the role of energy storage in helping to deliver fuel consumption improvement at the system level, and the project may help to drive lower cost hybrid solutions which will drive greater adoption.

Reviewer 3:
The reviewer stated that continued guidance on HEV design is useful, particularly for reduced power mild hybrids where there is currently no USABC guidance (somewhere between power assist and start-stop).

Reviewer 4:
The reviewer observed that the project is relevant; however, not significantly. The reviewer explained that mild hybrids have incremental gains and are mainly a way for major OEMs to stall progress towards PHEVS and BEVs, the technology for which is already out there.

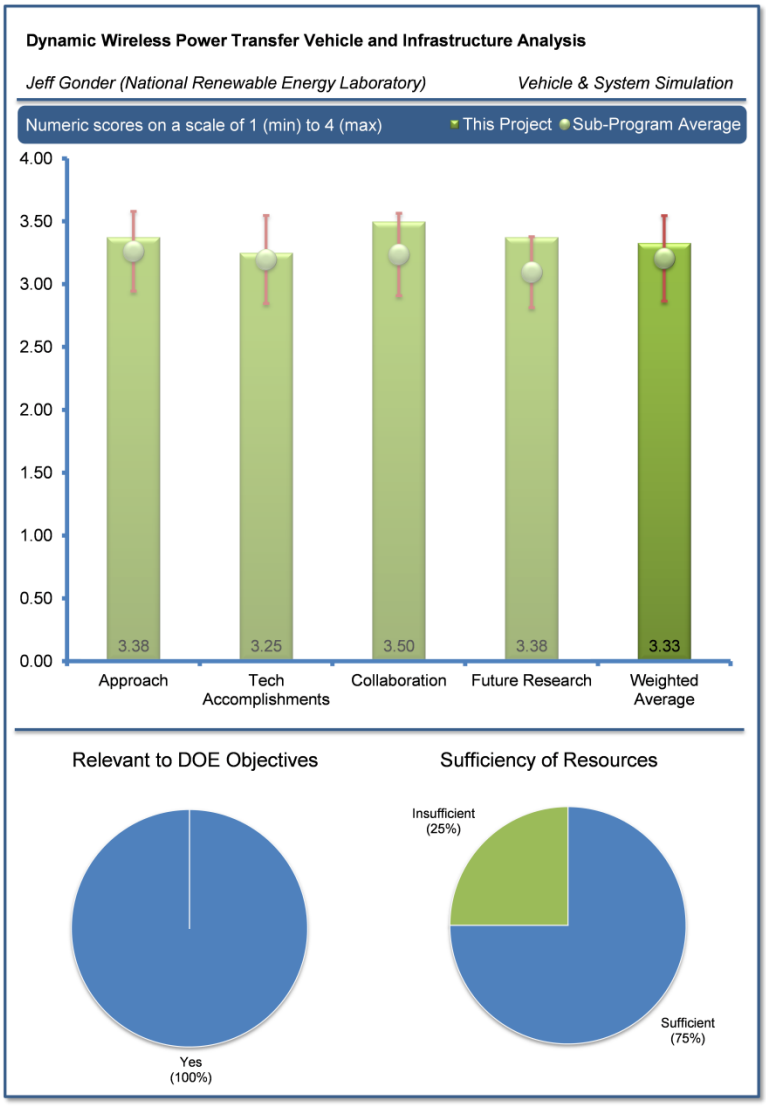
Question 6: Resources: How sufficient are the resources for the project to achieve the stated milestones in a timely fashion?

Reviewer 1:
The reviewer stated that the project appears to be on schedule and budget with existing resources.

Reviewer 2:
The reviewer said that this researcher and his team seem very talented. The reviewer thought their efforts would be better spent on powertrain technologies that lead to larger petroleum displacement.

Reviewer 3:
The reviewer noted that the resources for the project are sufficient.

Dynamic Wireless Power Transfer Vehicle and Infrastructure Analysis: Jeff Gonder (National Renewable Energy Laboratory) - vss130



Reviewer Sample Size

A total of four reviewers evaluated this project.

Question 1: Approach to performing the work - the degree to which technical barriers are addressed, the project is well-designed, feasible, and integrated with other efforts.

Reviewer 1:

The reviewer remarked that this looks good for the stage this project is currently; however, it is still highly speculative, characteristics and costs of vehicles as well as cost of service should be much more well-defined before using vehicle choice models. The reviewer added that at this stage this will tell you very little except that decreasing costs increases sales, which is already clear.

Reviewer 2:

The reviewer reported that the overall approach for making the case for light-duty and Class 8 trucks was excellent. The reviewer added that the plot that showed the percentage of distance traveled over the percentage of roadways was illuminating and a modest infrastructure investment could yield a significant benefit.

Reviewer 3:

The reviewer stated that the approach acknowledges uncertainty; assumes realistic limitations on the possibilities of the technology (e.g., 1% roadway penetration assumption).

Reviewer 4:

The reviewer observed that a lot of research is short-term and even medium-term focused, but research with a long-term focus is also crucial, and this project provides a significant contribution to exploring the future possibilities for wireless charging. The reviewer added that the analysis that revealed how a small fraction of overall roads having dynamic WPT installed would be sufficient for an outsized portion of electric driving was illuminating. The reviewer pointed out that the lack of a cost assessment at this stage of the project, given that the project ends September 30th, implies that insufficient effort has been directed in this area. The costs of dynamic charging (as opposed to quasi-stationary, which seems to make obvious sense for bus applications) appear to be a showstopper when the current state of infrastructure in the United States and how the funding is lacking for its improvement already is considered. The reviewer said that the cost-analysis should have been a larger portion of the project in this reviewer's opinion.

Question 2: Technical accomplishments and progress toward overall project and DOE goals – the degree to which progress has been made, measured against performance indicators and demonstrated progress toward DOE goals.

Reviewer 1:
The reviewer claimed that the modeling efforts have shown good results and indicate the potential of dynamic WPT to have considerable impact in reducing petroleum consumption. The reviewer added that the analysis of the required amount of dynamic WPT infrastructure to satisfy the demands of a large proportion of driving is a considerable contribution.

Reviewer 2:
The reviewer indicated that this project appears to be meeting its objectives, and seems headed towards an interesting final result.

Reviewer 3:
The reviewer concluded that most of the analysis was centered on justification of the need, but there was not as much information about how much power (per mile or per unit distance) would be required and what the cost of that power would be. The reviewer said that perhaps this is the next step in the project, but it is a critical piece in the evaluation.

Reviewer 4:
The reviewer remarked that given the uncertainties involved, the "what if" aspect is well handled. The reviewer added that the EV penetration prediction assumptions should be reported with some kind of error-bars on the various scenarios (for example, the total EV penetration percentage is surely not a single value in year “202x,” but a possible range).

Question 3: Collaboration and coordination with other institutions.

Reviewer 1:
The reviewer stated that the level of collaboration looks appropriate for this stage of the project.

Reviewer 2:
The reviewer reported that collaborating with DOT on a complementary analysis is a positive addition to the project. The reviewer added that the collaboration with OEMs and another national laboratory appears to be productive and useful to the project. The reviewer suggested including academic researchers into the project to add to the modeling capabilities.

Reviewer 3:
The reviewer commented that the collaboration with one of the electric-power industry associations may be needed to weigh in on the practicality of implementation.

Question 4: Proposed future research – the degree to which the project has effectively planned its future work in a logical manner by incorporating appropriate decision points, considering barriers to the realization of the proposed technology, and, when sensible, mitigating risk by providing alternate development pathways.

Reviewer 1:
The reviewer remarked that this project appears to have a well-defined plan.

Reviewer 2:
The reviewer stated that the future work addresses the questions raised by the study.

Reviewer 3:
The reviewer mentioned that more work is needed to get an understanding of the technical hurdles of electrifying roadways. The power required, how it would be distributed, interaction with grid and stationary storage, etc.

Reviewer 4:
The reviewer indicated that the proposed future research provides a strong framework for taking these future technologies forward and resulting in a deployment. The reviewer would suggest that focusing on quasi-stationary WPT, at least initially, might be the best approach.

Question 5: Does this project support the overall DOE objectives of petroleum displacement? Why or why not?

Reviewer 1:
The reviewer stated that increasing sales of electrified vehicles will decrease petroleum use.

Reviewer 2:
The reviewer commented that this study is needed to determine potential petroleum displacement of dynamic charging technology.

Reviewer 3:
The reviewer reported that a dynamic and quasi-stationary WPT have the potential to dramatically increase the number of electrified vehicles in the transportation fleet, and this will certainly result in significant petroleum displacement. The reviewer added that this project identifies this potential, and provides an indication of how dynamic charging can be implemented.

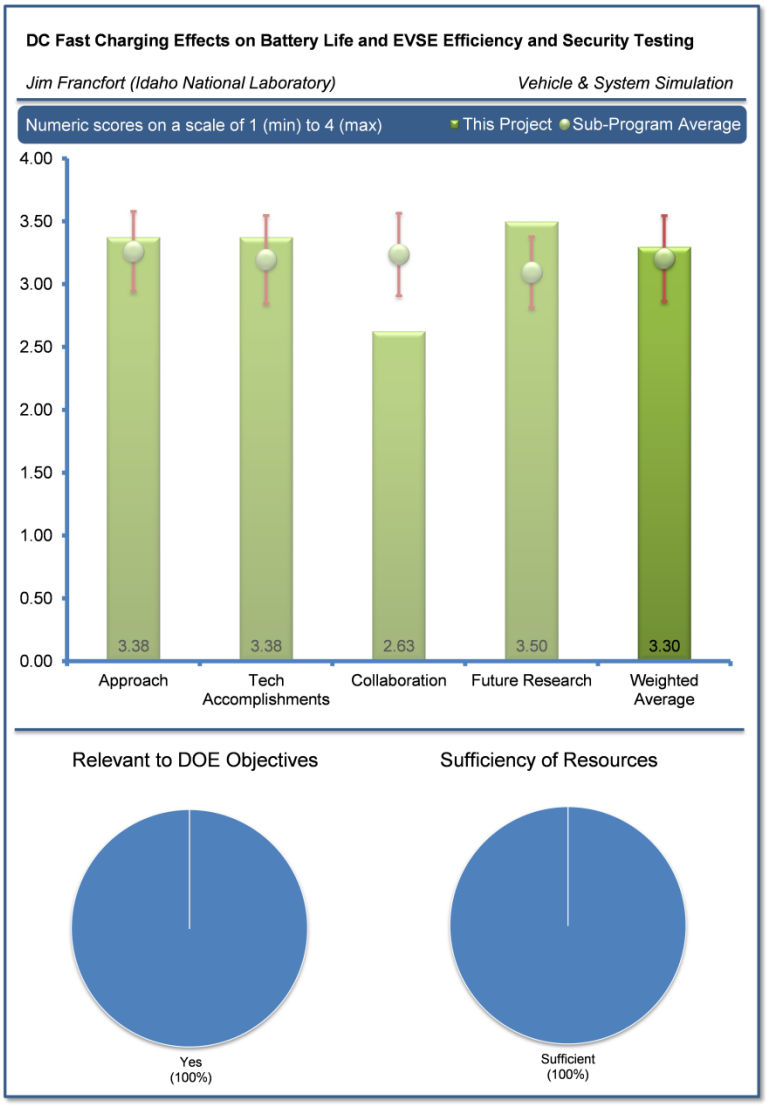
Question 6: Resources: How sufficient are the resources for the project to achieve the stated milestones in a timely fashion?

Reviewer 1:
The reviewer stated that resources appeared adequate.

Reviewer 2:
The reviewer said that the level of funding is relatively modest and seems appropriate to support this effort.

Reviewer 3:
The reviewer stated that this was not addressed directly, but funding seems adequate.

DC Fast Charging Effects on Battery Life and EVSE Efficiency and Security Testing: Jim Francfort (Idaho National Laboratory) - vss131



Reviewer Sample Size

A total of four reviewers evaluated this project.

Question 1: Approach to performing the work - the degree to which technical barriers are addressed, the project is well-designed, feasible, and integrated with other efforts.

Reviewer 1:

The reviewer commented that this is important work. The reviewer added that understanding the different types of charging and the effects on battery life is very important.

Reviewer 2:

The reviewer stated that the work seems great. The reviewer saw high value in the comparative testing of DC fast charging and L2 charging. The results are interesting so far, but releasing more data would increase value tremendously. The reviewer saw very low value, though, in cybersecurity testing with no output beyond the manufacturer. Unless this is funded by the manufacturer, this appears to be an inappropriate use of funding.

Reviewer 3:

The reviewer commented that the testing procedures (i.e., drive cycles, test setup, etc.) seem to be good, but more thought should be given to the types of situations that are simulated. The reviewer asked if the current driving patterns are representative of real-life driving. The fleet size and models are very limited though. The reviewer added that it may be more useful to extend this kind of testing to more models and manufacturers. Mixed charging cycles (slow and fast) should maybe be studied as well. Also, the reviewer said that it might be nice to see one vehicle pushed way beyond the manufacturers charge frequency specs to see what sort of degradation occurs. This will likely happen in real-life, so it should be tested.

Reviewer 4:

The reviewer reported that the approach is quite straightforward. The reviewer noted the approach was to design a test and conduct it that assure that multiple vehicles are tested as close to identically as possible to understand how different charging protocols affect long term battery capacity. The planned test methods are valid. The reviewer noted that what could be improved is the original plan for the test which should have included deeper dives to the causes and reasons for the capacity loss. This seems to be a focus now for the future. The reviewer cannot comment on the EVSE security issue as the reviewer did not understand what was presented in that area. So the reviewer will evaluate the capacity testing only.

Question 2: Technical accomplishments and progress toward overall project and DOE goals – the degree to which progress has been made, measured against performance indicators and demonstrated progress toward DOE goals.

Reviewer 1:
The reviewer stated that it looks great so far for the vehicles. The reviewer added that it is unclear what the concrete results are for the EVSE testing.

Reviewer 2:
The reviewer commented that the true value of this project rests in the ability to understand the trends and causes of the battery degradation. For example, need to relate the ambient temp profile to the degradation results on a more detailed basis. Also, the reviewer mentioned that the project team needs to understand the temperature condition of the battery after charge and as the vehicle goes on the next cycle. The reviewer asked if the battery went back to ambient temp before the next drive event. The reviewer also asked how the battery temperature profiles have related to the loss of capacity. Simply stated, the project team needs to look deeper for the things that affect the differences in the individual vehicles tested.

Reviewer 3:
The reviewer pointed out that the current accomplishments are good. They would be much better if more analysis were done on battery temperature, current, and voltage histories. The reviewer added that in order to make useful models of this data in the future these sorts of analyses need to be performed.

Reviewer 4:
The reviewer was concerned that the sample size was too small at four vehicles, but if this work can reduce the cost of testing it is very important. The reviewer also noted that the PI was very impressive.

Question 3: Collaboration and coordination with other institutions.

Reviewer 1:
The reviewer remarked that the collaboration partners look okay, but it is unclear what the nature of the collaboration is. It would be very valuable to release the data more widely, so that everyone could collaborate. The reviewer added that it is unclear why this data would be collected in the manner that it is being collected without intending it for public release.

Reviewer 2:
The reviewer stated that none were shown. The collaborations cited were not really collaborations; they were primarily internal groups and subcontractors. The reviewer suggested that the project team collaborate with the car manufacturer to verify that the findings are reasonable.

Reviewer 3:
The reviewer noted that very little collaboration seemed to be on-going. The reviewer added that this project should seek more collaborators. If OEMs are not interested in the results then the question should be asked if the data recorded from this testing is truly useful.

Reviewer 4:
The reviewer would like to see more OEM collaborators.

Question 4: Proposed future research – the degree to which the project has effectively planned its future work in a logical manner by incorporating appropriate decision points, considering barriers to the realization of the proposed technology, and, when sensible, mitigating risk by providing alternate development pathways.

Reviewer 1:
The reviewer stated that the future work appears to be on target to address many of the previously mentioned issues. The reviewer noted that the publication of this work and results should remain a main focus. This data is likely to be used by future researchers to build battery models, so dissemination of the work is critical.

Reviewer 2:
The reviewer commented that the project team had an excellent research plan.

Reviewer 3:
The reviewer reported that the future work is well planned. This reviewer noted that the activity, "Propose deep-dive of on-road data to examine more subtle changes beyond capacity, power capability (i.e., resistance growth)," stood out. The reviewer stated that this should be a top priority that will greatly increase the value of this project and also include investigation into the capacity causes.

Reviewer 4:
The reviewer encourages continuing the test, even after 70,000 miles, even if this has to be done on a simulator.

Question 5: Does this project support the overall DOE objectives of petroleum displacement? Why or why not?

Reviewer 1:
The reviewer said yes, this provides more information that may support EV use in the future. The reviewer added that most electricity is produced from non-petroleum sources, so this project is in line with DOE objectives.

Reviewer 2:
The reviewer reported that it helps to understand the current battery technology limits and if expanded could outline an agenda for future technology improvements.

Reviewer 3:
The reviewer pointed out that reducing uncertainty for PEV battery life will increase sales and decrease petroleum displacement.

Reviewer 4:
The reviewer stated that we need to lower testing cost which is a goal of this project. The reviewer added that the project had an excellent work plan and very impressive work.

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

Reviewer 1:
The reviewer said that funding is sufficient for the work as described.

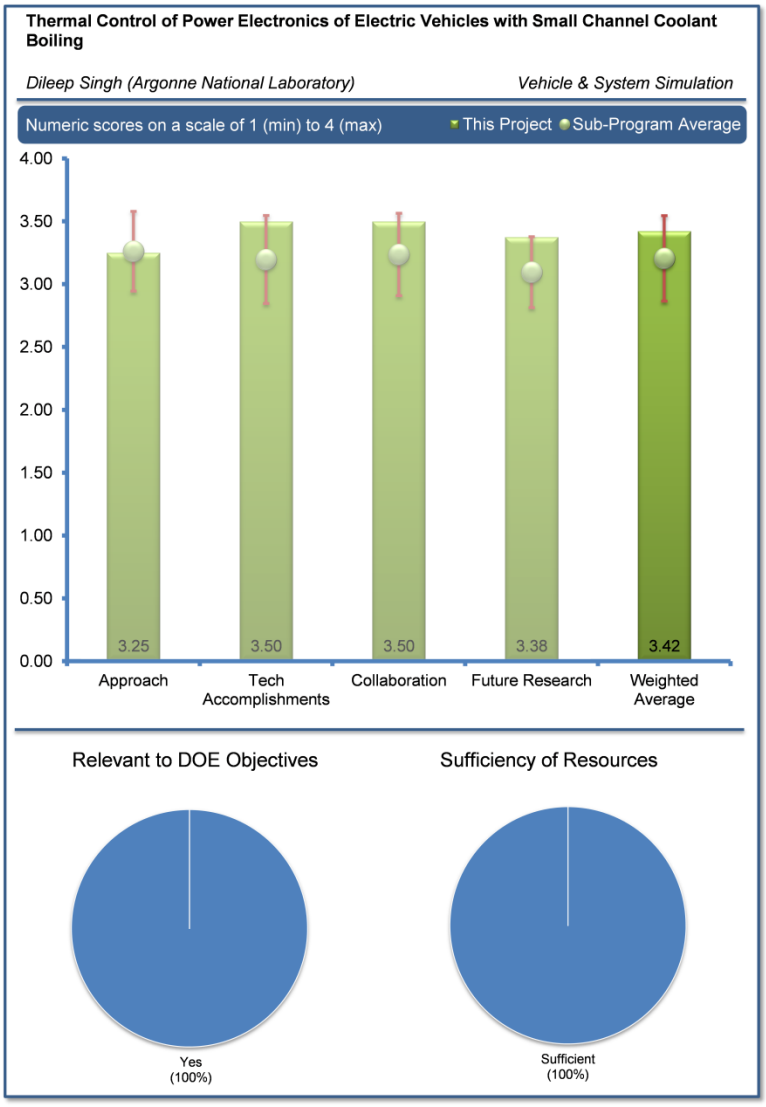
Reviewer 2:
The reviewer remarked that this seems sufficient, although the reviewer would defund the cybersecurity research if meaningful results could not be widely distributed.

Reviewer 3:
The reviewer noted that the team seems to have enough resources to achieve its goals, but the vehicles are a bit old and maybe some new ones should be added. The reviewer added that EV technology/batteries are evolving quickly, so systems from only a few years ago may be very out of date.

Reviewer 4:

The reviewer recommended increasing the sample size, which also increases cost, because this work is important.

Thermal Control of Power Electronics of Electric Vehicles with Small Channel Coolant Boiling: Dileep Singh (Argonne National Laboratory) - vss132



Reviewer Sample Size

A total of four reviewers evaluated this project.

Question 1: Approach to performing the work - the degree to which technical barriers are addressed, the project is well-designed, feasible, and integrated with other efforts.

Reviewer 1:

The reviewer said the project had an excellent PI, whom is published in the area.

Reviewer 2:

The reviewer commented that the project is intended to develop a small channel coolant boiling system that can eliminate the low temperature cooling systems for electronics in HEVs. The reviewer stated that the technical barriers are properly identified and the proposed approaches are well designed and reasonable. The reviewer added that the only concern relates to the general approach of combining the high temperature and low temperature systems into one cooling system with two loops, each rely on a different cooling mechanism. It may increase the system complexity, for example, the performance of one loop may impact the performance of another loop, and reliability.

Reviewer 3:

The reviewer reported that this appears to be a solid project with good potential benefits if it proves to be valid. The reviewer added that the effort is not highly funded and appears to be a one man effort, much like a post grad student project. The approach is good given the apparent constraints.

Reviewer 4:

The reviewer stated that the approach is not novel but is probably unique. The reviewer added that the use of the engine coolant instead of a separate circuit for the power electronics is a significant step towards cost reducing hybrid power trains.

Question 2: Technical accomplishments and progress toward overall project and DOE goals – the degree to which progress has been made, measured against performance indicators and demonstrated progress toward DOE goals.

Reviewer 1:

The reviewer reported that the project has progressed well and met its accomplishments.

Reviewer 2:

The reviewer commented that ANL invented nanofluids. The reviewer pointed out that working on better properties is the key.

Reviewer 3:
The reviewer indicated that the initial numerical thermal analysis has been completed, impacts of key variables have been analyzed and the potential capability of the system verified. The reviewer added that the project progressed as proposed.

Reviewer 4:
The reviewer mentioned that while some basic modelling had been done, it appears that much more design work on the system needs to be done to better guide the testing. The reviewer added that the PI could not answer what the reviewer thought was a pretty simple question about how much of the system cooling fluid has to be diverted to provide the expected cooling needs for the power electronics package. The reviewer said that it seemed like a pretty simple but very important question. The reviewer was concerned that it may be very difficult in practice to control the nucleate boiling regimen within the cooling channel and the surface temperatures may vary a lot in practice.

Question 3: Collaboration and coordination with other institutions.

Reviewer 1:
The reviewer noted that NIST should also be a collaborator. The reviewer added that the project team needs to work with OEMs.

Reviewer 2:
The reviewer would like to see a Tier 1 express interest in this if only to evaluate the concept on production intent power electronics design.

Reviewer 3:
The reviewer noted that there was not a lot of collaboration shown, although some with NREL.

Question 4: Proposed future research – the degree to which the project has effectively planned its future work in a logical manner by incorporating appropriate decision points, considering barriers to the realization of the proposed technology, and, when sensible, mitigating risk by providing alternate development pathways.

Reviewer 1:
The reviewer noted an impressive research plan. The project team should consider shear thinning nanofluids which lowers the viscosity. The reviewer added that the project team should consider propylene glycol. The reviewer warned that ethylene glycol (EG) is a hazardous material.

Reviewer 2:
The reviewer said that the proposed future research is appropriate.

Reviewer 3:
The reviewer stated that the future work is well planned and straightforward. The reviewer added that one weakness is that no industry partner is involved for future technology transfer. More importantly, the reviewer commented that the project team should evaluate the technical and commercial feasibility of the general concept.

Reviewer 4:
The reviewer suggested that building a testing lab for this project would be a good next step, but the reviewer would suggest that more system design issues need to be answered to better guide the testing.

Question 5: Does this project support the overall DOE objectives of petroleum displacement? Why or why not?

Reviewer 1:
The reviewer noted that nanofluids can save energy because they weigh less.

Reviewer 2:
The reviewer said yes this is relevant as it could lead to cost reduced hybrid solutions.

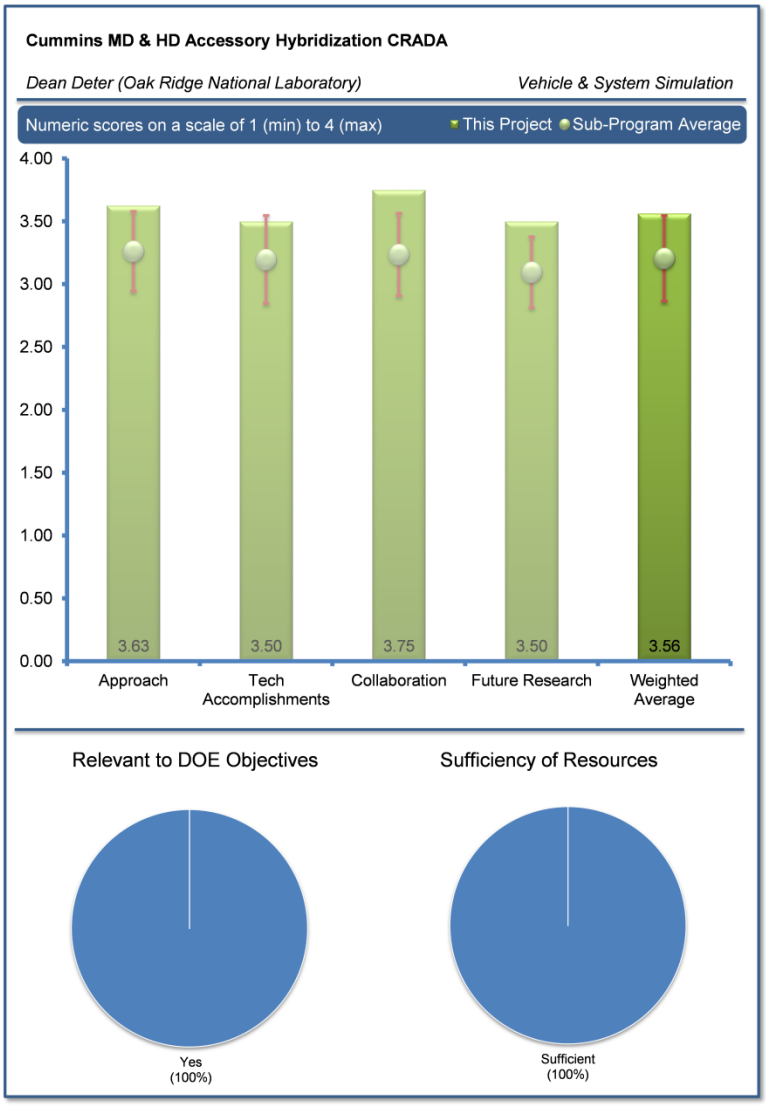
Question 6: Resources: How sufficient are the resources for the project to achieve the stated milestones in a timely fashion?

Reviewer 1:
The reviewer said that the project was excellent work and had some of the best researchers in the area.

Reviewer 2:
The reviewer stated that ANL has the thermal analysis and design capability, and ORNL provides expertise in power electronics design requirements.

Reviewer 3:
The reviewer commented that if further system design efforts could prove the viability of a full scale system, the reviewer would want to see more resources provided to the testing and design effort.

Cummins MD & HD Accessory Hybridization CRADA: Dean Deter (Oak Ridge National Laboratory) - vss133



Reviewer Sample Size

A total of four reviewers evaluated this project.

Question 1: Approach to performing the work - the degree to which technical barriers are addressed, the project is well-designed, feasible, and integrated with other efforts.

Reviewer 1:

The reviewer commented that the physics based model approach is an excellent way to evaluate systems approaches to solving problems; however, there needs to be verified grounding of the assumptions. For instance, the bus alternating current (AC) load is about one third of what is required to provide the function of AC for a passenger bus. The reviewer suggested that the project effort also includes development of a table known maximum power levels to adequately power their relevant sub-system. The reviewer added that power levels affect the fuel saved and the sizing of systems. The project is very relevant.

Reviewer 2:

The reviewer pointed out that this project was a valuable CRADA and had a well thought-out research plan.

Reviewer 3:

The reviewer said that the approach with analytical investigation and then on a test stand is good. The reviewer added that most component manufacturers do not think about this part of the duty cycle. The reviewer noted that the project team is using three drive cycles to select one for deeper analysis. The reviewer also said that the project team selected a system for long haul sleeper cabs to be hybridized.

Reviewer 4:

The reviewer observed that a deeper study on the relevance should be completed on the component level.

Question 2: Technical accomplishments and progress toward overall project and DOE goals – the degree to which progress has been made, measured against performance indicators and demonstrated progress toward DOE goals.

Reviewer 1:

The reviewer stated that so far, still early in the project life. The reviewer commented that it was great to work so close with Cummins for prototypes. The project has a great chance of being a real world application, for example, using Cummins real time fleet test data. Truck HVAC focus is strong and needed. The reviewer added that the cooling fan needs better fidelity, the reviewer agreed and is excited to see more work done here.

Reviewer 2:
The reviewer remarked that validation is an important part of the project. The reviewer said that the better understanding of auxiliaries is the key. The reviewer added that NREL has done a high fidelity model for the HVAC system called COOLCAB. The reviewer suggested that this software should be included.

Reviewer 3:
The reviewer noted that the building of the models and choosing the direction of the evaluation are great first steps. The reviewer observed that evaluation needs grounding based on actual sizing needs. The reviewer added that the technical approach to using the Merritor Hybrid system is not relevant (the system is not commercial and it is not planned to be commercial). The reviewer suggested that a commercial transmission partner be used or a transmission that is a part of an active product development.

Question 3: Collaboration and coordination with other institutions.

Reviewer 1:
The reviewer commented that Cummins and Meritor are an all-star team for this project's scope. The reviewer suggested taking as much advantage of their help as possible.

Reviewer 2:
The reviewer said that there was excellent partnership.

Reviewer 3:
The reviewer stated that Cummins is a great partner to have; however, it is not clear to what degree Cummins is participating in the project.

Question 4: Proposed future research – the degree to which the project has effectively planned its future work in a logical manner by incorporating appropriate decision points, considering barriers to the realization of the proposed technology, and, when sensible, mitigating risk by providing alternate development pathways.

Reviewer 1:
The reviewer remarked that eliminating overnight idling is a worthy goal.

Reviewer 2:
The reviewer reported that the proposed future work of completion of the models, component testing, validating the sub-system models, integrating into a powertrain and evaluation of the powertrain is a complete approach. This is assuming that a baseline of the initial powertrain has been completed. The reviewer added that if not in the plan or already completed, the baseline of the powertrain needs to be added to the list.

Reviewer 3:
The reviewer observed that it is important to do electric APU, or what we call battery HVAC along with diesel APU. The reviewer added that the project team had a strong approach for 2014/15 work and that the work was excellent.

Question 5: Does this project support the overall DOE objectives of petroleum displacement? Why or why not?

Reviewer 1:
The reviewers stated that there were excellent partnerships, but do not include air brakes for the type of vehicles the project is looking at.

Reviewer 2:
The reviewer remarked that the electrification of truck auxiliary systems (including idle reduction) is an excellent approach to improving truck petroleum usage.

Reviewer 3:
The reviewer pointed out that idling is an important piece of the duty cycle that needs more study. This gives us good data for understanding. The reviewer added that components do not typically get analyzed in this speed/situation and need this work.

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

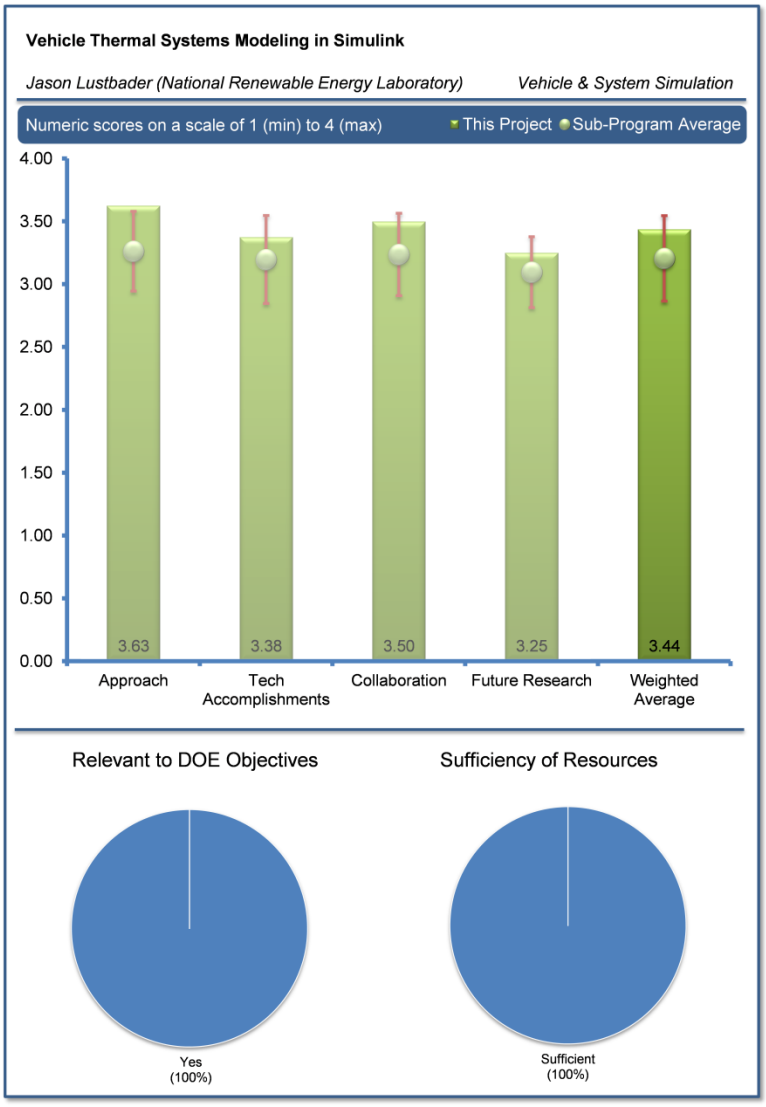
Reviewer 1:
The reviewer noted that laws for eliminating idling are a driving force.

Reviewer 2:
The reviewer commented that it looks like a very robust plan.

Reviewer 3:
The reviewer stated that more research is required to validate models. The reviewer said that there was good work over all.

Reviewer 4:
The reviewer indicated that the resources seem to be sufficient for the modeling work. In the next steps that require electric vehicle auxiliary systems will require additional resources if the components are not available. The reviewer added that the resourcing briefed is not forward looking, so no comment on the funding required doing the next steps.

Vehicle Thermal Systems Modeling in Simulink: Jason Lustbader (National Renewable Energy Laboratory) - vss134



Reviewer Sample Size

A total of four reviewers evaluated this project.

Question 1: Approach to performing the work - the degree to which technical barriers are addressed, the project is well-designed, feasible, and integrated with other efforts.

Reviewer 1:

The reviewer said that this is the second year the reviewer has reviewed this work. The reviewer greatly appreciates the approach and content. The reviewer added that the PI has taken a logical approach to modeling a system that is well known to industry but not necessarily evaluated to this point. He is now moving to the systems level modeling after a year of tools development. The reviewer looks forward to his review next year.

Reviewer 2:

The reviewer commented that the project and the approach are innovative and timely.

Reviewer 3:

The reviewer stated that the heating and cooling of EVs impacts EV range significantly and directly effects range anxiety which retards market adoption. The reviewer added that developing modeling tools that enable designers to optimize systems is valuable.

Reviewer 4:

The reviewer noted that the overall approach of developing an open-source framework that can co-simulate with Autonomie is sound. Autonomie is lacking a dedicated module for thermal system modeling, and this project serves to fill this void. The reviewer stated that with quantification of the loss of fidelity from the model being 1-D as opposed to 3-D would be useful here. Also, the M1 milestone was completed and the results of the model are said to have "reasonable trend." This reviewer asserted that a discussion of how this was judged is warranted. The reviewer asked how much of an improvement has been made over existing models. The reviewer added that the objective is stated to develop models from the first principles but several of the components are said to have lookup tables. The reviewer wanted to know if these tables are derived from the first principles or experimental data.

Question 2: Technical accomplishments and progress toward overall project and DOE goals – the degree to which progress has been made, measured against performance indicators and demonstrated progress toward DOE goals.

Reviewer 1:

The reviewer remarked that there was good progress to date. The reviewer added that the baseline tool set appears to be strong and fairly complete.

Reviewer 2:
The reviewer indicated that the PI presents a very viable account of the project progress.

Reviewer 3:
The reviewer stated that the modeling of the thermal system has been demonstrated and provides capability for development of advanced and optimized systems in EVs, hybrids, or conventional vehicles that can reduce petroleum consumption.

Reviewer 4:
The reviewer said that the project appears to be on track with the first milestone achieved and the bulk of the work still to come; however, because the details of the go/no-go decision are unclear, it is difficult to judge the current status of the progress. The reviewer said that the milestones are well laid out for the remaining work.

Question 3: Collaboration and coordination with other institutions.

Reviewer 1:
The reviewer stated that there was an excellent list of collaboration partners and their participation scope is provided. The reviewer said that a collaboration partner listed (Daimler) with listed scope of "Assisting with SuperTruck project" does not make sense.

Reviewer 2:
The reviewer commented that the project team had a solid collaboration group.

Reviewer 3:
The reviewer noted that the investigator has been in contact with persons from the reviewer's agency who have been inspired by this project.

Reviewer 4:
The reviewer remarked that there appeared to be significant collaboration with a variety of institutions and organizations; however, collaboration with some universities might be beneficial.

Question 4: Proposed future research – the degree to which the project has effectively planned its future work in a logical manner by incorporating appropriate decision points, considering barriers to the realization of the proposed technology, and, when sensible, mitigating risk by providing alternate development pathways.

Reviewer 1:
The reviewer stated that the proposed future work is a good listing of work that can be completed; however, it is not clear of the timing of the proposed future work. The reviewer suggested that the proposed future work also includes some kind of timing.

Reviewer 2:
The reviewer indicated that the technical progression is logical and achievable. The reviewer added that the support group appears to be an excellent advisory group.

Reviewer 3:
The reviewer reported that the plan to achieve the remainder of the project objectives appears sound. The reviewer stated that a validation of the overall model and the development of the open-source tool will be a significant accomplishment.

Reviewer 4:
The reviewer stated that the investigator did not discuss this item.

Question 5: Does this project support the overall DOE objectives of petroleum displacement? Why or why not?

Reviewer 1:
The reviewer stated that modeling of all parts of the vehicle is essential for vehicle design. The reviewer added that this project focuses on an often overlooked aspect of model development, but it can have significant impact on increasing the efficiency of thermal regulating systems onboard vehicles. The reviewer said that this can lead to a significant contribution towards petroleum displacement.

Reviewer 2:
The reviewer remarked that this is a good set of tools and system modelling for a broad industry base.

Reviewer 3:
The reviewer commented that HVAC is a large consumer of petroleum and improving HVAC performance will reduce petroleum consumption.

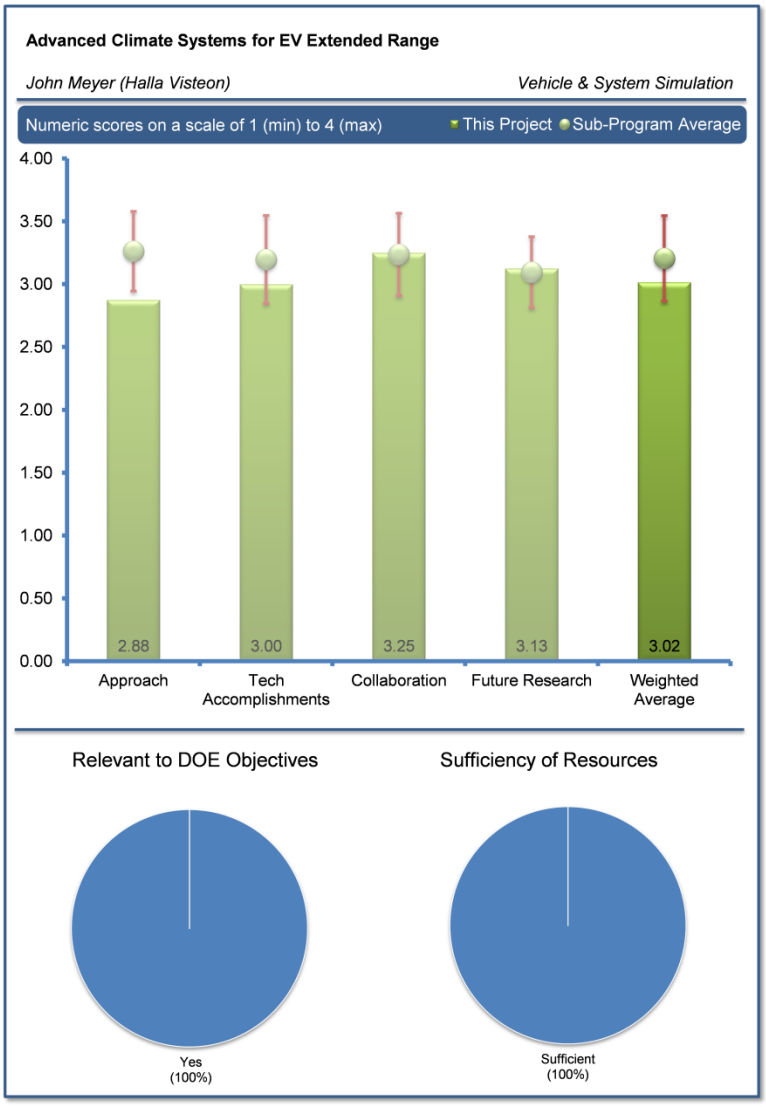
Question 6: Resources: How sufficient are the resources for the project to achieve the stated milestones in a timely fashion?

Reviewer 1:
The reviewer stated that the resources dedicated to this project appear to be sufficient and of appropriate scope.

Reviewer 2:
The reviewer commented that progress is steady and the reviewer did not see blatant holes in the research plan. The reviewer emphasized that this was a nice project.

Reviewer 3:
The reviewer explained that the resource rating of sufficient assumes that this project is in support of other projects that are developing the components and subsystems. The reviewer added that if this project does not have the support of other projects, a rating of insufficient is appropriate.

Advanced Climate Systems for EV Extended Range: John Meyer (Halla Visteon) - vss135



Reviewer Sample Size

A total of four reviewers evaluated this project.

Question 1: Approach to performing the work - the degree to which technical barriers are addressed, the project is well-designed, feasible, and integrated with other efforts.

Reviewer 1:

The reviewer reported that the approach is good and mentions improvements in components and subsystems. The reviewer asked if the project is going to develop a better overall (possibly different) system design or just improve the parts in the existing HVAC system. The reviewer was unable to attend the live presentation, so maybe this question was answered.

Reviewer 2:

The reviewer stated that it would help if the approach includes expected benefits in terms of percentage improvement in driving range, etc., the reviewer added that, of course, it is understood that this would depend on the chosen drive cycle, but some rough estimate would be helpful.

Reviewer 3:

The reviewer stated that this project demonstrates well laid out plans and good use of CAE tools to understand the baseline thermal loads. The reviewer added that some more thought could have been put into laying out project targets and metrics.

Reviewer 4:

The reviewer commented that the objectives lack the specificity necessary for the project to achieve its intended goal. The reviewer said that the project fails to specify objectives that will deliver advanced load reduction, advanced HVAC, and preconditioning systems that will make the EV viable in the very cold and hot temperature operating environments that are characteristic for large portions of the U.S. market. The reviewer added that this lack of specificity allows the performer to weigh the design requirements analysis to the moderate temperatures of the California market.

Question 2: Technical accomplishments and progress toward overall project and DOE goals – the degree to which progress has been made, measured against performance indicators and demonstrated progress toward DOE goals.

Reviewer 1:

The reviewer said that the work to date is crucial to executing the project goals and seemed to be progressing very well.

Reviewer 2:
The reviewer stated that based upon the level of funding received in FY 2014, the accomplishments were good. Perhaps, more funding could have helped to move this project along a bit better.

Reviewer 3:
The reviewer stated that the project is still in its infancy.

Question 3: Collaboration and coordination with other institutions.

Reviewer 1:
The reviewer noted that there was excellent collaboration with OEM and leveraging of DOE national laboratory expertise.

Reviewer 2:
The reviewer commented that collaboration with partners NREL and Hyundai appeared to be strong.

Reviewer 3:
The reviewer indicated that the relevant stakeholders were present to make the project successful.

Reviewer 4:
The reviewer stated that one of the 2014 tasks is to build and validate a CFD model. It seemed to this reviewer that the experience that NREL has gained in developing and validating CoolCab and CoolCalc should be leveraged here. The reviewer added that not only will NREL benefit when the tool is used for a purpose other than for simulating truck cabs, but Halle Visteon should benefit from all the experience that NREL has already gained.

Question 4: Proposed future research – the degree to which the project has effectively planned its future work in a logical manner by incorporating appropriate decision points, considering barriers to the realization of the proposed technology, and, when sensible, mitigating risk by providing alternate development pathways.

Reviewer 1:
The reviewer stated that the work elements proposed should produce good results.

Reviewer 2:
The reviewer observed that the long term plans for project are well laid out. The reviewer wanted to see a bit more on estimated gains in petroleum consumption reduction from the work.

Question 5: Does this project support the overall DOE objectives of petroleum displacement? Why or why not?

Reviewer 1:
The reviewer commented that any improvement in EV driving range would increase the acceptance of these vehicles among the general public, and contribute to a reduction in petroleum usage.

Reviewer 2:
The reviewer indicated that the project improves efficiency of EV HVAC subsystems, which enables improved overall vehicle energy efficiency and improved EV range. The reviewer added that this will help make EVs more practical as alternative to ICE-based transport.

Reviewer 3:
The reviewer noted that by reducing auxiliary loads the project has the potential to extend EV range and displace petroleum consumption.

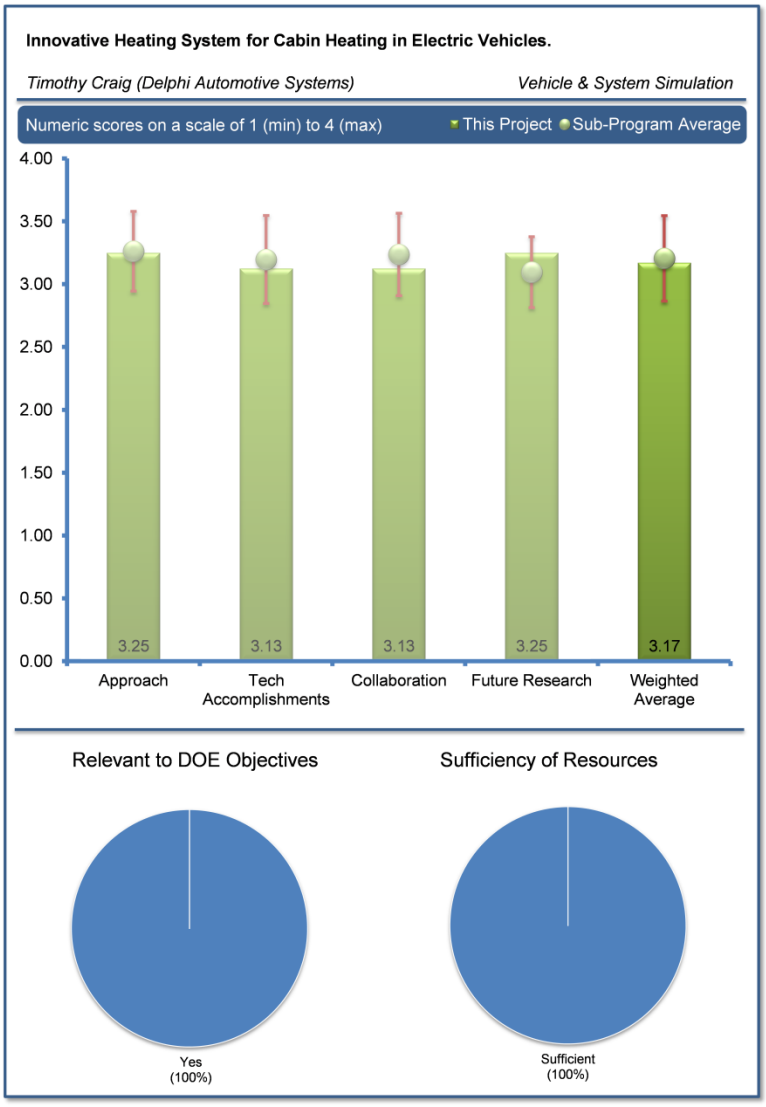
Reviewer 4:
The reviewer stated that the project directly supports the DOE objectives of petroleum displacement through minimizing air conditioning (A/C) loads for electric vehicles and increasing useful range.

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

Reviewer 1:
The reviewer stated that the resources appeared adequate.

Reviewer 2:
The reviewer stated that the resources are sufficient for this task.

Innovative Heating System for Cabin Heating in Electric Vehicles.: Timothy Craig (Delphi Automotive) - vss136



Reviewer Sample Size

A total of four reviewers evaluated this project.

Question 1: Approach to performing the work - the degree to which technical barriers are addressed, the project is well-designed, feasible, and integrated with other efforts.

Reviewer 1:

The reviewer pointed out that the project team had an excellent approach that incorporates practical requirements and test of the technology in real world conditions.

Reviewer 2:

The reviewer commented that the overall approach is laid out logically. While the component development technical approach is strong, it was not clear if the system performance requirements have been adequately determined. The reviewer added that up-front analysis is needed to determine the required system performance in order to improve over current solutions, namely adding more batteries. An argument needs to be made about the required system density, weight, and cost that if achieved, would make a compelling case over adding more battery capacity. The reviewer recommended that this analysis consider both heating and cooling, even if cooling is only sensible thermal storage. The reviewer also said that in the question and answer session, it sounded like some thought may have gone into this, but a more clear and complete augment was needed.

Reviewer 3:

The reviewer reported that, while understanding that the scope of this project is to develop a thermal heating system using phase change material (PCM), the cost and weight trade-off of this system when compared to increasing battery capacity should be highlighted, along with the fact that increasing battery size provides a positive benefit during the summer months through increased range, while this proposed system increases the weight. This does not, in the reviewers mind, reduce the technical merit of this approach. The reviewer added that this is another alternate solution to an existing problem that has to be weighed along with all the other solutions. The reviewer commented that the choice of extending grid-connected electric-drive vehicle (GCEV) range by greater than 20% at -10°C, is somewhat arbitrary, and has a direct influence on the benefit of this system over other competing systems as well. Perhaps, the analyses and tests should be carried over based on the duty cycles experienced by the current GCEVs in use to truly understand the trade-offs involved.

Question 2: Technical accomplishments and progress toward overall project and DOE goals – the degree to which progress has been made, measured against performance indicators and demonstrated progress toward DOE goals.

Reviewer 1:
The reviewer indicated that given that this project was started in October and is only 5% complete, good progress has been made on the component development. Identifying a possible PCM that approaches the target goals is an important step in the component design. The reviewer added that providing a more accurate schematic that includes the required bypass and controls would be helpful to understanding the system behavior. The reviewer asked if there are two valves in the system. The reviewer also noted that there was some discussion about how this control would be performed to minimize impacts on transient response, especially during cold weather startup would be helpful. The reviewer stated that the preliminary modeling is also a good initial accomplishment and shows some thought is being put into the component design.

Reviewer 2:
The reviewer commented that there was excellent progress on system requirements development. The reviewer added that it is not clear from accomplishments if tradeoff of added mass of ePATH has been considered in the energy savings projected.

Reviewer 3:
The reviewer said that the project still in its infancy.

Question 3: Collaboration and coordination with other institutions.

Reviewer 1:
The reviewer commented that there is an excellent team composition including an OEM, HVAC supplier, PCM company, and national laboratory. The reviewer added that it seemed that the right companies were involved for successful development and eventual commercialization.

Reviewer 2:
The reviewer stated that appropriate collaborations for success are in place.

Reviewer 3:
The reviewer noted that the presenters indicated that the project is planning to use a grid connection that bypasses the on-board energy storage and likely will not use the J1772 connector. The latter statement indicates that the project team needs to collaborate more with DOE and their partners for design review and feedback. The reviewer added that one cannot fulfill the requirement to integrate the device into grid connected vehicle if it does not use the standard grid connection interface. That being said, it is desirable to bypass the energy storage system from the standpoint of maximizing the life of the battery pack. The reviewer stated that the project should use the standard connector and bypass the energy storage system in the design to provide power to the phase change material energy storage device.

Question 4: Proposed future research – the degree to which the project has effectively planned its future work in a logical manner by incorporating appropriate decision points, considering barriers to the realization of the proposed technology, and, when sensible, mitigating risk by providing alternate development pathways.

Reviewer 1:
The reviewer stated that the necessary plans are in place, and looked forward to the results.

Reviewer 2:
The reviewer indicated that the proposed plan is logical, starting with design, development, then bench level testing, and finally integration as well as validation. The reviewer added that the plan would be improved by up-front feasibility and target analyses, even if simple, to set the correct performance goals and assess the feasibility of achieving the target.

Question 5: Does this project support the overall DOE objectives of petroleum displacement? Why or why not?

Reviewer 1:
The reviewer stated that the project improves range performance of EVs by reducing impact of HVAC loads on vehicle energy usage.

Reviewer 2:
The reviewer reported that this device has strong potential to extend EV range in while operating in cold temperatures.

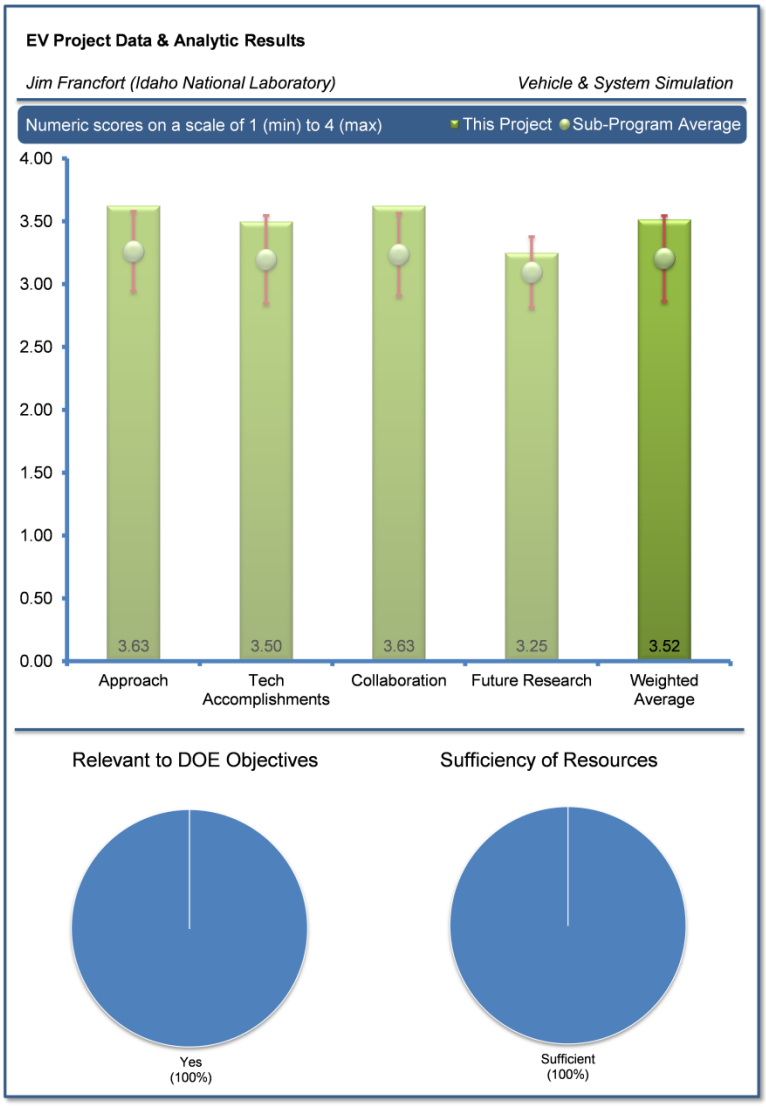
Reviewer 3:
The reviewer mentioned that as in the first comment above, this approach provides one solution to the problem of reduced driving range due to auxiliary heating loads.

Reviewer 4:
The reviewer commented that the presenter did a good job addressing DOE goals. Reducing the impact of cabin heating on EDV's is critical to their long term acceptance and wider adoption. The reviewer added that the goal to extend GCEV range by more than 20% by reducing or eliminating the auxiliary heating load from the vehicle battery at -10°C would be a significant accomplishment and is very relevant to DOE goals. Additionally, the reviewer said that decreasing the impact of HVAC system on EDV range is critical to reducing range uncertainty and therefore their widespread adoption. The reviewer remarked that it would be helpful to make an argument for the feasibility of a successful system design achieving this goal in the future.

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

Reviewer 1:
The reviewer stated that resources are good.

EV Project Data & Analytic Results: Jim Francfort (Idaho National Laboratory) - vss137



Reviewer Sample Size

A total of four reviewers evaluated this project.

Question 1: Approach to performing the work - the degree to which technical barriers are addressed, the project is well-designed, feasible, and integrated with other efforts.

Reviewer 1:

The reviewer observed that this is a giant project, a huge investment, and is collecting a tremendous amount of valuable data that highlights barriers for mass adoption and can be used to address barriers to EV adoption. The reviewer added that this is an awesome investment by the government.

Reviewer 2:

The reviewer reported that the project was a huge undertaking that was performed very well. The reviewer cannot wait to see the actual report with details. The reviewer added that the anecdotal references to issues are well appreciated, but moreover were successfully handled.

Reviewer 3:

The reviewer stated that the project plan and design has covered several important factors that will help the future deployment of the plug-in EV; however, in regard to diverse geographies there is less deployment in the Midwest area, which can have useful environmental and other factors to study.

Question 2: Technical accomplishments and progress toward overall project and DOE goals – the degree to which progress has been made, measured against performance indicators and demonstrated progress toward DOE goals.

Reviewer 1:

The reviewer pointed out that the investment and data collection are complete, the project is data rich. The reviewer added that the path forward is straightforward, and recommended to draw out as much knowledge as possible from the data collected, so that the project can become knowledge rich.

Reviewer 2:

The reviewer said that the project has a large collection of interesting data from all the work that was done. The reviewer added that this data has a wealth of information to analyze. The reviewer stated that more data analysis is needed for the maximum use of the project results.

Reviewer 3:

The reviewer stated that this overview in 20 minutes cannot describe what is apparent in the report.

Question 3: Collaboration and coordination with other institutions.

Reviewer 1:
The reviewer indicated that the project has excellent collaboration with diverse groups of government, laboratories, utility providers, general public, manufacturers, and others.

Reviewer 2:
The reviewer commented that a great deal of collaboration was completed with vehicle manufactures, charging suppliers and vehicle operators/users.

Reviewer 3:
The reviewer stated that all appropriate stakeholders were seemingly involved.

Question 4: Proposed future research – the degree to which the project has effectively planned its future work in a logical manner by incorporating appropriate decision points, considering barriers to the realization of the proposed technology, and, when sensible, mitigating risk by providing alternate development pathways.

Reviewer 1:
The reviewer stated that the project is winding down and analysis of the data is underway. The reviewer added that it is not clear whether the analysis will move into FY 2015.

Reviewer 2:
The reviewer commented that data loggers must be used to account for all energy use and performance.

Reviewer 3:
The reviewer reported that the project presented a future work plan that emphasized the use of the large collection of data generated from previous work. The project also identified several barriers mainly relate to managerial or consumer issues; however, more emphasis on technical barriers need to be identified and addressed.

Question 5: Does this project support the overall DOE objectives of petroleum displacement? Why or why not?

Reviewer 1:
The reviewer indicated that the project provides a huge amount of information and emerging knowledge on how to best address the needs of vehicles and charging systems to meet the user needs. The reviewer added that this will be invaluable in the path forward.

Reviewer 2:
The reviewer stated that EVs will support the DOE objectives of petroleum displacement. The reviewer added that this project will provide the needed data for improving the EV technologies, consumer acceptance, and other EV related issues.

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

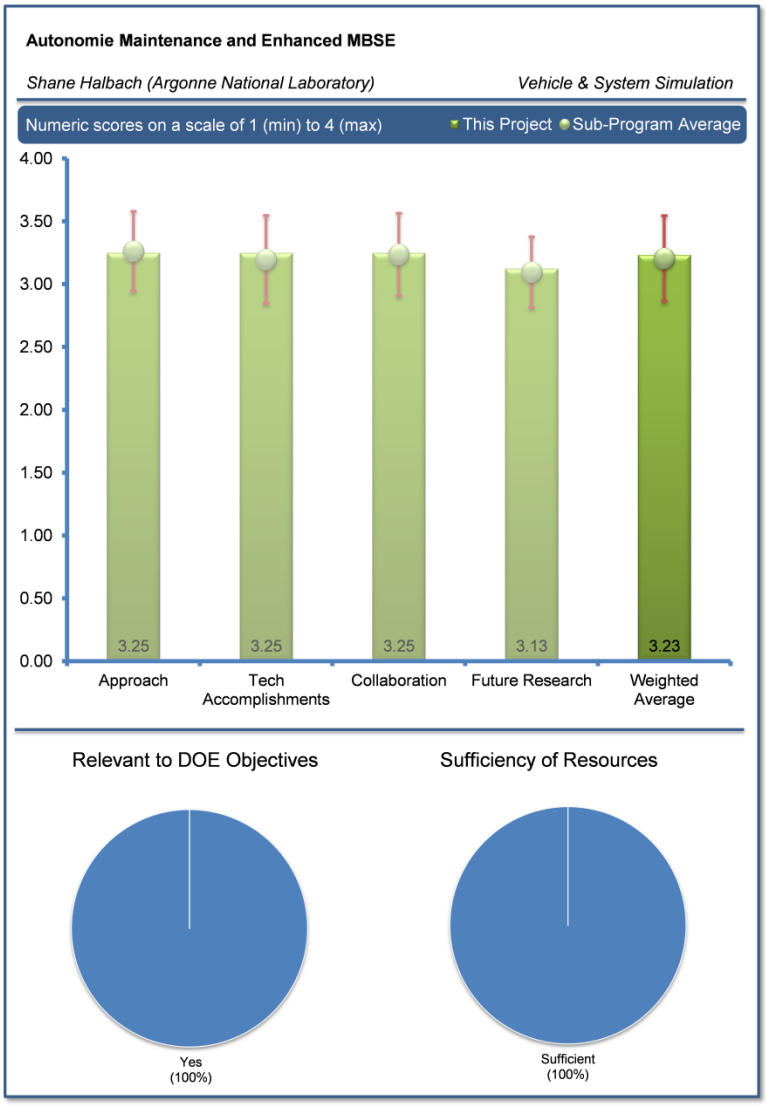
Reviewer 1:
The reviewer said that the project was very good overall.

Reviewer 2:
The reviewer commented that it appears that the project has sufficient funding to cover all of its milestones.

Reviewer 3:
The reviewer emphasized what a budget.

Reviewer 4:
The reviewer indicated that the project is winding down.

Autonomie Maintenance and Enhanced MBSE: Shane Halbach (Argonne National Laboratory) - vss139



Reviewer Sample Size

A total of four reviewers evaluated this project.

Question 1: Approach to performing the work - the degree to which technical barriers are addressed, the project is well-designed, feasible, and integrated with other efforts.

Reviewer 1:

The reviewer said that using a virtual engineering approach to accelerate the vehicle development process is an excellent practice. By using this approach the barriers of accelerating technology evaluation and bringing technologies to market faster are addressed in this project.

Reviewer 2:

The reviewer stated that Autonomie vehicle simulation tool has a large user base and is highly integrated with the R&D efforts of industry. The reviewer indicated that universities and national laboratories are to conduct R&D on vehicle efficiency improvements. The reviewer added that maintaining the simulation tool and adding features are vital to enable this user base to continue their R&D efforts and is highly aligned to the DOE's efforts to displace petroleum. Also, the reviewer said that some of this workload is a result on the dependency to Matlab/Simulink tool. The reviewer said that an alternative approach to consider is the creation of a stand-alone tool.

Reviewer 3:

The reviewer commented that since they come from industry, where they have already performed many vehicle simulations,, the reviewer was not just juiced on this presentation. The commenter criticized that this work has already been done and that parts of industry are already great at this. The commenter suggested that instead of doing a "me-too" simulation; that the researchers work on those vehicles / powertrains / configurations that are not being done in the industry.

Reviewer 4:

The reviewer reported that the initiative to make Autonomie more accessible through the FMI is a significant achievement and improvement, as are the connections to BatPac as well as the MOO addition. The reviewer added that Autonomie is widely used in the industry, and this project serves to maintain the position as the preeminent modeling software. One small suggestion the reviewer had would be to have a trial version of the software to give potential users a feel for what the capabilities of the software are.

Question 2: Technical accomplishments and progress toward overall project and DOE goals – the degree to which progress has been made, measured against performance indicators and demonstrated progress toward DOE goals.

Reviewer 1:
The reviewer indicated that technical accomplishments and progress of this project has been excellent. The reviewer pointed out that several new models, tool integration and software have been developed which will lead to added capabilities of Autonomie.

Reviewer 2:
The reviewer commented that there is a significant workload of accomplishments completed, including upgrades of features to make Autonomie more compatible with a larger user base (Functional Mockup Interface, BatPac, and co-simulation). Additional component models (dual clutch transmissions, PHEV 2-mode configuration) and general upgrades are to be compatible with newer Matlab versions.

Reviewer 3:
The reviewer remarked that the milestones page does not contain enough information to judge the progress of this project. The reviewer added that a more comprehensive presentation of specific milestones, including their date and past results should be included in subsequent years.

Question 3: Collaboration and coordination with other institutions.

Reviewer 1:
The reviewer reported that collaboration and coordination is very good. The reviewer added that ANL has worked closely with national laboratories and OEMs such as GM and Ford to get feedback to help enhance Autonomie.

Reviewer 2:
The reviewer observed that there appears to be considerable collaboration with other institutions and organizations. The reviewer suggested that more collaboration with universities would be a good idea.

Reviewer 3:
The reviewer said that a large user base depends on the use of Autonomie for their research efforts.

Reviewer 4:
The reviewer criticized that this is already being done in industry. The commenter asked what the far-reach on this type of modeling and simulation is.

Question 4: Proposed future research – the degree to which the project has effectively planned its future work in a logical manner by incorporating appropriate decision points, considering barriers to the realization of the proposed technology, and, when sensible, mitigating risk by providing alternate development pathways.

Reviewer 1:
The reviewer commented that the future work is well defined and will continue to enhance Autonomie to provide support to VTO activities by gathering new requirements from industry.

Reviewer 2:
The reviewer remarked that the proposed work to continue maintenance and upgrades to Autonomie is needed to support the larger R&D community. The reviewer noted that one alternative approach for the future is to investigate Autonomie as a stand-alone tool and wean the tool off its dependency on Matlab/Simulink. The reviewer said that this would make the tool accessible to a larger user community without having to purchase Matlab/Simulink licenses and avoid having to perform maintenance updated based on Matlab/Simulink changes.

Reviewer 3:
The reviewer mentioned that outside of the plans for large-scale simulation, the plans for future work on the project are relatively modest; however, the maintenance work required to keep Autonomie current is very important in its own right.

Question 5: Does this project support the overall DOE objectives of petroleum displacement? Why or why not?

Reviewer 1:
The reviewer stated that Autonomie is a relevant research tool for evaluation the effectiveness of fuel savings technologies and is highly aligned with DOE's mission.

Reviewer 2:
The reviewer said that Autonomie is a very relevant tool used by DOE to evaluate benefits of advanced technology and industry to help with market introduction of new technologies.

Reviewer 3:
The reviewer pointed out that Autonomie is a very important tool to a variety of stakeholders in the automotive industry. The reviewer added that this project is an important DOE venture to reduce petroleum consumption by allowing design of advanced vehicles to proceed more quickly and efficiently.

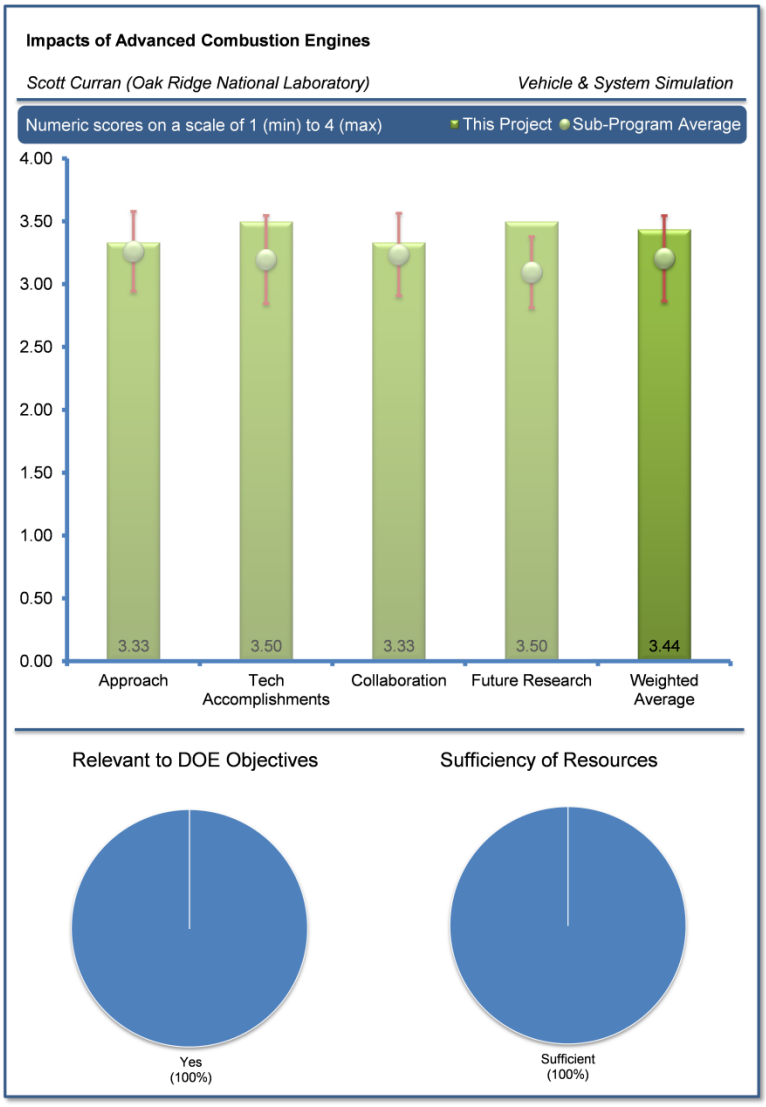
Question 6: Resources: How sufficient are the resources for the project to achieve the stated milestones in a timely fashion?

Reviewer 1:
The reviewer reported that the funding of this project appears appropriate and is relatively low, meaning that the DOE is receiving good value for its investment.

Reviewer 2:
The reviewer remarked that funding appears to be sufficient to implement this project successfully.

Reviewer 3:
The reviewer said that funding appears to be sufficient.

Impacts of Advanced Combustion Engines: Scott Curran (Oak Ridge National Laboratory) - vss140



Reviewer Sample Size

A total of three reviewers evaluated this project.

Question 1: Approach to performing the work - the degree to which technical barriers are addressed, the project is well-designed, feasible, and integrated with other efforts.

Reviewer 1:

The reviewer said that there was a strong technical approach and growth strategy. The reviewer added that the project had good relevance to industry with cooperative relationship through crosscut committee. Also, the reviewer said that there was an excellent cross relationship with other ORNL related projects.

Reviewer 2:

The reviewer stated that this task is focused on examining the fuel economy potential and resulting emissions and mitigation schemes for reactivity controlled compression ignition (RCCI) combustion. This multi-mode approach involves a RCCI operating regime and a conventional diesel operating mode. The RCCI regime may be fueled by gasoline or biofuel, while the conventional diesel combustion mode is fueled by diesel or a biodiesel blend. RCCI offers significant potential to increase fuel economy, even above diesel engines, in both conventional and hybrid vehicle applications. Oxides of nitrogen (NO_x) are significantly reduced; however, hydrocarbons (HC) and carbon monoxide (CO) increase considerably. The reviewer added that this activity is being conducted to support U.S. automakers in meeting 2025 Corporate Average Fuel Economy (CAFE) standards and EPA Tier III emissions regulations. The reviewer commented that the ORNL approach to this task appears sound: development of advanced steady state combustion maps from dynamometer measurements with exhaust species; evaluation of the fuel economy potential of RCCI advanced combustion in conventional and hybrid light duty powertrains; evaluation of the complete drive cycle implications on emissions /after treatment requirements; and evaluation of the effect of fuels on multi-mode operation. Also, the reviewer stated that multi-cylinder advanced combustion engine experiments are conducted, followed by aftertreatment model integration, and subsequently vehicle systems level modelling. The reviewer said that updating and refining after treatment component models depends upon timely acquisition of the latest available data on device physics and chemistry.

The commenter suggested that the concept of using two fuels may lead to a customer acceptance issue, but the commenter noted that the approach of developing a blended fuel that can be used that broadens the RCCI operating domain has good value. The reviewer asked if there is any data that has investigated adoption of dual fuel vehicles by consumers. If the project is successful, the project evaluator indicated that the modeling capability will be very helpful to system designers to make substantive system level changes and have a high degree of confidence that fuel and emissions targets will be met prior to building product. The reviewer suggested that there should be more parallel validation of the model against advanced systems under test at OEMs or at DOE labs to gain confidence in

modelling capability. The commenter also commented that the briefing should have shown the predicted versus actual for fuel economy, performance, and emissions.

Reviewer 3:
The reviewer stated that they were stuck on the acronym FLT, asking what it stands for. The commenter recommended that an acronym listing be given because it was not properly introduced in a manner that the reviewer could find. The commenter noted that there are many more acronyms in this briefing that are not introduced. The project evaluator offered that this made the presentation hard to follow. The reviewer explained that the relevance of the work is excellent and the result integrates with Autonomie.

Question 2: Technical accomplishments and progress toward overall project and DOE goals – the degree to which progress has been made, measured against performance indicators and demonstrated progress toward DOE goals.

Reviewer 1:
The reviewer noted that the project had impressive results so far; even though it is early in the program, an excellent data set was presented.

Reviewer 2:
The reviewer recognized that excellent progress has been made to date for the funding level of the project.

Reviewer 3:
The reviewer reported that the project has made significant technical progress including updating and refining RCCI multi-mode engine maps and transient combustion models for dual-mode combustion engines. These efforts have identified opportunities including a multi-mode strategy for high load transition with potential fuel efficiency gains, as well as a multi-mode strategy for low-load transition which has identified emissions concerns including the presence of sub 200°C exhaust temperatures with high HC and CO, which represent challenges for current oxidation catalysts. The reviewer added that accomplishment number two expanded range enabled by biofuels and RCCI drive cycle coverage over city and highway cycles, and further noted that 100% coverage of LTC is necessary to avoid mode switching and resulting FE and emission control penalties. This task has identified expanded low and high load operating range due to higher port fuel injection to direct injection ratio for a 20% biodiesel blend and gasoline. Using diesel and a 30% ethanol blend, an expanded high load was observed due to higher octane and charge cooling, while a reduced low load was observed due to stability issues. Also, the reviewer indicated that accomplishment number three utilized vehicle systems simulations to enable drive cycle coverage comparisons of renewable fuels. Modeling results show greater than 75% drive cycle coverage with RCCI over Urban Dynamometer Driving Schedule (UDDS) and Highway Fuel Economy Test (HWFET) cycles with B20 and gasoline. A 41% improvement in combined city/highway MPG was demonstrated compared to port fuel injection baseline and a 6% improvement over the combined cycles compared to conventional diesel combustion. Accomplishment four has successfully simulated the fuel economy of several RCCI enabled HEVs. Initial modeling shows significant improvement with RCCI-enabled HEV configurations over PFI and even diesel HEVs. A similar increase is seen with RCCI in both conventional and HEV powertrains. The reviewer added that accomplishment five is an initial simulation comparison among port fuel injection (PFI), gasoline direct injection (GDI), conventional diesel combustion (CDC), and RCCI in a power-split mid-sized hybrid sedan including cold start cycles. Results indicate RCCI achieves higher fuel economy than CDC and GDI with significantly lower NO_x, but higher CO and HC. The reviewer said that, overall, the project had an impressive list of accomplishments for the project, especially given a project start date of October 2013.

Question 3: Collaboration and coordination with other institutions.

Reviewer 1:
The reviewer stated that the collaboration group is impressive especially within ORNL. The reviewer would like to see some specific participants from engine manufacturing group if possible.

Reviewer 2:
The reviewer observed that this project demonstrates excellent coordination and collaboration with VTO between Advanced Combustion Engine, Fuels/Lubricants, and VSST. VTO Advanced Combustion has and is providing funding for development of combustion maps

while Fuels and Lubricants technologies is providing funding to evaluate the effects of drive cycle coverage as related to fuels. VSST is providing funding to conduct simulations at the vehicle level including fuel economy simulations of RCCI-enabled HEVs and conventional vehicles. The reviewer added that it also appears to be well coordinated with industry, suppliers, universities, and national laboratories through U.S. DRIVE tech team participation and involvement in Cross-Cut Lean Exhaust Emissions Reduction Simulation (CLEERS). The reviewer said that the project is well coordinated within ORNL itself indicating several ORNL projects with which it is being coordinated. It is important to keep up this strong collaboration especially with industry and suppliers to be sure research and modelling activities continue to track with industry needs and business realities.

Reviewer 3:
The reviewer suggested that there should be one or more OEM/powertrain suppliers as partners in this project to enable modeling verification and validation of correlation of the model against real vehicles/powertrains. The commenter noted that currently all of the collaborators are with the DOE/DOE laboratories.

Question 4: Proposed future research – the degree to which the project has effectively planned its future work in a logical manner by incorporating appropriate decision points, considering barriers to the realization of the proposed technology, and, when sensible, mitigating risk by providing alternate development pathways.

Reviewer 1:
The reviewer stated that this was a good startup plan and logical plan for the remainder of the program.

Reviewer 2:
The reviewer stated that the proposed future work seems reasonable and in line with activities needed to further explore and validate the potential of RCCI enabled conventional and hybrid electric vehicles. The reviewer added that efforts to examine/model potential after treatment scenarios and potential mitigation schemes to address higher HC and CO emissions, as well as continued vehicle level simulations seem particularly relevant. Also, the reviewer said little mention at this point is made of looking at potential vibration, harshness, and durability issues, may be something to consider in the not too distant future.

Reviewer 3:
The reviewer proposed that a plan with timing and collaborators/resources would be helpful in understanding what will be done and when and how the project collaborators contribute to the completion of the project. The commenter agreed with the proposed research. The reviewer suggested that in addition to the proposed future work should be collaboration with one or more vehicle OEMs/powertrain providers. The project evaluator indicated that the proposed research level is excellent for the funding level.

Question 5: Does this project support the overall DOE objectives of petroleum displacement? Why or why not?

Reviewer 1:
The reviewer claimed that the modeling capability will help system designers to meet CAFE and emissions requirements with a higher degree of confidence before pouring metal and making chips.

Reviewer 2:
The reviewer stated that the ideal activity for a national laboratory is to explore and define advanced technology and transfer to industry.

Reviewer 3:
The reviewer stated that 2025 CAFE requirements and EPA Tier 3 emission requirements are very challenging and will require substantial increases in vehicular fuel economy with concomitant reductions in emissions. The reviewer added that while significant progress may be achieved with various forms of electrification, vehicle weight reduction, auxiliary load mitigation, etc., significant further improvements in the fuel efficiency and emissions characteristics of heat engines will likely be required. This person explained that RCCI-enabled engines are showing promise in this regard and may be a key enabling technology to meet future requirements.

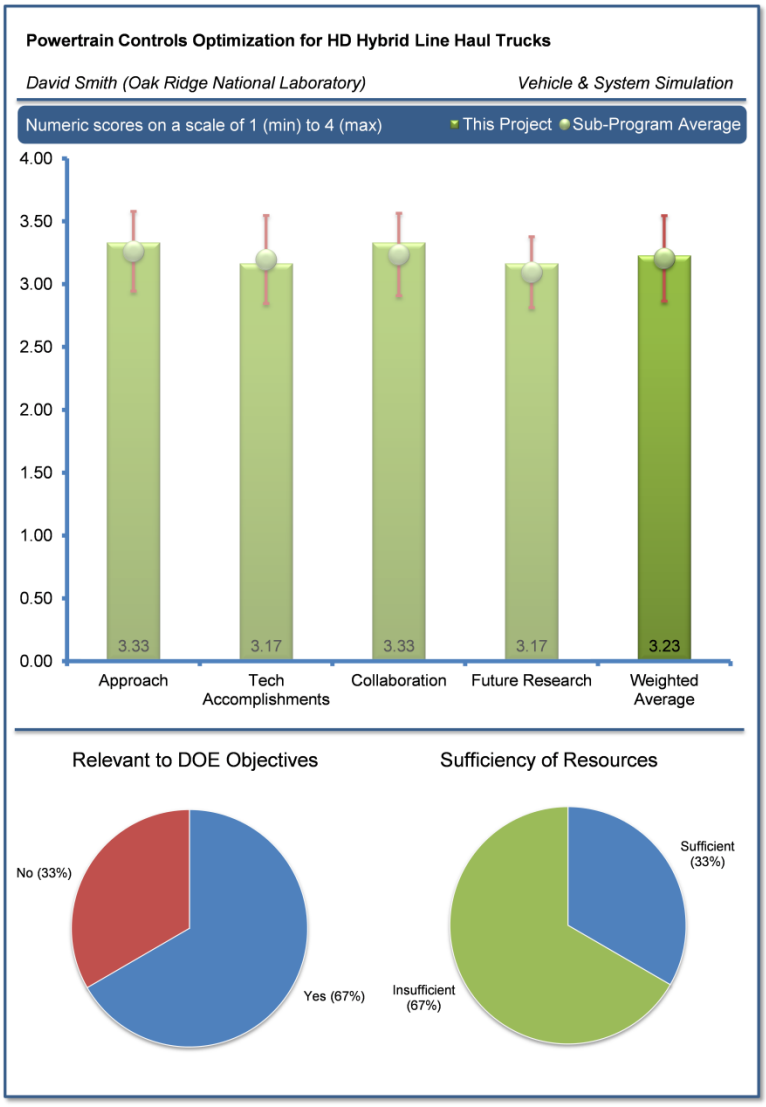
Question 6: Resources: How sufficient are the resources for the project to achieve the stated milestones in a timely fashion?

Reviewer 1:
The reviewer commented that funding is probably bordering on insufficient, but no specific holes in research plan were identified.

Reviewer 2:
The reviewer reported that presented resources are sufficient for the presently outlined tasks.

Reviewer 3:
The reviewer agreed that the funding may be sufficient to support the analytical/modelling effort. However, the reviewer added that the funding does not seem to be sufficient to complete the level of dynamometer testing on engines as discussed in the future work.

Powertrain Controls Optimization for HD Hybrid Line Haul Trucks: David Smith (Oak Ridge National Laboratory) - vss141



Reviewer Sample Size

A total of three reviewers evaluated this project.

Question 1: Approach to performing the work - the degree to which technical barriers are addressed, the project is well-designed, feasible, and integrated with other efforts.

Reviewer 1:

The reviewer really liked this project; it takes on a good role for an industry that does not invest much in this area. The reviewer added that the strategy is sound with strong partners.

Reviewer 2:

The reviewer stated that the approach leverages previous work regarding Ultra Caps in LD vehicles.

Reviewer 3:

The reviewer described that they support the approach of RCCI with the engine; however, they cautioned that series hybrid electric powertrains are very expensive and their adoption versus a parallel system is going to be highly-challenged because of the cost versus additional benefit (if any) is not justified. The project evaluator suggested the researchers look for a hybrid concept that has a higher likelihood of being relevant. The reviewer explained that unless the capability of ultracapacitors has improved, the size, weight, and cost of ultracapacitors are not a good candidate as a part of the solution. The commenter asserted that the size of the system to capture the regenerative energy of a loaded Class 8 truck is enormous; way bigger than for Li-ion batteries. The Meritor hybrid seems to require a large energy storage system, but regenerative braking should not overtax the batteries. The reviewer also remarked that the Meritor hybrid system has been discontinued, so using it as a basis for design may be flawed as well. The commenter believes that the cost of the system is prohibitive to user adoption.

Question 2: Technical accomplishments and progress toward overall project and DOE goals – the degree to which progress has been made, measured against performance indicators and demonstrated progress toward DOE goals.

Reviewer 1:

The reviewer commented that the project had a strong start for the fiscal year. The reviewer added that there were good steps in the technology plan, appears to be an aggressive, heavily reliant on related programs at ORNL.

Reviewer 2:

The reviewer suggested that the concept of the system architecture be re-investigated. The goal is to lead to substantive reduction in petroleum reduction, so if nothing is adopted, then there will be no net impact. The reviewer did indicate that the milestone of achieving RCCI operation with the engine is good.

Question 3: Collaboration and coordination with other institutions.

Reviewer 1:
The reviewer said that there were excellent supporting organization inside and industrial.

Reviewer 2:
The reviewer acknowledged that the collaboration partner of Cummins is good. The reviewer, however, asserted that the collaboration of Meritor is poor, given that they have discontinued development of the system and have disbanded their hybrid group as the reviewer understood.

Question 4: Proposed future research – the degree to which the project has effectively planned its future work in a logical manner by incorporating appropriate decision points, considering barriers to the realization of the proposed technology, and, when sensible, mitigating risk by providing alternate development pathways.

Reviewer 1:
The reviewer mentioned that the presenter indicated that a component of the experimental hardware had reached end-of-life, for example, Meritor Inverter Power Electronics. This indicates that the validation phase of the design work will be unable to use that hardware for validation and will likely reduce the evidence to support project conclusions.

Reviewer 2:
The reviewer commented that there was a good program plan and aggressive schedule for the year. The reviewer added that technical areas are complete and of high interest. The reviewer would have liked to see a broader set of technologies evaluated in a follow on program.

Reviewer 3:
The reviewer criticized that the hybrid energy storage approach is flawed because it is too heavy and too big. The reviewer explained that Li-ion batteries alone are a better value per pound, cost, performance, and size.

Question 5: Does this project support the overall DOE objectives of petroleum displacement? Why or why not?

Reviewer 1:
The reviewer said absolutely. The reviewer explained that the heavy industry is highly segmented unlike the autos. This type of evaluation is needed, which requires the participation of engine and transmission manufacturers. The reviewer added that the addition of another transmission manufacturer would be impressive (e.g., possibly Allison and possibly one of the chassis OEMs).

Reviewer 2:
The reviewer stated that the vision for the project is aimed at supporting the DOE objectives but the game plan to achieve the vision is seriously flawed.

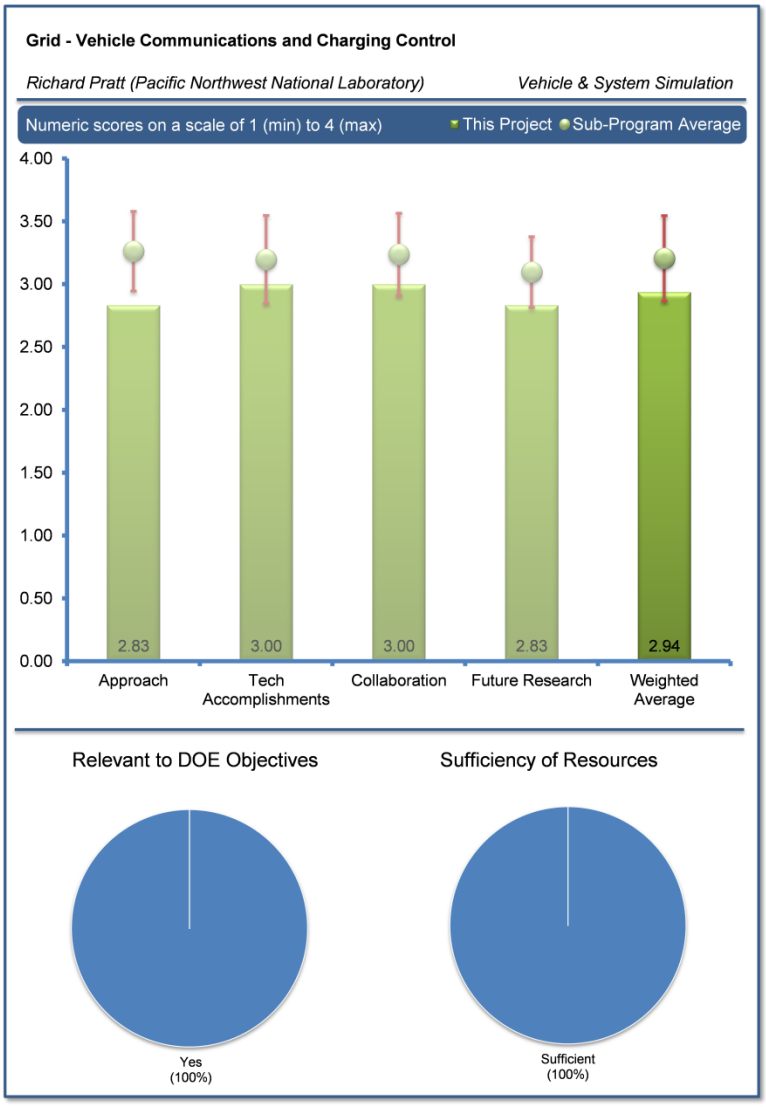
Question 6: Resources: How sufficient are the resources for the project to achieve the stated milestones in a timely fashion?

Reviewer 1:
The reviewer commented that this project needs more resources to ensure that experimental equipment can be maintained and rebuilt to enable validation of optimization strategies.

Reviewer 2:
The reviewer stated that the project had a good start and should expand after this year's run for the project trial. The reviewer said the team should look to expand on truck industry partners.

Reviewer 3:
The reviewer suggested that the project be revisited for scope/plan.

Grid - Vehicle Communications and Charging Control: Richard Pratt (Pacific Northwest National Laboratory) - vss142



Reviewer Sample Size

A total of three reviewers evaluated this project.

Question 1: Approach to performing the work - the degree to which technical barriers are addressed, the project is well-designed, feasible, and integrated with other efforts.

Reviewer 1:

The reviewer stated that the overall project has merit with the potential to reduce grid loads and energy storage requirements, transformer upgrades, and increase renewable energy utilization. The project consists of two basic activities. The first is exploration of advanced control strategies needed to optimize performance and efficiency of EV charging with associated hardware-in-the-loop testing of charging systems. The second is to support SAE standards committees for EV charging and grid connection, as well as the Smart Grid Interoperability Panel. The reviewer added that the approach to exploration of advanced control strategies is basically sound utilizing PNNL's powered and metered manufactured home and three employee-driven EVs. It is not clear, however, why three EVs would be hooked up to the same home as it is not likely any family will have more than one EV. In short, the reviewer said it would be good to develop a limited portfolio of additional potential use case scenarios, test them, and then draw more robust conclusions. Nonetheless, incorporating two customer preferences into charging including energy required and charge completion time seems to be accurate and likely predictive of customers' behavior. A maximum power goal reduction of 25% also seems on target. The reviewer also reported that with regards to support to the SAE standards committees and the Smart Grid Interoperability Panel (SGIP), it is hard to evaluate the approach here outside of the obvious committee participation and input process.

Reviewer 2:

The reviewer stated that it is not clear what the overall goal of the standards development portion of the project is. The reviewer added that standards development seems to be one of the objectives, but the SAE standards work is not being led by this project, and it is unclear what the impact of this project has been on the standards' development. The reviewer commented that the charge rate reduction portion of the project seems promising but without the connection with the building loads, remains too theoretical. It is too late because the project is ending in September 2014, but the reviewer believed this should have been part of the project from its inception. The reviewer would get customer preferences for range, not energy. The reviewer also said that not enough people will be able to express how much energy they want, but most will be know how much range that they prefer.

Reviewer 3:

The reviewer observed that the PI's coordinated charging strategy is based on historical grid load profiles and lookup tables based on ambient temperature. The reviewer suggested that the PI consider using grid synchrophasor data and other inputs as additional feedback

variables to support faster real-time control of the J1772 control signal duty cycle. The reviewer stated that in addition to local peak power thresholds and time of use targets, this could support utility company objectives to reduce demand at specific times.

Question 2: Technical accomplishments and progress toward overall project and DOE goals – the degree to which progress has been made, measured against performance indicators and demonstrated progress toward DOE goals.

Reviewer 1:
The reviewer said that the PI has made good progress. Last year, the PI was working to understand the J1772 standard and charge rate control. This year, the PI has taken measurements of real-time electrical consumption data in residential applications and active control of the PHEV chargers has been achieved to demonstrate a local coordinated charging strategy. The reviewer added that the PI was able to reduce peak loading by 26% using this strategy.

Reviewer 2:
The reviewer stated that the overall accomplishments for the task are reasonable given the current task duration and funding levels. For the scenario identified above under approach, the project has demonstrated the ability to reduce peak load by 26% using charging rate control for one use case scenario. Additionally, the reviewer said that three identical prototype charging rate control modules were developed and tested on EVSEs from three different manufacturers. The reviewer stated that with regards to standards support accomplishments, it is more difficult to gauge accomplishments although it is clear progress has and is being made on a number of SAE standards with regards to EVs and charging, as well as leadership support provided to the SGIP to accelerate development and harmonization of V2G codes and standards.

Reviewer 3:
The reviewer reported that the SAE standards have been updated and the work towards V2G standards is said to be ongoing; however, it is unclear what the status is of the latter, and how the work on these standards will reduce barriers to petroleum displacement. The reviewer added that the HIL study, if the connection with the house loads was not intended to be part of the project, appears to be on schedule

Question 3: Collaboration and coordination with other institutions.

Reviewer 1:
The reviewer stated that the level of collaboration and coordination for the project is acceptable including interactions with SAE, NIST, University of Vermont, and one industry partner, AeroVironment. The reviewer added that it seemed the project should have more extensive collaboration, including utilities, as well as additional EVSE manufacturers and potentially home energy control systems partners such as Johnson Controls. It is mentioned under Gaps that utility incentives for coordinated charging are beginning to appear in several regions.

Reviewer 2:
The reviewer remarked that more industry partners would be useful here. The reviewer asked if AeroVironment is the only EVSE OEM that was willing to participate. The reviewer added that the collaboration on the standards development appears sound.

Reviewer 3:
The reviewer commented that the PI is collaborating with Aerovironment to integrate the coordinated charging features into their EV chargers. The PI is also working with Professor Steve Letendre from the University of Vermont as well as the standards committees SAE and NIST.

Question 4: Proposed future research – the degree to which the project has effectively planned its future work in a logical manner by incorporating appropriate decision points, considering barriers to the realization of the proposed technology, and, when sensible, mitigating risk by providing alternate development pathways.

Reviewer 1:
The reviewer stated that the proposed work for the balance of FY 2014 is a logical extension of the current activities with field testing of coordinated charging (HIL) including examining static energy use goals, variable energy use goals, and determining vehicle response to external control. Additionally, activities will develop control strategies needed to optimize performance and efficiency of EV charging. The reviewer added that the final product is to prepare a report summarizing tested and projected technology options that can be exercised for automotive applications. One concern the reviewer had is whether enough collaboration and communication is being undertaken with those entities which would ultimately have to accept and implement recommended control strategies. It is important that the final report has a very clearly defined audience and that recommendations are not developed somewhat in a vacuum. Additionally, it seems that having a few additional use cases would be beneficial instead of relying on one case with three EVs and a single determination of when each one would be back ready to charge, before drawing peak load reduction conclusions.

Reviewer 2:
The reviewer stated that with the project ending in September, the proposed future work on the HIL study appears to be within reason for completion. It is unclear what remains for the standards development portion.

Reviewer 3:
The reviewer observed that the PI would benefit from a more comprehensive future research strategy. Presently, he has investigated frequency regulation and coordinated charging. The reviewer added that future research efforts involve further coordination with the utilities; however, limited details were provided.

Question 5: Does this project support the overall DOE objectives of petroleum displacement? Why or why not?

Reviewer 1:
The reviewer said that the project has relevance in that it offers advantages for reducing grid loads, delaying transformer upgrades, and potentially improving renewable energy utilization and lowering energy storage requirements. The reviewer added that Intelligent Vehicle Charging Infrastructure can offer substantial economic benefits and help reduce the cost of the overall EV infrastructure ecosystem.

Reviewer 2:
The reviewer reported that controlling the loads from PEV charging will impact utilities' acceptance of PEVs, for example, preventing local transformer overload. It can also increase customer acceptance, especially commercial customers who are subject to demand charges. The reviewer added that this project is a step towards increasing the viability of PEVs when it comes to reducing charging costs and eventually V2G infrastructure and this has the potential to reduce petroleum consumption.

Reviewer 3:
The reviewer pointed out that the developed methods can be used to maximize the use of vehicle chargers during periods of peak availability of renewable sources, for example, wind and solar. The reviewer added that the methods can also be used to reduce the need to bring less efficient generation capacity online.

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

Reviewer 1:
The reviewer said that resources are sufficient for current and projected activities.

Reviewer 2:
The reviewer commented that the funds allocated for this project were relatively modest, and appeared to be sufficient.

Reviewer 3:

The reviewer stated that the project was on track with the current level of resourcing.

Acronyms and Abbreviations

Acronym	Definition
AC	Alternating Current
A/C	Air-Conditioning
ACEC	Advanced Combustion & Emissions Control
AER	All-electric range
AEV	All electric vehicle
AHD	Advanced Hybrid Drives
AMR	Annual Merit Review
AMT	Air maintenance technology
ANL	Argonne National Laboratory
ANSI	American National Standards Institute
APEEM	Advanced Power Electronics and Electric Machines Program
AQMD	Air Quality Management Districts
ARPA-E	Advanced Research Projects Agency - Energy
APRF	Advanced Powertrain Research Facility (ANL)
APU	Auxiliary Power Unit
ARRA	American Recovery and Reinvestment Act
AVTA	Advanced Vehicle Testing Activity
BARTA	Berks Area Regional Transport Authority
BEV	Battery Electric Vehicle
BMS	Battery Management System
CAE	Computer aided engineering
CAFE	Corporate Average Fuel Economy
CAN	Controller Area Network
CARB	California Air Resources Board
CD	Charge Depleting
CDC	Conventional diesel combustion
CFD	Computational Fluid Dynamics
CLEERS	Cross-Cut Lean Exhaust Emission Reduction Simulation
CNG	Compressed Natural Gas
CO	Carbon Monoxide
CO_2	Carbon Dioxide
CPUC	California Public Utilities Commission
CRADA	Cooperative Research and Development Agreement
CS	Charge Sustaining
D3	Downloadable Dynamometer Database
DC	Direct Current
DOD	Department of Defense
DOE	Department of Energy
DOT	Department of Transportation
DQA	Data Quality Act
DSRC	Dedicated Short-Range Communications

Acronym	Definition
DWTP	Dynamic wireless power transfer
ECU	Engine control unit
EDLC	Electrochemical double-layer capacitors
EG	Ethylene glycol
EGR	Exhaust Gas Recirculation
EPA	Environmental Protection Agency
EREV	Extended Range Electric Vehicle
ESS	Energy Storage Systems
EV	Electric Vehicle
EVSE	Electric Vehicle Supplemental (Supply) Equipment
FHWA	Federal Highway Administration
FOA	Funding Opportunity Announcement
FTMPG	Freight-ton-miles per gallon
FTP	Federal Test Procedure
FY	Fiscal Year
FOT	Field operational test
GCEV	Grid-connected electric-drive vehicle
GDI	Gasoline direct injection
GM	General Motors Corporation
GnP	Graphite nano-Platelets
GSF	Generic Speed Form
GPS	Global Positioning System
GHG	Greenhouse Gas
H_2	Hydrogen
HC	Hydrocarbons
HD	Heavy-Duty
HEV	Hybrid electric vehicle
HFET	Highway Fuel Economy Test
HHDDT	Heavy heavy-duty diesel truck
HHV	Hydraulic hybrid vehicle
HIL	Hardware in the Loop
HMI	Human-machine interface
HPD	High power density
HV	High voltage
HVAC	Heating Ventilating and Air Conditioning
HWFET	Highway Fuel Economy Driving Schedule
IAV	Ingenieurgesellschaft Auto und Verkehr
ICE	Internal Combustion Engine
INL	Idaho National Laboratory
ISO	International Organization for Standardization
ITS JPO	Intelligent Transportation Systems Joint Program Office
JARI	Japan Automotive Research Institute
kW	Kilowatt

Acronym	Definition
kWh	Kilowatt-hour
Li-ion	Lithium Ion
LD	Light-Duty
LEESS	Lower-energy energy storage system
LIC	Lithium ion capacitor
MD	Medium-Duty
MOVES	Motor Vehicle Emissions Simulator
MPG	Miles per gallon
MPGe	Miles per gallon equivalent
MTNW	Measurement Technology Northwest
NA	Naturally aspirated
NHTSA	National Highway Traffic Safety Administration
NiMH	Nickel-metal hydride
NIST	National Institute of Standards and Technology
NO_x	Oxides of Nitrogen
NREL	National Renewable Energy Laboratory
O_2	Oxygen
OBD	On-board diagnostics
OEM	Original Equipment Manufacturer
ORNL	Oak Ridge National Laboratory
PCM	Phase change material
PEV	Plug-in Electric Vehicle
PFI	Port Fuel Injection
PHEV	Plug-In Hybrid Electric Vehicle
PI	Principal Investigator
PM	Permanent magnet
PMP	Pontryagin Minimization Principle
PTO	Power take-off
R&D	Research and Development
RCCI	Reactivity controlled compression ignition
ROI	Return on Investment
SAE	Society of Automotive Engineers
SCAQMD	South Coast Air Quality Management District
SDO	Standards definition organizations
SGIP	Smart Grid Interoperability Panel
SI	Spark Ignition
SOC	State Of Charge
TIM	Thermal interface materials
TRACC	Transportation Research and Analysis Commuting Center
UDDS	Urban Dynamometer Driving Schedule
UMTRI	University of Michigan Transportation Research Institute
U.S. DRIVE	U.S. Driving Research and Innovation for Vehicle efficiency and Energy sustainability
V2G	Vehicle-to-Grid

Acronym	Definition
V2I	Vehicle-to-Infrastructure
V2V	Vehicle-to-Vehicle
VSS	Vehicle & System Simulation
VSST	Vehicle and Systems Simulation and Testing
VTMS	Vehicle thermal management system
VTO	Vehicle Technologies Office
WHR	Waste Heat Recovery
WPT	Wireless Power Transfer