6. Materials Technologies

Introduction

Advanced materials, including metals, polymers, composites, and intermetallic compounds, can play an important role in improving the efficiency of transportation engines and vehicles. Weight reduction is one of the most effective ways to increase the fuel economy of vehicles while reducing exhaust emissions. The use of lightweight, high-performance materials will contribute to the development of vehicles that provide better fuel economy, yet are comparable in size, comfort, and safety to today's vehicles. The advanced materials research conducted under the direction of the U.S. Department of Energy's Vehicle Technologies Program will help ensure the nation's transportation energy and environmental future by making affordable full-function cars and trucks that use less oil and produce fewer harmful emissions.

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

Presentation Title	Principal Investigator and Organization	Page Number	Approach	Technical Accomplishments	Collaborations	Future Research	Weighted Average
Materials Characterization Capabilities at the High Temperature Materials Laboratory and HTML User Program Success Stories	Edgar Lara-Curzio (Oak Ridge National Laboratory (ORNL))	6-5	3.50	3.00	3.00	3.00	3.13
Low Cost Carbon Fiber Research in the LM Materials Program Overview	David Warren (Oak Ridge National Laboratory (ORNL))	6-9	3.50	3.50	3.00	3.00	3.38
Low Cost Carbon Fiber from Renewable Resources	Fred Baker (Oak Ridge National Laboratory (ORNL))	6-7	3.33	3.67	2.33	3.00	3.33
Advanced Oxidation & Stabilization of PAN-Based Carbon Precursor Fibers	Eng-Felix Paulauskas (Oak Ridge National Laboratory (ORNL))	6-9	3.25	3.00	3.25	3.00	3.09
Precursor and Fiber Evaluation	Dave Warren (Oak Ridge National Laboratory (ORNL))	6-11	3.75	3.50	3.00	3.25	3.47
Polymer Composites Research in the LM Materials Program Overview	Dave Warren (Oak Ridge National Laboratory (ORNL))	6-13	3.00	2.67	3.00	2.67	2.79
Carbon Fiber SMC	C.S. Wang (General Motors Corporation)	6-14	3.33	3.33	4.00	3.33	3.42
Structural Automotive Components from Composite Materials	Libby Berger (General Motors Corporation)	6-16	2.67	3.00	3.33	2.67	2.92
Predictive Technology Development and Crash Energy Management	Khaled Shahwan (Chrysler LLC)	6-18	2.33	2.00	2.00	2.33	2.13
TMAC User Program	R.E. Norris (Oak Ridge National Laboratory (ORNL))	6-20	3.25	3.00	3.00	2.75	3.03
Engineering Property Prediction Tools for Tailored Polymer Composite Structures	Mark Smith (Pacific Northwest National Laboratory (PNNL))	6-22	2.67	2.67	3.33	3.00	2.79

Presentation Title	Principal Investigator and Organization	Page Number	Approach	Technical Accomplishments	Collaborations	Future Research	Weighted Average
Natural Fiber Composites: Retting, Preform Manufacture & Molding	Mark Smith (Pacific Northwest National Laboratory (PNNL))	6-24	3.50	3.00	2.50	3.00	3.06
Overview of Joining Activities in Lightweighting Materials	Dean Paxton (Oak Ridge National Laboratory (ORNL))	6-25	3.25	3.00	3.00	3.25	3.09
Friction Stir Spot Welding of Advanced High Strength Steels	Glenn Grant (Pacific Northwest National Laboratory (PNNL))	6-27	3.00	3.00	3.33	2.50	2.98
Non-Destructive Inspection of Adhesive Bonds in Metal-Metal Joints	David Moore (Sandia National Laboratory (SNL))	6-28	3.33	3.67	3.00	3.33	3.46
Magnesium Powertrain Cast Components	James Quinn (General Motors Corporation)	6-30	3.33	3.67	3.67	3.33	3.54
High Integrity Magnesium Automotive Components (HIMAC)	James Quinn (General Motors Corporation)	6-32	3.50	3.00	4.00	3.00	3.25
Ultra Large Castings For Lightweight Vehicle Structures	James Quinn (General Motors Corporation)	6-33	3.67	3.67	4.00	3.33	3.67
Development of High-Volume Warm Forming of Low-Cost Magnesium Sheet	James Quinn (General Motors Corporation)	6-34	3.33	3.33	3.67	2.67	3.29
Magnesium Front End Research and Development AMD 604	James Quinn (General Motors Corporation)	6-36	3.50	3.50	3.50	3.00	3.44
Magnesium Front End Design and Development AMD 603	James Quinn (General Motors Corporation)	6-38	3.33	3.33	3.33	3.00	3.29
Low Cost Titanium Propulsion Applications	Curt Lavender (Pacific Northwest National Laboratory (PNNL))	6-40	3.00	3.00	3.00	3.00	3.00
Auto/Steel Partnership: Advanced High-Strength Steel Research and Development	Roger Heimbuch (A/SP)	6-41	3.00	2.67	3.67	2.67	2.88
NSF- 3d Generation Advanced High Strength Steel	Roger Heimbuch (A/SP)	6-43	3.67	3.33	3.33	3.33	3.42
Characterization of Thermo-Mechanical Behaviors of Advanced High Strength Steels (AHSS)	Mark Smith (Pacific Northwest National Laboratory (PNNL))	6-45	3.50	3.75	3.50	3.00	3.56
Auto/Steel Partnership: Fatigue of AHSS Strain Rate Characterization	Roger Heimbuch (A/SP)	6-47	3.33	3.33	3.33	3.00	3.29
Auto/Steel Partnership: Hydroforming Materials and Lubricant Lightweight Rear Chassis Structures Future Generation Passenger Compartment	Roger Heimbuch (A/SP)	6-48	3.33	3.00	3.67	2.67	3.13
Overview of Recycling Technology R&D	Ed Daniels (Argonne National Laboratory (ANL))	6-50	3.67	3.33	3.67	3.33	3.46
Post-Shred Materials Recovery Technology Development and Demonstration	Bassam Jody (Argonne National Laboratory (ANL))	6-51	3.00	3.00	3.00	2.50	2.94
Recycling Technology Validation	Joe Pomykala (Argonne National Laboratory (ANL))	6-52	3.50	3.50	4.00	3.50	3.56

Presentation Title	Principal Investigator and Organization	Page Number	Approach	Technical Accomplishments	Collaborations	Future Research	Weighted Average
Electron Microscopy Catalysis Projects: Success Stories from the High Temperature Materials Laboratory (HTML) User Program	*Lawrence Allard (Oak Ridge National Laboratory (ORNL))*	*6-53*	*3.00*	*2.00*	*3.00*	*2.00*	*2.38*
Advanced Battery Materials Characterization: Success Stories from the High Temperature Materials Laboratory (HTML) User Program	*Andrew Payzant (Oak Ridge National Laboratory (ORNL))*	*6-54*	*3.60*	*3.20*	*3.40*	*3.25*	*3.33*
Residual Stresses for Structural Analysis and Fatigue Life Prediction in Vehicle Components: Success Stories from the High Temperature Materials Laboratory (HTML) User Program	*Camden Hubbard (Oak Ridge National Laboratory (ORNL))*	*6-57*	*3.67*	*3.33*	*3.33*	*3.33*	*3.42*
Diesel Particulate Filtration (DPF) Technology: Success Stories at the High Temperature Materials Laboratory (HTML) User Program	*Amit Shyam (Oak Ridge National Laboratory (ORNL))*	*6-59*	*3.50*	*3.50*	*3.00*	*3.00*	*3.38*
Selection of a Wear-Resistant Tractor Drivetrain Material: Success Stories at the High Temperature Materials Laboratory (HTML) User Program	*Peter Blau (Oak Ridge National Laboratory (ORNL))*	*6-61*	*3.50*	*3.00*	*3.00*	*3.00*	*3.13*
High Temperature Thermoelectric Materials Characterization for Automotive Waste Heat Recovery: Success Stories from the High Temperature Materials Laboratory (HTML) User Program	*Hsin Wang (Oak Ridge National Laboratory (ORNL))*	*6-63*	*4.00*	*4.00*	*4.00*	*4.00*	*4.00*
OVERALL AVERAGE FOR LIGHTWEIGHT MATERIALS			**3.33**	**3.20**	**3.28**	**3.02**	**3.22**

NOTE: Italics denote poster presentations.

Overview of the Lightweight Materials Sub-program: Joseph Carpenter, U.S. Department of Energy

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

A reviewer stated the program area was well presented and all light weight material projects within the program are critical to reducing fuel consumption and to extending electric and hybrid vehicle range. This is especially critical that new fuel economy standards have been set. Another reviewer commented that the area was adequately covered, not only in Joe's presentation but also in the Q&A session. The presenters were very transparent in terms of issues and challenges and progress made over 2007/2008.

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

A reviewer stated as they mentioned at some of the presentations, NVH is not considered in any of the projects, even though NVH may be favorable in some lightweight material options, e.g., polymer matrix composites. The question arises whether or not light weighting of a vehicle affects NVH? The issue of safety is of course addressed and essentially answered: size matters! So keeping the size of the FreedomCAR constant, how does light weighting affect NVH? Another reviewer suggested that some of the projects need to be speeded up and funded as needed before there is no domestic auto industry or supplier base. They are also concerned about foreign companies copying or working around the intellectual property being developed and keeping the manufacturing capability off shore.

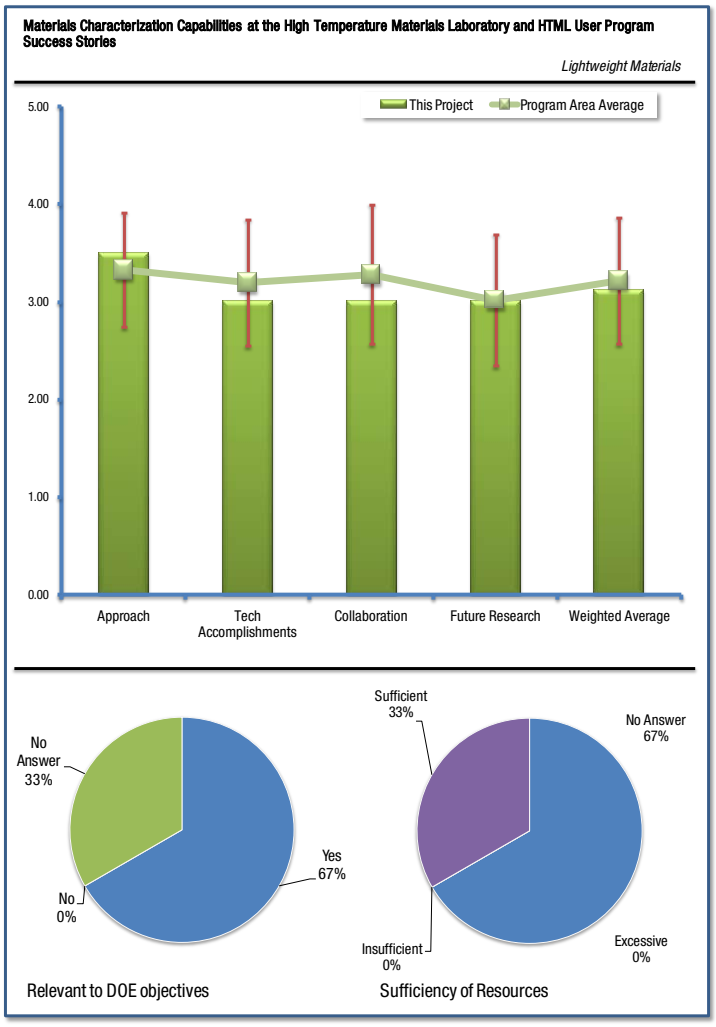
3. Does the Sub-program area appear to be focused, well-managed, and effective in addressing the DOE Vehicle Technologies Program R&D needs?

Both reviewers answered yes to this prompt, with one adding as far as the current program is structured based on the facts and issues at the time of conception. However, there seems to be difficulty in setting up gates in the sense of modifying programs as new facts arise. No provision for new concepts to be studied, as funding for most of the older projects is set with no cutoff to change horses if necessary or desired.

4. Other comments:

A reviewer stated there were not enough aluminum projects in spite of the fact that this material far outstrips magnesium in light weighting vehicles. The reason for this may have been lack of cooperation from aluminum companies in the past, but with the aluminum industry now strapped and times are different, perhaps it is the right time to approach the industry to get more cooperation. Also, concerns about Chinese control of the magnesium industry and their control of primary production and manufacture of magnesium structural components makes one wonder who benefits from all the DOE work on magnesium? Another reviewer mentioned the presenters all did a great job in this multifaceted program.

Materials Characterization Capabilities at the High Temperature Materials Laboratory and HTML User Program Success Stories: Edgar Lara-Curzio (Oak Ridge National Laboratory (ORNL))



Reviewer Sample Size

This project had a total of 3 reviewers.

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

One reviewer observed it wasn't easy to see for sure because the presentation was an overview of a very large array of projects. Having said that, it would appear that the work is directed at lightweighting and improving the performance of heat engines, both of which would tend to displace oil. Another noted lightweighting is the easiest way of displacing petroleum.

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

One reviewer again found it was a little hard to quantify the appropriateness of the approach because of the breadth of the presentation. It did appear from the examples given that the approaches to each of the projects described are appropriate.

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

One reviewer noted it would appear that progress on many issues has been excellent. The reviewers also noted many of the projects are fairly long-term and so it is hard to predict when they would be commercialized - and thus begin to contribute to decreasing the need for foreign oil.

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

One reviewer responded, noting the range of partnerships with industry and academia was indeed, impressive - although they all seemed to be U.S. based. The reviewer was not sure if this is a mandate, but often these types of projects are being done abroad as well.

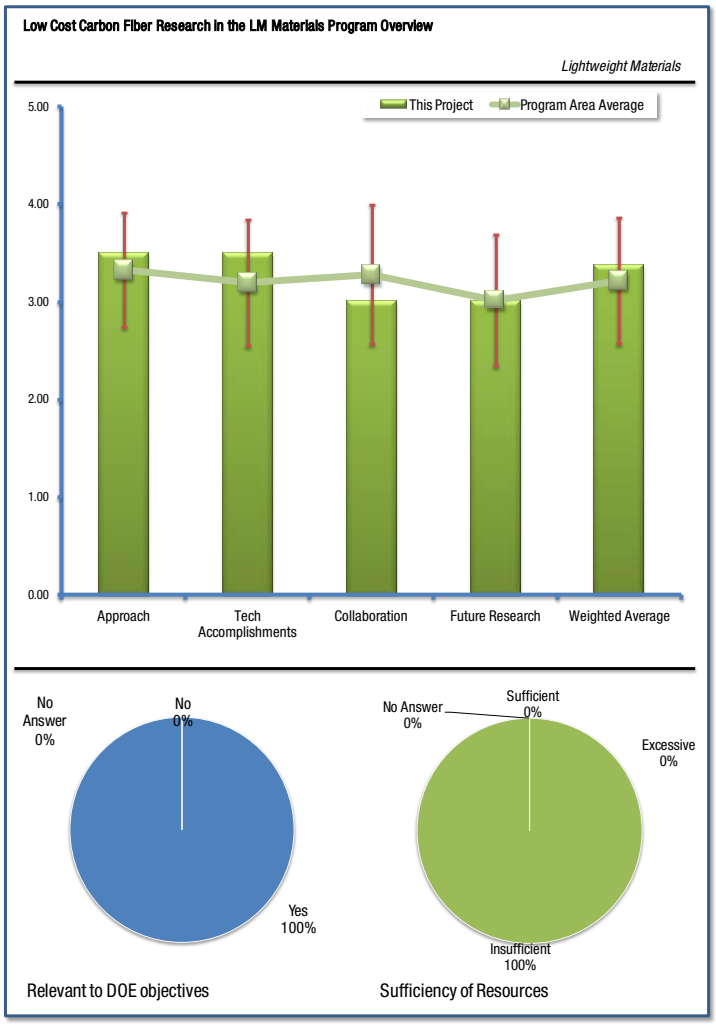
Question 5: Has the project effectively planned its future work in a logical manner by incorporating appropriate decision points, considering barriers to the realization of the proposed technology, and, when sensible, mitigating risk by providing alternate development pathways?

One reviewer noted the project sounds good.

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

One reviewer responded, noting they were not sure, but that it seems okay.

Low Cost Carbon Fiber Research in the LM Materials Program Overview: David Warren (Oak Ridge National Laboratory (ORNL))



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

Question 1: Does this project support the overall DOE objective of petroleum displacement? Why or why not?
Both reviewers found the project to find use life cycle beneficial. Questions remain about the production phase part of the life cycle and recycling. But there is a significant weight reduction potential.

Question 2: What is your assessment of the approach to performing the work? To what degree are technical barriers addressed? Is the project well-designed, feasible, and integrated with other efforts?
Both reviewers found the approach beneficial, and the projects well organized and sharply focused. A reviewer noted that manufacturing processes need to be simplified for high volume production transition.

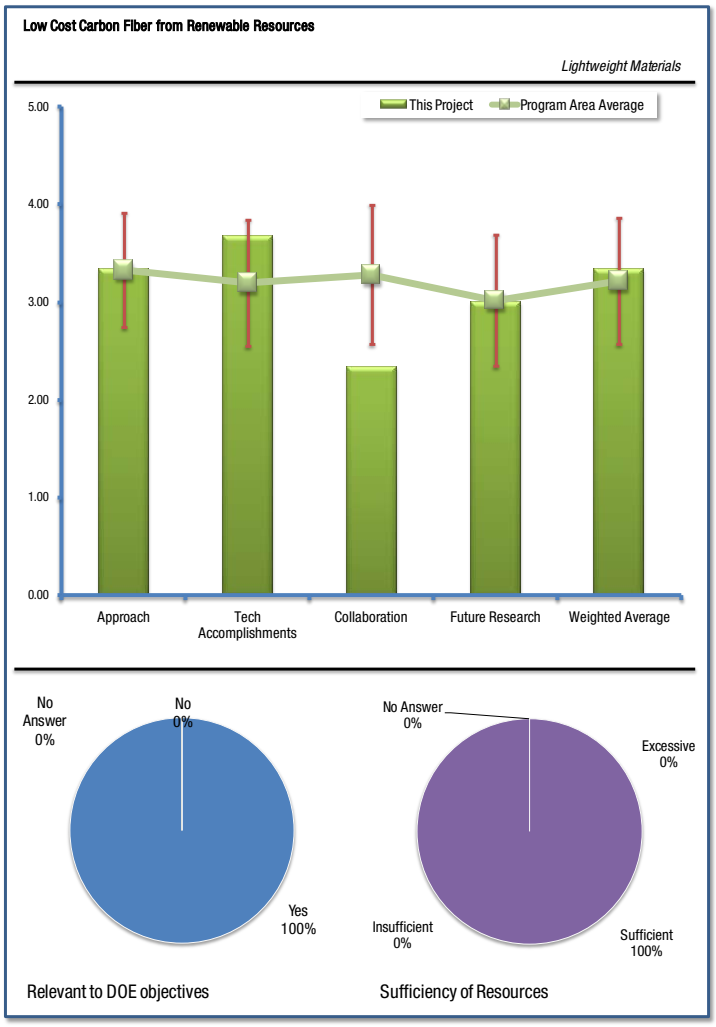
Question 3: Characterize your understanding of the technical accomplishments and progress toward overall project and DOE goals.
One reviewer responded, noting they cannot argue with the progress and technology so far, and the reviewer looks forward to the work on PE.

Question 4: What is your assessment of the level of collaboration and coordination with other institutions?
No comments.

Question 5: Has the project effectively planned its future work in a logical manner by incorporating appropriate decision points, considering barriers to the realization of the proposed technology, and, when sensible, mitigating risk by providing alternate development pathways?
No comments.

Question 6: How sufficient are the resources for the project to achieve the stated milestones in a timely fashion?
No comments.

Low Cost Carbon Fiber from Renewable Resources: Fred Baker (Oak Ridge National Laboratory (ORNL))



Reviewer Sample Size

This project had a total of 3 reviewers.

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

All three reviewers found the project meets the objectives of DOE. One noted it was able to meet lightweight materials objectives. Another observed that carbon fiber is a strong candidate for lightweighting - and this project could address the key problem of cost. Lastly, it was noted vehicle weight reduction is critical to improving fuel economy, driving range for electric and hybrid vehicle and carbon fiber can do that if the cost comes down dramatically.

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

Two reviewers noted some barriers in the approach, though it has potential. This project provides some methods to overcome some of the obstacles. The withdrawal of the key partner (MeadWestvaco) is a blow - but the whole project seems to be have recovered pretty well. The explanations provided for the economics and business aspects of the project were very helpful, as was the little video. Another reviewer noted that the barriers are well defined along with the focus areas to overcome them. This reviewer liked the fact that multiple feedstocks are being evaluated because different manufacturers may be able to use locally derived feedstock.

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

All three reviewers found the project plan to be very good in meeting objectives; however, there are many technical challenges which have to be solved. One reviewer noted, given the difficulties with the partner, things seem to be going very well. Achievement of the strength target will be a key goal for the next stage of the work now that the cost target appears to be in-hand. The presentation was somewhat curtailed (due to poor pacing) which prevented complete presentation of technical achievements and so a summary slide would have been helpful and quicker, commented one reviewer. Another noted the progress made on the winding speed will be significant in lowering fiber cost.

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

The reviewers held mixed opinions on the collaboration. One felt it was good; another found current partners to be the only suppliers of the feedstock, with the exception of the Swedish Research Institute. A suggestion was made by one reviewer that the project should get inputs from the final component manufacturers.

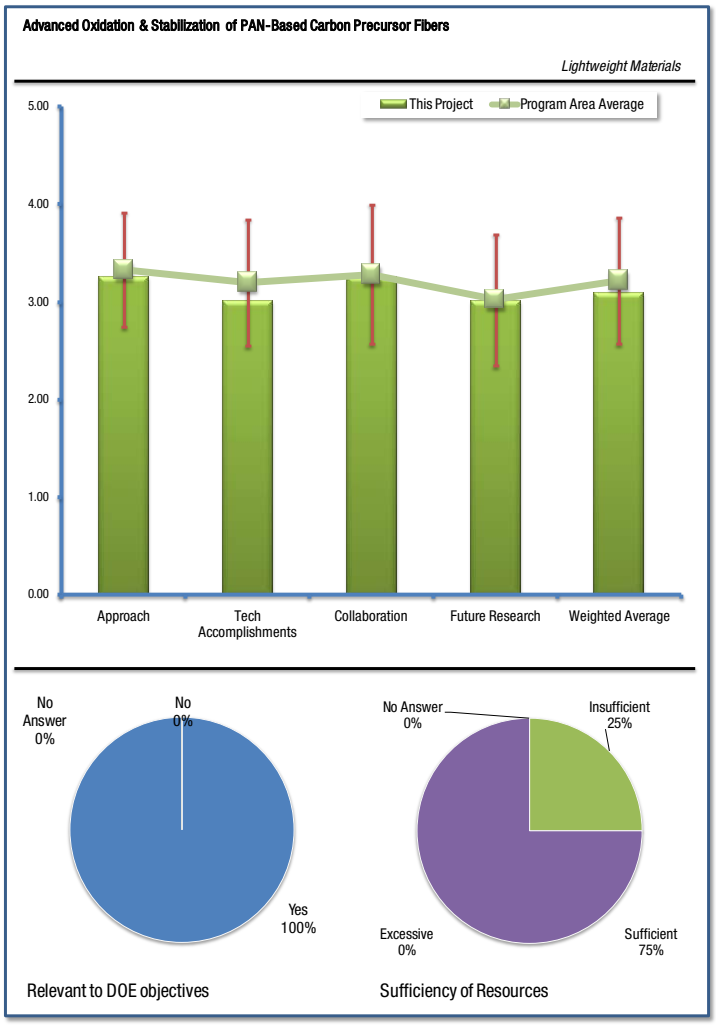
Question 5: Has the project effectively planned its future work in a logical manner by incorporating appropriate decision points, considering barriers to the realization of the proposed technology, and, when sensible, mitigating risk by providing alternate development pathways?

Two reviewers found the project well planned, with aggressive targets. A couple of suggestions were made–one that the project needs to get domestic companies involved that may set up production in the U.S. Another suggested that the project needs some focus in its future research plan.

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

One reviewer commented that resources seem sufficient.

Advanced Oxidation & Stabilization of PAN-Based Carbon Precursor Fibers: Eng-Felix Paulauskas (Oak Ridge National Laboratory (ORNL))



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

Question 1: Does this project support the overall DOE objective of petroleum displacement? Why or why not?
All reviewers felt the project supported DOE goals. Two reviewers noted the use of lightweight materials displaces petroleum fuel, by improving fuel economy. Another mentioned that precursors are key to the production of carbon fibers–also positive. Finally, one reviewer commented that technology would address issues to achieve a cost effective LM product for transportation industries.

Question 2: What is your assessment of the approach to performing the work? To what degree are technical barriers addressed? Is the project well-designed, feasible, and integrated with other efforts?
Reviewers were concerned about two aspects. One was that a three times reduction in oxidation/stabilization is already demonstrated. Another was that the approach may be good for the laboratory, but will be very difficult for commercial production. A complaint was raised that the presenter tried to pack too much information in the allotted time. Another reviewer found the effort addresses the time and cost pictures of materials manufacturing.

Question 3: Characterize your understanding of the technical accomplishments and progress toward overall project and DOE goals.
Reviewers noted the three times reduction in oxidation/stabilization time was demonstrated. Two found this project had made excellent progress, with one noting property enhancement on oxidized/stabilized tow was demonstrated. Others disagreed, noting there seemed to be not much progress with respect to last year presentation, and that better coordination between proposed metrics and achieved metrics should be presented. Another reviewer noted, in multi-year projects, there should be comparisons between each year's results in order of increasing progress.

Question 4: What is your assessment of the level of collaboration and coordination with other institutions?
Reviewers appreciated that the project had difficulties with an industry partner who went bankrupt. They noted it does need commercial partner. But, in spite of difficulties with partners, very good effort was made to find replacements.

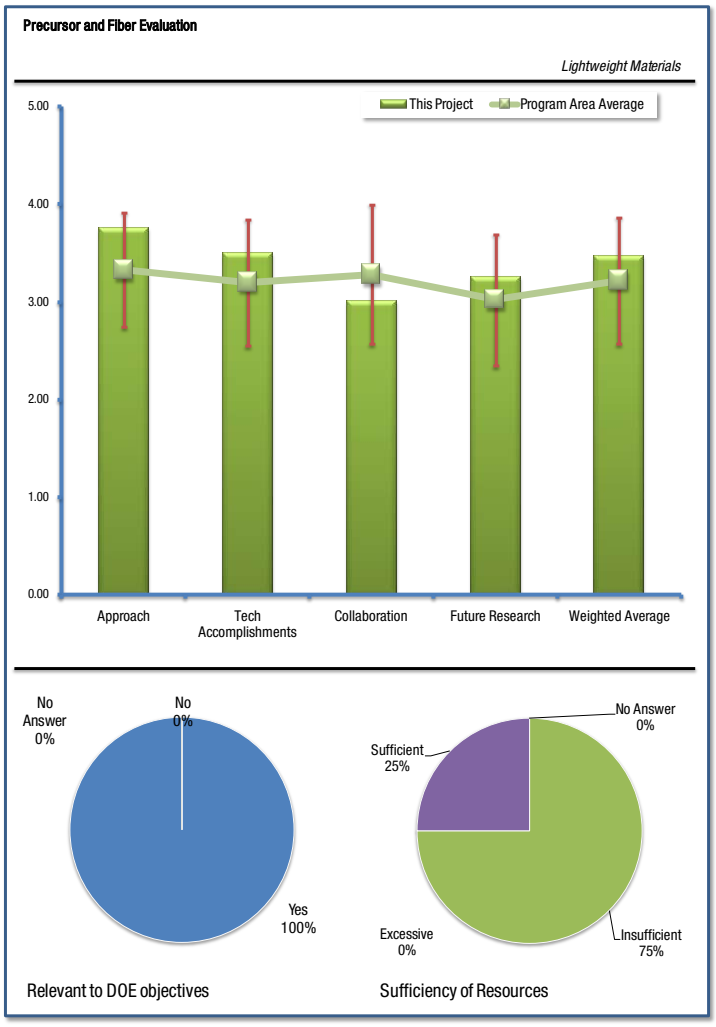
Question 5: Has the project effectively planned its future work in a logical manner by incorporating appropriate decision points, considering barriers to the realization of the proposed technology, and, when sensible, mitigating risk by providing alternate development pathways?
Reviewers were mixed over the project's future plans. One noted it is a well focused research program that has built up an impressive technological background, which leads to well established barriers that can be addressed. Another

noted the project should focus on some variables of the production process to overcome barriers. And a third noted the plans for next year's research should be strengthened.

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

Two reviewers responded with comments regarding the project resources. One found resources were sufficient until a commercial partner becomes seriously involved. Another said not enough information was provided to estimate whether resources were sufficient of not.

Precursor and Fiber Evaluation: Dave Warren (Oak Ridge National Laboratory (ORNL))



Reviewer Sample Size

This project had a total of 4 reviewers.

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

Reviewers agree that lightweighting supports the overall DOE objective. One noted carbon fiber is a strong candidate for lightweighting of future vehicles - if the cost barriers can be overcome. Given the strong DOE program in developing new ways of making CF precursors, it is critical to have a reliable and accurate method of evaluating these new materials. Another agreed, noting carbon fiber has the greatest potential to reduce the mass of a vehicle which will improve vehicle fuel economy and save many hundreds of thousands of barrels of oil per day. The material is also critical for electric vehicles to extend their range and also for hybrids and plug-in hybrids. The major impediment to use of carbon fibers in automotive applications today is the fiber cost. Current fibers are for aerospace applications and have much higher performance standards than will be needed for automotive applications. It was observed by another reviewer that this project seeks hardware to bring product to a reality that would enable introduction and commercialization of LM in the industries.

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

Reviewers were pleased with the approach taken in this project. One noted it looks really good. Another explained that the pilot facility at ORNL will greatly speed up the research and allow the researchers to try many new methods within their own laboratory and not have to go to outside vendors. Once success at the pilot level has been demonstrated, much of the risk for commercialization will be reduced and domestic manufacturers may be willing to get into the low cost automotive grade carbon fiber business. One reviewer did note that the project is well described but there were no quantifiable deliverables.

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

Reviewers had mixed understanding of the project. One found it a key project that will enable a large amount of other work. Another was impressed with how much has been done in such a short period of time and with such a limited budget. This reviewer was concerned that the project may end in 2015, however, questioning whether there will be a domestic auto manufacturer or supplier left by then. The project should be ramped up, partners brought in, and large scale production should be in place before the scheduled end date, the reviewer suggested.

Another reviewer found no comparison made in the presentation on technical metrics; it was thus very difficult to judge whether progress was made. The reviewer noted there was extensive comparison and evaluation about cost projections–this is excellent but a better correlation between costs and technical metrics would be helpful. Still

another reviewer felt that the work, being still in a laboratory and prototype scale, needs significant improvement to be applied in manufacturing.

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

Reviewers disagreed on the collaboration. One found great collaboration, noting hopefully that more CF work will come to North America because of this whole program. A second reviewer observed from the presentation that almost all of the work is being done at ORNL. Demos and sample materials are being made available but that is not enough, they noted.

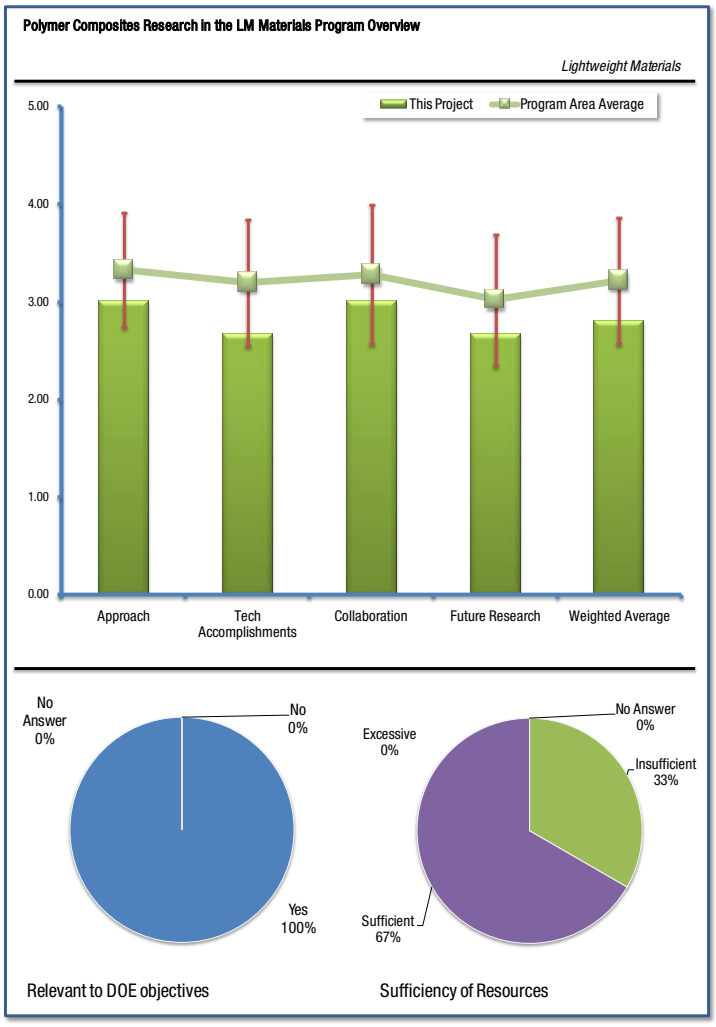
Question 5: Has the project effectively planned its future work in a logical manner by incorporating appropriate decision points, considering barriers to the realization of the proposed technology, and, when sensible, mitigating risk by providing alternate development pathways?

Reviewers held mixed opinions on the plans for future work. One saw a great plan going forward and another felt it should be sped up. Still another felt a lack of stated numerical goals, wondering if this is because they are proprietary. Finally, a reviewer found cost projections to be well presented.

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

One reviewer felt budget control seems solid. They suggested that the facility needs to grow rapidly to a pilot scale. The further suggested that EERE VTP should consider a solicitation in the near future for a cost share commercialization project(s). One reviewer found the discussion inadequate to really determine whether the project has sufficient funding, and doubts that it does.

Polymer Composites Research in the LM Materials Program Overview: Dave Warren (Oak Ridge National Laboratory (ORNL))



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

Question 1: Does this project support the overall DOE objective of petroleum displacement? Why or why not?
Reviewers agreed that polymer composites are an excellent candidate for lightweighting of automotive structures and trim parts, and that lightweighting supports the DOE goals. One reviewer added that the project seeks Critical Materials Technology to achieve light weighting.

Question 2: What is your assessment of the approach to performing the work? To what degree are technical barriers addressed? Is the project well-designed, feasible, and integrated with other efforts?
Reviewers found the approach seems fine, with a good summary presented.

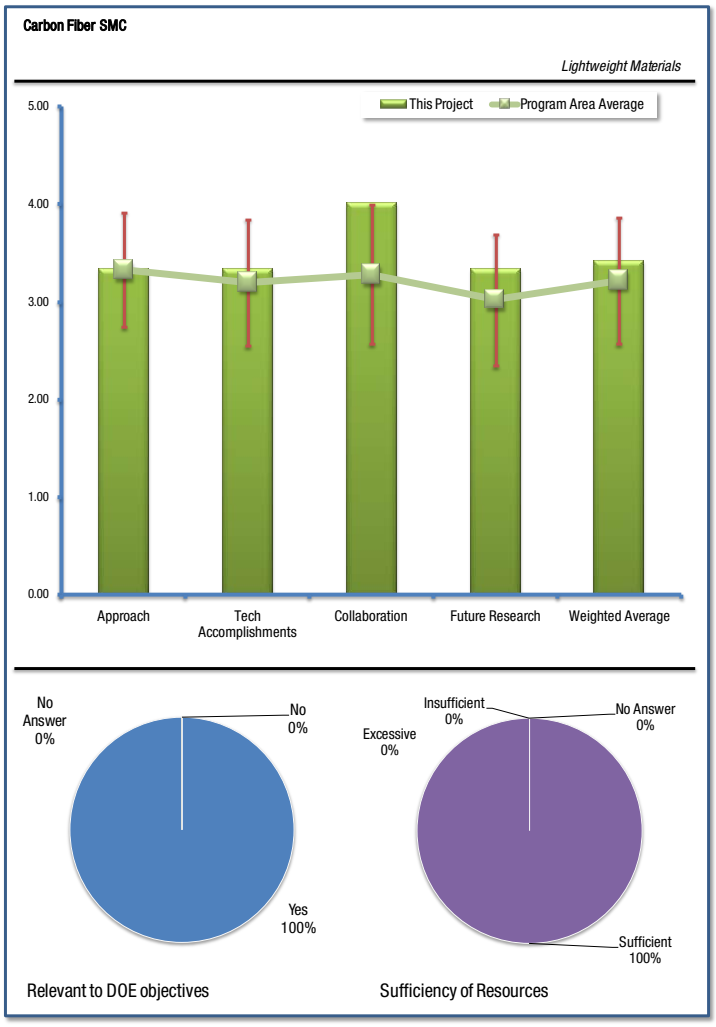
Question 3: Characterize your understanding of the technical accomplishments and progress toward overall project and DOE goals.
Reviewers were brief in their responses, noting the project was okay, though the presentation could be a bit more specific.

Question 4: What is your assessment of the level of collaboration and coordination with other institutions?
Reviewers found this work to be interesting because it is dealing with structural components whereas much of the work elsewhere is directed at non-structural parts. One reviewer hopes to see more collaboration with other groups in the future. Another reviewer felt it seems to be very well integrated with others.

Question 5: Has the project effectively planned its future work in a logical manner by incorporating appropriate decision points, considering barriers to the realization of the proposed technology, and, when sensible, mitigating risk by providing alternate development pathways?
Two reviewers responded, with one noting the plan is sound going forward, the other finding the plan a bit too nebulous for his taste.

Question 6: How sufficient are the resources for the project to achieve the stated milestones in a timely fashion?
Reviewers indicated that resources probably seem okay.

Carbon Fiber SMC: C.S. Wang (General Motors Corporation)



Reviewer Sample Size

This project had a total of 3 reviewers.

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

Reviewers all agreed that lightweighting with carbon fiber no doubt saves fuel in use. Questions remain about breakeven mileage to compensate for CO_2 puff up front (includes scrap in trim and overall production as well as CO_2 generated in production of carbon fiber SMC), and whether the cost and processing/ production barriers can be overcome.

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

Reviewers largely agree this is a good research project, that the approach is focused toward solving barriers: the project is identifying the key issues (such as bond line read-through) and addressing them, but manufacturing barriers remain to be resolved. One reviewer feels that the whole issue of adhesives really requires a more active effort (it sounded as though the adhesive issue was merely a side issue in the present project). Reviewers also agreed it is difficult to make significant improvements. Nonetheless, the overall approach appears to have a good likelihood of success.

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

Reviewers unanimously found good progress was made, with several barriers overcome.

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

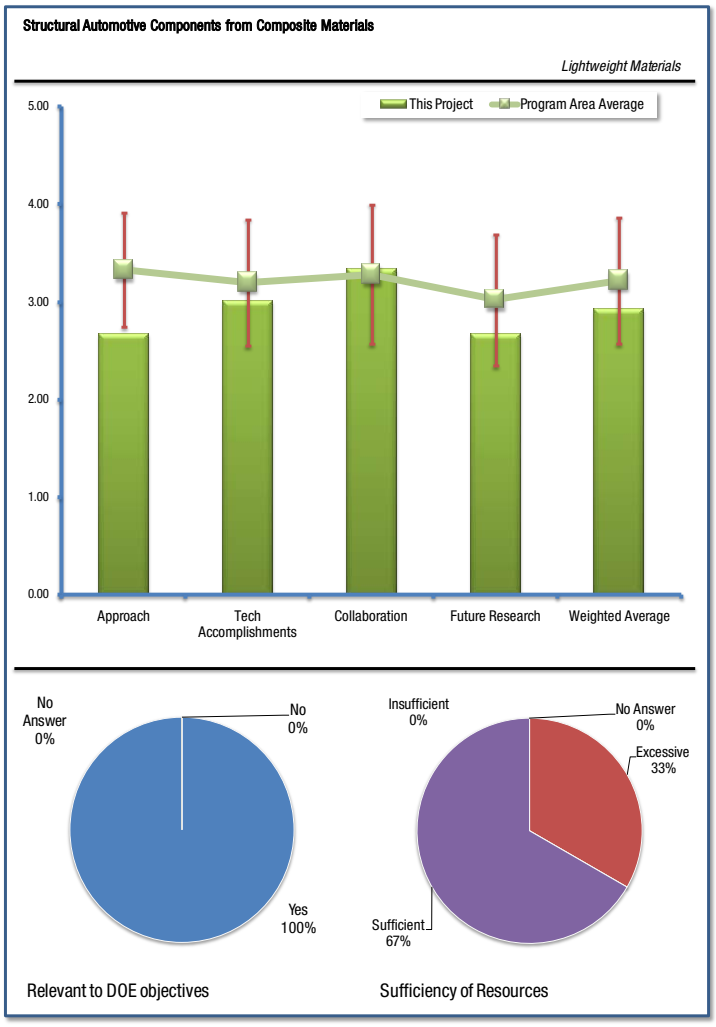
Reviewers found that the close collaboration with the full range of participants is well coordinated. There is good inclusion of production suppliers, according to one reviewer. Another reviewer suggests that this group contact Dr. Pascal Hubert of McGill University in Montreal (pascal.hubert@mcgill.ca). He is working on the issue of class-A surfaces and meeting with good success.

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

Reviewers agreed the program is right on schedule and sharply focused on barriers, with a very good project plan. One suggested someone should look at NVH of carbon fiber composite structures versus glass fiber composite and metallic structures. And the concern was reiterated about adhesives.

Question 6: How sufficient are the resources for the project to achieve the stated milestones in a timely fashion?
One reviewer responded, finding resources okay.

Structural Automotive Components from Composite Materials: Libby Berger (General Motors Corporation)



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

Question 1: Does this project support the overall DOE objective of petroleum displacement? Why or why not?
Reviewers noted weight savings is obvious and as mentioned in earlier reviews, petroleum (fuel) displacement will occur in use phase. Questions arise about breakeven mileage for initial CO_2 puff in terms of CO_2 total vs. steel, aluminum, and magnesium. One noted the use of composite will help to reduce weight which will help to improve fuel economy. Another noted the importance of technology validation for LM implementation.

Question 2: What is your assessment of the approach to performing the work? To what degree are technical barriers addressed? Is the project well-designed, feasible, and integrated with other efforts?
Reviewers were critical of the approach due to the many barriers. One noted underbody and seat structures are so disparate in terms of requirements that each have their own barriers with little crossover. High costs vs. alternative competitive materials may never be overcome. The reviewer did note the project has a generally effective approach. Another reviewer felt the project plan is not sound and the automotive needs have not been truly addressed. Composite materials are not good candidates for underbody applications. Also, seats are not good candidate for composite materials. Mg could be a better material.

Question 3: Characterize your understanding of the technical accomplishments and progress toward overall project and DOE goals.
Two reviewers responded, noting that significant progress was made but there is room for improvement, perhaps due to the many difficult barriers that still have to be overcome.

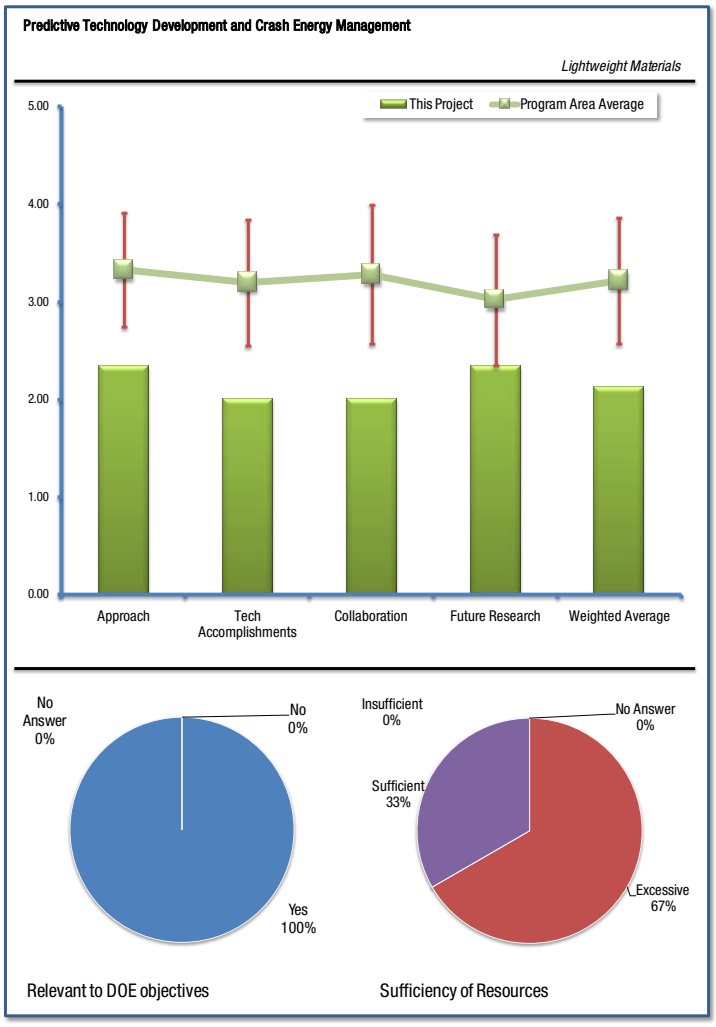
Question 4: What is your assessment of the level of collaboration and coordination with other institutions?
One reviewer noted there was close and appropriate collaboration with institutions and partners.

Question 5: Has the project effectively planned its future work in a logical manner by incorporating appropriate decision points, considering barriers to the realization of the proposed technology, and, when sensible, mitigating risk by providing alternate development pathways?
Reviewers found cost barriers relative to alternative materials are generally addressed but vague and not sharply focused. One reviewer speculated that the program may be waiting for low cost carbon fiber, and noted that NVH is not included in study. Another reviewer found the research program okay.

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

One reviewer responded, noting resources are sufficient to achieve the technical but not the cost milestones–the latter barrier may never be breached.

Predictive Technology Development and Crash Energy Management: Khaled Shahwan (Chrysler LLC)



Reviewer Sample Size

This project had a total of 3 reviewers.

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

Reviewers were mixed in this assessment. One questioned if the carbon footprint or life cycle analysis for carbon fiber composites had been examined. There is no doubt that the use phase of the lighter weight carbon fiber composite will displace petroleum fuel, but in life cycle analysis we need to include total life from manufacture of fiber, to transport of product, to use phase, to end-of-life. Another reviewer noted composites will be a key factor in lightweighting, as well as in making smaller production runs more competitive - both of which are key to the successful recovery of the North American auto industry.

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

Reviewers were critical of the approach in this project. One commented that the length of the project, in terms of coming to a conclusion, was brought up in the Q&A discussion. The reviewer questioned: Where is the cut off before moving on? Hasn't this work been done before and, if so, is the progress marginal?

Another reviewer found the project has significant weakness in relation to the actual behavior in crash–suggesting the project should be redefined. Another agreed, noting the project seems OK on the surface - but a good deal of work has been done on crack growth and damage in composites by the aerospace sector and that work should be drawn upon if at all possible (while recognizing the differences in cost and material characteristics).

Still another reviewer observed that political issues within the project team seem to be a major concern as well - this must be dealt with promptly and firmly. The research approach should mirror planned production methods (mat versus chopped, etc.) - or the program must be sufficiently flexible to accommodate all methods of manufacturing.

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

One reviewer referred the project team to comments in Question 2 regarding the length of project–seeing no end in sight, etc. Comparative data on competing materials would be helpful in this regard. It is time to make a choice on competing materials not only in cost but in crash energy management. Another reviewer agreed, citing that progress is very slow, having continued for the last two decades–perhaps we can't overcome the barriers. Still another reviewer agreed, stating the project needs a strong change in direction to get the results required.

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

Reviewers would like to see a good literature survey on this subject with previous work identified. Collaboration with those who conducted previous work might save time and money. There seems to be a lot of work already done in this area, and not just for aerospace. One reviewer saw coordination with academia to be very good, but progress is slow. Too many universities are involved and coordination between them is not very good. Another reviewer reiterated something mentioned previously, that, as an academic exercise this project sounds like a great effort and a lot of fun, but as an important part of a major industrial thrust, it is much less effective and the problem may be that the team is simply not made up the right group of people.

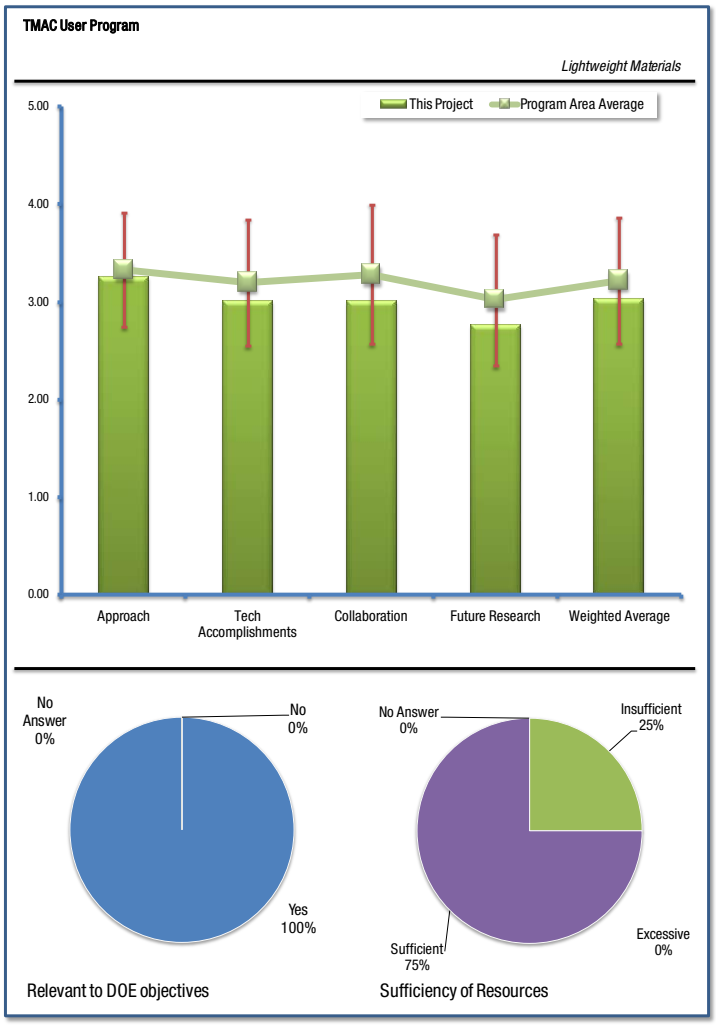
Question 5: Has the project effectively planned its future work in a logical manner by incorporating appropriate decision points, considering barriers to the realization of the proposed technology, and, when sensible, mitigating risk by providing alternate development pathways?

A reviewer noted that questions about improvements and difficulties in overcoming barriers have been raised in the Q&A. Another reviewer noted the effort should focus on only few variables rather than solving many barriers at the same time. One reviewer stated that the plan looks good but the "proof will be in the pudding." In short, this activity needs to get on-track to keep pace with the rest of the program.

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

A reviewer suggested it may be time to analyze data and see what has been done and determine how much can be gained by more resources being added to this project. Another noted that resources seem okay, but it is a little hard to say given the other difficulties noted above. One reviewer specifically expressed appreciation for Hamid Kia's frank and open words, noting they were reassuring and his efforts to lead this project under challenging circumstances laudable.

TMAC User Program: R.E. Norris (Oak Ridge National Laboratory (ORNL))



Reviewer Sample Size

This project had a total of 4 reviewers.

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

Reviewer observed that the TMAC equipment can aid in implementing automotive lightweighting by clarifying the crashworthiness of these competing materials. One reviewer noted that development of testing procedures to increase the use of lightweight materials helps to improve fuel economy. There are two sides to LM_10: a) user program and facility that can be tapped by the external community; and b) LM implementation enabler.

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

Reviewers found that the technical barriers are identified clearly and have been attacked with a sound approach, albeit with slow progress in overcoming barriers.

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

Reviewers found excellent progress to date, though at a slow rate of progress. One reviewer questioned how the data collected in this program is transferred to other programs. Another reviewer noted two observations: a) collisions seems to be at relatively low speed, so this begs the question how useful is it at high speed, say 20 m/s or more? b) large scattering of results of measurements: it is not clear whether one can make correlations. Finally, one reviewer found the technical strategy well defined, and that it would result in implementation.

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

One reviewer noted that coordination about crashworthiness of competing lightweighting materials is fair but needs more focus. The reviewer questioned: How do we assemble all the data (e.g., ala Ashby plot) so as to compare materials in terms of crashworthiness? Another noted that coordination with OEM and university is very good, but that data collection by different groups could be better coordinated. Yet another noted that this effort has a very large potential user base, and was surprised not to see more companies taking advantage of such a facility.

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

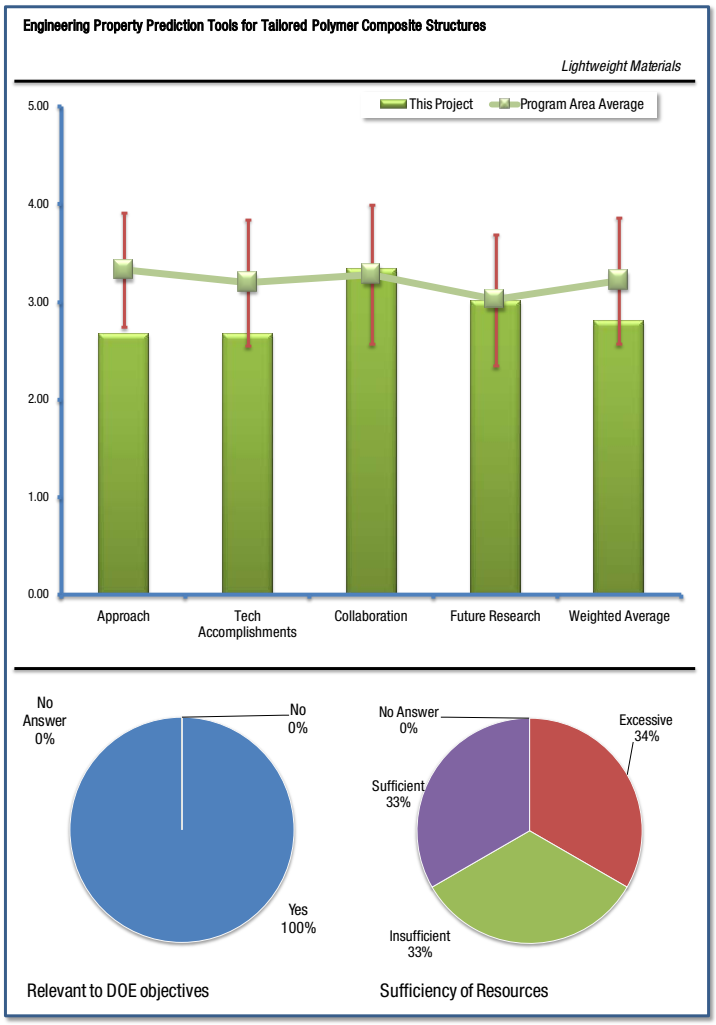
One reviewer questioned how to jump the gap between tests conducted on particular samples (tubes) and finished components with different geometries and performance requirements. Another noted that the project plan for

Advanced Preforming Project should be focused with smaller number of variables and should validate the proof of concepts. Still another found the future plans rather timid.

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

One reviewer found resources sufficient as far as the milestones are concerned. Jumping the gap between the TMAC test data and actual components will require more resources. Another reviewer found 2007 and 2008 funding clearly insufficient; they found resources for the current work potentially adequate but that the presentation was unclear on information on which to base a judgment.

Engineering Property Prediction Tools for Tailored Polymer Composite Structures: Mark Smith (Pacific Northwest National Laboratory (PNNL))



Reviewer Sample Size

This project had a total of 3 reviewers.

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

All three reviewers agreed that prediction of polymer composite behavior helps to introduce more polymer materials toward improving fuel economy. One noted composites are a key means of lightweighting and building a reliable database of properties and computer design tools are critical steps in the implementation of this technology.

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

Reviewers felt generally that the project plan is good but there were some shortcomings. One reviewer noted that it looks good - this is a tough area to deal with and this project appears to be taking a good approach by involving top-notch analysis package developers and good researchers in a well-designed program. Another noted that the predictive model and actual performance for validation is not sufficient. A third said that materials availability and tool design seem to be key factors of the work–materials availability may limit the impact of such project. It was suggested that maybe DOE should have a special budget item to procure specific materials for research and maintain a sufficient stock.

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

Reviewers found progress was made, though there is a need to validate predictions with actual performance. Also, another reviewer agreed that the project should be granted an extension. Lastly, another reviewer noted there were measurements, validation of models, lots of milestones but no metrics: so lots of words! One reviewer noted they found the creep results interesting.

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

Reviewers found collaboration with two national labs and a university to be very good. It was suggested the project work closely with manufacturers and users, and it was strongly recommended that the project contact the University of Windsor when the project moves into the DLFT portion of the work to take advantage of the impending experimental development facilities that are planned for that locale.

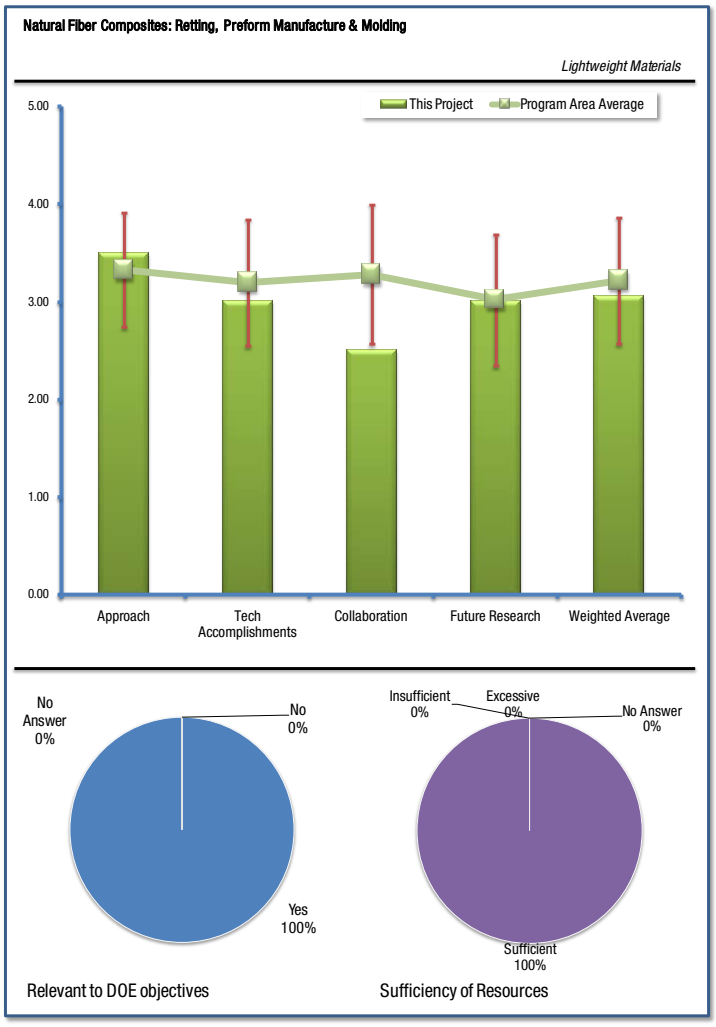
Question 5: Has the project effectively planned its future work in a logical manner by incorporating appropriate decision points, considering barriers to the realization of the proposed technology, and, when sensible, mitigating risk by providing alternate development pathways?

Reviewers liked the project plan, but suggested that it bring in the molders to this project. They should be an integral part of this program. Another believed the two year extension should allow the project to bear fruit. One reviewer thought the extension may not be enough time given the amount of work to be done.

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

One reviewer felt funding is excessive in compared to the project deliverables. Another found resources to be okay, though they were not sure what the impact of the 2-year extension is going to be on resources. They added that this is an important project with very promising results to date - so more resources would not be misplaced.

Natural Fiber Composites: Retting, Preform Manufacture & Molding: Mark Smith (Pacific Northwest National Laboratory (PNNL))



Reviewer Sample Size

This project had a total of 2 reviewers.

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

Reviewers found the project supportive of DOE objectives. The use of composites with biomaterials will help to reduce weight which will improve fuel economy. And natural fibers, in addition to a small lightweighting effect, can displace petroleum through decreased use of oil for the production of polymer resins.

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

Reviewers found the approach to the work to be solid, with good progress towards deliverable milestones. The basic problems with natural fibers have been identified and reasonable approaches are being proposed.

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

Reviewers found that good progress was made, with some barriers overcome. A reviewer noted that progress is okay, but it seems that closer collaboration with the similarly aimed Canadian research may help to advance this work more quickly. Dr. Mohini Sain at Univ of Toronto and his colleagues are doing very well on many of these issues and they are working with some of the same partners and others with good success.

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

Reviewers found collaboration with academic institute such as MIT is very helpful to achieve goals. As noted above, one reviewer suggested contacting Dr. Mohini Sain at the University of Toronto.

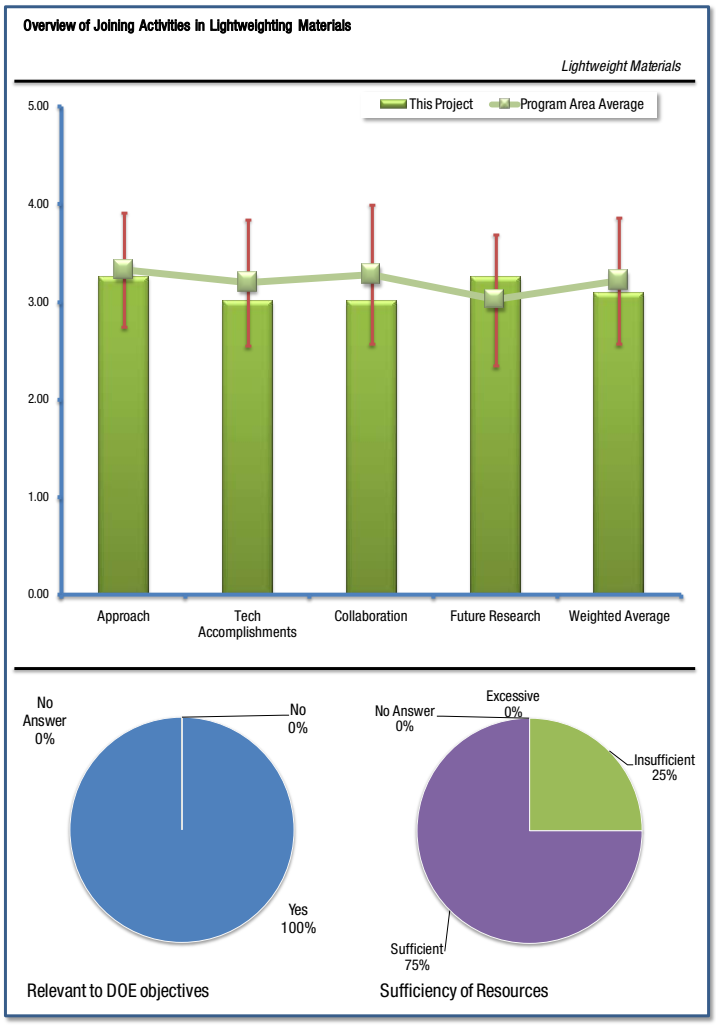
Question 5: Has the project effectively planned its future work in a logical manner by incorporating appropriate decision points, considering barriers to the realization of the proposed technology, and, when sensible, mitigating risk by providing alternate development pathways?

Reviewers found the future plan to be good, with a couple of caveats. One reviewer would like to reiterate that closer collaboration with researchers abroad would likely help to move things along faster - especially given that implementation of natural fiber materials is actually fairly advanced outside of the U.S. Another reviewer raised the concern about odor issues with natural fiber materials.

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

One reviewer commented on the resources, noting they seem okay given the issue raised.

Overview of Joining Activities in Lightweighting Materials: Dean Paxton (Oak Ridge National Laboratory (ORNL))



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

Question 1: Does this project support the overall DOE objective of petroleum displacement? Why or why not?
Reviewers generally noted that HSLA, complex alloyed steels, and the joining of all lightweight materials are important in the lightweighting of vehicles, with spot welding as the most common joining method. One reviewer noted that joining is a core competency for implementation of any material and building a knowledge-base in joining is critical step in bringing new materials into the auto industry. Thus, this project must be seen as a core task in lightweighting - which will be needed to decrease petroleum usage in future vehicles.

Question 2: What is your assessment of the approach to performing the work?
To what degree are technical barriers addressed? Is the project well-designed, feasible, and integrated with other efforts?
The reviewers found the project's approach generally good and effective at overcoming barriers for bare AHSSs. One reviewer considers it an important piece of work, though did reference concerns about collaboration discussed in Question 4. One reviewer noted the project is well planned, with barriers identified. However, these steels are mostly used in a coated condition (galvanized, galvalumed, etc.), and the surface coating can throw the results off substantially. The reviewer wondered if this is a major barrier that was not considered.

Question 3: Characterize your understanding of the technical accomplishments and progress toward overall project and DOE goals.
Reviewers acknowledged progress toward objectives, but they also cautioned that work could be accelerated, that choice of materials might not be entirely appropriate–something pointed out in the discussion–and that the project should take measures to assure it stays close to what the industry people need. One reviewer suggested that the project presenters again refer to the Question 2 discussion on barrier resulting from coatings. Significant progress made toward objectives on modeling and experiments on bare AHSSs.

Question 4: What is your assessment of the level of collaboration and coordination with other institutions?
Reviewers generally found coordination among a large pool of collaborators, including PNNL, A/SP, OEMs and USCAR, but also had several suggestions. One reviewer suggested collaboration with steelmakers and other institutions about coatings, and asked if coatings differ from producer to producer; and what the effect of oxide and lubricant layers on the AHSSs is (oxidation/rust, white rust due to oxidation of Zn, solid or liquid lube films).

Another reviewer noted that perhaps even better progress would result by working with non-US researchers such as Randy Bowers at Windsor (rbowers@uwindsor.ca), Norman Zhou at Waterloo (nzhou@mecheng1.uwaterloo.ca) and Moyra McDill at Carleton (Ottawa). In particular, Dr. Moyra McDill has 25 years of experience in developing non-

linear thermo-elastoplastic finite element models, new specialized elements and automatic adaptive meshing algorithms which are specifically designed to deal with situations like welding and casting. Her work has been used by Saab, Volvo, Rolls-Royce and others. She can be reached at: mmcdill@mae.carleton.ca.

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

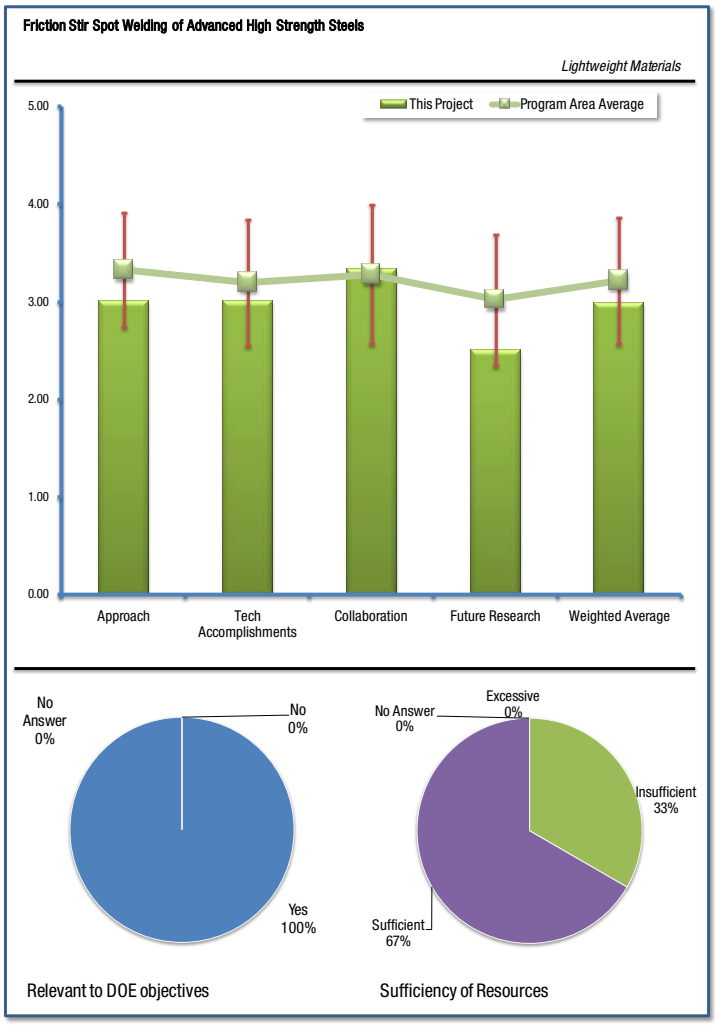
Reviewers held mixed views about the plans for future work. One reviewer noted that the project is focused on solving critical barriers. One reviewer was concerned whether the project is meeting the needs of industry people. Another reviewer found that a good summary was given on what needs to be done, but questions the depth which this group will be able to achieve.

One reviewer was concerned that future work sounds a lot like more of the same–with no effect of coatings! And comparative properties of spot welds on AHSS and aluminum alloy sheet not compared. The reviewer added that the aluminum industry has done a lot of work on spot welding; also on FSW and FSSW.

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

Reviewers found the project to have sufficient resources to achieve the stated milestones, while doing some preliminary work on coatings.

Friction Stir Spot Welding of Advanced High Strength Steels: Glenn Grant (Pacific Northwest National Laboratory (PNNL))



Reviewer Sample Size

This project had a total of 3 reviewers.

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

Reviewers found the project does support DOE goals. One noted AHSS will play a key role in the future lighter car, and joining this material is clearly a major barrier to implementation. Another agreed, noting FSW is part of the tools to render vehicles lighter. And still another noted that process optimization is needed to enable lightweight materials' introduction into production.

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

Reviewers found the approach very solid and straightforward. One reviewer wondered if a laser-assisted process might be worth trying to heat-up the target area to improve cycle time.

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

Reviewers found good progress is being made on the project. Improvements have been achieved on cycle time as well as tool wear. Affordability remains a concern - as are the above two issues. Crash worthiness of FSS welds remains an area that needs investigation. A reviewer noted that silicon nitride is interesting–it runs hotter and reduces welding time. They noted tool design is described but trials seem to have been reduced to one or two configurations.

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

Reviewers found collaboration to be okay, with partnership between two groups in two national labs, and good synergy. One reviewer noted that direct collaboration with users is needed.

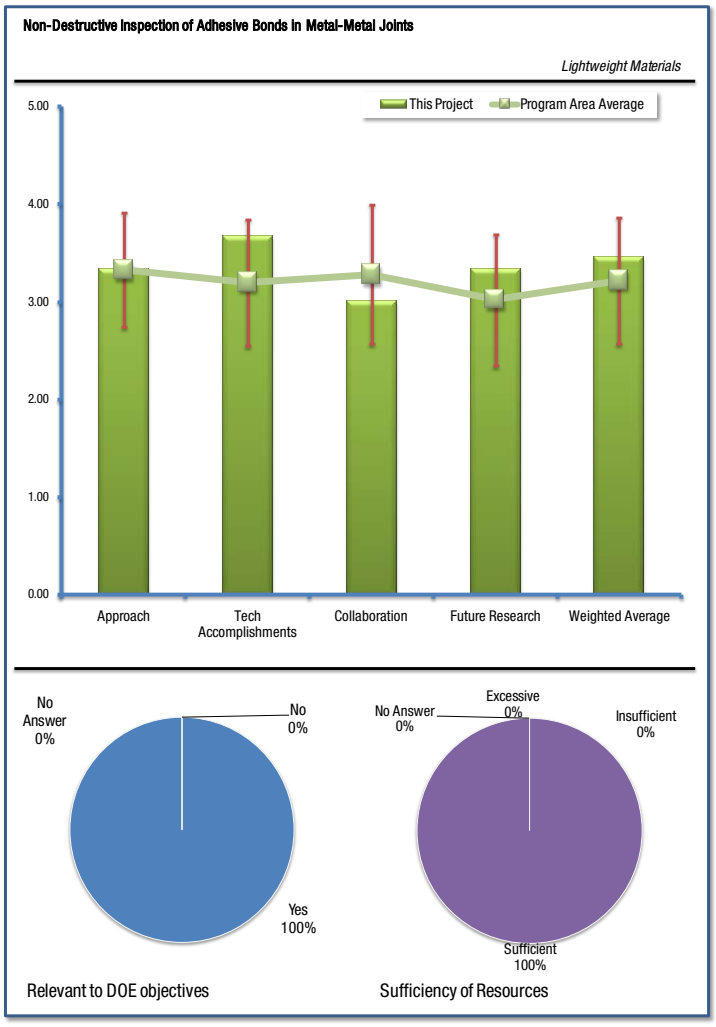
Question 5: Has the project effectively planned its future work in a logical manner by incorporating appropriate decision points, considering barriers to the realization of the proposed technology, and, when sensible, mitigating risk by providing alternate development pathways?

A sole reviewer responded, noting the project has a good plan for the future.

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

Two reviewers commented, noting that resources seem okay, but that FSW needs much more funding to be useful to the industry.

Non-Destructive Inspection of Adhesive Bonds in Metal-Metal Joints: David Moore (Sandia National Laboratory (SNL))



Reviewer Sample Size

This project had a total of 3 reviewers.

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

Reviewers unanimously agreed that adhesive bond reliability and non-destructive testing of adhesive joining methods address barriers to lightweighting and related fuel efficiency, especially on some of the new lightweight materials. A reviewer pointed out that having reliable and fast NDE methods will be critical to the successful introduction of these new materials and manufacturing processes.

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

Reviewers found the approach very sensible, with the phased array approach a correct approach considering the alternatives–many of which require two-sided QC. A reviewer noted that the project is well defined but also should be focused on specific barriers such as environment and time to complete the tests.

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

Reviewers found there was excellent progress on milestones, in particular for metal-metal bonds working, apparently overcoming the barriers for metal-metal bonding. This work should be pursued aggressively in order to use more adhesive bonding, another reviewer agreed. In order to form a kissing bond, maybe adhesive bonding of galvanneal steel can be used since adhesive bond strength is very poor bond with galvanneal materials. A reviewer commented that the usual problems with NDE development programs have come up and are being addressed (obtaining known "bad" bonds and correlating to actual production-rate methods).

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

Reviewers found collaboration with OEMs in this project to be good. One noted that partners in project may need to be expanded to include more adhesive suppliers, more outside NDT equipment makers. They questioned if this approach work for all adhesives, included hot melts and tapes. Are there other NDT equipment makers working on the same approach?

Another reviewer suggested another possible method to include in the round-robin testing, that being worked on by Dr. Roman Maev at University of Windsor. Work there has included efforts with Chrysler on an acoustic microscopy NDE method for welds for years with excellent results. Dr. Maev's company (Tessonics) is now commercializing this work. He can be reached at: maev@uwindsor.ca.

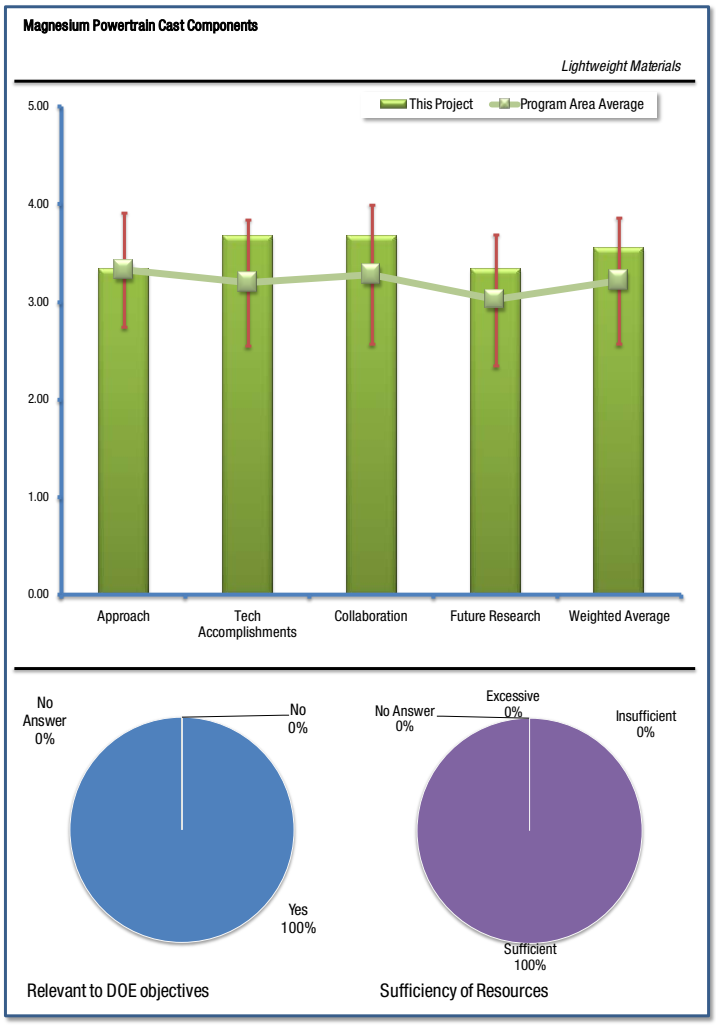
Question 5: Has the project effectively planned its future work in a logical manner by incorporating appropriate decision points, considering barriers to the realization of the proposed technology, and, when sensible, mitigating risk by providing alternate development pathways?

Reviewers generally felt milestones have been achieved. One noted that without a major field trial, actual feasibility cannot be known. As far as lab work, a major remaining issue involves using this UT method on composites. The reviewer expects completely different results with composite-composite and composite-metal compared with metal-metal.

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

Reviewers found resources in this project to be sufficient so far. One noted a field trial would demand more resources.

Magnesium Powertrain Cast Components: James Quinn (General Motors Corporation)



Reviewer Sample Size

This project had a total of 3 reviewers.

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

All reviewers noted this significant weight reduction in powertrain applications will be multiplied and support fuel economy. One noted it may do so more than any other lightweight materials project reviewed.

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

Reviewers found this a positive approach. One reviewer noted the project has a well structured, patient, and comprehensive approach to maximizing weight loss and performance–very commendable. The reviewer added some open questions for the planners of the project: what were the modifications to the Duratec V6 engine, which is made of aluminum alloy(s), to accommodate the magnesium alloy(s)? Would a totally redesigned magnesium alloy engine be more robust, effective, etc.? Originally, why weren't high-Si aluminum alloy sleeves used instead of cast iron? Another reviewer found the project plan to be very sound, involving many stakeholders helping to transfer the technology when it is fully developed. They added that major barriers were identified as well.

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

Reviewers found the project made significant progress, achieved deliverables according to the milestone described earlier. One reviewer noted this is one of the highest profile DOE materials lightweighting projects, and the progress toward objectives is commendable in light of the difficult barriers to overcome.

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

Reviewers noted collaboration with numerous groups. One reviewer questions why some of the European organizations and companies that have made significant progress on magnesium engines were not tapped. Another noted the potential, with collaboration of 36 suppliers and developers with OEMs, to accelerate the developments and help to transfer the technologies into production applications.

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

One reviewer noted this project is essentially in the a mop up stage of operation, as progress was substantial and then many things have changed since, especially considering the increasing dominance of China in controlling magnesium

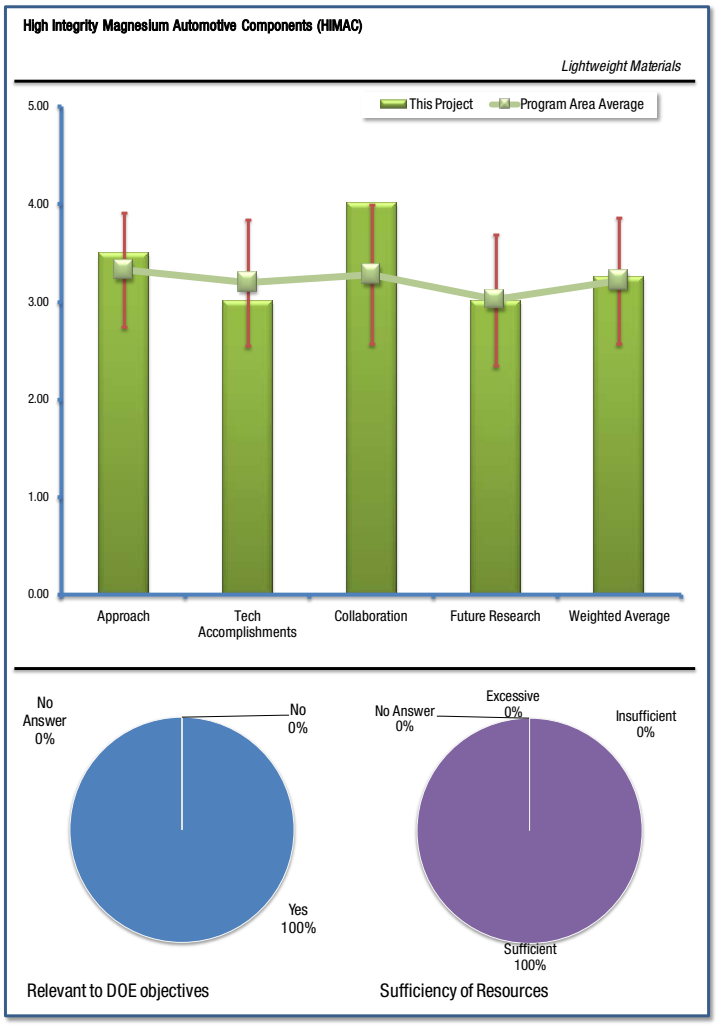
supply, and only one North American magnesium supplier exists. Planning R&D in such a vague economic and changing environment for such a critical component is difficult.

Another reviewer noted the recent extension of the project is justified, and that this is a very good project in developing new technologies and new applications of magnesium.

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

One reviewer commented that resources for the project are sufficient for taking it to a meaningful conclusion.

High Integrity Magnesium Automotive Components (HIMAC): James Quinn (General Motors Corporation)



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

Question 1: Does this project support the overall DOE objective of petroleum displacement? Why or why not?
Both reviewers agreed that magnesium is a key material for lightweighting the future car, thus increasing fuel efficiency and reducing energy demand.

Question 2: What is your assessment of the approach to performing the work? To what degree are technical barriers addressed? Is the project well-designed, feasible, and integrated with other efforts?
One reviewer commented, noting it is an excellent approach to a complex project.

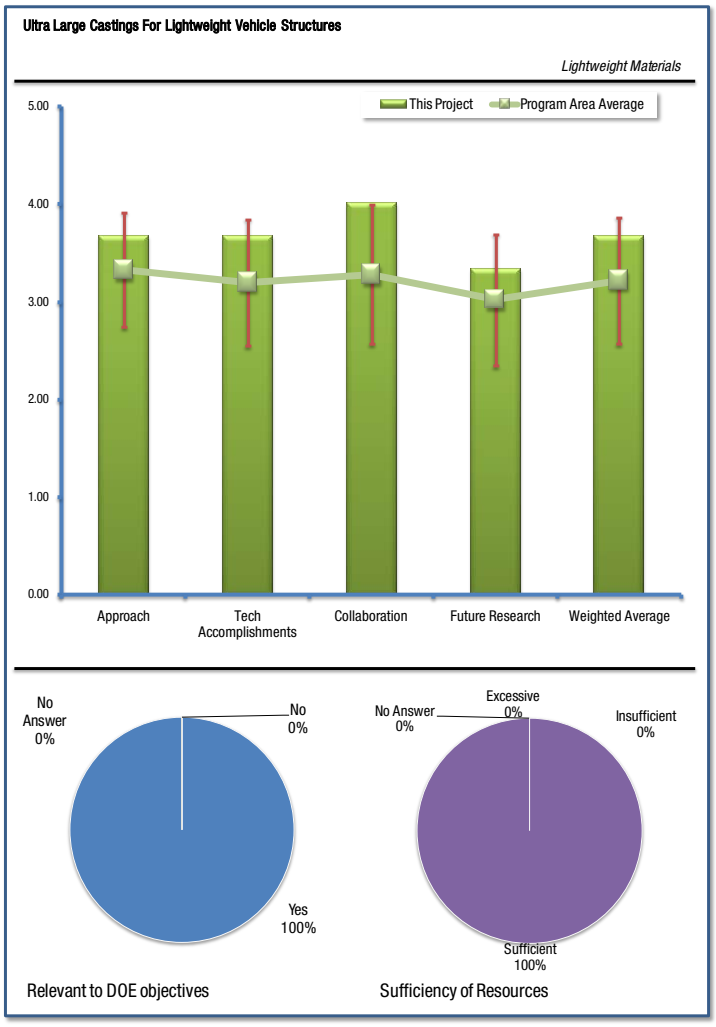
Question 3: Characterize your understanding of the technical accomplishments and progress toward overall project and DOE goals.
One reviewer acknowledged lots of difficult issues were faced on this project, but it appears that good progress is being made.

Question 4: What is your assessment of the level of collaboration and coordination with other institutions?
One reviewer responded, noting this was among the best collaborative projects he had seen.

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

Question 6: How sufficient are the resources for the project to achieve the stated milestones in a timely fashion?
The reviewer found resources satisfactory.

Ultra Large Castings for Lightweight Vehicle Structures: James Quinn (General Motors Corporation)



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

Question 1: Does this project support the overall DOE objective of petroleum displacement? Why or why not?
Reviewers all found this project very much in support of DOE goals. The consolidation of parts, lightweight structures, lightweight magnesium, etc. all support cost effective fuel savings. Magnesium is a key material for the future vehicle due to its low density and high specific strength.

Question 2: What is your assessment of the approach to performing the work? To what degree are technical barriers addressed? Is the project well-designed, feasible, and integrated with other efforts?
Reviewers found the approach in this project has worked very well, with barriers well defined and surmounted.

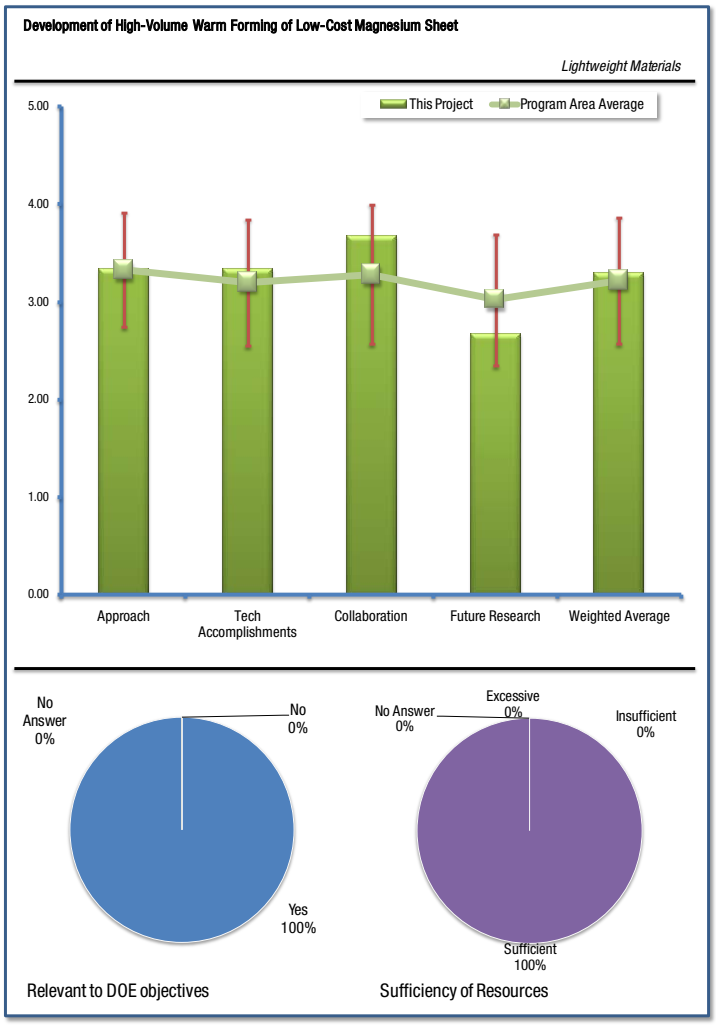
Question 3: Characterize your understanding of the technical accomplishments and progress toward overall project and DOE goals.
Reviewers found the work achieved validates the technical accomplishments in the project–the real world component met all technical criteria. The F-150 radiator support validates the approach and R&D achievements. One reviewer noted significant progress has been made, however the cost of the magnesium is varying widely. Joining will be a challenging barrier and should be addressed from the beginning.

Question 4: What is your assessment of the level of collaboration and coordination with other institutions?
Reviewers found close collaboration was critical to achieve the results realized in the project. It is a well coordinated project, especially considering the stretch with these advanced casting processes. Another reviewer commented that coordination was very good between casters and OEMs. Another added the design analysis was very good.

Question 5: Has the project effectively planned its future work in a logical manner by incorporating appropriate decision points, considering barriers to the realization of the proposed technology, and, when sensible, mitigating risk by providing alternate development pathways?
Reviewers noted that the project was hampered by instability in the magnesium market price and loss of the project leader (Mike Maj). They found testing of the components in a real world application to be a very good idea. One reviewer added that technology transfer should be a high priority from this development.

Question 6: How sufficient are the resources for the project to achieve the stated milestones in a timely fashion?
Reviewers found the resources in line with the mission essentially accomplished to date, with the available funding.

Development of High-Volume Warm Forming of Low-Cost Magnesium Sheet: James Quinn (General Motors Corporation)



Reviewer Sample Size

This project had a total of 3 reviewers.

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

Reviewers generally found this project supports DOE goals, with one caveat. One reviewer found increased use of magnesium in wrought form will help to reduce more weight in the closure panels and help to improve fuel economy. However, another reviewer pointed out that, while in the use phase of the magnesium life cycle, petroleum may be displaced by efficiency gains, questions arise about the total life cycle analysis, which includes recycling. Magnesium is not considered as recyclable as aluminum or steel.

Question 2: What is your assessment of the approach to performing the work? To what degree are technical barriers addressed?

Is the project well-designed, feasible, and integrated with other efforts?

One reviewer found the project seems to be derivative, i.e., the approach is similar to the warm forming of AZ31 sheet practiced by the aerospace industry since the 1940s. The new equipment (sheet heating, robotics, more automation) may have addressed some of the technical barriers better than in the past. The big difference is the use of continuous cast (CC) strip that is cold rolled and annealed to specification. The first item -- obtain low cost AZ31B sheet -- was a big challenge. We did not hear what the price point was, but it probably would not compare with aluminum alloy sheet. Another reviewer found it is a great project on technology development of Mg applications in wrought form.

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

Reviewers noted many barriers were addressed and solved. One cited good progress considering the difficulty of forming Mg alloy sheet. The main technical accomplishment is the promotion of continuous casting technology for lowering cost. Low cost CC aluminum sheet is available (Fata-Hunter) and probably significantly beats the cost of the CC magnesium sheet. No mention was made of new technology with nano-Mg sheet being developed by Thixomat (mention was made of this technology at the recent TMS show in San Francisco). At a critical low grain size, the HCP structure of Mg sheet apparently does not pose a formability problem. What about other Mg alloys for sheet?

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

Reviewers found coordination very good among partners, including suppliers, academia, and OEMs. Reviewers especially noted the Mg sheet producers. They also suggested looking into the nano-grain Mg work being done at Thixomat (Ann Arbor) and at other institutions and companies.

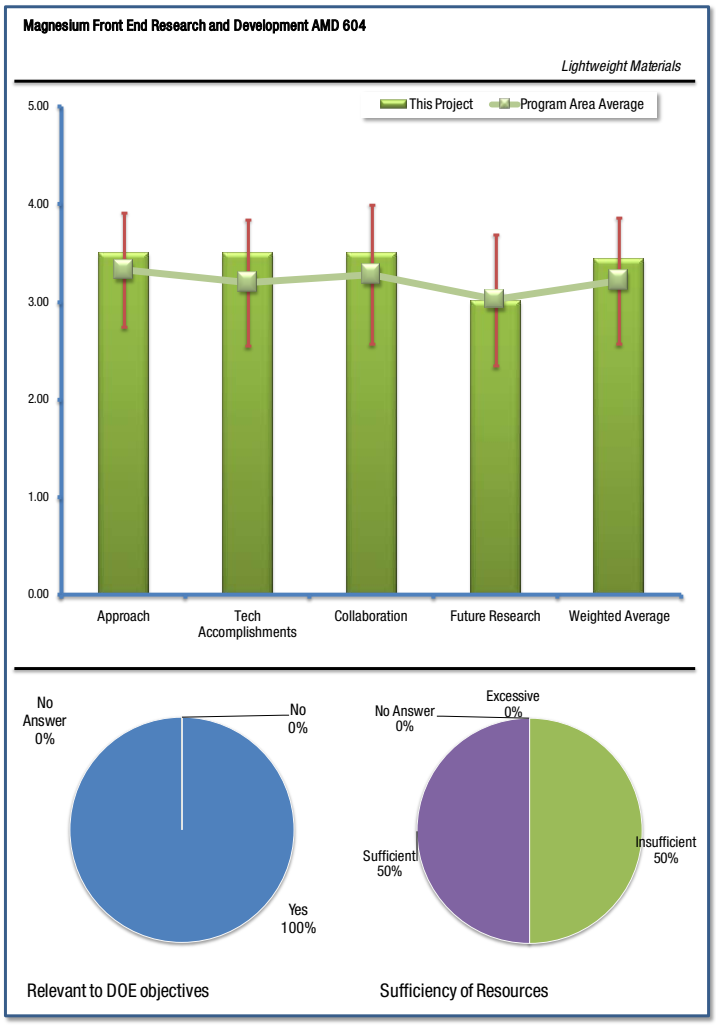
Question 5: Has the project effectively planned its future work in a logical manner by incorporating appropriate decision points, considering barriers to the realization of the proposed technology, and, when sensible, mitigating risk by providing alternate development pathways?

Reviewers raised questions about future work. New Mg alloys coming on the horizon are not mentioned. They asked whether they will be addressed in this project. Also, are the effects of grain size on formability, especially nano-sized grains going to be considered?

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

One reviewer provided comment, noting that resources seem sufficient until the cost effectiveness is really proved. Low-cost magnesium alloy sheet was the goal, which may be more a barrier now with the high cost of magnesium relative to aluminum.

Magnesium Front End Research and Development AMD 604: James Quinn (General Motors Corporation)



Reviewer Sample Size

This project had a total of 2 reviewers.

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

Reviewers found the project does support DOE goals. A reviewer noted magnesium is a key candidate for the future car due to its strength properties and light weight. Another reviewer agreed, noting lightweight material transportation subsystems improved energy efficiency.

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

One reviewer found the approach simply excellent from a scientific standpoint. Another noted the key issue really is to figure out how the US and Canada can benefit economically (and in terms of jobs) from this whole project. If we don't do that, we will simply accelerate the pace of technology export to China. Another commented that vehicle architecture optimization needs to be considered for sub-assembly design and energy management.

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

Reviewers noted excellent progress; however, one noted key barriers to success, specifically: corrosion, crash energy management and sheet forming (in terms of processing energy required and die performance with complex shapes). Another noted initial results and findings are promising for further optimization and technology transfer.

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

Reviewers found collaboration remarkable in its scope and depth as well as in the results. Once again though - the key point is to figure out how to actually make some money doing this commercially. One key defect in the slides is the omission of the AUTO21 Network as a Canadian partner. The fact is that AUTO21 is funding much (if not most) of the work being done in Canada outside of the work done at CANMET, and it is a misrepresentation to not include AUTO21 in the list of Canadian partners. A reviewer added he would appreciate it if this could be corrected in all future presentations.

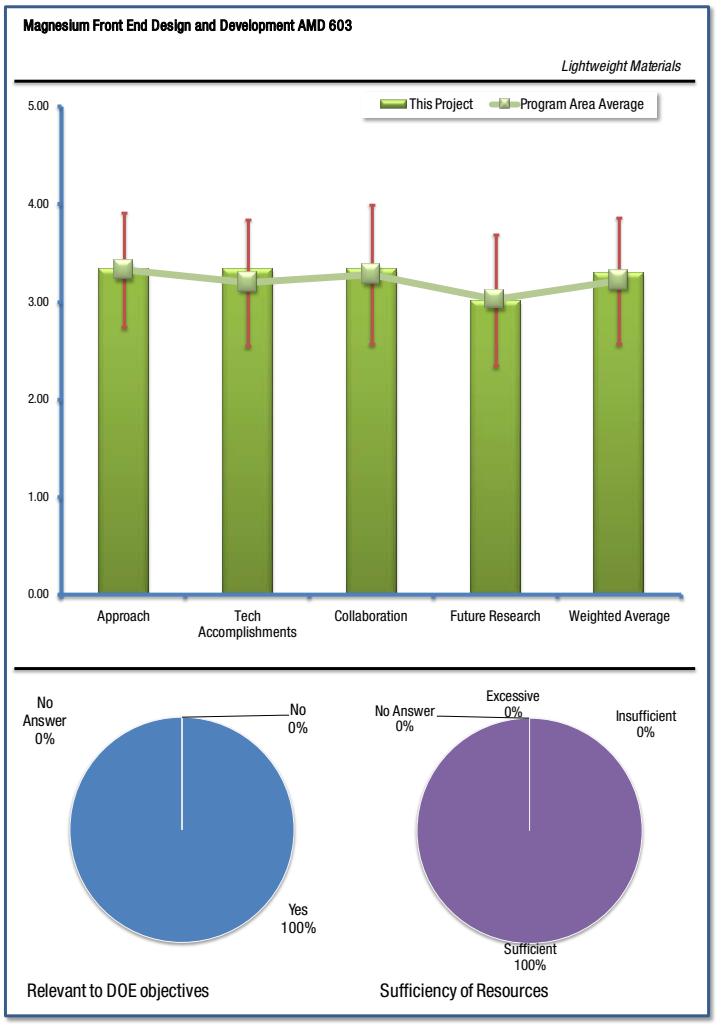
Question 5: Has the project effectively planned its future work in a logical manner by incorporating appropriate decision points, considering barriers to the realization of the proposed technology, and, when sensible, mitigating risk by providing alternate development pathways?

Reviewers found that while future plans look good, there still is a need to address both the technical issues (see above) and at least try to talk about the commercial / political ones in the future program.

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

One reviewer opined that much more money will be needed to do this properly in the future as we move toward commercialization.

Magnesium Front End Design and Development AMD 603: James Quinn (General Motors Corporation)



Reviewer Sample Size

This project had a total of 3 reviewers.

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

Significant reduction of mass with use of magnesium would improve fuel economy. Magnesium is a key material for the future car - widespread implementation of it will almost certainly lead to decreased petroleum use–a fantastic weight reduction here means fuel savings. However, as mentioned earlier, a total life cycle analysis for Mg vehicle components akin to those for Al and steel components would settle the issue. The reviewer added: don't forget end-of-life.

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

Reviewers found it an extremely focused program considering the technical barriers and cultural barriers, and that it was a very well thought-out approach. One reviewer commented that fatigue life, galvanic corrosion, etc., with other materials would be a significant challenge. It should be considered in the design stage and barriers should be solved. Finally, another reviewer noted, aside from the issues about corrosion, crash and cost (energy and dollars), the following caveat: how do we make this effort pay off in jobs and business for North American companies?

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

Reviewers held mixed assessments of the progress thus far. One noted significant progress on some fronts (SVDC, thixomolding, etc.); but not enough progress on wrought Mg components. Others felt that work should be continued as planned. Technical cost model is very important and should be aggressive pursued. A crash model should be developed and verified. One stated the project appears to be on-track and working well.

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

All reviewers found very good collaboration. One noted unbelievable collaboration considering the institutions and partners are Canadian, Chinese, and U.S., and there is no written agreement. Coordination is excellent considering language barrier, thanks to the internet, video conferencing, and face-to-face conferences and seminars. One reviewer added that while collaboration was very good, there was less emphasis on this aspect is evident than was noted on the other MFERD project.

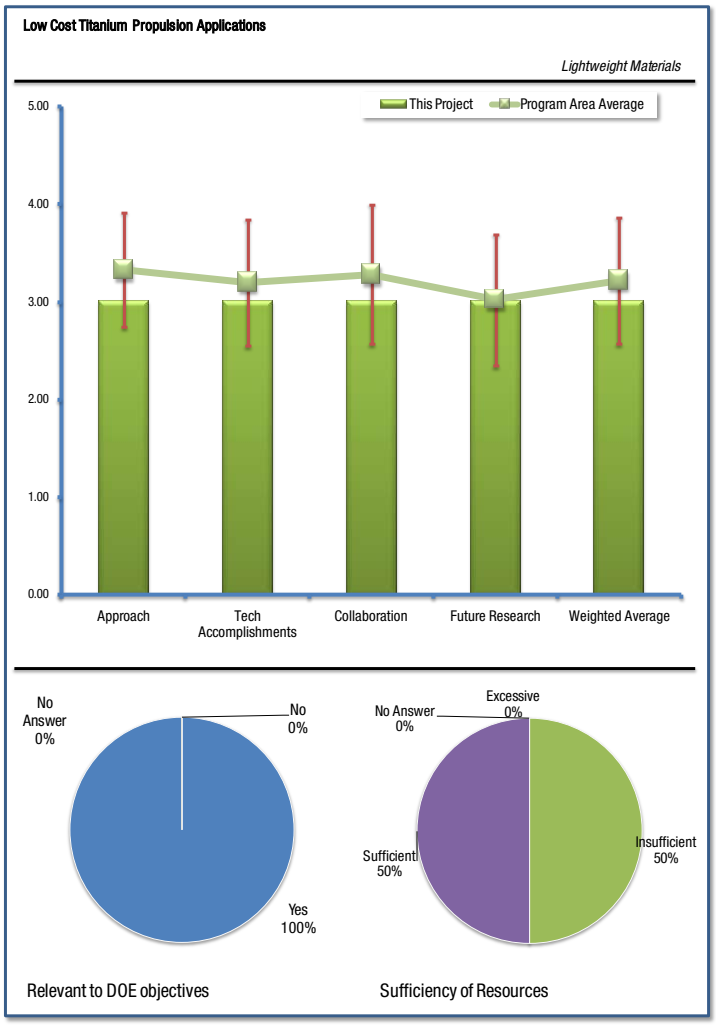
Question 5: Has the project effectively planned its future work in a logical manner by incorporating appropriate decision points, considering barriers to the realization of the proposed technology, and, when sensible, mitigating risk by providing alternate development pathways?

Reviewers found future plans for the project look good. One noted, considering some of the barriers being nearly impossible, the effort must address overcoming them in a general way. One noted the final outcome should be transferred to the design engineers to achieve the final objective of this project.

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

Two reviewers provided comment on the resources involved, noting they seem sufficient as long as cooperation continues on a hand shake basis.

Low Cost Titanium Propulsion Applications: Curt Lavender (Pacific Northwest National Laboratory (PNNL))



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

Question 1: Does this project support the overall DOE objective of petroleum displacement? Why or why not?
Both reviewers agreed use of titanium would help to reduce the weight of powertrain components and improve fuel economy.

Question 2: What is your assessment of the approach to performing the work? To what degree are technical barriers addressed? Is the project well-designed, feasible, and integrated with other efforts?
Reviewers noted that cost is the main issue, not the applications or manufacturing of components. Lowering cost of powder should be the main focus of this project.

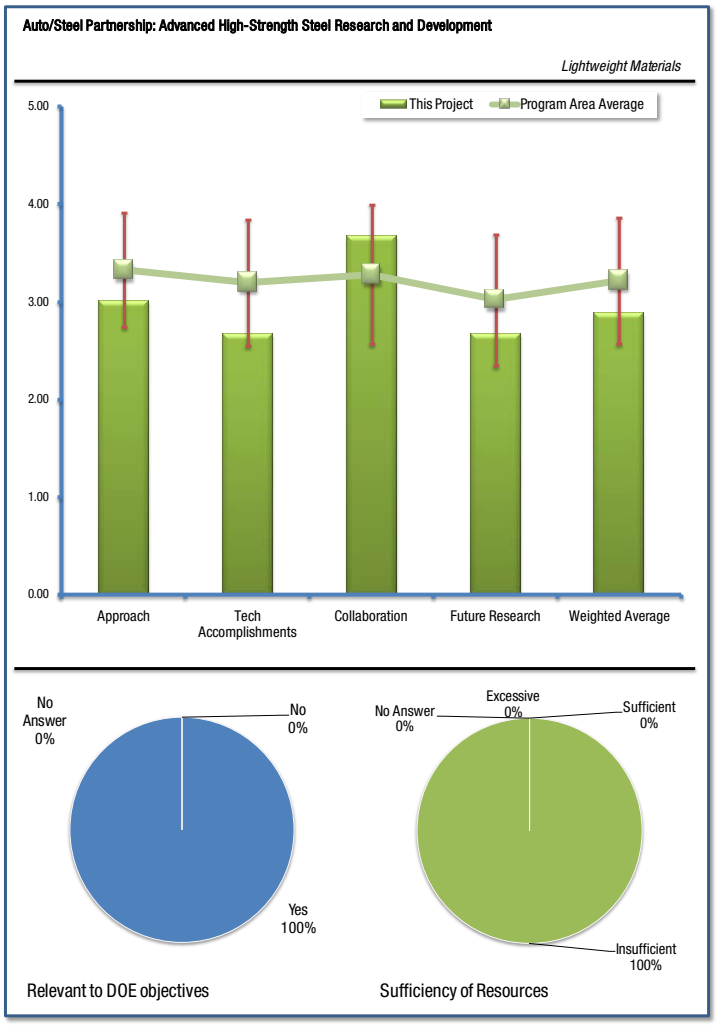
Question 3: Characterize your understanding of the technical accomplishments and progress toward overall project and DOE goals.
No comments.

Question 4: What is your assessment of the level of collaboration and coordination with other institutions?
No comments.

Question 5: Has the project effectively planned its future work in a logical manner by incorporating appropriate decision points, considering barriers to the realization of the proposed technology, and, when sensible, mitigating risk by providing alternate development pathways?
No comments.

Question 6: How sufficient are the resources for the project to achieve the stated milestones in a timely fashion?
One reviewer suggested the project needs more resources to make is a success.

Auto/Steel Partnership: Advanced High-Strength Steel Research and Development: Roger Heimbuch (A/SP)



Reviewer Sample Size

This project had a total of 3 reviewers.

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

Reviewers found the project supportive of DOE goals. One noted decreasing petroleum usage will require making auto parts lighter and this means either using different materials - or using thinner sections of existing materials. Thinner sections imply that materials must be stronger to enable them to withstand the loads called for in the future automobile. Another noted the most likely solution will be a combination of both new and existing materials - the leading one of which is steel. Therefore, making steel stronger while maintaining its ability to be formed, welded and painted will be a critical part of making the future automobile use less energy.

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

All reviewers were supportive of the approach taken in this project. One found it a well-planned and important program of impressive scope. Another said it is also vital to the support of the North American steel industry - as well as to the auto sector. And, for that reason, the support of DOE (and in Canada of CANMET and AUTO21) is warranted and an entirely worthwhile investment of public funds. One found the presentation a good summary of the strategy for introducing third generation AHSS for vehicles' lighting. Fatigue appears to be more difficult than planned; perhaps explanation about why would be helpful. The graph of lightweighting vs. time showing that AHSS can yield almost a 50% weight reduction was very interesting. Another reviewer added that efforts may be directed towards base materials innovations to avoid obstacles in manufacturing processes of functional products. Manufacturing cost of parts is too high for new materials introduction.

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

Reviewers saw good potential in this project. The accomplishments to date have been excellent - and a remarkable success story for the steel industry. One felt the only thing holding the program back is a shortage of funds - and this should be corrected if at all possible. Another remarked the modeling shows significant weight reduction, even if not 50%, it is clearly a good effort showing AHSS can be used more.

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

One reviewer provided that the AS-P is a remarkable display of collaboration among competitors, government and academia.

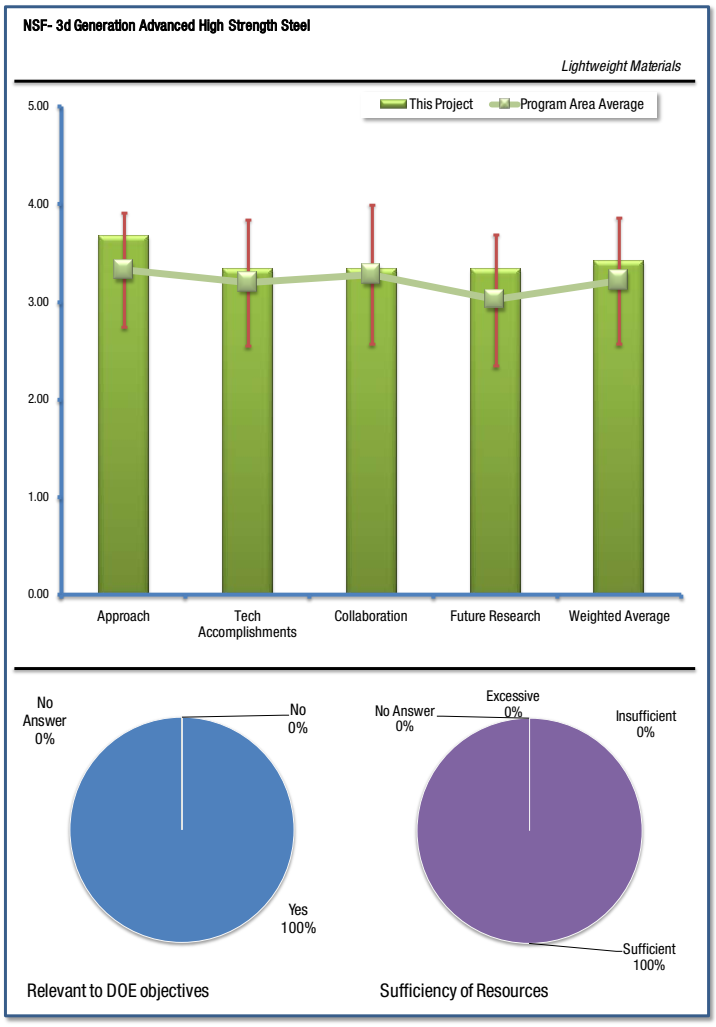
Question 5: Has the project effectively planned its future work in a logical manner by incorporating appropriate decision points, considering barriers to the realization of the proposed technology, and, when sensible, mitigating risk by providing alternate development pathways?

One reviewer felt the project's future plans look good, but there seems to be a funding gap which should be addressed on a priority basis. Another noted significant potential for development.

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

Reviewers felt additional resources are a must. This effort warrants an increase in funding.

NSF- 3d Generation Advanced High Strength Steel: Roger Heimbuch (A/SP)



Reviewer Sample Size

This project had a total of 3 reviewers.

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

All reviewers agreed that lightweight steel is the prime material used in lightweighting vehicles. Introduction of more AHSS, especially third generation AHSS, would significantly reduce weight of automobiles, further resulting in improved fuel economy.

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

Reviewers found the A/SP has done an outstanding job focusing on achieving 40% weight reduction (with mass compounding) from all aspects of auto manufacture. A reviewer noted the funding by the DOE has accelerated the progress no doubt. Steel has a cost advantage over alternative lightweight materials, and this is a technical barrier that is low for steel but high for the competition! Another noted the project plan was very good. Fundamental understanding of third generation of AHSS would help to produce new material more cost effectively.

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

Reviewers found the progress to be slow but worth the wait. One reviewer suggested progress should be accelerated, with focus on barriers to be overcome. Another noted that it is still early to assess. A third noted, that although Dr. Heimbuch has briefly covered the technical accomplishments, the progress toward weight reduction has been exemplary, which means the technical accomplishments overcame the lightweighting barrier (high for steel).

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

Reviewers unanimously found collaboration in this project outstanding, followed with a few suggestions. One specifically cited good collaboration with worldwide steel companies that would be the envy of the aluminum and magnesium industry. And there was outstanding collaboration with universities and national laboratories due to the A/SP efforts in promoting advanced high strength steels as a research topic. One reviewer noted interaction between different universities and steel industry is outstanding. Significant development is going on steel microstructure with heat treatment and carbon partitioning–a great program. One reviewer agreed, though also suggested that some great people in Canada could contribute to the overall effort which would benefit the program. For example, Stephen Yue (McGill Univ.), Michael Worswick (Waterloo) and Randy Bowers (Windsor) are all established researchers with a great deal of experience in the issues facing this important effort.

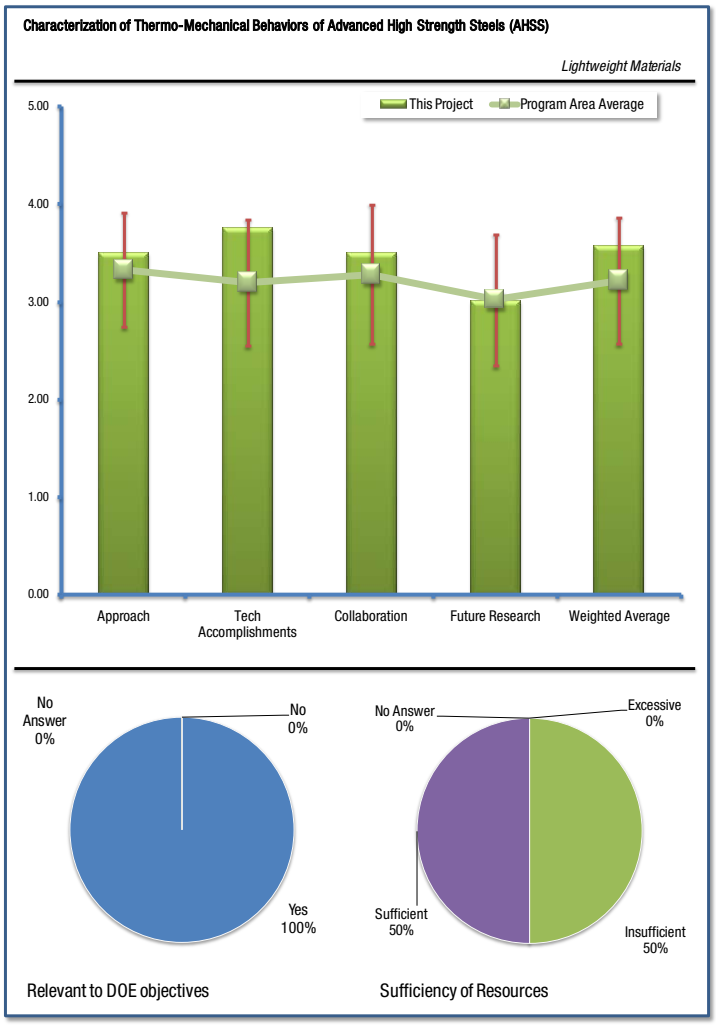
Question 5: Has the project effectively planned its future work in a logical manner by incorporating appropriate decision points, considering barriers to the realization of the proposed technology, and, when sensible, mitigating risk by providing alternate development pathways?

Reviewers were mixed on the plans for future work. One believed too much concentration is made on ultra-, ultra-high strength steels that will require thinning of the sheet to achieve light weight. This concentration will lead to problems with buckling in structures (localized and general), recycling, and cost, essentially raising new barriers to progress. Another felt future plans look good, while a third felt the proposed research program is very good, but due to time constraints to complete the project, development work should be accelerated.

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

One reviewer found the technical accomplishments achieved with the resources that have been available have been exemplary. This reviewer felt resources should be maintained and should yield good results in achieving the stated milestones. Another reviewer needed more information to make a determination, though felt the budget seems to be okay.

Characterization of Thermo-Mechanical Behaviors of Advanced High Strength Steels (AHSS): Mark Smith (Pacific Northwest National Laboratory (PNNL))



Reviewer Sample Size

This project had a total of 4 reviewers.

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

Reviewers found the project directionally supportive of DOE and FreedomCAR program goals, although one did note that the timeframe is long–perhaps 10 years. One reviewer noted AHSS materials are important bedrocks of the FreedomCAR program and support petroleum displacement in the total lifecycle of vehicles. Another added the increased use of new AHSS would lead to reduced weight and meet 50% weight reduction goal of FreedomCAR.

Question 2: What is your assessment of the approach to performing the work? To what degree are technical barriers addressed?

Is the project well-designed, feasible, and integrated with other efforts?

Reviewers found the approach taken in this project to be commendable. One reviewer lauded the effort to characterizing the effects of microstructure and thermo-mechanical effects on basic mechanical properties and fatigue resistance, important in modeling automotive components made from AHSS. Another added the basic understanding of mechanical behavior of these AHSS is very important for modeling. Basic understanding of welding of these materials is important for predicting mechanical behavior of these materials. So this work is very valuable. Still another reviewer remarked about forming and welding influences on microstructures that more depth is needed to establish whether the approach is outstanding or not.

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

Reviewers found progress proceeding well. One reviewer remarked that although the presentation was just a glimpse of the R&D, it is understood that the technical accomplishments were first class and achieved project goals. Basic understanding of interaction between microstructure and mechanical behavior would lead to the development of modeling for future material use. Depth of work is outstanding. Another reviewer found the results good, but a question was raised about the very homogeneous microstructure, pointing to rather small samples, and whether it is scalable. Another reviewer noted there was good understanding of the welding part, together with modeling; the quality of results was outstanding.

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

Reviewers found a narrow level of collaboration, with two good groups of two DOE labs. Although there aren't as many partners in this project, it was noted, they are fairly well coordinated. One reviewer specifically did note the coordination of both National Labs and steel companies is very good.

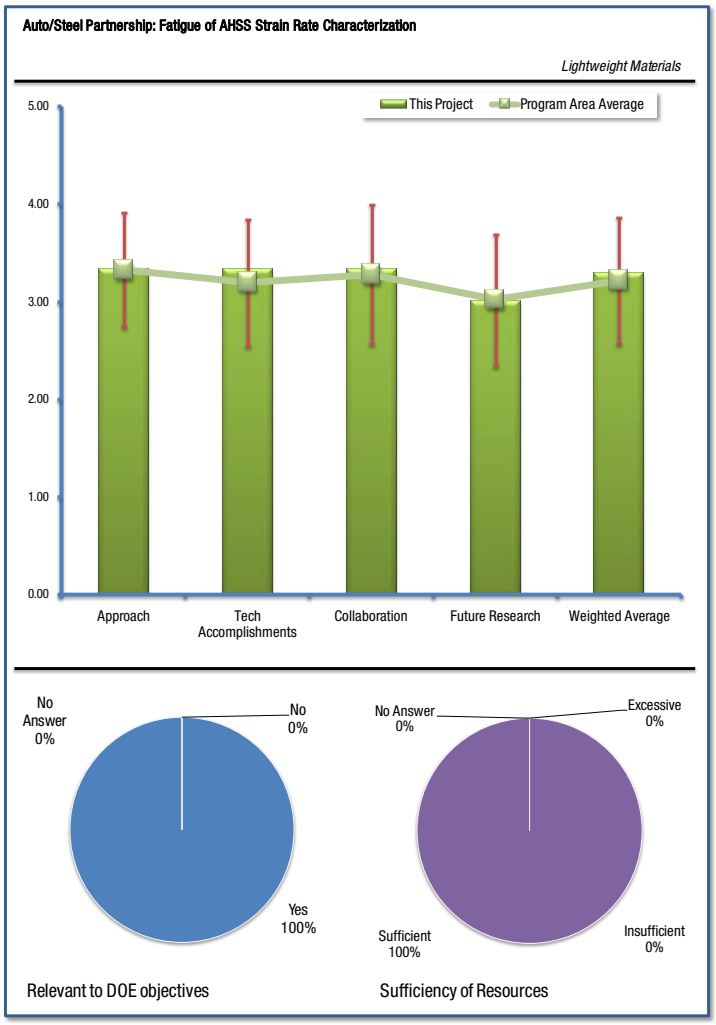
Question 5: Has the project effectively planned its future work in a logical manner by incorporating appropriate decision points, considering barriers to the realization of the proposed technology, and, when sensible, mitigating risk by providing alternate development pathways?

Reviewers were disappointed that the presentation did not explain future plans. One reviewer noted the presentation doesn't clearly establish the proposed future research, but it has been stated that these results will be useful in modeling applications for AHSS. A question was raised: how will these models be applied to actual production components? In comparing the results from this program with those in the following presentation (LM26), there seems to be a contradiction. LM26 concluded that fatigue of welded joints of most of the AHSS sheet materials was only affected by weld parameters and sheet thickness irrespective of composition. The results of LM25 and LM26 need to be compared and explained as to the contradiction. One reviewer did suggest that works in modeling should be accelerated, and that tech transfer to steel companies, OEMs and parts suppliers should be one of the prime objectives in the future plan.

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

One reviewer found milestones were achieved in this project and that it has sufficient resources; however, another reviewer felt it needs to be expanded.

Auto/Steel Partnership: Fatigue of AHSS Strain Rate Characterization: Roger Heimbuch (A/SP)



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

Question 1: Does this project support the overall DOE objective of petroleum displacement? Why or why not?
Reviewers found this project very important work for modeling the applications of AHSS in achieving petroleum displacement.

Question 2: What is your assessment of the approach to performing the work? To what degree are technical barriers addressed? Is the project well-designed, feasible, and integrated with other efforts?
Reviewers found this project did a great job in identifying an important issue with AHSS relative to effect of weld geometry, AHSS steel composition, sheet thickness on fatigue. Strain rate data are critical to crash modeling, and approach gives desired results. It looks to be a very solid and well-planned project.

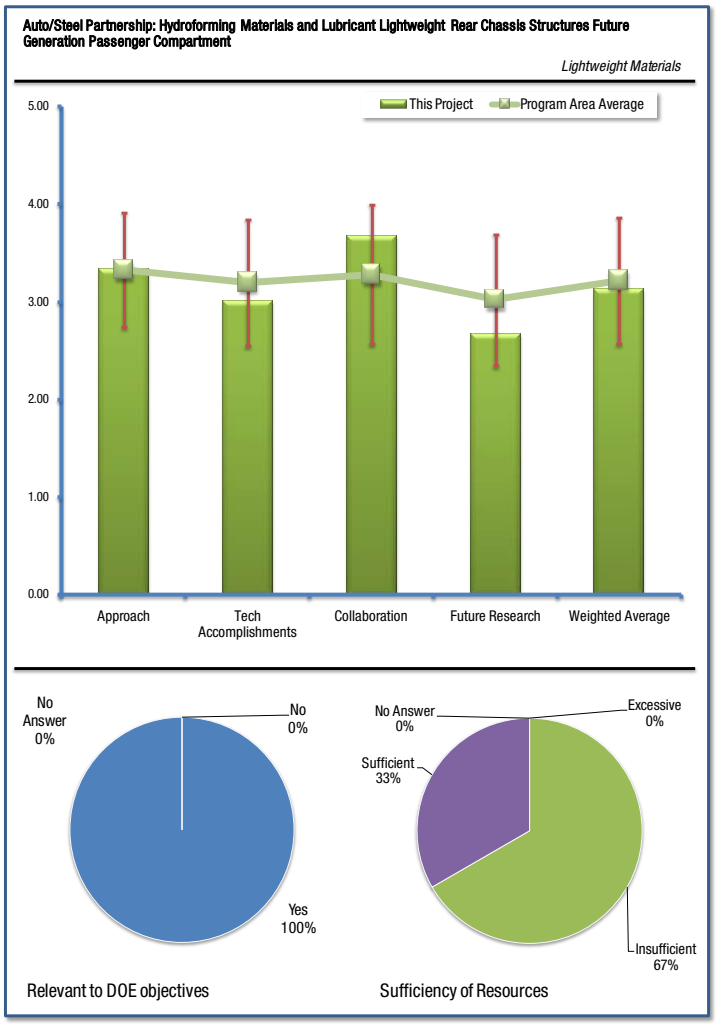
Question 3: Characterize your understanding of the technical accomplishments and progress toward overall project and DOE goals.
Reviewers felt this project achieved exemplary, work with excellent progress toward objectives and promising results. One noted significant work still is to be done. But all agreed that conclusions are critical to designing light weight vehicles with AHSS sheet.

Question 4: What is your assessment of the level of collaboration and coordination with other institutions?
Reviewers found this project has outstanding collaboration by A/SP with AHSS suppliers, users, and R&D personnel. One reviewer suggested, for additional input in weld modeling, that the researchers contact Dr. Moyra McDill at Carleton University (mmcdill@mae.carleton.ca). She has 25 years of experience in modeling transient processes such as welding and the cooling of castings as well as the development of automatic meshing algorithms that refine and coarsen the mesh in response to transients.

Question 5: Has the project effectively planned its future work in a logical manner by incorporating appropriate decision points, considering barriers to the realization of the proposed technology, and, when sensible, mitigating risk by providing alternate development pathways?
Reviewers found future work plan to be in order. One reviewer noted the application of data in modeling is generally addressed but there is a need for clarification as to how modeling will make use of the data. The general idea that a given number of welds are needed based on design and not on type of AHSS is a plus in assessing a new design.

Question 6: How sufficient are the resources for the project to achieve the stated milestones in a timely fashion?
Reviewers disagreed on future funding for the project. One found stated milestones are achievable with resources available. The other felt more funding could be useful for this task.

Auto/Steel Partnership: Hydroforming Materials and Lubricant Lightweight Rear Chassis Structures Future Generation Passenger Compartment: Roger Heimbuch (A/SP)



Reviewer Sample Size

This project had a total of 3 reviewers.

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

Reviewers found obvious weight reduction and life cycle analysis supports petroleum displacement. Achieving lightweight structures and application of these components would achieve towards the goal of FreedomCAR.

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

Reviewers found the approach generally effective, though with some criticism. One reviewer did find that except for the approach taken on the hydroforming project, the approaches on the rear chassis and passenger compartment were creative and generally effective. Although significant progress was made on the rear chassis and passenger compartment -- all made with 100% AHSS -- the question is begged: if the multi-material vehicle is anticipated to achieve the FreedomCAR goals, why doesn't the A/SP include these materials along with AHSS to help the program along? It seems that most of the DOE projects are uni- and not multi-material in approach. Another reviewer found the financial and technical problems appear to have partially derailed the effort.

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

Reviewers had mixed reactions to the progress in this project. One noted that two out of three objectives essentially achieved isn't bad. The use of a multi-material concept (plastic/AHSS roof component) in the passenger compartment may be a step toward what is brought up in Question 2 above. Another reviewer noted this project seems to have suffered from more than the usual amount of technical and financial difficulty, which is unfortunate. Significant progress has been made, noted another reviewer, and this should be transferred to OEMs and parts suppliers. Still another reviewer noted that overall, this effort appears to have worked well and been worthwhile (10-30% weight reduction and a 63% stronger roof).

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

Reviewers agreed that, as usual, A/SP does a great job in collaboration with institutes and participants.

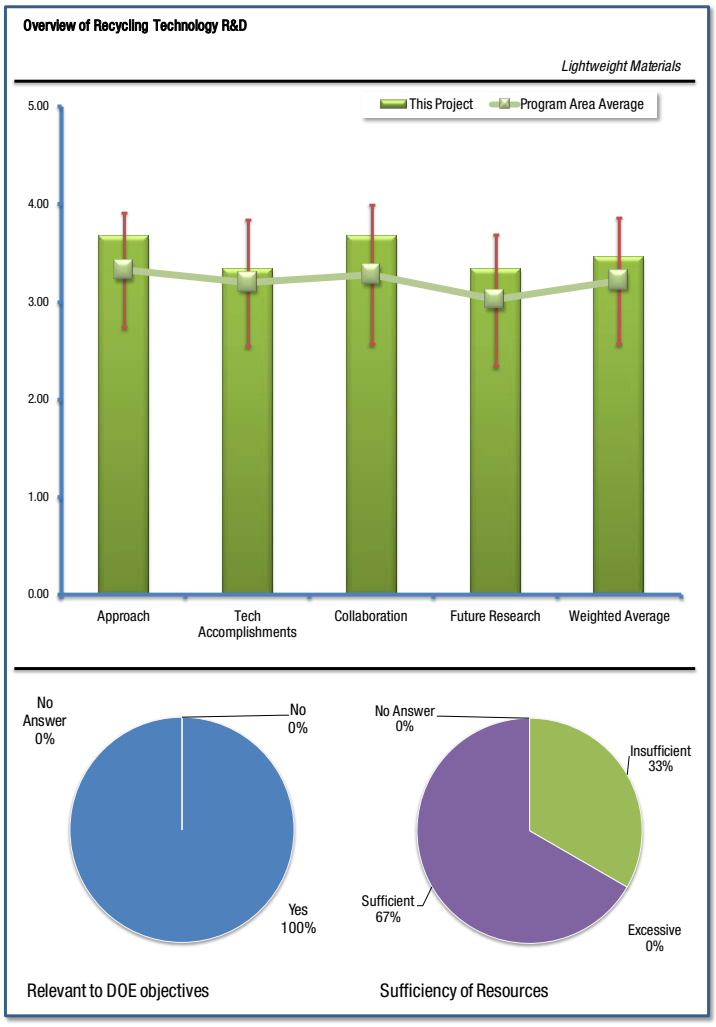
Question 5: Has the project effectively planned its future work in a logical manner by incorporating appropriate decision points, considering barriers to the realization of the proposed technology, and, when sensible, mitigating risk by providing alternate development pathways?

Reviewers found the forward plans seem to be good - assuming sufficient resources can be secured. One reviewer noted that achieving the tough weight reduction targets may necessarily require a multi-material approach, which is not recognized presently in the AHSS project portfolio. Another noted it is a good research program and should be completed according to milestones. Another noted the presentation dealt with several tasks - some of which are winding down and others are still in progress.

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

Reviewers found additional resources are essential to success of this project. One noted, to achieve stated milestones (50% weight reduction), a multi-material focus may need to be introduced into the AHSS programs that involve lightweight vehicle designs. The current resources are insufficient for this focus. Another found the mix of tasks somewhat difficult to assess, but overall it sounds as though more funding would be helpful.

Overview of Recycling Technology R&D: Ed Daniels (Argonne National Laboratory (ANL))



Reviewer Sample Size

This project had a total of 3 reviewers.

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

Reviewers agreed that, especially with the 4:1 energy advantage with the recovered plastic, this project supports DOE goals. Recycling is one of the goals of the FreedomCAR program and is essential to meet the DOE goal.

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

Considering the difficulties and high technical barriers to recycling polymers from this waste, the approach here was highly focused on that which was difficult to improve, especially considering the results. Another reviewer noted all the recycling projects were well defined and met the objectives. Still another noted the project is well structured but could be better detailed and developed.

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

One reviewer did not find sufficient detail in the presentation to make an assessment. Another reviewer found excellent progress. The chemical engineering processes to remove and separate the polyolefin and ABS polymers are directly transferable to the new demonstration plant. Another reviewer found all the deliverables were met as planned.

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

Reviewers found collaboration to be excellent in the project. All the partners and institutions helped and collaborated closely, leading to a successful result and good future prospects.

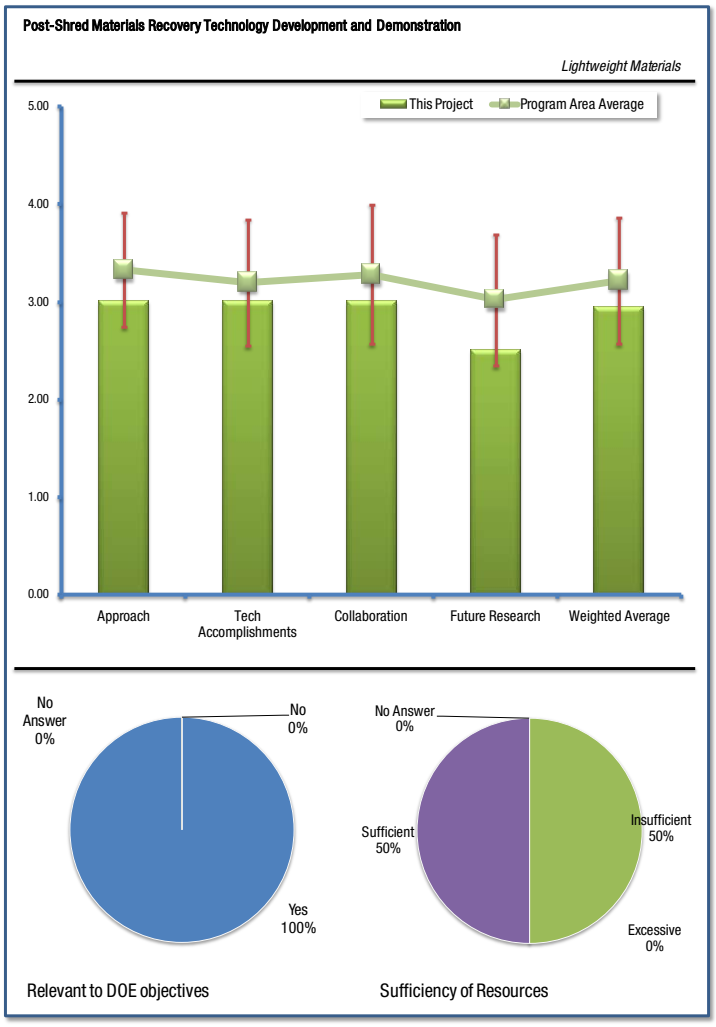
Question 5: Has the project effectively planned its future work in a logical manner by incorporating appropriate decision points, considering barriers to the realization of the proposed technology, and, when sensible, mitigating risk by providing alternate development pathways?

Reviewers noted the demonstration plant clearly builds on past progress and is sharply focused on success in overcoming barriers. The PCB is a real problem but, overall it is limited.

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

One reviewer commented that although resources seem sufficient, this is an assumption as the costs of building and operating the demonstration plant may be understated.

Post-Shred Materials Recovery Technology Development and Demonstration: Bassam Jody (Argonne National Laboratory (ANL))



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

Question 1: Does this project support the overall DOE objective of petroleum displacement? Why or why not?
One reviewer noted that while recycling does not directly decrease petroleum usage, it is certainly related in that it can assist by making the economics of lightweight materials more attractive. In addition, recycling of existing or used lightweight metal parts is much less energy intensive than making new LW metals from ore. Therefore, recycling is a useful and important means of obtaining raw materials for use in new lightweight auto parts. In this way, the recycling project does contribute to the reduction of energy use and thus, to the usage of petroleum. Another reviewer added that any recovery of material will displace petroleum.

Question 2: What is your assessment of the approach to performing the work? To what degree are technical barriers addressed? Is the project well-designed, feasible, and integrated with other efforts?
Reviewers found this to be a very sensible approach but it appears to be just about the same as last year's.

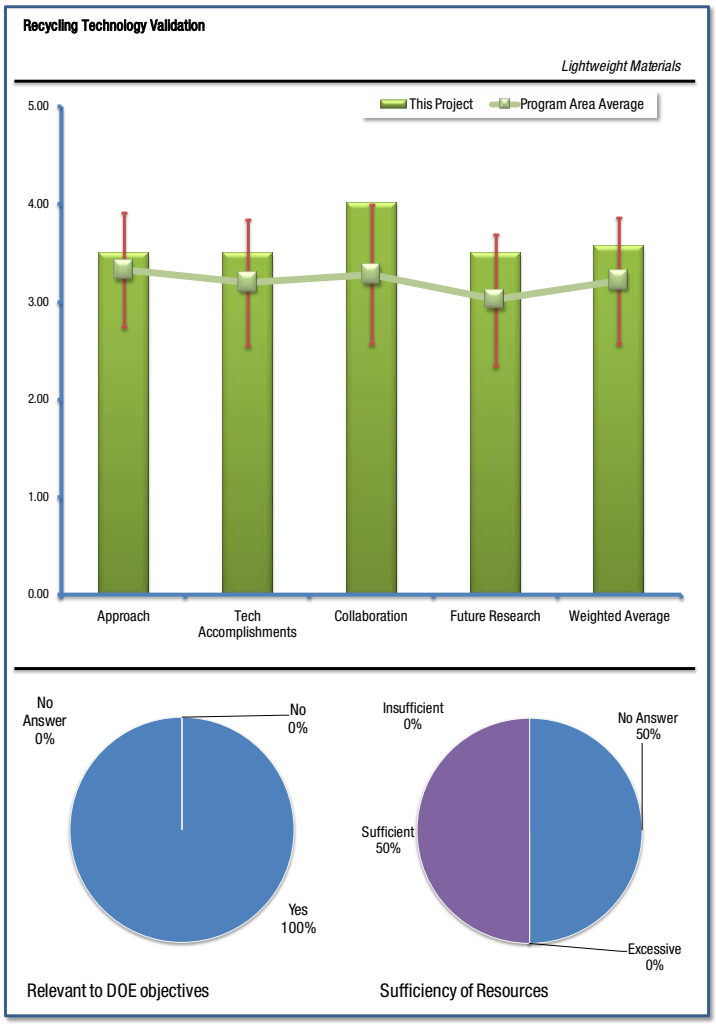
Question 3: Characterize your understanding of the technical accomplishments and progress toward overall project and DOE goals.
Reviewers were mixed on the perceived progress of the project. One reviewer liked the scale-up scheme to a validation scale unit and use of mold try-outs with recovered plastics. Another reviewer noted, even though milestones from two previous years were displayed, it's difficult to see progress. It was noted that nano particles are promising.

Question 4: What is your assessment of the level of collaboration and coordination with other institutions?
One reviewer noted the collaboration seemed good but did not notice a comprehensive listing of the partners involved.

Question 5: Has the project effectively planned its future work in a logical manner by incorporating appropriate decision points, considering barriers to the realization of the proposed technology, and, when sensible, mitigating risk by providing alternate development pathways?
One reviewer found the future plans to be reasonable. Another felt it should be more developed.

Question 6: How sufficient are the resources for the project to achieve the stated milestones in a timely fashion?
One reviewer noted that the resources seem okay but that not much was said about resources and the project is winding down this year.

Recycling Technology Validation: Joe Pomykala (Argonne National Laboratory (ANL))



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

Question 1: Does this project support the overall DOE objective of petroleum displacement? Why or why not?
One reviewer noted the validation plant will follow the petroleum displacement described in LM28 and LM29. Another noted any recovery of material will displace petroleum.

Question 2: What is your assessment of the approach to performing the work? To what degree are technical barriers addressed? Is the project well-designed, feasible, and integrated with other efforts?
One reviewer found the approach seems okay. Another reviewer noted, following up on the approaches in LM28 and LM29 and the detailed cost model, the technical and economic barriers are addressed.

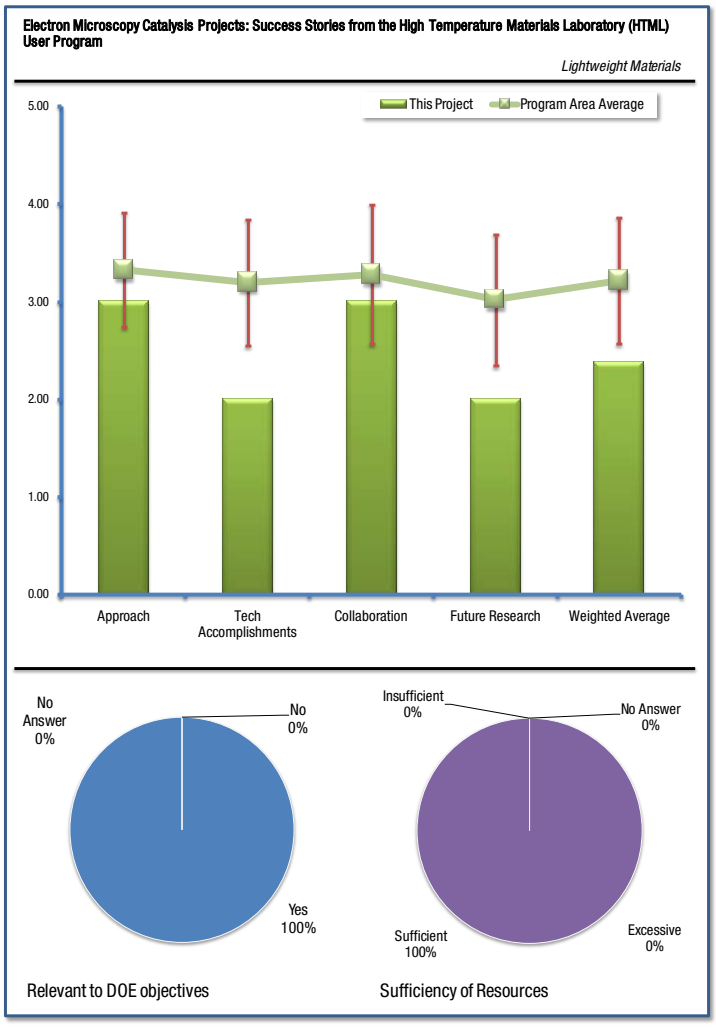
Question 3: Characterize your understanding of the technical accomplishments and progress toward overall project and DOE goals.
Reviewers noted that completions of layout, electrical and plumbing designs are expected soon and suggest that the barriers (now mostly cost) will be overcome. One reviewer noted it would appear that the project has achieved a good and useful set of results and is on-track to benefit from the start of the pilot plant which is presently under construction for commissioning shortly.

Question 4: What is your assessment of the level of collaboration and coordination with other institutions?
Reviewers found close cooperation with partners and equipment builders and that should result in start up on or close to schedule. Another added that the collaboration is important to fostering technology transfer.

Question 5: Has the project effectively planned its future work in a logical manner by incorporating appropriate decision points, considering barriers to the realization of the proposed technology, and, when sensible, mitigating risk by providing alternate development pathways?
Reviewers found planned future work to be commendable, with efforts building on past progress and a sharp focus. One reviewer did note the project is winding down.

Question 6: How sufficient are the resources for the project to achieve the stated milestones in a timely fashion?
One reviewer assumes, with such good cost modeling, that the project leader/team has secured sufficient funds and resources. Another reviewer is not sure how to answer the question–the research and validation preparation work is going to end this year with the start-up of the new validation plant. Another found the requested budget going forward is to support the start-up of operations of the plant and so it is somewhat speculative as to how much money will be needed.

Electron Microscopy Catalysis Projects: Success Stories from the High Temperature Materials Laboratory (HTML) User Program: Lawrence Allard (Oak Ridge National Laboratory (ORNL)) - POSTER



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

Question 1: Does this project support the overall DOE objective of petroleum displacement? Why or why not?
The reviewer didn't comment on this question.

Question 2: What is your assessment of the approach to performing the work? To what degree are technical barriers addressed? Is the project well-designed, feasible, and integrated with other efforts?
A reviewer stated the investigators could have shown how (through analysis and performance projections) how increases in catalyst performance impact/effect fuel cell performance or catalyst rates or oxygen reduction reactions in one particular case. PNNL section or case example was particularly lacking in effects on how progress overcomes barriers or impacts system performance.

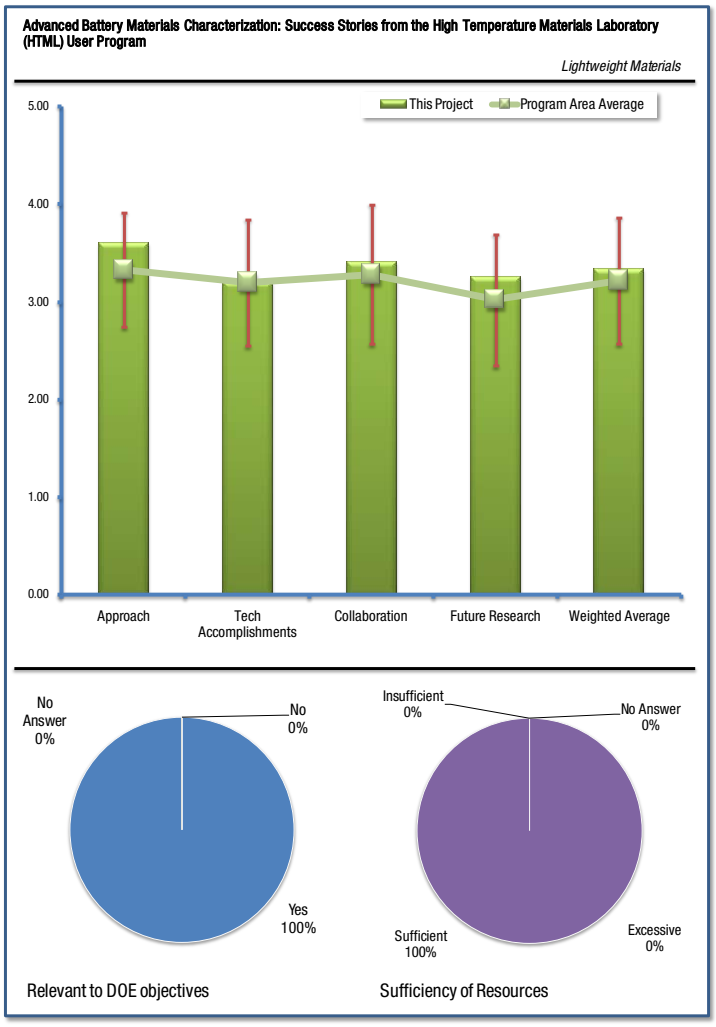
Question 3: Characterize your understanding of the technical accomplishments and progress toward overall project and DOE goals.
A reviewer stated it is very hard to judge progress on barriers because of comments discussed above in item #2. The investigators need to more strongly tie their progress shown to impacts and affects on fuel cell performance, catalyst performance in a system operation, or catalyst rates.

Question 4: What is your assessment of the level of collaboration and coordination with other institutions?
The reviewer didn't comment on this question.

Question 5: Has the project effectively planned its future work in a logical manner by incorporating appropriate decision points, considering barriers to the realization of the proposed technology, and, when sensible, mitigating risk by providing alternate development pathways?
A reviewer stated this was very hard to assess because there was no future or planned research shown or mentioned.

Question 6: How sufficient are the resources for the project to achieve the stated milestones in a timely fashion?
No comments were provided.

Advanced Battery Materials Characterization: Success Stories from the High Temperature Materials Laboratory (HTML) User Program: Andrew Payzant (Oak Ridge National Laboratory (ORNL)) - POSTER



Reviewer Sample Size

This project had a total of 5 reviewers.

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

A reviewer stated the battery materials characterization user projects highlighted in this presentation address technology development issues associated with abuse-tolerance, durability and power density. Another reviewer noted yes this is the kind of study that associate industry and National Lab will necessarily help to support DOE objectives. One reviewer commented the clarification of basic mechanisms impacting safety and performances of Li battery materials is fundamental in allowing for a large diffusion of EV and HEV and then significantly reducing petroleum use. Comments from another reviewer mentioned this HTML user program addresses advanced battery materials. These batteries are applicable to vehicles and so this topic is relevant to petroleum displacement. Observations from one reviewer added in situ measurements of batteries are important to addressing performance gaps. Specifically the work of this poster highlights efforts to understand internal short and crystal structure during charge and discharge may have benefits to improving safety.

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

A reviewer stated in this poster three HTML User Program projects focused on the characterization of materials for batteries were highlighted. Thermal runaway is an important safety and reliability issue for Li-ion batteries. The battery industry does not have a standard method to test production cells. The HTML is working with Motorola to develop a reliable method to test cells for potential of thermal runaway due to internal short. Thermal conductivity of the cell materials determine how fast heat can be dissipated in an event of internal short. If local temperature reaches a critical point, thermal runaway will occur. This reviewer went on to say high-speed infrared imaging was used to determine the temperature distribution in batteries. For the Brookhaven project the changes in electronic and crystal structures for both uncoated and carbon coated LiFe1/4Mn1/4Co1/4Ni1/4PO4cathode materials during charge-discharge cycling were determined using the in situ x-ray diffraction capabilities of HTML's X14A synchrotron beam line at the National Synchrotron Light Source (NSLS). Synchrotron x-rays were used to determine the site occupancy of dopants in the olivine structure, with particular emphasis on identifying site mixing and site vacancies for the MIT project. Another reviewer commented the development of in-situ techniques are always helpful to better understand the mechanism that limit battery's performance, life and abuse tolerance. Oak ridge has very unique capabilities. One reviewer added the idea of an independent laboratory able to investigate fundamental phenomena of Li battery

materials is excellent. The approach clearly addresses key technical barriers, whose comprehension is functional to a larger use of such batteries. Comments from another reviewer noted the program highlights 3 major projects involving IR imaging and in-situ x-ray diffraction for phase analysis. Observations from one reviewer mentioned they think the BNL effort is good and raising awareness is also good so that industry and academic partners can come forward to study problems. They question the value of Motorola's research developing a destructive QC test for a problem which is dependent on individual cells seems to not be very sound. Destructive sampling QC makes sense when there are systemic flaws but not as a method for detecting problems which are more related to individual units.

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

A reviewer stated the HTML User Program provided valuable characterization support for three User Projects investigating advanced battery materials. Another reviewer mentioned that all three cases shown are very impressive in term of results. One reviewer commented the results are not yet complete but seem quite interesting and in line with the scope and objectives of the HTML efforts. For example, the development of new evaluation methodologies, such as the use of infrared imaging for thermal runaway analysis, is of a wider importance, because it can be applied at various configurations, and it is already a very good result. Comments from another reviewer added the IR imaging project addresses thermal runaway in Li ion batteries. Thermal runaway and battery safety remains a concern. The availability of the IR imaging instrument in this HTML user program will enable researchers to study this problem and will improve the safety of battery technologies. The other 2 battery-related projects examine in-situ x-ray diffraction during charge/discharge cycles. These projects are also extremely meritorious.

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

A reviewer stated the project has collaborated with five institutions in battery materials research. Only three interactions were highlighted. Another reviewer added the collaborations are good and based on clear rules, even if the impression is that they are the result of casual commitment and interest. The HTML should be better integrated in the Battery Subprogram, as part of the basic characterization of the materials and batteries under investigation. The full involvement of the participating organizations and their coordination is well defined in the rules for asking the scientific support of HTML. One reviewer noted this program highlights collaborations with an industrial laboratory (Motorola), a university (MIT), and a national laboratory (Brookhaven National Laboratory). This shows a very diverse cross-section of users/collaborators. Comments from another reviewer mentioned the strength of this program is the need for external partners to propose and staff research - excellent collaboration. The reviewer really likes the model.

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

A reviewer stated the ORNL researchers working at HTML publicize the HTML facilities at scientific conferences and their website. Access to the HTML is provided through the HTML User Program proposal process. Research proposals are reviewed by a committee and approved based on scientific merit, relevance of the proposed research to the mission of DOE's Vehicle Technologies Program, and feasibility. Research is completed within 24 months. The research plan is set up by the users. A research plan is complete when the results are published in the open literature and/or presented at a professional conference. Another reviewer noted the prosecution of ongoing projects is reasonable, while the start of the new projects is interesting but not based on a coordinated or strategic plan. This implies that not necessarily the most interesting research needs are evaluated with the powerful expertise and instrumentation of HTML. One reviewer mentioned each user program has 2 main ways in which they are able to address future research plans:

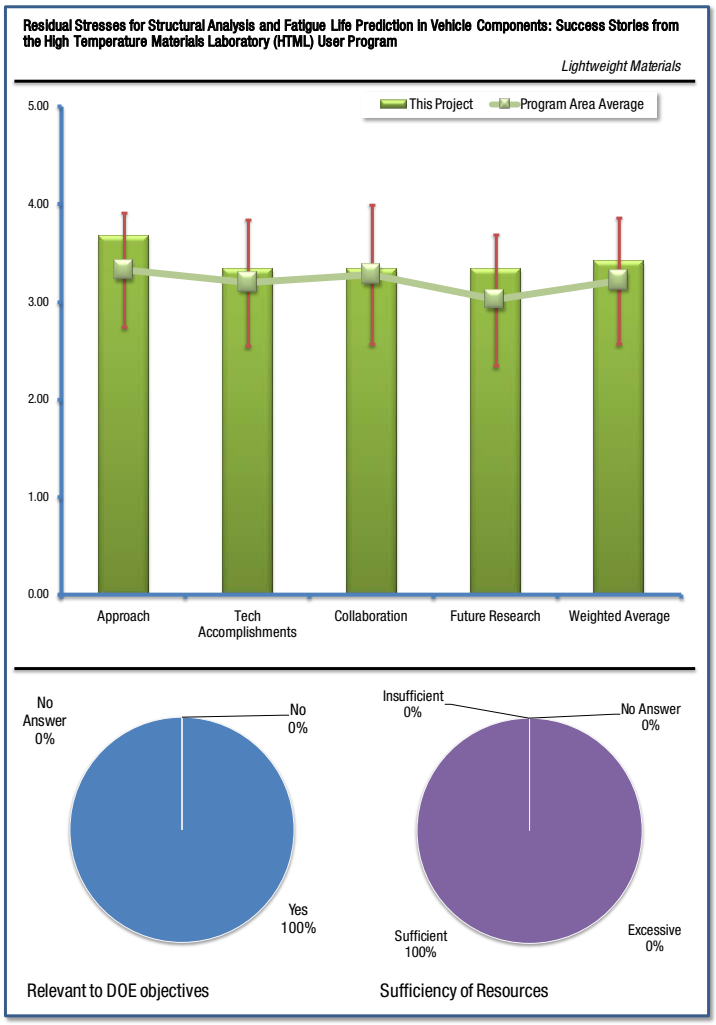
(1) to increase the number of users and ensure strong user base-- presentations are delivered at conferences and workshops, and results are published in peer reviewed literature; and

(2) a list of state-of-the-art instrumentation is maintained by the director of the HTML user program. This list is revisited and reprioritized on a regular basis-- ensuring availability of cutting-edge techniques to the user community.

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

A reviewer stated sufficient resources are provided for these HTML projects. Another reviewer commented the level of resources is clearly related to the number of projects accepted or scientific services required. One reviewer noted the resources seem appropriate but would depend on partner demand - in view of the queue length - on the order of a month or two - seems appropriate.

Residual Stresses for Structural Analysis and Fatigue Life Prediction in Vehicle Components: Success Stories from the High Temperature Materials Laboratory (HTML) User Program: Camden Hubbard (Oak Ridge National Laboratory (ORNL)) - POSTER



Reviewer Sample Size

This project had a total of 3 reviewers.

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

A reviewer stated the user project described in this poster presentation is relevant to the mission of the VTP, because they address the goals of material and manufacturing technologies for high volume production vehicles that enable/support the simultaneous attainment of reduction in the weight of vehicle structure and subsystems and affordability, and increased use of recyclable/renewable materials. This project assesses the impact of common hole-making processes on commercial vehicle side rail durability, specifically the residual stresses and crack growth properties. Another reviewer noted this X-ray and Neutron HTML user program highlighted projects which involved mechanical testing and residual strain measurement for vehicle components.

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

A reviewer stated the approach for hole making, fatigue crack growth measurement, and baseline materials properties were established by Metalsa. Metalsa worked with the researcher at HTML making use of the neutron residual stress mapping setup. The approach taken is the right one to evaluate the detrimental effects of manufacturing processes. The results of this approach enable Metalsa to optimize fabrication parameters, process variables and choice of alloys to meet requirements of truck manufacturers. Another reviewer commented the projects described in the poster examine alternative light weight materials and process evaluation for vehicle applications. The overall goal is a 15-25% reduction in chassis weight for large vehicles. One reviewer added the investigator provided a nice discussion on the project and how it clearly led to overcoming vehicle weight reduction barriers.

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

A reviewer stated there is lots of data but it is not clear what the accomplishments were. It would be nice if the accomplishments were summarized in one or two slides. There are too much details and it's very difficult to find the accomplishments. Another reviewer noted the program highlights projects involving residual stress mapping using neutron diffraction. The work is collaboration with industry, the Metals Roanoke Company. The project assessed fatigue life of components and hole-making processes (thermal vs. mechanical processes). Key findings are reported which highlight the relationship between residual stress and cooling rate. Neutron diffraction and strain analysis was also used to assess the heat affected zones of processed materials. One reviewer mentioned there was a very good

discussion on how their industrial collaboration led to vehicle weight reduction and how it affected trucking industry nationwide.

Question 4: What is your assessment of the level of collaboration and coordination with other institutions?
A reviewer stated Metalsa submitted a user proposal in October 2007. This proposal was selected and HTML researcher started working with Metalsa. It appears majority of the work was done by Metalsa. Another reviewer commented this HTML user program collaborated with 20 different user projects. At least 8 of the users were university-based research teams. Three companies were also represented in the user community. One reviewer noted the investigator takes a nice approach to collaboration with industry in properly planning measurement sequences, procedures, measurement parameters and metrics.

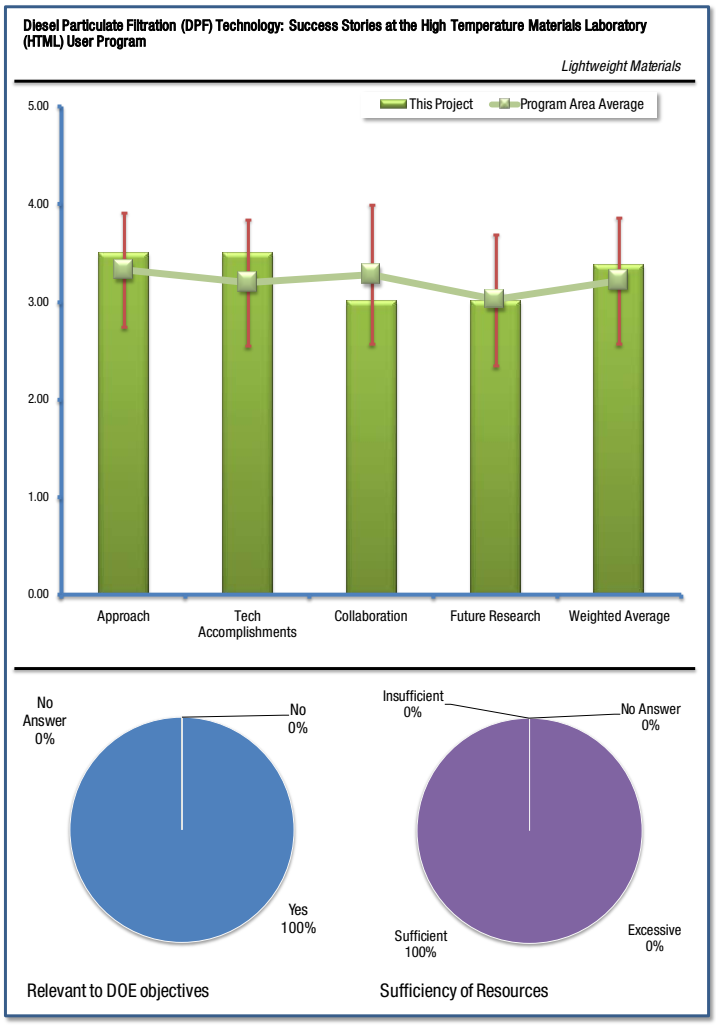
Question 5: Has the project effectively planned its future work in a logical manner by incorporating appropriate decision points, considering barriers to the realization of the proposed technology, and, when sensible, mitigating risk by providing alternate development pathways?
A reviewer stated this project with Metalsa is scheduled to end in June 2009. No future work for this project was presented. Another reviewer added the investigator demonstrated good follow-on research and measurement plans with industry. One reviewer mentioned each user program has 2 main ways in which they are able to address future research plans:

(1) to increase the number of users and ensure strong user base-- presentations are delivered at conferences and workshops, and results are published in peer reviewed literature; and

(2) a list of state-of-the-art instrumentation is maintained by the director of the HTML user program. This list is revisited and re prioritized on a regular basis-- ensuring availability of cutting-edge techniques to the user community.

Question 6: How sufficient are the resources for the project to achieve the stated milestones in a timely fashion?
A reviewer stated that sufficient resources are provided to HTML by DOE to carry out this short term user facility research.

Diesel Particulate Filtration (DPF) Technology: Success Stories at the High Temperature Materials Laboratory (HTML) User Program: Amit Shyam (Oak Ridge National Laboratory (ORNL)) - POSTER



Reviewer Sample Size

This project had a total of 2 reviewers.

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

A reviewer stated the user projects highlighted in this presentation address barriers associated with engine efficiency reduction by measures to reduce emissions identified in the Advanced Combustion and Emission Control Technical Roadmap for Light-Duty Powertrains and the Roadmap for the 21st Century Truck Partnership. In this poster four HTML User Program projects on diesel particulate filters were highlighted. Another reviewer noted this HTML user program assesses diesel particulate filtration technologies and is relevant to DOE objectives of petroleum displacement.

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

A reviewer stated in this presentation four HTML User Program projects on diesel particulate filters were highlighted. The approach for the project with CEO2 Technologies is to utilize techniques developed at the HTML to prepare test specimens of porous materials and determine their fracture toughness and thermal conductivity. Utilize scanning electron microscopy to characterize the microstructure of these materials. The approach for the interaction with University of Wisconsin is to utilize UV-illuminated optical microscopy and an environmental scanning electron microscope to determine penetration depth in porous substrates. The reviewer went on to say this approach is followed to understand the fundamentals of soot deposition in DPFs and to quantify soot penetration depth in DPF walls. The approach for the University of Utah project is to use laser flash thermal diffusivity and differential scanning calorimetry to determine the thermal diffusivity and specific heat of soot deposits as a function of deposition temperature. In-situ Raman spectroscopy and a diamond indenter were utilized to quantify the effect of stress on the beta-eta phase transformation in eucryptite in the project with Colorado School of Mines. Another reviewer mentioned the program shows projects which have used SEM, Raman spectroscopy, thermal conduction measurement, and UV microscopy as a part of the HTML user program on diesel particulate filtration. The project performed quantitative SEM to examine the cross-linked microstructure of mullite (and industrial collaborative project with GeO2 Technologies). Two universities were highlighted in the poster. One of the university research teams (Univ of Wisc) was interested in examining soot deposition into diesel particulate filter walls and used Raman to examine the penetration depth of the soot as a function of engine operation conditions. This reviewer also said the other university research team (Univ of Utah) was interested in examining the thermophysical properties (thermal conductivity) of soot generated by combustion under various conditions. Low thermal conductivity will lead to

thermal expansion of the soot, thereby applying stress to the filter and subsequent cracking. Both projects were well focused and the user program provided the appropriate instrumentation for assessment of relevant problems (relevant to displacement of petroleum technologies).

Question 3: Characterize your understanding of the technical accomplishments and progress toward overall project and DOE goals.
A reviewer stated the test methods developed at the HTML were utilized to determine the mechanical properties of novel fibrous materials developed by a small business (GEO2 Technologies). Using in situ Raman spectroscopy, the feasibility of phase transformation toughening in beta-eucryptite was demonstrated, which could lead to the use of this material for tough, durable and cost-effective diesel particulate filters. The thermophysical properties of soot deposits were determined, and the effects of engine operating parameters on soot penetration on porous substrates were quantified. Such information will help optimize filtration systems. Another reviewer commented the technical accomplishments highlighted were meritorious and resulted in several publications (3 listed in the presentation).

Question 4: What is your assessment of the level of collaboration and coordination with other institutions?
A reviewer stated the HTML is a National User Facility that supports the missions of DOE, EERE and the VTP in particular, by working with industry, universities and other national laboratories to develop energy efficient technologies that will enable the U.S. to use less petroleum. The project has collaborated with four institutions on diesel particulate filters. Another reviewer noted the user projects highlighted in the poster were from universities and industry. This demonstrates a diverse user base for this HTML user program.

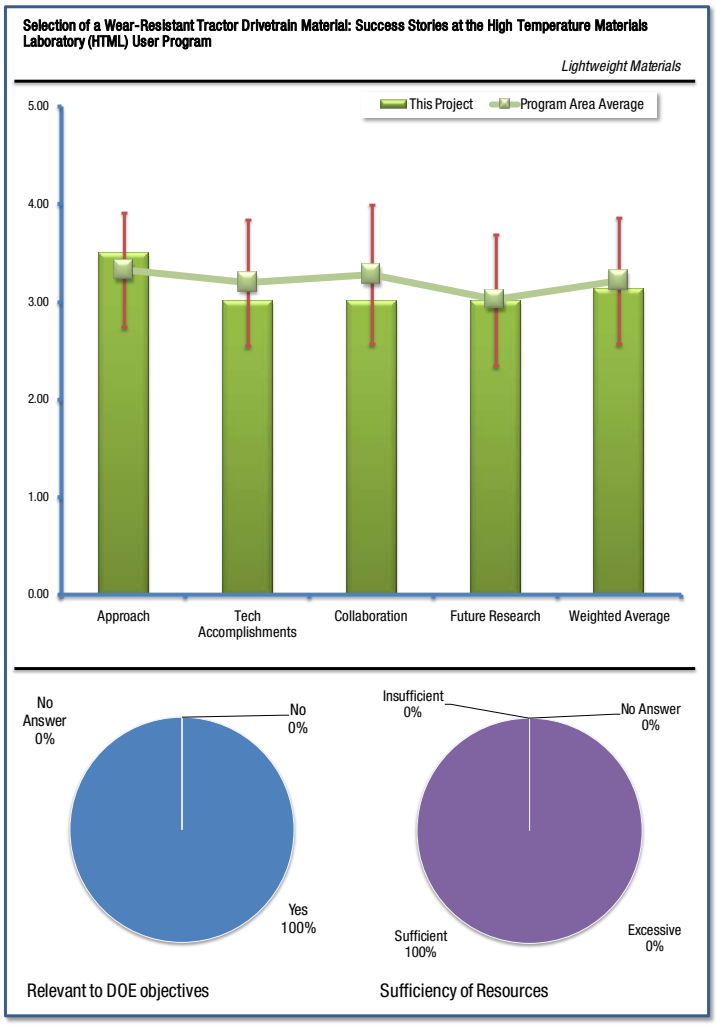
Question 5: Has the project effectively planned its future work in a logical manner by incorporating appropriate decision points, considering barriers to the realization of the proposed technology, and, when sensible, mitigating risk by providing alternate development pathways?
A reviewer stated the ORNL researchers working at HTML disseminate the HTML facilities at scientific conferences and their website. Access to the HTML is provided through the HTML User Program proposal process. Research proposals are reviewed by a committee and approved based on scientific merit, relevance of the proposed research to the mission of DOE's Vehicle Technologies Program, and feasibility. Research is completed within 24 months. The research plan is set up by the users. A research plan is complete when the results are published in the open literature and/or presented at a professional conference. Another reviewer mentioned each user program has 2 main ways in which they are able to address future research plans:

(1) to increase the number of users and ensure strong user base-- presentations are delivered at conferences and workshops, and results are published in peer reviewed literature; and

(2) a list of state-of-the-art instrumentation is maintained by the director of the HTML user program. This list is revisited and re prioritized on a regular basis-- ensuring availability of cutting-edge techniques to the user community.

Question 6: How sufficient are the resources for the project to achieve the stated milestones in a timely fashion?
A reviewer stated the resources are sufficient to achieve the milestones in a timely fashion. During FY2008, students and professors from 32 universities participated in the HTML User Program.

Selection of a Wear-Resistant Tractor Drivetrain Material: Success Stories at the High Temperature Materials Laboratory (HTML) User Program: Peter Blau (Oak Ridge National Laboratory (ORNL)) - POSTER



Reviewer Sample Size

This project had a total of 2 reviewers.

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

A reviewer stated the objective of this HTML User Facility Project is to identify which of three candidate alloys for transmission spools (used to couple the differential ring gear to the axles in a rubber-tracked tractor) represent the most cost-effective means to enhance the wear-life of the drivetrain. Work involves the development of a wear test plan for candidate spool materials under lubricated conditions. Another reviewer noted this HTML User program focuses on drive train components in tractors (to prevent loss of durability). Wear resistance testing of cast iron tractor splines was reported.

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

A reviewer stated the approach selected an appropriate contact stress, sliding speed, type of motion, test duration, and lubricant type to enable an adequate simulation of the contact conditions. Another reviewer added this facility has a unique set of tribological measurement equipment. The researchers are actively involved in developing ASTM standards-- and tests done at this laboratory follow ASTM standard procedures.

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

A reviewer stated that wear and friction tests were conducted on four candidate materials. These tests were based on ASTM Standard G 133 (reciprocating pin-on-dlat, developed at ORNL). Correlation between Brinell hardness and the wear resistance of both lubricated and non-lubricated material combinations were established. Unfortunately the poster presenter was not present to answer questions. This reviewer walked by this poster numerous times. The reviewer was told that this particular presenter had several posters to manage. This is not good. Another reviewer commented the tractor spline test setup was appropriately comparable to the in-service motion of the component. The facility offers a variety of tribological test options. The research on tractor spline components resulted in a publication.

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

A reviewer stated this is a John Deere project utilizing the resources at ORNL-HTML. The effort seems to be well coordinated. There is no follow-up to this project. Another reviewer noted only 1 collaborative work was presented in the poster. The author was able to describe several other user teams-- however, there seems to be primarily

industrial users (rather than universities). The reviewer would encourage the scientists associated with the tribological wear measurement team to attend conferences and visit universities to describe their user facilities. Given the wealth of instrumentation and expertise in tribological measurement, this reviewer believes that many mechanical engineering, materials science, and aerospace engineering departments across the U.S. would have compatible applications and become users at this HTML program.

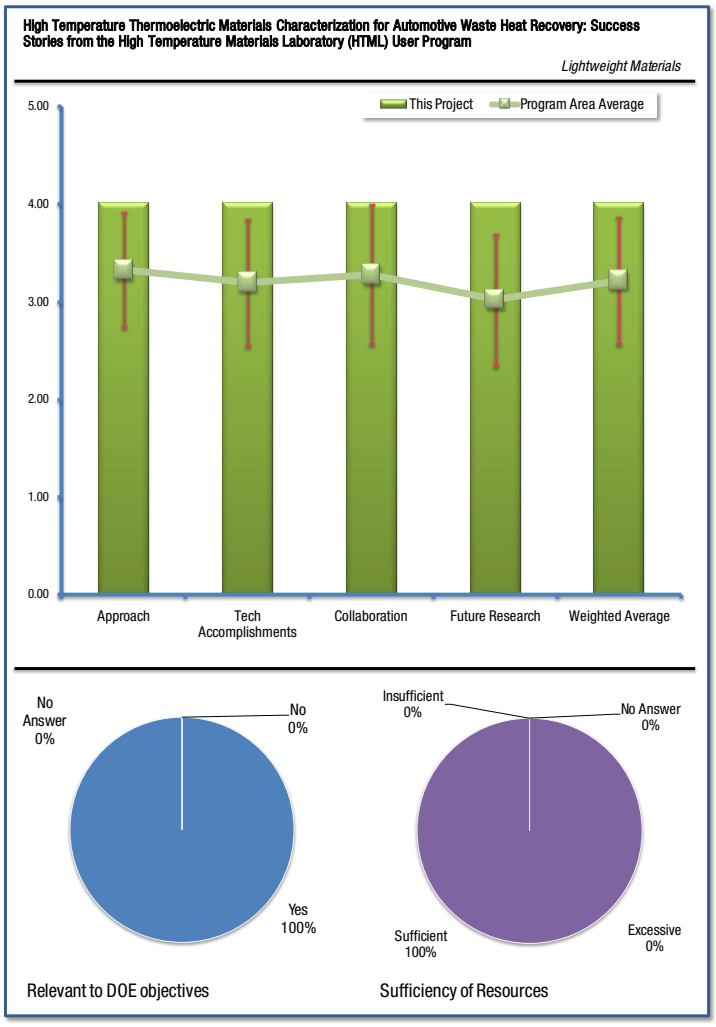
Question 5: Has the project effectively planned its future work in a logical manner by incorporating appropriate decision points, considering barriers to the realization of the proposed technology, and, when sensible, mitigating risk by providing alternate development pathways?

A reviewer stated this HTML user project has been completed (March 2009) and therefore no future work was presented. Not clear what this PI has done to attract new proposals. Another reviewer added each user program has 2 main ways in which they are able to address future research plans: (1) to increase the number of users and ensure a strong user base-- presentations are delivered at conferences and workshops, and results are published in peer reviewed literature; and (2) a list of state-of-the-art instrumentation is maintained by the director of the HTML user program. This list is revisited and re prioritized on a regular basis-- ensuring availability of cutting-edge techniques to the user community.

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

A reviewer stated that sufficient resources are provided for this work.

High Temperature Thermoelectric Materials Characterization for Automotive Waste Heat Recovery: Success Stories from the High Temperature Materials Laboratory (HTML) User Program: Hsin Wang (Oak Ridge National Laboratory (ORNL)) - POSTER



Reviewer Sample Size

This project had a total of 2 reviewers.

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

A reviewer stated this HTML user program assesses thermoelectric materials for automobile waste heat recovery (transformation into electrical energy). Many advanced materials compositions are studied at this facility. Another reviewer noted this project fits nicely with waste heat recovery efforts.

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

A reviewer stated the project highlighted in the poster was a GM project in which thermal conductivity measurements and high temperature electrical property measurements were performed. The data reported showed electrical characterization and thermal conductivity from 20C to 800C. The instruments are capable of achieving temperatures ranges from cryogenic up to 2200C. Another reviewer mentioned this is a nice example of state of the art user facility application to research problems.

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

A reviewer stated the unique instruments made available through this HTML user program assessed the thermal conductivity and elevated temperature electrical properties of BaGaGe clathrates and skutterudites (for thermoelectric applications). The technical outcomes included 3 publications. Another reviewer commented these facilities enable quality data that would not likely have gotten done without them.

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

A reviewer stated the participating institutions include both industry and academia. The institutions were GM (industry), Univ. of South Florida, the University of Michigan and Michigan State University. Another reviewer added that putting experts and world class instruments together with researchers who need data is a great use of DOE funds.

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

A reviewer stated to keep up the good work. Another reviewer noted each user program has 2 main ways in which they are able to address future research plans: (1) to increase the number of users and ensure a strong user base--

presentations are delivered at conferences and workshops, and results are published in peer reviewed literature; and (2) a list of state-of-the-art instrumentation is maintained by the director of the HTML user program. This list is revisited and re prioritized on a regular basis-- ensuring availability of cutting-edge techniques to the user community.

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