6. MATERIALS TECHNOLOGIES

Advanced materials, including metals, polymers, and composites, 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.

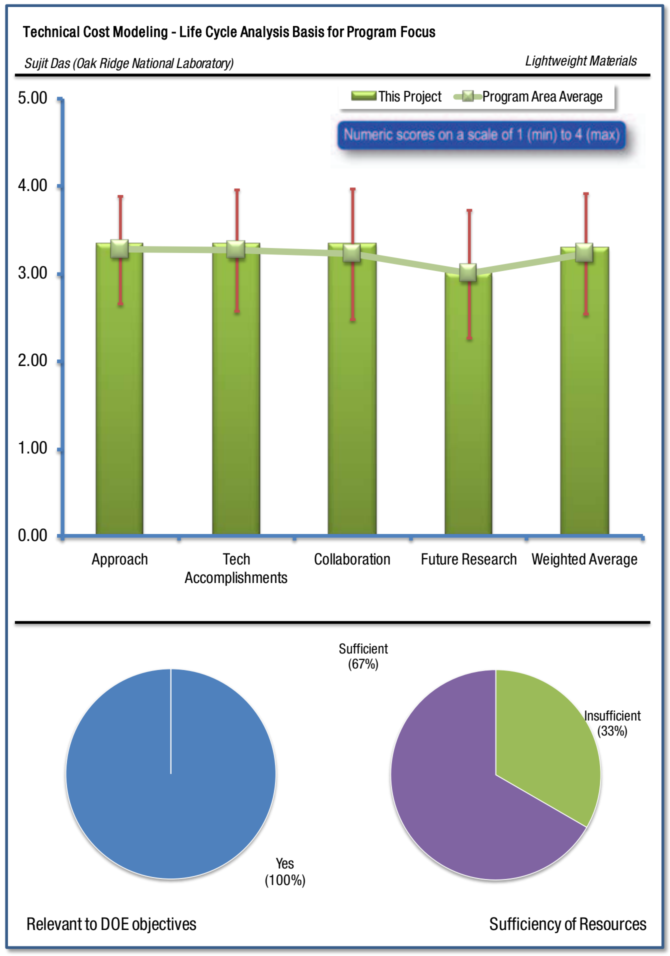
In this merit review activity, each reviewer was asked to respond to a series of questions, involving multiple-choice responses, expository responses where text comments were requested, and numeric score responses *(on a scale of 1 to 4)*. In the pages that follow, the reviewer responses to each question for each project will be summarized: the multiple choice and numeric score questions will be presented in graph form for each project, and the expository text responses will be summarized in paragraph form for each question. A 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
Technical Cost Modeling - Life Cycle Analysis Basis for Program Focus	Sujit Das (Oak Ridge National Laboratory)	6-3	3.33	3.33	3.33	3.00	3.29
Low Cost Carbon Fiber Overview	David Warren (Oak Ridge National Laboratory)	6-5	3.67	4.00	3.50	3.50	3.79
Carbon Fiber Pilot Plant and Research Facilities	David Warren (Oak Ridge National Laboratory)	6-7	3.67	3.00	3.33	3.33	3.25
Lower Cost Carbon Fiber Precursors	David Warren (Oak Ridge National Laboratory)	6-9	3.67	3.67	3.67	3.00	3.58
Low Cost Carbon Fiber from Renewable Resources	Frederick Baker (Oak Ridge National Laboratory)	6-11	4.00	4.00	3.50	4.00	3.94
Advanced Oxidation & Stabilization of PAN-Based Carbon Precursor Fibers	Felix Paulauskas (Oak Ridge National Laboratory)	6-12	3.67	3.33	3.33	3.67	3.46
Magnesium Front End Research and Development - Phase 1 (AMD 604)	Alan Luo (General Motors)	6-14	4.00	3.75	3.75	3.75	3.81
Multi-Materials Vehicle R&D Initiative	David Wagner (Ford Motor Company)	6-16	3.00	3.00	3.33	2.67	3.00
Development of High-Volume Warm Forming of Low-Cost Magnesium Sheet	Matt Zaluzec (Ford Motor Company)	6-18	3.50	4.00	3.25	2.33	3.57
Formability of Direct Cast Mg Sheet and Friction Stir and Ultrasonic Joining of Magnesium to Steel	Mark Smith (Pacific Northwest National Laboratory)	6-20	3.14	3.57	3.57	3.29	3.43
Integrated Computational Materials Engineering (ICME) for Mg: International Pilot Project (Part 1)	John Allison (Ford Motor Company)	6-23	3.00	3.50	3.00	3.50	3.31
Magnesium Projects	Paul Wang (Mississippi State University)	6-25	3.00	2.33	3.33	2.50	2.65
Pulse Pressure Forming of Lightweight Materials, Development of High Strength Superplastic Al Sheet, Friction Stir Spot Welding of Advanced High Strength Steels	Mark Smith (Pacific Northwest National Laboratory)	6-27	3.17	2.83	3.17	2.67	2.94
NSF Third Generation Advanced High Strength Steels	Ronald Krupitzer (Auto/Steel Partnership)	6-30	2.75	2.75	3.00	2.67	2.77

Presentation Title	Principal Investigator and Organization	Page Number	Approach	Technical Accomplishments	Collaborations	Future Research	Weighted Average
Fundamental study of the relationship of austenite-ferrite transformation details to austenite retention in carbon steels	Michael Santella (Oak Ridge National Laboratory)	6-32	3.33	3.33	2.50	3.00	3.19
Advanced High Strength Steel Project	Paul Wang (Mississippi State University)	6-34	3.33	3.33	2.67	3.33	3.25
Auto/Steel Partnership: AHSS Stamping, Strain Rate Characterization, Sheet Steel Fatigue, AHSS Joining	Roger Heimbuch (Auto/Steel Partnership)	6-36	3.20	3.20	3.60	3.00	3.23
Coherent Research Plan for the Third Generation Advanced High Strength Steels for Automotive Applications	Xin Sun (Pacific Northwest National Laboratory)	6-39	3.00	3.25	3.00	3.00	3.13
Advanced Materials & Processing of Composites for High Volume Applications (ACC932)	Matt Zaluzec (Ford Motor Company)	6-41	3.00	3.00	3.50	2.50	3.00
Composite Underbody Attachment, Advanced Preforming and Related Processes for Manufacturing Low Cost Composites	Bob Norris (Oak Ridge National Laboratory)	6-43	3.33	3.33	4.00	3.33	3.42
Dynamic Characterization of Spot Welds for AHSS	Zhili Feng (Oak Ridge National Laboratory)	6-45	3.40	3.40	3.20	3.00	3.33
Online Weld Quality NDE & Control with IR Thermography	Zhili Feng (Oak Ridge National Laboratory)	6-47	3.00	3.00	2.20	2.40	2.83
Enhanced Resonance Inspection for Light Metal Castings	Xin Sun (Pacific Northwest National Laboratory)	6-49	3.75	3.50	3.25	3.25	3.50
Evaluation and Characterization of Lightweight Materials: Success Stories from the High Temperature Materials Laboratory (HTML) User Program	*Camden Hubbard (Oak Ridge National Laboratory)*	*6-51*	*2.50*	*3.00*	*3.00*	*2.50*	*2.81*
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)*	*6-53*	*3.00*	*3.50*	*3.00*	*3.00*	*3.25*
Characterization of Catalysts for Aftertreatment and Biomass-derived Fuels: Success Stories from the High Temperature Materials Laboratory (HTML) User Program	*Larry Allard (Oak Ridge National Laboratory)*	*6-54*	*2.50*	*2.00*	*2.50*	*2.00*	*2.19*
Characterization of Materials for Li-ion Batteries: Success Stories from the High Temperature Materials Laboratory (HTML) User Program	*Andrew Payzant (Oak Ridge National Laboratory)*	*6-56*	*3.00*	*3.00*	*3.00*	*2.00*	*2.88*
OVERALL AVERAGE			**3.27**	**3.26**	**3.22**	**3.00**	**3.23**

NOTE: Italics denote poster presentations.

Technical Cost Modeling - Life Cycle Analysis Basis for Program Focus: Sujit Das (Oak Ridge National Laboratory)



REVIEWER SAMPLE SIZE

This project had a total of 3 reviewers.

QUESTION 1: DOES THIS PROJECT SUPPORT THE OVERALL DOE OBJECTIVE OF PETROLEUM DISPLACEMENT? WHY OR WHY NOT?

One reviewer felt that this work is necessary as a preliminary for every weight reduction endeavor. The other reviewer providing comment noted that technical cost modeling provides an objective relative measurement of lightweight and high-strength materials, promoting commercial use to reduce dependency on foreign sources and domestic petroleum for security and environmental benefit.

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 summarized that this effort is directed toward the estimation of the cost effectiveness on a life-cycle basis of the FY2010 50% vehicle body and chassis weight reduction goal compared to 2002 vehicles by developing and applying an Automotive System Cost Model. Another person commented that they believe the project intent was accomplished to sensitize the community as to the cost and GHG contribution of raw materials, manufacturing, assembly and use phase. Others had positive comments, and offered suggestions. For example, one evaluator remarked that the approach is good but recommended developing a user math model to provide an opportunity to modify material cost and GHG footprint segments (extraction, conversion, fabrication and use phase). The final reviewer observed that the weight reduction was obtained solely by materials swapping, weighted by cost for materials. They added that although this would be difficult to introduce in any model, attempts on weight saving by enhancing chemico-physical properties should be included, as well as gains through manufacturing.

QUESTION 3: CHARACTERIZE YOUR UNDERSTANDING OF THE TECHNICAL ACCOMPLISHMENTS AND PROGRESS TOWARD OVERALL PROJECT AND DOE GOALS.

A reviewer observed that in FY 2008 and 2009 the project analyzed cost effectiveness for the intermediate body and chassis weight reduction goals of 25% and 40% for either glass fiber-reinforced polymer composites or aluminum (25% weight reduction goal) of for carbon fiber-reinforced polymer composites and aluminum (40% weight reduction goal). Based on the milestones described, it seems that adequate technical progress has been achieved.

One reviewer expressed that this project represents very good work and acknowledged that the peer-reviewed technical content has received international recognition. Another agreed that this was a very good project, but would like to see weight reduction improvements based on physical properties enhancements.

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

Only two reviewers commented, with a difference of opinion. One felt that the researcher had shown a very good collaboration with international groups including Canada NRC. The other person knew that collaboration exists but added that the talk is far from explicit there.

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?

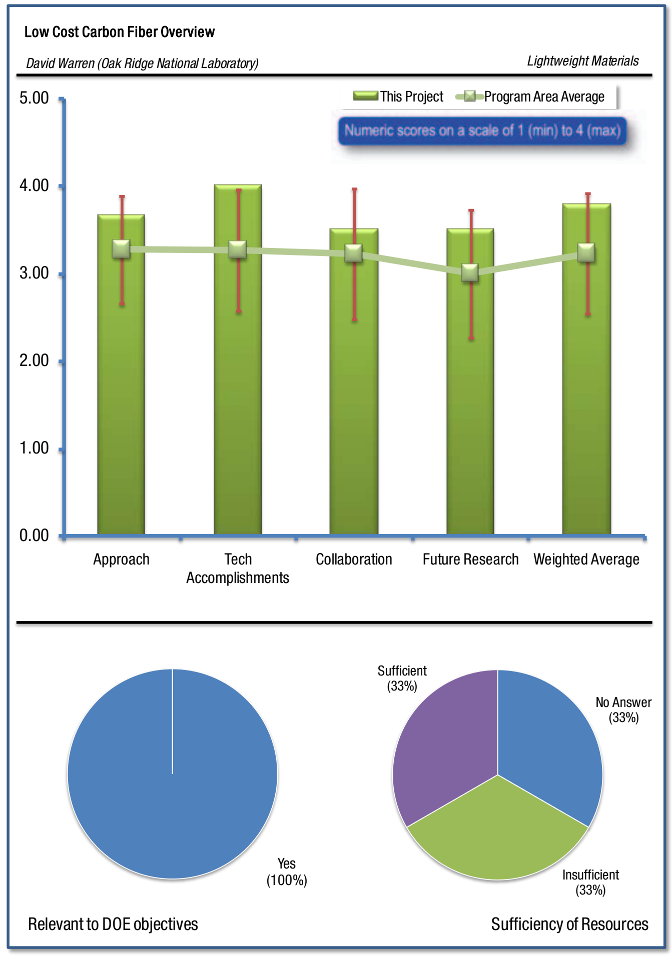
Reactions to this question were mixed. One reviewer simply summarized that the proposed future effort will be to extend the Automotive System Cost Model to accomplish the following objectives: (1) the development of a baseline cost model for multi-material vehicle; (2) the development and validation of various weight reduction goals (25%, 40%, and 50%) of a multi-material vehicle; (3) the determination of the viability of lightweight materials in advanced powertrains such as hybrids and fuel cell vehicles; (4) the economic, energy, and environmental impact analyses from a life cycle perspective of lightweight material manufacturing technologies with an emphasis on magnesium and carbon-fiber polymer composites; (5) the cost reduction impact of recycling of lightweight materials from an economic, energy, and environmental life cycle perspective; and (6) the potential (system?) cost advantages of using lightweight material in heavy-duty vehicles. One commenter believed that it will be possible to build such a model, but it would seem that the critical task will be to verify the cost-projection assumptions on which the model is based. They added that it is not obvious from the slides alone that sufficient consideration has been given to this requirement. Moreover, in order to have any significant impact over time, ORNL or some other organization or team will have to maintain (i.e., update and revise) the proposed model as the cost elements change and especially as new materials come on line. This could involve a substantial investment of time and money, or would do so if it is the intent of DOE that this model be an ongoing resource for companies in the vehicle manufacturing and materials industrial sectors.

Other reviewers were more critical, with one person simply stating that the researchers need to more clearly define next steps rather than continue with a new target. The final reviewer pointed out that the investigator provided no mention of what physical properties enhancements can bring to weight reduction. They acknowledged that this is a very complicated integration problem; however, answers to questions related to physical properties show that this aspect needs to be deepened to be fully integrated into weight reduction schemes.

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

One commenter remarked that the effort appears to be adequately funded. Another person disagreed, stating that the research team should be given more resources in order to produce a more comprehensive and optimized study on weight reduction.

Low Cost Carbon Fiber Overview: David Warren (Oak Ridge National Laboratory)



Reviewer Sample Size

This project had a total of 3 reviewers.

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

Both reviewers to comment to this question had positive comments. One reviewer noted that this type of research in low-cost carbon fiber for automotive mass reduction is extremely relevant for GHG and fuel economy goals. The other reviewer explained that carbon fibers are necessary for lightweight vehicles. They added that such an enormous project can only be possible because the government is instigating in such a program. This is the right thing to do; however, it would have been better if the project was initiated about 20 years ago.

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?

Comments were universally positive. One person simply noted that the program plans provide an excellent roadmap to show what is going on. Another person agrees, stating that the project is comprehensive and very well laid out. One commenter observed that the program overview covers a wide spectrum of projects; but suggested that LCA and recycling should be included in the program. The final commenter explained that the project goals and roadmap are very descriptive. They added that the researchers showed that a good process of concept feasibility of carbon fiber commercialization through technology up to market entry with specific deliverables was developed.

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

Comments to this question were all positive. One person stated that the presentation gave an overview and provided lots of information. Another evaluator noted that in view of the breadth of the program, the progress is amazingly strong. One reviewer remarked that the presentation gave a good overview of carbon fiber technology center to develop large scale material and processes for automotive uses. Another person pointed out that the researcher showed the common and unique issues between industries and addressed challenges for manufacturing in high volume automotive applications. Another reviewer had similar comments, adding that the presentation shows need for continued research into auto and other industries but requires “change” with this new major development. The final reviewer noted that the researcher provided an outstanding overview of costs including material, treatment, spooling, and packaging and showed that they have a full understanding of costs of carbon fiber including precursors. The reviewer also showed data for ramping up plant size to reduce cost by approximately 15%.

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

Comments were generally positive. One person noted that numerous collaboration partners were involved and that funding sources by multiple agencies/partners were included, but also felt that more detail is required. The other reviewer stated that the researcher seems to be doing an outstanding job in promoting carbon fiber in the U.S.

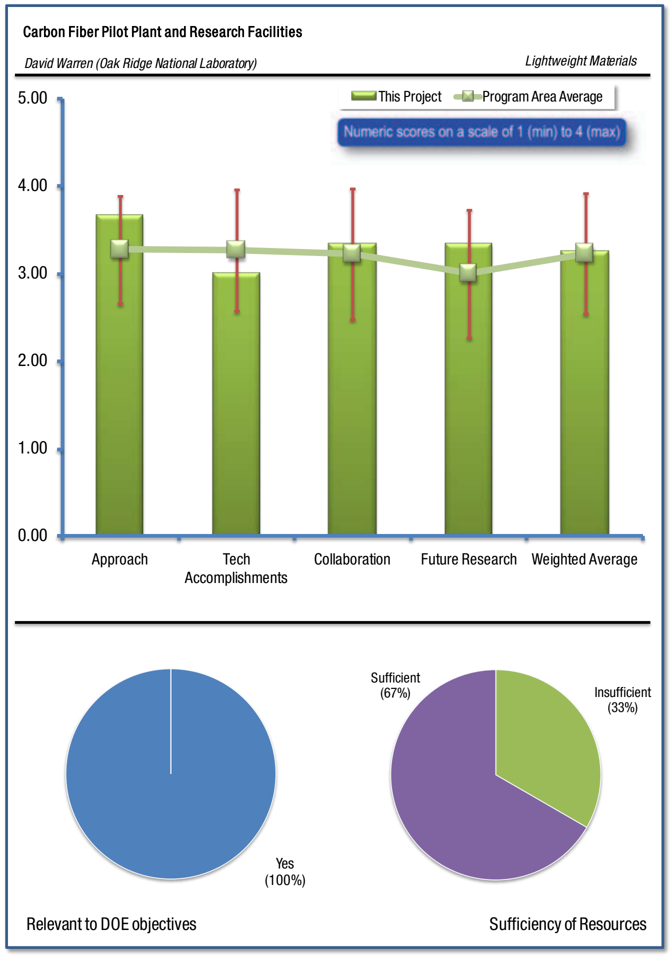
QUESTION 5: HAS THE PROJECT EFFECTIVELY PLANNED ITS FUTURE WORK IN A LOGICAL MANNER BY INCORPORATING APPROPRIATE DECISION POINTS, CONSIDERING BARRIERS TO THE REALIZATION OF THE PROPOSED TECHNOLOGY, AND, WHEN SENSIBLE, MITIGATING RISK BY PROVIDING ALTERNATE DEVELOPMENT PATHWAYS?

One person noted that the project addressed the challenges for manufacturing in high volume automotive applications. Another person commented that the slide that describes the 67% mass reduction in the body-in-white using carbon fiber and discussion of crash protection/energy absorption requires more detail, such as including CAE capability of carbon fiber in crush zones and what MY vehicles are targeted. $5-7 cost per pound for carbon fiber is the goal. They conclude by pointing out that the researchers need to understand and show how this translates into vehicle cost. Another commenter remarked that this presentation shows need for continued research into auto and other industries, but requires “change” with this new major development. They conclude by asking how this work translates into MY implementation. The final reviewer noted that the future work is more like completing all that is outstanding, and in their opinion, the funding resources are too little for the researchers to progress at the desired speed.

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

It was stated by the first reviewer that clearly there is an urgency here. Another person simply noted that the researchers have sufficient resources to achieve milestones. The final reviewer disagreed, remarking that the only way, with the present team in place, to speed up the planned processes to fruition is to help the team with more funding and a larger crew.

Carbon Fiber Pilot Plant and Research Facilities: David Warren (Oak Ridge National Laboratory)



Reviewer Sample Size

This project had a total of 3 reviewers.

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

All reviewers had positive comments to this question. One person commented that this project supports the overall DOE objectives; utilization of carbon fiber in automotive components for significant mass reduction in order to improve fuel economy. Another person observed that this is a long-range technology development project; it is known that carbon fibers can contribute to the lightweighting of automobiles; this facility can remove some of the processing barriers for achieving low-cost fiber. The final reviewer remarked that the project absolutely supports DOE's objectives; low-cost carbon fiber will provide a significant contribution the long-term lightweighting and 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?

All reviewer comments to this question were positive. One person expressed that this is a very good project where different approaches were taken to develop low-cost carbon fiber. They added that some of the technical and commercial barriers were not defined, so now the project should be focused on cost of production of carbon fiber to reach the original low-cost target ($5-7/pound). The next evaluator stated that the researchers have shown an excellent plan; the technical barriers are identified; the idea of running parallel operating lines to compare conventional versus new technology is quite good. The final person also noted the very good approach, creating a pilot facility based on state of the art proven process and parallel processing stations.

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

One person felt that the researchers have shown excellent progress associated with various materials and processes. They also acknowledged the dynamic adjustment of program goals based upon recent developments. Another person agreed that the progress is good, but felt that it can be accelerated. They noted that some barriers were overcome; however, the progress still lags the original goal of low-cost production. It should be evaluated at this stage for the final outcome. One evaluator remarked that currently the cost of the final product will not meet the cost target and that this project should be evaluated by outside experts for it is final outcome. Another commenter observed that the manufacture of carbon fiber is very impressive, but criticized that the conversion into functional parts is not progressing at the same rate. Another reviewer noted that chopped fiber and SMC continues to be applied, but that the cycle time/price of thermoset materials is not in-line with automotive volume. The final reviewer had a different perspective on the project evaluation, since the project happens in the future; this is infrastructure development so the technical progress cannot be measured at this stage but has the potential to influence future generation fiber developments.

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

Several reviewers noted that the great collaboration in carbon fiber preparation with various parties involved has been excellent. Another person pointed out that the presentation indicated the interest from the U.S. industry base; not much information was provided on the list of interested companies/researchers; but it was still assumed that a broad range of partners is interested. The final reviewer suggested that the researchers need to reconsider internal ORNL part fabrication and ACC to introduce new thermoplastic processing, which imposes high volume/low-cost processing.

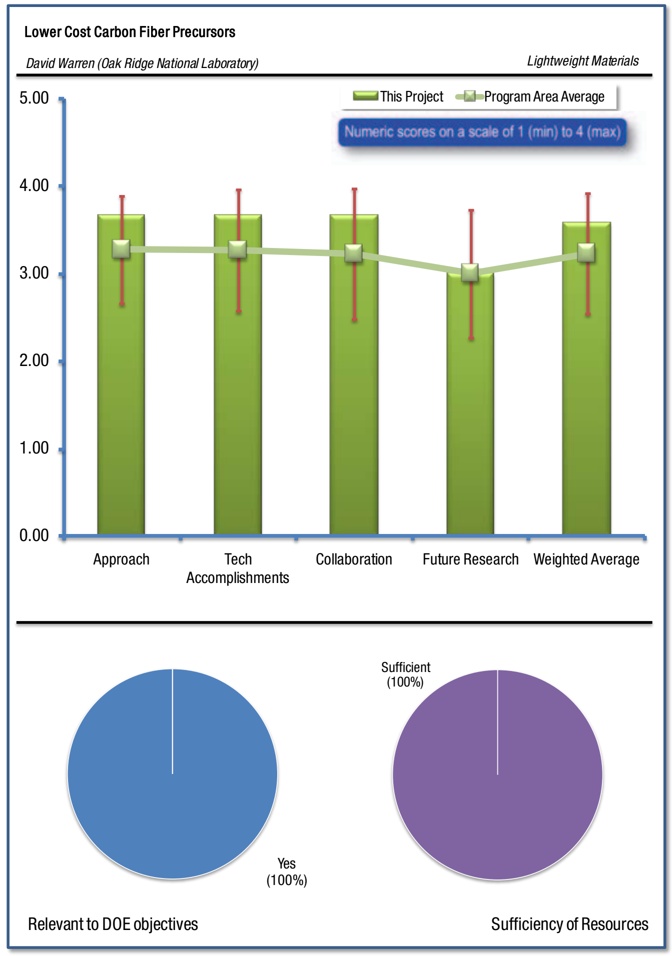
QUESTION 5: HAS THE PROJECT EFFECTIVELY PLANNED ITS FUTURE WORK IN A LOGICAL MANNER BY INCORPORATING APPROPRIATE DECISION POINTS, CONSIDERING BARRIERS TO THE REALIZATION OF THE PROPOSED TECHNOLOGY, AND, WHEN SENSIBLE, MITIGATING RISK BY PROVIDING ALTERNATE DEVELOPMENT PATHWAYS?

Comments were positive, but brought up suggestions in several areas. One person noted that the technical projects are not here as this is only infrastructure development. Another person mentioned that the research plan is very good; however they still have strong doubts about achieving the low-cost of the final product. The final evaluator noted that researcher's plans incorporate great next steps, but added that they need to predict the 10-year and 20-year plans.

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

Only one person commented, stating that it appears resource demand will increase for next year as well as the need for various types of engineers. Evolution requires new talents.

Lower Cost Carbon Fiber Precursors: David Warren (Oak Ridge National Laboratory)



REVIEWER SAMPLE SIZE

This project had a total of 3 reviewers.

QUESTION 1: DOES THIS PROJECT SUPPORT THE OVERALL DOE OBJECTIVE OF PETROLEUM DISPLACEMENT? WHY OR WHY NOT?

All reviewers generally agreed this work supports DOE objectives. One person commented that this topic is very relevant to obtain the goal of low-cost carbon fiber due the 51% cost of the precursor to the carbon fiber material. Another noted that all carbon fiber works are imperative for reducing the material weight for light vehicles. The final evaluator commented that the polyolefin work may very well produce game changing results.

QUESTION 2: WHAT IS YOUR ASSESSMENT OF THE APPROACH TO PERFORMING THE WORK? TO WHAT DEGREE ARE TECHNICAL BARRIERS ADDRESSED? IS THE PROJECT WELL-DESIGNED, FEASIBLE, AND INTEGRATED WITH OTHER EFFORTS?

One person simply stated that the project is comprehensive and exclaimed that the researchers have a good understanding of the subject matter and that the project shows good promise. Several people noted the effective data presentation methods. One person remarked about the good use of "simple" graphs/charts to explain the process, while having the detail included in additional slides. Another person agreed, noting the useful comparison of the current precursors and plan going forward with realistic expectations coded in red/yellow/green. They concluded by noting that the description of strength properties are at commercial levels with current precursor. Another commenter pointed out that the researcher fully explained the process–materials through process with concentration of precursors and differences between them. One person simply summarized that the work is attempting to optimize process control for consistent input material. Another noted that it is clear that the polyolefin work is still at the discovery stage. The final reviewer pointed out that the barrier is cost and efforts are being made to address this issue; however, the technology is still too new to tell the impact on cost.

QUESTION 3: CHARACTERIZE YOUR UNDERSTANDING OF THE TECHNICAL ACCOMPLISHMENTS AND PROGRESS TOWARD OVERALL PROJECT AND DOE GOALS.

One person commented that the project fits very well with DOE's goals and that the research team has shown good effort. Another evaluator noted that the researchers' experience is paying off because progress is very good. One commenter mentioned that the laboratory scale technology development is progressing well; upgrade to larger scale is still some time away. Another evaluator remarked that the defined target of polyolefin precursors are promising to reduce carbon fiber overall cost to $2-3 overall, adding that they felt that the textile precursor is currently the most viable. The final reviewer explained that new precursors are needed for carbon fiber manufacturing cost reduction. They felt that the researchers showed a good understanding and assessment that carbon fiber production, including relevant precursors, must be scaled for auto industry production for mass production usage as stated in the presentation.

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

One person commented that even though the project is restricted due to license exports, the collaboration is very comprehensive. Another person agreed, mentioning that due to trade restrictions the names of the partners are not revealed; however, the contributions are good. One evaluator noted the researchers' cooperative research program with U.S- based precursor producers is under development, as well as a sister project with commonization between but there are differences. The final commenter noted that the project is fully integrated with suppliers in the U.S. and Canada and technology transfer procedures in place for key suppliers outside this group.

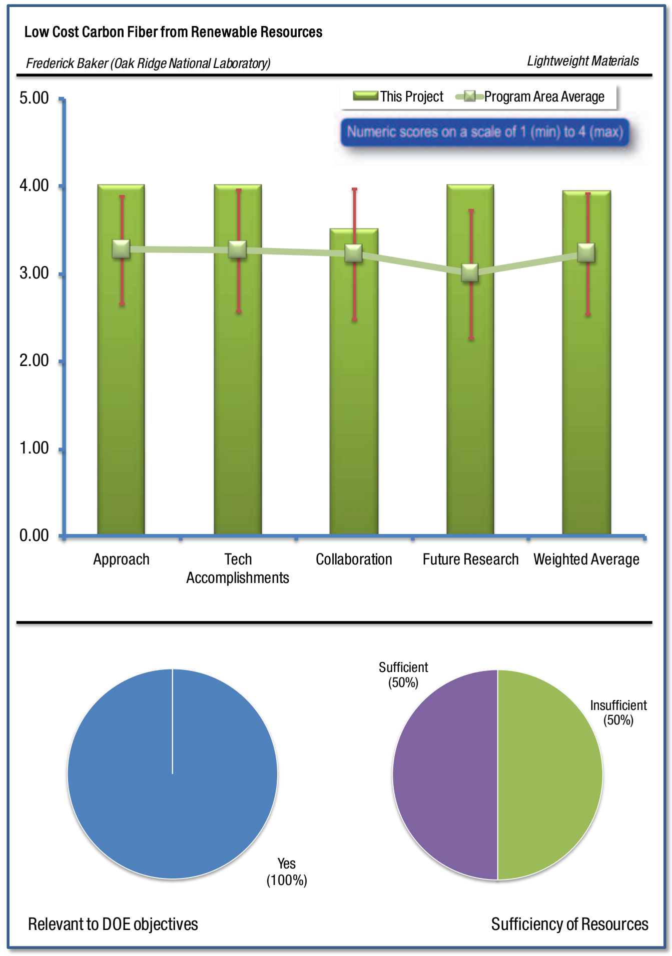
QUESTION 5: HAS THE PROJECT EFFECTIVELY PLANNED ITS FUTURE WORK IN A LOGICAL MANNER BY INCORPORATING APPROPRIATE DECISION POINTS, CONSIDERING BARRIERS TO THE REALIZATION OF THE PROPOSED TECHNOLOGY, AND, WHEN SENSIBLE, MITIGATING RISK BY PROVIDING ALTERNATE DEVELOPMENT PATHWAYS?

One evaluator suggested that the years of feasibility, technology readiness and MY introduction should be targeted for specific precursors and overall cost target. Another person noted that the researchers provided a good description and future plans to research kidney shape (not round) fiber decreases strength and plan in place to develop capability for "round" fibers. They acknowledged that a timeline in place to address but lacking detail. One person pointed out the good question from peer panel of "which horse" is winning the race considering precursors and manufacturing processes. They concluded by asking if there are other precursor materials that appear promising. The final reviewer commented that the objectives for three different material developments were explained. One reviewer stated that the rating would have been a "4" rating if the project were not in its last year.

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

One person simply stated that the project has sufficient resources to achieve milestones. Another person cautioned that before closing the program, DOE and ORNL need to carefully analyze the results to find out whether there would be more to gain by extending the work. The final person remarked that, according to his recollection, Dr. Warren had three talks. This was also the case last year, and maybe the year before. The reviewer suggested that ORNL should have different people present the project status and results to bring fresh perspectives to maintain the interest on such important projects.

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



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 evaluator expressed that any progress toward the use of renewable resources is good for DOE. The other reviewer commented that production of low-cost carbon fiber is essential for widespread utilization in automobiles in order to improve fuel economy. They agreed that this project supports the overall DOE objectives.

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 person simply stated that the project is very comprehensive. The other commenter agreed that this is a very good project, but added that their main concern is to minimize the variation of properties of carbon fiber with lignin process.

QUESTION 3: CHARACTERIZE YOUR UNDERSTANDING OF THE TECHNICAL ACCOMPLISHMENTS AND PROGRESS TOWARD OVERALL PROJECT AND DOE GOALS.

One person simply observed that this is a very good project. The other reviewer pointed out that excellent progress has been made; however, the production process has to be refined, and also the variation in lignin properties has to be minimized.

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

Responses were generally positive. One person remarked that the collaboration with different countries and various partners has been excellent. Another evaluator pointed out that partners are fully engaged. The final reviewer commented that there is evidence of a good effort but the collaboration should be broadened, especially more diverse than what was alluded to in the talk.

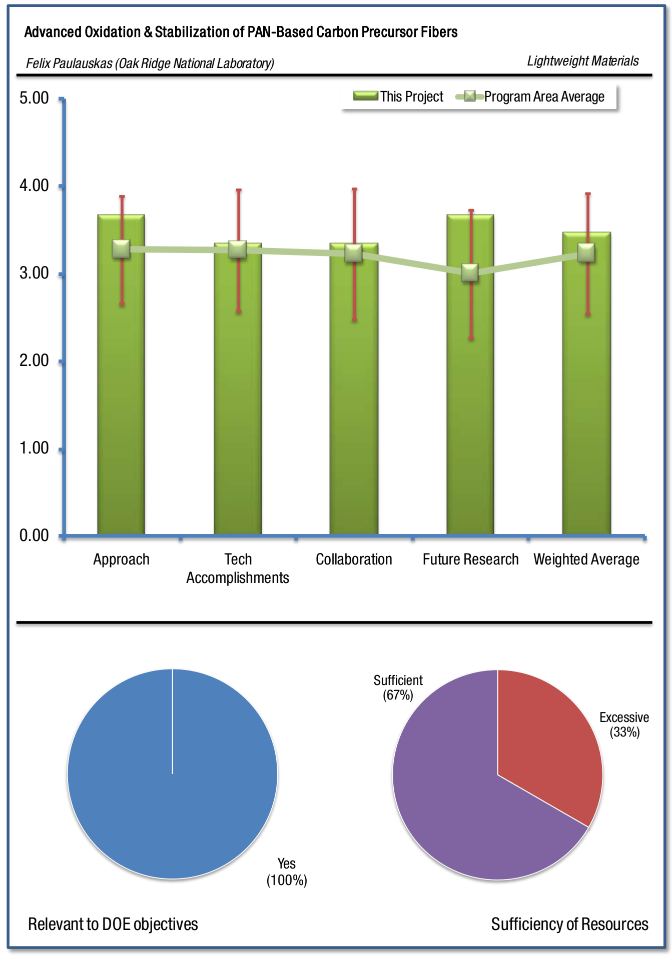
QUESTION 5: HAS THE PROJECT EFFECTIVELY PLANNED ITS FUTURE WORK IN A LOGICAL MANNER BY INCORPORATING APPROPRIATE DECISION POINTS, CONSIDERING BARRIERS TO THE REALIZATION OF THE PROPOSED TECHNOLOGY, AND, WHEN SENSIBLE, MITIGATING RISK BY PROVIDING ALTERNATE DEVELOPMENT PATHWAYS?

One person commented that the future work is well defined and focused on overcoming the barriers. The other reviewer simply exclaimed “go for it!”

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

Only one person commented, stating that the financial resources should clearly be expanded.

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



REVIEWER SAMPLE SIZE

This project had a total of 3 reviewers.

QUESTION 1: DOES THIS PROJECT SUPPORT THE OVERALL DOE OBJECTIVE OF PETROLEUM DISPLACEMENT? WHY OR WHY NOT?

One reviewer noted that the project effort is geared toward reducing the cost of carbon fiber. Another person also noted that development of low-cost carbon fiber for the automotive industry is critical to mass reduction, resulting in improved fuel economy; this project supports the overall DOE objectives in this regard. One commenter noted that this work is improving the process time for a particular feed material which can reduce the weight. The last comment was that the researchers are focused on fast stabilization to increase throughput, in spite of the risk of the process.

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 comments were very positive. One person remarked that this is a very good project with a very detailed and focused approach. The other commenter pointed out that the project is very comprehensive and shows that ORNL has had a long experience with working on carbon fibers.

QUESTION 3: CHARACTERIZE YOUR UNDERSTANDING OF THE TECHNICAL ACCOMPLISHMENTS AND PROGRESS TOWARD OVERALL PROJECT AND DOE GOALS.

Comments to this question were all positive. Two reviewers stated that this was a very good project. One continued, stating that more efforts to improve the properties of fiber, specially the modulus, should be directed. One person acknowledged that there is a good understanding of the process and defined deliverables and that excellent progress has been made within the timeframe. They concluded by stating that here is a good understanding of the shortcoming and what is achievable. The final reviewer observed that the lab-scale of the process is developed; the progress towards commercial use is being planned.

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

Reactions to this question were equally mixed. One person noted that collaboration with various parties has been excellent. Another person agreed that one company is identified; however, their role is not clearly defined. One evaluator explained that collaboration is a delicate point on which ORNL and DOE should spend more time discussing which information can be released and which cannot. The final reviewer criticized that if the goal is to disseminate part of the intellectual property knowledge, then they can do better. However, if ORNL is required to also protect the intellectual property of the industrial partners, then this reviewer wondered if they are not going too far in the amount of disclosures they produce.

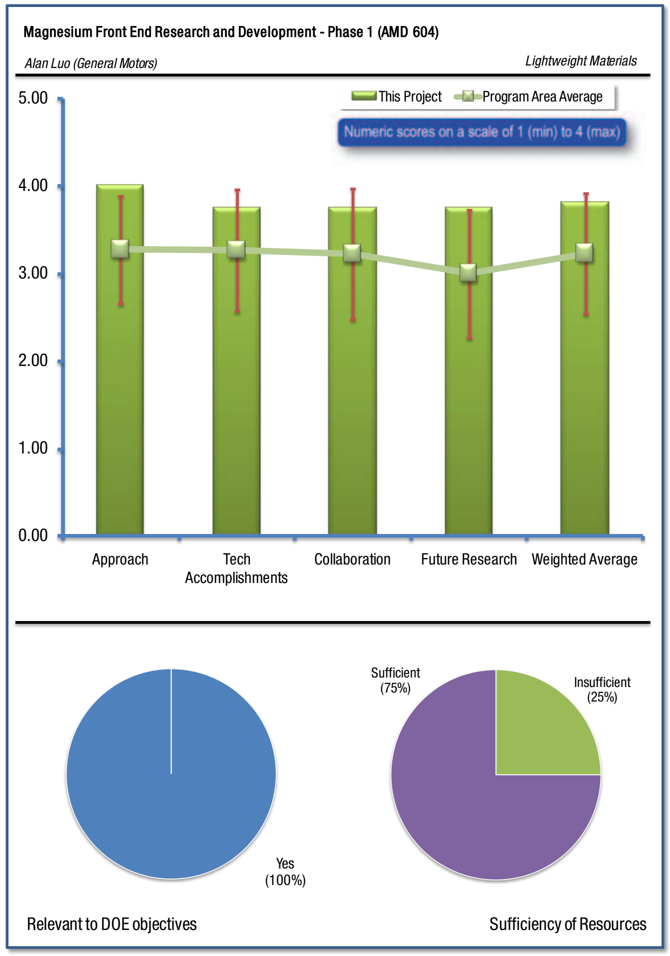
QUESTION 5: HAS THE PROJECT EFFECTIVELY PLANNED ITS FUTURE WORK IN A LOGICAL MANNER BY INCORPORATING APPROPRIATE DECISION POINTS, CONSIDERING BARRIERS TO THE REALIZATION OF THE PROPOSED TECHNOLOGY, AND, WHEN SENSIBLE, MITIGATING RISK BY PROVIDING ALTERNATE DEVELOPMENT PATHWAYS?

The future project plan is very clear and focused based on the results so far to overcoming major barriers. Another person added that the project is a good lead, and they expect that future work will be very well conducted. Others were positive, but had questions or reservations. One person commented that the presentation indicates that the Phase I was completed and Phase II is to begin October 2010; however the achievements of Phase I are not highlighted. The reviewer concluded by asking what is the decision gate to move to Phase II. Another evaluator observed that Phase II goals are defined, but looks like it is continuation of status quo from Phase I. The final reviewer acknowledged the comprehensive approach and planned scale up, the milestone list, and the ideas are good, but asked where the metrics are.

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

One person simply commented “maybe not.” Another reviewer suggested that maybe it is time to consider bringing new people with other perspectives to maintain interest on this important topics. The final evaluator observed that as the cost for Phase I is not available it is hard to estimate the request; they could not validate why $1 million is requested from the work information provided because no work breakdown was presented.

Magnesium Front End Research and Development - Phase 1 (AMD 604): Alan Luo (General Motors)



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 comments for this question were positive. One person remarked that this topic is very relevant to obtain the goal of vehicle mass reduction via component material replacement to magnesium and redesign. Another noted that lightweighting using magnesium directly relates to displacement of petroleum. One reviewer simply commented that this project is clearly an effort to reduce weight of any vehicle. The final person remarked “finally a talk where practical applications are exemplified,” adding that the project should clearly be promoted and extended.

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?

Comments to this question were all positive. One person noted that good targets and baseline vehicle (HSS) were provided as comparison, but pointed out that the researchers need to identify future model year implementation and cost with specific model years and feasibility. One commenter acknowledged that the investigator provided a good discussion of low-cost sheet and forming–builds on other projects for data. Another person added that the project used a great approach, assessment and recommendation towards commercialization. One evaluator noted that the project is very good and geared toward industrial applications. One person observed that the approach is highly detailed with a discussion focusing on the eight key tasks. They added that the presentation provided a good discussion of corrosion and surface finishing–acknowledged issues with body materials. The final reviewer had very detailed comments, stating that the technical target of the USAMP effort, which has several presentations in this project, is to organize and deploy an international research and development project aimed at the advancement of magnesium technology by a dedicated collective of researchers toward the goal of having sufficient engineering and manufacturing capabilities to exploit the full weight-reduction potential of magnesium alloys as engineering materials for entire automotive sub-structures, thereby leading to concomitant fuel economy realizations at affordable cost, excellent vehicle performance and with due consideration for the environment. (This is taken from the presentation materials). The targets are (1) mass reduction up to 60% less than steel comparator; 35% less than aluminum comparator structure, (2) neutral or slight cost penalty compared to steel baseline; and (4) vehicle performance attributes comparable to baseline structures. The specific approach is to focus on vehicle front end assembly components.

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

One person noted that the researcher showed very good progress, accomplishments according to objectives, and schedule compliance. Another commenter agreed that the progress was extremely good in view of handling difficulties exhibited by magnesium. One person observed that crashworthiness (fracture) was discussed with issues of buckling deformation, but asked what the next steps are to be addressed. One evaluator noted that the presentation showed that welding and joining of magnesium was being done with friction stir welding, but asked whether this is feasible, and under what circumstances, on this material. The reviewer added that the presentation discussed other types of welding (good), but also needs to include cost/feasibility of additional tooling for accurate comparison of costs. One person noted that the investigator acknowledged that magnesium does not address airborne noise and a sound package must be included for an NVH comparison; however the additional mass and cost were not accounted for in this study. One reviewer felt the researcher gave a good discussion of fatigue/durability and that they understand limitations and work to be done with CAE models. They added that adhesive systems must be addressed for body panels but further work must be done on this.

The final reviewer had very detailed comments, explaining that the FY2009 accomplishments for Tasks 1.1 to 1.8 are presented in the materials. They note with interest the comment in the discussion of Task 1.1 (Crashworthiness) that magnesium alloys showed pervasive fracture in crash loading. In general, the discussion presented indicates that this large project is working in a careful and thorough manner through what seems to this reviewer to be a very large material property option space. Task 1.5 (Low-Cost Extrusion and Forming) is clearly of great commercial importance, especially the effort to improve the mechanical properties of the listed alloys. In addition to the wide corporate and academic representation in this project from the U.S., the U.S.-Canada-China collaboration is an important and very positive feature.

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

Comments were all positive. One person observed that numerous collaboration partners are involved with multiple funding sources by multiple agencies/partners, but more detail is required on the extent of each. Another reviewer commented that the researcher showed significant domestic and international participants including industry, university and government labs worldwide. The final evaluator simply commented on the good team, synergy, and complementarity.

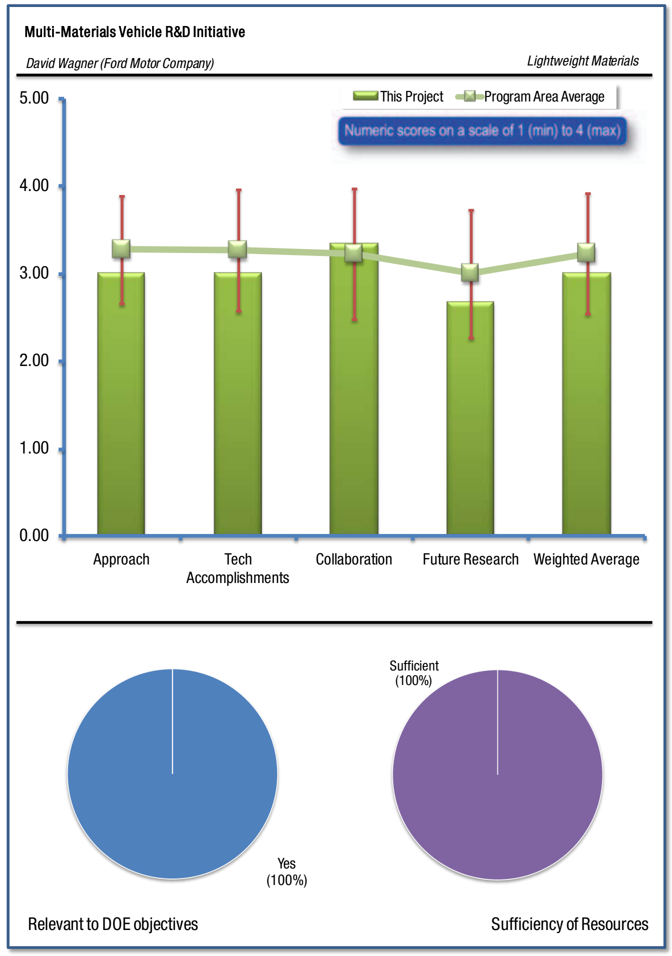
Question 5: Has the project effectively planned its future work in a logical manner by incorporating appropriate decision points, considering barriers to the realization of the proposed technology, and, when sensible, mitigating risk by providing alternate development pathways?

One person noted future research plans include low-cost extrusion and forming, also asking whether this process available today and at what additional cost. Another evaluator expressed that Phase II is interesting, but asked if this uses optimized design from other materials. They concluded by stating that “highly efficient design” requires better definition. Another commenter agreed with the excellent recommendation towards Phase II including multi-material construction of a cast, extruded and sheet (magnesium, steel and aluminum). One evaluator felt that the future is very promising, but also asked what applications of magnesium are unique and where can it be used. They noted that the presenter indicated that intricate shapes are best due to the casting. Body-in-white structures are limited to shock towers and non-corrosion placements (interior), so the reviewer asked how this applies to high volume vehicles. One reviewer had detailed comments, stating that the project’s future efforts for the magnesium alloy front end included the following: (1) the design and build of a demo structure which embodies attributes of a major body structure; (2) to work through tasks in corrosion, fatigue and joining centered around a demo structure; (3) to continue extrusion, sheet and casting tasks to make parts for the demo structure and fully integrate with the integrated computational materials engineering (ICME) task and to potentially evaluate additional alloys, especially age-hardening alloys and reduced anisotropy; and (4) to redefine the crashworthiness and noise, vibration and harshness (NVH) tasks. The final reviewer also had detailed comments, describing that while the search for better magnesium alloys (i.e., improved crashworthiness, better corrosion resistance, more uniformly controlled formability) is undoubtedly an appropriate undertaking, and one which will enhanced our understanding of this class of alloys, it should also be noted that solutions which pair up magnesium alloys with other light-weight material classes in multi-material assemblies might also be worthwhile to consider. The discussion of the critical assumptions and issues in the presentation material was very helpful and well done. It seems that the problems and issues pointed out here are the beginnings of a roadmap for future investigations. (A question for DOE: how widely beyond the project participants will the detailed technical results of this family of projects be made available? And what arrangements have been made concerning the ownership of the Intellectual Property?)

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

One person commented that is the kind of projects DOE should promote; there will be many applications in the pipeline. Two other reviewers stated that the project has sufficient resources for Phase II to achieve milestones.

Multi-Materials Vehicle R&D Initiative: David Wagner (Ford Motor Company)



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 commented that this project is very important in order to reduce the mass of vehicle resulting in improving fuel economy in a most cost-effective manner. They added that this project fully supports the overall DOE goal. Another person commented that this type of holistic vehicle project will fully integrate other specific areas of research into understanding the feasible percentage, cost and fuel efficiency gains of overall mass reduction.

QUESTION 2: WHAT IS YOUR ASSESSMENT OF THE APPROACH TO PERFORMING THE WORK? TO WHAT DEGREE ARE TECHNICAL BARRIERS ADDRESSED? IS THE PROJECT WELL-DESIGNED, FEASIBLE, AND INTEGRATED WITH OTHER EFFORTS?

One reviewer had detailed comments that summarized the project, stating that the objective of the USAMP Multi-Material Vehicle project is to develop lightweight materials technologies for cost-effective, large-scale implementation in vehicles that meet consumers' needs while providing increased fuel efficiency. The approach is to begin with identification of benchmark current production powertrains to use for simulation purposes to identify required weight reduction targets. Simulations have been ongoing since that time to ascertain appropriate weight reduction targets. Several evaluators explained that this project is closing out and wrapping up, and that the researchers need to integrate "lessons learned" from this project into the next MMV project. One person added that the presenter stated the need for a clean sheet for the next design–similar to Lotus type methodology based on recently released report, which they fully agree with. One person noted that the 2009 objectives for the "L7" minivan 7-passenger project were to achieve 31 mpg, but asked at what time frame. The final evaluator criticized that this project was ill-conceived; it should have started with a clean sheet of paper. Stitching several existing projects to a new project was a bad idea. It is very difficult to achieve the goal by eliminating the existing barriers.

QUESTION 3: CHARACTERIZE YOUR UNDERSTANDING OF THE TECHNICAL ACCOMPLISHMENTS AND PROGRESS TOWARD OVERALL PROJECT AND DOE GOALS.

One reviewer commented that they agree with presenter that the project needs a detailed report instead of a 30,000 foot view. One commenter observed that this MMV project was able to achieve 16% mass reduction; half of this was achieved by marrying with other projects. There is a need for an overall "new" project: three years at $1 million per year. Another evaluator criticized that very little progress was made towards the original goal and very few barriers have been overcome; the reviewer concluded by stating that this project should be closed. One reviewer pointed out that the researcher acknowledged the limitations of separate studies and noted that a further "holistic" vehicle approach is required. Another evaluator described that this type of holistic vehicle project will fully integrate other specific areas of research into understanding the feasible percentage, cost and fuel efficiency gains of overall mass reduction. One reviewer observed that this MMV project helped system/component optimization for cost/feasibility but further work is required in the next MMV project. The last evaluator commented that the MMV accomplishments for FY2009 are the following: (1) helped project teams complete the donor vehicle systems-level manufacturing and assembly baseline cost modeling project; (2)

continued to guarantee alignment between all three projects on engineering performance metrics (3) initiated MMV903 Lightweight 7+ Passenger Vehicle Study (L7) with the goals of developing a generic lightweight 7+ passenger vehicle concept to demonstrate application of mixed material technologies and mass compounding towards the creation of a lightweight, cost-effective vehicle to achieve at least a 40% increase in EPA combined fuel economy with no sacrifice in safety, comfort, features, utility, or performance.

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

Both commenters agreed that collaboration was present, but had criticisms. One person explained that coordination among various partners was good; however, the project plan was not well conceived, which resulted in poor end results. The other noted that numerous collaboration partners were involved. Funding sources were provided by multiple agencies/partners but more detail is required on the extent of each.

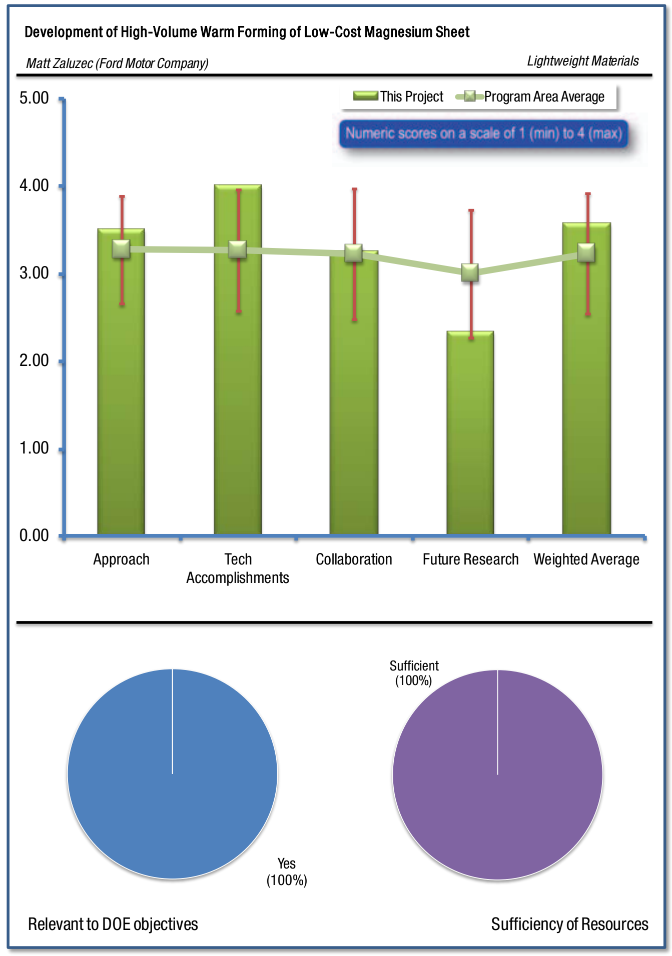
Question 5: Has the project effectively planned its future work in a logical manner by incorporating appropriate decision points, considering barriers to the realization of the proposed technology, and, when sensible, mitigating risk by providing alternate development pathways?

One reviewer had detailed comments that summarized the project, stating that in FY2010, the MMV R&D initiative will continue to help close out the three USAMP MMV "Seed" projects, and remain opportunistic in attracting new project ideas from USAMP in areas such as multi-material joining technologies. MMV will complete Phase 1 of the L7 project (MMV 903) in the second quarter of CY 2010, the powertrain and weight matching for fuel economy and performance, present the results to the USAMP Steering Committee and determine with the Committee whether further work in this area is warranted. Future efforts would be conducted under the auspices of other U.S.AMP groups, i.e., AMD, ACC, A/SP or NDE. MMV will complete all efforts and reports by mid September 2010 so that the project can be closed in FY2010. One reviewer simply noted that the MMV Phase 1 will be done in the second quarter of CY2010. Another person suggested that the powertrain could possibly be developed by EPA if agency coordination is required. One evaluator felt that the project is well-defined and the team seems to be working through the milestones in an efficient manner. Another person disagreed, stating that the project was ill-conceived, and thus has little relevance toward eliminating barriers. One evaluator suggested that the MMV project needs to be more of a near-term project targeting a specific MY and technology feasibility readiness CY. The final reviewer asked who is doing crashworthiness study.

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

Only one person commented, stating that they withhold their rating until the next study is started, but noted that this project had sufficient resources to achieve milestones.

Development of High-Volume Warm Forming of Low-Cost Magnesium Sheet: Matt Zaluzec (Ford Motor Company)



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?

Most comments to this question were positive. One person explained that magnesium has the potential to reduce the weight of vehicle which is known to improve fuel efficiency; this project is demonstrating an enabling technology to improve productivity of magnesium. Another person agreed that magnesium sheet is integral to the lightweighting initiative to reduce petroleum. Another evaluator also agreed that the project will reduce the dependence for foreign sources of petroleum. The final reviewer commented that the project was closed about a year ago, so it should not be in the session.

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 provided a detailed project summary, stating that the objective of this project was to develop the technology and material supply base for cost-effective lightweight body panels fabricated from sheet magnesium. Specific deliverables include the following: (1) design and build a warm forming die and demonstrate a deep draw capability on conventional direct chill (DC) material; (2) evaluate materials and compare the formability of continuous cast (CC) and direct chill (DC) materials; and (3) demonstrate high volume cycle times with CC material on an integrated forming cell. Continuous casting (CC) is a key technology for enabling the development of low-cost magnesium sheet. The project will receive material from major global magnesium suppliers and be characterized via lab-scale investigation at the University of Virginia and CANMET and through stamping trials at Troy Tooling Technologies. Novel die systems will be designed and constructed that enable the use of warm forming in conventional single-action presses. The die will be used to determine critical forming parameters for magnesium sheet including preheat temperature, die temperature, and forming speed. Full automation including loading of pre-heated sheet and part extraction will be developed to achieve acceptable cycle times. Another evaluator expressed that the project is focused, with all the aspects relevant to manufacturing of a component being considered, and that most of the work was carried out by independent participants who were coordinated by end users (auto OEM). One person commented that the effect of die temperature variability on formability was identified and the team developed technology for die temperature control. One commenter noted the solid approach toward development and material supplier comparison. The final reviewer had somewhat critical comments stating that the approach appeared to be good, but “what can be said for water that passed under the bridge quite a while ago... that hindsight is always 20/20.”

QUESTION 3: CHARACTERIZE YOUR UNDERSTANDING OF THE TECHNICAL ACCOMPLISHMENTS AND PROGRESS TOWARD OVERALL PROJECT AND DOE GOALS.

One reviewer provided a detailed project summary, stating that the FY2009 accomplishments are as follows: (1) established forming maps for all five materials and correlated those maps to the lab-scale characterization work. Both DC and CC material displayed large forming windows at 300^{o}C; (2) designed, developed a new pre-heating system based on a retrofitted conveyor furnace capable of supporting a production rate of 5 to 10 parts per minute; (3) integrated pre-heater, press and newly acquired robot (loaned from Ford) to automatically load pre-heated sheets into the press, and connected PLCs from the press and robot with various limit switches to enable a fully-automated forming cycle; and (4) demonstrated run-at-rate capability of warm forming panels from both DC and lower-cost CC magnesium sheet. One reviewer commented that the project had identified the technical issues and solved many of them; it was shown that for magnesium, forming is achievable at high temperature; however, the component is a simple form and no actual component was manufactured. The final person simply stated that the progress was very good accomplishment according to plan.

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

Responses to this question were mixed. One person mentioned that multiple, international partners are involved with the work being well distributed. One person simply observed that international material suppliers were involved. One evaluator remarked that universities, other than ICME, were not involved. The final person commented that the researcher did provide many details on the collaboration.

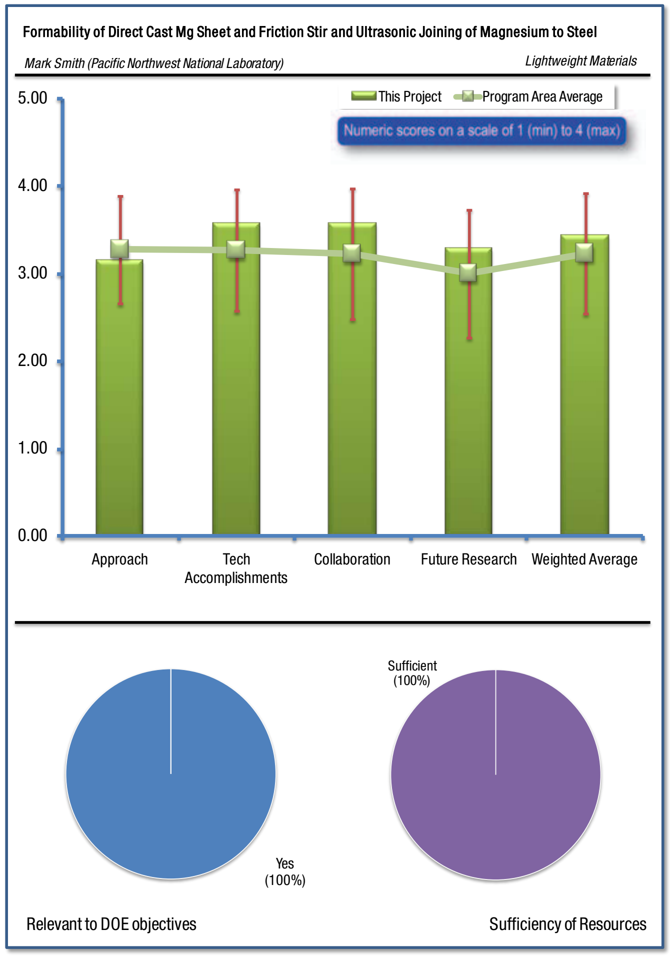
Question 5: Has the project effectively planned its future work in a logical manner by incorporating appropriate decision points, considering barriers to the realization of the proposed technology, and, when sensible, mitigating risk by providing alternate development pathways?

Reviewer comments in general showed uncertainty about the future plans. Two people commented that according to the presented materials, all of the tasks and milestones for this project were completed at the end of FY2009, and there is no indication that this project will continue into FY2010. Another person asked “What next? We spent the money and what do we have?” One evaluator observed that not much of a follow-up was presented but they were convinced there is still plenty to do for this to be fully transferred to industry. One reviewer commented that the question of why one sheet behaved differently than another still needs to be defined. The last reviewer pointed out that the critical assumptions and issues are very clearly described in the presentation material. The availability of magnesium sheet is clearly an important part of the DOE project. The emphasis on supplier development is an especially significant observation. If the supplier is properly qualified in advanced, then it would be reasonably anticipated that they would be tasked to address the issue of lubrication, thermal stability, and so on.

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

Reactions to this question were mixed, with a bit of confusion about why the project was evaluated. One person simply stated that the additional resources seem fine. Another evaluator expressed that this work should be continued. One evaluator criticized that this project should not have been in the session since it has passed. The last person asked whether a new project should start where the present one ends. They answered their own question, by saying “no”, but a new effort should be promoted and encouraged.

Formability of Direct Cast Mg Sheet and Friction Stir and Ultrasonic Joining of Magnesium to Steel: Mark Smith (Pacific Northwest National Laboratory)



Reviewer Sample Size

This project had a total of 7 reviewers.

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

Comments to this question were all positive. One person noted that this work is a very important subject for DOE and also for potential users. Another person acknowledged that the project is directly related to weight reduction objectives as well as cost reduction and performance improvement and design optimization. One person expressed that the use of magnesium sheet facilitates the use of magnesium in automobiles to improve fuel economy and displacement of petroleum. One evaluator remarked that cost reduction in warm forming is an enabler for the use of magnesium in vehicles; magnesium can be used to reduce the weight of the vehicle and this project is an enabler. One evaluator added that this work supports the use of magnesium as a suitable material for material replacement and mass reduction of vehicles. Others commented that warm forming and joining are fundamental techniques for such materials. One reviewer stated that bonding of this material is critical for advanced development of solid state methods (welding-friction stir and ultrasonic)–both deemed to be “non-melting” instead of adhesives. Another reviewer pointed out that multi-material joining is also important for the use of optimum material combination. The final reviewer explained that joining magnesium to steel is important and probably high risk, especially when considering long-term durability.

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 provided a detailed project summary and comments, stating that there are two targets of this project: (1) the formability of continuous cast magnesium sheet, and (2) friction stir and ultrasonic state joining of magnesium to steel. The objective of the first target is to reduce processing cost for automotive sheet products by replacing conventional wrought processed magnesium sheet with continuous-cast sheet. The objective of the second target is the development of solid-state technologies for bonding magnesium to steel which may enable broader application of magnesium alloys in automotive structures requiring integration with steel components. The technical approach for the first target is essentially to work through the following issues: the tribology of magnesium warm-forming (surface roughness, coefficient of friction with selected lubricants), then post-formed property characterization (tensile test, microstructural characterization), and elevated temperature formability testing. The technical approach for the second target is to work through the following issues: to evaluate friction stir and ultrasonic welding (the interaction of process parameters, develop tooling), and then characterize structural strength of the join (correlate process parameters to mechanical properties), and then investigate inter-layer corrosion (investigate coating effects). Another person simply noted that the approach in welding strength is sound. Another agreed that the researchers have used a well-defined and targeted approach. They also suggested that the researcher should also include corrosion assessment for FSW of magnesium to steel; for the resources expended corrosion of magnesium-steel joints should be evaluated). One evaluator felt the researcher gave good feedback of formability relative to surface roughness, lubricant alternatives. Another person commented that the approach includes milestone and go/no-go decision charts are helpful to explain choices. They added that the presentation outlined the report with deliverables developed but there is a need to concentrate on suitability for OEM usage. Others had comments related to the content and level of detail and analysis included in the presentation. One person mentioned that too many issues were evaluated; the findings are useful but the question of why needs to be answered more clearly; for example the presentation did not address why surface roughness affects the formability. Another evaluator commented that they would have given a higher rating, but the reviewer explained the presentation was too fast to be good. The last reviewer commented that the project really needs to focus on the zinc coatings, their composition and overall effects on mechanical properties. They added that it is highly unlikely that there is a metallurgical or even a solid-state joint without the zinc layer due to the differences in Mp.

QUESTION 3: CHARACTERIZE YOUR UNDERSTANDING OF THE TECHNICAL ACCOMPLISHMENTS AND PROGRESS TOWARD OVERALL PROJECT AND DOE GOALS.

One person provided a detailed summary, outlined below:

Project “A”

1. Reducing processing costs for conventional wrought processed Mg sheet with continuous cast sheet. Reviewing tooling lubricants. Good description of tasks are developed 1 through 4 with technical accomplishments of these lubricants shown by surface roughness measured. Mentioned that vender-to-vendor variation. (approximately 10 times). Interesting high roughness had better formability.

2. Post formed mechanical characterization by vendors. Green checks show acceptable parts.

Review microstructure of the Mg "texture" on post formed material.

Accomplishments included 5 suggestions for feedback to vendors and identified.

3. Proposed future work.

Non-isothermal warm forming of Al and Mg (shown on slide 15).

Project “B”

Friction stir welding with U.S.CAR (GM, Ford, and Chrysler)

Noted few options exist for joining Mg components to steel parts.

Plan to evaluate corrosion and possible coatings.

Technical accomplishments shown (20% increase in joint strength)

Summary and upcoming work is slightly vague on deliverables.

Several reviewers had brief comments noting project elements that were described such as 1) the effect of surface roughness on the formability, 2) the alternate lubricant analysis, and 3) the joining efficiency for magnesium-steel joint. One person noted that the FSW and USW work well because zinc seems to facilitate the welding. One evaluator observed that the project made great progress on high-temperature forming lubricants, influence of surface roughness on forming and reasonable progress on post-formed properties. Another person agreed, stating that the progress to date on both project targets has been excellent. Another reviewer also agreed about the good progress as well as the thoughts for potential for commercialization. One reviewer questioned what caused the dip in the friction stir welding graph. They also noted that the researchers stated that the graph is “correct” with little explanation. One evaluator explained that this is all fundamental work and relevant to sheet forming and joining magnesium structures, but they added that they would like to see the spot friction welding work expanded to include mixed magnesium products, i.e. sheet, extrusions and die castings that are joined to coated steel. The last reviewer suggested that the work be expanded to include spot friction weld bonding where an adhesive is incorporated.

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

Responses were generally positive, but some reviewers felt improvement was necessary. One person criticized that better clarity is necessary here. Another evaluator acknowledged that the project included many partners both industrial and within laboratories, but not much was said. It appears that PNNL is going alone and it is hoped that this is not the case. Another person, however, felt that the project is an extremely well coordinated collaboration with the USAMP program on warm-forming and that the project plays a key role and delivered. One evaluator noted that numerous collaboration partners involved and that funding is provided by multiple agencies/partners, but also felt that more detail is required on the extent of each. One reviewer remarked that this project entails U.S. DOE lab participation in a larger USAMP project with many partners and suppliers that is integrated with a larger project. The final commenter noted that Mark has always been an excellent collaborator with the USAMP/USCAR organization and encourages this to continue as it is positive and beneficial.

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?

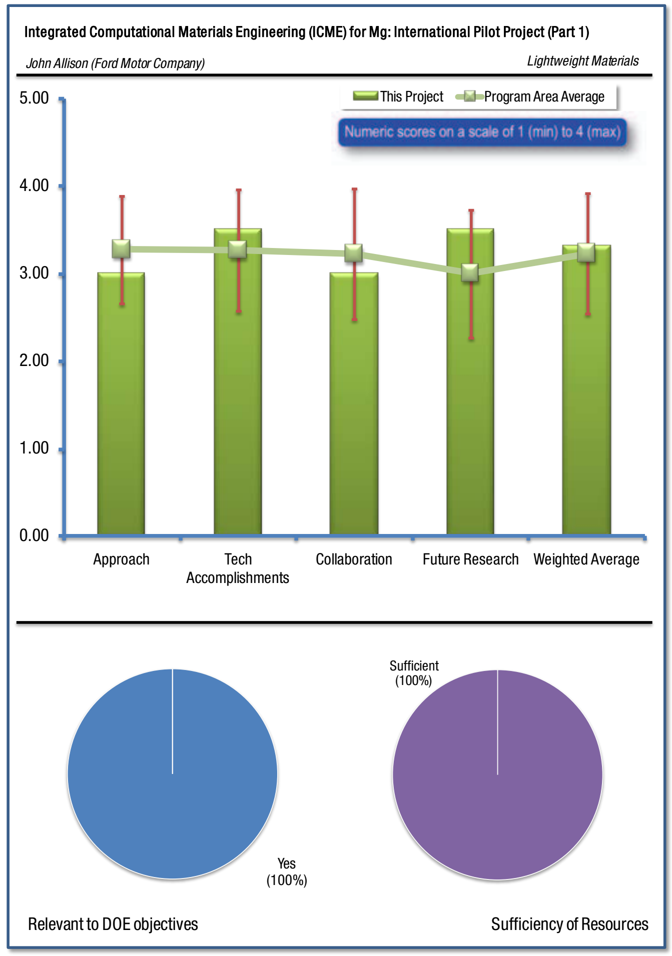
One reviewer provided a detailed project summary and comments. For the reminder of FY2010, the proposed future work on the first target will be (1) to relate microstructure, post-formed strength and formability properties, and also (2) to investigate forming limits under bi-axial forming. For the longer term, the issues to be investigated will include (3) non-isothermal warm-forming of aluminum and magnesium, concentrating on tribology under non-isothermal conditions, the development of models of thermal and strain distribution in sheet, and investigating ways to enhance durability of forming-dies for high-volume manufacturing. The upcoming work for the magnesium to steel joining target includes: (4) the join interface characterization, especially the effects of coatings, adhesives, and paint on the surfaces, and (5) future efforts to address the fundamentals and manufacturing of each process, e.g., clamping forces, weld offsets, and corrosion protection. One reviewer expressed that the future work plans seems beneficial, specifically relative to corrosion. Another person remarked that this work clearly needs to be pursued and encouraged; it is the key to the multi-material vehicle.

The effort should be refocused. One evaluator noted that one project is complete this FY; plan for the second project (joining) is too broad but exploratory. Another person commented that the zinc coatings on the steel appear to help joining as the zinc melts possible; this could be future research. One reviewer asked whether the tip sticks when ultrasonic welding magnesium, since this occurs with aluminum. The reviewer suggested that this might be a good area to review to determine feasibility; this research would be critical to understand manufacturing and joining issues with magnesium. One evaluator noted that a reviewer asked a good question about variability between weld-to-weld and within the weld. They suggested that this could be a future research area conducted under realistic OEM conditions. A reviewer asked whether there are production targets for these types of methods. They also asked what the agreement of the OEMs and established tooling costs is. The final reviewer suggested that the researchers consider more computational modeling with others, or redirected on existing resources available at PNNL.

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

One person commented that this project had sufficient resources to achieve milestones. Another person agreed, stating that the funding resources seem to be adequate for scope, but suggested that further work in this area is needed. The final reviewer expressed that the project may not have adequate resources, pointing out that adding samples is important to assess the variability of the results.

Integrated Computational Materials Engineering (ICME) for Mg: International Pilot Project (Part 1): John Allison (Ford Motor Company)



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 person commented that this project is important to the overall goal of the DOE objectives because of the weight reduction potential with magnesium to improve fuel economy. The only other reviewer to comment observed that this is the first project where ICME is being used to enable optimization of manufacturing processes and design to reduce cost of magnesium components. This project combines the theoretical aspects of material science and magnesium alloy developments. This project is very valuable to develop materials where cost-effective new materials can be used in order to reduce the cost of vehicle.

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 evaluator noted that some of the technical challenges have been addressed; however, coordination with so many parties involved is a significant challenge. They suggested that the program should be focused to achieve a particular goal within the time frame and validate with experimental data. Another evaluator noted that the main objective of this project is to establish, demonstrate and utilize an Integrated Computational Materials Engineering (ICME) knowledge infrastructure for magnesium in body applications for microstructural engineering, process and product optimization, and future alloy development. The reviewer predicted that two consequences will follow: (1) this effort will create a "collaboration space" for high quality data and models, and (2) it will also help to identify and fill technical gaps in the fundamental knowledge base.

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

One person commented that this project has just started and has made excellent technical progress in FY2009. The only other reviewer to comment added that some critical progress has been made towards the objectives, but it should be better coordinated among various parties involved.

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

This project involves so many partners such as different countries, various research institutions and many manufacturing companies, it must be better coordinated.

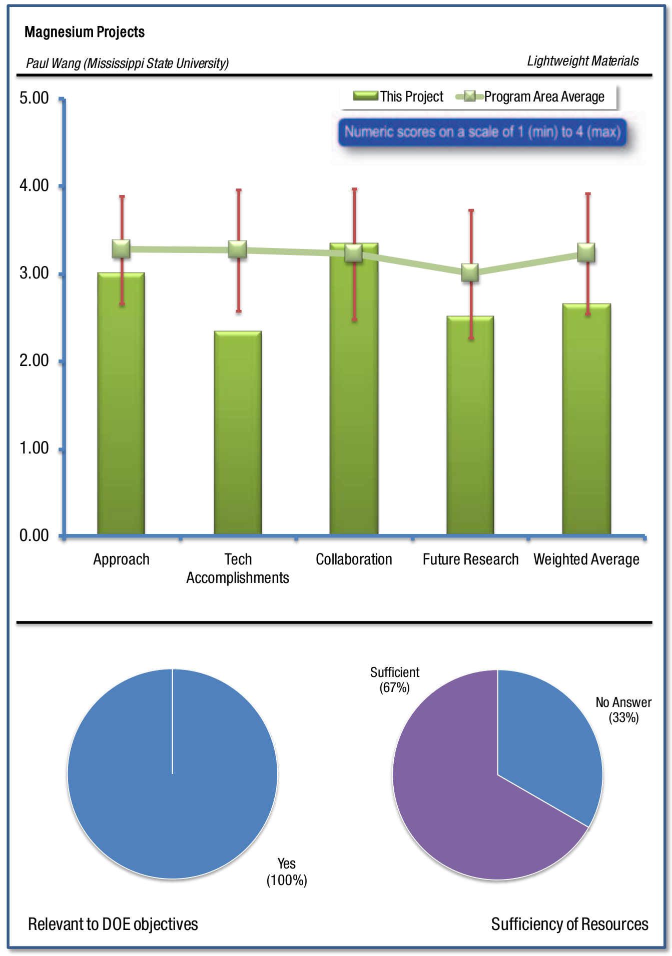
Question 5: Has the project effectively planned its future work in a logical manner by incorporating appropriate decision points, considering barriers to the realization of the proposed technology, and, when sensible, mitigating risk by providing alternate development pathways?

One reviewer provided a detailed summary and comments, stating that the future work being proposed is described on slides 21 and 22. These efforts are associated with five technical teams: (1) Phase Equilibria and DFT Task Team (e.g., complete first-principles calculations of precipitate or meta-stable phases other than AZ9; link with casting precipitation hardening model); (2) Sheet Task Team (implement dynamic recrystallization model into crystal plasticity; develop constitutive model formulation including adiabatic heating, damage, anisotropy, and kinematic hardening); (3) Casting Task Team (calibrate the solution treatment kinetics model; complete strength model); (4) Cyberinfrastructure Task Team (assess informatics needs and enhance repository of experimental data and model calibration tools); (5) Extrusion Task Team (complete static / dynamic recrystallization experiments; complete weld seam studies and develop weld seam models; model twinning and precipitation hardening). Another evaluator commented that the project is a very challenging project with material science and process development. Another person noted that the future project plan is very ambitious. It addresses some of the challenges in overcoming the barriers. The final reviewer also had detailed comments stating that the project objective is to build an ICME infrastructure for magnesium alloys is very important. The collaborative agreement which has been pulled together, both national and international, is a strong and encouraging indication of success. They remarked with respect to the earlier USAMP project, that one of their areas of concern is the future financial support which will be required to maintain, and grow, the ICME database when the current DOE project funding is over in FY2012. They concluded by expressing that they believe that this point is really only the tip of a large collection of questions which are becoming increasingly hard to avoid.

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

Only one person commented, stating that at this time the resources are sufficient, and can be adjusted in future depending upon the results.

Magnesium Projects: Paul Wang (Mississippi State University)



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?

Both reviewer comments were positive. One evaluator remarked that magnesium has a significant potential contribution in future years resulting in petroleum displacement. The other person described that the multi-scale model, as presented, is a good introduction to any experimental lightweight endeavor, but that the work needs to go further.

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 provided a detailed project summary and comments that the objective is to develop multiscale physics-based material models which are experimentally validated to be used for design optimization of components, systems, and lightweight materials; and to provide a robust design methodology including uncertainty to create innovative solutions for the automotive and materials industries. Theory development, experimental characterization, large-scale computing, new material development, and math-based tools are sought for use in designing next-generation vehicles under various crash and high-speed impact environments. The development of the cyberinfrastructure will leverage tools, technologies, and software developed by other large-scale scientific cyberinfrastructure projects and will be augmented by original research in computer science and software engineering towards the creation of large, distributed, autonomic and cooperative software systems supporting virtual organizations. Another evaluator felt the approach was comprehensive, but in such complicated multi-dimensional systems, the strategy becomes key to any real progress. Others were more critical of the approach. One person stated that the approach seems fragmented and more aligned with sustainability for the next 20 years. The vision is outstanding but the approach is a bit selfish. The final commenter criticized that the explanation about the strategy should be reviewed and clarified.

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

One person felt that the progress is good, although the spread of properties has to be significantly narrowed to have any real industrial applications in a not too distant future. Others, however, were not able to ascertain the level of progress. One person explained that the ICME results are very long-term, and the accomplishments are more of a vision and not yet measurable. The last reviewer remarked that it is difficult to determine what this team has accomplished in FY2009 based on the presentation alone. They acknowledged that some of the effort has gone into a literature search on magnesium, which is of course useful. They concluded by stating that for example, the presentation material shows the FY2009 work which was done on modeling and doing experimental work on corrosion.

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

Reviewers were all complimentary on this subject. One person simply noted that the researchers had shown collaboration with industry. Another evaluator felt that the collaborations were extensive, which is a strong point of this effort. The last commenter remarked that it appears to include many industrial and university partners.

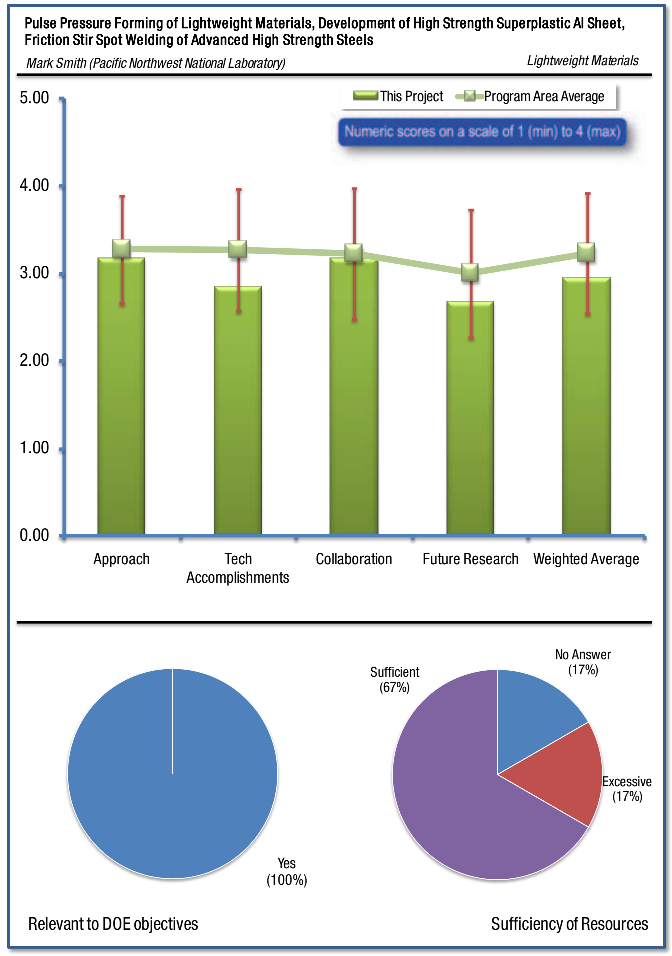
Question 5: Has the project effectively planned its future work in a logical manner by incorporating appropriate decision points, considering barriers to the realization of the proposed technology, and, when sensible, mitigating risk by providing alternate development pathways?

One evaluator observed that the integrated model is outstanding, but felt that it is difficult to see too much how this will apply to real cases for now. They added that they understand why the researchers want to keep the effort as broad as possible, but suggested that it is in their best interest to illustrate the strength of their approach by giving one "practical" example. The other reviewer commented that it seems that the plans are to acquire data via experimentation on magnesium alloys and then to code up the results in a database. The reviewer added that they do not understand the relevance of the K-12 education effort in Task 12, even though this is a potentially useful effort in its own right.

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

Reviewers had a difficult time evaluating this question. One person mentioned that it was hard to judge whether the level of funding is adequate or not. The other reviewer commented that the effort clearly has to be continued but would like to see advantages through "practical" examples.

Pulse Pressure Forming of Lightweight Materials, Development of High Strength Superplastic Al Sheet, Friction Stir Spot Welding of Advanced High Strength Steels: Mark Smith (Pacific Northwest National Laboratory)



Reviewer Sample Size

This project had a total of 6 reviewers.

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

Reviewers were all positive, with some providing suggestions for keeping the work on track. One person commented that this is relevant to most of the VT goals, especially, performance optimization and somewhat to lightweight. Another person agreed, simply noting that pulse pressure forming (PPF) is adequate for DOE lightweight vehicles. One evaluator observed that this type of work supports the use of alternative suitable material and methods for material replacement and mass reduction of vehicles. Another commenter explained that this will enable the use of magnesium and aluminum which reduces weight and improves fuel economy, thus reducing petroleum use within the U.S. Another evaluator agreed, adding that commercialization of a magnesium sheet, aluminum and dual phase AHSS lead to lightweighting and subsequent fuel reduction. The final reviewer cautioned that since considerable PPF forming underway at the OEMs, it is critical to make sure the PNNL work is more stretch than what the OEMs are working on already.

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?

Comments were generally positive, but reviewers provided several suggestions for improving. One reviewer provided a detailed project summary that stated that the project objective is resolved into three main targets: (1) pulse pressure forming (PPF) of lightweight materials, (2) development of high-strength superplastic aluminum sheet for automotive applications; and (3) friction stir spot welding of advanced high-strength steel (AHSS). The reviewer concluded by noting that each technical target is paired with a clear gap analysis. Another reviewer noted that the researcher captured the cost and cycle time limitations of SPF and has a target to improve to 250 MPa, so "good direction and good luck, this will be difficult." One evaluator remarked that barriers of individual projects are identified along with potential mass reduction feasibility in all three topics. Another person simply mentioned that superplastic forming of aluminum sheet can produce high elongation, while another mentioned that PPF was well prepared and executed. One evaluator observed that pulse-forming and FSW of steels are good approach, however they are concerned about the need for work on high-strength alloys for superplastic forming–the real issue is forming speed. One reviewer mentioned that technology gaps were identified and a basic approach/strategy was shown; however, the reviewer felt that the researcher needs to use technologies presented in both forming and joining to feasible high volume production implementation timeline. They concluded by asking when these technologies will be used and on which parts specifically. Another commenter pointed out that while the project is still in the research phase for fundamentals, tooling capital costs and manufacturing times at OEM speed should be considered as future research. One person criticized that the goals other than high strain rate forming characteristics are not clearly defined, and seem to be made-up as the program proceeds. They noted that the project involves fundamental research, but near-term commercial applications were not apparent. The final reviewer remarked that the project is ending without opportunity for pulse pressure application.

QUESTION 3: CHARACTERIZE YOUR UNDERSTANDING OF THE TECHNICAL ACCOMPLISHMENTS AND PROGRESS TOWARD OVERALL PROJECT AND DOE GOALS.

One reviewer provided a detailed project summary and comments, stating that the FY2009 accomplishments for each of the targets area are precisely described in the presentation materials. About target 1 (PPF): the reviewer found the diagram of the PPF very useful and the series of slides describing both the experimental apparatus and the experimental results convincing. One issue they identified was the non-uniform distribution of the pressure on the bottom of the sheet and the odd shape of the pressure profile vs. time curve (they also noted that the time scale appears to be mislabeled as seconds instead of the actual units of microseconds) To what extent is the shape of this curve dependent on the geometry of the chamber? Can more complicated part geometries than the dome using the PPF approach? Would preheating the material enhance its formability? What is the intrinsic (shot-to-shot) variability of the PPF process? About Target 2 (high-strength superplastic aluminum sheet): The process was to preheat the aluminum sheet to SPF temperature (about 450^{o}C). Five alloys were prepared and investigated. This reviewer's take on this target area in light of the discussion in the supplemental slides is that there are significant issues remaining. About target 3 (friction stir spot welding of AHSS): The project has done material selection and also done work on the definition of the process parameters. Work on coating materials is ongoing.

Another reviewer also provided a detailed account of the project progress.

Project 3: Pulse pressure forming overview and deliverables achieved. Good chart on project overview with funding and partners. Addresses all types of materials (Al, Mg, HSS). Acknowledgement of single sided tooling is preferred due to cost. Technology gaps identified and approach/strategy shown (although basic). Technical accomplishments; EMF (electromagnetic forming) is key enabler going forward. High speed cameras employed for micro sampling of material strain during forming. Using OEM and supplier input for material selection. Bounded material selection to available products instead of exotic materials (good).

Project 4: Super plastic AL sheet for auto applications. SPF relevance to technology gaps. Need to identify comparison to "steel" part. Which type? HSS, UHSS? Good point of identifying auto manufacturing process constrains for high volume SPF aluminum sheet.

Project 5: Friction stir spot welding. Did not have time to present.

One reviewer commented that the work is too summarized to have a real opinion on it. Another person agreed that the project showed good results on all fronts and specifically that the aluminum superplastic forming is interesting work but not really relevant to auto needs. One evaluator mentioned that there has been little if any accomplishment for commercialization. Another person expressed that regarding the SPF alloys, the focus on the 6xxx alloys should focus on two things, reducing the processing costs that are required to get the grain refinement. The last reviewer described that what most do not know is that the SPF sheet aluminum results in surface striations. They suggested that the researcher ask GM how much money it costs to hand finish the SPF panels they introduced on their products; it eventually led to them pulling the process due to cost.

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

Comments were all positive. One person simply stated the researcher has shown a good use of OEMs. Another evaluator observed that only GM, Ford and Chrysler were collaborators; no university or other DOE labs. They added that both OEMs and material suppliers are engaged, as well as the good partnership with U.S. Steel and Alcoa along with OEMs (Chrysler, Ford and GM). Another reviewer agreed that there has been good OEM and USAMP collaboration, and reinforced that the researchers should continue this. The final commenter noted that efforts should be made to broaden collaboration: new members should be included in the team.

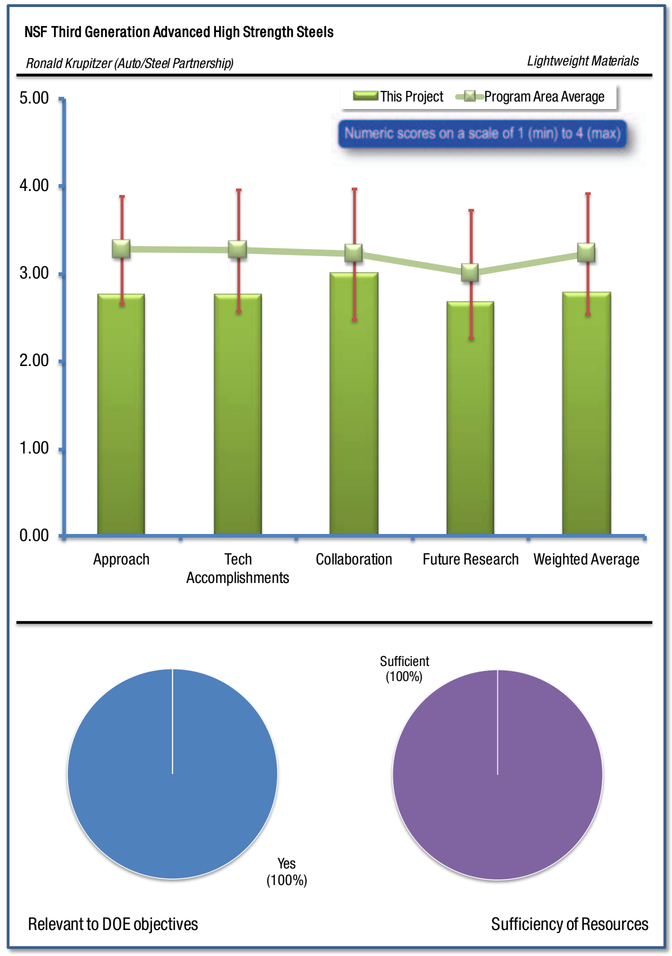
QUESTION 5: HAS THE PROJECT EFFECTIVELY PLANNED ITS FUTURE WORK IN A LOGICAL MANNER BY INCORPORATING APPROPRIATE DECISION POINTS, CONSIDERING BARRIERS TO THE REALIZATION OF THE PROPOSED TECHNOLOGY, AND, WHEN SENSIBLE, MITIGATING RISK BY PROVIDING ALTERNATE DEVELOPMENT PATHWAYS?

One reviewer provided a detailed summary and comments. Future plans for Target 1: This is clearly indicated in the presentation materials. The multi-pulse PPF process and the deeper study of the constitutive relations are critically important. The reviewer supposed that one would also like to investigate the controllability of the electric discharge and the effects of its positioning in the chamber with respect to the bottom surface of the part being formed. Future plans for Target 2: The primary deliverable from the project will be an alloy system and microstructure that produces the desired properties. This system will then be transferred to an aluminum mill for production. The project notes that material supplier involvement has been difficult. Future plans for Target 3: Final process parameter validation and injection molding die design are underway. Another person also provided detailed comments, observing that this is an interesting project with a range of difficult issues which will need to be faced. The participation of some aluminum companies, including one or more of those listed in the presentation (Kaiser, Alcoa, and Corus), is absolutely essential for Target Area 2 to have any chance at all of having practically useful consequences. It also seems that the AHSS welding effort in Target Area 3 is frankly one to which the team is not strongly committed and which is inadequately funded. The bright light in this show is the PPF approach in Target Area 1. The reviewer concluded the comments by observing that this technique is a variant of an old forming process called “explosive” forming and that controllability issues for process technologies of this sort are not easy. Another evaluator commented that all these have to be pursued and amplified to have any use for the industry. One evaluator suggested that the researchers continue to focus on cost reduction for both the SPF 5xxx and 6xxx alloys. Another person suggested that the researcher’s attention should be turned to SPF of steels which is very challenging. Another person observed that further understanding of room temperature forming is required regarding pulse pressure forming. One reviewer acknowledged that technology gaps identified and basic approach/strategy were shown, but that the researchers need to use technologies presented in both forming and joining to feasible high volume production implementation timeline. They concluded by asking when these technologies will be used, and on which parts specifically. The next person remarked that although they are still in research phase for fundamentals, tooling capital costs and manufacturing times at OEM speed should be considered as future research. Another asked what the consistency and repetition of the various processes is; this was not shown. They added that they were unsure about the differences between symmetrical and non-symmetrical dies. The final reviewer suggested that the program be closed without future research or commercialization.

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

Reactions to this question were mixed. One person thought that this project had sufficient resources to achieve milestones. Another person suggested that maybe not, especially since a lot more experiments have to be done. Another person observed that $3 million seems like an enormous amount of funds for this effort, especially since there are efforts on pulse forming within OEMs and SPF of aluminum is questionable. The final reviewer has non-funding resource related comments that Dr. Smith had several talks and this year as well as in years past. The reviewer was not fully convinced that this is necessary, and felt that DOE and PNNL should bring new faces with fresh perspectives to rekindle the interest on such projects.

NSF Third Generation Advanced High Strength Steels: Ronald Krupitzer (Auto/Steel Partnership)



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?

Reactions to this question were all positive. One person commented that utilization of advanced high strength steels helps to reduce vehicle mass resulting in improved fuel economy; so this project supports the overall DOE objectives. Another person agreed, stating that any work on AHSS is necessary to lightweighting vehicles. The final person commented that the suite of projects involving development of new steels or modeling efforts; will improve the use of third generation steels and achieving increased weight reduction.

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

One reviewer provided a detailed project summary and comments that the objective of this Auto/Steel Partnership (A/SP) project is to enhance the capability of AHSS from 25% mass savings to over 35% as an affordable materials approach to improving fuel economy and reducing vehicle emissions. More specifically, this team intends to (1) develop the metallurgy for a 3rd Generation AHSS with NSF, DOE and A/SP funded university research, (2) improve AHSS mechanical properties defined by the "Third Generation AHSS" field on the following total elongation-tensile strength diagram, and to improve modeling methods for fundamental steel mechanical property development. (The presentation materials contained a useful depiction of the AHSS "opportunity" in the elongation vs. tensile strength graph.). One reviewer pointed out that the project plan is very well defined, but addresses only some of the barriers. They suggested that a more focused definition and realistic goal should be articulated. Another person noted that the project includes nine tasks each involving its own work plan; each is trying to solve a fundamental problem and the approach for each one is quite well drawn and progressing well. The final reviewer commented that the approach appears to be thoughtful but the effort is too disparate to give any indication that this will lead to some real applications in a not too distant future. The project appears to be too much a collection of NSF projects. The need for consolidation is there.

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

One evaluator noted that the FY2009 accomplishments are listed by participant. Another mentioned that significant progress by researchers in universities was made so far: however, even small scale production of these steels needs to be demonstrated from the models. The next person commented regarding higher austenite contents; at least two projects are creating structure containing more than 13% retained austenite. One person simply pointed out that the researchers were able to show good microstructure control. Another reviewer observed that models to predict properties/forming are being developed. The final reviewer did not see how this can be put together to have any near-term use.

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

One person noted that the project is jointly funded from DOE and NSF. Another person acknowledged the collaboration between universities, AS/P and funding agencies. One evaluator remarked that there is excellent technology transfer potential due to industry participation in each step of the project. Another commenter explained that good project collaboration exists, but it can be improved; there are some duplications because of undisclosed information among various researchers. The last reviewer had similar comments that the project includes a significant pool of co-workers and/or institutions, but they do not appear to be collaborating on a unique goal.

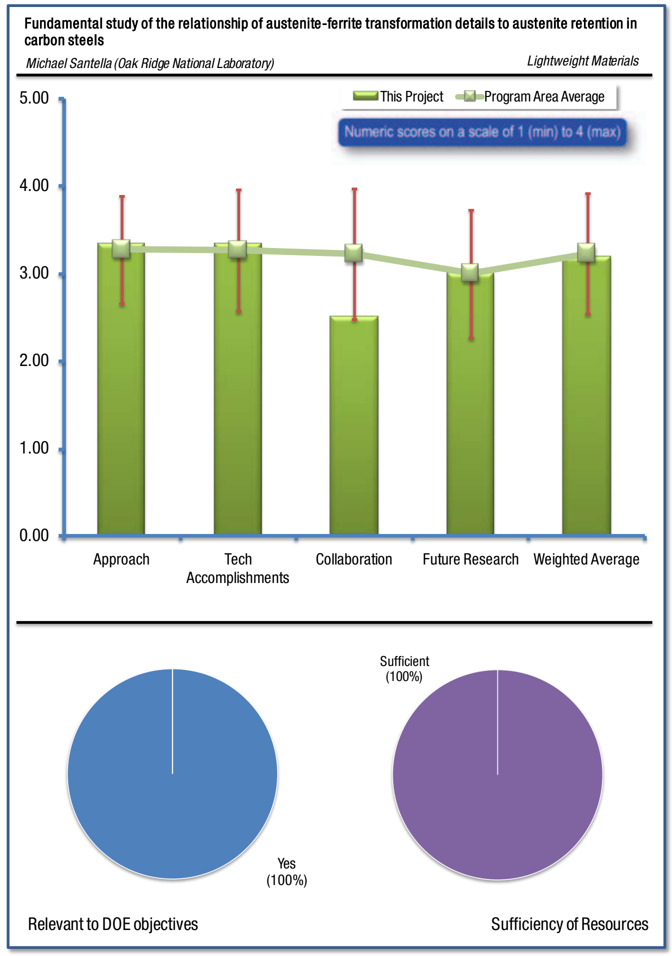
Question 5: Has the project effectively planned its future work in a logical manner by incorporating appropriate decision points, considering barriers to the realization of the proposed technology, and, when sensible, mitigating risk by providing alternate development pathways?

One person had detailed comments, stating that as noted in the presentation, FY 2010 is the final year for many of the projects. The researchers apparently used the 2010 workshop of investigators to announce the potential for future work in these project areas. They added that depending on the individual projects, some third year work on several projects will be completed in the next fiscal year because of variations in the scheduling and funding for these projects. They concluded by pointing out that the project plans to do technology transfer by means of workshops and technical publications. Another person commented that future research programs have been identified, but that some of the barriers need to be defined. One evaluator noted that this will be the last year for most of the tasks. The final reviewer commented that, as structured, they are not convinced whether such interagency effort should be pursued.

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

One person remarked that if the effort was to create a database of 3rd generation AHSS then the funding is sufficient. The other reviewer to comment was not convinced the effort should be continued.

Fundamental study of the relationship of austenite-ferrite transformation details to austenite retention in carbon steels: Michael Santella (Oak Ridge National Laboratory)



REVIEWER SAMPLE SIZE

This project had a total of 3 reviewers.

QUESTION 1: DOES THIS PROJECT SUPPORT THE OVERALL DOE OBJECTIVE OF PETROLEUM DISPLACEMENT? WHY OR WHY NOT?

One reviewer commented that more utilization of advanced high-strength steels in automotive applications would result in mass reduction, which would in turn help to improve the fuel economy, which supports the overall goal of DOE objective. The second, and final, evaluator stated that retaining more austenite will increase the ductility; will improve the performance and reduce the weight; however, this will be effective only in a longer time line as the enabling technologies need to be created.

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 person provided a detailed project summary and comments, noting that the project objective is real-time characterization of austenite-ferrite transformation behavior during temperature/time conditions representative of the processing conditions of AHSS. The effort is to determine conditions that promote retained austenite. This will contribute to building the scientific foundation needed for development of "3rd Generation" (Gen III) AHSS. The deliverables include (1) the quantitative description of austenite-ferrite transformation behavior during simulated finishing operations, including the effects of carbon, manganese, and silicon; (2) a quantitative description of alloying element partitioning between austenite and ferrite; and (3) an assessment of how retained austenite can be maximized within constraints of normal sheet processing infrastructure. Another reviewer expressed that the project is well defined and noted that some barriers were identified. The researchers added that some of the barriers were well simplified, but felt that the project needs to be focused only few barriers. One commenter simply suggested that the researchers concentrate on microstructure modification. The final reviewer asked what happens to the structure during subsequent processing (welding, annealing etc). They added that these steels exhibit good properties due to the special microstructures, so they asked what the use of the initial phase distribution is if these steels are modified due to secondary processing.

QUESTION 3: CHARACTERIZE YOUR UNDERSTANDING OF THE TECHNICAL ACCOMPLISHMENTS AND PROGRESS TOWARD OVERALL PROJECT AND DOE GOALS.

One reviewer provided a detailed project summary describing that the project demonstrated in FY2009 that it could successfully track α-γ transformations during rapid heating/cooling. The researchers also established that measurements of lattice parameters are possible. Some challenges were noted: (1) continuous proposal writing for Advanced Photon Source (APS) beam time, and (2) experimentation and data analysis is not "canned" and is in fact being perfected in parallel with experiments. The experiment begins with resistive heating of the sample in a vacuum and then continues with the exposure of the same to the APS synchrotron flux. Another person remarked that the researcher achieved good progress in understanding the transformation kinetics and microstructure development. The last person noted that some progress has been made, that the researcher has demonstrated basic feasibility, and that some barriers were overcome, but concluded by noting that the researcher needs to focus on specific deliverables.

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

One person noted that this is a national lab project and that project partners are being sought. The other reviewer to comment observed that with limited partnership, the coordination is very good.

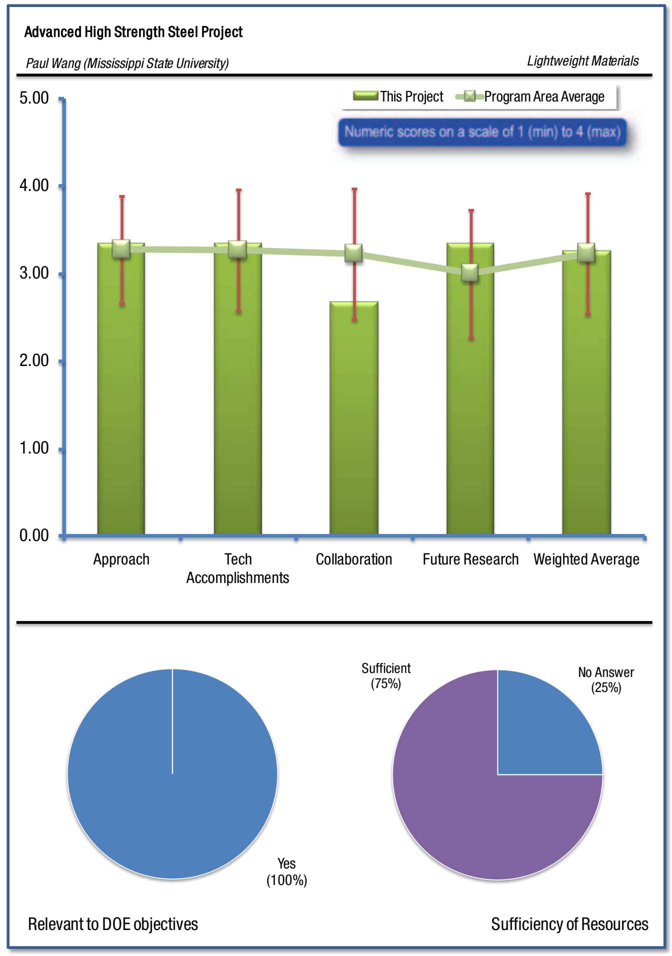
QUESTION 5: HAS THE PROJECT EFFECTIVELY PLANNED ITS FUTURE WORK IN A LOGICAL MANNER BY INCORPORATING APPROPRIATE DECISION POINTS, CONSIDERING BARRIERS TO THE REALIZATION OF THE PROPOSED TECHNOLOGY, AND, WHEN SENSIBLE, MITIGATING RISK BY PROVIDING ALTERNATE DEVELOPMENT PATHWAYS?

One person noted that the future work for FY2010 includes the following tasks: (1) experimental alloys are being defined to promote austenite through alloying, and (2) a novel processing scheme to produce ferrite + austenite is under consideration. They added that the project notes that industry/university collaborations are being sought. Another person thought that the future plan is well defined. It addresses some of the barriers, but should be focused on deliverables. The final reviewer suggested that the researchers include more characterization and have less emphasis on tech transfer.

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

There were no responses to this question.

Advanced High Strength Steel Project: Paul Wang (Mississippi State University)



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 had positive comments for this question. One person stated that the project fits very well with DOE's petroleum displacement objective. Another commenter felt that this type of work supports the use of alternative suitable materials and methods for material replacement for mass reduction of vehicles. One commenter stated that AHHS provides lightweighting opportunity which translates into displacement of petroleum. The final evaluator expressed that AHSS is very important for lightweighting vehicles and so is creating new alloys with improved physical properties.

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 person provided a detailed project overview and comments, describing that the project objective is to use a hierarchical multi-scale methodology to investigate the effect of precipitates and additives to the overall strength and ductility in steel alloy design for automotive applications. Critical issues being addressed include the selection of key micro-alloying elements, interaction of precipitate and matrix phases, and ultimately composition-structure-property relationship. The approach is to perform simulations on quantum mechanical first-principles based on Density Functional Theory (DFT). Accurate atomistic simulations will be performed using Modified Embedded Atom Method (MEAM) and force-matching-embedded-atom-method (FMEAM) potentials. Finally, large-scale atomistic simulations will be conducted to study the effect that size, shape, and volume fraction of different inclusion particles have on the material properties of steel alloys. The correlation with atomistic simulations is made explicitly in the presentation materials. Another reviewer observed that the researchers presented a very comprehensive correlation with atomistic research, while another noted the good definition of approach and subtasks. Another person simply noted that project included topics from microstructures to DFT computations. One evaluator thought that the program is solid, but very broad, and suggested that a more focused project would be better. One reviewer mentioned that the project investigated advanced HSS project microstructure states to determine fundamental mechanisms to determine overall strength and ductility of steel alloys. The final person noted that the flowchart is clear but asked if there is a defined detailed timeline.

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

One person provided a detailed project overview and comments, stating that as the FY2009 accomplishments demonstrate, this project has done a very good job of working through its tasks. The results are clearly presented in the materials provided. The accomplishments include the following: (1) performed the full spin-polarized density functional theory (DFT) calculations on Fe ferrite phase to correctly account for the ferromagnetism in Fe atoms; (2) developed a new multi-objective optimization methodology as a robust procedure to construct reliable and transferable interatomic potentials for steel alloy systems; (3) applied the multi-objective optimization procedure to construct reliable interatomic potentials for Fe, C, and Fe-C using the force-matching-embedded-atom-method (FMEAM); (4) obtained FMEAM interatomic potentials for Fe-V alloys; (5) established a basic framework for the accelerated development of reliable and efficient interatomic potentials for other combination of alloy systems; (6) performed DFT calculations of cementite Fe-C alloy phase and optimized the structure, of the diffusion of V in ferrite phase, and of the diffusion of V in cementite phase; and (7) conducted fundamental materials/mechanical properties characterization and microstructure characterization on advanced high-strength steel (AHSS) alloy samples obtained from POSCO, performed thermomechanical treatment and investigated the effect of bake-hardening. Another person noted that the researcher provided a good summary of the project. The final evaluator commented that the results "appear to be quite good ... remain quite theoretical ... strong on modeling, including grain boundaries effects ... too academic to be readily applied."

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

Reviewers were suggested work could be done to improve in this area. It was unclear to one reviewer if industry, suppliers, or OEMs actively engaged. The other person to comment observed that the work appears to come uniquely from Mississippi State. It would be desirable to see collaboration and work integration.

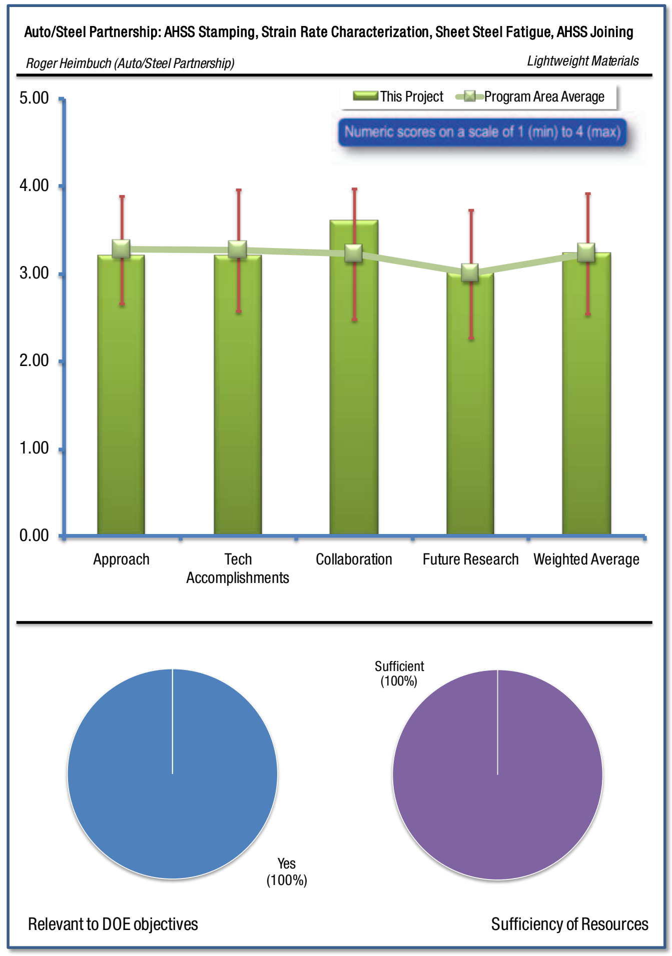
QUESTION 5: HAS THE PROJECT EFFECTIVELY PLANNED ITS FUTURE WORK IN A LOGICAL MANNER BY INCORPORATING APPROPRIATE DECISION POINTS, CONSIDERING BARRIERS TO THE REALIZATION OF THE PROPOSED TECHNOLOGY, AND, WHEN SENSIBLE, MITIGATING RISK BY PROVIDING ALTERNATE DEVELOPMENT PATHWAYS?

One person summarized that the FY2010 deliverables for this project are (1) the development and validation of MEAM potentials to model lightweight alloys, specifically, Fe-C; (2) atomistic simulations of micro-alloying effect, specifically, V diffusion and V segregation at grain boundaries; and (3) the effect of altered microstructure on the strength-ductility combination of DP steels. Another person summarized that the use of computational chemistry simulations, especially the DFT simulations for (quasi-) ab initio computations of the properties of engineering materials is critically important. The reviewer strongly concurred with the project's remarks that "this investigation should facilitate the design of new generation of advanced high-strength steels by providing fundamental understanding of several critical issues that include the selection of key combination of micro-alloying elements, interaction of precipitate and matrix phases, and ultimately composition-structure-property relationship." One evaluator asked how this relates to feasibility of using this material in production or future vehicles. They added that this advanced type of research has been completed on a single composition but asked how this translates into future OEM usage of 3rd generation steels and wondered if the steel industry uses this information or directs use to the OEMs and suppliers. The final person noted that the project is going from magnesium alloys, aluminum alloys, and then to steel alloys for next years.

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

Reactions to this question were mixed. One person thought that this project had sufficient resources to achieve milestones. The other reviewer to comment suggested that the project may not have sufficient funds; the project is so broad that it can "consume" more funds.

Auto/Steel Partnership: AHSS Stamping, Strain Rate Characterization, Sheet Steel Fatigue, AHSS Joining: Roger Heimbuch (Auto/Steel Partnership)



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?

Reactions to this question were all positive. One person commented that the utilization of AHSS sheet steel in automotive components helps to reduce mass of the vehicle, resulting in improvements in fuel economy in a most cost-effective manner. They added that this project strongly supports the overall DOE objectives in replacing petroleum. Another evaluator commented that this type of work supports the use of alternative suitable materials and methods for material replacement and mass reduction of vehicles. Third generation AHSS, along with previous generations, are enablers. The reviewer added that the future proposal will consist of manufacturing challenges for OEMs using reduced gage material, implementing tooling and OEM constraints resulting in usable information for OEM use. One commenter simply stated "especially for vehicle manufacturing". One evaluator pointed out that high-strength steels can contribute to improved performance and save fuel; many projects explained in this presentation contribute to the increased use of AHSS in vehicle structures. The final person observed that AHSS stamping is now the state-of-the-art, maybe not for reaching 50% weight reduction, but for everything in 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?

One person provided a detailed project overview and comments, stating that the objective of this project is the investigation of the engineering properties of Advanced High Strength Steels (AHSS). This project resolves into four technical target areas: (1) AHSS stamping, (2) fatigue of AHSS, (3) strain rate characterization, and (4) AHSS joining. Each of these target areas has a specific line of approach: (1) AHSS stamping investigates springback prediction, reduction, and the characterization of fracture during AHSS stamping; (2) fatigue of AHSS will develop guidance and data for base-material, spot-weld, and MIG/laser weld fatigue to support the weight reduction initiative, and also use the results to evaluate predictive methods; (3) strain rate characterization will develop new experimental setups for characterization of the strain rate sensitivity of AHSS, a new robust spot weld finite element formulation for modeling the spot weld, and a characterization of the bake hardening effect of DP steels at high strain rates; and finally (4) AHSS joining will provide welding and joining expertise to support A/SP project teams in developing lightweight automotive body structures, supplement the existing welding and joining technical knowledge to facilitate an increased use of AHSS, and utilize A/SP research data to prepare industry weldability and weld quality acceptance standards. Another reviewer commented that the overall project goals were well defined, but that some of the barriers could have been better defined and that the project should be better focused on end results. One commenter noted that the researcher provided a good overall presentation and past work with goals, deliverables and future direction clearly defined. They concluded by noting that the technology transfer plan is always in sight. One reviewer simply mentioned that the project included a predictive tool and good development of the model, while another person observed that springback was explicitly dealt with. Another person commented that further work needs to be completed as crash models show mass is left on the table, which should incorporate non-linear strain curves. Several people commented on the long project timeframe and loss of focus. One person noted that 3rd generation AHSS forming trials are on the horizon, but also suggested that the project needs a more concrete time frame for MY implementation on high volume vehicles. Another evaluator remarked that it has been a very long timeline since start (10 years), which can lead to the loss of focus. The final person acknowledged that many aspects were studied, but that this will reduce the focus as well.

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

One person provided a detailed project overview and comments, stating that the progress to date for the technical target areas is described as follows: (1) In the AHSS stamping area the progress to date is described on slides 11 through 18. The reviewer noted with interest the work done on the well known problem of edge fracture and cracking and also concurs with the observation that this is dependent upon the specific geometry of the edge as well as the local stress/strain rates. (2) In study of fatigue of AHSS, the empirical approach to weld fatigue measurements seems to be moving in a plausible direction. (3) The goals of the strain rate characterization target were apparently reached in early FY2009. (4) The AHSS joining target area will be concluded in September 2010. The description of the results obtained is provided in the presentation materials. Another reviewer mentioned that the researchers provided a good description of achieved results for tensile strains and tensile strength. Another highlighted the good data generation and the creation of a substantial database. One evaluator pointed out that significant progress has been made and that some of the barriers were identified. The reviewer also suggested that this project should be focused and must be completed by 2011. Others had similar comments about project timing and value. One person commented that the project findings are relevant to the industry, but in some cases it is incremental. Another person commented that long running projects will add small value after few years. Another evaluator acknowledged that realistic designs were achieved with two published manuals for industry. The reviewer read the application guidelines in January 2010 for advanced high-strength steel. The final person commented that the technology transfer plan shows they are engaged with supply industry and this is technically relevant work.

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

Reactions to this question were mixed. One person felt that the whole supply chain (manufacturers, parts supplier and OEM) are involved. Another evaluator agreed, stating that the technology transfer plan shows they are engaged with supply industry. Another reviewer acknowledged that partnering with U of M and others is good and that the project is aligned with FreedomCar and A/SP goals. The reviewer also mentioned that other partners for fatigue and other items were included and that the researcher has shown good technology transfer in published papers and with results being used in crash model events. Others simply stated that there was good dissemination of results, teams, and complementarily. Another commenter noted that the collaboration with universities is good, but suggested that some component manufacturers should also be included. They added that technology transfer should be directed to OEM and component manufacturers, cautioning that this suggestion should be taken seriously. One person noted that the researchers finished FEA-predicted results with experimental work, but that the results were vague and that the tool is completed even though the current supplier dropped out. They noted that project work is continuing without a supplier project partner, but were unsure whether the team was working to identify a new supplier project partner. The final person commented that it appears there are issues with collaboration with some universities. They noted that all groups are engaged, but asked about other issues.

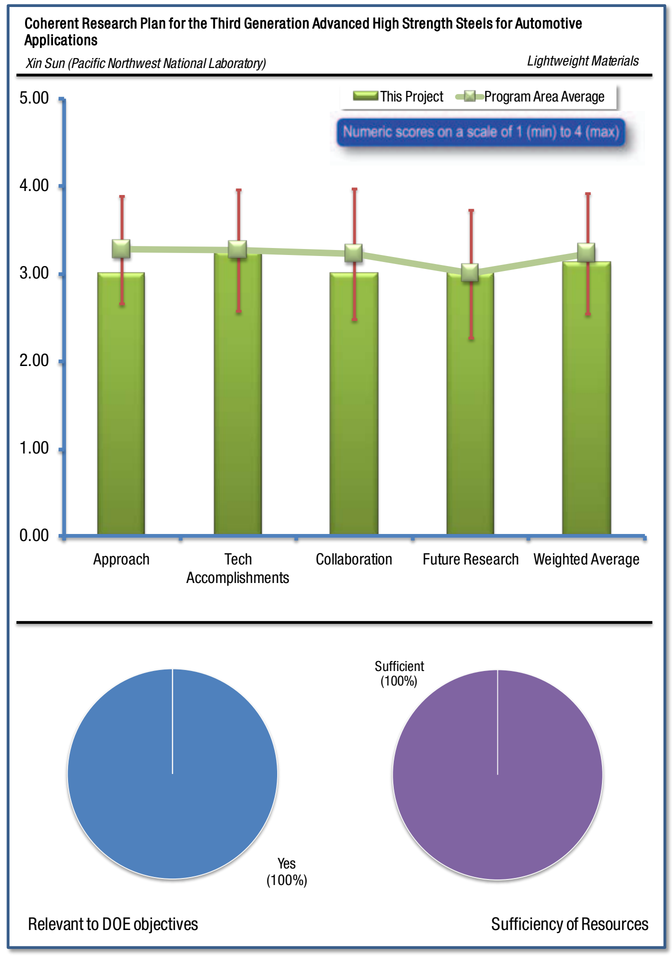
Question 5: Has the project effectively planned its future work in a logical manner by incorporating appropriate decision points, considering barriers to the realization of the proposed technology, and, when sensible, mitigating risk by providing alternate development pathways?

One person provided a detailed project overview and comments, stating that the future plans for each technical target area is described as follows: (1) In AHSS stamping, the edge fracture work will be continuing into 2011, and the 3rd Generation Advanced High-Strength Steel forming trials are on the horizon. (2) The work proposed toward a variability study of fatigue of AHSS is important and will doubtlessly be a useful addition to the work which has already been done. It seems to the reviewer that the identification of “key geometric parameters” is a reasonable step, but they would not be surprised to hear that the root cause analysis of weld variability for the AHSS class of materials will require a more extensive set of process parameters. (3) Since the goals of the strain rate characterization technical task have been completed, the tasks remaining seem to be technology transfer. Finally, (4) since the AHSS joining target area will be completed in September 2010, A/SP does note that they are preparing a future project under the ASP310 Joining Strategy Steering Committee. Another person felt that this team has done a very thorough and careful job. One reviewer noted that edge fracture, fatigue, strain rate modeling, welding and forming, and joint efficiency for cost models are all very important, but were glossed over. Another person commented that previous work concentrated on chassis and body-in-white, and that lightweight fuel tanks are the next target. They remarked that the future works plan should be sure to include high-volume production vehicles. One evaluator asked about the availability of these HSS for the "world" market; they note that this is challenging, pointed out but no plan is discussed. Another reviewer mentioned that the future proposal will consist of manufacturing challenges for OEMs using reduced gage material. Several people had comments relating to the future project scheduling. One person observed that various tasks are completed, or will be completed, this FY. Another noted that these four projects should be completed within the completion date as specified in the report. One evaluator explained that the reviewer discussed having the joining project complete by 9/2010, but that no current plans were developed. The final person noted the future work developed under the ASP310 joining strategy steering committee. The reviewer was unsure of future goals, but hopefully would be complete by end of summer.

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

One person commented that overall, the project should be somewhat more focused. Another reviewer felt that the project had sufficient resources to achieve milestones. The final person commented that although resources are quite substantial, such a project can "consume" even more.

Coherent Research Plan for the Third Generation Advanced High Strength Steels for Automotive Applications: Xin Sun (Pacific Northwest National Laboratory)



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?

One reviewer suggested that next generation AHSS will lead to weight reductions in high volume vehicles; however in their view, it is highly unlikely that these steels will meet the goal of 50% weight reduction. They added that with the exception of the 50% goal, "The Plan" addresses all of the other major objectives of the DOE lightweight vehicles technology program and they will contribute to overall weight reductions in multi-material vehicles. Another evaluator stated that more utilization of AHSS would result in mass reduction, thus improving fuel economy; so for this reason the project supports the overall DOE objectives. One commenter remarked that high formability AHSS provides significant lightweighting, crashworthiness (safety) and fuel economy, and displacing petroleum. The last reviewer to comment explained that steels will continue to drive weight out of the body structures, especially in the cast of cars. They concluded by stating that the design of the ultra-lightweight safety cage out of steel is a focal point for the domestic OEMs.

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 mentioned that the stated goal was to develop a "coherent plan" for Gen 3 AHSS, but that the approach to arriving at a coherent plan was not well described. The reviewer felt that there seemed to be three material concepts that were explored using interesting techniques, but this did not result in a coherent plan. The detailed models (dislocation dynamics and FEA-based microstructure-stress-strain response) were state-of-the-art and provided interesting insights - they could have been much more valuable if placed in a coherent plan to provide real direction. The approach also did not deal with manufacturing issues such as joining, forming, surface finish, which limits its impact. Another person commented that the project is well defined, but could be more focused on deliverables. They added that the researcher also needs to identify some specific barriers. One evaluator acknowledged the good approach, but added that it is reliant on the university to define a series of individual projects They also noted that the project lacks overall technical leadership and the resulting projects lack a common vision for subsequent commercialization. One commenter pointed out that the original goal of this project has been changed to include 3rd generation of AHSS. They criticized that the original project should have been completed, and a new project should have been started specifically geared to 3rd generation of AHSS. The final reviewer commented that the fundamental strengthening mechanisms were referred to as "new", but stressed that these have been the fundamental strengthening mechanisms for years, whether it is steel, aluminum or nickel-base super alloys.

QUESTION 3: CHARACTERIZE YOUR UNDERSTANDING OF THE TECHNICAL ACCOMPLISHMENTS AND PROGRESS TOWARD OVERALL PROJECT AND DOE GOALS.

One person criticized that the original project deliverables have been changed, and that the rate of progress has been slow. Another person criticized that they did not see the "coherent" plan. They acknowledged that the detailed modeling results were helpful and interesting, but they did not seem to result in a clear plan or vision of where to go. One reviewer noted that some progress has been made so far for 3rd generation of AHSS. One person remarked that the researcher has shown excellent work in understanding the effects of particle size on the strengthening mechanisms of steel products. There appears to be a good fundamental knowledge of nano- and sub-micron particles sizes on substitutional and GB n. Another evaluator also noted the good progress, and that many small projects were included, but the work was lacking in defined goals and milestones to evaluate performance. The reviewer added that the results reported are quite impressive but not coordinated.

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

Responses to this question were all positive. One person pointed out the good collaboration with A/SP, auto industry and steel companies. Another evaluator mentioned the good collaboration with North American and European steel suppliers. Another person agreed that the collaboration with partners is good, but felt that it should have been extended to steel producers. The final commenter stated that the collaboration was limited to annual meetings. They suggested that the beneficial results could be amplified if multiple university resources were working together on a common theme.

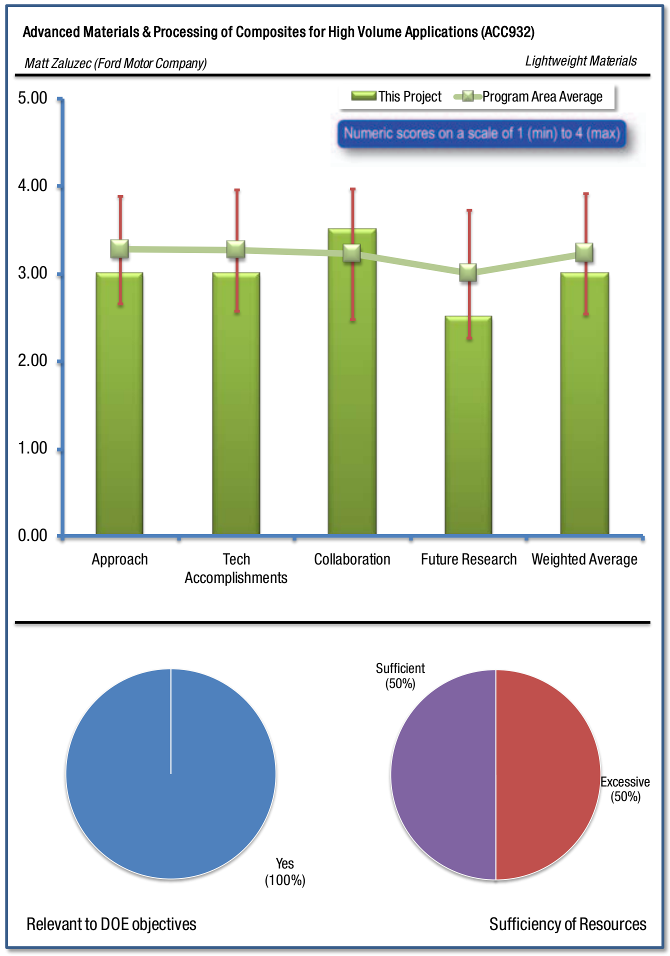
QUESTION 5: HAS THE PROJECT EFFECTIVELY PLANNED ITS FUTURE WORK IN A LOGICAL MANNER BY INCORPORATING APPROPRIATE DECISION POINTS, CONSIDERING BARRIERS TO THE REALIZATION OF THE PROPOSED TECHNOLOGY, AND, WHEN SENSIBLE, MITIGATING RISK BY PROVIDING ALTERNATE DEVELOPMENT PATHWAYS?

Reactions to this question were mixed, with several reviewer providing comments to improve this area. One person simply stated that the researchers should definitely continue this work. One reviewer commented that as individual alloy design ideas, the future plans were very good, but as a coherent plan, they missed the future work that would lead to a plan. They suggested that a coherent plan would deal with many different aspects, formability, cost, welding, surface finish, etc. This reviewer was expecting an industry roadmap and did not see it. Another person pointed out that the future research program is too broad, and needs to focus on deliverables. The final commenter explained that there are many ongoing small projects that are all ending in 2010. They added that the researchers will look at new projects after the projects are completed, but suggested that they should consider commencing projects each year to avoid the transition period of starting research.

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

Both reviewer comments were positive. One person commented that the resources are sufficient for what was accomplished. The other person stated that the projects seem to be directly related to funding.

Advanced Materials & Processing of Composites for High Volume Applications (ACC932): Matt Zaluzec (Ford Motor Company)



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 had positive comments. One person remarked that the introduction of composite materials in automotive components is essential for mass reduction for improved fuel economy; this project supports the overall DOE objectives. The other reviewer commented this type of research in low-cost carbon fiber for automotive mass reduction is extremely relevant for GHG and fuel economy goals for near-term usage.

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 provided a detailed summary of the presentation that covered several separate work projects.

#1 Carbon fiber SMC - Carbon Fiber Sheet Molding Compound Material: Good timeline complete with barriers addressed and partners determined. 2012 usage for possible MY 2016 vehicles (?). Still need better link to overall mass reduction, ultimate OEM cost and MY usage.

#2 Thermoplastic Composites (D-LFT): Good steps to investigate challenges with suppliers. Direct compounding process limits shipping/logistic costs. Raw material made on site to finished material. Glass fiber compatible with e-coat process.

#3 Crash Energy Management: Must understand failure modes of critical components. Complex physics of crush. Working with four independent universities. Truly predictive tools are required–per the slide. It appears that this project is driving standardization. This is similar to steel where dual phase is used and during crash–strain hardening is occurring. This becomes complex as new carbon fiber precursors are developed and used. Consistently changing environment but U.S. AMP understands and is following the issues. Some challenges include resin, precursor, process, static vs dynamic crush and weave angle.....even work being done with “random” weave which would be less expensive to produce.

#4 (ACC007): 2014 completion of cost-effective mass reduction of the passenger vehicle with safety included. Note this is done at high volume with acceptable cost. Good usage of milestones with underbody and composite seat including design, fabrication and testing. Note cycle time is estimated at 2-1/2 minutes but standard steel stamping is much less (seconds). Prototypes are available but still need to address impact resistance of this versus steel.

One reviewer commented that the 23% mass reduction appears feasible on the seat but at what MY implementation and from what baseline? The last person noted that these projects have significant weaknesses, not addressing the most of the barriers. These projects are not well defined and also not deliverables. The projects are too optimistic on deliverables.

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

One person thought that the progress to date is lagging, and that not many barriers have been addressed by the researcher. Another reviewer remarked that the researcher is very concerned on the outcome (deliverables). One evaluator noted that the identified bending stiffness is most important–have established primary causes of BLRT (Note phase 2 slide). One person noted that the researcher understands the challenges of density and control for consistent properties. The final person commented that the researcher understands the challenges ahead still exist due to manufacturing/process variability for low-cost carbon fiber. They also noted that challenges still exist with steel industry as well.

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

One person noted that there is good collaboration among partners, although the progress is slow. Another reviewer pointed out that the collaboration with suppliers for carbon fiber along with OEMs to define production limitations. One evaluator observed that U of M is doing significant research on defects (intentional and unintentional) based on size of part. The final reviewer commented that, with respect to Project #3, crash energy management, that the researchers must understand the failure modes of critical components. They also noted that the project includes the complex physics of crush and that the researchers are working with four independent universities.

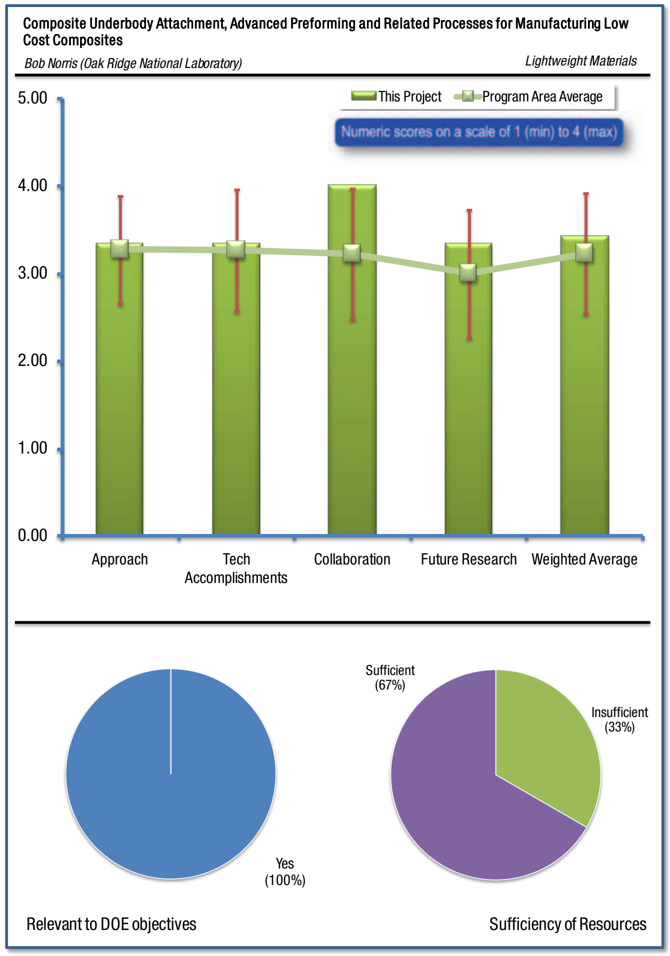
Question 5: Has the project effectively planned its future work in a logical manner by incorporating appropriate decision points, considering barriers to the realization of the proposed technology, and, when sensible, mitigating risk by providing alternate development pathways?

One person simply noted that the additional work is being done with chopped fiber and injection molded parts. Another reviewer commented that the milestones developed for BLRH and peer reviewed journal papers estimated to be delivered in October 2010. They also mentioned that Bond Line Read Through (BLRT) is an issue for Class A surfaces and that OEMs have Class A challenges to use carbon fiber for surface appearance. The last person to comment stated that the final deliverables are too optimistic and that they doubt very much in meeting timing and deliverables. They concluded by noting that the project timeline is too long, and should be tied to deliverables.

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

Reactions to this question were mixed. One reviewer commented that this project has sufficient resources to achieve milestones. The other person commented that the funding is very excessive for the deliverables.

Composite Underbody Attachment, Advanced Preforming and Related Processes for Manufacturing Low Cost Composites: Bob Norris (Oak Ridge National Laboratory)



Reviewer Sample Size

This project had a total of 3 reviewers.

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

All reviewers had positive comments. One person stated that the good integration between ORNL and ACC ensures that the fabrication of carbon fiber for the automotive industry is becoming practical, so the project definitely fits DOE's objective. Another reviewer commented that the development of manufacturing technologies for composite parts will increase their use in vehicles; composites can contribute to more than 25% weight reduction. The last evaluator felt that the project absolutely met DOE's goals; the post-2020 era will be dominated by carbon fiber to 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 person simply noted that the approach is good and relatively easy to follow. Another person agreed, remarking that the researcher presented an excellent approach towards commercialization by creating a state of the art pilot facility and parallel advanced modules adjacent to baseline processes. The final reviewer pointed out that the process development for part manufacturing; this is enabling technology for wider acceptance of the product.

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

One person noted that automated fiber laying is an improvement over hand laying or laminate routes. Another reviewer simply stated that excellent progress was made with a published schedule. One evaluator expressed that the progress is good and that the advantage for thermoplastics to get thinner cross-sections is well presented. The last person suggested that equipment development may not be the best task to be supported (chopper gun).

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

One reviewer explained that this is a U.S. DOE lab project in collaboration with ACC, and is well integrated with good participation from various levels of supplier, producer and end user. Another person simply noted that the project is a two-party collaboration, with very good collaboration. The last person noted that many partners, domestic and international, including large experienced industrial partners are involved.

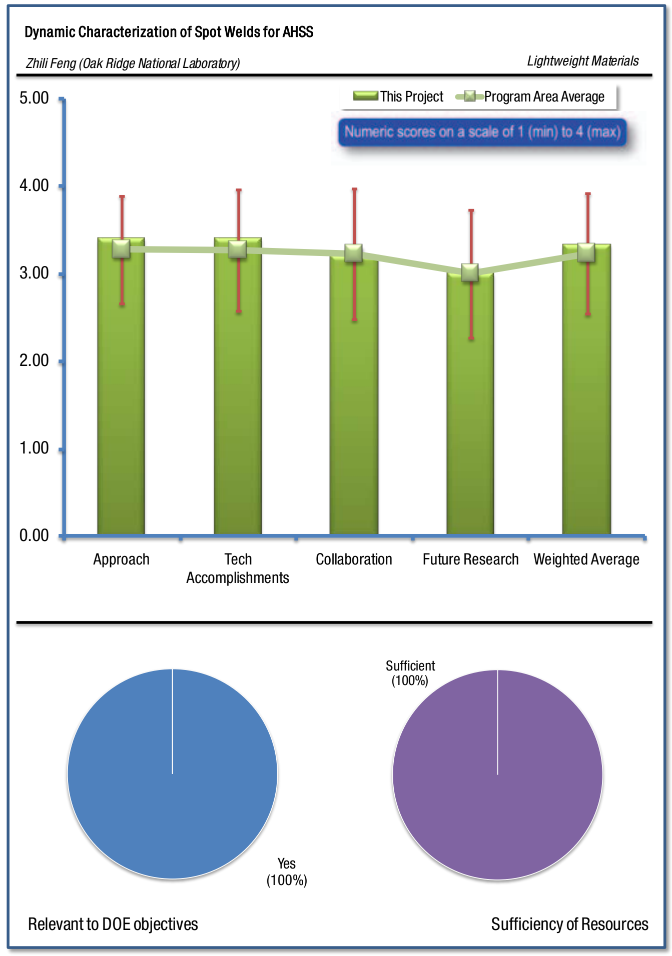
Question 5: Has the project effectively planned its future work in a logical manner by incorporating appropriate decision points, considering barriers to the realization of the proposed technology, and, when sensible, mitigating risk by providing alternate development pathways?

One commenter mentioned that barriers are identified, and that many have been overcome (e.g. organosolv). The other reviewer to comment described that the effort is substantial and the future work is even more important because it will lead directly to real applications.

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

One commenter suggested that to realize the potential, resources are most probably off by an order of magnitude. The other reviewer commented that as presented, the funding appears sufficient; however, they would like to see it increased for faster integration with the car industry.

Dynamic Characterization of Spot Welds for AHSS: Zhili Feng (Oak Ridge National Laboratory)



REVIEWER SAMPLE SIZE

This project had a total of 5 reviewers.

QUESTION 1: DOES THIS PROJECT SUPPORT THE OVERALL DOE OBJECTIVE OF PETROLEUM DISPLACEMENT? WHY OR WHY NOT?

All people had positive comments to this question. One person stated that the project relates to VT objectives related to improved performance optimization. Another reviewer commented that joining of new materials is an essential part of widespread use of lightweight materials in order to achieve mass reduction resulting in improved fuel economy; this project supports the overall DOE objectives. One evaluator expressed that this type of work supports the use of alternative suitable materials and methods for material replacement and mass reduction of vehicles. Third generation AHSS, along with previous generations, are enablers. OEMs have challenges with new material usage and require practical tools for crash modelers to use this joining method. Another reviewer observed that this is an enabling technology development; development of modeling capability to predict weld performance. The last commenter said that AHSS are integral to the OEMs drive toward higher fuel efficiency. AHSS and the associated joining technology are critical for both all-steel and mixed-metal vehicle body-in-white architectures.

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 person simply stated that the researcher presented a good plan with valid assumptions, while another noted that the approach is very good. Another reviewer agreed, stating that this is a comprehensive and very well targeted program. They added that all of the key requirements have been included in the program plan, from detailed weld nugget strength predictions to solid element for FEA and mapping programs. Another evaluator also agreed, expressing that this is a very good project because most of the joining failures occur in dynamic conditions, so understanding of joining for AHSS in dynamic characterization is essential in widespread utilization of AHSS. One person summarized the project phases. Phase 1: Accomplishments resulted in correlation in various failure modes. The initial version of SWE has been developed and is capable of addressing weld geometry. Phase 2: will include additional materials and R&D with OEM modelers along with component level demonstration and validation for technology transfer. The last person to comment noted that this work attempts to go beyond existing models developed for SW failure analysis. If successful, this will nicely mesh with crash models like Rdioss and LS-dyna.

QUESTION 3: CHARACTERIZE YOUR UNDERSTANDING OF THE TECHNICAL ACCOMPLISHMENTS AND PROGRESS TOWARD OVERALL PROJECT AND DOE GOALS.

One person felt that the researcher has shown excellent progress in a relatively short time. Another person agreed that the progress is good considering the material availability of various grades of AHSS. They also noted that some of the barriers have been addressed. One evaluator described that the project covers a wide range of AHSS grades FY2010 to 2013 and the results were used to collaborate with OEM modelers to integrate into commercial tools for CAE. Another person remarked that this model can be tied into major OEM crash simulation code as special user element. The code has been tested by a major U.S. OEM with simulation results reasonably capturing the observed failure modes. They concluded by asking whether the code is accurate enough for OEMs in general for production vehicles. Several reviewers raised questions about the work. One person asked whether welds of dissimilar metals are included. Another evaluator stressed that the researcher must consider the heat affected zone on the material and model the center and sides of welds appropriately. One person acknowledged that the modeling predicts the failure mode, but felt that it over- or under-predicts the actual test results. Another reviewer explained that the use of hardness measurements to estimate strength need to be validated. The final reviewer commented that the success of Phase I could lead to more efforts in fatigue testing of complex 2Tm 3T and 4T weldments. Once Phase II is completed, consider a Phase II focused on fatigue testing yet another element of ensuring safe and reliable AHSS vehicles.

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

The collaboration was recognized by all but one commenter. One person noted that the collaboration with various partners has been good. Another person pointed out that the project includes collaboration with the Auto Steel Partnership; while another described that the project is a joint effort between USAMP and DOE. OEMs were used to validate models. One reviewer suggested that the researcher continue with the current level of collaboration, it is strong and duly noted. The final person commented that the collaboration is generally excellent, but suggested that to maximize the project value it would be good to include commercial code vendors such as LS-DYNA and ESA - and SORPAS (for welds).

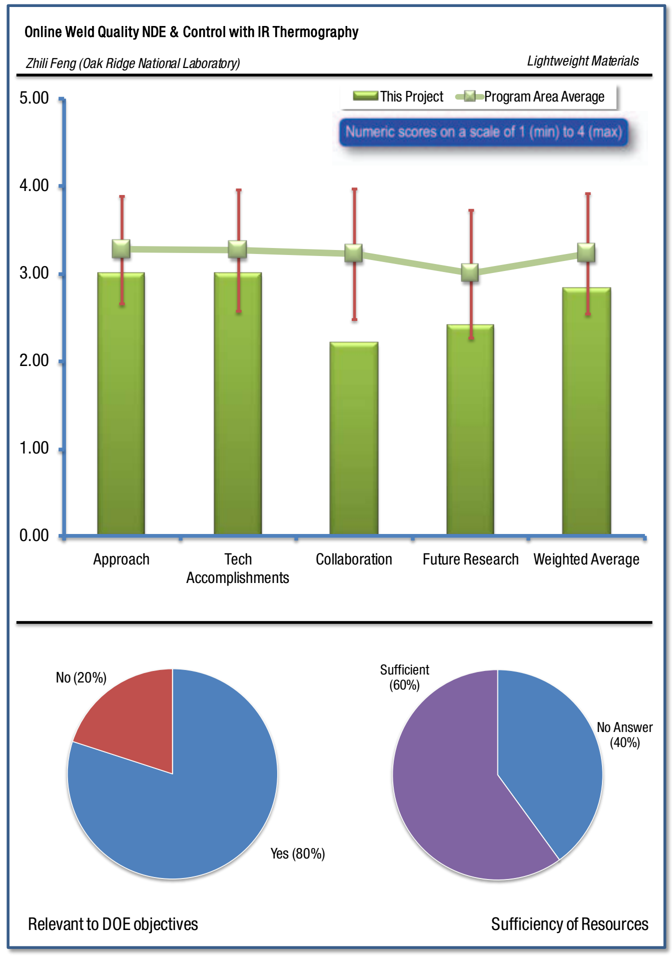
Question 5: Has the project effectively planned its future work in a logical manner by incorporating appropriate decision points, considering barriers to the realization of the proposed technology, and, when sensible, mitigating risk by providing alternate development pathways?

One person commented that the future plan of this project is good, and that some barriers to be overcome have been defined. Another reviewer observed that the future plans are generally well defined and appropriate, but proposed that it would be good to include more activity to interface with commercial code vendors. They added that another aspect which would be good to explore is moving to a quantitative structure-property model for HAZ rather than a correlation. One person pointed out that the presenter identified the issues to be studied; however no mention of validation with actual tests and improving the predictability. Another evaluator noted that the framework is being developed in this project so this can be applied to other materials (e.g. aluminum). They recommended that the researcher explore this area further for use in additional materials. One commenter pointed out that, as stated in technical assessment, the code has been tested by a major U.S. OEM with simulation results reasonably capturing the observed failure modes, but they asked whether this is this accurate enough for OEMs in general for production vehicles. Another evaluator asked if gaps or other potential flaws in manufacturing process are being considered or reviewed. They also asked how the tolerance of weld is included in the simulation code, but questioned whether this is outside the scope of this project. The last person simply advised that the researcher should consider fatigue testing as part of a Phase III proposal.

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

Both comments to this question were positive. One person felt that the money is very well targeted and will provide excellent value to the automotive industry. The second person expressed that this project has sufficient resources to achieve milestones.

Online Weld Quality NDE & Control with IR Thermography: Zhili Feng (Oak Ridge National Laboratory)



Reviewer Sample Size

This project had a total of 5 reviewers.

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

One reviewer commented that the project is very relevant for manufacturing cost reduction and performance optimization of welded structures. Another person agreed, remarking that in order to utilize any new material for the automotive industry, joining capability and its quality of joining is an essential part of the applications; so this project fits the overall DOE objective in order to improve fuel economy. One reviewer agreed this work is important, but suggested that it is a stretch to consider spot weld modeling as a lightweighting petroleum displacement. Another reviewer commented that although this is strictly an NDE study, it is an enabler for qualifying the integrity of RSW's of steel and aluminum weldments. The last person acknowledged that NDE is a fundamental cost saving tool and fits well the DOE objective; however, they doubt that this project will be of any use because its application is too impractical.

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?

Reactions to this question were mixed, with most reviewers having critical comments. One person simply stated that the project is exceptionally well targeted and well thought out approach. Another felt that the approach is interesting but most likely will not be useful without years of research and a comprehensive plan intern milestones which lead to completion. One evaluator explained that several online weld quality inspections have been developed during the last several years, but that none of them are perfect, but direction of new developments has been positive. They added that although the barriers have been identified, the actual practice in a real assembly plant would be very difficult and that the application and interpretation of IR method are very difficult in a production line. Another reviewer commented that the methodology appears to be a low-budget approach which used textbook assumptions, and did not include baseline measurements. One reviewer recommended re-scoping the project to achieve the long-term goal of commercial usefulness including multiple materials, coatings, HAZ. Another person had similar recommendations to re-scope the team to include CAE code manufacturer(s), increase scope to include benchmarking, multiple materials, multiple weld conditions (2T, 3T, etc.). One reviewer stated that the goal of licensing code inhibits the commercialization and use. One evaluator criticized that the team includes the “same old guys who get the same old result.” They admonished that the technical community is not the material suppliers and OEMs, so they recommended including the Edison Weld Institute and Weld Suppliers (e.g. CenterLine). One reviewer pointed out that NDE's of AHSS spot welds could be very important. Since the technique would be applied on the fly, once the spot weld is done and the frame is moving from one point to another, it does not matter whether the weld is good or bad. In case the weld is bad, the frame cannot be moved back for a repeat, so at this point, this reviewer was not sure whether the manufacturer wants to know if a particular weld is bad. Several reviewers had camera technology related comments. One person said that IR thermography could be a very good tool for identifying whether a weld is good or bad, but thermodynamics may not be helping. Another person noted that 1-second is needed for good IR system resolution, but since frames are continuously moving, the residence time of the instrumentation could become a severe limitation. The last reviewer strongly cautioned that a large body of this work was done in the mid 1990's by Thermal Wave Imaging to use pulse thermography to inspect spot welds; the limitation then was the speed of image capture and the cost of a 600Hz IR camera.

QUESTION 3: CHARACTERIZE YOUR UNDERSTANDING OF THE TECHNICAL ACCOMPLISHMENTS AND PROGRESS TOWARD OVERALL PROJECT AND DOE GOALS.

One person observed that excellent results have been shown in a short time. This reviewer was especially impressed with unique devices for heating and cooling, but was not sure how well this will translate into an OEM body shop until they are able to determine more about cost and speed of implementation. Others had similar scale-up questions. One person commented that some laboratory processes have been made, but noted that how they will be used in a production line is a big question because the method has to be significantly modified in order to be used in a production line. Another person agreed that good progress has been shown, but stressed that a robust system is needed for plant applications. One evaluator thought that preliminary findings "appear" to be interesting and match, but the images need to be characterized visually. Another person commented that the model for predicting microstructure of spot welds is progressing well and promises to be an important tool for the car industry. The final commenter expressed that the model correlating microhardness to weld temperature is intriguing, but not clear. They suggested that the researcher needs to develop some calibrations and, maybe, some standards. More work would improve that aspect. They concluded by stating that since microhardness is relatively easy to apply, such use could become an enabler for other technologies than welding.

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

One person simply noted that the target is a turnkey system that would cost no more than $25K; typically a minimum of four systems would be needed per plant. One reviewer noted that the team appears to be good. One person observed that there appears to be an extended group of industries interested in the project, but the PI did not explain well the different roles of these companies. Another person suggested that there might be lots of conflicting aspects in the group presented on the slides. One person commended the researchers on the very good use of A/SP to set out targets and priorities. Another evaluator, however, felt that more OEMs and Tier One suppliers should be involved in the program. Another person agreed, recommending to expanding the group beyond the A/SP. They also asked why the researcher would isolate based upon paid membership. The last person suggested that the researchers really need to do more homework and cite a large body of work done in the past.

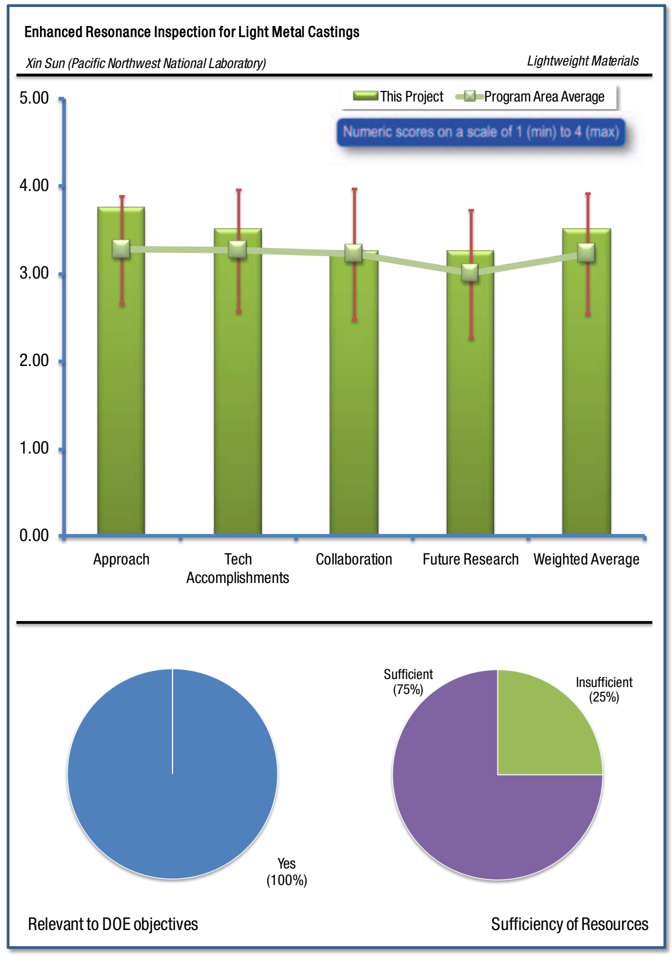
QUESTION 5: HAS THE PROJECT EFFECTIVELY PLANNED ITS FUTURE WORK IN A LOGICAL MANNER BY INCORPORATING APPROPRIATE DECISION POINTS, CONSIDERING BARRIERS TO THE REALIZATION OF THE PROPOSED TECHNOLOGY, AND, WHEN SENSIBLE, MITIGATING RISK BY PROVIDING ALTERNATE DEVELOPMENT PATHWAYS?

One person felt that the preliminary results deserve reconsideration to re-scope long-term project. Another evaluator suggested that more input is needed from OEMs in overcoming barriers. Another reviewer recommended that the project should move quickly to low-cost devices and aluminum. One person suggested that the researcher continue to develop a "make-like-production" system and a detailed database to look up and characterize weld quality. The final reviewer is not convinced that this work should be continued: for safety reasons, companies are still going to have a lot of extra welds. The testing will have to done in situ with possibility of repeating the weld operation (if necessary) before the redundant welds will be eliminated.

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

Only one person commented, stating that as presented, the project should be stopped.

Enhanced Resonance Inspection for Light Metal Castings: Xin Sun (Pacific Northwest National Laboratory)



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 had positive comments for this question. One reviewer pointed out that this is an enabling technology for improved use of light metal alloy components. One person observed that development of inspection methods for quality control is essential for widespread use of lightweight materials in order to improve fuel economy, so this project clearly supports the overall DOE objectives. Another evaluator described that light metal castings and validation will significantly contribute to improved fuel economy and displacement of petroleum. The last commenter remarked that any NDE technique fits very well DOE's goal on reducing weight for vehicles because it enables the constructor to better the capacity of the material by limiting “the safety margin.”

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?

Reactions to this question were all positive. One person felt that the approach is very good and that new developments in controlling the quality of castings would be very beneficial for widespread use of lightweight materials. Others stated that the basic mechanism was well elaborated, that the need and the advantages are well explained, and that the gap on the decision making process was identified. One reviewer thought the researcher provided a great summary and leadership developing nondestructive tests with quantitative measurement. The last person commented that extracting useful information from such a simple excitation mechanism requires cleverness and brightness. They added that this is a very difficult problem and the author made a good demonstration.

QUESTION 3: CHARACTERIZE YOUR UNDERSTANDING OF THE TECHNICAL ACCOMPLISHMENTS AND PROGRESS TOWARD OVERALL PROJECT AND DOE GOALS.

One person simply stated that this was a good demonstration of technology. Another felt that the progress is very good considering so many parties are involved in the work. It is a good project in developing new technology in determining the quality of casting, especially for lightweight castings. One person highlighted that the model can predict the location of the defect and the size; however, validation from actual parts is to be completed. The last reviewer mentioned that this project is on the way in solving a major problem of detecting flaws within a material, and their locations as well.

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

One person characterized the industry collaboration as satisfactory, while another called it good. The final person described that there is a large pool of companies interested in the project but the effort appears to be solely that of PNNL. It would be desirable that companies start on dealing with this technique to vet it as soon as possible.

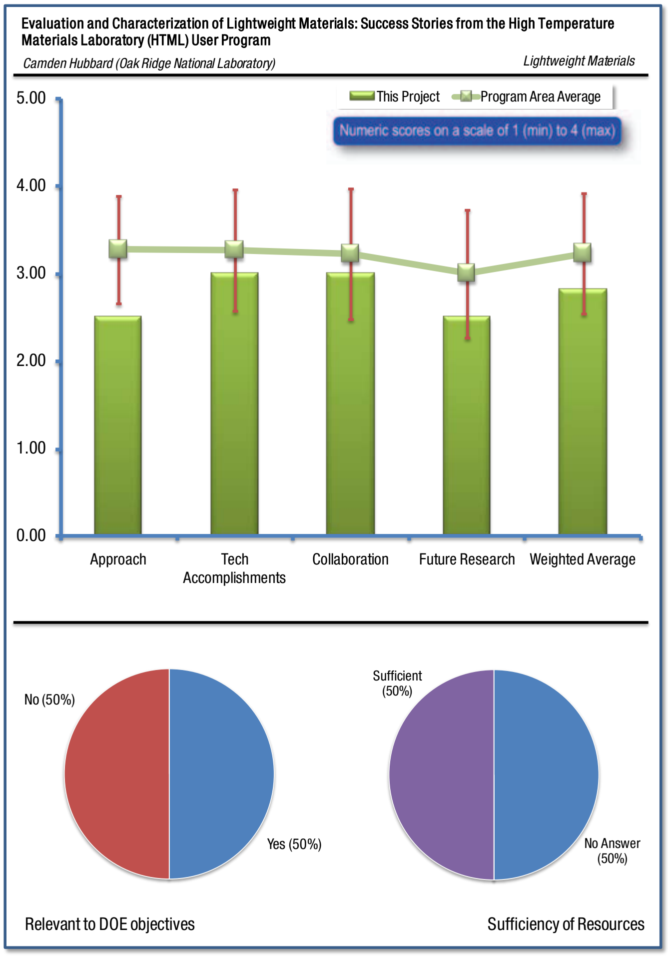
QUESTION 5: HAS THE PROJECT EFFECTIVELY PLANNED ITS FUTURE WORK IN A LOGICAL MANNER BY INCORPORATING APPROPRIATE DECISION POINTS, CONSIDERING BARRIERS TO THE REALIZATION OF THE PROPOSED TECHNOLOGY, AND, WHEN SENSIBLE, MITIGATING RISK BY PROVIDING ALTERNATE DEVELOPMENT PATHWAYS?

Reactions to this question were mixed. One person stated that the project is completed, and that no additional funding is requested. Others however stated that the future research program seems to be very good, but the process has to be user friendly and also reliable. One person however, stated that this work is continuing in another project. Another evaluator continued, stating that preliminary work has resulted in significant findings and most importantly a new project. The last person commented that the idea of using more than one excitation source may greatly help in the identification and the location of flaws. They advocated that this should be pursued provided that the instrumentation of the excitation remains simple to apply.

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

One reviewer commented that the funding appears to be sufficient, but this project should be significantly extended because, in the end, the industry will always try to accelerate and simplify its work. The other reviewer to comment stated that it appears that more human resources will be needed to address the computational requirements and multiple applications.

Evaluation and Characterization of Lightweight Materials: Success Stories from the High Temperature Materials Laboratory (HTML) User Program: Camden Hubbard (Oak Ridge National Laboratory)



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 person commented that the measurement of stress in various components after manufacturing processes is an important factor determining the final performance; since the residual stress affects corrosion, fatigue life and other functions understanding this is important before using advanced material for lightweighting. The other reviewer commented that HTML can always present results that would fit any topics, but it is not because techniques are applied to light materials that it fits DOE's goal for light 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?

One person summarized that this presentation covers four different characterization projects carried out at HTML lab; and added that the approach for each task is well planned and executed and that the work is contributing to the overall progress of a larger project. Another reviewer remarked that any measurement can be applied to light materials, but this project needs to much more focused to "get my vote." The last reviewer commented that not much input is necessary for such characterization tasks.

QUESTION 3: CHARACTERIZE YOUR UNDERSTANDING OF THE TECHNICAL ACCOMPLISHMENTS AND PROGRESS TOWARD OVERALL PROJECT AND DOE GOALS.

One person felt that the tasks clearly identified the final outcome and explained how it affects the overall program. The other reviewer to comment felt that the results are OK, but stated that the presentation is tailored to what can be done with light materials rather than applied to light materials to fit a broader goal.

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

One person simply stated that collaboration is a strong point of this organization. Another person agreed, remarking that as a user facility, HTML has many partners.

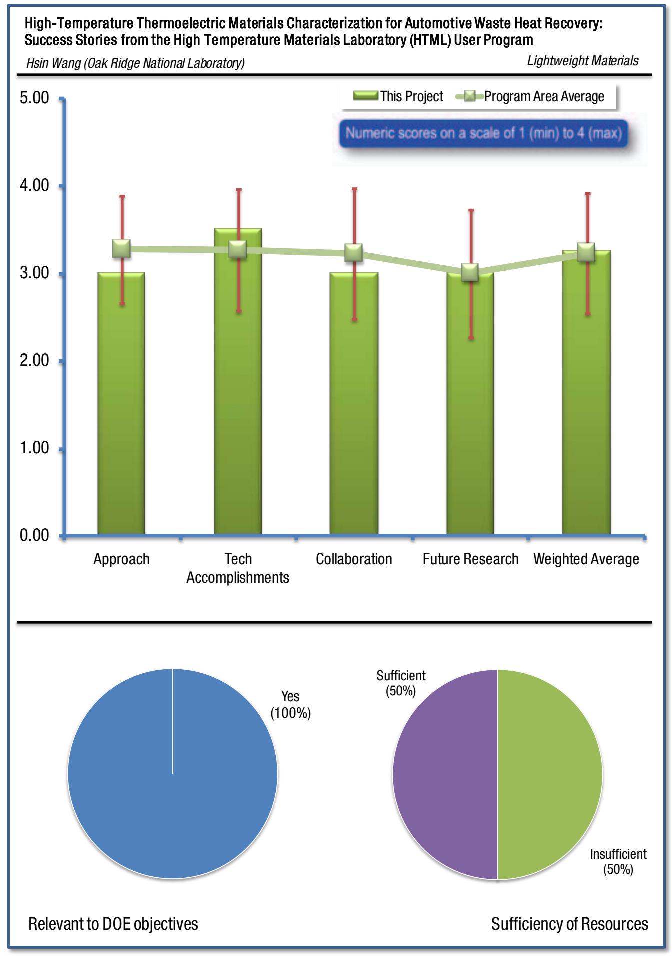
QUESTION 5: HAS THE PROJECT EFFECTIVELY PLANNED ITS FUTURE WORK IN A LOGICAL MANNER BY INCORPORATING APPROPRIATE DECISION POINTS, CONSIDERING BARRIERS TO THE REALIZATION OF THE PROPOSED TECHNOLOGY, AND, WHEN SENSIBLE, MITIGATING RISK BY PROVIDING ALTERNATE DEVELOPMENT PATHWAYS?

One reviewer described that two of the projects are being completed in 2010, while three more are planned to go up to 2011; however, no change in direction is planned. The last person commented that the HTML represents a good set of facilities and they will always produce results, but criticized that if "the final goal is not well defined, so what..."

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

The only reviewer to comment criticized that the funding should be stopped for this kind of open-ended research; this kind of work is NSF's focus.

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)



Reviewer Sample Size

This project had a total of 2 reviewers.

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

One reviewer felt that the work is important, but is not directly related to light materials. The first applications may well be for heavy vehicles where the amount of energy to harvested is far greater than for light vehicles. The other evaluator commented that material development for automotive applications needs clear understanding of behavior of materials under various loadings and environments; this presentation elaborates the efforts of one company, GM, trying to develop new thermoelectric materials.

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 pointed out that characterization of new materials for their thermoelectric behavior is carried out using the HTML. The other person to comment stated that the researcher used a very good approach for a difficult (high-risk) program that may well lead to high rewards.

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

One person observed that a clear understanding of the behavior of new materials, calthrates, was obtained after the testing. The other reviewer commented that the project has reached a stage where hope appears to be feasible for real applications; excellent.

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

One person pointed out that as a user facility it is necessary for a partner to carry out work at HTML. Others commented on the good team, complementary capabilities, and good synergy.

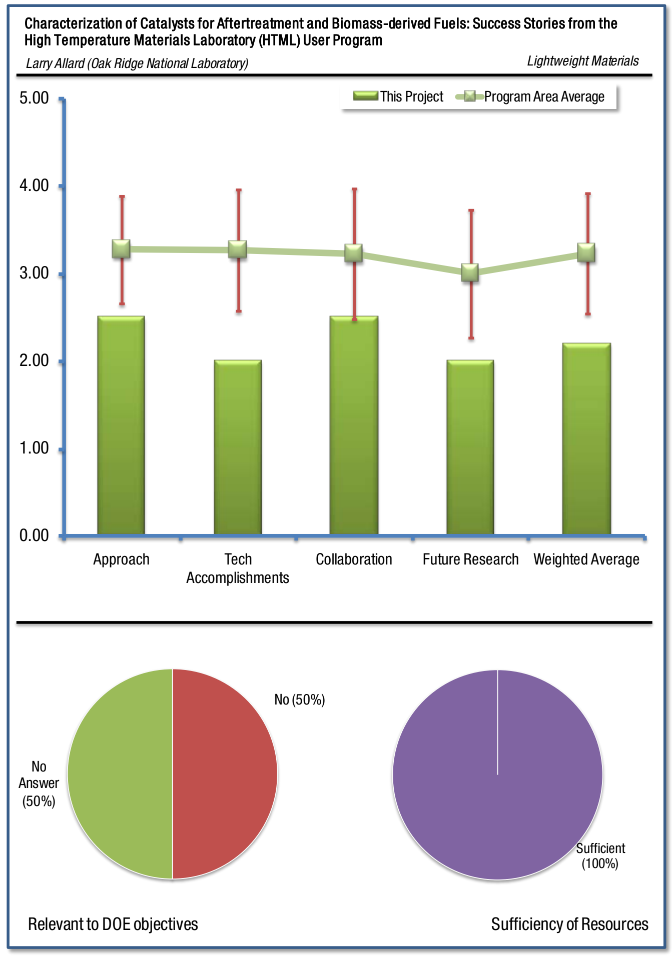
Question 5: Has the project effectively planned its future work in a logical manner by incorporating appropriate decision points, considering barriers to the realization of the proposed technology, and, when sensible, mitigating risk by providing alternate development pathways?

The only person to comment said “go for it!”

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

One person stressed that the funding should clearly be extended. The other person to comment noted that a new program may be initiated to promote such energy saving technology.

Characterization of Catalysts for Aftertreatment and Biomass-derived Fuels: Success Stories from the High Temperature Materials Laboratory (HTML) User Program: Larry Allard (Oak Ridge National Laboratory)



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 person commented that biofuels can contribute to petroleum displacement; the characterization of catalytic behavior is important in improving the efficiency of the biofuel production. Another person cautioned that any project can be associated with improving efficiency and to reduce petroleum dependency; however, quantification will remain difficult. This performance measure may not be relevant to all projects. The last person expressed that any catalysis program can fit the DOE goal for light vehicles; however, the material as presented is more in NSF's court than in any other.

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 person noted that these are characterization experiments and the methodology is quite clear. The other reviewer to comment stated that the approach is typically that for a NSF proposal but not for DOE; open-ended research has no place here. They added that to fit DOE's goal, the approach should be changed and fit an applied goal within a rather short timeframe.

QUESTION 3: CHARACTERIZE YOUR UNDERSTANDING OF THE TECHNICAL ACCOMPLISHMENTS AND PROGRESS TOWARD OVERALL PROJECT AND DOE GOALS.

One evaluator mentioned that the facilities are excellent and state-of-the art; and that the characterization methodology is good. The last reviewer commented that the project seems to show that they can do measurements on catalysts, but the reviewer stressed that they need to see real catalysis improvement over the present state-of-the art to get their vote.

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

One commenter remarked that since HTML is a user facility, collaboration with other researchers is essential; and that the collaboration mentioned in the presentation is fair. The other reviewer to comment pointed out that the University of Michigan team is well known for catalysis and the HTML is a good match for high temperature characterization of catalysts.

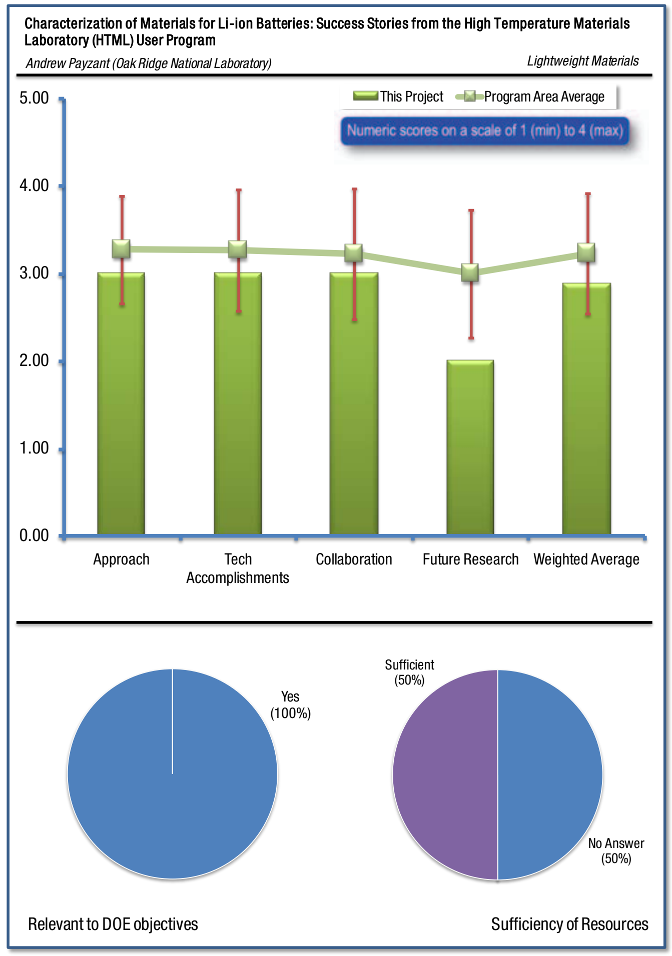
QUESTION 5: HAS THE PROJECT EFFECTIVELY PLANNED ITS FUTURE WORK IN A LOGICAL MANNER BY INCORPORATING APPROPRIATE DECISION POINTS, CONSIDERING BARRIERS TO THE REALIZATION OF THE PROPOSED TECHNOLOGY, AND, WHEN SENSIBLE, MITIGATING RISK BY PROVIDING ALTERNATE DEVELOPMENT PATHWAYS?

One reviewer described that the four projects reported are all characterization of materials; the plan is based on the material development carried out in partner organization, but not much detail is presented here. The last person to comment felt that this program should be continued, but the final goal should be much more focused with significant improvement over the present state-of-the art toward drastic energy savings of, for instance, doubling the mileage per gallon with respect to the present average to about 80 miles/gallon for light vehicles.

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

The only reviewer to comment stated that the project can be structured to better match DOE's energy savings goals.

Characterization of Materials for Li-ion Batteries: Success Stories from the High Temperature Materials Laboratory (HTML) User Program: Andrew Payzant (Oak Ridge National Laboratory)



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 person commented that electric vehicles need to improve their performance and the information generated in this project can provide inputs for the development of new compositions for Li-ion batteries. Another reviewer simply stated that it is not a straight yes. The last evaluator pointed out that this project is an open-ended research project, so this reviewer would like to see a more focused application.

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 person felt the presented approach is comprehensive. The other reviewer to comment explained that the projects are characterization in nature and the work plan is good.

QUESTION 3: CHARACTERIZE YOUR UNDERSTANDING OF THE TECHNICAL ACCOMPLISHMENTS AND PROGRESS TOWARD OVERALL PROJECT AND DOE GOALS.

One reviewer stated that the technical accomplishments were OK, but without a direct application to an existing battery, it is difficult to estimate accomplishments. They added that there is no state-of-the art, no metrics, no difference between the state-of-the art and the final goal; stating that measurements for the sake of measuring something. The other reviewer expressed that significant understanding of material behavior had been achieved in the projects; various aspects such as effects of service temperature, repeated charging and fatigue on the performance of battery materials were evaluated; this leads to development of newer materials with better capabilities.

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

One evaluator described that the presentation is on the collaboration between HTML and various other organizations; each project has one partner; as HTML is a service provider in nature it is fair that they have at least one partner in each project. The other reviewer to comment felt that the collaboration was a strong point of the project and that the researchers had assembled a good complementary team.

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 person highlighted that the presentation covers four individual projects on characterization; three of them are expected to be completed in 2010 and one will end in 2011; so there is no need to evaluate the future research plan. The other reviewer to comment thought that the project should be tailored to a given battery to improve its characteristics by an overall factor of 2 or more, which would be equivalent to creating an entirely new battery.

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

One reviewer commented that DOE should continue to fund such research, but has to keep the “feet of the team to the fire” toward a definite goal. The last person commented that allowing the HTML to continue on presented open-ended research results do very little to promote substantial energy savings. On the other hand, if HTML wants to continue along the lines described in the presentation, then its funding should be transferred to NSF.