6. Materials Technologies

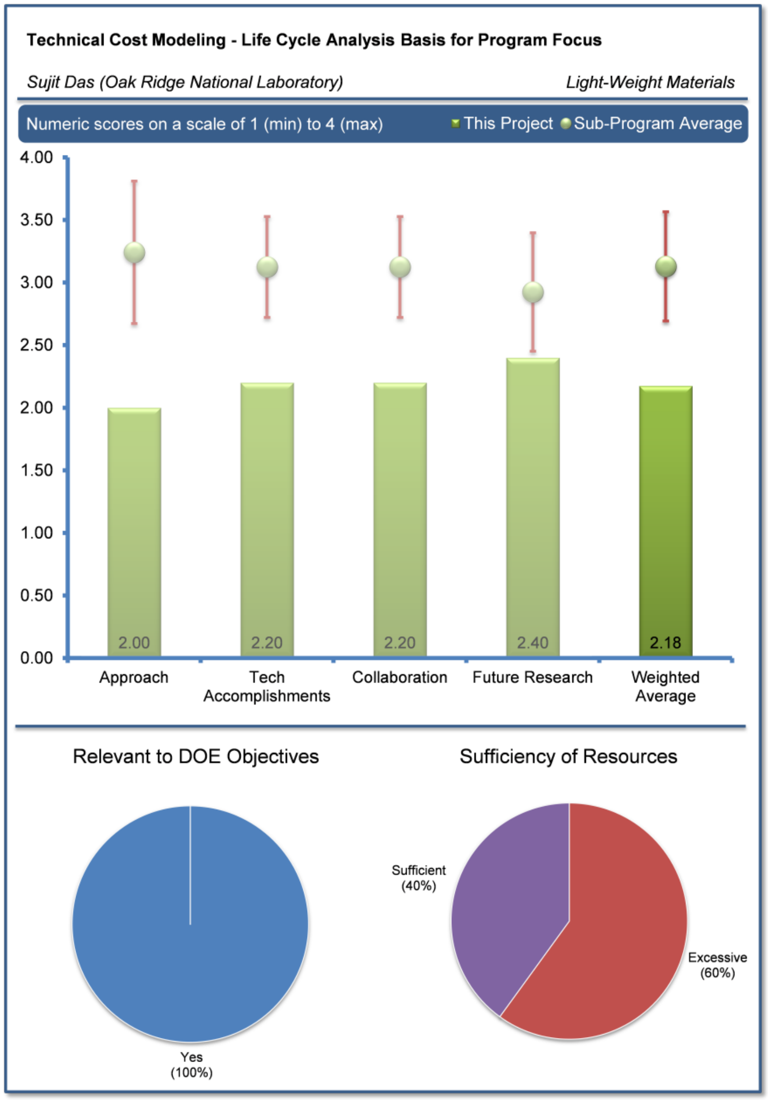
Advanced materials, including metals, polymers, composites, and intermetallic compounds, can play an important role in improving the efficiency of transportation engines and vehicles. Weight reduction is one of the most effective ways to increase the fuel economy of vehicles while reducing exhaust emissions. The use of lightweight, high-performance materials will contribute to the development of vehicles that provide better fuel economy, yet are comparable in size, comfort, and safety to today's vehicles. The development of propulsion materials and enabling technologies will help reduce costs while improving the durability, efficiency, and performance of advanced internal combustion, diesel, hybrid, and fuel-cell-powered vehicles. The advanced materials research conducted under the direction of the U.S. Department of Energy and the 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.

During this merit review, each reviewer was asked to answer a series of questions using multiple-choice responses (and with explanatory comments when requested), as well as using numeric scores *(on a scale of 1 to 4)*. In the following pages, reviewer responses to each question for each project are summarized, the multiple choice and numeric score questions are presented in graph form, and the explanatory text responses are summarized for each question. The summary table below lists the average numeric score for each question and for each of the projects.

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	2.00	2.20	2.20	2.40	2.18
Carbon Fiber Technology Facility	Dave Warren (Oak Ridge National Laboratory)	6-6	3.50	2.75	2.75	3.00	2.97
Lower Cost Carbon Fiber Precursors	Dave Warren (Oak Ridge National Laboratory)	6-8	3.75	3.00	3.00	3.50	3.25
Advanced Oxidation & Stabilization of PAN-Based Carbon Precursor Fibers	Dave Warren (Oak Ridge National Laboratory)	6-10	3.00	2.75	2.75	3.00	2.84
Magnesium Front End Development (AMD 603/604/904)	Alan Luo (General Motors)	6-12	4.00	3.50	3.50	3.00	3.56
Integrated Computational Materials Engineering (ICME) for Mg: International Pilot Project	Mei Li (USAMP/AMD)	6-14	3.50	3.00	3.00	3.00	3.13
Supporting Vehicle Weight Reduction Through Characterization	Edgar Lara-Curzio (ORNL/HTML)	6-16	4.00	4.00	4.00	3.33	3.92
Friction Stir and Ultrasonic Solid State Joining of Magnesium to Steel	Yuri Hovanski (Pacific Northwest National Laboratory)	6-18	4.00	3.33	3.33	3.00	3.46
Pulse-Pressure Forming of Lightweight Metals	Rich Davies (Pacific Northwest National Laboratory)	6-20	3.33	2.50	2.50	2.33	2.69
Solid Oxide Membrane (SOM) Electrolysis of Magnesium: Scale-Up Research and Engineering for Light-Weight Vehicles	Steve Derezinski (MOxST)	6-22	3.75	3.00	3.00	3.75	3.28
High Throughput Isotopic Diffusion Databases for Magnesium Integrated Computational Materials Engineering	Dave Warren (Oak Ridge National Laboratory)	6-24	3.00	3.00	3.00	3.00	3.00
Southern Regional Center for Lightweight Innovative Design (SRCLID)	Mark Horstemeyer (Mississippi State University)	6-26	2.75	3.25	3.25	2.25	3.00

Presentation Title	Principal Investigator and Organization	Page Number	Approach	Technical Accomplishments	Collaborations	Future Research	Weighted Average
Advanced Materials and Processing of Composites for High Volume Applications (ACC932)	Dan Houston (USAMP/ACC)	6-28	3.00	3.33	3.33	2.00	3.08
Low Cost Carbon Fiber Composites for Lightweight Vehicle Parts	Jim Stike (Materials Innovation Tech)	6-30	3.50	3.67	3.67	3.67	3.63
Development and Commercialization of a Novel Low-Cost Carbon Fiber	George Husman (Zoltek)	6-32	3.75	3.50	3.50	3.75	3.59
Structural Automotive Components from Composite Materials	Libby Berger (USAMP/AMD)	6-34	3.33	3.33	3.33	3.00	3.29
Reliability Tools for Resonance Inspection of Light Metal Castings	Martin Jones (USAMP/NDE)	6-36	4.00	3.00	3.00	3.00	3.25
Hybrid NDE Method for Spot Weld Quality Evaluation	Leo Lev (USAMP/NDE)	6-38	2.67	3.00	3.00	3.00	2.92
Development of Steel Fastener Nano-Ceramic Coatings for Corrosion Protection of Magnesium Parts (AMD-704)	Richard Osborne (USAMP/AMD)	6-40	2.33	3.33	3.33	2.50	2.98
Development of Corrosion Inhibiting E-Coat System for Body-in-White Assemblies	Yar-Ming Wang (USAMP/ACC)	6-42	3.67	3.00	3.00	3.00	3.17
On-Line Weld NDE with IR Thermography	Dave Warren (Oak Ridge National Laboratory)	6-44	3.00	2.67	2.67	3.00	2.79
Ablation Casting Evaluation for High Volume Structural Castings	Jake Zindel (USAMP/AMD)	6-46	2.67	3.00	3.00	2.00	2.79
Non-Rare Earth High-Performance Wrought Magnesium Alloys	Curt Lavender (Pacific Northwest National Laboratory)	6-48	3.25	3.00	3.00	3.00	3.06
PNNL: Mechanistic-Based Ductility Prediction for Complex Mg Castings	Xin Sun (Pacific Northwest National Laboratory)	6-50	4.00	4.00	4.00	3.00	3.88
Low-Cost Magnesium Sheet Production using the Twin Roll Casting Process and Asymmetric Rolling	Dave Warren (Oak Ridge National Laboratory)	6-51	2.67	3.00	3.00	2.50	2.85
Aerodynamic Lightweight Cab Structure Components	Mark Smith (Pacific Northwest National Laboratory)	6-53	2.50	3.00	3.00	2.50	2.81
Optimization of High-Volume Warm Forming for Lightweight Sheet Alloys	Nia Harrison (USAMP/AMD)	6-54	3.33	3.00	3.00	3.33	3.13
Improving Fatigue Performance of AHSS Welds	Dave Warren (Oak Ridge National Laboratory)	6-56	3.50	3.33	3.33	3.50	3.40
Advanced High-Strength Steel Stamping	Gene Hsiung (USAMP/AMD)	6-58	3.67	3.67	3.67	3.00	3.58
Nonlinear Strain Paths	Thomas Stoughton (USAMP/AMD)	6-60	3.67	3.67	3.67	3.50	3.65
Mapping of Forming Effects to Structural Models	Raj Sohmshetty (USAMP/AMD)	6-62	3.33	3.33	3.33	3.00	3.29
Lightweight Sealed Steel Fuel Tanks	Phil Yaccarino (USAMP/AMD)	6-63	3.33	3.00	3.00	3.00	3.08
First Generation Advanced High-Strength Steels Deformation Fundamentals	Xin Sun (Pacific Northwest National Laboratory)	6-64	2.50	2.50	2.50	2.00	2.44
Engineering Property Prediction Tools for Tailored Polymer Composite Structures	Ba Nguyen (Pacific Northwest National Laboratory)	6-66	2.00	2.67	2.67	2.67	2.50
Overall Average			3.24	3.13	3.13	2.93	3.13

Technical Cost Modeling - Life Cycle Analysis Basis for Program Focus: Sujit Das (Oak Ridge National Laboratory) – lm001



Reviewer Sample Size

This project was reviewed by five reviewers.

Question 1: Does this project support the overall DOE objectives? Why or why not?

Of the five reviewers commenting, two responded affirmatively. One said yes, for vehicle lightweighting. The other called the basic premise of the function good, to provide some guidance to Department of Energy (DOE) management on the financial impact of projects and technologies. Two others offered additional approval, one noting that while the project does not provide any technology advances to meet the objective of petroleum displacement, it does evaluate multiple scenarios that are alternatives to increasing fuel economy and thus reducing petroleum use, assuming that total vehicle miles traveled remain the same. The other said that cost modeling of lightweight material systems is equally important to implementing and enabling the technology for product applications, thus enabling us to reduce dependence on imported petroleum. The reviewer said that staying connected to the multi-material lightweight vehicle (MMLV) project is encouraged. The final reviewer termed the PowerPoint presentation very poor, with very little original content, but rather a literature review of lightweighting trends and a conglomeration of various studies previously published (yesterday's news). There was no take-away. The DOE literature review should not be published, as it implies validation of the data. This reviewer recommended, at a minimum, a formal peer review/approval. Example is of greenhouse gas (GHG) calculations developed by Metal Oxygen Separation Technologies, Inc. (MOxST), not DOE and based on industrial-scale predictions of a future, much larger system that MOxST does not know whether or when will be developed. DOE should only publish and validate actual peer-reviewed calculations by chemists and scientists and state assumptions. Reference process information must also be certified to be correct. Assumptions and sources need be documented, this reviewer concluded.

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?

Five reviewers again offered comments on this aspect of the project. One gave qualified approval of the approach, observing that preliminary data is extracted from lower-volume, niche products - a good starting point - but cost models will be significantly improved as higher-volume materials and processes are considered at volumes exceeding 60,000 unit production per annum (UPA). This reviewer recommended that the researchers continue to direct the project to higher-volume cost analysis for a 25% lightweighted vehicle at higher volumes. The other four reviewers were critical of the approach. One called it generally less accurate compared with the process-based technical cost modeling, and cited the need to benchmark the Massachusetts Institute of Technology (MIT) approach and improve the robustness of the technical cost modeling (TCM) approach in this study. Another said an overly simplified view is taken of automotive applications. For example, it is not appropriate to assume that you can automatically achieve an arbitrary ~50% secondary weight saved for all vehicle systems. Many cannot be downsized due to a reduction in mass of other systems. For example, you cannot reduce the mass of glass in a vehicle another 40% just because a smaller engine is used. A third said the approach is fragmented and results presented do not address objectives. Manufacturer's suggested retail price (MSRP) vs. lifecycle cost. We may want to identify the components of the Internal Revenue Service (IRS) mileage guideline of $0.50 /mile for internal combustion engine (ICE) vehicles, and develop a model (formula) describing MSRP, insurance, maintenance and fuel usage (6% for every 10% mass) thus a 30% mass savings yields an 18% fuel usage reduction = 20 mpg baseline at $4/gal = $0.20/mile, vs. $0.30 savings/mile = 200K useful life = $6,000 fuel economy offset. This reviewer went on to say that results presented do not address the objectives of cost modeling. Manufacturing cost and MSRP are of no technical or commercial value and can be easily described using a 1.3 ratio cost vs. selling price. In reality, a technical cost model would include raw material (cost/kg); manufacturing conversion (cost/kg); product, subassembly (cost/kg); corrosion cost/kg; vehicle assembly; paint (cost/ vehicle) and MSRP (1.3 cost). The percent mass reduction potential appears to accomplish the objective to classify materials selection and to realize a 30%, 40% and 50% mass reduction using a power train change from V8 to V6, 170 kg to 190 kg plus a mass compounding factor of 1.4 gets you to the target numbers. Primary GHG and CO_2 comparison for solid oxide membrane (SOM) process is interesting but is only one component of the life cycle. Further work regarding life cycle components associated with manufacture of magnesium auto components, corrosion protection, automotive use and recycling need be addressed. The last of these four reviewers noted that the project's first listed objective for fiscal year (FY) 2012 is validate the cost-effectiveness of reducing the weight of passenger vehicle by 25%, with safety, performance, and recyclability comparable to 2002 vehicles (FY 2012 focus). According to this reviewer, there is no effort reported in the presentation that gives any confidence that the proposed lightweight designs could meet the safety, fatigue, vibration, recyclability or other performance measures comparable to a 2002 vehicle. With any use of composites, the recyclability would be substantially degraded relative to the predominantly steel 2002 vehicle. There is nothing that indicates the lightweight designs proposed would meet 2002 safety requirements or Insurance Institute for Highway Safety (IIHS) performance. This reviewer added that the 2002 vehicle would be illegal to sell today and would be illegal in the future.

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

One reviewer of five offered general approval of the technical accomplishments and progress, saying the project tries to address some of the most important questions facing the automotive industry. It has made some good progress and provided directionally correct answers. The other four reviewers were more critical. One found it unclear how the mass saved analysis will translate into cost impact. But, according to this reviewer, it appears that the carbon fiber cost modeling is more specific and therefore more accurate and useful than the mass studies. The second said the literature search lacks contribution of technical content. Shallow content reports devalue the technical capability of the DOE and DOE laboratories. This reviewer commented that if I presented such depth to justify a project, industrial management would walk out of the room. Another reviewer noted that the information presented shows considerable work has been performed, but unfortunately little of the work addresses the objective. While the cost of production and ownership is shown, nothing is presented that speaks to the cost modeling or how different scenarios would affect the production cost or the cost of ownership. Additionally, nothing in the presentation addresses the safety or performance of the proposed vehicle scenarios. The efforts on the pickup truck and carbon fiber costs appear disconnected from the core of the project. There are deficiencies in the pickup truck lightweight scenarios since, for example, most V6 engines are already built with aluminum blocks and heads and unlikely to become lighter while maintaining performance. For the pickup truck, the assumption of 50% secondary mass savings is questionable, since most engine, driveline and chassis components as well as the truck bed are sized for the maximum towing and cargo. With the proposed weight reduction scenarios, the study should specifically state that the resulting truck would not meet the performance and capabilities of the baseline truck. In the carbon fiber cost work there is no information on the performance of the carbon fiber from the proposed different processes. Again, there is no discussion or examples of how the cost model works to explore sensitivities. The third reviewer generally concurred, saying the mass saving scenarios for the F150 need additional refinement. The three scenarios which include advanced high-strength steel (AHSS), aluminum and carbon fiber (CF) composites does not define whether that included making the chassis (primary) weight out of these lightweight materials or was it limited to the body in white. This reviewer also felt that a 50% weight saving on a pickup is too much of a stretch and should be reconsidered, due to the above scenario wherein it is highly unlikely we would make a CF truck frame, whereas even a AHSS truck frame with a CF body will not deliver a 50% weight savings.

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

Reviewers were generally unimpressed with the degree of collaboration and inter-institutional coordination in this project. One noted an interesting list of collaborators spanning the projects, but the contributions are not clear. The effort with Tier 1 suppliers and original equipment manufacturers (OEMs) is lacking for filtering the effects from low-volume examples to high volume production. A second reviewer urged the project to stay connected with VEHMA and Ford as well as other OEMs to get a fair and accurate assessment of what we can deliver by way of lightweight materials beyond 2020. A third cited the need for input from a broader base of OEMs and suppliers. Another reviewer said it is obvious that the studies involved the firms cited; however, there is no obvious interaction or interdependencies. It appears the others likely provided some general information, but there is no indication that they were deeply involved in the studies or that they provided any validation/confirmation of the results. Finally, the fifth reviewer said the nature of the literature review did not include collaboration and coordination with other institutions. Inherently, an incorrect, high-risk conclusion is the result. Research summarized and published by DOE presents a huge problem. Example includes Ford truck lightweighting as well as the MOxST assumptions for energy and CO_2 comparison. Business decisions continue to be made on old, unqualified data.

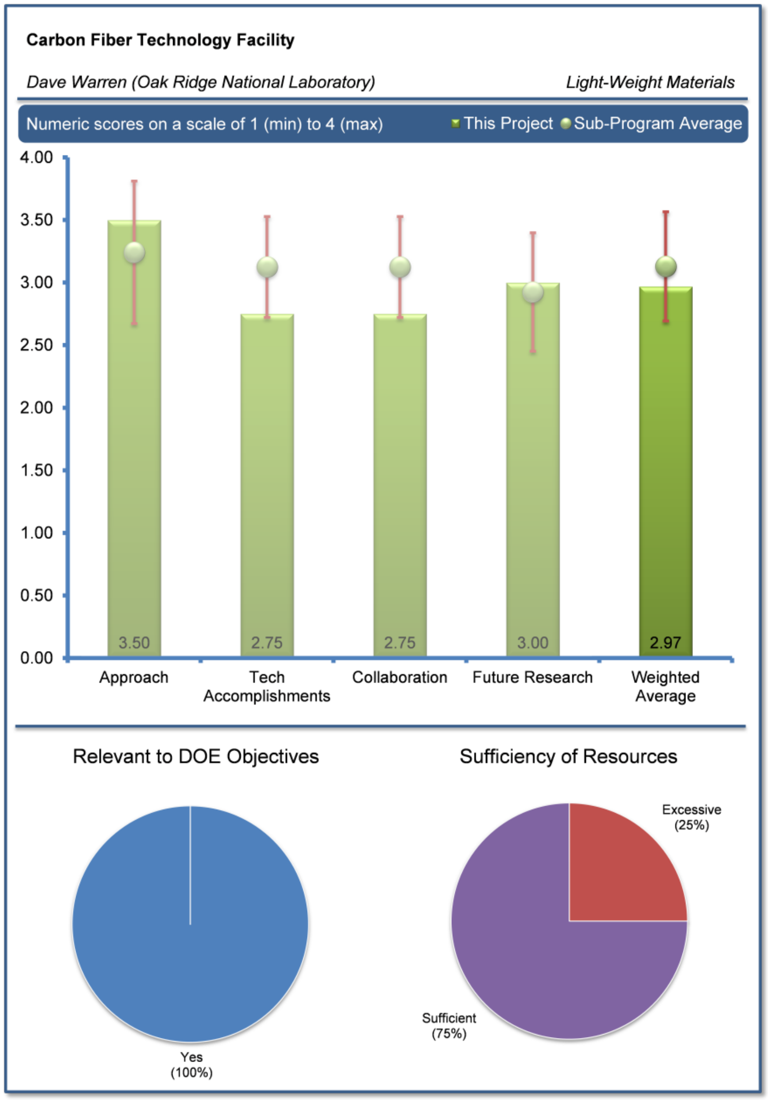
Question 5: Has the project effectively planned its future work in a logical manner by incorporating appropriate decision points, considering barriers to the realization of the proposed technology, and, when sensible, mitigating risk by providing alternate development pathways?

According to one reviewer, the plans look good; their value will be in how they are executed. A second commented that research should continue, but Oak Ridge National Laboratory (ORNL) must continue to engage the OEMs regarding the real potential for using magnesium (Mg), aluminum (Al) and especially CF. It will be imperative, in this reviewer’s opinion, that we do not oversell the merits of CF prematurely. It was suggested by the third reviewer that the costs of lightweighting be compared to advanced powertrains (ICE, hybrid and electric vehicle (EV)). Many of the proposed future efforts are properly aligned with the project goals, in the view of the fourth reviewer. However, this reviewer went on, there is little or no proposed effort on ascertaining the performance, safety and recyclability of the potential lightweight alternatives. The efforts on trucks must address capability at a reduced weight truck. The last reviewer commented that future task ordered funding was not identified. This reviewer strongly discouraged publication of results prior to peer review.

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

Two reviewers termed resources sufficient. Of the two reviewers who deemed the project resources sufficient, only one elaborated, saying task ordered funding by definition utilizes available resources and inherently lacks building a sustainable infrastructure. Establishing a group of professionals capable of conducting life cycle analysis and performing an independent third-party cost/benefit assessment is required. This reviewer recommended that effort be focused on validation of third- party claims and conduct of complete life-cycle calculations, considering this to be imperative. An example is Western Europe-focused magnesium research without addressing GHG impact/cost of primary production (which MOxST does address). Further, application of magnesium for commercial use requires recycling and corrosion resistance, which are synergistic. This type of task ordered funding is needed and will provide independent assessment, considering the complete life cycle for both environmental impact and cost. Three reviewers characterized the project resources as excessive. One reviewer commented that the project is based on surveys and simple spreadsheet analyses. No specialized skills/manpower are needed in design, finite element analysis (FEA) and advanced simulation. This reviewer concluded that the work could be done with much less funding. Another opined that given the lack of attention to half the primary objective -with safety, performance, and recyclability comparable to 2002 vehicles (FY 2012 focus) - the resources appear excessive for the results presented. The third emphatically stated that no additional funding is necessary.

Carbon Fiber Technology Facility: Dave Warren (Oak Ridge National Laboratory) – lm003



Reviewer Sample Size

This project was reviewed by four reviewers.

Question 1: Does this project support the overall DOE objectives? Why or why not?

All four reviewers agreed that this project furthers the overarching DOE goal. One noted that it creates an avenue for testing various ideas at a large scale, another observing that if it truly does facilitate introduction of low-cost carbon fiber into the marketplace, it will greatly help reduce vehicle weights. The other two reviewers offered more detailed assessments, one affirming that reducing the weight of vehicles is a route to improve fuel economy and reduce petroleum dependency and deeming carbon fibers to be the material of the future with great potential for reducing the weight of vehicles. More and more carbon fiber-based components are being used in aerospace applications, this reviewer continued, but the cost is considerably higher for economic automotive applications. The project involves construction of a prototype facility which can facilitate research and development (R&D) to reduce the cost of the fibers and make them accessible for vehicle applications. The fourth commented that this project supports a critical element of the infrastructure to make future use of carbon fiber in automotive and other industries. The country needs a facility to demonstrate carbon fiber manufacturing processes at the pilot plant level to reduce the risk for larger-scale production facility investments.

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?

Three of four commenting reviewers praised the project approach warmly, one saying that funding such facility is a great approach, another calling the project well planned and noting that the facilities are flexible to accommodate variations in the process. The third reviewer cited a great definition of the project for the capital investment. The project addresses one of the critical technical barriers to increased use of carbon fiber for lightweight components – the cost of manufacturing carbon fiber. The availability of prototype-level carbon fiber in multiple formats is a key to understanding the effects of carbon fiber production on the material properties of the final fiber and composites. The final reviewer qualified approval of the project approach somewhat. According to this reviewer, the facility is set up to address and evaluate changes to existing conventional technologies for producing carbon fiber. However, it lacks the ability to incorporate game changing technologies. For example it cannot accommodate the technologies employed by Zoltek in its low-cost carbon fiber efforts. Also it appears the expenses for staff, and facility maintenance will be a drain on resources that would be better spent on material technology research, for the foreseeable future and there is no specific vision or plan for making the center self-sustaining in a reasonable amount of time.

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

Here, too, three of four reviewers offered positive assessments. One simply noted on time implementation. Another said the project is ahead of time and on budget. The facilities will include the best ideas and options for processing different feedstock materials and different processing stages into carbon fiber. The third observed that while this is not an R&D project, the accomplishments are quite significant in that most of the project tasks are on or ahead of schedule. The final commenter expressed the view that thus far there is good progress against construction targets, but tempered this by saying there have been no research accomplishments achieved during the construction.

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

Three reviewers commented favorably on the project’s collaboration and coordination. One reviewer commented that it is in process. A second noted that many discussions are being held with equipment suppliers, manufacturers and end users. According to the presentation, this reviewer went on, at least five new proposals are being prepared or submitted for the use of this facility. The third reviewer remarked that collaboration with the industrial base for potential future users is only beginning. Collaboration within the project team must be great, given the construction, logistics and installation successes. The last reviewer offered qualified praise of the work approach, saying the principal research organization appeared to have a good working relationship with construction contractors, but said that does not truly indicate collaboration as much as cooperation. There appears to be collaboration forming relative to workforce training efforts, but this reviewer felt it is premature to assess its effectiveness.

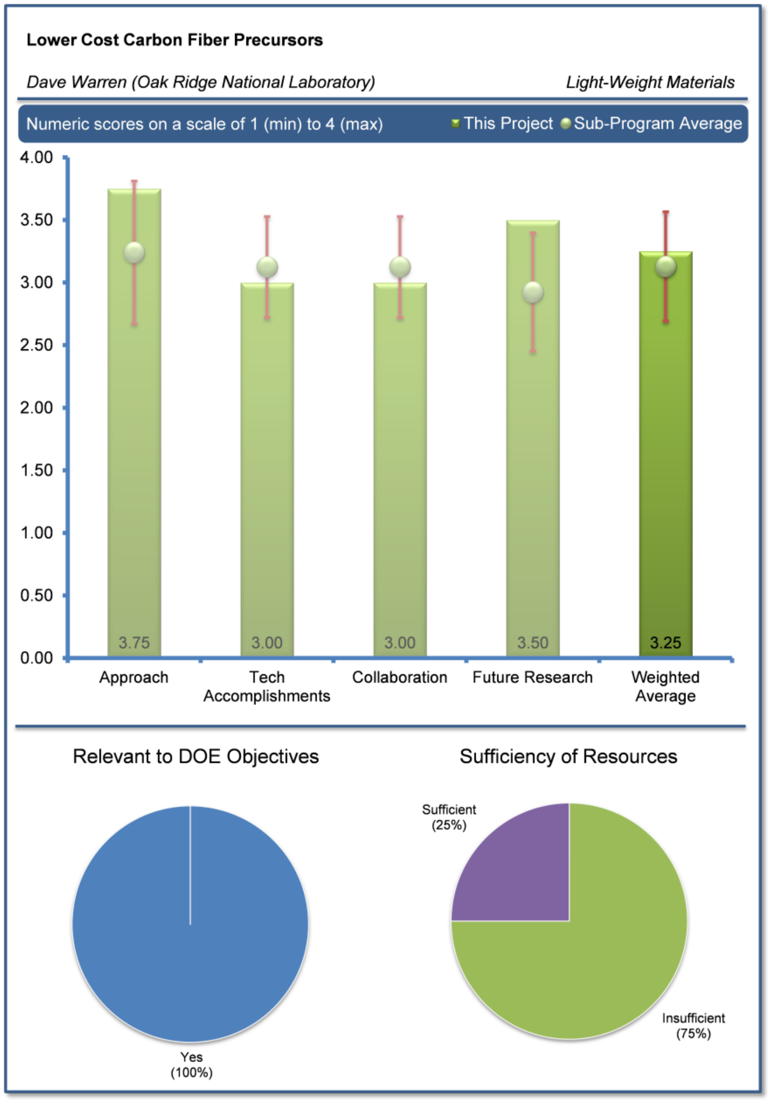
Question 5: Has the project effectively planned its future work in a logical manner by incorporating appropriate decision points, considering barriers to the realization of the proposed technology, and, when sensible, mitigating risk by providing alternate development pathways?

One reviewer felt proposed future work offers a good opportunity for all to participate. A second concurred, saying it appears equipment producers and some fiber producers would make use of the facility. However, this reviewer added, research details and plans are sketchy at this time. The third reviewer commented that the project is at the beginnings of identifying future projects to test and use the carbon fiber from the facility. There is good outreach to the educational base for training. Finally, the last reviewer felt the operating cost of the facility needs to be estimated more accurately. Also, industrial partners should be engaged in developing new projects which will support the facilities.

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

Three of four reviewers deemed project resources to be sufficient. One of these reviewer commented good plan, right resources. One reviewer considered resources excessive. This reviewer commented that $35 million plus an estimated $6 million per year to staff and run a facility with limited capability to try out any technologies other than conventional seems unreasonably high.

Lower Cost Carbon Fiber Precursors: Dave Warren (Oak Ridge National Laboratory) – lm004



Reviewer Sample Size

This project was reviewed by four reviewers.

Question 1: Does this project support the overall DOE objectives? Why or why not?

Reviewers concurred in a generally positive assessment of this project's advancement of DOE goals. One noted that polyolefins can be a great low-cost precursor and a second said the project addresses a major cost element of carbon fiber. A third agreed, saying the low- cost precursor has the largest leverage for potentially producing affordable carbon fiber. This project supports DOE's objectives of petroleum displacement through the associated goal of reducing the weight of automobiles and other manufactured products. The fourth said that continued emphasis on low-cost carbon fiber continues to be a future enabler for vehicle lightweighting and will reduce dependence of future oil imports.

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?

Reviewer comments were uniformly positive. One was that the project embodied good science in resolving the pertinent issues. Another cited the clear vision for what is to be addressed. The project, the third reviewer said, is directly focused on the barriers to low- cost carbon fiber for automotive and other industrial uses. The precursor cost to provide the strength and stiffness required for weight saving and performance is being targeted. The polyolefin precursor is a great material to investigate since it has the potential to deliver the performance at higher yield ratios. The fourth reviewer cited excellent technical achievements to date, and a well-planned approach. This reviewer urged the researchers to look at the details of the lab oxidation furnace and to seek to scale process from a test tube type of oven to one that is more scaled to production units.

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

Here, too, reviewers were strongly positive in their comments. The project has made excellent progress in a relatively short time, according to one reviewer. A second reviewer noted that progress was substantial in spite of funding reduction. Another reviewer agreed, calling technical accomplishments strong. This reviewer went on to observe that achieving the 200 thousand pounds per square inch (KSI) strength and 20 million pounds per square inch (MSI) stiffness is a great 2011 accomplishment. Many of the barriers have already been overcome. The fundamental investigations into the cores and sulfonation as they depend on fiber thickness gives the necessary insights into what is required for manufacturing. Noting that these small diameter fibers will be tough to process, the reviewer recommended that work focus on the polyolefin precursor since it has the greatest potential for low-cost carbon fiber production. The reviewer suggested that efforts on polyethylene (PE) be reduced. The last reviewer observed that carbon fiber is recognized as getting close to the 250 KSI tensile strength and 25 MSI modulus. Accordingly, this reviewer's recommendation was to continue to push the process to achieve the goal while thinking about process scale from lab to the make-like production line scale.

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

While one reviewer noted that the efforts are focused in ORNL, the others generally approved of the level of collaboration. One opined that there appears to be good involvement, with the active participation by collaborating firms. Another agreed, saying the collaboration with partners is good, but that it was only briefly described in the presentation. The success to date, this reviewer added, indicates that the team is working well. The last reviewer found an acceptable amount of collaboration, praised the work as a good job, and urged the researchers to press on.

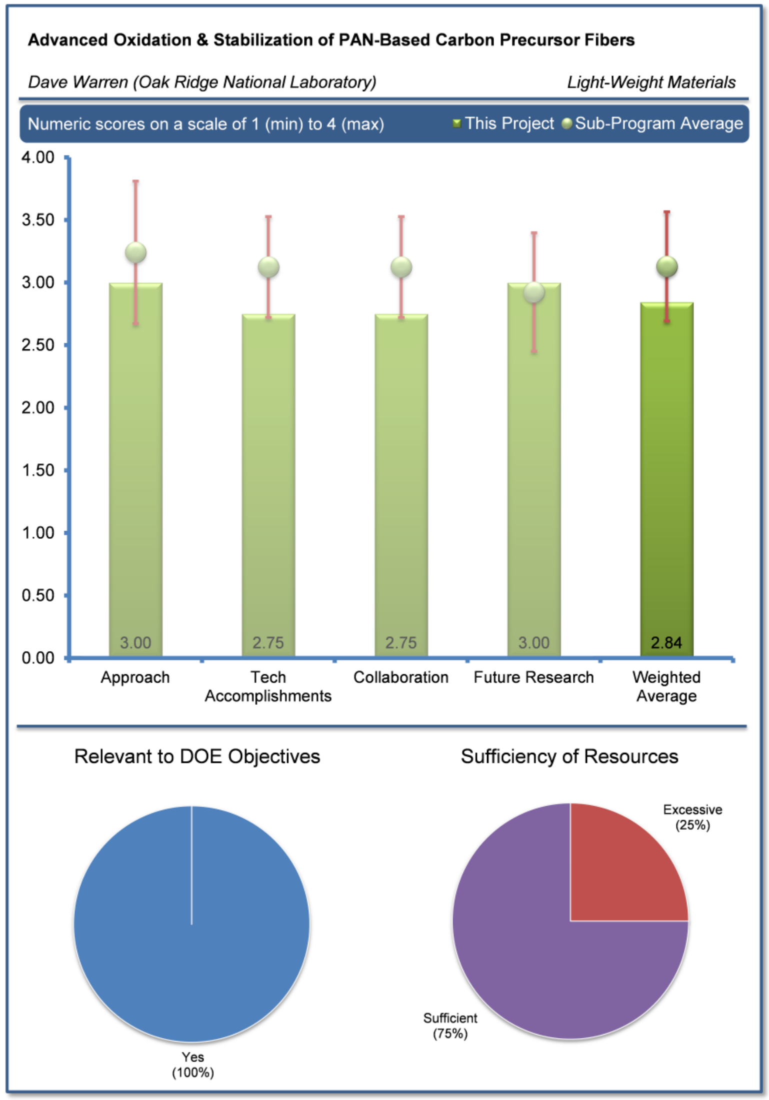
Question 5: Has the project effectively planned its future work in a logical manner by incorporating appropriate decision points, considering barriers to the realization of the proposed technology, and, when sensible, mitigating risk by providing alternate development pathways?

The first reviewer noted that the researchers have developed a plan to complete work that was originally anticipated prior to funding cut and to address newly identified barriers. The proposed future work, in the view of another reviewer, while only briefly described in the presentation, addresses the logical next steps to improving the quality of the carbon fibers produced from polyolefin or polyethylene. Work to improve the properties appears well conceived, needs further definition. Another reviewer, while noting that no new future research was presented, nonetheless felt that the target mechanical properties and progress to date indicates the project should stay the course and hit the final tensile strength and modulus targets. The final reviewer commented if the funding is provided.

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

Three of four reviewers called project resources insufficient. One said this project needs funding. A second agreed, urging that funds cut during FY 2012 be restored, since this technology has potential greatly to improve process time and throughput while reducing cost. A similar comment was offered by a third reviewer, who said the resources should be increased, given the success of this project to date. The polyolefin precursors appear very promising for reducing the final cost of carbon fiber. The fourth reviewer said this program is well funded and on track; no changes in funding are recommended.

Advanced Oxidation & Stabilization of PAN-Based Carbon Precursor Fibers: Dave Warren (Oak Ridge National Laboratory) – lm006



Reviewer Sample Size

This project was reviewed by four reviewers.

Question 1: Does this project support the overall DOE objectives? Why or why not?

Two reviewers addressed this question explicitly; one observing that low-cost carbon fiber continues to be a common theme and future enabler for vehicle lightweighting and a direct impact on future reduction in dependence of oil imports. This view was concurred by the second reviewer who said the project indirectly supports the DOE goal of petroleum displacement through reducing one of the costly parts of the carbon fiber production process. The other two commenters noted that reducing the oxidation time reduces the overall cost of carbon fiber, and that the project addresses reducing the cost of producing and using carbon fiber.

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?

Opinions were more or less equally split on this question. One reviewer said plasma oxidation is the right way to go. Another felt that the new lab furnace looks like a significant improvement over the previous oxidation/plasma treatment systems and urged continued development of this system. The remaining reviewers submitted more nuanced comments. One noted that after many years effort it appears to be making progress but not in a clearly focused manner. It appears that there is no clear vision of how much more improvement is needed, how much research will be needed, or what the economic benefit will be. The other reviewer called the approach well focused on the technical barrier of oxidation and stabilization of polyacrylonitrile- (PAN)-based fibers. The project, this reviewer said, addresses one of the lower contributors to the overall cost of carbon fiber. The reviewer continued that while it is a residency time bottleneck, the stabilization and oxidation step contributes far less to the cost of carbon fiber than either the precursor or the carbonization step. The same reviewer opined that great success on this project will make a small but important contribution to reducing the cost of carbon fiber.

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

One reviewer cited the identification of humidity as the source of the problem and said many issues were resolved. The second reviewer said the development and testing of the close proximity, indirect exposure methods gives good results. Accomplishments in improving the fiber performance properties (strength, stiffness and elongation) are laudable. Efforts on the improved properties appear successful for this lab-scale project. Effort to scale this process to larger tows and faster speeds is the best next step. The last reviewer felt the key to plasma processing is to focus on high volume rates and commercial equipment that can help to reduce system-level costs. Nonetheless, the plasma process does have the potential to reduce the oxidation cost portion of carbon fiber processing.

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

Four reviewers commented on this question. One reviewer said that the center of expertise is at ORNL. Two others lauded the project's collaboration with other institutions. One said this project is demonstrating the right amount of collaboration and found it encouraging that ORNL is securing intellectual property. The other reviewer deemed the collaboration with the equipment supplier to be good for this lab-scale project. To the final reviewer, however it was not clear how closely ORNL is working with ReMaxCo Technologies or what they are contributing.

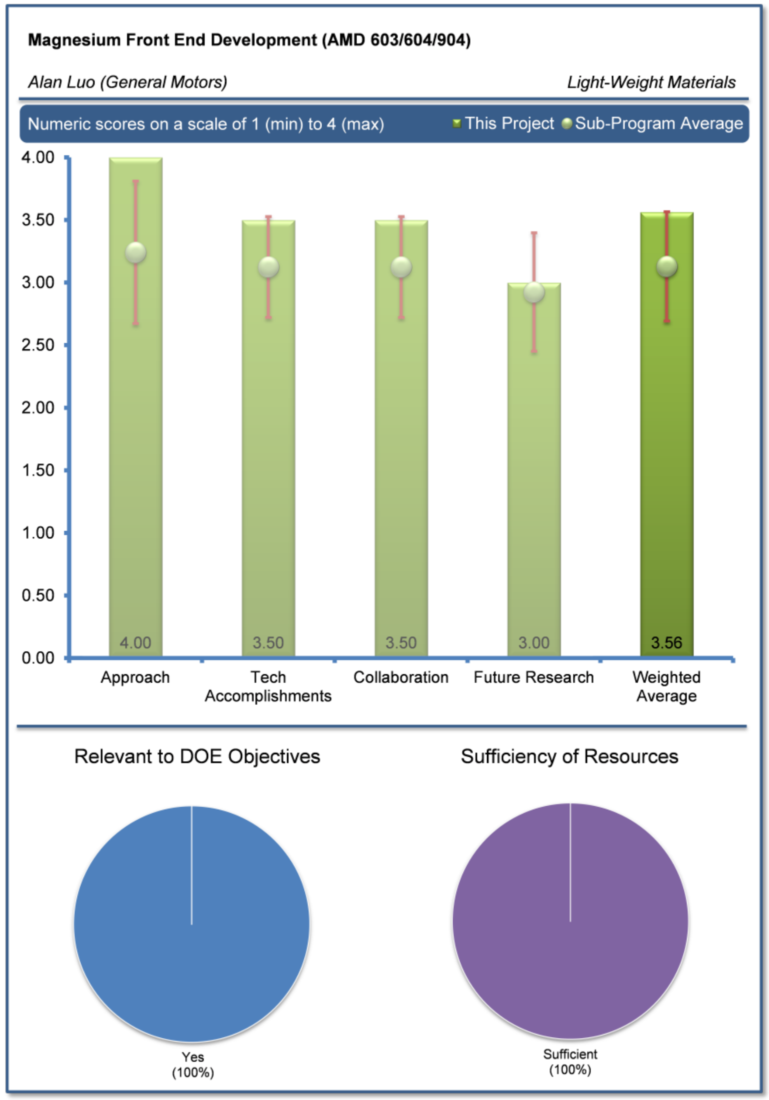
Question 5: Has the project effectively planned its future work in a logical manner by incorporating appropriate decision points, considering barriers to the realization of the proposed technology, and, when sensible, mitigating risk by providing alternate development pathways?

Two reviewers mentioned issues surrounding process scale-up specifically, one saying such issues need to be resolved, the other urging that the project be accelerated to get into the pilot plant facility. The latter reviewer also offered the opinion that the focus on PAN-based fiber does not seem as valuable as a focus on polyolefin-based fiber. Unless the stabilization and oxidation step is completely independent of the base chemistry, this project should be redirected to reduce the processing time and energy consumption of the polyolefin-based fibers. Another reviewer described project plans and targets as general in nature, offering as examples to develop a revolutionary new method for converting carbon fiber, which offers much higher potential for achieving significant cost reduction than evolutionary improvements to existing conversion technology, and process and equipment scaling, as well as textile PAN adaptation, will constitute the majority of future work. In the view of the last reviewer, there is plenty of future potential in current and future programs using plasma processing of low-cost carbon fibers.

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

Three reviewers considered funding levels to be sufficient. One reviewer said funding is sufficient, assuming there are no further cuts. If DOE is forced to reduce funding, something this reviewer did not recommend, the project would be considered under-funded. The third deemed the project to be adequately resourced. Another reviewer thought project resources at $2 million a year to be excessive in view of the amount of progress reported.

Magnesium Front End Development (AMD 603/604/904): Alan Luo (USAMP/AMD) – lm008



Reviewer Sample Size

This project was reviewed by two reviewers.

Question 1: Does this project support the overall DOE objectives? Why or why not?

Two reviewers commented, both in agreement that this project is relevant to DOE goals. One noted that systems-level integration of components including magnesium, joints, etc. is naturally of concern going forward if magnesium use is to increase. The other termed the project a typical example of what DOE should be supporting. The front end is an important part of any vehicle to be considered for weight reduction while keeping safety at its optimum.

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

The only reviewer offering a comment felt that for a largely trial-and-error project, the project covered a great deal and have generated a lot of experimental results that can be used to tweak modeling going forward. If there is any criticism, this reviewer felt, it is that they seem to have cast their net very wide, working on formability, performance, joining, casting alloy development, sheet alloy development, etc. At this point in the development cycle for magnesium, this reviewer thought, focusing on alloy development would have the biggest payoff. The reviewer acknowledged, however, that this is a prototype project at base.

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

One reviewer noted that the auto industry used to adapt solutions from the aerospace industry. Here, the auto industry goes beyond the aerospace industry and leads the way - quite an achievement. The second reviewer felt the researchers have accomplished quite a bit, although the depth in any of the many various task items is not clear.

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

One reviewer cited very wide collaboration. The other asked why this team cannot work with a European auto maker, also.

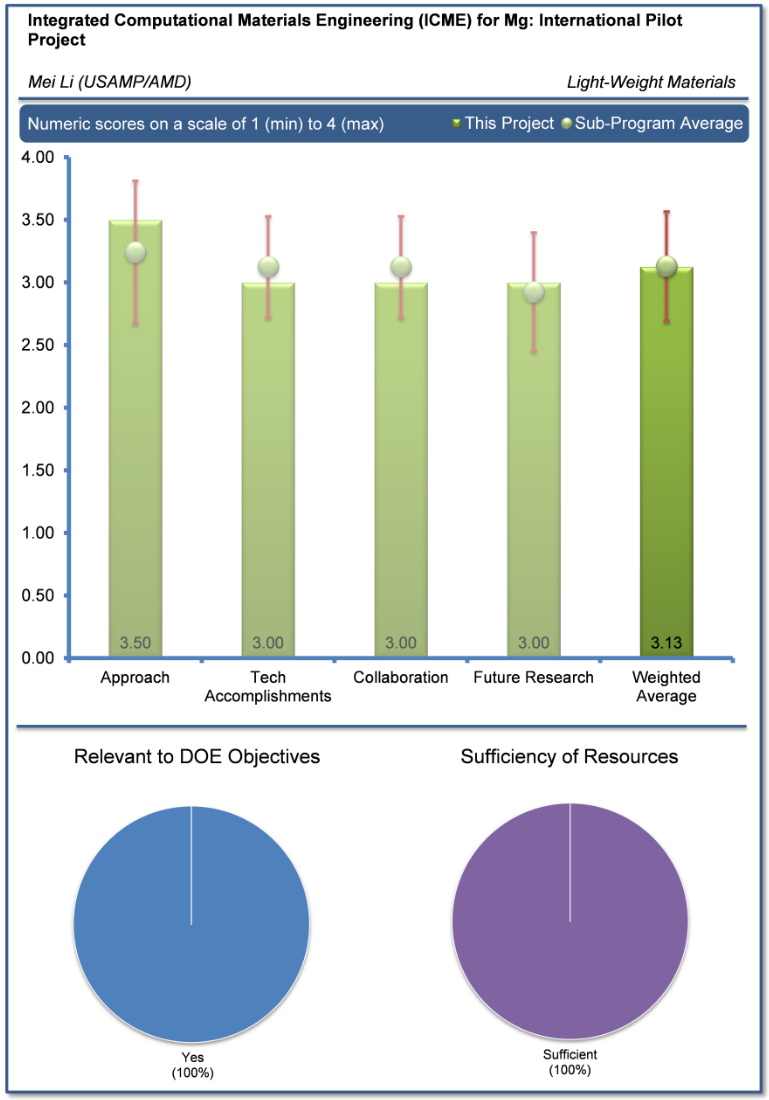
Question 5: Has the project effectively planned its future work in a logical manner by incorporating appropriate decision points, considering barriers to the realization of the proposed technology, and, when sensible, mitigating risk by providing alternate development pathways?

The sole commenting reviewer expressed hope that there will be future work along those lines.

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

Both reviewers felt resources to be sufficient. One reviewer commented sufficient, but probably on the minus side.

Integrated Computational Materials Engineering (ICME) for Mg: International Pilot Project: Mei Li (USAMP/AMD) – lm012



Reviewer Sample Size

This project was reviewed by two reviewers.

Question 1: Does this project support the overall DOE objectives? Why or why not?

Reviewer comments were generally positive. One reviewer termed this project a good example of a project that suits DOE's objectives very well. It goes hand in hand with Dr. Luo's presentation. Both are tackling a real problem of weight and safety. The other reviewer called it a good start, but the FEA modeling using porosity, etc. is an overextension. Perhaps a simpler comparison with all parameters being predicted and not measured would be more convincing.

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, noting that the project has ended, said the approach was excellent. This reviewer, however, questioned the strategy of little steps. At some point the team will have to take a big leap starting from the physical properties of magnesium and leading to a new geometry of the front end, instead of the other way around. The other reviewer noted that the capability of predicting yield strengths is in its infancy and looks promising. The reviewer expressed the hope the researchers will be able to use it with additional information on the thermodynamic variables as a function of composition for new alloying constituents.

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

In the view of one reviewer, the goals were achieved, so excellent progress was made. The other felt that for the time they had available, the Ford people have done a really nice job so far. This reviewer counseled the researchers not to reach so hard to show applicability with a complicated part.

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

Mississippi State University, in the opinion of one reviewer, seems to have been left alone to work on what they usually work on. The other reviewer reiterated the view that collaboration should include a European automaker.

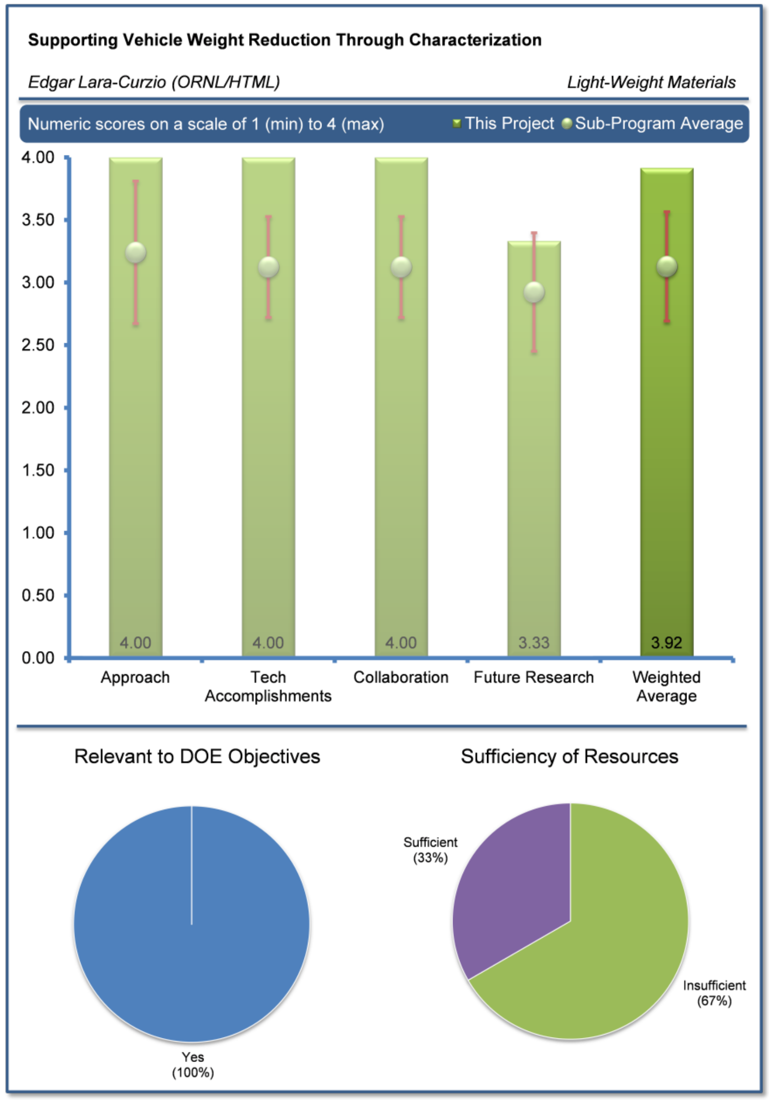
Question 5: Has the project effectively planned its future work in a logical manner by incorporating appropriate decision points, considering barriers to the realization of the proposed technology, and, when sensible, mitigating risk by providing alternate development pathways?

One reviewer expressed the hopes that this line of work can be continued and broadened to include more participants and that the main actors will dare new lines of thought.

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

Both reviewers thought project resources to be sufficient. One reviewer commented sufficient, but on the minus side.

Supporting Vehicle Weight Reduction Through Characterization: Edgar Lara-Curzio (ORNL/HTML) – lm028



Reviewer Sample Size

This project was reviewed by three reviewers.

Question 1: Does this project support the overall DOE objectives? Why or why not?

Two reviewers offered comments on this question, both in substantial agreement. One said the project provides unique equipment and skills capable of characterizing materials needed for reducing the weight of future vehicles, and the other affirmed that this center provides a critical capability to attack the fundamental materials questions of technologies that lead to petroleum displacement. The materials characterization efforts support many lightweighting projects.

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

Two of three reviewers submitted comments and they were again in accord. The approach, in the view of one, was a very good approach inasmuch as the High Temperature Materials Laboratory (HTML) deals with numerous independent activities, each addressing a unique challenge and need, which cannot be met elsewhere. The collaborative user facility, said the other, is an outstanding example for a national center to focus efforts on critical materials problems. The facilities and staff at the HTML provide a tremendous resource to the nation.

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

The project came in for high praise in this category also. One reviewer said the examples cited seemed to be of high importance and value. The other reviewer agreed, saying the technical accomplishments are strong. Since this is a user facility, there are not deliverables associated with the lab. The projects and deliverables come from the requesters. The large number of research efforts in FY 2011 indicate the technical merits of the HTML. Great work is done at HTML.

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

The center, in the words of one reviewer, is used by numerous high-quality and highly talented entities. The other reviewer cited great collaboration with industry, universities and other labs.

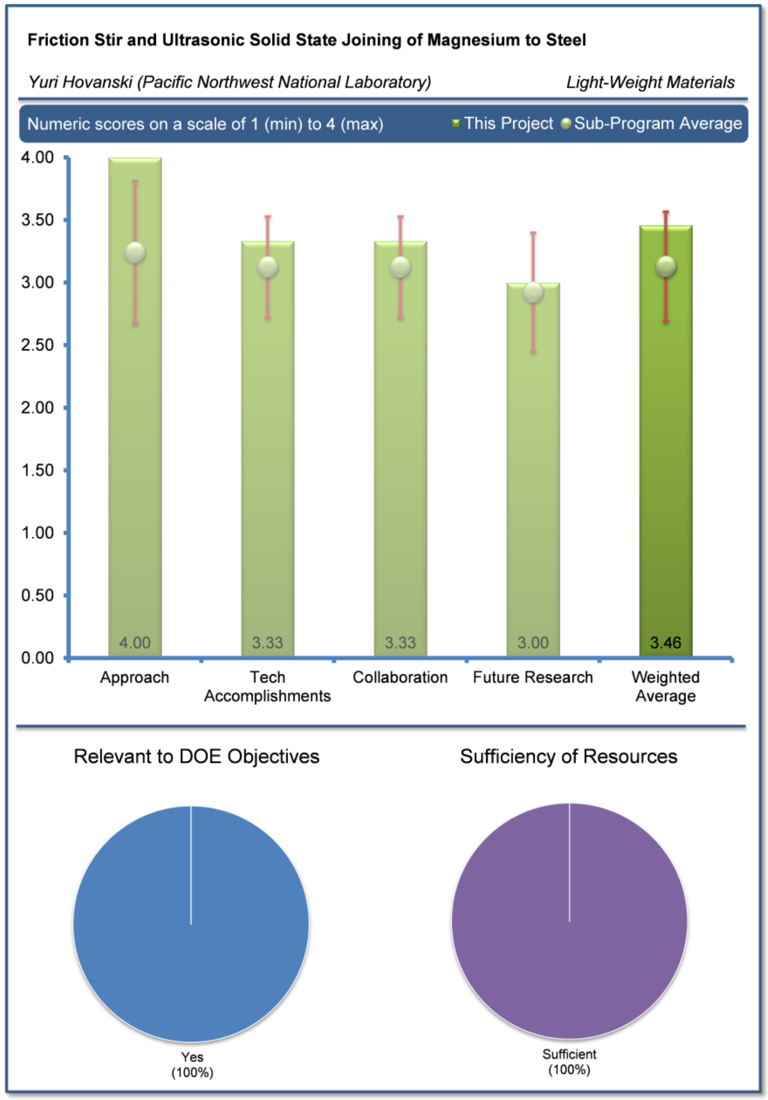
Question 5: Has the project effectively planned its future work in a logical manner by incorporating appropriate decision points, considering barriers to the realization of the proposed technology, and, when sensible, mitigating risk by providing alternate development pathways?

One reviewer noted that future research unfortunately appears to be in jeopardy, since it appears that the HTML has to focus on survival in FY 2013 rather than on the technologies to be developed. The other reviewer wanted to see the plan for the continuation of this national resource in some fashion. The equipment and researchers need to be kept at the cutting edge of material characterization.

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

Two reviewers deemed project resources insufficient. One called FY 2012 funding precariously low. The researchers and testing equipment must be maintained and improved each year. The second said this program should be continued, although its work might have to be more selective due to budget constraints. The reviewer who considered resources to have been sufficient in FY2012 also opined that they should continue in the future.

Friction Stir and Ultrasonic Solid State Joining of Magnesium to Steel: Yuri Hovanski (Pacific Northwest National Laboratory) – lm030



Reviewer Sample Size

This project was reviewed by three reviewers.

Question 1: Does this project support the overall DOE objectives? Why or why not?

All reviewers appeared to agree that this project supports DOE goals. One noted that joining of dissimilar metals is a key barrier in the development of lightweight vehicles to displace petroleum. If the joining of magnesium to steel were robust, more body and chassis parts would be able to be considered in magnesium. The second agreed, remarking that reliable dis-similar joining technologies are an obvious need for a lightweight, multi-material body. The third reviewer said lightweighting with mixed material applications of steel and magnesium.

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

Two reviewers offered comments on this question. They were in general agreement. One took the view that the project researchers seem to be studying what is required, but wonders about the long-term stability of magnesium-steel components, such as when they are heated to 40-50°C in sunlight and whether this could result in formation of iron-magnesium compounds within the mechanically mixed structure. This was a minor concern. The other reviewer said the approach of focusing on the magnesium AZ31-to-high strength, low alloy (HSLA)-steel appeared pragmatic, as these are likely candidates for automotive body structure materials. The technical GATES are appropriate and the focus on corrosion is key.

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

Only one reviewer commented, noting good accomplishments this year toward the end of the project. The tool development is creative. The testing showing the separation in the 0.8 mm steel rather than the weld tells the best story. Showing that ultrasonic joining is possible for steel on top of magnesium for the joint is a key finding for mixed material joining. The data on the corrosion with and without adhesives is extremely valuable for future design studies.

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

Two reviewers offered positive comments. One observed lots of interactive teaming and data sharing, building work upon work. The other called project collaboration good, but wanted to see interactions with a tooling company. The work with PPG for coatings was termed a good start.

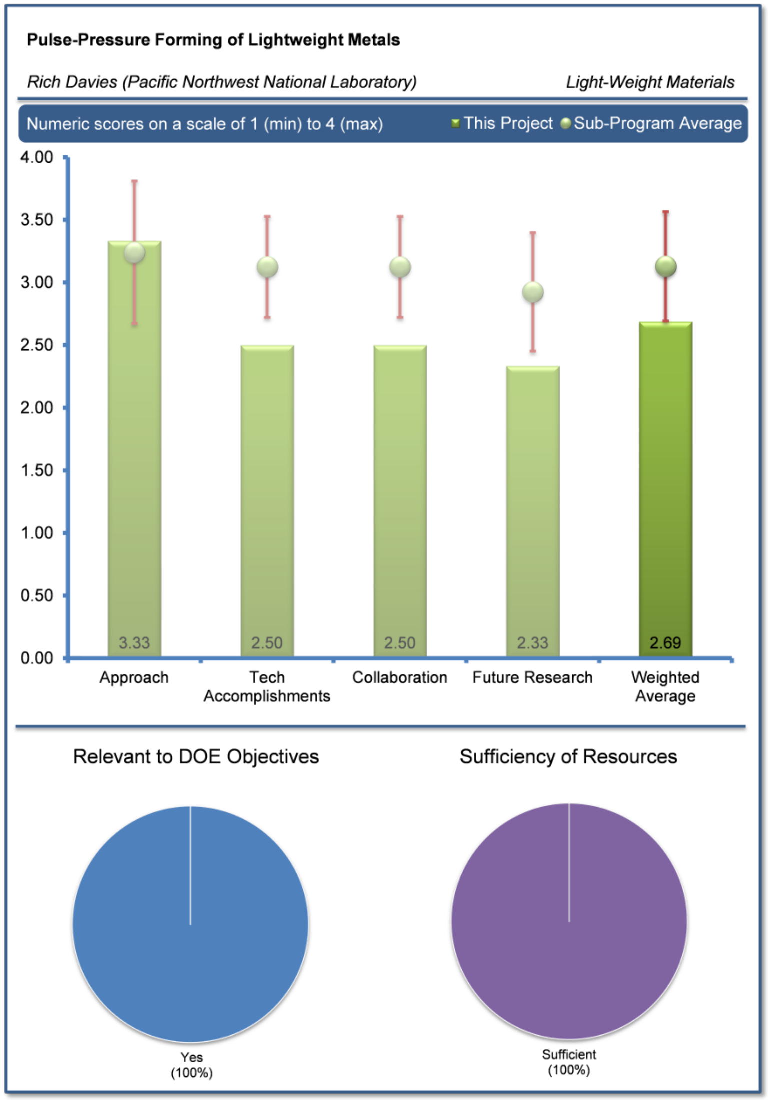
Question 5: Has the project effectively planned its future work in a logical manner by incorporating appropriate decision points, considering barriers to the realization of the proposed technology, and, when sensible, mitigating risk by providing alternate development pathways?

In the single response to this question, the reviewer predicted that the final efforts in this project will be good deliverables. The proposed future projects are not yet clearly focused.

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

All three reviewers deemed project resources sufficient. One reviewer observed that the project is all concluded now.

Pulse-Pressure Forming of Lightweight Metals: Rich Davies (PNNL) – lm033



Reviewer Sample Size

This project was reviewed by four reviewers.

Question 1: Does this project support the overall DOE objectives? Why or why not?

Only one of the four reviewers offered a comment. That was to the effect that pulse pressure forming of aluminum is an enabling technology for forming deep-drawn aluminum to depths not achievable via conventional stamping and can stretch the application of aluminum for vehicle lightweighting, thus improving fuel economy and reducing our dependence of petroleum imports.

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

Two of the four reviewers offered opinions on the project's technical approach, one calling it an interesting and rather scientific approach, the other saying this work nicely extends work started at OEMs and the U.S. Automotive Materials Partnership (USAMP) and encouraging that it be continued. The third reviewer observed that the work was directed at enhanced formability at very high strain rates.

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

Reviewer comments were generally positive but tempered. One said the project had produced interesting insight on the change in sign of the strain rate coefficient and its implications for the much higher formability in aluminum at high strain rates. The second saw a significant amount of good work relative to basic research but could see no practical application. The third also noted good progress, but felt that system scale should be the focus, including reducing cycle time and extending the life of the electrodes.

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

Here again, qualified praise was the general tone of reviewer comments. One recognized a continued interface with OEMs and USAMP and encouraged it for offering direction and guidance. The second acknowledged project collaborators at GM, Ford and Chrysler, but felt they lacked a vision for potential application. The third comment took a contrary view, assessing the project work to be all in-house, except Vecchio's work at the University of California San Diego (UCSD).

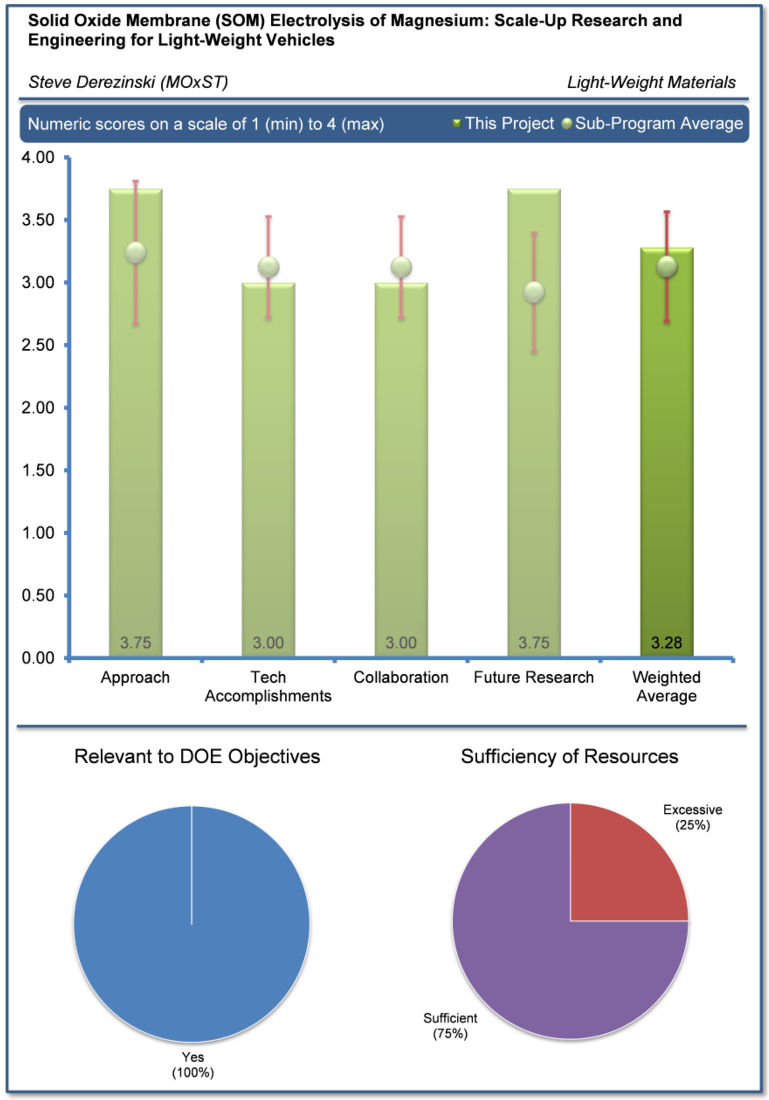
Question 5: Has the project effectively planned its future work in a logical manner by incorporating appropriate decision points, considering barriers to the realization of the proposed technology, and, when sensible, mitigating risk by providing alternate development pathways?

The first reviewer said the focus of future work must be on cycle time improvement and urged a concerted effort to extend electrode life. The other commenting reviewer said the project accomplished the objective, and therefore, concurred with its termination.

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

All four reviewers considered resources to be sufficient. One commented further that the project had achieved its goals, another that the project was appropriate and adequate. The third cited a need for greater understanding of magnesium sheet forming.

Solid Oxide Membrane (SOM) Electrolysis of Magnesium: Scale-Up Research and Engineering for Light-Weight Vehicles: Steve Derezinski (MOxST) – lm035



Reviewer Sample Size

This project was reviewed by four reviewers.

Question 1: Does this project support the overall DOE objectives? Why or why not?

Reviewers seemed in general to agree that the project supports DOE's goals. One affirmed that we need low-cost and clean production of magnesium in the United States for automotive lightweighting. Echoing this view, a second reviewer observed that the availability of cost-effective magnesium would be a major enabler for its increased usage, which in turn would lead to substantial reduction in the weight of passenger vehicles. The third comment was similar, asserting that MOxST and the process for refining magnesium is directly related to enabling future lightweighting of automobiles and heavy trucks and ultimately reducing use of fuel and decreasing dependence on foreign petroleum.

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

Reviewers approved of the project work approach. One reviewer said there appears to be a clear understanding of what will have to be done to make the technology viable. There is also a reasonable scale-up plan and an aggressive timeline established. The second saw a good approach to scale laboratory efforts up to commercial application. The third reviewer termed the concept for reducing the magnesium oxide sound and very novel and deemed the results to date to be very promising regarding the technology to reduce magnesium oxide. This reviewer further suggested a focus on complementary report-outs on the status of equipment life and capital projects based on durability of systems to deliver lower-cost magnesium.

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

One reviewer cited excellent progress, urging that more chemical data on purity of magnesium produced via the MOxST process be presented. Most of the 2012 slides, this reviewer observed, were focused on the system-level development, i.e., the equipment. This reviewer expressed a desire to see data on the properties (purity) of the magnesium produced to date even via the prototype system operational to date. Other reviewers observed significant progress being made in areas such as anode materials and noted a good approach to overcoming obstacles identified during scale-up. The fourth reviewer expressed reservations concerning the kilo-scale demonstration, noting that it is still small and wondering whether it will facilitate enough learning for commercial production.

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

Reviewers offered lukewarm approval in this area. One noted that the lead organization is working with several pertinent partners, although most will participate after the technology is more fully developed by MOxST. In a similar vein, a reviewer noted that the work was primarily a MOxST operation, but recognized the collaboration and discussions with OEMs and encouraged its continuation in the development of this important magnesium oxide reduction process. The third reviewer felt the project does not really involve collaboration. Cosma will evaluate material for commercial use at the end of the project, but there will be no participation until the development program is completed.

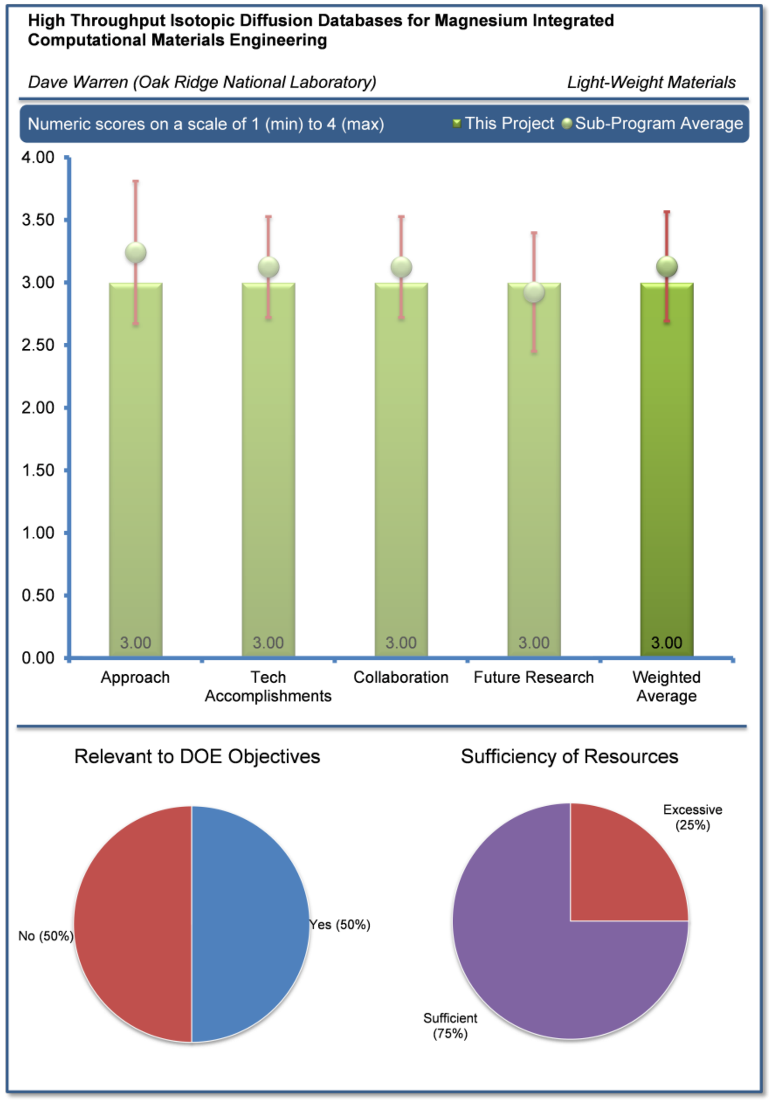
Question 5: Has the project effectively planned its future work in a logical manner by incorporating appropriate decision points, considering barriers to the realization of the proposed technology, and, when sensible, mitigating risk by providing alternate development pathways?

One reviewer cited the project's sharp focus and aggressive timeline, and a second reviewer noted its good goals, low greenhouse gas production and low cost potentials. Another reviewer urged continued progress to the large scale process capability development.

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

Three reviewers considered project resources to be sufficient. These reviewers said variously that resources seem appropriate for the level of research and technical risk; that the project appears to be hiring necessary subject matter experts as required during the commercialization laboratory scale-up process; and that the project represented well-funded and planned R&D for this scale-up process. One reviewer deemed resources excessive. This reviewer felt that the scale of the demonstration (40 tons per year), did not justify the funding. A larger-scale demonstration unit should be considered to learn more about the potential for commercialization.

High Throughput Isotopic Diffusion Databases for Magnesium Integrated Computational Materials Engineering: Dave Warren (Oak Ridge National Laboratory) – lm036



Reviewer Sample Size

This project was reviewed by four reviewers.

Question 1: Does this project support the overall DOE objectives? Why or why not?

Opinion on this question was sharply split. Two of the four reviewers deemed the project to be relevant to DOE goals. One said it is providing valuable insights into Integrated Computational Material Engineering (ICME) of magnesium, which will ultimately enable more its more extensive use and lead to lighter- weight vehicles. One other reviewer agreed, calling magnesium an enabler for vehicle lightweighting and a long-term feeder of vital importance to first-principles design and development of magnesium alloys, thus indirectly and proactively supporting the reduction of dependence on foreign petroleum. The other two reviewers were more skeptical. One said this is nice diffusion work, but its relevance to lightweighting is more than a stretch. The final reviewer said this project is quite a reach to claim it supports petroleum displacement. The tie, at best, is to improved magnesium alloys. However, this is fundamental materials research that is not yet aligned to produce improved alloys. This research, this reviewer continued, should be funded through a different, more basic science path. There is quite a gap between this diffusion project and lightweight vehicles 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?

If reviewers were not unanimously persuaded of this project's direct relevance to DOE's overarching petroleum conservation goal, they nonetheless felt the work approach to be praiseworthy. One reviewer called it a nice piece of work, well-constructed, logically led. Another said this is an excellent technique for measuring diffusion of magnesium in magnesium and very difficult. This work is applauded as novel and very important. The final reviewer concurred, saying the fundamental approach is good to address the basic diffusion rates for magnesium. However, the principal barrier is the cost of magnesium and the lack of predictive models for magnesium materials characterization, so the approach does not address the high-level barriers.

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

Two reviewers offered somewhat different assessments. One, noting that magnesium diffusion is very difficult to measure, called this research focused, targeted and important. Attention to detail was noted and lauded. The other reviewer observed that progress is being made, though not as quickly as hoped. Technical progress toward the milestones appeared to be lagging compared to the calendar-scheduled milestones, in this reviewer's estimation. The progress on diffusion measurements is good, but the progress is somewhat disjointed from the objectives and the goals.

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

Two reviewers opined that there was good collaboration with other researchers. One singled out the website as a potentially valuable tool for collaboration and wanted to see more data on the number of users and hours of activity or some other such measure. The other reviewer expressed the hope that this can be connected and contribute to the Materials Genome Initiative (MGI). The third reviewer dissented, noting that although there are a number of pertinent partners involved, there did not appear to be a link to automotive products or auto manufacturers.

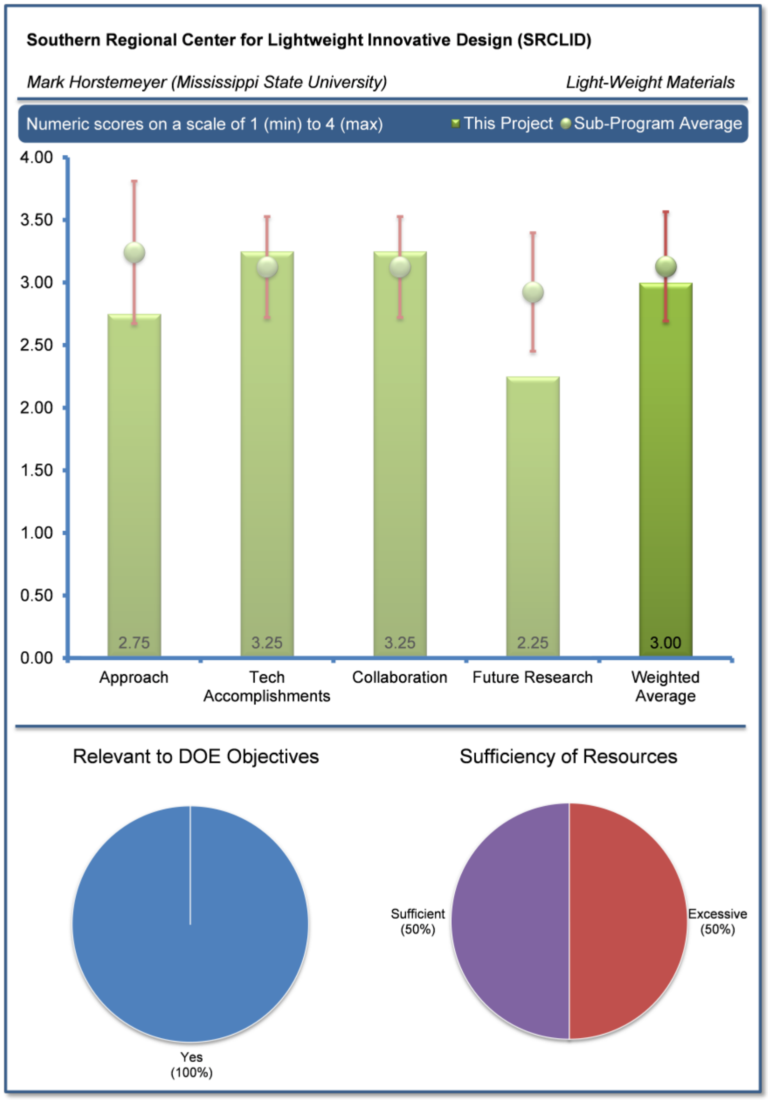
Question 5: Has the project effectively planned its future work in a logical manner by incorporating appropriate decision points, considering barriers to the realization of the proposed technology, and, when sensible, mitigating risk by providing alternate development pathways?

One reviewer felt this project needs to clarify the short-term goals and anticipated deliverables against a timeline. Efforts on the rare earth elements are less important than the cesium, manganese and tin systems. The other said continued R&D of a suite of alloy diffusivities in magnesium and its alloys is highly recommended.

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

Three of four reviewers called resources sufficient. One of these reviewers called current funding appropriate and recommended it be continued. The fourth reviewer felt resources excessive. This reviewer commented that since that project is too far from lightweighting objectives, it should not be here and therefore the funding was excessive.

Southern Regional Center for Lightweight Innovative Design (SRCLID): Mark Horstemeyer (Mississippi State University) – lm037



Reviewer Sample Size

This project was reviewed by four reviewers.

Question 1: Does this project support the overall DOE objectives? Why or why not?

Reviewers' comments were generally positive. One said the project has several activities focused on understanding and improving performance of materials that can be used to reduce vehicle mass. Another agreed that the overall project will help to identify key material processing effects on structural material properties to help optimize part geometries and therefore reduce weight. The other two comments offered more mixed assessments. One found the project to be important and to fit DOE objectives. However, this reviewer said the fit would be even better if this work were part of the development of a new, lighter, stronger and cheaper vehicle front end. To that end, the reviewer suggested collaborative work with any or all of the Detroit automakers. This effort, the reviewer felt, could go on for decades without truly helping the auto industry. The last reviewer termed the project an all-encompassing project that does contribute to existing computational modeling of lightweight material efforts already established at other organizations and institutions.

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

Reviewers submitted comments that, while generally approving some aspects of the work under this project, offered suggestions for its improvement. A first reviewer said that while the work is probably outstanding as far as the database construction is concerned, it could benefit from a more hands-on approach. Another said the approach to the from-atoms-to-autos project is solid but lacks sufficient usable intermediate deliverables. The developments should focus on those barriers that can be overcome first and deploy solutions to overcome them as quickly as possible. The presentation identified 12 bridges but did not quantify (or even qualify) which are in place, which are under construction and which are not yet started. A third reviewer termed this a collection of work that expands on other work that has been done extensively to date, which has been shared and provided to Mississippi State University (MSU). This reviewer urged project researchers to keep up the effort but to recognize that it is complementary to existing work and not new to academia or industry. The final reviewer said the program appears to lack focus. The teams are making incremental progress in several areas rather than substantial progress through a concerted effort in any one or few areas.

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

Reviewers largely reiterated the comments made in the previous section. One repeated that the teams are making incremental progress in several areas rather than substantial progress through a concerted effort in any one or a few areas. Another again noted good contributions and complementary work to existing efforts at other institutions. During the last year, a third reviewer commented, there has been only fair progress on many of the technical paths. This reviewer offered further criticism of the project's accomplishments and progress. This reviewer noted the 2012 status of the magnesium material developments and the cyber infrastructure appears to be only slightly ahead of 2011. According to this reviewer, the future work stated in 2011 – develop and validate material models and deploy them for use – the Magnesium Front End Research and Development (MFERD) Phase II demo project (September 2011) –has not been accomplished. Only a few of the models have been verified and none has been deployed. Last year the second item in future work was establish magnesium alloy design method using lower-length scale models. There has been no progress reported toward this work.

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

Reviewers commenting on this question seemed unclear on the extent and breadth of collaboration in this project. One, acknowledging that the team has engaged a number of pertinent partners, found it difficult to determine the extent to which those collaborators are involved. For example, the steel overview slide indicates partnerships and cost share from several steel suppliers, yet the future plans indicate MSU intends to establish partnership with steel companies to direct steel R&D. The same claims apply to the plastic industry. A second reviewer concurred, saying the presentation is not clear on what collaboration has taken place in the past year. While partners are listed on Slide 7, their interactions have not been quantified. Another urged that collaboration be extended so as to directly influence the manufacturing of auto parts. The fourth noted that to date, MSU has engaged other institutions and organizations doing comparable work. This reviewer cautioned against trying to give the impression it is leading a new field and continue to focus on contributing to the overall effort.

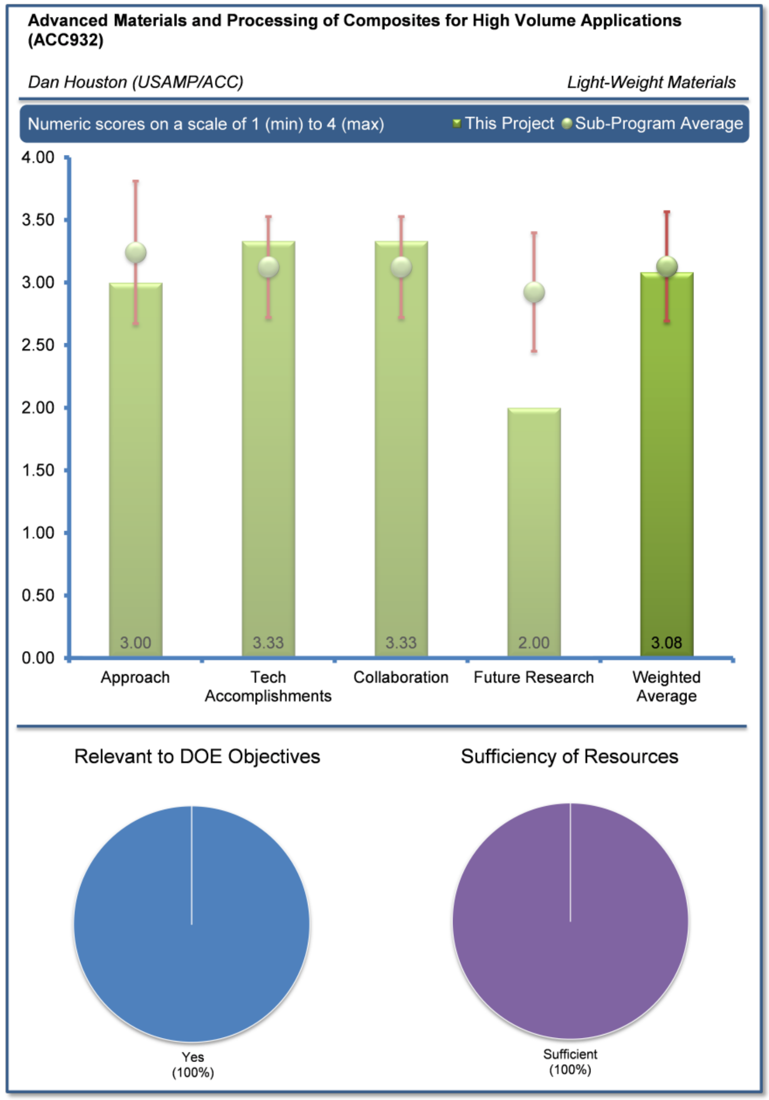
Question 5: Has the project effectively planned its future work in a logical manner by incorporating appropriate decision points, considering barriers to the realization of the proposed technology, and, when sensible, mitigating risk by providing alternate development pathways?

A reviewer said that, provided MSU remains connected to the technical experts in the field, this research will contribute to the common good of computational materials and manufacturing design of lightweight vehicles. A reviewer noted that project goals appear to be general in nature, and another reviewer remarked that less theory, less modeling (theoretical?) and more front end applications are needed. A final reviewer said the proposed future work is so close to what was suggested a year ago as to call the effectiveness or the robustness of the research planning into question.

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

Two reviewers found project resources to be sufficient. One of these reviewers said the level of R&D funding should continue until completion, but additional should be focused on what is new and needed by industry, and less on replication and existing projects. Two reviewers deemed resources excessive. One of these reviewers commented that $12 million since 2008 appears excessive for the few specific accomplishments claimed. Another reviewer noted that nothing was said about the resources until the Q&A. If the investment is $12 million, as Dr. Wang stated, this effort is excessively funded compared to the results distributed from 2008.

Advanced Materials and Processing of Composites for High Volume Applications (ACC932): Dan Houston (USAMP/ACC) – lm046



Reviewer Sample Size

This project was reviewed by three reviewers.

Question 1: Does this project support the overall DOE objectives? Why or why not?

Reviewers generally viewed this project as relevant to the DOE goal. One was explicit, stating that this kind of project is relevant to DOE's mission. Another called work on reducing the complication and costs of carbon fiber composite processing highly relevant, and added that changing how fiber is produced (avoiding the pelletizing steps) seems smart and very useful. The third reviewer noted that sheet molding compound (SMC) carbon fiber is too expensive for commercial use.

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

The researchers, in the view of one reviewer, seem to have a good plan and to have followed a nice progression of design steps, but there was insufficient detail in the presentation to know if their process was the best way to go. A concurring view was expressed by the second reviewer, who deemed the project to have taken a good approach to a new subject over a long period of time. The final reviewer said that compression molding versus injection molding was well explained in the presentation, but not fully exploited. This should be pursued, the reviewer said. The two techniques are complementary: some applications will be better suited to compression molding, others to injection molding. The reviewer did not think that one is necessarily better than the other in a given application.

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

The project team seem to have developed some good insights, said one reviewer, and a second agreed, noting good accomplishment, albeit not a commercial application or direction. The third reviewer noted the speaker's statement that all goals had been achieved.

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

The first reviewer noted an excellent list of collaborators. Another reviewer found it not terribly clear, but concluded the project researchers seem to have developed complete teams.

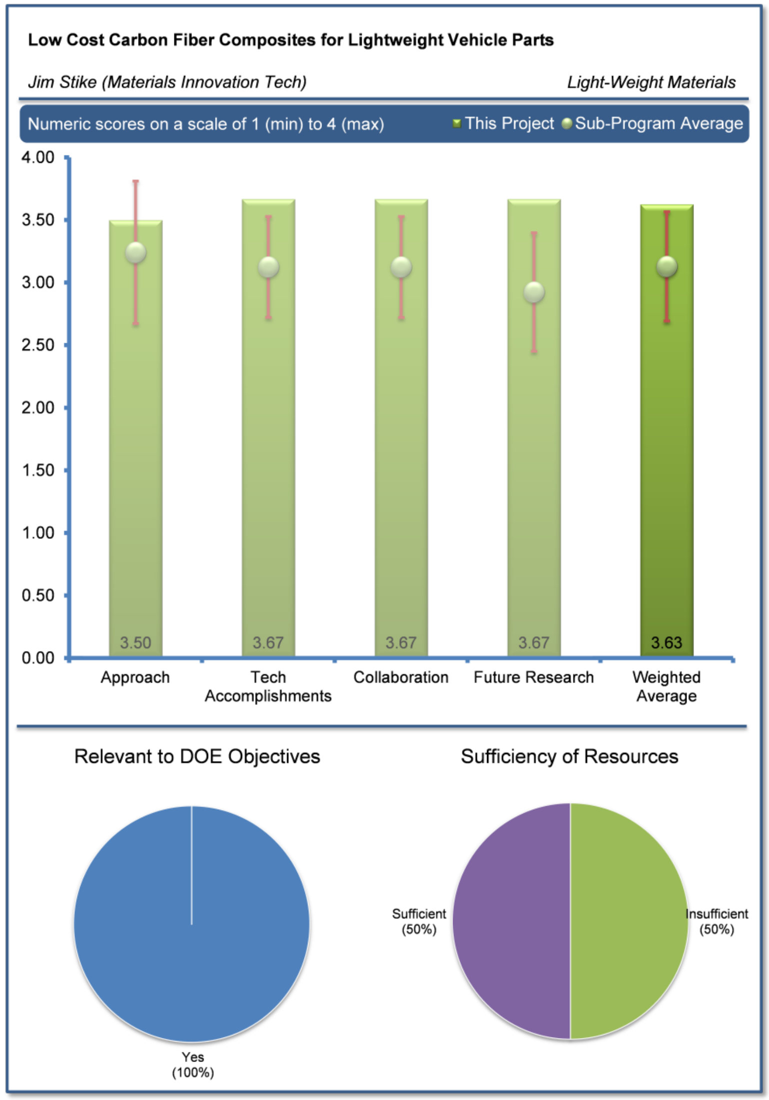
Question 5: Has the project effectively planned its future work in a logical manner by incorporating appropriate decision points, considering barriers to the realization of the proposed technology, and, when sensible, mitigating risk by providing alternate development pathways?

The first reviewer noted that the project is over. This reviewer questioned if it would lead to future work, and expressed the strong hope that it would. The second reviewer saw no plan for future work and wondered if time and money had been wasted.

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

All three reviewers viewed resources as sufficient. One reviewer remarked that funding was sufficient to support adequate resources. A second reviewer guesses that funding was sufficient because the project is over.

Low Cost Carbon Fiber Composites for Lightweight Vehicle Parts: Jim Stike (Materials Innovation Tech) – lm047



Reviewer Sample Size

This project was reviewed by four reviewers.

Question 1: Does this project support the overall DOE objectives? Why or why not?

Two reviewers were of opinion that this project was relevant to the Department's petroleum conservation goal. One said it supports the petroleum displacement by developing reduced-weight parts with recycled carbon and other fibers. This reviewer added that using reclaimed carbon fiber to make lightweight parts supports petroleum displacement twice over. The second reviewer considered working on recycled carbon fiber to be an excellent direction for the DOE to support by weight of lightweight materials development. Another reviewer asserted that carbon fiber must be recycled to meet GHG requirements and called for parallel projects/programs in same subject area. Finally, a reviewer called recycling an important issue to be addressed.

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

The approach is sharply focused on attacking the barriers of cost, manufacturing speed and supply base, according to one reviewer, who called the prototype 3-DEP process and roll goods equipment a perfect demonstration for developing improved manufacturing. Another said this is the best way to make preform out of reclaimed fiber, and a third lauded a good approach, but felt funding adequate to achieve production scale at projected volumes was lacking. The final reviewer sounded a cautionary note, observing that if recycled carbon fiber can bring costs down, do not lose sight of $3 per pound for high-volume applications. Even aluminum at $1.50 a pound is a challenge to justify and introduce into high-volume automotive applications.

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

The technical accomplishments are outstanding, said one reviewer. Accelerating the 50-inch-wide roll goods line so that larger parts can be produced is a great accomplishment. The 25% to 40% weight reduction seen in trim panels and close-out panels is at or above expectations. This reviewer anticipated information on material properties and especially the temperature dependence of the material properties, expressing concern about fracture resistance at -30°C. A second reviewer noted good progress during the past year and recommended efforts to promote volume process capability. The third reviewer likewise called progress good but noted that some 50% of information presented was recycled from the project's 2011 presentation. The last reviewer noted the project's recent initiation and offered no comment of its technical progress.

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

Two reviewers offered relevant comments on this question. One noted the project included a good number of OEMs and suppliers to make actual components, and the other reviewer saw strong collaboration with suppliers and end users of the materials. This second reviewer termed the investment in a 50-inch-wide roll system a very proactive step for future scaling of the process.

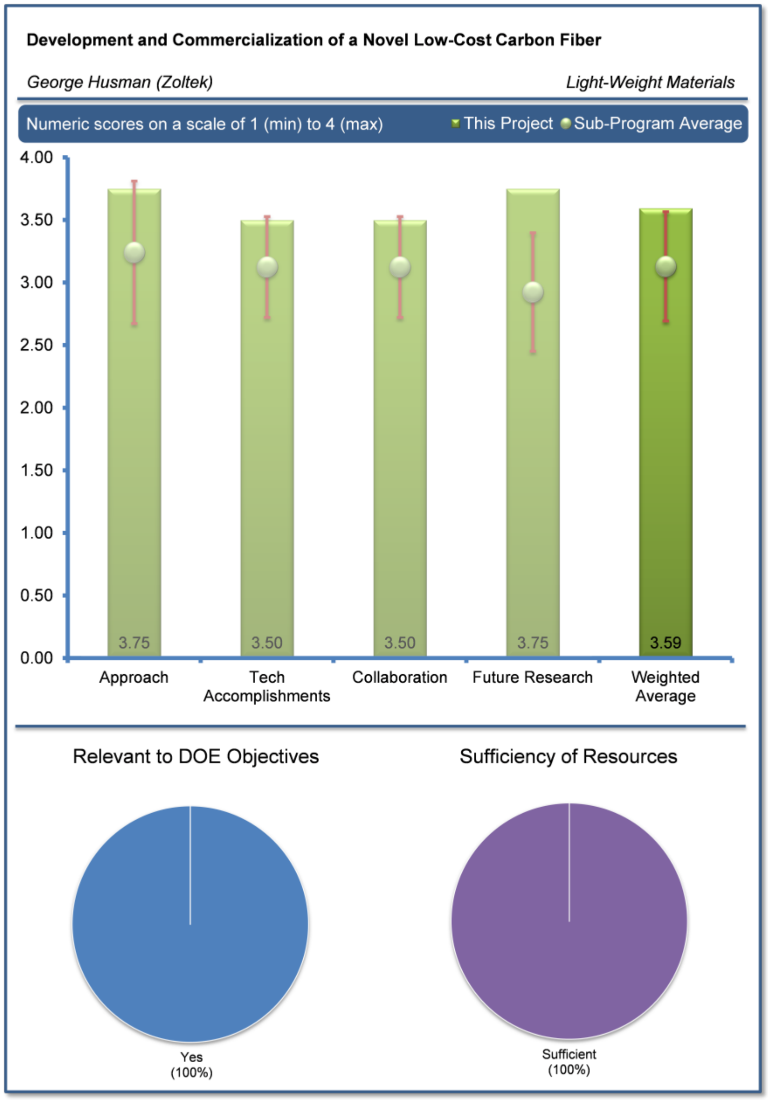
Question 5: Has the project effectively planned its future work in a logical manner by incorporating appropriate decision points, considering barriers to the realization of the proposed technology, and, when sensible, mitigating risk by providing alternate development pathways?

One reviewer asserted that making those parts and testing them is the only way to go. The other reviewer viewed future efforts as focused on the key barriers of reducing manufacturing time and cost and deemed use of reclaimed and recycled carbon fibers an added feature.

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

The four reviewers split evenly on this question. Two reviewers viewed resources as inadequate. One reviewer commented that additional funding is required to support additional resources. Dumpster picking indicates insufficient funding. The other said that future efforts in this project should be funded to the maximum amount allowable, as this project is delivering much-needed results. Two considered resources to be sufficient. One of these reviewers commented that research is well-funded and planned, and believes no changes are necessary.

Development and Commercialization of a Novel Low-Cost Carbon Fiber: George Husman (Zoltek) – lm048



Reviewer Sample Size

This project was reviewed by four reviewers.

Question 1: Does this project support the overall DOE objectives? Why or why not?

All four reviewers agreed this project furthers DOE goals. One said that reducing carbon fiber costs and using a bio-based precursor both support the goal of petroleum displacement. Using lignin directly displaces petroleum in the production of carbon fiber. Reducing the cost of carbon fiber has an indirect relationship to displacing petroleum through lighter weight parts for cars and trucks. Low-cost carbon fiber is a significant part of the future lightweighting strategy and provides a significant weight save potential, according to a second reviewer. A third called lignin a good alternative precursor, noting that since it does not lead to the right crystal structure as a neat material, its combination with PAN could change the picture. Finally, the fourth reviewer observed that low-cost carbon fiber is still the target and expressed the hope that with multiple people working in this space, it would be possible to deliver $5 per pound carbon fiber, leading to a less costly composite.

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

Reviewers generally approved the work approach. One commented that developing solution-spun fibers as the basis for carbon fibers using current production equipment is a sound approach to quickly commercialize a reduced-cost and reduced-petroleum carbon fiber. The push to commercialization is a great approach to start making the carbon fiber. Concurring views were expressed by two other reviewers. The first reviewer observed a very good approach, addressing scale manufacturing to meet price and quality requirements. The other reviewer commented excellent progress and work plan, and urged the research team to continue on to the July 2012 make-like-production plans. The last reviewer speculated that identifying the proper ratio of the mixture, the right oxidation temperature profile, and the applied strain can show a window of opportunity.

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

Two reviewers lauded the progress that had been made in this recently initiated project. One saw great progress, considering that the project has just started, and the other reviewer, noting the project is at the beginning, said good progress has been made on using a mixture of lignin and PAN in solution spinning for initial fiber production. The accomplishments since October 2011 project start are solid in improving the morphology of the precursor fibers. A third reviewer highlighted great progress in the pilot oxidation line (POL) and the target of 45% lignin/PAN carbon fiber system. The fourth reviewer saw both significant accomplishments to date and planned accomplishments.

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

Reviewers were emphatically positive in their responses to this question. The right people are doing this project, said one. Another cited outstanding relationships and collaboration. A third noted strong collaboration between the two principal companies and anticipated that future efforts will bring in more collaborators. Collaboration between Zoltek and Weyerhauser was rated excellent by a fourth reviewer, who urged continuing connection with ORNL.

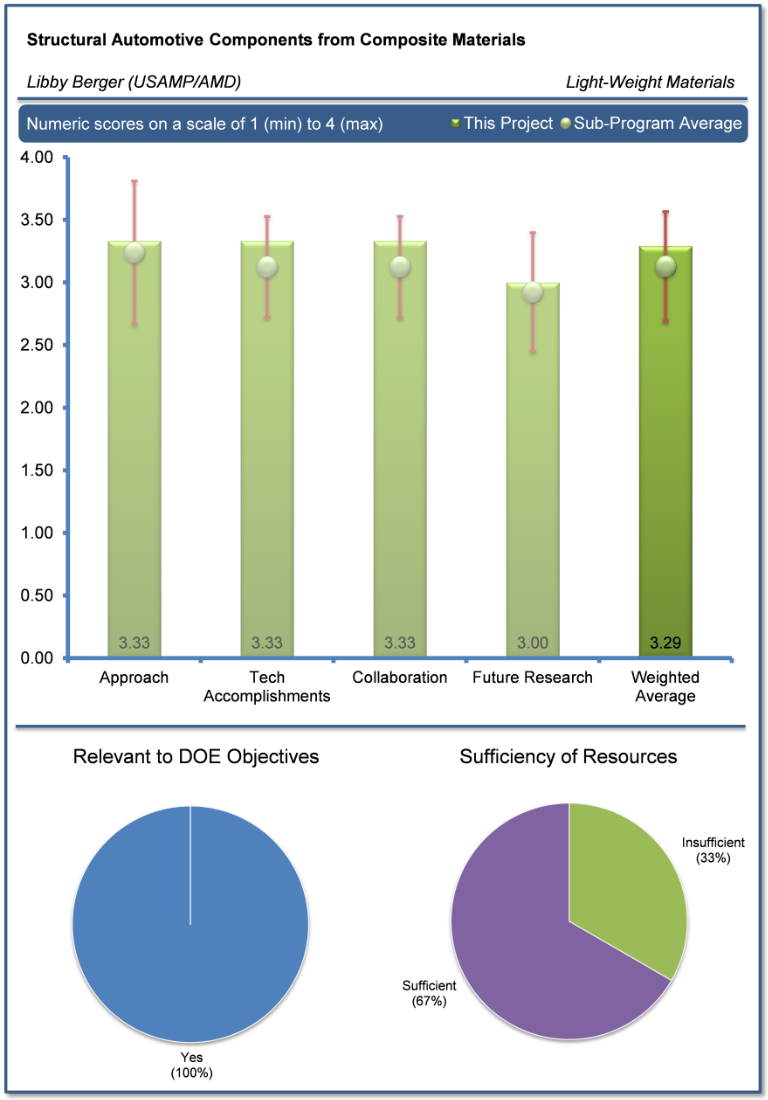
Question 5: Has the project effectively planned its future work in a logical manner by incorporating appropriate decision points, considering barriers to the realization of the proposed technology, and, when sensible, mitigating risk by providing alternate development pathways?

In this area, too, reviewers were strongly positive in their assessments of this project. Comments included very well planned and staffed; great, specific future plans for development; and excellent work plan and meeting milestones stated in the funding opportunity announcement (FOA) 239 solicitation. The fourth reviewer suggested more focused localized X-ray and morphology analysis to get a better picture of what is happening at the molecular level in this process.

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

All four reviewers deemed project resources sufficient. One reviewer termed the project well-staffed; another urged the project team to press on and described the project as well-funded and well-resourced.

Structural Automotive Components from Composite Materials: Libby Berger (USAMP/ACC) – lm049



Reviewer Sample Size

This project was reviewed by three reviewers.

Question 1: Does this project support the overall DOE objectives? Why or why not?

One reviewer said the hybrid scheme for integrating materials shows likely promise, and the research team seems to understand the limitations (fatigue, joining, crash, etc.). Another discerned good scope integrating load floor and seat for weight savings. The third, noting that the project had ended, professed to be at a loss for what to say. Nevertheless, that reviewer said this was a good project that has potential for applications and encouraged DOE to pursue that line of projects.

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

A reviewer expressed regret that time limitations and the absence of the two principal investigators (PIs) limited the reviewer's ability to analyze the approach. The presentation, this reviewer said, was basically we-are-done, here-are-some-results. The reviewer noted that the score is caveated by these limitations. The second said the approach was good and addressed joining and crash barriers. The third felt the approach should be applied to other parts and/or applications such as wind turbines, especially the nacelle and support for the drivetrain.

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

Reviewers had mixed feedback. One reviewer found the background and flow of the project lacking in the presentation. The researchers, this reviewer said, seem to have made good progress and have created some intellectual property, but at least some of it is irrelevant as the project passed it by. This reviewer noted that there has been no commitment by the car companies to move forward, and wondered if there were potential applications to the front end. The second reviewer said good technical accomplishment, but the effort did not and will not result in commercial application in any form. The third reviewer questioned the huge amount of different materials that are in that bottom panel; that seems unrealistic for large production scale.

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

One reviewer cited good collaboration. The other saw almost no mention of the topic in the presentation.

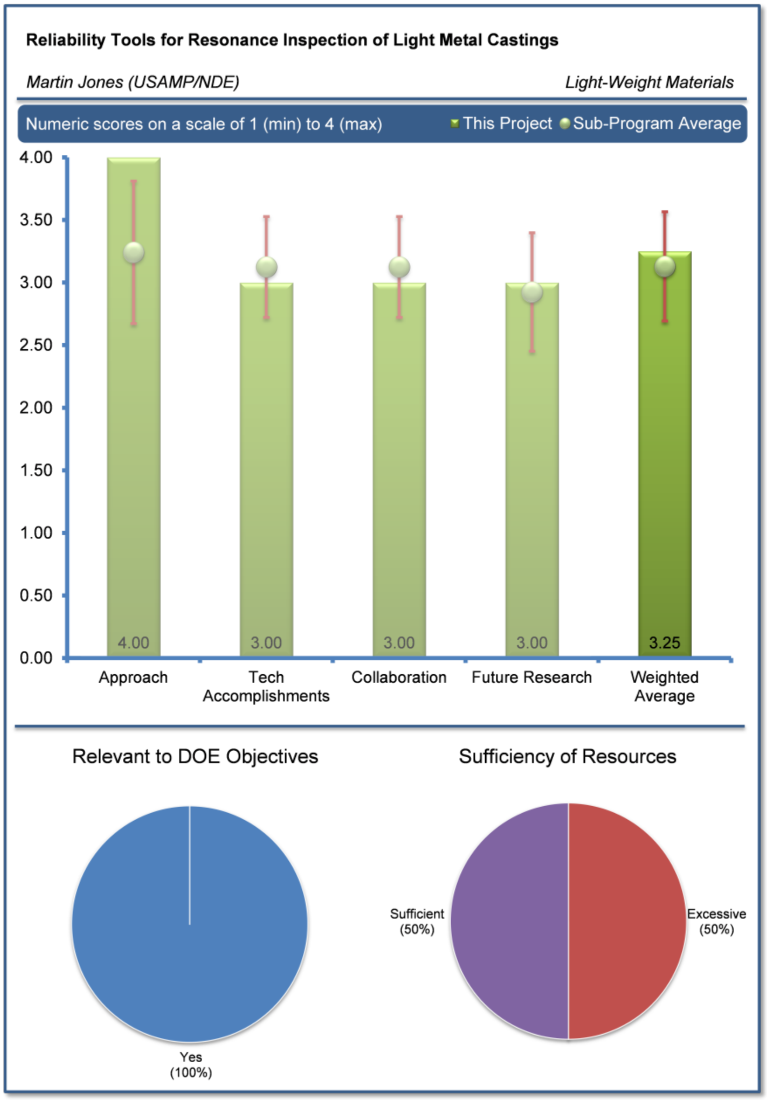
Question 5: Has the project effectively planned its future work in a logical manner by incorporating appropriate decision points, considering barriers to the realization of the proposed technology, and, when sensible, mitigating risk by providing alternate development pathways?

One reviewer called for more projects, saying this line of work is far from finished. The other termed the project dead, with no potential for commercial application. This reviewer called the project a good effort but time and money was somewhat wasted.

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

One reviewer felt resources were insufficient. Two reviewers termed project resources sufficient. One reviewer commented good funding to support sufficient resources. The other reviewer guessed funding to have been sufficient since the project is finished.

Reliability Tools for Resonance Inspection of Light Metal Castings: Martin Jones (USAMP/NDE) – lm050



Reviewer Sample Size

This project was reviewed by two reviewers.

Question 1: Does this project support the overall DOE objectives? Why or why not?

Two reviewers spoke positively about the project. One reviewer noted that better non-destructive evaluation (NDE) tools for lightweight castings, especially for materials like magnesium that are brittle at room temperature, have obvious applications and utility. Knowing whether and how well things lend themselves to NDE is always of high use. The other reviewer asserted that quality control has to be part of DOE's mission, regardless of the field. Quality control of welds is fundamental to lightweighting, but it is necessary to have it done in situ to be fully effective. This project shows that the industry is not there yet. While important, this reviewer concluded, the project is done. Much more needs to be done to ensure this can be used elsewhere.

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 said the project team hit all the points they needed to and expressed personal approval of all the analytical techniques employed. The other, noting that the project had concluded, observed that it was no longer possible to influence the approach. The approach could have benefited from comparisons with other techniques, such as x-ray topography and acoustic emission.

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

Technical accomplishments and progress, in the view of one of the commenters, were commensurate with the stochastic nature of the flaw production and the observation technique. The project, the other reviewer offered, showed one possible way to assess weld quality. There are other techniques, which may or may not prove better than that used in the present study, but there was no indication which one may be used in situ.

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

One reviewer said it was unclear, but that there seemed to have been a complete team.

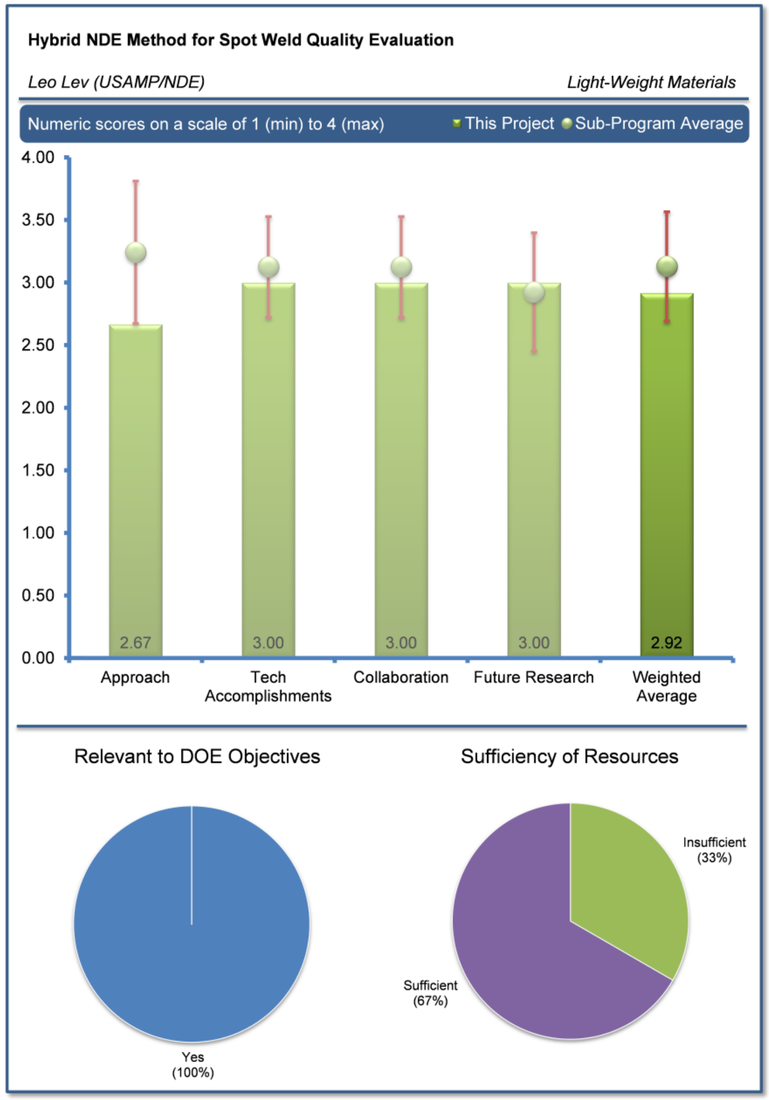
Question 5: Has the project effectively planned its future work in a logical manner by incorporating appropriate decision points, considering barriers to the realization of the proposed technology, and, when sensible, mitigating risk by providing alternate development pathways?

One reviewer said that such a work needs to be pursued, but only with the goal of on-line and in situ testing, so as to not disrupt production.

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

One reviewer inferred that resources must have been sufficient, since the project is over. A second reviewer considered resources to have been excessive, and said they could probably have done much more useful work if they had more time and money.

Hybrid NDE Method for Spot Weld Quality Evaluation: Leo Lev (USAMP/NDE) – lm051



Reviewer Sample Size

This project was reviewed by three reviewers.

Question 1: Does this project support the overall DOE objectives? Why or why not?

One reviewer said the use of multi-materials-based structure is an important solution for energy saving in vehicles. Because spot welding is the most prevalent joining technique in the auto industry, inspection of this joining process is necessary and this project is developing a process to do this. The second reviewer called this a good preliminary study that begs much more work. This reviewer acknowledged that it is important to check spot welds but was unconvinced that this study is sufficient to ensure the quality and the reliability of welds. Work needs to be continued.

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

A reviewer described the work as well planned, and that the problem is well defined with experiments and modeling tasks. The second reviewer felt that comparison with other techniques is essential to establish whether shearography is the tool for on-line testing. The third reviewer found it interesting, but believed the research team is ignoring a number of key variables that would need to be evaluated to ascertain true viability, such as maintaining focus or their over-riding faith in FEA.

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

A reviewer praised the experimental work as rigorous and having produced enough data for model development. A tool has been developed to measure the nugget size in a spot weld; validation of the measurement and the tool has been carried out. A second reviewer noted that work has been confined to the laboratory so far, and a third commented that the project is over.

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

One of the two commenting reviewers approved the degree of collaboration, citing good participation by three OEMs in this USAMP project and the involvement of university researchers, which has helped in development of mathematical models. The other reviewer commented that the collaborator at the University of Oakland is not the best.

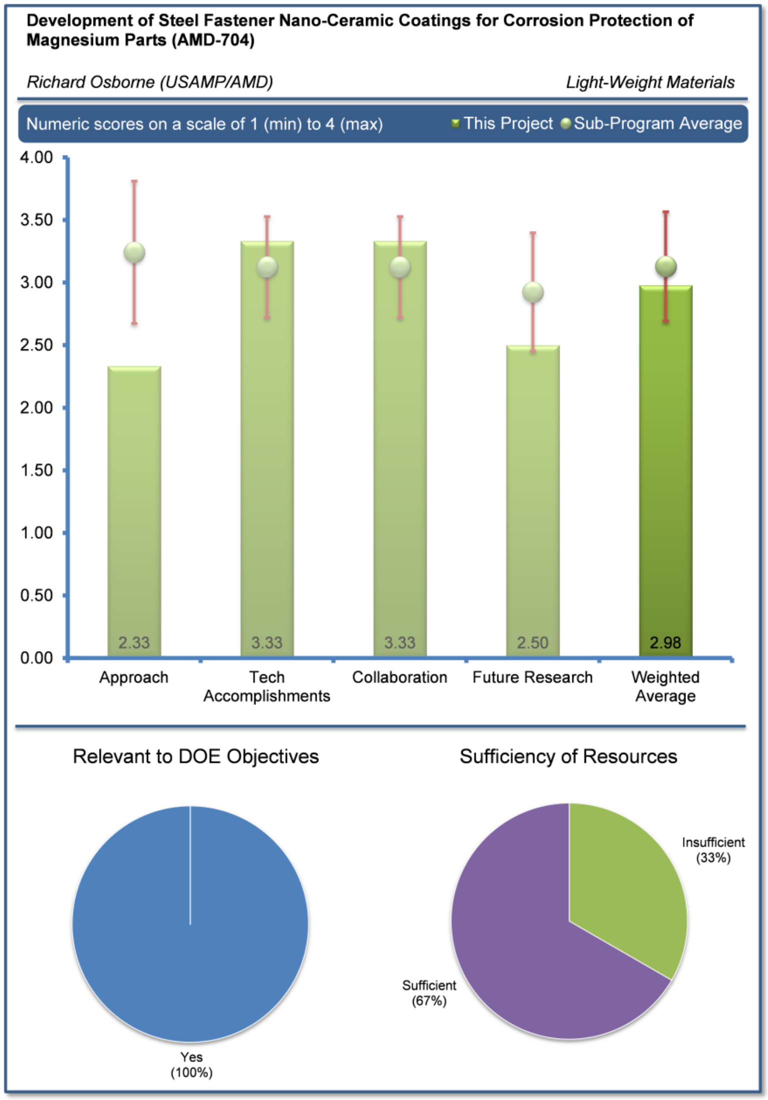
Question 5: Has the project effectively planned its future work in a logical manner by incorporating appropriate decision points, considering barriers to the realization of the proposed technology, and, when sensible, mitigating risk by providing alternate development pathways?

One reviewer urged the project's continuation, as other techniques and broader collaboration are necessary for this to become a success. According to the second reviewer, this project is complete, but the project team has identified the future action plan for implementation of its findings.

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

One reviewer termed resources insufficient. This reviewer commented for feasibility. Two reviewers deemed project resources to have been sufficient.

Development of Steel Fastener Nano-Ceramic Coatings for Corrosion Protection of Magnesium Parts (AMD-704): Richard Osborne (USAMP/AMD) – lm052



Reviewer Sample Size

This project was reviewed by three reviewers.

Question 1: Does this project support the overall DOE objectives? Why or why not?

One reviewer said that use of magnesium in vehicle structure will reduce the mass and thus enable increased fuel efficiency. One of the major impediments to the use of magnesium is the high corrosion rates the metal experiences when joined to steel structures due to galvanic corrosion. This work is developing methods to reduce this problem, which will enable wider use of magnesium in structures. Another reviewer said that coatings to protect magnesium parts from corrosion are an obvious solution to a major factor inhibiting application of magnesium in automotive bodies. A third reviewer said yes, in the sense that it would enable the use of lighter materials than steel. However, this reviewer was not persuaded that nanocoatings are necessary, speculating that they have intermediate results between micro- and nanocoatings, but the presentation, as it stands, does not satisfy this reviewer.

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

Reviewers had mixed input on the project's approach. The approach to solving the problem of galvanic current is good, in the opinion of one reviewer, but could have been better. Rather than making a lot of different coatings, this reviewer suggested the team would have been better advised to pick one specific coating and work on eliminating these currents by refining the deposition technique and ensuring that there are no possible paths for these currents. Another reviewer felt there was poor justification for using nanomaterials for this application. The research team, in this view, did not investigate the coating microstructure to look for density or any microstructural issues that might be controlling behavior. The last reviewer identified the objective as the reduction of galvanic coupling between steel and magnesium when joined using a fastener. However, the experimental work had only magnesium sheet joined with the new fastener and the reviewer did not see how this addresses the question of coupling between steel and magnesium.

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

One reviewer felt the coating process had been well selected and the results were encouraging but felt more work is needed to determine the durability of the coating and a more rigorous cost analysis should be done. Another reviewer, noting the project had ended, said more needs to be done, as this is an important consideration for combining lighter materials. The other reviewer said the team had made some rudimentary observations, but the real issue of reliability was a can kicked down the road.

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

Two reviewers commented, agreeing in general. The team, said one, was complete and well integrated. As with any other USAMP project, said the second, participation from the three OEMs is good; also, the team consists of suppliers, users and university, making the supply chain complete.

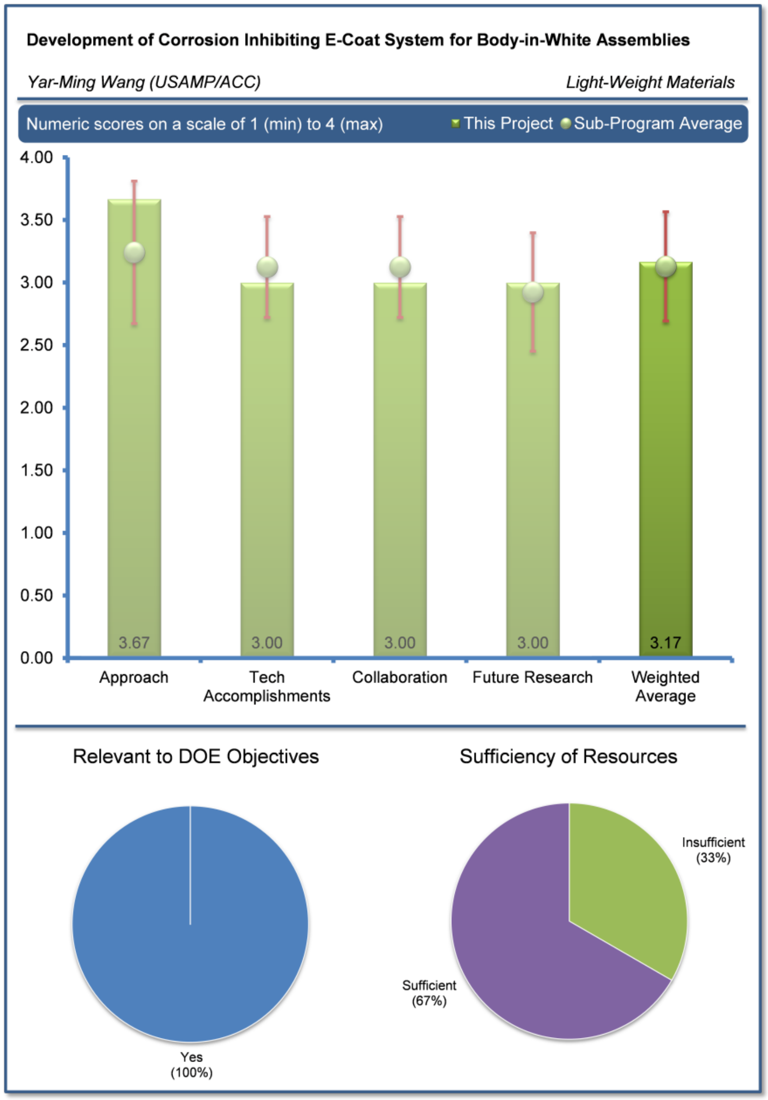
Question 5: Has the project effectively planned its future work in a logical manner by incorporating appropriate decision points, considering barriers to the realization of the proposed technology, and, when sensible, mitigating risk by providing alternate development pathways?

One reviewer noted that this project is complete, and no further work is funded. The team has identified the future developments required for the implementation of this project’s findings. The second reviewer recommended that this line of work be pursued, as corrosion is a critical problem.

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

One reviewer found funding was insufficient. Two reviewers thought resources had been sufficient, with one reviewer commenting that funding must have been sufficient since the project is over.

Development of Corrosion Inhibiting E-Coat System for Body-in-White Assemblies: Yar-Ming Wang (USAMP/ACC) – lm053



Reviewer Sample Size

This project was reviewed by three reviewers.

Question 1: Does this project support the overall DOE objectives? Why or why not?

One reviewer noted that use of multi-materials in the structure is necessary to optimize the weight of the vehicle, making it possible to improve its fuel efficiency. This project, the reviewer opined, is developing a technology which can make the process much easier and cheaper. The second reviewer called corrosion a critical problem to be solved to achieve lighter-weight vehicles, and so felt this project supports DOE's objectives. Describing corrosion as such a vast and complicated problem, the reviewer said it must be on DOE radar's screen for a long time and that DOE must commit to efforts beyond those of this project. The third reviewer observed that multi-material ecoats will be needed for multi-material bodies-in-white, and might have spillover benefits, such as isolating corrosively active joints by encapsulation rather than needing to resort to individual isolation.

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 called the project well planned and the problem well defined. According to this reviewer, the galvanic coupling problem due to multi-material joints is well explained. The experimental work has covered all aspects of the problem and various solutions have been tested.

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

A reviewer commented that the work has tested various combinations and the results are quite encouraging. The technology should be tested on a larger scale to validate the outcomes. If fully developed, this can be a game-changer in the use of multi-material structure.

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

One reviewer noted that the team consists of OEMs, a material supplier and a university, which is good. This enables easy technology transfer.

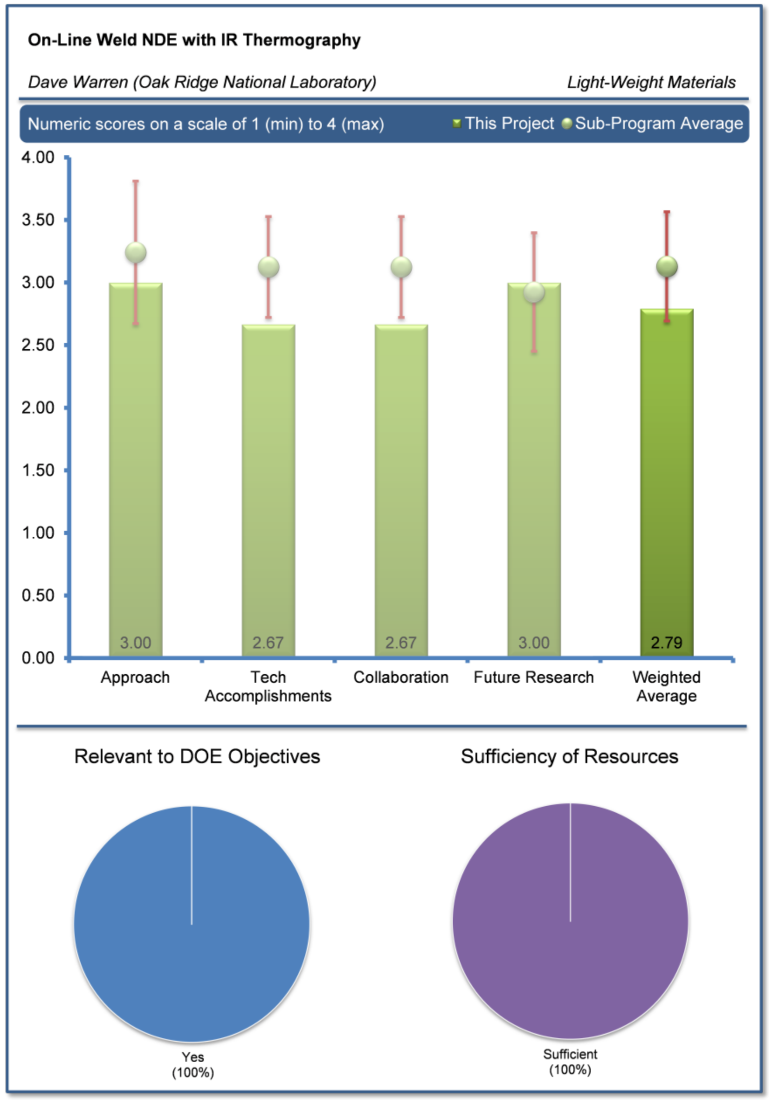
Question 5: Has the project effectively planned its future work in a logical manner by incorporating appropriate decision points, considering barriers to the realization of the proposed technology, and, when sensible, mitigating risk by providing alternate development pathways?

One reviewer noted that the project is complete, and said the proposed testing of the coating process in a demonstration structure is good. Another reviewer called for the restructuring of research on corrosion for industrial applications with the help of all interested parties.

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

One reviewer characterized project resources as insufficient, and two reviewers found resources sufficient.

On-Line Weld NDE with IR Thermography: Dave Warren (Oak Ridge National Laboratory) – lm054



Reviewer Sample Size

This project was reviewed by three reviewers.

Question 1: Does this project support the overall DOE objectives? Why or why not?

One reviewer offered the opinion that robust evaluation of spot welds without destructive teardown testing indirectly supports the goal of petroleum displacement by making manufacturing of lightweight spot-welded body structures more robust and cost-effective. A second called this project's focus an enabling technology for on-line quality control of automotive manufacturing using AHSS for vehicle lightweighting. The third noted that joining is an enabling technology for lightweight metals and nondestructive evaluation is an important element of moving forward with lightweight steels and aluminum.

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

Two reviewers endorsed the approach, one calling the technical approach sound, the other terming it a good approach to investigate the non-destructive evaluation of two touch and three touch spot welds of high strength and ultra-high strength steels. The second reviewer also noted one aspect of the approach in particular, saying the prioritization of weld attributes and potential defects is a good addition to the approach for a robust NDE method, but wanted to learn if the detection algorithm would have to be developed for each stack-up in the entire body or structure. The third reviewer asserted this work replicates similar technology developed in 1995 by Thermal Wave Imaging using their Ecotherm process employing a heating source and an infrared (IR) camera to look at heat decay in a resistance spot weld (RSW) without the need to paint the surface black. The company also investigated inspecting an e-coated surface. This reviewer deemed it unfortunate that this project is a replication of work done in the past and urged a literature search be performed to see what has been done, to learn from it and improve upon what has been done to date in this project.

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

The first reviewer cited good progress and noted the project is on schedule. From the second reviewer's perspective, the biggest new development is staring at welds from oblique angles, whereas such systems in the past required this be done perpendicular to the surface. This reviewer singled out a look-up table for weld quality for praise as an excellent part of this program and the research and encouraged continued effort on this aspect of the work. The presentation, said the final reviewer, detailed good progress toward the goals of robust NDE for spot welds. Correlation of the NDE signature to weld size is a good start for the full system. However, calibration for every stack-up in a vehicle will be daunting if this is required. The reviewer wanted to see more details on the temperature increases required to get a good signal and felt there was a lack of detail on the surface conditions and emissivity sensitivity of the results. Effort on the reduced-cost IR camera was good, but this is still expensive for all but critical welds.

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

One reviewer said the list of collaborators is good but saw no mention of their specific contributions and interactions, about which more information was desired. The second reviewer likewise was unsure how much OEM input is involved. The third cited excellent direction and overall progress, and encouraged the research team to contact Thermal Wave Imaging Inc. to make sure both are looking at the same opportunities to implement this technology.

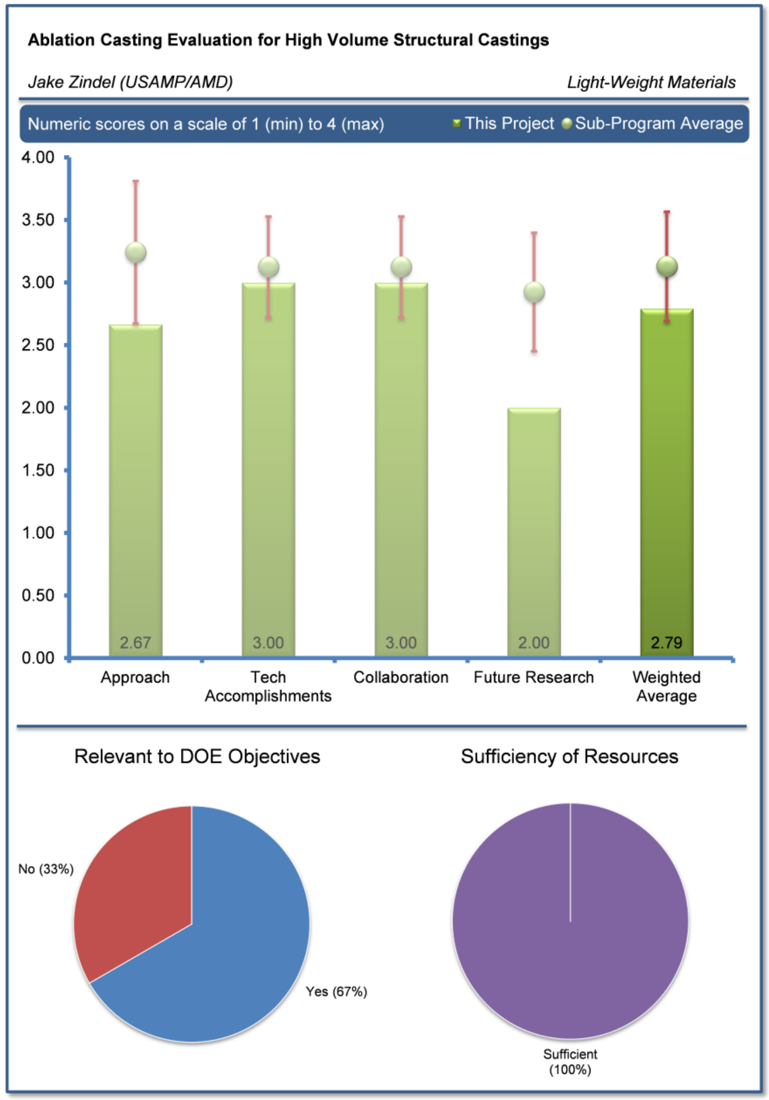
Question 5: Has the project effectively planned its future work in a logical manner by incorporating appropriate decision points, considering barriers to the realization of the proposed technology, and, when sensible, mitigating risk by providing alternate development pathways?

The proposed future work is reasonable, in the view of one reviewer, but lacking in details on the joints, materials and robustness metrics. Another reviewer cited the need to demonstrate the technique in an actual production environment. The third felt that less future research should be needed, but identifying a supplier to develop and replicate a system that is production capable is the next step.

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

All three reviewers considered resources to be sufficient. One reviewer termed them sufficient for the timing and goals. The other recommended continuing this research to a conclusion, but suggested it go into a commercialization mode, and then only for welding aluminum.

Ablation Casting Evaluation for High Volume Structural Castings: Jake Zindel (USAMP/AMD) – lm055



Reviewer Sample Size

This project was reviewed by three reviewers.

Question 1: Does this project support the overall DOE objectives? Why or why not?

Reviewer opinions on this question varied. One reviewer said that any casting technique that improves the cast quality fits DOE's objectives. Stronger materials lead to lighter parts because less material is required to satisfy the specifications. Another reviewer noted that as more and more light-metal (aluminum, magnesium) components are used in vehicles, the demand for high-integrity castings will also increase. Ablation is one of the emerging processes to produce high-strength, light metal castings. The third commenter said that the presentation really did not reveal the broad-based benefits of this technology.

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

One reviewer noted that the project had validated the process for repeatability and reliability and that this project supports another current project by the team. The cost modeling is one of the required project tasks and the feasibility of mass production has been evaluated. The second reviewer commented that this project's purpose is confusing. This reviewer inquired whether the project team checks out technologies like this on the project team's dime all the time. The third reviewer speculated that the real approach may well be better than was presented.

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

One reviewer said that a wrought alloy such as 6061 aluminum has been cast using conventional process, making it unique. As this aluminum alloy is susceptible for hot tearing, it is difficult to cast; this project proves the viability of ablation casting. According to this reviewer, comparing alloy A356 with the wrought alloy may not be appropriate; it would have been better if the properties of wrought alloy were provided.

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

A reviewer commented that this project partnered with another current project on ablation, hence, in the reviewer's opinion, it has many partners, including the supplier and end users.

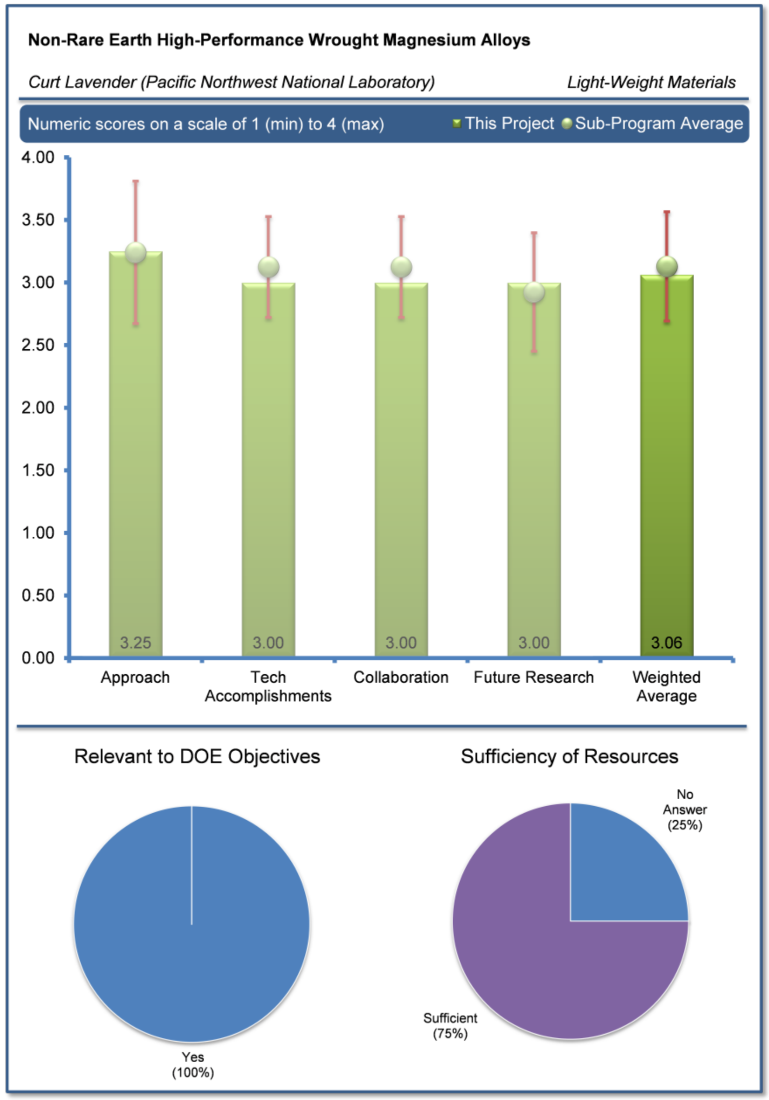
Question 5: Has the project effectively planned its future work in a logical manner by incorporating appropriate decision points, considering barriers to the realization of the proposed technology, and, when sensible, mitigating risk by providing alternate development pathways?

One reviewer offered the opinion that additional work needs to be done to validate such a casting technique. A second reviewer noted the project has been completed.

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

All reviewers deemed project resources sufficient.

Non-Rare Earth High-Performance Wrought Magnesium Alloys: Curt Lavender (PNNL) – lm056



Reviewer Sample Size

This project was reviewed by four reviewers.

Question 1: Does this project support the overall DOE objectives? Why or why not?

All four reviewers agreed that this project supports DOE's petroleum displacement goals directly and/or indirectly. One cited the need for new magnesium alloys' high strength/ductility for automotive lightweighting. The second noted the project is targeted at enabling more use of magnesium which will in turn lower vehicle mass and increase efficiency. The third noted the strength limitations of magnesium which inhibit the number of its automotive applications. Success of this work, the reviewer predicted, will develop a high-strength magnesium alloy which will increase strength and reduce vehicle weight by expanding the number of automotive applications in which high-strength steel can be replaced with lightweight, high-strength aluminum. The last reviewer described non-rare earth (RE) magnesium alloys as an enabling technology to reduce the cost of magnesium and allow vehicle weight reduction, reducing dependence of foreign petroleum and thus supporting the DOE/Vehicle Technologies Program (VTP) goals.

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 said this work nicely parallels what others in the industry are trying to achieve and complements much-needed R&D on non-RE magnesium alloys. This work should continue as planned. The second reviewer commented good focus, but does not comprehend the auto industry application. Energy absorption would be important for crash cans, whereas the bumper beam (the targeted application) needs the strength to transfer load to the crash cans. Even with somewhat improved energy absorption of the magnesium alloy, it would not be as suitable for crash can use as aluminum or similar materials. The last reviewer agreed that the approach is good, but felt there was some distraction in attempting to develop an energy-absorbing magnesium alloy. However, the work to develop a high-strength magnesium alloy, in this reviewer's opinion, is outstanding. The work must address reduction in corrosion resistance of magnesium alloys with manganese additions. The weldability of magnesium alloys, on the other hand, is improved by manganese additions.

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

One reviewer remarked very good results to date, incorporating past research and applying them to current commercial needs based on Magnesium Front End lessons learned to develop tailored material properties for extrusion application. The second urged the research team to narrow down to potential new alloy systems with high strength/ductility soon. The third reviewer observed that the presentation described work on both RE and non-RE alloys encouraged the team to try to direct the primary R&D to the non-RE magnesium alloys and to continue the R&D. This reviewer emphasizes future work in modeling and verification or the texture grain orientation as an ICME tool.

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

One reviewer cited great interaction with Magna, MENA and the project's interface with OEMs, urging that the dialogue with them be kept open as alloy development progresses. The other felt that appropriate partners are identified, but that they were not deeply involved.

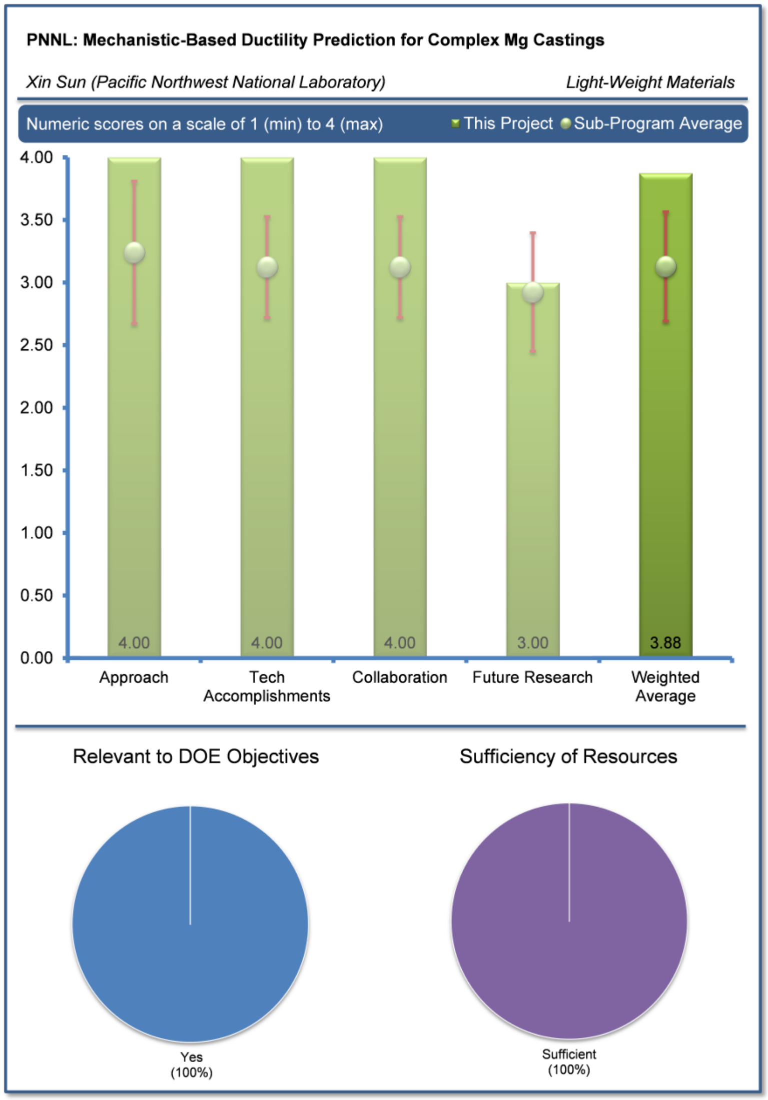
Question 5: Has the project effectively planned its future work in a logical manner by incorporating appropriate decision points, considering barriers to the realization of the proposed technology, and, when sensible, mitigating risk by providing alternate development pathways?

One reviewer noted a good plan to go forward. This reviewer sees the need to focus on application needs rather than attempting to develop ultinimium to have high strength, high elongation, and high-energy absorption. Need to refine focus on the application, replacing extruded Al and boron-steel. The second reviewer noted a good research plan and target to engineer Mg alloys by design.

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

Three reviewers described resources as sufficient. One reviewer commented an appropriate amount of funding to continue this research effort.

PNNL: Mechanistic-Based Ductility Prediction for Complex Mg Castings: Xin Sun (Pacific Northwest National Laboratory) – lm057



Reviewer Sample Size

This project was reviewed by one reviewer.

Question 1: Does this project support the overall DOE objectives? Why or why not?

The reviewer commented supporting lightweight magnesium casting applications.

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

There were no comments submitted.

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

There were no comments submitted.

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

There were no comments submitted.

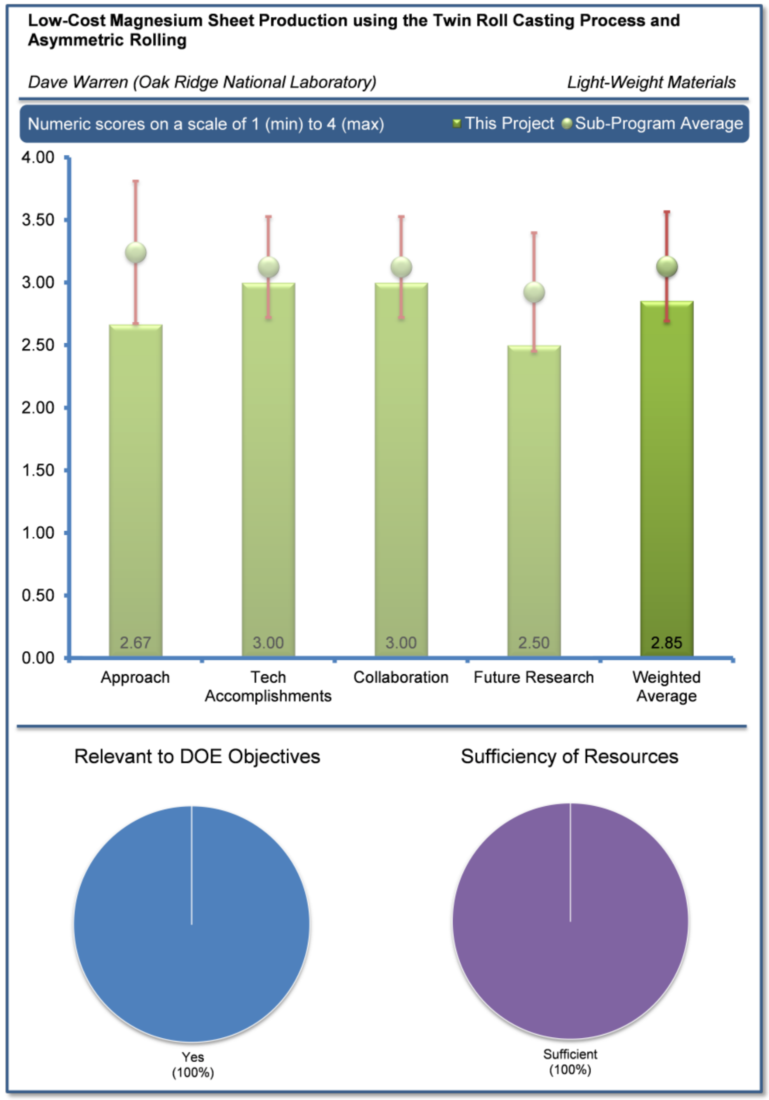
Question 5: Has the project effectively planned its future work in a logical manner by incorporating appropriate decision points, considering barriers to the realization of the proposed technology, and, when sensible, mitigating risk by providing alternate development pathways?

There were no comments submitted.

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

The reviewer found resources sufficient.

Low-Cost Magnesium Sheet Production using the Twin Roll Casting Process and Asymmetric Rolling: Dave Warren (Oak Ridge National Laboratory) – lm058



Reviewer Sample Size

This project had a total of three reviewers.

Question 1: Does this project support the overall DOE objectives? Why or why not?

One reviewer said it is relatively obvious that affordable magnesium sheet with enhanced properties would be of use in advancing the goals of the program. The second reviewer remarked lightweighting with magnesium applications. The third said the project addresses anisotropic material properties in wrought alloys.

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 said it would have been nice to see how this work slots into existing work in this field and what is novel here versus other current efforts. The second reviewer called for a more focused approach, citing a lot of activity, many alloys, heated rolls, but a very small sample and no real plan.

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

The first reviewer discerned some interesting results to compare to the work of others. The second reviewer noted good progress on equipment procurement, but little accomplishments.

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

One reviewer noted good collaboration with a machinery supplier, to whom it appeared there was minimal collaboration with Magnesium Electron. To this reviewer it also appeared there was no collaboration or pull from industry, which is working on alloy development to address anisotropy. The other reviewer wondered whether the project team had re-invented the wheel or whether the implementers had been in contact with other groups doing similar work.

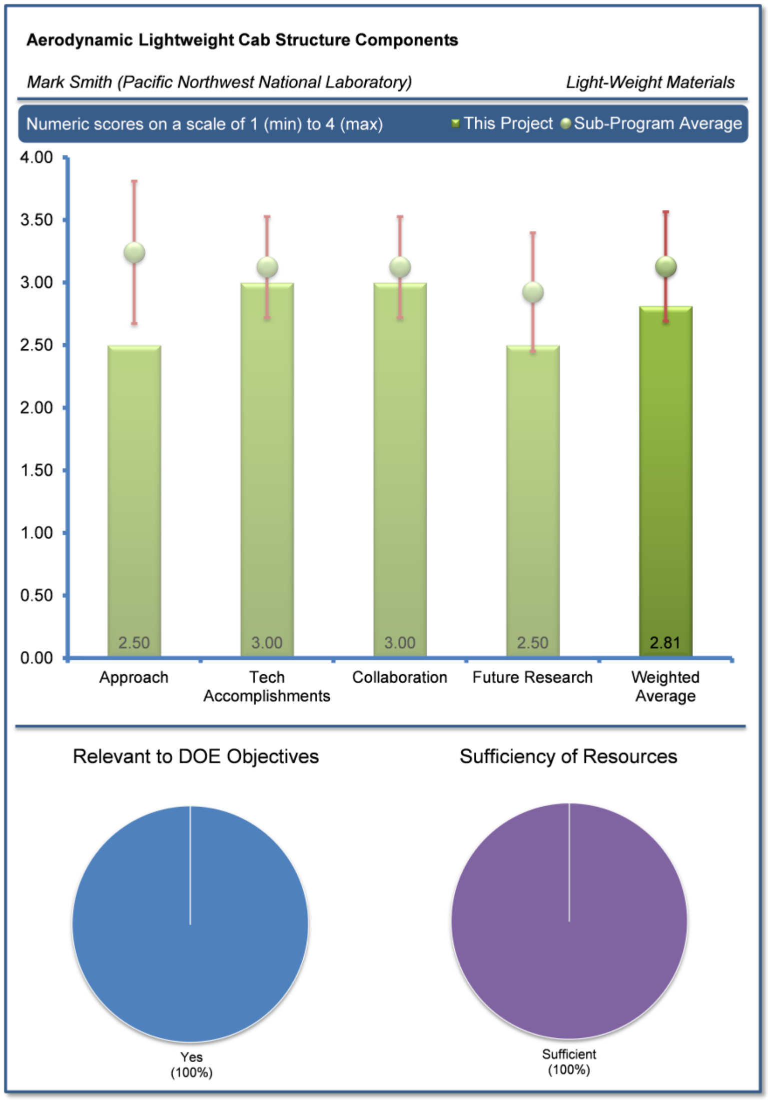
Question 5: Has the project effectively planned its future work in a logical manner by incorporating appropriate decision points, considering barriers to the realization of the proposed technology, and, when sensible, mitigating risk by providing alternate development pathways?

One reviewer felt the presentation left the details unclear as to exactly where the project team is going to make this controllable or predictable. The other reviewer urged development of a plan to determine the benefit, commercial feasibility and cost. Shear rolling is limited to individual sheets versus roll product, which most probably will not be cost-effective for automotive use.

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

All three reviewers deemed resources sufficient. One said the project needs to focus its resources toward specific goals.

Aerodynamic Lightweight Cab Structure Components: Mark Smith (Pacific Northwest National Laboratory) – lm060



Reviewer Sample Size

This project was reviewed by two reviewers.

Question 1: Does this project support the overall DOE objectives? Why or why not?

Reducing the weight of heavy vehicles may not be the top priority, one reviewer commented, but any development in the aluminum sheet forming process is an enabler for the economic use of this material in vehicles. The second reviewer stated lightweighting.

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

One reviewer commented more engineering work than scientific development.

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

One reviewer said the research team had identified the issue in achieving the property goals; tested several variables (forming temperature, quenching and ageing cycles) and assessed the performance of the part and material.

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

A reviewer noted that an end user (PACCAR), auto Tier 1 supplier (Magna) and material supplier (Novelis) are involved, along with the research team. This completes the supply chain and will enable an effective technology transfer.

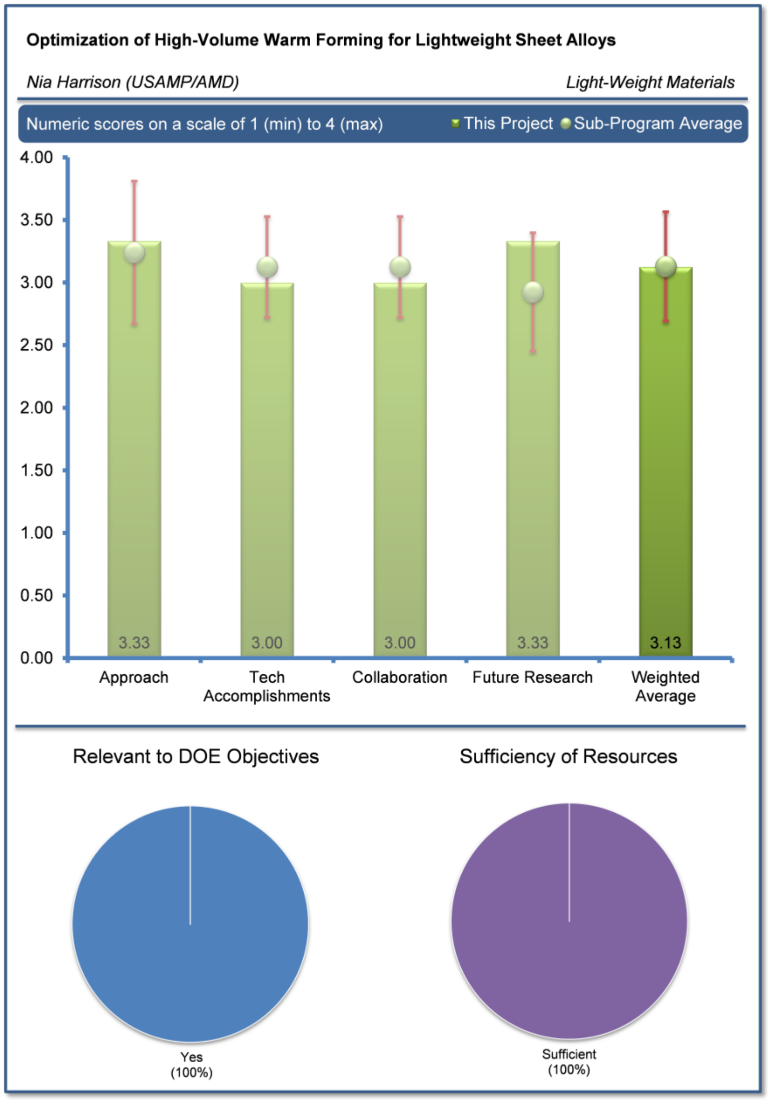
Question 5: Has the project effectively planned its future work in a logical manner by incorporating appropriate decision points, considering barriers to the realization of the proposed technology, and, when sensible, mitigating risk by providing alternate development pathways?

One reviewer called for more scientific and innovative research. The second reviewer noted that no plan for the next year’s work is provided, and that discussions are undergoing with industrial partners for demonstration of parts. This reviewer would like to know what will be the work to be carried out at PNNL.

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

Reviewers felt project resources to be sufficient. One reviewer reiterated the question of what the role of PNNL would be in the next year’s work.

Optimization of High-Volume Warm Forming for Lightweight Sheet Alloys: Nia Harrison (USAMP/AMD) – lm061



Reviewer Sample Size

This project was reviewed by three reviewers.

Question 1: Does this project support the overall DOE objectives? Why or why not?

Two reviewers expressed the view that this work is supportive of DOE’s overarching goal of fuel conservation. One said light metals can significantly contribute to the weight reduction of vehicles. Forming of aluminum is important in making parts and this project is developing understanding in the area of warm forming. The other said manufacturing and weight saving is doubly supportive of DOE’s objectives. The third reviewer observed that enhanced formability of lightweight aluminum sheet under conditions that tend to produce failures treats a problem encountered with aluminum.

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 called this well planned work; the experimental trials have simulated actual manufacturing conditions, making it easy for adaptation. Also, many aspects have been incorporated into the project plan, including experiments, data collection and modeling. The second reviewer termed the project basic but effective. The punch appears to be as much a challenge as the manufactured parts.

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

Reviewers offered positive comments, one citing good results and calling the projects very promising and urging its continuation. The results, the second reviewer said, indicate the feasibility of the process and noted that guidance has been developed for the tool design.

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

A reviewer said the research team has developed an excellent partnership with many suppliers and users.

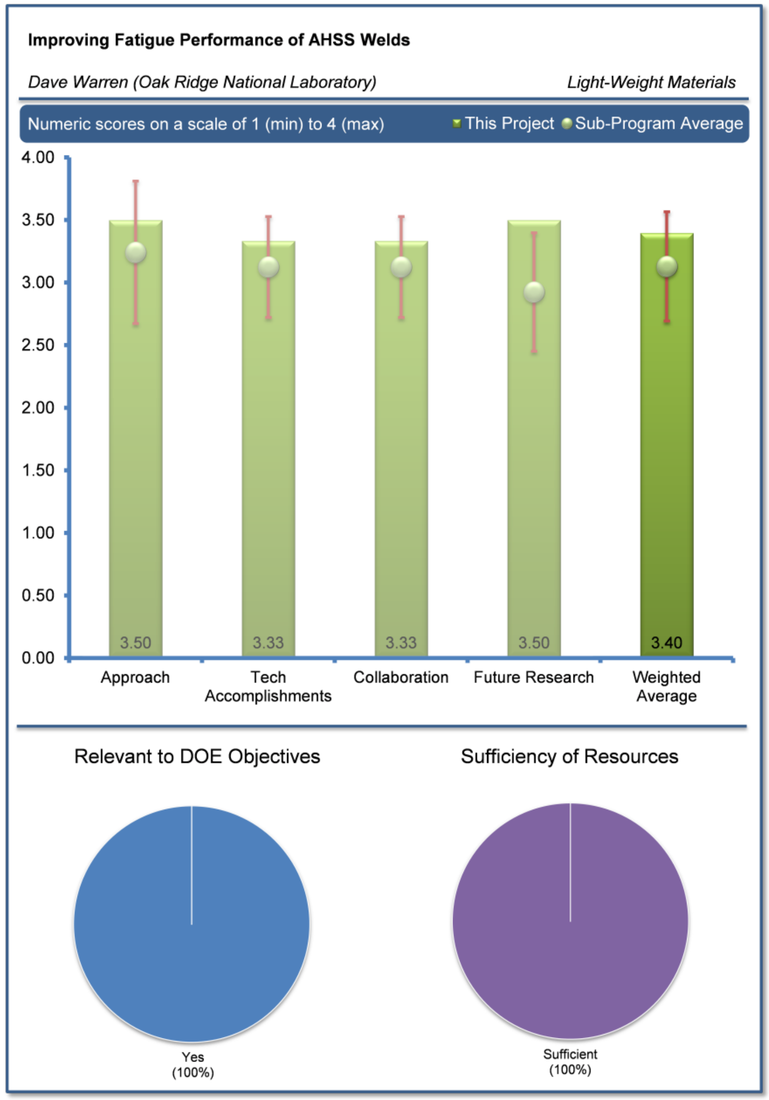
Question 5: Has the project effectively planned its future work in a logical manner by incorporating appropriate decision points, considering barriers to the realization of the proposed technology, and, when sensible, mitigating risk by providing alternate development pathways?

The research team has identified the gaps to be filled in before the process is implemented in actual production, one reviewer said, and some possible paths have been suggested. Another reviewer expressed hope that the effort will be continued.

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

All three reviewers deemed project resources to be sufficient.

Improving Fatigue Performance of AHSS Welds: Dave Warren (Oak Ridge National Laboratory) – lm062



Reviewer Sample Size

This project was reviewed by four reviewers.

Question 1: Does this project support the overall DOE objectives? Why or why not?

All reviewers appeared to believe the project supports DOE goals. One reviewer said that as an enabler of AHSS implementation, fatigue testing of joints and weldments will lead to wider application of lightweight steels, reducing weight, improving fuel economy and reducing dependence on imported petroleum. A second said that understanding what adversely impacts the fatigue life of AHSS, and finding ways to extend that fatigue life, will enable better use of the improved properties of AHSS. Currently, this limits application of some AHSS and causes less than mass-optimized designs. A third comment was that weld fatigue durability is key to lightweighting, providing an opportunity to reduce safety factor, which drives gauge reduction. The final reviewer said enabling the use of AHSS in automotive lightweighting.

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 said the approach is very good -- reviewing past literature and understanding the problem prior to engagement and proving your initial assumptions are true. When successful, added this reviewer, initial assumptions no longer fit the needs and thes are not implemented. The second reviewer termed the project an interesting and promising assessment of cause of current fatigue life deficiency, and an investigation of means to assess residual stress and to increase residual compressive stress. The final commenter described the project as very relative welding work applicable to high-volume processing of AHSS.

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

Two of the three reviewers were impressed by the project's accomplishments and progress. One called the initial results very encouraging and said it is refreshing to see time spent planning the project. The second reviewer said the data behind this work is well received, considered valuable and usable by the automotive industry. The last reviewer remarked using the low-temperature transformation to reduce tensile stress.

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

The first reviewer commented excellent collaboration between Fatigue and Fracture Research Laboratory (FFRL), OEMs and academia. A second reviewer commented seems like appropriate choice of partners, each with clearly defined roles and responsibilities. A third reviewer noted very good vertical alignment of participants to solve problem: scientist, steel supplier, weld process and weld wire.

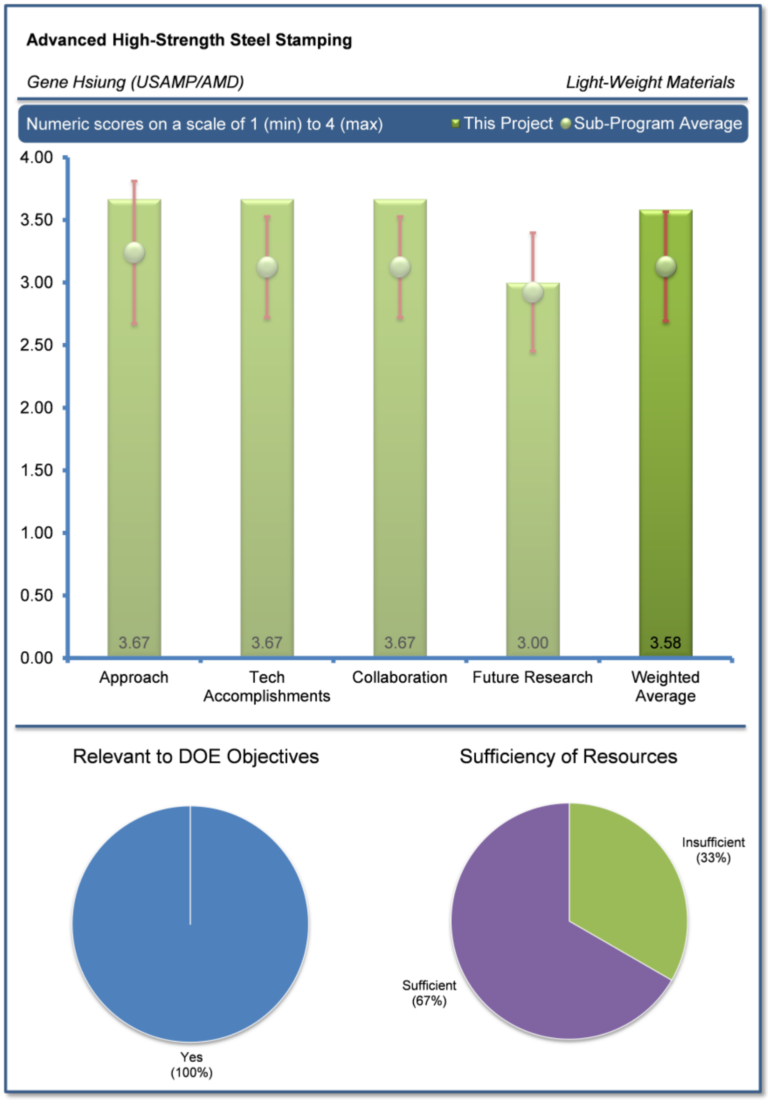
Question 5: Has the project effectively planned its future work in a logical manner by incorporating appropriate decision points, considering barriers to the realization of the proposed technology, and, when sensible, mitigating risk by providing alternate development pathways?

Reviewers concurred in their positive assessment of the future direction of project effort. One cited good direction and focus. Another cited a very good plan to identify solutions to meet project objectives, and the third said good progress toward future and endorsed continuation of the work.

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

The reviewers were unanimous in considering project resources sufficient. One reviewer remarked resources seem sufficient, and a second reviewer commented this project is appropriately funded for the research being delivered.

Advanced High-Strength Steel Stamping: Gene Hsiung (USAMP/AMD) – lm063



Reviewer Sample Size

This project was reviewed by three reviewers.

Question 1: Does this project support the overall DOE objectives? Why or why not?

One reviewer said this project shows clear relevance to greater implementation of AHSS through investigation of the primary limiting factors, cracking at stress risers and springback. The second, calling stamping the workhorse of the auto industry, agreed that the use of AHSS is in DOE's objective for lightweighting.

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

A reviewer called the approach good and well thought out. The team is steadily working on achieving good stamping characteristics. However, materials batches consistencies have so far been problematic; perhaps such work is premature. It is good to try something, this reviewer acknowledged, but if the material is not sufficiently known, perhaps it is time to try something new. Moreover, using conventional dies, i.e., for standard steel materials may not be appropriate for AHSS. A new die material and/or new die design may be required to make this work. More thought should be given before starting a new project of the kind. The second reviewer noted there had been a full range of tests with a good amount of innovation for fixing things, but not much work had been done on what the researchers say is the real problem – springback. The last reviewer said this project was focused on the technical barriers to understanding how to address edge fracture and evaluate local softening techniques.

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

All reviewers offered general approval of project accomplishments. One said the accomplishments and results supported the objectives and approach and will advance the understanding and state of the art for AHSS stamping. Another said the project seems to have developed some insights, but springback seems to be the killer. The third reviewer said in view of the tooling used, the results are very good.

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

A reviewer noted that the project included a key contributor from major OEMs, material suppliers, software designer and universities.

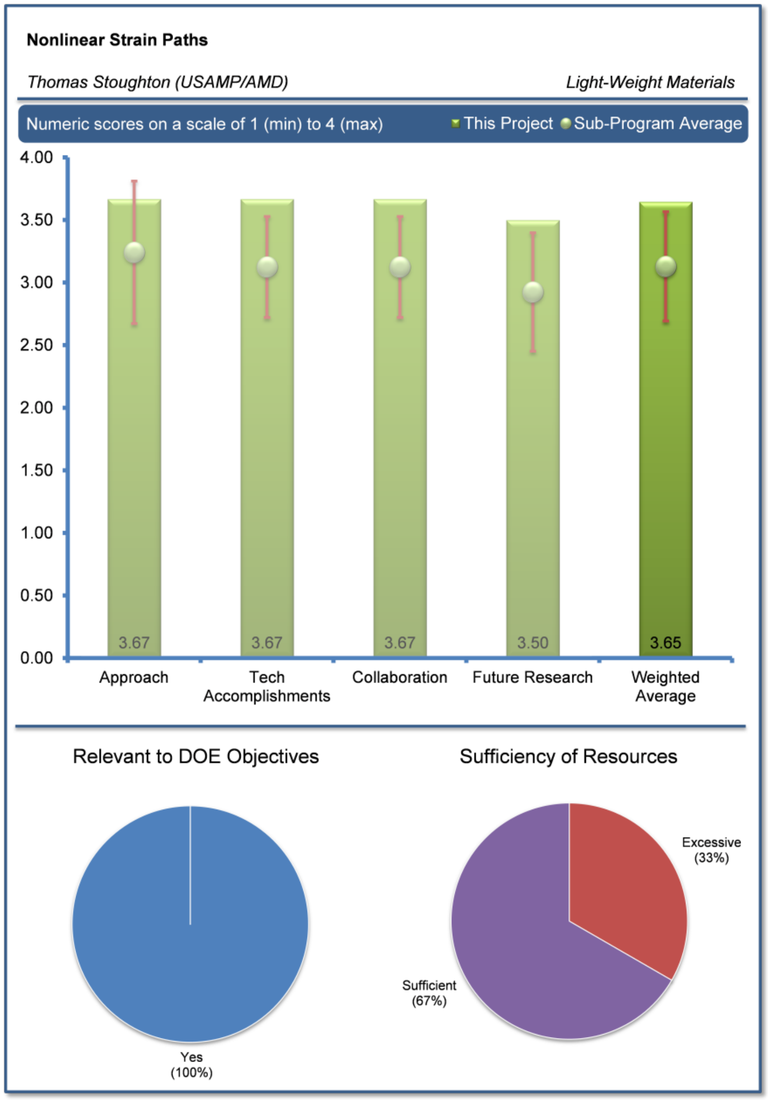
Question 5: Has the project effectively planned its future work in a logical manner by incorporating appropriate decision points, considering barriers to the realization of the proposed technology, and, when sensible, mitigating risk by providing alternate development pathways?

One reviewer expressed the hope that there will be future research, not only on AHSS materials, but also on die materials and design.

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

One reviewer called resources insufficient. This reviewer said that working on new die material and/or new die design is expensive, clearly indicating that funding is insufficient. Such work offers great promise, not only for the auto industry, but elsewhere. The reviewer termed this enabling work. Two reviewers termed resources sufficient.

Nonlinear Strain Paths: Thomas Stoughton (USAMP/AMD) – lm064



Reviewer Sample Size

This project was reviewed by three reviewers.

Question 1: Does this project support the overall DOE objectives? Why or why not?

Two reviewers affirmed that this project is supportive of DOE's goal. Yes, one said, the project objectives target greater implementation of AHSS which supports the lightweighting mission which improves fuel economy and thus petroleum displacement. The other said the project, by enabling the use of stronger materials as replacements for standard ones, and creating lighter structures, is in line with DOE's objective of petroleum displacements.

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

All reviewers commented favorably on the work approach. Very focused and innovative work, one offered, and a lot of work. The tube expansion test has problems with bending and the introduction of non-uniform material properties due to the presence of the weld. The approach, as described by the second reviewer, aims to better understand and take credit for the hardening behavior of existing materials in modeling to improve design efficiency as well as reducing the validation time to implementation. The third reviewer praised the work as solid.

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

One reviewer said the technical accomplishments and results presented showed significant progress in understanding non-linear strain paths and showed numerous cases of unexpected material behavior that required further investigation. The second reviewer noted that the project team has gathered quite a bit of data, and it is nice that the OEMs intend to continue the analysis. The third, noting the project had been completed, said the team had achieved everything.

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

A reviewer noted that the project included a key contributor from major OEMs, material suppliers, software designer, universities, and a Federal laboratory.

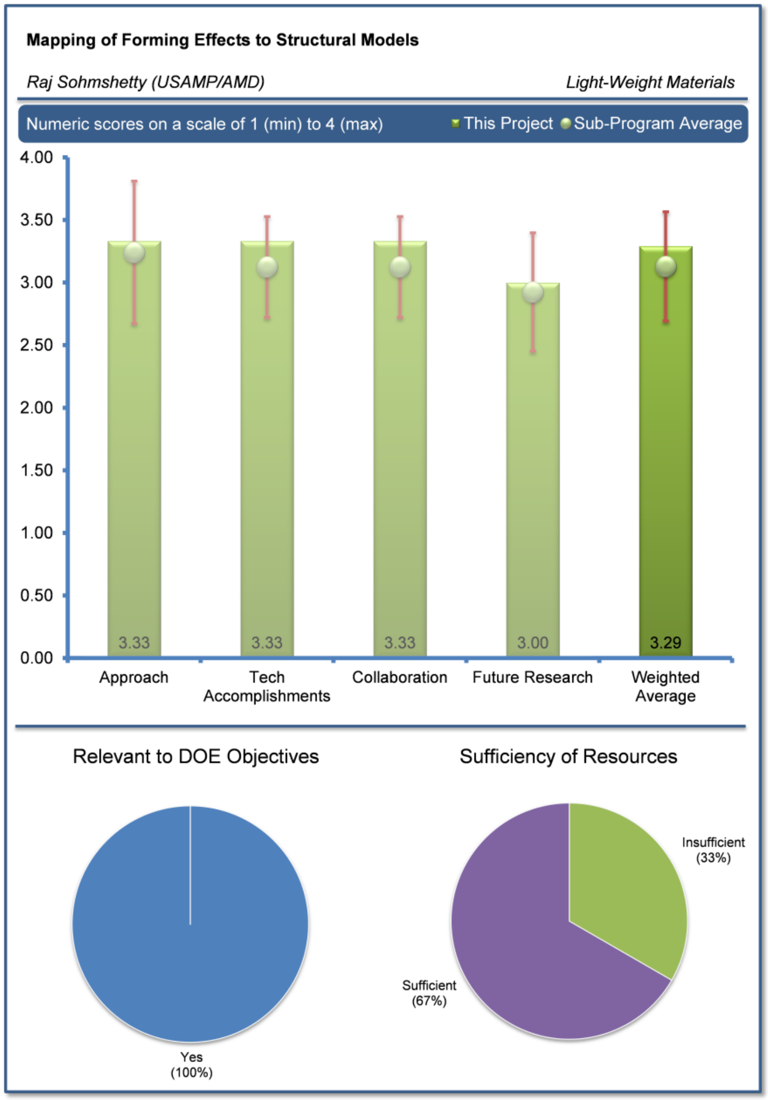
Question 5: Has the project effectively planned its future work in a logical manner by incorporating appropriate decision points, considering barriers to the realization of the proposed technology, and, when sensible, mitigating risk by providing alternate development pathways?

Future work being conducted with non-Federal funding is an excellent metric for successful technology transfer, said one reviewer. The second said the work should be continued and extended.

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

Two reviewers considered that resources were sufficient. One reviewer deemed project resources to have been excessive. This reviewer expressed the view that it is strange that AHSS modeling was better funded than AHSS stamping; it should be the other way around as then the modeling will be significantly better and more important for the user.

Mapping of Forming Effects to Structural Models: Raj Sohmshetty (USAMP/AMD) – lm065



Reviewer Sample Size

This project was reviewed by three reviewers.

Question 1: Does this project support the overall DOE objectives? Why or why not?

A reviewer affirmed that since the project objectives target greater implementation of AHSS, which supports the lightweighting mission and thus improves fuel economy and displaces petroleum, it supports the DOE goal.

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

A reviewer termed the approach good, taking into account the small amount of funding. This reviewer expressed the hope that this is preliminary work. A second reviewer described the approach as aiming to better understand the effect of stamping on component properties of existing materials and to use that information during modeling to improve design efficiency and reduce the validation time to implementation. The third reviewer found it difficult to extract from the presentation the information needed to assess this aspect of the project.

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

A reviewer said including forming effects seems like a low-burden way to get enhanced performance, and called this a good case study looking at a specific performance metric (crash) and offering a good return on investment for DOE.

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

This project, said one reviewer, included a key contributor from major OEMs, material suppliers, and a software designer. A second reviewer discerned little information in the presentation on who did what.

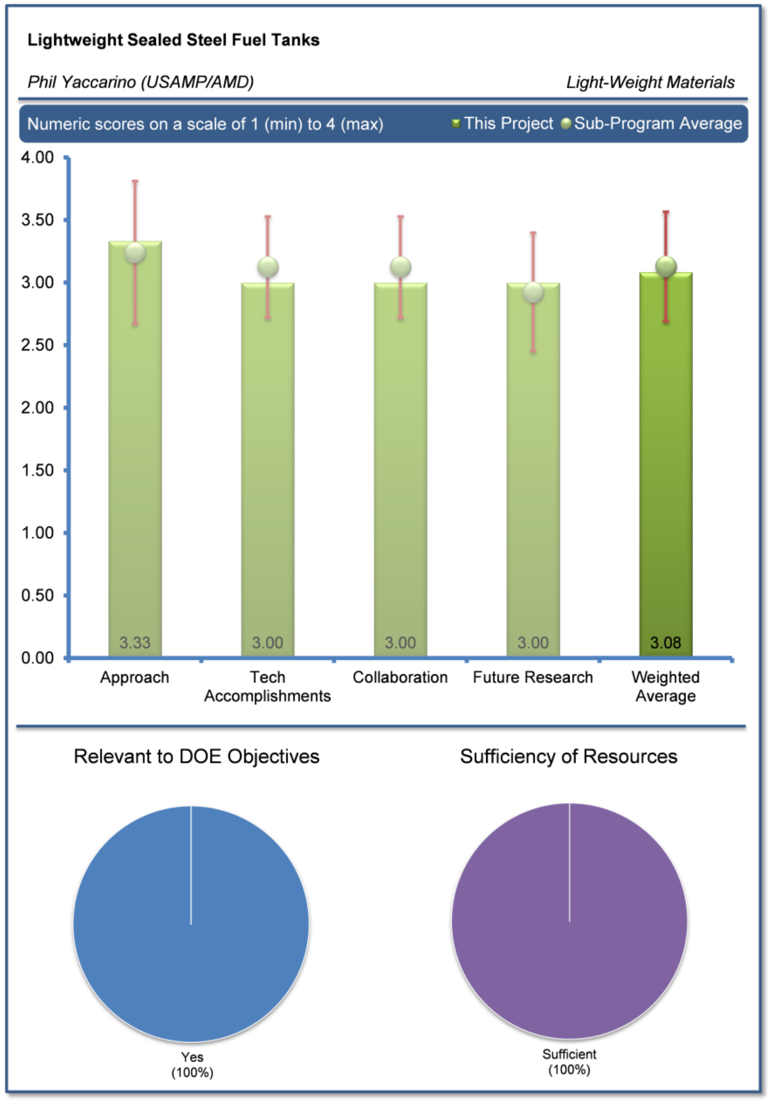
Question 5: Has the project effectively planned its future work in a logical manner by incorporating appropriate decision points, considering barriers to the realization of the proposed technology, and, when sensible, mitigating risk by providing alternate development pathways?

The significance of the research, in the estimation of the one reviewer, will depend on funding.

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

One reviewer was of opinion resources are insufficient, and commented that resources are clearly insufficient. Two reviewers thought the resources were sufficient.

Lightweight Sealed Steel Fuel Tanks: Phil Yaccarino (USAMP/AMD) – lm066



Reviewer Sample Size

This project was reviewed by three reviewers.

Question 1: Does this project support the overall DOE objectives? Why or why not?

One reviewer found the project support's DOE's goals, and commented that the project objectives target implementation of AHSS and/or stainless steel, furthering the lightweighting mission which improves fuel economy and thus aids in displacing petroleum. Another reviewer remarked this sure looks like ordinary, fairly easy development work that the company should be doing.

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

One reviewer commented that the team employed a well-organized and systematic design approach to evaluate new materials/design features and compared against the design baseline.

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

The design results showed a 30%-40% weight savings by implementing this material and design features relative to the baseline, noted one reviewer.

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

This project included a key contributor from major OEMs, material suppliers, and Tier 1 design contractors, said one reviewer.

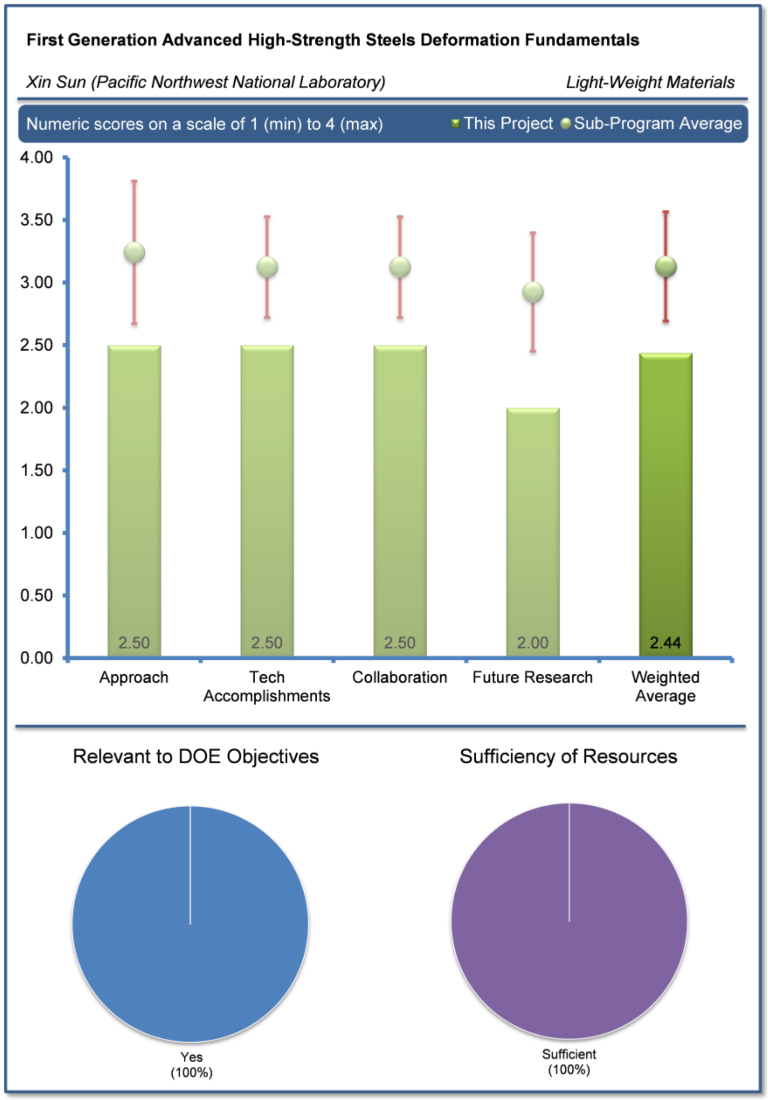
Question 5: Has the project effectively planned its future work in a logical manner by incorporating appropriate decision points, considering barriers to the realization of the proposed technology, and, when sensible, mitigating risk by providing alternate development pathways?

There were no comments submitted.

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

Reviewers deemed resources sufficient.

First Generation Advanced High-Strength Steels Deformation Fundamentals: Xin Sun (Pacific Northwest National Laboratory) – lm067



Reviewer Sample Size

This project was reviewed by two reviewers.

Question 1: Does this project support the overall DOE objectives? Why or why not?

One reviewer noted that understanding what is controlling sudden fracture in AHSS, now that the stresses are high enough that we are fracturing constituents instead of failing by ductile fracture, is critical to this class of materials moving forward in automotive lightweighting. The other reviewer commented the project concerned lightweighting with AHSS.

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

Both reviewers' comments faulted the approach. One noted that a key part of the analysis that is missing is any way or intention of measuring the strength of interphase boundaries: ferrite/martensite, martensite/austenite, etc. These may turn out to be the key weak link in these steels. The second cited the project's challenging objective, but believed it was unclear that the approach is well thought out.

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

While recognizing the effort that had been exerted, the reviewers did not discern significant progress. One said not much real progress, and the project did not get too into the microstructures, but relied instead on macro measurements. The other reviewer said significant effort, but not conclusive results.

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

One reviewer cited the need to list the names of industrial participants so that findings can be shared with industry. Another reviewer commented mostly looky-loos.

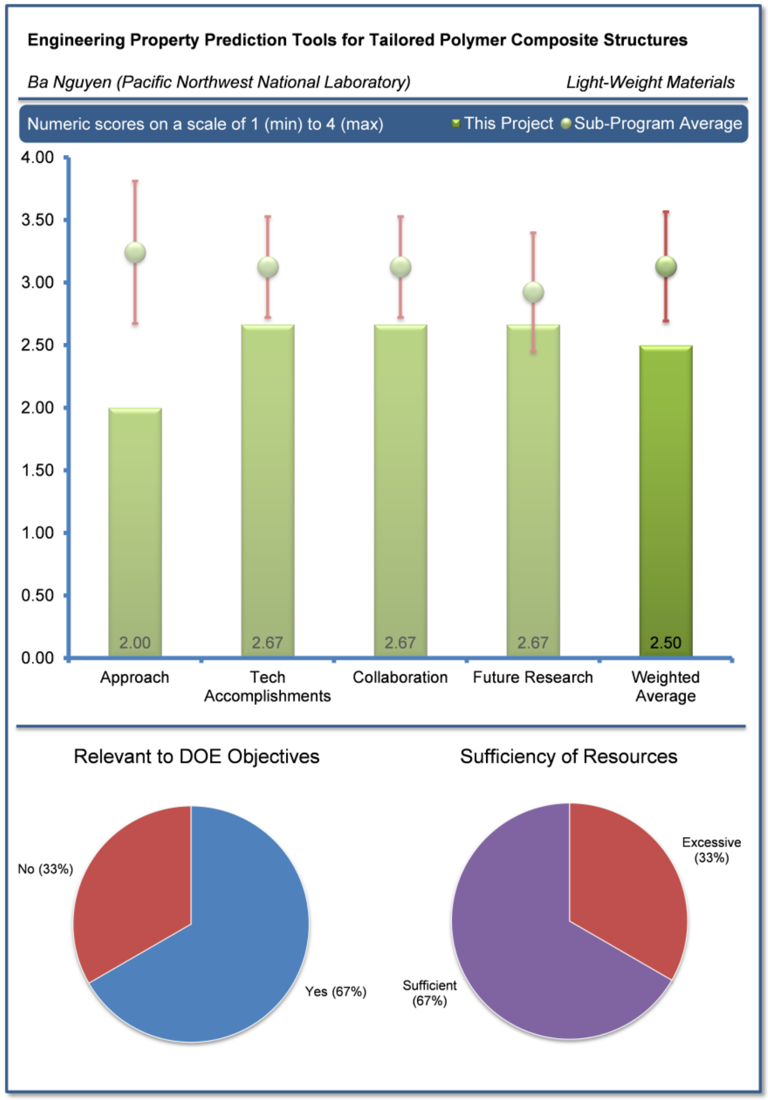
Question 5: Has the project effectively planned its future work in a logical manner by incorporating appropriate decision points, considering barriers to the realization of the proposed technology, and, when sensible, mitigating risk by providing alternate development pathways?

One reviewer was unsure if the proposed plan can achieve the project objective.

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

Two reviewers found project resources sufficient. Neither commented further.

Engineering Property Prediction Tools for Tailored Polymer Composite Structures: Ba Nguyen (Pacific Northwest National Laboratory) – lm068



Reviewer Sample Size

This project was reviewed by three reviewers.

Question 1: Does this project support the overall DOE objectives? Why or why not?

One reviewer said lightweighting of vehicles depends on effective use of many materials, including polymer composites. It is necessary to predict the performance of these materials under stress before producing components. The project is aimed at developing preliminary models to predict the properties. This is an enabler for the use of composite materials in vehicle structures. The second reviewer disagreed explicitly, commenting this project does not support the DOE goal of petroleum displacement. Even if the project is wildly successful, the opportunity to reduce part thickness is minimal with the long fiber thermoplastics (LFT) 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 called the problem well defined and said the approach is planned. However, it should be mentioned that the effort is preliminary; continued development is necessary to understand the problem. The fiber distribution and its impact on properties are well understood and this project is trying to develop some predictive models so that the issue can be quantified. The second reviewer felt there was little discussion of the approach. It appears, this reviewer said, that the approach is limited to MoldFlow computational fluid dynamics (CFD) predictions and using the typical distribution statistics to estimate properties. There is no discussion of any feedback loop for mold design. The flow in a center-gated panel is not particularly difficult to calculate, or to guess, for that matter.

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

Reviewers had mixed responses. In the view of one commenter, the results are good. However, this reviewer continued, more rigorous analysis is required. For example, the prediction of cracking at particular locations in the test plate has been confirmed, but more analysis is needed to predict the properties in other locations. This reviewer also asked if it is possible to predict how the process can be modified to achieve certain properties. The second reviewer concurred in part, saying progress for the last year had not been clearly reported. Flow simulation and property prediction are limited to simple samples. More complex parts are needed to validate the models developed. The third reviewer cited apparent project shortcomings. The predictions of stress-strain response are outside the scatter band of the five experiments, this reviewer noted, concluding that if, after six years, this is the best the technology can predict for a center-gated panel, it would have been better just to use the handbook properties with an appropriate safety factor. Since the two sets of experiments showed that the stress-strain behavior is almost isotropic, this reviewer questioned the necessity of this effort.

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

Reviewers spoke favorably of project collaboration. One noted that inputs from the OEM had been obtained and involvement of the team from USAMP is valuable. The second cited good collaboration with partners in industry.

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 project is complete, one reviewer noted, but the investigators have provided the future path and issues that need to be investigated. The second reviewer deemed the proposed future work – to move from a center-gated flat plaque to a three-dimensional, multi-faceted part to provide a more interesting validation – to be the proper next step. However, given the nearly isotropic stress-strain material response, the weight associated with overdesign is likely to be minimal.

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

Two reviewers called project resources sufficient. One deemed resources excessive. This reviewer said resources appear excessive for this project. The costs for parts are from the partners and the costs for computer modeling and testing should not be this high.

Section Acronyms

The following list of Acronyms cited within this section is provided as a reference for readers.

Acronym	Definition
3-DEP	Three Dimensional Engineered Preform
AHSS	Advanced High Strength Steel
Al	Aluminum
AZ31	A Magnesium alloy
C	Degrees Celsius
CF	Carbon Fiber
CFD	Computational Fluid Dynamics
CO2	Carbon Dioxide
DOE	Department of Energy
EV	Electric Vehicle
FEA	Finite Element Analysis
FFRL	Fatigue and Fracture Research Laboratory
FOA	Funding Opportunity Announcement
FY	Fiscal Year
GATE	Graduate Automotive Technology Education
GHG	Greenhouse Gases
HSLA	High Strength Low Alloy Steel
HTML	High Temperature Materials Laboratory
ICE	Internal Combustion Engine
ICME	Integrated Computational Material Engineering
IIHS	Insurance Institute for Highway Safety
IR	Infrared
IRS	Internal Revenue Service
ksi	Thousand pounds per Square Inch
LFT	Long Fiber Thermoplastics
MENA	Magnesium Electron North America
MFERD	Magnesium Front End Research and Development
Mg	Magnesium
MGI	Materials Genome Initiative
MIT	Massachusetts Institute of Technology
MMLV	Multi-Material Lightweight Vehicle
MOxST	Metal Oxygen Separation Technologies, Inc.
msi	Million Pounds per Square Inch
MSRP	Manufacturer Suggested Retail Price
MSU	Michigan State University
MSU	Mississippi State University
NDE	Non-Destructive Evaluation
OEM	Original Equipment Manufacturer

Acronym	Definition
ORNL	Oak Ridge National Laboratory
PACCAR	Commercial Vehicle Manufacturer (Kenworth, Peterbilt, DAF)
PAN	Polyacrylonitrile
PE	Polyethylene
PI	Principal Investigator
PNNL	Pacific Northwest National Laboratory
POL	Pilot Oxidation Line
R&D	Research and Development
RE	Rare Earth
RSW	Resistance Spot Welding
SMC	Sheet Molding Compound
SOM	Solid Oxygen Ion Membrane
TCM	Technical Cost Modeling
UCSD	University of California San Diego
UPA	Unit Production per Annum
USAMP	U.S. Automotive Materials Partnership
VEHMA	Vehma International
VTP	Vehicle Technologies Program

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