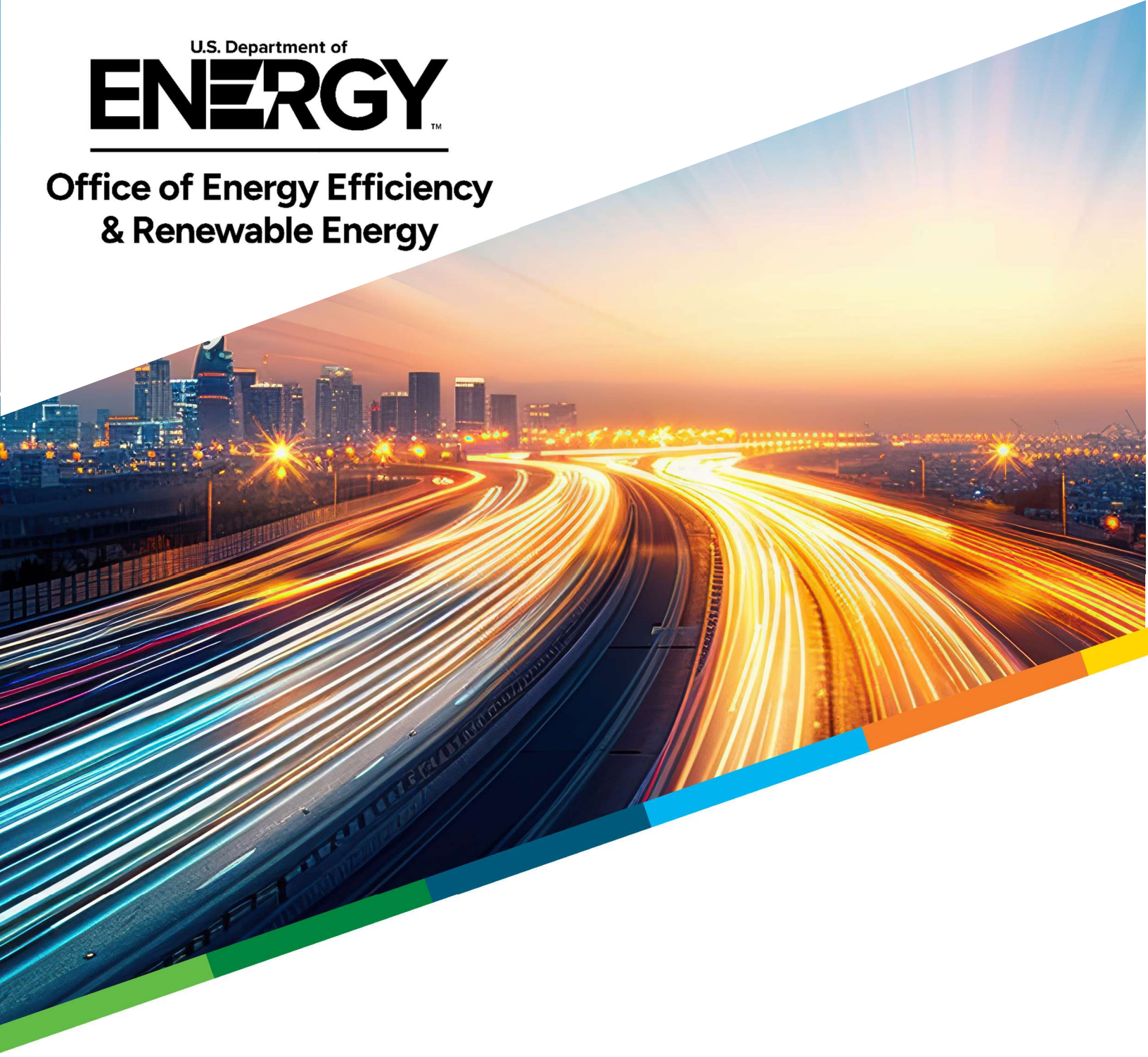
U.S. Department of ENERGY

Office of Energy Efficiency & Renewable Energy



2024 Annual Merit Review Vehicle Technologies Office

Results Report

January 2025

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Disclaimer

Introduction

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Introduction

The 2024 U.S. Department of Energy (DOE), Office of Energy Efficiency and Renewable Energy's (EERE) Vehicle Technologies Office (VTO) Annual Merit Review (AMR) was held June 3-6, 2024, in Arlington, Virginia. The review encompassed work done by VTO: 226 individual activities were reviewed by 218 reviewers. Exactly 888 individual review responses were received for the VTO technical reviews. Each project was reviewed by 2–7 independent reviewers, with a majority of projects having 4–5 reviewers.

The objective of the meeting was to review the accomplishments and plans for VTO over the previous 12 months, and provide an opportunity for industry, government, and academia to give inputs to DOE with a structured and formal methodology. The meeting also provided attendees with a forum for interaction and technology information transfer. VTO technology managers and leadership use the peer review results to inform their oversight of the project and to inform future investments. Project leads receive reviewer scores and comments and are expected to address these comments in their future peer review presentations.

The peer review process followed the guidelines of the Peer Review Guide developed by EERE. Each activity is reviewed every three years, at a minimum. However, VTO strives to have every activity reviewed every other year. The reviewers for the technical sessions were drawn from a wide variety of backgrounds, including current and former vehicle industry members, academia, government, and other expertise areas. Each reviewer was screened for conflicts of interest as prescribed by the Peer Review Guide.

Reviewers provided qualitative and quantitative feedback on VTO projects evaluated during the AMR. Qualitatively, reviewers offered written comments in response to a series of specific project evaluation questions. Quantitatively, reviewers provided numeric assessments for each of the same questions. These scores were organized and analyzed on both a project-level and subprogram-level basis. Tables summarizing the average numeric score for each question, with 4.0 being the highest possible score, by VTO subprogram portfolio are presented below.

Table I-1. Average Project Scores, By VTO Research & Development Subprogram

VTO Subprogram	Approach	Technical Accomplishments	Collaboration	Future Research	Weighted Average
Battery R&D (BAT)	3.43	3.41	3.54	3.33	**3.42**
Electrification (ELT)	3.33	3.32	3.33	3.18	**3.31**
Decarbonization of Off-Road, Rail, Marine, and Aviation (DORMA)	3.39	3.38	3.36	3.26	**3.37**
Energy Efficient Mobility Systems (EEMS)	3.29	3.33	3.36	3.19	**3.34**
Materials Technology (MAT)	3.36	3.38	3.28	3.12	**3.34**
Vehicle Analysis (VAN)	3.36	3.38	3.37	3.44	**3.38**

Table I-2. Average Project Scores, By VTO Technology Integration Subprogram

VTO Subprogram	Objectives	Approach	Accomplishments	Collaboration	Energy Equity/ Environmental Justice	Weighted Average
Technology Integration (TI)	3.51	3.36	3.20	3.45	3.29	**3.33**

Evaluation Criteria—Research & Development Subprograms

In the technical research and development (R&D) subprogram sessions, reviewers were asked to respond to a series of specific questions regarding the breadth, depth, and appropriateness of the VTO R&D activities. The technical questions are listed below, along with appropriate scoring metrics. These questions were used for all formal VTO R&D project reviews.

Question 1: Approach to performing the work—How would you rate the degree to which technical barriers are addressed? Is the project well designed, and is the timeline reasonably planned? (Scoring weight for overall average = 25%)

4.0=Outstanding. Sharply focused on critical barriers; difficult to improve significantly.

3.5=Excellent. Effective; contributes to overcoming most barriers.

3.0=Good. Generally effective but could be improved; contributes to overcoming some barriers.

2.5=Satisfactory. Has some weaknesses; contributes to overcoming some barriers.

2.0=Fair. Has significant weaknesses; may have some impact on overcoming barriers.

1.5=Poor. Minimally responsive to project objectives; unlikely to contribute to overcoming the barriers.

1.0=Unsatisfactory. Not responsive to project objectives; unlikely to contribute to overcoming the barriers.

Question 2: Technical Accomplishments and Progress—How would you rate the technical progress that has been made compared to the project plan? (Scoring weight for overall average = 50%)

4.0=Outstanding. Sharply focused on critical barriers; difficult to improve significantly.

3.5=Excellent. Effective; contributes to overcoming most barriers.

3.0=Good. Generally effective but could be improved; contributes to overcoming some barriers.

2.5=Satisfactory. Has some weaknesses; contributes to overcoming some barriers.

2.0=Fair. Has significant weaknesses; may have some impact on overcoming barriers.

1.5=Poor. Minimally responsive to project objectives; unlikely to contribute to overcoming the barriers.

1.0=Unsatisfactory. Not responsive to project objectives; unlikely to contribute to overcoming the barriers.

Question 3: Collaboration and Coordination Across Project Team—How would you rate the collaboration within the project team? Are there specific contributions made by industry,

national laboratories, or other external entities? Are there areas where more collaboration is needed? (Scoring weight for overall average = 12.5%)

4.0=Outstanding. Close, appropriate collaboration with other institutions; partners are full participants and well-coordinated.

3.5=Excellent. Good collaboration; partners participate and are well-coordinated.

3.0=Good. Collaboration exists; partners are well-coordinated.

2.5=Satisfactory. Some collaboration exists; coordination between partners could be significantly improved.

2.0=Fair. A little collaboration exists; coordination between partners could be significantly improved.

1.5=Poor. Most work is done at the sponsoring organization with little outside collaboration; little or no apparent coordination with partners.

1.0=Unsatisfactory. No apparent coordination with partners.

Question 4: Proposed Future Research—How would you rate the proposed future research? Has the project clearly defined a purpose for future work? To what extent will future work likely achieve its targets? (Scoring weight for overall average = 12.5%)

4.0=Outstanding. Purpose of future work and likelihood of achieving future work targets clearly stated.

3.5=Excellent. Effective; contributes to overcoming most barriers.

3.0=Good. Generally effective but could be improved; contributes to overcoming some barriers.

2.5=Satisfactory. Has some weaknesses; contributes to overcoming some barriers.

2.0=Fair. Has significant weaknesses; may have some impact on overcoming barriers.

1.5=Poor. Minimally responsive to project objectives; unlikely to contribute to overcoming the barriers.

1.0=Unsatisfactory. Not responsive to project objectives; unlikely to contribute to overcoming the barriers.

Question 5: Relevance—Is the project relevant? Does the project support the overall VTO subprogram objectives? (Did not factor into overall weighted average numeric score)

Yes

No.

Question 6: Resources—How would you rate the resources of the project? Are the resources sufficient for the project to achieve the stated milestones in a timely fashion? Did not factor into overall weighted average numeric score)

Excessive

Sufficient

Insufficient.

Evaluation Criteria—Technology Integration Subprogram

Reviewers for the Technology Integration (TI) technical session answered questions tailored to TI's 2024 AMR focus on improving fuel diversity, use of domestic fuel sources, reducing transportation

energy costs for businesses and consumers, and enabling energy resiliency with affordable alternatives to conventional fuels that may face unusually high demand in emergency situations. These technical questions are listed below, along with appropriate scoring metrics.

Question 1. Project Objectives— How would you rate this project's degree of support for the overall Technology Integration (TI) objectives of improving fuel diversity, increasing local resiliency, and reducing greenhouse gas emissions through increasing alternative fuel use and transportation efficiency? (Scoring weight for overall average = 20%)

4.0=Outstanding. Project Objectives are sharply focused on supporting DOE/VTO/TI objectives. The project has a direct and substantial impact upon addressing barriers; difficult to improve project objectives significantly.

3.5=Excellent. Project objectives are effective and substantially support DOE/VTO/TI objectives; project addresses a significant number of barriers; effectively contributes to program objectives.

3.0=Good. Project objectives are generally effective and support DOE/VTO/TI objectives but could be improved; project addresses some barriers; contributes to program objectives.

2.5=Satisfactory. Project objectives have some weaknesses and support DOE/VTO/TI objectives; project addresses some barriers; project may have some impact in achieving program objectives.

2.0=Fair. Project objectives have significant weaknesses and minimally support DOE/VTO/TI objectives; project addresses few barriers; project may have a small impact on achieving program objectives.

1.5=Poor. Project objectives are minimally responsive to DOE/VTO/TI objectives; project does not address barriers; project is unlikely to contribute materially to achieving program objectives.

1.0=Unsatisfactory. Project objectives are not responsive to DOE/VTO/TI objectives project fails to address any barriers; project is highly unlikely to contribute materially to achieving program objectives.

Question 2. Project Approach— How would you rate this project's approach for integrating advanced transportation technologies and practices to solve real-world challenges? (Scoring weight for overall average = 20%)

4.0=Outstanding. Project approach is sharply focused on achieving project objectives; difficult to improve project approach significantly.

3.5=Excellent. Effective; project approach contributes to achieving the majority of project Objectives.

3.0=Good. Generally effective but project approach could be improved; contributes to achieving some of the project objectives.

2.5=Satisfactory. Has some weaknesses; project approach contributes to achieving some project objectives.

2.0=Fair. Has significant weaknesses; project approach may have some impact on achieving project objectives.

1.5=Poor. Minimally responsive to project objectives; project approach is unlikely to contribute to achieving project objectives.

1.0=Unsatisfactory. Not responsive to project objectives; project approach is highly unlikely to contribute to achieving project objectives.

Question 3. Project Accomplishments and Progress—How would you rate the project's progress and significant accomplishments to date? (Scoring weight for overall average = 40%)

4.0=Outstanding. Project demonstrates significant accomplishments; strong progress toward achieving both project and VTO-TI objectives; difficult to improve progress significantly.

3.5=Excellent. Project demonstrates many accomplishments; very effective progress toward achieving overall project objectives and VTO-TI goals.

3.0=Good. Project accomplishments are generally effective; progress is on schedule to contribute to some project objectives and VTO-TI goals.

2.5=Satisfactory. Project has some accomplishments, but also displays some weaknesses; progress could be improved; contributes to some project objectives and VTO-TI goals.

2.0=Fair. Project has few accomplishments and demonstrates significant weaknesses; rate of progress is slow; minimal contribution to project objectives or VTO-TI goals.

1.5=Poor. Minimal demonstration of accomplishments; progress is significantly behind schedule; unlikely to contribute to project objectives or VTO-TI goals.

1.0=Unsatisfactory. Project demonstrates no accomplishments; limited or no demonstrated progress; not responsive to project objectives.

Question 4. Collaboration and Coordination Among Project Team—How would you rate the level of collaboration within the project team and the degree to which the project team has identified and leveraged the proper connections to achieve its project goals? (Scoring weight for overall average = 10%)

4.0=Outstanding. Sharply focused on collaboration among project team members; team is well-suited to effectively carry out the work of the project and have strong working relationships; no notable weaknesses.

3.5=Excellent. Effective; team members meaningfully contribute to carrying out the work of the project, are well-suited to effectively carry out the work and have excellent working relationships.

3.0=Good. Generally effective but could be improved; collaboration exists; team members are fairly well-suited to project work and have good working relationships.

2.5=Satisfactory. Has some weaknesses; collaboration among team members is satisfactory for carrying out the work of the project; project partnerships, team members and working relationships could be improved.

2.0=Fair. Has significant weaknesses; little collaboration exists and team lacks effective working relationships.

1.5=Poor. Minimally responsive; little collaboration exists and team lacks effective working relationships.

1.0=Unsatisfactory. Little or no apparent collaboration between team members; project team is lacking critical expertise to effectively carry out the work of the project.

Question 5. Energy Equity and Environmental Justice Project Contribution—How would you rate the contribution of this project to energy equity and environmental justice by ensuring

the project benefits underserved and overburdened communities and does not cause increased burdens to these communities? (Scoring Weight for overall average = 10%)

4.0=Outstanding. Project maximizes the benefits to underserved and overburdened communities and incorporates affected communities in the planning and execution of the project.

3.5=Excellent. Project maximizes the benefits to underserved and overburdened communities and includes some collaboration with affected communities.

3.0=Good. Project will have significant benefits to underserved and overburdened communities.

2.5=Satisfactory. Project will have some benefits to underserved and overburdened communities.

2.0=Fair. Project does not benefit or burden underserved and overburdened communities.

1.5=Poor. Project will have some benefits to underserved and overburdened communities while also causing increased burdens to underserved and overburdened communities.

1.0=Unsatisfactory. Project has no benefits to underserved and overburdened communities while also causing increased burdens to underserved and overburdened communities.

Project Scoring

R&D Subprogram Projects

For R&D subprogram sessions, reviewers were asked to provide numeric scores (on a scale of 1.0-4.0 in one-half point increments, as indicated above) for Question 1 through Question 4 of each formally reviewed activity. For each reviewed project, the individual reviewer scores for Question 1 through Question 4 were averaged to provide information on the project's question-by-question scoring. Scores for each of these four criteria were weighted using the formula below to create a Weighted Average for each project. This allows a project's question-by-question and final overall scores to be meaningfully compared against another project:

Weighted Average* = [Question 1 Score x 0.25] + [Question 2 Score x 0.50] +

[Question 3 Score x 0.125] + [Question 4 Score x 0.125]

**R&D subprogram Questions 5 and 6 were not factored in the Weighted Average Score calculation because their scoring scales were incompatible with Questions 1 through 4.*

Each reviewed activity has a corresponding bar chart representing that project's average scores for each of the four designated criteria. As demonstrated in Figure 1, a bullet and error line are included within the green bars representing the corresponding average and standard deviation of criteria scores for all of the reviewed projects in the same subprogram.

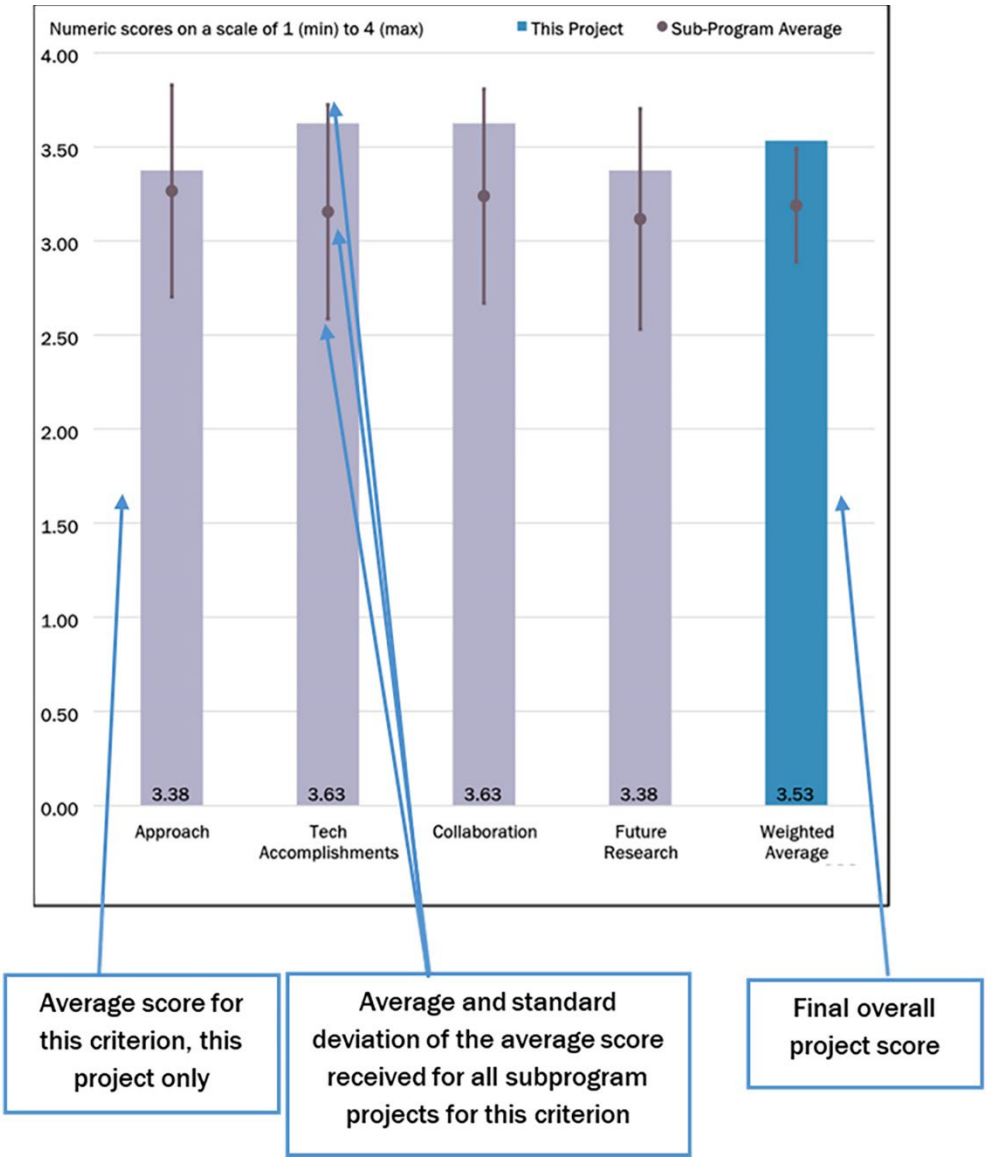

Figure 1. Sample Question 1 through Question 4 score averages, standard deviations, and overall Weighted Average for an R&D subprogram project

Reviewers were also asked to evaluate a given project's relevance and funding through Question 5 and Question 6, which were each scored on a different scale than Question 1 through Question 4. For the R&D subprogram sessions, while Question 1 through Question 4 were rated on a 1.0 to 4.0 scale in one-half point increments, Question 5 was rated on a yes or no scale, and Question 6 was rated on an excessive, sufficient, or insufficient scale. Consequently, Question 5 and Question 6 results were excluded from the Weighted Average calculation (as shown above) because the scoring scales are incompatible.

TI Subprogram Projects

For the TI subprogram session, reviewers were asked to provide numeric scores (on a scale of 1.0-4.0 in one-half point increments, as indicated above) for Question 1 through Question 5 of each formally reviewed activity. For each reviewed project, the individual reviewer scores for Question 1 through Question 5 were averaged to provide information on the project's question-by-question

scoring. Scores for each of these five criteria were weighted using the formula below to create a Weighted Average for each project. This allows a project's question-by-question and final overall scores to be meaningfully compared against another project:

Weighted Average = [Question 1 Score x 0.20] + [Question 2 Score x 0.20] + [Question 3 Score x 0.40] + [Question 4 Score x 0.10] + [Question 5 Score x 0.10]

Each reviewed TI activity has a corresponding bar chart representing that project's average scores for each of the five designated criteria. As demonstrated in Figure 2, a bullet and error line are included within the green bars representing the corresponding average and standard deviation of criteria scores for all of the reviewed projects in the same subprogram.

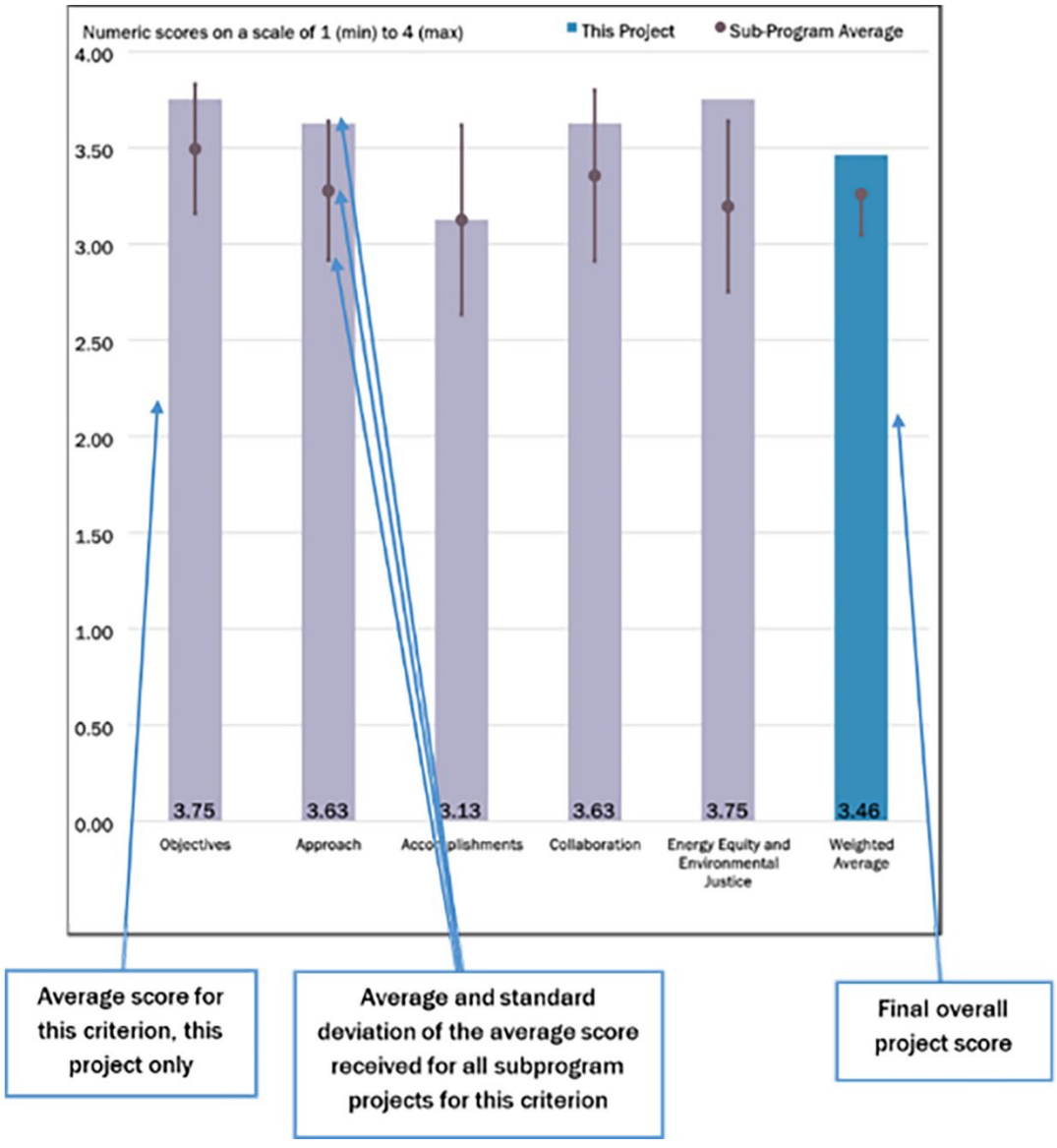

Figure 2. Sample Question 1 through Question 5 score averages, standard deviations, and overall Weighted Average for a TI subprogram project

Reviewer Responses

Text responses and numeric scores to the questions were submitted electronically through a web-based software application, PeerNet, operated by Oak Ridge Associated Universities (ORAU). Database outputs from this software application were analyzed and summarized to collate the multiple-choice, text comments, and numeric scoring responses and produce the summary report.

Responses to the questions are summarized in this report, with summaries of numeric scores for each technical session, as well as text and graphical summaries of the responses for each individual technical activity. For each project, the reviewer sample size is identified.

Each reviewed activity is identified by Presentation Number, followed by the Presentation Title, the Principal Investigator (PI), and the PI's organization. For each subprogram area, reviewed activities are ordered numerically by project number. Figure 3, below, provides an example project title.

Presentation Number: DORMA020

Presentation Title: Sustainable Aviation Fuel (SAF) Contrail Modeling

Principal Investigator: Matt McNenly (Lawrence Livermore National Laboratory)

Figure 3. Sample project title with Presentation ID, Presentation Title, PI, and PI organization

For each project, in addition to the PI, the presenter at the AMR is identified, along with the reviewer sample size. For some projects, the presenter at the AMR was a project team member rather than the PI.

Individual reviewer comments for each question are identified under the heading Reviewer 1, Reviewer 2, etc. Note that for each question the order of reviewer comments may be different; for example, for each specific project the reviewer identified as Reviewer 1 in the first question may not be Reviewer 1 in the second question, etc. Not all reviewers provided a response to each question for a given project.

The report is organized by technical subprogram area. Each technical area section includes a summary of that subprogram, a subprogram activities score summary table (and page numbers), project-specific reviewer evaluation comments with corresponding bar graphs, and a list of acronyms and abbreviations.