U.S. DEPARTMENT OF

ENERGY

Office of
**ENERGY EFFICIENCY &
RENEWABLE ENERGY**

2020 Annual Merit Review, Vehicle Technologies Office

Results Report

October 2020

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Introduction

The 2020 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 1-4, 2020, virtually, due to extenuating circumstances resulting from the global Coronavirus (COVID-19) pandemic. The review encompassed work done by VTO: 292 individual activities were reviewed by 334 reviewers. Exactly 1,133 individual review responses were received for the VTO technical reviews.

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 virtual forum for interaction and technology information transfer.

The peer review process followed the guidelines of the Peer Review Guide developed by EERE. Each activity is reviewed every 3 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, by VTO subprogram portfolio, is presented below.

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

VTO Subprogram	Approach	Technical Accomplishments	Collaborations	Future Research	Weighted Average
Advanced Combustion Engines (ACE)	3.29	3.23	3.29	3.14	3.24
Battery Technologies R&D (BAT)	3.36	3.29	3.41	3.20	3.31
Energy Efficient Mobility Systems (EEMS)	3.30	3.31	3.34	3.17	3.30
Electrification (ELT)	3.19	3.16	3.17	3.08	3.16
Fuel and Lubricant Technologies (FT)	3.36	3.45	3.47	3.31	3.41
Materials Technologies (MAT)	3.29	3.31	3.30	3.14	3.28
Vehicle Analysis (VAN)	3.46	3.43	3.34	3.25	3.40

Table 1-2 – Average Project Scores, VTO Technology Integration Subprogram

VTO Subprogram	Objectives	Approach	Accomplish-ments	Collaboration	Overall Impact	Weighted Avg.
Technology Integration (TI)	3.33	3.37	3.27	3.50	3.25	3.32

Evaluation Criteria—Research & Development Subprogram Projects

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—the degree to which technical barriers are addressed, the project is well-designed and well-planned. (Scoring weight for overall average = 20%)

- 4.0=Outstanding (sharply focused on critical barriers; difficult to improve approach 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 toward overall project goals—the degree to which progress has been made and plan is on schedule. (Scoring weight for overall average = 40%)

- 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. (Scoring weight for overall average = 10%)

- 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 fairly 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—the degree to which the project has effectively planned its future work in a logical manner by incorporating appropriate decision points, considering barriers to the realization of the proposed technology and, when sensible, mitigating risk by providing alternate development pathways. Note: if the project has ended, please state project ended. (Scoring weight for overall average = 10%)

- 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)

- N/A=Not Applicable (project has ended).

Question 5. Relevance—Does this project support the overall DOE objectives? Why or why not? (Scoring weight, not included with overall average = 20%)

- Yes

- No.

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

- Excessive

- Sufficient

- Insufficient.

Evaluation Criteria—Technology Integration Projects

Reviewers for the Technology Integration (TI) technical session answered questions tailored to TI's 2020 AMR focus on increasing transportation efficiency and fuel diversity. These technical questions are listed below, along with appropriate scoring metrics.

Question 1. Project Objectives—the degree to which the project objectives support the DOE/VTO objectives of increasing fuel diversity through the use of alternative fuels and increasing transportation efficiency. (Scoring weight for overall average = 20%)

- 4.0=Outstanding (project objectives are sharply focused on supporting DOE/VTO objectives of increasing fuel diversity through the use of alternative fuels and increasing transportation efficiency. 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 objectives; project addresses a significant number of barriers; effectively contributes to increasing fuel diversity through the use of alternative fuels and increasing transportation efficiency)

- 3.0=Good (project objectives are generally effective and support DOE/VTO objectives, but could be improved; project addresses some barriers; contributes to increasing fuel diversity through the use of alternative fuels and increasing transportation efficiency)

- 2.5=Satisfactory (project objectives have some weaknesses and support DOE/VTO objectives; project addresses some barriers; project may have some impact contributing to increasing fuel diversity through the use of alternative fuels and increasing transportation efficiency)

- 2.0=Fair (project objectives have significant weaknesses and minimally support DOE/VTO objectives; project addresses few barriers; project may have a small impact contributing to increasing fuel diversity through the use of alternative fuels and increasing transportation efficiency)

- 1.5=Poor (project objectives are minimally responsive to DOE/VTO objectives; project does not address barriers; project is unlikely to contribute to increasing fuel diversity through the use of alternative fuels and increasing transportation efficiency)

- 1.0=Unsatisfactory (project objectives are not responsive to DOE/VTO objectives; project fails to address any barriers; project is highly unlikely to contribute to increasing fuel diversity through the use of alternative fuels and increasing transportation efficiency).

Question 2. Project Approach to supporting the integration of advanced transportation technologies and practices to support overall project objectives—the degree to which the project is well-designed, feasible, and aligned with other efforts. (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 toward overall project and DOE objectives and goals—the degree to which progress/significant accomplishments have been achieved, measured against performance indicators and demonstrated progress toward project objectives and DOE goals. (Scoring weight for overall average = 40%)

- 4.0=Outstanding (project demonstrates significant accomplishments; strong progress toward achieving both project and DOE objectives; difficult to improve progress significantly)

- 3.5=Excellent (project demonstrates many accomplishments; very effective progress toward achieving overall project objectives and DOE goals)

- 3.0=Good (project accomplishments are generally effective; progress is on schedule to contribute to some project objectives and DOE goals)

- 2.5=Satisfactory (project has some accomplishments, but also displays some weaknesses; progress could be improved; contributes to some project objectives and DOE goals)

- 2.0=Fair (project has few accomplishments and demonstrates significant weaknesses; rate of progress is slow; minimal contribution to project objectives or DOE goals)

- 1.5=Poor (minimal demonstration of accomplishments; progress is significantly behind schedule; unlikely to contribute to project objectives or DOE 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—the degree to which the appropriate team members and partners are involved in the project work and the effectiveness of the collaboration between and among partners. (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 perform 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 could be improved)

- 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. Overall Impact—the degree to which the project has already contributed, as well as the potential to continue to contribute in the future, to increasing fuel diversity through the use of alternative fuels and increasing transportation efficiency. (Scoring Weight for overall average = 10%).

- 4.0=Outstanding (sharply focused on critical barriers to achieving project objectives; difficult to improve significantly)

- 3.5=Excellent (effective; contributes to overcoming most barriers to achieving project objectives)

- 3.0=Good (generally effective in overcoming barriers to achieving project objectives)

- 2.5=Satisfactory (has some weaknesses; but needs better focus on overcoming some barriers to achieve project objectives)

- 2.0=Fair (has significant weaknesses)

- 1.5=Poor (minimally responsive)

- 1.0=Unsatisfactory (not responsive to eliminating barriers to achieving project objectives).

Question 6. Use of Resources. Are DOE resources being leveraged and funds being used wisely? Should DOE fund similar projects in the future?

- Yes

- Maybe

- No.

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 0.20] + [Question 2 Score x 0.40] +

[Question 3 Score x 0.10] + [Question 4 Score x 0.10]

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.
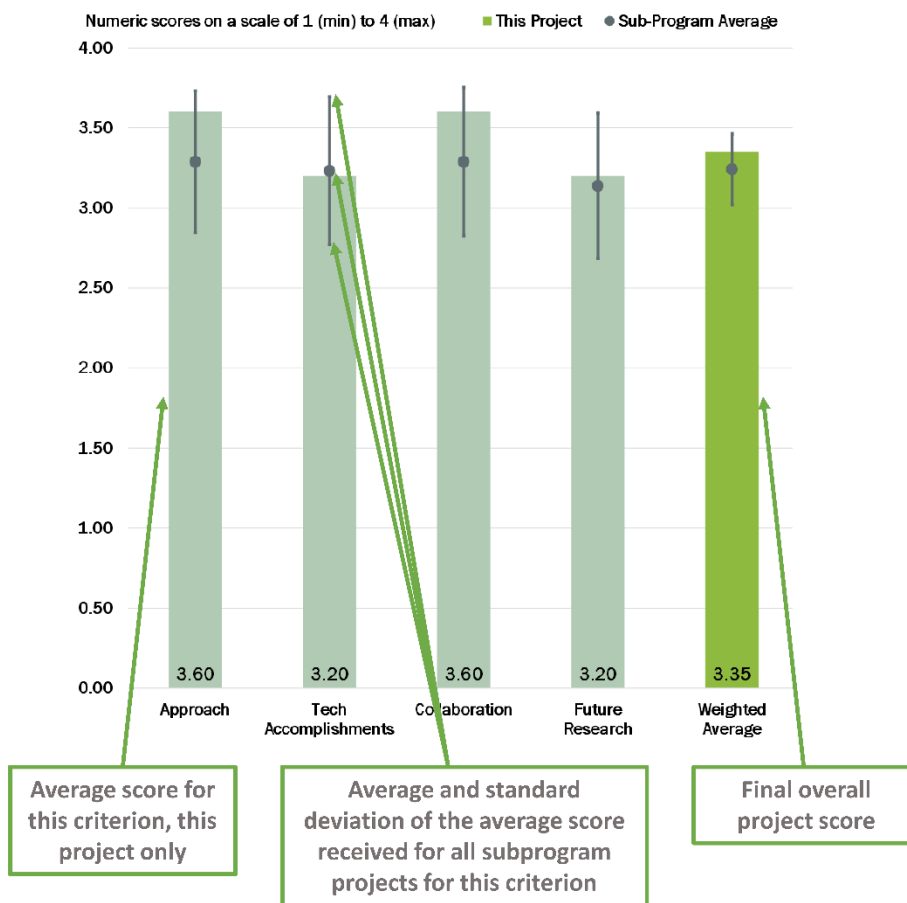

Figure 1. Sample Question 1 through Question 4 score averages, standard deviations, and Overall Weighted Average for an R&D project.

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 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.
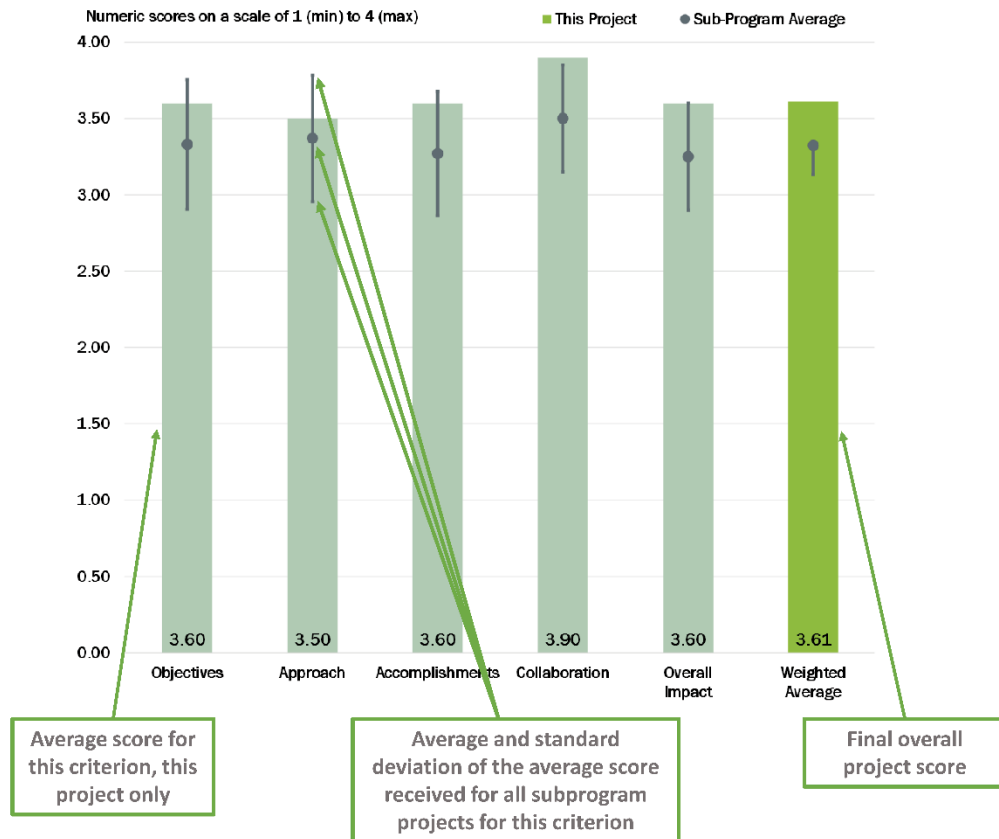

Figure 2. Sample Question 1 through Question 5 score averages, standard deviations, and overall Weighted Average for a TI subprogram project.
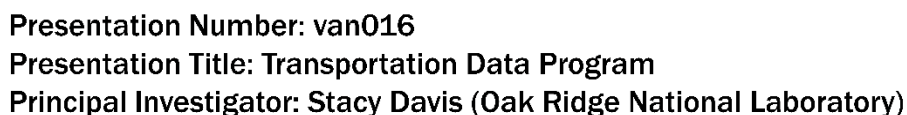
For TI projects, Question 1 through Question 5 were rated on a 1.0 to 4.0 scale in one-half point increments, whereas Question 6 was rated on a yes, maybe, or no scale. Consequently, Question 6 results were excluded from the Weighted Average calculation because the scoring scales are incompatible.

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: van016
Presentation Title: Transportation Data Program
Principal Investigator: Stacy Davis (Oak Ridge 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, reviewer feedback received specific to the subprogram overview presentation(s) given by DOE, a subprogram activities score summary table (and page numbers), and project-specific reviewer evaluation comments with corresponding bar graphs.

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